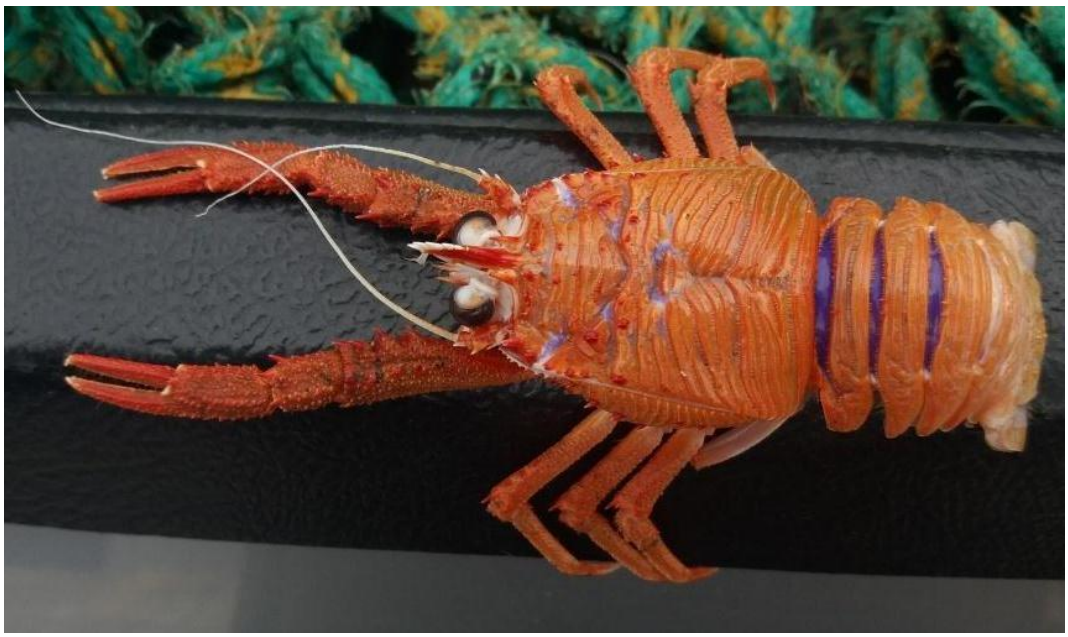
Chile Squat Lobsters and Nylon Shrimp Modified Trawl Fishery

MSC Certification Code: **MSC-F-31264**



Picture: Yellow squat lobster (*Cervimunida johni*). Credits: José Ríos

ANNOUNCEMENT COMMENT DRAFT REPORT

September 2021

Conformity Assessment Body: **Bureau Veritas Certification Holding SAS**

Conformity Assessment Body (CAB)	Bureau Veritas Certification Holding SAS
Assessment team	Edith Saa Collantes, Earl G. Dawe, José Ríos
Fishery client	Asociación de Armadores e Industriales Pesqueros Región IV (AIP)
Assessment Type	First Reassessment

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2 Glossary

Below are presented the abbreviations and acronyms used in the report. None of the terms defined here contradict the terms used in the MSC-MSCI vocabulary.

Concepts and Terms:

ACDR	(MSC) Announcement Comment Draft Report
B_{LIM}	Precautionary reference point. SSB below B_{lim} indicate increase risk of impairment of recruitment
B_{MSY}	Spawning biomass (equilibrium) when fishing at FMSY
CAB	Conformity Assessment Body (in this case the CAB is Bureau Veritas)
CAP	Client Action Plan
CBA	Aceptable Biological Quota (Cuota Biologica Aceptable). Equivalent to TAC
CoC	Chain of Custody
DA	Artisanal Landing form (Formulario de Desembarque Artesanal)
DI	Industrial Landing Form (Formulario de Desembarque Industrial)
DRI	Image Registrarion Device (Dispositivo de Registro de Imágenes)
EMS	Electronic Monitoring System (cameras on-board)
ETP	Endangered, Threatened and Protected
FCR	(MSC) Fisheries Certification Requirements
f/v	Fishing vessel
F_{LIM}	Fishing mortality which should be avoided with high probability because it is associated with unknown population dynamics or stock collapse
F_{MSY}	Fishing mortality at MSY
GFW	Global Fishing Watch
HCRs	Harvest Control Rule(s)
LGPA	Chilean General Fishing and Aquaculture Law (Ley General de Pesca y Acuicultura)
LME	Large Marine Ecosystem
LTP	Tradable Fishing Licence (Licencia Transable de Pesca)
MAP	Multi-annual Management Plan
MCS	Monitoring, Control and Surveillance
MPDC	Management Plan for Demersal Crustaceans
MSC	Marine Stewardship Council
MSY	Maximum Sustainable Yield
NGO	Non-Governmental Organization
PCR	(MSC) Public Certification Report
PI	(MSC) Performance Indicator
PRI	Point where Recruitment would be Impaired
RAE	Artisanal Extractive Regime (Regimen Artesanal de Extraccion)
SA	MSC surveillance audit
SG	(MSC) Scoring Guidepost
SSB0	Virgin Spawning Biomass
SSB_{MSY}	Spawning biomass at MSY
TAC	Total Allowable Catch. Equivalent to CBA in Chile
UoA	Unit of Assessment
UoC	Unit of Certification
UPN	Northern Fishery Unit (Unidad de Pesquería Norte). This applies for the squat lobsters fisheries
UPS	Southern Fishery Unit (Unidad de Pesquería Sur). This applies for the squat lobsters fisheries
VME	Vulnerable Marine Ecosystems
VMS	Vessel Monitoring System
ZCN	Central-North Zone (Zona Centro-Norte). This applies for the nylon shrimp fishery
ZCS	Central-South Zone (Zona Centro-Sur). This applies for the nylon shrimp fishery

Institutions, organizations, bodies and agreements:

ACAB	Agreeement on the Conservation of Albatrosses and Petrels
AIP	Artisanal and Industrial Fisheries Association from the Coquimbo Region (Asociación de Industriales y Armadores Pesqueros de la Región de Coquimbo)
ATF	Albatross Task Force
ASIPES	Insdustrial Fishers Association (Asociación de Industriales Pesqueros A.G.)
BV	Bureau Veritas
CCT-CD	Scientific Technical Committee for Demersal Crustaceans (Comité Científico de Recursos Crustaceos Demersales)
CCT-J	Scientific Technical Committee for theChilean jack mackerel fishery (Comité Científico de jurel)
CCT-RDAP	Scientific Technical Committee for Deep-water Demersal fisheries (Comité Científico de Recursos Demersales de Aguas Profundas)

CCT-RDZCS	Scientific Technical Committee for Demersal Resources Central-South Zone (Comité Científico de Recursos Demersales Zona cenrto-Sur)
CM-CD	Management Committee for Demersal Crustaceans (Comité de Manejo Crustaceos Demersales)
CM-MC	Management Committee for the Chilean hake (Comité de Manejo de Merluza comun)
CONAPACH	National confederation of artisanal fishers (Confederación Nacional de Pescadores Artesanales de Chile)
CONFEPACH	National confederetion of Artisanal Fishers' Federations (Confederación Nacional de Federaciones de Pescadores Artesanales de Chile)
FAO	Food and Agriculture Organization of the United Nations
GFW	Global Fishing Watch
IFOP	Fisheries Development Institute (Instituto de Fomento Pesquero)
INPESCA	Instituto de Investigacion pesquera Region VIII
MINECON	Ministry of Economy, Development, and Tourism (Ministerio de Economía, Fomento y Turismo)
MSC	Marine Stewardship Council
NOAA	(US) National Oceanic and Atmospheric Administration.
PUCV	Pontifical Catholic University of Valparaíso (Pontificia Universidad Católica de Valparaíso)
RSPB	(UK) Royal Society for Protection of Birds
SERNAPESCA	National Fisheries Service (Servicio Nacional de Pesca)
SPRFMO	South Pacific Regional Fisheries Organization
SUBPESCA	Undersecretariat for Fisheries (Subsecretaría de Pesca)
WWF	World Wildlife Fund
UCN	Catholic University of the North (Universidad Católica del Norte)
UdeC	University of Concepcion (Universidad de Concepción)
UN	United Nations

3 Executive summary

Draft determination to be completed at Public Comment Draft Report stage

The Association of Shipowners and Industrial Fisheries Region IV (AIP) is the owner of the certificate. Henceforth, the term client will be used to refer to this company.

This Announcement Comment Draft Report (ACDR) provides details to the client on the preliminary results of the reassessment of the Chile Squat Lobsters and Nylon Shrimp Modified Trawl Fishery against the MSC-Fisheries Standard v2.01. The reassessment process will follow the MSC Fisheries Certification Process v2.2 and using the default assessment tree (Annex SA) of the MSC Fisheries Standard, v2.01.

Bureau Veritas shall give the client an opportunity to question the team and have an issue re-examined if the client has a concern that insufficient information is available to support the team's decisions or that a decision has been made in error, in accordance with FCP7.11.3. After reviewing the ACDR, the client shall inform Bureau Veritas of its decision to either proceed to announcement of reassessment or defer announcement of reassessment. If the client proceeds to announce the reassessment of the fishery, this ACDR will be published together with the announcement that the fishery is entering its first reassessment, in accordance with FCP7.12.1. After the announcement and the publication of this ACDR, 30-day consultation period for stakeholder input will be allowed before the site visit takes place, in accordance with FCP 7.15.1.2.

This fishery was initially assessed against MSC Fisheries Certification Requirements version 1.3, and it is certified since September 13, 2016. As a result of the pandemic and subsequent Covid-19 pandemic derogation issued by the MSC on March 2020, the certificate was extended for 6 months until March 13, 2022.

This report was prepared by Bureau Veritas Certification Holding SAS. The assessment team for this fishery is comprised of Edith Saa who is mainly responsible for assessing P3, Earl Dawe who is mainly responsible for assessing P1, and José Ríos who is acting as Team Leader and his main responsibilities are on assessing P2 and ensuring compliance with the MSC fisheries certification process and standard.

The assessment team has completed this ACDR using the information provided in the Client Document Checklist, and also all previous reports from the first certificate cycle, which are available at the fishery-specific site at the MSC website: https://fisheries.msc.org/en/fisheries/chile-squat-lobsters-demersal-trawl-camanchaca-fishery/@@view.

The other overlapping fishery (the Chile squat lobsters Camanchaca demersal trawl fishery, henceforth referred as 'Camanchaca fishery' or overlapping fishery) is being reassessed by the same CAB and assessment team. The scores and timing on the conditions have been harmonised throughout the first certificate cycle. Also, preliminary outcomes for this reassessment have been applied consistently on the two overlapping fisheries.

Main strengths and weaknesses of the client's operation identified during the preliminary assessment performed for this ACDR are described below:

Strengths:

- A major strength is the design and performance of the harvest strategy (HS). The harvest strategy is well designed, consisting of multiple elements that have collectively been effective in maintaining the stocks above the PRI and fluctuating around the MSY level in recent years
- Another strength is the accurate quantification of all fishery removals from all target stocks due to 100% dockside monitoring of landings and quantification of discards through observer coverage and electronic monitoring system (EMS).
- Logbooks, VMS, EMS and the observer program on board provide detailed information on the impact of the fishery on primary, secondary and ETP species.
- Despite fisheries targeting demersal crustaceans are catching a wide range of species and taxa of cnidarians, crustaceans, echinoderms, cartilaginous fish, jawless fish and teleosts, almost the entire catch (in weight) is comprised by less than 10 species regardless of the UoA considered. Catches on all other species are negligible.
- Three main primary species were identified for the different UoAs: Chilean hake, red squat lobster UPN and UPS and yellow squat lobster UPN and UPS. All these stocks are above the PRI.
- A strategy is in place for the UoAs for managing the impact on primary, secondary and ETP species based on the plan to reduce discards and interactions in fisheries targeting demersal crustaceans which. An annual list of species subject to the discard plan s published annually by Subpesca. This list details which species can be discarded, which are subject to landing obligation and which shall be returned back to the sea. In any case, all discards shall be separated, boxed, quantified, recorded and shown to the EMS.
- There are specific regulations setting that chondrichthyes and benthic crustaceans shall be returned to the sea, and this shall be done according to specific best practices on board to reduce post-capture mortality.
- Results show that this fishery has a low rate of incidental interactions with marine mammals (only sea lions) and seabirds (7 different species impacted since 2016).
- There is specific regulation to reduce mortality on seabirds.
- The Demersal Crustacean Fishery Management Plan is under review within the Management Committee, complying with the review requirements established in the LGPA.
- Most of the vessels included in the UoCs correspond to vessels that qualify as industrial and therefore have the EMS implemented on board.
- The fishing gear design adopted in 2014 is lighter and lacks protective hard roller structures (made out of metal or hard plastic). Only protections made of buoyant net material are allowed at the bottom of the gear. This type of fishing gear could not bear the abrasion derived from being dragged on hard bottoms.
- Fisheries targeting demersal crustaceans mostly operate on mud and sand substrate areas, where bottom trawl gear disturbs organisms regenerated in relatively short time. Besides, they operate in a limited geographical area which has been trawled for a long time.
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Weaknesses:

- A major weakness is high uncertainty in the of stock status associated with uncertainty in the assessment model as well as in the fishery and survey biomass indices. Results of the assessment model may be highly uncertain or unreliable in determining the status of exploitation. The fishery and survey-based biomass indices are associated with high variability and inconsistency across years due to annual changes in catchability such that they do not represent reliable indices of trends in biomass.
- Another weakness is that the HCRs are not robust to the uncertainties in the assessment of stock status by the assessment model. The HCRs do not account for high uncertainty in stock status and there is no HCR available for cases where the assessment is not informative
- A continuous increase in spawning biomass of the Chilean hake was observed between 2013 and 2020, consistent with the increase observed in acoustic surveys. According to the latest assessment. However, the stock is overfished.
- The declaration of discarded Chilean hake might still not be 100% since the estimated catch in 2020 based on observer data doubles that from the official statistics
- The status of the three main secondary species impacted by UoA1 (hooked tooth dogfish and Aconcagua grenadier), UoA2 (hooked tooth dogfish) and UoAs6&7 (big-eyed flounder) remains unknown
- It is not clear if some of the measures included in the Discards' Plan (e.g. move-on rule, fishing ground survey) have been detailed and implemented.
- Despite the observers are recording data on the level of compliance with the measures included in the plan and in specific regulations on Chondrichthyes, benthic crustaceans or birds, there are no clear quantitative indicators on compliance.
- It has been acknowledged that the regulation to reduce mortality on seabirds has to be adapted to the specific characteristics of this fishery (the net is hauled by the side of the vessel instead of by the stern). However, it is not clear which is the current status and next steps.
- Two benthic crustaceans (the boxed armed crab and the Chilean lemon crab) are caught at levels close to the designated threshold value to be considered as 'Main'. According to specific regulation this species shall be returned to the sea. Studies on post-capture survival rate would be advisable.
- If Sernapesca does not obtain adequate funding to be able to review the image recording cameras with a smaller lag, this will undermine the discard inspection.

Draft scorings presented in this report suggest that **the fishery should pass the MSC-Fisheries certification process,** Draft scorings presented in this report suggest that **the fishery should maintain its current MSC-Fisheries certificate,** subject the progress on the conditions that remain open from previous certificate cycle

4 Report details

4.1 Authorship and peer review details

Peer reviewer information to be completed at Public Comment Draft Report stage

Jose Rios, holds a degree in Sea Sciences from the University of Vigo and an MSc in Fisheries and Aquaculture from the University of Wales-Bangor. He has more than 20 years of experience working in fisheries from different angles and places around the world. In 1999 he worked at the ICM-CSIC on trophic ecology of demersal fish species and participated in different research cruises on board the r/v Garcia del Cid. In 2001/02 he was hired by the University of Azores as observer and fisheries inspector assessing an experimental fishing license for Orange roughy. Between 2003 and 2010 he was responsible for designing and monitoring fisheries management plans for several marine resources (clams, cockles and barnacles) for the Regional Fisheries Authority of Galicia (Spain). In 2008-09 he developed and implemented a scientific monitoring scheme for an experimental octopus fishery in the waters of Namibia (IIM-CSIC). Between 2008 and 2012, as part of different projects funded by the Spanish International Cooperation Agency (AECID), he supported local fisheries and aquaculture management bodies to strengthen organizational and managing capacities of the fishing and rural aquaculture sector in Namibia, Cape Verde, Colombia and Mozambique. Since 2013, as part of the fisheries team of WWF Spain, he promoted different initiatives to improve fisheries management in coastal Spanish fisheries. As the WWF representative in fisheries co-management committees, he took part in the daily management of the following coastal fisheries in the Spanish Mediterranean: Catalan sandeel, Balearic boat seines, and Palamós red shrimp. Between 2016 and 2020 he was a full-time employee at Bureau Veritas Fisheries Department and then at DNV-GL, mainly acting as MSC-Fisheries and MSC-CoC auditor. Since September 2020 he is a freelance and he keeps acting as MSC-Fisheries auditor. He has participated in several MSC fisheries assessments and surveillance audits. He has completed the MSC training in the use of the RBF.

His 7 years in charge of designing and monitoring fisheries management plans for the exploitation different marine resources in Galicia, together with his experience on trophic ecology of demersal fish species in the Mediterranean (ICM-CSIC), his work with the University of Azores assessing an experimental fishing license for Orange roughy in the Azores islands, and his experience designing and monitoring an experimental fishing license for octopus in Namibia (IIM-CSIC) ensure he meets qualification and competency criteria established in PC3 for (i) Fishing impacts on aquatic ecosystems. Also, his 3 years of experience as a practicing fishery manager as a WWF representative in 3 Mediterranean fisheries, together with his 7 years of experience participating in the implementation of fisheries management plans in Galicia and his experiences assessing experimental fishing licenses in the Azores and Namibia ensure he meets qualification and competency criteria established in PC3 for (ii) Fishery management and operations.

For this reassessment he will act as Team Leader and his main responsibility will be on assessing Principle 2.

Edith Saa. Edith is a fisheries engineer. She obtained her degree at the Universidad Católica de Valparaíso. She worked between 1976- 1991 at Servicio Nacional de Pesca. After that through 1993 to 2006, she developed her work at Subsecretaria de Pesca. First as manager of the Departamento de Estudios. After, as manager of División de Pesca.

She has participated on the elaboration of several laws regarding to fisheries activities which they were set between 1991 and 2014. She gained experience as assessor of the Ministerio de Economía throughout 2008 to 2010 with her participation on the Salmon workshop. There, she collaborated to modify the fishery law and the normative regarding to fishing, aquaculture and impacts on the environmental. Nowadays, she is working as an independent assessor of fisheries activities.

Her years of experience as a fishery manager in the Chilean administration ensure she meets qualification and competency criteria established in PC3 for (i) Fishery management and operations and (ii) Fishing impacts on aquatic ecosystems. Furthermore, she meets the competences for (iii) knowledge of the country, language and local fishery context. Her main responsibility on this reassessment will be on assessing Principle 3.

Earl Dawe, Earl retired in July 2015 following a 35-year research career which focused on the fisheries, population biology, and ecology of cephalopods (particularly short-finned squid) as well as crustaceans (particularly snow crab). Research effort has most recently focused on ecosystem structure and functioning, particularly the relative effects of ocean climate versus predation on finfish and crustacean resources. Career included heavy involvement in the review and formulation of scientific advice for management of shellfish resources in Atlantic Canada as well as the advisory/consultative part of managing the Newfoundland fisheries for short-finned squid and snow crab. Furthermore, an extensive list (totaling 170) of scientific/technical reports and journal articles (60 in the primary, peer reviewed literature) on various aspects of population biology and ecology as well as fisheries biology and management of both short-finned squid and snow crab.

Therefore, his research career has ensured that he meets the qualification and competency criteria established in PC3 on (i) fish stock assessment, (ii) fish stock biology and (iii) fishing impacts on aquatic ecosystems. Furthermore, his experience in consultation with stakeholders and monitoring ongoing fisheries supports the qualification and competency criteria established in PC3 for (iv) fishery management and operations. His main responsibility on this reassessment will be on assessing Principle 1.

4.2 Version details

Details on the version of the fisheries program documents used for this assessment are presented in table below.

Table 4.2.1 – Fisheries program documents versions

Document	Version number, date of publication (and date effective)
MSC Fisheries Certification Process	Version 2.2, 25 March 2020 (25 September 2020)
MSC Fisheries Standard	Version 2.01, 31 August 2018 (28 February 2019)
MSC General Certification Requirements	Version 2.4.1, 7 May 2019 (28 September 2019)
MSC Reporting Template	Version 1.2, 25 March 2020 (25 September 2020)

5 Unit(s) of Assessment and Unit(s) of Certification and results overview

5.1 Unit(s) of Assessment and Unit(s) of Certification

Bureau Veritas has confirmed that the assessed fishery is within the scope of the MSC fisheries certification since:

- This is a wild-capture fishery
- The fishery is not based on any introduced species
- It does not target species classified as 'out-of-scope' (amphibians, reptiles, birds, mammals)
- The fishery does not make use of any kind of poisons or explosives
- The assessed fishery takes place within Chilean waters and its management depends on the competent national authorities (Subpesca and Sernapesca). The fishery is not conducted under any controversial unilateral exemption to an international agreement and its management regime includes mechanisms for resolving disputes
- Chile has been a member of the International Labour Organization (ILO). The country has ratified 63 conventions, including the 8 Fundamental Conventions and Governance Conventions. The CAB is not aware that none of the fishing operators included in the UoA have been prosecuted for a forced or child labour in the last 2 years
- The client has completed and submitted to the CAB the 'Certificate Holder Forced and Child Labour Policies, Practices and Measures Template' to detail the policies, practices and measures in place to ensure the absence of forced and child labour. This template was submitted to the CAB and it will be published at the MSC website together with the ACDR and the announcement of the fishery entering re-assessment, as required in FCP 7.4.4.4.

Besides, Bureau Veritas has checked that:

- There are no catches of non-target species that are inseparable or practically inseparable (IPI) from target stock.
- The fishery has not previously failed an assessment and has no certificate withdrawn. At the time of entering re-assessment the MSC certified status for this fishery is: 'Certified'.

5.1.1 Unit(s) of Assessment

The CAB shall include in the report a statement of the CAB's determination that the fishery is within scope of the MSC Fisheries Standard. For geographical area, the CAB should refer to G7.5.6.
Reference(s): FCP v2.2 Sections 7.4 and 7.5

Table 5.1.1.1 – Unit(s) of Assessment (UoA)

UoA 1	Description
Species	Nylon shrimp (*Heterocarpus reedi)*

Stock	Central North & Central South Zones -ZCN & ZCS- (Regions II, III, IV, V, VI, VII, XVI, VIII)
Fishing gear type(s) and, if relevant, vessel type(s)	Industrial modified trawl
Client group	AIP is the certificate holder
Other eligible fishers	The entire Chilean fleet targeting demersal crustaceans is assessed and therefore included in the UoA. However, in the case of getting the certificate, the UoC would be restricted to a list of vessels facilitated by the client. This list would be kept updated, and changes would be communicated to the pertinent CAB. Thus, all vessels excluded from the UoC would be considered as other eligible fishers.
Geographical area	Regions II, III, IV, V, VI, VII, XVI, VIII
UoA 2	**Description**
Species	Nylon shrimp (*Heterocarpus reedi*)
Stock	Central Northern Zone -ZCN - (Region II-IV)
Fishing gear type(s) and, if relevant, vessel type(s)	Artisanal modified trawl
Client group	AIP is the certificate holder.
Other eligible fishers	The entire Chilen fleet targeting demersal crustaceans is assessed and therefore included in the UoA. However, in the case of getting the certificate, the UoC would be restricted to a list of vessels facilitated by the client. This list would be kept updated, and changes would be communicated to the pertinent CAB. Thus, all vessels excluded from the UoC would be considered as other eligible fishers.
Geographical area	Region IV
UoA 3	**Description**
Species	Yellow squat lobster (*Cervimunida johni*)
Stock	Northern Fishery Unit -UPN- (Regions III and IV)
Fishing gear type(s) and, if relevant, vessel type(s)	Industrial modified trawl
Client group	AIP is the certificate holder
Other eligible fishers	The entire Chilen fleet targeting demersal crustaceans is assessed and therefore included in the UoA. However, in the case of getting the certificate, the UoC would be restricted to a list of vessels facilitated by the client. This list would be kept updated, and changes would be communicated to the pertinent CAB. Thus, all vessels excluded from the UoC would be considered as other eligible fishers.
Geographical area	Regions III and IV
UoA 4	**Description**
Species	Yellow squat lobster (*Cervimunida johni*)
Stock	Northern Fishery Unit -UPN- (Regions III, IV)

Fishing gear type(s) and, if relevant, vessel type(s)	Artisanal modified trawl
Client group	AIP is the certificate holder
Other eligible fishers	The entire Chilen fleet targeting demersal crustaceans is assessed and therefore included in the UoA. However, in the case of getting the certificate, the UoC would be restricted to a list of vessels facilitated by the client. This list would be kept updated, and changes would be communicated to the pertinent CAB. Thus, all vessels excluded from the UoC would be considered as other eligible fishers.
Geographical area	Region IV
UoA 5	**Description**
Species	Yellow squat lobster (*Cervimunida johni*)
Stock	Southern Fishery Unit -UPS- (Regions V, VI, VII, XVI, VIII)
Fishing gear type(s) and, if relevant, vessel type(s)	Industrial modified trawl
Client group	AIP is the certificate holder
Other eligible fishers	The entire Chilen fleet targeting demersal crustaceans is assessed and therefore included in the UoA. However, in the case of getting the certificate, the UoC would be restricted to a list of vessels facilitated by the client. This list would be kept updated, and changes would be communicated to the pertinent CAB. Thus, all vessels excluded from the UoC would be considered as other eligible fishers.
Geographical area	Regions V, VI, VII, XVI, VIII
UoA 6	**Description**
Species	Red squat lobster (*Pleuroncodes monodon*)
Stock	Northern Fishery Unit -UPN- (Regions XV, I, II, III, IV)
Fishing gear type(s) and, if relevant, vessel type(s)	Industrial modified trawl
Client group	AIP is the certificate holder
Other eligible fishers	The entire Chilen fleet targeting demersal crustaceans is assessed and therefore included in the UoA. However, in the case of getting the certificate, the UoC would be restricted to a list of vessels facilitated by the client. This list would be kept updated, and changes would be communicated to the pertinent CAB. Thus, all vessels excluded from the UoC would be considered as other eligible fishers.
Geographical area	Regions II, III and IV
UoA 7	**Description**
Species	Red squat lobster (*Pleuroncodes monodon*)
Stock	Northern Fishery Unit -UPN- (Regions XV, I, II, III, IV)
Fishing gear type(s) and, if relevant, vessel type(s)	Artisanal modified trawl

Client group	AIP is the certificate holder
Other eligible fishers	The entire Chilen fleet targeting demersal crustaceans is assessed and therefore included in the UoA. However, in the case of getting the certificate, the UoC would be restricted to a list of vessels facilitated by the client. This list would be kept updated, and changes would be communicated to the pertinent CAB. Thus, all vessels excluded from the UoC would be considered as other eligible fishers.
Geographical area	Region IV
UoA 8	**Description**
Species	Red squat lobster (*Pleuroncodes monodon*)
Stock	Southern Fishery Unit -UPS- (Regions V, VI, VII, XVI, VIII)
Fishing gear type(s) and, if relevant, vessel type(s)	Industrial modified trawl
Client group	AIP is the certificate holder
Other eligible fishers	The entire Chilen fleet targeting demersal crustaceans is assessed and therefore included in the UoA. However, in the case of getting the certificate, the UoC would be restricted to a list of vessels facilitated by the client. This list would be kept updated, and changes would be communicated to the pertinent CAB. Thus, all vessels excluded from the UoC would be considered as other eligible fishers.
Geographical area	Regions V, VI, VII, XVI, VIII

AIP is the owner of the certificate. Among AIP members those holding demersal crustaceans quotas are: Antarctic Seafood, S.A, Pesquera Quintero S.A, Bracpesca S.A., Soc Pesquera Isladamas S.A., Pesquera Sunrise S.A., Exportadores De Mariscos Rymar, Guillermo Donoso, Eric Aravena. They all have vertically integrated operations, managing their own fleet and processing plants.

5.1.2 Unit(s) of Certification

To be drafted at Client and Peer Review Draft Report stage
To be completed at Public Certification Report stage

If there are changes to the proposed Unit(s) of Certification (UoC), the CAB shall include in the report a justification.

Reference(s): FCP v2.2 Section 7.5

Table 5.1.2.1 – Unit(s) of Certification (UoC)

UoA 1	**Description**
Species	Nylon shrimp (*Heterocarpus reedi)*
Stock	Central North & Central South Zones -ZCN & ZCS- (Regions II, III, IV, V, VI, VII, XVI, VIII)
Fishing gear type(s) and, if relevant, vessel type(s)	Industrial modified trawl
Client group	AIP is the certificate holder. See table 5.1.2.2 for a list of the vessels included in the UoC
Geographical area	Regions II, III, IV, V, VI, VII, XVI, VIII

UoA 2	Description
Species	Nylon shrimp (*Heterocarpus reedi*)
Stock	Central Northern Zone -ZCN - (Region II-IV)
Fishing gear type(s) and, if relevant, vessel type(s)	Artisanal modified trawl
Client group	AIP is the certificate holder. See table 5.1.2.2 for a list of the vessels included in the UoC
Geographical area	Region IV
UoA 3	**Description**
Species	Yellow squat lobster (*Cervimunida johni*)
Stock	Northern Fishery Unit -UPN- (Regions III and IV)
Fishing gear type(s) and, if relevant, vessel type(s)	Industrial modified trawl
Client group	AIP is the certificate holder. See table 5.1.2.2 for a list of the vessels included in the UoC
Geographical area	Regions III and IV
UoA 4	**Description**
Species	Yellow squat lobster (*Cervimunida johni*)
Stock	Northern Fishery Unit -UPN- (Regions III, IV)
Fishing gear type(s) and, if relevant, vessel type(s)	Artisanal modified trawl
Client group	AIP is the certificate holder. See table 5.1.2.2 for a list of the vessels included in the UoC
Geographical area	Region IV
UoA 5	**Description**
Species	Yellow squat lobster (*Cervimunida johni*)
Stock	Southern Fishery Unit -UPS- (Regions V, VI, VII, XVI, VIII)
Fishing gear type(s) and, if relevant, vessel type(s)	Industrial modified trawl
Client group	AIP is the certificate holder. See table 5.1.2.2 for a list of the vessels included in the UoC
Geographical area	Regions V, VI, VII, XVI, VIII
UoA 6	**Description**

Species	Red squat lobster (*Pleuroncodes monodon*)
Stock	Northern Fishery Unit -UPN- (Regions XV, I, II, III, IV)
Fishing gear type(s) and, if relevant, vessel type(s)	Industrial modified trawl
Client group	AIP is the certificate holder. See table 5.1.2.2 for a list of the vessels included in the UoC
Geographical area	Regions II, III and IV
UoA 7	**Description**
Species	Red squat lobster (*Pleuroncodes monodon*)
Stock	Northern Fishery Unit -UPN- (Regions XV, I, II, III, IV)
Fishing gear type(s) and, if relevant, vessel type(s)	Artisanal modified trawl
Client group	AIP is the certificate holder. See table 5.1.2.2 for a list of the vessels included in the UoC
Geographical area	Region IV
UoA 8	**Description**
Species	Red squat lobster (*Pleuroncodes monodon*)
Stock	Southern Fishery Unit -UPS- (Regions V, VI, VII, XVI, VIII)
Fishing gear type(s) and, if relevant, vessel type(s)	Industrial modified trawl
Client group	AIP is the certificate holder. See table 5.1.2.2 for a list of the vessels included in the UoC
Geographical area	Regions V, VI, VII, XVI, VIII

The Units of Assessment includes the entire Chilean fleet targeting the demersal crustaceans, while the Units of Certification is restricted to the vessels owned by the AIP members plus other vessels hired by AIP members.

Every year, before the fishing season starts, AIP sends to BV an updated list of the vessels they are expecting to use, see **Table 5.1.2.2** for the list of the vessels authorised since 2020.

Table 5.1.2.2. List of vessels included in the UoC since 2020. Source: the client

#	Vessel	Reg.Nº Port	Administrator	Fishing Register	GTR (tons)	Length (m)	Fleet category
1	Isla Picton	2239 - Valparaiso	Antartic Seafoods	1496	79.8	21	Industrial
2	Gringo	1778 - Valparaiso	Antartic Seafoods	745	81.9	22	Industrial
3	Punta Talca	2234 - Coquimbo	Antartctic Seafoods	68051	50.00	17.9	Artisanal
4	Oriente	1234 - Quintero	Pesquera Quintero	2631	49,7	17.9	Artisanal
5	Don Stefan	2945 – Valparaiso	Pesquera Quintero	1995	86.0	21.0	Industrial
6	Elbe	2891 – Valparaiso	Pesquera Quintero	1965	54.1	17.9	Industrial

7	Rauten	3088-Valparaiso	Pesquera Quintero	2513	79.0	18.3	Industrial
8	Isla Tabón	329-San Vicente	Pesquera Quintero	966378	40.4	17.88	Artisanal
9	Nissin Maru III	2192 – Valparaiso	Bracpesca	865	97.8	20.5	Industrial
10	Foche	2111 – Valparaiso	Bracpesca	1065	84.1	22	Industrial
11	Chaffic I	2570 – Coquimbo	Rymar	68189	15.00	11.9	Artisanal
12	Traüwun I	1913-Coquimbo	Eric Aravena	920731	46,1	17.5	Artisanal
13	Cocha	1826 – Valparaiso	Isla Damas	25	84.1	22	Industrial
14	Isla Orcas	1868 – Valparaiso	Sunrise	85	84.1	22	Industrial
15	Polux	2234 -Valparaíso	Guillermo Donoso	764	71.4	22	Industrial

5.2 Assessment results overview

5.2.1 Determination, formal conclusion and agreement

To be drafted at Public Comment Draft Report stage

The CAB shall include in the report a formal statement as to the certification determination recommendation reached by the assessment team on whether the fishery should be certified.

The CAB shall include in the report a formal statement as to the certification action taken by the CAB's official decision-maker in response to the determination recommendation.

Reference(s): FCP v2.2, 7.20.3.h and Section 7.21

5.2.2 Principle level scores

To be drafted at Client and Peer Review Draft Report stage

The CAB shall include in the report the scores for each of the three MSC principles in the table below.

Reference(s): FCP v2.2 Section 7.17

Table X - Principle level scores

Principle	UoA 1	UoA 2	UoA 3	UoA 4
Principle 1 – Target species				
Principle 2 – Ecosystem impacts				
Principle 3 – Management system				

5.2.3 Summary of conditions

To be drafted at Client and Peer Review Draft Report stage

The CAB shall include in the report a table summarising conditions raised in this assessment. Details of the conditions shall be provided in the appendices. If no conditions are required, the CAB shall include in the report a statement confirming this.

Reference(s): FCP v2.2 Section 7.18

Table X – Summary of conditions

Condition number	Condition	Performance Indicator (PI)	Deadline	Exceptional circumstances?	Carried over from previous certificate?	Related to previous condition?
				Yes / No	**Yes / No / NA**	**Yes / No / NA**
				Yes / No	**Yes / No / NA**	**Yes / No / NA**
				Yes / No	**Yes / No / NA**	**Yes / No / NA**

5.2.4 Recommendations

To be drafted at Client and Peer Review Draft Report stage

If the CAB or assessment team wishes to include any recommendations to the client or notes for future assessments, these may be included in this section.

6 Traceability and eligibility

6.1 Eligibility date

The existing MSC fishery certificate for this fishery expires on the March 13, 2022. The elegibility date for this fishery is therefore the date of recertification, pending the successful outcome of this reassessment.

6.2 Traceability within the fishery

Ship-owners of industrial and artisanal vessels registered in Chile and authorised to carry out extractive fishery activities in jurisdictional areas, such as the high seas and areas in which Chile has signed international conventions are governed by the dispositions in the General Fisheries and Aquaculture Law and S.D. No. 139 and its amendments (S.D. 170 - 2014).

In Fisheries managed with LTPs or PEPs, the holders of these fishing rights, to make them effective, must previously register the vessels in a Registry maintained by the National Fishing Service, in accordance with the provisions of the Article 29 of the LGPA. Once the vessel is registered, Sernapesca deduct that catch from the individual quota owned by the holder. This is also the case, if a quota holder (LTP or PEP) hires an artisanal vessel to catch its quota.

In artisanal fisheries managed under the Artisanal Extraction Regime (RAE), their holders must report their catches using the Artisan Landing Form (DA), and if the assignment is individual the Service must deduct that catch from the individual quota corresponding to the shipowner.

It is compulsory to have an operating vessel monitoring system (VMS) on board industrial and artisanal vessels ≥12m length, with capacity to transmit the fishing vessel's location in the sea via satellite to land, and also an electronic logbook (or manual in the case of artisanal vessels) containing the catch data for each haul and landing data. The skipper must also inform SERNAPESCA about the estimated catches stowed at the holds of each vessel at least 2-hours prior to port arrival (Art. 64 law 20,657 and Exempt Resolution No. 5440 of 2014).

Landing can only take place at authorised ports (the list of authorised ports is set by SERNAPESCA through Exempt Resolution No. 4-2015 and its amendments (Exempt Resolution No. 10,320 of 23-11-2015) (Art. 63 fourth LGPA). All catches shall be certified by SERNAPESCA at landing. Landings must be weighed on National Fishing Service-certified and approved systems, in accordance with Sernapesca Res. 1,588 of 2014. National Fishing Service Resolution No. 619 of 2016 sets out the procedure to estimate the proportion of species in the landing. In accordance with Res. 5440/2014, if the vessel does not start the unloading process within 60 minutes of arrival to port, the National Fishing Service should be asked to seal its holds. The catches can be offloaded directly at the processing plant or they can be offloaded on trucks for it subsequent transport to the processing plant.

Resolution 2523/2017, based on a previous Decree (D.S.N.129/2913), regulates the development and implementation of the integral traceability system. The objective of this system is to ensure a very detailed control over allocated quotas and ensure traceability. At the same time, it also facilitates administrative procedures for the fishing and processing companies since all procedures (from landing to exporting) can be performed on-line. Recent Resolution 2205/2018 extends the obligation to be included in the traceability system to other stakeholders such as carriers and retailers, but that's beyond the scope of the MSC-Fishery certificate. All procedures are done and shared electronically through the same interface. For instance, the traceability system and the export system are connected, so the mandatory document for exporting (AOL, Acreditacion de Origen Legal or Legal Origin Accreditation) can be requested by the processing plants using the traceability system.

This integral traceability system is in place for all the different stakeholders (fishers, processing plants, etc.) and enforced since January 2019. However, it is still subject to improvements to cover all the different eventualities. For instance, the system is being modified to include the notification prior to port arrival (at this moment the landing declaration is the first document to be included).

Law 21132 reinforcing the role of Sernapesca is considered to reinforce the implementation of the traceability issues. All vessels ≥12m and/or fishing for a processing plant are subject to landing certification by Sernapesca (costs are funded by the buyers). Further, Sernapesca inspectors can raise infringements, while previous inspectors (from a private consultancy hired by Sernapesca) were not entitled to do so.

The integral traceability system allows adjusting the landing declaration in accordance with data obtained by the processing plants. The different documents generated by the traceability system are as follows:

1. Declaracion de desembarque (Landing declaration, called DI in the case of the industrial fisheries, DA in the case of the artisanal fisheries). This document can only be issued by the vessel once the landings were certified by Sernapesca. There is no possibility to create a landing declaration without being inspected by Sernapesca.
2. Declaracion de abastecimiento (Supply declaration, issued by the processing plants). This declaration is created against the information contained in the landing declaration. Any supply declaration is linked to a landing declaration.
3. Certificado de produccion (Production certificate, issued by the processing plant). This certificate is created against the information contained in the supply declaration. Any production declaration is linked to a supply declaration.
4. Declaracion de destino (Destiny declaration). In the case the product is for export, then the AOL (Acreditacion de Origen Legal or Legal Origin Accreditation) is triggered. All the information contained in the AOL is checked by Sernapesca before issuing the AOL.

Considering the information presented above, the team considers that the existing tracking, tracing and segregations systems within the fishery allow products sold as MSC-certified to be traced back to the UoC.

The table below provides a description of the factors that may lead to risks of non-certified seafood being mixed with certified seafood prior to entering Chain of Custody.

For each risk factor, there shall be a description of whether the risk factor is relevant for the fishery and, if so, a description of the relevant mitigation measures or traceability systems in place.

Table 4.2.1 – Traceability within the fishery

Factor	Description
Will the fishery use gears that are not part of the Unit of Certification (UoC)? If Yes, please describe: - If this may occur on the same trip, on the same vessels, or during the same season; - How any risks are mitigated.	The vessels to be included in the UoCs are only entitled to use the trawl for targeting demersal crustaceans. No other fishing gear is allowed on board. All industrial vessels have operating EMS on board since 2020. This risk factor is considered to be NOT relevant for this fishery.
Will vessels in the UoC also fish outside the UoC geographic area? If Yes, please describe: - If this may occur on the same trip; - How any risks are mitigated.	The geographic scope of the UoCs includes the entire geographical range of each stock or, so this is not a relevant risk factor for all UoCs but UoA2. In any case, all the vessels have an operating VMS on board and there are different authorities monitoring those signals (Sernapesca, Subpesca, the Chilean Army). Besides, the sanctions for operating in a non-authorised area are deterrent. So, the risk that the vessels to be included in the UoC operate the UoC geographic area is considered to be NOT relevant for this fishery.
Do the fishery client members ever handle certified and non-certified products during any of the activities covered by the fishery certificate? This refers to both at-sea activities and on-land activities. - Transport - Storage - Processing - Landing - Auction	All squat lobsters caught by the fleet included in the UoC will be certified products when fishing with quota from the AIP members. When it comes to onboard storage, mixing will not occur given that all squat lobsters caught the vessels included UoC will be certified.

If Yes, please describe how any risks are mitigated.	All landings are performed at authorised ports and certified by Sernapesca. Terrestrial transport is only undertaken using sealed trucks. The driver must present and signed a transport document when entering in the processing plant. The MSC-Fishery certificate will only cover activities up to the entrance to the processing plant following the first point of offloading. From that point onwards the MSC-CoC certificate will be necessary. Thus, this risk factor is considered to be NOT relevant for this fishery.
Does transhipment occur within the fishery? If Yes, please describe: - If transhipment takes place at-sea, in port, or both; - If the transhipment vessel may handle product from outside the UoC; - How any risks are mitigated.	Transhipment cannot occur in high seas for this fishery. This risk factor is considered to be NOT relevant for this fishery.
Are there any other risks of mixing or substitution between certified and non-certified fish? If Yes, please describe how any risks are mitigated.	There are 3 vessels included in the UoC and listed in the RAE (Punta Talca, Oriente and Isla Tabón) whose catches are only eligible when using quota from AIP members (see **table 5.1.1.2**). When these vessels are using the RAE quota allocated to them catches are not eligible. Only catches reported with the Industrial Landing Form (DI) are eligible. None of the catches from these vessels reported using the Artisanal Landing Form (DA) are eligible. However, the other two artisanal vessels listed in table 5.1.1.2 (Chaffic I and Traüwun I) can use their RAE quota, since the holders are AIP members (Rymar and Eric Aravena, respectively). No other risks of mixing or substitution between certified and non-certified product have been identified by the team.

6.3 Eligibility to enter further chains of custody

To be drafted at Client and Peer Review Draft Report stage

The CAB shall include in the report a determination of whether the seafood product will be eligible to enter certified chains of custody, and whether the seafood product is eligible to be sold as MSC certified or carry the MSC ecolabel.

The CAB shall include in the report a list of parties, or category of parties, eligible to use the fishery certificate, and sell product as MSC certified.

The CAB shall include in the report the point of intended change of ownership of product, a list of eligible landing points, and the point from which subsequent Chain of Custody certification is required.

If the CAB makes a negative determination under FCP v2.2 Section 7.9, the CAB shall state that fish and fish products from the fishery are not eligible to be sold as MSC certified or carry the MSC ecolabel. If the client group includes other entities such as agents, unloaders, or other parties involved with landing or sale of certified fish, this needs to be clearly stated in the report including the point from which Chain of Custody is required.

Reference(s): FCP v2.2 Section 7.9

6.4 Eligibility of Inseparable or Practicably Inseparable (IPI) stock(s) to enter further chains of custody

No IPI stocks have been identified by the CAB during the assessment.

7 Scoring

7.1 Summary of Performance Indicator level scores

The CAB shall include in the report a completed copy of the Fishery Assessment Scoring Worksheet.

Reference(s): FCP v2.2 Section 7.17

At the ACDR, the team provides a draft scoring range for each PI. The table below summarises the results at this stage:

Table 7.1.1 – Summary of Performance Indicator level scores

Performance Indicator	Draft scoring range	Data deficient?
1.1.1 – Stock status	**≥80 (All UoAs)**	**No**
Rationale or key points		
According to the latest stock assessments, the 95% confidence intervals about the SB estimate is well above the LRP (Blim) for all target stocks, and this has also been the case in recent years. However, due to the high uncertainty in the assessment model as well as the results (in general) it cannot be concluded that here is a high degree of certainty that the stock has been fluctuating around a level consistent with MSY or has been above this level over recent years for all target stocks.		
1.1.2 – Stock rebuilding	**Not applicable (All UoAs)**	**No**
Rationale or key points		
Since PI 1.1.1 achieved an 80 score for all target stocks, this Pi is not applicable for any of the UoAs (SA2.3.1).		
1.2.1 – Harvest Strategy	**≥80 (All UoAs)**	**No**
Rationale or key points		
The current HS for all target stocks is responsive to the state of the stock and is designed to maintain the stock at or fluctuating around a level consistent with MSY, and it is achieving its objectives as evidence by all target stocks being maintained around SB_{MSY} level in recent years. There is an effective monitoring programmein place for all fleets targeting demersal crustaceans, involving VMS, logbooks, VMS, EMS inspections of landings at the dockside, integral traceability system, biological sampling through observer program, fishery-independent estimates of stock biomass… The HS is periodically reviewed and improved as necessary.		
1.2.2 – Harvest control rules and tools	**60 – 79 (All UoAs)**	**Yes**
Rationale or key points		
There are well-defined HCRs in the MPCD, primary consisting of a set of four rules for determining quotas based on whether the stocks are considered to be under-exploited, fully-exploited, over-exploited or collapsed, If previously over-exploited, the stock may be designated as “in recovery. However it cannot be concluded that these HCRs ensure that the exploitation rate is reduced as the PRI is approached, This is because there is currently no HCR to trigger appropriate management action in cases where the assessment is not informative such that the CBA cannot be calculated, as was the case		

for nylon shrimp in 2020. This applies to all target stocks because the same model is applied to all target stocks such that any UoAs may experience unreliable assessment results in any year. This is recognized by the CCT-CM, as reflected in the mandate that a decision rule (ie. HCR) is required in such cases when the assessment is uninformative (Subsecretaria de Pesca 2020).

Besides, there are some recent examples showing that HCRs are not robust to main uncertainties associated with the assessment due to model uncertainty and process errors, as well as observational uncertainty associated with inconsistency in both the fishery and survey abundance indices.

However, evidence indicates that the tools in use are effective in achieving the exploitation levels required under the HCRs (spawning biomass has remained within the target range for more than 10 years for all target stocks, and F has remained within the target proxy Fmsy range or below Fmsy for more than 10 years).

Information is sought regarding:

- The rationale for the decision to increase the quota for red squat lobster northern region in 2021 by 53% above the 2020 quota.

- The basis for the failure of the assessment for nylon shrimp in 2020 as well as the great change in status of northern red squat lobster in 2020, including whether the problems with the model are specific to the 2020 assessment or whether there is a basic flaw in the model.

- Whether the HCRs are being reviewed as part of the current review of the MPCD.

1.2.3 – Information and monitoring	**60 – 79 (All UoAs)**	**No**

Rationale or key points

A wide range of information on the stock structure, stock productivity, stock abundance and fishery removals is collected from both fishery-dependent and fishery-independent sources.

However, there is high uncertainty about the state of exploitation from the model because the trajectory and recent history of SB and state of exploitation may change with each successive assessment. Furthermore, it was found that the most recent assessment for nylon shrimp was unreliable such that the SB and state of exploitation could not be determined. Also, the fishery and survey indices are erratic or inconsistent and so can't be relied upon to indicate annual changes in abundance. Therefore it cannot be concluded that stock abundance is monitored at a level of accuracy consistent with the harvest control rule.

1.2.4 – Assessment of stock status	**60 – 79 (All UoAs)**	**No**

Rationale or key points

The stock assessment model used for all three species is an age-structured model used within a Bayesian framework. The model is fitted to length compositions using multinomial residual errors and to landings, CPUE and fisheries-independent survey indices using log-normal residual errors.

While this model is appropriate in principle, its application for these crustacean resources does not provide reliable evaluations of stock status in recent years or of predicted SB and F for the upcoming year (upon which to estimate acceptable biological catch (CBA)). As a result, the projected status may be found to be in error based on the model results of the following year. A consequence of this is that management actions, including how to implement the HCR could be inappropriate, as was the case for Red Squat Lobster South based on the 2017 assessment.

The basis for model unreliability appears to be poor fit of the model, such that it is sensitive to inclusion of an additional year of data, which results in the model adjusting to a higher or lower level of biomass in recent years. The model is also sensitive to changes in assumptions regarding survey trawl catchability

The poor fit of the model is related to poor fit to the main biomass indices, CPUE and (especially) survey biomass. The survey is considered unreliable and so is given the least weight in the model. Therefore, the model is driven mainly by fishery data, especially landings which is given the greatest weight and so provides the best model fit. In some cases the model does not detect changes in survey biomass trajectory and results can be unclear.

2.1.1 – Primary Outcome	≥80 (All UoAs)	Yes

Rationale or key points

Three main primary species were identified for the different UoAs (Chilean hake, red squat lobster UPN and UPS and yellow squat lobster UPN and UPS). All stocks of demersal crustaceans are above the PRI with a high degree of certainty, while the South Pacific is highly likely to be above the PRI.

Besides, the following minor primary species were identified for the different UoAs (yellow squat lobster UPN and UPS, red squat lobster UPN and UPS, nylon shrimp ZCN and ZCS, Humbolt squid, longnose skate (UP), hoki, cardinalfish, and Chilean jack mackerel. Most of the minor primary species are highly likely to be above the PRI (YSL-UPN, YSL-UPS, RSL-UPN, RSL-UPS, NS-ZCN, NS-ZCS, Chilean hake, Chilean jack mackerel) or, if below, there is evidence that the UoA does not hinder the recovery and rebuilding of those species since UoA's catches are almost negligible (Humbolt squid, longnoseskate, hoki). Only in the case of the cardinalfish (subject to an extractive ban), the team did not score SG100 despite observed catches for this species are almost negligible in the assessed fishery.

Information is sought regarding:

-Estimates of total catches of cardinalfish caught by each of the fisheries targeting demersal crustaceans. To cross-check against the authorized 12t/year

2.1.2 – Primary Management	≥80 (All UoAs)	Yes

Rationale or key points

A strategy is in place for the UoAs for managing main and minor primary species (quota system based on scientific advice, management plan for the main primary species -and some minor-, plan to reduce discards and interactions in fisheries targeting demersal crustaceans which includes monitoring program, EMS). According to the Discards Plan, discarding those species subject to quota is forbidden except under some circumstances and, if that is the case, the discarded fraction shall be separated, boxed, quantified, recorded and shown to the EMS.

There is evidence that the strategy is being implemented and there is some objective basis for confidence that it will work, based on fishery-specific information collected by observers and the EMS. Besides, annual quotas of these species are being set in accordance with the scientific advice, landing and discards are being monitored, recorded reported and counted against the quotas.

There is also evidence that the potential effectiveness and practicality of the plan to reduce discards and interactions in fisheries targeting demersal crustaceans are being reviewed by IFOP and then by the CCT-CD.

However:

- The EMS is a highly demanding system in terms of workforce and storage capacity of digital images. During the 4th surveillance audit, Sernapesca expressed their concern to the team in relation to their capacity to sustain the system.
- The team could not verify the implementation of some of the measures detailed in the discards' plan, such as the survey protocol (trial haul) and 'move-on rules'.
- The declaration of discarded Chilean hake might still not be 100% since the estimated catch in 2020 based on observer data doubles that from the official statistics

Information is sough regarding:

- Further cross-checking official landings of Chilean hake and estimates using observers' data

-Details on the capacity of Sernapesca to analyse and store the images recorded on board would be advisable

-Info on the move-on rules and the fishing ground survey protocol

2.1.3 – Primary Information	≥80 (All UoAs)	No

Rationale or key points
Logbooks, VMS, EMS and observers on board provide detailed information on the impact of the fishery on main and minor primary species. The information on primary species is adequate to support the strategy. However, uncertainties in the stock assessment models of the demersal crustaceans are preventing to use the outputs for setting the CBA in some cases (nylon shrimp ZCS, Humbolt squid, longnose skate), and some of these resources are collapsed (cardinalfish, hoki), overexploited (Chilean hake, Humbolt squid, longnose skate) or subject to overfishing (Nylon shrimp ZCS).

2.2.1 – Secondary Outcome	**≥80 (for UoAs3, 4, 5 & 8)**	**No** (PF 4.1.4 invoked)
	RBF needed (for UoAs1, 2, 6 & 7)	**Yes**

Rationale or key points
No main secondary species are impacted by UoAs 3, 4, 5 & 8. UoA1 impacts on two main secondary species: Hooked tooth dogfish (tollo negro) and Aconcagua grenadier (granadero Aconcagua). UoA2 impacts on one main secondary species: Hooked tooth dogfish (tollo negro) UoAs6 & 7 impact on one main secondary species: big-eyed flounder (lenguado de ojos grandes). Besides, all UoAs impact on a wide list of minor secondary species (including crustaceans, echinoderms, cartilaginous fish and teleosts). All secondary species (main and minor) are Data Deficient since there are no biological based limits available, derived either from analytical stock assessment or using empirical approaches. Thus, RBF shall be triggered to assess their status. However, PF 4.1.4 allows the team to not score minor components and the team will make use of this requirement (overall PI score will be cap to 80). RBF will be triggered for assessing the three main secondary scoring elements identified: Hooked tooth dogfish, Aconcagua grenadier and Big-eyed flounder.

2.2.2 – Secondary Management	**≥80**	**Yes**

Rationale or key points
A strategy is in place for the UoAs for managing the impact on main and minor secondary species based on the plan to reduce discards and interactions in fisheries targeting demersal crustaceans which includes a monitoring program. An annual list of species subject to the discard plan s published annually by Subpesca. This list details which species can be discarded, which are subject to landing obligation and which shall be returned back to the sea. The list of secondary species impacted by the UoAs includes all cases. In any case, all discards shall be separated, boxed, quantified, recorded and shown to the EMS. There are specific regulations setting that chondrichthyes and benthic crustaceans shall be returned to the sea, and this shall be done according to specific best practices on board to reduce post-capture mortality. There is evidence that the strategy is being implemented and there is some objective basis for confidence that it will work, based on fishery-specific information collected by observers and the EMS. There is also evidence that the potential effectiveness and practicality of the plan to reduce discards and interactions in fisheries targeting demersal crustaceans are being reviewed by IFOP and then by the CCT-CD. **Information is sought regarding:** - Request for estimates of total catches of cardinalfish - Request information on move-or rules and fishing ground survey protocol - Studies on post-capture survival rate of the armed box crab and the Chilean lemon crab would be advisable, since catches on these two species are close to the designated threshold level to be classified as ‘Main’

2.2.3 – Secondary Information	≥80	No
Rationale or key points		
Existing sources of information (logbooks, VMS, EMS, landing inspections and observers records) ensure that there is adequate information to assess susceptibility on secondary species. Besides, quantitative information adequate to assess productivity attributes of three main secondary species is available at different open data base on fish, such as FishBase: https://www.fishbase.de/ However, the stock status of all secondary species impacted by the UoAs remains unknown		
2.3.1 – ETP Outcome	**≥80**	**Yes**
Rationale or key points		
A total of 8 ETP species have been identified to be impacted by all vessels targeting demersal crustaceans in Chilean waters (table7.3.1.1.6). The list includes one marine mammal, the South American sea lion (Otaria flavescens) and 7 seabird species: black-browed albatross, pink-footed shearwater; white-chinned petrel, Savin's albatross, Peruvian pelican, Masatierra petrel, Guanay cormorant. None of them are subject to national or international limits. Results show that this fishery has a low rate of incidental interactions with sea lions (between 0,0001 and 0,007 ind/haul depending on the model used), and only around 40% are resulting in fatalities. Estimates of the total annual number of sea lions impacted by the fisheries targeting demersal crustaceans have varied a lot between 2016 and 2020 (from 10 to 105, or from 7 to 70 depending on the model used). However, results from 2019 and 2020 indicate an average of around 40 sea lions impacted per year. Results show that this fishery has a low rate of incidental interactions with seabirds, between 9 and 35 (lower and higher range value respectively) estimated interactions for the entire fleet in 4 years, resulting in between 4 and 28 dead individuals. Two potential detrimental indirect effects of the fisheries targeting demersal crustaceans on ETP species were identified: (i) the potential disruption of predator-prey dynamics resulting (directly and/or indirectly) from the fishery mostly in seabirds' populations, and (ii) the likelihood of plastic contamination, including pieces of fishing gear and other plastic debris. (i) There is no evidence of any seabird species being critically dependent on any of these species. Actually, those species are not part of the diet of any seabird species, since they are out of their trophic niche. (ii) IFOP observers are recording information on the degree of awareness and knowledge among the crew members and also on the compliance with the regulations set in Annex V of the Marpol Convention, 93% of the vessels targeting demersal crustaceans correctly apply the regulations for the disposal of other garbage **Information is sought regarding:** - More detailed information on the evidence gathered by the observers in relation to the compliance of the fleet with MARPOL		
2.3.2 – ETP Management	**≥80**	**Yes**
Rationale or key points		
A strategy is in place for the UoAs for managing main and minor secondary species based on the plan to reduce discards and interactions in fisheries targeting demersal crustaceans which includes monitoring program. According to the Discards Plan, all specimens of out-of-scope species (birds, mammals, reptiles) shall be returned to the sea. Observers are recording these interactions and analyses and estimates are performed by IFOP and presented to the CCT-Cd for review. Besides, protocols and measures to mitigate incidental interactions with seabirds have been adopted (Res.Ex.2941/2019), in accordance with the Code of best practices adopted in the Discards' Plan.		

There is evidence that the strategy is being implemented successfully, based on fishery-specific information collected by observers and the EMS.

There is also evidence that the potential effectiveness and practicality of the plan to reduce discards and interactions in fisheries targeting demersal crustaceans are being reviewed by IFOP and then by the CCT-CD.

Information is sought regarding:

- Evidence on the level of compliance of the regulation to reduce mortality in birds, and evidence of the necessary modifications agreed with the fishing industry (which are the modifications being discussed and when are they expected to be implemented?).
- Evidence of compliance with the following measure detailed in the Discards Plan M3): “action plan shall be developed to comply with Article 4ºC, D and E”
- More details on the information used by the UCN to estimate the historical trawl footprint within the first 5NM

2.3.3 – ETP Information	**≥80**	**No**

Rationale or key points

Observers on board vessels targeting demersal crustaceans are devoting specific attention to observe the interactions with out-of-scope species. The observer program covers the entire area where fishing takes places and sampling coverage for incidental interactions is around 10% of the hauls. The fate of the interacted specimens is recorded (alive/dead), and severe injured specimens are recorded as dead. Observers’ data is further reviewed and analysed by IFOP (including spatial-temporal analyses, models are used to estimate the total impacts) and included in the annual reports on the monitoring of the Discard Plan. Results show that this fishery has a low rate of incidental interactions with sea lions and seabirds.

Information on the general status and trends of the impacted ETP populations is compiled and analysed against the IUCN Redlist methodology. Furthermore, in the case of the sea lion, Chile has performed recent aerial surveys to assess the current population.

The observer program and the EMS provide adequate information to support the existing regulations applicable to incidental interactions with out-of-scope species. However, current strategy cannot be considered tested and therefore ‘comprehensive.

2.4.1 – Habitats Outcome	**≥80**	**Yes**

Rationale or key points

Thus, fisheries targeting demersal crustaceans mostly operate on mud and sand substrate areas, where bottom trawl gear disturbs organisms regenerated in relatively short time. Besides, they operate in a limited geographical area which has been trawled for a long time (and the annual trawl coverage of the AIP fleet over the historical footprint is estimated to be around 30%). Besides, the total trawl coverage in this region is far from that on other areas of the world, including the southern region of Chile.

The modified trawl used in this fishery since 2014 is lighter and also more susceptible to tear than the previous gear used, which has caused the fishery to move away from hard substrate. This type of fishing gear could not bear the abrasion derived from being dragged on hard bottoms, such as seamount or cold-water coral reefs. Besides, no seamounts, geothermal vents, or underwater canyons in the study area were found between Region III and X and between 100 and 500m depth (Melo et al 2007).

Melo et al (2007) did not reported any sponge field or cold-water coral reefs between Region IV and IX and between 100 and 500m depth, although species of corals and sponges were found (the area presenting more coral diversity and abundance was Region IX, out of the geographical scope of the fisheries targeting demersal crustaceans). This is consistent with observations of small quantities of sponges and actinias recorded by observers on board vessels targeting demersal crustaceans. No corals of any kind have been recorded by observers on board vessels targeting red or yellow squat lobsters in the UPS, but soft corals have been observed sporadically on-board vessels targeting nylon shrimp (ZCN and ZCS).

Results presented in Acuña et al (2021), show that the AIP fleet operates within the historical footprint of the trawling fisheries off Chile (see section 7.3.1.5.III). This area has been trawled since (at least) the

latest 20 years. As far as the fleet keeps operating within this area, interactions with some VME-habitat forming species (i.e. sponges, soft corals, actinias and starfish) are likely to be sporadic and limited to small numbers of sponges or soft corals, and existing observer records corroborate it.

Information is sought on:

More details on the quantity of sponges and corals recorded per haul.

2.4.2 – Habitats Management	**≥80**	**Yes**

Rationale or key points

Despite some of the provisions adopted in the LGPA for the conservation of VMEs have still not been implemented (in particular those derived from Article 6B), and also despite the recommendation of banning bottom trawl outside of the historical footprint has not been implemented. The team considers that existing provisions (Articles 5, 6A, 6B and 6C), measures (technical characteristics of the fishing gear, VMS, EMS, observer program recording interactions with VME-forming species, inclusion of VME-forming species in Res.Ex.142/2021) and elaborated proposals to regulate fishing operations on areas susceptible to VMEs (Informe Tecnico RPESQ Nº154/2016) constitute a strategy designed to protect marine habitats, and VMEs in particular

However, most of the provisions adopted in Article 6B of the LGPA for the conservation of VMEs have still not been implemented. Subpesca has not yet established a list of marine resources which their fisheries are susceptible to impact on VMEs. The VME Operational and Evidence protocols proposed by Subpesca in Informe Tecnico RPESQ Nº154/2016 have yet not been adopted.

No additional measures afforded to VMEs by other MSC UoAs/non-MSC fisheries have been adopted, as far as the team is aware.

In Chile, VMS system is mandatory for all fishing vessels above 12m length. The VMS data is regularly sent to Sernapesca, Subpesca and the Chilean Army. Further, Law 21.132/2019 determined that VMS data shall be publicly available, and the Chilean Government signed an agreement to make its vessel tracking data publicly available through the Global Fishing Watch (GFW) map, which tracks the movements of commercial fishing vessels in near real-time (https://globalfishingwatch.org/press-release/chile-to-publish-vessel-tracking-data-through-gfw/).

Sernapesca performs regular inspections to fleets targeting demersal crustaceans (See section 7.4.1.12 for more details) to check compliance with existing regulations, including compliance with regulation setting the technical characteristics of the fishing gear (Res.Ex 762/2013 was amended by Res. Ex. 145/2015). All vessels are using the authorised gear which lacks of any rubber or metal protections against rubbing.

Besides, the agreement signed in June 2019 between AIP and the UCN has allowed the client to have a detailed monitoring of the spatial-temporal activity of its fleet, both industrial and artisanal. Results compiled in Acuña et al (2021) shows that the AIP industrial fleet operates within the historical trawl footprint as defined in the Informe Técnico Nº09/2018 from SUBPESCA. This area has been trawled since, at least, the latest 20 years. The trawl coverage of the industrial AIP fleet over the historical trawl footprint has not been calculated, but **figure 7.3.6.1.11** (for UPN) and **figure 7.3.6.1.12** (for UPS) show that annual coverage in 2019 and 2020 accounted for approximately 30% of the historically trawled area. As far as the fleet keeps operating within this area, interactions with some VME-habitat forming species (i.e. sponges, soft corals, actinias and starfish) are likely to be sporadic and limited to small numbers of sponges or soft corals, and existing observer records corroborate it. In the case of the artisanal fleet, the UCN has also calculated a historical footprint in the IV Region, and artisanal vessels are operating within those boundaries.

As part of the monitoring programme on the implementation of the discards' plan, observers are getting on board industrial and artisanal vessels targeting demersal crustaceans and record the interactions with benthic species, including invertebrates considered as VME-forming species. Observers data compiled between 2016 and 2020 are presented in section 7.3.1.1.I, including quantitative results for interactions with benthic invertebrates. These invertebrates are being returned to the sea as required by Res.Ex.142/2021.

Only small quantities of sponges, actinias and starfish recorded by observers on board vessels targeting demersal crustaceans. No corals of any kind have been recorded by observers on board vessels targeting red or yellow squat lobsters in the UPS, but soft corals (belonging to the Alcyonacea Order, the most abundant according to Melo et al, 2007) have been observed sporadically on-board vessels targeting nylon shrimp (ZCN and ZCS)

Information sough on:

- The reason why actinias and starfish are included as VME-forming species in Res. 142/2021, when they were not included as VME-forming species in the proposal to regulate fishing operations on areas susceptible to VMEs (Informe Tecnico RPESQ Nº154/2016)
- Next steps regarding Provisions on the protection of VME adopted in Articles 5, 6A and 6B.

Request information on move-or rules and fishing ground survey as required in the Discard Plan (in this case in relation to benthic invertebrates)

2.4.3 – Habitats Information	**≥80**	**Yes**

Rationale or key points

Melo et al (2007) and FIP Nº2006-57 'Biodiversity of seamount' provide information on the nature, vulnerability and distribution of habitats in the assessed area.

IFOP annually maps the distribution of fishing effort by the demersal crustacean fisheries. The spatial extent of the fisheries to the studies available suggests that nature, distribution and vulnerability of the main habitats in the fishery area are known at a level of detail relevant to the scale and intensity of the industrial demersal crustacean fisheries

The type of trawl used in this fishery since 2015 is light and lacks protective hard roller structures (made out of metal or rubber). Protections allowed in the bottom of the gear shall be made of buoyant net material. This type of fishing gear could not bear the abrasion derived from being dragged on hard bottoms.

However, no further research or habitat mapping distribution off the central Chilean coast have been performed since Melo et al (2007).

Information is sought on:

More recent habitat mapping or characterization since Melo et al 2007

2.5.1 – Ecosystems Outcome	**≥80**	**No**

Rationale or key points

Potential ecosystem impacts of the fisheries are from removals of the target species and other by catches such as Chilean hake (the main predator in the ecosystem as identified in FIP Nº 2001- 29), or Chondrichthyes and grenadiers and flounders that also play important roles in the demersal food web. Additionally, the gear disturbs benthic communities that are important functional components at the base of the food webs. These actions can have an effect for ecosystem function, nevertheless based on analysis of food web dynamics from models, and considering that removals of target and bycatch species in each fishery are modest the fisheries are highly unlikely to disrupt ecosystem key elements to a point of serious harm.

2.5.2 – Ecosystems Management	**≥80**	**No**

Rationale or key points

Measures in place make sure that target species are within biologically based limits and that the fisheries do not constitute a risk for bycatches or discarded species. The area exclusion measures take into account that trawling has its greatest impact in coastal areas where productivity and biodiversity is highest and which constitute areas of reproduction and recruitment for numerous species, including birds. The gear design adopted in 2014 has caused fishing operations to avoid more susceptible hard substrates as the net is prone to tear. Also, the new gear allows some non-target fish species to escape unharmed

2.5.3 – Ecosystems Information	**≥80**	**No**

Rationale or key points

Several studies have developed from an ecosystem approach to implementing the management of the major fisheries of Chile. They key species in the ecosystem and trophic interactions that affect the dynamics of populations of species that are major fisheries are identified (Neira, 2003; Neira et al., 2004,

Neira et al., 2014). Ecopath models were used with Ecosim (EwE) simulating the possible responses of exploited populations quantifying changes in predator and prey against different scenarios in catch levels of the main fishery resources analyzed and against different types of control in the food web (FIP Nº 2001- 29, Neira et al., 2014) These simulations include the effect of the environment through ENSO events in the structure and dynamics of the marine ecosystem community (FIP Nº 2001- 29).
The main result of these studies indicate that although predation mortality is the main cause of total mortality for the majority of the fish groups, fishing mortality of target species is high. Also recognize changes in system energetics that could have resulted in loss of productivity by increased flow to detritus. The models show that the species with small body size, short life span and low trophic level are dominant. Therefore suggest that the fishing-induced trends are result in stressed ecosystems and the food web could now be more susceptible to external forcing and negative ecological interactions (Neira et al., 2014). The team concludes that main interactions between the UoA and these ecosystem elements can be inferred from existing information, and some have been investigated in detail.

3.1.1 – Legal and customary framework	**≥80**	**No**

Rationale or key points

There is an effective national legal system (LGPA) with binding procedures that govern cooperation with other parties (CM, CCT, MPCD), participate in and respect the main international agreements (SPRFMO, CBD, ACAP, CMS, CITES, IAC..) , which provides management results consistent with MSC Principles 1 and 2, Besides, the management system incorporates to a transparent mechanism for the resolution of legal disputes (that is appropriate to the context of the fishery and has been tested and proven to be effective.

In the case of small-scale rights, both vessels and fishermen must be registered in a Small-Scale Fishing Register, held by SERNAPESCA by region. Registration grants an indefinite, transmissible and transferable right between small-scale fishermen. The causes for total expiry of these rights are expressly stipulated in law.

Current fishing legislation sets down according to law 20,249 the granting of the delivery of an area called Indigenous Peoples' Marine and Coastal Zone to the communities of indigenous peoples that request it. Its main objective is to protect the customary use of these spaces, in order to maintain traditions and the use of natural resources by the communities attached to the coastline. The Indigenous Peoples' Marine and Coastal Zone is provided for the community through a use agreement and during its processing the granting of these areas takes priority over other uses of those areas. In accordance with SUBPESCA website, from 2012 to date, 13 Indigenous Peoples' Marine and Coastal Zone areas have been granted.

3.1.2 – Consultation, roles and responsibilities	**≥80**	**No**

Rationale or key points

The LGPA expressly stipulates the roles, duties and responsibilities of each of the institutions that participate in the management of fisheries, be these governmental institutions or the MINECON, SUBPESCA, SERNAPESCA, IFOP, and the Fisheries Research Fund, as well as the advisory bodies of the administration, comprising Steering Committees, Technical Scientific Committees, National Fishery Board and the 8 Regional Fishery Boards. The duties and powers in fisheries matters of the Ministry of Economy, Fishing Undersecretariat and SERNAPESCA, are stipulated in Decree Law Nno.2.442, 1978, that sets out its duties and responsibilities, supplemented by the stipulations of the LGPA and Law 21,132. The duties and powers of the IFOP, are stipulated in article 158, LGPA, while those of the Fisheries Research Fund are stipulated in paragraph 2, Heading VII, LGPA. Regarding the advisory bodies, their duties, membership and responsibilities are stipulated in the LGPA, Steering Committees, (Paragraph 3, Heading II, LGPA); Technical Scientific Committees (Paragraph 3, Heading XII, LGPA), National Fishery Board and Regional Fishery Boards (Paragraphs 1 and 2, Heading XII, LGPA). A list of its members and the minutes from their meetings are available on SUBPESCA website. The way to nominate its members is stated in the Regulations.

The LGPA stipulates the consultation procedures for the different advisory institutions for the adoption of the different administration and management measures, either through consultations or by requesting technical reports, which the authority must take into consideration and in some cases are mandatory when adopting a management measure. In the consultation processes, relevant information is gathered, such as that provided by the scientific-technical committees. All the information provided by the different

instances is available on SUBPESCA website. However, the management system cannot demonstrate knowledge of the information and explain how it is used or not used

The LGPA provides the opportunity and encourages stakeholders and affected parties to participate in management through the Steering Committees by fishery or group of fisheries, the CCT by fishery or group of fisheries, the National Fishery Board and the 8 Regional Fishery Boards. Regarding the low participation in the CZP, although the authority has modified some rules to facilitate the application for vacant positions, to date there are still a significant number of vacancies in some of the Regional Fishery Boards, and it may be possible that the Authority has not sufficiently encouraged participation in that instance.

3.1.3 – Long term objectives	**≥80**	**No**

Rationale or key points

Articles 1B, 1C and 3C provide clear long-term objectives that guide decision-making, consistent with MSC Fisheries Standard and the precautionary approach.

3.2.1 – Fishery specific objectives	**≥80**	**No**

Rationale or key points

The MPCD adopted in 2016 set well defined and measurable short and long-term objectives for the fisheries targeting demersal crustaceans, which are demonstrably consistent with achieving the outcomes expressed by MSC P1 and P.

3.2.2 – Decision making processes	**≥80**	**No**

Rationale or key points

The decision-making process of the demersal crustacean fisheries for the adoption of management measures and the strategies to achieve the specific objectives of the demersal crustacean fishery are explicitly defined in the LGPA and in the Management Plan of the fishery.

Several examples (e.g. development and adoption of the Discards' Plan, development and implementation of the EMS, annual adoption of the CBA based on scientific advice, workplan to review stock assessment approach) demonstrate that the decision-making processes report to serious and other important issues identified in relevant research, monitoring, evaluation or consultation, in a transparent, timely and adaptive manner and take account of the wider implications of decisions.

All interested parties are exhaustively informed about the behaviour of the fishery and management actions adopted (CCT, CM, and open access to all IFOP reports and minutes of the CCT and CM).

Interested or affected parties participate through their representatives in the different participatory bodies, National and Regional Fishery Boards, Steering Committees and CCT, and through these become aware of the actions that the authority is taking in fishery management. They have the option of discussing the problems that in their opinion they could generate.

Notwithstanding the foregoing, if problems or conflict arise between users or between users and the authority, national regulation will find several ways to find a solution, both before the Courts as well as before government agencies. Users can appeal through government agencies, in accordance with the provisions of the administrative procedure law, Law 18,880, by submitting an administrative appeal for review, filed with the authority that issued the measure, or an appeal filed with a higher administrative authority, submitted to the institution to which the person who issued the measure is affiliated. Also, through government agencies, an appeal can be filed with the Comptroller General of the Republic, which constitutes the highest body of the State Auditor, which issues rulings. Users can also resort to the courts of justice, through Appeals for Legal Protection or ordinary proceed. Both the decisions taken before the Courts and before government agencies must be addressed by the Authority, immediately.

3.2.3 – Compliance and enforcement	**≥80**	**No**

Rationale or key points
The MCS implemented in the fishery targeting demersal crustaceans include: 100% landing inspections by Sernapesca, EMS, VMS, logbook, traceability requirements, scientific observers, risk-based inspection program run by Sernapesca. The LGPA stipulates various penalties for non-compliance detected in the exercise of extractive fishing activity, processing, transportation, storage and sale of resources or products derived from fishing. Regarding demersal crustacean fisheries, according to the information provided by SERNAPESCA during the last three years, it can be inferred that there are no significant breaches by the holders of the Tradable Fishing Licenses, Extraordinary Fishing Permits and holders of the Small-Catch Extraction Scheme. Despite the inspection carried out by the control authority, no disciplinary penalties have been applied to the breaches regarded as the most serious in the administration of these fisheries. In the last three years, only complaints of non-compliance have been filed with the courts of justice, which do not apply in general terms to the holders of the allocation. Notwithstanding the foregoing, the number breaches that can be observed through the image registration cameras concerning discards, and which qualify as disciplinary penalties, is still unknown, since according to a consultation with SERNAPESCA on the matter, and as Mr. Naranjo has pointed out in an email that: “To date, 8 findings have been identified of operations that have a high probability of being engaged in unauthorized discards, which are in different phases of legal technical analysis with a view to soon issue the respective notification instructions. As it is at the stage of establishing the potential non-compliance, it is not possible to provide more details of the offenders, but it is possible to point out that they are associated with fishing fleets whose home port is in Coquimbo”. On the other hand, it should be taken into account that the owners of the demersal crustacean fisheries actively cooperate with the Authority through their participation in the Steering Committee, first by drafting the Management Plan for the fisheries and currently in the revision of the Plan that they are carrying out. Similarly, the entire fleet, both industrial and small-catch, actively participated in the investigation carried out to determine the causes of discard.

3.2.4 – Management performance evaluation	**≥80**	**No**

Rationale or key points
According to the LGPA, there are mechanisms to evaluate some parts of the management system. Regarding the investigation, it is up to the Ministry of Economy to submit the reports of the investigation carried out by the IFOP, in order to determine if there is compliance with technical terms of reference stipulated by SUBPESCA, in addition to verifying the technical quality of the investigation carried out, as well as the results obtained. The reports of the external evaluators are public. (Art. 156A, LGPA). Similarly, the investigation commissioned by the Fisheries Research Fund must also be fined by external evaluators, who must be equally or more qualified than those carrying out the investigation. (Art. 96, LGPA). Regarding management measures, article 1C stipulates that these must be reviewed every five years. Although there is no specific Fishing Undersecretariat document in which they are detailed, there is the Discard Reduction Plan for demersal crustacean fisheries, contained in the Technical Report R. Pesq. no. 124, 2019, point 4, addresses, amongst the aspects to be implemented by the evaluation of the management measures adopted and which enable the discard of the target species, the bycatch and incidental catch to be reduced. Consistent with the foregoing, and prior to the entry into force of the image recording cameras for auditing the discard, the following management measures were reviewed and modified during 2019: Modification of the yellow squat lobster and red squat lobster bycatch percentage in the catching of nylon shrimp (Decree no. 170 de 2019); Regulation of fishing gear for various species that cannot be trawled or purse-seined (Resolution no. 3917 de 2019) and establishment of catch percentages of these species as bycatch of demersal crustacean fisheries (Decree no. 45 de 2019); the minimum sole size is waived (Resolution no. 3.044 de 2019); mandatory return of crabs in trawling or longline fishing operations (Resolution no. 2820 de 2019). In this same area according to the LGPA, management plans should be reviewed at least every 5 years. According to the minutes of the Steering Committee for this fishery, the review of the Management Plan began in mid-2020, and according to the latest minutes of the 2021, is still in process.

In their capacity as inspection bodies, both SERNAPESCA and the General Directorate of Maritime Territory must publish a report on the inspection actions carried out in March of each year.

According to its constitution, the remit of the CCT, an external organisation of SUBPESCA, includes making decisions on various aspects, amongst which can be highlighted the determining of the status and situation of fisheries and biological reference points, the proposing of the range in which the catch quota can be stipulated, the design of the management measures and the formulation of the management plan. Consequently, it regularly exercises the review of management measures.

Also, the CM-CD permanently implements the review of management measures applied to fisheries. During the last two years, it held 9 meetings during 2020 and in August 2021 has held 7 meetings.

7.2 Principle 1

7.2.1 Principle 1 background

7.2.1.1 Distribution Biology and Population Dynamics

The following review is updated from Addison and Adlerstein-Gonzalez 2016

I. Nylon shrimp

Taxonomy and distribution

The nylon shrimp*, Heterocarpus reedi* (Bahamonde, 1955), known in Chile as 'camarón nailon', is a decapod crustacean of the family Pandalidae. Its distribution is off the north-central and south-central Chilean coast, between 23°48'S (south of Antofagasta) and 39º00'S (Puerto Saavedra) (**Figure 7.2.1.1**). The distribution is essentially continuous within Antofagasta and Coquimbo Regions (III and IV), but further south their presence is becoming sporadic, found in small pockets in the north and south of the Maipo River Canyon in Region VI, and off Point Nugurne in Region VII. In addition, this species is also present off the coast of Peru. The nylon shrimp inhabits the continental shelf and upper slope at depths ranging between 150 and 800 m, although the fishery is carried out primarily between 150 and 500 m, with a more or less continuous distribution, parallel to the Chilean coast within this depth range. The nylon shrimp inhabits the mixing zone of the masses of Equatorial Subsurface Water (AESS) and Antarctic Intermediate Water (AIA), which is characterized by being cold (10-12 ° C) and saline (34.5 to 34.9 ppt) (Addison and Adlerstein-Gonzalez 2016). Nylon shrimp is found primarily in clay, sedimentary rock, sand, muddy sand and sandstone.

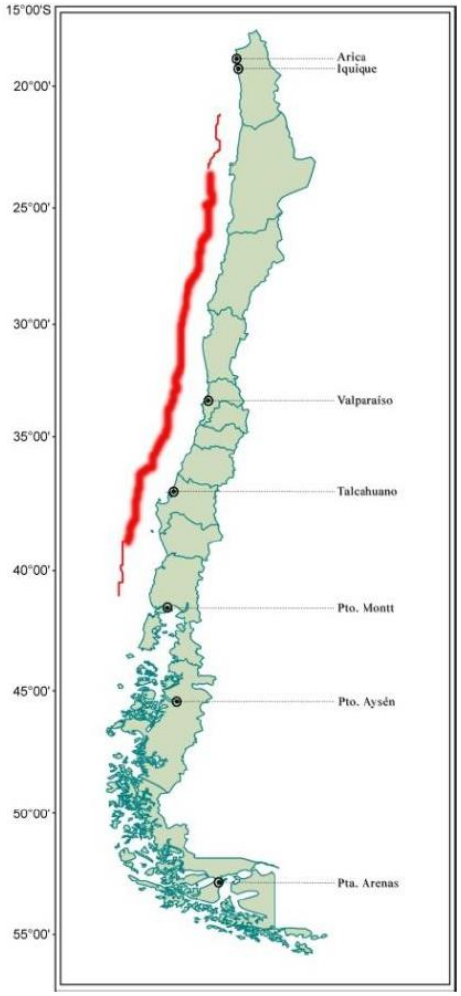

Figure 7.2.1.1. Geographical distribution of nylon shrimp (*Heterocarpus reedi*) in Chile. Source; Addison and Adlerstein-Gonzalez 2016, Figure 17

Migration and stock structure

Whilst local movements in both latitude and depth have been observed (Mistakidis & Henriquez, 1966), there have been few studies of movements of the nylon shrimp. Within a local region, Arana & Nakanishi (1971) identified seasonal movements in which the highest densities were located north of Valparaiso Bay (32°10'S) in deeper waters during summer and autumn, while between winter and spring highest densities were south of this bay in shallower waters, resulting in a migration pattern in an oblique direction to the coast. This migration is assumed to be related to biotic and

abiotic factors, possibly to promote reproductive and larval development aspects, and may be linked with the presence in the same location of a centre of upwelling, contributing to the rise of the larvae to a plankton-rich ocean area, thus favouring its initial development. Studies of population structure of nylon shrimp (Mistakidis & Henríquez, 1966; Bahamonde & Henríquez 1970; Arana et al., 1975) and results from recent stock surveys show that the average carapace length (CL) of males is lower than that of females, and that for both sexes larger individuals of the population are generally located to the south of latitude 32°S.

Growth

Growth of crustaceans occurs through the shedding of the exoskeleton (ecdysis). As with all crustacean species, estimation of growth parameters is difficult because until recently age has not been determined from hard structures (in comparison with otoliths in fish), and because growth rate depends on both moult increase and moult frequency. Arana et al. (1976) observed that moulting may occur in three periods of the year (April, August and October-December), which is consistent with the periods in which there are noticeable changes in moisture content and ash in nylon shrimp. Estimates of growth parameters from various studies are given in Table 7.2.1.1.

Table 7.2.1.1. Growth parameters estimated for *Heterocarpus reedi* by various authors. Source Addison and Adlerstein-Gonzalez 2016 Table 6

Área	Método	Sexo	L_∞ (mm)	k	t_o (años)	phi	Período	Referencia
Papudo a Punta Tres Cruces	Separación estados de muda	Machos Hembras	37,67 43,87	0,343 0,305	-0,117 0,170	2,688 2,769	1969 – 1980 1984 - 1985	Ziller, 1993
V Región	MIX (Tallas modales) Ajuste no lineal	Machos Hembras	40,68 48,34	0,199 0,174	-0,809 -0,510	2,518 2,608	1968-1973, 1981 y 1992-1994	Roa & Ernst, 1996
II - VIII Región	MIX (Tallas modales)	Machos Hembras	52,14 52,86	0,105 0,149	0,508 0,614	2,455 2,620	May-Ago 1996	Pavez *et al.*, 1996
II - VIII Región	MIX (Tallas modales)	Ambos	46,33	0,138	0,374	2,471	Base de datos 1980	Canales *et al.*, 1999

phi= log k + 2*log L_∞ Longitud infinita (L_∞) expresada como longitud cefalotorácica

A recent study of age and growth in all three demersal crustaceans (Kilada and Acu˜na 2015) was based on examination of the gastric mill in yellow and red squat lobsters or the eyestalk of nylon shrimp, structures that are retained through the molt. The study indicated that males were larger at age than females, as is true for all 3 species (**Figure 7.2.1.2**). Maximum age of nylon shrimp from the limited direct study was 5 years of age (Figure **7.2.1.2**) as opposed to 7- 9 years, as previously believed (Addison and Adlerstein-Gonzalez 2016).

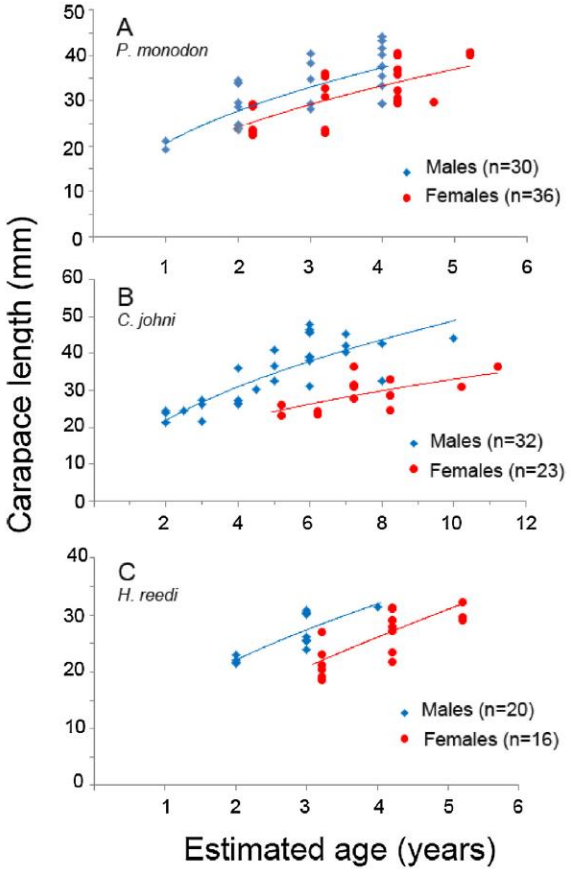

Figure 7.2.1.2. Size-at-age relationships for (A) Red squat lobster (*P. monodon*), (B) Yellowsquat lobster (*C. johni*) and (C) nylon shrimp (*H. reedi*). Fitted lines are power regressions and symbols represent males (blue) and females (red). Female individuals were offset by +0.2 to improve clarity by eliminating overlap with the male data. (For interpretation of the references to color in this figure legend, the reader is referred to the web version of this article). Source; Kilada and Acu˜na 2015 Figure 4

Size at age is highly variable (**Figure 7.2.1.2**). This is reflected in size compositions which are typically unimodal (**Figure 7.2.1.3**, Ibarra and Yanez 2021), indicating high variability in growth and a consequential a high degree indicating of overlap among annual cohorts.

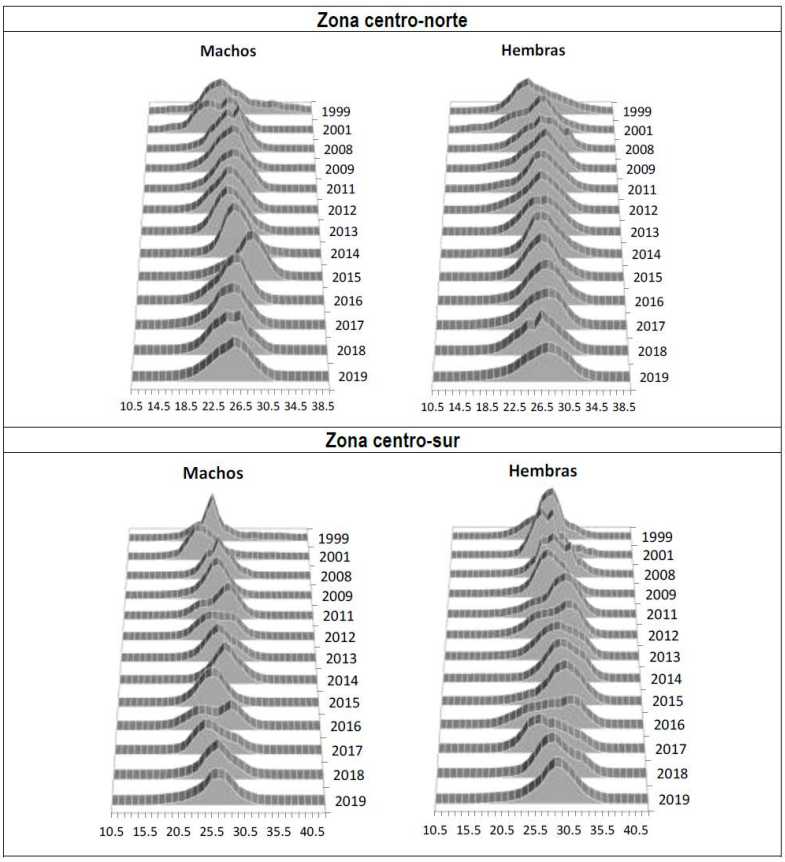

Figure 7.2.1.3. Nylon shrimp size frequency distribution (in proportion) of the direct evaluation of the years 1999, 2001, 2008, 2009, 2011-2019 (length of the cephalothorax in mm). Source; Ibarra and Yanez 2021, Figure 26.

Reproduction

Nylon shrimps mate in the autumn, followed by extrusion of eggs which are carried by the female for 4-6 months followed by release of larvae in early spring. The number of eggs has been observed to vary between 1,000 and 27,000 with fecundity dependent on size of female shrimp as follows:

Number of eggs = 0,010 * CL3,903

(Arana et al., 1976)

The length at first maturity was estimated by different authors (Table 7.2.1.2), demonstrating that this species reaches maturity in the range of 24.5-28.8 mm CL, with the most probable size of 25 mm CL and an age of about 2.5 years (Arana et al, 1976; Canales et al, 1999.).

Table 7.2.1.2. Estimates of length at first sexual maturity in *Heterocarpus reedi* from various sources. Source Addison and Adlerstein-Gonzalez 2016 Table 7.

Método	Período analizado	$LC_{50\%}$ (mm)	Rango (mm)	Edad (años)	Referencia
Ajuste logístico		25,5		3,02	Arana & Tiffou, 1970
Ajuste logístico		25,1		2,5	Arana *et al.*, 1976
Ajuste logístico, ajuste no lineal	May-Ago 1996	24,5	23,8-24,9		Monardes & Olate, 1996
Ajuste no lineal, Máxima verosimilitud		28,8	28,2 - 29,6		Acuña *et al.*, 1997
Máxima verosimilitud	Jul-Ago 1997		18,0 - 37,3	6	Canales *et al.*, 1999

LC = longitud cefalotorácica

Ibarra and Yanez (2021) presented average length at maturity based on multiple studies (Table 7.2.1.3). They noted that an estimate of female average length at maturity of 24.3 based on an average from Canales et al 1999 seems appropriate given that the authors used in the analysis a wider size distribution, which reduces the estimation bias due to problems of sample coverage of size composition. This size approximately corresponds to an age-at-maturity of about 3 years (Table 7.1.2, Figure 7.1.2)

Table 7.2.1.3 Estimates of average length at maturity of *Heterocarpus reedi* females according to various sources. Source Ibarra and Yanez 2021, Table 2.

Método	Datos	LC (mm)	Rango	Edad (años)	Referencia
		25.5		3.02	Arana & Tiffou, 1970
		25.1		2.5	Arana *et al.* (1976)
Modelo logístico, ajuste por máxima verosimilitud	mayo-agosto 1996	24.5	23.8-24.9		Monardes & Olate (1996)
Modelo logístico. ajuste por máxima verosimilitud		28.77	28.19-29.56		Acuña *et al.* (1997)
Modelo logístico. ajuste por máxima verosimilitud	12752 ind./07-08-1997	24.33	18-37.3	6	Canales *et al.* (1999)

Natural mortality

Natural mortality has been estimated using different methodologies by various authors (Table 7.2.1.4). These estimates are highly variable ranging 0.18-0.74. Ibarra and Yanez (2021) adopted a value of M=0.36 for both sexes for their assessment model. That estimate was based on the relationship between the growth constant (k) and the longevity of the species, proposed by Beverton & Holt (1959).

Table 7.2.1.4. *Heterocarpus reedi* natural mortality estimated by different methodologies and authors. Source Addison and Adlerstein-Gonzalez 2016 Table 8.

Metodología	Machos	Hembras	Ambos	M/K machos	M/K hembras	Referencia
Pauly (1980)	0,590	0,526				
Pauly (1980)	0,649	0,580				
Pauly (1980)	0,704	0,629				Ziller, 1993
Rikhter & Efanov (1976)	-	0,533				
Roff (1988)	-	0,604				
Roff (1988)	-	0,479				
Pauly (1980)	0,203	0,253				Pavez *et al.*, 1996
Van Sickle (1974) Caddy (1984)	0,85	0,74				Acuña *et al.*, 1997
Rikhter & Efanov (1976)		0,46	0,28		2,64	
Alagaraja (1984)	0,33	0,27	0,21	1,66	1,55	
Alverson & Carney (1975)	0,59	0,48	0,36	2,96	2,76	Canales *et al.*, 1999
Roff (1988)		0,28	0,12		1,61	
Taylor (1958)	0,21	0,18	0,14	1,06	1,03	
Promedio ponderado			0,28			

Generation time was approximated based on an equation that provides a reasonable approximation in cases where when 0.1 ≤ M ≤ 2 MSC guidance (see guidance GSA2.2.4)

GT=1/M + Am50

where Am50 is the age at 50% maturity.

In this case age-at maturity is approximately 3 years for females and M=0.36.
Generation time is calculated at GT=5.8 years or about 6 years.

Prey and predators

Nylon shrimp are active predators, with some feeding specificity, and omnivorous detritivore feeders (Addison and Adlerstein-Gonzalez 2016). The main predators for nylon shrimp are the bigeye flounder (*Hippoglossina macrops*), Patagonian toothfish (*Dissostichus eleginoides*), kingclip (*Genypterus blacodes*) and Chilean hake (*Merluccius gayi gayi*). Nylon shrimp is not considered to be a key low trophic level (LTL) species.

II. Yellow squat lobster

Taxonomy and distribution

The yellow squat lobster, *Cervimunida johni*, known in Chile as 'langostino amarillo' is a decapod crustacean of the family Galatheidae. Its distribution is generally considered to be from Punta Lobos (28 º 18'S, Region III) in the north to the southern boundary of the island of Chiloé (43 º 10'S, Region X) (**Figure 7.2.1.4**). However, research vessel surveys have confirmed the presence of *C. johni* further to the north off Punta Foxes (26 º 10'S). The squat lobster is distributed in depths ranging from 150 to 500 m, in a thin strip of seabed on the upper continental slope and sporadically over the continental shelf. The highest concentrations are found off the coasts of the Regions of Coquimbo, Valparaiso and O'Higgins (Regions IV to VI). There is some overlap in the geographical distribution of the yellow squat lobster with other commercially-exploited crustaceans, the red squat lobster (*Pleuroncodes monodon*) and the nylon shrimp *(Heterocarpus reedi*), but the three species tend to be found at different depths. Areas of abundance of *C. johni* are influenced by the Equatorial Subsurface Water (AESS), which are characterized by relatively high salinities, usually greater than 36.6 ppt, with temperatures ranging between 10 and 11ºC and very low concentrations of dissolved oxygen, usually less than 1.0 mL L-1. Especially in the south of the yellow squat lobster's distribution area, upwelling is observed during periods of prevailing winds, which contributes to fertilization of the surface water and the growth of phytoplankton.

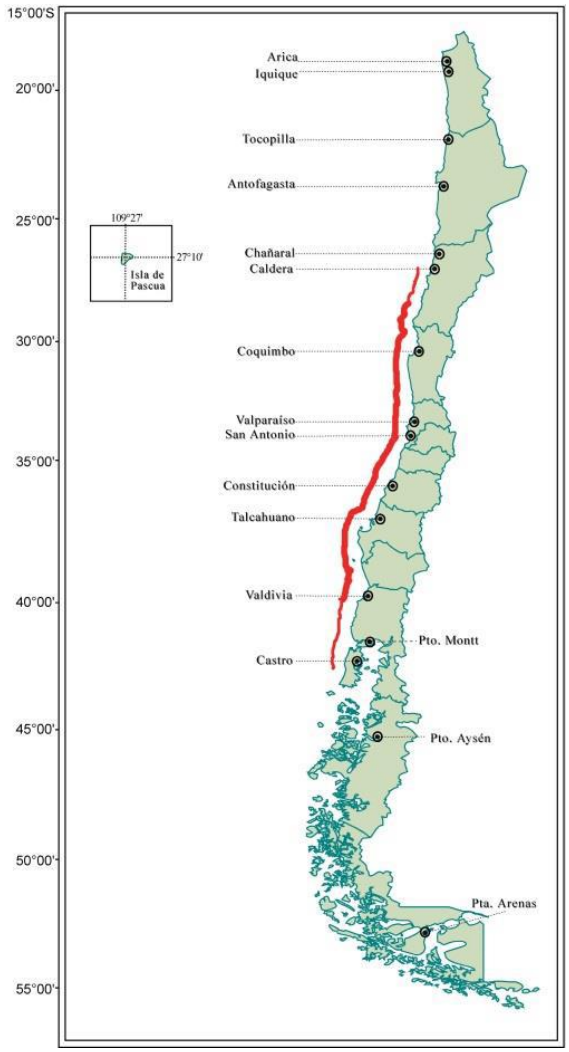

Figure 7.2.1.4. Distribution of yellow squat lobster, *Cervimunida johni*, off the Chilean coast. Source Addison and Adlerstein-Gonzalez 2016 Figure 18

Migration and stock structure

Yellow squat lobster distribution is characterized by large scale clusters of individuals in certain areas of the continental slope (Addison and Adlerstein-Gonzalez 2016. Local movements are observed, but this species does not exhibit large scale migrations on the continental shelf as exhibited by the red squat lobster. In the Northern Fisheries Unit (Regions III and IV), observations of population structure of yellow squat lobsters in 2008 showed that the length frequency distribution was unimodal (Acuña *et al*. 2010). Males ranged in size between 10.1 and 53.9 mm carapace length (CL) with a mode at 37 mm CL, whereas females ranged in size from 11.2 to 46.7 mm CL with a mode of 28 mm CL. In subsequent research cruises in 2009 and 2010, length distributions of lobsters exhibited more than one mode showing peaks of recruitment to the stock, although this was more evident in males than in females. In the Southern Fisheries Unit (Regions V and VI), monitoring conducted in 2007 determined that males have larger average lengths in all areas compared to females. Average lengths of males and females ranged between 32.2 and 41.8 mm CL and 31.2 and 34.8 mm CL respectively (Arana *et al.,* 2008). Males predominate in the total catches and there is a progressive dominance of males above 35 mm CL, reaching nearly 100% at lengths > 38 mm CL (Arana *et al*., 2008).

Growth

Growth of crustaceans occurs through the shedding of the exoskeleton (ecdysis). The main moulting period after which the squat lobster has a soft shell for a short period of time is from late November to late summer (February-March). For this reason, SUBPESCA maintains a biological ban from 1 January until 31 March each year, seeking to protect individuals during the main moulting period. As with all crustacean species, estimation of growth parameters is difficult because determination of age is difficult and not routinely conducted and because growth rate depends on both moult increase and moult frequency. In addition, in the yellow squat lobster it is common for individuals to protect themselves, burying or hiding in cavities or inaccessible areas of the seafloor after moulting, thus reducing the chances of being caught by fishing gear (Arana, 1990).

The recent study of age and growth in all three demersal crustaceans (Kilada and Acu˜na 2015) indicated that for yellow squat lobsters males were larger at age than females, with this sexual dimorphism more pronounced than in the other two species. (**Figure 7.2.1.2**). Maximum age of yellow squat lobster was 11 years of age (**Figure 7.2.1.2**),

There have been various estimates of growth parameters with varying results (Table 7.2.1.5). According to these estimates, most individuals in the catch would be 5-8 years, sexual maturity would be reached at 3-4 years of age, and the maximum age that could be reached would be close to 10-12 years (Addison and Adlerstein-Gonzalez 2016) consistent with the study by Kilada and Acu˜na (2015).

Table 7.2.1.5. Growth parameters estimated for *Cervimunida johni* by various authors. Source Ibarra and Yanez 2021 Table 18.

Sexo	L_∞	K	t_0	Fuente
Hembras	54,60	0,177		Alegría *et al*., 1993
Machos	60,70	0,265		
Ambos sexos	46,00	0,315		Wolf & Caroca, 1995
Hembras	51,80	0,194	-0,44	Pavéz & Falcón, 1994
Machos	58,00	0,165	-0,58	
Hembras	53,90	0,196		Pavéz & Falcón, 1995
Machos	57,40	0,221		
Hembras	54,60	0,177	-1,87	Pool *et al*., 1996
Machos	62,10	0,165	-1,62	
Hembras	49,00	0,154		Acuña *et al*., 1996
Machos	59,30	0,118		
Hembras	45,60	0,174		Arancibia *et al*., 2005
Machos	52,80	0,151		

Ibarra and Yanez (2021) noted that the values growth of parameters adopted for the yellow squat lobster assessment are those provided by Arancibia et al. (2005) including a maximum asymptotic length ($L\infty$) of 45.6 mm for females and 52.8 mm for males, and a K = 0.174 year-1 for females and K = 0.151year-1 for males.

Size at age is highly variable (**Figure 7.2.1.2**). This is reflected in size compositions which are typically unimodal (**Figure 7.2.1.5**, Ibarra and Yanez 2021), indicating high variability in growth and a consequential high degree of overlap among annual cohorts.

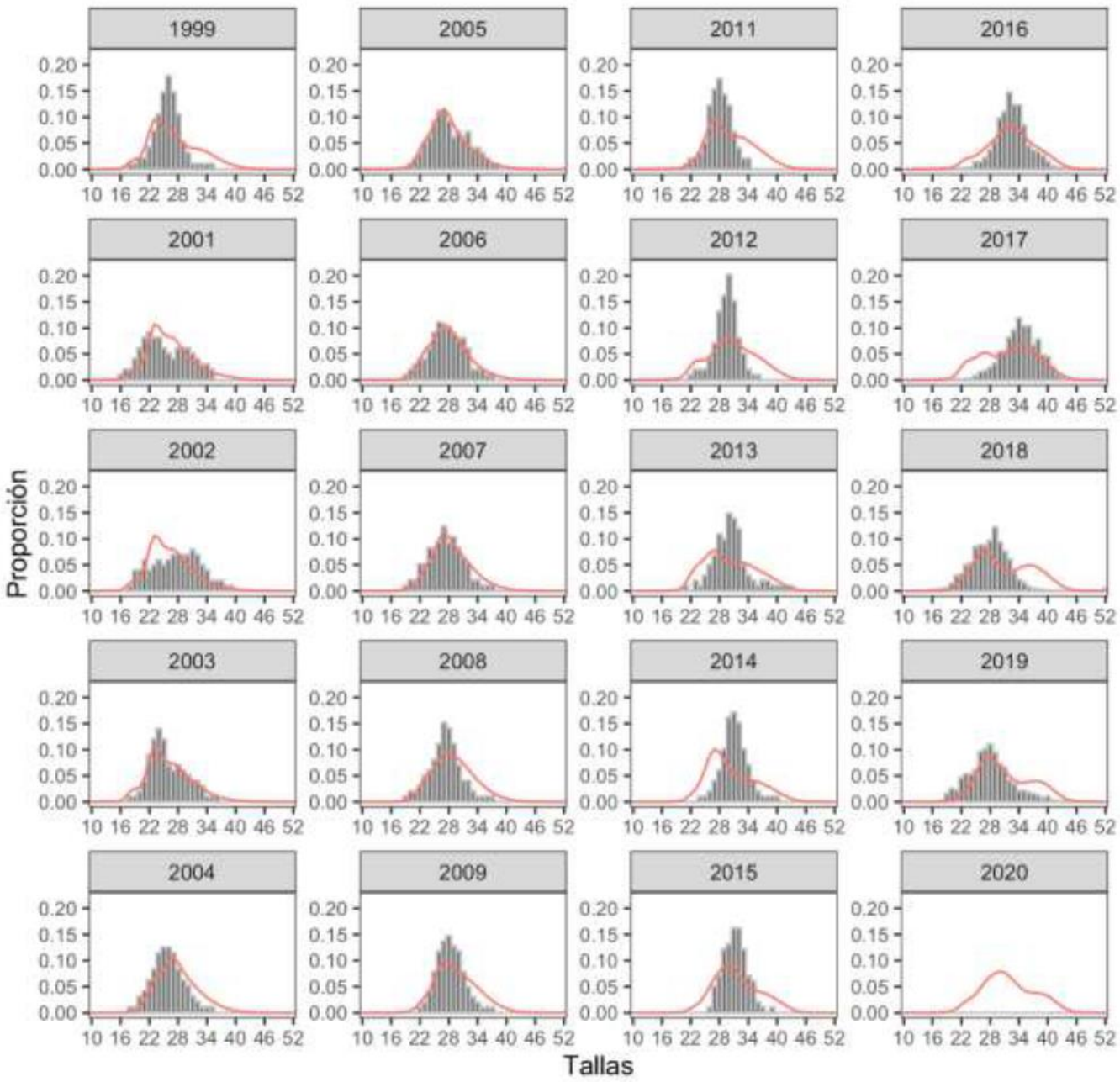

Figure 7.2.1.5. Fit the model (lines) to the length compositions of females (bars) in the survey, yellow squat lobster northern zone. Period 1999 - 2020. Source Ibarra and Yanez Figure 88.

Reproduction

Information on the reproductive behaviour of yellow squat lobster is based mainly on the analysis of the proportion of egg-carrying females and the stages of embryo development (Henriquez, 1979; Palma & Arana, 1997; Acuña *et al*, 2005.). Monitoring surveys indicate the presence of egg-carrying females during winter and spring, and based on the high percentage of carrying females in catches (> 80% of all females), it has been suggested that each female produces one clutch of eggs per year (Palma & Arana, 1997 Acuña et *al.*, 2005). However, in the period from June to October females with early stage embryos have been found, suggesting that not all females are mated at the same time. The size range of egg-carrying females is very broad, ranging from 11.5 mm to 43.5 mm CL (Palma & Arana, 1997, Acuña et al., 2005).

Size at sexual maturity has been investigated in both the northern and southern fisheries. In the northern region, Espejo *et al*. (2001) estimated the size at which 50% of individuals are sexually mature (LM50%) to be 26.1 mm CL and in a separate study in Region IV Acuna *et al*. (2008) estimated the length at first maturity to be 24.9 mm CL. In the southern area, Zilleruelo & Montenegro (2007) estimated the size at 50% maturity to be 32.7 mm CL, although this may represent an overestimate of size at maturity in this area (Addison and Adlerstein-Gonzalez 2016).

It has been suggested that in *C. johni* it is not necessary for females to have moulted for mating to take place. The presence of eggs under the abdomen of the female of this species is recorded from May to November in the north and between May and December in the south, with maximum numbers of egg-carrying females between July and October in the north and between July and November in the south

Fecundity has been determined in the northern regions with the number of eggs between 500 and 13,500 eggs. (**Figure 7.2.1.6**). The relationship between carapace length and number of eggs is:

$$NTH = 0{,}00011 \cdot LC^{5{,}1006}$$

(Acuña *et al.,* 2008)
where,

NTH: total number of eggs. LC: female carapace length (mm).

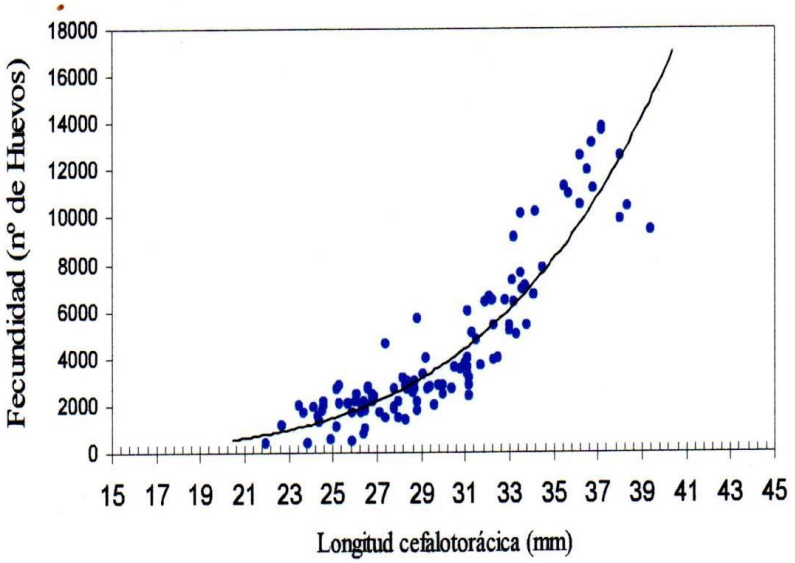

Figure 7.2.1.6. Ratio adjustment carapace length-average number of eggs by female yellow squat lobster caught in Region IV. 22. Source; Addison and Adlerstein-Gonzalez 2016, Figure 22.

Larvae stage

Monitoring the embryonic development of *C. johni* under laboratory conditions (11-13°C in seawater), revealed that for these conditions, this phase lasts between 28-40 days. There has been no study of the development of the larvae stage in *C. johni*.

Natural mortality Estimates of the natural mortality rate (M) are of great importance in the analysis of population dynamics, and biological reference points may be more sensitive to changes in natural mortality than variations in growth (Collie & Gislason, 2001). A number of studies have estimated natural mortality rate (M) in the yellow squat lobster, resulting in a range of estimates (Table 7.2.1.6). Overall, estimates of M ranged 0.25-0.77 for males and 0.17-0.92 for females. Ibarra and Yanez (2021) adopted a value of M=0.3 year-1 for the stock assessment, based on the estimates provided by Acuña et al., 1996.

Table 7.2.1.6. Natural mortality rate of *Cervimunida johni* estimated by various authors Source; Ibarra and Yanez 2021 Table 19.

Sexo	M (1/año)	Método	Referencia
Machos Hembras	0.317 0.352		Pavéz *et al*. (1994)
Machos Hembras	0.66-0.77 0.77-0.92	Algaraja, 1994	Wolff & Aroca (1995)
Machos Hembras	 0.88-0.99	Rikhter & Efanov, 1976	Wolff & Aroca (1995)
Machos Hembras	0.250 0.300	Pauly, 1980	Acuña *et al*. (1996)
Machos Hembras	0.263 0.165	Algaraja, 1994	Escuela de Cs. Del Mar (2000)

Generation time was approximated based on an equation that provides a reasonable approximation in cases where when 0.1 ≤ M ≤ 2 MSC guidance (see guidance GSA2.2.4)

GT=1/M + Am50

where Am50 is the age at 50% maturity.

In this case age-at-maturity is approximately 5-6 years for females, based on estimated size at 50% maturity of 26.1 as noted above and the relationship of size with age (**Figure 7.2.1.2**). Natural mortality is taken as M=0.30.

Generation time is calculated as GT=8.3-9.3 years or about 8-9 years.

Predators and prey

Acuña *et al.* (2007) identified the bigeye flounder (*Hippoglossina. macrops*) as an important predator of yellow shrimp, recording the presence of *C. johni* juveniles (8.0 to 8.7 mm CL) in flounder stomachs mainly in June. Larger bigeye flounder is known to prey upon nylon shrimp and yellow squat lobster (Villarroel & Acuña, 1999). Yellow squat lobster is not considered to be a key low trophic level (LTL) species.

III. Red squat lobster

Taxonomy and distribution

The red squat lobster, *Pleuroncodes monodon* (H. Milne Edwards, 1837), known in Chile as 'langostino colorado' is a decapod crustacean of the family Galatheidae. The species is characteristic of the south eastern Pacific Ocean, and is distributed from Lobos de Afuera in Peru, to the island of Chiloe in Chile (Haig, 1955) (**Figure 7.2.1.7**). Abundance of *P. monodon* is influenced by the Equatorial Subsurface Water (AESS), which are characterized by relatively high salinities, usually greater than 36.6 ppt, with temperatures ranging between 10 and 11ºC and very low concentrations of dissolved oxygen, usually less than 1.0 mL L-1. Especially in the south of the red squat lobster's distribution area, upwelling is observed during periods of prevailing winds, which contributes to fertilization of the surface water and the growth of phytoplankton. Sediment and nutrients that outflow from various rivers in this region are also important in determining distribution and abundance of P. monodon. The red squat lobster inhabits muddy sand, rich in organic matter that serves as a food source (Gallardo et al. 1994).

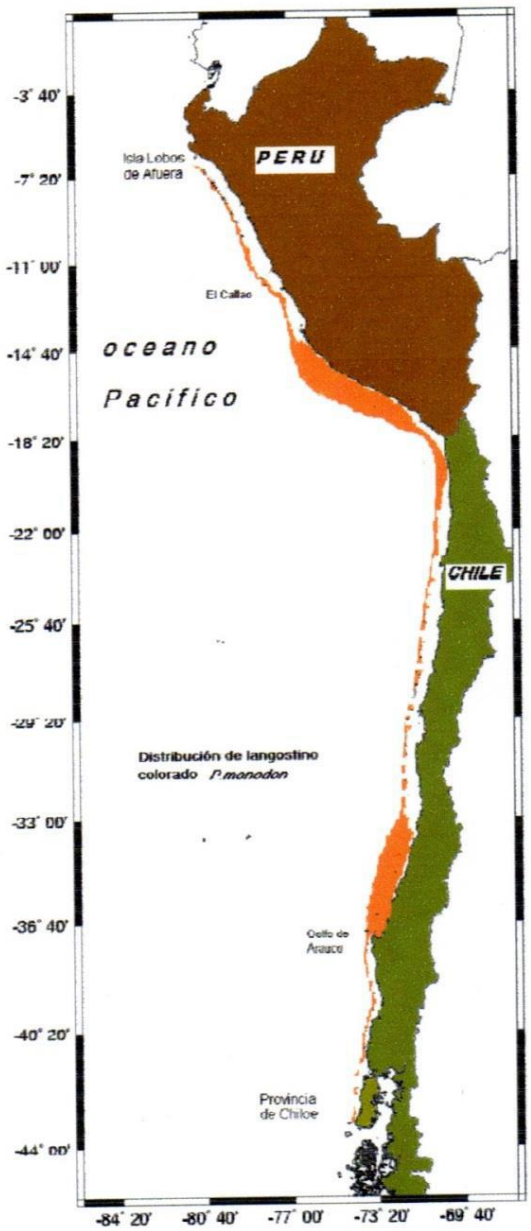

Figure 7.2.1.7. Distribution of *Pleuroncodes monodon* in the Southeast Pacific Ocean. Source; Addison and Adlerstein-Gonzalez 2016, Figure 23.

Migration and stock structure

Red squat lobsters are found in high concentrations on parts of the continental shelf, in shallow water in the spring when the females are carrying eggs and in deeper water during the summer. It is hypothesized that these shifts must be associated with changes in environmental conditions or biological requirements of the females, which require higher temperature during the embryonic development. Direct assessments of red squat lobster during the period 1979-2012 showed variations in the overall sex ratio, but there were always more males than females. Monitoring also suggests that the average size of red squat lobster declines during the fishing season.

Growth

The main moulting period for the red squat lobsters after which lobsters have a soft shell for a short period of time is from late November to late summer (February-March). For this reason, SUBPESCA maintains a biological ban from 1 January until 31 March each year, seeking to protect individuals during the main moulting period. As with the yellow squat lobster, estimation of growth parameters is difficult because of the age is not routinely determined from hard structures and because squat lobsters bury or hide in cavities or inaccessible areas of the seafloor to protect themselves after moulting, thus reducing the chances of being caught by fishing gear (Arana, 1990).

The recent study of age and growth in all three demersal crustaceans (Kilada and Acu˜na 2015) indicated that for red squat lobsters males were larger at age than females. (Figure 7.1.2). Maximum age of red squat lobster was 5 years of age (**Figure 7.2.1.2**),

There have been various estimates of growth parameters with varying results (Table 7.1.7). According to these estimates, most individuals in the catch would be 3-5 years old, and the maximum age that could be reached would be close to 8 years. This is considerably older that the maximum of 5 years from the direct ageing study (Kilada and Acu˜na 2015).

Table 7.2.1.7. Growth parameters estimated for red squat lobster by various authors. Source Ibarra and Yanez 2021 Table 38.

Sexo	L_∞	k	t_0	Zona	Fuente
Machos	60,00	0,196	1,66	Centro-sur	Miranda, 1965
Ambos sexos	47,81	0,109		Centro-sur	Bustos et al., 1982
Ambos sexos	52,6	0,220	-1,425		Rodríguez *et al.*, 1987
Hembras	59,92	0,244	-0,066	Centro-sur	Arana et al., 1990
Machos	59,95	0,245	-0,056		
Ambos	59,95	0,245	-0,056		
Hembras	55,00	0,260	-0,056	Centro-sur	Peñailillo y Henríquez, 1990
Machos	59,00	0,230	-0,056		
Hembras	44,55	0,179	-0,510	Centro-sur	Roa, 1993
Machos	50,45	0,197	-0,510		
Hembras	38,36	0,375	-0,328	Cañón del Biobío	Roa y Tapia, 1998
Machos	40,78	0,371	-0,240		
Hembras	41,30	0,199	-0,510	Pichilemu-Achira	
Machos	50,04	0,200	-0,510		
Hembras	47,10	0,157		Atacama	Quiroz et al., 2006
Machos	47,53	0,164			
Hembras	50,34	0,121		Coquimbo	
Machos	46,40	0,167			

Size at age is highly variable (**Figure 7.2.1.2**). This is reflected in size compositions which are typically unimodal (**Figure 7.2.1.8**, Ibarra and Yanez 2021), indicating high variability in growth and a consequential high degree of overlap among annual cohorts. The appearance of modal groups of small lobsters can indicate incoming recruitment as seen in 2002 and 2018.

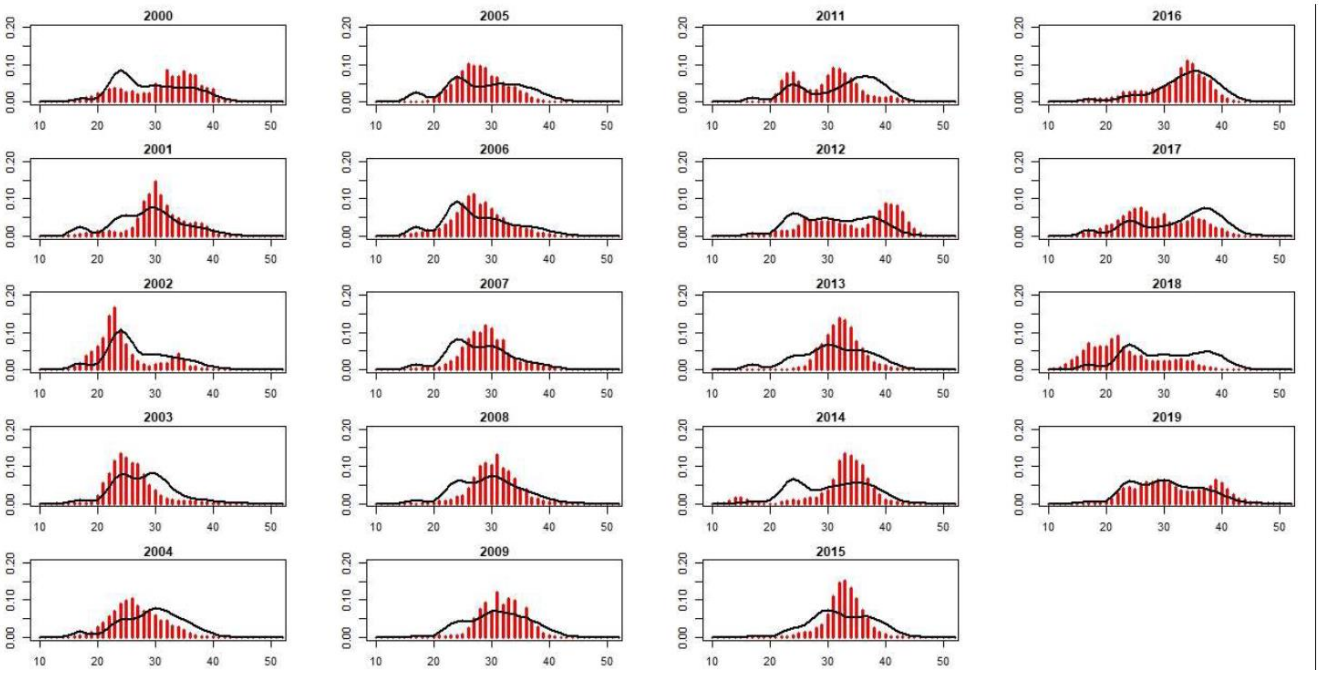

Figure 7.2.1.8. Fit the model (lines) to the length compositions (bars) in the survey, red squat lobster northern zone, sexes combined. Source Ibarra and Yanez Figure 155.

Reproduction

P. monodon exhibits females carry eggs on their pleopods for about six months between April and December of each year, and females ranging in size from 12.0 to 43.9 mm CL have been observed carrying eggs. Various studies have

shown that size at 50% maturity may vary with geographical area from 22.8 to 32.0 mm CL (Palma & Arana, 1997, Roa 1993, Arana et al., 2007, 2010).

Recently, Queirolo et al., 2015, estimated Lt-at-Mat 50 of 24.8 mm for the northern zone and 28.9 mm for the southern zone.

Fecundity of the red squat lobster ranges from 1,000 to 50,000 eggs dependent on size of female and three studies have estimated the relationship between number of eggs and female carapace length:

$Fecundity = 0{,}010 \cdot CL^{4.02}$ (Bustos & Retamal, 1985)

$Fecundity = 0{,}015 \cdot CL^{3.844}$ (Palma & Arana, 1997)

$Fecundity = 0{,}002 \cdot CL^{4.45}$ (Roa *et al.,* 1997)

Natural mortality

Estimates of M have been made in both the northern and southern fishery areas, resulting in a range of estimates of natural mortality rate (Tables 7.2.1.8 and 7.2.1.9). M estimates from various studies ranged 0.18-0.42 (by sex) in the northern zone with mean estimates of 0.36 for males and 0.27 for females. Estimates for the southern zone ranged 0.21-0.75.

Ibarra and Yanez (2021) adopted a value M = 0.35 year-1, for both sexes as a fixed parameter (not estimable) within the assessment model

Table 7.2.1.8. Estimation of natural mortality *Pleuroncodes monodon* in Region IV (Coquimbo) (Canales *et al*., 1998). Source Addison and Adlerstein-Gonzalez 2016 Table 12.

	MACHOS					
EEPE+EEPM	**Media ponderada (M)**		**0.36**			
Estimación	**Mediana (M)**	**Perc. 2.5% (M)**	**Perc. 97.5% (M)**	**CV (M)**	**Media (M)**	**Var (M)**
Pauly (1980)	0.31	0.15	0.65	40%	0.34	0.018
Rikhter & Efanov (1976)	0.41	0.26	0.59	21%	0.42	0.007
Alverson & Carney (1975)	0.27	0.15	0.47	30%	0.28	0.007
Hoening (1983)	0.22	0.11	0.43	36%	0.23	0.007
Jensen (1996)	0.42	0.33	0.52	12%	0.42	0.002
EEPE	**Media ponderada (M)**		**0.33**			
Estimación	**Mediana (M)**	**Perc. 2.5% (M)**	**Perc. 97.5% (M)**	**CV (M)**	**Media (M)**	**Var (M)**
Pauly (1980)	0.31	0.26	0.37	9%	0.31	0.0009
Rikhter & Efanov (1976)	0.41	0.36	0.46	6%	0.41	0.0006
Alverson & Carney (1975)	0.27	0.21	0.33	11%	0.27	0.0009
Hoening (1983)	0.22	0.17	0.27	11%	0.22	0.0006
Jensen (1996)	0.42	0.37	0.47	6%	0.42	0.0007

	HEMBRAS					
EEPE+EEPM	**Media ponderada (M)**		**0.27**			
Estimación	**Mediana (M)**	**Perc. 2.5% (M)**	**Perc. 97.5% (M)**	**CV (M)**	**Media (M)**	**Var (M)**
Pauly (1980)	0.26	0.12	0.57	40%	0.28	0.013
Rikhter & Efanov (1976)	0.30	0.17	0.47	25%	0.31	0.006
Alverson & Carney (1975)	0.21	0.11	0.35	28%	0.21	0.004
Hoening (1983)	0.17	0.08	0.34	37%	0.18	0.004
Jensen (1996)	0.31	0.25	0.38	11%	0.31	0.001
EEPE	**Media ponderada (M)**		**0.25**			
Estimación	**Mediana (M)**	**Perc. 2.5% (M)**	**Perc. 97.5% (M)**	**CV (M)**	**Media (M)**	**Var (M)**
Pauly (1980)	0.26	0.22	0.31	8%	0.26	0.0004
Rikhter & Efanov (1976)	0.31	0.27	0.34	6%	0.30	0.0003
Alverson & Carney (1975)	0.21	0.17	0.24	9%	0.21	0.0003
Hoening (1983)	0.17	0.14	0.20	9%	0.17	0.0002
Jensen (1996)	0.31	0.28	0.34	5%	0.31	0.0003

Table 7.2.1.9. Estimation of natural mortality *Pleuroncodes monodon* in the central-south (Quiroz *et al*., 2006). Source Addison and Adlerstein-Gonzalez 2016 Table 13.

Método	M			M/K		
	Machos	Hembras	Ambos	Machos	Hembras	Ambos
Rikther & Efanov (1976)		0,65			2,5	
Alagaraja (1984)	0,35	0,42	0,38	1,52	1,62	1,55
Alverson & Carney (1975)	0,62	0,75	0,68	2,7	2,88	2,78
Roff (1988)		0,21			0,81	
Taylor (1958)	0,23	0,26	0,25	1	1	1,02

Generation time was approximated based on an equation that provides a reasonable approximation in cases where when 0.1 ≤ M ≤ 2 MSC guidance (see guidance GSA2.2.4)

GT=1/M + Am50

where Am50 is the age at 50% maturity.

In this case age-at-maturity is approximately 5-6 years for females, based on estimated size at 50% maturity of 24.8-28.9 as noted above and the relationship of size with age (**Figure 7.2.1.2**). Natural mortality is taken as M=0.35. Generation time is approximated as GT=2-3 years.

Prey and predators

Red squat lobster is an active predator, with some food specificity. In its larval stage, it feeds by filtering algae and other planktonic organisms, whereas in the benthic phase it feeds by filtering suspended particles near the seafloor. It also tends to consume waste arising from the decomposition of plants and animals (detritus), as well as polychaetes and amphipods (Roa & Tapia, 1998). Likewise, a key part of their diet consists of the prokaryotic bacteria Thioploca, so juveniles of this species are usually located in anoxic areas, where the bacteria is found in abundance (Roa *et al*., 1995b). The main predators of squat lobsters are the black eel (*Genypterus maculatus*), bigeye flounder (*Hippoglossina macrops*), Chilean hake (*Merluccius gayi gayi*), pejerrata (*Coelorhynchus aconcagua*) and occasionally elasmobranchs such as skate (*Raja chilensis*) (Bahamonde *et al*., 1984; Retamal, 1977 Arancibia & Meléndez (1984, 1987). Red squat lobster is not considered to be a key low trophic level (LTL) species.

7.2.1.2 Management

The overarching legislation which determines the harvest strategies for the three demersal crustacean fisheries in Chile is the new General Law on Fisheries and Aquaculture (LGPA in Spanish). The harvest strategy is also governed by the distinction between industrial vessels, which fish under Tradeable Fishing Licences (LTPs in Spanish) or Extraordinary Fishing Permits (PEPs in Spanish), and artisanal fishing vessels which fish under the Artisanal Harvest Regime (RAE in Spanish).

The LGPA mandates that management plans should be established for each fishery resource, to provide a package of measures to support the work of Scientific Committees. Harvest strategies are regularly reviewed within both the Scientific Committee and the Management Committee in consultation with stakeholders through the National Fishery Council (CNP in Spanish) and the Regional Fisheries Councils (CZP). More details on the overall management objectives and associated framework are detailed in in Addison and Addison and Adlerstein-Gonzalez 2016

The decision-making process is one that involves all stakeholders. IFOP carries out stock assessments for each target stock fitting age- structured stock assessment models to fisheries data and fisheries-independent survey indices. IFOP assesses the status of the stocks in relation to pre-defined reference points which are formulated within an MSY framework. For setting global catch quotas, the scientific committees propose a range of acceptable biological catch (CBA) within which SUBPESCA can choose a quota level based on the application of explicit HCRs for various states of exploitation. The CCT debates the technical aspects of the assessments and makes recommendations to SUBPESCA, The CCT-CD also meets regularly to review and discuss different issues relevant to the fishery.

I. Harvest strategy

Details of the harvest strategy are outlined in the current management plan for the three demersal crustacean fisheries that was completed in 2015 (Subsecretaria de Pesca 2016) and is currently being revised. The various elements of the harvest strategy that are common to all three demersal crustacean fisheries are represented by harvest control rules (HCRs) and an assortment of tools associated with implementation of the HCRs. Tools include regulations, monitoring activities, and reference points, as outlined below (updated from Addison and Adlerstein-Gonzalez 2016).

Regulations

(i) Limited entry. All fishing vessels must have a licence issued by the Chilean government, and so fishing effort is limited. Under the LGPA, open access is not granted for fisheries that are fully exploited or have been overexploited and then declared in recovery which is the case for the three demersal crustacean fisheries. Licences are transferable

and are granted to vessels either for industrial or artisanal fishing (see section 3.2.5 for further details). In practice, the quotas are owned by the fishing companies who may determine which vessels fish for their quota each year.

(ii) Quotas. Catches are regulated by global annual quotas for the fisheries. These quotas may be allocated by region, and split between industrial and artisanal fishing vessels, and small allocations will be made for bycatch in other fisheries and for research purposes (for example to cover catches made during the fishery-independent stock surveys). Individual transferable quotas (ITQs) are allocated within the overall industrial and artisanal quotas. The way in which quotas are allocated across the industrial and artisanal components of the fleet depends upon whether the fishery is defined as under-exploited, fully-exploited, over-exploited or depleted.

(iii) Technical conservation measures. Fishing is not permitted by any vessels within 1nm of the coast, and the 1nm to 5nm region is reserved for artisanal fishing vessels except in Regions III and IV. There are closed seasons for each species linked to moult and reproductive stages. The yellow and red squat lobster fisheries are closed from 1 January to 31 March each year which coincides with the main moult period when mating occurs. This closure therefore protects against both the capture of soft-shelled lobsters and provides protection for mating individuals. Similarly, the nylon shrimp fishery is closed from 1 July to 31 August. In addition, all demersal crustacean fisheries in Regions V-VII are closed during September which is the time of peak abundance of egg-bearing females. There is no prohibition on the landing of egg-bearing females in any of the fisheries, as the closed seasons are considered sufficient to protect egg production. There is no minimum landing size in the demersal crustacean fisheries.

(iv) Gear restrictions. A new modified trawl became mandatory in November 2014. The new regulation prescribes overall dimensions, net material and mesh sizes in different parts of the nets, structures to protect against wear, and escape devices. The minimum mesh size for the tunnel and cod end for the nylon shrimp fishery is 50 mm and for yellow and red squat lobster fisheries is 60 mm.

Monitoring

A key element of the harvest strategy is that the above regulations are underpinned by a comprehensive monitoring programme as outlined below:

- All industrial vessels must record fishing position through a mandatory Vessel Monitoring System (VMS)

- Catches must be recorded for each tow of the gear on electronic log books

- An observer programme covering approximately 17% of all fishing trips (Ibarra and Yanez 2021) records species composition including bycatch, total catch composition, length frequency, sex and reproductive status of females for the target species and collects biological samples

- Fishery-independent stock surveys are conducted annually

- 100% dockside monitoring of landings

-EMS for quantification of discardsdiscards

-Annual assessment of stock status using an age-structured model

- Processors must keep mandatory data records on amounts of each species processed

Monitoring and enforcement activities are primarily the responsibility of SERNAPESCA, which monitors landings and quotas, collects statistics and plays an enforcement role. Log book records, dockside landings, transport documentation and processors' records are all cross-checked by SERNAPESCA to monitor compliance with the regulations. Currently there is no on-board enforcement system, as scientific observers do not have an enforcement role. The implementation of on-board camera systems (EMS) in 2020 provides further monitoring of compliance.

Reference points

The harvest strategy for all three demersal crustacean fisheries requires the definition of biological reference points within an MSY framework. As outlined in the section on stock assessment below, target reference points for stock biomass (Bmsy) and fishing mortality (Fmsy) and a biomass limit reference point (Blim) have been defined for each fishery.

II. Harvest Control Rules

The key harvest control rule is to adjust the annual quota in line with fishing at Fmsy, which in the long term should implicitly maintain the biomass at Bmsy.

Well-defined HCRs are in place and specified in the management plan (Subsecretaria de Pesca 2016) which specify management actions to be taken with respect to quota establishment dependent upon the status of the stocks in relation to the biological reference points, from the assessment model results. Based on the relationship of SB with SBmsy stock status is characterised as under-exploited, fully exploited, over-exploited or collapsed.

These states of exploitation are defined as follows;

Under-exploited: $SB/SB_{MSY} > 1.5\ SB_{MSY}$
Fully exploited; $0.8\ SB_{MSY} > SB/SB_{MSY} > 1.5\ SB_{MSY}$

Over-exploited: $SB/SB_{MSY} < 0.8\ SB_{MSY}$
Collapsed: $SB/SB_{MSY} < 0.5\ SB_{MSY}$

If previously over-exploited, the stock may be designated as “in recovery”.

The specific HCRs mandated to be applied in the various states of exploitation are;

1. 1.If the spawning biomass is greater than 40% of B0, then it is recommended that any increase in the percentage of the annual catch quota does not exceed 15% over the quota of the previous year.
2. 2.In the event that spawning biomass is less than 40% of B0, and that the recovery period associated with the use of the Fmsy is greater than a generational cycle, a value of F should be used that will allow the fishery to recover in, at the most, a generational cycle.
3. In the event that the spawning biomass indicator passes from a state of overexploitation (lower than the 40%B0) to a fully exploited one, the quota should be set at a level consistent with Fmsy even when this increase exceeds the 15% indicated in rule 1.
4. If the spawning biomass is less than 20% of the B0, the application of a fishery closure should be evaluated.

III. Data / Information

An annual monitoring programme for the three demersal crustacean fisheries is set out in the Programa de Seguimiento de las Pesquerías de Crustáceos Demersales, this programme collects information on the following aspects of the fishery (updated from Addison and Adlerstein-Gonzalez 2016);

1. Fleet operations - distribution of catch quotas and landings, number of vessels operating, number of trips, catch per trip, average length of haul, fishing regions and depth, spatial coverage.
2. Fishery indicators - fishing effort (hours trawling), catch (tonnes) and fisheries yield (kilos / hour trawling).
3. Stock composition - length compositions, sex ratio.
4. Information associated with the reproductive process - proportion of females that are ovigerous, size at maturity, and proportion of individuals with soft shell.
5. Other biological information – e.g. length-weight relationship.

This fishery-dependent information is collected through electronic log books completed by the skippers after each tow of the trawl, satellite monitoring of fishing activity through VMS records, observer sampling on around 17% of all trips of total catch composition in 2020 (Ibarra and Yanez 2021), size and sex composition, biological sampling of catches, EMS monitoring of discards, 100% dockside monitoring of landings, and records of landings processed by the factories and transportation records.

In addition to the collection of fisheries-dependent data, the main indicator of stock biomass of the three demersal crustacean species comes from annual fisheries-independent stock surveys. The Fisheries Research Fund (FIP) has funded annual surveys since 1996 to undertake direct biomass assessments of yellow and red squat lobsters (except in 1998 and 2010) and nylon shrimp (except 1997, 2007 and 2010) between Regions II and VIII. The surveys are contracted out by IFOP to various institutions such as the Catholic University of Valparaiso (PUCV), the Catholic University of the North (UCN), the Fisheries Research Institute (INPESCA), the Fisheries Development Institute (FIFG) and the University of Concepción (UdeC). Although the surveys have not been undertaken by the same contractor each year, the surveys use commercial fishing vessels for the surveys under standard sampling regimes. The surveys take place in spring to coincide with peak of egg-carrying in the females. The survey uses a stratified random sampling design with the duration of the trawl tows standardized to 30 minutes, running on average for 1.6 km. The surveys use a swept area method for estimating total biomass: biomass indices per unit area are calculated from the catch taken over a known swept area, based on the time per tow and the width of the opening of the fishing gear, and then extrapolated to the total area of the distribution of the species. Stakeholders have expressed two concerns about the stocks surveys. Firstly, the surveys may not be covering the full geographical distribution of the stocks because they are conducted using industrial vessels, which can operate within the 5nm zone only in the northern regions, and so in the southern regions the surveys therefore do not cover the 1 to 5nm zone, and for the squat lobster species, there may be some areas in the southern region which are not covered by the surveys. Secondly, there was some concern expressed that the bureaucratic process of tendering for and awarding of contracts is too slow and results in the surveys being carried out too late in the season when most of the fisheries have taken place and thus underestimating biomass.

In addition to the IFOP-contracted surveys, direct assessments and/or monitoring in the southern area of yellow and red squat lobsters have been carried out through funding by the fishing companies exploiting these species, but it is not clear whether these surveys are incorporated within the assessments.

7.2.1.3 Stock assessments

I. Biological reference points

Resources are assessed, separately for northern and southern stocks of each species, using fishery data as well as fishery-independent data. Stock assessments for each species are conducted fitting age-structured models to fisheries data and fisheries-independent survey indices. The age-structured stock assessment model is used within a Bayesian framework. The model is fitted to length compositions using multinomial residual errors and to landings, CPUE and fisheries-independent survey indices using log-normal residual errors. The nylon shrimp assessment includes a Beverton and Holt stock-recruitment curve with the steepness parameter (h) set at 0.7. There is no observed stock-recruitment relationship for the squat lobster species, but average recruitment with deviations away from that average are used in the stock assessment. There are some uncertainties in the catches prior to 1995 when quotas were introduced, and in relation to the conversion of length distributions to age distributions. There are also uncertainties relating to stock boundaries.

MSY proxy reference points have been set for both squat lobster species as follows;

B_{MSY} = 40% B0, where B0 is the equilibrium biomass under no fishing
B_{lim} = 20% B0
F_{MSY} = F45%SPR|F=0 (i.e. the F when biomass per recruit is 45% of biomass per recruit when F=0)

F 45%SPR|F=0 is considered a suitable proxy for target fishing mortality that would drive a stock towards Bmsy (40% of B0) under a wide range of steepness values in a Beverton and Holt stock recruitment curve, without the need to specify a specific steepness value. Additionally, the target range of biomass levels is defined between 20% under and 50% over Bmsy and F between 25% under and over F_{MSY}.

The status of each stock is assessed in relation to these reference points by characterising them as under-exploited, fully exploited or over-exploited (including collapsed) (**Figure 7.2.1.9**). If previously over-exploited, the stock may be designated as "in recovery". These zones have been defined with respect to fishing mortality (F) as +/- 0.25 F/F_{MSY}. Spawning stock biomass (SB), biomass of all sexually mature animals) limits for these zones are as follows (**Figure 7.2.1.9**);

Under-exploited: $SB/SB_{MSY} > 1.5\ SB_{MSY}$
Fully exploited; $0.8\ SB_{MSY} > SB/SB_{MSY} > 1.5\ SB_{MSY}$
Over-exploited: $SB/SB_{MSY} < 0.8\ SB_{MSY}$
Collapsed: $SB/SB_{MSY} < 0.5\ SB_{MSY}$
(Note that overfishing is considered to occur when: $F>1.25F_{MSY}$.

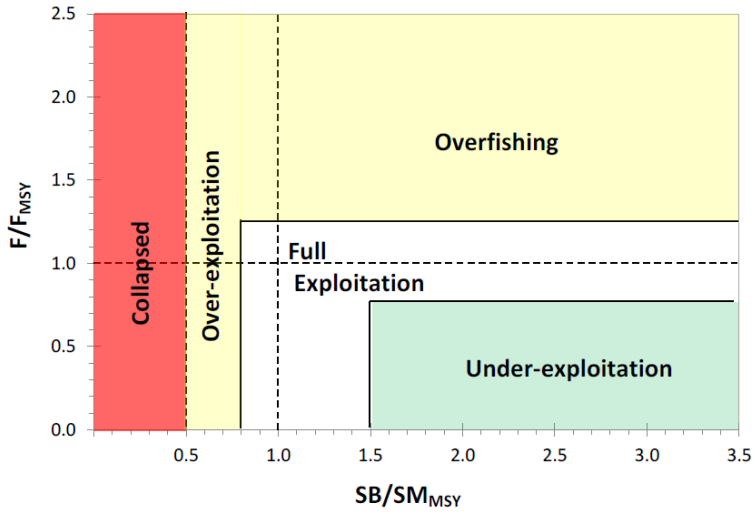

Figure 7.2.1.9. Phase diagram illustrating phases of fishery exploitation based on fishing mortality and spawning biomass (relative to MSY levels). Dashed lines at values of 1.0 represent MSY levels: Source: Cavieres 2017, Fig. 53

II. Uncertainties underlying the stock assessments

A review of the assessment approach in 2014 highlighted multiple concerns with the assessment (Dichmont 2015). These included that the model does not fit the size compositions well. Also concern was expressed with estimation of age composition from unimodal size compositions. Age is not routinely determined on an annual basis, but rather an age-length key is applied that does not account for annual variation in growth. It was also noted that model uncertainty has not been addressed which is the ability of the model to describe the population dynamics. The review noted that a totally different model would be required to address model uncertainty. It was concluded that the model is over-parameterized and it was recommended that a length-based model be explored, as is more commonly applied to crustacean resources that are difficult to age.

There are also uncertainties in the assessment related to the fishery independent survey. A new (modified) trawl has been introduced in the fishery and is used exclusively since 2014, but the traditional (unmodified) trawl continues to be

used in the survey for consistency. However, the estimated survey trawl catchability for all demersal crustaceans is uncertain. A recent study using trawl-mounted video camera (Ahumada et al in press) indicated that the catchability for yellow squat lobster is much less than unity which suggests that the trawl survey underestimates biomass. The survey catchability coefficient estimated by the model is much higher, exceeding unity in some cases, suggesting that the model may be underestimating biomass as well. While there is high uncertainty about the low experimental estimates of catchability from two vessels (about 0.35-0.43), the third vessel involved in the survey had a much higher catchability estimate (approaching unity) of 0.88, associated with the accidental use of a cable in advance of the groundrope which stimulated lobster activity and increased catchability (Ahumada et al in press). This provides support for the low estimates from the other two vessels.

There is also uncertainty regarding consistency or changes in survey catchability over time. This is reflected in erratic annual changes is survey biomass estimates for some stocks. This inconsistency is likely related to variable catchability in the surveys. Ahumada et al (in press) found that there was high variability in catchability of yellow squat lobsters within and among vessels involved in the survey due to variation in trawl configuration and sampling methods. Different commercial vessels and fishing captains are involved in annual surveys, likely contributing to inconsistency in catchability.

There is also uncertainty associated with inconsistency (among resources as well as years) in the application of assumptions regarding catchability. For example, two blocks of catchability were applied in the assessment of southern red squat lobster in 2017 but not in 2018, whereas the reverse was true for central-north nylon shrimp with two catchability blocks applied in 2018 but not 2017. In recent assessments two time blocks of catchability have been used related to changes in the estimation of tow duration based on an experiment using bottom contact sensors. Other uncertainties with the survey have been previously identified (Addison & Adlerstein-Gonzalez 2016), including incomplete coverage of resource distribution and variability in survey timing relative to the fishery. Survey estimates may also be biased by dynamically changing resource distribution during the survey. The 2014 review of the assessment stressed that resolving the uncertainties in the survey, particularly annual inconsistency so as to develop a reliable index, should be the highest research priority (Dichmont 2015).

There are also uncertainties in the assessment model related to the fishery data. Changes in trawl catchability due to mesh selectivity associated with introduction of the modified trawl to the fishery are known and incorporated into the assessment. However, changes in catchability due to changes in trawl configuration, which could affect degree of contact with the substrate, remain unknown. There are also uncertainties in the catches prior to 1995 There are also uncertainties relating to stock boundaries. There is also uncertainty in the prediction of biomass for the current year, as a basis for determining CBA, because this is based on incomplete fishery data and because the trajectory of biomass can change considerably with the inclusion of an additional year of data.

7.2.1.4 Stock status

I. Nylon Shrimp

The Nylon Shrimp fishery is managed as a single resource throughout Regions II-VIII, although the overall quota is partitioned between the two zones. The fishery began in 1953 and developed rapidly during the 1960s (Ibarra and Yanez 2021). Over the past 7 decades fishery removals have fluctuated with two peaks each of around 11,000 t; one in the mid-1960s and another in the mid-1990s, (**Figure 7.2.1.10**). Landings subsequently declined substantially to about 3500 t in 2003. Landings have increased slightly in recent years reflecting changes in global quotas.

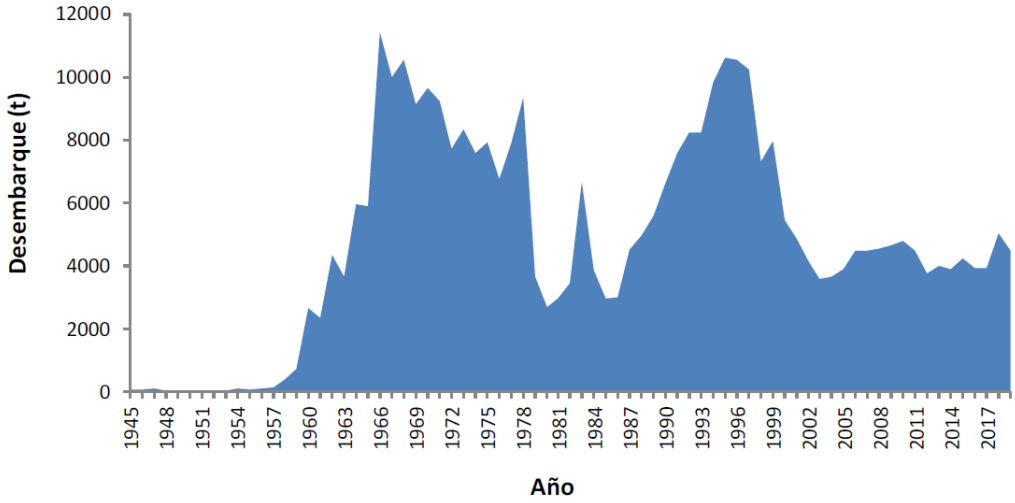

Figure 7.2.1.10. Nylon shrimp landings (t) from the total area of the fishery. Period 1945 - 2019. Source: Ibarra and Yanez 2021, Figure 2.

As of 1995, the nylon shrimp fishery has been declared to be in state of full exploitation regime and, therefore, subject to annual catch quotas. The quota was set at 10,000 t in 1996 and was steadily reduced by about half to 2000 (**Figure 7.2.1.11**). Quotas have since increased slightly in 3 stages.

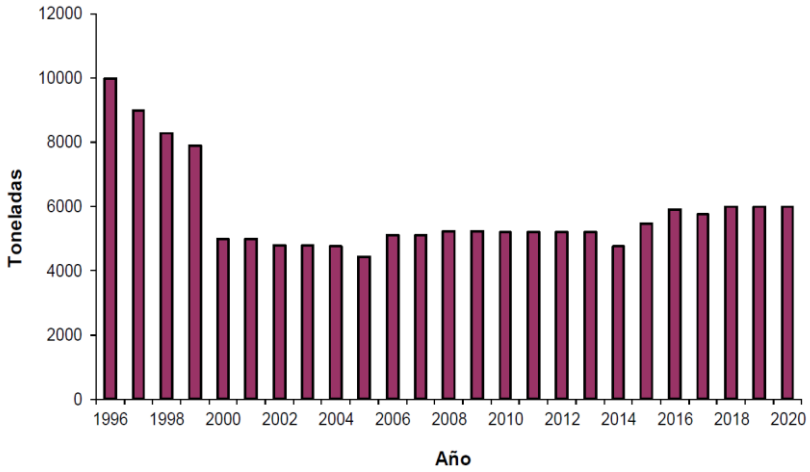

Figure 7.2.1.11. Annual global catch quotas for nylon shrimp for the fishery unit between the Antofagasta (II) and Biobio (VIII) regions. 1996 - 2020. Source: Ibarra and Yanez Figure 5.

The overall landings decreased from about 5018 t in 2018 to 4248 t in 2019 **(Figure 7.2.1.10)**, representing 71% of the quota of 5992 t. The overall quota has remained unchanged since 2019 at 5992 t (**Figure 7.2.1.11**), representing, in 2021, the upper limit of the proposed range of acceptable biological catch (see **Table 4.2.3.1**).

Temporary fishery closures have been imposed in portions of the fishing area during 2001-2003 and 2004-2005. Also, seasonal closures have been in place to protect egg-bearing females during July-August of 1998-2014 and during Aug-Sept since 2015. The distribution of fishing area has shifted southward over recent years (Ibarra and Yanez 2021. **Figure 7.2.1.12**) as the centre of gravity of the resource appears to have shifted southward.

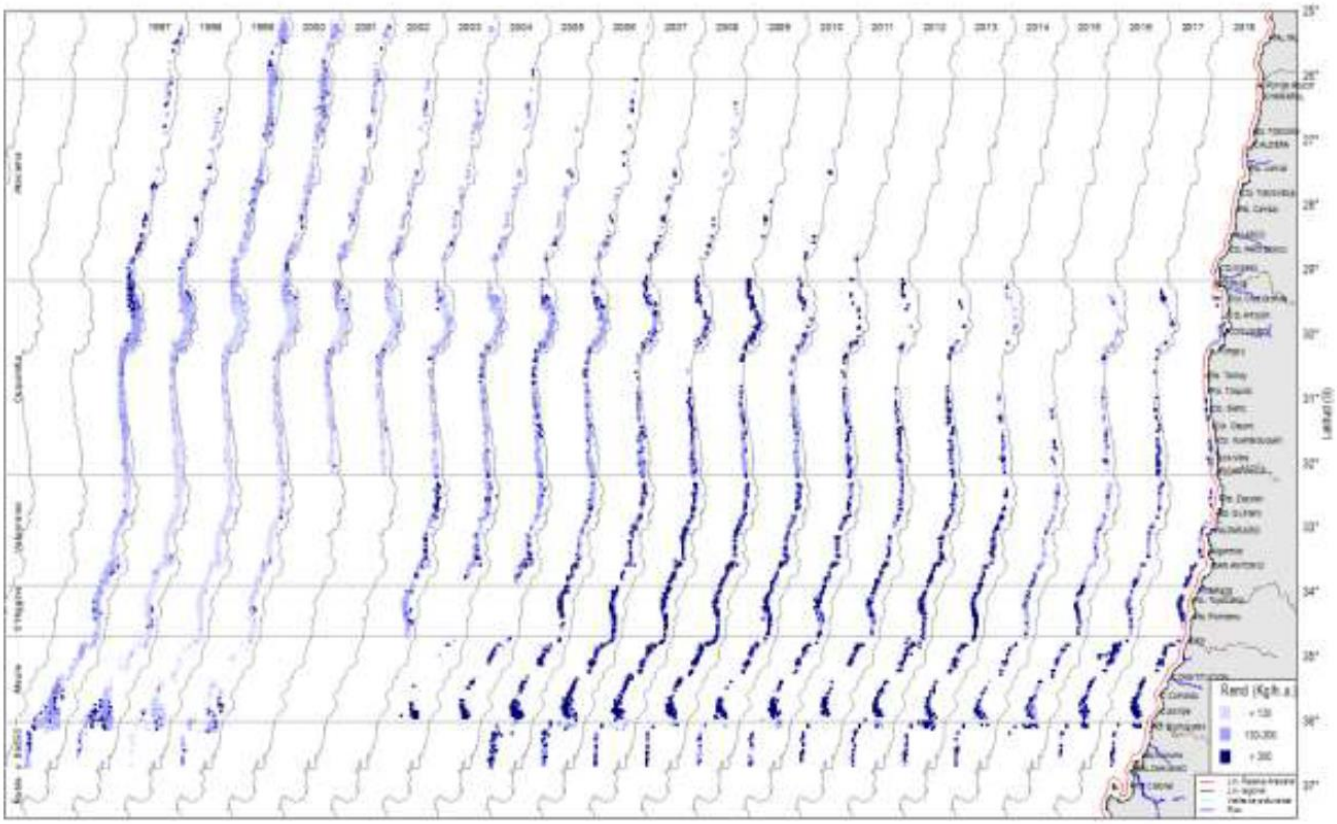

Figure 7.2.1.12. Spatial distribution of fishing performance (kg / h.a.) of nylon shrimp obtained from the fleet trawler that operates between the Antofagasta and Biobío Regions. Period 1997-2018. Source; Ibarra and Yanez 2021

Nylon Shrimp (North Central Region II-IV)

Landings declined from 2009-2014, due primarily to quota reductions and increased slightly in 2017 with increase in quota (**Figure 7.2.1.13**). Landings declined (with quota reduction) since 2017 to 517 t in 2020, representing 53% of the value of the global quota established (975 t) (Zilleruelo et al 2020) and the lowest level in the time series. Quotas have not been fully subscribed in recent years due to small size of shrimp such that they are undesirable to markets and effort is diverted to more lucrative fisheries (Ibarra 2019).

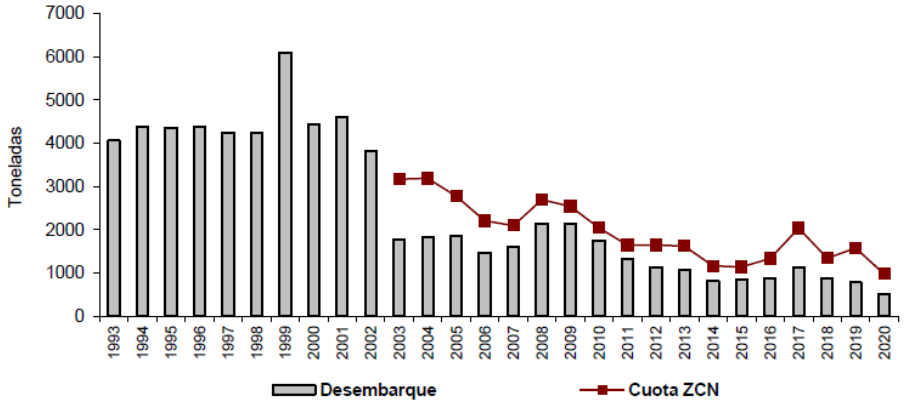

Figure 7.2.1.13. Annual landings (t) and catch quota (t) for the nylon shrimp fishery in Region II-IV during 1993-2020. Source: Zilleruelo et al 2020 Fig. 8.

Mean size in the fishery (Ibarra and Yáñez, 2021) increased sharply from 2013 to peak in 2015 (females) or 2016 (males) and then declined sharply to 2018 (males) or 2019 (females) (**Figure 7.2.1.14**). The sharp decline in females was to its smallest size since 2004. Size of both sexes has since increased to 2020.

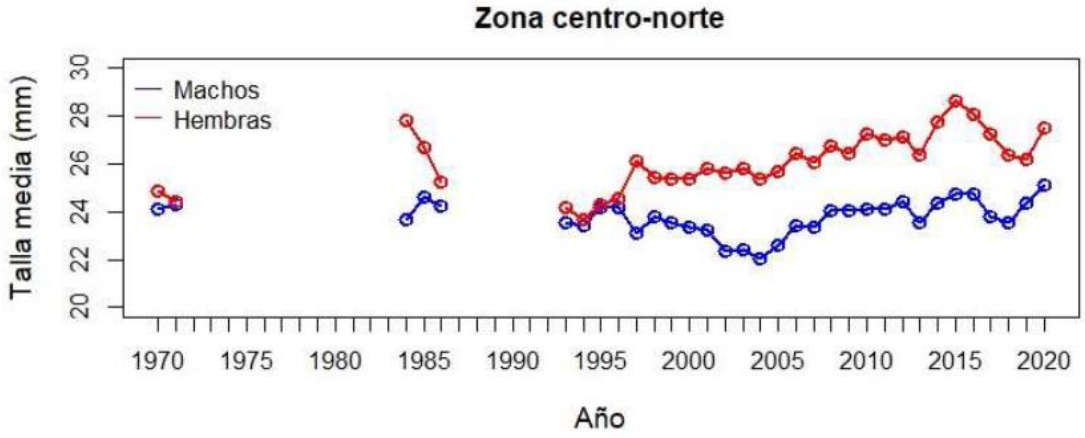

Figure 7.2.1.14. Mean annual size of nylon shrimp from the north-central fishery by sex and in total during 1970-2020: Source: Ibarra and Yañez, 2021. Fig.23.

The model provided a poor fit to the observed standardized catch per unit effort (CPUE) series (**Figure 7.2.1.15)**, overestimating CPUE from about 1998-2006 and underestimating the highly variable empirical estimates from 2007-2018. The observed CPUE estimates increased from about 2003-2011 and have since varied greatly, featuring a sharp decrease in 2019. The model greatly overestimated CPUE in the past two years.

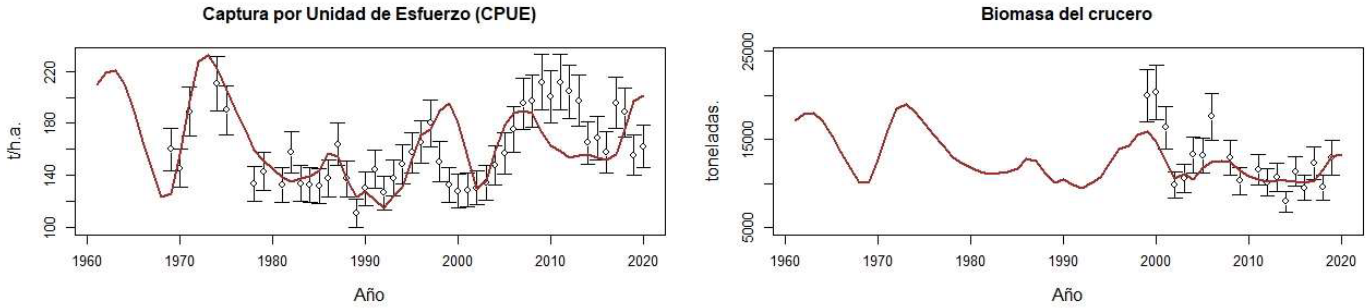

Figure 7.2.1.15. Fit of the model for nylon shrimp in the north-central zone (Region II-IV) during 1961-2020 to the standardized CPUE estimates (left) and observed survey biomass estimates (right). The points represent the observed data with its observation error and the line represents the model estimate. Source Ibarra and Yañez, 2021. Fig.27.

The model generally provides an adequate fit to the highly variable survey biomass estimates during the past decade (**Figure 7.2.1.15**), while the empirical means show no clear signal in recent years, being dominated by high year-to-year variability, the model indicates a very recent increase.

There is high uncertainty in recent biomass trends due to the erratic fluctuations in both the fishery and survey indices (**Figure 7.2.1.15**). A poor fit of the CPUE standardization model (Ibarra and Yáñez, 2021) also contributes to this high uncertainty.

The most recent assessment indicates that recruitment peaked during the 1990's and then declined to about 2003. It has since changed little, varying around the average level (**Figure 7.2.1.16**). The trend in total biomass is similar to that in recruitment, peaking in the 1990s and showing no significant change in recent years (**Figure 7.2.1.16**).

The model indicates that spawning, and exploitable biomass changed little in the past decade until they increased in the past two years (**Figure 7.2.1.16**). However, this increase does not appear to be significant based on the 95% confidence intervals.

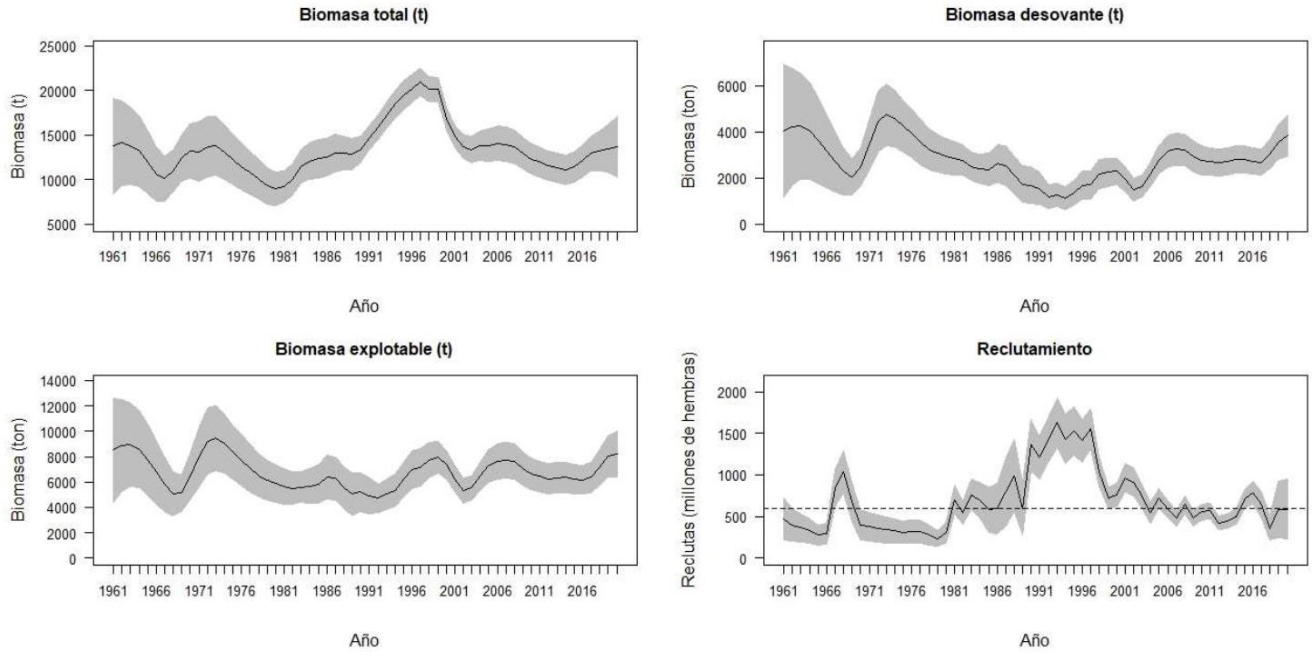

Figure 7.2.1.16.. Results of the north-central nylon shrimp assessment model showing (clockwise from upper left) trends in total biomass, spawning biomass, recruitment and exploitable biomass, 1945-2020. Shaded areas represent 95% confidence bands: Source: Ibarra and Yañez, 2021. Fig. 39.

The status of the fishery in 2020 is evaluated based on changes in fishing mortality and spawning biomass relative to a phase diagram (**Figure 7.2.1.17**). The current assessment indicates that the fishery has continued to improve over the past two decades, moving from the fully exploited phase to the under-exploited phase (SB/SB_{MSY} >1.5 SB_{MSY}) in 2019 and improving further in 2020.

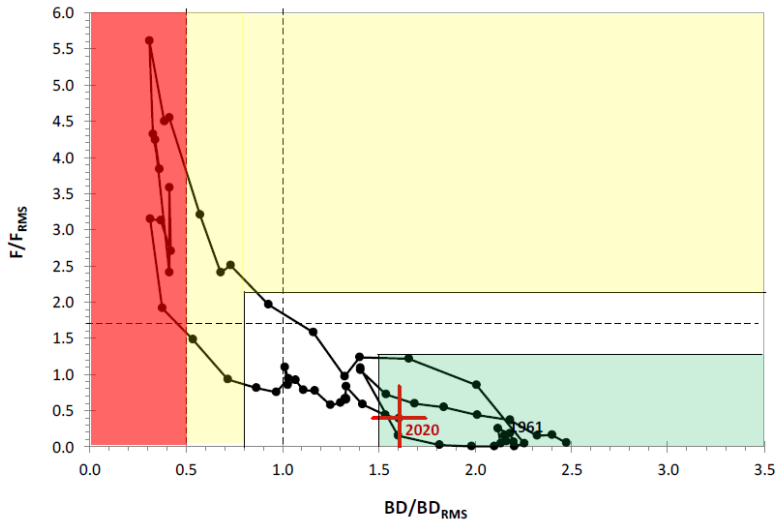

Figure 7.2.1.17. Phase diagram of north central nylon shrimp with stock trajectory based on fishing mortality and spawning biomass (relative to MSY levels) overlain. Dashed lines at values of 1.0 represent MSY levels with F/F_{MSY} representing the

overfishing threshold. Fishery status or phases are defined relative to MSY levels. Red cross corresponds to the confidence intervals of the SB / SB_{MSY} and F / F_{MSY} ratio: Source: Ibarra and Yañez, 2021 Fig. 43.

However, there is high uncertainty regarding the reliability of this assessment. The trajectory in spawning stock biomass differs considerably from that resulting from the previous assessment due (at least in part) to changes in methodology related to the parameterization of the model. Also, there is high uncertainty in recent biomass trends due to the erratic fluctuations in both the fishery and survey indices (**Figure 7.2.1.15**), A poor fit of the CPUE standardization model (Ibarra and Yáñez, 2021) also contributes to this high uncertainty.

The CCT-CD recently determined that very different assessment results are found between years for nylon shrimp, that cannot be explained by the biology of the resource or by the operation of the fleet (Subsecretaria de Pesca 2020a). It was concluded that the assessment was not informative for determining the CBA range. It was noted that the fishery indicators did not show significant changes compared to recent years so it was decided to maintain the status quo with respect to the CBA range for 2020. It was concluded that there is no stock assessment available for nylon shrimp and that a simple decision-making rule needs to be developed. The management authority stressed that review of the evaluation procedure is urgently required, and plans were quickly developed to undertake a review (Subsecretaria de Pesca 2020a).

Nylon Shrimp (South Central Region V-VIII)

Annual landings approximately tripled from 2004-2016 due to quota increases (**Figure 7.2.1.16**), although quotas were not fully subscribed during 2012-2016. Landings decreased slightly in 2017 due to quota reduction but increased in 2018 to 4141 t (Ibarra 2019) its highest level since 1997. Quotas have not been fully subscribed in recent years, as in the central-north zone, as effort is diverted to more lucrative fisheries (Ibarra 2019). Fishery landings decreased to 3448 t in 2020 representing 71% of the record high quota of 4873 t. (Zilleruelo et al 2020).

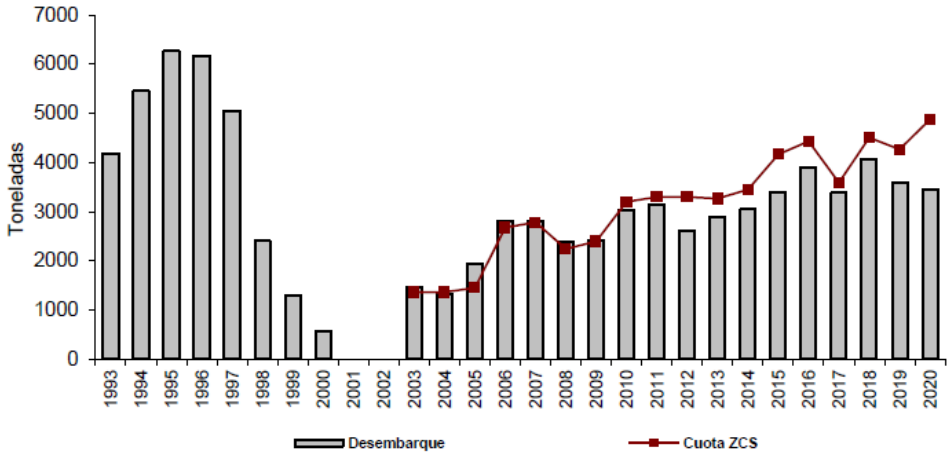

Figure 7.2.1.16. Annual landings (t) and catch quota (t) for the central-south nylon shrimp fishery in Region V-VIII during 1993-2020. Source: Zilleruelo et al 2020 Fig. 14.

Mean size in the fishery increased from 2013-2015 (as in the central-north zone) and then size declined markedly to very small size in 2017 (males) or 2018 (females) (**Figure 7.2.1.17**). Size increased since 2018 for females but not for males.

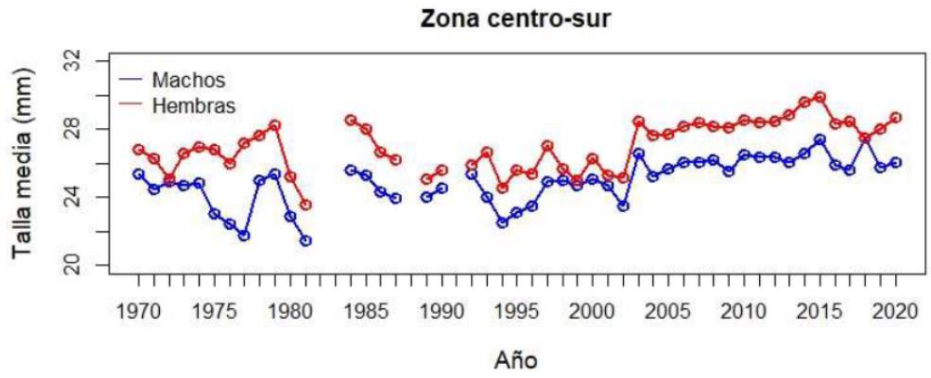

Figure 7.2.1.17. Mean annual size of nylon shrimp from the central-south (Region V-VIII) fishery by sex and in total during 1970-2020: Source: Ibarra and Yañez, 2021.Fig 23.

The model provided an adequate fit to the observed standardized catch per unit effort (CPUE) series until 2004 (**Figure 7.2.1.18**), but has since generally overestimated CPUE. The model did represent the recently increased empirical estimates indicating that fishery performance has recently improved.

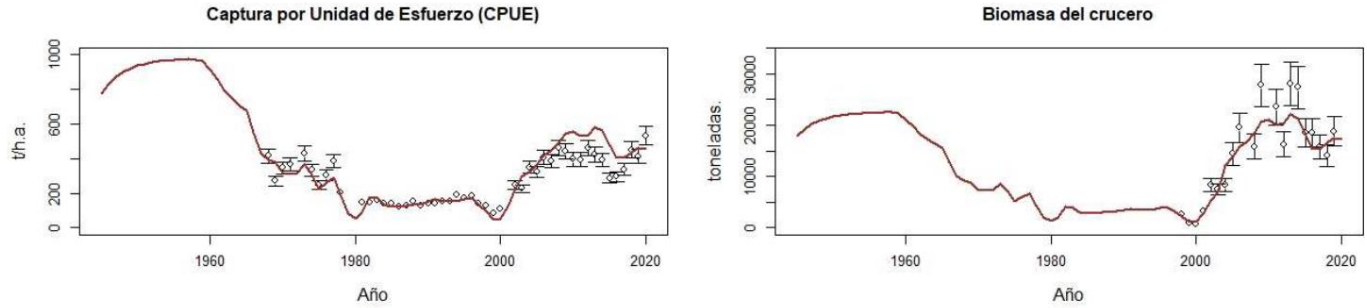

Figure 7.2.1.18. Fit of the model for nylon shrimp in the south-central zone (Region V-VIII) during 1945-2020 to the standardized CPUE estimates (left) and observed survey biomass estimates (right). The points represent the observed data with its observation error and the line represents the model estimate. Source; Ibarra and Yáñez, 2021, Fig. 44.

The model generally provides an adequate fit to the limited time series of observed survey biomass estimates (**Figure 7.2.1.18**). Despite high variability, the model indicates a very recent slight increase in biomass consistent with the CPUE increase (Ibarra and Yáñez, 2021).

The most recent assessment indicates that recruitment has been highly variable, fluctuating about the historical average for two decades (**Figure 7.2.1.19)**. Total, spawning, and exploitable biomass have all increased from their lowest level around 2000. The model indicates that both spawning and exploitable biomass increased from about 1999-2013 and then declined to 2017. Slight subsequent increases to 2019 were not significant, with no change in 2020.

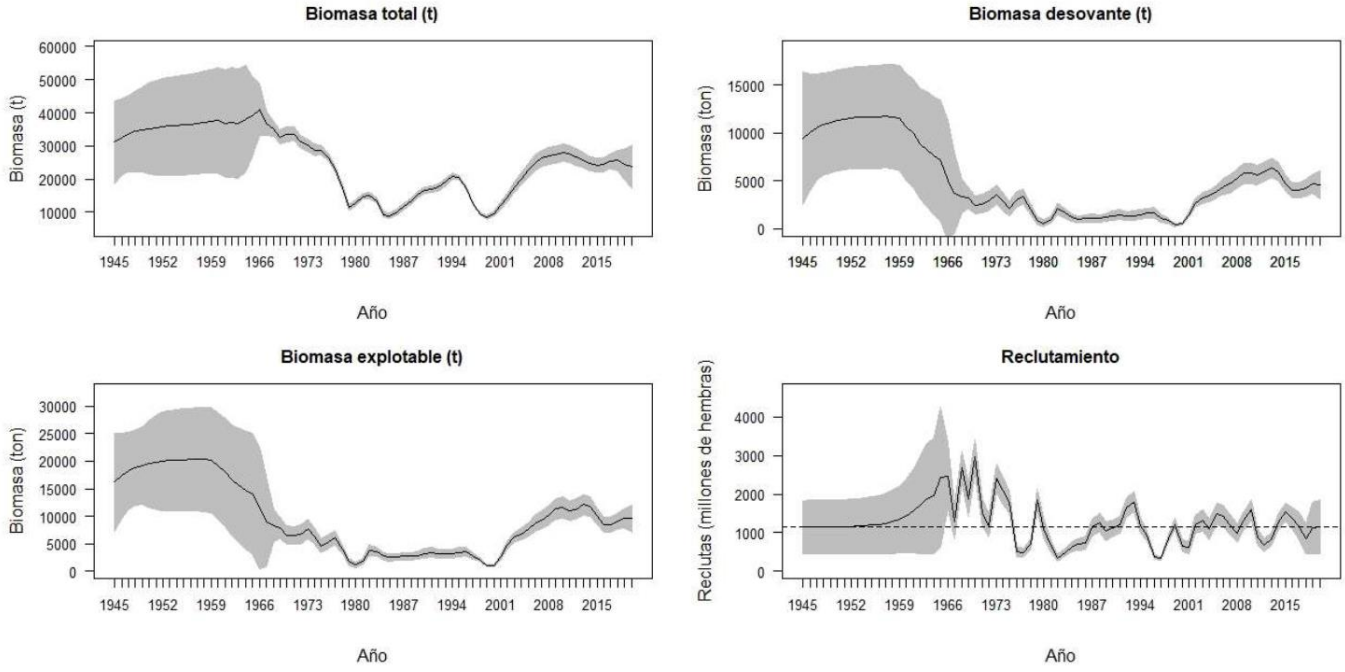

Figure 7.2.1.19. Results of the south-central nylon shrimp assessment model showing (clockwise from upper left) trends in total biomass, spawning biomass, recruitment and exploitable biomass 1945-2020. Shaded areas represent 95% confidence bands: Source: Ibarra and Yáñez, 2021, Fig. 55.

The current assessment indicates that the resource was over-exploited in 2020 (Ibarra and Yáñez, 2021). The stock trajectory in relation to SB and F reference levels **(Figure 7.2.1.20)** indicates that the resource was fully exploited in 2020 based on SB but was overexploited based on F. It appears that the resource has been overexploited for some time, with F exceeding its overexploitation reference level for at least the past 4 years.

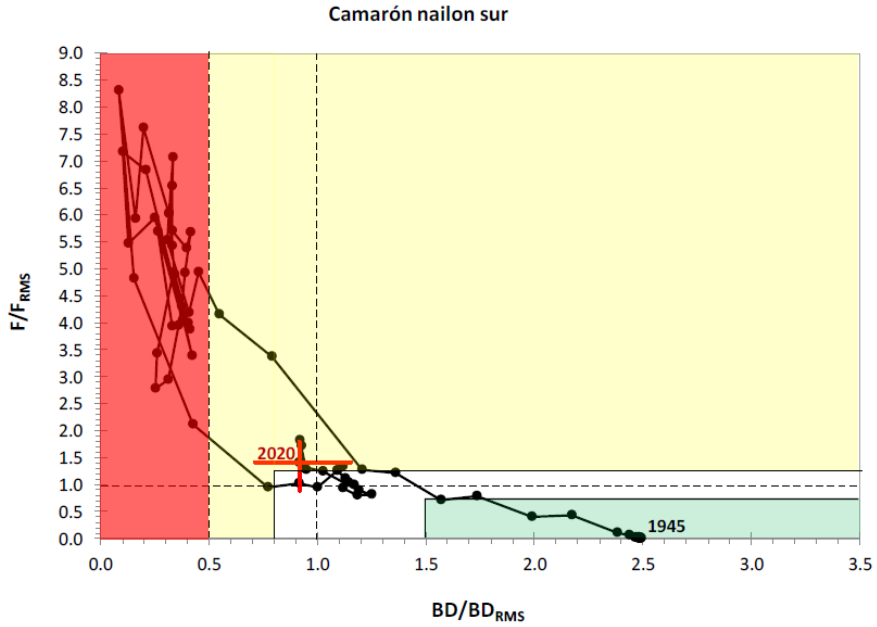

Figure 7.2.1.20. Phase diagram of south-central nylon shrimp with stock trajectory based on fishing mortality and spawning biomass (relative to MSY levels) overlain. Dashed lines at values of 1.0 represent MSY levels with F/F_{MSY} representing the overfishing threshold. Fishery status or phases are defined relative to MSY levels: Red cross corresponds to the confidence intervals of the SB / SBMSY and F / FMSY ratio; Source: Ibarra and Yáñez, 2021 Fig. 59.

However, as in the northern zone, there is high uncertainty regarding the reliability of this assessment. The trajectory in spawning stock biomass differs considerably from that resulting from the previous assessment (Ibarra 2020). That assessment indicated that the resource was fully exploited in 2019 with confidence intervals indicating little risk that F has exceeded F_{msy} for about the past 15 years. The increase in F from the current assessment is due (at least in part) to changes in methodology related to the parameterization of the model. More specifically, the increase in F levels from the current assessment is related to leaving F unconstrained in the current assessment, whereas F was bounded by an upper limit in the previous assessment. Given the uncertainty in F level associated with changes in methodology this resource is presently considered to be fully exploited rather than over-exploited, based on SB.

The CCT-CD noted that concerns with unreliability of the assessment results described above were most acute for the northern zone but also apply to the southern zone such that the assessment was considered uninformative for the entire nylon shrimp stock (Subsecretaria de Pesca 2020a).

II. Yellow squat lobster – northern and southern stocks

The Yellow squat lobster fishery started in the 1950s with Coquimbo, Valparaíso and San Antonio being the most important ports. In 1995, management of the species was separated into two units of fishery; the first covering regions III and IV (UPN), and the second covering regions V to VIII (UPS). The northern unit is classified under the full exploitation regime, while the second is currently considered as a Fishery under Recovery. Under both regimes, the fishery has been subject to conservation measures, such as biological and seasonal closures and catch quotas. There is an annual closed season between the beginning of January through March for both units. The southern fishery was closed between 2001 and 2007. In the northern region annual landings were around 6,000 tonnes in 1996 and 1997, declined considerably at the beginning of the millennium but in recent years have recovered. In the southern region landings were around 4,000 tonnes in 1997-1998, but declined significantly prior to the closure of the fishery in 2001. Landings recovered to around 2,500 tonnes in 2008 to 2011, but have since declined. Landings do not necessarily reflect stock abundance as they are regulated by annual quotas. For both the northern and southern fishing zones, the landings in recent years have not exceeded the quotas

Total landings of yellow squat lobster have been higher in the southern zone than in the northern zone (**Figure 7.2.1.21**) They fluctuated considerably in both zones from about 1979-2000 with two peaks of about 9,000 t, in the southern zone. They declined sharply in both zones to their lowest level in the early 2000s. They subsequently remained generally around this level in the north, whereas they increased to a peak in 2008-2010 at about 5,000 t before declining to 2013.

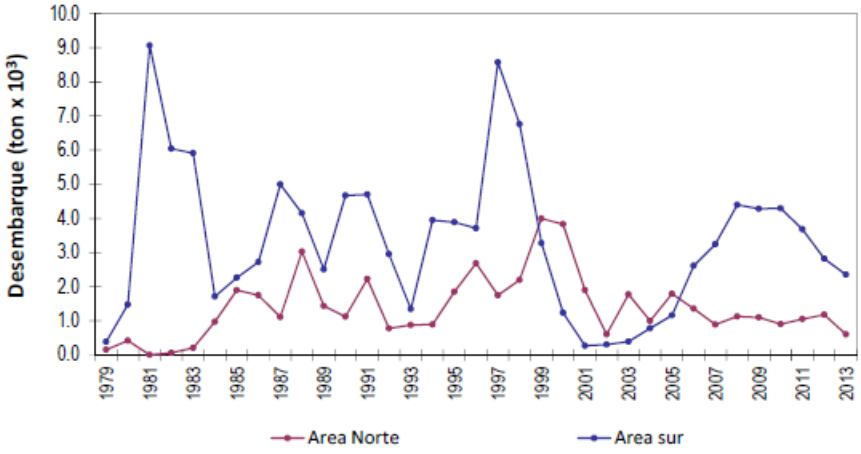

Figure 7.2.1.21. CPUE (nominal and standardised) for yellow squat lobster in the northern fishing zone. (source: Addison andAdlerstein-Gonzalez Figure 41)

Yellow squat lobster (Northern Area)

Landings declined gradually from 2010-2014 but increased in 2015 due to quota increase (**Figure 7.2.1.22**). They have since declined (due to quota reductions) to 1676 t in 2018. They decreased further to 1,345 t in 2020, representing 88% of the quota of 1,526 t (Zilleruelo et al 2020). The quota has been reduced to 1494 t in 2021 t (Decree No. 119), representing the upper limit of the proposed range of acceptable biological catch (see **Table 4.2.3.1**).

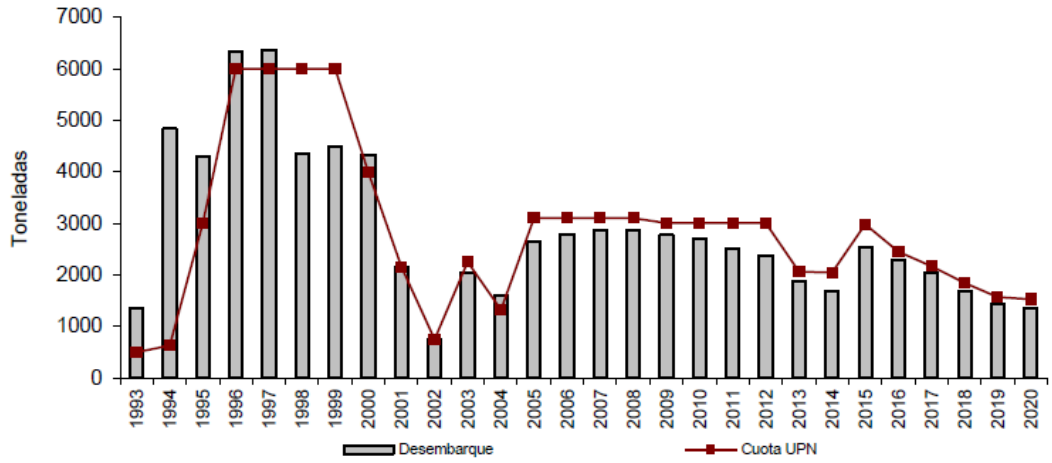

Figure 7.2.1.22. Annual landings (t) and catch quota (t) for the yellow squat lobster fishery in Regions III-IV during 1993-2020: Source: Zilleruelo et al 2020, Fig 36.

The model provided an adequate fit to the to the observed standardized catch per unit effort (CPUE) series in recent years (**Figure 7.2.1.23**). It suggests a declining trend in abundance from 2014 to 2019, while the data shows some stability since 2015, but it does well represent the observed estimates in the last three years.

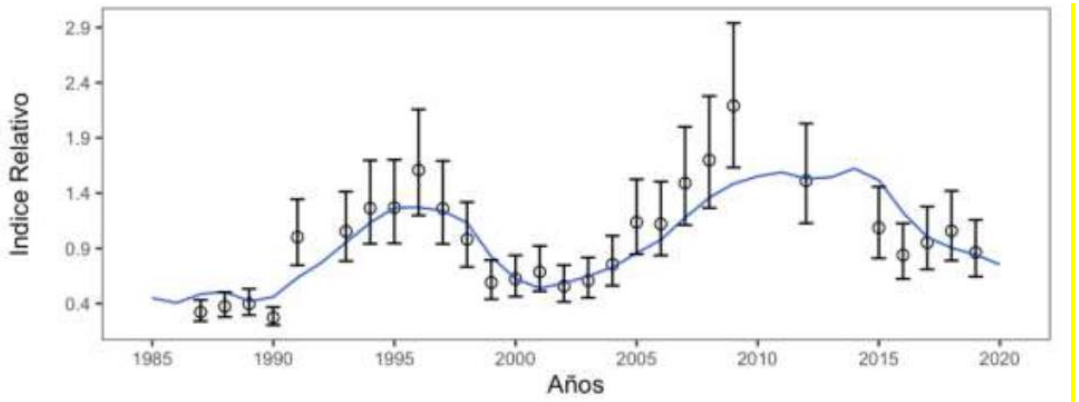

Figure 7.2.1.23. Fit of the model to the standardized CPUE data for yellow squat lobster in Region III-IV during 1985-2020. The points represent the observed data with its error and the blue line represents the model estimate. (partial): Source: Ibarra and Yáñez 2021, Fig.83.

The model provided a poor fit to the observed survey biomass estimates, generally over-estimating biomass since 2012 (**Figure 7.2.1.24**). The empirical estimates show no significant change in the recent years. However, the observed estimates decreased in the past four years, consistent with the model trend which shows a continuing decline.

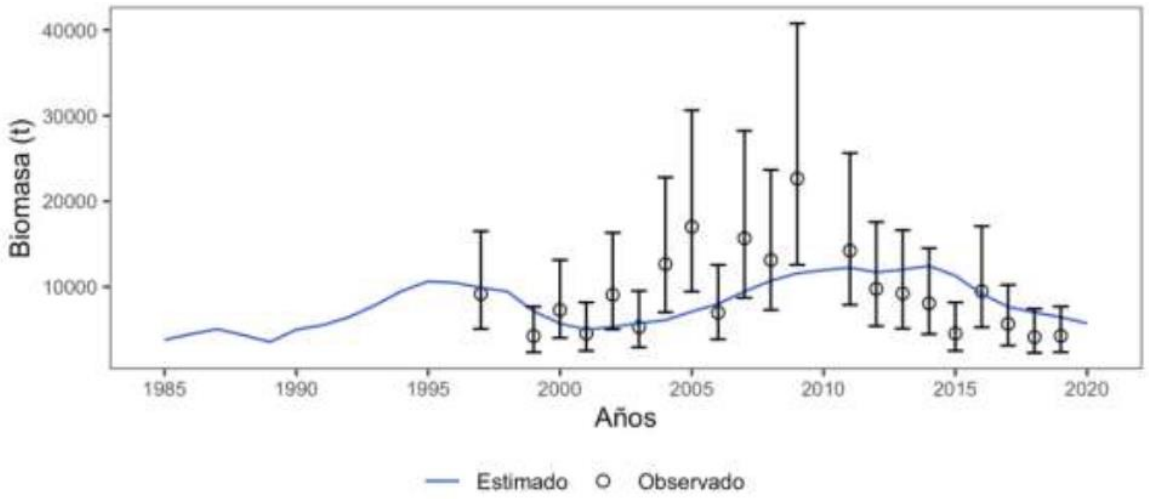

Figure 7.2.1.24. Fit of the model to the observed survey biomass estimates for yellow squat lobster in Region III-IV during 1985-2019. The points represent the observed data with its observation error and the blue line represents the model estimate. Source Ibarra and Yáñez 2021, Fig.83.

The model indicates that both total and spawning biomass have been in steady decline for an expended period. (**Figure 7.2.1.25**). Spawning biomass and exploitable biomass have both declined by about half from their peaks in 2011 and 2013 respectively.

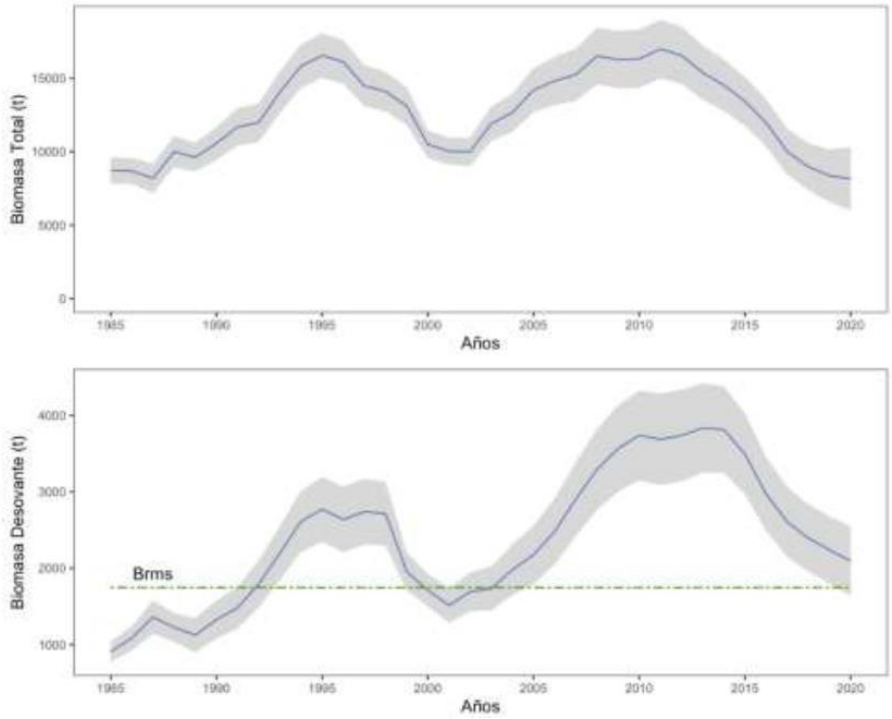

Figure 7.2.1.25. Total (a) and spawning (b) biomass of yellow squat lobster in Region III-IV during 1985-2020 with 95% confidence intervals (shaded area) and value of the biological reference point, Bmsy (dotted line). Source: Ibarra and Yáñez 2021, Fig.91.

Recruitment was relatively stable and slightly above the historical average until 2006 (**Figure 7.2.1.26**). It was subsequently more variable, peaking in 2011 before dropping to its historical low in 2013. It subsequently remained low until it increased to about the historical average level in the past three years although confidence intervals indicate high uncertainty (Ibarra and Yáñez, 2021).

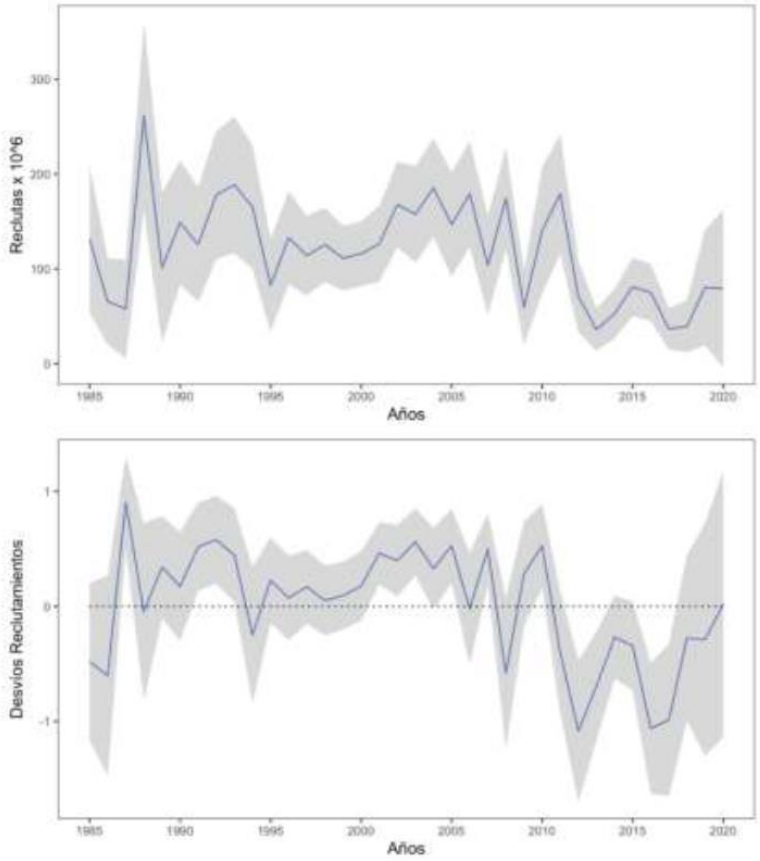

Figure 7.2.1.26. Recruitment (above) and logarithmic anomalies of northern yellow squat lobster recruitment (below) with 95% confidence intervals (shaded area). The dotted line represents the historical average. Source Ibarra and Yáñez 2021 Fig. 92.

Fishing mortality was highly variable during 1985-2005 with high values, generally exceeding natural mortality and Fmsy (**Figure 7.2.1.27**). F declined greatly from 2005-2010 and has since changed little, remaining below M and Fmsy since 2007 (Ibarra and Yáñez, 2021).

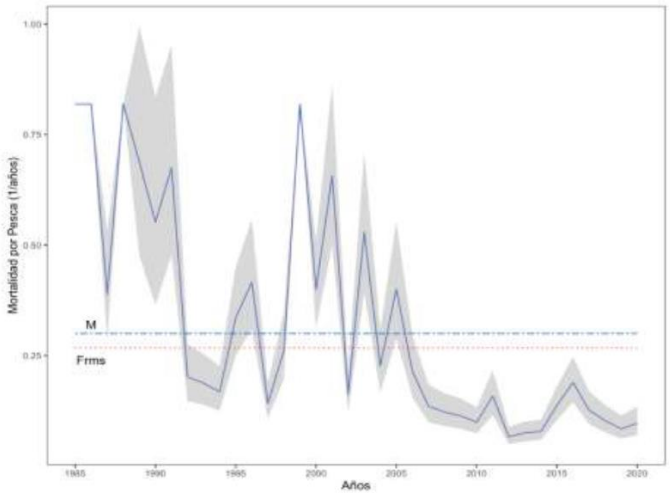

Figure 7.2.1.27. Annual fishing mortality (F year-1) of northern yellow squat lobster. The green line represents the value of natural mortality and the dotted line the value of the biological reference point Fmsy. Source; Ibarra and Yáñez 2021 Fig. 93.

The status of the fishery in 2020 is evaluated based on changes in fishing mortality and spawning biomass relative to a phase diagram (**Figure 7.2.1.28**). The stock trajectory indicates that the fishery had remained in the under-exploited phase for about 10 years until 2018. Despite a decline in F since 2016 (**Figure. 7.2.1.27**), projected SB / SB_{MSY} declined such that the status of the fishery moved from the under-exploited phase in 2016 to the fully-exploited phase in 2018. It has since remained in the fully exploited phase despite continued decline in SB, without risk of SB_{2020} / SB_{MSY} or F_{2020} / F_{MSY} being respectively below or above their proxy MSY based biological refence points.

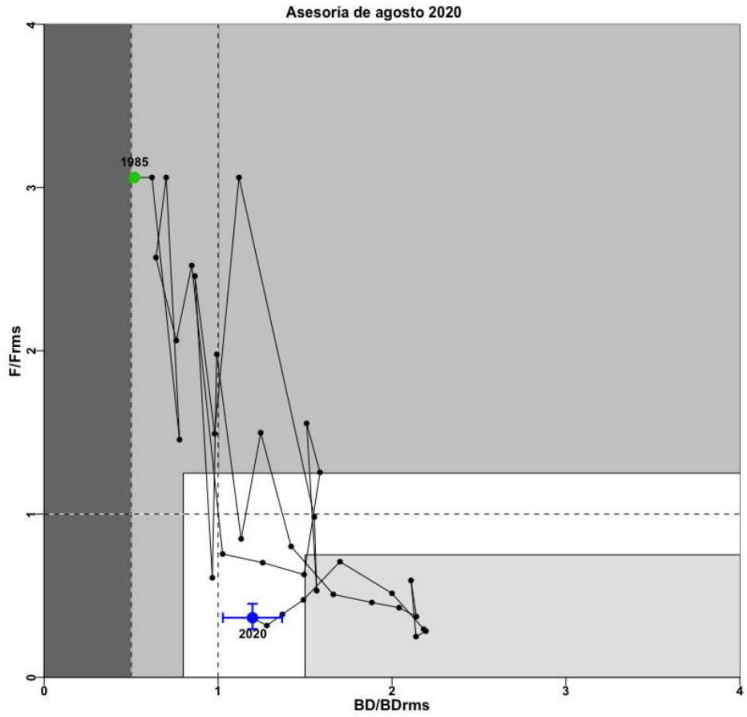

Figure 7.2.1.28. Phase diagram of northern yellow squat lobster with stock trajectory based on fishing mortality and spawning biomass (relative to MSY levels) overlain. Dashed lines at values of 1.0 represent MSY levels with F/Fmsy representing the overfishing threshold. Fishery status or phases are defined relative to MSY levels. Blue cross corresponds to the confidence intervals of the SB / SBMSY and F / FMSY ratio. Source Ibarra and Yáñez 2021 Fig. 96.

Yellow squat lobster (Southern Area)

Landings declined from 2010-2013 and changed little in 2014 (**Figure 7.2.1.29**). They increased in 2015 and have since changed little. Landings totalled 1875 t in 2020 representing 95% of the total quota of 1,960 t (Zilleruelo et al 2020). The quota for 2021 was increased to 2,260 t, based on a proposed range of acceptable biological catch of 1,864 – 2,331 (see **Table 4.2.3.1**).

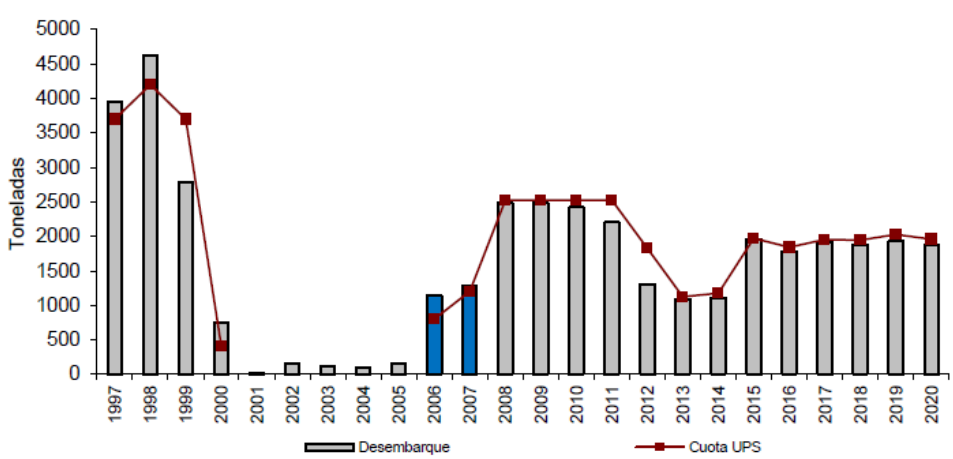

Figure 7.2.1.29. Annual landings (t) and catch quota (t) for the yellow squat lobster fishery in the southern region during 1997-2020: Source: Zilleruelo et al 2020 Fig. 42.

The model provided a poor fit to the observed standardized catch per unit effort (CPUE) series (**Figure 7.2.1.30**). It did not adjust well to the recent trend in observed estimates, suggesting a declining trend in abundance since 2007, while the data show an increasing trend over the past 5 years. The model underestimates the empirical estimates in the past 3 years.

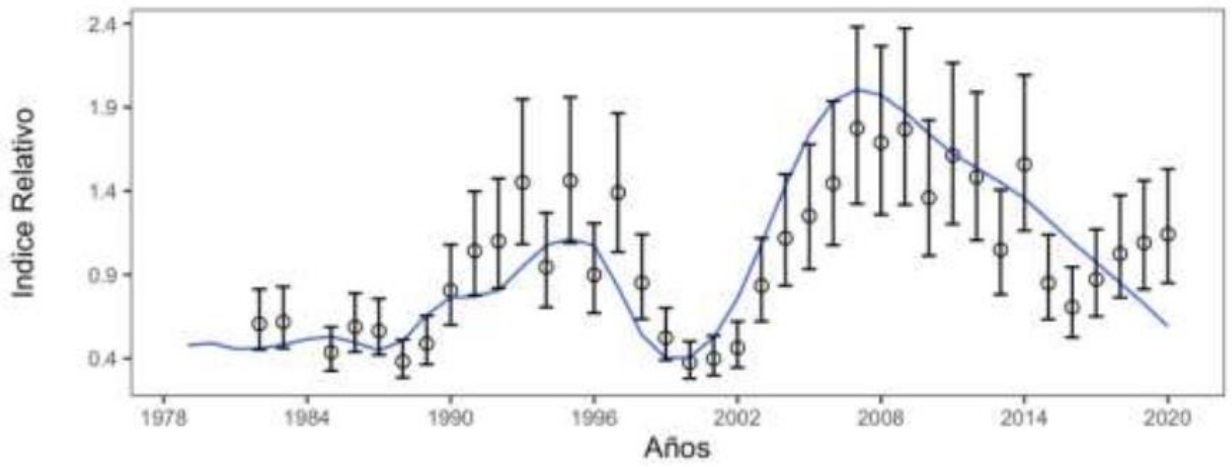

Figure 7.2.1.30. Fit of the model to the standardized CPUE data for yellow squat lobster in the southern region during 1985-2020 The points represent the observed data with its error and the blue line represents the model estimate. (partial): Source: Ibarra and Yáñez 2021, Fig.97.

The model also provided a poor fit to the observed survey biomass estimates, that are associated with high variability, especially during 2004-2009 (**Figure 7.2.1.31**). The model did not adjust to the recent trend in observed estimates, suggesting a declining trend in biomass since 2007, while the data show an increasing trend since 2012.

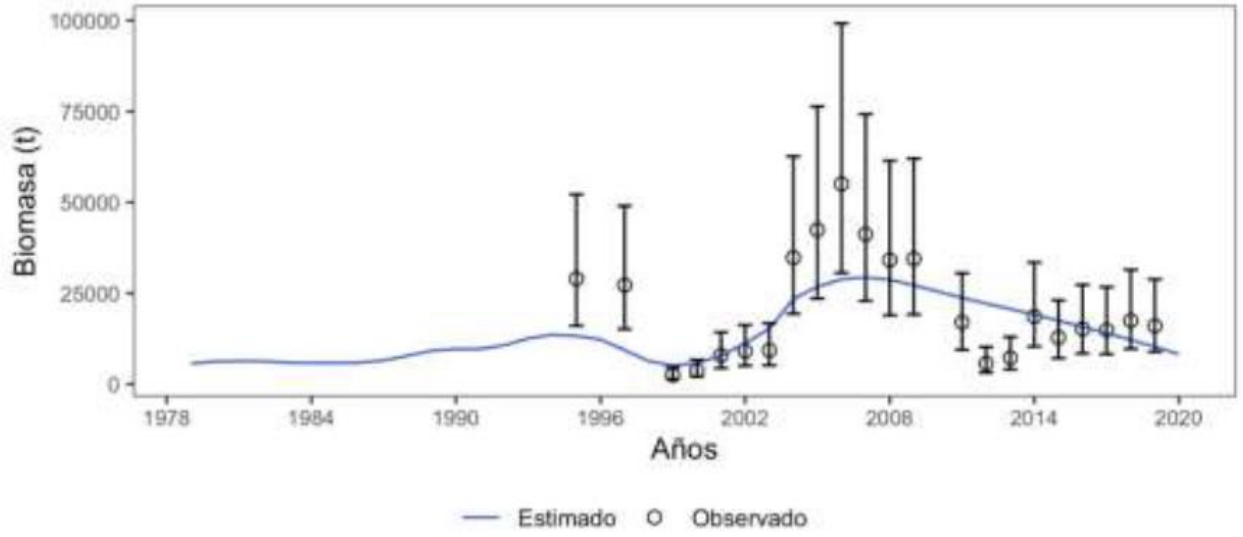

Figure 7.2.1.31. Fit of the model to the observed survey biomass estimates for yellow squat lobster in the southern region during 1979-2019. The points represent the observed data with its observation error and the blue line represents the model estimate. Source Ibarra and Yáñez 2021, Fig.97.

The total biomass and spawning biomass estimated by the model have both been in decline since 2006 (**Figure 7.2.1.32**). This continued decline in total biomass in recent years is not consistent with the recent increase in the empirical survey biomass values (**Figure 7.2.1.31**) and reflects high variability and uncertainty in the observed area-swept estimates as well as poor fit of the model. The modelled spawning biomass has declined by about 71% since 2006 (Ibarra and Yáñez 2021).

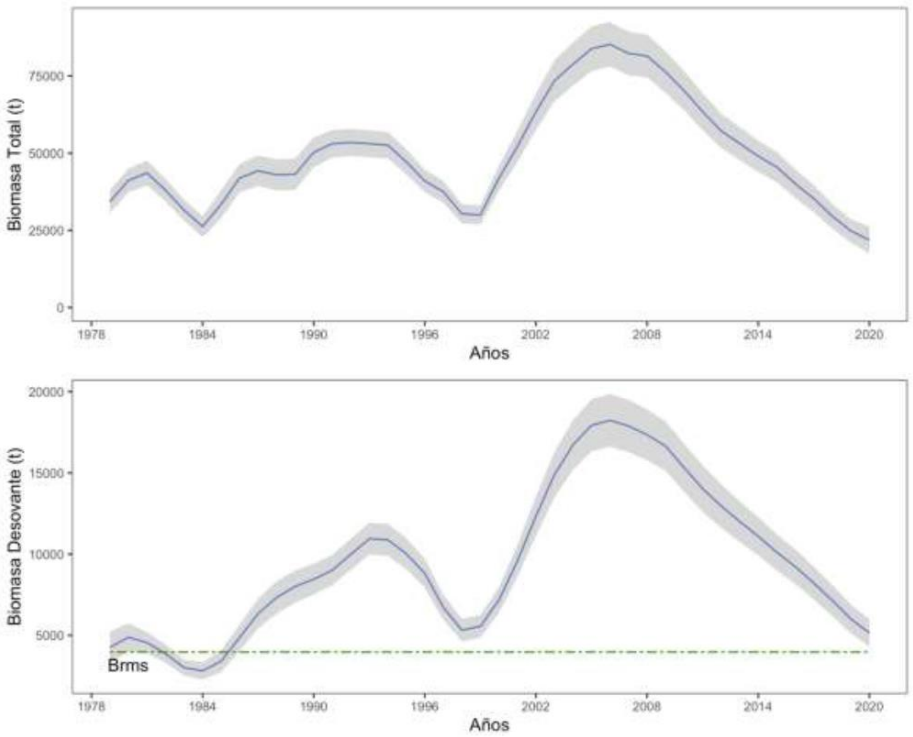

Figure 7.2.1.32. Total (a) and spawning (b) biomass of yellow squat lobster in the southern region during 1979-2020. The dotted line the value of the biological reference point Bmsy and the shaded area shows 95% confidence intervals. Source: Ibarra and Yáñez 2021, Fig. 105.

The assessment model results indicate that recruitment was highly variable and above the long-term average during the 2000's (**Figure 7.2.1.33**). It dropped by almost an order of magnitude from a peak in 2008 to its historical low in 2017 but appears to be recently recovering, approaching the long-term average.

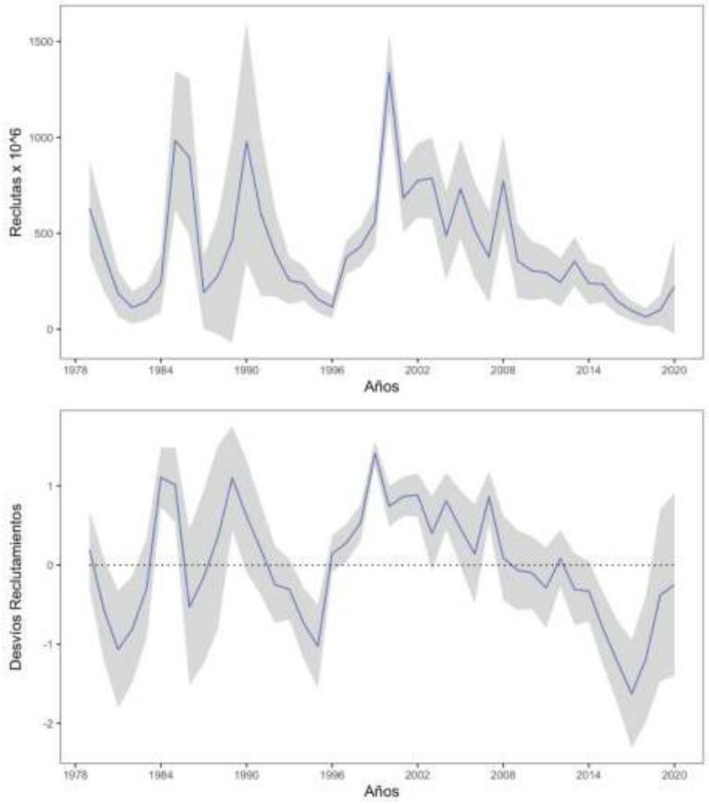

Figure 7.1.2.33. Recruitment (above) and logarithmic anomalies of southern yellow squat recruitment (below). The dotted line represents the historical average. Source Ibarra and Yáñez 2021 Fig. 106.

Fishing mortality increased from 2003-2006 and has since been variable, remaining well below the F_{MSY} level in 2020 (**Figure 7.2.1.34**).

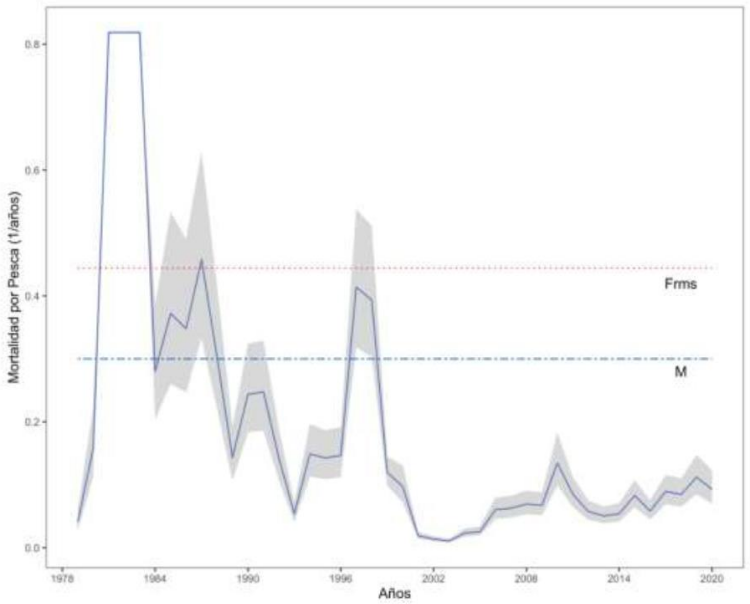

Figure 7.1.2.34. Annual fishing mortality (F year-1) of southern yellow squat lobster. The green line represents the value of natural mortality and the dotted line the value of the biological reference point Fmsy. Source Ibarra and Yáñez 2021 Fig. 107.

The status of the fishery in 2020 is evaluated based on changes in fishing mortality and spawning biomass relative to a phase diagram (**Figure 7.2.1.35**). A continued decrease in spawning biomass in 2020 resulted in the fishery moving from the under-exploited phase (SB/SB_{MSY} >1.5 SB_{MSY}) to the fully-exploited phase ($0.8 \geq SB/SB_{MSY} \geq 1.5$). SB remained above SB_{MSY} and F remained well below the F_{MSY} level in 2020.

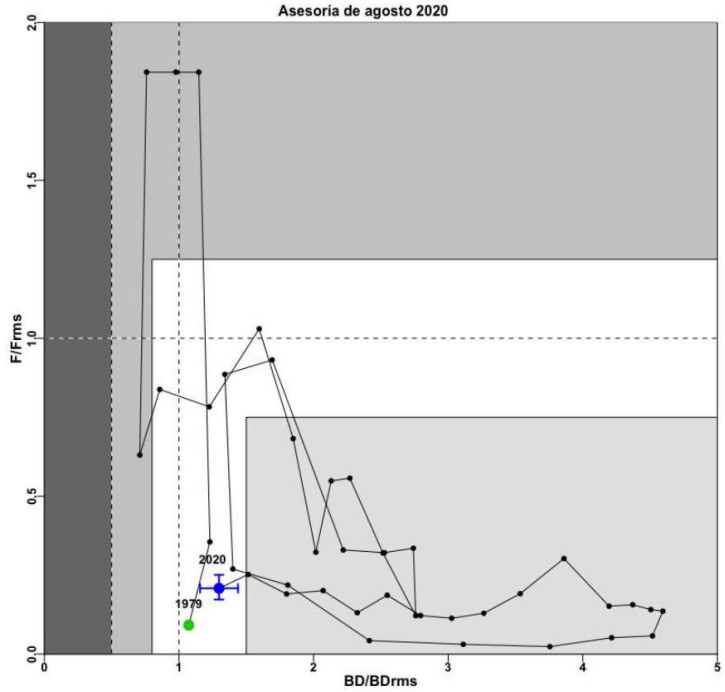

Figure 7.12.1.35. Phase diagram of southern yellow squat lobster with stock trajectory based on fishing mortality and spawning biomass (relative to MSY levels) overlain. Dashed lines at values of 1.0 represent MSY levels with F/F_{MSY} representing the overfishing threshold. Fishery status or phases are defined relative to MSY levels. Blue cross corresponds to the confidence intervals of the SB / SB_{MSY} and F / F_{MSY} ratio. Source Ibarra and Yáñez 2021, Fig. 110.

III. Red squat lobster northern and southern areas

Red squat lobster is distributed between Isla Lobos de Afuera, Peru to Region VIII of Chile. Two fishing units are distinguished: northern (Regions XV to IV) and southern (Regions V to VIII) (**Figure 7.2.1.36**) and they are evaluated separately.

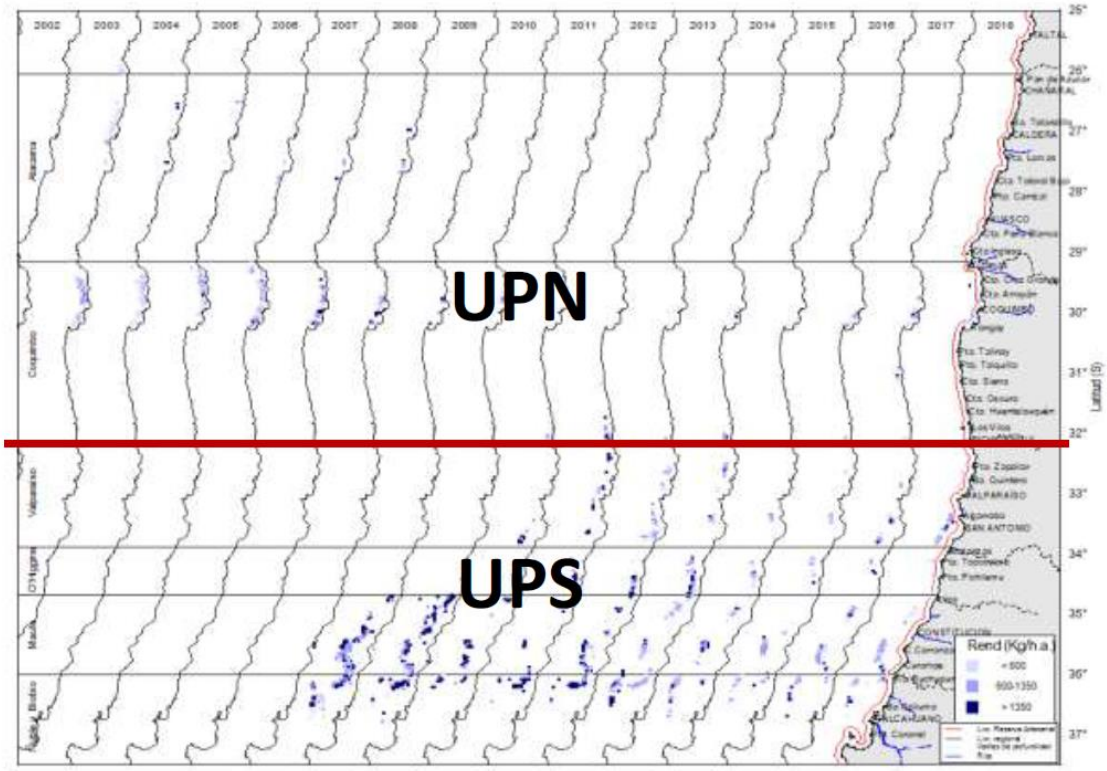

Figure 7.2.1.36. Spatial distribution of the fishing performance (kg / h.a.) Of red shrimp obtained from the fleet trawler that operated between the Antofagasta Region and the Biobío Region. Period 2003-2018. Source Ibarra and Yanez 2021 Figure 130

The fishery uses the same vessels that target the two other species. While the fishery has been active since the mid-1950s, official landing figures distinguishing landings of red squat lobster from the yellow have only been available since 1978. Initially, the fishery was between Regions V and VIII, with activity in the north (Regions III and IV) from 1998 only (**Figure 7.2.1.36**).

Landings from the red squat lobster fishery in the southern zone have been highly variable (**Figure 7.2.1.37**), peaking in 1976, at about 60,000 tonnes, but during the 1980s and 1990s landings rarely exceeded 10,000 tonnes, and by 2001, the fishery was closed. From 2005, there was a small research quota, and commercial quotas were re-introduced in 2009. The fishery in the northern zone began in 1998, with landings fluctuating around 1,300 tonnes with a peak in 2000 of 2,500 tonnes (**Figure 7.2.1.37**).

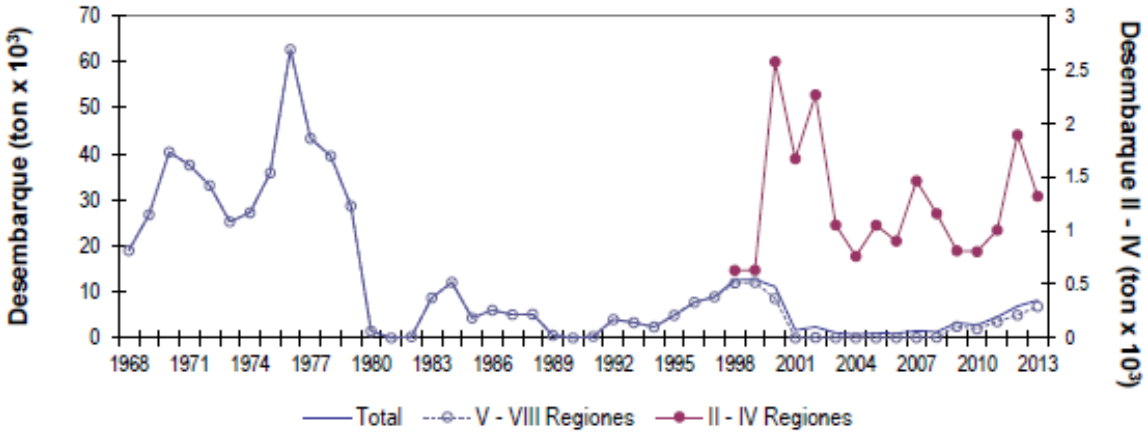

Figure 7.2.1.37. CPUE (nominal and standardised) for red squat lobster in the northern fishing zone. (source: Adlerstein-Gonzalez 2016, Figure 56, from Bucarey et al., 2015).

Red squat lobster (Northern Area)

Landings in the northern area declined greatly from a 2012 peak to about the historical low in 2014-2015, before increasing to 2017. (**Figure 7.2.1.38**). They have since declined substantially, with steady quota reductions, to 456 t in 2020, representing 63% of the quota of 729 t (Ibarra and Yáñez 2021). The quota for 2021 was increased to 1,112 t, representing the upper limit proposed range of acceptable biological catch of 889 – 1,112 (See **Table 4.2.3.1**). This represents a 53% increase in quota in 2021 far exceeding the 15% maximum increase allowed under the HCR specified

in the management plan for resources that are fully exploited or under-exploited (Subsecretaría de Pesca 2016), although consistent with the HCR specified in the management plan for resources that move from the over-exploited phase to the fully exploited phase.

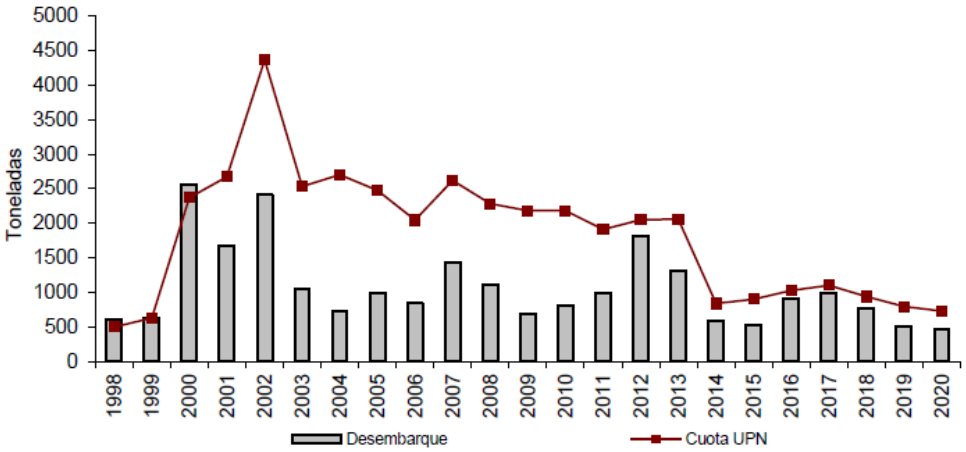

Figure 7.2.1.38. Annual landings (t) and catch quota (t) for the red squat lobster fishery in the northern area during 1993-2020: Source: Zilleruelo et al 2020, Fig 65.

Standardized CPUE was relatively stable at a low level during 1998-2007 (**Figure 7.2.1.39**). It increased sharply in 2008 and has since been highly variable. The model provides a reasonable fit to the data. and indicates a decline from 2016-2018. Both the model and the empirical estimates indicate that CPUE was virtually unchanged in 2019.

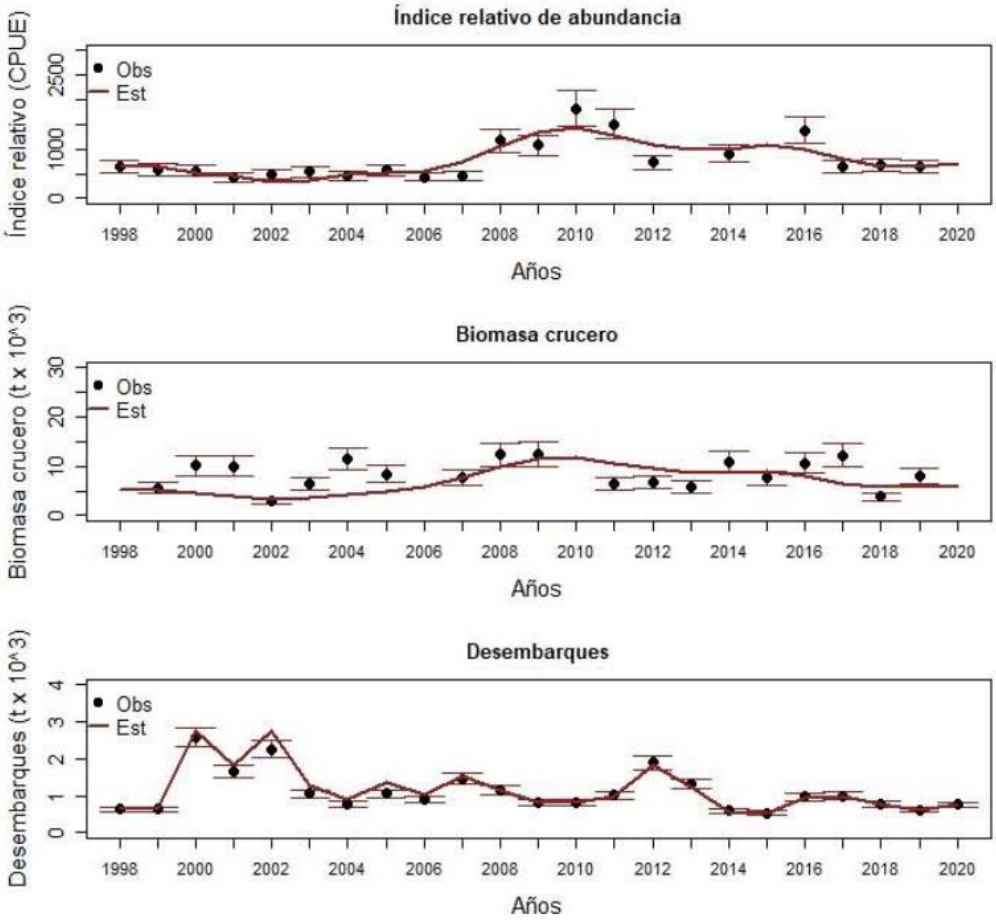

Figure 7.2.1.39. Fit of the model for red squat lobster in the northern region during 1998-2018 to the standardized CPUE estimates (top), observed survey biomass estimates (middle) and landings (bottom) The points represent the observed data with its observation error and the line represents the model estimate. Source Ibarra and Yáñez 2021, Fig.153.

The model fails to represent a trend in the observed survey biomass due to high annual variability in the area-swept estimates (**Figure 7.2.1.39**) (Ibarra and Yáñez 2021). This variability has been especially severe in recent years with observed biomass decreasing sharply in 2018 before increasing significantly in 2019.

The model provides a poor fit to the mean size data from the fishery as well as from the survey (**Figure 7.2.1.40**), underestimating size from the fishery and overestimating size from the survey in most recent years. Mean size in the fishery increased to near its historical high during 2016-2018 before dropping greatly in 2019 (**Figure 7.2.1.40**). By contrast, mean size in the survey declined sharply during 2016-2018 before increasing greatly in 2019 due to growth of small lobsters that recruited to the population in 2018. (Ibarra 2020). This increased recruitment in 2018 is reflected in the appearance of a modal group of small lobsters in 2018 that was underestimated by the model (**Figure 7.2.1.8**).

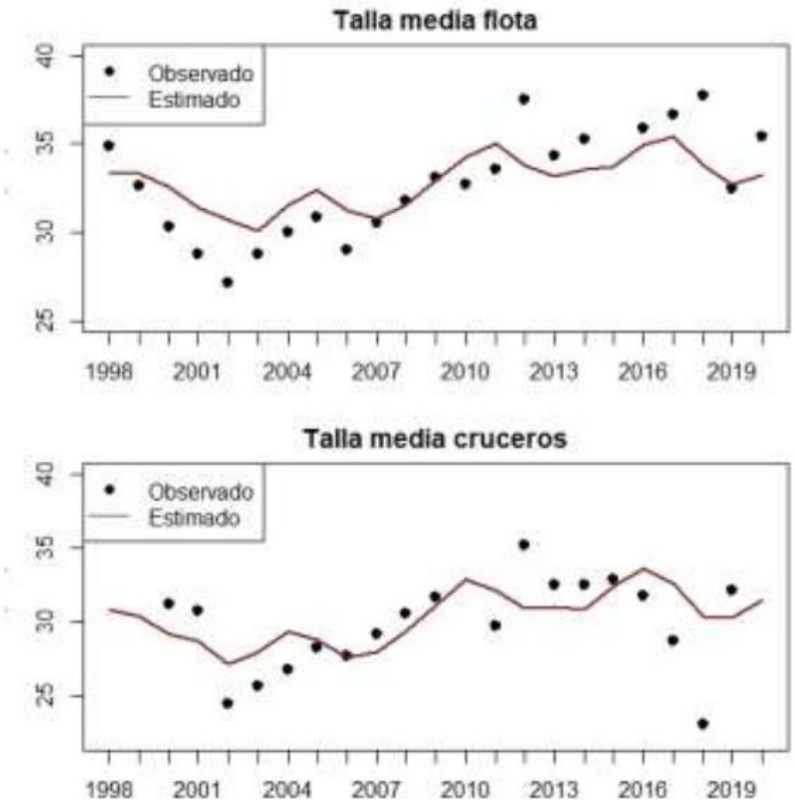

Figure 7.2.1.40. Mean sizes estimated by the model (solid line) and those observed (points) in the fishery (above) and in the survey (below) for northern red squat lobster during 1998-2020: Source: Ibarra and Yáñez 2021, Fig.156.

The assessment model results (**Figure 7.2.1.41**) indicate that total and spawning biomass both declined by about half from 2010-2019 and changed little in 2020.

Recruitment increased from 2015-2017 (**Figure 4.2.6.28**), consistent with the decrease in size during those years (**Figure 7.2.1.41**). Although size further decreased greatly in 2018, the model indicates no further increase in recruitment (**Figure 7.2.1.41**), consistent with the failure of the model to represent the prevalence of smallest lobsters in that year, as noted above. Recent trends are highly uncertain but recruitment appears to have varied about the historical average. The model indicates that recruitment decreased since 2017 and has been below the historical average during the past two years.

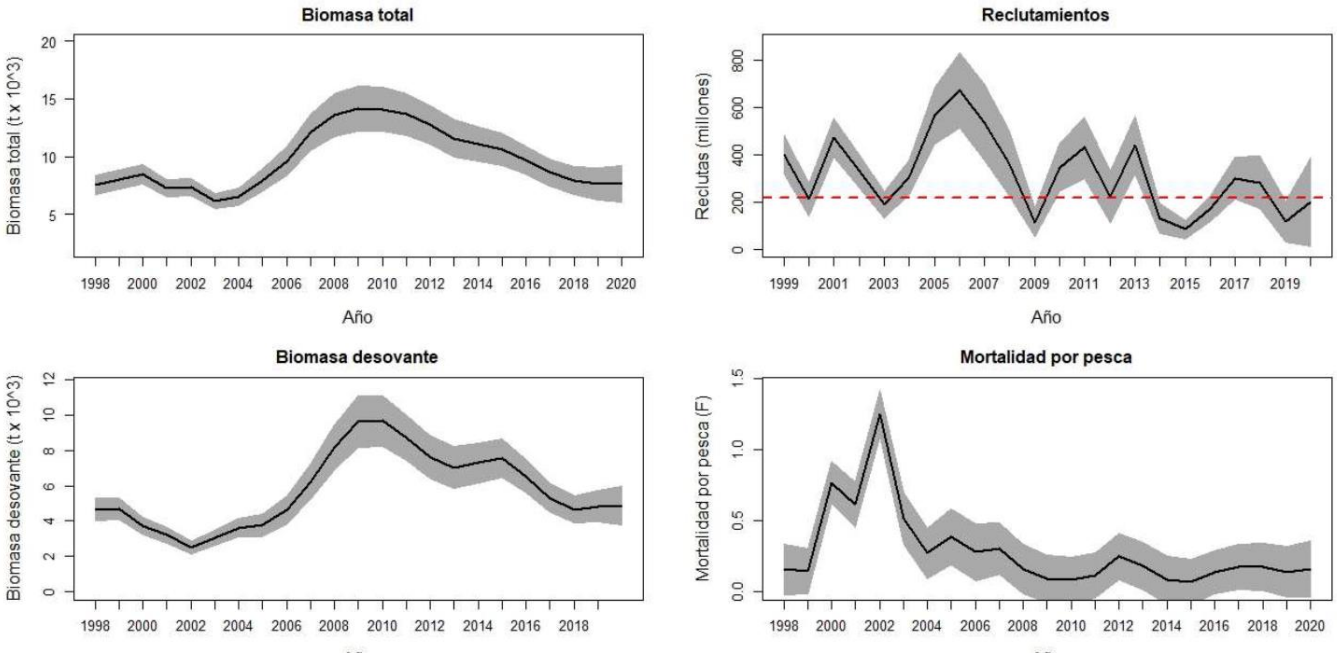

Figure 7.2.1.41. Results of the northern red squat lobster assessment model showing (clockwise from upper left) trends in total biomass, recruitment, fishing mortality and spawning biomass, 1985-2020. Shaded areas represent 95% confidence bands; Source: Ibarra and Yáñez 2021, Fig.158.

Fishing mortality has changed little in the past 5 years, remaining low, at about half the proxy Fmsy level. (**Figure 7.2.1.42**).

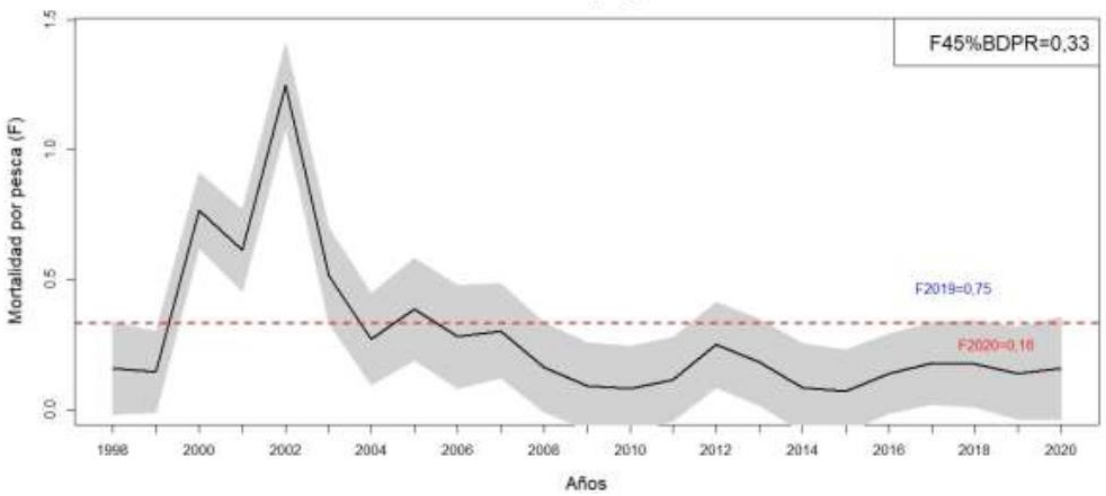

Figure 7.2.1.42. Trend in northern red squat lobster fishing mortality in relation to Fmsy (red line) during 1996-2020; Source: Ibarra and Yáñez 2021, Fig.161.

The status of the fishery in 2020 is evaluated based on changes in fishing mortality and spawning biomass relative to a phase diagram (**Figure 7.2.1.43**). The current assessment indicates that the fishery has remained in the under-exploited phase (SB/SB_{MSY} >1.5 SB_{MSY}), with little change in the past 3 years, following a continued decline in spawning biomass from 2010-2018. SB remained well above SB_{MSY} and F remained well below the F_{MSY} level in 2020.

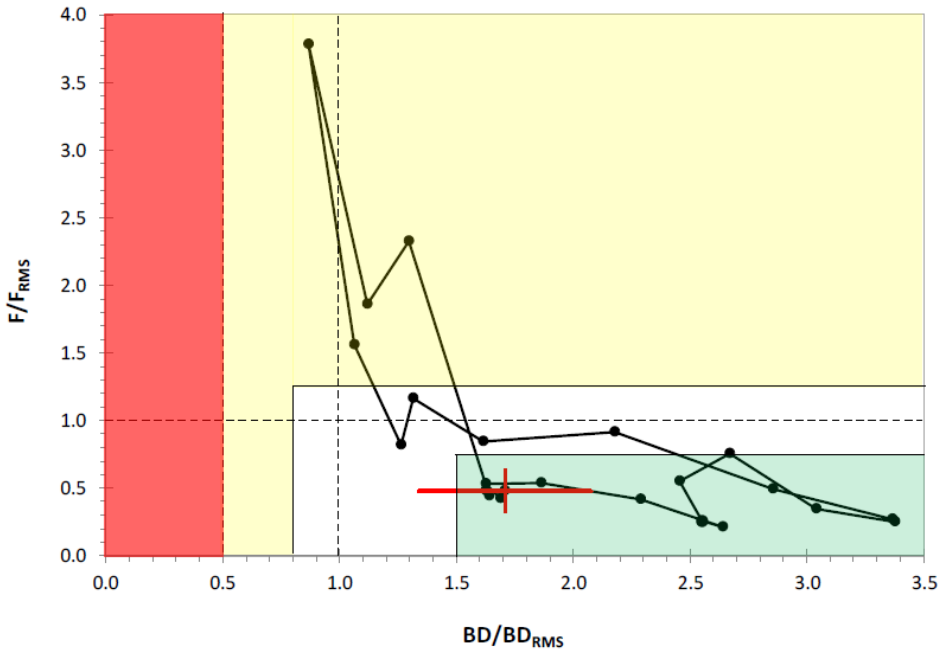

Figure 7.2.1.43. Phase diagram of northern red squat lobster with stock trajectory to 2020 based on fishing mortality and spawning biomass (relative to MSY levels) overlain. Dashed lines at values of 1.0 represent MSY levels with F/F_{MSY} representing the overfishing threshold. Red cross corresponds to the confidence intervals of the SB / SB_{MSY} and F / F_{MSY} ratio.: Source Ibarra and Yáñez 2021, Fig.162.

There is concern however that the stock status from the current assessment differs radically from that of the previous assessment (Ibarra 2020). That previous assessment indicated that the resource was overexploited in 2017-2018 and SB increased in 2019 to be marginally within the fully-exploited phase (0.8≥SB/SBMSY≥1.5). The audit team had expressed concern that this resource may be over-exploited in 2019 and that the recommendation to reduce F to the F_{MSY} level had not been followed (Saa et al 2020). By contrast, the latest assessment (Ibarra and Yanez 2021) indicated virtually no change in SB during the past 3 years (**Figure 7.2.1.41)** and that the stock has been above Bmsy for the past 16 years **(Figure 7.2.1.43).** The SB trajectory in the latest assessment was at a much higher level of biomass than that from the previous assessment such that SB_{2019} was twice as large from the latest assessment (Ibarra and Yanez 2021) as it was from the previous assessment (Ibarra 2020). The assessment team can see no basis for such a great difference between the results of the past two assessment, especially considering the low level of recent recruitment estimated by the model (**Figure 7.2.41**) and lack of undated information on CPUE or survey biomass in the latest assessment (**Figure 7.2.1.39**)

The CCT-CD accepted the results of the latest assessment (Subsecretaria de Pesca 2020b), despite high uncertainty, and considered the resource to be fully exploited (as a precautionary measure), which required implementing the HCR that specified that the quota should not be increased by more than 15% from above that of the previous year. However, the quota was increased by 53% for 2021 consistent with the HCR specified for resources that had recently recovered from over-exploitation. This suggests that the state of exploitation was subjectively interpreted based on consideration of results of the past two assessments. There is concern that the next assessment could indicate a return of the stock trajectory to a lower biomass level, such that Fmsy was exceeded in 2021 The HCRs do not account for such high uncertainty in their application. The assessment team feels that the most precautious HCR should be applied in such cases of high uncertainty.

Red squat lobster (Southern Area)

Landings and quotas increased substantially from 2011-2014, declined to 2016 and changed little since. **(Figure 7.2.1.44**). Landings increased marginally from 4,614 t in 2018 to 5,246 t in 2020 representing 98% of the total quota of 5,348 t (Zilleruelo et al 2020). The quota for 2021 was increased to 6,160 t, based on a proposed range of acceptable biological catch of 5,076 – 6,346 (See **Table 4.2.3.1**).

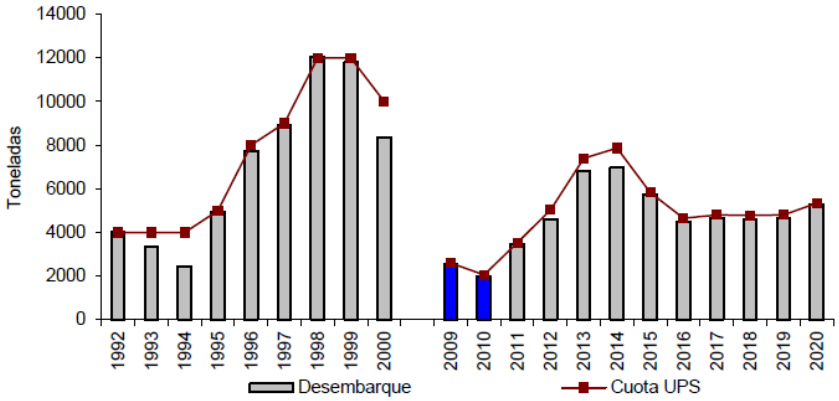

Figure 4.2.6.44. Annual landings (t) and catch quota (t) for the red squat lobster fishery in Regions V-VIII during 1993-2020: Source: Zilleruelo et al 2020, Fig 71.

The model provides a reasonable fit to the standardized CPUE data in recent years (**Figure 7.2.1.45**). Generally, the model and the empirical data indicate that CPUE declined from 2012-2016 and has since changed little.

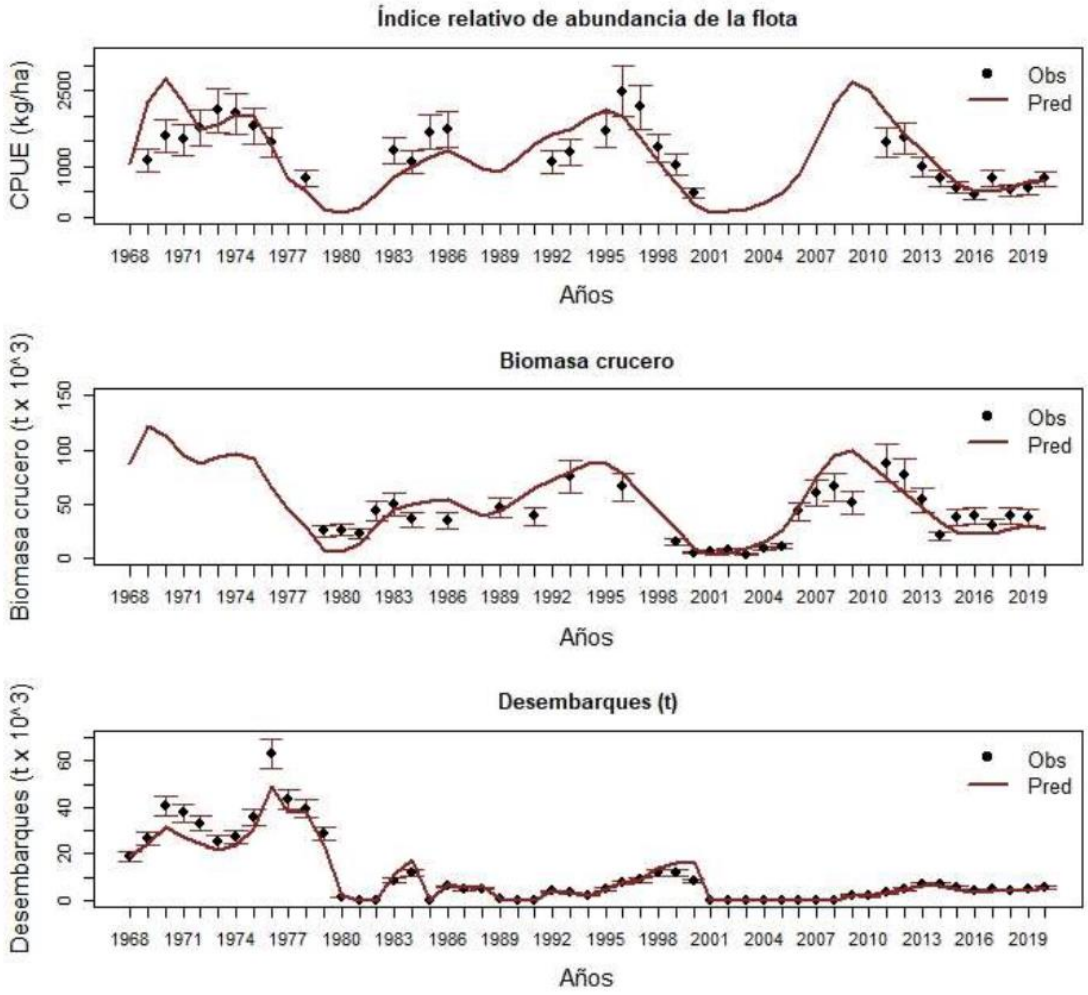

Figure 4.6.2.45. Fit of the model for red squat lobster in the southern region to the standardized CPUE estimates (top), observed survey biomass estimates (middle) and landings (bottom) The points represent the observed data with its observation error and the line represents the model estimate. Source Ibarra and Yáñez 2021, Fig.163.

The model provides a poor fit to the observed biomass (**Figure 7.2.1.45**) generally underestimating observed survey biomass estimates since 2010. However, the model and the empirical estimates agree that survey biomass declined from about 2011-2014 and has since changed little. This generally agrees with the recent trend in CPUE.

The model provides a poor fit to the mean size data from the fishery as well as from the survey (**Figure 7.2.1.46**), underestimating size from the fishery and overestimating size from the survey in most recent years. The empirical data indicate mean size decreased somewhat from 2016-2018 in the fishery, but lobsters remained large relative to the historical trend. Mean size in the survey showed a very similar trend to that in the northern area (**Figure 7.2.1.40**).; mean size declined severely during 2014-2018, from the historical high to near the historical low (**Figure 7.2.1.46**),

before increasing greatly in 2019. This great increase reflected progression of the single modal group in the 2019 survey (Ibarra 2020).

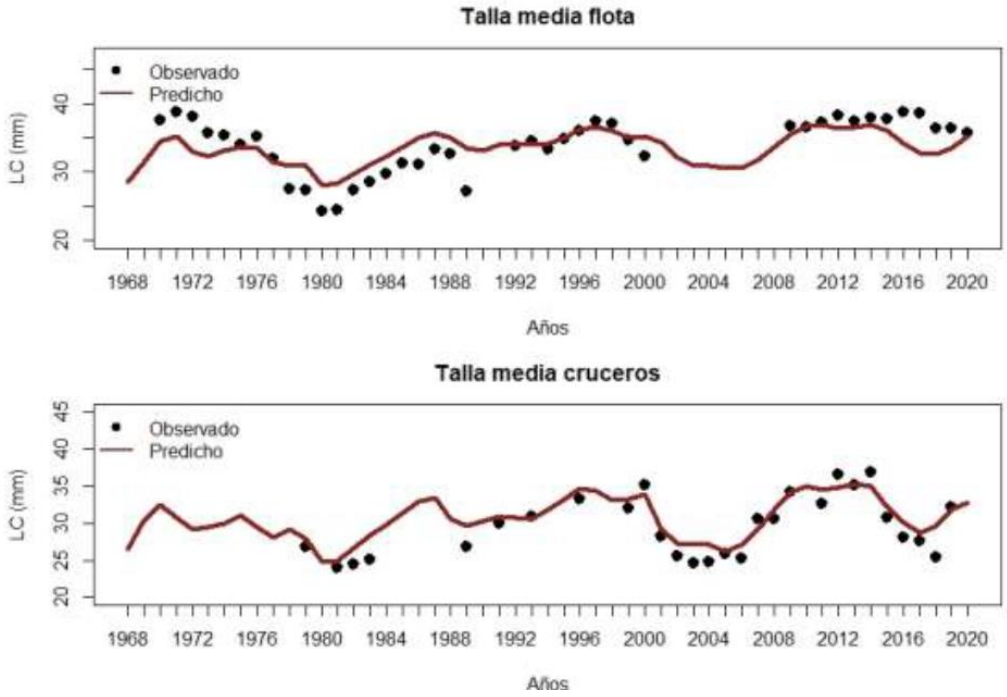

Figure 7.2.1.46. Mean sizes estimated by the model (red line) and those observed (points) in the fishery (above) and in the survey (below) for northern red squat lobster during 1998-2020: Source Ibarra and Yáñez 2021 Fig. 166.

The assessment model results (**Figure 7.2.1.47**) indicate that total biomass and spawning biomass declined during 2008-2016 and 2009-2016 respectively. Both have since increased, with total biomass increasing in 2017 and since changing little whereas spawning biomass continued to increase slightly to 2019 and change little in 2020 (Ibarra and Yáñez 2021).

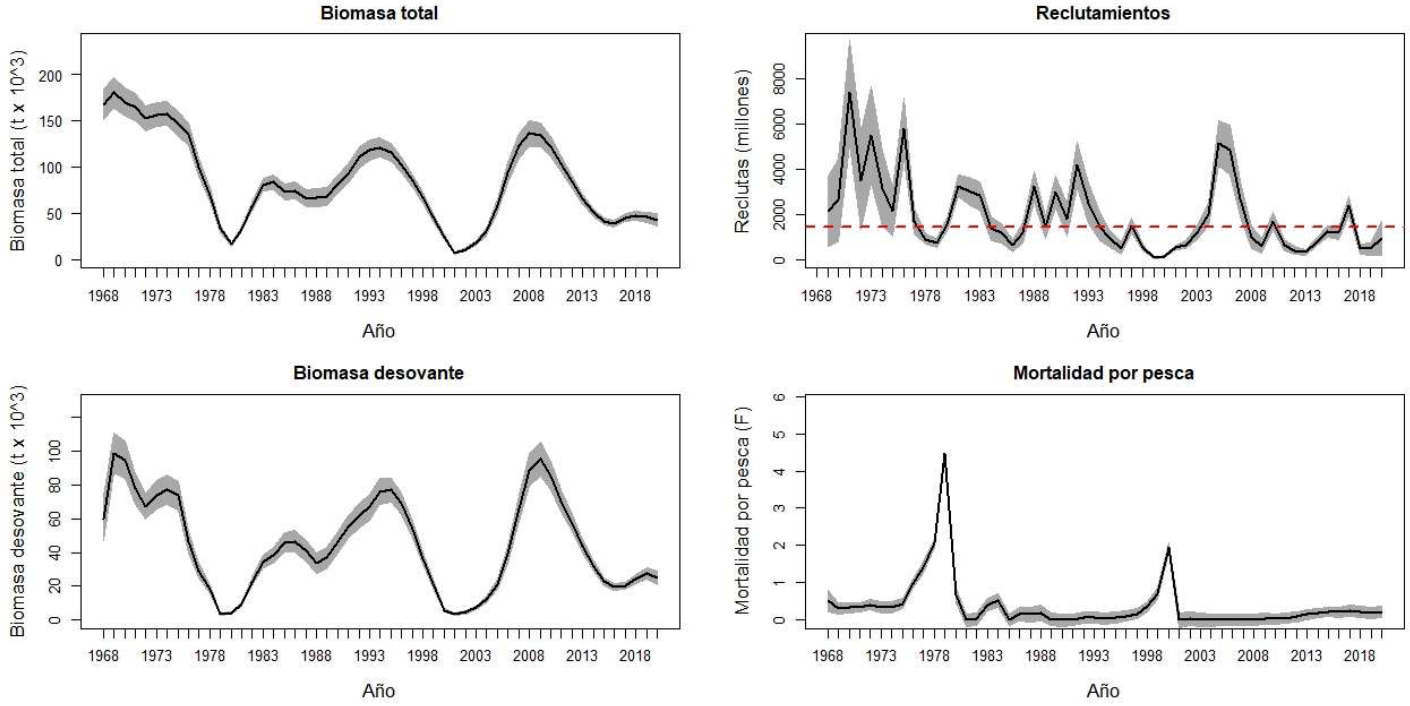

Figure 7.2.1.47. Results of the southern red squat lobster assessment model showing (clockwise from upper left) trends in total biomass, recruitment, fishing mortality and spawning biomass, 1968-2017. Shaded areas represent 95% confidence bands: Source Ibarra and Yáñez 2021 Fig. 168.

Recruitment has been variable throughout the time series (**Figure 7.2.1.47**). It declined by more than an order of magnitude from 2005-2013 and has since generally remained below the historical average. It increased to a peak in 2017 consistent with the decrease in size during from 2013-2017 (**Figure 7.2.1.46**), It then declined sharply and remained below average during the past three years, as also observed in the northern area.

Fishing mortality increased steadily from 2010-2017 (**Figure 7.1.2.48**) and has since changed little, remaining below the Fmsy level (Ibarra and Yáñez 2021).

The status of the fishery in 2020 is evaluated based on changes in fishing mortality and spawning biomass relative to a phase diagram (**Figure 7.2.1.49**). Fishery status has improved recently with SB increasing from 2016-2019 and remaining above the SBMSY level in 2020 such that the resource remains in the fully exploited phase in 2020. F declined slightly from 2017-2019 and increased slightly to remain below the FMSY level in 2020.

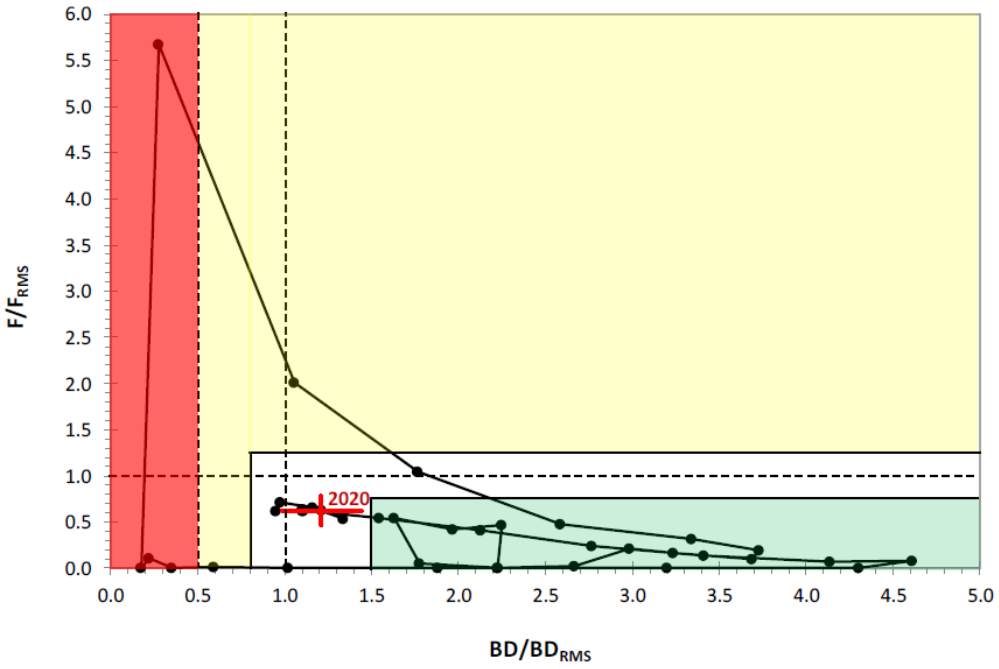

Figure 7.2.1.49. Phase diagram of southern red squat lobster with stock trajectory based on fishing mortality and spawning biomass (relative to MSY levels) overlain. Dashed lines at values of 1.0 represent MSY levels with F/F_{MSY} representing the overfishing threshold. Fishery status or phases are defined relative to MSY levels. Red cross corresponds to the confidence intervals of the SB / SB_{MSY} and F / F_{MSY} ratio. Source Ibarra 2020 Fig. 43.

The increase in SB in 2020, relative to that in 2019 from the previous assessment, is slight by comparison with the large increase in the northern area. This could be due to the substantial decline in fishery removals in the northern area (**Figure 7.2.1.38**), not realized in the southern area (**Figure 4.2.6.44**). There may also have been area differences in strength of the recent recruitment pulse but this is highly uncertain. However the assessment team feels that this difference is likely primarily due to overestimation of SB by the highly uncertain latest assessment for the northern zone.

7.2.1.5 Role in the ecosystem

Nylon shrimp and yellow and red squat lobsters are predatory detritivores with an omnivore diet (Andrade & Baez, 1980) and a low trophic level species (TL=2), slightly lower than planktonic forage fish such as sardines considered low trophic level species. These species are major components of the benthic food web pathway and in recycling organic matter back to the pelagic pathway. Ecosystem food web models showed that predation mortality constituted the main source of mortality for demersal crustaceans in 1992 and 1998 (Neira et al 2004) accordingly with their important role as prey.

However, Figure 7.3.1.7.2 and Table 7.3.1.7.2 show that key LTL species are euphausiids and the pelagic forage fishes, anchovy and sardines. These are the species that feed exclusively on phytoplankton and have very high biomass levels such that they are responsible for most of the transfer of energy to highest levels. By contrast, demersal crustaceans are predatory detritivore and their biomasses are very low compared with euphausiids, anchovy and sardine. See section 7.3.1.7 for more details on the ecosystems role of these species and the impact of these fisheries at ecosystem level.

Thus, none of the 3 P1-species are key LTL as defined by MSC since: (i) they are not one of the species types listed in Box SA1 (SA2.01); (ii) none of these species, in their adult life cycle phase feeds predominantly on plankton. So they do not meet SA2.2.9(b). In addition, they do not meet requirements in SA2.2.9(a).

7.2.2 Catch profiles

The historical landings series of the target species for UoA1 and UoA2 is presented in section 7.2.3 (**table 7.2.3.1**), while the species composition of the catches for both UoAs (based on data collected by observers) are presented in **section 7.3.1.1.**

7.2.3 Total Allowable Catch (TAC) and catch data

There is a closed seasons for the nylon shrimp (from August 1 to August 31), and for red and yellow squat lobsters (In January, February, and September).

The fishery got the MSC certificate on the 13th of September 2016, just before the end of the 2016 fishing season. Thus, the certification only covered the last 3½ months of the 2016 fishing season. TACs issued between 2016 and 2020 for target stocks and fleets are shown in **table 7.2.3.1**., together with UoA and UoC quotas and catches.

In the case of UoA 1 and 2 shrimp nylon, UoA 3 and 4 of yellow squat lobster and UoC 6 and 7 of red squat lobster it was decided to present TAC, quotas and catches corresponding to the industrial and artisanal fleets together (corresponding to a single row), since artisanal fishers may transfer all or part of their quota to a tradable fishing license holder providing that it is the same stock (according to Article 55 of the LGPA). Similar situation establishes Article 55 T of the LGPA, which authorizes a holder of a transferable fishing license within the calendar year to assign all or part of its quota to one or more small-scale owners, provided it is the same stock. This is a common transaction for the 3 stocks targeted by artisanal fleet. **Table 7.2.3.1** shows that MSC certificated catches of nylon shrimp represented 51.76% of the target TAC in 2020, and between 36,47% and 81,64% of the North stocks of yellow and red squat lobsters. While in the case of the South stocks of red and yellow squat lobsters the percentage es 26.10% y 55.41%, respectively.

Table 7.2.3.1 TACs, UoAs and UoCs quotas and UoC catches in 2016-2020. Source: Elaborated by the BV team based on data provided by SERNAPESCA

Target stock + UoAs	Year	Target TAC (t)	UoA landings(*) (t, green weight)	UoC Quotas(**) (t)	UoC landings(***) (t, green weight)	UoC landings Vs target TAC (%)
Nylon shrimp UoA1(ind) **+ UoA2** (art)	**2016**	5,794 (i)	4,199	4,198	-	-
	2017	5,653 (ii)	3,992	4,725	3,848	68.07%
	2018	5.872 (xi)	4,887	4,633	4,103	69.87%
	2019	5,873(XVI)	4,389	4,533	3,819	65,03%
	2020	5,873(XXI)	4.049	4,574	3,040	51,76%
Yellow sl North **UA3** (ind) + **UoA4** (art)	**2016**	2,450 (iii)	2,213		-	-
	2017	2,125 (iv)	1,985	1,693	1,670	78.59%
	2018	1.806 (xii)	1,674	1,347	1,320	73.09%
	2019	1,536(XVII)	1.451	1,492	1,199	78.06%
	2020	1,536(XXII)	1.440	1,347	1,254	81.64%
Yellow sl South **UoA5** (ind)	**2016**	1,830 (v)	1,785		-	-
	2017	1,900 (vi)	1,877	989	622	32.74%
	2018	1,890 (xiii)	1,869	622	607	32.12%
	2019	1,960(XVIII)	1,894	989	894	45.61%
	2020	1,960(XXIII)	1,879	1.162	1,086	55.41%
Red sl North **UoA6** (ind) + **UoA7** (art)	**2016**	1,029 (vii)	887		-	-
	2017	1,081(viii)	953	773	741	68.55%
	2018	919 (xiv)	763	522	505	54.95%
	2019	781(XIX)	610	701	453	58.00%
	2020	743(XXIV)	546	398	271	36.47%
Red sl South **UoA8** (ind)	**2016**	4,618 (ix)	4,428		-	-
	2017	4,673 (x)	4,589	1,099	1,078	23.07%
	2018	4,662 (xv)	4,535	1,262	1,217	26.10%
	2019	4,662(XX)	4,571	1,242	923	19,80%
	2020	5,348(XXV)	5,270	1,457	1,396	26,10%

(*) Total landings performed by the Chilean demersal trawl fleets targeting those stocks.
(**) Quotas allocated to the 7 fishing companies included in the MSC-fishery certificate
(***) Tonnes landed by the 7 companies included in the MSC-fishery certificate. Data from 2016 should correspond to landings since certification data but this information was not available at the time of the audit, while data for 2017 and 2018 correspond to the entire fishing season.
(i) Global total quota 2016: 5,904t. Target quota 2016: 5,794t. excluding quota for research and by-catch and research, Target quota for the industrial fleet in Regions II-VIII was 4,405t, while target quota for the artisanal fleet in Region IV was 730t; **(ii)** Global total quota 2017 for Nylon shrimp: 5,768t. Target quota 2017: 5,653t. excluding quota for research and by-catch and research. Target quota for industrial fleet in Regions II- VIII was 4,292t, while target quota for artisanal fleet in Regin IV was 730t; **(iii)** Global total quota 2016: 2,500 t. Target quota 2016: 2,450 t. excluding quota for research and by-catch and research, Target quota for industrial fleet in Regions III-IV was 1,482t, while target quota for artisanal fleet in Region IV was 850t. **(iv)** Global total quota 2017 for Yellow squat lobster North: 2,168 t. Target quota 2017: 2,125 t. excluding quota for research and by-catch and research, Target quota for industrial fleet in Regions III-IV was 1,264t, while target quota for artisanal fleet in Region IV was 861t; **(v)** Global total quota 2016: 1,880 t. Target quota 2016: 1,830 t excluding quota for research and by-catch and research; **(vi)** Global total quota 2017 for Yellow squat lobster South: 1,954 t. Target quota 2017: 1,900 t excluding quota for research and by-catch and research; **(vii)** Global total quota 2016: 1,050 t. Target quota 2016: 1,029 t. excluding quota for research and by-catch. Target quota for industrial

fleet in Regions II-IV was 169t, while target quota for industrial fleet in Region IV was 780t; **(viii)** Global total quota 2017 for red squat lobster North: 1,103 t. Target quota 2017: 1,081 t. excluding quota for research and by-catch. Target quota for industrial fleet in Regions II-IV was 221t, while target quota for artisanal fleet in Region IV was 860t; **(ix)** Global total quota 2016:4,750 t. Target quota 2016: 4,618 t., excluding quota for research and by-catch. Se encuentra asignado el 97,5% de la cuota objetivo; **(x)** Global total quota 2017 for red squat lobster South:4,798 t. Target quota: 4,673 t., excluding quota for research and by-catc; **(xi)** Global total quota 2018 for Nylon shrimp:5,992 t. Target quota: 5,872 t., excluding quota for research and by-catch; Target quota for the industrial fleet in Region II-VIII was 4,468t, while target quota for the artisanal fleet in Region IV was 775t; **(xii)** Global total quota 2018 for Yellow squat lobster North: 1,843 t. Target quota 2018: 1,806 t. excluding quota for research and by-catch and research, Target quota for the industrial fleet in Regions III-IV was 1,050t, while target quota for the artisanal fleet in Regio IV was 710t; **(xiii)** Global total quota 2018 for Yellow squat lobster South: 1,954 t. Target quota 2018: 1,890 t excluding quota for research and by-catch and research; **(xiv)** Global total quota 2018 for red squat lobster North: 938 t. Target quota 2018: 919 t. excluding quota for research and by-catch. Target quota for the industrial fleet in Regions III-IV was 59t, while target quota for the artisanal fleet in Regio IV was 810t; **(xv)** Global total quota 2018 for red squat lobster South:4,798 t. Target quota: 4,662 t., excluding quota for research and by-catch. **(XVI)** Total quota for nylon shrimp in 2019: 5,992 t., Target quota: 5,873 excluded quota for research and bycatches. **(XVII)** Yellow squat lobster UPN quota in 2019: 1,567 t, Target quota: 1,536 t. excluding quota for research and by-catch. **(XVIII)** Yellow squat lobster UPS quota in 2019: 2,027 t., Target quota: 1,960 t. excluding quota for research and bycatches**. (XIX)** red squat lobster UPN quota in 2019: 797 t., Target quota: 781 t. excluding research and bycatch. **(XX)** red squat lobster UPS quota in 2019: 4,798 t., target quota: 4,662 t. excluding quota for research and bycatch**. (XXI**) Nylon shrimp quota for 2020: 5,992 t, Target quota: 5,873 t. excluding research and bycatches. **(XXII)** Yellow squat lobster UPN quota in 2020: 1,567 t., Target quota: 1,536 t, excluding research and bycatches**. (XXIII)** Yellow squat lobster UPS quota in 2020: 2027 t. Target quota: 1960 t. excluding research and bycatches, **(XXIV)** red squat lobster UPN: 757 t., Target quota: 743 t. excluding research quota and bycatches, **(XXV)** red squat lobster UPS: 5,518 t. Target quota: 5,348 t. excluding research and bycatches.

7.2.4 Principle 1 Performance Indicator scores and rationales

PI 1.1.1 – Stock status

PI 1.1.1		The stock is at a level which maintains high productivity and has a low probability of recruitment overfishing		
Scoring Issue		SG 60	SG 80	SG 100
a	Stock status relative to recruitment impairment			
	Guide post	It is **likely** that the stock is above the point where recruitment would be impaired (PRI).	It is **highly likely** that the stock is above the PRI.	There is a **high degree of certainty** that the stock is above the PRI.
	Met?	**Yes (All UoAs)**	**Yes (All UoAs)**	**Yes (All UoAs)**
Rationale				

Explicit target and limit reference points have been developed and are contained in the management plan (Subsecreataria de Pesca 2016). These reference points are proxies that follow international advice and MSC guidance. Proxy reference points are calculated ed as;

B_{MSY} = 40% B0, where B0 is the equilibrium biomass under no fishing (ie virgin biomass) and is estimated by the assessment model.
B_{lim} = 20% B0
F_{MSY} = F45%SPR|F=0 (i.e. the F when biomass per recruit is 45% of biomass per recruit when F=0)

Estimates of SB and F are provided from annual stock assessments performed by IFOP on all target stocks.

The spawning biomass estimated from the most recent assessment **(**Ibarra and Yáñez, 2021) is well above the limit RP of 20%B0 For all target stocks (see below the table on 'Stock status relative to reference points'). While there is high uncertainty in the assessment results, particularly for nylon shrimp, there has been no evidence of recent recruitment impairment for any of the target stocks. Recruitment has fluctuated about the historical average for the past two decades for both nylon shrimp UoAs. For all target stocks there has also been no evidence of recruitment impairment throughout the time series, even at historically low SB levels. Therefore SG 80 is met.

According to the latest stock assessments, the 95% confidence intervals about the SB estimate is well above the LRP (B_{lim}) for all target stocks (see below the table on 'Stock status relative to reference points'), and this has also been the case in recent years. Therefore, there is a high degree of certainty that the stocks are above the PRI and **SG60, SG80 and SG 100 are met.**

b	Stock status in relation to achievement of Maximum Sustainable Yield (MSY)

	Guide post		The stock is at or fluctuating around a level consistent with MSY.	There is **a high degree of certainty** that the stock has been fluctuating around a level consistent with MSY or has been above this level over recent years.
	Met?		**Yes (All UoAs)**	**No (All UoAs)**

Rationale

Stock status is considered to be fluctuating around Bmsy if SB exceeds 80%SBmsy in the most recent assessment, consistent with MSC guidance (MSC GSA2.2.2). On this basis all UoCs are considered to be at or fluctuating around a level consistent with MSY. MSC cautions however that that a model-derived estimate of stock size from the most recent year will often be more uncertain than earlier years and advised that a single estimate of stock status should be supported by an estimate of certainty either derived from a time series trend or from a statistical model (MSC GSA2.2.2).

This is highly relevant to scoring in this assessment due to the high uncertainty in the assessment results (see PI 7.2.1 for more considerations on the uncertainty of the outputs of the stock assessments). The SB for all UoAs has exceeded 80%SBmsy for at least the past 10 years, a period that exceeds the generation time for all three species. Also, fishing mortality has been maintained below the Fmsy proxy level for recent years for all UoAs except nylon shrimp north (see below the table on 'Stock status relative to reference points'). which should ensure that biomass continues to fluctuate around or be above the target reference point. In the case of nylon shrimp north the assessment and F estimate are unreliable, as detailed below.

There is higher uncertainty about the current status of nylon shrimp than that of both squat lobster species because of the unreliability of the most recent nylon shrimp assessment (Subsecretaría de Pesca 2020a). However, the CCT-CD considered that the status of nylon shrimp was not changed in 2020 because the fishery indicators did not show significant changes compared to recent years so it is decided to maintain the status quo with respect to the CBA range for 2021. Furthermore, previous assessments of nylon shrimp for both UoAs indicated that SB has exceeded 80%SBmsy for more than 10 years, exceeding the generation time. **Therefore SG 80 is met**.

Due to the high uncertainty in the assessment model as well as the results (in general) it cannot be concluded that here is a high degree of certainty that the stock has been fluctuating around a level consistent with MSY or has been above this level over recent years for all target stocks. Accordingly **SG 100 is not met.**

References

Subsecretaría de Pesca. 2020a. Acta N° 6-2020 Comité Científico de Crustaceos Demersales (CCT-CD) CCT-RCD N°6/2020.

Ibarra and Yáñez, 2021. Estatus y posibilidades de explotación biológicamente sustentables de los principales recursos pesqueros nacionales, año 2021. Informe convenio de desempeño 2021 Subsecretaría de Economía y EMT / marzo 2021, 123 pp.

Subsecretaría de Pesca. 2016. Propuesta plan de manejo de crustaceos demersal,

Stock status relative to reference points

	Type of reference point	Value of reference point	Current stock status relative to reference point
Reference point used in scoring stock relative to PRI (SIa)	***All UoAs*** *Blim proxy* .	**All UoAs** *Blim proxy = 20% of B0*	**Nylon shrimp (UoAs 1 & 2)** **ZCN** B/Blim = 3.22 **ZCS** B/Blim = 1.84 **Yellow squat lobster UPN (UoAs 3 & 4)** B/Blim = 2.40 **Yellow squat lobster UPS (UoA 5)** B/Blim = 2.60 **Red squat lobster UPN (UoAs 6 & 7)** B/Blim = 3.4 **Red squat lobster UPS (UoA 8)** B/Blim =2.42
Reference point used in scoring stock relative to MSY (SIb)	**All UoAs** Bmsy proxy Fmsy proxy	**All UoAs** Bmsy proxy = 40% of B0 Fmsy proxy = F45%SPR|0.	**Nylon shrimp (UoAs 1 & 2)** **ZCN:** B/Bmsy = 1.61 F/Fmsy = 0.39 **ZCS:** B/Bmsy =0.92 F/Fmsy = 1.44 **Yellow squat lobster UPN (UoAs 3 & 4)** B/Bmsy = 1.20 F/Fmsy = 0.36 **Yellow squat lobster UPS** (UoA 5)

			B/Bmsy =1.30 F/Fmsy = 0.21 **Red squat lobster UPN (UoAs 6 & 7)** B/Bmsy=1.7 F/Fmsy=0.48 **Red Squat Lobster UPS (UoA8)** B/Bmsy=1.21 F=0.63

Draft scoring range and information gap indicator added at Announcement Comment Draft Report stage

Draft scoring range	**≥80**
Information gap indicator	**Information sufficient to score PI**

Overall Performance Indicator scores added from Client and Peer Review Draft Report stage

Overall Performance Indicator score	
Condition number (if relevant)	

PI 1.1.2 – Stock rebuilding

PI 1.1.2		Where the stock is reduced, there is evidence of stock rebuilding within a specified timeframe		
Scoring Issue		SG 60	SG 80	SG 100
a	Rebuilding timeframes			
	Guide post	A rebuilding timeframe is specified for the stock that is the **shorter of 20 years or 2 times its generation time**. For cases where 2 generations is less than 5 years, the rebuilding timeframe is up to 5 years.		The shortest practicable rebuilding timeframe is specified which does not exceed **one generation time** for the stock.
	Met?	**NA**		**NA**
Rationale				

Since PI 1.1.1 achieved an 80 score for both target stocks, this Pi is not applicable for any of the UoCs (SA2.3.1).

b	Rebuilding evaluation			
	Guide post	Monitoring is in place to determine whether the rebuilding strategies are effective in rebuilding the stock within the specified timeframe.	There is **evidence** that the rebuilding strategies are rebuilding stocks, **or it is likely** based on simulation modelling, exploitation rates or previous performance that they will be able to rebuild the stock within the **specified timeframe**.	There is **strong evidence** that the rebuilding strategies are rebuilding stocks, **or it is highly likely** based on simulation modelling, exploitation rates or previous performance that they will be able to rebuild the stock within the **specified timeframe**.
	Met?	**NA**	**NA**	**NA**
Rationale				

Since PI 1.1.1 achieved an 80 score for both target stocks, this Pi is not applicable for any of the UoCs (SA2.3.1).

References

Draft scoring range and information gap indicator added at Announcement Comment Draft Report stage

Draft scoring range	**NA**
Information gap indicator	**Information sufficient to score PI**

Overall Performance Indicator scores added from Client and Peer Review Draft Report stage

Overall Performance Indicator score	
Condition number (if relevant)	

PI 1.2.1 – Harvest strategy

PI 1.2.1		There is a robust and precautionary harvest strategy in place		
Scoring Issue		SG 60	SG 80	SG 100
a	Harvest strategy design			
	Guide post	The harvest strategy is **expected** to achieve stock management objectives reflected in PI 1.1.1 SG80.	The harvest strategy is responsive to the state of the stock and the elements of the harvest strategy **work together** towards achieving stock management objectives reflected in PI 1.1.1 SG80.	The harvest strategy is responsive to the state of the stock and is **designed** to achieve stock management objectives reflected in PI 1.1.1 SG80.
	Met?	**Yes (All UoAs)**	**Yes (All UoAs)**	**Yes (All UoAs)**
Rationale				

The decision-making process is one that involves all stakeholders. IFOP carries out stock assessments for each target stock fitting age- structured stock assessment models to fisheries data and fisheries-independent survey indices. IFOP assesses the status of the stocks in relation to pre-defined reference points which are formulated within an MSY framework. For setting global catch quotas, the scientific committees propose a range of acceptable biological catch (CBA) within which SUBPESCA can choose a quota level based on the application of explicit HCRs for various states of exploitation. The scientific committee (CCT) debates the technical aspects of the assessments and makes recommendations to SUBPESCA, The CCT-CD also meets regularly to review and discuss different issues relevant to the fishery.

The stock management objective for all the demersal crustacean species is to manage the stocks within a MSY framework and ensure that stock biomass remains within a target range around the Bmsy proxy and that fishing mortality remains within a target range around the Fmsy proxy.

The primary tool that is applied to achieve this objective is annual adjustments to the quota. The assessment of stock status in relation to reference points provides the more specific tools of SB and F estimates that are used to calculate a range of acceptable biological catch (CBA). A quota is determined within this range of CBA based on 4 scenarios of stock status and associated management actions specified in the HCR contained in the management plan.

Furthermore, the harvest strategy includes limited entry licensing of fishing vessels in which licences are transferable and are granted to vessels either for industrial or artisanal fishing, the setting of annual global quotas for each fishery in line with maintaining the stocks at target reference points, the use of individual transferable quotas, closed areas, seasonal closures during the main moulting and reproductive periods, and strict restrictions on the trawl design including minimum mesh sizes in the cod end to reduce the capture and potential discarding of both non-commercial-sized squat lobsters and bycatch species, controls on dimensions and material used in the trawl and escape devices. There are also strict monitoring requirements for all vessels in the fisheries including mandatory use of VMS, completion of electronic log books for every tow of the trawl, monitoring of catch compositions and biological sampling through an observer programme covering nearly 25% of fishing trips, direct evaluation of biomass through fishery-independent surveys and 100% dockside monitoring of landings.

The harvest strategy is responsive to the state of the stock and the elements of the harvest strategy work together towards achieving stock management objectives reflected in PI 1.1.1 SG80. This is supported by evidence from the most recent assessments that the target squat lobster stocks have been fluctuating about the SBmsy level for more than a decade (Ibarra and Yanez 2021). In the case of target nylon shrimp stocks the latest assessment was unreliable and uninformative (Subsecretaria de Pesca 2020a) but the previous assessment indicated that these UoAs were also fluctuating about the SBmsy level for more than a decade. Although the existing HCRs could not be applied the CCT-CD inferred, based on other elements of the harvest strategy, (fishery and survey biomass indices) that the status of nylon shrimp was not significantly different in 2020 from recent years. Therefore **SG60 and SG80 are met**.

The harvest strategy was designed to achieve stock management objectives reflected in PI 1.1.1 SG80. Therefore **SG 100 is met.**

The assessment team notes that the management authority stressed that review of the evaluation procedure is urgently required, and plans were quickly developed to undertake a review (Subsecretaría de Pesca 2020a). It was also noted that a simple decision rule is needed for cases where the assessment is uninformative. This provides confidence that the management agency can and will act effectively and in a timely fashion when needed; in this case to resolve concerns for important tools in the harvest strategy (the assessment model and HCRs).

b	Harvest strategy evaluation			
	Guide post	The harvest strategy is **likely** to work based on prior experience or plausible argument.	The harvest strategy may not have been fully **tested** but evidence exists that it is achieving its objectives.	The performance of the harvest strategy has been **fully evaluated** and evidence exists to show that it is achieving its objectives including being clearly able to maintain stocks at target levels.
	Met?	**Yes (All UoAs)**	**Yes (All UoAs)**	**No (All UoAs)**
Rationale				

Annual landings have not exceeded the quotas in any of the fisheries in recent years, so that element of the harvest strategy appears to be working. Cross-checking by SERNAPESCA of landings declarations with log book records and processors' records, and VMS records with fishing positions recorded on electronic log books did not identify any systematic mis-recording of catch or fishing position data. The harvest strategy is comprised of multiple tools and HCRs that collectively are intended to maintain stock biomass and fishing mortality at levels reflected in the target and limit reference points, and in general this appears to be working.

The harvest strategy has not been fully tested but is currently being reviewed in the preparation of a new management plan. The harvest strategy is achieving it's objectives as evidenced by both target stocks being maintained around the SBmsy level in recent years (See PI 1.1.1b and PI 1.2.1a). **Accordingly SG60 and SG80 are met**.

The HS has not been fully evaluated and there are concerns with the assessment model. The assessment team considers that there is high uncertainty about the results from the assessment model and that it could prove unreliable and uninformative for any of the demersal crustacean target stocks as it did for nylon shrimp in 2020, when the HCR could not be applied (Saa et al in prep., Secretaria de Pesca 2020a). Therefore it cannot be concluded that the harvest strategy is clearly able to maintain stocks at target levels. **Therefore SG 100 is not met**.

c	Harvest strategy monitoring			
	Guide post	Monitoring is in place that is expected to determine whether the harvest strategy is working.		
	Met?	**Yes (All UoAs)**		
Rationale				

An effective monitoring programme is in place including continual recording of the fishing positions through VMS, recording of catches on electronic log books, inspection of landings at the dockside, monitoring of total catch compositions and discards, biological sampling through observer programmes, and fishery-independent estimates of stock biomass. In addition, regulations are enforced by SERNAPESCA, and therefore sufficient monitoring is in place to determine whether the harvest strategy is working. **SG60 is met.**

d	Harvest strategy review			
	Guide post			The harvest strategy is periodically reviewed and improved as necessary.
	Met?			**Yes (All UoAs)**
Rationale				

The harvest strategy is under continuous review through regular meetings of the Scientific Committee and the Management Committee and has been previously improved and will be improved when necessary in the future. The Scientific Committee reviews the results of the stock assessments undertaken by IFOP and provides advice to the Ministry on quotas on an annual basis, but also periodically reviews elements of the harvest strategy (e.g. the determination of reference points) if required to do so by the Management Committee or in consultation with stakeholders through the National Fishery Council (CNP) and the Regional Fisheries Councils (CZP). All elements of the harvest strategy are currently being rigorously reviewed by the Management Committee during the preparation of a new Management Plan for all three demersal crustacean fisheries. Elements of the harvest strategy were also reviewed in 2013-14 by a panel of international experts in collaboration with Chilean scientists (Dichmont 2015). **SG100 is met.**

e	Shark finning			
	Guide post	It is **likely** that shark finning is not taking place.	It is **highly likely** that shark finning is not taking place.	There is a **high degree of certainty** that shark finning is not taking place.
	Met?	**NA**	**NA**	**NA**

Rationale

None of the P1 species are sharks, so this scoring issue is not evaluated.

f	Review of alternative measures			
	Guide post	There has been a review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of unwanted catch of the target stock.	There is a **regular** review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of unwanted catch of the target stock and they are implemented as appropriate.	There is a **biennial** review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of unwanted catch of the target stock, and they are implemented, as appropriate.
	Met?	**Yes (All UoAs)**	**Yes (All UoAs)**	**Yes (All UoAs)**

Rationale

Discards caused by these fisheries on target species, other retained species (such as common hake) and also on non-commercial species have been an issue of concern. In order to respond to these concerns, IFOP implemented a research program on discards and incidental catches on demersal crustacean fisheries between 2013 and 2015. This program provided exhaustive and comprehensive information in relation to discards of target species between 2013 and 2015. The ultimate goal of the program was to compile the technical background to allow the design of the plan for the reduction of discards which was finally approved in 2017 (Resolution Nº1106/2017). This Plan introduced severe measures to avoid discards of target species: all catches shall be recorded, landed and counted against the quota of the vessel. The monitoring on board has been maintained since 2016 up to date. Furthermore, between 2017 and 2020 an electronic monitoring system (EMS) was developed and implemented based on image analysis of the total catch from onboard cameras. It was required that the total catch from each fishing set be sorted and photographed before being discarded. This is intended to fully document all discarding; since discarding of the target species is not permitted and subject to sanctions, this measure is a strong deterrent to discarding of the target species. This was fully implemented in the industrial fleet and must be fully implemented in the artisanal fleet in the next two years. Since the development and implementation of this measure represents a continuous process that has been monitored annually over the past 5 years it is concluded that there has been a regular (annual) review of the effectiveness and practicality of this measure for reducing catch and discarding of the target species. Therefore SG 80 is met.

EMS monitoring of discarded catch was fully implemented in the industrial fleet in January 2020 and the analysis of images from this system has recently begun. This analysis is expected to be an ongoing annual process for the foreseeable future, such that review of its effectiveness will be on an annual basis..

The effectiveness of these measures is being reviewed annually at the CM—CD and CCT-CD.

SG60, SG80 and SG100 are met.

References

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Ibarra and Yáñez, 2021. Estatus y posibilidades de explotación biológicamente sustentables de los principales recursos pesqueros nacionales, año 2021. Informe convenio de desempeño 2021 Subsecretaría de Economía y EMT / marzo 2021, 123 pp.

Subsecretaría de Pesca. 2020a. Acta N° 6-2020 Comité Científico de Crustaceos Demersales (CCT-CD) CCT-RCD N°6/2020.

Draft scoring range and information gap indicator added at Announcement Comment Draft Report stage

Draft scoring range	**≥80**

Information gap indicator	**Information sufficient to score PI**

Overall Performance Indicator scores added from Client and Peer Review Draft Report stage

Overall Performance Indicator score	
Condition number (if relevant)	

PI 1.2.2 – Harvest control rules and tools

PI 1.2.2		There are well defined and effective harvest control rules (HCRs) in place		
Scoring Issue		SG 60	SG 80	SG 100
a	HCRs design and application			
	Guide post	**Generally understood** HCRs are in place **or available** that are **expected** to reduce the exploitation rate as the point of recruitment impairment (PRI) is approached.	**Well defined** HCRs are **in place** that **ensure** that the exploitation rate is reduced as the PRI is approached, are expected to keep the stock **fluctuating around** a target level consistent with (or above) MSY, or for key LTL species a level consistent with ecosystem needs.	The HCRs are expected to keep the stock **fluctuating at or above** a target level consistent with MSY, or another more appropriate level taking into account the ecological role of the stock, **most** of the time.
	Met?	**Yes (All UoAs)**	**No (All UoAs)**	**Not scored**
Rationale				

The key management tool in all three demersal crustacean fisheries is the revision of the annual quotas in response to changes in stock status. The objective is to maintain the stock biomass within the target range around the Bmsy proxy and to maintain fishing mortality within the target range around the Fmsy proxy. The stock assessment evaluates projections of biomass and catches based on a range of exploitation patterns – no fishing, F40%, F45% (Fmsy proxy), F48% and Fsq (current fishing mortality) for nylon shrimp, and no fishing, F45% (Fmsy proxy) and Fsq (current fishing mortality) for the yellow and red squat lobsters – to assess the short-term consequences of the different exploitation levels and to understand the implications for the stock in the medium term. The Scientific Committee then advises a maximum quota (CBA) that can be taken in the following year whilst ensuring that the level of risk of exceeding the Fmsy proxy should be no more than a pre-defined level (usually 10%). Subpesca adopts the CBA based on this scientific advice.

The primary HCR consists of a set of four rules for determining quotasbased on whether the stocks are considered to be under-exploited, fully-exploited, over-exploited or collapsed, If previously over-exploited, the stock may be designated as “in recovery”.

These represent well-defined HCRs specified in the management plan (Subsecretaría de Pesca 2016):

1. 1.If the spawning biomass is greater than 40% of B0, then it is recommended that any increase in the percentage of the annual catch quota does not exceed 15% over the quota of the previous year.
2. 2.In the event that spawning biomass is less than 40% of B0, and that the recovery period associated with the use of the Fmsy is greater than a generational cycle, a value of F should be used that will allow the fishery to recover in, at the most, a generational cycle.
3. In the event that the spawning biomass indicator passes from a state of overexploitation (lower than the 40% to a fully exploited one (around 40% the B0), the quota should be set at a level consistent with Fmsy value of F relative to the MSY, even when this increase exceeds the 15% indicated in rule 1.
4. If the spawning biomass is less than 20% of the B0, the application of a fishery closure should be evaluated.

These HCRs are expected to reduce the exploitation rate as the point of recruitment impairment (PRI) is approached**. SG 60 is met**.

However it cannot be concluded that these HCRs **ensure** that the exploitation rate is reduced as the PRI is approached, This is because there is currently no HCR to trigger appropriate management action in cases where the assessment is not informative such that the CBA cannot be calculated, as was the case for nylon shrimp in 2020 (Sunbecretaria de Pesca 2020a,.Saa et al in prep.). This applies to all demersal crustacean stocks because the same model is applied to all target stocks such that any UoAs may experience unreliable assessment results in any year. This is recognized by the CCT-CM, as reflected in the mandate that a decision rule (ie. HCR) is required in such cases when the assessment is uninformative Sunbecretaria de Pesca 2020a).

Therefore **SG 80 is not met.**

b	HCRs robustness to uncertainty			
	Guide post		The HCRs are likely to be robust to the main uncertainties.	The HCRs take account of a **wide** range of uncertainties including the ecological role

				of the stock, and there is **evidence** that the HCRs are robust to the main uncertainties.
	Met?		**No (All UoAs)**	**Not scored**
Rationale				

HCRs are not robust to a main uncertainties associated with the assessment due to model uncertainty and process errors, as well as observational uncertainty associated with inconsistency in both the fishery and survey abundance indices. Application of the HCR to determine quota is sensitive to the model estimate of SB and associated state of exploitation of the stock. However there is high uncertainty about the state of exploitation from the model because the trajectory and recent history of state of exploitation may change with each successive assessment, such that application of the HCR in any year could be found to have been inappropriate based on the next assessment.

This was the case for southern red squat lobster in from 2016-2018 (Saa et al 2019). The assessment for 2017 indicated that the resource was over-exploited in 2016 and 2017 (Cavieres and Yañez 2017) whereas the next assessment indicated that that the resource has not clearly been over-exploited for more than two decades. (Ibarra 2018, Saa et al 2019).

In the case of northern red squat lobster, the most recent assessment indicated that the resource was under-exploited and had not been overexploited for more than a decade (Ibarra and Yanez 2021). By contrast the previous assessment indicated that the resource had been recently overexploited and was fully exploited in 2019 (Ibarra 2020). The CCT-CD accepted the results of the latest assessment (Subsecretariat de Pesca 2020b), despite high uncertainty, and considered the resource to be fully exploited, which required implementing the HCR that specified that the quota should not be increased by more than 15% from above that of the previous year. However, the quota was increased by 53% for 2021 consistent with the HCR specified for resources that had recently recovered from over-exploitation. This suggests that the state of exploitation was subjectively interpreted based on consideration of results of the past two assessments. There is concern that next assessment could indicate a return of the stock trajectory to a lower biomass level, such that Fmsy was exceeded in 2021. The current HCRs include no provision for dealing with such cases of high uncertainty.

In the case of nylon shrimp the most recent assessment results were so uncertain that the assessment was considered unreliable such that the SB and state of exploitation could not be determined and the CBA could not be estimated such that the HCR could not be applied to establish a quota (Subsecretaria de Pesca 2020a Saa et al 2020a). There is presently no HCR to trigger appropriate management action in cases where the assessment is not informative.

These examples illustrate instances where the HCRs have proven to be not robust to uncertainties associated with the assessment model results. The same model is applied to all demersal crustaceans such that it is concluded that for all target stocks the HCRs are not likely to be robust to the main uncertainties.

Therefore **SG 80 is not met.**

	HCRs evaluation			
c	Guide post	There is **some evidence** that tools used **or available** to implement HCRs are appropriate and effective in controlling exploitation.	**Available evidence indicates** that the tools in use are appropriate and effective in achieving the exploitation levels required under the HCRs.	**Evidence clearly shows** that the tools in use are effective in achieving the exploitation levels required under the HCRs.
	Met?	**Yes (All UoAs)**	**Yes (All UoAs)**	**No (All UoAs)**
Rationale				

The exploitation level required under the HCRs is represented by a target range around the Fmsy proxy which is estimated internally by the model. The assessment model and annual quota represent important tools in regulating exploitation. Other tools include limited entry licensing of fishing vessels in which licences are transferable and are granted to vessels either for industrial or artisanal fishing, the setting of annual global quotas for each fishery in line with maintaining the stocks at target reference points, the use of individual transferable quotas, closed areas, seasonal closures during the main moulting and reproductive periods, and strict restrictions on the trawl design including minimum mesh sizes in the codend to reduce the capture and potential discarding of both non-commercial-sized squat lobsters and bycatch species, controls on dimensions and material used in the trawl and escape devices. There are also strict monitoring requirements for all vessels in the fisheries including mandatory use of VMS, completion of electronic log books for every tow of the trawl, monitoring of catch compositions and biological sampling through an observer program, EMS monitoring of discards, direct evaluation of biomass through fishery-independent surveys and 100% dockside monitoring of landings.

Evaluation of the effectiveness of tools used to implement the HCRs should be based on the overall history of effectiveness of the tools as well as the current status (guidance SA2.5.6-SA2.5.7). Spawning biomass has remained within the target range for more than 20 years for both target stocks, as previously noted. Also fishing mortality has remained below the proxy Fmsy level for both target stocksfor more than 20 years, based on the current assessment (Ibarra and Yanez 2021). Therefore it is concluded that the evidence indicates that the tools in use are effective in achieving the exploitation levels required under the HCRs. Accordingly, **SG60 and SG80 are met.**

As noted above effectiveness of the tools used to implement the HCR should include consideration of current status, which is uncertain for nylon shrimp due to unreliability of the latest assessment. There is also high uncertainty about the latest assessment model results for northern squat lobster because of the great change in status from the previous year. The assessment team considers that there is considerable uncertainty about the model results for all target stocks because stock trajectories commonly change with successive assessments. Therefore it cannot be concluded that the evidence clearly shows that the tools in use (specifically the assessment model) are effective in achieving the exploitation levels required under the HCRs. Accordingly, **SG 100 is not met.**

References

Cavieres, J. and A. Yañez. 2017.Estatus y posibilidades de explotación biológicamente sustentables de los principales recursos pesqueros nacionales, año 2018: Langostino colorado, 2018. Informe 2. Convenio Desempeño 2017. Subsecretaria de Economia y EMT / Agosto 2017. 97 pp + anexos.

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Saa, E, E. Dawe and J. Rios et al. 2019. Chile Squat Lobsters Camanchaca Demersal Trawl Fishery. 1st surveillance report May 2018, 66 pp.

Saá, E., E. Dawe and J. Rios. In prep. Chile squat lobsters and nylon shrimp modified trawl fishery; Announcement Comment Draft Report 2021.

Subsecretaría de Pesca. 2016. Propuesta plan de manejo de crustaceos demersal.

Subsecretaría de Pesca. 2020a. Acta N° 6-2020 Comité Científico de Crustaceos Demersales (CCT-CD) CCT-RCD N°6/2020.

Subsecretaría de Pesca. 2020b. Acta N° 5-2020 Comité Científico de Crustaceos Demersales (CCT-CD) CCT-RCD N°5/2020

Draft scoring range and information gap indicator added at Announcement Comment Draft Report stage

Draft scoring range	**60-79**
Information gap indicator	**More information sought** *If more information is sought, include a description of what the information gap is and what is information is sought*

Information is sought on:

- the rationale for the decision to increase the quota for red squat lobster northern region in 2021 by 53% above the 2020 quota.
- the basis for the failure of the assessment for nylon shrimp in 2020 as well as the great change in status of northern red squat lobster in 2020, including whether the problems with the model are specific to the 2020 assessment or whether there is a basic flaw in the model.
- whether the HCRs are being reviewed as part of the current review of the MPCD.

Overall Performance Indicator score	
Condition number (if relevant)	

PI 1.2.3 – Information and monitoring

PI 1.2.3		Relevant information is collected to support the harvest strategy		
Scoring Issue		SG 60	SG 80	SG 100
a	Range of information			
	Guide post	**Some** relevant information related to stock structure, stock productivity and fleet composition is available to support the harvest strategy.	**Sufficient** relevant information related to stock structure, stock productivity, fleet composition and other data are available to support the harvest strategy.	A **comprehensive range** of information (on stock structure, stock productivity, fleet composition, stock abundance, UoA removals and other information such as environmental information), including some that may not be directly related to the current harvest strategy, is available.
	Met?	**Yes (All UoAs)**	**Yes (All UoAs)**	**No (All UoAs)**
Rationale				

A wide range of information on the stock structure, stock productivity, stock abundance and fishery removals is collected from both fishery-dependent and fishery-independent sources. Catch and effort data are recorded for each tow of the trawl in electronic log books and CPUE is standardized for year, month, fishing area and vessel. Landings are also monitored rigorously through a100% dockside monitoring program. An observer program covering approximately 17% of all fishing trips in 2020 (Ibarra and Yanez 2021) records species composition including bycatch, total catch composition, length frequency, sex and reproductive status of females for the target species and collects biological samples. An electronic monitoring system (EMS) has been in place since early 2020 to monitor discards and ensure compliance with the regulation requiring quantification and recording of discards of target species (Resolution Nº1106/2017). In addition to the collection of fisheries-dependent data, the main indicator of stock biomass for both target stocks comes from annual fisheries-independent stock surveys, which use a swept area method for estimating total biomass and provide information on stock structure.

For all UoAs, a limited entry licensing scheme which differentiates between industrial and artisanal vessels, rigorous catch reporting procedures and the mandatory use of VMS means that fleet composition and behavior are well known.

Based on the above, the assessment team considered that the **SG60 and SG80 are met**.

However it is not clear whether any additional non-fishery information, such as environmental information, is collected on a regular basis, and therefore the **SG100 is not met.**

b	Monitoring			
	Guide post	Stock abundance and UoA removals are monitored and **at least one indicator** is available and monitored with sufficient frequency to support the harvest control rule.	Stock abundance and UoA removals are **regularly monitored at a level of accuracy and coverage consistent with the harvest control rule**, and **one or more indicators** are available and monitored with sufficient frequency to support the harvest control rule.	**All information** required by the harvest control rule is monitored with high frequency and a high degree of certainty, and there is a good understanding of inherent **uncertainties** in the information [data] and the robustness of assessment and management to this uncertainty.
	Met?	**Yes (All UoAs)**	**No (All UoAs)**	**Not scored**
Rationale				

Information about abundance and fishery removals is available for both target stocks and is used in the assessment model to evaluate the status of the stock in relation to limit and target reference points, and to evaluate the short and medium term impact of various catch options. Stock abundance is quantitatively estimated annually by the assessment model. Indices of abundance are also determined annually from fishery and survey data. Recording of catches from each individual tow of the trawl is mandatory, and standardized CPUE data are available providing indices of stock

abundance. In addition the direct assessments from the annual fishery-independent trawl surveys provide a time series of biomass estimates and stock structure information.

UoA removals are closely monitored on an annual basis through electronic log book records of catches, EMS monitoring of discards, observer sampling of total catch compositions, 100% dockside monitoring and processors' landings records. Cross-checking by SERNAPESCA of these various records provides evidence of the accuracy of the data. Therefore **SG 60 is met**.

Appropriate application of the main HCRs to determine quota requires accurate estimation of the state of exploitation based on the relationship of SB with the proxy SBmsy However there is high uncertainty about the state of exploitation from the model because the trajectory and recent history of SB and state of exploitation may change with each successive assessment, as noted previously. Also, the fishery and survey indices are inconsistent and uncertain as reflected by broad confidence intervals. Recent trends in biomass indices do not agree with the model trajectories so they can't be relied upon to indicate annual changes in abundance.

Therefore it cannot be concluded that stock abundance is monitored at a level of accuracy consistent with the harvest control rule. **SG 80 is not met**

c	Comprehensiveness of information			
	Guide post		There is good information on all other fishery removals from the stock.	
	Met?		**Yes (All UoAs)**	
Rationale				

Squat lobsters are also caught in other fisheries when they are not the target species. As such if any vessels target nylon shrimp, then any bycatch of squat lobsters from the nylon shrimp fishery are required to be recorded and included in the annual global quota. The integral traceability system is now fully operational for demersal crustacean fisheries and, together with the dockside sampling provides reliable estimates of the different squat lobster species in the landings.

Regulations require that all catches of commercial species (species subject to quota), whether targeted or bycatch from other fisheries, must be quantified and reported (Resolution Nº1106/2017). Non-compliance with this regulation (ie. discarding) is subject to sanctions.

The observer program derived from the research plan on discards has provided reliable estimates of the level of discards of target and non-target species in the different demersal crustacean fisheries in recent years. Also, the EMS has been fully operational in the Industrial Fleet sector since January 1, 2020. Although the EMS has not yet been fully implemented in the Artisanal Fleet, only a single vessel is affected and regulations now ensure that this will occur within 2 years. Meanwhile, all other measures now in place provide assurance that the level of discarding of target and non-target species is (for practical purposes) fully quantified in all demersal crustacean fisheries.

Therefore, **SG 80 is met.**

References

Ibarra and Yáñez, 2021. Estatus y posibilidades de explotación biológicamente sustentables de los principales recursos pesqueros nacionales, año 2021. Informe convenio de desempeño 2021 Subsecretaría de Economía y EMT / marzo 2021, 123 pp.

Draft scoring range and information gap indicator added at Announcement Comment Draft Report stage

Draft scoring range	**60-79**
Information gap indicator	**Information sufficient to score PI**

Overall Performance Indicator scores added from Client and Peer Review Draft Report stage

Overall Performance Indicator score	
Condition number (if relevant)	

PI 1.2.4 – Assessment of stock status

PI 1.2.4		There is an adequate assessment of the stock status		
Scoring Issue		SG 60	SG 80	SG 100
a	Appropriateness of assessment to stock under consideration			
	Guide post		The assessment is appropriate for the stock and for the harvest control rule.	The assessment takes into account the major features relevant to the biology of the species and the nature of the UoA.
	Met?		**No (All UoAs)**	**Not scored**
Rationale				

Extensive data are available for both target stocks from both fisheries-dependent and fisheries-independent sources. A long time series of data is available on landings, nominal fishing effort, and standardised catch per unit effort (CPUE) along with length composition data, sex ratio and weight at-size. In addition a fisheries-independent estimate of stock biomass from a trawl survey has been undertaken annually since 1998 for nylon shrimp, since 1995 for yellow squat lobster and since 1979 for the red squat lobster in the southern region. There is also good information on growth, size at-maturity and geographical distribution of the stocks for all three species.

The stock assessment model used for all three species is an age-structured model used within a Bayesian framework. The model is fitted to length compositions using multinomial residual errors and to landings, CPUE and fisheries-independent survey indices using log-normal residual errors.

While this model is appropriate in principle, its application for these crustacean resources has not consistently provided reliable evaluations of stock status in recent years or of predicted SB and F for the upcoming year (upon which to estimate acceptable biological catch (CBA)) (Subsecretaria de Pesca 2020a, Saa et al in prep). As a result, the projected status may be found to be in error based on the model results of the following year. A consequence of this is that management actions, including how to implement the HCR could be inappropriate, as was the case for Red Squat Lobster South based on the 2017 assessment (Saa et al 2019).

The basis for model unreliability appears to be poor fit of the model, such that it is sensitive to inclusion of an additional year of data, which results in the model adjusting to a higher or lower level of biomass in recent years. The model is also sensitive to changes in assumptions regarding survey trawl catchability (see scoring issue c below).

The poor fit of the model is related to poor fit to the main biomass indices, CPUE and (especially) survey biomass. The survey is considered unreliable and so is given the least weight in the model. Therefore, the model is driven mainly by fishery data, especially landings which is given the greatest weight and so provides the best model fit. In some cases (eg Yellow squat lobster) the model does not detect changes in survey biomass trajectory and results can be unclear.

A review of the assessment approach in 2014 highlighted multiple concerns with the assessment (Dichmont 2015) These included that the model does not fit the size compositions well. Also concern was expressed with estimation of age composition from unimodal size compositions. Age is not routinely determined on an annual basis, but rather an age-length key is applied that does not account for annual variation in growth. It was also noted that model uncertainty has not been addressed which is the ability of the model to describe the population dynamics. The review noted that a totally different model would be required to address model uncertainty. It was concluded that the model is over-parameterized and it was recommended that a length-based model be explored, as is more commonly applied to crustacean resources that are difficult to age. The assessment team is not aware that this recommendation has been addressed or that any alternative model has been explored. The assessment team considers that it cannot be concluded that the assessment is appropriate for the stock and so **SG80 is not met.**

b	Assessment approach			
	Guide post	The assessment estimates stock status relative to generic reference points appropriate to the species category.	The assessment estimates stock status relative to reference points that are appropriate to the stock and can be estimated.	
	Met?	**Yes (All UoAs)**	**Yes (All UoAs)**	
Rationale				

For all three demersal crustacean species, the assessment estimates stock biomass and fishing mortality in relation to the pre-defined limit reference point (Blim = 20% of B0) and target reference points (Bmsy proxy = 40% of B0 and Fmsy proxy = F45%SPR|F=0). The reference points are proxies that are based on MSC guidance as well as international recommendations. They are based on the virgin biomass, B0, which is estimated by the model and so are subject to many of the same uncertainties that affect the annual estimates and so are considered to be appropriate to the stock. **SG60 and SG80 are therefore met.**

	Uncertainty in the assessment			
c	Guide post	The assessment **identifies major sources** of uncertainty.	The assessment **takes uncertainty into account**.	The assessment takes into account uncertainty and is evaluating stock status relative to reference points in a **probabilistic** way.
	Met?	**Yes (All UoAs)**	**No (All UoAs)**	**Not scored**
Rationale				

Many sources of uncertainty have been identified, associated with the survey data as well as the fishery data. Therefore **SG 60 is met.**

There are uncertainties in the assessment model related to the fishery independent survey. A new (modified) trawl has been introduced in the fishery and is used exclusively since 2014, but the traditional (unmodified) trawl continues to be used in the survey for consistency. However, the estimated survey trawl catchability for all demersal crustaceans is uncertain. A recent study using trawl-mounted video camera (Ahumada et al in press) indicated that the catchability for yellow squat lobster, while uncertain, is much less than unity which suggests that the trawl survey underestimates biomass. The survey catchability coefficient estimated by the model is much higher, exceeding unity in some cases, suggesting that the model may be underestimation biomass as well. There is also uncertainty regarding changes in survey catchability over time. There is also uncertainty associated with inconsistency (among resources as well as years) in the application of assumptions regarding catchability. For example, two blocks of catchability were applied in the assessment of southern red squat lobster in 2017 but not in 2018, whereas the reverse was true for central-north nylon shrimp with two catchability blocks applied in 2018 but not 2017. Other uncertainties with the survey have been previously identified (Addison & Adlerstein-Gonzalez 2016), including incomplete coverage of resource distribution and variability in survey timing relative to the fishery. There is also uncertainty related to conversion of length composition data to age distributions. It was also noted during the site visit that survey estimates may be biased by dynamically changing resource distribution during the survey.

There is uncertainty in the assessment model (model uncertainty) related the ability of the model to describe the population dynamics (Dichmont 2015).There are also uncertainties in the assessment model related to the fishery data. Changes in trawl catchability due to mesh selectivity associated with introduction of the modified trawl are known and incorporated into the assessment. However, changes in catchability due to changes in trawl configuration, which could affect degree of contact with the substrate, remain unknown. There are also uncertainties in the catches prior to 1995 There are also uncertainties relating to stock boundaries. There is also uncertainty in the prediction of biomass for the current year, as a basis for determining CBA, because this is based on incomplete fishery data.

While these uncertainties are well documented, most of them have not been accounted for in the assessment. Therefore **SG 80 is not met.**

	Evaluation of assessment			
d	Guide post			The assessment has been tested and shown to be robust. Alternative hypotheses and assessment approaches have been rigorously explored.
	Met?			**No (All UoAs)**
Rationale				

The assessment model has been developed continuously. The methods for estimating the Bmsy and Fmsy proxy reference points have been rigorously explored both within the Chilean scientific community and through a series of workshops that reviewed the use of biological reference points within the Chilean fisheries management system. The current assessment approach is an outcome of that review. However It has not been fully tested in that model uncertainty has not been tested, which would require application of a different assessment model (Dichmont 2015). The assessment is not robust to changes in stock trajectory and biomass from successive assessments, or to annual inconsistency in

the abundance indices. Also the stock assessment has not yet been modified to include the selectivity properties of the new trawl.

The most recent review of the current assessment approach and model, as applied to nylon shrimp (Dichmont 2015) recommended that a length-based model be explored, as is more commonly applied to crustacean resources that are difficult to age. The assessment team is not aware that this recommendation has been addressed or that any alternative assessment approach has been rigorously explored.

SG100 is not met.

	Peer review of assessment			
e	Guide post		The assessment of stock status is subject to peer review.	The assessment has been **internally and externally** peer reviewed.
	Met?		**Yes (All UoAs)**	**Yes (All UoAs)**

Rationale

The stock assessment and management approach used in the demersal crustacean fisheries undergoes detailed peer review through the Scientific Committee and Management Committee. This peer review can be considered to be both internal and external as members of the committees may be outside the assessment process. In addition, both IFOP and SUBPESCA have commissioned external peer reviews, for example, the series of three workshops convened in 2013 to 2014 with invited international experts to evaluate the setting of biological reference points within the MSY framework (IFOP, 2013; 2014a; 2014b). The stock assessment and management approach used in the demersal crustacean fisheries undergoes detailed peer review through the Scientific Committee and Management Committee. This peer review can be considered to be both internal and external as members of the committees may be outside the assessment process. In addition, both IFOP and SUBPESCA have commissioned external peer reviews, for example, the series of three workshops convened in 2013 to 2014 with invited international experts to evaluate the setting of biological reference points within the MSY framework (IFOP, 2013; 2014a; 2014b). In addition, the stock assessment underwent an expert review by Dr Catherine Dichmont (Australia) and Dr Tom Polacheck (US) in November 2014. **SG80 and SG100 are therefore met.**

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Draft scoring range and information gap indicator added at Announcement Comment Draft Report stage

Draft scoring range	**60-79**
Information gap indicator	**Information sufficient to score PI**

Overall Performance Indicator scores added from Client and Peer Review Draft Report stage

Overall Performance Indicator score	
Condition number (if relevant)	

7.2.5 References P1

Relevant links:

Every listed IFOP technical report is available at: https://www.ifop.cl/busqueda-de-informes/

Every listed minute of the CM-CD is available at: https://www.subpesca.cl/portal/616/w3-propertyvalue-52793.html

Every listed SERNAPESCA regulation is available at: http://www.sernapesca.cl/.

Every listed SUBPESCA regulation is available at: https://www.subpesca.cl/portal/615/w3-channel.html

Every listed SUBPESCA technical report (Informes Tecnicos R.PESQ) is available at: https://www.subpesca.cl/portal/618/w3-propertyvalue-53750.html

Every listed Technical Report or Minute from the CCT_CD is available at: https://www.subpesca.cl/portal/616/w3-propertyvalue-51147.html

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7.3 Principle 2

7.3.1 Principle 2 background

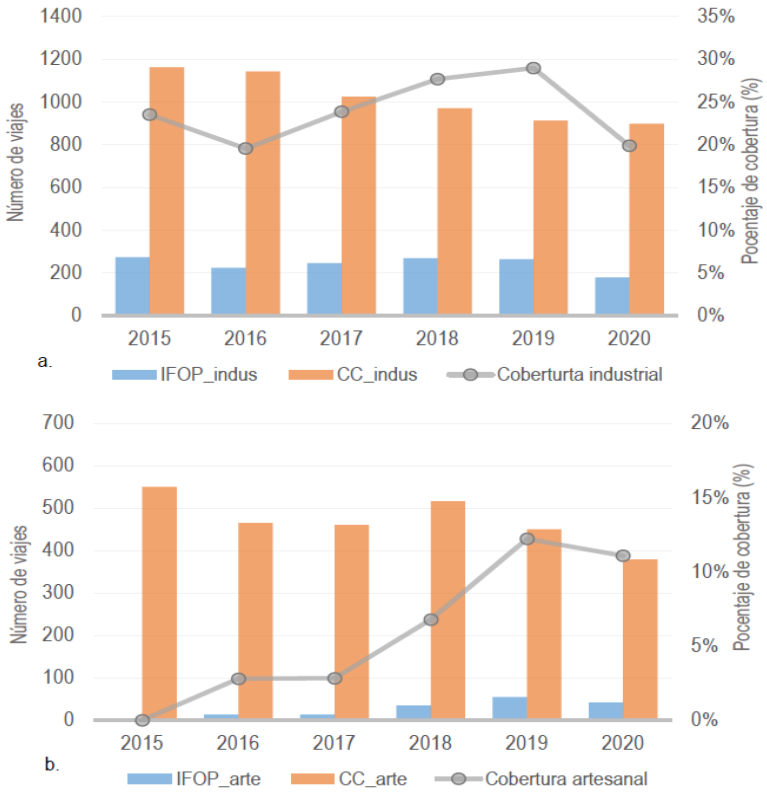
7.3.1.1 UoAs catch composition: species assignment to the MSC P2-categories

The species to be assessed under P2 are those coming on board which are not covered under P1. MSC FCR SA3.1.2 sets that the team shall consider each P2 species within only one of the primary species, secondary species or ETP species components, following SA3.1.3-3.1.5 and SA3.4.4-3.4.5.

I. Catch composition of the different UoAs based on observers' data

The source of information used by the team to identify and classify the different species components and subcomponents to be assessed against P2 was the data collected since 2013 by the IFOP observers on board the fleet targeting demersal crustaceans along the Chilean coastline. This observer program existed since 2002, but it was enhanced during the research program on discards and incidental catches on demersal crustacean fisheries implemented between 2013 and 2015. The ultimate goal of the program was to compile the technical background to allow the design of the Plan for the reduction of discards which was finally approved in 2017 (Resolution Nº1106/2017). This observer program has been maintained and continues to this day to monitor the implementation of the measures adopted in Resolution Nº1106/2017. The priorities of the observers on board have been slightly modified (e.g. the effort on estimating interactions with seabirds, turtles and marine mammals increased in recent years), but the characterization of the catches and incidental interactions has always been part of the observers' tasks. To do so, observers' data allows to calculate (among other indicators) the relative contribution of each species to the total catch (in weight), the occurrence per haul of each species, the mortality of seabirds, sea turtles and marine mammals (Zilleruelo et al, 2021[1]). IFOP prepares annual reports presenting latest data and compiling and analysing data the historical data series. All these documents are all available at the IFOP website, and all recent reports have been reviewed as part of the surveillance audits performed along the first certificate cycle. However, to evaluate the entire historical data series since the certification, IFOP allowed to share the database of the relative contribution of each species to the total catch (in weight) with the team, so data presented under bullets (a) and (b) below have been prepared by the team based on the IFOP database.

Figure below shows the observer coverage between 2015 and 2020 for the industrial and artisanal fleets targeting demersal crustaceans. The observer coverage increases in both fleet types from 2016 to 2019: from 20% to 29% in the industrial fleet and from 3% to 12% in the artisanal fleet. However, this trend could not be maintained in 2020 due to the pandemic, and observer coverage decrease to 20% in the industrial fleet and to 11% in the artisanal fleet.



[1] Zilleruelo, M., Bravo, C., Párraga, D. 2021. Programa de Seguimiento de las Principales Pesquerías Nacionales, año 2020. Informe Final. Convenio de Desempeño 2020. Subsecretaría de Economía y EMT /Mayo 2021. 125 pp + anexos

Figure 7.3.1.1.1. Number of observed trips according to IFOP data (blue bar), total fishing trips according to Sernapesca data (orange bar) and % of observer coverage (grey line). Source: Zilleruelo et al 2021.

a) Catch composition of UoA1 (Industrial fleet targeting the red squat lobster in UPS)

The historical data series assessed during the initial assessment stopped in 2015. Therefore, data on the contribution of species to the annual catch (in weight) between 2016 and 2020 is being considered for this reassessment (**table 7.3.1.1.1**). Consistent with what was observed during the initial assessment, this fishery catches a high number of species, but only 10 species (including the target species) are accounting for around 95% (in weight) of the annual catches.

A total of 85 different species and taxa have been caught by the industrial and artisanal vessels targeting red squat lobster in UPS (**table 7.3.1.1.1**). The target species represented between 76 and 84% of the total annual catches during the studied period. The other 9 species are: Aconcagua grenadier – *Coelorinchus Aconcagua*- (4-6%), Chilean hake - *Merluccius gayi gayi*- (4-6%), big-eye flounder- *Hippoglossina macrops*- (2-3%), Chilean grenadier -*C chilensis*- (1-2%), armed box crab -*Platymera gaudichaudii*- (1-3%), Hooked tooth dogfish – *Aculeola nigr*a- (1-2%), Chilean lemon crab - *Cancer porter*- (1%), yellow squat lobster - *Cervimunida johni*- (1-2%), and red squat lobster -*Pleuroncodes monodon*- (0-2%).

Table 7.3.1.1.1. Relative contribution (in weight) of each species to the total annual catch, as recorded by the observers on board industrial and artisanal vessel targeting nylon shrimp in ZCN+ZCS. Source: Table elaborated by the team based on observers' data provided by IFOP. (Note: 0,0% stands for all values lower than <0,05%)

Common name (Spanish)	Scientific Name	2016	2017	2018	2019	2020
Cnidarians						
Actinias	-	0,0%	0,0%	0,0%	0,0%	0,0%
Coral	Alcyonium sp.		0,0%			
Medusas	-			0,0%		
Sponges						
Esponjas (Spongia sp)	-	0,0%	0,0%		0,0%	0,0%
Crustaceans						
Langostino amarillo	Cervimunida johni	0,9%	0,6%	0,9%	0,4%	0,5%
Langostino colorado	Pleuroncodes monodon	0,2%	0,2%	0,3%	1,5%	0,3%
Camaron nailon	Heterocarpus reedi	80,2%	84,1%	80,5%	75,5%	79,2%
Jaiba paco	Platymera gaudichaudii	0,7%	0,8%	1,2%	2,4%	3,2%
Jaiba limón	Cancer porteri	0,7%	0,5%	0,6%	0,7%	0,6%
Jaiba mochilera	Lophorochinia parabranchia	0,0%	0,1%	0,1%	0,2%	0,0%
Centolla (juvenil)	Lithodes turkayi	0,0%				
Centolla falsa	Libidoclaea granaria	0,2%	0,1%	0,1%	0,0%	0,0%
Gamba	Haliporoides diomedeae	0,0%	0,0%	0,0%	0,0%	0,0%
Camaron acorazado	Glyphocrangon alata	0,0%				
Zapateador	Pterygosquilla armata	0,0%	0,0%	0,0%	0,0%	0,0%
Equinoderms						
Estrella sin identificar	-	0,0%	0,0%	0,0%	0,0%	0,0%
Estrella de profundidad	Hippasteria phrygiana		0,0%	0,0%		
Porania sin identificar	Poronia sp		0,0%			
Estrella flaca	Myxoderma qawashqari			0,0%		
Erizo sin identificar	-	0,0%			0,0%	
Erizo de profundidad	Sterechinus agassizii			0,0%	0,0%	0,0%
Molluscs						
Caracol picuyo	Argobuccinum pustulosum	0,0%			0,0%	0,0%
Caracol sin identificar	-	0,0%	0,0%	0,1%	0,0%	0,0%
Caracol de humbold	Bathybembix humboldti	0,0%		0,0%	0,0%	
Pulpo de brazos largos	Muusoctopus longibrachus	0,2%	0,0%	0,0%	0,0%	
Pulpo de brazos cortos	Opisthoteuthis bruuni	0,0%	0,0%	0,0%	0,0%	0,0%

Pulpo de brazos iguales	Muusoctopus eicomar		0,1%	0,1%	0,2%	0,1%
Pulpito	Robsonella fontanianus	0,0%				
Jibia	Dosidicus gigas	0,1%	0,0%	0,0%	0,0%	0,0%
Calamar antartico	Todarodes filippovae				0,0%	0,0%
Rays						
Raya volantin	Zearaja chilensis	0,2%	0,1%	0,2%	0,3%	0,2%
Raya peruana	Bathyraja peruana	0,1%	0,0%	0,0%	0,0%	0,0%
Raya mariposa	Gurgesiella furvescens	0,0%	0,0%	0,0%	0,0%	0,0%
Raya negra	Rajella nigerrima	0,0%	0,0%	0,0%	0,0%	
Raya espinosa	Dipturus trachyderma	0,0%	0,0%	0,0%		
Raya torpedo	Tetronarce tremens	0,0%	0,0%	0,0%	0,0%	0,0%
Raya aserrada	Bathyraja multispinis	0,0%	0,0%			
Raya (Psammobatis)	Psammobatis sp			0,1%	0,0%	0,2%
Raya costera	Sympterygia lima			0,0%	0,0%	
Raya de manchas blancas	Bathyraja albomaculata	0,0%		0,0%		
Raya gris	Bathyraja griseocauda	0,0%		0,0%	0,0%	0,0%
Pequen de hocico blanco	Psammobatis rudis	0,0%	0,1%	0,1%		
Pequen espinoso	Psammobatis scobina	0,3%	0,1%	0,4%	0,4%	0,6%
Torpedo	Discopyge tschudii	0,1%	0,0%	0,0%	0,0%	0,0%
Sharks and Quimeras						
Tollo negro	Aculeola nigra	0,7%	0,8%	1,0%	1,5%	1,5%
Tollo negro peine	Centroscyllium nigrum	0,2%	0,1%	0,1%	0,0%	0,0%
Tollo comun	Mustelus mento			0,0%		
Tollo negro raspa	Centroscyllium granulatum	0,4%	0,2%	0,2%	0,3%	0,5%
Tollo gato	Bythaelurus canescens	0,3%	0,2%	0,3%	0,4%	0,7%
Tollo pajarito	Deania calcea	0,0%	0,0%	0,0%	0,0%	
Tiburón negro	Centroscymnus crepidater	0,0%	0,0%	0,1%		
Peje humo	Hexanchus griseus	0,0%			0,0%	0,0%
Tiburon narigon	Apristurus nasutus	0,0%	0,0%	0,0%	0,0%	0,0%
Pejegato de profundidad	Apristurus brunneus	0,0%	0,0%	0,0%	0,3%	0,1%
Sapata espinuda	Centroscymnus macracanthus	0,0%				
Quimera de ojo grande	Hydrolagus macrophthalmus	0,0%	0,0%	0,0%	0,0%	0,0%
Jawless fish						
Anguila babosa	Eptatretus polytrema	0,0%	0,0%	0,0%	0,0%	0,1%
Teleosts						
Merluza común	Merluccius gayi gayi	4,8%	4,4%	5,7%	4,8%	3,8%
Merluza de cola	Macruronus magellanicus	0,0%	0,0%	0,0%	0,0%	
Lenguado de ojos grandes	Hippoglossina macrops	2,4%	1,9%	1,8%	2,7%	2,7%
Granadero aconcagua	Coelorinchus aconcagua	5,2%	4,1%	4,7%	6,3%	4,5%
Granadero chileno	Coelorinchus chilensis	1,5%	0,7%	0,6%	0,5%	0,1%
Granadero Patagónico	Coelorinchus fasciatus					0,0%
Granadero atacama	Nezumia pudens			0,1%	0,3%	0,0%
Granadero abisal	Coryphaenoides armatus			0,0%	0,0%	
Granadero pichirata	Coryphaenoides delsolari			0,0%	0,0%	0,1%
Granadero cabeza de armadura	Trachyrincus helolepis			0,1%		
Granadero pulgar	Nezumia pulchella	0,1%	0,2%	0,2%	0,1%	0,2%
Granadero gris	Trachyrincus villegai			0,0%	0,3%	0,2%
Granadero sin identificar	-				0,0%	

Congrio dorado	Genypterus blacodes	0,0%	0,0%		0,0%	0,0%
Congrio de profundidad	Bassanago nielseni	0,0%	0,0%	0,0%	0,0%	0,0%
Congrio negro	Genypterus maculatus	0,0%	0,0%	0,0%	0,0%	0,0%
Congrio colorado	Genypterus chilensis			0,0%	0,1%	
Anguila espinosa	Notacanthus sexspinis	0,0%	0,0%		0,0%	0,0%
Anguila	Ophichthus sp		0,0%			
Talisman de ojos grandes	Bajacalifornia megalops			0,0%	0,0%	
Gutigaidido	Guttigadus kongi	0,0%	0,0%	0,0%	0,0%	0,0%
Alfonsino	Beryx splendens			0,2%	0,0%	
Besugo	Epigonus crassicaudus	0,3%	0,3%	0,1%	0,2%	0,4%
Chancharro de juan fernandez	Helicolenus lengerichi			0,0%	0,0%	
Barba negra	Alepocephalus sp					0,0%
Pez chancho	Congiopodus peruvianus					0,0%
Cabrilla	Sebastes capensis	0,0%	0,0%	0,0%	0,0%	0,0%
Cabrilla española	Sebastes oculatus				0,0%	
		100,00%	***100,00%***	***100,00%***	***100,00%***	***100,00%***

b) Catch composition of UoA2 (Artisanal fleet targeting the nylon shrimp ZCN)

The historical data series assessed during the initial assessment stopped in 2015. Therefore, data on the contribution of species to the annual catch (in weight) between 2016 and 2020 is being considered for this reassessment (**table 7.3.1.1.2**). Consistent with what was observed during the initial assessment, this fishery catches a high number of species, but only 10 species (including the target species) are accounting for around 95% (in weight) of the annual catches.

A total of 72 different species and taxa have been caught by the industrial and artisanal vessels targeting nylon shrimp in ZCN (**table 7.3.1.1.2**). The target species represented between 74 and 87% of the total annual catches during the studied period. The other 9 species are: Chilean hake - *Merluccius gayi gayi*- (3-7%), Aconcagua grenadier – *Coelorinchus Aconcagua*- (2-4%), big-eye flounder- *Hippoglossina macrops*- (2-4%), Chilean grenadier -*C chilensis*- (0-1%), armed box crab -*Platymera gaudichaudii*- (1-4%), Hooked tooth dogfish – *Aculeola nigr*a- (1-2%), Chilean lemon crab - *Cancer porter*- (0-1%), yellow squat lobster - *Cervimunida johni*- (0-2%), and red squat lobster -*Pleuroncodes monodon*- (0-3%).

Table 7.3.1.1.2. Relative contribution (in weight) of each species to the total annual catch, as recorded by the observers on board industrial and artisanal vessel targeting nylon shrimp in ZCN. Source: Table elaborated by the team based on observers' data provided by IFOP. (Note: 0,0% stands for all values lower than <0,05%)

Common names (Spanish)	**Scientific names**	**2016**	**2017**	**2018**	**2019**	**2020**
Cnidarians						
Actinia	-		0,0%	0,0%	0,0%	
Sponges						
Esponja	Spongia sp		0,0%			0,0%
Crustaceans						
Langostino amarillo	Cervimunida johni	1,7%	1,2%	0,1%	0,1%	0,6%
Langostino colorado	Pleuroncodes monodon	0,2%	0,1%		2,5%	
Camaron nailon	Heterocarpus reedi	80,8%	86,8%	81,7%	76,1%	73,8%
Jaiba paco	Platymera gaudichaudii	0,7%	0,6%	1,0%	3,0%	4,0%
Jaiba limón	Cancer porteri	0,6%	0,3%	0,3%	0,5%	0,7%
Jaiba mochilera	Lophorochinia parabranchia	0,1%	0,2%	0,1%	0,4%	0,1%
Centolla (juvenil)	Lithodes turkayi	0,0%				
Centolla falsa	Libidoclaea granaria	0,1%	0,0%	0,0%	0,0%	0,0%
Gamba	Haliporoides diomedeae			0,0%	0,0%	0,0%
Camaron acorazado	Glyphocrangon alata	0,0%				
Langosta enana	Projasus bahamondei			0,0%		

Zapateador	Pterygosquilla armata	0,0%	0,0%	0,0%	0,0%	0,0%
Equinoderms						
Estrella sin identificar	-		0,0%		0,0%	
Estrella de profundidad	Hippasteria phrygiana			0,0%		
Erizo sin identificar	-					
Erizo de profundidad	Sterechinus agassizii			0,0%		
Molluscs						
Caracol picuyo	Argobuccinum pustulosum	0,0%			0,0%	
Caracol sin identificar	-	0,0%		0,1%	0,0%	0,0%
Caracol de humbold	Bathybembix humboldti			0,0%	0,0%	
Pulpo de brazos largos	Muusoctopus longibrachus	0,3%	0,0%	0,0%	0,0%	
Pulpo del norte	Octopus mimus					
Pulpo de brazos cortos	Opisthoteuthis bruuni		0,0%	0,0%	0,0%	0,0%
Pulpo de brazos iguales	Muusoctopus eicomar		0,1%	0,1%	0,3%	0,1%
Jibia	Dosidicus gigas	0,0%	0,1%			
Calamar antartico	Todarodes filippovae				0,0%	0,0%
Rays						
Raya volantin	Zearaja chilensis		0,0%	0,1%	0,2%	0,3%
Raya peruana	Bathyraja peruana	0,1%	0,0%	0,0%	0,0%	0,1%
Raya mariposa	Gurgesiella furvescens	0,0%	0,0%	0,0%	0,1%	0,0%
Raya negra	Rajella nigerrima		0,0%		0,0%	
Raya espinosa	Dipturus trachyderma		0,0%			
Raya torpedo	Tetronarce tremens					0,0%
Raya aserrada	Bathyraja multispinis		0,0%			
Raya (Psammobatis)	Psammobatis sp				0,0%	0,3%
Raya de manchas blancas	Bathyraja albomaculata			0,0%		
Raya gris	Bathyraja griseocauda			0,0%		
Pequen de hocico blanco	Psammobatis rudis	0,0%	0,0%	0,2%		
Torpedo	Discopyge tschudii	0,2%		0,0%		0,0%
Pequen espinoso	Psammobatis scobina	0,1%	0,0%	0,4%	0,1%	0,5%
Sharks and Quimeras						
Tollo negro	Aculeola nigra					
Tollo negro peine	Centroscyllium nigrum	0,3%	0,1%	0,1%	0,0%	
Tollo comun	Mustelus mento			0,0%		
Tollo negro raspa	Centroscyllium granulatum	0,1%	0,1%	0,1%	0,0%	0,4%
Tollo pajarito	Deania calcea				0,0%	
Tiburón negro	Centroscymnus crepidater			0,1%		
Peje humo	Hexanchus griseus				0,0%	0,1%
Tiburon narigon	Apristurus nasutus				0,1%	0,0%
Pejegato de profundidad	Apristurus brunneus	0,0%	0,0%		0,6%	0,2%
Tollo gato	Bythaelurus canescens	0,1%	0,2%	0,3%	0,4%	0,7%
Quimera de ojo grande	Hydrolagus macrophthalmus		0,0%		0,0%	
Jawless fish						
Anguila babosa	Eptatretus polytrema	0,0%	0,0%	0,0%		0,0%
Teleosts						
Merluza común	Merluccius gayi gayi					
Merluza de cola	Macruronus magellanicus				0,0%	
Lenguado de ojos grandes	Hippoglossina macrops	3,5%	1,5%	1,8%	2,7%	3,7%

Granadero aconcagua	Coelorinchus aconcagua	3,1%	2,3%	2,8%	3,3%	3,9%
Granadero chileno	Coelorinchus chilensis	1,1%	0,8%	0,7%	0,5%	0,2%
Granadero Patagónico	Coelorinchus fasciatus					0,0%
Granadero atacama	Nezumia pudens			0,2%	0,6%	0,1%
Granadero abisal	Coryphaenoides armatus			0,0%		
Granadero pichirata	Coryphaenoides delsolari			0,0%	0,0%	0,1%
Granadero cabeza de armadura	Trachyrincus helolepis			0,2%		
Granadero pulgar	Nezumia pulchella	0,1%	0,4%	0,3%	0,2%	0,3%
Granadero gris	Trachyrincus villegai			0,0%	0,6%	0,4%
Granadero sin identificar	-				0,0%	
Congrio de profundidad	Bassanago nielseni		0,0%	0,0%	0,0%	0,0%
Congrio dorado	Genypterus blacodes		0,0%			
Anguila espinosa	Notacanthus sexspinis				0,0%	
Talisman de ojos grandes	Bajacalifornia megalops			0,0%	0,0%	
Gutigaidido	Guttigadus kongi		0,0%	0,0%	0,0%	
Alfonsino	Beryx splendens			0,3%	0,0%	
Besugo	Epigonus crassicaudus	0,3%	0,2%	0,2%	0,2%	0,6%
Pez chancho	Psychrolutes sio					0,0%
		100,00%	***100,00%***	***100,00%***	***100,00%***	***100,00%***

c) Catch composition of UoA3 and UoA4 (Industrial and artisanal fleet targeting yellow squat lobster UPN)

The historical data series assessed during the initial assessment stopped in 2015. Therefore, data on the contribution of species to the annual catch (in weight) between 2016 and 2020 is being considered for this reassessment (**table 7.3.1.1.3**). Consistent with what was observed during the initial assessment, this fishery catches a high number of species, but only 7 species (including the target species) are accounting for almost 100% (in weight) of the annual catches.

A total of 40 different species and taxa have been caught by the industrial and artisanal vessels targeting nylon shrimp in ZCN (**table 7.3.1.1.3**). The target species represented between 83and 93% of the total annual catches during the studied period. The other 6 species are: Chilean hake - *Merluccius gayi gayi*- (2-4%), big-eye flounder- *Hippoglossina macrops*- (2-3%), armed box crab -*Platymera gaudichaudii*- (1-4%), Chilean lemon crab - *Cancer porter*- (1-2%), red squat lobster -*Pleuroncodes monodon*- (0-5%), and nylon shrimp -*Heterocarpus reedi*- (0-2%).

Table 7.3.1.1.3. Relative contribution (in weight) of each species to the total annual catch, as recorded by the observers on board industrial and artisanal vessels targeting yellow squat lobster in UPN. Source: Table elaborated by the team based on observers' data provided by IFOP. (Note: 0,0% stands for all values lower than <0,05%)

Common name	**Scientific name**	**2016**	**2017**	**2018**	**2019**	**2020**
Cnidarians						
Actinia			0,0%	0,0%		
Sponges						
Sponge (Spongia sp)						0,0%
Crustaceans						
Langostino amarillo	Cervimunida johni	92,9%	89,0%	88,1%	82,9%	92,1%
Langostino colorado	Pleuroncodes monodon	0,1%	0,8%	3,8%	4,5%	
Camaron nailon	Heterocarpus reedi	0,0%	1,1%	1,9%	1,9%	
Jaiba paco	Platymera gaudichaudii	1,8%	3,5%	0,7%	1,6%	2,5%
Jaiba limón	Cancer porteri	0,7%	0,9%	0,4%	1,7%	0,7%
Jaiba mochilera	Lophorochinia parabranchia	0,0%	0,1%	0,2%	0,2%	0,0%
Centolla falsa	Libidoclaea granaria		0,0%	0,0%	0,0%	
Zapateador	Pterygosquilla armata			0,0%	0,0%	
Molluscs						
Pulpo de brazos largos	Muusoctopus longibrachus	0,0%				

Pulpo de brazos iguales	Muusoctopus eicomar				0,0%	
Jibia	Dosidicus gigas	0,0%		0,0%		
Rays						
Raya volantin	Zearaja chilensis		0,0%		0,0%	0,0%
Raya mariposa	Gurgesiella furvescens	0,0%				
Raya (Psammobatis)	Psammobatis sp			0,0%		0,0%
Raya costera	Sympterygia lima					0,0%
Pequen espinoso	Psammobatis scobina		0,0%		0,0%	0,0%
Sharks and Quimeras						
Tollo negro	Aculeola nigra	0,0%	0,0%	0,2%	0,1%	0,1%
Tollo negro raspa	Centroscyllium granulatum				0,0%	
Tollo gato	Bythaelurus canescens			0,0%	0,0%	0,0%
Jawless fish						
Anguila babosa	Eptatretus polytrema	0,0%				
Teleosts						
Merluza común	Merluccius gayi gayi	2,8%	2,2%	1,7%	3,9%	2,3%
Lenguado de ojos grandes	Hippoglossina macrops	1,6%	2,1%	2,8%	2,7%	2,0%
Lenguado de ojos chicos	Paralichthys microps	0,0%	0,0%		0,0%	
Granadero aconcagua	Coelorinchus aconcagua	0,0%	0,1%	0,0%	0,1%	0,1%
Granadero chileno	Coelorinchus chilensis	0,0%	0,0%	0,0%	0,0%	
Granadero Patagónico	Coelorinchus fasciatus			0,0%		
Granadero atacama	Nezumia pudens				0,0%	
Granadero pichirata	Coryphaenoides delsolari			0,0%		
Granadero pulgar	Nezumia pulchella		0,0%	0,1%	0,1%	0,0%
Granadero gris	Trachyrincus villegai				0,0%	0,0%
Congrio de profundidad	Bassanago nielseni		0,0%	0,0%	0,0%	0,0%
Congrio negro	Genypterus maculatus				0,0%	0,0%
Congrio colorado	Genypterus chilensis				0,0%	0,0%
Gutigaidido	Guttigadus kongi			0,0%		
Alfonsino	Beryx splendens				0,0%	
Besugo	Epigonus crassicaudus		0,0%	0,0%	0,0%	
Blanquillo	Prolatilus jugularis	0,0%	0,0%		0,1%	0,0%
Jurel	Trachurus murphyi	0,0%				0,0%

d) Catch composition of UoA5 (Industrial fleet targeting the yellow squat lobster South stock)

The historical data series assessed during the initial assessment stopped in 2015. Therefore, data on the contribution of species to the annual catch (in weight) between 2016 and 2020 is being considered for this reassessment (**table 7.3.1.1.4**). Consistent with what was observed during the initial assessment, this fishery catches a high number of species, but only 7 species (including the target species) are accounting for practically the 100% (in weight) of the annual catches.

A total of 40 different species and taxa have been caught by the industrial vessels targeting red squat lobster in UPS (**table 7.3.1.1.4**). The target species represented between 77 and 96% of the total annual catches during the studied period. The other 6 species are: red squat lobster - *Pleuroncodes monodon*- (accounting between 1 and 23%), Chilean hake - *Merluccius gayi gayi*- (1-3%), big-eye flounder- *Hippoglossina macrops*- (1-2%), nylon shrimp -*Heterocarpus reedi* -(0-2%), armed box crab -*Platymera gaudichaudii*- (1-2%), and the Chilean lemon crab- *Cancer porter*- (0-1%).

The relative contribution of all bycatches species but the red squat lobster is below the trigger values adopted by the MSC to assign a P2-species as ‘main’ (5%, or 2% in the case of ‘less resilient species’ such as sharks and rays).

Table 7.3.1.1.4. Relative contribution (in weight) of each species to the total annual catch, as recorded by the observers on board industrial vessel targeting yellow squat lobster in UPS. Source: Table elaborated by the team based on observers’ data provided by IFOP.

Common name	Scientific name	2016	2017	2018	2019	2020
Cnidarians						
Jellyfish	-		<0,0%			
Sponges						
Sponge (Spongia sp)	-				<0,0%	<0,0%
Crustaceans						
Langostino amarillo	Cervimunida johni	71,2%	95,7%	86,9%	88,2%	95,9%
Langostino colorado	Pleuroncodes monodon	22,9%		3,9%	4,8%	1,2%
Camaron nailon	Heterocarpus reedi	0,5%	<0,0%	2,4%	<0,0%	<0,0%
Jaiba paco	Platymera gaudichaudii	0,9%	0,5%	1,1%	1,6%	0,7%
Jaiba limón	Cancer porteri	0,7%	0,9%	1,2%	1,0%	0,3%
Centolla falsa	Libidoclaea granaria	<0,0%	0,1%		<0,0%	
Zapateador	Pterygosquilla armata		<0,0%			
Equinoderms						
Estrella de mar sin identificar	-				<0,0%	
Molluscs						
Pulpo de brazos iguales	Muusoctopus eicomar		<0,0%		<0,0%	
Jibia	Dosidicus gigas		<0,0%		<0,0%	
Rays						
Raya volantin	Zearaja chilensis		<0,0%		<0,0%	
Raya peruana	Bathyraja peruana		<0,0%	<0,0%		
Raya aserrada	Bathyraja multispinis		<0,0%			
Raya (Psammobatis)	Psammobatis sp			<0,0%	<0,0%	<0,0%
Pequen de hocico blanco	Psammobatis rudis	<0,0%	<0,0%			
Pequen espinoso	Psammobatis scobina	<0,0%	<0,0%	<0,0%	<0,0%	<0,0%
Torpedo	Discopyge tschudii				<0,0%	
Sharks and Quimeras						
Tollo negro	Aculeola nigra	<0,0%		<0,0%	<0,0%	<0,0%
Tollo negro peine	Centroscyllium nigrum		<0,0%	<0,0%		
Tollo negro raspa	Centroscyllium granulatum		<0,0%			
Tiburon narigon	Apristurus nasutus				<0,0%	
Peje humo	Hexanchus griseus			<0,0%		
Pejegallo	Callorhinchus callorynchus					<0,0%
Jawless fish						
Anguila babosa	Eptatretus polytrema				<0,0%	
Teleosts						
Merluza común	Merluccius gayi gayi	1,7%	1,9%	2,3%	2,5%	1,1%
Merluza de cola	Macruronus magellanicus					<0,0%
Lenguado de ojos grandes	Hippoglossina macrops	1,9%	0,6%	1,8%	1,7%	0,7%
Lenguado de ojos chicos	Paralichthys microps	<0,0%				
Granadero aconcagua	Coelorinchus aconcagua	<0,0%	0,2%	0,2%	0,1%	<0,0%
Granadero chileno	Coelorinchus chilensis		<0,0%		<0,0%	
Congrio negro	Genypterus maculatus			<0,0%	<0,0%	<0,0%
Congrio colorado	Genypterus chilensis				<0,0%	
Besugo	Epigonus crassicaudus		<0,0%		<0,0%	
Brótula	Salilota australis		<0,0%			
Blanquillo	Prolatilus jugularis	<0,0%	<0,0%		<0,0%	0,1%
Jurel	Trachurus murphyi					<0,0%

Cabrilla	Sebastes capensis		<0,0%			<0,0%

e) Catch composition of UoA6 and UoA7 (Industrial and artisanal fleet targeting red squat lobster UPN)

The historical data series assessed during the initial assessment stopped in 2015. Therefore, data on the contribution of species to the annual catch (in weight) between 2016 and 2020 is being considered for this reassessment (**table 7.3.1.1.5**). Consistent with what was observed during the initial assessment, this fishery catches a high number of species, but only 7 species (including the target species) are accounting for almost 100% (in weight) of the annual catches.

A total of 19 different species and taxa have been caught by the industrial and artisanal vessels targeting nylon shrimp in ZCN (**table 7.3.1.1.5**). The target species represented between 71 and 89% of the total annual catches during the studied period. The other 6 species are: yellow squat lobster -*Cervimunida johni*- (1-15%), Chilean hake - *Merluccius gayi gayi*- (2-4%), big-eye flounder- *Hippoglossina macrops*- (2-3%), armed box crab -*Platymera gaudichaudii*- (1-4%), Chilean lemon crab - *Cancer porter*- (1-4%), and nylon shrimp -*Heterocarpus reedi*- (1-3%).

Table 7.3.1.1.5. Relative contribution (in weight) of each species to the total annual catch, as recorded by the observers on board industrial and artisanal vessels targeting yellow squat lobster in UPN. Source: Table elaborated by the team based on observers' data provided by IFOP. (Note: 0,0% stands for all values lower than <0,05%)

Common name	Scientific name	2016	2017	2018	2019	2020
Sponges					0,0%	
Sponge (Spongia sp)						0,1%
Crustaceans						
Langostino amarillo	Cervimunida johni	0,7%	4,4%	14,5%	13,1%	
Camaron nailon	Heterocarpus reedi	1,2%	1,0%	0,6%	3,3%	
Jaiba paco	Platymera gaudichaudii	1,6%	1,8%	0,8%	2,6%	3,5%
Jaiba limón	Cancer porteri	0,5%	0,9%	0,4%	4,3%	0,3%
Jaiba mochilera	Lophorochinia parabranchia		0,1%	0,1%	0,2%	
Zapateador	Pterygosquilla armata			0,0%		
Molluscs						
Caracol sin identificar			0,0%			0,0%
Rays						
Pequen espinoso	Psammobatis scobina		0,0%			
Sharks and Quimeras						
Tollo negro	Aculeola nigra			0,0%	0,0%	0,0%
Pejegato de profundidad	Apristurus brunneus		0,0%			
Teleosts						
Lenguado de ojos grandes	Hippoglossina macrops	2,3%	2,1%	1,7%	1,6%	8,5%
Granadero aconcagua	Coelorinchus aconcagua	0,0%	0,1%	0,0%		
Granadero pulgar	Nezumia pulchella				0,0%	
Granadero gris	Trachyrincus villegai				0,0%	
Congrio de profundidad	Bassanago nielseni				0,0%	
Blanquillo	Prolatilus jugularis	0,0%	0,0%			0,0%

f) Catch composition of UoA8 (Industrial fleet targeting the red squat lobster in UPS)

The historical data series assessed during the initial assessment stopped in 2015. Therefore, data on the contribution of species to the annual catch (in weight) between 2016 and 2020 is being considered for this reassessment (**table 7.3.1.1.6**). Consistent with what was observed during the initial assessment, this fishery catches a high number of species, but only 6 species (including the target species) are accounting for practically the 100% (in weight) of the annual catches.

A total of 50 different species and taxa have been caught by the industrial vessels targeting red squat lobster in UPS (**table 7.3.1.1.6**). The target species represented between 77 and 90% of the total annual catches during the studied

period. The other 5 species are: yellow squat lobster - *Cervimunida johni*- (accounting between 2 and 13%), Chilean hake - *Merluccius gayi gayi*- (2-7%), big-eye flounder- *Hippoglossina macrops*- (1-3%), armed box crab -*Platymera gaudichaudii*- (1-2%), and the Chilean lemon crab - *Cancer porter*- (1%).

Table 7.3.1.1.6. Relative contribution (in weight) of each species to the total annual catch, as recorded by the observers on board industrial vessel targeting red squat lobster in UPS. Source: Table elaborated by the team based on observers' data provided by IFOP.

Common name	Scientific name	2016	2017	2018	2019	2020
Cnidarians						
Actinia	-				<0,0%	<0,0%
Jellyfish	-	<0,0%				
Crustaceans						
Langostino colorado	Pleuroncodes monodon	78,7%	90,0%	77,7%	77,1%	84,2%
Langostino amarillo	Cervimunida johni	11,2%	2,3%	10,0%	12,7%	7,6%
Camaron nailon	Heterocarpus reedi	<0,0%	<0,0%	0,2%	0,2%	0,9%
Jaiba paco	Platymera gaudichaudii	1,0%	1,0%	1,9%	2,3%	1,5%
Jaiba limón	Cancer porteri	1,1%	0,8%	1,3%	1,4%	0,7%
Zapateador	Pterygosquilla armata		<0,0%	<0,0%	<0,0%	
Centolla falsa	Libidoclaea granaria	<0,0%	<0,0%	<0,0%		
Equinoderms						
Estrella sin identificar	-				<0,0%	
Molluscs						
Caracol picuyo	Argobuccinum pustulosum					
Pulpo de brazos iguales	Muusoctopus eicomar			<0,0%	<0,0%	
Pulpito	Robsonella fontanianus					
Jibia	Dosidicus gigas	<0,0%	<0,0%	0,1%	<0,0%	
Rays						
Raya volantin	Zearaja chilensis	<0,0%	<0,0%	<0,0%		
Raya torpedo	Tetronarce tremens	<0,0%				
Raya aserrada	Bathyraja multispinis	<0,0%				
Raya (Psammobatis)	Psammobatis sp	0,0%			<0,0%	
Raya costera	Sympterygia lima					<0,0%
Pequen de hocico blanco	Psammobatis rudis		<0,0%			
Pequen espinoso	Psammobatis scobina	<0,0%	<0,0%	<0,0%	<0,0%	<0,0%
Sharks and Quimeras						
Tollo negro	Aculeola nigra	<0,0%		<0,0%	<0,0%	0,1%
Tollo negro peine	Centroscyllium nigrum			<0,0%		
Tollo negro raspa	Centroscyllium granulatum		<0,0%	<0,0%	<0,0%	<0,0%
Tollo negro narigón	Etmopterus granulosus		<0,0%			
Pejegato de profundidad	Apristurus brunneus			<0,0%		
Jawless fish						
Anguila babosa	Eptatretus polytrema		<0,0%	<0,0%		
Teleosts						
Merluza común	Merluccius gayi gayi	6,6%	4,3%	6,6%	4,1%	2,5%
Granadero aconcagua	Coelorinchus aconcagua	0,1%	0,1%	0,1%	<0,0%	<0,0%
Granadero chileno	Coelorinchus chilensis			<0,0%		
Congrio de profundidad	Bassanago nielseni			0,0%		
Congrio dorado	Genypterus blacodes		<0,0%			
Congrio negro	Genypterus maculatus	<0,0%	0,1%	<0,0%	<0,0%	<0,0%
Congrio colorado	Genypterus chilensis		<0,0%	<0,0%		0,1%

Lenguado de ojos grandes	Hippoglossina macrops	1,2%	1,4%	2,0%	2,1%	2,5%
Besugo	Epigonus crassicaudus			<0,0%		
Blanquillo	Prolatilus jugularis	<0,0%	<0,0%	<0,0%		
Reineta	Brama australis	<0,0%			<0,0%	
Pez chancho	Congiopodus peruvianus	<0,0%	<0,0%			
Jurel	Trachurus murphyi			<0,0%		
Cabrilla	Sebastes capensis			<0,0%		
Cabrilla común	Paralabrax humeralis	<0,0%				

g) Incidental interactions of both UoAs with out-of-scope species

The annual reports on the monitoring of the fisheries targeting demersal crustaceans prepared by IFOP presents the details the observed interactions with out-of-scope species (seabirds, marine mammals and sea turtles). **Table 7.3.1.1.7** presents all observed interactions on board vessels targeting either red squat lobster or yellow squat lobster all along the Chilean coast. Due to the low frequency of interactions, the information is not presented segregated by fishing zone (UPN and UPS).

No interactions with turtles or cetaceans have been observed. The only marine mammals interacted by these fisheries is the South American sea lion (Otaria flavescens), a total of 6 individuals were impacted between 2016 and 2020. The interactions with seabirds are also scarce (11 individuals were impacted between 2016 and 2020), and 5 species were affected (3 species of albatrosses - grey-backed albatross, black-browed and an unidentified individual-, the white shearwater and the Peruvian pelican).

Table 7.3.1.1.7. Interactions with out-of-scope species observed on board vessels targeting red and yellow squat lobster between 2016 and 2020. **Source**: Table elaborated by the team based on data included in Zilleruelo et al 2021, Zilleruelo et al 2020, Zilleruelo et al 2019, Zilleruelo et al 2018 and Zilleruelo et al 2017.

	2016		**2017**		**2018**		**2019**		**2020**	
	Sea lion	**Seabirds**	**Sea lion**	**Seabirds**	**Sea lion**	**Seabirds**	**Sea lion**	**Seabirds**	**Sea lion**	**Seabirds**
RSL fishery	1	1 Savin's albatros 1 black-browed albatross	1	6 Peruvian pelicans	0	1 unid. albatross	2	0	0	0
YSL fishery	1	0	0	1 Peruvian pelican	0	1 black-browed albatross 1 pink-footed searwater	1	0	0	0

Information on the interactions with birds or marine mammals presented at the annual reports on the monitoring of the fisheries targeting demersal crustaceans is limited to observed interactions (no scaled-up estimates and/or spatial-temporal analyses), since this information will be further reviewed and analysed at the reports on the monitoring of the research plan to reduce discards and incidental catches, which are normally published later on. This is consistent with the fact that this research plan aims, among its objectives, to quantify and analyze occurrence of interactions with seabirds, turtles and marine mammals.

The annual report on the monitoring to reduce discards and incidental catches published in 2019 (Escobar et al 2019) compiled all the incidental interactions occurred between 2015 and 2018 (a total of 3701 observed hauls) and provides estimates on the incidental of incidental catches and mortalities of seabirds and sea lions for all the demersal crustacean fishing operations (including the nylon shrimp). This review confirms that no marine turtles or cetaceans interact with these fisheries, and that the South American sea lion is the only marine mammal affected. This review expands the list of interacted seabirds up to 7 different species, as shown in table below.

Table 7.3.1.1.8 List of all seabird species impacted by the Chilean fleet targeting demersal crustaceans between 2015 and 2018. Source: Escobar et al 2019b

#	**Scientific name**	**English common name**	**Chilean common name**
1	*Thalassarche melanophris*	Black-browed albatross	Albatros de ceja negra
2	*Ardenna creatopus*	Pink-footed shearwater	Fardela blanca
3	*Procellaria aequinoctialis*	White-chinned petrel	Fardela negra grande
4	*Thalassarche salvini*	Savins Albatross	Albatros de Salvin
5	*Pelacanus thagus*	Pelicano peruano	Pelicano peruano
6	*Pterodroma defilippiana*	Masatierra petrel	Fardela blanca de Mas a Tierra
7	*Phalacrocorax bougainvillii*	Guanay cormorant	Guanay

II. P2 species classification following MSC requirements

Primary species are defined as those species in the catch within the scope of the MSC program but are not covered under P1 because they are not included in the UoA, and that are managed with tools and measures intended to achieve stock management objectives reflected in either limit or target reference points (SA 3.1.3). **Secondary species** are defined as those species caught within the scope of MSC program but are not covered under P1 because they are not included in the UoA and cannot be considered 'Primary', including out-of-scope species (birds, reptiles and mammals) that cannot be considered ETP (SA3.1.4). All Endangered, Threatened or Protected species are assigned as **ETP** (SA3.1.5).

Both the Primary and the Secondary components (not the ETP component) shall be divided into two subcomponents: Main and Minor. If the relative contribution of a non-ETP P2-species comprises ≥5% by weight of the total catch of all species caught by the UoA (2% in the case of 'less resilient' species), then it shall be assigned to the **Main** subcomponent, while in cases where a species does not meet the designated threshold of 5% or 2%, the species shall be assigned to the **Minor** subcomponent (SA3.4.2.1-3.4.2.5). Besides, for species that are defined as 'out-of-scope' that are not classified as ETP shall be considered **'Main',** regardless of the degree of interaction (SA3.7.1.2).

a) P2 species impacted by UoA1 (Industrial fleet targeting the nylon shrimp ZCN+ZCS)

A total of 85 different species and taxa of cnidarians, crustaceans, echinoderms, cartilaginous fish, jawless fish and teleosts were caught by the fishery targeting nylon shrimp in ZCN and ZCS between 2016 and 2020.

Besides, the fisheries targeting demersal crustaceans were found to interact with the following out-of-scope species: the South American sea lion and 7 species of seabirds.

Thus, a total of 92 P2-species were considered for this reassessment in relation to UoA1. **Table 7.3.1.1.9** lists all the P2-species considered for UoA1. Each one of the species was assigned to a particular P2-species component (**Primary/Secondary/ETP**) and subcomponent (**Main/Minor**), in accordance with MSC requirements.

There are 6 species managed based on biological reference points (Yellow and red squat lobsters, Humbolt squid, Chilean hake, hoki and cardinalfish), so they are all Primary species. Out of 6 species, only the Chilean hake is at or above (in any year of the studied period) the designated threshold of 5% or 2% (for skates, rays, sharks and cardinalfish[2]) to be classified as Main. All the other primary species were classified as Minor Primary.

All other (non-ETP) species which management is not based on biological reference points were classified as Secondary. Only the Hooked tooth dogfish and the Aconcagua grenadier are at or above (in any year of the studied period) the designated threshold of 5% or 2% (for skates, rays, sharks and cardinalfish) to be classified as Main. All the other secondary species were classified as Minor Secondary. All secondary species are Data Deficient since there are no biological based limits available, derived either from analytical stock assessment or using empirical approaches.

Neither the Peruvian pelican nor the Guanay cormorant are classified as VU, EN or CE in the IUCN Redlist. However, Article 7C of the LGPA (amended by Las Nº20.625) sets that all marine mammals, turtles, penguins and other seabirds incidentally caught by fishing vessels shall be immediately released. Furthermore, the two species are listed in Decree Nº5 of January 1998 (modified by Decree Nº53 of 2004 and Decree Nº65 of 2015), which is a Regulation on the Hunting Law (Law Nº19.473) as beneficial for the silvoagropecuarian activity and also beneficial for the maintenance of the natural ecosystems, and the status of the Guanay cormorant is classified as vulnerable. Article 3 of this Law prohibits hunting or catching individuals of species listed as vulnerable or beneficial either for the silvoagropecuarian activity or the maintenance of the natural ecosystems. Since these 2 species are protected by national regulations, they were classified as ETP for this assessment.

The two albatrosses, the pink-footed shearwater and one of the petrels (white-chinned petrel) listed in **Table 7.3.1.1.5** are listed in the Annex I of the ACAB, which is a binding agreement concluded under CMS. Chile became Party of the CMS in 1983, and Party of the ACAB in 2005. Besides, the Masatierra petrel is listed in the IUCN Redlist as Vulnerable (VU). Therefore, all these 5 species of seabirds are classified as ETP species.

For all ETP species there are detailed records of observed interactions with the fleets targeting demersal crustaceans. Scaled-up estimates of total interactions along the Chilean coast are available. IUCN also provides updated assessments of all the ETP species assessed. Thus, none of the ETP components were classified as Data Deficient, and they were all assessed using the Default Assessment Tree (Annex SA of the MSC Fisheries Standard).

Finally, the South American sea lion is classified as Least Concern (LC) by IUCN, but it is protected under the Chilean regulation through an extractive ban which has been renovating every 4-5 years since, at least, 2004. The latest renewal was jointly signed by the Ministry of Economy and Tourism and SUBPESCA on January 21, 2021 (D.Ex.Nº202100004). Also, Article 7C of the LGPA (amended by Las Nº20.625) sets that all marine mammals incidentally caught by fishing vessels shall be immediately released.

[2] These were the less resilient species considered for this assessment. In the case of cardinalfish, it was considered as less resilient because of its longevity and slow growth rate. Besides, this species was assessed as collapsed in 2012 and it was calculated that it will need at least 81 years to recover.

For habitat components and subcomponents see **section 7.3.1.5.III.**

Table 7.3.1.1.9. List of all P2-speciesconsidered for UoA1. Species classified in accordance with SA3.1.3-3.1.5, SA3.4.2.1-3.4.2.5 and SA3.4.4.-3.4.5. Data deficient column was assessed using criteria in Table 3 of FCP7.7.3.

Common name (Spanish)	Scientific Name	P2 comp	P2 subcomp	ETP regulation	Data Deficient (Y/N)
Cnidarians					
Actinias	-	Habitat	VME		N
Coral	*Alcyonium sp.*	Habitat	VME		N
Medusas	-	Secondary	Minor	N/A	Y
Sponges					
Esponjas (Spongia sp)	-	Habitat	VME		N
Crustaceans					
Langostino Amarillo UPN& UPS/ Yellow squat lobster UPN & UPS	*Cervimunida johni*	Primary	Minor	N/A	N
Langostino colorado UPN & UPS/ Red squat lobster UPN & UPS	*Pleuroncodes monodon*	Primary	Minor	N/A	N
Jaiba paco	*Platymera gaudichaudii*	Secondary	Minor	N/A	Y
Jaiba limón	*Cancer porteri*	Secondary	Minor	N/A	Y
Jaiba mochilera	*Lophorochinia parabranchia*	Secondary	Minor	N/A	Y
Centolla (juvenil)	*Lithodes turkayi*	Secondary	Minor	N/A	Y
Centolla falsa	*Libidoclaea granaria*	Secondary	Minor	N/A	Y
Gamba	*Haliporoides diomedeae*	Secondary	Minor	N/A	Y
Camaron acorazado	*Glyphocrangon alata*	Secondary	Minor	N/A	Y
Zapateador	*Pterygosquilla armata*	Secondary	Minor	N/A	Y
Echinoderms					
Estrella sin identificar	-	Habitat	VME	N/A	N
Estrella de profundidad	*Hippasteria phrygiana*	Habitat	VME	N/A	N
Porania sin identificar	*Poronia sp*	Habitat	VME	N/A	N
Estrella flaca	*Myxoderma qawashqari*	Habitat	VME	N/A	N
Erizo sin identificar	-	Secondary	Minor	N/A	Y
Erizo de profundidad	*Sterechinus agassizii*	Secondary	Minor	N/A	Y
Mollucs					
Caracol picuyo	*Argobuccinum pustulosum*	Secondary	Minor	N/A	Y
Caracol sin identificar	-	Secondary	Minor	N/A	Y
Caracol de humbold	*Bathybembix humboldti*	Secondary	Minor	N/A	Y
Pulpo de brazos largos	*Muusoctopus longibrachus*	Secondary	Minor	N/A	Y
Pulpo de brazos cortos	*Opisthoteuthis bruuni*	Secondary	Minor	N/A	Y
Pulpo de brazos iguales	*Muusoctopus eicomar*	Secondary	Minor	N/A	Y
Pulpito	*Robsonella fontanianus*	Secondary	Minor	N/A	Y
Jibia/ Humbolt squid	*Dosidicus gigas*	Primary	Minor	N/A	N
Calamar antartico	*Todarodes filippovae*	Secondary	Minor	N/A	Y
Rays and Skates					
Raya volantin	*Zearaja chilensis*	Secondary	Minor	N/A	Y
Raya peruana	*Bathyraja peruana*	Secondary	Minor	N/A	Y
Raya mariposa	*Gurgesiella furvescens*	Secondary	Minor	N/A	Y
Raya negra	*Rajella nigerrima*	Secondary	Minor	N/A	Y
Raya espinosa	*Dipturus trachyderma*	Secondary	Minor	N/A	Y
Raya torpedo	*Tetronarce tremens*	Secondary	Minor	N/A	Y
Raya aserrada	*Bathyraja multispinis*	Secondary	Minor	N/A	Y

Raya (Psammobatis)	*Psammobatis sp*	Secondary	Minor	N/A	Y
Raya costera	*Sympterygia lima*	Secondary	Minor	N/A	Y
Raya de manchas blancas	*Bathyraja albomaculata*	Secondary	Minor	N/A	Y
Raya gris	*Bathyraja griseocauda*	Secondary	Minor	N/A	Y
Pequen de hocico blanco	*Psammobatis rudis*	Secondary	Minor	N/A	Y
Pequen espinoso	*Psammobatis scobina*	Secondary	Minor	N/A	Y
Torpedo	*Discopyge tschudii*	Secondary	Minor	N/A	N
Sharks and Quimeras					
Tollo negro/Hooked tooth dogfish	*Aculeola nigra*	Secondary	Main	N/A	Y
Tollo negro peine	*Centroscyllium nigrum*	Secondary	Minor	N/A	Y
Tollo comun	*Mustelus mento*	Secondary	Minor	N/A	Y
Tollo negro raspa	*Centroscyllium granulatum*	Secondary	Minor	N/A	Y
Tollo gato	*Bythaelurus canescens*	Secondary	Minor	N/A	Y
Tollo pajarito	*Deania calcea*	Secondary	Minor	N/A	Y
Tiburón negro	*Centroscymnus crepidater*	Secondary	Minor	N/A	Y
Peje humo	*Hexanchus griseus*	Secondary	Minor	N/A	Y
Tiburon narigon	*Apristurus nasutus*	Secondary	Minor	N/A	Y
Pejegato de profundidad	*Apristurus brunneus*	Secondary	Minor	N/A	Y
Sapata espinuda	*Centroscymnus macracanthus*	Secondary	Minor	N/A	Y
Quimera de ojo grande	*Hydrolagus macrophthalmus*	Secondary	Minor	N/A	Y
Jawless fish					
Anguila babosa	*Eptatretus polytrema*	Secondary	Minor	N/A	Y
Teleosts					
Merluza común/ Chilean hake	*Merluccius gayi gayi*	Primary	Main	N/A	N
Merluza de cola/ Hoki	*Macruronus magellanicus*	Primary	Minor	N/A	N
Lenguado de ojos grandes	*Hippoglossina macrops*	Secondary	Minor	N/A	Y
Granadero aconcagua	*Coelorinchus aconcagua*	Secondary	Main	N/A	Y
Granadero chileno	*Coelorinchus chilensis*	Secondary	Minor	N/A	Y
Granadero Patagónico	*Coelorinchus fasciatus*	Secondary	Minor	N/A	Y
Granadero atacama	*Nezumia pudens*	Secondary	Minor	N/A	Y
Granadero abisal	*Coryphaenoides armatus*	Secondary	Minor	N/A	Y
Granadero pichirata	*Coryphaenoides delsolari*	Secondary	Minor	N/A	Y
Granadero cabeza de armadura	*Trachyrincus helolepis*	Secondary	Minor	N/A	Y
Granadero pulgar	*Nezumia pulchella*	Secondary	Minor	N/A	Y
Granadero gris	*Trachyrincus villegai*	Secondary	Minor	N/A	Y
Granadero sin identificar	-	Secondary	Minor	N/A	Y
Congrio dorado	*Genypterus blacodes*	Secondary	Minor	N/A	Y
Congrio de profundidad	*Bassanago nielseni*	Secondary	Minor	N/A	Y
Congrio negro	*Genypterus maculatus*	Secondary	Minor	N/A	Y
Congrio colorado	*Genypterus chilensis*	Secondary	Minor	N/A	Y
Anguila espinosa	*Notacanthus sexspinis*	Secondary	Minor	N/A	Y
Anguila	*Ophichthus sp*	Secondary	Minor	N/A	Y
Talisman de ojos grandes	*Bajacalifornia megalops*	Secondary	Minor	N/A	Y
Gutigaidido	*Guttigadus kongi*	Secondary	Minor	N/A	Y
Alfonsino	*Beryx splendens*	Secondary	Minor	N/A	Y
Besugo/ Cardinalfish	*Epigonus crassicaudus*	Primary	Minor	N/A	N

Chancharro de juan fernandez	*Helicolenus lengerichi*	Secondary	Minor	N/A	Y
Barba negra	*Alepocephalus sp*	Secondary	Minor	N/A	Y
Pez chancho	*Congiopodus peruvianus*	Secondary	Minor	N/A	Y
Cabrilla	*Sebastes capensis*	Secondary	Minor	N/A	Y
Cabrilla española	*Sebastes oculatus*	Secondary	Minor	N/A	Y
Seabirds					
Black-browed albatross/ Albatros de ceja negra	*Thalassarche melanophris*	ETP	N/A	Chilean Law 20.625 ACAP Annex I	N
Pink-footed shearwater/ Fardela blanca	*Ardenna creatopus*	ETP	N/A	Chilean Law 20.625 IUCN (**VU)**; ACAP Annex I	N
White-chinned petrel/ Fardela Negra grande	*Procellaria aequinoctialis*	ETP	N/A	Chilean Law 20.625 IUCN (**VU)**; ACAP Annex I	N
Salvin's albatross/ Albatros de Salvin	*Thalassarche salvini*	ETP	N/A	Chilean Law 20.625 IUCN (**VU)**; ACAP Annex I	N
Peruvian pelican/ Pelicano Peruano	*Pelecanus thagus*	ETP	N/A	Chilean Laws 20.625 and Nº19.473	N
Masatierra petrel/ Fardela blanca de Mas a Tierra	*Pterodroma defilippiana*	ETP	N/A	Chilean Law 20.625 IUCN (**VU)**	N
Guanay cormorant/ Guanay	*Phalacrocorax bougainvillii*	ETP	N/A	Chilean Laws 20.625 and Nº19.473	N
Marine mammals					
South American sea lion/ Lobo marino	*Otaria flavescens*	ETP	N/A	Chilean Law 20.625 D.Ex. N° 202100004/2021	N

b) P2 species impacted by UoA2 (Artisanal fleet targeting nylon shrimp ZCN)

A total of 72 different species and taxa of cnidarians, crustaceans, echinoderms, cartilaginous fish, jawless fish and teleosts were caught by the vessels targeting nylon shrimp in ZCN between 2016 and 2020.

Besides, the fisheries targeting demersal crustaceans were found to interact with the following out-of-scope species: the South American sea lion and 7 species of seabirds.

Thus, a total of 79 P2-species were considered for this reassessment in relation to UoA1. **Table 7.3.1.1.10** lists all the P2-species considered for UoA1. Each one of the species was assigned to a particular P2-species component (**Primary/Secondary/ETP**) and subcomponent (**Main/Minor**), in accordance with MSC requirements.

There are 6 species managed based on biological reference points (Yellow and red squat lobsters, Humbolt squid, Chilean hake, hoki and cardinalfish), so they are all Primary species. Out of 6 species, only the Chilean hake is at or above (in any year of the studied period) the designated threshold of 5% or 2% (for skates, rays, sharks and cardinalfish[3]) to be classified as Main. All the other primary species were classified as Minor Primary.

All other (non-ETP) species which management is not based on biological reference points were classified as Secondary. Only the Hooked tooth dogfish is at or above (in any year of the studied period) the designated threshold of 5% or 2% (for skates, rays, sharks and cardinalfish) to be classified as Main. All the other secondary species were classified as Minor Secondary. All secondary species are Data Deficient since there are no biological based limits available, derived either from analytical stock assessment or using empirical approaches.

For the justification on the species classified as ETP refer to the section above (bullet (a) on UoA1). For habitat components and subcomponents see section 7.3.1.5.III.

[3] These were the less resilient species considered for this assessment. In the case of cardinalfish, it was considered as less resilient because of its longevity and slow growth rate. Besides, this species was assessed as collapsed in 2012 and it was calculated that it will need at least 81 years to recover.

Table 7.3.1.1.10. List of all P2-speciesconsidered for UoA2. Species classified in accordance with SA3.1.3-3.1.5, SA3.4.2.1-3.4.2.5 and SA3.4.4.-3.4.5. Data deficient column was assessed using criteria in Table 3 of FCP7.7.3.

Common name (Spanish)	Scientific Name	P2 comp	P2 subcomp	ETP regulation	Data Deficient (Y/N)
Cnidarians					
Actinias	-	Habitat	VME		N
Sponges					
Esponjas (Spongia sp)	-	Habitat	VME		N
Crustaceans					
Langostino amarillo UPN/ Yellow squat lobster UPN	*Cervimunida johni*	Primary	Minor	N/A	N
Langostino colorado UPN/ Red squat lobster UPN	*Pleuroncodes monodon*	Primary	Minor	N/A	N
Jaiba paco	*Platymera gaudichaudii*	Secondary	Minor	N/A	Y
Jaiba limón	*Cancer porteri*	Secondary	Minor	N/A	Y
Jaiba mochilera	*Lophorochinia parabranchia*	Secondary	Minor	N/A	Y
Centolla (juvenil)	*Lithodes turkayi*	Secondary	Minor	N/A	Y
Centolla falsa	*Libidoclaea granaria*	Secondary	Minor	N/A	Y
Gamba	*Haliporoides diomedeae*	Secondary	Minor	N/A	Y
Camaron acorazado	*Glyphocrangon alata*	Secondary	Minor	N/A	Y
Langosta enana	*Projasus bahamondei*				
Zapateador	*Pterygosquilla armata*	Secondary	Minor	N/A	Y
Echinoderms					
Estrella sin identificar	-	Habitat	VME	N/A	N
Estrella de profundidad	*Hippasteria phrygiana*	Habitat	VME	N/A	N
Erizo sin identificar	-	Secondary	Minor	N/A	Y
Erizo de profundidad	*Sterechinus agassizii*	Secondary	Minor	N/A	Y
Mollucs					
Caracol picuyo	*Argobuccinum pustulosum*	Secondary	Minor	N/A	Y
Caracol sin identificar	-	Secondary	Minor	N/A	Y
Caracol de humbold	*Bathybembix humboldti*	Secondary	Minor	N/A	Y
Pulpo de brazos largos	*Muusoctopus longibrachus*	Secondary	Minor	N/A	Y
Pulpo del norte	*Octopus mimus*				
Pulpo de brazos cortos	*Opisthoteuthis bruuni*	Secondary	Minor	N/A	Y
Pulpo de brazos iguales	*Muusoctopus eicomar*	Secondary	Minor	N/A	Y
Jibia/ Humbolt squid	*Dosidicus gigas*	Primary	Minor	N/A	N
Calamar antartico	*Todarodes filippovae*	Secondary	Minor	N/A	Y
Rays and Skates					
Raya volantin	*Zearaja chilensis*	Secondary	Minor	N/A	Y
Raya peruana	*Bathyraja peruana*	Secondary	Minor	N/A	Y
Raya mariposa	*Gurgesiella furvescens*	Secondary	Minor	N/A	Y
Raya negra	*Rajella nigerrima*	Secondary	Minor	N/A	Y
Raya espinosa	*Dipturus trachyderma*	Secondary	Minor	N/A	Y
Raya torpedo	*Tetronarce tremens*	Secondary	Minor	N/A	Y
Raya aserrada	*Bathyraja multispinis*	Secondary	Minor	N/A	Y
Raya (Psammobatis)	*Psammobatis sp*	Secondary	Minor	N/A	Y
Raya de manchas blancas	*Bathyraja albomaculata*	Secondary	Minor	N/A	Y
Raya gris	*Bathyraja griseocauda*	Secondary	Minor	N/A	Y
Pequen de hocico blanco	*Psammobatis rudis*	Secondary	Minor	N/A	Y

Pequen espinoso	*Psammobatis scobina*	Secondary	Minor	N/A	Y
Torpedo	*Discopyge tschudii*	Secondary	Minor	N/A	N
Sharks and Quimeras					
Tollo negro/ Hooked tooth dogfish	*Aculeola nigra*	Secondary	Main	N/A	Y
Tollo negro peine	*Centroscyllium nigrum*	Secondary	Minor	N/A	Y
Tollo comun	*Mustelus mento*	Secondary	Minor	N/A	Y
Tollo negro raspa	*Centroscyllium granulatum*	Secondary	Minor	N/A	Y
Tollo gato	*Bythaelurus canescens*	Secondary	Minor	N/A	Y
Tollo pajarito	*Deania calcea*	Secondary	Minor	N/A	Y
Tiburón negro	*Centroscymnus crepidater*	Secondary	Minor	N/A	Y
Peje humo	*Hexanchus griseus*	Secondary	Minor	N/A	Y
Tiburon narigon	*Apristurus nasutus*	Secondary	Minor	N/A	Y
Pejegato de profundidad	*Apristurus brunneus*	Secondary	Minor	N/A	Y
Tollo gato	*Bythaelurus canescens*	Secondary	Minor	N/A	Y
Quimera de ojo grande	*Hydrolagus macrophthalmus*	Secondary	Minor	N/A	Y
Jawless fish					
Anguila babosa	*Eptatretus polytrema*	Secondary	Minor	N/A	Y
Teleosts					
Merluza común/ Chilean hake	*Merluccius gayi gayi*	Primary	Main	N/A	N
Merluza de cola/ Hoki	*Macruronus magellanicus*	Primary	Minor	N/A	N
Lenguado de ojos grandes	*Hippoglossina macrops*	Secondary	Minor	N/A	Y
Granadero aconcagua	*Coelorinchus aconcagua*	Secondary	Main	N/A	Y
Granadero chileno	*Coelorinchus chilensis*	Secondary	Minor	N/A	Y
Granadero Patagónico	*Coelorinchus fasciatus*	Secondary	Minor	N/A	Y
Granadero atacama	*Nezumia pudens*	Secondary	Minor	N/A	Y
Granadero abisal	*Coryphaenoides armatus*	Secondary	Minor	N/A	Y
Granadero pichirata	*Coryphaenoides delsolari*	Secondary	Minor	N/A	Y
Granadero cabeza de armadura	*Trachyrincus helolepis*	Secondary	Minor	N/A	Y
Granadero pulgar	*Nezumia pulchella*	Secondary	Minor	N/A	Y
Granadero gris	*Trachyrincus villegai*	Secondary	Minor	N/A	Y
Granadero sin identificar	-	Secondary	Minor	N/A	Y
Congrio dorado	*Genypterus blacodes*	Secondary	Minor	N/A	Y
Congrio de profundidad	*Bassanago nielseni*	Secondary	Minor	N/A	Y
Anguila espinosa	*Notacanthus sexspinis*	Secondary	Minor	N/A	Y
Talisman de ojos grandes	*Bajacalifornia megalops*	Secondary	Minor	N/A	Y
Gutigaidido	*Guttigadus kongi*	Secondary	Minor	N/A	Y
Alfonsino	*Beryx splendens*	Secondary	Minor	N/A	Y
Besugo/ Cardinalfish	Epigonus crassicaudus	Primary	Minor	N/A	N
Pez chancho	Congiopodus peruvianus	Secondary	Minor	N/A	Y
Seabirds					
Black-browed albatross/ Albatros de ceja negra	*Thalassarche melanophris*	ETP	N/A	Chilean Law 20.625 ACAP Annex I	N
Pink-footed shearwater/ Fardela blanca	*Ardenna creatopus*	ETP	N/A	Chilean Law 20.625 IUCN (**VU**); ACAP Annex I	N
White-chinned petrel/ Fardela Negra grande	*Procellaria aequinoctialis*	ETP	N/A	Chilean Law 20.625	N

				IUCN (**VU**); ACAP Annex I	
Salvin's albatross/ Albatros de Salvin	*Thalassarche salvini*	ETP	N/A	Chilean Law 20.625 IUCN (**VU**); ACAP Annex I	N
Peruvian pelican/ Pelicano Peruano	*Pelecanus thagus*	ETP	N/A	Chilean Laws 20.625 and Nº19.473	N
Masatierra petrel/ Fardela blanca de Mas a Tierra	*Pterodroma defilippiana*	ETP	N/A	Chilean Law 20.625 IUCN (**VU)**	N
Guanay cormorant/ Guanay	*Phalacrocorax bougainvillii*	ETP	N/A	Chilean Laws 20.625 and Nº19.473	N
Marine mammals					
South American sea lion/ Lobo marino	*Otaria flavescens*	ETP	N/A	Chilean Law 20.625 D.Ex. N° 202100004/2021	N

c) P2 species impacted by UoA3 and UoA4 (Industrial and artisanal fleets targeting the yellow squat lobster UPN)

A total of 40 different species and taxa of cnidarians, crustaceans, echinoderms, cartilaginous fish, jawless fish and teleosts were caught by the fleets targeting yellow squat lobster in UPN between 2016 and 2020.

Besides, the fisheries targeting demersal crustaceans were found to interact with the following out-of-scope species: the South American sea lion and 7 species of seabirds.

Thus, a total of 48 P2-species were considered for this reassessment in relation to UoA1. **Table 7.3.1.1.10** lists all the P2-species considered for UoA1. Each one of the species was assigned to a particular P2-species component (**Primary/Secondary/ETP**) and subcomponent (**Main/Minor**), in accordance with MSC requirements.

There are 6 species managed based on biological reference points (red squat lobster, nylon shrimp, Humbolt squid, Chilean hake, Chilean jack mackerel, and cardinalfish), so they are all Primary species. Only red squat lobster is at or above (in any year of the studied period) the designated threshold of 5% or 2% (for skates, rays, sharks and cardinalfish) to be classified as Main. All the other primary species were classified as Minor Primary.

All other (non-ETP) species which management is not based on biological reference points were classified as Secondary. The relative contribution of each of the secondary species was below (for any year of the studied period) the designated threshold value to be classified as Main. Thus, all secondary species were classified as Minor Secondary. All secondary species are Data Deficient since there are no biological based limits available, derived either from analytical stock assessment or using empirical approaches.

For the justification on the species classified as ETP refer to the section above (bullet (a) on UoA1). For habitats components and subcomponents see **section 7.3.1.5.III.**

Table 7.3.1.1.11. List of all P2-species considered for UoA3 and UoA4. Species classified in accordance with SA3.1.3-3.1.5, SA3.4.2.1-3.4.2.5 and SA3.4.4.-3.4.5. Data deficient column was assessed using criteria in Table 3 of FCP7.7.3.

Common name	Scientific name	P2 Comp	P2 subcomp	ETP regulation	Data Deficient (Y/N)
Cnidarians					
Actinia	-	Habitat	VME	N/A	N
Sponges					
Sponge (Spongia sp)	-	Habitat	VME	N/A	N
Crustaceans					
Langostino colorado UPN /Red squat lobster UPN	*Pleuroncodes monodon*	Primary	Main	N/A	No
Camaron nailon ZCN/ Nylon shrimp ZCN	*Heterocarpus reedi*	Primary	Minor	N/A	Yes
Jaiba paco	*Platymera gaudichaudii*	Secondary	Minor	N/A	Yes
Jaiba limón	*Cancer porteri*	Secondary	Minor	N/A	Yes
Jaiba mochilera	*Lophorochinia parabranchia*	Secondary	Minor	N/A	Yes
Centolla falsa	*Libidoclaea granaria*	Secondary	Minor	N/A	Yes

Zapateador	*Pterygosquilla armata*	Secondary	Minor	N/A	Yes
Molluscs					
Pulpo de brazos largos	*Muusoctopus longibrachus*	Secondary	Minor	N/A	Yes
Pulpo de brazos iguales	*Muusoctopus eicomar*	Secondary	Minor	N/A	Yes
Jibia /Humbolt squid	*Dosidicus gigas*	Primary	Minor	N/A	No
Rays					
Raya volantin	*Zearaja chilensis*	Secondary	Minor	N/A	Yes
Raya mariposa	*Gurgesiella furvescens*	Secondary	Minor	N/A	Yes
Raya (Psammobatis)	*Psammobatis sp*	Secondary	Minor	N/A	Yes
Raya costera	*Sympterygia lima*	Secondary	Minor	N/A	Yes
Pequen espinoso	*Psammobatis scobina*	Secondary	Minor	N/A	Yes
Sharks					
Tollo negro	*Aculeola nigra*	Secondary	Minor	N/A	Yes
Tollo negro raspa	*Centroscyllium granulatum*	Secondary	Minor	N/A	Yes
Tollo gato	*Bythaelurus canescens*	Secondary	Minor	N/A	Yes
Jawless fish					
Anguila babosa	*Eptatretus polytrema*	Secondary	Minor	N/A	Yes
Teleosts					
Merluza común/ Chilean hake	*Merluccius gayi gayi*	Primary	Main	N/A	No
Lenguado de ojos grandes	*Hippoglossina macrops*	Secondary	Minor	N/A	Yes
Lenguado de ojos chicos	*Paralichthys microps*	Secondary	Minor	N/A	Yes
Granadero aconcagua	*Coelorinchus aconcagua*	Secondary	Minor	N/A	Yes
Granadero chileno	*Coelorinchus chilensis*	Secondary	Minor	N/A	Yes
Granadero Patagónico	*Coelorinchus fasciatus*	Secondary	Minor	N/A	Yes
Granadero atacama	*Nezumia pudens*	Secondary	Minor	N/A	Yes
Granadero pichirata	*Coryphaenoides delsolari*	Secondary	Minor	N/A	Yes
Granadero pulgar	*Nezumia pulchella*	Secondary	Minor	N/A	Yes
Granadero gris	*Trachyrincus villegai*	Secondary	Minor	N/A	Yes
Congrio de profundidad	*Bassanago nielseni*	Secondary	Minor	N/A	Yes
Congrio negro	*Genypterus maculatus*	Secondary	Minor	N/A	Yes
Congrio colorado	*Genypterus chilensis*	Secondary	Minor	N/A	Yes
Gutigaidido	*Guttigadus kongi*	Secondary	Minor	N/A	Yes
Alfonsino	*Beryx splendens*	Secondary	Minor	N/A	Yes
Besugo/ Cardinalfish	*Epigonus crassicaudus*	Primary	Minor	N/A	No
Blanquillo	*Prolatilus jugularis*	Secondary	Minor	N/A	Yes
Jurel/ Chilean Jack mackerel	*Trachurus murphyi*	Primary	Minor	N/A	No
Seabirds					
Black-browed albatross/ Albatros de ceja negra	*Thalassarche melanophris*	ETP	N/A	Chilean Law 20.625 ACAP Annex I	N
Pink-footed shearwater/ Fardela blanca	*Ardenna creatopus*	ETP	N/A	Chilean Law 20.625 IUCN (**VU**); ACAP Annex I	N
White-chinned petrel/ Fardela Negra grande	*Procellaria aequinoctialis*	ETP	N/A	Chilean Law 20.625 IUCN (**VU**); ACAP Annex I	N
Salvin's albatross/ Albatros de Salvin	*Thalassarche salvini*	ETP	N/A	Chilean Law 20.625 IUCN (**VU**); ACAP Annex I	N
Peruvian pelican/ Pelicano Peruano	*Pelecanus thagus*	ETP	N/A	Chilean Laws 20.625 and Nº19.473	N
Masatierra petrel/	*Pterodroma defilippiana*	ETP	N/A	Chilean Law 20.625	N

Fardela blanca de Mas a Tierra				IUCN (**VU)**	
Guanay cormorant/ Guanay	*Phalacrocorax bougainvillii*	ETP	N/A	Chilean Laws 20.625 and Nº19.473	N
Marine mammals					
South American sea lion/ Lobo marino	*Otaria flavescens*	ETP	N/A	Chilean Law 20.625 D.Ex. N° 202100004/2021	N

d) P2 species impacted by UoA5 (Industrial fleet targeting the yellow squat lobster South stock)

A total of 39 different species and taxa of cnidarians, crustaceans, equinoderms, cartilaginous fish, jawless fish and teleosts were caught by the fishery targeting red squat lobster in the UPS between 2016 and 2020.

Besides, the fisheries targeting demersal crustaceans were found to interact with the following out-of-scope species: the South American sea lion and 7 species of seabirds.

Thus, a total of 46 P2-species were considered for this reassessment in relation to UoA1. **Table 7.3.1.1.12** lists all the P2-species considered for UoA1. Each one of the species was assigned to a particular P2-species component (**Primary/Secondary/ETP**) and subcomponent (**Main/Minor**), in accordance with MSC requirements.

There are 8 species managed based on biological reference points (red squat lobster, nylon shrimp, Humbolt squid, longnose skate -between North of Region Ñuble and parallel 41º28,6'L.S., known as UP-, Chilean hake, hoki, Chilean jack mackerel, and cardinalfish), so they are all Primary species. Out of 7 species, only the red squat lobster is at or above (in any year of the studied period) the designated threshold of 5% or 2% (for skates, rays, sharks and cardinalfish) to be classified as Main. All the other primary species were classified as Minor Primary.

All other (non-ETP) species which management is not based on biological reference points were classified as Secondary. The relative contribution of each of the secondary species was below (for any year of the studied period) the designated threshold value to be classified as Main. Thus, all secondary species were classified as Minor Secondary. All secondary species are Data Deficient since there are no biological based limits available, derived either from analytical stock assessment or using empirical approaches.

For the justification on the species classified as ETP refer to the section above (bullet (a) on UoA1). For habitats components and subcomponents see **section 7.3.1.5.III.**

Table 7.3.1.1.12. List of all P2-species considered for UoA5. Species classified in accordance with SA3.1.3-3.1.5, SA3.4.2.1-3.4.2.5 and SA3.4.4.-3.4.5. Data deficient column was assessed using criteria in Table 3 of FCP7.7.3.

	Common name (Spanish/English)	Scientific name	P2 Comp	P2 subcomp	ETP Regulation	Data Deficient (Y/N)
	Cnidarians					
1	Medusa/Jellyfish	-	Secondary	Minor	N/A	Yes
	Sponges					
2	Sponge	*Spongia sp.*	Habitat	VME	N/A	No
	Crustaceans					
3	Langostino Colorado UPS/ Yellow squat lobster UPS	*Pleuroncodes johni*	Primary	Main	N/A	No
4	Camaron nailon ZCS/ Nylon shrimp ZCS	*Heterocarpus reedi*	Primary	Minor	N/A	No
5	Jaiba paco/ Armed box crab	*Platymera gaudichaudii*	Secondary	Minor	N/A	Yes
6	Jaiba limón/ Chilean lemon crab	*Cancer porteri*	Secondary	Minor	N/A	Yes
7	Zapateador/-	*Pterygosquilla armata*	Secondary	Minor	N/A	Yes
8	Centolla falsa/-	*Libidoclaea granaria*	Secondary	Minor	N/A	Yes
	Equinoderms					
9	Estrella sin identificar/ Und. starfish	-	Habitat	VME	N/A	No
	Molluscs					
10	Pulpo de brazos iguales/ Deep-sea octopus	*Muusoctopus eicomar*	Secondary	Minor	N/A	Yes
11	Jibia/ Humbolt squid	*Dosidicus gigas*	Primary	Minor	N/A	No
	Skates and Rays					

12	Raya volantin/ Longnose skate	*Zearaja chilensis*	Primary (UP)	Minor	N/A	No
			Secondary (North of UP)	Minor	N/A	Yes
13	Raya peruana/-	*Bathyraja peruana*	Secondary	Minor	N/A	Yes
14	Raya aserrada/-	*Bathyraja multispinis*	Secondary	Minor	N/A	Yes
15	Raya (Psammobatis)/-	*Psammobatis sp*	Secondary	Minor	N/A	Yes
16	Pequen de hocico blanco/-	*Psammobatis rudis*	Secondary	Minor	N/A	Yes
17	Pequen espinoso	*Psammobatis scobina*	Secondary	Minor	N/A	Yes
18	Torpedo/-	*Discopyge tschudii*	Secondary	Minor	N/A	Yes
	Sharks					
19	Tollo negro/ Hooktooth dogfish	*Aculeola nigra*	Secondary	Minor	N/A	Yes
20	Tollo negro peine/-	*Centroscyllium nigrum*	Secondary	Minor	N/A	Yes
21	Tollo negro raspa/-	*Centroscyllium granulatum*	Secondary	Minor	N/A	Yes
22	Tollo negro narigón/-	*Etmopterus granulosus*	Secondary	Minor	N/A	Yes
23	Peje humo	*Hexanchus griseus*	Secondary	Minor	N/A	Yes
24	Pejegallo	*Callorhinchus callorynchus*	Secondary	Minor	N/A	Yes
	Jawless fish					
25	Anguila babosa/ Chilean hagfish	*Eptatretus polytrema*	Secondary	Minor	N/A	Yes
	Teleosts					
26	Merluza común/ Chilean hake	*Merluccius gayi gayi*	Primary	Minor	N/A	No
27	Merluza de cola/ Hoki	*Macruronus magellanicus*	Primary	Minor	N/A	No
28	Granadero Aconcagua/ Aconcagua grenadier	*Coelorinchus Aconcagua*	Secondary	Minor	N/A	Yes
29	Granadero chileno/ Chilean grenadier	*Coelorinchus chilensis*	Secondary	Minor	N/A	Yes
30	Congrio negro/ Black cusk-eel	*Genypterus maculatus*	Secondary	Minor	N/A	Yes
31	Congrio colorado/ Red cusk eel	*Genypterus chilensis*				
32	Lenguado de ojos grandes/ Big-eye flounder	*Hippoglossina macrops*	Secondary	Minor	N/A	Yes
33	Lenguado de ojos chicos	*Paralichthys microps*	Secondary	Minor	N/A	Yes
34	Besugo/ Cardinalfish	*Epigonus crassicaudus*	Primary	Minor	N/A	No
35	Brótula	*Salilota australis*	Secondary	Minor	N/A	Yes
36	Blanquillo/-	*Prolatilus jugularis*	Secondary	Minor	N/A	Yes
37	Jurel/ Chilean Jack mackerel	*Trachurus murphyi*	Primary	Minor	N/A	No
38	Cabrilla/-	*Sebastes capensis*	Secondary	Minor	N/A	Yes
	Seabirds					
39	Black-browed albatross/ Albatros de ceja negra	*Thalassarche melanophris*	ETP	N/A	Chilean Law 20.625 ACAP Annex I	No
40	Pink-footed shearwater/ Fardela blanca	*Ardenna creatopus*	ETP	N/A	Chilean Law 20.625 IUCN (**VU**); ACAP Annex I	No
41	White-chinned petrel/ Fardela Negra grande	*Procellaria aequinoctialis*	ETP	N/A	Chilean Law 20.625 IUCN (**VU**); ACAP Annex I	No
42	Salvin's albatross/ Albatros de Salvin	*Thalassarche salvini*	ETP	N/A	Chilean Law 20.625 IUCN (**VU**); ACAP Annex I	No
43	Peruvian pelican/ Pelicano Peruano	*Pelecanus thagus*	ETP	N/A	Chilean Laws 20.625 and Nº19.473	No
44	Masatierra petrel/ Fardela blanca de Mas a Tierra	*Pterodroma defilippiana*	ETP	N/A	Chilean Law 20.625 IUCN (**VU)**	No

45	Guanay cormorant/ Guanay	*Phalacrocorax bougainvillii*	ETP	N/A	Chilean Laws 20.625 and Nº19.473	No
	Marine Mammals					
46	South American sea lion/ Lobo marino	*Otaria flavescens*	ETP	N/A	Chilean Law 20.625 D.Ex. N° 202100004/2021	No

e) P2 species impacted by UoA6 and UoA7 (Industrial and artisanal fleets targeting the red squat lobster UPN)

A total of 19 different species and taxa of cnidarians, crustaceans, echinoderms, cartilaginous fish, jawless fish and teleost were caught by the fishery targeting red squat lobster in the UPN between 2016 and 2020.

Besides, the fisheries targeting demersal crustaceans were found to interact with the following out-of-scope species: the South American sea lion and 7 species of seabirds.

Thus, a total of 27 P2-species were considered for this reassessment in relation to UoA1. **Table 7.3.1.1.12** lists all the P2-species considered for UoA1. Each one of the species was assigned to a particular P2-species component (**Primary/Secondary/ETP**) and subcomponent (**Main/Minor**), in accordance with MSC requirements.

There are 3 species managed based on biological reference points (yellow squat lobster, nylon shrimp, Chilean hake), so they are all Primary species. Yellow squat lobster and Common hake are at or above (in any year of the studied period) the designated threshold of 5% or 2% (for skates, rays, sharks and cardinalfish) to be classified as Main, while nylon shrimp was classified as Minor Primary.

All other (non-ETP) species which management is not based on biological reference points were classified as Secondary. Only the big-eyed flounder is at or above (in any year of the studied period) the designated threshold of 5% or 2% (for skates, rays, sharks and cardinalfish) to be classified as Main, while all the other secondary were classified as Minor Secondary. All secondary species are Data Deficient since there are no biological based limits available, derived either from analytical stock assessment or using empirical approaches.

For the justification on the species classified as ETP refer to the section above (bullet (a) on UoA1). For habitat components and subcomponents see section 7.3.1.5.III.

Table 7.3.1.1.13. List of all P2-species considered for UoA6 and UoA7. Species classified in accordance with SA3.1.3-3.1.5, SA3.4.2.1-3.4.2.5 and SA3.4.4.-3.4.5. Data deficient column was assessed using criteria in Table 3 of FCP7.7.3.

Common name	Scientific name	P2 comp	P2 subcomp	ETP regulation	Data Deficient (Y/N)
Sponges					
Sponge (Spongia sp)	-	Habitat	VME	N/A	No
Crustaceans					
Langostino amarillo UPN/ Yellow squat lobster UPN	Cervimunida johni	Primary	Main	N/A	No
Camaron nailon ZCN/ Nylon shrimp ZCN	Heterocarpus reedi	Primary	Minor	N/A	No
Jaiba paco	Platymera gaudichaudii	Secondary	Minor	N/A	Yes
Jaiba limón	Cancer porteri	Secondary	Minor	N/A	Yes
Jaiba mochilera	Lophorochinia parabranchia	Secondary	Minor	N/A	Yes
Zapateador	Pterygosquilla armata	Secondary	Minor	N/A	Yes
Molluscs					
Caracol sin identificar	-	Secondary	Minor	N/A	Yes
Rays					
Pequen espinoso	Psammobatis scobina	Secondary	Minor	N/A	Yes
Sharks					
Tollo negro	Aculeola nigra	Secondary	Minor	N/A	Yes
Pejegato de profundidad	Apristurus brunneus	Secondary	Minor	N/A	Yes
Teleosts					
Merluza común/ Chilean hake	Merluccius gayi gayi	Primary	Main	N/A	No
Lenguado de ojos grandes/ Big-eyed flounder	Hippoglossina macrops	Secondary	Main	N/A	Yes
Granadero aconcagua	Coelorinchus aconcagua	Secondary	Minor	N/A	Yes

Granadero pulgar	Nezumia pulchella	Secondary	Minor	N/A	Yes
Granadero gris	Trachyrincus villegai	Secondary	Minor	N/A	Yes
Congrio de profundidad	Bassanago nielseni	Secondary	Minor	N/A	Yes
Blanquillo	Prolatilus jugularis	Secondary	Minor	N/A	Yes
Seabirds					
Black-browed albatross/ Albatros de ceja negra	*Thalassarche melanophris*	ETP	N/A	Chilean Law 20.625 ACAP Annex I	N
Pink-footed shearwater/ Fardela blanca	*Ardenna creatopus*	ETP	N/A	Chilean Law 20.625 IUCN (**VU)**; ACAP Annex I	N
White-chinned petrel/ Fardela Negra grande	*Procellaria aequinoctialis*	ETP	N/A	Chilean Law 20.625 IUCN (**VU)**; ACAP Annex I	N
Salvin's albatross/ Albatros de Salvin	*Thalassarche salvini*	ETP	N/A	Chilean Law 20.625 IUCN (**VU)**; ACAP Annex I	N
Peruvian pelican/ Pelicano Peruano	*Pelecanus thagus*	ETP	N/A	Chilean Laws 20.625 and Nº19.473	N
Masatierra petrel/ Fardela blanca de Mas a Tierra	*Pterodroma defilippiana*	ETP	N/A	Chilean Law 20.625 IUCN (**VU)**	N
Guanay cormorant/ Guanay	*Phalacrocorax bougainvillii*	ETP	N/A	Chilean Laws 20.625 and Nº19.473	N
Marine mammals					
South American sea lion/ Lobo marino	*Otaria flavescens*	ETP	N/A	Chilean Law 20.625 D.Ex. N° 202100004/2021	N

f) P2 species impacted by UoA8 (Industrial fleet targeting the red squat lobster South stock)

A total of 42 different species and taxa of cnidarians, crustaceans, echinoderms, cartilaginous fish, jawless fish and teleosts were caught by the fishery targeting red squat lobster in the UPS between 2016 and 2020.

Besides, the fisheries targeting demersal crustaceans were found to interact with the following out-of-scope species: the South American sea lion and 7 species of seabirds.

Thus, a total of 49 P2-species were considered for this reassessment in relation to UoA1. **Table 7.3.1.1.5** lists all the P2-species considered for UoA1. Each one of the species was assigned to a particular P2-species component (**Primary/Secondary/ETP**) and subcomponent (**Main/Minor**), in accordance with MSC requirements.

There are 7 species managed based on biological reference points (Yellow squat lobster, nylon shrimp, Humbolt squid, longnose skate -between North of Region Ñuble and parallel 41º28,6'L.S., known as UP-, Chilean hake, Chilean jack mackerel and cardinalfish), so they are all Primary species. Out of 6 species, only 2 (yellow squat lobster and Chilean hake) are at or above (in any year of the studied period) the designated threshold of 5% or 2% (for skates, rays, sharks and cardinalfish[4]) to be classified as Main. All the other primary species were classified as Minor Primary.

All other (non-ETP) species which management is not based on biological reference points were classified as Secondary. The relative contribution of each of the secondary species was below (for any year of the studied period) the designated threshold value to be classified as Main. Thus, all secondary species were classified as Minor Secondary. All secondary species are Data Deficient since there are no biological based limits available, derived either from analytical stock assessment or using empirical approaches.

For the justification on the species classified as ETP refer to the section above (bullet (a) on UoA1). For habitats components and subcomponents see **section 7.3.1.5.III.**

[4] These were the less resilient species considered for this assessment. In the case of cardinalfish, it was considered as less resilient because of its longevity and slow growth rate. Besides, this species was assessed as collapsed in 2012 and it was calculated that it will need at least 81 years to recover.

Table 7.3.1.1.14. List of all P2-species considered for UoA8. Species classified in accordance with SA3.1.3-3.1.5, SA3.4.2.1-3.4.2.5 and SA3.4.4.-3.4.5. Data deficient column was assessed using criteria in Table 3 of FCP7.7.3.

	Common name (Spanish/English)	Scientific name	P2 Comp	P2 subcomp	ETP Regulation	Data Deficient (Y/N)
	Cnidarians					
1	Actinia	-	Habitat	VME	N/A	No
2	Medusa/Jellyfish	-	Secondary	Minor	N/A	Yes
	Crustaceans					
3	Langostino Amarillo UPS/ Yellow squat lobster UPS	*Cervimunida johni*	Primary	Main	N/A	No
4	Camaron nailon ZCS/ Nylon shrimp ZCS	*Heterocarpus reedi*	Primary	Minor	N/A	No
5	Jaiba paco/ Armed box crab	*Platymera gaudichaudii*	Secondary	Minor	N/A	Yes
6	Jaiba limón/ Chilean lemon crab	*Cancer porteri*	Secondary	Minor	N/A	Yes
7	Zapateador/-	*Pterygosquilla armata*	Secondary	Minor	N/A	Yes
8	Centolla falsa/-	*Libidoclaea granaria*	Secondary	Minor	N/A	Yes
	Equinoderms					
9	Estrella sin identificar/ Und. starfish	-	Habitat	VME	N/A	No
	Molluscs					
10	Caracol picuyo/-	*Argobuccinum pustulosum*	Secondary	Minor	N/A	Yes
11	Pulpo de brazos iguales/ Deep-sea octopus	*Muusoctopus eicomar*	Secondary	Minor	N/A	Yes
12	Pulpito/-	*Robsonella fontaniana*	Secondary	Minor	N/A	Yes
13	Jibia/ Humbolt squid	*Dosidicus gigas*	Primary	Minor	N/A	No
	Skates and Rays					
14	Raya volantin/ Longnose skate	*Zearaja chilensis*	Primary (UP)	Minor	N/A	No
			Secondary (Norht of UP)	Minor	N/A	No
15	Raya torpedo/-	*Tetronarce tremens*	Secondary	Minor	N/A	Yes
16	Raya aserrada/-	*Bathyraja multispinis*	Secondary	Minor	N/A	Yes
17	Raya (Psammobatis)/-	*Psammobatis sp*	Secondary	Minor	N/A	Yes
18	Raya costera/-	*Sympterygia lima*	Secondary	Minor	N/A	Yes
19	Pequen de hocico blanco/-	*Psammobatis rudis*	Secondary	Minor	N/A	Yes
20	Pequen espinoso/-	*Psammobatis scobina*	Secondary	Minor	N/A	Yes
	Sharks					
21	Tollo negro/ Hooktooth dogfish	*Aculeola nigra*	Secondary	Minor	N/A	Yes
22	Tollo negro peine/-	*Centroscyllium nigrum*	Secondary	Minor	N/A	Yes
23	Tollo negro raspa/-	*Centroscyllium granulatum*	Secondary	Minor	N/A	Yes
24	Tollo negro narigón/-	*Etmopterus granulosus*	Secondary	Minor	N/A	Yes
25	Pejegato de profundidad/-	*Apristurus brunneus*	Secondary	Minor	N/A	Yes
	Jawless fish					
26	Anguila babosa/ Chilean hagfish	*Eptatretus polytrema*	Secondary	Minor	N/A	Yes
	Teleosts					
27	Merluza común/ Chilean hake	*Merluccius gayi gayi*	Primary	Main	N/A	No
28	Granadero Aconcagua/ Aconcagua grenadier	*Coelorinchus aconcagua*	Secondary	Minor	N/A	Yes
29	Granadero chileno/ Chilean grenadier	*Coelorinchus chilensis*	Secondary	Minor	N/A	Yes

30	Congrio de profundidad/-	*Bassanago nielseni*	Secondary	Minor	N/A	Yes
31	Congrio dorado/ Pink cusk-eel	*Genypterus maculatus*	Secondary	Minor	N/A	Yes
32	Congrio negro/ Black cusk-eel	*Genypterus maculatus*	Secondary	Minor	N/A	Yes
33	Congrio colorado/ Red cusk eel	*Genypterus chilensis*				
34	Lenguado de ojos grandes/ Big-eye flounder	*Hippoglossina macrops*	Secondary	Minor	N/A	Yes
35	Besugo/ Cardinalfish	*Epigonus crassicaudus*	Primary	Minor	N/A	No
36	Blanquillo/-	*Prolatilus jugularis*	Secondary	Minor	N/A	Yes
37	Reineta/-	*Brama australis*	Secondary	Minor	N/A	Yes
38	Pez chancho/-	*Congiopodus peruvianus*	Secondary	Minor	N/A	Yes
39	Jurel/ Chilean Jack mackerel	*Trachurus murphyi*	Primary	Minor	N/A	No
40	Cabrilla/-	*Sebastes capensis*	Secondary	Minor	N/A	Yes
41	Cabrilla común/-	*Paralabrax humeralis*	Secondary	Minor	N/A	Yes
	Seabirds					
42	Black-browed albatross/ Albatros de ceja negra	*Thalassarche melanophris*	ETP	N/A	Chilean Law 20.625 ACAP Annex I	No
43	Pink-footed shearwater/ Fardela blanca	*Ardenna creatopus*	ETP	N/A	Chilean Law 20.625 IUCN (**VU)**; ACAP Annex I	No
44	White-chinned petrel/ Fardela Negra grande	*Procellaria aequinoctialis*	ETP	N/A	Chilean Law 20.625 IUCN (**VU)**; ACAP Annex I	No
45	Salvin's albatross/ Albatros de Salvin	*Thalassarche salvini*	ETP	N/A	Chilean Law 20.625 IUCN (**VU)**; ACAP Annex I	No
46	Peruvian pelican/ Pelicano Peruano	*Pelecanus thagus*	ETP	N/A	Chilean Laws 20.625 and Nº19.473	No
47	Masatierra petrel/ Fardela blanca de Mas a Tierra	*Pterodroma defilippiana*	ETP	N/A	Chilean Law 20.625 IUCN (**VU)**	No
48	Guanay cormorant/ Guanay	*Phalacrocorax bougainvillii*	ETP	N/A	Chilean Laws 20.625 and Nº19.473	No
	Marine Mammals					
49	South American sea lion/ Lobo marino	*Otaria flavescens*	ETP	N/A	Chilean Law 20.625 D.Ex. N° 202100004/2021	No

7.3.1.2 Plan for the reduction of discards and interactions in trawl fisheries targeting demersal crustaceans

The Government of Chile, promulgated in September 2012, Law 20.625 or "Discards Law", aware that a modern fisheries management policy must be based on certain key principles such as sustainable harvest, an ecosystem approach, adequate regulations and efficient control and monitoring, and that these are undermined if discards are not being properly monitored and managed. Law 20.625 modified the General Law of Fishing and Aquaculture (LGPA), defining the discard as "action of returning captured hydrobiological species to the sea" and incidental fishing as "that made up of species that are not part of the bycatches and which is made up of marine reptiles, seabirds and marine mammals ". The Law also established control measures and sanctions for those who engage in such practices during their fishing operations. It was determined that the first step would be to develop and implement research programs for one or more fisheries (Article 7ºA). The aim of those research programs would be to compile the technical background that would make possible to develop, where necessary, discard reduction plans for target species, bycatches and incidental interactions. Those research programs should at least include the quantification of discards and incidental interactions, the determination of its causes and the procedures on board. The first research program to be implemented was at the demersal crustaceans fisheries (initially at the industrial fleet and then at the artisanal fleet). The implementation of the research program at fisheries targeting demersal crustaceans latest between 2013 and 2015. The existing observer program was enhanced and modified to comply with the specific objectives of the research program.

As a result of the information gathered during the research program, and after consultations with the fishing sector through the CM-CD, a Plan for the reduction of discards and incidental interactions for the trawl fisheries targeting demersal crustaceans was developed and detailed in the Technical Report Nº04/2017 (Informe Técnico (R.Pesq) Nº04/2017). The objective of the plan is to reduce discards of target, bycatch species (regardless of whether they are subject to quota or not) and incidental interactions with out-of-scope species. Finally, Resolution 1106/2017 (Res.EX.1106 del 29 de Marzo 2017) approved the Plan for the reduction of discards as detailed in the Technical Report Nº04/2017.

This plan sets management measures to reduce discards on target, bycatches and incidental interactions with out-of-scope species, but it also sets the need to continue with a monitoring program, codes of best practices on board, and identifies needs in relation to capacity building and technological innovation on the fishing gears to increase selectivity.

In accordance with Article 7ºB of Law 20.625, every year Subpesca issues a Resolution (based on a prior technical report) listing all target and bycatch species subject to Articles 7ºA, 7ºB and 7ºC of the LGPA (as modified by Law 20.625). Resolution 142/2021 is the latest list to be published.

I. Management measures and code of best practices to reduce discards on target species

The plan for the reduction of discard and interactions sets the following management measures adopted for target species (red squat lobster, yellow squat lobster and nylon shrimp:

M1. Discarding target species is forbidden

M2. All catches of red and yellow squat lobsters and nylon shrimp shall be landed, inspected and counted against the applicable quota (RAE, PRP or LTP).

M3. Discards are allowed only if conditions set in Article 7ºB of the LGPA are met. In this case, discarded individuals shall be set apart, boxed and quantified by the EMS on board, in accordance with protocols set in D.S.Nº76/2015.

M4. Industrial and artisanal vessel owners shall report all discards of target species in accordance with applicable regulation

M5. Other discards of target species are prohibited and are susceptible to be punished with the applicable sanctions (LGPA, Art.40C, 111A, 111B, and 113).

Besides, the following code of best practices to reduce discards on target species is detailed:

1. Compliance with a fishing ground survey protocol (a short trial haul can be performed at the beginning of each fishing trip). Catches shall be recorded and reported.
2. Compliance with move-on-rules.
3. In the case of having a trial haul with an inadequate catch composition, the information shall be share with the other vessels fishing in the area.

II. Management measures and code of best practices to reduce discards on bycatch species with no commercial value or no subject quota

The plan for the reduction of discard and interactions sets the following management measures adopted for bycatches with no commercial value and no subject to quota:

M1. Discarding bycatch species is forbidden, except for those expressly indicated in the annual Resolution issued by Subpesca in accordance with Article 7ºB of LGPA.

M2. Species for which discarding is not allowed shall be landed, and landing shall be inspected.

M3. When discards are allowed, discards shall be classified by species, boxed and quantified by the EMS on board, in accordance with protocols set in D.S.Nº76/2015.

M4. In the case of catching invertebrates denoting the existence of VMEs, the measures established for this purpose in accordance with Articles 6a and 6b of the LGPA must be complied with.

M5. Industrial and artisanal vessel owners shall report all discards of target species in accordance with applicable regulation

M6. Other discards of bycatch species with no commercial value are prohibited and are susceptible to be punished with the applicable sanctions (LGPA, Art.40C, 111A, 111B, and 113).

M7. Protocols for handling bycatches on board shall be complied with, in particular for those recognized as vulnerable species. The protocol shall include, at least: identification and recording, handling and return to the sea if applicable.

M8. Regulation impeding to land and use bycatches shall be reviewed and modified if necessary.

M9. Biological parameters determining the legal resolutions that impede the use of bycatches shall be reviewed.

Besides, the following code of best practices to reduce discards on bycatches with no commercial value and no quota is detailed:

1. Compliance with a fishing ground survey protocol (a short trial haul can be performed at the beginning of each fishing trip). Catches shall be recorded and reported.
2. Compliance with move-on-rules.
3. In the case of having a trial haul with an inadequate catch composition, the information shall be share with the other vessels fishing in the area.
4. Increase of the retained fraction and sustainable use of the species with potential for the market. From the third year onwards, an increasing % of the bycatches shall be retained, until reaching 100% of the catches in 5 years.

III. Management measures and code of best practices to reduce discards on bycatch species with commercial value and subject to quota

The plan for the reduction of discard and interactions sets the following management measures adopted for bycatches with commercial value and subject to quota:

M1. Discarding as bycatch is forbidden. Catches shall be quantified and counted against the RAE or LTP as appropriate. The discount will be progressive, following the rate of 1/3, 2/3 and 3/3 (100%) throughout the period 2017-2019.

M2. In the case of authorized discards (in accordance with Article 7ºB of the LGPA), the discarded fraction shall be classified by species, boxed and quantified by the EMS on board, in accordance with protocols set in D.S.Nº76/2015.

M3. Industrial and artisanal vessel owners shall report all discards of target species in accordance with applicable regulation

M4. Other discards of species subject to quota are prohibited and are susceptible to be punished with the applicable sanctions (LGPA, Art.40C, 111A, 111B, and 113).

M5. Quota owners shall have access to LTP class B (auction class B) or PEP to generate the access rights and therefore be in the position to comply discount their Chilean hake catches against their quotas.

M6. The existing regulation in relation to access to LTP or PEP and the maximum % allowed per fishing trip shall be modified.

Besides, the following code of best practices to reduce discards on bycatches with commercial value and subject quota is detailed:

1. Compliance with a fishing ground survey protocol (a short trial haul can be performed at the beginning of each fishing trip). Catches shall be recorded and reported.
2. Compliance with move-on-rules.
3. In the case of having a trial haul with an inadequate catch composition, the information shall be share with the other vessels fishing in the area.
4. Increase of the retained fraction and sustainable use of Chilean hake caught as bycatch.

IV. Management measures and code of best practices to reduce incidental interactions with out-of-scope species

The plan for the reduction of discard and interactions sets the following management measures adopted for interactions with out-of-scope species:

M1. Mandatory return of catches for incidental interactions, in accordance with Article 7 of the LGPA. The operation shall be performed in accordance with applicable regulations.

M2. Implementation of protocols for the identification and record of incidental interactions

M3. An action plan shall be developed to comply with Article 4ºC, D and E, in relation to the protection of incidental catches.

M4. Procedures for data compilation at national level shall be homologated with requirements from international markets.

Besides, the following code of best practices to reduce incidental interactions is detailed:

1. Training protocols for the crews in relation to incidental catches shall be adopted, in accordance with the MPDC
2. Protocols to mitigate incidental interactions shall be adopted, in accordance with the MPDC.

7.3.1.3 Primary species impacted by the UoAs

A total of 9 primary species are impacted by the two UoAs considered in this assessment: yellow squat lobster (*Cervimunida johni*), red squat lobster (*Pleuroncodes monodon*), Chilean hake (*Merluccius gayi gayi*), nylon shrimp (*Heterocarpus reedi*), Humbolt squid (*Dosidicus gigas*), longnose skate (*Zearaja chilensis*), pink cusk-eel (*Genypterus blacodes*), cardinalfish (*Epigonus crassicaudus*), hoki (*Macruronus magellanicus*).

The only Main primary species are: yellow squat lobster (in UoA6, UoA7 and UoA8), red squat lobster (in UoA3m UoA4 and UoA5), and Chilean hake (in all UoAs except in UoA5). All other primary species are minor.

A summary on the management objective and status for these species is presented below:

I. Yellow and red squat lobsters:

Both yellow and red squat lobsters caught as bycatch in fisheries targeting demersal crustaceans are subject to the specific measures adopted in the Plan for reduction of discards and interactions (approved by Res.EX.1106 del 29 de Marzo 2017). See section 7.3.1.2.I for details on these measures.

Information on the status and relevant management history for the yellow and red squat lobsters is provided in **section 7.2.1**.

II. Chilean hake:

a) Management objectives

The Chilean hake caught as a bycatch in fisheries targeting demersal crustaceans is subject to the specific measures adopted in the Plan for reduction of discards and interactions (approved by Res.EX.1106 del 29 de Marzo 2017). See section 7.3.1.2.III for details on these measures. This species is subject to a quota, so these measures aim that all Chilean hake as bycatch is declared and counted against the hake quota.

The Chilean hake is the target species of a specific fishery, and this fishery is managed through a multi-annual management plan for the Chilean hake was adopted in 2016 (Res.EX.Nº1308/2016). This fishery is MSC-certified (https://fisheries.msc.org/en/fisheries/chile-hake-trawl/@@view). The stock was considered depleted when the MAP was adopted. The Management Plan established a set of goals that seek (among other objectives) to maintain or bring the fishery to the MSY level. To achieve it, two specific objectives were adopted:

Objective 1.1: Rebuild the Chilean hake stock to biomass levels of 20% or higher of its virginal spawning biomass in 5 years (i.e., from the state of depletion to the state of overexploitation).

Objective 1.2: Once the state of depletion has been overcome, bring or maintain the Chilean hake stock at biomass levels of 40% of its virginal spawning biomass in 7 years. (i.e., from a state of overexploitation to a state of full exploitation). In turn, each control rule has two forms. The specific form of the rule depends on the level of compliance with the measure (compliance with access measures, quota, seasonal closure…) that is reported annually by the CM-MC in the month of August of each year.

Therefore, the MAP set the following biological reference points for this species:

- Target biological reference point: SSB_{MSY} = 40%SSB0
- Limit biological reference point: 20%SSB0

Besides, two harvest control rules were adopted in accordance with Objectives 1.1 and 1.2:

Control rule 1.1.1 (responds to objective 1.1): Constant exploitation rate strategy: If% B0 <20% B0, F = X% * F_{MSY}; where X% is adjusted according to the level of compliance of the measure: X = 60 with low level of compliance. X = 75 with high level of compliance. The CM-MC will report annually during the month of August of each year the level of compliance with the measure.

Control rule 1.1.2 (responds to objective 1.2.): Constant exploitation rate strategy: SI% B0> = 20% B0, F = X% * F_{MSY}; where X% is adjusted according to the level of compliance of the measure: X = 75 with low level of compliance. X = 100 with high level of compliance. The Management Committee will report annually during the month of August of each year the level of compliance with the measure with a well-founded report.

b) Catches and fishery-based indicators

The Chilean hake fishery has historically been prosecuted throughout Regions IV-VIII (Addison and Adlerstein-Gonzalez 2016). Most of the landings are derived from the industrial large-vessel offshore fishery using trawls (**Figure 7.3.1.3.1**), especially in Region VIII. An artisanal small-boat coastal fishery is conducted mostly throughout Regions IV-VII using longline and gillnets. Total landings declined from 121,000 t in 2001 to 47,400 t in 2005 and further declined to about 13,000 t in 2014 before increasing to 2017 and changing little since. Preliminary landings for 2018 totalled 22,136 t, with 13,836 t derived from the industrial fishery and 8,300 t derived from the artisanal fishery (Gálvez et al 2019). The industrial fishery landings represented 94% of the quota of 14,760 t for that fishing sector. Total landings have changed little in the past 3 years.

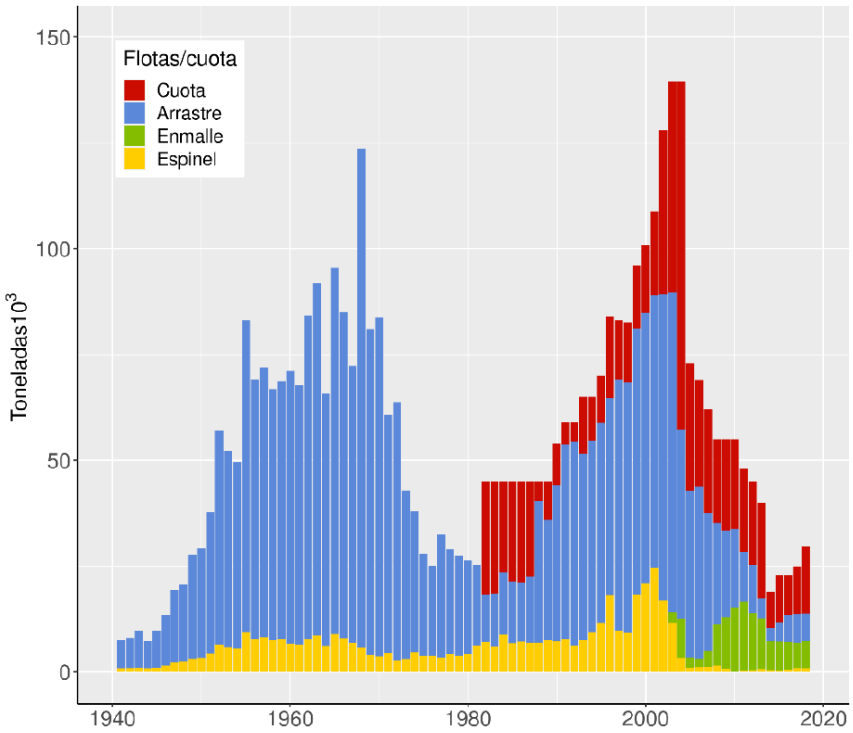


Figure 7.3.1.3.1. Landings by fishery and in total of Chilean hake 1940-2019. Overall quota also shown for years when it was applied: Source: Tascheri 2021 Fig. 2.

The number of industrial vessels decreased from more than 41 in 2000 to 9 in 2014, and it seems that it has stabilized since then (figure 7.1.3.2.2).

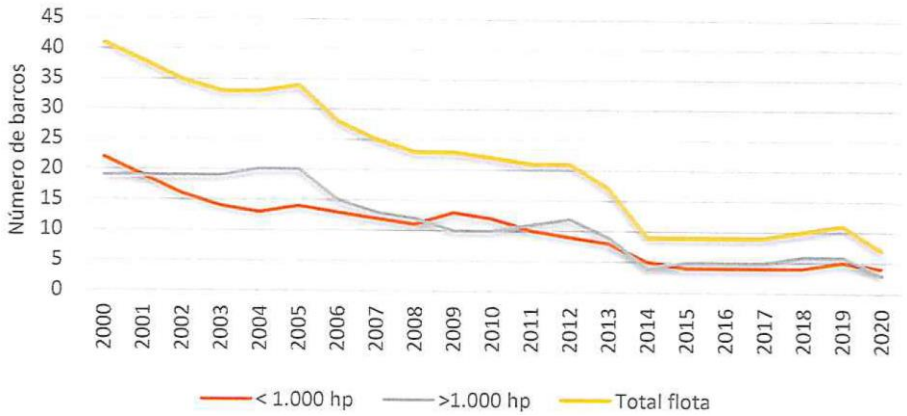


Figure 7.3.1.3.2. Size of the industrial fleet targeting Chilean hake between 2000 and 2020. Source: CCT-RDZCS. 2020 Fig. 2.

Fishery performance deteriorated in the early 2000's, as best reflected by a decline in catch per unit effort (CPUE) of the large-vessel sector of the industrial trawler fleet (**Figure 7.3.1.3.3**). There has been no clear change in relative abundance since the mid 2000's based on fishery data. The increase in CPUE and decrease in fishing effort since 2013 in the large-vessel trawler fleet is not believed to be due to an increase in biomass but rather due to changes in fishing practices (Tascheri 2018). Both fleets showed a slight increase in CPUE from 2018-2021 (CCT-RDZCS. 2020).

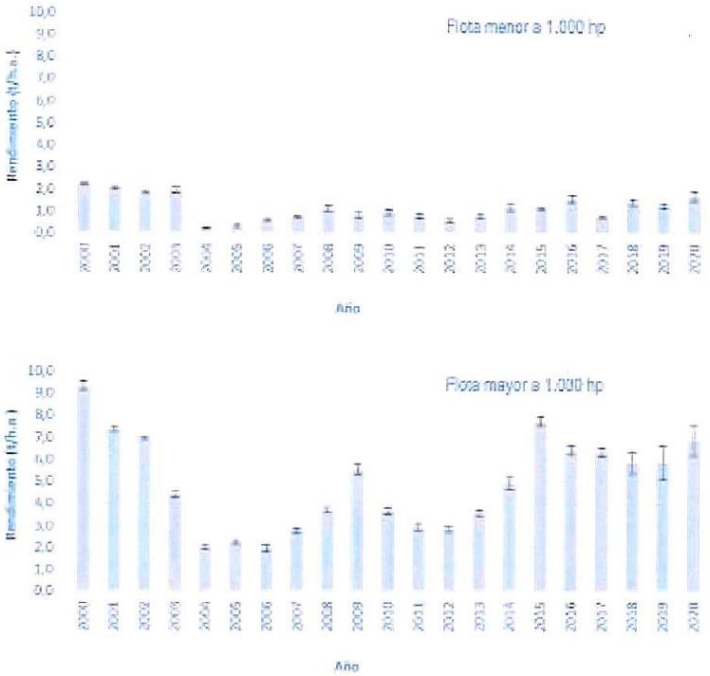


Figure 7.3.1.3.3. Catch per unit Effort (CPUE, t/ha) and associated effort (ha) from the small (above) and large (below) vessels of the industrial trawler fleet, 1997-2018: Source: CCT-RDZCS. 2020 Fig. 3.

Annual size structure of the fishery catch has been represented by unimodal size compositions in recent years (Tascheri 2019[5]). Mean size decreased substantially from 2003-2005 and, while since remaining small, has been increasing steadily since 2013 to be above a 37 cm reference level during 2018-2020 (**Figure 7.3.1.3.4**).

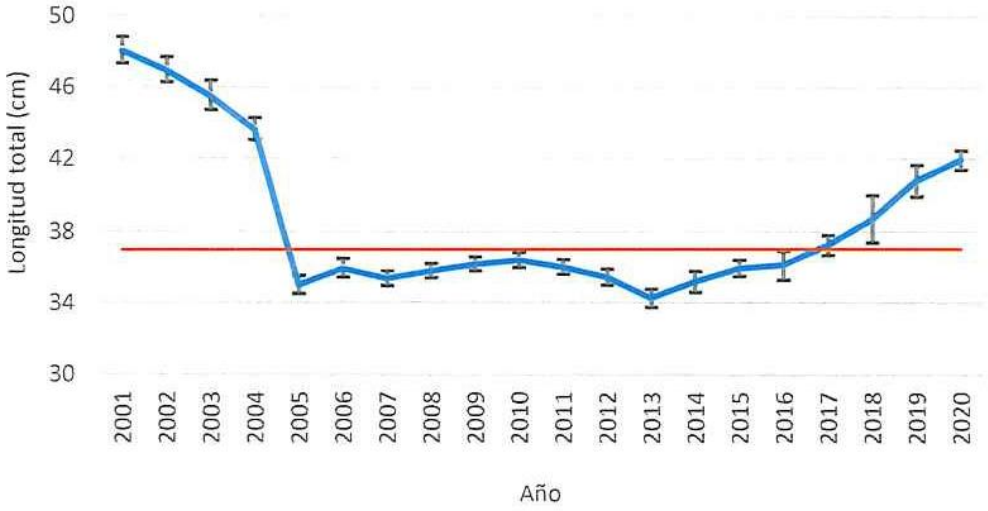


Figure 7.3.1.3.4. Mean annual size, with 95% confidence intervals, of Chilean hake from catches of the industrial trawler fishery in the south-central zone, for sexes combined, 2001-2020. Horizontal line is at 37 cm total length: Source: CCT-RDZCS. 2020, Fig. 5.

c) Direct surveys and model-based assessments

Biomass is estimated from annual acoustic surveys that incorporate biological sampling using a bottom trawl. Biomass dropped sharply from a level of about 800,000 t during 1999-2002, with the 2002 value considered anomalous (**Figure 7.3.1.3.5**) to a level of about 220,000-260,000 t from 2004-2016. Biomass has recently increased from about 240,000 t in 2016 to about 357,000 t in 2019 and changed little in 2020.

[5] Tascheri , R. 2019. Convenio “Estatus y posibilidades de explotación biológicamente sustentables de los principales recursos pesqueros nacionales año 2019: Merluza común, 2020”. Documento Técnico de evaluación. Subsecretaría de Economía y EMT/ septiembre 2019, 27 pp.

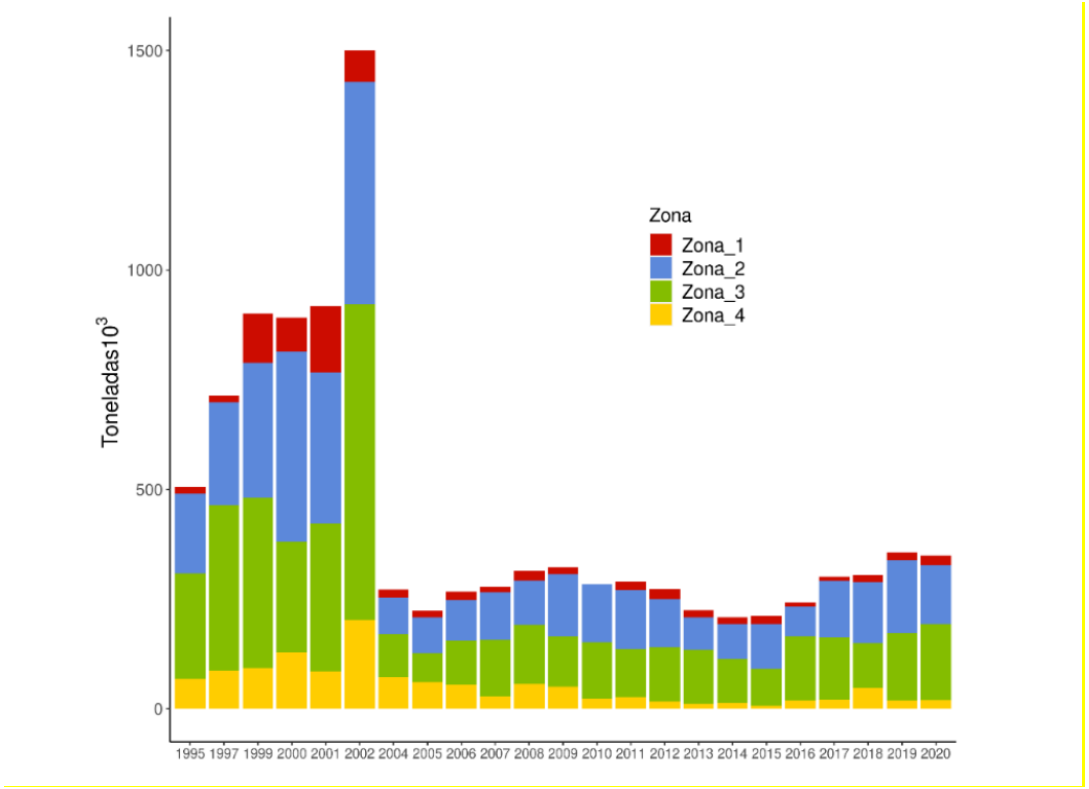


Figure 7.3.1.3.5. Series of biomass estimates from acoustic surveys by survey area, 1995-2020. Source: Tascheri 2021, Fig. 4.

Age composition data from both the trawl fishery and the survey show that the mean age has declined greatly during the early 2000's (**Figure 7.3.1.3.6**). Mean age continued to decline gradually to 2015 in the trawl fishery, whereas it remained constant, at about 3 years of age, in the survey data. There has been a gradual increase in mean age in both series in recent years.

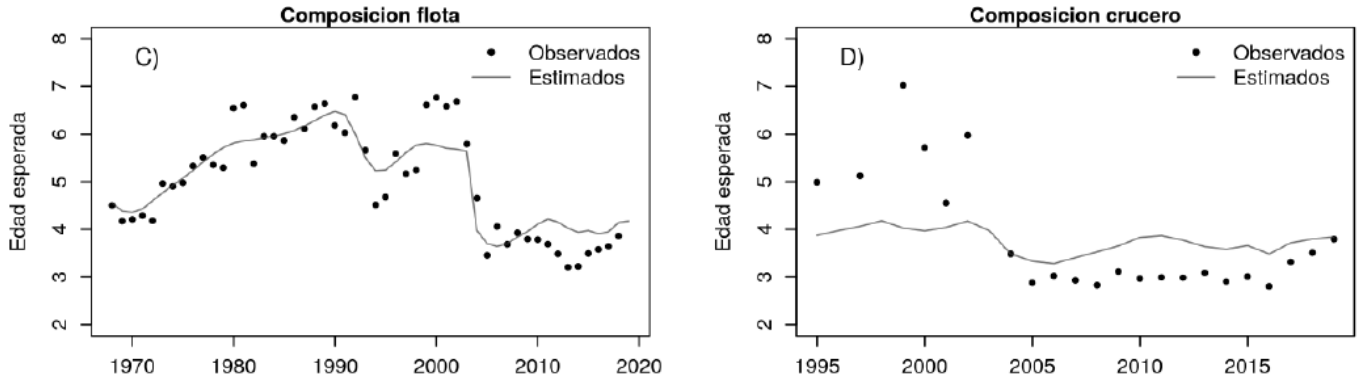


Figure 7.3.1.3.6. Observed mean age (points), with 95% confidence intervals, and predicted ages (continuous line) of two sets of age composition data included in the stock assessment model (Case 0); C) Trawl fishery; D) Survey. Source: Tascheri 2019, Fig. 4.

The assessment process is based on an age-structured assessment model that includes survey and fishery data. The assessment for the Chilean hake is updated on an annual basis. Results from the latest update are presented in Tascheri (2021). The greatest source of uncertainty in the assessment is related to estimates of fishery removals. Accordingly, to determine the stock status and the CBA, three scenarios (cases) have been considered that differ with respect to the series of catch data included: official catches maintained by SERNAPESCA (Case 0), the reconstruction of the catches proposed in 2019 by the CM-RDZS (Case 1) and the series of catches developed by the CCT-RDZS (Case 2). Cases 1 and 2 include estimated discards since 2016. All these cases used a common catch series for the years 1940 to 1979. Cases 1 and 2 used catches that included estimated discards since 2016. Besides, another additional 3 cases were used (Cases 3-5). These additional cases use the same catch series as Cases 0-2, but an alternative ponderation of the age-structured data (mentioned as Francis method).

Recruitment decreased greatly between 1999 to its historical low in 2010. It has since increased gradually but remains low with a slight decrease in 2020 (Tascheri 2021).

Spawning biomass dropped by a factor of 5 between 2000-2005 and has since remained low, although it has increased steadily in recent years, by at least a factor of 3 since 2013. This recent increase was associated with low fishing mortality; F declined from 2013-2019 and remained low in 2020 (Tascheri 2021). In all cases considered in Tascheri

(2021), a continuous increase in spawning biomass was observed between 2013 and 2020, consistent with the increase observed in acoustic surveys. Recent estimates of spawning biomass were consistent across cases 0-2: spawning biomass for 2020 was estimated between 159 kt and 179 kt. However, when using the Francis method (cases 3-5), the estimated spawning biomasses were between 15% and 26% higher than in cases 0-2.

Consistent with the information presented above, the level of spawning biomass reduction in relation to B0 in 2020 was estimated at 0.27, 0.22 and 0.22 for cases 0, 1 and 2, while it was found to be 0.34, 0.28 and 0.29 for cases 3, 4 and 5.

d) Stock status

Since the biological reference points adopted in the MAP are 20%SSB0 (limit) and 40%SSB0 (target). The level of reduction of the spawning biomass (with respect to its value in the absence of exploitation) estimated for 2020 is above the limit value but below the management objective for all the cases considered in Tascheri (2021). Therefore, the CCT-RDZCS concluded that the state of the fishery corresponds to a situation of overexploitation, regardless of the case considered. The CBA recommended by the CCT-RDZCS followed the applicable HCR.

e) Chilean hake bycatches in demersal crustacean fisheries

Chilean hake is considered a retained species because it has commercial value but until recently it has not been possible to distinguish retained from discarded hake bycatch in the demersal crustacean fisheries. Several studies have indicated that bycatch and discarding of hake has been underestimated in the official fishery data (Saa et al 2017). The official landings statistics indicate a sharp decline in hake bycatch from 2011-2014, with bycatch since remaining very low to 2018 (**Figure 7.3.1.3.7**). This steady decline in the reported values is a result of regulations that limited the percentage of Chilean hake that could be landed in relation to the landing of the target species and a subsequent requirement for shipowners to have hake catch quota to land it (Zilleruelo 2018). Since 2013 hake bycatches are allowed only against hake quota. However, between 2013 and 2015, during the implementation of the research programme on the reduction of discards, bycatches were allowed for the vessels participating in the programme (although they were thoughtfully recorded and reported by observers on board). However, until 2017 for most of the fishing companies targeting demersal crustaceans it was very difficult to have access to hake quota, since the existing hake quota was owned and consumed by the fishing companies targeting hake. This situation changed in 2018 when a new regulation established that 5% of the total hake quota shall be available to be purchased by fishing companies targeting demersal crustaceans, so they can cover their hake bycatches. AIP members (and all other main fishing companies targeting demersal crustaceans) has been purchasing hake quota in the annual tenders since then (see previous surveillance audit reports for the accountability of the purchases each year). These allocations will last for 15 years. Stakeholders feel that hake quota allocation to demersal crustacean fishing companies helps to improve the reporting of hake bycatches.

According to data presented in Zilleruelo et al 2021, the reported hake bycatch has increased substantially in the past two years (**Figure 7.3.1.3.7**). This bycatch increased by about 400% across both fleets in 2020 with 122 t and 7 t landed by the industrial and artisanal fleets respectively (Zilleruelo et al 2021).

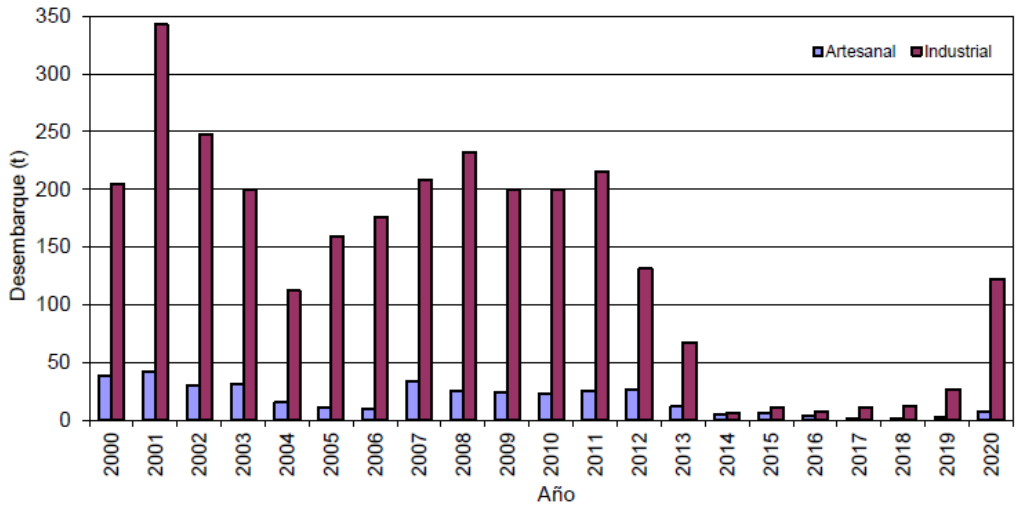


Figure 7.3.1.3.7. Annual series of landing of Chilean hake (t) as bycatch in the demersal crustacean fishery, by fleet during 2000-2020 based on official data from Control-quota SERNAPESCA Source: Zilleruelo et al 2020 Fig. 108.

A recent comparison of 2018 hake bycatch reported in the official data from the demersal crustacean industrial fishery (12 t) with that estimated from at-sea sampling (431 t) indicated that hake bycatch (mostly from the nylon shrimp fishery) was greatly underestimated in the official statistics (Zilleruelo 2019). The estimated hake bycatch based on observer data (**Figure 7.3.1.3.8**) has always exceeded that from the official statistics (**Figure 7.3.1.3.7**) by at least an order of magnitude since 2013. Estimated hake bycatch has declined from about 750-357 t during 2013-2017 (**Figure 7.3.1.3.8**) representing a decline from 6%-2%, as percentage of total catch from the directed hake fishery. This bycatch increased slightly, but not significantly to 2019 before decreasing by about half in 2020 (**Figure 7.3.1.3.8**). This is consistent with

the relative contribution to the total UoAs catches shown Tables 7.3.1.1.1 (for UoA1) and 7.3.1.1.2 (for UoA2). The information presented indicate that the level of reporting of hake bycatches and discards has improved in recent years. However, this might still not be 100% since the estimated catch in 2020 based on observer data (288 t, **Figure 7.3.1.3.8)** doubles that from the official statistics (127 t, **Figure 7.3.1.3.7**).

The observer-based CPUE fishery performance index declined greatly from 2013-2016 despite concurrent decline in observer-estimated landings (**Figure 7.3.1.3.8**). This CPUE abundance index increased substantially in 2018 despite a slight increase in landings. CPUE then declined to its lowest level in 2020 despite a great decrease in observer-estimated landings. This great decrease in CPUE contrasts the great increase in reported bycatch from the official statistics during 2018-2020 (**Figure 7.3.1.3.7)**. However, the drop in both indices (Catch and CPUE) in 2020 from the observer data (**Figure 7.3.1.3.8**) are not evident in the catch data from official statistics.

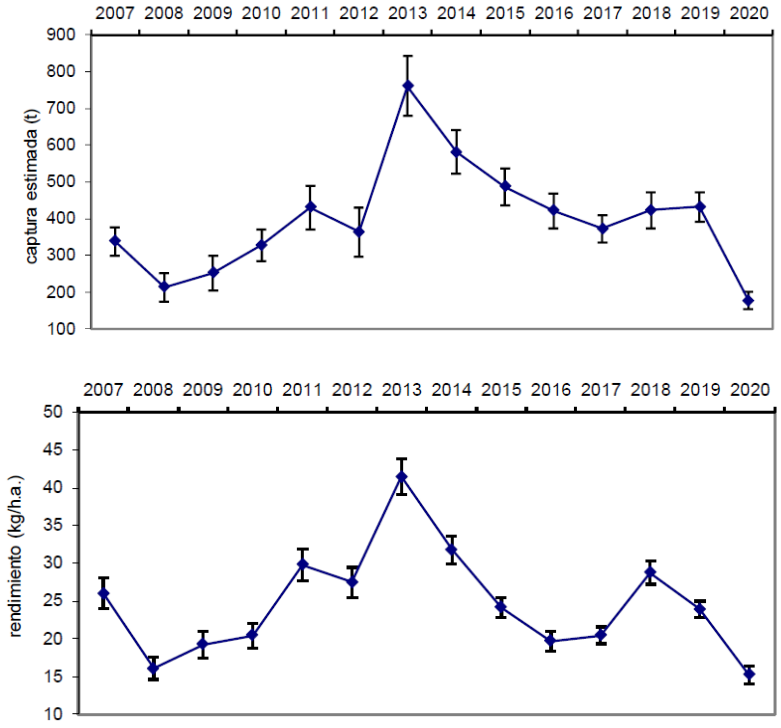


Figure 7.3.1.3.8. Estimated total catch of Chilean hake (above) and CPUE (below), caught as bycatch in the demersal crustacean fisheries; Industrial fleet IV-VIII Region, period 2007-2018. Source: Zilleruelo 2020 Fig 106 and 107.

III. Nylon shrimp:

Nylon shrimp caught as bycatch in fisheries targeting demersal crustaceans is subject to the specific measures adopted in the Plan for reduction of discards and interactions (approved by Res.EX.1106 del 29 de Marzo 2017). See section 7.3.1.2.I for details on these measures.

Information on the status and relevant management history for nylon shrimp is provided in **section 7.2.1**.

IV. Humbolt squid

This species is targeted, mainly since 2001, by artisanal vessels from the Regions of Coquimbo, Valparaíso, Maule and Biobio. Joint management for this species is being sought through the South Pacific Regional Fisheries Organization (SPRFMO) /Subpesca, 2021). However, up to date, this species is still managed as single (and separate) stock for the entire Chilean coast.

To assess the status of this stock a data-poor model (based on the hypothesis of a Chilean stock) is being used. This model uses the historical series of annual catches up to 2020. The estimated average biomass in 2020 was 239kt, which is 5% higher than in 2019. The most likely status for 2020 according to the model is overfished (0,77), followed by collapsed (0,19), similar to the previous year. See figure 7.3.1.3.9.

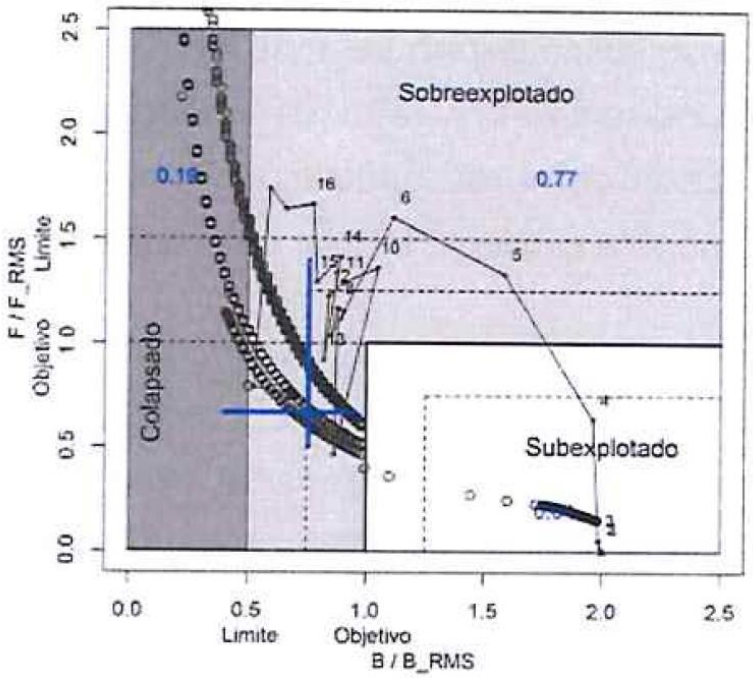


Figure 7.3.1.3.9. Diagram of the stock status of the Humbolt squid. Source: CCT-RDZCS Nº022/2020

The CCT-RDZCS determined that this resource is overexploited with positive signs of recovery (CCT-RDZCS Nº022/2020; Minutes CCT-RDZCS Nº05/2020). Besides, it was advised to maintain the status quo in relation to the CBA, since the CBA cannot be based on the output of the assessment model due to uncertainties. So, the quota for 2021 has been maintained at 200.000t (Des.Ex.Folio 202000130/2020).

V. Longnose skate (UP)

The CCT-RDZCS set in November 2020 the biological reference framework for the stock of this species located between the North of the Ñuble Region and parallel 41º28,6 L.S, known as UP (Unidad de Pesquería). The population located North of UP is not managed based on biological reference points.

According to the latest assessment performed by the IFOP F_{MSY}=0,064 and B_{MSY}=4687t. However, the CCT-RDZCS did based the advice on CBA on the outputs of the stock assessment due to the uncertainties in the information used (CCT-RDZCS Nº022/2020; Minutes CCT-RDZCS Nº05/2020). The CCT-RDZCS concluded that the stock is not in full exploitation, but it is not possible to ascertain whether it is overexploited or collapsed. The advised was to maintain the status quo, and the stock was considered as overexploited.

When caught as a bycatch in fisheries targeting demersal crustaceans, this species shall be returned to the sea following the detailed protocols adopted in R.Ex.2063/2020 to minimize post-capture mortality of chondrichthyans (see **section 7.3.1.4** for more details).

VI. Cardinalfish

The information below was extracted from Subpesca 2021.

This species is managed as a single stock from the Atacama Region to the Lagos Region. The management of the cardinalfish is based on the reference points adopted for demersal and deep-water species:

BD_{RMS}=0,40BD_0
F_{MSY}=F40%BD_{PR0}
$BD_{lím}$= 0,2BD_0

In 2012 it was determined that the SSB (BD) of the cardinalfish was around 600t, corresponding to only 4,7% of the SSB_0 (BD_0). This, the stock was classified as collapsed (**figure 7.3.1.3.10**). Besides, it was calculated that this species would require at least 81 years to recover, due to its longevity and slow growth rate[6]. Based on this, and the scarce knowledge on its stock structure and migration patterns, an extractive ban was adopted in 2010. Since then, the IFOP monitoring program for demersal and deep-water fisheries has been recording all cardinalfish bycatches, which has been regularly above the authorized level of 12t/year. Based on this fact, and considering that the extractive ban would expired on January 2021, in 2020 Subpesca requested to the CCT-RDAP to extend the extractive ban (D.Ex. Nº23/2016) for another five years. However, the CCT-RDAP refused to elaborate a technical report arguing that updated information on the status of this resource was a pre-requisite to elaborate a technical report. In accordance with Article 1ºC of the LGPA, which indicates that at the time of adopting management measures the precautionary approach shall be adopted,

[6] Based on this, the species was considered as 'less resilient' for this assessment.

Subpesca resolved to dispense the advise from the CCT-RDAP and extended the extractive ban on the cardinalfish for another 5 years through D.Ex.Nº03 of January 20, 2021.

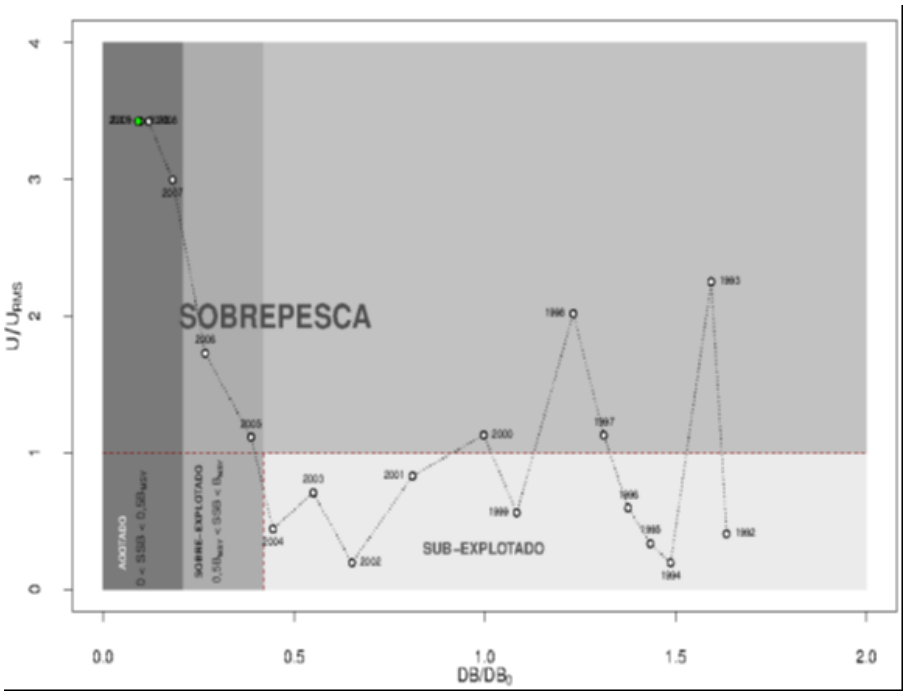


Figure 7.3.1.3.10. Status of the cardinalfish in 2012. Source: Subpesca 2012.

VII. Hoki

The information below was extracted from Subpesca 2021.

This species is managed as a single stock from the Valparaiso Region down to the southern tip of the Chilean coast (Magallanes and Chilean Antarctica Region). The management of the cardinalfish is based on the following reference:

$BD_{RMS}=0,40BD_0$
$BD_{lím}= 0,2BD_0$
$F_{MSY}=U_{45\%BDPR}$

The latest stock assessment found that there was 99,6% chances of the stock being collapsed, although overfishing was not taking place ($U<U_{MSY}$). Despite significant reductions of effort and catch rates have been implemented since 2013, the spawning biomass has continued to decreased. It is not clear whether this is due to environmental issues or problems in the assessment process.

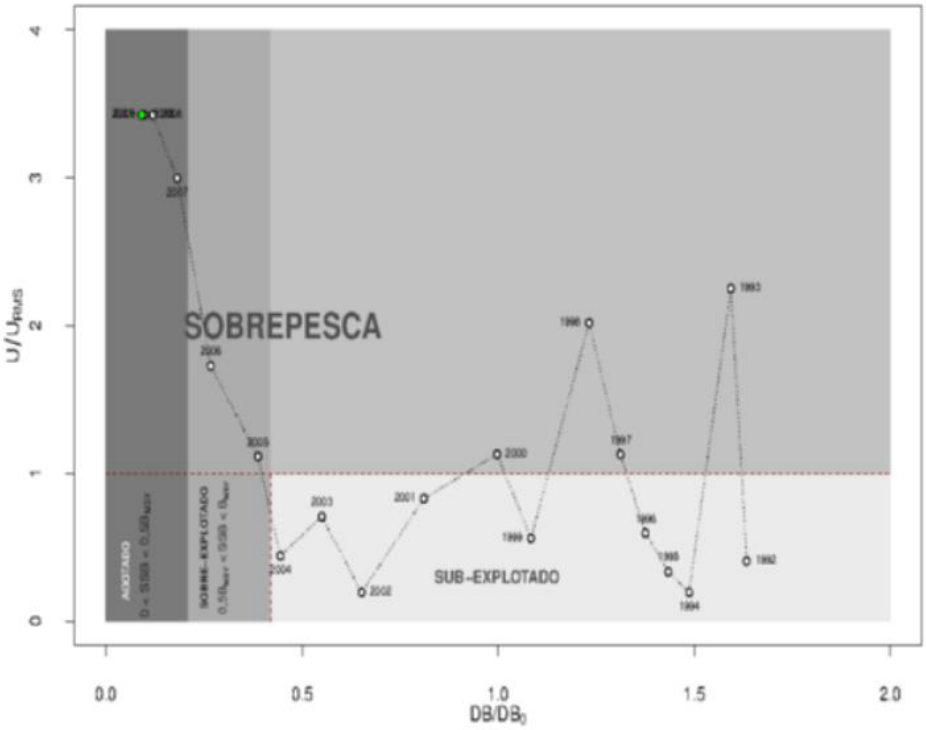


Figure 7.3.1.3.11. Status of the hoki in 2019. Source: Subpesca 2021

VIII. Chilean jack mackerel

Information presented below was extracted from Subpesca 2021.

This species is managed as a single stock from the Norther tip of the Chilean coastline (North of Region XV) down to the south of Los Lagos Region (Region X). A management plan was adopted for this stock (R.Ex.Nº4344/2017). The fishery targeting this stock along the Chilean coast is MSC-certified (https://fisheries.msc.org/en/fisheries/chilean-jack-mackerel-industrial-purse-seine-fishery/). The reference points adopted for managing this stock are presented below:

SSB_{MSY}=4.583.000t

SSBlim=1.146.000t

F_{MSY}=0,13 $year^{-1}$

On the 8th SC- SPFRMO meeting a statistical catch at age model was used to determine and update the Jack Mackerel stock status. In this framework the following reference points were calculated: proxy for SSBmsy= 5.500.000t, and a dynamic FMSY.

However, to determine the status of the stock, the CCT-J recommended to maintain the estimate of the reference points with a dynamic approach and not static as the one used by the SPRFMO. It was also determined that, in terms of management, any of the approaches (dynamic or static) does not alter the current status of the stock (see **figure 7.3.1.3.12**).

The stock shows signs of recovery since 2010, with a increasing trend for the SSB which is estimated to be above MSY levels, high recruitments and low F. Based on that, the CCT-J determined the stock to be not overfished and not subject to overfishing. The stock was classified as fully exploited (plena explotacion).

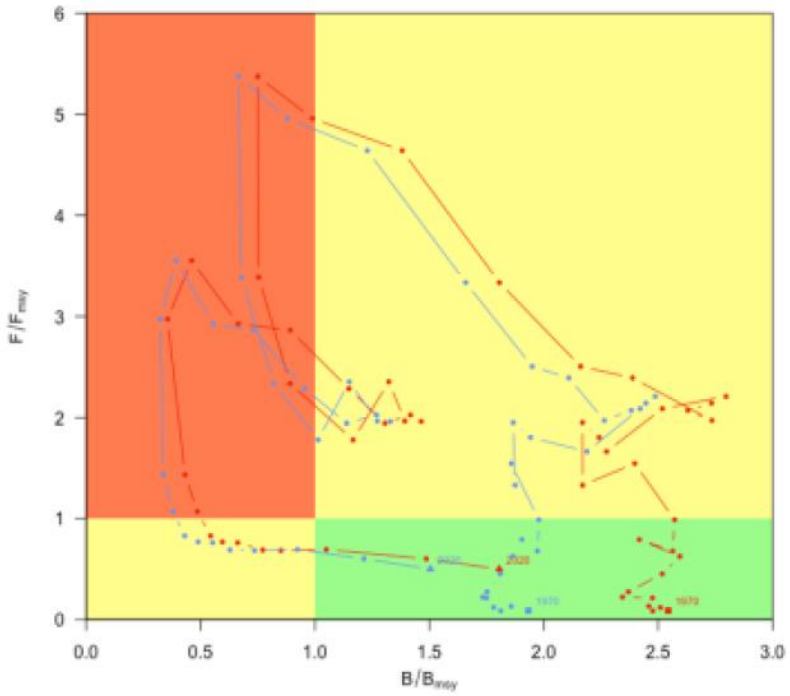


Figure 7.3.1.3.12. Kobe plot showing the estimated trajectory for the Chilean jack mackerel using both a dynamic approach (red line) and a static approach (blue line). Source: Subpesca 2021

7.3.1.4 Secondary species impacted by the UoAs

I. Information on the status:

A comprehensive list of all species impacted by all UoAs between 2016 and 2020 is presented in **section 7.3.1.1**. This list gets to 85 different species and taxa of cnidarians, crustaceans, echinoderms, cartilaginous fish, jawless fish and teleost in the case of UoA1 (fishery targeting nylon shrimp in ZCN and ZCS, while for UoAs6&7 (fisheries targeting yellow squat lobster in UPN) the list shortens to 19 species and taxa.

Among all these P2-species, only 3 species are at or above (in any year of the studied period) the designated threshold of 5% or 2% (for skates, rays, sharks and cardinalfish) to be classified as Main: Hooked tooth dogfish (*Aculeola nigra*), Aconcagua grenadier (*Coelorinchus Aconcagua*) and big-eye flounder (*Hippoglossina macrops*).

In 2019 and 2020, the relative contribution (in weight) of the hooked tooth dogfish to the total catch of UoA1 reached 1.5% (~2%), and 2.4% in the case of UoA2. So this species was classified as Main Secondary for the UoA targeting nylon shrimp (UoA1 and UoA2).

The relative contribution of the Aconcagua grenadier to the total catch of UoA1 between 2016 and 2020 has been consistently at or above 5%: 2015 (5.2%), 2017 (4.7%), 2018 (6.3%) and 2020 (4.5%). So this species was classified as Main Secondary for the UoA targeting nylon shrimp in ZCN and ZCS (UoA1).

The relative contribution of the big-eyed flounder to the total catch of UoAs6&7 reached 8.5% in 2020. Despite the annual contribution of this species since 2016 was always around 1-2%, the team decided to classify this species as Main Secondary.

No main secondary species were found to be impacted by UoA3, UoA4, UoA5 and UoA8.

There are no biologically based limits established and the status remain unknown for all these species and taxa, regardless of whether they were classified as main on minor. Therefore, all secondary species were classified as Data Deficient species according to FCR7.7.6, and RBF shall be triggered for assessing their status. However, PF4.1.4 allows the team to avoid conducting RBF on 'minor' species when evaluating PI2.1.1 or 2.2.1 as far as final PI score is adjusted downward according to clause PF5.3.2. Due to the high number of different taxa to be assessed as minor secondary species the assessment team decided to take this option. However, **RBF shall be triggered to assess the three main secondary species: Hooked tooth dogfish, Aconcagua grenadier and big-eyed flounder.**

II. Applicable management regulations:

The main management regulations applicable to assessed fishery in relation to these species are presented below:

a) Plan for the reduction of discards and interactions

The list of species subject to landing obligation is updated by the Subpesca on an annual basis. According to the latest update (R.Ex.Nº142/2021) some minor secondary species are subject to landing obligation (anguila babosa, anguilas, blanquillo, cabrilla, pez chancho, congrio negro, congrio colorado, congrio de profundidad, lenguado de ojo chico, reineta), while other shall be returned to the sea (all sharks, rays and skates, all benthic crustaceans, sponges, actinia, corals, starfish). Discarding of all remaining species is authorized.

In all cases discards shall be quantified, boxed and showed to the EMS before returning them to the sea (see **section 7.3.1.2.II** for more details on the applicable measures and code of best practices on board).

b) Regulation on mandatory return of benthic crustaceans in fisheries using trawl and longline

R.Ex. 28320 from August 16, 2019, sets that all benthic crustaceans caught by trawlers or longliners shall be returned to the sea. Furthermore, this regulation sets a handling protocol to minimize post-capture mortality on these species.

R.Ex.Nº142/2021 sets that all benthic crustaceans (armed box crab, Chilean lemon crab) caught by fisheries targeting demersal crustaceans shall be returned to the sea following the procedures set at this Regulation.

c) Regulation on mandatory return of all Chondrichthyes in fisheries using purse seine, trawl, longline and nets

R.Ex. 2063 from September 23, 2020, sets that all Chondrichthyes caught by vessels using different fishing gears (purse seine, trawl, longline, nets) shall be returned to the sea. Furthermore, this regulation sets a detailed handling protocol to minimize post-capture mortality on these species. The protocol is customized depending on the size of the specimens, classified as follows:

- Small: between 10cm and 1m
- Medium: between 1-1.6m
- Big: bigger than 1.6m

Also, specific best practices on board are detailed depending on the fishing gear.

R.Ex.Nº142/2021 sets that all sharks, rays, skates and quimeras caught by fisheries targeting demersal crustaceans shall be returned to the sea following the procedures set at this Regulation

7.3.1.5 ETP species impacted by the UoAs

A total of 8 ETP species have been identified to be impacted by vessels targeting demersal crustaceans (**table7.3.1.1.6**). The list includes one marine mammal, the South American sea lion (*Otaria flavescens*) and 7 seabird species: black-browed albatross, pink-footed shearwater; white-chinned petrel, Savin's albatross, Peruvian pelican, Masatierra petrel, Guanay cormorant

I. Applicable management regulations:

The applicable ETP national and/or international regulations for each of the 8 species was detailed in section 7.3.1.1.II. Besides, the main management regulations applicable to assessed fishery in relation to these species are presented below:

a) Plan for the reduction of discards and interactions

Out-of-scope species caught as bycatch in fisheries targeting demersal crustaceans is subject to the specific measures adopted in the Plan for reduction of discards and interactions (approved by Res.EX.1106 del 29 de Marzo 2017). See section 7.3.1.2.IV for details on these measures.

b) Resolution 2941/2019 setting measures to reduce incidental catches of seabirds on trawl fisheries

Resolution 2941 of August 28, 2019, sets measures to reduce incidental catches of seabirds on different trawl fisheries, including fisheries targeting demersal crustaceans. This Resolution entered into force 3 months after its publication.

Trawlers targeting demersal crustaceans shall adopt the following:

- Mitigation measures:
    - Bird scary lines
        - The two main bird scary lines shall cover a minimum of 10m after point where the cable touches the sea surface while trawling. These lines shall be made out of polypropylene, have a minimum length of 30m, and a diameter between 8 and 12mm.
        - In those vessels where the block for the cable is higher than 6m, the total length of the main bird scary lines shall have a ratio of 1:5 compared to that height.
        - The colors of the secondary lines shall rather be red, orange or yellow
        - The bird scary lines shall be set 2m above the block, and 2m at the side. It might be necessary to fix arms to extend the distance.
        - The secondary lines (streamers), flags…shall be double and placed a 1m from the stern, and then at regular intervals of 2.5m along all the length of the main bird scary line until it touches the sea surface.
    - Bird scary buffers

- These devices could be use instead of bird scary lines.
- The materials and colors of the secondary lines shall be the same as those described for the bird scary lines

- Best practices on board:
  - Cleaning of the nets before shooting. All remains from fish and other material shall be removed from the net before shooting.
  - Night hauls. Fishing operations performed at night and with low light will be excluded from the obligation to use bird scary lines or buffers
  - Discards handling. Discards allow in accordance with the plan for the reduction of discards and offals from cleaning the catches shall be thrown to the water in between hauls. To do so, discards shall be batched, crushed, and thrown beyond the point where the cable touches the sea surface, or they will be submerged.

Infractions against the measures detailed in this Resolution are to be sanctioned in accordance with the penalty procedure included in the LGPA.

II. Information on the status:

a) Black-browed albatross

The information presented below was extracted from the latest assessment available for this species: Birdlife International, 2018a[7]. This is the information used at the IUCN Redlist.

This species has an extremely large range, and hence does not approach the thresholds for Vulnerable under the range size criterion (extent of occurrence <20,000 km2 combined with a declining or fluctuating range size, habitat extent/quality, or population size and a small number of locations or severe fragmentation). The population size is extremely large, and hence does not approach the thresholds for Vulnerable under the population size criterion (<10,000 mature individuals with a continuing decline estimated to be >10% in ten years or three generations, or with a specified population structure). The population trend appears to be increasing, and hence the species does not approach the thresholds for Vulnerable under the population trend criterion (>30% decline over ten years or three generations). For these reasons the species is evaluated as Least Concern.

The species is threatened by current longline fisheries and the development of fisheries over much of the Patagonian Shelf, around South Georgia, off the southern African coast and in the Southern Ocean. It is one of the most frequently killed species in many longline fisheries including tuna longliners off southern Africa, the pelagic longline swordfish fishery off Chile and Argentine longliners targeting toothfish and kingclip on the Patagonian Shelf. Mortality in trawl fisheries has also been identified as a major source of mortality for this species over the Patagonian Shelf and South Africa and was previously estimated to result in minimum 5,000 individuals killed per annum across the deep-water hake trawl fishery in South African waters during winter. This threat has since been significantly reduced, largely due to the introduction and use of mitigation measures. In addition to the commercial longline fishery, this species was the second most frequently recorded bycatch in artisanal fisheries off the coast of Peru, suggesting that these poorly regulated fisheries represent a considerable threat to the proportion of the population that forages in the Humboldt current.

Climate change also poses a significant threat to the species. Studies showed that climatic fluctuations have a negative impact on survival. Positive sea-surface temperature anomalies at the species' wintering ground around Tasmania were identified to have a negative impact on breeding success, while positive sea-surface temperature anomalies had a positive effect.

b) Pink-footed shearwater

The information presented below was extracted from the latest assessment available for this species: Birdlife International, 2018b[8]. This is the information used at the IUCN Redlist

This species has a very small breeding range at only three known locations, which renders it susceptible to stochastic events and human impacts. Hence it is listed as Vulnerable. If invasive species, harvesting of chicks, bycatch in fisheries or other factors are found to be causing population declines, the species might warrant uplisting to Endangered.

Ardenna creatopus is an east Pacific seabird that breeds only on Robinson Crusoe and Santa Clara in the Juan Fernández Islands, and on Isla Mocha off the coast of Arauco, Chile. Recent evidence suggests a small colony on Isla Santa Maria in the Gulf of Arauco, Chile. These sites combined indicate around 30,000 breeding pairs, which would imply a maximum of 100,000 individuals

Interactions with fisheries potentially poses a major threat to this species. Birds have been found entangled in fishing gear near colonies and in the non-breeding range. The distribution of longline commercial fishing activities overlap both spatially and temporally with the species' wintering range over the continental shelf of North America, making the risk of interacting with the fishing fleet highly likely. Bycatch mortality has been recorded in artisanal fisheries off the coast

[7] BirdLife International. 2018a. Thalassarche melanophris. The IUCN Red List of Threatened Species 2018: e.T22698375A132643647. https://dx.doi.org/10.2305/IUCN.UK.2018-2.RLTS.T22698375A132643647.en

[8] BirdLife International. 2018b. Ardenna creatopus. The IUCN Red List of Threatened Species 2018: e.T22698195A132633266. https://dx.doi.org/10.2305/IUCN.UK.2018-2.RLTS.T22698195A132633266.en.

of Ecuador and Peru which are poorly regulated and consist of a considerable number of small longline vessels whose overall impact may exceed that of large-scale fisheries. In Chile, capture by small vessels represents at least 76% of the overall bycatch of this species.

Predation by cats and other small mammals on Robinson Crusoe and Mocha represents another significant threat.

Chicks are harvested by islanders on Mocha in the fledgling season (March-May), with an estimated 20% of all chicks (3000-5000) taken in 1998 (Guicking et al. 1999, CEC 2005). More recently, due to enforcement of the prohibition of chick harvest begun in 2011, the magnitude of the chick harvest has decreased considerably, but illegal poaching still seems to occur most years (ACAP 2018). Quantitative estimates of harvest rates are difficult to obtain (P. Hodum pers. comm.). In 2018, illegal hunting was reported from Isla Mocha with c. 300 individuals killed in one incident (ACAP 2018).

Plastic ingestion is widespread in the species, but there is no indication of what impact this currently has, or will have over the next three generations at either the individual or population level (P. Hodum in litt. 2017).

c) White-chinned petrel

The information presented below was extracted from the latest assessment available for this species: Birdlife International, 2018c[9]. This is the information used at the IUCN Redlist.

This species is classified as Vulnerable because of suspected rapid declines, although almost no reliable estimates of historical populations exist. Very high rates of incidental mortality in longline fisheries have been recorded in recent decades; the probability that these circumstances will continue, the susceptibility of chicks to predation, and the degradation of breeding habitat indicate that a rapid and on-going population decline is likely. An updated assessment of the population on South Georgia is needed in order to fully assess the overall trend.

The main threat faced by this species is high rate of incidental mortality in longline fisheries, although bycatch mitigation measures are returning a significant decrease in mortality.

d) Savin's albatross

The information presented below was extracted from the latest assessment available for this species: Birdlife International, 2018d[10]. This is the information used at the IUCN Redlist.

This species may have undergone a rapid decline, but different census methods make a comparison of the available data potentially misleading. However, breeding is largely restricted to one tiny island group, where it is susceptible to stochastic events. It is therefore classified as Vulnerable.

Thalassarche salvini breeds on the Bounty Islands (nine islands and islets), Western Chain islets (Snares Islands), and The Pyramid and The Forty-Fours (Chatham Islands), New Zealand, and has bred at least once on Ile des Pingouins.

In 2014, there were 39,995 breeding pairs on the Bounty Islands, which represents 99% of the global population; this is equivalent to 79,990 mature individuals, or roughly 110,000 total individuals. Due to methodological differences, it is not possible to combine all data sets and further studies using the same methodology is necessary to assess the population trend

Incidental capture by commercial longline and trawl fisheries poses a significant threat to the species. Salvin's Albatross constituted approximately 15% of the 247 albatrosses returned by New Zealand fisheries observers in the period 1996-2005, with 150 killed in longlines and 197 in trawls. Limited data indicates that T. salvini are also killed in the pelagic longline fishery operating off the coast of Chile, targeting Swordfish Xiphias gladius, with most mortality likely to be adults.

e) Peruvian pelican

The information presented below was extracted from the latest assessment available for this species: Birdlife International, 2018e[11]. This is the information used at the IUCN Redlist.

Although the population of this species is now stable or perhaps even increasing, it is likely to still be recovering after dramatic declines in the El Niño year of 1998. It could suffer similar declines in the future if conditions were repeated, for these reasons it is classified as Near Threatened.

This species is restricted to the coast of central Peru and Chile. A new register at Isla Foca (Northern Peru) extends its breeding range. Although the population may currently exceed 500,000 mature individuals, this is a fraction of former numbers and numbers fluctuate greatly in association with El Niño Southern Oscillation, and with numbers of schooling anchoveta. It is likely to have been as badly affected by the El Niño event of 1998 as other Humboldt Current species

[9] BirdLife International. 2018c. Procellaria aequinoctialis. The IUCN Red List of Threatened Species 2018: e.T22698140A132628887. https://dx.doi.org/10.2305/IUCN.UK.2018-2.RLTS.T22698140A132628887.en

[10] BirdLife International. 2018d. Thalassarche salvini. The IUCN Red List of Threatened Species 2018: e.T22698388A132644161. https://dx.doi.org/10.2305/IUCN.UK.2018-2.RLTS.T22698388A132644161.en

[11] BirdLife International. 2018e. Pelecanus thagus. The IUCN Red List of Threatened Species 2018: e.T22697619A132596827. https://dx.doi.org/10.2305/IUCN.UK.2018-2.RLTS.T22697619A132596827.en.

such as Inca Tern (*Larosterna inca*), and although the population is thought to be increasing, declines over 36 years (three generations) are thought to have been in the region of 10-19%.

Large-scale harvesting of aquatic resources caused dramatic declines in abundance in the past by limiting prey availability, especially due to competition with the fishery for anchovies. Bycatch of pelicans by small-scale subsistence fishermen is an ongoing threat, but only affects a minority of the population and has negligible effects on its abundance.

f) Masatierra petrel

The information presented below was extracted from the latest assessment available for this species: Birdlife International, 2018f[12]. This is the information used at the IUCN Redlist.

This species qualifies as Vulnerable because it has a very small breeding range at three or four locations, and is therefore susceptible to stochastic events or human impacts. It is likely to have been extirpated from one island some time ago, but the bulk of the population is presumably stable.

While the majority of the breeding population appear to be on predator-free islands the presence of cats, coati and rats may continue to prevent recovery on Robinson Crusoe and cats have caused extensive mortality on San Félix. Rats are present on many islands but it is unclear whether they are causing declines. Goats are present on San Ambrosio, but their impacts on the species are unknown.

g) Guanay cormorant

The information presented below was extracted from the latest assessment available for this species: Birdlife International, 2018g[13]. This is the information used at the IUCN Redlist.

This species is suspected to have experienced moderately rapid declines in the past three generations (33 years), and as a result it is classified as Near Threatened.

Phalacrocorax bougainvilliorum is found along the Pacific coast of Peru and northern Chile. From historical times the Guanay Cormorant has been the dominant avian species in the Peruvian Coastal Current in terms of numbers and consumption of marine resources. The population in Peru was estimated as <4 million birds during the period 1909-1920; 21 million were estimated in 1954 and 3.7 million were estimated on the north-central Peruvian coast in 1996. Mass dispersal, breeding failures and temporary declines have resulted periodically from El Niño Southern Oscillation (ENSO) events, and both fish-stocks and the populations of seabirds that depend on them are adapted to these fluctuations. Although the species is now protected in Peru, and the guano industry is adequately regulated, there are concerns that this species has been badly affected by the ENSO event of 1998, and that declines now approach 30% over three generations (33 years in this species).

Several threats result from the seabird-fishery interactions, including bycatch, resource competition and direct persecution. The global extent of bycatch has not been quantified but is thought to affect a majority of the population. The Guanay Cormorant preys almost exclusively on anchovies and is therefore vulnerable to competition for food with the industrial fishery, resulting in food limitation. Studies found that the proportion of anchovy biomass removed by fishing is negatively correlated to the abundance of Guanay Cormorants. Direct persecution for consumption still represents a threat with around 20,000 birds taken annually in Northern Peru.

Climatic fluctuations associated with El Niño Southern Oscillation (ENSO) also threaten the species. The 1982-83 El Niño caused total reproductive failure and the death of an estimated 1.7 million adult birds in study sites on the Peruvian coast, resulting in a sharper population decline than any of the other studied species. Communal diving behaviour and the need to exploit large water columns simultaneously may explain why the impacts of El Niño are particularly severe for this species. ENSO is a naturally occurring phenomenon and population recovery following previous declines suggest the species has a certain capacity to cope with periodical population crashes. However, the frequency of ENSO events is expected to increase in concord with future climate change and adverse climatic conditions operating in synergy with an intensified industrial fishery and compromised food availability could exhaust the species' adaptive capacity.

Extensive guano mining in the 19th century caused severe population declines through high levels of constant disturbance, habitat conversion and direct exploitation. Unrestrained guano extraction on breeding islands displaced large numbers of birds and caused the loss of entire colonies. Exploitation of guano is still ongoing, but at a much smaller scale and within regulatory frameworks.

h) South American sea lion

South American Sea Lion numbers are high in most of their entire geographical range (see **figure 7.3.1.5.1**) and trends are positive for some of the most important local populations (Cardenas-Alayza et al., 2016)[14].

[12] BirdLife International. 2018f. Pterodroma defilippiana. The IUCN Red List of Threatened Species 2018: e.T22697990A132617737. https://dx.doi.org/10.2305/IUCN.UK.2018-2.RLTS.T22697990A132617737.en.
[13] BirdLife International. 2018g. Leucocarbo bougainvilliorum. The IUCN Red List of Threatened Species 2018: e.T22696810A133553624. https://dx.doi.org/10.2305/IUCN.UK.2018-2.RLTS.T22696810A133553624.en.
[14] Cárdenas-Alayza, S., Crespo, E. & Oliveira, L. 2016. Otaria byronia. The IUCN Red List of Threatened Species 2016: e.T41665A61948292. https://dx.doi.org/10.2305/IUCN.UK.2016-1.RLTS.T41665A61948292.en.

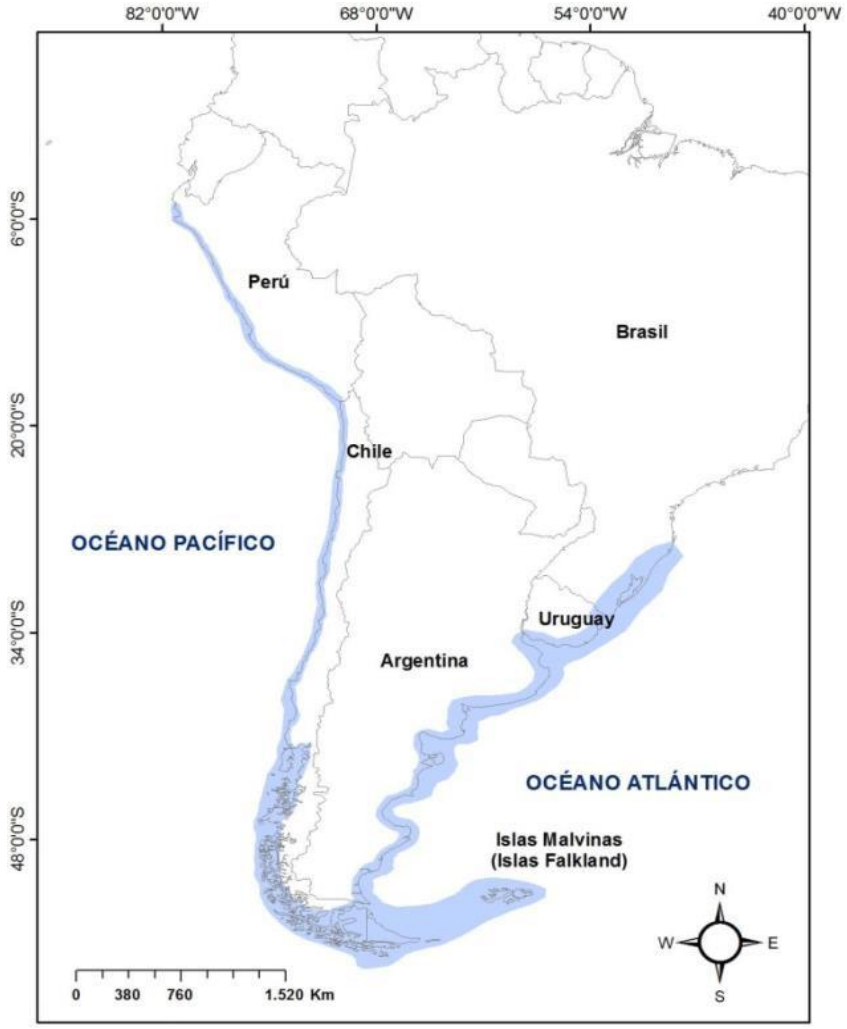


Figure 7.3.1.5.1. Geographical distribution of the South American sea lion. Source: Oliva et al (2020).

In Peru, Sea Lions continue to recover from the strong El Niño event of 1997/98 and could decline dramatically again with the next ENSO (Cardenas-Alayza et al., 2016). Uruguayan populations are in decline for reasons that are not well known (Cardenas-Alayza et al., 2016). A total of 222,500 mature individuals were estimated, and the Chilean population was estimated at 197,000 animals (Cardenas-Alayza et al., 2016). Most subpopulations in the southwestern Atlantic Ocean are increasing, although the trends are not homogeneous (Cardenas-Alayza et al., 2016). For instances, in the Northern Chile the populations are increasing, whereas the trend is unknown for Central and Southern Chile. Globally, the South American Sea Lion does not meet any IUCN criteria for a threatened listing and should remain classified as Least Concern (Cardenas-Alayza et al., 2016).

Oliva et al (2020) reports the latest estimate available for the Chilean population of the South American sea lion. This study was performed as a FIPA project 2018-14. The aim of this study was to estimate the abundance and distribution of this species and also of South American fur seal (*Arctocephalus australis*) during the summer season between the Arica and Paricota Region and the Aysén Region to assess the effect of incidental catches of the fisheries operating in these Regions. To do so, aerial surveys were complemented with drone flights, land-based observations and observations at sea performed between February and March 2019.

In the case of the South American sea lion, the number of colonies was: 78 in the Northern Zone (Regions of Arica & Parinacota, Tarapacá, Antofagasta, Atacama and Coquimbo), 272 for the Central Zone (Regions of Valparaiso, O'Higgins, Marule, Biobio and Araucaria) and 71 in the Southern Zones (Regions of Los Rios , Los Lagos and Aysén). This means that the number of colonies in the Northern zone has been stable since the previous survey, in the Central zone was the first survey performed, and in the Southern zone the number of colonies increased from 2 in 1998 to 19 in 2019 (Oliva et al., 2020).

Results presented in Oliva et al (2020) gives an estimated population of sea lions of 128,070±631 animals (40,2448±3,129 in the Northern zone, 22,696±325 in the Central zone and 65,135±2,913 in the Southern zone) during the summer season.

III. Information on the impact of the fisheries targeting demersal crustaceans

As detailed in Escobar et al 2019, observation and recording protocols used were developed through a process guided by IFOP researchers and feedback from the observers, based on protocols used in similar fisheries. The most relevant factor for the development of the protocols was the balance between the safety of the observers and the access to a proper place to observe during hauling. Escobar et al 2019 also confirms that scientific observers were trained to identify out-of-scope specimens according to the protocols developed, and details that the training included two types of instruction: (i) courses implemented by national experts and (ii) implementation of internal workshops for discussion. During the species identification courses, the observers were instructed in the use of identification guides. As reference material for the recognition of birds, the “Atlantic Seabird Photographic Identification Guide” was used. In addition to the "Identification guide for captured seabirds, updated in August 2015" (ACAP, 2017). On the basis of these guides and assistance of the Albatross Task Force - Chile, an adaptation was made, giving as a final product the "Guide for the Identification of Procellariiformes and other common seabirds in fishing areas of the Chilean sea". For the identification of marine mammals, Carwardine 1995 was used as the reference document. While the visual guide Reyes and Hüne 2015 served as supporting document, in addition to a cetaceans and pinnipeds identification chart prepared by EUTROPIA.

The hauls monitored for interactions with out-of-scope species are randomly selected considering at least a minimum of 10% of the sets of the trip. Normally the observation period lasts at least 15 minutes, allowing to observe more than 50% of the hauling process (Roman et al 2020). Records, in the case of birds, include those specimens that were caught by the net or got entangled in the cable. For mammals, records correspond to those specimens that got entangled in the net or captured within the codend. For both groups of animals, the identification, quantification and condition of the specimens is recorded, making the difference between alive and dead specimens. Serious injuries that can be seen with naked eye, such as broken wings or broken beaks in the case of birds, or injuries impeding mammals to swim, were considered as ‘dead’.

Despite the fact that during 2019 there was a reduction in the number of vessels and fleet trips, the observation coverage remained at 12% (% observed hauls) (**Table 7.3.1.5.1**). However, in 2020 observer coverage get down to 15% of the fishing trips and 8% of the hauls due to the pandemic. The number of observed vessels has remained constant over the years (between 83 and 100% of the entire fleet).

During 2020, the demersal crustacean fleet maintained its historic operation, distributed mainly between 29°S and 37°S. although the main fishing effort concentrated between North of the Coquimbo Region and North of the Bío Bío Region (**Figure 7.3.1.5.1**). **Figure 7.3.1.5.2** shows the spatial coverage in relation to the observation effort devoted to incidental interactions between 2016 and 2018. Results clearly shows that incidental catches have been sampled along the entire latitudinal extension of the area where the fleets are operating, between the Atacama region (~ 28°S) and the Biobío region (37°S).

Table 7.3.1.5.1. Annual indicators of the observation for incidental interactions in the demersal crustacean fishery, period 2016-2019. Source: Escobar et al 2021.

Año	Operación anual (*)		Datos observados				Estimados poblacionales		Coberturas de observación		
	Barcos	N° viajes Totales	Barcos Obs.	Viajes Observados	Esfuerzo (h/arr)	Lances	Esfuerzo total (h/arr) (SD)	Lances totales estimados (SD)	Viajes (%)	Lances (%)	Esfuerzo (%)
2016	18	1.637	15	201	1.982	810	32.786 (1,26)	10.482 (451)	12	8	6
2017	18	1.484	16	244	1.890	817	32.045 (756)	10.570 (315)	16	8	6
2018	17	1.507	15	297	2.714	1.209	28.063 (718)	10.224 (291)	20	12	10
2019	15	1.265	15	312	2.990	1.347	25.445 (576)	10.927 (226)	25	12	12
2020	23	1.276	15	191	1.523	727	20.842 (806)	9.279 (283)	15	8	7

* Información Sernapesca

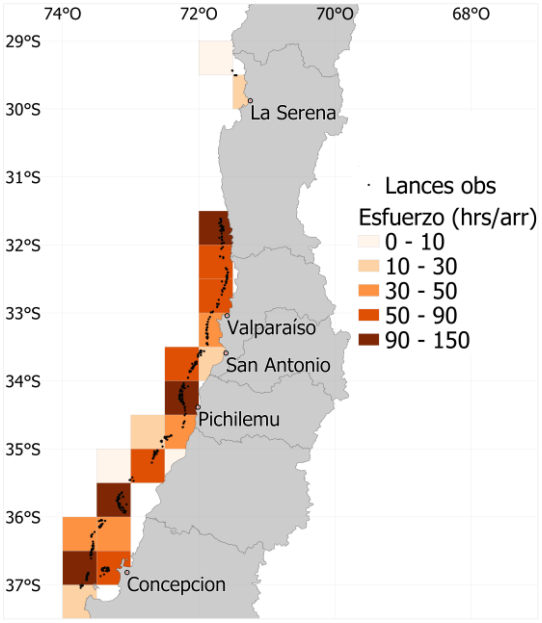


Figure 7.3.1.5.1. Distribution of total fishing effort (trawling hours.) Per square (0.5 degrees) of the observed hauls for bycatch incidental interactions in the demersal crustacean fishery, year 2020. Source: Escobar et al 2021.

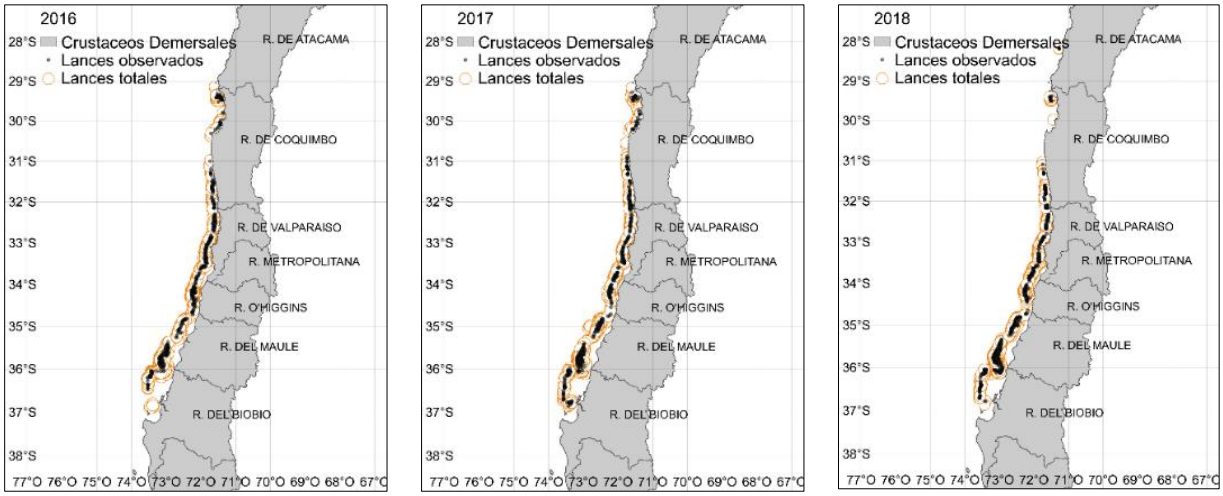


Figure 7.3.1.5.2. Distribution of total fishing effort in trawling hours represented by the orange circles of the observed hauls for bycatch incidental interactions (black dots) in the demersal crustacean fishery, year 2019. Source: Roman et al 2019.

Information on the interactions with out-of-scope species is presented at the annual reports on the monitoring of the fisheries targeting demersal crustaceans prepared by IFOP. However, this information is limited to the observed interactions (no scaled-up estimates and/or spatial-temporal analyses), since this information will be further reviewed and analyzed at the annual reports on the monitoring of the research program to reduce discards and incidental catches, which are normally published later.

The annual report on the monitoring to reduce discards and incidental catches published in 2019 (Escobar et al 2019) compiled all the incidental interactions occurred between 2015 and 2018 (a total of 3701 observed hauls) and provides spatial-temporal analyses of the interactions and estimates on the incidental of incidental catches and mortalities of seabirds and sea lions for all the demersal crustacean fishing operations (including the nylon shrimp). To validate the information recorded and adjust previous estimates, an exhaustive review of the observer logs and databases collected between 2013 and 2018 was carried out in 2019 (Escobar et al 2019). Although information was available since 2013, data before 2015 were not used for the estimates, due to the low number of observations available for those years. Although no new estimates for birds were made in 2020 due to the few interactions recorded, the estimates of interactions with sea lions were updated in 2020 (Roman et al 2020).

a) Impacts on seabirds

Escobar et al 2019 shows a low interaction between the UoA and the seabirds during the period 2015-2018 (**table 7.3.1.5.2**). 43% of the incidental catches with seabirds (and 47% of the mortality) corresponded to the pink-footed shearwater.

Table 7.3.1.5.2. Total incidental catches (CIT, total number of seabirds caught) and total mortality of seabirds (MORT, total number of dead seabirds) in the demersal crustacean fishery (CRU) between years 2015-2018 Source: Escobar et al 2019

	Nº total birds caught	%	Nº dead birds	%
Black-browed albatross	4	19%	2	12%
Pink-footed shearwater	9	43%	8	47%
White-chinned petrel	1	5%	0	0%
Savins Albatross	2	10%	2	12%
Pelicano peruano	3	14%	3	18%
Masatierra petrel	1	5%	1	6%
Guanay cormorant	1	5%	1	6%
TOTAL	21		17	

Give **Table 7.3.1.5.3** shows that incidental catch rate of seabirds for the entire Chilean fleet targeting demersal crustaceans was estimated at 0,006 seabirds/haul (SD±0,11) for the period 2015-2018, while mortality rate was estimated at 0,005 seabirds/haul (SD±0,10). Incidental catches and mortality of pink-footed shearwater was estimated at 0,002 individuals/hauls.

Table 7.3.1.5.3. Descriptive incidental catches and mortality by fishing haul in the demersal crustacean fishery between the years 2015-2018. The range (min and max), total number of individuals ('Suma'), average rate per haul ('Tasa promedio'), standard error (EE), variance (Varianza), standard deviation (DE) and coefficient of variation (Coef.var) are shown for total catch of individuals (CIT), total mortality (MORT), pink-footed shearwater incidental catches (PISHC) and pink-footed shearwater mortality (PISHM) by fishing haul. Additionally, the confidence interval (L-lower range value; U-upper range value) for each value is shown after 1000 re-samples (bootstrap). Source: Escobar et al 2019

	CIT	L	U	MORT	L	U
N lances	3701			3701		
Min	0			0		
Max	5			5		
Suma	24	9	35	18	4	28
Tasa promedio	0.006	0.002	0.009	0.005	0.001	0.008
EE	0.002	0.000	0.002	0.002	0.000	0.002
Varianza	0.012	0.000	0.020	0.010	0.000	0.018
DE	0.109	0.000	0.142	0.101	0.000	0.135
Skewness	30.009	24.183	48.207	35.834	28.992	57.814
Coef. var	1678.66	1182.57	2168.28	2081.31	1318.66	2770.35
	PISHC	L	U	PISHM	L	U
N lances	3701			3701		
Min	0			0		
Max	5			5		
Suma	9	4	17	8	4	15
Tasa promedio	0.002	0.001	0.005	0.002	0.001	0.004
EE	0.001	0.000	0.002	0.001	0.000	0.002
Varianza	0.008	0.000	0.015	0.008	0.000	0.015
DE	0.088	0.000	0.124	0.087	0.000	0.122
Skewness	50.247	39.658	79.046	52.553	44.269	82.168
Coef. var	3639.24	1194.90	5129.65	4023.21	1962.84	5748.91

In Escobar et al 2019 different modellings for determining spatial-temporal patterns in the incidental interactions with seabirds were explored both for the fishery targeting Chilean hake and the fisheries targeting demersal crustaceans. In the case of the fisheries targeting demersal crustaceans, given that the number of sets with interactions was low (which affected the convergence of the statistical models evaluated) only the probability of bycatch of birds (at least one individual) per fishing set was modeled, using a binomial distribution and a logistic function. As candidate predictive variables, it was incorporated; set year (factor; 2015-2018), set month (factor), set time, set latitude (decimal degrees), set longitude (decimal degrees), haul time (min), trawling speed (knots), total catch weight (log ton), set discard (log ton). For the variables latitude, longitude and time of the set, a non-linear function of cubic splines was used smoothed. However, due to the low number of sets with bycatch (N = 20), for this fishery the best model (binomial distribution modeling the probability of bycatch, see methods) had only one intercept (i.e. average). All candidate explanatory variables were discarded during the automatic selection process.

Observed interactions in 2019 and 2020 for the fisheries targeting red and yellow squat lobster were null (see **table 7.3.1.1.3**), and in the case of the nylon shrimp fishery remained very low. Thus, the historical review of incidental catches presented Escobar et al 2019 has not been updated in the most recent reports prepared by IFOP.

b) Impacts on the South American sea lion

As explained in **section 7.3.1.1.l**, the South American sea lion is the only species of marine mammal observed to interact with the fleets targeting demersal crustaceans. This is confirmed by the latest report on the monitoring of the plan to reduce discards (Escobar et al 2021).

Figure 7.3.1.5.3 shows the sampling effort and incidental catches of sea lion observed on board vessels targeting demersal crustaceans between 2015-2019. **Figure 7.3.1.5.4** shows that interactions normally occur during the second half of the year. However, some of the interactions recorded in 2020 occurred during the first half of the year.

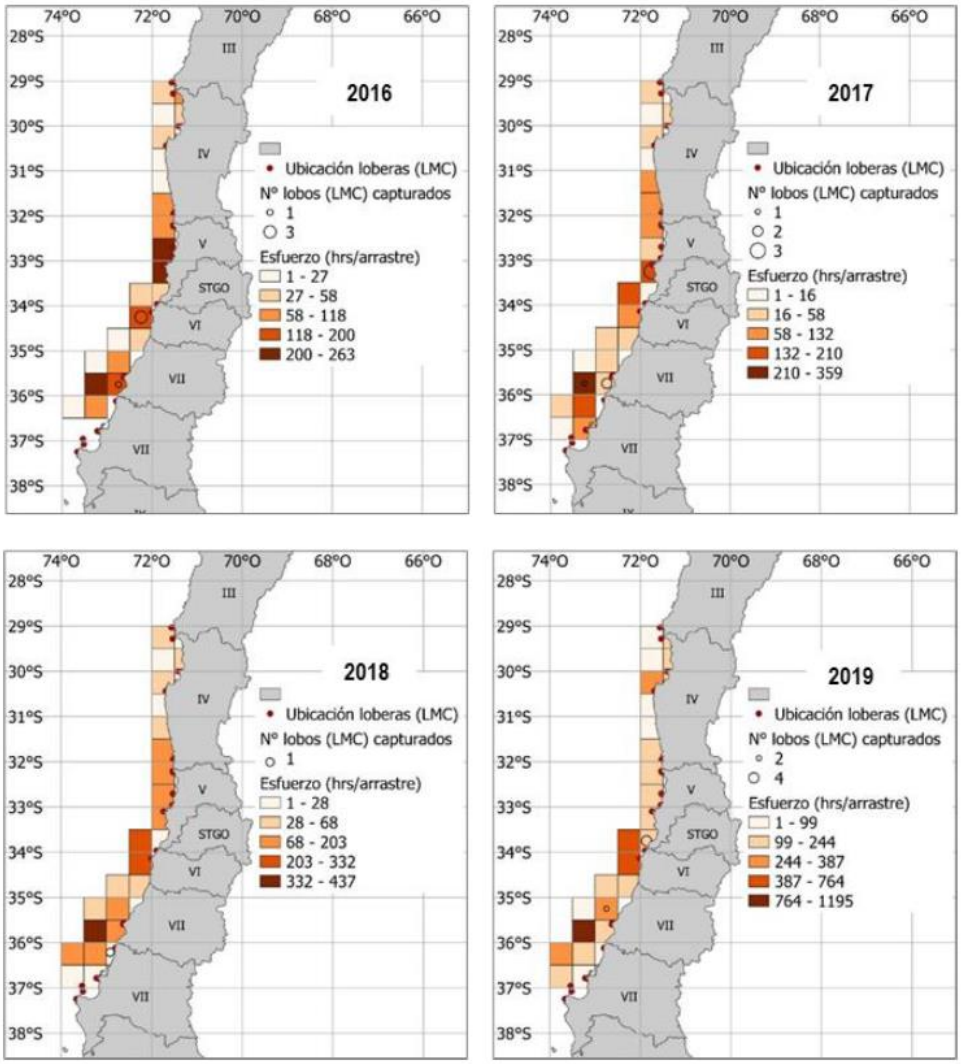


Figure 7.3.1.5.3. Historical series of maps showing sampling effort and incidental catches of sea lion observed on board vessels targeting demersal crustaceans between 2015-2019. Source: Roman et al 2020.

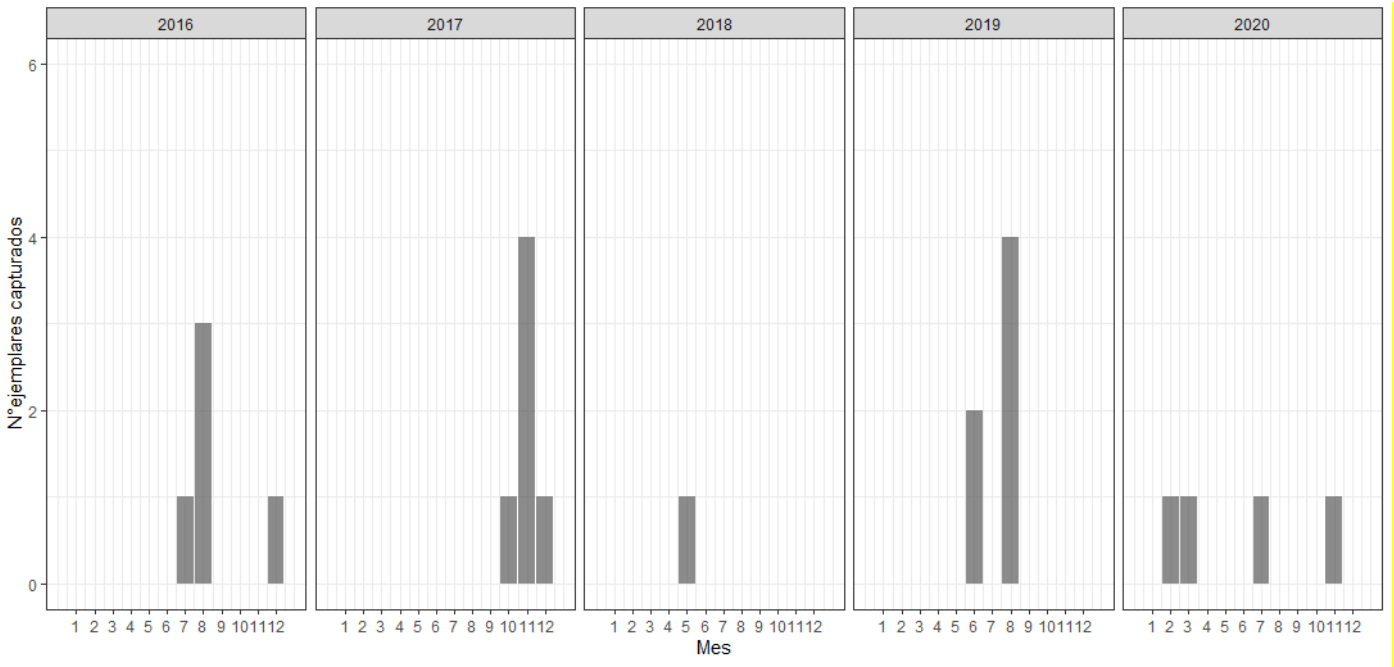


Figure 7.3.1.5.4. Incidental monthly catches (Nº) with sea lions observed on board vessels targeting demersal crustaceans between 2016 and 2020. Source: Escobar et al 2021.

Estimates of the total number of sea lions incidentally caught by the fisheries targeting demersal crustaceans have varied a lot between 2016 and 2020 (from 10 to 105, or from 7 to 70 depending on the model used). However, results from 2019 and 2020 indicate an average of around 40 sea lions impacted per year (**table 7.3.1.5.4**).

The incidental catch rate for the Chilean fleet targeting demersal crustacean between 2016-2020 ranged between a minimum of 0,0001 ind/haul (in 2018) and maximum of 0,007 ind/haul (in 2016), regardless of the methodology used (**table 7.3.1.5.4**).

Mortality rate in 2020 decreased significantly, being estimated at around 10 specimens (**Table 7.3.1.5.5**). It is worth mentioning that, even though there was a decrease in coverage of trips and sets, the CVs for all catch estimates remained around 50%. However, for mortality estimates the CVs increased, exceeding 94%. This could be attributed to the fact that interactions events, especially resulting in death, are infrequent or rare in this fishery.

Half of the observed interactions resulted in fatalities (11 out of 22). However, estimated mortality rate varies 40 and 43% depending on the methodology used.

Table 7.3.1.5.4. Estimates of sea lions impacted (Nº) by vessels targeting demersal crustaceans, based on Simple Random Sampling (MAS) with ratio estimator and also based on sampling by conglomerates using means estimator. CV (coefficient of variation) and CI (confidence intervals) with lognormal approximation for the ratio estimator, period 2016-2020. Source: Escobar et al 2021.

			MAS					Sampling by conglomerates				
			Ratio estimator					Means estimator				
Year	Species	Observed catches	Rate	CV rate (%)	N	CV N (%)	Linf-Lsup	Rate	CV rate (%)	N	CV N (%)	Linf-Lsup
2016	*Otaria flavescens*	5	0,007	43	105	43	47-236	0,007	51	70	51	1-139
2017		6	0,006	39	94	39	44-197	0,005	44	49	44	7-92
2018		1	0,001	94	10	94	2-45	0,001	92	7	93	0-21
2019		6	0,003	54	42	54	16-114	0,003	52	28	52	0-55
2020		4	0,003	48	41	48	17-99	0,005	51	48	51	0-96

Table 7.3.1.5.5. Estimates of dead sea lions (Nº) as a result of being caught by vessels targeting demersal crustaceans, based on Simple Random Sampling (MAS) with ratio estimator and also based on sampling by conglomerates using means estimator. CV (coefficient of variation) and CI (confidence intervals) with lognormal approximation for the ratio estimator, period 2016-2020. Source: Escobar et al 2021.

			MAS					Sampling by conglomerates				
			Ratio estimator					Means estimator				
Year	Species	Observed fatalities	Rate	CV rate (%)	N	CV N (%)	Linf-Lsup	rate	CV rate (%)	N	CV N (%)	Linf-Lsup
2016	*Otaria flavescens*	2	0,003	68	42	68	13-141	0,003	69	29	69	0-67
2017		2	0,002	68	31	68	9-105	0,001	67	16	67	0-36
2018		0	0,000	-	0	-	-	0,000	-	0	-	-
2019		6	0,003	54	42	54	16-114	0,003	52	28	52	0-55
2020		1	0,001	96	10	96	2-50	0,001	94	9	94	0-25

7.3.1.6 Habitats

Impacts of trawling depend on type of substrate trawled and degree of contact with the seafloor. Area impacted by fishing is a function of width of the trawl and distance towed. According to FAO (2007) when bottom trawl gear is used on sandy seabed impacts can be minimal; otter boards scar the seabed and trawl sweeps only smooth the seabed removing small seafloor forms that are regenerated in a relatively short time period. However, when used on hard, gravel, cobble, and boulder substrates, trawls will roll-over larger rocks, and scrape off attached, emergent, epibenthic organisms including sponges and corals. Impacts of bottom trawling depend also on gear design, how the gear is operated, and fishing intensity.

I. Characterization of marine habitats encountered by Chilean fisheries targeting demersal crustaceans

Distributions of the demersal crustacean populations are associated with substrate types and Equatorial Sub-superficial (AESS) and Intermediate Antarctic Water (AIA) (Melo et al 2007). The area where the fisheries operate off Central Chile is influenced by the Humboldt Current and is a typical upwelling ecosystem with high level of primary production. Sediment composition is characterized by large amounts of organic matter. Sediments, dominated by sand and mud, show latitudinal and longitudinal variation depending on extent of the continental shelf, seafloor morphology (presence of canyons), continental inputs, water column production, and fauna associated with the seafloor (Melo et al 2007). Other characteristics are determined by contribution of rivers, weather and type of material transport.

Melo et al (2007) reviewed available information on habitat and communities associated with seafloor, and conducted a survey to investigate habitat and assemblage distributions. Sampling covered the latitudinal range where the vessels targeting demersal crustaceans operate and also most of the depth range (from 29ºS to 39ºS and between 100 and 500 m depth). Melo et al (2007) analyzed the characteristics of the superficial marine sediments in 8 sectors from North to South along the Chilean coast, considering the predominance of the mean diameter of the sediment, degree of selection and content of organic matter expressed in percentages (%). Results presented in **table 7.3.1.6.1** show that the substratum is dominated by mud (<0.1mm particle diameter) and fine sediments (0.1-1mm).

Table 7.3.1.6.1 Granulometric characteristics and content of Organic Matter in sediments of the 8 zones sampled by Melo et al (2007).

(a) Zone 1

		Peso (g)								Diametro		G. S.	Clasificación		Materia Orgánica	
Est.	Z (m)	-1	0	1	2	3	4	4,45	Platina	ø medio	mm	σ	Arena	Selección	(mg/g)	%
1	113	0.00	0.04	1.30	19.37	38.52	27.86	4.99	7.31	2.82	0.142	1.02	Fina	Poco seleccionada	43.90	4.39
2	236	0.20	0.14	0.45	1.05	49.94	36.88	0.85	0.46	2.95	0.129	0.46	Fina	Bien seleccionada	93.40	9.34
3	383	0.00	0.07	0.03	0.16	1.44	9.62	5.25	1.02	3.77	0.073	0.58	Muy Fina	Moderadamente seleccionada	55.00	5.50
4	355	0.24	0.24	0.72	19.06	54.56	23.55	1.23	0.33	2.55	0.170	0.66	Fina	Moderadamente seleccionada	48.10	4.81
5	454	0.59	0.25	0.53	5.92	27.22	56.19	6.20	2.85	3.15	0.113	0.74	Muy Fina	Moderadamente seleccionada	52.50	5.25
6	123	4.53	5.37	58.11	53.68	15.84	12.24	1.76	1.13	1.37	0.388	1.09	Mediana	Poco seleccionada	47.00	4.70
7																
8																
9	286	10.24	1.24	13.77	18.67	73.60	35.25	2.88	0.98	2.28	0.205	1.39	Fina	Poco seleccionada	95.10	9.51
10	304	5.20	0.77	5.54	11.29	36.01	86.31	5.47	1.92	2.95	0.129	0.95	Fina	Moderadamente seleccionada	63.10	6.31
11	291	18.74	1.75	5.30	10.70	76.89	42.50	2.28	0.67	2.40	0.189	1.67	Fina	Poco seleccionada	70.60	7.06
12	360	0.00	2.42	4.04	4.44	7.64	22.67	2.61	0.77	1.73	0.301	1.31	Mediana	Poco seleccionada	46.30	4.63
13	459	5.27	0.89	1.08	2.42	24.79	82.40	21.88	13.08	3.47	0.090	0.88	Muy Fina	Moderadamente seleccionada	49.10	4.91
14	488	0.09	0.07	0.13	0.54	0.75	35.70	32.82	28.66	4.16	0.055	0.55	L. Grueso	Moderadamente seleccionado	76.50	7.65
15	366	0.31	0.08	0.30	1.46	3.68	118.61	21.96	10.66	3.72	0.076	0.44	Muy Fina	Bien seleccionada	59.70	5.97

(b) Zone 2

		Peso (g)								Diametro		G. S.	Clasificación		Materia Orgánica	
Est.	Z (m)	-1	0	1	2	3	4	4,45	Platina	ø medio	mm	σ	Arena	Selección	(mg/g)	%
1	483	0.02	0.77	1.40	0.64	3.51	93.86	32.82	20.18	3.85	0.069	0.52	Muy Fina	Moderadamente seleccionada	41.90	4.19
2	371	0.13	0.40	2.70	9.41	47.11	80.62	7.25	5.49	3.13	0.114	0.76	Muy Fina	Moderadamente seleccionada	41.10	4.11
3																
4	179	0.05	0.42	13.91	33.17	50.12	40.77	7.47	10.16	2.60	0.165	1.19	Fina	Poco seleccionada	46.60	4.66
5	325	0.06	0.15	5.29	4.80	27.45	102.10	11.73	6.54	3.33	0.099	0.73	Muy Fina	Moderadamente seleccionada	38.00	3.80
6	380	0.02	0.03	0.06	0.87	1.23	128.16	35.21	21.56	3.85	0.069	0.45	Muy Fina	Bien seleccionada	43.20	4.32
7	192	0.06	0.28	11.92	10.34	29.88	80.50	10.90	12.68	3.13	0.114	1.05	Muy Fina	Poco seleccionada	43.30	4.33
8	156	0.39	1.96	26.98	35.49	24.35	25.42	7.21	5.98	2.13	0.228	1.31	Fina	Poco seleccionada	64.90	6.49
9	146	0.00	0.36	22.55	29.62	21.48	13.50	5.21	7.15	2.20	0.218	1.39	Fina	Poco seleccionada	57.70	5.77
10	252	0.12	0.14	5.19	37.57	33.76	40.51	7.01	6.69	2.67	0.157	1.07	Fina	Poco seleccionada	43.10	4.31
11	243	0.05	0.03	2.40	34.60	51.88	58.24	5.95	2.99	2.73	0.150	0.84	Fina	Moderadamente seleccionada	45.60	4.56
12	358	0.02	0.09	0.20	2.98	24.98	96.27	19.69	7.19	3.47	0.090	0.60	Muy Fina	Moderadamente seleccionada	31.40	3.14
13	367	0.21	1.29	16.98	8.14	17.08	82.80	17.46	13.44	3.15	0.113	1.18	Muy Fina	Poco seleccionada	47.00	4.70
14	440	0.03	0.05	0.06	0.15	1.08	74.50	49.00	30.97	4.03	0.061	0.45	L.Grueso	Bien seleccionado	53.60	5.36
15	490	0.06	0.07	1.20	1.08	2.08	63.67	19.77	11.64	3.77	0.073	0.52	Muy Fina	Moderadamente seleccionada	43.20	4.32
16	450	0.00	0.01	0.16	0.25	1.16	98.24	37.00	25.50	3.97	0.064	0.49	Muy Fina	Bien seleccionada	49.50	4.95

(c) Zone 3

Est.	Z (m)	Peso (g)								Diametro		G. S.	Clasificación		Materia Orgánica	
		-1	0	1	2	3	4	4,45	Platina	ø medio	mm	σ	Arena	Selección	(mg/g)	%
1		5.19	3.12	4.75	3.50	2.91	110.22	17.44	9.47	3.57	0.084	0.92	Muy Fina	Moderadamente seleccionada	40.40	4.04
2	202	0.88	0.97	0.82	1.52	1.44	107.13	15.61	11.55	3.70	0.077	0.45	Muy Fina	Bien seleccionada	37.30	3.73
3	336	0.15	0.95	1.21	1.67	1.27	23.01	6.05	4.74	3.68	0.078	0.92	Muy Fina	Moderadamente seleccionada		
4																
5	458	0.03	0.18	0.45	1.73	0.78	63.11	17.12	15.83	3.85	0.069	0.61	Muy Fina	Moderadamente seleccionada	47.30	4.73
6	326	4.36	2.91	1.76	2.91	3.98	118.23	20.77	7.65	3.60	0.082	0.82	Muy Fina	Moderadamente seleccionada	42.50	4.25
7	266	4.69	10.22	6.88	3.46	3.31	106.39	11.69	5.59	3.10	0.117	1.23	Muy Fina	Poco Seleccionada	31.70	3.17
8																
9	460	0.00	0.06	0.06	0.32	0.31	28.00	33.74	27.79	4.27	0.051	0.53	L. Grueso	Moderadamente seleccionado	60.10	6.01
10	352	0.04	0.36	0.56	0.95	1.14	81.04	42.51	28.66	3.98	0.063	0.51	Muy Fina	Moderadamente seleccionada	58.60	5.86
11	258	2.74	4.54	4.88	3.24	1.72	38.89	5.18	3.26	2.65	0.159	1.60	Fina	Poco seleccionada	44.00	4.40
12		0.17	19.14	75.11	24.27	11.57	43.46	7.17	4.73	1.57	0.337	1.51	Mediana	Poco seleccionada	30.70	3.07
13	139	0.10	0.15	0.13	0.31	22.95	24.55	45.40	53.67	4.01	0.062	0.84	L. Grueso	Moderadamente seleccionado	89.90	8.99
14	235	0.34	0.80	0.82	1.22	5.23	20.65	36.98	27.54	4.10	0.058	0.70	L. Grueso	Moderadamente seleccionada	53.70	5.37
15	351	0.12	0.26	0.37	2.53	1.95	68.71	31.48	26.86	3.93	0.065	0.61	Muy Fina	Moderadamente seleccionada	62.40	6.24
16	480	0.11	0.26	1.34	2.40	4.99	102.90	29.98	30.26	3.87	0.069	0.62	Muy Fina	Moderadamente seleccionada	54.90	5.49

(d) Zone 4

Est.	Z (m)	Peso (g)								Diametro		G. S.	Clasificación		Materia Orgánica	
		-1	0	1	2	3	4	4,45	Platina	ø medio	mm	σ	Arena	Selección	(mg/g)	%
1	178	0.00	0.03	0.08	0.60	57.52	69.76	10.92	15.51	3.33	0.099	0.74	Muy Fina	Moderadamente seleccionada	43.60	4.36
2	175	0.16	0.13	0.37	1.56	45.32	79.10	19.26	20.99	3.52	0.087	0.77	Muy Fina	Moderadamente seleccionada	37.70	3.77
3	177	3.92	0.12	0.14	0.80	1.37	43.78	22.63	39.88	4.20	0.054	0.82	L. Grueso	Moderadamente seleccionado	56.10	5.61
4	165	0.00	0.08	0.09	0.69	0.39	30.59	25.40	15.30	4.10	0.058	0.51	L. Gueso	Moderadamente seleccionado	92.00	9.20
5	272	11.63	4.56	9.84	25.48	11.26	56.35	11.24	7.37	2.53	0.173	1.88	Fina	Poco seleccionada	57.70	5.77
6	280	0.44	1.24	9.88	16.54	34.60	71.85	12.23	6.24	3.01	0.124	1.06	Muy Fina	Poco seleccionada	48.50	4.85
7	360	12.46	4.39	6.64	7.64	17.14	82.32	10.65	10.88	2.78	0.145	2.78	Fina	Poco Seleccionada	59.40	5.94
8	460	0.07	0.09	0.52	1.09	0.90	57.44	17.09	18.58	3.92	0.066	0.57	Muy Fina	Moderadamente seleccionada	67.40	6.74
9	336	4.43	6.54	5.64	4.04	2.28	104.27	15.56	9.09	3.52	0.087	0.94	Muy Fina	Moderadamente seleccionada	49.00	4.90
10	237	0.14	0.30	1.14	1.06	1.01	99.48	26.27	24.69	3.83	0.068	0.49	Muy Fina	Bien seleccionada	38.20	3.82
11	250	0.31	0.12	0.30	0.82	2.86	65.23	30.00	24.20	3.95	0.065	0.49	Muy Fina	Bien seleccionada	38.10	3.81
12	353	7.73	2.64	4.28	8.30	51.93	50.30	10.96	14.59	3.02	0.123	1.42	Muy Fina	Poco seleccionada	71.80	7.18
13	441	4.32	0.79	2.54	8.60	14.40	31.31	6.76	8.18	3.07	0.119	1.77	Muy Fina	Poco seleccionada	83.80	8.38
14	448	1.22	0.21	4.28	10.97	3.21	54.79	18.17	12.20	3.30	0.102	1.15	Muy Fina	Poco seleccionada	68.50	6.85
15	345	0.58	0.35	0.82	2.51	24.20	56.69	12.65	16.40	3.55	0.085	0.91	Muy Fina	Moderadamente seleccionada	80.40	8.04
16	430	0.77	0.19	0.80	2.57	19.75	14.03	31.34	30.12	3.88	0.068	0.96	Muy Fina	Moderadamente seleccionada	39.30	3.93

(e) Zone 5

Est.	Z (m)	Peso (g)								Diametro		G. S.	Clasificación		Materia Orgánica	
		-1	0	1	2	3	4	4,45	Platina	ø medio	mm	σ	Arena	Selección	(mg/g)	%
1	467	1.88	0.62	0.40	13.75	8.81	32.47	41.33	52.66	4.02	0.062	1.06	L. Grueso	Poco seleccionada	42.30	4.23
2	449	11.94	11.51	6.84	6.67	6.32	45.87	33.38	31.10	2.78	0.145	2.19	Fina	Mal seleccionada	37.70	3.77
3	487	0.14	0.50	1.08	1.64	8.40	121.20	12.38	11.79	3.60	0.082	0.52	Muy Fina	Moderadamente seleccionada	46.20	4.62
4	430	1.01	0.20	0.30	0.54	0.88	17.99	93.00	30.44	4.23	0.053	0.32	L.Grueso	Muy Bien seleccionado	41.60	4.16
5	357	30.97	17.56	8.78	5.13	3.79	49.10	6.66	9.19	1.70	0.308	2.64	Mediana	Mal seleccionada	87.80	8.78
6	360	34.65	21.30	15.33	8.96	10.60	52.56	6.01	7.42	1.40	0.379	2.42	Mediana	Mal seleccionada	65.00	6.50
7	362	29.67	30.58	10.77	8.07	5.60	51.67	9.04	9.72	1.52	0.349	2.52	Mediana	Mal seleccionada	61.70	6.17
8	351	35.28	19.23	13.69	12.39	9.15	67.16	7.47	6.85	1.60	0.329	2.52	Mediana	Mal seleccionada	54.90	5.49
9	251	9.70	5.49	6.66	8.60	33.09	83.80	7.49	2.57	2.75	0.149	1.39	Fina	Poco seleccionada	35.60	3.56
10																
11	253	60.58	28.38	11.51	4.43	6.19	69.99	7.30	4.92	0.66	0.630	2.66	Gruesa	Mal seleccionada	38.80	3.88
12	270	56.77	21.02	1.48	4.98	4.64	55.09	4.50	3.53	0.25	0.841	2.95	Gruesa	Mal seleccionada	42.50	4.25
13	99	0.06	0.27	1.09	3.33	15.53	15.63	20.09	15.35	5.31	0.025	0.58	L. Mediano	Moderadamente seleccionado	81.80	8.18
14	99	0.00	0.07	0.14	0.33	1.82	7.35	3.68	27.61	5.85	0.017	0.38	L. Mediano	Bien seleccionado	75.10	7.51
15	96	0.00	0.00	1.16	0.71	5.53	9.12	19.30	70.76	5.73	0.019	0.48	L. Mediano	Bien seleccionado	73.60	7.36
16	103	0.00	0.00	0.06	0.15	0.73	0.57	29.39	54.58	5.92	0.016	0.49	L. Mediano	Bien seleccionada	77.50	7.75

(f) Zone 6

Est.	Z (m)	Peso (g)								Diametro		G. S.	Clasificación		Materia Orgánica	
		-1	0	1	2	3	4	4,45	Platina	ø medio	mm	σ	Arena	Selección	(mg/g)	%
1	180	37.94	4.08	3.89	19.29	41.57	50.72	3.58	1.71	1.60	0.329	2.10	Mediana	Mal seleccionada	48.90	4.89
2	177	28.93	23.38	20.94	32.26	25.30	32.25	3.30	2.07	1.16	0.445	2.02	Mediana	Mal seleccionada	46.70	4.67
3	161	0.00	1.76	3.86	5.49	34.04	80.41	12.52	14.77	3.31	0.100	0.90	Muy Fina	Moderadamente seleccionada	56.70	5.67
4	252	0.52	5.17	4.86	29.25	28.33	66.42	11.47	13.48	3.06	0.119	1.11	Muy Fina	Poco Seleccionada	65.90	6.59
5	261	1.90	6.13	10.11	31.52	16.13	71.68	8.91	6.74	2.75	0.149	1.30	Fina	Poco Seleccionada	53.90	5.39
6	262	12.82	1.11	2.35	8.91	17.82	30.18	1.03	0.33	1.77	0.293	2.58	Mediana	Mal seleccionada	67.00	6.70
7	346	23.47	15.32	17.05	23.51	19.70	15.16	1.11	0.43	0.86	0.548	2.75	Gruesa	Mal seleccionada	55.90	5.59
8	250	51.77	3.92	4.02	25.29	23.09	21.83	1.51	0.70	0.20	0.870	3.30	Gruesa	Mal seleccionada	76.60	7.66
9	359	43.41	15.45	9.12	11.07	6.58	18.75	1.79	1.04	-0.03	1.023	2.85	Muy Gruesa	Mal seleccionada	66.40	6.64
10	440	3.50	0.11	0.14	2.48	9.22	21.86	17.17	28.01	4.01	0.064	1.18	L.Grueso	Poco Seleccionada	60.80	6.08
11																
12	450	2.96	4.20	3.64	7.28	20.49	32.57	11.61	10.04	3.08	0.118	1.50	Muy Fina	Poco seleccionada	72.00	7.20
13	352	39.66	2.49	0.78	1.97	4.81	9.49	17.19	10.33	0.73	0.602	3.56	Gruesa	Mal seleccionada	87.80	8.78
14	445	2.39	1.43	4.06	8.26	15.48	31.59	10.84	9.10	3.10	0.117	1.35	Muy Fina	Poco seleccionada	74.80	7.48

(g) Zone 7

Est.	Z (m)	Peso (g)								Diametro		G. S.	Clasificación		Materia Orgánica	
		-1	0	1	2	3	4	4,45	Platina	ø medio	mm	σ	Arena	Selección	(mg/g)	%
1	452	0.00	0.00	0.03	0.23	20.75	100.41	15.23	13.41	3.62	0.082	0.58	Muy Fina	Moderadamente seleccionada	49.90	4.99
2	433	0.00	0.08	0.11	0.41	1.96	80.56	38.42	30.69	4.02	0.062	0.56	L. Grueso	Moderadamente seleccionada	81.00	8.10
3	414	0.07	0.14	0.70	1.29	3.60	47.47	15.93	11.63	3.82	0.071	0.62	Muy Fina	Moderadamente seleccionada	63.40	6.34
4	453	0.08	1.28	4.89	37.42	60.05	13.66	3.24	3.15	2.30	0.203	0.85	Fina	Moderadamente seleccionada	56.30	5.63
5																
6																
7	339	0.00	0.18	0.18	1.49	2.27	94.62	33.46	21.35	3.88	0.068	0.51	Muy Fina	Moderadamente seleccionada	63.50	6.35
8	234	0.12	0.44	5.44	7.63	37.47	95.99	19.01	14.07	3.36	0.098	0.87	Muy Fina	Moderadamente seleccionada	49.40	4.94
9	241	0.00	0.07	0.34	1.90	28.58	111.60	15.17	4.67	3.43	0.092	0.55	Muy Fina	Moderadamente seleccionada	50.10	5.01
10	241	0.00	0.04	0.14	1.81	23.29	136.10	19.86	11.32	3.55	0.085	0.51	Muy Fina	Moderadamente seleccionada	40.90	4.09
11	242	0.21	0.10	0.57	6.72	38.12	107.04	13.70	10.38	3.35	0.098	0.70	Muy Fina	Moderadamente seleccionada	49.20	4.92
12	151	0.02	0.09	0.55	8.50	43.98	94.90	26.15	18.26	3.43	0.093	0.79	Muy Fina	Moderadamente seleccionada	78.20	7.82
13	146	0.00	0.00	0.00	0.04	0.55	9.89	29.59	31.97	4.40	0.048	0.39	L. Grueso	Bien Seleccionado	100.60	10.60
14	147	0.57	0.00	0.04	0.12	0.74	27.07	29.51	38.69	4.40	0.048	0.59	L. Grueso	Mal seleccionado	115.70	11.57

(h) Zone 8

Est.	Z (m)	Peso (g)								Diametro		G. S.	Clasificación		Materia Orgánica	
		-1	0	1	2	3	4	4,45	Platina	ø medio	mm	σ	Arena	Selección	(mg/g)	%
1	461	2.13	1.03	0.48	0.71	0.72	30.46	50.16	14.95	3.62	0.082	0.41	Muy Fina	Bien seleccionada	47.80	4.78
2	430	0.00	0.04	0.03	0.28	0.80	30.09	19.60	12.96	4.05	0.060	0.53	L. Grueso	Moderadamente seleccionada	52.20	5.22
3	420	0.00	0.11	0.42	3.04	19.71	68.62	45.82	25.32	3.80	0.071	0.73	Muy Fina	Moderadamente seleccionada	62.10	6.21
4	464	0.00	0.17	0.05	0.43	2.27	12.47	56.49	63.94	5.65	0.019	0.59	L. Mediano	Moderadamente seleccionado	50.90	5.09
5	344	1.53	0.91	0.09	6.70	18.98	22.46	29.57	3.29	3.36	0.097	0.94	Muy Fina	Moderadamente seleccionada	57.20	5.72
6	354	1.13	0.56	1.45	8.16	15.23	34.41	10.26	7.39	3.27	0.104	1.25	Muy Fina	Poco seleccionada	63.60	6.36
7	346	0.02	0.62	1.07	12.16	27.75	80.77	28.21	26.89	3.56	0.084	0.97	Muy Fina	Moderadamente seleccionada	60.90	6.09
8	365	0.00	0.12	0.09	2.26	4.49	39.22	42.32	29.18	4.07	0.059	0.60	L. Grueso	Moderadamente seleccionado	42.40	4.24
9	290	0.31	1.06	2.36	2.30	8.86	51.46	12.98	8.90	3.62	0.081	0.84	Muy Fina	Moderadamente seleccionada	56.30	5.63
10	243	2.85	1.63	3.76	3.74	17.35	61.31	8.11	5.96	3.20	0.109	1.05	Muy Fina	Poco seleccionada	56.00	5.60
11	247	6.52	8.44	1.87	15.41	43.82	59.91	16.02	15.64	3.01	0.124	1.49	Muy Fina	Poco seleccionada	60.90	6.09
12	250	8.54	3.92	1.32	9.74	27.40	20.51	2.90	2.51	2.05	0.241	1.97	Fina	Poco seleccionada	50.00	5.00
13	150	1.44	0.45	0.26	1.61	21.21	72.60	11.73	10.29	3.46	0.090	0.72	Muy Fina	Moderadamente seleccionada	47.00	4.70
14	143	0.42	0.62	0.09	1.48	16.53	74.54	8.27	6.21	3.46	0.090	0.60	Muy Fina	Moderadamente seleccionada	51.30	5.13
15	143	0.01	0.03	0.04	0.31	4.23	77.12	49.62	33.32	4.03	0.061	0.45	L. Grueso	Bien seleccionado	69.10	6.91

A total of 150 samples from the 8 geographic areas were analyzed by Melo et al (2007), and macrofauna was recorded in 140 of those samples. A total of 99 species and / or taxonomic units were identified. In terms of specific composition, the Polychaeta group was the most representative in all areas with a range that varied between 60 to 75% of the total macrobenthos. The Mollusca group was the second most important group with values that varied between 8 and 18% of the total macrobenthos. Echiurida, Sipunculida and Nemertina presented the lowest contribution to the total of the macrobenthos (**Figure 7.3.1.6.1**). In terms of composition by larger groups, the macrobenthos in the study area did not show significant differences between zones (**Figure 7.3.1.6.2**). Overall, the Polychaeta group contributed between 98 and 49% of the total macrobenthos and mollusks in second place. An exception is Zone 3, where the Echinodermata group was the second most important group (34%). Zones 4 and 5 showed the highest dominances, which were higher than 60% of the total macrobenthos, being the species Prionospio sp. and Ampharetidae sp., responsible for the highest numerical contribution of polychaeta to the total macrobenthos. In contrast, zones 2 and 8 exhibited the lowest dominances for their faunal assemblages. The latter is due to the lower contribution of the species Levinsenia gracilis and Paramphinome australis, respectively.

Results from analysis based on the presence/absence of the different taxonomic units identified in the study areas showed that there are no clear clustering patterns and / or clear spatial trends. In addition, the similarity values between the zones registered low values, suggesting that the distribution pattern does not show a geographic or zone influence (i.e., north-south).

In the <150 m depth range, the species Cossura sp., Prionospio sp. and a species of Ophiuroidea sp. they were the most important in terms of relative abundances. In the 150-350 m depth range, a species belonging to the Cirratulidae family and Cossura sp. contributed 40% of the relative abundances for the study area. In the deepest stratum (350-500 m), the species Ampharetidae sp A., Amphipoda sp A., Paramphinome australis and a species of Maldanid polychaete of the genus Asychis sp. they were the most important species in relation to their contribution to the relative abundances in the study area.

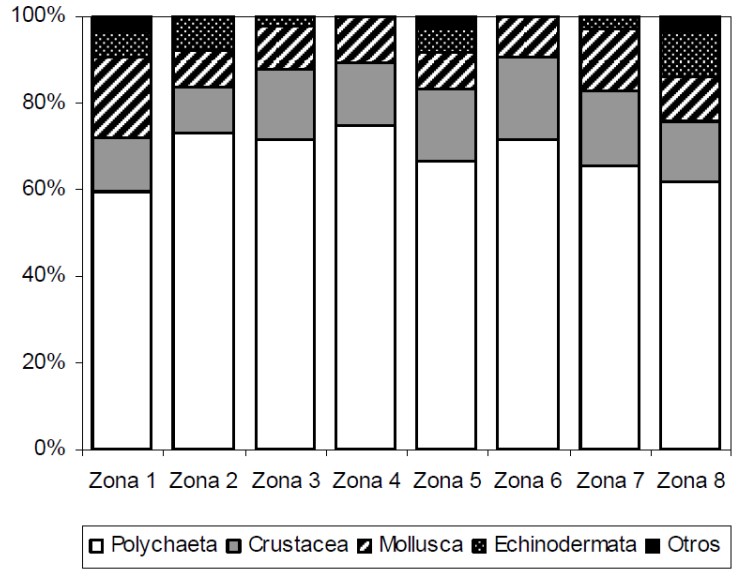


Figure 7.3.1.6.1. Percentual distribution of the species richness (S) for macrobentos in each of the 8 sampled zones (2ºS-39ºS). Source: Melo et al 2007.

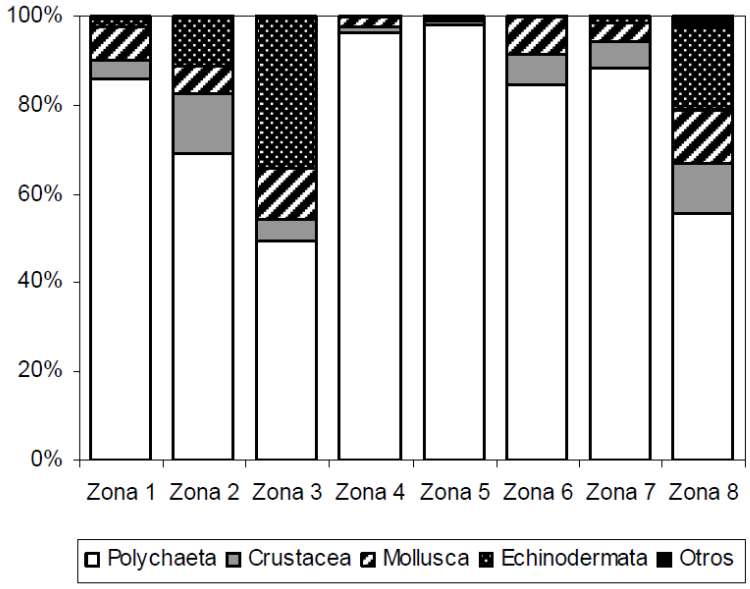


Figure 7.3.1.6.2. Percentual distribution of relative abundance of larger groups for macrobentos in each of the 8 sampled zones (2ºS-39ºS). Source: Melo et al 2007.

Another objective of Melo et al (2007) was to determine the presence or absence of other VMEs such as seamounts, spong fields, corals reefs or geothermal vents in the area where the fishing fleets targeting Chilean hake and demersal crustaceans operate.

Melo et al (2007) also reported a total of 17 species of corals were found between Region III and X, including an endemic species of the Hexacoralia Subclass, Order Scleractinia (Bathycyathus chilensis). The Alcyonaria Subclass recorded the highest species richness with a total of 15 species (5 from the Order Alcyonacea, 8 from the Order Gorgonacea and 2 from the Order Pennatulacea). From the Ceriantipatharia Subclass, a species belonging to the Antipatharia Order was collected.

Figure 7.3.1.6.3 shows that the highest value of coral species richness (10) was observed in the north of Region IX (zone 8), with at least one representative of each Order (the fisheries targeting demersal crustaceans does not operate in Region IX).

Corals were found in 35% of the sampling stations. The species with the highest frequency of occurrence was the alcyonaceous Anthomastus sp, present in 5 zones; the gorgonian Swiftia sp was present in 4 zones, together with Alcyoniidae sp which was present in 3 zones.

The bathymetric distribution range of the presence of corals in general, varies between 241-467 m, collecting from the total of 46 sets, 28% between 241-400 m in contrast to 72% between 401-467m (**Figure 7.3.1.6.4**). The highest number of species was observed between 401 and 467 m, with 16 species.

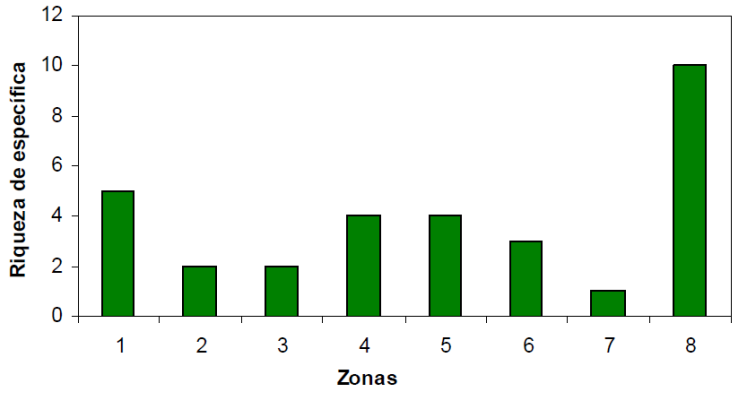


Figure 7.3.1.6.3. Coral species richness for each sampled zone. Source: Melo et al 2007.

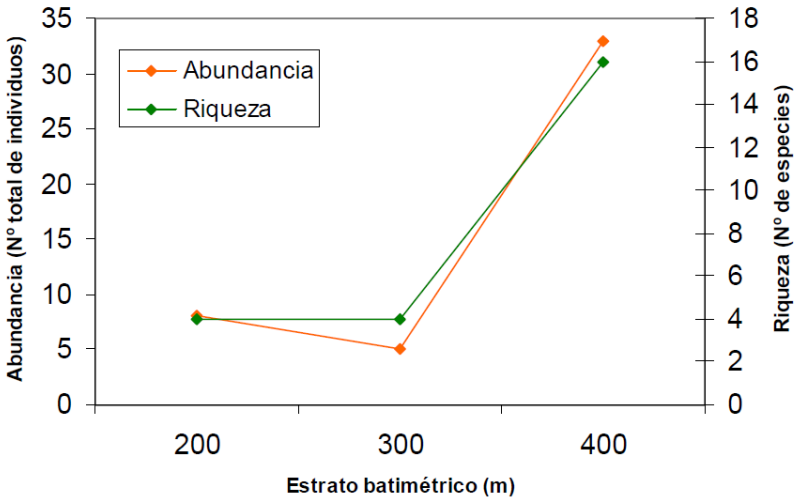


Figure 7.3.1.6.4. Abundance -N individuals- (left) and species richness (right) according to depth range. Source: Melo et al 2007.

No seamounts, geothermal vents, or sponge fields in the study area were found as a result of the sampling performed by Melo et al (2007). Another ecosystems of high diversity and with endemic species are the methane emergence areas. Species depend on autotrophic bacteria and are prey of numerous species, and processes occurring on those areas generate hard bottoms colonized by sessile organisms and utilized as refuge by fish and invertebrate larvae. Normally these areas occur in much deeper waters than where demersal crustacean fisheries operate, but finding by Melo et al (2007) at 349 m in one station located in 33o 23 4'S indicates presence within the fishery area. Methane emergence areas are not listed among VMEs, but they do present characteristics enumerated by FAO (see section III below for more details).

Assemblages of bryozoans, sponges and hydrozoans were reported by Melo et al (2007), and sponges (Spongia sp.) are also reported among species listed for catch composition the demersal crustacean fisheries by IFOP (Zilleruelo et al 2021 and **tables 7.3.1.1.1 and 7.3.1.1.2**). When soft seafloor is mechanically perturbed these filter feeder species can re-populate where sponge fields previously existed, although this depends on how often they are disturbed and how slowly they grow. According to Melo et al (2007) species composition of these benthic assemblages could indicate that mechanical disturbances of the seafloor occurred and that re-colonization and ecological succession in macro benthic communities took place.

Finally, Roa et al (1995) described benthic habitats in nursery areas for squat lobster between 35ºS and 37ºS and down to 200m in depth. According to the authors sediments consist of muddy soft bottoms and rocky-muddy hard bottoms. The second type is hardly accessible to trawling due to abrasion (rubber protections are not allowed in the modified trawl) and abundant interspersed rocks lying in the sediments; other areas consist partially or completely of hard bottoms which are not accessible to trawling. According to Roa et al (1995) these areas are also characterized by bacterial mats (Thioploca spp), and that there is strong association between these mats and juvenile squat lobsters. These extensive microbial communities are local features of the central Chile continental shelf.

II. Habitat management measures in Chile

a) Provisions for the protection of VMEs adopted in the LGPA

International discussions focused on the protection of Vulnerable Marine Ecosystems led to the UN Resolution 61/105 adopted in 2007, and to the approval in 2008 of the FAO document 'International Guidelines for the Management of Deep-sea Fisheries in the High Seas' (FAO 2009). Chile has not been oblivious to this discussio, basically within the

framework of the South Pacific Regional Fisheries Organization (SPRFMO), which established measures for the development of bottom fishing activities on the high seas and mechanisms for the protection of Vulnerable Marine Ecosystems (VMEs) as well as methodologies for evaluating the impacts of bottom fishing on them.

At National level, the LGPA was modified to accommodate the recommendations contained in FAO (2009). Law No. 20,657, incorporated the protection of vulnerable marine ecosystems within the Exclusive Economic Zone. Art 2(68) defines a Vulnerable Marine Ecosystem as a *"natural unit made up of fragile geological structures, populations or communities of invertebrates of low biological productivity, which in the face of anthropic disturbances have slow or poor recovery rates, such as in seamounts, hydrothermal sources, formations cold water coral reefs or underwater canyons".* It also defines seamounts, such as *"elevations of the oceanic floor that do not emerge to the surface and whose height exceeds 1000 m, measured from the surrounding seabed that constitutes its base"*.

In Article 5, third paragraph, it is established that in the case of seamounts, bottom fishing will not be allowed, unless there is a scientific investigation carried out in accordance with the protocol and regulations referred to in Article 6B, which demonstrates that the fishing activity does not generate adverse effects on the vulnerable marine ecosystems present in the area. With this, seamounts are recognized as VME and protected from commercial fishing activities.

Article 6A establishes that in maritime waters under national jurisdiction and in specific geographical areas, regardless of the applicable access regime (LTPs, PEPs, RAE, AMERBS….), the Ministry shall adopt a fisheries management regime for VMEs, when verifying that invertebrates or geological structures that constitute VME/s occur in a specific area, in accordance with the regulations.

Article 6B states that the list of hydrobiological resources will be established whose fisheries qualify as bottom fishing that can affect VMEs. To carry out fishing activities on hydrobiological resources included in that list, the shipowner must, before sailing, notify the Sernapesca of: (i) the intention to carry out bottom fishing activity, (ii) the area in which they will carry out operations and the detection equipment that they will use in the fishing operations, (iii) comply with the Operational Protocol in VMEs, to be develop in further regulations. This regulation will specify the fishery information to be delivered, which must at least include: a) Details of the shipowner and the vessel and its main characteristics; b) description of the communication and detection equipment; c) likely bycatch species; d) area of operation and projected fishing footprint; e) fishing period; f) place/s of departure and landing; g) details of construction and maneuvering and operation of the fishing gear; h) authorized catch quota, if applicable; i) number of projected hauls per day and their duration.

Likewise, it must be proven before departure that the ship has the scientific observer on board to apply the respective protocol.

This same article indicates that if, when targeting one of the hydrobiological resources included in the list, a vessel accidentally captures elements that are constitutive of a VME, the scientific observer on board will apply the Protocol of Evidence of VME to be established in further regulation. If the application of the aforementioned protocol establishes that the elements captured are constitutive of the presence of a VME, the captain of the ship must immediately suspend the fishing operations in the area where that element was caught. The area in which fishing operations will be suspended will be established in the regulations, which must take into consideration the constituent elements of the interacted VME. The observer must submit to Subpesca a report on the application of the VME Evidence Protocol. The accidental catch limits that account for the constitutive presence of a VME will be established in accordance with the regulations.

Finally, Article 6C recalls that all vessels authorized to target one of the hydrobiological resources included in the list referred in Article 6B shall have scientific observers on board on all fishing trips.

b) Bottom trawl banned areas around seamounts

Yañez et al (2006) identified 118 seamounts within the Chilean EEZ and calculated a circular area associated with each seamount based on the bathymetry which is considered as the limit for bottom fishing operations. In application of Article 6A, these bottom trawl-ban areas around seamounts were officially adopted through DS 451/2015, later amended by DS 687/2016.

As detailed in sub section I above, Melo et al (2007) provided information on the presence/absence of geothermal vents, cold water corals patches or methane upwelling areas in the area where the assessed fishery operates: no seamounts, geothermal vents, underwater canyons, sponge fields or cold-water coral reefs were found in the study area. No further research or mapping on VME distribution off the central Chilean coast have been performed. Therefore, no delimitated geographical areas with special fishing management regimes have been set for protecting these types of habitats so far.

c) Proposal to implement Article 6B

However, up to date no official Regulations have been issued to comply with Article 6B. Subpesca has not yet established a list of marine resources which their fisheries are susceptible to impact on VMEs.

On the other hand, there is evidence that Subpesca has been working on developing a proposal to regulate fishing operations on areas susceptible to VMEs. The proposed regulation (Informe Tecnico RPESQ Nº154/2016) defines Vulnerable-habitat-forming species (see **table 7.3.1.6.2**), the VME Operational and Evidence Protocols mentioned in Article 6B. The Operation Protocol in VMEs consist in a set of requirements for carrying out extractive activities in areas

where the administration regime for VME is established and for hydrobiological resources whose fisheries qualify as bottom fishing that can affect VMEs. While the Protocol for the Evidence of VME set of procedures for an immediate assessment in the presence of VME-forming species to trigger a management response to limit the impact in the area. These protocols include and a detailed protocol to operate on areas susceptible to VMEs, including threshold values and move-on rules, among other measures. The main features are: detailed prior notification of the intent to operate in those areas, mandatory 100% observer coverage in all hauls to perform the activity, 5NM move-on rule to be applied in those cases where more than 50kg of sponges or 30kg of corals come on board.

Table 7.3.1.6.2 Cold-water corals and sponges considered as VME-forming elements for the purpose of the proposed regulation in Informe Tecnico RPESQ Nº154-2016.

Nombre común	Clase	Orden	Familia
Esponjas	Calcarea, Hexactinellidae, Demospogidae	-	-
Corales blandos	Anthozoa	Alcyonacea	*Acanthogorgiidae* *Alcyoniidae*
Corales negros	Anthozoa	Antipatharia	*Antipathidae spp.* *Cladopathidae spp.* *Leiopathidae spp.*
Corales de piedra	Anthozoa	Scleractinia	*Caryophylliidae spp.* *Oculinidae spp.*
Hidrocorales	Hydrozoa	Stylasterina	*Stylasteridae spp.*
Gorgonias	Anthozoa	Gorgonacea	*Gorgoniidae spp.* *Isididae spp.* *Primnomidae spp.*

d) Plan for the reduction of discards and interactions

Invertebrates denoting the existence of VMEs caught by fisheries targeting demersal crustaceans are subject to the specific measures adopted in the Plan for reduction of discards and interactions (approved by Res.EX.1106 del 29 de Marzo 2017). It is stated that: "*In the case of catching invertebrates denoting the existence of VMEs, the measures established for this purpose in accordance with Articles 6a and 6b of the LGPA must be complied with"*. See **section 7.3.1.2.II** for details.

Resolution Nº142/2021 listing the species for which the discard plan in fisheries targeting demersal crustaceans is applicable states that actinias (Actinia sp.), Sponges (Sponges sp.), unidentified corals, Deep-sea starfish (Hippasteria hyadiesi) and unidentified starfish shall be returned to the sea since they are VME-habitat forming species.

e) Recommendation for a regulation on industrial fishing operations targeting demersal marine resources between the Antofagasta Region and parallel 41º28,6'L.S

In January 2018 Subpesca prepared a document (INFORME TECNICO RPESQ Nº09-2018) containing a recommendation for a regulation on the fishing operations targeting demersal marine resources between the Antofagasta Region and parallel 41º28,6'L.S (outside of the 5NM area reserved for artisanal fisheries). This area covers the entire geographical scope of the Chilean hake fisheries (longline, set nets and bottom trawl) and demersal crustaceans fisheries (bottom trawl targeting nylon shrimp, yellow squat lobster and red squat lobster).

This report first establishes the historical footprint of the trawl fisheries targeting both common hake and demersal crustaceans. In order to do so, the geographical information from all hauls targeting common hake between 2000-2015 (16 years) and also all hauls targeting demersal crustaceans between 2001-20015 (15 years) were considered in the analysis. A total of 52,513 hauls were considered for the common hake, and 156,537 for the demersal crustaceans were analyzed. Squares of 2' by 2' were defined and 3 points were plotted for each haul. Those squares which were not visited at least 5 times during the observed period were not considered. The footprint of the trawl fisheries was calculated outside of the area reserved for artisanal fisheries. The joint footprint of the trawl fisheries targeting demersal resources

was estimated to be 29,524.50 Km^2, Region VIII accounting with the biggest trawled surface (23.5% of the total surface). **Table 7.3.1.6.3** shows the squared kilometers accounted in each Region, while **figure 7.3.1.5.5** shows the map of the trawl footprint, and **figure 7.3.1.5.6** provides an example of a zoomed area in front of Talcahuano (UPS). The report provides latitude and longitude for the all the vertices accounting the footprint.

Table 7.3.1.6.3. Joint footprint (Km^2) for common hake and demersal crustaceans trawl fisheries in each Region. Source: INFORME TECNICO RPESQ Nº09-2018

Región	Huella de pesca (km2)
II	235,72
III	1.318,60
IV	2.374,60
V	3.246,74
VI	1.604,95
VII	5.495,60
VIII	8.087,10
IX	3.269,71
XIV	1.469,69
X	2.421,80
TOTAL	**29.524,50**

Once the footprint of the trawl fisheries has been defined, the study recommends the following regulation of the fisheries operating between the Antofagasta Region and parallel 41º28,6'L.S.:

i. Outside of the area bounded by the polygon defining the footprint of the trawl fisheries, the following fishing gears are authorized: longline (espinel, palangre), jigging, arpoon, midwater trawl, purse seine, set nets and traps.

ii. Inside of the area bounded by the polygon defining the footprint of the trawl fisheries trawling is also authorized (apart from the other fishing gears mentioned above)

During third site visit (Saa et al 2020), Subpesca confirmed that the historical footprint was updated with recent data (up to 2018), but the addition of these new records did not result in a modification of the historical footprint. So far, no other actions have been taken after this preliminary study.

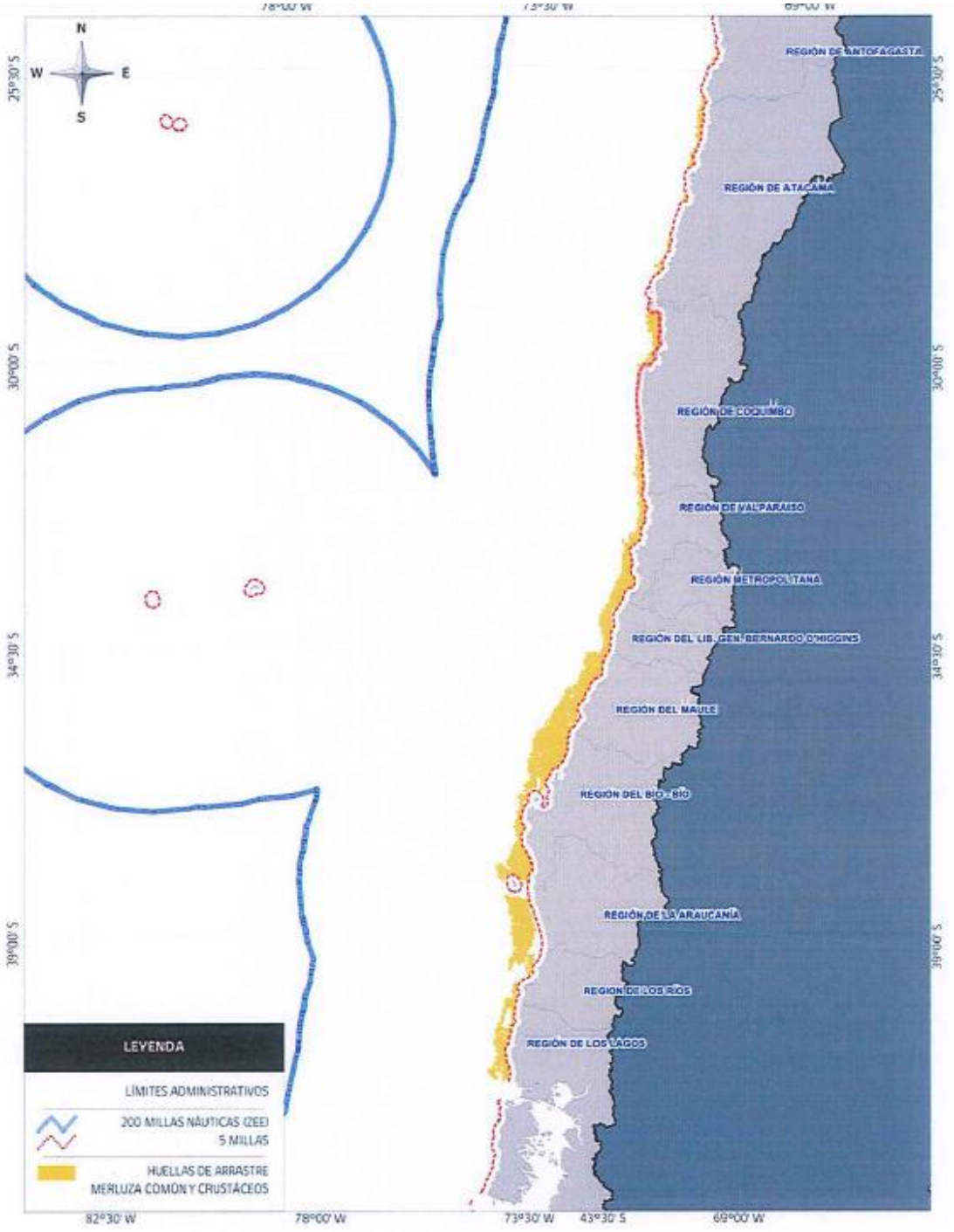


Figure 7.3.1.6.5. Joint footprint of the trawl fisheries targeting common hake and demersal crustaceans. Source: INFORME TECNICO RPESQ Nº09-2018

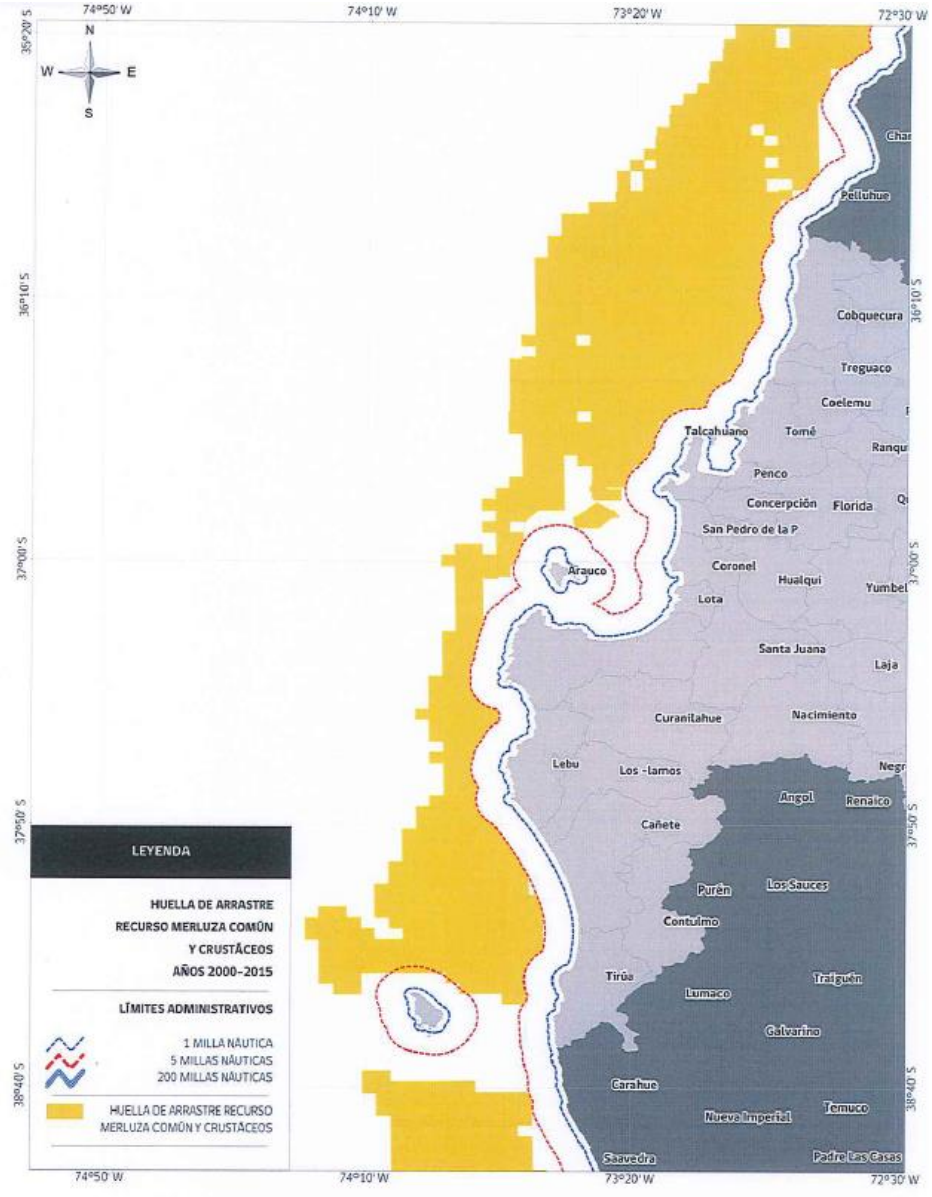


Figure 7.3.1.6.6. Zoomed of the footprint in front of Talcahuano. Source: INFORME TECNICO RPESQ Nº09-2018

III. Habitats classified as MSC P2 subcomponents

When benthic habitat is being assessed, the team shall recognize habitat categories based on the following habitat characteristics (SA3.13.2):

a) Substratum- sediment type
b) Geomorphology- seafloor topography
c) Biota- characteristic floral and/or faunal group/s.

In accordance with SA 3.13.2 and based on the information presented in Melo et al (2007) and Roa et al (1995), the team identified 2 different habitat categories (see **table 7.3.1.6.4**).

Table 7.3.1.6.4. Habitat categories identified by the team. Table elaborated by the team following GSA3.13.2.

Habitat category	Habitat description
1	Fine substratum (dominated by mud and fine sands), flat geomorphology (dominated by simple surface structures), and with a biota dominated by polychaeta.
2	Rocky-muddy hard bottoms with rough surface.

Besides, the team shall determine and justify which habitats are commonly encountered, vulnerable marine ecosystems (VMEs) and minor (i.e. all other habitats) (SA3.13.3).

A commonly encountered habitat shall be defined as a habitat that regularly comes into contact with a gear used by the UoA, considering the spatial (geographical) overlap of fishing effort with the habitat's range within the management area(s) covered by the governance body(s) relevant to the UoA (SA3.13.3.1).

A VME shall be defined as is done in paragraph 42 subparagraphs (i)-(v) of the FAO Guidelines2. This definition shall be applied both inside and outside EEZs and irrespective of depth (SA3.13.3.2).

VMEs have one or more of the following characteristics, as defined in paragraph 42 of the FAO Guidelines:

- Uniqueness or rarity – an area or ecosystem that is unique or that contains rare species whose loss could not be compensated for by similar areas or ecosystems
- Functional significance of the habitat – discrete areas or habitats that are necessary for survival, function, spawning/reproduction, or recovery of fish stocks; for particular life-history stages (e.g., nursery grounds, rearing areas); or for ETP species
- Fragility – an ecosystem that is highly susceptible to degradation by anthropogenic activities
- Life-history traits of component species that make recovery difficult – ecosystems that are characterised by populations or assemblages of species that are slow growing, are slow maturing, have low or unpredictable recruitment, and/or are long lived
- Structural complexity – an ecosystem that is characterised by complex physical structures created by significant concentrations of biotic and abiotic features

The FAO Guidelines' Annex identifies the following species groups, communities, and habitat-forming species that may form VMEs and may be indicative of the occurrence of VMEs:

- Certain coldwater corals and hydroids (e.g., reef builders and coral forest, such as stony corals, alcyonaceans, gorgonians, black corals, and hydrocorals)
- Some types of sponge-dominated communities
- Communities composed of dense emergent fauna where large sessile protozoans and invertebrates (e.g., hydroids and bryozoans) form an important structural component of habitat
- Seep and vent communities comprised of invertebrate and microbial species found nowhere else (i.e., endemic)

Finally, Resolution Nº142/2021 issued by Subpesca and listing the species for which the discard plan in fisheries targeting demersal crustaceans is applicable states that actinias (Actinia sp.), Sponges (Sponges sp.), unidentified corals, deep-sea starfish (Hippasteria hyadiesi) and unidentified starfish shall be returned to the sea since they are VME-habitat forming species.

In accordance with SA 3.13.3 and based on the information presented in Melo et al (2007), Roa et al (1995) and the applicable regulations detailed in subsection II above, the team identified 2 different habitat categories (see **table 7.3.1.6.5**).

Table 7.3.1.6.5. Habitats classified in accordance with SA 3.13.3. Table elaborated by the team

P2-Habitat subcomponent (main, VME, minor)	Habitat description
Commonly encountered	Habitat category 1 (see **table 7.3.1.5.2**)
Minor	Habitat category 2 (see **table 7.3.1.5.2**)
VMEs (or VME-forming species)	Seamounts
	Geothermal vents
	Methane emergence areas
	Cold-water coral reefs
	Sponge fields
	Sponges (Calcarean, Hexactinellidae, Demospogidae)
	Soft corals (Order Alcyonacea, Families: Acanthogorgiidae and Alcyoniidae)
	Black corals (Order Antipatharia, Families: Antipathidae, Cladopathidae and Leiopathidae)
	Stony corals (Order Sclaractinia, Families: Caryophyliidae and Oculinidae)
	Hydrocorals (Order Stylasterina, Family: Stylasteridae)
	Gorgonians (Order Gorgonacea, Families: Gorgoniidae, Isididae, Primnomidae)
	Actinias (*Actinia sp*.)
	Deep-sea starfish (*Hippasteria hyadesi*)
	Unidentified starfish

IV. Spatial-temporal pattern of the UoAs' fishing activity

a) <u>VMS data: requirements and transparency</u>

VMs is required on all industrial vessels since 2000, irrespective of the access rights under which they are operating (LTLs, PEPs). VMS shall be operational for every fishing trip, from departure to arrival (Law 19521 that amended the

LGPA). Besides, VMS is also mandatory for all artisanal vessels of a length equal to or longer than 15m (or 12m in the case of purse seiners).

The positioning system's signal is automatically received at two institutions, the General Directorate of Maritime Territory (attached to the Chilean Navy) and SERNAPESCA. Both institutions are obliged to ensure compliance with the requirement and are authorised to make the respective claims when they detect non-compliances. In the case of SERNAPESCA, this signal also reaches their regional offices. Following the modification of the Fisheries Law by Law 21.132, VMS data is available at the SERNAPESCA website.

Besides, the Chilean government signed on May 15, 2019, an agreement to make its vessel tracking data publicly available through the Global Fishing Watch (GFW) map, which tracks the movements of commercial fishing* vessels in near real-time (https://globalfishingwatch.org/press-release/chile-to-publish-vessel-tracking-data-through-gfw/).

The agreement, which was made between Chile's National Fisheries and Aquaculture Service (or SERNAPESCA) and GFW, demonstrates Chile's commitment to increase transparency of commercial fishing in Chilean waters. It follows the Chilean Senate's approval of Law 21.132 earlier in 2019 that modernizes SERNAPESCA, and requires that national fishing vessel tracking information, known as Vessel Monitoring System (VMS), be publicly available.

By publishing its VMS data to the GFW platform, Chile's fishing fleet, comprising more than 700 fishing vessels and more than 900 vessels that provide support for aquaculture, will be viewable by anyone accessing the public map, including governments, fishery managers, seafood buyers, researchers and non-profit organizations.

Public sharing of VMS data, including lists of authorized vessels, helps improve surveillance and encourages vessels to comply with regulations. Unauthorized vessels, and those with a history of non-compliance, can be identified more easily and prioritized for inspections, while vessels that turn off tracking devices can be held accountable when they come into port.

As of today, that data is published through the Global Fishing Watch (GFW) map (https://globalfishingwatch.org/our-map/), which tracks the movements of commercial fishing vessels in near real-time.

b) Spatial-temporal characterization of the fishing activity performed by the AIP fleet

Within the framework of the agreement signed between AIP and the UCN in June 2019, spatial-temporal information on the AIP fleet has been collected and analysed by the UCN. Results between January 2019 and April 2021 were compiled in Acuña et al (2021). This report was shared with the team during the surveillance audit. The information included in Acuña et al 2021 continues the historical series included in the previous report (see Saa et al 2020) and allows the spatial-temporal characterization of the distribution of the operation of the fleet. As in the previous report, the VMS data were filtered according to speed: [0 - 1.4] kn – vessel stopped, [1.5 – 3] kn – vessel towing; > 3 kn- vessel sailing.

In **figures 7.3.1.6.7 and 7.3.1.6.8** all VMS information for 2020 and 2021 is presented (data from 2019 were already presented in the previous surveillance audit report). In general, the fishing activity for the years 2019 and 2020 are quite similar and make it clear that practically the entire fishing area was used from the north of the Coquimbo region to the south of the Biobío region. However, some differences in coverage are detected in particular compared to the northern area of the Coquimbo bay system, south of the Coquimbo region, with the highest coverage in general during 2019 in most of the fishing area. In the data corresponding to the first four months of 2021, a coverage similar to the previous two years is already hinted at, which will probably be consolidated during the rest of the fishing season, but which must be definitively evaluated at the end of this one. A total of 373,337 VMS records were analysed, which were separated according to the speed criteria described above, 75,389 (20.19%) of them corresponding to navigation records and 90,245 (24.17%) to trawling records.

Acuña et al (2021) also presents the monthly fishing activity of the AIP fleet (see **figure 7.3.1.6.9 and 7.3.1.6.10)**. **Figure 7.3.1.6.9** shows that no fishing activity took place in September 2020, due to the temporal closure for all three demersal crustaceans. A temporary closure for the red and yellow squat lobsters is enforced in January and February, meaning that at the beginning of the year most of the fleet operates from the south of the Coquimbo region to the southern areas, leaving only one or two vessels artisanal vessels for nylon shrimp in northern region IV. From May to August, fishing activity increases towards the north, particularly on red and yellow squat lobsters (since in July the temporary closure is for nylon shrimp). Finally, greater activity is noted in the northern Coquimbo region during the last quarter of the year.

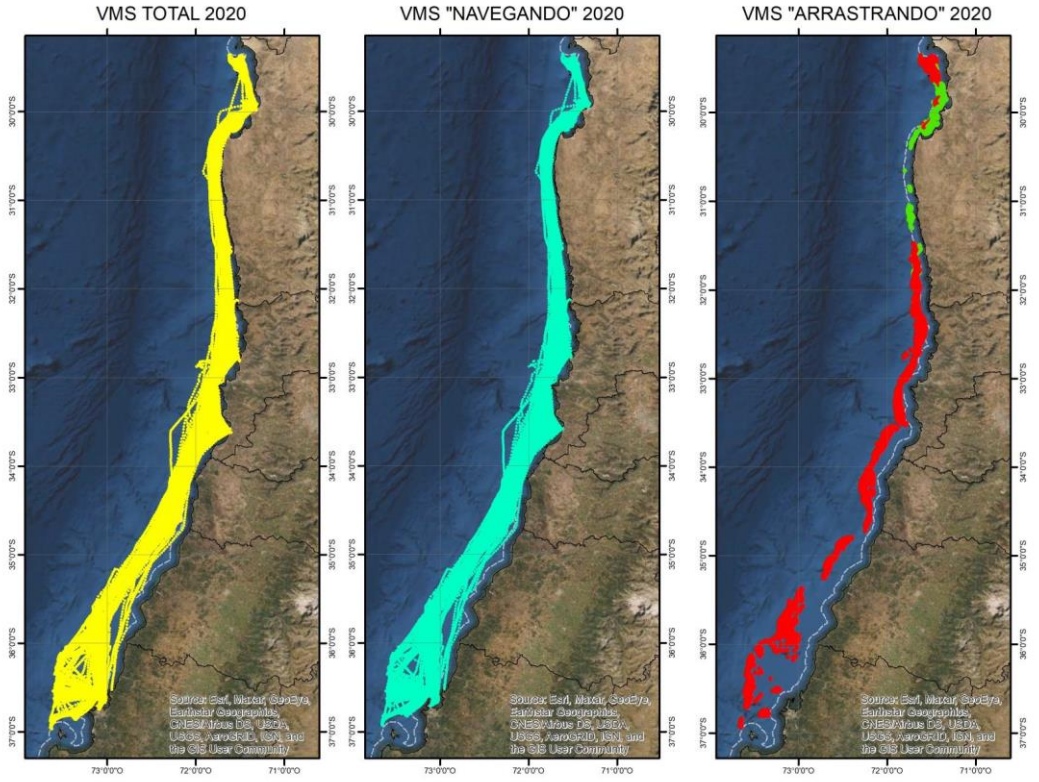


Figure 7.3.1.6.7. VMS data of the AIP fleet in 2020. From left to right: total records, sailing and towing. Source: Acuña et al 2021.

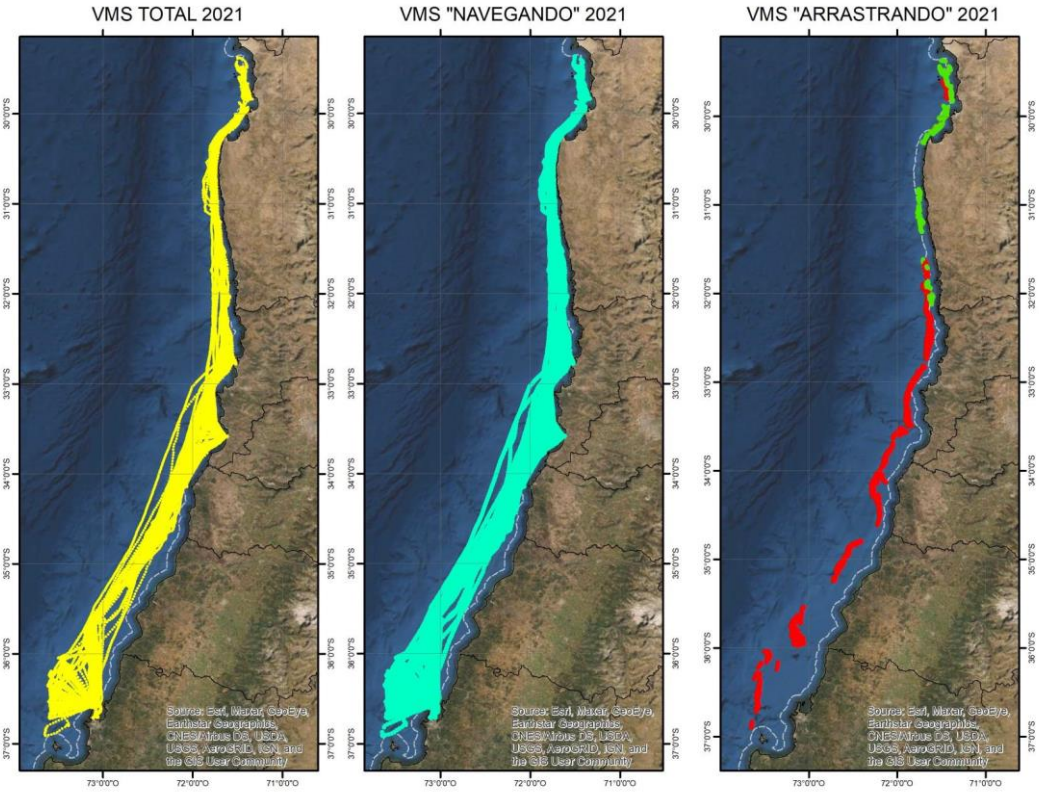


Figure 7.3.1.6.8. VMS data of the AIP fleet in 2021 (up to April). From left to right: total records, sailing and towing. Source: Acuña et al 2021.

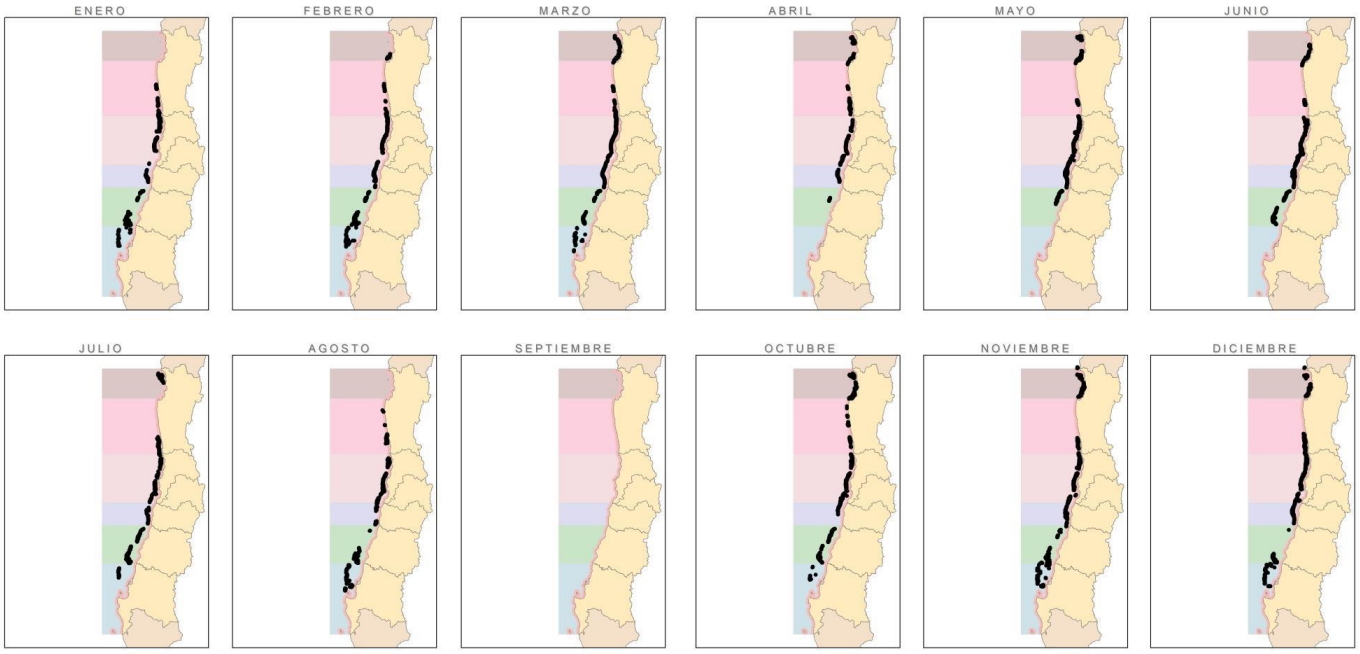


Figure 7.3.1.6.10. Monthly fishing activity of the AIP fleet in 2020. Source: Acuña et al 2021.

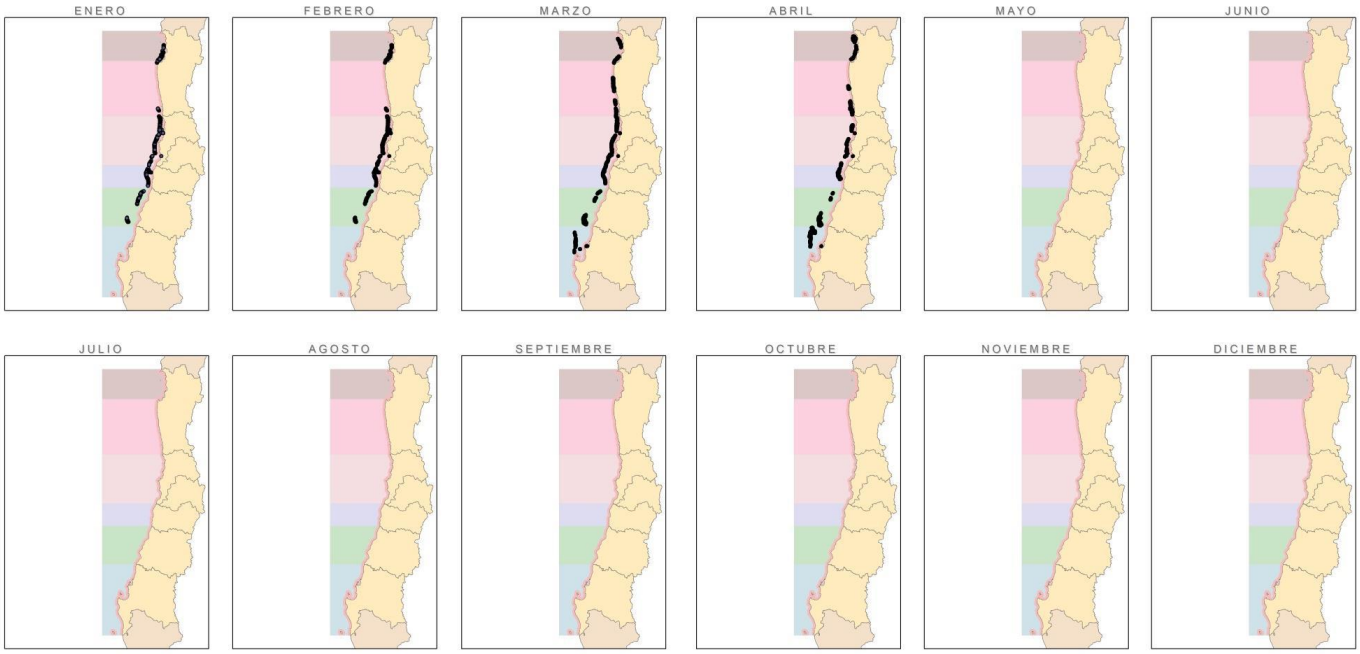


Figure 7.3.1.6.10. Monthly fishing activity of the AIP fleet in 2021 (up to April). From left to right: total records, sailing and towing. Source: Acuña et al 2021.

Fishing operations of the industrial and artisanal fleets in the Northern Area (North of Region IV) are depicted in **Figure 7.3.1.6.11** (red dots for industrial fleet and green dots for the artisanal fleet). In 2019, part of the fishing activity of the industrial fleet took place within the 5-mile Artisanal Fishing Reserve Area (ARPA), since during the first nine months of that year the authorization to enter or “drill” (perforaciones) into that reserve area was still in force. However, it can be seen that in 2020 and 2021 the industrial fleet (in red) had no fishing activity within 5 miles, as the authorization for “drilling” has not been renewed since the end of 2019. The artisanal fleet is not constrained to operate outside the ARPA, so this fleet operates both inside and outside the ARPA. It is worth noting that the trawl footprint calculated by SUBPESCA (Informe Técnico Nº09-2018) did not included the artisanal fleet. However, based on historical records, Enzo et al (2021) calculated the historical fishing grounds of this fleet (including the area inside ARPA).

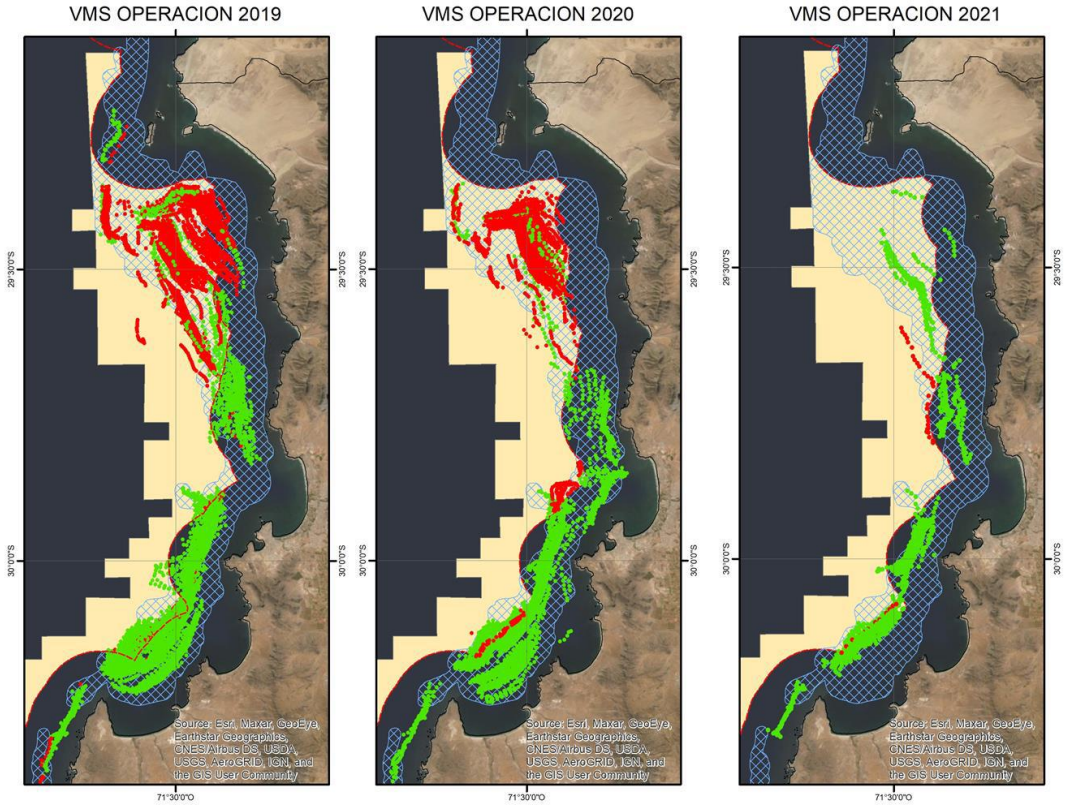


Figure 7.3.1.6.11. Total VMS Trawl Records for the years 2019 - 2020 and the first four months of 2021, North zone (North of IV Region) of the industrial fleet (red dots). The area painted in light color at the background represents the digitized "trawl footprint" based on the Inf. Tec N09/2018, while the dashed area represents the "historic fishing ground" developed by the UCN Team is outlined. Source: Acuña et al 2021

Fishing operations of the industrial fleet in the Southern Area (VII and VIII Regions) are shown in **Figure 7.3.1.6.12.** The operations of the artisanal fleet are restricted to IV Region (green dots in **Figure 7.3.1.6.13**), so all fishing activity depicted in **Figure 7.3.1.6.12** is from the industrial fleet. Results show that there are three separated fishing grounds in this area, and that all trawling activity falls within the trawl historic footprint as calculated in Inf. Tec. N09/2018.

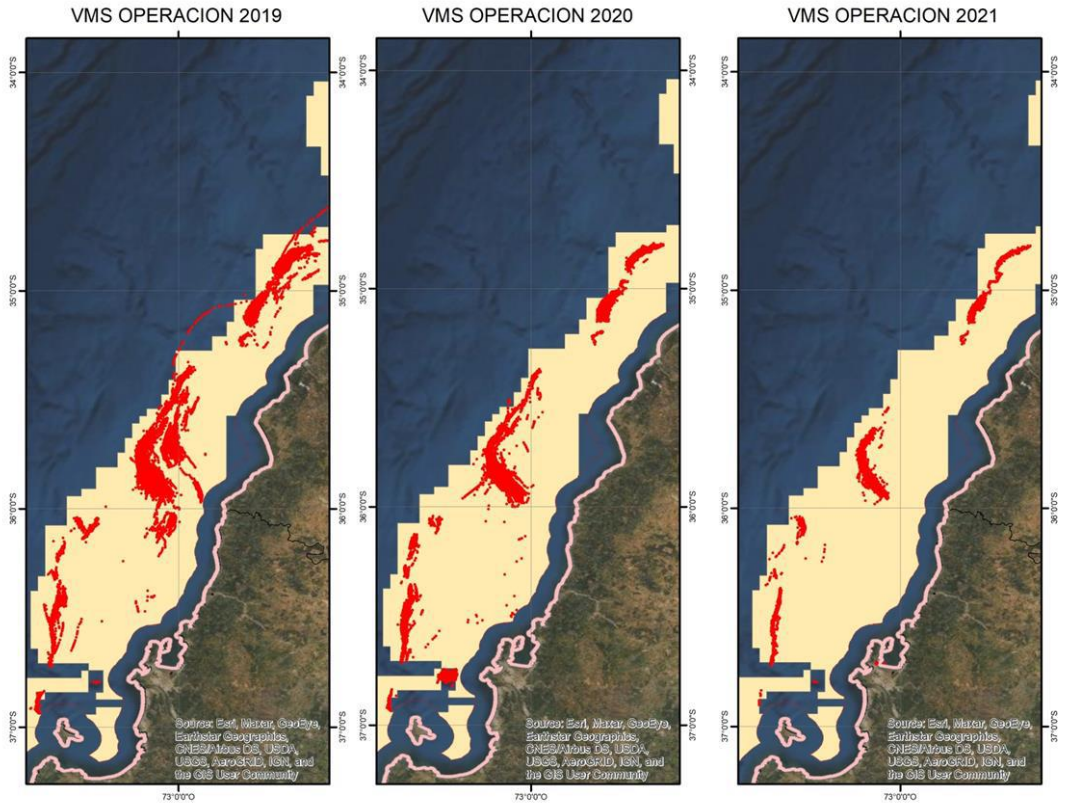


Figure 7.3.1.6.12. Total VMS Trawl Records for the years 2019 - 2020 and the first four months of 2021, South zone (VII and VIII Regions) of the industrial fleet. The area painted in light color at the background represents the digitized "trawl footprint" based on the Inf. Tec N09/2018. Source: Acuña et al 2021.

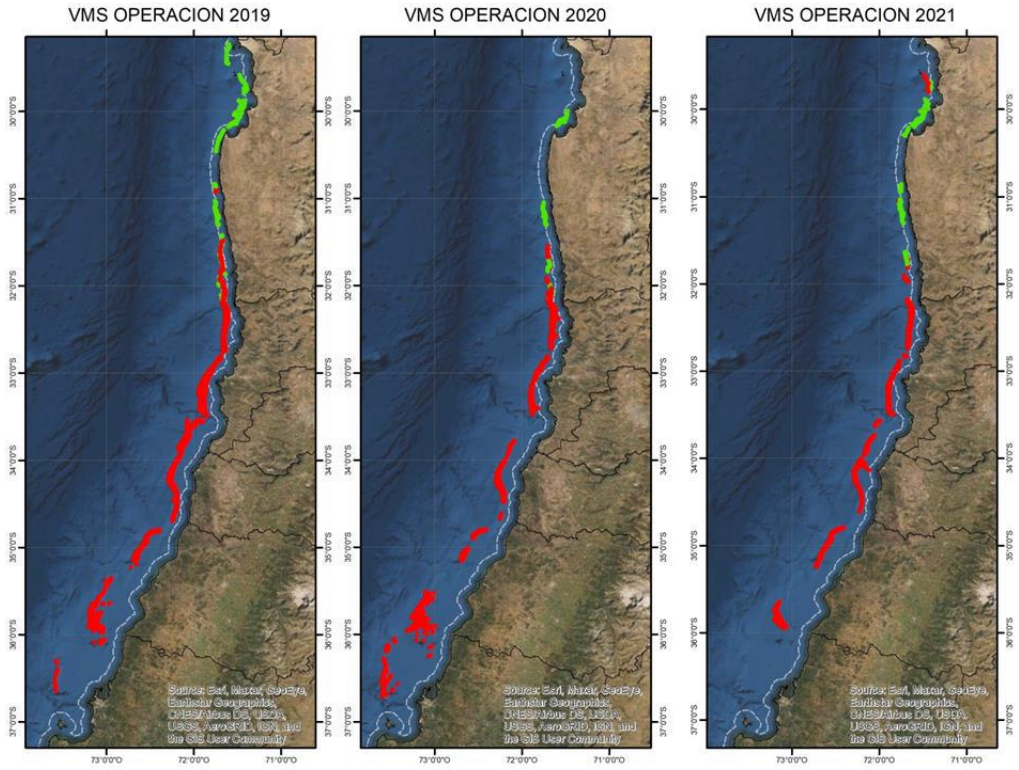


Figure 7.3.1.6.13. Total VMS Trawl Records for the years 2019 - 2020 and the first four months of 2021, for North and South zones (IV, V, VI, VII and VIII Regions) of the industrial fleet (red dots) and artisanal fleet (green dots). Inf. Tec N09/2018. Source: Acuña et al 2021.

According to Acuña et al (2021), the results obtained have confirmed the usefulness of using the information generated by the VMS installed in the vessels of the fleets associated with the AIP. The next step in the analysis will correspond to the integration of the information on catches and landings (mainly from the captains' logs and the certification of landings) with the records obtained from the VMS. Additionally, when performing a historical analysis, when all the VMS records are available since the satellite positioners were installed, the area covered by the fishery could be estimated year-by-year, in order to collect and visualize long-term patterns in the fishing activity developed by the fleet of AIP associates.

On the other hand AIP point out that, in a meeting of the Management Committee of January 26, 2021, it was agreed to request that the trawl footprint be quantified and considered within the artisanal reserve area (Minutes CM Session N ° 1 / 2021).

V. Characteristics of the fishing gear

According to Addison and Adlerstein-Gonzalez (2016), traditionally the trawl gear models used by demersal crustacean fisheries were the "modified German trawl" and the "modified semiballon", the second used mainly in the south. Mesh sizes were of 1 ½ " (38-40 mm) usually in the tunnel and cod end, and to 2"(50 mm), in the wings. The opening of the net varied between 2.5 and 3.5 m. To avoid friction with the seabed and consequent wear, protectors were used covering parts of the net. The nets were mainly of polyamide and reused from discarded nets from purse seiners. According to Saa et al 2017, factors such as overall size, thick twines, heavy materials and small mesh (50 mm knot-centre to knot-centre), resulted in poor functional and selective performance. These trawl gears were replaced by a new design because of concerns of catching small and immature individuals of the target species, bycatch mortality imposed on non-target species, and damage caused by interaction with the seafloor.

The new gear design was the product of several years of efforts conducted by researchers at the Pontificia Universidad Catolica de Chile. According to Saa et al 2017, this involved the FIPA financing four projects over an eight-year period. Among the objectives was to develop and evaluate a new trawl net which minimizes contact with the sea floor, and enabling the incorporation of BRDs and selective systems for the separation of juvenile crustaceans.

Characteristics of the new trawl gear were established by Res.Ex. 762 of 2013 and use was to be mandatory starting December 31, 2013. Unfortunately, difficulties in obtaining construction materials delayed compulsory use (SUBPESCA R 3796 and R 2018). The fishery started gradually using the new gear in 2013 and the fleet fully transitioned to the modified trawl when the 762 resolution actually took effect in November 2014. Preliminary data from the 2015 fishery were available for assessment of performance of the new gear., and Res.Ex 762/2013 was amended by Res. Ex. 145/2015.

The gear consists of a net with two panels of 28.8 m headrope and 32 m footrope with sweeps and bridles of 1 and 5 m, respectively. The main features regulated through Res.Ex 762/2013 and R.Ex145/2015 include overall dimensions, net material and mesh sizes in different parts of the nets, structures to protect against wear, and escape devices.

Regulation R.E. 762 of 2013 (amended by Res.Ex142/2015) established the following technical specifications for the modified trawl gear (**Figure 7.3.1.6.15**):

- The ropes maximum length will be equivalent to 5% of the length of the upper line.
- Panels of Polyethylene, polypropylene, polysteel or other can be used of a density less than density of sea water (buoyant material), banning the use of non-buoyant materials.
- The use of non-buoyant materials may be used only in the codend section
- The maximum diameters of the wires used will depend on the installed power of the ship. On vessels up to 1,000 HP, the maximum diameter of the wire may not exceed 3.5 mm, while on vessels of more than 1,000 HP the maximum diameter shall be 5 mm.
- The use of double-threaded fabrics in the tunnel and cup is permitted on vessels over 1,000 HP
- Mixed cable (Hercules type) may be used exclusively in the upper cable wich diameter shall not exceed 80% of the diameter of the cable, and any type of structural cable in the rest of the network shall be prohibited
- Floats should be attached to the upper fishing line of the fishing net, ensuring a minimum buoyancy of 1,5 kg per linear meter of upper row
- It is allowed to use a protection against rubbing only in the lower section of the tunnel and the cod-end, which can only be made of buoyant net material. The mesh size should be at least twice the mesh size of the section to be protected. The use of other elements that obstruct the net are prohibited.
- In the fisheries of shrimp nylon, and yellow and red squat lobsters, the nets shall use a panel of square meshes constructed of a mesh net having a minimum mesh size of 70 mm or 35 mm in length Internal bar. The panel of square meshes shall have a minimum extension equal to 25% of the length of the tunnel and cup, while its width shall cover the upper panel of the respective section
- The sections constituting the tunnel and cod of the trawl nets shall be constructed of mesh netting with minimum mesh size depending on the target species to catch:
    - For nylon shrimp, between II and VIII Regions: 50mm.
    - for yellow squat lobster, in III and IV and between V and VIII Regions: 60 mm
    - for red squat lobster between XV and IV and between V and VIII Region: 60 mm.

For any other modification the user shall demonstrates through technical reports that their use improves the capture selectivity to the size of the target resource. Different trials with net designs within the regulations had been made to improve net selectivity and allow hake to exit the gear unharmed and minimize bycatch, in particular in the nylon shrimp fishery. But, up to date, the characteristics of the gear have not been modified.

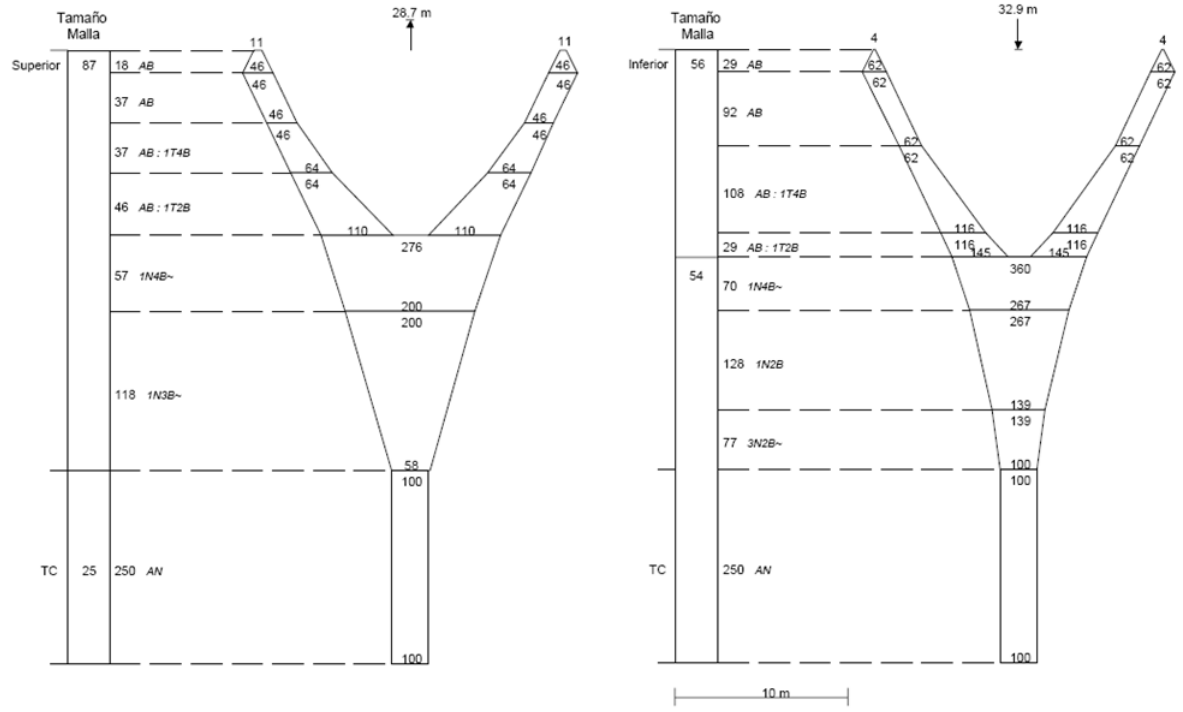


Figure 7.3.1.6.14 Design of the modified crustacean trawl gear according to regulation Res.Ex. 762/2013

The resulting modified trawl is lighter and also more susceptible to tear than the previous gear used, which has caused the fishery to move away from hard substrate. **Figure 7.3.1.6.15** shows that footrope of the gear used to target squat lobster is light and lacks of protective hard roller structures (made out of metal or hard plastic). The only authorised

protection against rubbing shall be made of of buoyant net material. This type of fishing gear could not bear the abrasion derived from being dragged on hard bottoms.

Figure 7.3.1.6.15 Details of the fishing gear used to target squat lobsters in the UPS. Source: Camanchaca Pesca Sur, S.A.

7.3.1.7 Ecosystem

This section follows the section included in the Public Certification Report (Addison and Adlerstein-Gonzalez, 2016).

I. Introduction

The ecosystem component considers the broad ecological community and ecosystem in which fisheries operate and addresses system-wide issues primarily indirectly impacted, including ecosystem structure, trophic relationships and biodiversity. This component is meant to address cumulative fishery effects on the broader ecological community and ecosystem, in contrast to fishery impacts on species addressed above as primary, secondary, ETP and habitats. Three performance indicators for the ecosystem components verify if: i) the fishery causes irreversible harm to key ecosystem components, ii) confirms that there are measures in place to ensure that the fishery does not pose a risk of serious or irreversible harm, and iii) that there is adequate knowledge of the impacts of the fishery on the ecosystem.

II. Background

The Humboldt Current ecosystem characteristics where the fisheries operate off the Chilean coast are shaped by a typical upwelling system. Information on ecosystem structure and trophic relationships is available mostly for the southern Humboldt system off central Chile, located from 33◦S to 39◦S and up to 30 nautical miles offshore the coastline, covering approximately 50,000 km^2. The system comprised areas between Region IV and VIII and the geographical unit corresponds to the “Mediterranean District” of the Humboldt system described by Camus (2001) but is within the “Intermediate Area” which is ecologically independent from the “Peruvian Province” north of 30$_o$S (**Figure 7.3.1.7.1**). Characteristics reported for the southern Humboldt system are applicable to the area of this assessment. Main oceanographic and biogeographic patterns that characterize the system are: (i) rather narrow continental shelf (<30 nm), (ii) strong seasonal upwelling period (September to March) and (iii) high primary productivity levels.

Biodiversity in the marine environment along central Chile is high due to four main water masses: Subtropical Surface (STSW), Subantarctic (SAW), Antarctic Intermediate (AAIW), and Equatorial Subsurface Water (ESSW) (Strub et al 1998). Wind driven coastal upwelling brings ESSW to the surface in the coastal zone, causing persistent and characteristic shallow oxygen minimum zones. suggest that coastal SSTs comprise two large-scale climate processes affecting the southern Humboldt: at the inter-annual scale the main source of variability is the ENSO cycle, whereas on a long-term scale, inter-decadal oscillation occurs at a basin-wide, and maybe even global, scale.

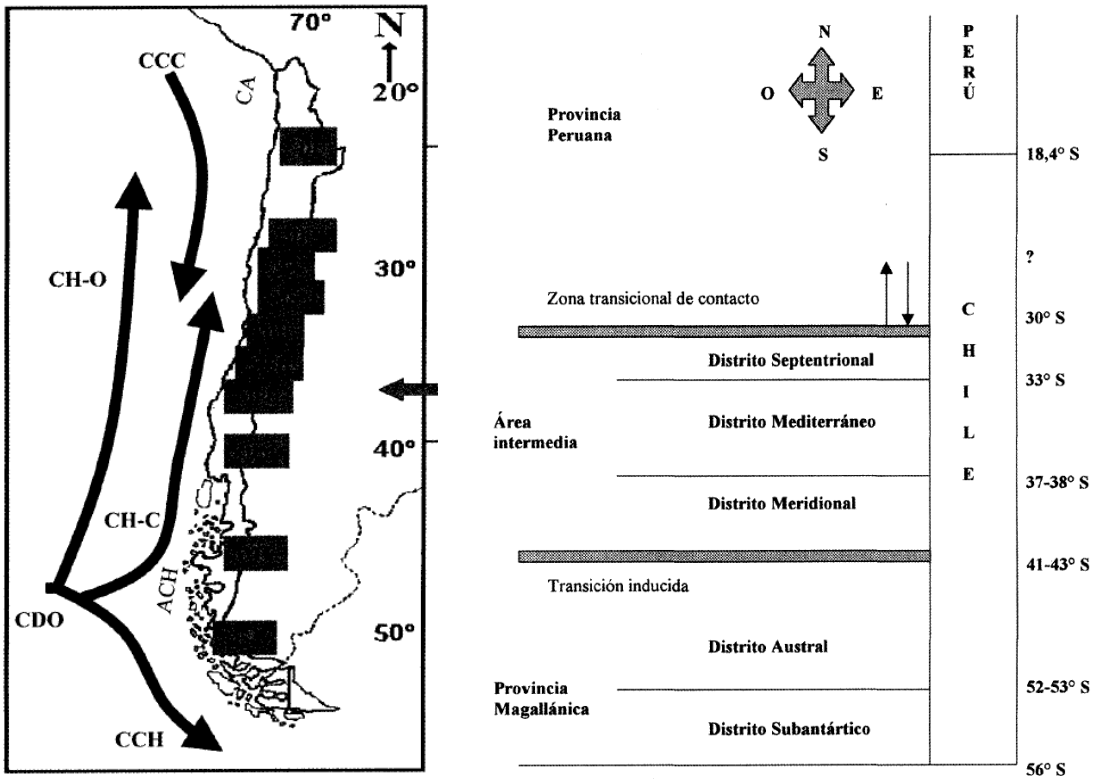


Figure 7.3.1.7.1. Main Circulation Patterns and Biogeographic Zones off Chile. CCC=Contra Corriente Ecuatorial, CDO=Corriente de Deriva del Oriente, CH-O=Chileno Peruana, CH-C=Corriente de los Fiordos, CCH=Corriente Cabo de Hornos. Source: Camus 2001

The southern Humboldt sustains a diverse food web. Large diatoms dominate phytoplankton, while zooplankton is dominated by copepods and euphausiids. Jellyfish also constitute an important group in the plankton. Macro crustaceans, such as red and yellow squat lobster and nylon shrimp, are significant benthic components. The fish community is dominated by pelagic species: anchovy (*Engraulis ringens)* and pilchard (*Strangomera bentincki),* which feed on phytoplankton and zooplankton, and are highly abundant and dominate landings. Horse mackerel feeds mainly on euphausiids. The demersal fish community is dominated by Chilean hake in biomass and landings. Chilean hake inhabits 200–400 m waters and feeds on euphausiids, demersal crustaceans, small pelagic fishes, and is cannibalistic. Status and basic ecology of top predators such as marine birds, sea lions, and cetaceans is poorly known.

In Central Chile, fisheries and ENSO induce changes in pelagic and benthic species. The southern Humboldt ecosystem represents an independent management unit, comprising the main fishing ground for the Chilean purse seine and trawling fleets, both industrial and small scale operations, and accounting for approximately 75% of total landings (Neira and Arancibia 2004, Neira et al 2004). Since the 1980's, development and westward expansion of horse mackerel fishery influenced landings reaching an historical maximum of > 4 million t in 1995, and during 1997–1998 juveniles dominated fishing grounds. A dramatic drop in horse mackerel landings was accompanied by increasing landings of other important resources, Chilean hake, pilchard, and anchovy. In its more recent state, individual stocks and the whole food chain are considered significantly altered (Arancibia and Neira 2005), and evidence indicates that most main stocks are overexploited (Neira et al 2014). Ecosystem effects of changes in landings of the most important resources are not well understood.

III. Outcome

Available food web studies have quantified effects of removals of fisheries in the area including the demersal crustacean fisheries under assessment. These models have considered the ecosystem ranging from 33$_o$S to 39$_o$S

Nylon Shrimp Fisheries

The industrial nylon shrimp fishery is widely distributed covering both most of the latitude and bathymetric distribution of the species (Regions II to VIII and 150-500 m). The upwelling system off Central Chile is an immature system, with short trophic chains and low trophic transfer efficiency (Neira & Arancibia 2004). Predators consume the greater part of juvenile production of most important fishery resources, and fisheries remove a large fraction of adult production. Food web models for such a system which include nylon shrimp in the benthic pathway (**Figure 7.3.1.7.2**, **Table 7.3.1.7.1**) show that fisheries can have profound effects through food web interactions (Neira et al 2004, 2005, 2014; Arancibia et al 2005). Nylon shrimp feeds exclusively on detritus and is a low trophic level species (2). The species are a major component of the benthic food web pathway and in recycling organic matter back to the pelagic pathway

Ecosystem food web models showed that predation mortality constituted the main source of mortality for demersal crustaceans in 1992 and 1998 (Neira et al 2004) accordingly with the important role as prey. Main predators in the study

are Chilean hake, a main retained species in the nylon shrimp fishery, and grenadiers, black conger, bigeye flounder, and skates, most of the bycatch species in the fishery. Some of these taxa, such as skates and bigeye flounder, feed almost exclusively on demersal crustaceans. Nylon shrimp biomass is negatively affected by Chilean hake through predation. The study found positive net effects of the Chilean fisheries as a whole on the crustacean species, as direct removal effects were compensated by indirect effects from Chilean hake removals (**Figure 7.3.1.7.3**). Hake predation is decreased in a depressed population condition. Studies report strong impact of fishing that causes changes in energy flows, consumption, respiration and production in the ecosystem; but removals are for fisheries combined.

In addition to effects from removals of nylon shrimp by the fishery in the ecosystem, there is a large number of non-targeted species removed in nylon shrimp fishing operations (see **section 7.3.1.1.I**). Most important species in terms of total biomass removals were Chilean hake, yellow squat lobster, grenadiers, bigeye flounder, armed box and Chilean lemon crab. Removal of Chilean hake, a main predator in the ecosystem can have significant effects for ecosystem function. Also removals of grenadiers, a main component of the benthic fish community, and of chondrichthyes can have significant effects for ecosystem function**.**

Yellow Squat Lobster North UPN Fisheries

Potential ecosystem impacts of the fishery, same as from the nylon shrimp fishery, are from removals of this relatively abundant low trophic species and from removals of nylon shrimp and red squat lobster which play a significant role as prey; also from removal of non-target species that are top predators such as Chilean hake. Yellow squat lobster as the other two non-target crustacean demersal species feed exclusively on detritus and are low trophic level species (2) slightly lower than planktonic forage fish such as sardines. The species are a major component of the benthic food web pathway and in recycling organic matter back to the pelagic pathway.

In addition to effects from removals of yellow squat lobster and the two demersal crustaceans by the fishery, there are other non-targeted species (see **section 7.3.1.1.I**). Most important species in terms of total biomass removals were Chilean hake, grenadiers, bigeye flounder, armed box and lemon crab. Removal of Chilean hake, a main predator in the ecosystem can have significant effects for ecosystem function. Also removals of grenadiers, main components of the benthic fish community, and of chondrichthyes can have significant effects for ecosystem function. But biomass of non-target catch in the fishery has been generally < 20% of the total catch in the fishery and total catch < 3000 t. There are no known effects from removal of species at risk.

Yellow Squat Lobster UPS Fishery

The industrial yellow squat fishery in UPS has operated mostly in Regions V and VIII. Potential ecosystem fishery impacts, same as from the nylon shrimp fishery and yellow squat lobster fishery in the northern area, are from removals of this relatively abundant low trophic species and from nylon shrimp and red squat lobster which play a significant role as prey.

In additional to effects from removals of yellow squat lobster and the two demersal crustaceans by the fishery in the ecosystem, there are other non-targeted species (see **section 7.3.1.1.I**). Most important species in terms of total biomass removals were Chilean hake, bigeye flounder, armed box and lemon crab, but none of the bycatch species constituted main bycatch. Removal of Chilean hake, a main predator in the ecosystem can have significant effects for ecosystem function. But biomass of non-target catch has been generally <20% of the total catch in the fishery and total catch < 2500 t. There are no known effects from removal of species at risk.

Red Squat Lobster UPN Fisheries

The industrial red squat fisheries in the northern unit have operated mostly in Region IV. Potential ecosystem impacts of the fishery, same as from the nylon shrimp fishery and yellow squat lobster fisheries, are from removals of this relatively abundant low trophic species and from nylon shrimp and yellow squat lobster which play significant roles as prey.

In additional to effects from removals of red squat lobster and the two demersal crustaceans by the fishery in the ecosystem, there are other non-targeted species (see sections on retained and bycatch species). Most important species in total biomass removals were Chilean hake, bigeye flounder, armed box and lemon crab. Removal of Chilean hake, main predator in the ecosystem can have significant effects for ecosystem function. But biomass of non-target catch has been generally <10% of total catch in the fishery excluding yellow squat lobster and total catch is < 2000t. There are no known effects from removal of species at risk.

Red Squat Lobster UPS Fishery

Potential ecosystem impacts of the fishery in UPS, same as from the other UoAs, are from removals of this relatively abundant low trophic species and from nylon shrimp and yellow squat lobster which play significant roles as prey.

In additional to effects from removals of red squat lobster and the two demersal crustaceans by the fishery, there are other non-targeted species (see **section 7.3.1.1.I**). Most important species in terms of total biomass removals were Chilean hake, bigeye flounder, armed box and lemon crab. Removal of Chilean hake, main predator in the ecosystem can have significant effects for ecosystem function. But biomass of non-target catch has been generally <10% of total catch; total catch is nevertheless higher than in others UoC reaching close to 7000t. There are no known effects from removal of species at risk.

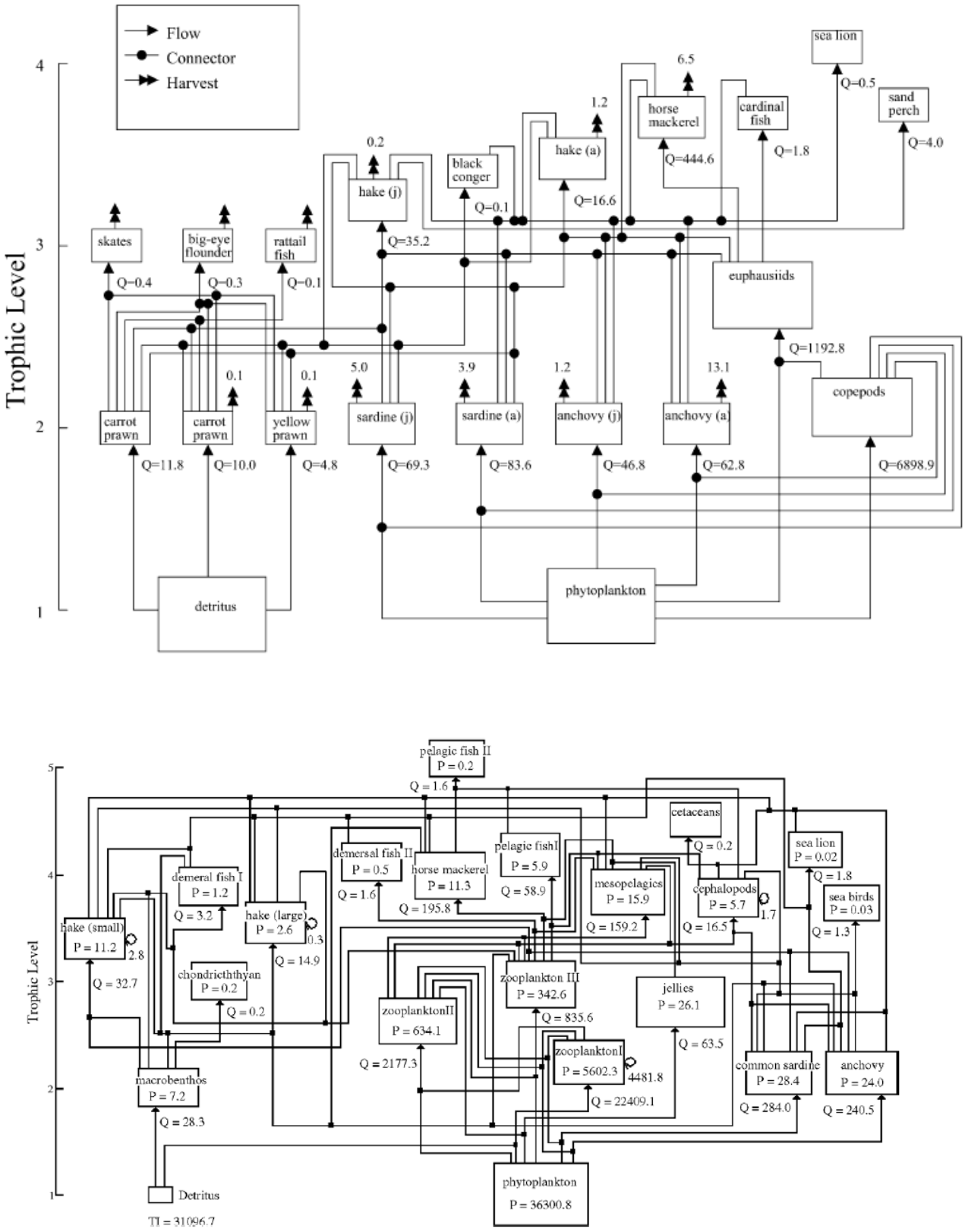


Figure 7.3.1.7.2. Flow (t/km2 per year) -1992 Food web of the Marine ecosystem off central Chile. (Top) species as separate groups, (bottom) species aggregated into functional groups: yellow and red squat lobster and nylon shrimp are “macrobenthos”. Source: Neira et al 2004, Neira and Arancibia 2004

Table 7.3.1.7.2. Ecopath Input (bold) and output parameters of 1992 central Chile food web in Figure 2. TL-Trophic level, B=Biomass, Y=Fishing yields, F= Fishing mortality, M2= Predation mortality, MO = Other mortality. Souce: Neira et al 2004, Neira and Arancibia 2004

Group name/parameter	B_i (t km^{-2})	P_i/B_i (per year)	Q_i/B_i (per year)	Y_i (t km^{-2} per year)	F_i (per year)	M_{0i} (per year)	M_{2i} (per year)	EE_i	GE_i
1. Sea lion	**0.030**	**1.050**	**15.000**	**0.003**	0.120	0.930	0.000	0.095	0.070
2. Chilean hake (j)	**4.827**	**2.497**	**8.323**	**0.243**	0.050	0.610	1.830	0.755	0.300
3. Chilean hake (a)	**4.487**	**0.541**	**5.159**	**1.188**	0.260	0.130	0.150	0.764	0.105
4. Pilchard (j)	**4.620**	2.537	**15.000**	**5.019**	1.090	0.130	1.320	**0.950**	0.169
5. Pilchard (a)	**6.970**	1.771	**12.000**	**3.933**	0.560	0.090	1.120	**0.950**	0.148
6. Anchovy (j)	**3.120**	3.625	**15.000**	**1.160**	0.370	0.180	3.070	**0.950**	0.242
7. Anchovy (a)	**5.230**	2.171	**12.000**	**4.942**	0.940	0.110	1.120	**0.950**	0.181
8. Carrot prawn (j)	0.665	**5.900**	**18.000**	**0.000**	0.000	0.090	5.810	**0.985**	0.328
9. Carrot prawn (a)	**0.799**	**2.520**	**12.500**	**0.080**	0.100	0.910	1.510	0.638	0.202
10. Yellow prawn	**0.416**	**2.184**	**11.600**	**0.059**	0.140	0.750	1.290	0.657	0.188
11. Horse mackerel	**13.790**	**0.823**	**14.200**	**6.480**	0.470	0.330	0.020	0.598	0.058
12. Black conger	**0.212**	**0.212**	**3.000**	**0.036**	0.170	0.020	0.020	0.913	0.071
13. Rattail fish	**0.256**	0.278	**4.000**	**0.064**	0.250	0.080	0.540	**0.900**	0.069
14. Big-eye flounder	**0.286**	0.304	**3.000**	**0.073**	0.260	0.120	0.000	**0.850**	0.101
15. Cardinal fish	**0.780**	**0.320**	**4.500**	**0.021**	0.030	0.190	0.100	0.198	0.071
16. Pacific sand perch	**0.759**	0.358	**7.000**	**0.231**	0.300	0.220	0.000	**0.850**	0.051
17. Skates	**0.436**	0.362	**3.500**	**0.134**	0.310	0.2200	0.000	**0.850**	0.103
18. Copepods	48.956	**35.000**	**154.519**	–	–	1.750	33.250	**0.950**	0.227
19. Euphausiids	73.627	**2.960**	**16.200**	–	–	0.140	2.820	**0.953**	0.183
20. Phytoplankton	112.107	**120.000**	**0.000**	–	–	82.940	37.060	**0.500**	–
21. Detritus	100.000	–	–	–	–	–	–	–	–

Table 2
Input parameters (bold) and results for the final run of the ecosystem model representing the upwelling system of central Chile, year 1992

Group name/ parameter	TL_i	B_i (t km^{-2})	P_i/B_i (year^{-1})	Q_i/B_i (year^{-1})	Y_i (t km^{-2} year^{-1})	F_i (year^{-1})	$M2_i$ (year^{-1})	$M0_i$ (year^{-1})	EE_i	GE_i
(1) Phytoplankton	1.00	302.506	**120.000**	–	–	–	36.000	84.000	**0.300**	–
(2) Zooplankton I	2.25	11.623	**482.000**	**1928.000**	–	–	481.518	0.482	**0.999**	0.250
(3) Zooplankton II	2.62	14.091	**45.000**	**154.519**	–	–	44.955	0.045	**0.999**	0.291
(4) Zooplankton III	2.98	26.353	**13.000**	31.707	–	–	12.987	0.013	**0.999**	**0.410**
(5) Jellies	2.81	44.707	**0.584**	1.420	–	–	0.088	0.496	**0.150**	**0.411**
(6) Macrobenthos	2.00	**2.008**	**3.569**	**14.104**	**0.228**	0.114	2.589	0.866	0.757	0.253
(7) Anchovy	2.14	**8.350**	**2.880**	28.800	**6.112**	0.731	1.843	0.306	0.894	**0.100**
(8) Common sardine	2.14	**11.590**	**2.450**	24.500	**8.952**	0.772	1.280	0.397	0.838	**0.100**
(9) Mesopelagic fish	3.84	13.263	**1.200**	**12.000**	–	–	1.199	0.001	**0.999**	0.100
(10) Horse mackerel	3.99	**13.790**	**0.823**	**14.200**	**6.480**	0.470	0.108	0.245	0.702	0.058
(11) Hake (large)	3.55	**4.287**	**0.605**	**5.159**	**1.188**	0.277	0.204	0.124	0.796	0.117
(12) Hake (small)	3.40	**4.487**	**2.500**	**8.323**	**0.243**	0.054	1.616	0.830	0.668	0.300
(13) Pelagic fish I	4.18	**13.380**	0.440	**4.400**	**3.950**	0.295	0.059	0.085	0.806	0.100
(14) Demersal fish I	3.89	**1.683**	0.700	**3.500**	**0.196**	0.116	0.044	0.540	0.229	0.200
(15) Demersal fish II	4.12	**0.780**	0.700	**3.500**	**0.021**	0.027	0.141	0.532	0.240	0.200
(16) Chondricththyans	3.00	**0.436**	0.362	**2.413**	**0.134**	0.307	–	0.055	0.849	0.150
(17) Pelagic fish II	5.08	**0.318**	0.500	**5.000**	**0.106**	0.333	–	0.167	0.667	0.100
(18) Cephalopods	3.78	1.636	**3.500**	**10.606**	**0.001**	0.001	3.496	0.003	**0.999**	**0.330**
(19) Sea lion	4.23	0.090	**0.250**	**20.000**	–	–	0.250	–	**0.999**	0.012
(20) Sea birds	3.74	**0.065**	0.500	**20.000**	–	–	–	0.500	0.000	0.025
(21) Cetaceans	4.51	**0.023**	0.150	**10.000**	–	–	0.01	0.140	0.067	0.015

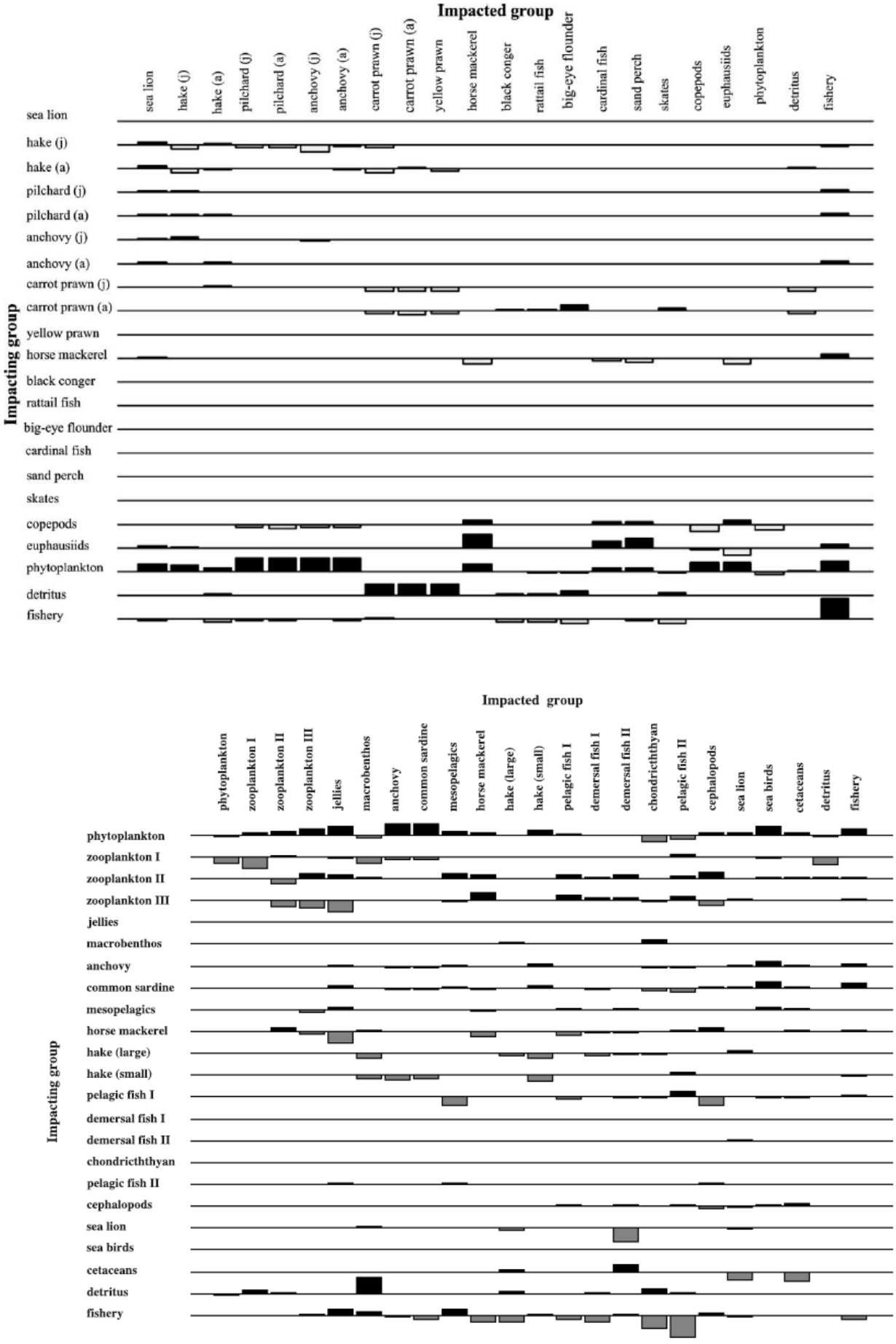


Figure 7.3.1.5.3. Mixed Trophic Impact from Ecopath Food Web Model for 1992 Central Chile Marine Ecosystem. Yellow and red squat lobsters and nylon shrimp constitute macrobenthos. + and - impacts are shown above and below the baseline. Neira et al 2004, Neira and Arancibia 2004

IV. Management strategy

There are several measures in place within the crustacean fisheries that minimize ecosystem fishery direct impacts from removals of the target species and some non-target species on trophic structure by restricting harvest and fishing areas. Use of quotas for target demersal crustacean species and other bycatch species reduces risk of serious or irreversible harm to ecosystem structure and function from fisheries. Besides, recent regulations have been adopted to reduce discards and mortality on seabirds and benthic invertebrates and sharks, skates and rays. Additionally, apart from off Region IV, there is no trawling activity allowed within 5 nm of the coast. There is an Action Plan for implementation of the Biodiversity National Strategy including a network of protected areas.

LGPA makes specific reference to an ecosystem approach to fisheries management. Many of its provisions have clear orientation towards conservation and protection of marine ecosystems (see **section 7.3.1.6**). While much effort in Chile, as elsewhere, has been on studies to better understand ecosystem structure and function, there have been management efforts to protect ecosystem components, with limits on fishing within 5 nm. Within the framework of an Action Plan for implementation of Biodiversity National Strategy, Chile is creating a national network of protected aquatic areas, which includes marine reserves and parks.

There are no specific measures based on ecosystem impact from demersal crustacean removals by fisheries on trophic structure. Food web models are available for the ecosystem off central Chile; fishery management has considered them to inform uncertainties in stock assessment. Materials presented in the ecosystem section reflect that much is known about food webs and impacts of some fisheries on the ecosystem, but the management system has not considered the information for ecosystem based management. From ecosystem studies elsewhere, we can reach similar conclusions. It becomes evident that impediments are system complexity, timely and large data requirements and many uncertainties associated with available information. Nevertheless, there is a need for models incorporating ecosystem interactions to help guide management decisions for demersal crustacean fisheries. They are important prey of Chilean hake, dominant species in the demersal ecosystem and currently depressed so that predation mortality is relatively low. This can partially help explain recovery of some crustacean stocks. So currently, crustacean fisheries are not affecting Chilean hake through feeding interactions, but otherwise fisheries need to account for predator-prey interactions.

V. Information and monitoring

Significant ecosystem work has been conducted off central Chile which provides adequate understanding of key ecosystem functions, and from which fishery impacts on these functions can be inferred. Main input flows in Central Chile marine ecosystem are between planktonic invertebrates (copepods and euphausiids) and primary producers, as reported for other upwelling ecosystems. Other important flows within the pelagic environment are from euphausiids and copepods to horse mackerel, and primary producers and copepods to pilchard and anchovy. Within the demersal environment, main flows are from pilchard and anchovy, and squat lobsters, shrimp and euphausiids, to Chilean hake.

Ongoing research and monitoring of main stocks and fisheries continually contributes to ecosystem understanding, and would likely detect changes in ecosystem functioning over time. A number of studies have investigated the impact of the Chilean fisheries on marine ecosystems (among others Arancibia & Neira 2005; Neira 2003; Neira et al. 2004, 2014). Arancibia & Melendez (1984, 1987) analyzed inter-specific relationships between fishery resources and their prey in Central Chile, and concluded that most species that are fishery resources play important ecological roles in the marine system. Trophic relationships between the main components, such as Chilean hake and horse mackerel, have been studied in some detail (Arancibia &Melendez 1987). Studies use food web ecosystem models to evaluate impacts of Chilean fisheries on food webs at different time periods. Nevertheless, these studies consider effects of demersal crustacean fisheries as a whole. Thus outputs from models do not help understand effects of each fishery on other ecosystem groups. Overall, pelagic species such as horse mackerel, pilchard, and anchovy dominate the system and Chilean hake is the dominant species in the demersal environment. Chilean hake is the main predator in the system and sea lions play a secondary role. Fisheries today represent the main predator for main target species in the system (Neira et al 2014).

7.3.2 Principle 2 Performance Indicator scores and rationales

PI 2.1.1 – Primary species outcome

PI 2.1.1		The UoA aims to maintain primary species above the point where recruitment would be impaired (PRI) and does not hinder recovery of primary species if they are below the PRI		
Scoring Issue		SG 60	SG 80	SG 100
a	Main primary species stock status			
	Guide post	Main primary species are **likely** to be above the PRI. OR If the species is below the PRI, the UoA has measures in place that are **expected** to ensure that the UoA does not hinder recovery and rebuilding.	Main primary species are **highly likely** to be above the PRI. OR If the species is below the PRI, there is either **evidence of recovery** or a demonstrably effective strategy in place **between all MSC UoAs which categorise this species as main**, to ensure that they collectively do not hinder recovery and rebuilding.	There is a **high degree of certainty** that main primary species are above the PRI **and are** fluctuating around a level consistent with MSY.
	Met?	**UoAs 1 & 2** Chilean hake: **Y** **UoAs 3 & 4** Red squat lobster UPN: **Y** Chilean hake: **Y** **UoA 5** Red squat lobster UPS: **Y** **UoAs 6 & 7** Yellow squat lobster UPN: **Y** Chilean hake: **Y** **UoA 8** Yellow squat lobster UPS: **Y** Chilean hake: **Y**	**UoAs 1 & 2** Chilean hake: **Y** **UoAs 3 & 4** Red squat lobster UPN: **Y** Chilean hake: **Y** **UoA 5** Red squat lobster UPS: **Y** **UoAs 6 & 7** Yellow squat lobster UPN: **Y** Chilean hake: **Y** **UoA 8** Yellow squat lobster UPS: **Y** Chilean hake: **Y**	**UoAs 1 & 2** Chilean hake: **N** **UoAs 3 & 4** Red squat lobster UPN: **Y** Chilean hake: **N** **UoA 5** Red squat lobster UPS: **Y** **UoAs 6 & 7** Yellow squat lobster UPN: **Y** Chilean hake: **N** **UoA 8** Yellow squat lobster UPS: **Y** Chilean hake: **N**
Rationale				

See **section 7.3.1.1** for more details on the catch composition of the assessed UoAs and the P2-species classification following the MSC requirements. **Table 7.3.1.1.5** shows P2-speciesconsidered for UoA1 and **Table 7.3.1.1.6** shows P2-speciesconsidered for UoA2.

Yellow squat lobster UPN:

The yellow squat lobster UPS was assessed as the P1 for the UoA5. As shown in PI1.1.1(a), there is a high degree of certainty that the stock is above the PRI. Thus, the **yellow squat lobster meets SG60, SG80 and SG100.**

Yellow squat lobster UPS:

The yellow squat lobster in UPN was assessed as the P1 for the UoA3 and UoA4. As shown in PI1.1.1(a), there is a high degree of certainty that the stock is above the PRI. Thus, the **yellow squat lobster meets SG60, SG80 and SG100.**

Red squat lobster UPN:

The red squat lobster in UPN was assessed as the P1 for the UoAs 6 and 7. As shown in PI1.1.1(a), there is a high degree of certainty that the stock is above the PRI. Thus, the red squat lobster meets **SG60, SG80 and SG100.**

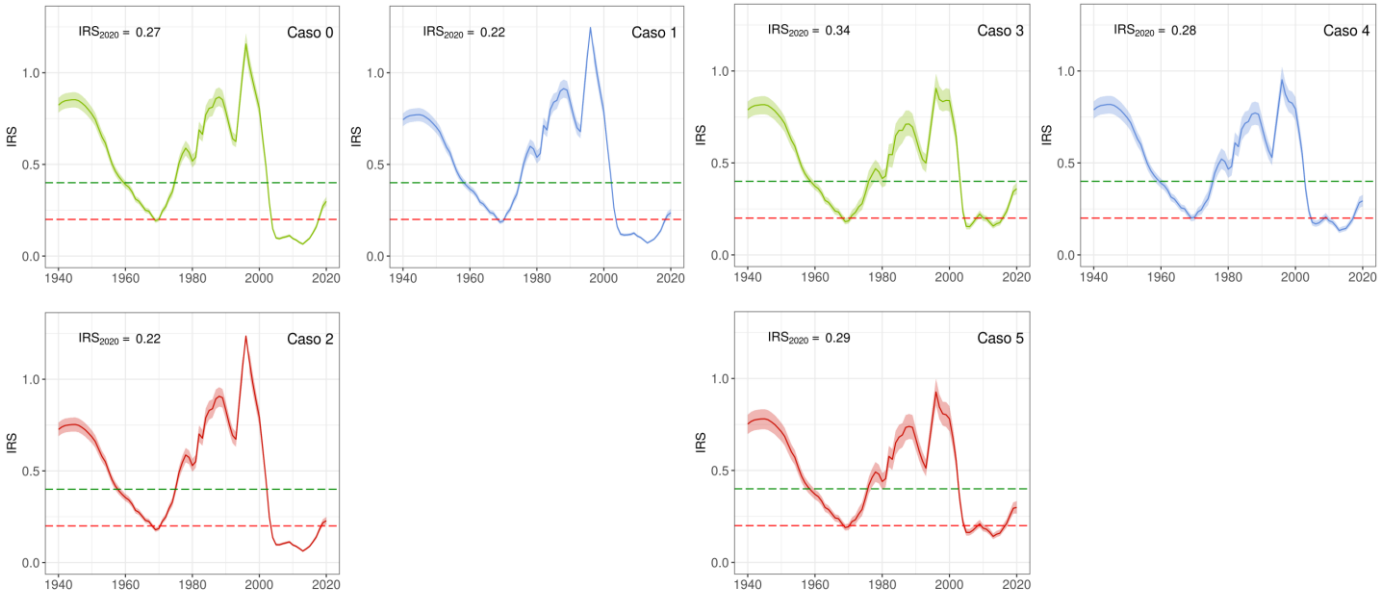
Red squat lobster UPS:

The red squat lobster in UPS was assessed as the P1 for the UoA 8. As shown in PI1.1.1(a), there is a high degree of certainty that the stock is above the PRI. Thus, the red squat lobster meets **SG60, SG80 and SG100.**

Chilean hake:

Results from the latest stock assessment for the Chilean hake are presented in Tascheri (2021). Figures below shows that, regardless of which of the 6 different assessed scenarios is considered (see **section 7.3.1.3.II** for more details), a continuous increase in spawning biomass was observed between 2013 and 2020, consistent with the increase observed in acoustic surveys. Also, regardless of the case considered, the level of spawning biomass reduction in relation to the virgin biomass (B0) was found to be above the biological limit reference point and below the target reference point. The 25-75% quartiles are depicted in the graphs. Even for those cases with the lower estimates (cases 1 and 2), the lower limit of the confidence interval is above the limit reference point. Table SA9 of the MSC Fishery Standard v2.01 indicates that the probability requirement for SG80 for PI 2.1.1 is >80%ile. Despite Tascheri (2021) does not present the 80%iles, there is only one chance (case 2) that the lower limit could fall at or slightly below the limit reference point. However, for the other 5 scenarios the lower limit of the spawning biomass confidence interval is clearly above the limit reference. **SG60 and SG80 are met for the Chilean hake.**

Figure below clearly show that the stock has not been fluctuating around a level consistent with MSY. Furthermore, the lower limit of the confidence interval for the 75%ile in cases 1 and 2 are very close to the PRI, and it is unlikely that they could meet MSC requirement for SG100 (>90%ile, Table SA9 of the MSC Fishery Standard v2.01). **SG100 is not met for the Chilean hake.**



b	Minor primary species stock status			
	Guide post			Minor primary species are highly likely to be above the PRI. OR If below the PRI, there is evidence that the UoA does not hinder the recovery and rebuilding of minor primary species.
	Met?			**UoAs 1** Yellow squat lobster UPN: **Y** Yellow squat lobster UPS: **Y** Red squat lobster UPN**: Y** Red squat lobster UPS**: Y** Humbolt squid: **Y** Longnose skate (UP): **Y** Hoki: **Y** Cardinalfish: **N** Chilean jack mackerel: **Y**

				UoAs 2 Yellow squat lobster UPN: **Y** Red squat lobster UPN**: Y** Humbolt squid: **Y** Longnose skate (UP): **Y** Hoki: **Y** Cardinalfish: **N** Chilean jack mackerel: **Y** **UoAs 3 & 4** Yellow squat lobster UPN: **Y** Red squat lobster UPN**: Y** Humbolt squid: **Y** Longnose skate (UP): **Y** Cardinalfish: **N** Chilean jack mackerel: **Y** **UoA 5** Nylon shrimp ZCS: **Y** Humbolt squid: **Y** Longnose skate (UP): **Y** Cardinalfish: **N** Chilean hake**: Y** Hoki: **Y** Chilean jack mackerel: **Y** **UoAs 6 & 7** Nylon shrimp ZCN: **Y** **UoA 8** Nylon shrimp ZCS**: Y** Humbolt squid: **Y** Longnose skate (UP): **Y** Cardinalfish: **N** Chilean jack mackerel: **Y**

Rationale

See **section 7.3.1.1** for more details on the catch composition of the assessed UoAs and the P2-species classification following the MSC requirements. **Table 7.3.1.1.5** shows P2-species considered for UoA1 and **Table 7.3.1.1.6** shows P2-species considered for UoA2.

Below is presented the information on the status of all minor species impacted by the two UoAs:

Yellow squat lobster UPN:

The yellow squat lobster in UPN was assessed as the P1 for the UoA3 and UoA4. As shown in PI1.1.1(a), there is a high degree of certainty that the stock is above the PRI. Thus, the **yellow squat lobster meets SG100.**

Yellow squat lobster UPS:

The yellow squat lobster yellow squat lobster UPS was assessed as the P1 for the UoA5. As shown in PI1.1.1(a), there is a high degree of certainty that the stock is above the PRI. Thus, the **yellow squat lobster meets SG100.**

Red squat lobster UPN:

The red squat lobster in UPN was assessed as the P1 for the UoAs 6 and 7, while red squat lobster in UPS was assessed as the P1 for the UoA 8. As shown in PI1.1.1(a), there is a high degree of certainty that the stock is above the PRI. Thus, the red squat lobster meets **SG100**

Red squat lobster UPS:

The red squat lobster in UPS was assessed as the P1 for the UoA 8. As shown in PI1.1.1(a), there is a high degree of certainty that the stock is above the PRI. Thus, the red squat lobster meets **SG100**

Nylon shrimp ZCN:

The nylon shrimp in ZCN was assessed as the P1 for the UoA1 and UoA2. As shown in PI1.1.1(a), there is a high degree of certainty that the stock is above the PRI. Thus, the red squat lobster meets **SG100**

Nylon shrimp ZCS:

The nylon shrimp in ZCS was assessed as the P1 for the UoA1. As shown in PI1.1.1(a), there is a high degree of certainty that the stock is above the PRI. Thus, the red squat lobster meets **SG100**

Humbolt squid:

The estimated average biomass in 2020 was 239kt, which is 5% higher than in 2019. The most likely status for 2020 according to the model is overfished (77%), followed by collapsed (19%), similar to the previous year (CCT-RDZCS Nº02/2020). See **figure 7.3.1.3.9**. The MSC requires 80%ile for the stock to be above PRI to meet SG80.

However, the contribution of this species to the total catches of both UoAs (based on observed catches) have always been negligible (<0.05%). Based on the above, the team considers that **SG100 is met.**

Longnose skate (UP):

In November 2020, the CCT-RDZCS concluded that the stock is not in full exploitation, but it is not possible to ascertain whether it is overexploited or collapsed. The advised was to maintain the status quo, and the stock was considered as overexploited (Subpesca, 2021). Thus, it cannot be considered as highly likely that this stock is above its PRI

However, this species was only observed in the catch composition of the UoAs in 2017 and 2018 in the case of UoA1, and in 2017 and 2019 in the case of UoA2. The contribution of this species to the total catches have always been negligible (<0.05%).

Based on the above, the team considers that **SG100 is met.**

SG100 is not met.

Cardinalfish:

The stock was found to be seriously collapsed in 2012 (SSB_{2012}=0,047SSB_0) (Subpesca 2021). Besides, it was calculated that this species would require at least 81 years to recover, due to its longevity and slow growth rate. Based on this, and the scarce knowledge on its stock structure and migration patterns, an extractive ban was adopted. Since then, bycatches of cardinalfish in other fisheries (mainly deep-water fisheries) have been monitored by IFOP and they have always been above the authorized level of 12t/year. In 2021 Subpesca has extended the extractive ban on the cardinalfish for another five years (D.Ex.Nº03 of January 20, 2021), until January 2026.

This species was only observed in the catch composition of the UoAs in 2018 in the case of UoA1, and in 2019 in the case of UoA2. In both cases, the contribution of this species to the total was negligible (<0.05%). However, there is an extractive ban for this stock, and the maximum authorised bycatch is restricted to 12t. Despite the very reduced observed catches for this species, the team decided to apply a precautionary approach and consider that **SG100 is not met.**

Chilean hake:

See rationale provided in SI(a) for the Chilean hake justifying that Chilean hake is highly likely above the PRI. **SG100 is met.**

Hoki:

According to Subpesca 2021, the latest stock assessment on the hoki found that there was 99,6% chances of the stock being collapsed. **Figure 7.3.1.3.11** shows that SB_{2019} is clearly below the 0,2SB_0 (adopted as biological limit reference point). Thus, it is not highly likely that this stock is above its PRI.

However, this species has not been observed in the catch composition of any of the UoAs between 2016 and 2019. While in 2020 it was observed only in the UoA2, but with a negligible contribution to the total catches (<0.05%). Based on the above, the team considers that **SG100 is met.**

SG100 is not met.

Chilean jack mackerel

The stock shows signs of recovery since 2010, with a increasing trend for the SSB which is estimated to be above MSY levels, high recruitments and low F. Based on that, the CCT-J determined the stock to be not overfished and not subject to overfishing. The stock was classified as fully exploited (plena explotacion). **SG100 is met.**

References

CCT-RDZCS Nº02/2020, Subpesca 2021, Tascheri (2021)

Draft scoring range and information gap indicator added at Announcement Comment Draft Report stage

Draft scoring range	**≥80**
Information gap indicator	**More information sought**

Information is sought regarding:

-Estimates of total catches of cardinalfish caught by each of the fisheries targeting demersal crustaceans. To cross-check against the authorized 12t/year

PI 2.1.2 – Primary species management strategy

PI 2.1.2		**There is a strategy in place that is designed to maintain or to not hinder rebuilding of primary species, and the UoA regularly reviews and implements measures, as appropriate, to minimise the mortality of unwanted catch**		
Scoring Issue		SG 60	SG 80	SG 100
a	Management strategy in place			
	Guide post	There are **measures** in place for the UoA, if necessary, that are expected to maintain or to not hinder rebuilding of the main primary species at/to levels which are likely to be above the PRI.	There is a **partial strategy** in place for the UoA, if necessary, that is expected to maintain or to not hinder rebuilding of the main primary species at/to levels which are highly likely to be above the PRI.	There is a **strategy** in place for the UoA for managing main and minor primary species.
	Met?	**Yes (All UoAs)**	**Yes (All UoAs)**	**Yes (All UoAs)**
Rationale				

All main primary species assessed for the assessed UoAs are the three demersal crustaceans (yellow squat lobster, red squat lobster, nylon shrimp) plus the Chilean hake.

- These four primary species are managed under individual transferable quota systems.

- There is a management plan for the demersal crustaceans (approved by Res.Ex.3423/2016) and another for the Chilean hake. Both MAPs set management objectives for these species, biological reference points and HCRs, and strategies to achieve those objectives. These MAPs aim to rebuild the stocks, if necessary, and then maintain them at MSY levels.

- These four primary species have a model-based assessment strategy that incorporates fishery-dependent information and information from direct surveys. Direct surveys are conducted annually, and stock assessments are also updated on annual basis.

- Scientific advice on the TAC (or CBA) is provided by the applicable CCT (CCT-CD in the case of the demersal crustaceans, and CCT-RDZS in the case of the Chilean hake) based on the outputs of the stock assessments, and the TAC shall be set in accordance with this scientific advice.

- There are seasonal closures for all four primary species: Nylon shrimp (from August 1 to 31 August, D.Ex.Nº92/1998; and September in the Regions of Valparaiso a Maule, D.Ex.Nº126/2015); yellow and red squat lobsters (In January, February and September, D.Ex.324/1998 amended by D.Ex..Nº126/2015); Chilean hake (from September 1 to 30, D.Ex.Nº464/2016).

- There is an specific plan for the reduction of the discards and incidental catches in fisheries targeting demersal crustaceans (Informe Tecnico -R.Pesq.- Nº04/2017), which was approved by Resolution Nº1106/2017. This plan requires all catches of the yellow squat lobster, red squat lobster, nylon shrimp and common to be reported, landed and counted against the applicable quota. Discards are only allowed in certain circumstances, but if that is the case the discarded fraction must be separated, boxed and shown to the image recording cameras on board (EMS) for its detection and quantification by SERNAPESCA. The discards' Plan also details best practices on board to be accomplished and objective of training programmes (see section 7.3.1.2.i&III for more details on the applicable measures and best practices to demersal crustaceans and Chilean hake). This, together with the comprehensive MCS in place (e-logbooks, VMS, EMS, list of authorised ports, inspections of all landings, integral traceability system), ensures that all catches (landings and discards) of these species is recorded and reported.

- Observers shall be admitted on board since 2002. However, since the inception of the research program for the reduction of discards and interactions in 2013 (see SIe for more details), the observer program was enhanced. The Discard Plan requires maintaining a monitoring program through the observer program and the EMS. On board observers are recording detailed data of all fishing operations and catches coming on board (and interactions with out-of-scope species), analyse the discarded fraction, and perform biological sampling (size, sex ratio, maturity stage…) on the target species (i.e. demersal crustaceans) and Chilean hake (only size). IFOP prepares annual reports summarising the information collected regarding discards and interactions of these fisheries, and this information is presented at the CCT-CD for review.

- An EMS on board all industrial vessels is mandatory since early 2020.

Based on the information presented above, the team considers that there is a strategy in place for the two UoAs for managing both main and minor species. **SG60, SG80 are met.**

Apart from the cardinalfish (which is subject to an extractive ban), all minor species impacted by the assessed UoAs have model-based assessment strategies that incorporate fishery-dependent information and information from direct surveys. Scientific advice on the TAC (CBA) is provided by the applicable CCT(CCT-CD in the case of the demersal crustaceans, CCT-RDZS in the case of the Chilean hake, Humbolt squid and longnose skate, CCT-RDAP for the hoki and the cardinalfish, CCT-J for Chilean jack mackerek) based (if possible) on the outputs of the stock assessments, and the TAC shall be set in accordance with this scientific advice. The discards plan is applicable to all species caught by the fleets targeting demersal crustaceans. The list of species subject to landing obligation is updated by the Subpesca on an annual basis. According to the latest update (R.Ex.Nº142/2021) all minor species the following minor primary species are subject to landing obligation (demersal crustaceans, Chilean hake, hoki, cardinalfish and Chilean jack mackerel), while Humbolt squid and longnose skate can be discarded (discarding of longnose skate shall follow protocols adopted in Res.Ex.2063/2020 to minimise mortality on sharks, rays and skates). In all cases discards shall be quantified, boxed and showed to the EMS before returning them to the sea (see **section 7.3.1.2.II** for more details).

The observer program to monitor the discards' plan for the fisheries targeting demersal crustaceans provides detailed information on that bycatch of all minor primary species caught, while the implementation of the Discards' Plan ensures a detailed recording of all catches by the fleets. The EMS ensures enforcement of the Discard Plan.

Based on the above, **SG100.**

	Management strategy evaluation			
b	Guide post	The measures are considered **likely** to work, based on plausible argument (e.g., general experience, theory or comparison with similar fisheries/species).	There is some **objective basis for confidence** that the measures/partial strategy will work, based on some information directly about the fishery and/or species involved.	**Testing** supports **high confidence** that the partial strategy/strategy will work, based on information directly about the fishery and/or species involved.
	Met?	**Yes (All UoAs)**	**Yes (All UoAs)**	**No (All UoAs)**
Rationale				

Annual quotas set are being set in accordance with the scientific advice from the applicable CCT. In turn, annual landings have not exceeded the quotas in any of the fisheries targeting main primary species in recent years, so that element of the harvest strategy appears to be working. The harvest control rules in place for the main primary species are designed to recover their stock biomasses and maintain the biomass and fishing mortality at levels reflected in the target and limit reference points. In general, this also appears to be working since the status of the four primary species assessed has increased up to levels above PRI.

Cardinalfish is subject to an extractive ban since 2013 which has just been renewed in January this year for another five years.

Concerns regarding the level of unreported discards in all fisheries targeting demersal crustaceans are being solved since the implementation of the research plan for the reduction of the discards in 2013 and its subsequent improvements (i.e. Resolution Nº1106/2017 approving a fishery-specific plan for the reduction of the discards, implementation of the EMS). This is allowing for better estimates of the fisheries removals, and therefore improved estimates of stock status.

Based on the information presented above, the team considers that **SG60 and SG80 are met**.

However, uncertainties in the stock assessment models of the demersal crustaceans are preventing to use the outputs for setting the CBA in some cases (nylon shrimp ZCS, Humbolt squid, longnose skate), and some of these resources are collapsed (cardinalfish, hoki), overexploited (Chilean hake, Humbolt squid, longnose skate) or subject to overfishing (Nylon shrimp ZCS).

Furthermore, the team cannot consider that the Discards' Plan has been tested, since no official outputs from the EMS has been released so far, so no cross-check on the level of discards and total catches between the different sources of information (official landings, observers and EMS) has been done so far.

Thus, **SG100 is not met.**

c	Management strategy implementation			
	Guide post		There is **some evidence** that the measures/partial strategy is being **implemented successfully**.	There is **clear evidence** that the partial strategy/strategy is being **implemented successfully and is achieving its overall objective as set out in scoring issue (a).**
	Met?		**Yes (All UoAs)**	**No (All UoAs)**
Rationale				

Annual quotas are being adopted by Subpesca based on the scientific advice from the CCTs, which in turn is based on the stock assessment prepared by IFOP. All IFOP annual reports can be downloaded from the IFOP website, including those reporting on: (i) the status and fishing possibilities for the main fishing stocks; (ii) monitoring of the fisheries targeting demersal crustaceans; (iii) monitoring of the fisheries targeting demersal resources in the central-south zone; (iv) monitoring of the demersal and deep-water fisheries; (v) monitoring of the research plan for reducing discards and incidental interactions in the fishery targeting demersal crustaceans. Also, all the minutes and technical reports from the applicable CCTs and CMs are available at its specific websites.

Cross-checking by SERNAPESCA of landings declarations with log book records and processors' records (through the Integral Traceability System), and VMS records with fishing positions recorded on electronic log books did not identify any systematic mis-recording of catches or fishery-dependant information. Sernapesca confirmed that the EMS is being implemented since 2020, and the team had the chance to visit the facilities during the third surveillance audit and has and interviewed the people in charge of running the system.

Based on the information presented above, the team considers that **SG80 is met.**

However, there are some issues preventing the team to score 100 in this SI:

- The EMS is a highly demanding system in terms of workforce and storage capacity of digital images. During the 4th surveillance audit, Sernapesca expressed their concern to the team in relation to their capacity to sustain the system.
- The team could not verify the implementation of some of the measures detailed in the discards' plan, such as the survey protocol (trial haul) and 'move-on rules'.
- The declaration of discarded Chilean hake might still not be 100% since the estimated catch in 2020 based on observer data (288 t, Figure 7.3.1.3.8) doubles that from the official statistics (127 t, Figure 7.3.1.3.7).

SG100 is not met.

d	Shark finning			
	Guide post	It is **likely** that shark finning is not taking place.	It is **highly likely** that shark finning is not taking place.	There is a **high degree of certainty** that shark finning is not taking place.
	Met?	**NA (all UoAs)**	**NA (All UoAs)**	**NA (all UoAs)**
Rationale				

None of the primary species impacted by the UoAs is a shark species. Thus, this SI is **not applicable** for this assessment.

e	Review of alternative measures			
	Guide post	There is a review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of unwanted catch of main primary species.	There is a **regular** review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of unwanted catch of main primary species	There is a **biennial** review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of unwanted catch of all primary species,

			and they are implemented as appropriate.	and they are implemented, as appropriate.
	Met?	**Yes (All UoAs)**	**Yes (All UoAs)**	**Yes (All UoAs)**

Rationale

The implementation of the research program for the reduction of discards between 2013 and 2015 helped to solve many concerns regarding the level of discarding in fisheries targeting demersal crustaceans (and others). Detailed information on the discarded fraction (including species composition, reasons for discarding, operational details) was collected in all fisheries targeting demersal crustaceans, and it continues to be collected today since the observer program is still in place. Data collected during the research program allowed to design a specific plan for the reduction of the discards and incidental catches in fisheries targeting demersal crustaceans (Informe Tecnico -R.Pesq.- Nº04/2017), which was approved by Resolution Nº1106/2017. In 2020 an EMS has been implemented by Sernapesca in all Chilean industrial fishing fleets (including those targeting demersal crustaceans).

The discard plan requires maintaining a monitoring program through the observer program and the EMS. As part of this monitoring program, IFOP shall evaluate existing measures to come with proposal on modifications or improvements to promote the reduction of discards and interactions. IFOP prepares annual reports summarising the information collected regarding discards and interactions of these fisheries, and this information is presented at the CCT-CD for review.

The CM-CD has been the forum to discuss and review the implementation of the research program first, the design of the fishery-specific plan to reduce discards and the EMS For instance, discussions on issues arising from the implementation of the EMS took place at the CM-CD during 2020, as confirmed by the representatives of Sernapesca, Subpesca and the fishing industry interviewed during the 4th surveillance audit held in May 2020 (Saa et al 2020).

Based on the information presented above, the team considers that **SG60, SG80 and SG100 are met**.

References

Saa et al. 2020.
Informe Tecnico -R.Pesq.- Nº04/2017. Plan de Reduccion del Descarte y de la Captura de Pesca Incidental para la Pesquería de Langostino Amarillo, Langostino colorado y Camarón nylon. Valparaíso, Marzo 2017. Available at:
Resolution Nº1106/2017. Available at: https://www.subpesca.cl/portal/615/articles-96693_documento.pdf
Res.Ex.3423/2016 approving the Management Plan for Demersal Crustaceans. Available at: xxx
R.Ex.Nº142/2021 setting the list of species subject to Articles 7ºA, 7ºB and 7ºC of the LGPA for the fisheries targeting demersal crustaceans in 2021.
Res.Ex.2063/2020 adopting mandatory release of chondrichthyans.

Website of the CM-CD: https://www.subpesca.cl/portal/616/w3-propertyvalue-52793.html
Website of the CCT-CD: https://www.subpesca.cl/portal/616/w3-propertyvalue-51147.html
Website of the CM-MC: https://www.subpesca.cl/portal/616/w3-propertyvalue-52792.html
Website of the CCT-RDZCS: https://www.subpesca.cl/portal/616/w3-propertyvalue-51144.html

Draft scoring range and information gap indicator added at Announcement Comment Draft Report stage

Draft scoring range	**≥80**
Information gap indicator	**More information sought**

Information is sought regarding:

- Further cross-checking official landings of Chilean hake and estimates using observers' data
- More details on the capacity of Sernapesca to analyse and store the images recorded on board would be advisable
- Information on the move-on rules and the fishing ground survey protocol

Overall Performance Indicator scores added from Client and Peer Review Draft Report stage

Overall Performance Indicator score	
Condition number (if relevant)	

PI 2.1.3 – Primary species information

PI 2.1.3		Information on the nature and extent of primary species is adequate to determine the risk posed by the UoA and the effectiveness of the strategy to manage primary species		
Scoring Issue		SG 60	SG 80	SG 100
a	Information adequacy for assessment of impact on main primary species			
	Guide post	Qualitative information is **adequate to estimate** the impact of the UoA on the main primary species with respect to status. **OR** **If RBF is used to score PI 2.1.1 for the UoA:** Qualitative information is adequate to estimate productivity and susceptibility attributes for main primary species.	Some quantitative information is available and is **adequate to assess** the impact of the UoA on the main primary species with respect to status. **OR** **If RBF is used to score PI 2.1.1 for the UoA:** Some quantitative information is adequate to assess productivity and susceptibility attributes for main primary species.	Quantitative information is available and is **adequate to assess with a high degree of certainty** the impact of the UoA on main primary species with respect to status.
	Met?	**Yes (All UoAs)**	**Yes (All UoAs)**	**No (All UoAs)**
Rationale				

The three main primary species impacted by the assessed UoAs are yellow squat lobster, red squat lobster and Chilean hake.

As explained in PI1.2.1(a), these three primary species have a model-based assessment strategy that incorporates fishery-dependent information and also information from direct surveys. Direct surveys are conducted annually, and stock assessments are also updated on annual basis.

The fishery dependent information (positions and duration of the hauls, other effort indicators, catches, landings, discards, …) is collected mainly through:

- Information generated by the fishing vessels: electronic logbooks (mandatory for all vessels above 15m, and manual logbook for artisanal vessels) and VMS (mandatory for all industrial fishing vessels since 2000, Law 19.521)

- EMS (mandatory for all industrial vessels since 2020, Law 20.625). Sernapesca elaborates reports for each inspected fishing trip. These reports might contain qualitative and some quantitative information. However, up to date, the EMS is still not providing quantitative information available to the public.

- Landing inspections: all landings from industrial vessels and artisanal vessel ≥12m length shall be inspected at port arrival since 2002. Since 2019 these inspections are performed by Sernapesca (Law 21.132). This information is the first input for the integral traceability system (see **section 6** for more details).

- Data collected by the observers: Observers shall be admitted on board since 2002. However, the observer program was enhanced since the inception of the research program for the reduction of discards and interactions in 2013 (see PI2.1.2SI(e) for more details on the research program). On board observers are recording detailed data of all fishing operations and catches that come on board (and also interactions with out-of-scope species), analyse the discarded fraction, and perform biological sampling (size, sex ratio, maturity stage…) on the target species (i.e. demersal crustaceans) and Chilean hake (only size).

Based on the information presented above, the team considers that **SG60 and SG80 are met.**

However, uncertainties in the stock assessment models of the demersal crustaceans are preventing to use the outputs for setting the CBA in some cases, and the CCT_RDZCS has recognized in 2020 (Informe Tecnico 01/2020 CCT-RDZCS) the uncertainty related to the estimates of historical fishery removals and the age-structure of the direct survey. **SG100 is not met.**

b	Information adequacy for assessment of impact on minor primary species			
	Guide post			Some quantitative information is adequate to estimate the impact of the UoA on minor

				primary species with respect to status.
	Met?			**Yes (All UoAs)**

Rationale

There are nine minor primary species impacted by the assessed UoAs: yellow squat lobster, red squat lobster, nylon shrimp, Humbolt squid, longnose skate, hoki, cardinafish and Chilean hake.

Apart from the cardinalfish (which is subject to an extractive ban), all minor species impacted by the two UoAs have model-based assessment strategies that incorporate fishery-dependent information and information from direct surveys. Scientific advice on the TAC (CBA) is provided by the applicable CCT (CCT-CD in the case of the demersal crustaceans, CCT-RDZS in the case of the Chilean hake, Humbolt squid and longnose skate, CCT-RDAP for the hoki and the cardinalfish, CCT-J for Chilean jack mackerel) based (if possible) on the outputs of the stock assessments, and the TAC shall be set in accordance with this scientific advice.

In the case of the cardinalfish, IFOP has continued to monitor all bycatches of this species occurring in other fisheries (mainly deep-water fisheries).

The observer program to monitor the discards' plan for the fisheries targeting demersal crustaceans provides detailed information on that bycatch of all minor primary species caught, while the implementation of the Discards' Plan ensures a detailed recording of all catches by the fleet.

Based on the information presented above, the team considers that **SG100 is met.**

c	Information adequacy for management strategy			
	Guide post	Information is adequate to support **measures** to manage **main** primary species.	Information is adequate to support a **partial strategy** to manage **main** primary species.	Information is adequate to support a **strategy** to manage **all** primary species, and evaluate with a **high degree of certainty** whether the strategy is achieving its objective.
	Met?	**Yes (All UoAs)**	**Yes (All UoAs)**	**No (All UoAs)**

Rationale

The three main primary species impacted by the assessed UoAs are yellow squat lobster, red squat lobster and Chilean hake.

The approval of the plan for the reduction of the discards in fisheries targeting demersal crustaceans (Resolution Nº1106/2017) and the implementation of the EMS, together with all the other elements of the MCS in place,ensures that all catches (landings and discards) of these species is recorded and reported.

There is a management plan for the demersal crustaceans (approved by Res.Ex.3423/2016) and another for the Chilean hake (Res.EX.Nº1308/2016). Both MAPs set management objectives for these species, biological reference points and HCRs, and strategies to achieve those objectives. These MAPs aim to rebuild the stocks, if necessary, and then maintain them at MSY levels.

Scientific advice on the TAC (or CBA) is provided by the applicable CCT (CCT-CD in the case of the demersal crustaceans, and CCT-RDZS in the case of the Chilean hake) based on the outputs of the stock assessments performed by IFOP and the HCR adopted in the MAPs.

As justified in PI 2.1.2(c), this management strategy is being implemented successfully.

Based on all the information presented above, the team considers that **SG60 and SG80 are met**.

The information on all of them is adequate to support the strategy described in PI 2.1.2(a). However, uncertainties in the stock assessment models of the demersal crustaceans are preventing to use the outputs for setting the CBA in some cases (nylon shrimp ZCS, Humbolt squid, longnose skate), and some of these resources are collapsed (cardinalfish, hoki), overexploited (Chilean hake, Humbolt squid, longnose skate) or subject to overfishing (Nylon shrimp ZCS). Thus, **SG100 is not met.**

References

Law 19.521, Law 21.132, Law 20.625, Informe Tecnico 01/2020 CCT-RDZCS

Draft scoring range and information gap indicator added at Announcement Comment Draft Report stage

Draft scoring range	**≥80**
Information gap indicator	**Information sufficient to score PI**

Overall Performance Indicator scores added from Client and Peer Review Draft Report stage

Overall Performance Indicator score	
Condition number (if relevant)	

PI 2.2.1 – Secondary species outcome

PI 2.2.1		The UoA aims to maintain secondary species above a biologically based limit and does not hinder recovery of secondary species if they are below a biological based limit		
Scoring Issue		SG 60	SG 80	SG 100
a	Main secondary species stock status			
	Guide post	Main secondary species are **likely** to be above biologically based limits. OR If below biologically based limits, there are **measures** in place expected to ensure that the UoA does not hinder recovery and rebuilding.	Main secondary species are **highly likely** to be above biologically based limits. OR If below biologically based limits, there is either **evidence of recovery** or a **demonstrably effective partial strategy** in place such that the UoA does not hinder recovery and rebuilding. AND Where catches of a main secondary species outside of biological limits are **considerable**, there is either **evidence of recovery** or a, **demonstrably effective strategy in place between those MSC UoAs that have considerable catches of the species**, to ensure that they collectively do not hinder recovery and rebuilding.	There is a **high degree of certainty** that main secondary species are above biologically based limits.
	Met?	**UoA1** Hooked tooth dogfish: **RBF needed** Aconcagua grenadier: **RBF** **UoA2** Hooked tooth dogfish: **RBF needed** **UoA3, UoA4, UoA5 & UoA8** No main spp: **Yes** **UoA6 & UoA7**	**UoA1** Hooked tooth dogfish: **RBF needed** Aconcagua grenadier: **RBF** **UoA2** Hooked tooth dogfish: **RBF needed** **UoA3, UoA4, UoA5 & UoA8** No main spp: **Yes** **UoA6 & UoA7**	**UoA1** Hooked tooth dogfish: **RBF needed** Aconcagua grenadier: **RBF** **UoA2** Hooked tooth dogfish: **RBF needed** **UoA3, UoA4, UoA5 & UoA8** No main spp: **Yes** **UoA6 & UoA7**

		Big-eyed flounder: **RBF needed**	Big-eyed flounder: **RBF needed**	Big-eyed flounder: **RBF needed**

Rationale

UoA3, UoA4, UoA5, UoA8

A comprehensive list of all species impacted by all UoAs between 2016 and 2020 is presented in **section 7.3.1.1**. This list gets to 85 different species and taxa of cnidarians, crustaceans, echinoderms, cartilaginous fish, jawless fish and teleost in the case of UoA1 (fishery targeting nylon shrimp in ZCN and ZCS, while for UoAs6&7 (fisheries targeting yellow squat lobster in UPN) the list shortens to 19 species and taxa. Besides, incidental interactions with 7 species of seabirds and 1 marine mammal were recorded for all fisheries targeting demersal crustaceans. Among all these P2-species, no main secondary species were identified by the team in the following UoAs: UoA3 (**table 7.3.1.1.11)**, UoA4 (**table 7.3.1.1.11)**, UoA5 (**table 7.3.1.1.12**) and UoA8 (**table 7.3.1.1.14)**. Thus, no main secondary species are impacted by any of these UoAs. **SG60, SG80 and SG100 are met.**

UoA1

Hooked tooth dogfish and the Aconcagua grenadier are at or above (in any year of the studied period) the designated threshold of 5% or 2% (for skates, rays, sharks and cardinalfish) to be classified as Main. All the other secondary species were classified as Minor Secondary.

The relative contribution of the Aconcagua grenadier to the total catch of UoA1 between 2016 and 2020 has been consistently at or above 5%: 2015 (5.2%), 2017 (4.7%), 2018 (6.3%) and 2020 (4.5%). Thus, this species was classified as Main Secondary for this UoA.

In 2019 and 2020, the relative contribution (in weight) of the hooked tooth dogfish to the total catch of UoA1 reached 1.5% (~2%). Thus, this species was classified as Main Secondary for this UoA.

All secondary species are Data Deficient since there are no biological based limits available, derived either from analytical stock assessment or using empirical approaches. Thus, RBF shall be triggered to assess the status of both hooked tooth dogfish and Aconcagua grenadier. **RBF needed.**

UoA2

Hooked tooth dogfish is at or above (in any year of the studied period) the designated threshold of 2% (for skates, rays, sharks and cardinalfish) to be classified as Main. All the other secondary species were classified as Minor Secondary.

In 2019 and 2020, the relative contribution (in weight) of the hooked tooth dogfish to the total catch of UoA2 reached 2.4%. Thus, this species was classified as Main Secondary for this UoA.

All secondary species are Data Deficient since there are no biological based limits available, derived either from analytical stock assessment or using empirical approaches. Thus, RBF shall be triggered to assess the status of hooked tooth dogfish. **RBF needed.**

UoAs6&7

Big-eyed flounder is at or above (in any year of the studied period) the designated threshold of 5% to be classified as Main. All the other secondary species were classified as Minor Secondary.

The relative contribution of the big-eyed flounder to the total catch of UoAs6&7 reached 8.5% in 2020. Despite the annual contribution of this species since 2016 was always around 1-2%, the team decided to classify this species as Main Secondary.

All secondary species are Data Deficient since there are no biological based limits available, derived either from analytical stock assessment or using empirical approaches. Thus, RBF shall be triggered to assess the status of big-eyed flounder. **RBF needed.**

b	Minor secondary species stock status		
	Guide post		Minor secondary species are highly likely to be above biologically based limits. OR If below biologically based limits', there is evidence that the UoA does not hinder the recovery and rebuilding of secondary species

	Met?			**All UoAs** **No** (RBF needed but PF5.3.2.1 invoked)

Rationale

The list of minor secondary species identified ranges between 14 and 75 depending on the UoA (see **section 7.3.1.1**).

There are no biologically based limits established and the status remain unknown for all these species and taxa. Therefore, they are all classified as Data Deficient species according to FCR7.7.6, and RBF shall be triggered for assessing their status against this SI. However, PF4.1.4 allows the team to avoid conducting RBF on 'minor' species when evaluating PI2.1.1 or 2.2.1 as far as final PI score is adjusted downward according to clause PF5.3.2. Due to the high number of different taxa to be assessed as minor secondary species the assessment team decided to take this option. Therefore, **in accordance with PF5.3.2.1 the final PI score shall not be greater that 80.**

References

Draft scoring range and information gap indicator added at Announcement Comment Draft Report stage

Draft scoring range	**≥80**
Information gap indicator	**More information sought**

All secondary species are data-deficient since there are no biologically based limits to assess their status. RBF would be needed. However, PF 4.1.4 allows the team to not score minor components and the team will make use of this requirement. RBF will be triggered for assessing the three main secondary species identified: Hooked tooth dogfish, Aconcagua grenadier and Big-eyed flounder.

Overall Performance Indicator scores added from Client and Peer Review Draft Report stage

Overall Performance Indicator score	
Condition number (if relevant)	

PI 2.2.2 – Secondary species management strategy

PI 2.2.2		There is a strategy in place for managing secondary species that is designed to maintain or to not hinder rebuilding of secondary species and the UoA regularly reviews and implements measures, as appropriate, to minimise the mortality of unwanted catch		
Scoring Issue		SG 60	SG 80	SG 100
a	Management strategy in place			
	Guide post	There are **measures** in place, if necessary, which are expected to maintain or not hinder rebuilding of main secondary species at/to levels which are highly likely to be above biologically based limits or to ensure that the UoA does not hinder their recovery.	There is a **partial strategy** in place, if necessary, for the UoA that is expected to maintain or not hinder rebuilding of main secondary species at/to levels which are highly likely to be above biologically based limits or to ensure that the UoA does not hinder their recovery.	There is a **strategy** in place for the UoA for managing main and minor secondary species.
	Met?	**Yes (All UoAs)**	**Yes (All UoAs)**	**Yes (All UoAs)**
Rationale				

As a result of the research program on the reduction of discards and interactions (instigated by Law 20.625), a Discards' Plan for the trawl fisheries targeting demersal crustaceans was designed (Technical Report Nº04/2017) and approved in 2017. The objective of the plan is to reduce discards of target, bycatch species (regardless of whether they are subject to quota or not) and incidental interactions with out-of-scope species.

The Discards' Plan sets the mandatory return of catches for incidental interactions in accordance with Article 7 of the LGPA. The operation shall be performed in accordance with applicable regulations (see **section 7.3.1.2.IV** for more details). The Plan also details that a monitoring program shall be in place, through maintaining the observer program (vessels shall accept the observers on board) and EMS. It also states that standardized methodologies to monitor interactions shall be developed and implemented. Finally, the Plan also states the need to provide specific training to crew members and observers, and identifies needs in relation to capacity building and technological innovation on the fishing gears to increase selectivity.

Subpesca issues an annual Resolution (based on a prior technical report) listing all target and bycatch species subject to Articles 7ºA, 7ºB and 7ºC of the LGPA (as modified by Law 20.625). According to the latest list (R.Ex.Nº142/2021), some minor secondary species are subject to landing obligation (anguila babosa, anguilas, blanquillo, cabrilla, pez chancho, congrio negro, congrio colorado, congrio de profundidad, lenguado de ojo chico, reineta), while other shall be returned to the sea (all sharks, rays and skates, all demersal crustaceans, esponja, actinia, corals, starfish). Discarding of all remaining species is authorized. In all cases discards shall be quantified, boxed and showed to the EMS before returning them to the sea (see **section 7.3.1.2.II** for more details on the applicable measures and code of best practices on board).

The monitoring program on the Discards' Plan ensure that observers keep recording detailed data on all catches coming on board vessels targeting demersal crustaceans. Overall observer coverage has been maintained above 20% of all fishing trips in recent years (**figure 7.3.1.1**). IFOP prepares annual reports summarising the information collected regarding discards and interactions of these fisheries, and this information is presented at the CCT-CD for review.

R.Ex. 28320 from August 16, 2019, sets that all benthic crustaceans (e.g. armed box crab, Chilean lemon crab…) caught by trawlers or longliners shall be returned to the sea. Furthermore, this regulation sets a handling protocol to minimize post-capture mortality on these species. R.Ex.Nº142/2021 sets that all benthic crustaceans caught by fisheries targeting demersal crustaceans shall be returned to the sea following the procedures set at this Regulation.

R.Ex. 2063 from September 23, 2020, sets that all Chondrichthyes caught by vessels using different fishing gears (purse seine, trawl, longline, nets) shall be returned to the sea. Furthermore, this regulation sets a detailed handling protocol to minimize post-capture mortality on these species. The protocol is customized depending on the size of the specimens and the fishing gear used. R.Ex.Nº142/2021 sets that all sharks, rays, skates and quimeras caught by fisheries targeting demersal crustaceans shall be returned to the sea following the procedures set at this Regulation

An EMS on board all industrial vessels is mandatory since early 2020, allowing Sernapesca to enforce the Regulations detailed above.

b	Management strategy evaluation

	Guide post	The measures are considered **likely** to work, based on plausible argument (e.g. general experience, theory or comparison with similar UoAs/species).	There is **some objective basis for confidence** that the measures/partial strategy will work, based on some information directly about the UoA and/or species involved.	**Testing** supports **high confidence** that the partial strategy/strategy will work, based on information directly about the UoA and/or species involved.
	Met?	**Yes (All UoAs)**	**Yes (All UoAs)**	**No (All UoAs)**
Rationale				

Concerns regarding the level of unreported discards in all fisheries targeting demersal crustaceans are being solved since the implementation of the research plan for the reduction of the discards in 2013 and its subsequent improvements (i.e. Resolution Nº1106/2017 adopting a fishery-specific plan for the reduction of the discards, implementation of the EMS). This is allowing for better estimates of the fisheries removals. Details information on all species caught by the fisheries targeting dermersal crustaceans, and analyses on the discarded fraction, is presented at the annual reports on the monitoring of the fisheries targeting demersal crustaceans prepared by IFOP.

Based on the information presented above, the team considers that **SG60 and SG80 are met**.

Furthermore, the team cannot consider that the Discards' Plan has been tested, since no official outputs from the EMS has been released so far, so no cross-check on the level of discards and total catches between the different sources of information (official landings, observers and EMS) has been done so far.

Thus, **SG100 is not met.**

	Management strategy implementation			
c	Guide post		There is **some evidence** that the measures/partial strategy is being **implemented successfully**.	There is **clear evidence** that the partial strategy/strategy is being **implemented successfully and is achieving its objective as set out in scoring issue (a).**
	Met?		**Yes (All UoAs)**	**No (All UoAs)**
Rationale				

Annual reports prepared by IFOP provide detailed information on the implementation of the observer program, while evidence of the implementation of the EMS on the assessed fishery were collected at the 3rd surveillance audit (Saa et al 2020). All stakeholders interviewed during the first certification cycle, and Sernapesca in particular, confirmed that the measures included in the Discards' Plan related to out-of-scope species and also measures included in the are being succesfully implemented (Saa et al 2020, and Saa et al 2021).

Regulations on mandatory return of all benthic crustaceans and chondrocytes have been developed and implemented.

Results show that bycatches of secondary species are restricted to minor species, and the relative contribution of most species to total catches of the UoAs are negligible (<0.05%).

Based on the above, **SG60 and SG80 are met.**

However, there are some issues preventing the team to score 100 in this SI:

- The EMS is a highly demanding system in terms of workforce and storage capacity of digital images. During the 4th surveillance audit, Sernapesca expressed their concern to the team in relation to their capacity to sustain the system.
- The team could not verify the implementation of some of the measures detailed in the discards' plan, such as the survey protocol (trial haul) and 'move-on rules'
- Analyses providing estimates on the total volume of catches of sensitive species (e.g. cardinalfish) are missing.

SG100 is not met.

	Shark finning			
d	Guide post	It is **likely** that shark finning is not taking place.	It is **highly likely** that shark finning is not taking place.	There is a **high degree of certainty** that shark finning is not taking place.
	Met?	**Yes (All UoAs)**	**Yes (All UoAs)**	**Yes (All UoAs)**

Rationale

Article 5 bis" of the general law (LGPA n. 20.525) includes an amendment which states that any finning activity is illegal and vessels practicing any illegal activity in relation with this article will be prosecuted and enforcement regulations will be applied.

Besides, R.Ex. 2063/2020 sets that all Chondrichthyes caught by vessels using different fishing gears (purse seine, trawl, longline, nets) shall be returned to the sea. Furthermore, R.Ex.Nº142/2021 sets that all sharks, rays, skates and quimeras caught by fisheries targeting demersal crustaceans shall be returned to the sea following the procedures set at R.Ex.2063/2020. See **section 7.3.1.4.II** for more details.

Since early 2020 all industrial vessels shall have ESM on board. This system allows Sernapesca to enforce R.Ex.2063/2020.

SG60, SG80 and SG100 are met.

	Review of alternative measures to minimise mortality of unwanted catch			
e	Guide post	There is a review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of **unwanted** catch of main secondary species.	There is a **regular** review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of **unwanted** catch of main secondary species and they are implemented as appropriate.	There is a **biennial** review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of **unwanted** catch of all secondary species, and they are implemented, as appropriate.
	Met?	**Yes (All UoAs)**	**Yes (All UoAs)**	**Yes (All UoAs)**

Rationale

The implementation of the research program for the reduction of discards between 2013 and 2015 helped to solve many concerns regarding the level of discarding in fisheries targeting demersal crustaceans (and others). Detailed information on the discarded fraction (including species composition, reasons for discarding, operational details) was collected in all fisheries targeting demersal crustaceans, and it continues to be collected today since the observer program is still in place. Data collected during the research program allowed to design a specific plan for the reduction of the discards and incidental catches in fisheries targeting demersal crustaceans (Informe Tecnico -R.Pesq.- Nº04/2017), which was approved by Resolution Nº1106/2017. In 2020 an EMS has been implemented by Sernapesca in all Chilean industrial fishing fleets (including those targeting demersal crustaceans).

The discard plan requires maintaining a monitoring program through the observer program and the EMS. As part of this monitoring program, IFOP shall evaluate existing measures to come with proposal on modifications or improvements to promote the reduction of discards and interactions. IFOP prepares annual reports summarising the information collected regarding discards and interactions of these fisheries, and this information is presented at the CCT-CD for review.

Regulations on mandatory return of all benthic crustaceans and chondrocytes have been recently developed and implemented.

The CM-CD has been the forum to discuss and review the implementation of the research program first, the design of the fishery-specific plan to reduce discards and the EMS For instance, discussions on issues arising from the implementation of the EMS took place at the CM-CD during 2020, as confirmed by the representatives of Sernapesca, Subpesca and the fishing industry interviewed during the 4th surveillance audit held in May 2020 (Saa et al 2020).

Based on the information presented above, the team considers that **SG60, SG80 and SG100 are met**.

References

The CAB shall list any references here, including hyperlinks to publicly-available documents.

Draft scoring range and information gap indicator added at Announcement Comment Draft Report stage

Draft scoring range	**≥80**
Information gap indicator	**More information sought**

Information is sought regarding:

- Request for estimates of total catches of cardinalfish

- Request information on move-or rules and fishing ground survey protocol.
- Studies on post-capture survival rate of the armed box crab and the Chilean lemon crab would be advisable, since catches on these two species are close to the designated threshold level to be classified as 'Main'

Overall Performance Indicator scores added from Client and Peer Review Draft Report stage

Overall Performance Indicator score	
Condition number (if relevant)	

PI 2.2.3 – Secondary species information

PI 2.2.3		Information on the nature and amount of secondary species taken is adequate to determine the risk posed by the UoA and the effectiveness of the strategy to manage secondary species		
Scoring Issue		SG 60	SG 80	SG 100
a	Information adequacy for assessment of impacts on main secondary species			
	Guide post	Qualitative information is **adequate to estimate** the impact of the UoA on the main secondary species with respect to status. OR **If RBF is used to score PI 2.2.1 for the UoA:** Qualitative information is adequate to estimate productivity and susceptibility attributes for main secondary species.	Some quantitative information is available and **adequate to assess** the impact of the UoA on main secondary species with respect to status. OR **If RBF is used to score PI 2.2.1 for the UoA:** Some quantitative information is adequate to assess productivity and susceptibility attributes for main secondary species.	Quantitative information is available and **adequate to assess with a high degree of certainty** the impact of the UoA on main secondary species with respect to status.
	Met?	**UoA3, UoA4, UoA5 & UoA8 Yes** **UoA1, UoA2, UoA6 & UoA7 Yes**	**UoA3, UoA4, UoA5 & UoA8 Yes** **UoA1, UoA2, UoA6 & UoA7 Yes**	**UoA3, UoA4, UoA5 & UoA8 Yes** **UoA1, UoA2, UoA6 & UoA7 Yes**
Rationale				

As indicated in PI 2.2.1, the stock status of all secondary species impacted by the UoAs remains unknown and RBF should be triggered to assess their status against that SI. Thus, the second part of Scoring Issue shall be used for assessing PI2.2.3(a).

The fishery dependent information (positions and duration of the hauls, other effort indicators, catches, landings, discards, …) is collected mainly in through:

- Information generated by the fishing vessels: electronic logbooks (mandatory for all vessels above 15m, and manual logbook for smaller artisanal vessels), VMS (mandatory for all industrial fishing vessels since 2000, Law 19.521)

- EMS (mandatory for all industrial vessels since 2020, Law 20.625). Sernapesca elaborates reports for each inspected fishing trip. These reports might contain qualitative and some quantitative information. However, up to date, the EMS is still not providing quantitative information available to the public.

- Landing inspections: all landings from industrial vessels and artisanal vessel ≥12m length shall be inspected at port arrival since 2002. Since 2019 these inspections are performed by Sernapesca (Law 21.132). This information is the first input for the integral traceability system (see **section 6** for more details).

- Data collected by the observers: Observers shall be admitted on board since 2002. However, the observer program was enhanced since the inception of the research program for the reduction of discards and interactions in 2013 (see PI2.1.2SI(e) for more details on the research program). On board observers are recording detailed data of all fishing operations and catches that come on board (including interactions with out-of-scope species) and perform analyses on the discarded fraction.

UoA3, UoA4, UOA5 & UoA8

All the information presented above is adequate to assess susceptibility on secondary species and conclude that UoA4, UoA5 (**table 7.3.1.1.11**), UoA6 (**table 7.3.1.1.11**)and UoA8 (**table 7.3.1.1.14**) are not impacting on any Main secondary species (**tables 7.3.1.1.5 and 7.3.1.1.6**).

Thus, **SG60 and SG80 are met.**

However, the stock status of all secondary species impacted by the UoAs remains unknown. **SG100 is not met.**

UoA1, UoA2, UoA6 & UoA7

All the information presented above is adequate to assess susceptibility on secondary species attributes on the three main secondary species identified for UoA1 (hooked tooth dogfish, Aconcagua grenadier, see **table 7.3.1.1.9**), UoA2 (hooked tooth dogfish, see **table 7.3.1.1.10**), UoA6 and UoA7 (big-eyed flounder, see **table 7.3.1.1.13**).

Besides, quantitative information adequate to assess productivity attributes on these three species is available at different open data base on fish, such as FishBase: https://www.fishbase.de/

Thus, **SG60 and SG80 are met.**

However, the stock status of all secondary species impacted by the UoAs remains unknown. **SG100 is not met.**

	Information adequacy for assessment of impacts on minor secondary species			
B	Guide post			Some quantitative information is adequate to estimate the impact of the UoA on minor secondary species with respect to status.
	Met?			**Yes / No**
Rationale				

Existing sources of information (logbooks, VMS, EMS, landing inspections and observers records) ensure that there is adequate information to assess susceptibility on secondary species. However, the stock status of all secondary species impacted by the UoAs remains unknown. **SG100 is not met.**

	Information adequacy for management strategy			
C	Guide post	Information is adequate to support **measures** to manage **main** secondary species.	Information is adequate to support a **partial strategy** to manage **main** secondary species.	Information is adequate to support a **strategy** to manage **all** secondary species, and **evaluate** with a **high degree of certainty** whether the strategy is **achieving its objective**.
	Met?	**Yes (All UoAs)**	**Yes (All UoAs)**	**No (All UoAs)**
Rationale				

The approval of the plan for the reduction of the discards in fisheries targeting demersal crustaceans (Resolution Nº1106/2017) and the implementation of the EMS, together with all the other elements of the MCS in place, ensures that all catches (landings and discards) from these fleets are being recorded and reported. IFOP prepares annual reports summarising the information collected regarding discards and interactions of these fisheries, and this information is presented at the CCT-CD for review. Observed catches between 2016 and 2020 confirm that no main secondary species is being impacted by any of the two UoAs. **SG60 and SG80 are met.**

However, the stock status of all secondary species impacted by the UoAs remains unknown. **SG100 is not met.**

References

Draft scoring range and information gap indicator added at Announcement Comment Draft Report stage

Draft scoring range	**≥80**
Information gap indicator	**Information sufficient to score PI**

Overall Performance Indicator scores added from Client and Peer Review Draft Report stage

Overall Performance Indicator score	
Condition number (if relevant)	

PI 2.3.1 – ETP species outcome

PI 2.3.1		The UoA meets national and international requirements for the protection of ETP species The UoA does not hinder recovery of ETP species		
Scoring Issue		SG 60	SG 80	SG 100
a	Effects of the UoA on population/stock within national or international limits, where applicable			
	Guide post	Where national and/or international requirements set limits for ETP species, the **effects of the UoA** on the population/ stock are known and **likely** to be within these limits.	Where national and/or international requirements set limits for ETP species, the **combined effects of the MSC UoAs** on the population /stock are known and **highly likely** to be within these limits.	Where national and/or international requirements set limits for ETP species, there is a **high degree of certainty** that the **combined effects of the MSC UoAs** are within these limits.
	Met?	**NA**	**NA**	**NA**
Rationale				

None of the assessed UoAs are impacting ETPs species with national or international limits established. This scoring issue only applies to species for which national and or international limits for protection or rebuilding are in place, either through national legislation or binding international agreements see FCR v2.01 at SA3.10.1. If there is no applicable national legislation or binding international agreements, this SI shall not be scored.

b	Direct effects			
	Guide post	Known direct effects of the UoA are likely to not **hinder recovery** of ETP species.	Direct effects of the UoA are **highly likely** to not **hinder recovery** of ETP species.	There is a **high degree of confidence** that there are no **significant detrimental direct effects** of the UoA on ETP species.
	Met?	**All UoAs:** Sea lion: **Yes** Seabirds: **Yes**	**All UoAs:** Sea lion: **Yes** Seabirds: **Yes**	**All UoAs:** Sea lion:**Yes** Seabirds: **Yes**
Rationale				

A total of 8 ETP species have been identified to be impacted by all vessels targeting demersal crustaceans in Chilean waters (table7.3.1.1.6). The list includes one marine mammal, the South American sea lion (*Otaria flavescens*) and 7 seabird species: black-browed albatross, pink-footed shearwater; white-chinned petrel, Savin's albatross, Peruvian pelican, Masatierra petrel, Guanay cormorant

Direct effects of the fishery on sea lions are due to specimens getting entangled with the net or even got trapped into the cod-end during hauling. In the case of seabirds, direct effects are due to collisions against the cables and specimens getting entangled mainly while hauling.

IFOP observers have been recording information on the interactions between vessels targeting demersal crustaceans and out-of -scope species between 2013, first as part of the implementation of the research program on the reduction of discards and interactions (2013-2016), and then as a part of the monitoring program on the implementation of the plan for the reduction of discards and interactions (approved in 2017, see section 7.3.1.2 for more details on the discards'

plan). As shown in section 7.3.1.5.III, hauls observed for incidental interactions have covered the entire Chilean coast (**figures 7.1.3.51 and 7.1.3.5.2**). During that period, observer coverage ranged between 12 and 25% of the total fishing trips performed by the fleets targeting demersal crustaceans, and between 8 and 12% of total hauls were observed. Fate of the specimens is recorded (alive/dead), bad injured specimens (e.g. seabirds with broken wings or beak, sea lions experiencing difficulties to swim) are recorded as dead (Escobar et al 2020).

Information on the interactions with out-of-scope species is presented at the annual reports on the monitoring of the fisheries targeting demersal crustaceans prepared by IFOP on annual basis. This information, however, is limited to observed interactions. This raw data is reviewed and further analysed and presented at the annual report on the monitoring of the discard plan, which is normally published later on. In recent years, these reports included spatial-temporal analyses and estimates on the total interactions with seabirds and sea lions. Results are presented below:

Sea lions

According to data presented in Escobar et al 2021, between 1 and 6 sealions were observed to interact with vessels targeting demersal crustaceans between 2016-2020 (see **table 7.3.1.5.4**). Estimates on the total number of sea lions impacted by fisheries targeting were carried using two different methodologies (see Escobar et al 2021 for a detailed account on the methods used). The incidental catch rate of sea lions for the Chilean fleet targeting demersal crustacean ranged between a minimum of 0,0001 ind/haul (in 2018) and maximum of 0,007 ind/haul (in 2016), regardless of the methodology used (**table 7.3.1.5.4**).

Estimates of the total annual number of sea lions impacted by the fisheries targeting demersal crustaceans have varied a lot between 2016 and 2020 (from 10 to 105, or from 7 to 70 depending on the model used). However, results from 2019 and 2020 indicate an average of around 40 sea lions impacted per year (**table 7.3.1.5.4**).

Half of the observed interactions between 2016 and 2020 resulted in fatalities (11 out of 22) (**table 7.3.1.5.4**). However, estimated mortality rate varies 40 and 43% depending on the methodology used.

Results show that this fishery has a low rate of incidental interactions with sea lions, and less than half of the interactions are resulting in fatalities. The total number of mature individuals is estimated at 222,500, and the Chilean population is estimated to be approximately 197,000 animals (Cardenas-Alayza et al, 2016). It has been reported that mature and overall sea lion population abundance in South America have increased resulting in a positive population growth trend. IUCN has stated the current stock status for this population is stable, and the species is classified as Least Concern in the Redlist. Furthermore, a recent estimate of the population of sea lions was performed in 2019 and results are presented in Oliva et al (2020). According to this study the Chilean population of sea lions is 128,070±631 animals (40,2448±3,129 in the Northern zone, 22,696±325 in the Central zone and 65,135±2,913 in the Southern zone) during the summer season. Oliva et al (2020) also found that the number of sea lions' colonies has remained stable in the Northern zone since the previous estimate and increased from 2 to 19 in the Southern zone.

Based on the above information, the team considers that **SG60, SG80 and SG100 are met for sealions.**

Seabirds

The status of the populations varies a lot among the 7 species of seabirds impacted. The one accounting for almost half of the fatalities, the pink-footed shearwater is classified as vulnerable and its population trend unknown. However, the number of mature individuals is estimated to be 56,146 (Birdlife International, 2018b). The black-browed albatross is classified as Least Concern (LC) and the estimated number of mature individuals is 1,400,000 (Birdlife International, 2018a). The Peruvian pelican is classified as Near Threatened but the population trend is known to be increasing (Birdlife International, 2018e). The Salvin's albatross is classified as VU, but the number of mature individuals is estimated at 79,990 (Birdlife International, 2018d).

According to data presented in Escobar et al 2019, a total of 21 seabirds were observed to interact with vessels targeting demersal crustaceans between 2015-2018 (see **table 7.3.1.5.4**), 17 out of them resulted dead. The pink-footed shearwater accounted for 43% of the interactions and 47% of the fatalities, followed by the black-browed albatross (19% of the interactions and 12% of the fatalities), the Peruvian pelican (14% of the fatalities and 18% of the fatalities), and the Savin's albatross (10% of the interactions and 12% of the fatalities).

According to Escobar et al (2019), the incidental catch rate of seabirds for the entire Chilean fleet targeting demersal crustaceans was estimated at 0,006 seabirds/haul (SD±0,11) for the period 2015-2018, while mortality rate was estimated at 0,005 seabirds/haul (SD±0,10). Incidental catches and mortality of pink-footed shearwater was estimated at 0,002 individuals/hauls.

Results show that this fishery has a low rate of incidental interactions with seabirds, between 9 and 35 (lower and higher range value respectively) estimated interactions for the entire fleet in 4 years, resulting in between 4 and 28 dead individuals.

Besides, Resolution 2941/2019 setting measures to reduce incidental catches of seabirds on different trawl fisheries (including fisheries targeting demersal crustaceans) entered into force in late 2019. Observed interactions in 2019 and 2020 for the fisheries targeting red and yellow squat lobster were null (see **table 7.3.1.1.3**), and in the case of the nylon shrimp fishery remained very low.

Based on the information presented above it is considered that **SG60, SG80 and SG100 are met**.

c	Indirect effects			
	Guide post		Indirect effects have been considered for the UoA and are thought to be **highly likely** to not create unacceptable impacts.	There is a **high degree of confidence** that there are no **significant detrimental indirect effects** of the UoA on ETP species.
	Met?		**All UoAs:** Sea lion: **Yes** Seabirds: **Yes**	**All UoAs:** Sea lion: **No** Seabirds: **No**

Rationale

Indirect impacts on ETPs must consider unobserved mortality besides the potential effect of the fishery in key elements of the ecosystems that can have a negative effect on ETP populations.

Consequently, the Assessment Team have identified two potential detrimental indirect effects of the fisheries targeting demersal crustaceans on ETP species: (i) the potential disruption of predator-prey dynamics resulting (directly and/or indirectly) from the fishery mostly in seabirds' populations, and (ii) the likelihood of plastic contamination, including pieces of fishing gear and other plastic debris.

This fishery targets demersal marine resources, and almost the entire catch is comprised by red and yellow squat lobster, Chilean hake, big-eye flounder, armed boxed crab and the Chilean lemon crab. There is no evidence of any seabird species being critically dependent on any of these species. Actually, those species are not part of the diet of any seabird species, since they are out of their trophic niche.

To determine and improve the degree of knowledge and implementation of "Annex V of the Marpol 73/78 International Convention" in vessels is among the objectives of the monitoring program on the implementation of the discard's plan. This document establishes the prohibition of throwing plastics into the sea in all its forms, including ropes, synthetic fiber fishing nets, plastic bags, and even ashes from the incineration of plastic products that may contain toxic residues or heavy metals. To do so, IFOP observers are recording information on the degree of awareness and knowledge among the crew members and also on the compliance with the regulations set in Annex V of the Marpol Convention.

According to data presented in Escobar et al (2021), 93% of the vessels targeting demersal crustaceans correctly apply the regulations for the disposal of other garbage.

Based on the information presented above, the team considers that **SG60 and SG80 are met.**

However, there is no specific research on the indirect effects identified by team in relation to the assessed fishery. The information provided on the compliance with Annex V of the Marpol Convention are not detailed enough to provide a clear picture of the actual compliance and current levels of plastic disposal. **SG100 is not met.**

References

Birdlife International 2018a, Birdlife International 2018a, Birdlife International 2018b, Birdlife International 2018d, Birdlife International 2018e, Cardenas-Alayza et al, 2016, Escobar et al 2019, Escobar et al 2021

Draft scoring range and information gap indicator added at Announcement Comment Draft Report stage

Draft scoring range	**≥80**
Information gap indicator	**More information sought**

Information is sought regarding:

- More detailed information on the evidence gathered by the observers in relation to the compliance of the fleet with MARPOL

Overall Performance Indicator scores added from Client and Peer Review Draft Report stage

Overall Performance Indicator score	
Condition number (if relevant)	

PI 2.3.2 – ETP species management strategy

PI 2.3.2		The UoA has in place precautionary management strategies designed to: - meet national and international requirements; - ensure the UoA does not hinder recovery of ETP species. Also, the UoA regularly reviews and implements measures, as appropriate, to minimise the mortality of ETP species		
Scoring Issue		SG 60	SG 80	SG 100
a	Management strategy in place (national and international requirements)			
	Guide post	There are **measures** in place that minimise the UoA-related mortality of ETP species, and are expected to be **highly likely to achieve** national and international requirements for the protection of ETP species.	There is a **strategy** in place for managing the UoA's impact on ETP species, including measures to minimise mortality, which is designed to be **highly likely to achieve** national and international requirements for the protection of ETP species.	There is a **comprehensive strategy** in place for managing the UoA's impact on ETP species, including measures to minimise mortality, which is designed to **achieve above** national and international requirements for the protection of ETP species.
	Met?	**NA**	**NA**	**NA**
Rationale				

Neither UoA1 or UoA2 are impacting ETPs species with national or international limits established. Thus, this SI shall not be scored (SA3.11.2)

b	Management strategy in place (alternative)			
	Guide post	There are **measures** in place that are expected to ensure the UoA does not hinder the recovery of ETP species.	There is a **strategy** in place that is expected to ensure the UoA does not hinder the recovery of ETP species.	There is a **comprehensive strategy** in place for managing ETP species, to ensure the UoA does not hinder the recovery of ETP species.
	Met?	**All UoAs:** Sea lion: **Yes** Seabirds: **Yes**	**All UoAs:** Sea lion: **Yes** Seabirds: **Yes**	**All UoAs:** Sea lion: **No** Seabirds: **No**
Rationale				

A Law 20.625 or "Discards Law" was passed in 2012. Article 7ºC of this Law set that all marine mammals, reptiles, penguins and other seabirds shall be returned to the sea.

As a result of the research program on the reduction of discards and interactions (instigated by Law 20.625), a Discards' Plan for the trawl fisheries targeting demersal crustaceans was designed (Technical Report Nº04/2017) and approved in 2017. The objective of the plan is to reduce discards of target, bycatch species (regardless of whether they are subject to quota or not) and incidental interactions with out-of-scope species.

The Discards' Plan sets the mandatory return of catches for incidental interactions in accordance with Article 7 of the LGPA. The operation shall be performed in accordance with applicable regulations (see **section 7.3.1.2.IV** for more details). The Plan also details that a monitoring program shall be in place, through maintaining the observer program (vessels shall accept the observers on board) and EMS. It also states that standardized methodologies to monitor interactions shall be developed and implemented. Finally, the Plan also states the need to provide specific training to crew members and observers.

In accordance with Article 7ºB of Law 20.625, every year Subpesca issues a Resolution (based on a prior technical report) listing all target and bycatch species subject to Articles 7ºA, 7ºB and 7ºC of the LGPA (as modified by Law 20.625). Resolution 142/2021 is the latest list to be published.

Resolution 2941setting measures to reduce incidental catches of seabirds on trawl fisheries was adopted in 2019. See **section 7.3.1.5.I** for more details on the measures applicable for trawlers targeting demersal crustaceans.

Details on the observation and recording protocols followed by the observers in relation to incidental interactions is provided in **section 7.3.1.5.III.**

An EMS on board all industrial vessels is mandatory since early 2020.

Based on the above, **SG60 and SG80 are met.**

A 'comprehensive strategy', as defined by the MSC, "is a complete and tested strategy made up of linked monitoring, analyses ad management measures and responses" (Table SA8, MSC-FSv2.01). The team cannot consider that this strategy has been tested, since no official outputs from the EMS has been released so far, so no cross-check between the different sources of information (observers and EMS) has been done so far. **SG100 is not met.**

	Management strategy evaluation			
c	Guide post	The measures are **considered likely** to work, based on **plausible argument** (e.g. general experience, theory or comparison with similar fisheries/species).	There is an **objective basis for confidence** that the measures/strategy will work, based on **information** directly about the fishery and/or the species involved.	The strategy/comprehensive strategy is mainly based on information directly about the fishery and/or species involved, and a **quantitative analysis** supports **high confidence** that the strategy will work.
	Met?	**All UoAs:** Sea lion: **Yes** Seabirds: **Yes**	**All UoAs:** Sea lion: **Yes** Seabirds: **Yes**	**All UoAs:** Sea lion: **Yes** Seabirds: **Yes**
Rationale				

Information on the interactions with out-of-scope species is presented at the annual reports on the monitoring of the fisheries targeting demersal crustaceans prepared by IFOP. This information is limited to the observed interactions (no scaled-up estimates and/or spatial-temporal analyses), since this information will be further reviewed and analyzed at the annual reports on the monitoring of the research program to reduce discards and incidental catches, which are normally published later.

All recent reports on the monitoring to reduce discards and incidental catches include historical compilation and analyses of incidental interactions with sea lions and/or seabirds (Escobar et al 2019, Roman et al 2020 and Escobar et al 2021). These reports also provide spatial-temporal analyses of the interactions and estimates on the incidental of incidental catches and mortalities of seabirds and sea lions for all the demersal crustacean fishing operations (including the nylon shrimp). To validate the information recorded and adjust previous estimates, an exhaustive review of the observer logs and databases collected between 2013 and 2018 was carried out in 2019 (Escobar et al 2019).

As an example, in Escobar et al 2019 different modellings for determining the incidental interactions with seabirds were explored both for the fishery targeting Chilean hake and the fisheries targeting demersal crustaceans. In the case of the fisheries targeting demersal crustaceans, given that the number of sets with interactions was low (which affected the convergence of the statistical models evaluated) only the probability of bycatch of birds (at least one individual) per fishing set was modeled, using a binomial distribution and a logistic function. As candidate predictive variables, it was incorporated; set year (factor; 2015-2018), set month (factor), set time, set latitude (decimal degrees), set longitude (decimal degrees), haul time (min), trawling speed (knots), total catch weight (log ton), set discard (log ton). For the variables latitude, longitude and time of the set, a non-linear function of cubic splines was used smoothed. However, due to the low number of sets with bycatch (N = 20), for this fishery the best model (binomial distribution modeling the probability of bycatch, see methods) had only one intercept (i.e. average). All candidate explanatory variables were discarded during the automatic selection process.

Based on the above, **SG60, SG80 and SG100 are met**.

	Management strategy implementation			
d	Guide post		There is some **evidence** that the measures/strategy is being implemented successfully.	There is **clear evidence** that the strategy/comprehensive strategy is being implemented successfully and **is achieving its objective as set out in scoring issue (a) or (b).**
	Met?		**All UoAs:** Sea lion: **Yes** Seabirds: **Yes**	**All UoAs:** Sea lion: **No** Seabirds: **No**
Rationale				

Annual reports prepared by IFOP provide detailed information on the implementation of the observer program, while evidence of the implementation of the EMS on the assessed fishery were collected at the 3rd surveillance audit (Saa et al 2020). All stakeholders interviewed during the first certification cycle, and Sernapesca in particular, confirmed that

the measures included in the Discards' Plan related to out-of-scope species and also measures included in the are being succesfully implemented (Saa et al 2020, and Saa et al 2021).

Protocols for the identification and record of incidental interactions have been implemented, in accordance with the measures adopted in the Discards' Plan.

Protocols and measures to mitigate incidental interactions with seabirds have been adopted (Res.Ex.2941/2019), in accordance with the Code of best practices adopted in the Discards' Plan.

Results show that this fishery has a low rate of incidental interactions with sea lions and seabirds.

Based on the above, **SG60 and SG80 are met.**

However, during the fourth surveillance audit (Saa et al 2021), it has been acknowledged by different stakeholders that Res.Ex. 2941/2019 to reduce incidental mortality on seabirds shall be adapted to this fishery due to the particularities of the trawling operations (the net is hauled by the side of the vessel instead of by the stern, as in most modern trawling fisheries). The issue is being reviewed by SUBPESCA together with representatives of the fishing sector, but at this moment it is not clear which modifications will be made and when.

Among the measures to be implemented in the Discards' Plan is stated that "an action plan shall be developed to comply with Article 4ºC, D and E, in relation to the protection of incidental catches". It is not clear that this measure has been implemented.

The EMS in being implemented, but it has been acknowledged by the Sernapesca (Saa et al 2021) that this is a highly demanding system in terms of workforce and storage capacity of digital images. Time is needed to assess whether Sernapesca's current capabilities are sufficient to keep this system working properly

Based on the above, SG100 is not met.

	Review of alternative measures to minimise mortality of ETP species			
e	Guide post	There is a review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of ETP species.	There is a **regular** review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of ETP species and they are implemented as appropriate.	There is a **biennial** review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality ETP species, and they are implemented, as appropriate.
	Met?	**All UoAs:** Sea lion: **Yes** Seabirds: **Yes**	**All UoAs:** Sea lion: **Yes** Seabirds: **Yes**	**All UoAs:** Sea lion: **Yes** Seabirds: **Yes**
Rationale				

The implementation of the research program for the reduction of discards and interactions between 2013 and 2015 helped to start collecting information on the level of interactions with out-of-scope species. Data collected during the research program allowed to design a specific plan for the reduction of the discards and incidental catches in fisheries targeting demersal crustaceans (Informe Tecnico -R.Pesq.- Nº04/2017), which was approved by Resolution Nº1106/2017. In 2020 an EMS has been implemented by Sernapesca in all Chilean industrial fishing fleets (including those targeting demersal crustaceans).

From 2015 onwards, more effort was devoted to the observation of the incidental interactions, and later on the analyses of the data was also strengthen (e.g. models to estimate interactions in Escobar et al 2019, Escobar et al 2020 and Escobar et al 2021). The Discards' Plan requires maintaining a monitoring program through the observer program and the EMS, and also the need to develop and implement standardized methodologies to monitor interactions.

As a result of the information on interactions with seabirds, a new regulation to reduce these interactions was adopted in 2019 (Resolution 2941/2019). Data on the implementation of this Regulation is being collected by the observers, and this information is being used by Subpesca to have discussion with the fishing industry on the feasibility to implement each of the measures included.

As part of this monitoring program, IFOP shall evaluate existing measures to come with proposal on modifications or improvements to promote the reduction of discards and interactions. Also, Sernapesca and Subpesca confirmed that the EMS is providing valuable information to fully understand the practices on board in relation to discards and interactions (Saa et al 2020 and Saa et al 2021). All the above enables that the competent authorities engage in discussions with the fishing industry in relation review the effectiveness and practicality of the existing measures.

IFOP prepares annual reports summarising the information collected regarding discards and interactions of these fisheries, and this information is presented at the CM-CD for review. The CM-CD has been the forum to discuss and review the implementation of the research program first, the design of the fishery-specific discards' plan and the EMS. For instance, discussions on issues arising from the implementation of the EMS and the Regulation on birds took place

at the CM-CD during 2020, as confirmed by the representatives of Sernapesca, Subpesca and the fishing industry interviewed during the 4th surveillance audit held in May 2020 (Saa et al 2020).

Based on the information presented above, **SG60, SG80 and SG100 are met.**

References

Escobar et al 2019, Escobar et al 2020, Escobar et al 2021, Informe Tecnico -R.Pesq.- Nº04/2017, Resolution Nº1106/2017, Resolution 2941/2019, Saa et al 2020

Draft scoring range and information gap indicator added at Announcement Comment Draft Report stage

Draft scoring range	**≥80**
Information gap indicator	**More information sought / Information sufficient to score PI**

Information is sought regarding:

- Evidence on the level of compliance of the regulation to reduce mortality in birds, and evidence of the necessary modifications agreed with the fishing industry (which are the modifications being discussed and when are they expected to be implemented?).

- Evidence of compliance with the following measure detailed in the Discards Plan M3): “action plan shall be developed to comply with Article 4ºC, D and E” (see section 7.3.1.2.IV

Overall Performance Indicator scores added from Client and Peer Review Draft Report stage

Overall Performance Indicator score	
Condition number (if relevant)	

PI 2.3.3 – ETP species information

PI 2.3.3		Relevant information is collected to support the management of UoA impacts on ETP species, including: - Information for the development of the management strategy; - Information to assess the effectiveness of the management strategy; and - Information to determine the outcome status of ETP species		
Scoring Issue		SG 60	SG 80	SG 100
a	Information adequacy for assessment of impacts			
	Guide post	Qualitative information is **adequate to estimate** the UoA related mortality on ETP species. **OR** **If RBF is used to score PI 2.3.1 for the UoA:** Qualitative information is **adequate to estimate productivity and susceptibility** attributes for ETP species.	Some quantitative information is **adequate to assess** the UoA related mortality and impact and to determine whether the UoA may be a threat to protection and recovery of the ETP species. **OR** **If RBF is used to score PI 2.3.1 for the UoA:** Some quantitative information is **adequate to assess productivity and susceptibility attributes** for ETP species.	Quantitative information is available to assess with a high degree of certainty the **magnitude of UoA-related impacts, mortalities and injuries and the consequences for the status** of ETP species.
	Met?	**All UoAs:** Sea lion: **Yes** Seabirds: **Yes**	**All UoAs:** Sea lion: **Yes** Seabirds: **Yes**	**All UoAs:** Sea lion: **Yes** Seabirds: **No**
Rationale				

Sernapesca elaborates reports for each inspected fishing trip. These reports might contain qualitative and some quantitative information. However, up to date, the EMS is still not providing quantitative information available to the public.

As detailed in 7.3.1.5.III observers on board vessels targeting demersal crustaceans are devoting specific attention to observe the interactions with out-of-scope species. The observer program covers the entire area where fishing takes places and sampling coverage for incidental interactions is around 10% of the hauls (**Table 7.3.1.5.1**).

Based on the above, **SG60 and SG80 are met**.

The fate of the interacted specimens is recorded (alive/dead), and severe injured specimens are recorded as dead.

Observers' data is further reviewed and analysed by IFOP (including spatial-temporal analyses, models are used to estimate the total impacts) and included in the annual reports on the monitoring of the Discard Plan.

Results show that this fishery has a low rate of incidental interactions with sea lions and seabirds.

Information on the general status and trends of the impacted ETP populations is compiled and analysed against the IUCN Redlist methodology. Furthermore, in the case of the sea lion, Chile has performed recent aerial surveys to assess the current population (Oliva et al 2020).

Therefore, **SG100 is met for the sea lion.**

However, observers are only recording those specimens which get on board because they got entangled in the net or trapped in the cod-end during hauling. This is ok for assessing impact on the sea lions, but seabirds can collide with the cable without being entangled in the net and getting on board. Besides, observations are limited to the hauling process, while towing is not being observed. Again, this is ok for sea lions, but seabirds can collide with the cables during towing, although most of the interactions are happening during hauling. Thus, part of the of the interactions with seabirds might not being recorded. Thus, **SG100 is not met for birds.**

b	Information adequacy for management strategy

	Guide post	Information is adequate to support **measures** to manage the impacts on ETP species.	Information is adequate to measure trends and support a **strategy** to manage impacts on ETP species.	Information is adequate to support a **comprehensive strategy** to manage impacts, minimise mortality and injury of ETP species, and evaluate with a **high degree of certainty** whether a strategy is achieving its objectives.
	Met?	**All UoAs:** Sea lion: **Yes** Seabirds: **Yes**	**All UoAs:** Sea lion: **Yes** Seabirds: **Yes**	**All UoAs:** Sea lion: **No** Seabirds: **No**

Rationale

The observer program and the EMS provide adequate information to support the existing regulations applicable to incidental interactions with out-of-scope species (i.e. Discards' Plan based and Res.Ex.2941/2019). **SG60 and SG80 are met**.

However, as stated in PI 2.3.1a, current strategy cannot be considered tested and therefore 'comprehensive'. **SG100 is not met.**

References

Informe Tecnico -R.Pesq.- Nº04/2017, Res.Ex.2941/2019, Saa et al 2020, Saa et al 2021

Draft scoring range and information gap indicator added at Announcement Comment Draft Report stage

Draft scoring range	**≥80**
Information gap indicator	**Information sufficient to score PI**

Overall Performance Indicator scores added from Client and Peer Review Draft Report stage

Overall Performance Indicator score	
Condition number (if relevant)	

PI 2.4.1 – Habitats outcome

PI 2.4.1		The UoA does not cause serious or irreversible harm to habitat structure and function, considered on the basis of the area covered by the governance body(s) responsible for fisheries management in the area(s) where the UoA operates		
Scoring Issue		SG 60	SG 80	SG 100
a	Commonly encountered habitat status			
	Guide post	The UoA is **unlikely** to reduce structure and function of the commonly encountered habitats to a point where there would be serious or irreversible harm.	The UoA is **highly unlikely** to reduce structure and function of the commonly encountered habitats to a point where there would be serious or irreversible harm.	There is **evidence** that the UoA is highly unlikely to reduce structure and function of the commonly encountered habitats to a point where there would be serious or irreversible harm.
	Met?	**Yes (All UoAs)**	**Yes (All UoAs)**	**No (All UoAs)**
Rationale				

The characterization of the seabed in the south regions has a distribution of soft and muddy bottoms covering a wide range of depths and exposed to minimum oxygen between 50 and 450 m depth along the continental Pacific SE margin (Melo et al 2007). According to results presented in Melo et al (2007), this fishery mainly operates on an habitats characterized by fine substratum (dominated by mud -<0.1mm particle diameter- and fine sediments -0.1-1mm-), high in organic content and biota dominated by polychaeta and a few more species with high turn around rates and composed by many scarce taxa. Thus, this habitat category was considered as the commonly encountered habitat for trawl fisheries targeting demersal crustaceans along the Chilean coast between Region III and VIII (see **table 7.3.1.6.4**).

The extent of bottom trawling footprint (seabed area trawled at least once in a specified region and time period) is often contested but poorly described (Amoroso et al 2018). Amoroso et al (2018) quantified worldwide footprints using high-resolution satellite vessel monitoring system (VMS) and logbook data on 24 continental shelves and slopes to 1,000-m depth over at least 2 years. Regional swept area ratio (SAR; ratio of total swept area trawled annually to total area of region, a metric of trawling intensity) and footprint area were related, providing an approach to estimate regional trawling footprints when high resolution spatial data are unavailable. The proportion of seabed trawled varied >200-fold among regions (from 0.4 to 80.7% of area to a depth of 1,000 m). Chile was included in this study, and the Chilean EEZ was divided in two areas, South and North of 41ºS. Fleets operating in the northern region are those targeting Chilean hake and vessels targeting demersal crustaceans, always using bottom trawling. Tow by tow data was provided by IFOP and the Chilean fishing industry covering the period 2009-2013. The Northern region of Chile was found to be one of the areas with lower coverage among all those included in the study (32), with a coverage of total bottom trawling effort of 35% of the total area (in the Southern region of Chile the coverage was estimated at 85%).

Besides, Subpesca estimated the historical footprint of the trawl fisheries targeting both common hake and demersal crustaceans using geographical information from all hauls targeting common hake between 2000-2015 (16 years) and also all hauls targeting demersal crustaceans between 2001-20015 (15 years). A total of 52,513 hauls were considered for the common hake, and 156,537 for the demersal crustaceans were analysed (see **section 7.3.1.6.II** for more details). The footprint of the trawl fisheries was calculated outside of the area reserved for artisanal fisheries. The joint footprint of the trawl fisheries targeting demersal resources was estimated to be 29,524.50 Km2, Region VIII accounting with the biggest trawled surface (23.5% of the total surface) (see **table 7.3.1.6.3**).

Besides, the agreement signed in June 2019 between AIP and the UCN has allowed the client to have a detailed monitoring of the spatial-temporal activity of its fleet, both industrial and artisanal. Results compiled in Acuña et al (2021) shows that the AIP industrial fleet operates within the historical trawl footprint as defined in the Informe Técnico Nº09/2018 from SUBPESCA. This area has been trawled since, at least, the latest 20 years. The trawl coverage of the industrial AIP fleet over the historical trawl footprint has not been calculated, but **figure 7.3.6.1.11** (for UPN) and **figure 7.3.6.1.12** (for UPS) show that annual coverage in 2019 and 2020 accounted for approximately 30% of the historically trawled area. As far as the fleet keeps operating within this area, interactions with some VME-habitat forming species (i.e. sponges, soft corals, actinias and starfish) are likely to be sporadic and limited to small numbers of sponges or soft corals, and existing observer records corroborate it. In the case of the artisanal fleet, the UCN has also calculated a historical footprint in the IV Region, and artisanal vessels are operating within those boundaries.

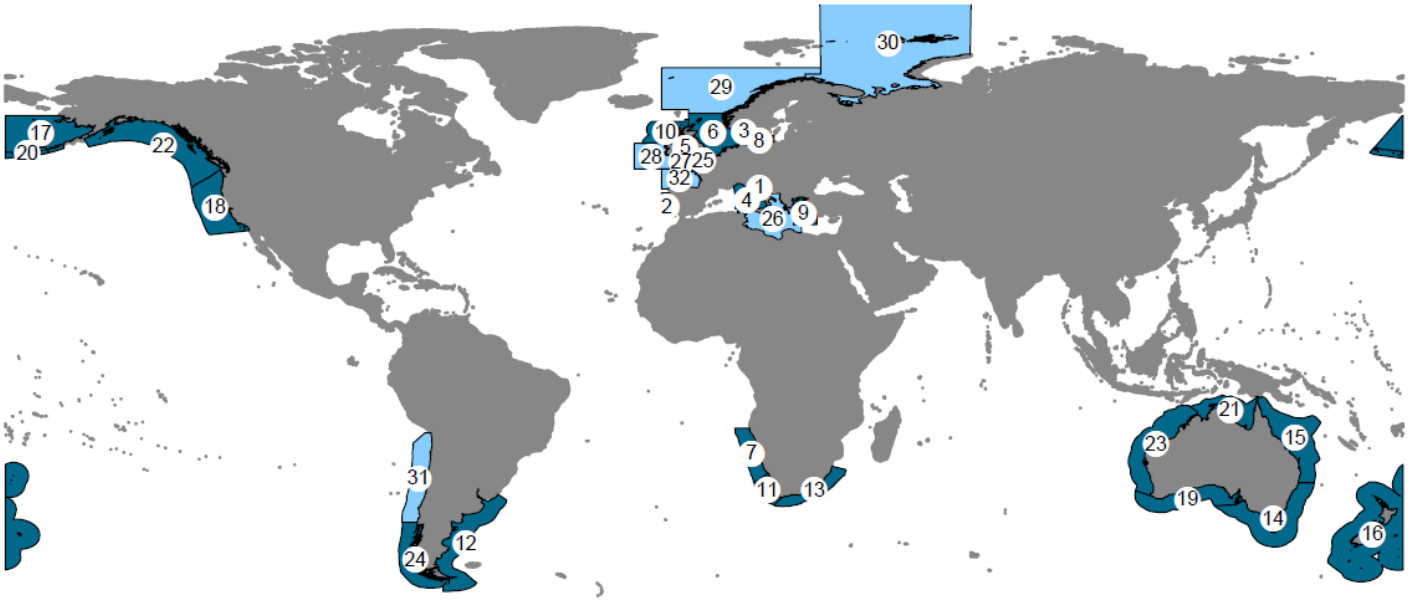


Figure 2.4.1.1 Location of the 32 regions where high-resolution trawling data were collected: light blue indicates areas with low coverage of activity (≤70%) and dark blue indicates areas where coverage exceeded 70%. The number correlates with trawl coverage (Region coded as 1 is the one with the highest %coverage, whereas Region 32 has the lowest %coverage). Northern Chile is region 31. Source: Amoroso et al 2018.

Thus, fisheries targeting demersal crustaceans mostly operate on mud and sand substrate areas, where bottom trawl gear disturbs organisms regenerated in relatively short time. Besides, they operate in a limited geographical area which has been trawled for a long time (and the annual trawl coverage of the AIP fleet over the historical footprint is estimated to be around 30%). Besides, the total trawl coverage in this region is far from that on other areas of the world, including the southern region of Chile. Thus, information suggests that fisheries are highly unlikely to reduce habitat structure and function to a point where there would be serious or irreversible harm. The fishery **meets SG60 and SG80**.

However, specific research projects to evaluate potential effects of the fisheries targeting demersal crustaceans on habitat structure and benthic biodiversity are missing to provide evidence about significance of impact on habitat. **SG100 is not.**

	VME habitat status			
b	Guide post	The UoA is **unlikely** to reduce structure and function of the VME habitats to a point where there would be serious or irreversible harm.	The UoA is **highly unlikely** to reduce structure and function of the VME habitats to a point where there would be serious or irreversible harm.	There is **evidence** that the UoA is highly unlikely to reduce structure and function of the VME habitats to a point where there would be serious or irreversible harm.
	Met?	**Yes (All UoAs)**	**Yes (All UoAs)**	**No (All UoAs)**
Rationale				

Article 2(68) of the LGPA recognizes seamount, hydrothermal sources, formations of cold water coral reefs or underwater canyons as VMEs. Besides, a proposal to implement Article 6B prepared by Subpesca (Informe Tecnico RPESQ Nº154/2016 list vulnerable-habitat forming species, including sponges, soft corals, stony corals and hydrocorals, gorgonians (see **table 7.3.1.6.2**). Finally, Resolution Nº142/2021 listing the species for which the discard plan in fisheries targeting demersal crustaceans is applicable states that actinias (Actinia sp.), Sponges (Sponges sp.), unidentified corals, deep-sea starfish (Hippasteria hyadiesi) and unidentified starfish shall be returned to the sea since they are VME-habitat forming species.Based on this, the team prepared a list of the VMEs considered in this assessment (see **table 7.3.1.6.6** for a detailed list).

The modified trawl used in this fishery since 2014 is lighter and also more susceptible to tear than the previous gear used (**section 7.3.1.6.V** for more details), which has caused the fishery to move away from hard substrate. **Figure 7.3.1.6.15** shows that footrope of the gear used to target squat lobster is light and lacks of protective hard roller structures (made out of metal or hard plastic). The only authorised protection against rubbing shall be made of buoyant net material. This type of fishing gear could not bear the abrasion derived from being dragged on hard bottoms, such as seamount or cold-water coral reefs.

Besides, no seamounts, geothermal vents, or underwater canyons in the study area were found between Region III and X and between 100 and 500m depth (Melo et al 2007).

Yañez et al (2006) identified 118 seamounts within the Chilean EEZ. All the identified seamounts (see **figure 7.3.6.11**) are outside the geographical scope of any fishery targeting demersal crustaceans, and trawling is prohibited in 117 of them (Res. Ex. 451, February 17, 2015; and Res. Ex. 687 , March 4, 2016). Mapping of the spatial fishing effort of the AIP fleet (figures in **section 7.3.1.6.VII**) show that no possible overlapping occurs with the protected seamounts.

Melo et al (2007) did not reported any sponge field or cold-water coral reefs between Region IV and IX and between 100 and 500m depth, although species of corals and sponges were found (the area presenting more coral diversity and abundance was Region IX, out of the geographical scope of the fisheries targeting demersal crustraceans). This is consistent with observations of small quantities of sponges and actinias recorded by observers on board vessels targeting demersal crustaceans. No corals of any kind have been recorded by observers on board vessels targeting red or yellow squat lobsters in the UPS, but soft corals (belonging to the Alcyonacea Order, the most abundant according to Melo et al, 2007) have been observed sporadically on-board vessels targeting nylon shrimp (ZCN and ZCS) (see tables in **section 7.3.1.1.I**).

Results compiled in Acuña et al (2021) shows that the AIP industrial fleet operates within the historical trawl footprint as defined in the Informe Técnico Nº09/2018 from SUBPESCA. This area has been trawled since, at least, the latest 20 years. As far as the fleet keeps operating within this area, interactions with some VME-habitat forming species (i.e. sponges, soft corals, actinias and starfish) are likely to be sporadic and limited to small numbers of sponges or soft corals, and existing observer records corroborate it. In the case of the artisanal fleet, the UCN has also calculated a historical footprint in the IV Region, and artisanal vessels are operating within those boundaries. See **figures 7.3.1.6.11 and 7.3.6.1.12**

In Chile, VMS system is mandatory for all fishing vessels above 12m length. The VMS data is regularly sent to Sernapesca, Subpesca and the Chilean Army. Further, Law 21.132/2019 determined that VMS data shall be publicly available, and the Chilean Government signed an agreement to make its vessel tracking data publicly available through the Global Fishing Watch (GFW) map, which tracks the movements of commercial fishing* vessels in near real-time. Also,

Based on the information presented above, **SG60 y SG80 are met.**

Methane emergence areas present are associated with high biodiversity. Normally these areas occur in much deeper waters than where demersal crustacean fisheries operate but finding by Melo et al (2007) at 349 m in one station located in 33o 23 4’S indicates that they might be present in the study area. No other methane emergence areas in this area have been identified since Melo et al (2007). These areas generate hard bottoms colonized by sessile organisms and serving as refuge for fish and invertebrate larvae.

Specific research projects to evaluate potential effects of the fisheries targeting demersal crustaceans on VMEs present in the Chilean waters are missing to provide evidence about significance of impact on habitat. **SG100 is not.**

	Minor habitat status			
C	Guide post			There is **evidence** that the UoA is highly unlikely to reduce structure and function of the minor habitats to a point where there would be serious or irreversible harm.
	Met?			**No (All UoAs)**
Rationale				

Nursery areas for squat lobster down to 200 m consist of muddy soft bottoms and also rocky-muddy hard bottoms (Roa et al, 1995). Hard bottoms are generally not accessible to trawling due to abrasion (rubber protections are not allowed in the modified trawl) and abundant interspersed rocks lying in the sediments. However, due to the presence of target species in these habitat types, rock-muddy hard bottoms with rough surface were considered as the minor habitat encountered by trawl fisheries targeting demersal crustaceans along the Chilean coast.

The modified trawl is lighter and also more susceptible to tear than the previous gear used (**section 7.3.1.6.V** for more details), which has caused the fishery to move away from hard substrate. **Figure 7.3.1.6.15** shows that footrope of the gear used to target squat lobster is light and lacks of protective hard roller structures (made out of metal or hard plastic). The only authorised protection against rubbing shall be made of buoyant net material. This type of fishing gear could not bear the abrasion derived from being dragged on hard bottoms.

However, specific research projects to evaluate potential effects of the fisheries targeting demersal crustaceans on habitat structure and benthic biodiversity are missing to provide evidence about significance of impact on habitat. **SG100 is not met.**

References

Acuña et al 2021, Amoroso et al 2018, Roa et al, 1995.

Draft scoring range and information gap indicator added at Announcement Comment Draft Report stage

Draft scoring range	**≥80**
Information gap indicator	**More information sought**

Information is sought on:

- More details on the quantity of sponges and corals recorded per haul.
- The reason why actinias and starfish are included as VME-forming species in Res. 142/2021, when they were not included as VME-forming species in the proposal to regulate fishing operations on areas susceptible to VMEs (Informe Tecnico RPESQ Nº154/2016)
- More details on the information used by the UCN to estimate the historical trawl footprint within the first 5NM

Overall Performance Indicator scores added from Client and Peer Review Draft Report stage

Overall Performance Indicator score	
Condition number (if relevant)	

PI 2.4.2 – Habitats management strategy

PI 2.4.2		There is a strategy in place that is designed to ensure the UoA does not pose a risk of serious or irreversible harm to the habitats		
Scoring Issue		SG 60	SG 80	SG 100
a	Management strategy in place			
	Guide post	There are **measures** in place, if necessary, that are expected to achieve the Habitat Outcome 80 level of performance.	There is a **partial strategy** in place, if necessary, that is expected to achieve the Habitat Outcome 80 level of performance or above.	There is a **strategy** in place for managing the impact of all MSC UoAs/non-MSC fisheries on habitats.
	Met?	**Yes (All UoAs)**	**Yes (All UoAs)**	**Yes (All UoAs)**
Rationale				

The new trawl gear design for the demersal fisheries adopted in 2014 was (in part) designed to address concerns of effects from interaction with the seafloor and have less impact on habitat (is lighter and more susceptible to tear than the previous gear used). The modified trawl with lighter materials should minimize the impact of bottom trawl fisheries on the seafloor.

VMS is mandatory in all Chilean vessels larger than 12m length, and Law 21.132 requires VMS data from commercial fishing fleets to be publicly available.

EMS on board all industrial vessels is mandatory since early 2020.

SG60 is met.

The LGPA was modified to accommodate the recommendations contained in FAO (2009) in relation VME conservation. Law No. 20,657, incorporated the protection of vulnerable marine ecosystems within the Exclusive Economic Zone. In Article 5, third paragraph, it is established that in the case of seamounts, bottom fishing will not be allowed. Article 6A establishes that the Ministry shall adopt a fisheries management regime for VMEs, when verifying that invertebrates or geological structures that constitute VME/s occur in a specific area. In application of Article 6A, 118 identified seamounts by Yañez et al (2006) in the Chilean waters were protected by banning any bottom-trawl fishing activity in circular areas around those seamounts (DS 451/2015, later amended by DS 687/2016).

No seamounts, geothermal vents, underwater canyons, sponge fields or cold-water coral reefs were found between Region III and X and between 100 and 500m depth (Melo et al 2007). No further research or mapping on VME distribution off the central Chilean coast have been performed. Therefore, no delimitated geographical areas with special fishing management regimes have been set for protecting these types of habitats so far.

Article 6B states that the list of hydrobiological resources will be established whose fisheries qualify as bottom fishing that can affect VMEs. This Article also sets to carry out fishing activities on these hydrobiological resources, vessels shall follow VME Operational and Evidence Protocols (to be elaborated).

Finally, Article 6C recalls that all vessels authorized to target one of the hydrobiological resources included in the list referred in Article 6B shall have scientific observers on board on all fishing trips.

Invertebrates denoting the existence of VMEs caught by fisheries targeting demersal crustaceans are subject to the specific measures adopted in the Plan for reduction of discards and interactions (approved by Res.EX.1106 del 29 de Marzo 2017). It is stated that: "*In the case of catching invertebrates denoting the existence of VMEs, the measures established for this purpose in accordance with Articles 6a and 6b of the LGPA must be complied with"* (see **section 7.3.1.2.II** for more details). And the associated code of best practices detailed in the plan include 'compliance with move-on rules'. Resolution Nº142/2021 listing the species for which the discard plan in fisheries targeting demersal crustaceans is applicable states that actinias (Actinia sp.), Sponges (Sponges sp.), and unidentified corals shall be returned to the sea since they are VME-habitat forming species. As part of the monitoring programme on the implementation of the discards' plan, observers are getting on board industrial and artisanal vessels targeting demersal crustaceans and provide details on the interactions with VME-forming species.

Up to date no official Regulations have been issued to comply with Article 6B: Subpesca has not yet established a list of marine resources which their fisheries are susceptible to impact on VMEs. On the other hand, there is evidence that Subpesca has been working on developing a proposal to regulate fishing operations on areas susceptible to VMEs. The proposed regulation (Informe Tecnico RPESQ Nº154/2016) defines Vulnerable-habitat-forming species (see **table 7.3.1.6.2**), the VME Operational and Evidence Protocols mentioned in Article 6B. The Operation Protocol in VMEs consist in a set of requirements for carrying out extractive activities in areas where the administration regime for VME is established and for hydrobiological resources whose fisheries qualify as bottom fishing that can affect VMEs. While

the Protocol for the Evidence of VME set of procedures for an immediate assessment in the presence of VME-forming species to trigger a management response to limit the impact in the area. These protocols include and a detailed protocol to operate on areas susceptible to VMEs, including threshold values and move-on rules, among other measures. The main features are: detailed prior notification of the intent to operate in those areas, mandatory 100% observer coverage in all hauls to perform the activity, 5NM move-on rule to be applied in those cases where more than 50kg of sponges or 30kg of corals come on board.

In December 2017 SUBPESCA and Oceana gave a joint speech saying that the fishing footprint for the fisheries of common hake and demersal crustaceans was to be frozen, implying that trawlers would have to limit their operations to their traditional fishing grounds, preventing them to expand to new areas. In January 2018 Subpesca prepared a document (INFORME TECNICO RPESQ Nº09-2018) containing a recommendation for a regulation on the fishing operations targeting demersal marine resources between the Antofagasta Region and parallel 41º28,6'L.S (outside of the 5NM area reserved for artisanal fisheries). This area covers the entire geographical scope of the Chilean hake fisheries (longline, set nets and bottom trawl) and demersal crustaceans fisheries (bottom trawl targeting nylon shrimp, yellow squat lobster and red squat lobster). The report first defined the historical footprint of the trawl fisheries targeting both common hake and demersal crustaceans (See **section 7.3.1.6.II** for more details). The study recommends the following regulation of the fisheries operating between the Antofagasta Region and parallel 41º28,6'L.S.:

i. Outside of the area bounded by the polygon defining the footprint of the trawl fisheries, the following fishing gears are authorized: longline (espinel, palangre), jigging, arpoon, midwater trawl, purse seine, set nets and traps.

ii. Inside of the area bounded by the polygon defining the footprint of the trawl fisheries trawling is also authorized (apart from the other fishing gears mentioned above)

During third site visit (Saa et al 2020), Subpesca confirmed that the historical footprint was updated with recent data (up to 2018), but the addition of these new records did not result in a modification of the historical footprint. So far, no other actions have been taken after this preliminary study.

Despite some of the provisions adopted in the LGPA for the conservation of VMEs have still not been implemented (in particular those derived from Article 6B), and also despite the recommendation of banning bottom trawl outside of the historical footprint has not been implemented. The team considers that existing provisions (Articles 5, 6A, 6B and 6C), measures (technical characteristics of the fishing gear, VMS, EMS, observer program recording interactions with VME-forming species, inclusion of VME-forming species in Res.Ex.142/2021) and elaborated proposals to regulate fishing operations on areas susceptible to VMEs (Informe Tecnico RPESQ Nº154/2016) constitute a strategy designed to protect marine habitats, and VMEs in particular. **SG80 and SG100 are met.**

	Management strategy evaluation			
b	Guide post	The measures are **considered likely** to work, based on plausible argument (e.g. general experience, theory or comparison with similar UoAs/habitats).	There is some **objective basis for confidence** that the measures/partial strategy will work, based on **information directly about the UoA and/or habitats** involved.	**Testing** supports **high confidence** that the partial strategy/strategy will work, based on **information directly about the UoA and/or habitats** involved.
	Met?	**Yes (All UoAs)**	**Yes (All UoAs)**	**No (All UoAs)**
Rationale				

The use of the new trawl gear design adopted in 2014 (lighter and more susceptible to tear) should minimize the impact the fishery targeting demersal crustaceans on the seafloor and has caused to move it away from hard substrates. **SG60 is met.**

No seamounts, geothermal vents, underwater canyons, sponge fields or cold-water coral reefs were found between Region III and X and between 100 and 500m depth (Melo et al 2007).

According to Amoroso et al (2018) the Northern region of Chile was found to be one of the areas with lower coverage among all those included in the study (32), with a coverage of total bottom trawling effort of 35% of the total area down to 1.000m depth (in the Southern region of Chile the coverage was estimated at 85%).

Results compiled in Acuña et al (2021) shows that the AIP industrial fleet operates within the historical trawl footprint as defined in the Informe Técnico Nº09/2018 from SUBPESCA. This area has been trawled since, at least, the latest 20 years. The trawl coverage of the industrial AIP fleet over the historical trawl footprint has not been calculated, but **figure 7.3.6.1.11** (for UPN) and **figure 7.3.6.1.12** (for UPS) show that annual coverage in 2019 and 2020 accounted for approximately 30% of the historically trawled area. As far as the fleet keeps operating within this area, interactions with some VME-habitat forming species (i.e. sponges, soft corals, actinias and starfish) are likely to be sporadic and limited to small numbers of sponges or soft corals, and existing observer records corroborate it. In the case of the artisanal

fleet, the UCN has also calculated a historical footprint in the IV Region, and artisanal vessels are operating within those boundaries.

Only small quantities of sponges, actinias and starfish recorded by observers on board vessels targeting demersal crustaceans. No corals of any kind have been recorded by observers on board vessels targeting red or yellow squat lobsters in the UPS, but soft corals (belonging to the Alcyonacea Order, the most abundant according to Melo et al, 2007) have been observed sporadically on-board vessels targeting nylon shrimp (ZCN and ZCS) (see tables in **section 7.3.1.1.I**).

Based on the above, **SG80 is met.**

No further research or mapping on VME distribution off the central Chilean coast have been performed since Melo et al 2007. **SG100 is not met.**

c	Management strategy implementation			
	Guide post		There is **some quantitative evidence** that the measures/partial strategy is being implemented successfully.	There is **clear quantitative evidence** that the partial strategy/strategy is being implemented successfully and is achieving its objective, as outlined in scoring issue (a).
	Met?		**Yes (All UoAs)**	**No (All UoAs)**

Rationale

Sernapesca performs regular inspections to fleets targeting demersal crustaceans (See **section 7.4.1.12** for more details) to check compliance with existing regulations, including compliance with regulation setting the technical characteristics of the fishing gear (Res.Ex 762/2013 was amended by Res. Ex. 145/2015). All vessels are using the authorised gear which lacks hard protections against rubbing.

In Chile, VMS system is mandatory for all fishing vessels above 12m length. The VMS data is regularly sent to Sernapesca, Subpesca and the Chilean Army. Further, Law 21.132/2019 determined that VMS data shall be publicly available, and the Chilean Government signed an agreement to make its vessel tracking data publicly available through the Global Fishing Watch (GFW) map, which tracks the movements of commercial fishing vessels in near real-time (https://globalfishingwatch.org/press-release/chile-to-publish-vessel-tracking-data-through-gfw/).

Results compiled in Acuña et al (2021) shows that the AIP industrial fleet operates within the historical trawl footprint as defined in the Informe Técnico Nº09/2018 from SUBPESCA. This area has been trawled since, at least, the latest 20 years. The trawl coverage of the industrial AIP fleet over the historical trawl footprint has not been calculated, but **figure 7.3.6.1.11** (for UPN) and **figure 7.3.6.1.12** (for UPS) show that annual coverage in 2019 and 2020 accounted for approximately 30% of the historically trawled area. As far as the fleet keeps operating within this area, interactions with some VME-habitat forming species (i.e. sponges, soft corals, actinias and starfish) are likely to be sporadic and limited to small numbers of sponges or soft corals, and existing observer records corroborate it. In the case of the artisanal fleet, the UCN has also calculated a historical footprint in the IV Region, and artisanal vessels are operating within those boundaries.

As part of the monitoring programme on the implementation of the discards' plan, observers are getting on board industrial and artisanal vessels targeting demersal crustaceans and record the interactions with benthic species, including invertebrates considered as VME-forming species. Observers data compiled between 2016 and 2020 are presented in **section 7.3.1.1.I**, including quantitative results for interactions with benthic invertebrates. These invertebrates are being returned to the sea as required by Res.Ex.142/2021.

EMS has been implemented in the industrial fleet targeting demersal crustaceans since early 2020.

SG80 is met.

However, most of the provisions adopted in Article 6B of the LGPA for the conservation of VMEs have still not been implemented. Subpesca has not yet established a list of marine resources which their fisheries are susceptible to impact on VMEs. The VME Operational and Evidence protocols proposed by Subpesca in Informe Tecnico RPESQ Nº154/2016 have yet not been adopted.

The code of best practices detailed in the plan for species with no commercial value (including VME-forming species) considers the 'compliance with move-on rules'. However, no move-on rules have been adopted for VME-forming species.

SG100 is not met.

d	Compliance with management requirements and other MSC UoAs'/non-MSC fisheries' measures to protect VMEs

	Guide post	There is **qualitative evidence** that the UoA complies with its management requirements to protect VMEs.	There is **some quantitative evidence** that the UoA complies with both its management requirements and with protection measures afforded to VMEs by other MSC UoAs/non-MSC fisheries, where relevant.	There is **clear quantitative evidence** that the UoA complies with both its management requirements and with protection measures afforded to VMEs by other MSC UoAs/non-MSC fisheries, where relevant.
	Met?	**Yes (All UoAs)**	**Yes (All UoAs)**	**Yes (all UoAs)**

Rationale

The management requirements and provisions to protect VME are listed in SI(a). No other measures afforded to VMEs by other MSC UoAs/non-MSC fisheries have been adopted, as far as the team is aware.

VMS data provides quantitative evidence that the UoAs comply with the trawl-ban on seamounts (see **figure 7.1.6.1.12**). Up to date, no other fisheries management regime to protect VMEs have been adopted for any other designated area in application of Article 6A. Thus, **SG100 is met.**

Up to date no other measure to protect VME has been adopted (most of the provisions adopted in Article 6B of the LGPA for the conservation of VMEs have still not been implemented, and no move-on rule for VME-forming invertebrates has been adopted in application of the discards' plan).

References

Acuña et al (2021), Amoroso et al (2018), Law 21.132/2019, Melo et al 2007

GFW map: https://globalfishingwatch.org/press-release/chile-to-publish-vessel-tracking-data-through-gfw/

LGPA (Law 18.892), Res.Ex.451/2015, Res.Ex.687/2016, R.Ex.142/2020

Draft scoring range and information gap indicator added at Announcement Comment Draft Report stage

Draft scoring range	**≥80**
Information gap indicator	**More information sought**

Information sough on:

- The reason why actinias and starfish are included as VME-forming species in Res. 142/2021, when they were not included as VME-forming species in the proposal to regulate fishing operations on areas susceptible to VMEs (Informe Tecnico RPESQ Nº154/2016)
- Next steps regarding Provisions on the protection of VME adopted in Articles 5, 6A and 6B.
- Request information on move-or rules and fishing ground survey as required in the Discard Plan (in this case in relation to benthic invertebrates)

Overall Performance Indicator scores added from Client and Peer Review Draft Report stage

Overall Performance Indicator score	
Condition number (if relevant)	

PI 2.4.3 – Habitats information

PI 2.4.3		Information is adequate to determine the risk posed to the habitat by the UoA and the effectiveness of the strategy to manage impacts on the habitat		
Scoring Issue		SG 60	SG 80	SG 100
a	Information quality			
	Guide post	The types and distribution of the main habitats are **broadly understood**. **OR** **If CSA is used to score PI 2.4.1 for the UoA:** Qualitative information is adequate to estimate the types and distribution of the main habitats.	The nature, distribution and **vulnerability** of the main habitats in the UoA area are known at a level of detail relevant to the scale and intensity of the UoA. **OR** **If CSA is used to score PI 2.4.1 for the UoA:** Some quantitative information is available and is adequate to estimate the types and distribution of the main habitats.	The distribution of all habitats is known over their range, with particular attention to the occurrence of vulnerable habitats.
	Met?	**Yes (All UoAs)**	**Yes (All UoAs)**	**No (All UoAs)**
Rationale				

Melo et al (2007) undertook a multidisciplinary effort to study the main areas that constitute fishing grounds on the platform and continental break in Chilean waters, and to understand the variables that determine the existing communities and their spatial distribution, both in the latitudinal and longitudinal axis. For this, a review of the main available data on the existing knowledge of the seabed in the study area was carried out, in particular with respect to its biotic and abiotic characteristics. Once the representative descriptors were defined, a sampling procedure was designed to characterize the seabed in the study area. Due to the extension of the study area and the requirements of physical, chemical and biological information, it was necessary to make the sampling compatible with other sources of information, such as databases generated prior to this study and samplings on board the fishing fleet. In particular, databases of multibeam soundings generated in the framework of national and international cruises were used to characterize the bathymetry and slope of the seabed, and oceanographic data from stations near the seabed were also used. Sampling was performed at 8 study areas, distributed between Regions IV and IX, in which 16 sampling stations were defined distributed in 4 bathymetric ranges (100-200, 200-300, 300-400 and 400-500 m). A total of 126 stations were carried out, using trawl nets for the capture of bento-demersal fauna, dragging and dredge / box-corer for benthic fauna, sensors and bottles for temperature, salinity and dissolved oxygen, and an underwater camera to record the diversity and the fund characteristics. Findings in Melo et al (2007) related to characteristics of superficial marine sediments, macrofauna, and presence of VMEs or VME-forming species are presented in **section 7.3.1.6.I**, but the study covered many other aspects (characterization of the megafauna and the benthic-demersal communities, ecotrophic modelling…). This study allowed to know that the main habitat in the operational area for the fisheries targeting demersal crustaceans has fine substratum (dominated by mud and fine sands), have flat geomorphology and biota is dominated by polychaeta.

FIP No. 2006-57, "*Biodiversity of seamounts*", was another project that provided data on marine habitats, which had the overall aim of collecting, organising, and increasing existing knowledge about the geographical distribution, biodiversity, and fishery impact of the seamounts in Chile's exclusive economic zone.

Besides, there are other studies available on more restricted geographical areas or topics, such as Roa et al (1995) describing benthic habitats in nursery area for squat lobsters.

IFOP annually maps the distribution of fishing effort by the demersal crustacean fisheries. The spatial extent of the fisheries to the studies available suggests that nature, distribution and vulnerability of the main habitats in the fishery area are known at a level of detail relevant to the scale and intensity of the industrial demersal crustacean fisheries.**SG60 and SG80 are met.**

However, no further research or mapping on VME distribution off the central Chilean coast have been performed, and further efforts on mapping methane emergence areas was recommended by Melo et al (2007). Also, the distribution and characterization of minor habitats (rocky-muddy hard bottoms) is still poorly known. **SG100 is not met.**

	Information adequacy for assessment of impacts			
b	Guide post	Information is adequate to broadly understand the nature of the main impacts of gear use on the main habitats, including spatial overlap of habitat with fishing gear. OR **If CSA is used to score PI 2.4.1 for the UoA:** Qualitative information is adequate to estimate the consequence and spatial attributes of the main habitats.	Information is adequate to allow for identification of the main impacts of the UoA on the main habitats, and there is reliable information on the spatial extent of interaction and on the timing and location of use of the fishing gear. OR **If CSA is used to score PI 2.4.1 for the UoA:** Some quantitative information is available and is adequate to estimate the consequence and spatial attributes of the main habitats.	The physical impacts of the gear on all habitats have been quantified fully.
	Met?	**Yes (All UoAs)**	**Yes (All UoAs)**	**No (All UoAs)**

Rationale

The type of trawl used in this fishery since 2015 is light and lacks protective hard roller structures (made out of metal or rubber). Protections allowed in the bottom of the gear shall be made of buoyant net material. This type of fishing gear could not bear the abrasion derived from being dragged on hard bottoms.

As already detailed in the previous SI, there is information on distribution of the main habitats and spatial location of the fisheries, timing and fishing effort which is adequate to broadly understand impacts.

SG60 is met.

Melo et al (2007) recorded underwater videos during trawling operations using ancient fishing gear (prior to 2014), allowing the main impacts of this type of fishing to be identified on seabed dominated by mud and fine sand. The characterization of the habitat derived from the results present in Melo et al (2007) shows that the fisheries targeting demersal crustaceans operate mainly in soft bottoms inhabited by macrofauna dominated by Polychaeta and other taxa with a high rate of regeneration that allows them to recover quickly after disturbances bottom trawling.

The project, “Biodiversity of seamounts” presents underwater photographs showing characteristics attributable to the impact of bottom trawling methods on hard bottoms.

Results from Acuña et al (2021) presents a detailed information on the spatial-temporal extend interaction between the fishing gear and the main habitat. Besides, IFOP annually maps the distribution of fishing effort by all the vessels targeting demersal crustacean fisheries in Chilean waters. **SG80 is met.**

However, physical impacts of the gear on all habitat have not been fully quantified. **SG100 is not met.**

	Monitoring			
c	Guide post		Adequate information continues to be collected to detect any increase in risk to the main habitats.	Changes in all habitat distributions over time are measured.
	Met?		**Yes / No**	**Yes / No**

Rationale

In Chile, VMS system is mandatory for all fishing vessels above 12m length. The number of vessels operating, the spatial-temporal distribution of the fishing operations, and therefore, the area covered by trawling is monitored on annually basis by IFOP. IFOP observers are getting on board industrial and artisanal vessels targeting demersal crustaceans and record the interactions with benthic species, including invertebrates considered as VME-forming species. All this data and analyses are included in the different annual reports prepared by IFOP, which are available to the general public at the IFOP website (https://www.ifop.cl/busqueda-de-informes/). **SG80 is met.**

However, no further research or habitat mapping distribution off the central Chilean coast have been performed since Melo et al (2007). **SG100 is not met.**

References

Acuña et al (2021), Melo et al (2007), Roa et al (1995), FIP No. 2006-57, "*Biodiversity of seamounts*

Draft scoring range and information gap indicator added at Announcement Comment Draft Report stage

Draft scoring range	**≥80**
Information gap indicator	**More information sought**

Information is sought on:

- More recent habitat mapping or characterization since Melo et al 2007

Overall Performance Indicator scores added from Client and Peer Review Draft Report stage

Overall Performance Indicator score	
Condition number (if relevant)	

PI 2.5.1 – Ecosystem outcome

PI 2.5.1		The UoA does not cause serious or irreversible harm to the key elements of ecosystem structure and function		
Scoring Issue		SG 60	SG 80	SG 100
a	Ecosystem status			
	Guide post	The UoA is **unlikely** to disrupt the key elements underlying ecosystem structure and function to a point where there would be a serious or irreversible harm.	The UoA is **highly unlikely** to disrupt the key elements underlying ecosystem structure and function to a point where there would be a serious or irreversible harm.	There is **evidence** that the UoA is highly unlikely to disrupt the key elements underlying ecosystem structure and function to a point where there would be a serious or irreversible harm.
	Met?	**Yes (All UoAs)**	**Yes (All UoAs)**	**Yes (All UoAs)**
Rationale				

The nylon shrimp, yellow and red squat lobster fisheries overlap in distribution and target species play similar ecological roles in the ecosystem and fisheries are evaluated together.

Potential ecosystem impacts of the fisheries are from removals of the target species and other by catches sucha as Chilean hake (the main predator in the ecosystem as identified in FIP Nº 2001- 29), or Chondrichthyes and grenadiers and flounders that also play important roles in the demersal food web. Additionally, the gear disturbs benthic communities that are important functional components at the base of the food webs. These actions can have an effect for ecosystem function, nevertheless based on analysis of food web dynamics from models, and considering that removals of target and bycatch species in each fishery are modest the fisheries are highly unlikely to disrupt ecosystem key elements to a point of serious harm. The fisheries meet **SG60 & SG 80**.

Studies are missing on the current food web and on biomass of bycatch species and other components of the food web to provide evidence that each fishery is unlikely to disrupt ecosystem key elements and the fisheries do not meet **SG100**.

References

Arancibia (1989, 1992), Quiñones et al (1997), Arancibia (1987, 1991), Melo et al (2007), Miranda et al (1998), Arancibia & Neira (2004, 2005), Neira (2003), Neira et al (2004, 2014), Neira and Arancibia (2004).

FIP Nº 2001- 29. Enfoque metodológico para el análisis ecosistémico en la administración de pesquerías de la zona central de Chile. Universidad de Concepción.

Draft scoring range and information gap indicator added at Announcement Comment Draft Report stage

Draft scoring range	**≥80**
Information gap indicator	**Information sufficient to score P**

Overall Performance Indicator scores added from Client and Peer Review Draft Report stage

Overall Performance Indicator score	
Condition number (if relevant)	

PI 2.5.2 – Ecosystem management strategy

PI 2.5.2		There are measures in place to ensure the UoA does not pose a risk of serious or irreversible harm to ecosystem structure and function		
Scoring Issue		SG 60	SG 80	SG 100
a	Management strategy in place			
	Guide post	There are **measures** in place, if necessary which take into account the **potential impacts** of the UoA on key elements of the ecosystem.	There is a **partial strategy** in place, if necessary, which takes into account **available information and is expected to restrain impacts** of the UoA on the ecosystem so as to achieve the Ecosystem Outcome 80 level of performance.	There is a **strategy** that consists of a **plan**, in place which contains measures to **address all main impacts of the UoA** on the ecosystem, and at least some of these measures are in place.
	Met?	**Yes (All UoAs)**	**Yes (All UoAs)**	**No (All UoAs)**
Rationale				

There are measures that constitute a partial strategy including closed entry, global quotas for the three species and quotas for some of the bycatch species, areas closed to fishing and regulations to reduce discards. There are area exclusions within 5 nm of the coast (except for Region IV) to protect nursery and recruitment areas and mandatory use of a modified trawl to improve selectivity and minimize interaction with benthic assemblages. There are protections for ETP species and vulnerable ecosystems. The CCT-CD evaluates the performance of the fishery and provides advice to the CM-CD and Subpesca.

The measures in place constitute a partial strategy that is expected to restrain impacts of the UoAs on the ecosystem so as to achieve the Ecosystem Outcome 80 level of performance. Thus, **SG60 and SG80 are met**.

The lack of a strategy consisting of a plan for any of the demersal crustacean fisheries means the **SG100 is not met.**

b	Management strategy evaluation			
	Guide post	The **measures** are considered likely to work, based on plausible argument (e.g., general experience, theory or comparison with similar UoAs/ ecosystems).	There is **some objective basis for confidence** that the measures/ partial strategy will work, based on some information directly about the UoA and/or the ecosystem involved.	**Testing** supports **high confidence** that the partial strategy/ strategy will work, based on information directly about the UoA and/or ecosystem involved.
	Met?	**Yes (All UoAs)**	**Yes (All UoAs)**	**No (All UoAs)**
Rationale				

Measures in place make sure that target species are within biologically based limits and that the fisheries do not constitute a risk for bycatches or discarded species. The area exclusion measures take into account that trawling has its greatest impact in coastal areas where productivity and biodiversity is highest and which constitute areas of reproduction and recruitment for numerous species, including birds. The gear design adopted in 2014 has caused fishing

operations to avoid more susceptible hard substrates as the net is prone to tear. Also, the new gear allows some non-target fish species to escape unharmed. **SG60 and SG80 are met**.

Although the new LGPA explicitly considers an ecosystem management approach, there is no plan yet that considers aspects of functional relationships between the fishery and components and elements of the ecosystem. **SG100 is not met**.

	Management strategy implementation			
c	Guide post		There is **some evidence** that the measures/partial strategy is being **implemented successfully**.	There is **clear evidence** that the partial strategy/strategy is being **implemented successfully and is achieving its objective as set out in scoring issue (a).**
	Met?		**Yes (All UoAs)**	**No (All UoAs)**

Rationale

VMS, logbooks, portside inspections, EMS and the observer program are providing clear evidence that most of the measures are being implemented successfully. **SG60 and SG80 are met**.

However, there are no clear evidence that all measures included in the Discards plan (e.g. move-on rules) or in the regulation to reduce mortality on birds are being implemented successfully, and provisions for the protection of VMEs in Article 6B have not been implemented yet. Besides, no clear evidence have been found to support that the partial strategy is actually restraining all main impacts of the UoA on the ecosystem. **SG100 is not met.**

References

LGPA

Draft scoring range and information gap indicator added at Announcement Comment Draft Report stage

Draft scoring range	**≥80**
Information gap indicator	**Information sufficient to score PI**

Overall Performance Indicator scores added from Client and Peer Review Draft Report stage

Overall Performance Indicator score	
Condition number (if relevant)	

PI 2.5.3 – Ecosystem information

PI 2.5.3		There is adequate knowledge of the impacts of the UoA on the ecosystem		
Scoring Issue		SG 60	SG 80	SG 100
a	Information quality			
	Guide post	Information is adequate to **identify** the key elements of the ecosystem.	Information is adequate to **broadly understand** the key elements of the ecosystem.	
	Met?	**Yes (All UoAs)**	**Yes (All UoAs)**	
Rationale				

Information from numerous studies available on ecosystem productivity and seasonal patterns, abundance of main predators and prey, biodiversity, diets, food web structure, and pelagic and demersal food web components allows the fisheries to meet **SG60**.

Information from these studies has been used to implement Ecopath food web models which quantify main trophic interactions in the northern and southern areas where the demersal fisheries take place. Information is considered adequate to broadly understand ecosystem key elements. The fisheries **meet SG80**.

b	Investigation of UoA impacts			
	Guide post	Main impacts of the UoA on these key ecosystem elements can be inferred from existing information, but **have not been investigated** in detail.	Main impacts of the UoA on these key ecosystem elements can be inferred from existing information, and **some have been investigated in detail**.	Main interactions between the UoA and these ecosystem elements can be inferred from existing information, and **have been investigated in detail**.
	Met?	**Yes (All UoAs)**	**Yes (All UoAs)**	**No (Alll UoAs)**
Rationale				

Several studies have developed from an ecosystem approach to implementing the management of the major fisheries of Chile. They key species in the ecosystem and trophic interactions that affect the dynamics of populations of species that are major fisheries are identified (Neira, 2003; Neira et al., 2004, Neira et al., 2014). Ecopath models were used with Ecosim (EwE) simulating the possible responses of exploited populations quantifying changes in predator and prey against different scenarios in catch levels of the main fishery resources analyzed and against different types of control in the food web (FIP Nº 2001- 29, Neira et al., 2014) These simulations include the effect of the environment through ENSO events in the structure and dynamics of the marine ecosystem community (FIP Nº 2001- 29).

The main result of these studies indicate that although predation mortality is the main cause of total mortality for the majority of the fish groups, fishing mortality of target species is high. Also recognize changes in system energetics that could have resulted in loss of productivity by increased flow to detritus. The models show that the species with small body size, short life span and low trophic level are dominant. Therefore suggest that the fishing-induced trends are result in stressed ecosystems and the food web could now be more susceptible to external forcing and negative ecological interactions (Neira et al., 2014). The team concludes that main interactions between the UoA and these ecosystem elements can be inferred from existing information, and some have been investigated in detail. **SG 60 and SG80 are met.**

However, not all main interactions between the UoAs and the ecosystem elements have been investigated in detail. **SG100 is not met.**

c	Understanding of component functions			
	Guide post		The main functions of the components (i.e., P1 target species, primary, secondary and ETP species and Habitats) in the ecosystem are **known**.	The impacts of the UoA on P1 target species, primary, secondary and ETP species and Habitats are identified and the main functions of these components in the ecosystem are **understood**.
	Met?		**Yes (All UoAs)**	**No (All UoAs)**

Rationale

Academic research is available on multiple ecosystem components off Chile and the three demersal crustacean species supporting the fisheries under assessment to provide adequate knowledge on their main functions. Nylon shrimp, yellow squat lobster and red squat lobster feed on detritus and have a trophic level species of 2; species are major components of the benthic food web pathway and in recycling organic matter back to the pelagic pathway. Ecosystem food web models showed that predation mortality constituted the main source of mortality for demersal crustaceans in 1992 and 1998. Main retained species is Chilean hake with a level of 3.55 (adults). Chilean hake consume a variety of crustacean and fish species and are cannibalistic. Euphausiids, squat lobsters and nylon shrimp are the most important prey. Some of the bycatch taxa, such as skates and bigeye flounder, feed almost exclusively on demersal crustaceans. Status and basic ecology of top predators such as marine birds, sea lions, and cetaceans is less known. A study on seafloor characteristics has been conducted in the operational area of the fishery and there has been a study to establish the basis of a new system to regulate discards. The main functions of the targets and bycatch species and habitats are known. On the basis of the foregoing it may be concluded that the fisheries **meet SG80**.

The function of target species, retained species and bycatch in the ecosystem are understood but impacts on bycatch and habitat are not identified and the fisheries **do not meet SG100**.

	Information relevance			
d	Guide post		Adequate information is available on the impacts of the UoA on these components to allow some of the main consequences for the ecosystem to be inferred.	Adequate information is available on the impacts of the UoA on the components **and elements** to allow the main consequences for the ecosystem to be inferred.
	Met?		**Yes (All UoAs)**	**No (All UoAs)**

Rationale

Logbooks and observers' data provided a very detailed data on all catches (primary and secondary species) and incidental interactions with out-of-scope species (ETP species) getting on board the vessels targeting demersal crustaceans in Chilean waters. Besides, VMS and logbook data provide detailed information on the spatial and temporal fishing effort and therefore on the trawl coverage of the marine habitats. **SG80 is met.**

The status of the secondary species remains unknown. Status and basic ecology of top predators such as marine birds, sea lions, and cetaceans is poorly known. Besides, there are other factors influencing the ecosystem (e.g. ENSO, environmental factors such as climate change) making sometimes difficult to infer the main consequences of the impacts of the UoAs on the P2 elements. **SG100 is not met.**

	Monitoring			
e	Guide post		Adequate data continue to be collected to detect any increase in risk level.	Information is adequate to support the development of strategies to manage ecosystem impacts.
	Met?		**Yes (All UoAs)**	**Yes (All UoAs)**

Rationale

Information on catch composition data, landings, number of vessels, and area trawled and trawling effort is sufficient to detect any increase in risk to ecosystem impacts. **SG80 is met**.

Ecopath ecosystem models are available, if updated with current information they can be used to implement Ecosim models to simulate food web dynamics and responses to fisheries and climate and support development of strategies to manage ecosystem impacts. **SG100 is met**.

References

Melo et al (2007), Neira and Arancibia (2004), Neira and Arancibia (2004), Neira et al (2004, 2005, 2014); Arancibia et al (2005).

Draft scoring range and information gap indicator added at Announcement Comment Draft Report stage

Draft scoring range	**≥80**

Information gap indicator	**Information sufficient to score PI**

Overall Performance Indicator scores added from Client and Peer Review Draft Report stage

Overall Performance Indicator score	
Condition number (if relevant)	

7.3.3 References P2

Relevant links:

ACAP-CMS: https://www.cms.int/es/legalinstrument/acap

Every listed IFOP technical report is available at: https://www.ifop.cl/busqueda-de-informes/

Every listed minute of the CM-CD is available at: https://www.subpesca.cl/portal/616/w3-propertyvalue-52793.html

Every listed minute of the CM-MC is available at: https://www.subpesca.cl/portal/616/w3-propertyvalue-52792.html

Every listed minute of the CM-RDZCS is available at: https://www.subpesca.cl/portal/616/w3-propertyvalue-51144.html

Every listed SERNAPESCA regulation is available at: http://www.sernapesca.cl/.

Every listed SUBPESCA regulation is available at: https://www.subpesca.cl/portal/615/w3-channel.html

Every listed SUBPESCA technical report (Informes Tecnicos R.PESQ) is available at: https://www.subpesca.cl/portal/618/w3-propertyvalue-53750.html

Every listed Technical Report or Minute from the CCT_CD is available at: https://www.subpesca.cl/portal/616/w3-propertyvalue-51147.html

IUCN Red List: https://www.iucnredlist.org/

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7.4 Principle 3

7.4.1 Principle 3 background

7.4.1.1 Area of operation of the UoA and under which jurisdiction it falls

The region III-IV yellow squat lobster *(Cervimunida Johni)*, region V-VIII yellow squat lobster, region III-IV red squat lobster *(Pleuroncodes monodon)*, region V-VIII red squat lobster and region II-VIII nylon shrimp (Herocarpus reedi) fisheries are worked by the industrial sector. Their limits lie between an imaginary line located five miles from the coast to the western limit, which is an imaginary line drawn at a distance of 60 nautical miles as measured from the Chilean coast. The small-scale yellow squat lobster, red squat lobster and nylon shrimp fisheries are worked from an imaginary line located 1 mile from the coast to the imaginary line drawn at a distance of 60 nautical miles as measured from the coast. It is administered as a single jurisdiction.

As of August, 2013, the region III-IV yellow squat lobster, region III-IV red squat lobster and nylon shrimp industrial fisheries are administered with Tradable Fishing Licenses (LTP), based on a system of individual transferable quotas.

The region V-VIII yellow squat lobster and red squat lobster fisheries are administered through the Recovery Scheme, based on an individual transferable quota scheme.

The region IV yellow squat lobster, red squat lobster and nylon shrimp small-scale fisheries are administered through the small-catch extraction scheme, with individual quotas allocated per vessel.

7.4.1.2 Area of operation of the UoA and under which jurisdiction it falls

The stakeholders that, according to the LGPA, participate in the fisheries management process at the different stages of the management process are as follows:

- **Ministry of Economy, Development and Tourism (MINECON)**: its competences are, amongst others, to set the basic policies for managing and co-ordinating the activities of the State in relation to the fishing sector in accordance with Decree Law no. 2,442/1978. Their actions involve promoting the development of the fisheries sector, along with the protection, conservation and full use of resources and the marine environment. The Ministry stipulates both the regulations of the Law as well as some of the administration measures, based on a report from SUBPESCA.

  The Economy Minister is Lucas Palacios Covarrubias.

- **Fishing and Aquaculture Undersecretariat (SUBPESCA)**: dependent regulatory body of the MINECON. It is responsible for designing and implementing administration policies and measures aimed at the conservation and sustainability of hydrobiological resources, in coordination with sectoral economic agents through the participatory bodies stipulated by the Law. The adoption of administrative and management measures must be supported by a technical report and comply, as appropriate, with the requirements for consultations, approvals or notifications stipulated by the LGPA for each of them. The organizational structure of SUBPESCA is presented in the figure below.

  The Undersecretary for Fishing is Alicia Gallardo Lagno.

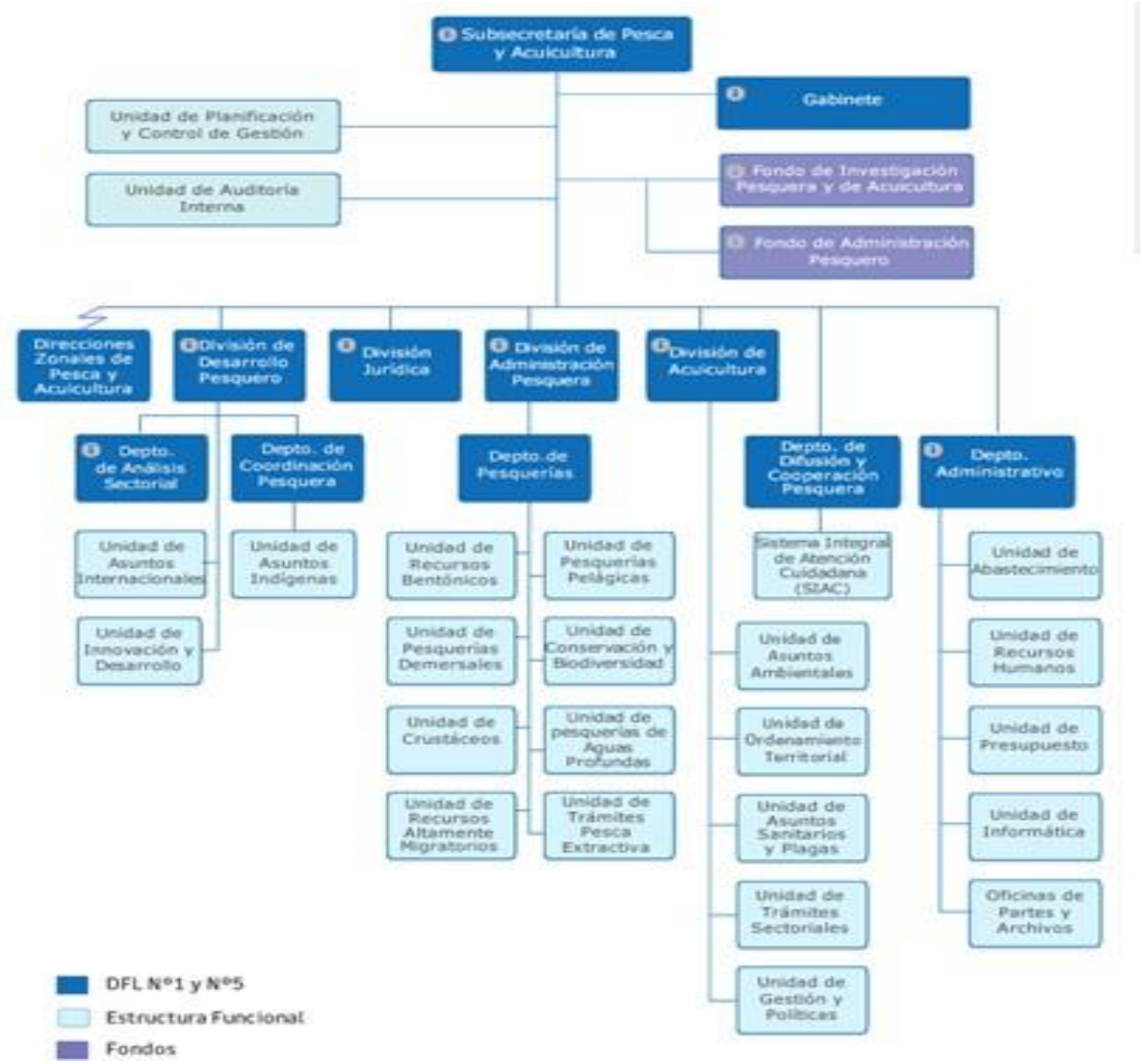

Figure 7.4.1.2. Diagram of the organizational structure of SUBPESCA. Source: Fishing Undersecretariat website.

- **National Fisheries Service (SERNAPESCA)**: A dependent body of the Ministry of Economy, created by Decree Law no. 2,442, 1978. It supervises fishing activities, overseeing compliance with stipulated legal and regulatory standards. It also manages the fishing registers, registration in which enables the practise of extractive activities of small-scale fishermen and of the industrial fishing sector, and the collecting and processing of information on landing, capture, and the processing of hydrobiological resources.

  The Director of SERNAPESCA is Claudio Báez Beltrán.

- **Fisheries Development Institute (IFOP)**: Created in 1964, IFOP is the specialist technical organisation for scientific research into fisheries and aquaculture. It is a collaborator with and permanent advisor to SUBPESCA concerning decision making on the sustainable use of fishing resources and the conservation of the marine environment, in accordance with the latest modification, LGPA (Law no. 20,657, 2013). IFOP undertakes continuous research as part of the research programme developed on an annual basis by SUBPESCA, as well as administering the databases generated during fisheries monitoring and research activities.

  The research databases are state owned and accessible to the public. The standards referring to statistical quality, form, and contents of the data obtained from the research programmes should be stipulated jointly with the Scientific Technical Committee (CCT).

  The Director of IFOP is Luis Parot Donoso

- **Steering Committee (CM):** an advisory body created by Law no. 20,657, 2013. One of its main tasks is the drafting of the proposal for the Management Plan of the fisheries within its remit, including their implementation, evaluation and adaptation, if applicable. The Committee is comprised of representatives from small-scale fishing, the industrial sector, processing plants, SERNAPESCA, and SUBPESCA.

  The CM-CD was established on October 10th, 2014 and its members were nominated through SUBPESCA Resolutions no. 2199/2014 and no. 2456/2014. It includes representatives of the small-scale sector, the industrial sector, processing plants, SERNAPESCA and SUBPESCA. According to law, the members representing the private sector hold their posts for 4 years. The names of the current members of the Steering

Committee, as well as its minutes, are published on SUBPESCA the website. The demersal crustaceans fisheries management plan was made official by SUBPESCA Resolution no. 3,423, 2016.

- **Scientific Technical Committees, (CCT)**: an advisory and/or consultative body of SUBPESCA, created through Law no. 20,657, 2013, for scientific issues relevant to the administration and management of closed-access fisheries, as well as the environmental and conservation matters regarding which SUBPESCA believes it must issue an opinion. The names of CCT members are published on SUBPESCA website. (Paragraph 3, Heading XII, LGPA).

  The CCT, in general terms, comprise between 3 and 5 members. To participate, applicants must prove that they have a professional degree and expertise in marine science related to the management and conservation of fishery resources. Members are appointed by public examination, hold their posts for four years and not fall in any of the clauses of ineligibility or incompatibility stated. Furthermore, two representatives of the IFOP and SUBPESCA are members. In addition, up to two members who do fall in one or more of the clauses of ineligibility or incompatibility stated may participate, but without the right to vote. The grounds for incompatibility are related to conflict of interest/impartiality.

  In accordance with article 153, LGPA, the CCT must determine: (i) The fishery's current status, (ii) the biological points of reference, and (iii) the range within which the authority can set the catch quota. In addition, they can be consulted by SUBPESCA in other matters such as: design of administration and conservation measures, and formulation of management plans.

  CCT-CD members were appointed by Resolution 1,386, 2013, constituted and applicable since November 2013. The names of its current members and the minutes of its meetings are available on SUBPESCA website.

- **National Fishery Board (CNP):** a subsidiary body of the State administration with a consultative and decision-making role, as appropriate. Its objective is to contribute to the participation of fishing sector agents at the national level in matters related to fishing activity. (Paragraph 1, Heading XII, LGPA).

  The Council has 28 members representing the public, business (industrial), employees, the small-scale sector, processing plants and shipping sectors, and members nominated by the President of the Republic and approved by the Senate. National Fishery Board members are published on SUBPESCA website.

  In addition to the matters in which the Law stipulates the participation of the Council, SUBPESCA must consult it regarding the following matters: (i) the National Fisheries Development Plan; (ii) the International Fisheries Policy; (iii) Amendments to the General Fisheries and Aquaculture Law; (iv) Measures to promote small-scale fishing, and (v) the National Fisheries Research Plan.

  The Council can also refer to other sector issues it considers relevant and can request the necessary technical background from the public or private organizations in the sector. Members can also inform sectoral authorities of events they believe affect fishery activities, hydrobiological resources and their environment, and require Undersecretariat initiatives on any issue within their powers, a request SUBPESCA may refuse by reasoned decision.

  The National Fishery Board has been in operation since 1993. The names of its current members and minutes are available on SUBPESCA website.

- **Regional Fishery Boards (CZP):** a subsidiary governmental body with a consultatory and decision-making role as required. Its purpose is to support the decentralisation of the authority's adopted administration measures and enable participation of the national fishing sector agents in issues relating to fishing activity. (Paragraph 2, Heading XII, LGPA).

  There are 8 Regional Fishery Boards in the country, each of which has 18 members representing the regional or local public sector, universities related to marine sciences, trade union organizations (industrial), fishing fleet and processing plant workers, the small-scale sector and non-profit organizations whose objective is to defend the environment or the preservation of natural resources, or engage in research into natural resources. The names of the members of the Regional Fishery Boards and the minutes from their meetings are published on SUBPESCA website.

  The Regional Fishery Boards must issue their opinion when consulted and prepare technical reports on the different issues involving the administration of fishing resources as stipulated by law.

- **Fisheries and Aquaculture Research Fund (FIPA):** A Ministry of Economy fund for the purposes of financing research projects required to support the application of administrative measures adopted by the fishing authority. (Paragraph 2, Heading VII, LGPA).

- **National Institute for Sustainable Development of Small-Scale Fisheries and Small-Scale Aquaculture (INDESPA):** This Institute aims to encourage and promote the development of small-scale fishing, small-scale aquaculture and its beneficiaries. Created by Law 21,069. The main duties of INDESPA are the following:

  Contribute to improving the productive or commercial capacity of small-scale fishing and small-scale aquaculture sectors.

Promote the productive diversification of small-scale fishing and small-scale aquaculture sectors.

Contribute to strengthening comprehensive and harmonious development, as well as the natural and economic heritage, of coves and surrounding sectors.

Develop infrastructure works for small-scale fishing and small-scale aquaculture, which should preferably be carried out through agreements with the competent State Administration bodies.

Coordinate and execute State activity aimed at such objectives, preferably through the existing bodies of the State Administration, or finance as appropriate.

Other stakeholders

The holders of Tradable Fishing Licenses (LTP) for nylon shrimp *(Merluccius gayi)* and Chilean hake *(Heterocarpus reedi)* trawl fisheries in the regions V to VIII area, given that they also capture yellow squat lobster and red squat lobster, and also associated species when they catch their target species. It should be noted that according to law, the holders of nylon shrimp and Chilean hake LTP must, prior to the start of their operations, prove that they have a quota (extraordinary fishing permits) for yellow squat lobster and red squat lobster where they allocate their catches.

7.4.1.3 Details of consultations leading to the formulation of the management plan.

The CM-CD must draft the demersal crustaceans fisheries management plan (yellow squat lobster and red squat lobster) in this case. Once drafted, it must be submitted to the CCT-CD for its assessment. Following this, the Management Plan must be approved and made official through a SUBPESCA Resolution.

Currently, the demersal crustaceans fisheries Management Plan is being reviewed within the Steering Committee.

7.4.1.4 Arrangements for on-going consultations with interest groups.

In the decision-making process, SUBPESCA or Ministry of Economy, in accordance with the stipulations of the LGPA, must consult the various agencies involved in management in order to establish the various management measures.

The participation of stakeholders in the establishment of prohibitions or administration measures is explained below:

For conservation or management measures, such as: the establishment of close seasons, prohibition of temporary or permanent capture of species protected by international conventions, quantification of capture, foundation of marine parks and marine reserves, and setting percentages of landing and bycatch: the measure must be previously notified to the respective CCT in addition to receiving a technical report from SUBPESCA. Some of these measures should be reported to the National Fishery Board, such as the quota that is reserved for research.

Regarding the establishment of global catch quotas, the respective CCT must provide an appropriate proposal, always taking into account that the fishery must be managed or maintained within the MRS, and within this scope, the Ministry of Economy may determine the quota.

For conservation or management measures such as establishing minimum extraction sizes, setting fishing methods and gear sizes and specifications, requiring the use and installation of devices to minimise bycatch, requiring the use and installation of tools to release bycatch), SUBPESCA must stipulate these measures after prior consultation with the respective Local Fishery Board and consultation with the respective CCT.

For the regulation of Vulnerable Marine Ecosystems: the Minister can establish this on the basis of a prior technical report from SUBPESCA and prior notification to the competent Local Fishery Board. The respective CCT determines which fisheries qualify as bottom fishing and which may affect vulnerable marine ecosystems.

7.4.1.5 Details of other non-MSC fishery users or activities, which could affect the UoA, and arrangements for liaison and co-ordination

In the geographical area of activity of the evaluation units, only extractive activities are carried out on different resources fishing resources for demersal fish and crustaceans. The activities related to aquaculture in the area take place in the coastal area within the strip of the first mile measured from the coast, and therefore outside the geographical limits of the UoAs.

7.4.1.6 Details of the decision-making process or processes, including the recognised participants.

In the decision-making process of the management measures, the participants are the Ministry of Economy, SUBPESCA, IFOP, the Fisheries Research Fund, the Scientific and Technical Committee, the National and Zonal Fisheries Councils and the Management Committee.

The Sub-secretariat of Fisheries is always responsible for preparing the technical reports on which the management measures are based, for that purpose it must consider, as appropriate, the scientific information provided by the research carried out by IFOP or Fisheries Research Fund. After that, it must consult the opinion of the relevant CCT regarding the design of the management measure, and inform the Fisheries Councils and the Management Committee, with the exception of the establishment of catch quotas and biological reference points, where a proposal from the relevant CCT is required.

The following management measures are established by Resolution of the Sub-secretariat of Fisheries: establishment of minimum sizes or weights, characteristics of fishing gear and equipment, use and carrying of devices to minimise the catch of bycatch, use and carrying of utensils to release bycatch, biological reference points, definition of target species and bycatch that constitute a fishery and according to their fishing gear, closures of access to fisheries.

In addition, the following management measures are established by Decree of the Ministry of Economy: establishment of annual catch quotas (CBA, by its acronym in Spanish), establishment of the Artisanal Extraction Regime (RAE, by its acronym in Spanish), establishment of closures, establishment of percentages of bycatch, areas corresponding to Vulnerable Marine Ecosystems.

7.4.1.7 Objectives for the fishery (referring to any or all of the following if relevant):

Chile's fishing activity is regulated by the MINECON, and SUBPESCA, within the framework of the provisions of the following standards:

General Fisheries and Aquaculture Law, LGPA, under Ministry of Economy Supreme Decree no. 430, 1991, which issues a consolidated, coordinated and systematized text of the fishing law stipulated in 1991 and all its subsequent modifications.

The objective of the LGPA, which regulates fishing activity in accordance with its article 1B, is the conservation and sustainable use of hydrobiological resources, through the application of the precautionary and ecosystem approach and thereby safeguarding marine ecosystems, where the effectiveness of the measures adopted must be assessed at least every five years.

To achieve the objective of sustainability to which article 1B refers, the authority must take into consideration the following when establishing management measures and interpreting the law:

Concerning resources:

- Establish long-term objectives for the conservation and management of fisheries and the protection of their ecosystems. (Article 1C, item a), LGPA): these specific objectives for each fishery must be stipulated through the fishery Management Plan.
- Periodically evaluate the effectiveness of the measures adopted. (Article 1C, item a), LGPA)
- Apply the precautionary principle, exercising caution when scientific data is unclear, unreliable, or incomplete, and insufficient scientific data should not be used as a reason for postponing or not adopting conservation and administration measures. (Article 1C, item b), LGPA)
- Audit the effective compliance of the conservation and administration measures (Article 1C, item h), LGPA).

Regarding the Environment:

- Apply the ecosystem approach for the conservation and administration of fishery resources and the protection of their ecosystems, taking into account the interaction of the predominant species in a given area. (Article 1C, item c), LGPA)

Regarding Biodiversity and ecology:

- Take into account the impact of fishing on associated or dependent species and the preservation of the aquatic environment. (Article 1C, item f), LGPA)
- Minimise discards of both the target and bycatch species and incidental fish catches. (Article 1C, item i), LGPA)

Regarding the creation of Social Awareness:

- Try to avoid or eliminate overexploitation and excessive fishing capacity. (Article 1C, item g), LGPA).
- Administer fishing resources in a transparent, responsible, and inclusive manner. (Article 1C, item d), LGPA)
- Collect, verify, inform, and share data on hydrobiological resources and their ecosystems in a systematic, timely, appropriate, and public manner. (Article 1C, item e), LGPA).

7.4.1.8 Outline the fleet types or fishing categories participating in the fishery.

In accordance with the stipulations of current fishing regulations, region III-IV yellow squat lobster and red squat lobster and region II to VIII nylon shrimp industrial fisheries are administered through Tradable Fishing Licenses. Region V to VIII yellow squat lobster and red squat lobster fisheries are administered through Extraordinary Fishing Permits. Both systems are based on individual quotas, independent of the vessels.

Consistent with the foregoing, in order to exercise their rights, holders must register the vessel/s in a SERNAPESCA register prior to the start of the fishing season. In order to be registered, vessels must fly the Chilean flag and may be owned by the PEP or LTP holder, or provide proof of the right of another party to use it.

In accordance with SERNAPESCA register, there were 25 vessels that were authorized to catch the LTP or PEP in 2020, of a length range between 11.98 m and 43.6 m. 88% of them were between 17 and 25.8 metres in length. The following table lists the vessels registered for each of the resources and areas of operation.

Table 7.4.1.8.1: Vessels authorized to carry out extractive activities in demersal crustacean fisheries. Source: Register of vessels authorized to operate in fisheries managed by PEP and LTP. Sernapesca Website

Fishing Fleet Registered in the LTP and PEP Register, 2020, for demersal crustacean fisheries				
Length in metres	**Length in metres**	**Length in metres**	**Length in metres**	**Length in metres**
22.50		Altair I		
25.80		Antares		
11.98			Chafic I	Chafic I
22.00	Cocha	Cocha	Cocha	Cocha
21.30		Crusoe I		
31.80	Don Enrique			
18.80	Don Stefan	Don Stefan	Don Stefan	Don Stefan
18.00	Elbe	Elbe	Elbe	Elbe
22.20	Eldom		Eldom	Eldom
22.00	Foche	Foche	Foche	Foche
22.00	Gringo	Gringo	Gringo	Gringo
22.00	Isla Orcas		Isla Orcas	Isla Orcas
20.00	Isla Picton	Isla Picton	Isla Picton	Isla Picton
17.88	Isla Tabon			
22.00		Lonquimay		
19.60	Nisshin Maru 3	Nisshin Maru 3	Nisshin Maru 3	Nisshin Maru 3
22.00		NS de la Tirana II		
17.90	Oriente		Oriente	Oriente
22.00	Polux	Polux	Polux	Polux
17.91	Punta Talca		Punta Talca	
18.30	Rauten	Rauten	Rauten	Rauten
43.60	Surmar I			
17.50	Tio Gringo			
17.80		Tome		
17.50	Trauwun I			
Total	**18 vessels**	**15 vessels**	**14 vessels**	**13 vessels**

It should be noted that according to the current regulatory system, small-scale vessels can be leased by LTP and PEP holders to catch their quotas.

Vessels operating through the small-catch extraction scheme (RAE).

In accordance with the stipulations of the DAS 013 technical report, 2013, issued by SUBPESCA Sector Analysis Department (DAS), which is the basis for the establishment of the small-catch extraction scheme stipulated by Ministry of Economy Decree no. 81, 2014, the following vessels are entered in the Small-scale Register in region IV demersal crustacean fisheries:

- Nylon shrimp: 24 vessels, of which 5 use the bottom trawling fishing method. The rest are authorized to use entangling nets.
- Yellow squat lobster: 78 vessels, of which 5 are authorised to use the bottom trawling fishing method. The rest are authorized to use entangling nets.
- Red squat lobster: 82 vessels, of which 4 are authorised to use the bottom trawling fishing method. The rest are authorized to use entangling nets.

A substantial part of the allocation in the RAE is on the basis of historical rights, regarding which the DAS 13-2013 report points out that in accordance with National Fisheries Service information, 98% of the catches of the three resources in the three-year period before the RAE was established were landed by 4 vessels.

Consistent with the foregoing, 4 vessels that opted for the individual RAE in the yellow squat lobster, red squat lobster and nylon shrimp fisheries are listed in the following table:

Table 7.4.1.8.2: small-scale vessels authorized in demersal crustacean fisheries with RAE.

RAE demersal crustacean in region IV	
Name Vessel	**Length in m.**
Punta Talca	17.91
Trauwün I	17.50
Chafic I	11.98
Isla Tabon	17.88

7.4.1.9 Details of those individuals or groups granted rights of access to the fishery and particulars of the nature of those rights.

- Extraordinary Fishing Permits Specifications

They are individual quota permits, are not associated with a vessel, are transferable, transmissible, divisible, and subject to all legal transactions. They are obtained by public auction and are valid for 10 years. The rights to capture 10% of the quota are auctioned annually. As they are transferable, they can also be obtained from another holder. Their grounds for expiry are stipulated in the LGPA, and can be total or partial due to non-compliance or non-payment of the buyer at the auction.

According to the 2020 quota control report, holders of Extraordinary Fishing Permits for yellow squat lobster and red squat lobster, and their respective quotas, according to the quota allocated and the transfers made, are listed in the following table:

Table 7.4.1.9.1: Allocated quotas and actual quotas of PEP holders in 2020. Source**:** Annual State Report on quotas in the Small-scale and Industrial sector. 2020. National Fisheries and Aquaculture Service. January 2021.

PEP Yellow squat lobster, Region V-VIII 2020		
Holder of PEP	**Allocated quota t.**	**Actual quota t.**
Antartic Seafood S.A	178.556	138.556
Quintero S.A.	65.413	65.413
Bracpesca S.A.	469.509	449.509
Camanchaca Pesca Sur S.A.	570.729	672.251
Antonio Cruz Cordova	5.268	5.268

PEP Red squat lobster, Region V- VIII 2020		
Holder of PEP	**Allocated quota t.**	**Actual quota t.**
Antartic Seafood S.A	313.904	353.903
Quintero S.A.	27.488	23.488
Bracpesca S.A.	360.591	380.591
Camanchaca Pesca Sur S.A.	3.403.170	3.178.397
Antonio Cruz Cordova	25.441	25.421

Grimar S.A.	0.157	0.157
Isla Damas S.A	364.062	508.328
Landes S.A.	1.960	1.960
Zuñiga Romero Gonzalo	0.051	0.051
Pacificblu SpA.	297.060	32.973
Da Venezia Antonio	0.040	0.040
Enfemar Ltda.	7.095	7.095
Jorge Cofre Toledo	-	60.956
Pesquera CMK ltda.	-	17.440
Total	**1,959.900**	**1,959.997**

Grimar S.A.	2.086	2.086
Isla Damas S.A	317.029	698.817
Landes S.A.	2.674	2.674
Zuñiga Romero Gonzalo	0.057	0.057
Pacificblu SpA.	847.637	20.002
Da Venezia Antonio	0.048	0.068
Enfemar Ltda.	21.133	23.133
Jorge Cofre Toledo	-	489.342
Pesquera CMK ltda.	-	123.279
Total	**5,321.258**	**5,321.258**

- Tradable Fishing Licenses. LTP.

They are individual quota permits. are not associated with a vessel. are transferable. transmissible. divisible. and subject to all legal transactions. 85% of allocations are made on the basis of historical rights and 15% through auction. The Tradable Fishing Licenses. class A. are issued on the basis of historical rights. are valid for 20 years and renewable depending upon the holder's compliance with regulations. The Tradable Fishing Licenses. class B. are issued by auction and are valid for 20 years. Both types of licenses may be revoked completely or partially. according to compliance and payments required by law. the specific tax for LTP class A and payment of the commitment at auction for LTP class B.

According to the 2020 quota control report. holders of Tradable Fishing Licenses for yellow squat lobster. red squat lobster and nylon shrimp are listed in the following table:

Table 7.4.1.9.2: Allocated quotas and actual quotas of LTP holders in 2020. Source: Annual State Report on quotas in the Small-scale and Industrial sector. 2020. National Fisheries and Aquaculture Service. January 2021.

LTP Yellow squat lobster. Region III-IV 2020		
Holder of LTP	**Allocated quota t.**	**Actual quota t.**
Antartic Seafood S.A	378.909	409.909
Quintero S.A.	68.508	68.508
Baycic Baycic María	0.031	0.031
Bracpesca S.A.	394.031	462.698
Grimar S.A.	0.178	0.178
Isla Damas S.A	108.901	108.901
Morozin B. María	0.103	0.103
Morozin Y. Mario	0.021	0.021
Zuñiga R. Gonzalo	0.062	0.062
Rubio y Mauad Ltda.	77.423	7.623
Enfemar Ltda.	0.834	0.834
Total	**1,029.001**	**1,058.868**

LTP Red squat lobster. Region XIV- IV 2020		
Holder of LTP	**Allocated quota t.**	**Actual quota t.**
Antartic Seafood S.A	10.375	70.375
Quintero S.A.	0.074	0.074
Bracpesca S.A.	20.671	89.715
Isla Damas S.A	9.051	9.051
Rubio y Mauad Ltda.	2.809	0.209
Zuñiga R. Gonzalo	0.020	0.02
Total	**43.000**	**169.444**

LTP Nylon shrimp. Region II-VIIII 2020

Holder of LTP	Allocated quota t.	Actual quota t.
Antartic Seafood S.A	772.502	772.502
Quintero S.A.	1,447.205	1,447.205
Baycic Baycic María	0.141	0.141
Bracpesca S.A.	759.213	693.770
Camanchaca Pesca Sur	24.696	22.394
Antonio Cruz Cordova	22.049	22.049
Grimar S.A.	13.337	13.337
Isla Damas S.A	1,405.973	1,405.973
Landes S.A.	7.280	7.280
Zuñiga Romero Gonzalo	152.617	161.617
Morozin Y. Mario	0.141	0.141
Quintero Ltda.	0.095	0.095
Pacificblu SpA.	85.420	167.016
Da Venezia Antonio	0.046	0.046
Enfemar Ltda.	1.269	1.269
Rubio y Mauad Ltda.	6.015	6.015
Jorge Cofre Toledo	-	1.269
Pesquera CMK ltda.	-	1.034
Total	**4,697.999**	**4,723.153**

- Small-catch extraction scheme (RAE).

The small-catch extraction scheme is a quota allocation mechanism for small-scale fishermen which consists of the allocation of the quota for a certain region, either by area, fleet, size of the vessels, fishing organization or individual. Small-scale rights are indefinite. transferable. associated with a vessel which can be replaced by one with an equal or lower level of effort. The small-catch extraction scheme in demersal crustacean fisheries was stipulated for the period between 2014 and 2018. The largest proportion of the quota is allocated to 4 vessels and a lower percentage as a residual quota accessible to all vessels registered in the aforementioned fisheries via the Small-scale Register.

According to the 2020 quota control report. holders of Extraordinary Fishing Permits for yellow squat lobster and red squat lobster are listed in the following table:

Table 7.4.1.9.3. Allocated quotas and actual quotas of RAE holders in 2020. Source**:** Annual State Report on quotas in the Small-scale and Industrial sector. 2020. National Fisheries and Aquaculture Service. January 2021.

RAE Yellow squat lobster. Region IV 2020		
RAE Holder	**Allocated quota t.**	**Actual quota t.**
Punta Talca	137.334	68.667
Trauwun I	128.081	197.881
Chafic	98.861	98.861
Isla Tabon	93.504	62.504
Cuota Residual	29.220	29.220
Total	**487.000**	**457.133**

RAE Red squat lobster. Region IV 2020		
RAE Holder	**Allocated quota t.**	**Actual quota t.**
Punta Talca	197.280	128.236
Trauwun I	183.860	86.460
Chafic	142.250	142.250
Isla Tabon	134.200	74.200
Cuota Residual	13.420	13.420
Total	**671.010**	**444.566**

RAE Nylon shrimp. Region IV 2020

RAE Holder	Allocated quota t.	Actual quota t.
Punta Talca	161.530	145.377
Trauwun I	151.504	146.504
Chafic	116.970	111.970
Isla Tabon	110.286	105.286
Cuota Residual	16.710	16.710
Total	**557.000**	**525.847**

7.4.1.10 Description of the measures agreed upon for the regulation of fishing in order to meet the objectives within a specified period. These may include general and specific measures. precautionary measures. contingency plans. mechanisms for emergency decisions. etc.

The region V-VIII red squat lobster and yellow squat lobster fishery. region III-IV yellow squat lobster fishery. region XV-IV red squat lobster fishery and region II-VIII nylon shrimp fishery are administered. in accordance with the LGPA. through various administrative and regulatory measures. which are indicated below:

Catch quota: the global catch quota for the following year must be stipulated during the previous calendar year. The last stipulated quotas are the following:

- Ministry of Economy Decree no 94 de 2020. stipulates the region V a VIII area yellow squat lobster quota for 2021 as 2.331 t with a target quota of 2.260 t.
- Ministry of Economy Decree no. 97. 2020. stipulates the region V to VIII area red squat lobster quota for 2021 as 6.346 t.. with a target quota of 6.160 t.
- Ministry of Economy Decree no. 119. 2020. stipulates the region III-IV yellow squat lobster quotas for 2021. total 1.494 t and target 1.466; region XV-IV red squat lobster. total 1.112 t and target 1.092; and region II-VIII nylon shrimp. total 5.992 t. and target 5.873 t.
- Fishing Undersecretariat Resolution no. 2.975. 2020. stipulates the small-scale regional quota distribution for 2021. with a quota for region IV nylon shrimp of 557 t.
- SUBPESCA Resolution no. 2.867. 2020. stipulates the small-scale regional quota distribution for 2021. with a quota for region IV yellow squat lobster of 467 t.
- SUBPESCA Resolution no. 2.887. 2020. stipulates the small-scale regional quota distribution for 2021. with a quota for region IV red squat lobster of 671 t.
- Ministry of Economy Decree no º 240 de 2019. stipulates the region V a VIII area yellow squat and red squat lobster lobster quota for 2020. yellow squat as 2.027 t with a target quota of 1.960 t. and red squat lobster as 5.518 t with a target quota of 5.348 t.
- Ministry of Economy Decree no. 311. 2019. stipulates 2020 quotas for region III-IV yellow squat lobster at 1.567 t.. with a target quota of 1.536 t. and for region XV-IV red squat lobster at a total quota of 757 and target of 743 t.
- Decree no. 28. 2020. amending DS 311. 2019. both of the Ministry of Economy. stipulates the region II to VIII nylon shrimp quota for 2020 at 5.990 t.. with a target quota of 5.873 t.
- SUBPESCA Resolution no. 3961. 2019. stipulates the small-scale regional quota distribution for 2020. with a quota for region IV yellow squat lobster 487 t of.
- SUBPESCA Resolution no. 4.053. 2019. stipulates the small-scale regional quota distribution for 2020. with a quota for region IV nylon shrimp of 557 t.
- SUBPESCA Resolution no. 40. 2020. stipulates the small-scale regional quota distribution for 2020. with a quota for region IV red squat lobster of 671 t.
- SUBPESCA Resolution no. 2.867. 2020. stipulates the small-scale regional quota distribution for 2021. with a quota for region IV yellow squat lobster of 467 t.
- SUBPESCA Resolution no. 2.887. 2020. stipulates the small-scale regional quota distribution for 2021. with a quota for region IV red squat lobster of 671 t.
- SUBPESCA Resolution no. 2.975. 2020. stipulates the small-scale regional quota distribution for 2021. with a quota for region IV nylon shrimp of 557 t.

Allocation of individual quotas:

- SUBPESCA Resolution no. 2.976. 2020. stipulates tons for Tradable Fishing Licenses. Class A. 2021. and draws up the list of leaseholders and simple holders.
- SUBPESCA Resolution no. 2.977. 2020. stipulates tons for holders of Tradable Fishing Licenses. Class B. 2021.
- SUBPESCA Resolution no. 6. 2021. stipulates the distribution of the small-scale fraction of the demersal crustacean fisheries region of Coquimbo. per fleet. and individuals. 2021.

Biological Close Season:

- Ministry of Economy Decree no. 126, 2015, modifies decrees 323 and no. 324, 1992 and decree no. 92, 1998. Consistent with the foregoing, the close seasons are stipulated as: Between September 1st and 30th each year, for nylon shrimp, yellow squat lobster and red squat lobster resources; and between January 1st and February 28th or 29th each year, for the yellow squat lobster and red squat lobster.

Regulation of fishing gear:

- Resolution no. 762, 2013, supplemented by Resolution no. 145, 2015, both of SUBPESCA, regulates the specifications and dimensions of trawl nets for demersal crustacean fisheries, stipulating, amongst others, the minimum net size and escape device for bycatch species.

Fishery Definition:

In accordance with article 33, LGPA, the holders of tradable fishing licenses and extraordinary fishing permits must have licenses or permits for the species they catch as associated or bycatch species of their fishery in order to use their permit. It also stipulates that SUBPESCA must define the species that can be caught as species associated with the fishing gear.

Resolution no. 3,200, 2013, modified by Resolution no. 3,544, 2014, both of SUBPESCA, stipulates the species associated with each of these fisheries:

The species associated with the bottom trawling fishing method that can be caught in each of the fisheries are listed in the following **Table 7.4.1.10**:

Table 7.4.1.10: Associated species or bycatch that may be caught by holders of: PEP of yellow squat lobster and red squat lobster from V to VIIII region. LTP of yellow squat lobster III-V region. red squat lobster XV-IV region and nylon shrimp II-VIII region, all trawled.

Common name	Scientific name	yellow squat lobster and red squat lobster from V to VIIII region	yellow squat lobster III-V region	red squat lobster XV-IV region	nylon shrimp II-VIII region
Eel	*Psedoxenomystax albenscens*	x	x	x	x
	Xenomystax atrarius	x	x	x	x
Catfish	*Aphos porosus*	x	x	x	x
Sea bream	*Alepocephalus spp.*				x
Brotula	*Epignus crassicaudus*	x	x	x	x
Brotulín	*Salilota australis*	x	x	x	x
Small redfish	*Austrophycis marginata*	x	x	x	x
Chanchito	*Helicolenus lengerichi*	x	x	x	x
Palm ruff	*Congiopodus peruvianus*	x	x	x	x
Red cusk eel	*Seriolla violacea*	x			
Grenadiers / banded whiptails	*Genypterus blacodes*	x	x	x	x
Abyssal grenadier	*Coelorhynchus chilensis*	x	x	x	x
	Coelorhynchus aconcagua	x	x	x	x
	Nezumia pulchella	x	x	x	x
	Coryphaenoides sp.	x	x	x	x
	Trachyrhynchus sp.	x	x	x	x
Aconcagua grenadier	*Coryphaenoides armatus*	x	x	x	x
Thumb grenadier	*Coelornchus aconcagua*	x	x	x	x
Trident grenadier	*Nezumia pulcheella*	x	x	x	x
Atacama grenadier	*Macrourus carinatus*				x
Grenadier	*Coryphaenoides delsolari*	x	x	x	x
Humboldt grenadier	*Nezumia pudens*	x	x		x
Grey grenadier	*Trachyrincus helolepis*	x	x	x	x
Chilean grenadier	*Coryphaenoides ariommus*	x	x	x	x
Austral cod	*Trachyrincus villegay*	x	x	x	x
Panpanito	*Coelorinchus chilensis*	x	x	x	
Hatchetfish	*Guttigadus kongi*	x	x		x
	Uroptychus milnedwardsi				x

Angler	*Munida propinqua*				x
	Munidopsis spp				x
Blackfish	*Stromateus stellatus*	x	x	x	x
Ghost shark	*Argyropelecus sladeni*	x	x	x	x
	Argyropelecus affinis	x	x	x	x
Rays	*Lampanyctus iselinoide*	x	x	x	x
	Triphoturus mexicanus	x	x	x	x
	Binghamichthys aphos	x	x	x	x
	Hydrolagus macrophtalmos	x	x	x	x
	Hydrolagus sp.	x	x	x	x
Velvet catfish/sharks	*Myliobatis peruvianus*	x	x	x	x
	Discopyge tschudii	x	x	x	x
	Dipturus trachyderma	x	x	x	x
	Psammobatis maculatus	x	x	x	x
	Zearaja chilensis	x	x	x	x
Prawn Squid Eel	*Aculeola sp.*	x			
	Apristurus nasutus	x			
	Centroscyllium sp.	x			
	Deania sp.	x			
	Echinorhinus cookei	x			
	Etmopterus granulosus	x			
	Bythaelurus canescens	x			
	Schroederichthys chilensis	x			
	Hexanchus griseus	x			
Catfish	*Haliporoides diomedeae*	x	x	x	x
Sea bream	*Loligo gahi*	x	x	x	x
Brotula	*Dosidicus gigas*	x	x	x	x

Similarly, this Resolution stipulates the proportion of managed associated species with LTP or PEP that each holder must confirm with SERNAPESCA at the time of registering their vessels for the capture of each target resource, according to fishing gear and expressed in percentages.

Yellow squat lobster V-VIII: 0.01 Nylon shrimp; 0.01 Red squat lobster V-VIII and 0.01 Chilean hake.
Red squat lobster V-VIII: 0.01 Nylon shrimp; 0.01 Yellow squat lobster V-VIII or 0.01 Chilean hake**.**
Yellow squat lobster III-IV: 0.01 Nylon shrimp; 0.01 Red squat lobster XV-IV; and 0.01 Chilean hake.
Red squat lobster XV-IV: 0.01 Nylon shrimp; 0.01 Yellow squat lobster III-IV; and 0.01 Chilean hake.
Nylon shrimp II-VIII: 0.01 Yellow squat lobster III-IV; 0.01 Red squat lobster XV-IV; and 0.01 Chilean hake

Demersal Crustacean Fishery Management Plan.

Made official by SUBPESCA Resolution no. 3,423, 2016.

This management plan stipulates the Purposes, Goals and Objectives of the Management Plan, where the Purpose is to “Maintain a sustainable fishery of demersal crustaceans in the biological-fishing, economic, social and environmental spheres, safeguarding the social and economic benefit of the activity and well-being of the fishery.”.

To achieve this purpose, the following goals are stipulated.

- Biological Dimension Objective: Maintain the fishery around the MSY, protecting the juvenile and spawning fractions of each stock, with appropriate quality and timely research.
- Environmental Dimension Objective: Develop an environmentally sustainable production chain with all its components, and that contributes to improving society's perception of the crustacean industry.
- Economic Dimension Objective: To optimise the economic returns linked to the demersal crustaceans fishery in terms of fleet and plants operation.
- Social Dimension Objective: strengthen the well-being conditions of all actors in the fishery, with emphasis on working conditions, education and training.

To achieve the desired changes in the fishery for the different Objectives, the management plan encompasses a series of operational objectives associated with management standards with which the progress of the different objectives will be measured.

One of the Environmental Objectives was the Discard Reduction Plan. The one that was specified was according to what is indicated in the following point.

Discard Reduction Plan for demersal crustacean fisheries and their bycatch species:

- SUBPESCA Resolution no. 1106, 2017, stipulated in the terms indicated in the Technical Report (R.Pesq.) No. 4, 2017 of the Fisheries Department of SUBPESCA.

The Discard Reduction Plan includes aspects related to Administration and Conservation Measures; Measurement Plan and Evaluation Monitoring Programme; Training and Dissemination Programme; Code of good practices to reduce discards, and Innovation and technological improvements in fishing gear that increase the selectivity of the fleet.

The objective of the Plan is to reduce the discarding of the target species, the bycatch of commercial value without catch quotas, the bycatch that have catch quotas and incidental catch.

Each of these aspects includes:

- Administration and Conservation Measures: during 2019, management measures were established in order to avoid discard.
- Measurement Plan and Evaluation Monitoring Programme: SUBPESCA includes the annual monitoring of discards in its research program and during 2019 the modification of various administration measures was carried out, compliance with which generated discard.
- Training and Dissemination Programme: during the beginning of 2020, SERNAPESCA held various meetings with the crew and owners of the fishery in order to identify the deficiencies that were detected through the image recording cameras so that they were corrected.
- Code of good practices to reduce discards:
- Innovation and technological improvements in fishing gear that increase the selectivity of the fleet.

Reduction of bycatches of seabirds in trawl fisheries:

- SUBPESCA Resolution no. 2941, 2019, stipulates various management measures to avoid or minimize bycatches of seabirds in trawl fisheries that occur in waters under national jurisdiction, such as on the high seas for vessels flying the Chilean flag.

Protection of vulnerable marine ecosystems, EMV:

- Resolution no. 451, 2015, modified by Resolution no. 687, 2016, both of SUBPESCA, stipulates the areas associated with 100 seamounts, in whose areas bottom fishing is prohibited.

7.4.1.11 Particulars of arrangements and responsibilities for monitoring. control and surveillance and enforcement.

The LGPA requires the use of various technological tools to aid monitoring, control and surveillance of the stipulated standards, which are overseen by SERNAPESCA, Chilean Navy, and Chilean National Police, both in the area of their territorial competence.

The main inspection tools applicable to extractive fishing activity are the following:

- **Satellite Positioning Device**: valid since August 2000, they have been required on all industrial vessels, irrespective of the management scheme under which they are operating. They must undertake their extractive activities, maintaining the automatic positioning system (satellite tracking devices) operational when at sea from the moment they set sail until they put into the authorised port. (Law 19521 that amended the LGPA).

Also from 2013, the law (law 20.657) makes the satellite positioning system mandatory for all artisanal vessels of a length equal to or longer than 15 metres and artisanal vessels of a length equal to or longer than 12 metres operating in pelagic fisheries with purse seine gear.

The positioning system's signal is automatically received at two institutions, the General Directorate of Maritime Territory (attached to the Chilean Navy) and SERNAPESCA. Both institutions are obliged to ensure compliance with the requirement and are authorised to make the respective claims when they detect non-compliances. In the case of SERNAPESCA, this signal also reaches their regional offices. Following the modification of the Fisheries Law by Law 21.132, the position information for the vessels is available on SERNAPESCA website and according to an agreement signed between SERNAPESCA and iGlobal Fishing Watch, with a lag of 3 or 4 days.

- **Certification of catches upon landing**: from 2002, the law establishes the requirement for all industrial ships, and small-catch vessels of a length equal to or greater than 12 metres, to certify catches at the time of landing, until 2019 when an auditing body authorised by SERNAPESCA carried this out. It is currently carried out by SERNAPESCA officials. (Law 21,132).
- **Scientific Observer**: since 2002, the law stipulates an obligation to accept Undersecretariat-assigned scientific observers on board industrial and small-scale vessels, irrespective of the management scheme under which they are operating. (Heading VIII, LGPA).

During the final days of each month, SUBPESCA issues a Resolution indicating which vessels must accept a scientific observer on board for the following month. The designated vessels will not be authorised to set sail without the Maritime Authority observer on board.

- **Image recording cameras on board ships**: the law stipulates the requirement for industrial vessels to install and maintain an operational image recording device on board their vessels in order to enable all discard actions that could occur on board to be detected and recorded. (Law 20.625 which modifies LGPA). This is required from the industrial fishing fleet from January 1st, 2020. In the case of small-scale vessels, this requirement is postponed for January 1st, 2024. (Law 21,259).
- **Electronic logbook of catch per fishing haul:** The requirement is stipulated for industrial fishermen to report the catch estimate in an electronic log after each catch. The current system does not allow the information to be entered for the next catch until the previous one has been closed. Catch information is automatically transmitted to Sernapesca when the ship has internet access. It becomes enforceable from 2015. The last regulation refers to SERNAPESCA Resolution no. 267, 2020.

Artisanal vessels must report their catches per fishing haul according to the format and conditions established by Sernapesca Resolutions, in accordance with the provisions of Decree No. 129 of 2013, which regulates the provision of information referred to in Article 63 of the LGPA.

- **Ports or landing points**: In accordance with article 63 d, LGPA, SERNAPESCA must establish through a Resolution the points or ports of disembarkation in which this activity can be carried out. It becomes enforceable from 2015. The last regulation refers to SERNAPESCA Resolution no. 4,533, 2019.
- **Weighing of landings**: according to article 64E, LGPA, landings to be certified must be weighed in a weighing system duly authorized by SERNAPESCA. It becomes enforceable from 2013. The last regulation refers to SERNAPESCA Resolution no.1,588, 2014.

7.4.1.12 Compliance

Inspection Actions and Penalities

According to the information provided by SERNAPESCA, the control actions undertaken in order to verify faithful compliance with the general regulations and administration measures applicable to demersal crustacean fishing in recent years are displayed in the following tables:

2020

The auditing actions carried out by SERNAPESCA on demersal crustacean fisheries during 2020 totalled 442 actions, of which 373 referred to the industrial sector and 69 to the small-scale sector.

Table 7.4.1.12: Control actions carried out in demersal crustacean fisheries, during 2020. **Source:** SERNAPESCA information, delivered upon request, code **460110221.**

Demersal Crustacean Fisheries, 2020			
Auditing Actions	**Auditing Actions**	**Auditing Actions**	**Auditing Actions**
IRD Installation Certification	-	6	6
Disembarkation control in process	-	8	8
Disposal control	-	3	3
Fishing research audit	-	2	2
Industrial Warehouse Sanitary Qualification	-	2	2
Inspection of means of transport	4	3	7
Plant Inspection	-	9	9
Inspection at disembarkation point	35	229	264
Inspection at Boarding Point	-	2	2
Fishing Zone Inspection	3		3
Sealing of wells	4	33	37
Landing certification audit.	21	35	56
VMS Device Monitoring	2	3	5
Check landing weight (not RAE)	-	29	29
Verification of species proportion	-	9	9
TOTAL.	**69**	**373**	**442**

As a result of the control actions in the demersal crustacean fisheries, SERNAPESCA reported to the courts of justice 3 non-compliances. One was in the nylon shrimp fishery, where a vessel could not confirm the legal source of the

resource. Two were in the yellow prawn fishery: one, where a vessel could not confirm the legal source of the resource and the other, for a vessel due to quota.

Regarding discard breaches, at the beginning 2020, the requirement for cameras for recording images on board industrial vessels for monitoring discard came into force, according to the information provided by SERNAPESCA at the site visit meeting. It was pointed out that in some of the vessels there have been difficulties in fully complying with the on-board catch management protocols, especially regarding the separation of the different resources for their quantification and the immediate return of resources that should not be retained, such as crabs. The unauthorized discard of species was observed in some situations.

It was pointed out that one of the reasons why they estimated that this occurred in the demersal crustacean fleet was fundamentally associated with the age and behavioural characteristics of some crew members. Many of them are older. They believe that this new way of working on board means more unremunerated work, as well as the reluctance of some crew members to continue doing the same thing they did before this requirement.

During the first months of the entry into force of the image recording cameras, Sernapesca had several meetings with the companies and their crew members in order to inform them of the faults that were evident in the review of the images. They also pointed out that this situation was not generalized, since the Quintero and Camanchaca fishing grounds at least have not encountered the problems indicated above.

It should be noted that on the date of the site visit, SERNAPESCA still had not finished reviewing all the images of 2020 for this fishery, mainly due to the problems caused by the pandemic, which has prevented work in person to be undertaken for some periods and the budgetary restrictions due to the pandemic, which is why it has not been possible to increase the number of professionals dedicated to this matter.

In response to the query made regarding the disciplinary penalties issued in the demersal crustacean fisheries for unauthorized discards, Mr. Naranjo points out in an email that: “To date, 8 findings have been identified of operations that have a high probability of being engaged in unauthorized discards, which are in different phases of legal technical analysis with a view to soon issue the respective notification instructions. As it is at the stage of establishing the potential non-compliance, it is not possible to provide more details of the offenders, but it is possible to point out that they are associated with fishing fleets whose home port is in Coquimbo”.

In this regard, it should be noted that the penalties for discards according to articles 40C and 55Ñ, LGPA, are of an administrative nature and therefore are substantiated by SERNAPESCA. The possibility that those fined appeal against this in the courts of justice exists at the end of the procedure

In accordance with the remarks made by the Sernapesca Fisheries Deputy Director, Fernando Naranjo, given the growing volume of images generated by the activity, which must be reviewed, the personnel engaged in this task did little, believing an increase in them as being necessary for this task. He also indicated that they were making efforts to create more storage capacity for this information.

2019

With the aim of confirming that the regulations stipulated for the demersal crustacean fishery are complied with correctly, SERNAPESCA reported (Standard No. 150217, dated March 19th, 2020) that there were 197 auditing activities on these fisheries during 2019, which aimed to evaluate compliance with the different requirements and administrative measures:

- Inspection at landing points : 53
- Inspection at sales centres : 43
- Certification supervision on landing : 45
- VMS device supervision : 21
- Processing plant inspection : 22
- Inspection of means of transport : 8
- Sanitary authorisation for the vessel : 4
- Fishing area inspection : 1

TOTAL : 197

As a result of the audit activities during 2019, SERNAPESCA reported to Court no. 5 breaches in shrimp fishing, 3 of them concerning means of transport, 1 concerning a processing plant and 1 concerning a trader.

2018

With the aim of confirming compliance with the stipulated regulations for the demersal crustacean fishery, the Service reported that 490 auditing activities took place in these fisheries during 2018, which aimed to evaluate compliance with the following aspects:

Access : 61 actions
Legal source certification : 102 actions
Fishing gear and tackle : 8 actions

Quotas	: 204 actions
Close seasons	: 115 actions
TOTAL	: 490 actions

As a result of the audit actions during 2018, SERNAPESCA reported to the courts 10 breaches for the following reasons: 5 Not providing legal documentation; 1 Obstructing the audit; 1 Selling; 2 catching or extracting and 1 Not submitting catch information.

7.4.1.13 Details of any planned education and training for interest groups.

No information available

7.4.1.14 Date of next review and audit of the management plan.

In accordance with the stipulations in article 8, LGPA, the Management Plans must be evaluated by the Steering Committee within five years of it being drafted. In accordance with the CM-CD minutes, the review of the Management Plan began in mid-2020, for which a working group was set up in order to address the issue and make progress on it.

According to the tenor of the minutes, progress has been made in different areas; however, it is unknown when it will be completed.

7.4.2 Principle 3 Performance Indicator scores and rationales

PI 3.1.1 – Legal and/or customary framework

PI 3.1.1		**The management system exists within an appropriate legal and/or customary framework which ensures that it:** - **Is capable of delivering sustainability in the UoA(s);** - **Observes the legal rights created explicitly or established by custom of people dependent on fishing for food or livelihood; and** - **Incorporates an appropriate dispute resolution framework**		
Scoring Issue		SG 60	SG 80	SG 100
a	Compatibility of laws or standards with effective management			
	Guide post	There is an effective national legal system **and a framework for cooperation** with other parties, where necessary, to deliver management outcomes consistent with MSC Principles 1 and 2	There is an effective national legal system and **organised and effective cooperation** with other parties, where necessary, to deliver management outcomes consistent with MSC Principles 1 and 2.	There is an effective national legal system and **binding procedures governing cooperation with other parties** which delivers management outcomes consistent with MSC Principles 1 and 2.
	Met?	**Yes (All UoAs)**	**Yes (All UoAs)**	**Yes (All UoAs)**
Rationale				

There is a legal framework stipulated in the General Fisheries and Aquaculture Law (LGPA) and its modifications, contained in Ministry of Economy Decree no. 430, 1991, which stipulates the regulations that enable results to be achieved that are consistent with MSC principles 1 and 2. For its part, article 1C, LGPA, expressly stipulates the factors that the Authority must observe when adopting conservation measures, that is, to make them sustainable (detailed in 7.4.1, item g).

The stipulated management rules are applicable to all vessels engaged in activities within the areas of national jurisdiction, and in some cases, those carried out outside the EEZ by vessels flying the Chilean flag when fisheries are distributed both within and outside the EEZ.

The LGP stipulates mandatory and explicit procedures for cooperation between parties involved in fisheries management. Thus, for example i) the definition of the BRP and the range within which catch quotas should be stipulated refers to the CCT of each fishery ii) the Management Plan where the short and long-term objectives for a determined

fishery are stipulated, and the management measures to be applied for sustainability, falls to the Management Committee, with the participation of the actors involved and the sectoral authority.

The LGPA requires its nationals to comply with the standards and requirements stipulated in the international documents to which Chile is a Party. The main international agreements to which Chile is a party are: United Nations Convention on the Law of the Sea –CONVEMAR, signed in 1997; and United Nations Agreement on Fish Stocks -New York agreement, joined in June, 2014.

It participates in the following Regional Fisheries Organizations: Commission for the Conservation of Antarctic Marine Living Resources, CCAMLR, joined in July, 1981; and the South Pacific Regional Fisheries Management Organisation, SPRFMO, in force from August 2012, believe that the horse mackerel fishery is distributed both within and outside the Exclusive Economic Zone.

It is part of the following Environmental Forums affecting Aquatic Biodiversity. Convention on Biological Diversity, CBD; Convention on Migratory Species, CMS; Convention on International Trade in Endangered Species of Wild Flora and Fauna, CITES; International Whaling Commission, IWC; Agreement for the Conservation of Albatrosses and Petrels, ACAP; Inter-American Convention (IAC) for the Protection and Conservation of Sea Turtles, IAC; Memorandum of Understanding on Sharks.

It also participates in the following International Forums: Sustainable Fisheries Rulings adopted by the United Nations General Assembly; Rulings on Oceans and the Law of the Sea adopted by the United Nations General Assembly; United Nations Conference on Sustainable Development; FAO Fisheries Committee, COFI; FAO Sub-Committee on Fish Trade; Agreement on Compliance with International Conservation and Management Measures by fishing vessels on the high seas, Agreement on FAO Compliance, FAO Agreement on Port State Measures to Prevent, Avoid and Eliminate Illegal, Unreported and Unregulated Fishing, ratified in 2012.

Within the framework of the implementation of the FAO Code of Conduct for Responsible Fisheries (FAO), three National Action Plans were drawn up: National action plan to reduce incidental catches of birds in longline fisheries, (approved by decree no. 136, 2007); National action plan for the conservation of sharks (approved by Decree no. 198, 2007) and National action plan to prevent, discourage and eliminate illegal, unreported and unregulated fishing, approved by Decree no. 267, 2005).

This is complemented by the requirements stipulated to reduce incidental catches of birds in longline fisheries (Resolution no. 2110, 2014) and in trawl fisheries. (Resolution No. 2941, 2019).

It participates on the OCDE Fisheries Committee; on the South Pacific Permanent Committee, CPPS; and in the APEC Oceans and Fisheries Working Group.

Therefore, since there is an effective national legal system with binding procedures that govern cooperation with other parties, participate in and respect the main international agreements, which provides management results consistent with MSC Principles 1 and 2, and therefore **complies with SG 60, SG 80 and SG 100a**.

	Resolution of disputes			
b	Guide post	The management system incorporates or is subject by law to a **mechanism** for the resolution of legal disputes arising within the system.	The management system incorporates or is subject by law to a **transparent mechanism** for the resolution of legal disputes which is **considered to be effective** in dealing with most issues and that is appropriate to the context of the UoA.	The management system incorporates or is subject by law to a **transparent mechanism** for the resolution of legal disputes that is appropriate to the context of the fishery and has been **tested and proven to be effective**.
	Met?	**Yes (All UoAs)**	**Yes (All UoAs)**	**Yes (All UoAs)**
Rationale				

The LGPA examines different aspects to minimize conflicts of interest that may occur between fisheries users, such as:

- The establishment of a 5-mile strip measured from the coast and the inland waters of the country, for the exclusive use of small-scale fishing, that is, for vessels up to 18 meters in length, which qualify as small-scale. (Article 47, LGPA). This is to minimize the interaction and possible conflicts in the development of the activity between the industrial and small-scale sectors.

- Establishment of a 1-mile maritime mile strip, measured from the coastline, for the exclusive use of small-scale fishermen who use vessels with an overall length of under 12 metres. (Article 47 bis, LGPA). This is to minimize conflicts between small-catch fishermen who use smaller boats with larger ones.
- Subdivision by law of the capture quotas of the main hydrobiological resources that are shared between the small-catch sector and the industrial sector for a period of 20 years. (Sixth provisional article, Law 20,657)
- Incorporation within the management plans of the power to adopt agreements that allow solving conflicts of interest that may arise (Article 8, LGPA)

On the other hand, in order to solve the conflicts that may arise between users and the fishing authority, arising from actions by the latter, the following solution options are available:

- All administrative acts stipulated by the authority can be contested at government agencies, according to law 19,880, Administrative Procedures Act, in this case before the Minister of Economy, through: the administrative appeal for review and appeal filed with a higher administrative authority, and jeopardy assessments, addressed in the aforementioned law.
- Administrative acts can also be filed at government agencies with the Comptroller General of the Republic.
- Similarly, the effects that may be caused by the administrative acts of the Fishing Authority can be appealed and requested to be corrected through the Courts of Justice, through Appeals for Legal Protection.

The decisions that are adopted in any of the instances, whether administrative or judicial, are of a mandatory nature for the administrative authority and are of a public nature.

As an example, three judgements for 2020 and 2021 were issued by the Supreme Court of Justice on issues raised by users.

- Supreme Court judgement in favour of Sernapesca in two cases of illegal fishing, October 30th, 2020.

http://www.sernapesca.cl/noticias/corte-suprema-fallo-favor-de-sernapesca-en-dos-casos-de-pesca-ilegal

- The Supreme Court confirmed a ruling that rejected protection provided by Regional Fishermen's Board of Region X against the Fishing and Aquaculture Undersecretariat and by issuing a ruling that modified the fraction of small-scale hake extraction, April 17th, 2020.

https://www.diarioconstitucional.cl/noticias/asuntos-de-interes-publico/2020/04/17/cs-confirmo-sentencia-que-rechazo-proteccion-deducido-por-consejo-regional-de-pescadores-de-x-region-contra-subsecretaria-de-pesca-y-acuicultura-por-dictacion-de-resolucion-que-modifico-fraccion-de-extraccion-artesanal-de-merluza/

- Supreme Court nullifies SUBPESCA Resolution that authorizes industrial fishing in a small-scale reserve area.

https://www.terram.cl/2021/04/corte-suprema-deja-sin-efecto-resolucion-que-autoriza-pesca-industrial-en-zona-reservada-para-captura-artesanal/

These conflict resolution mechanisms are transparent, they have proven to be effective for the resolution of conflicts, whether between administered and between administered and the administration, **therefore the SG 60, SG 80 and SG 100 b.**

	Respect for rights			
c	Guide post	The management system has a mechanism to **generally respect** the legal rights created explicitly or established by custom of people dependent on fishing for food or livelihood in a manner consistent with the objectives of MSC Principles 1 and 2.	The management system has a mechanism to **observe** the legal rights created explicitly or established by custom of people dependent on fishing for food or livelihood in a manner consistent with the objectives of MSC Principles 1 and 2.	The management system has a mechanism to **formally commit** to the legal rights created explicitly or established by custom of people dependent on fishing for food and livelihood in a manner consistent with the objectives of MSC Principles 1 and 2.
	Met?	**Yes (All UoAs)**	**Yes (All UoAs)**	**Yes (All UoAs)**
Rationale				

The LGPA clearly stipulates the rights that each user has to engage in extractive fishing activity, depending on the administration scheme through which the fishery is administered; the obligations that generate these rights and the penalties and causes for their expiry are also formally and explicitly stipulated, whether these be complete or partial. The holder of a right has an administrative act from the authority that guarantees his/her right in a legal way.

Extraordinary Fishing Permits, PEP, for the individual quota scheme, are granted by SUBPESCA Resolution, and are transferable, divisible and subject to all legal business. They are granted by auction for a period of 10 years.

Tradable Fishing Licenses, LTP, a scheme under which the majority of national industrial fisheries are administered. These are granted through SUBPESCA Resolution, and according to law have the following specifications: the LTP class A are obtained by historical rights of the catches obtained during the three years prior to their application. They are granted for a term of 20 years, are renewable depending on the owner's compliance with regulations; and the LTP class B are obtained by public auction at 15% less than the LTP class A, once only, for fixed periods of 20 years; they are fully transferable, divisible, transferable, and susceptible to any legal business.

The holders of LTP and PEP must register the vessels with which they will exercise their rights in a registry kept by SERNAPESCA, and in both cases, they give them the right to catch each year the number of tons obtained by multiplying the coefficient indicated in the ruling by the quota stipulated for the industrial sector. The law considers non-compliance or non-payment of the rights that the law requires as causes for total or partial expiration as stipulated explicitly in the law.

In the case of small-scale rights, both vessels and fishermen must be registered in a Small-Scale Fishing Register, held by SERNAPESCA by region. Registration grants an indefinite, transmissible and transferable right between small-scale fishermen. The causes for total expiry of these rights are expressly stipulated in law.

Current fishing legislation sets down according to law 20,249 the granting of the delivery of an area called Indigenous Peoples' Marine and Coastal Zone to the communities of indigenous peoples that request it. Its main objective is to protect the customary use of these spaces, in order to maintain traditions and the use of natural resources by the communities attached to the coastline. The Indigenous Peoples' Marine and Coastal Zone is provided for the community through a use agreement and during its processing the granting of these areas takes priority over other uses of those areas. In accordance with SUBPESCA website, from 2012 to date, 13 Indigenous Peoples' Marine and Coastal Zone areas have been granted.

Consistent with the foregoing, the management system encompasses mechanisms to formally commit to the legal rights created for the different agents engaged in the extractive activity, and recognizes rights for individuals belonging to native peoples who depend on fishing in order to feed themselves as a livelihood. Consistent with the foregoing, it is estimated that there is **compliance with the SG60, SG 80 and SG 100c**.

References

- General Fisheries and Aquaculture Law, set out in Supreme Decree no 430, 1991, Ministry of Economy.
- Law 20,249, created the Indigenous Peoples' Marine and Coastal Zone
- Law 19,880, Administrative Procedures Act.
- Ministry of Economy Decree no. 265, 2005, approves an Action Plan to prevent, discourage and eliminate illegal, unreported and unregulated fishing.
- Ministry of Economy Decree no. 136, 2007, approves an Action Plan to reduce bycatches of birds in longline fisheries.
- Ministry of Economy Decree no. 198, 2007, approves a National Action Plan for the Conservation of Sharks.
- SUBPESCA Resolution no. 2110, 2014, stipulates measures to reduce incidental catch of seabirds in longline fisheries.
- SUBPESCA Resolution no. 2941, 2019, stipulates measures to reduce bycatches of seabirds in trawl fisheries.

Draft scoring range and information gap indicator added at Announcement Comment Draft Report stage

Draft scoring range	**≥80**
Information gap indicator	**Information sufficient to score PI**

Overall Performance Indicator scores added from Client and Peer Review Draft Report stage

Overall Performance Indicator score	
Condition number (if relevant)	

PI 3.1.2 – Consultation, roles and responsibilities

PI 3.1.2		**The management system has effective consultation processes that are open to interested and affected parties** **The roles and responsibilities of organisations and individuals who are involved in the management process are clear and understood by all relevant parties**		
Scoring Issue		SG 60	SG 80	SG 100
a	Roles and responsibilities			
	Guide post	Organisations and individuals involved in the management process have been identified. Functions, roles and responsibilities are **generally understood**.	Organisations and individuals involved in the management process have been identified. Functions, roles and responsibilities are **explicitly defined and well understood for key areas** of responsibility and interaction.	Organisations and individuals involved in the management process have been identified. Functions, roles and responsibilities are **explicitly defined and well understood for all areas** of responsibility and interaction.
	Met?	**Yes (All UoAs)**	**Yes (All UoAs)**	**Yes (All UoAs)**
Rationale				

The LGPA expressly stipulates the roles, duties and responsibilities of each of the institutions that participate in the management of fisheries, be these governmental institutions or the MINECON, SUBPESCA, SERNAPESCA, IFOP, and the Fisheries Research Fund, as well as the advisory bodies of the administration, comprising Steering Committees, Technical Scientific Committees, National Fishery Board and the 8 Regional Fishery Boards.

The duties and powers in fisheries matters of the Ministry of Economy, Fishing Undersecretariat and SERNAPESCA, are stipulated in Decree Law Nno.2.442, 1978, that sets out its duties and responsibilities, supplemented by the stipulations of the LGPA and Law 21,132.

The duties and powers of the IFOP, are stipulated in article 158, LGPA, while those of the Fisheries Research Fund are stipulated in paragraph 2, Heading VII, LGPA.

Regarding the advisory bodies, their duties, membership and responsibilities are stipulated in the LGPA, Steering Committees, (Paragraph 3, Heading II, LGPA); Technical Scientific Committees (Paragraph 3, Heading XII, LGPA), National Fishery Board and Regional Fishery Boards (Paragraphs 1 and 2, Heading XII, LGPA). A list of its members and the minutes from their meetings are available on SUBPESCA website. The way to nominate its members is stated in the Regulations.

For each of these organizations, it is the law itself that stipulates their duties, the duration of their members in office, as well as their membership and participation of the agents that comprise them, which is supplemented with regulations to determine the procedure, requirements and manner of election of its members. The election processes for the members of each of these bodies are absolutely transparent and public.

In the background point 7.4.1.2, of this report, the duties and roles of each of the agencies that participate in the management are set out.

The duties, roles and responsibilities are explicitly defined and well understood, so that the interested parties know how the management system works and the roles of each of the organizations that participate in it and in case of any doubt or query they know where to turn. Therefore, there is **compliance with SG60, SG80 and SG 100a**.

b	Consultation processes			
	Guide post	The management system includes consultation processes that **obtain relevant information** from the main affected parties, including local knowledge, to inform the management system.	The management system includes consultation processes that **regularly seek and accept** relevant information, including local knowledge. The management system demonstrates	The management system includes consultation processes that **regularly seek and accept** relevant information, including local knowledge. The management system demonstrates consideration of the

			consideration of the information obtained.	information and **explains how it is used or not used**.
	Met?	**Yes (All UoAs)**	**Yes (All UoAs)**	**No (All UoAs)**
Rationale				

The LGPA stipulates the consultation procedures for the different advisory institutions for the adoption of the different administration and management measures, either through consultations or by requesting technical reports, which the authority must take into consideration and in some cases are mandatory when adopting a management measure.

In the consultation processes, relevant information is gathered, such as that provided by the scientific-technical committees. All the information provided by the different instances is available on SUBPESCA website.

For the adoption of measures such as close seasons, the prohibition of temporary or permanent capture of species protected by international conventions, quotas, the identifying of marine parks and marine reserves, landing percentages as bycatch, in addition to the technical report of SUBPESCA must previously communicate the measure to the appropriate Scientific Technical Committee (CCT). Some of the measures must also be reported to the National Fishery Board, such as, for example, the quota allocated for research in each fishery unit.

The CCT must propose the range within which the authority may establish the quota for a calendar year, as well as the biological reference points of the fishery.

For measures such as: minimum extraction sizes, dimensions and characteristics of fishing gear and gear, use and carrying of devices to minimize the capture of bycatch, use and carrying of utensils to release incidental catch, SUBPESCA must consult the respective Local Fishery Board beforehand and notify the respective CCT in advance.

For the measures regulating Vulnerable Marine Ecosystems, the Minister can establish this on the basis of a prior technical report from SUBPESCA and prior notification to the respective Local Fishery Board.

The identification of the resources whose fisheries classify as bottom fishing, through which vulnerable marine ecosystems can be affected, is carried out according to the identification undertaken by the respective CCT.

SUBPESCA may consult the CCT concerning the design of the administration and conservation measures and management plan preparations. The CCT must include IFOP data from in their reports, along with data from other sources. There is therefore **compliance with SG 60 and SG 80b**.

The management system includes consultation processes that regularly seek and accept relevant information, including local knowledge, but the management system cannot demonstrate knowledge of the information and explain how it is used or not used. Therefore, standard SG **100b is not met.**

	Participation			
c	Guide post		The consultation process **provides opportunity** for all interested and affected parties to be involved.	The consultation process provides **opportunity and encouragement** for all interested and affected parties to be involved, and **facilitates** their effective engagement.
	Met?		**Yes (All UoAs)**	**No (All UoAs)**
Rationale				

The LGPA provides the opportunity and encourages stakeholders and affected parties to participate in management through the Steering Committees by fishery or group of fisheries, the CCT by fishery or group of fisheries, the National Fishery Board and the 8 Regional Fishery Boards.

- Stakeholders, such as representatives of the industrial and small-catch extractive sectors and process plants, can participate through the National Fishery Board, the Regional Fishery Boards and in the Steering Committees.

- Researchers or scientists from universities with careers related to marine sciences, as well as researchers from research centres, can participate through the National Fishery Board, the Regional Fishery Boards and the CCT.
- The representatives of ONGs, can participate through the Regional Fishery Boards and the National Fishery Board.
- Scientists specializing in fisheries management can participate in the CCT.
- The scientists of IFOP, participate through the Technical Scientific Committees.
- SERNAPESCA, in its capacity as an auditing body, participates through the National Fishery Board, Regional Fishery Boards and the Steering Committees.

The members of the National Fishery Boar may notify the authorities of the facts that in their opinion affect fishing activities, resources and their environment. Also, by a majority of its members, they may request measures from the Undersecretary for Fishing in any matter falling within its competence, a requirement that can only be denied by a reasoned decision of SUBPESCA.

By modifying the Regulation that stipulates the operation of the CCT, the obligation has been stipulated for the technical scientific committee to include, within its annual programme of activities, a meeting with the respective management committee. (Decree no. 87, 2015, of the Ministry of Economy).

After the modification of the fishing law at the beginning of 2013, which created the Steering Committees and the CCT, 36 Steering Committees have been created to date, of which 20 refer to benthic resources operated exclusively by the small-catch sector and 16 Steering Committees for crustacean and fish fisheries, operated by both the small-catch and industrial sectors. All the scientific committees are active and functioning, these last two participatory bodies diminished the interest in participating in the Regional Fishery Boards, since the duties and roles of Steering Committees and Scientific Committees are of greater relevance in the resource management process.

Given that the organizations and personnel that participate in the management process are well defined, the law stipulates roles and responsibilities for them, which are expressly defined and well understood; the consultation procedure offers the possibility that all those affected and interested can participate; the requirements of the **SG 80c are met.**

Regarding the low participation in the CZP, although the authority has modified some rules to facilitate the application for vacant positions, to date there are still a significant number of vacancies in some of the Regional Fishery Boards, and it may be possible that the Authority has not sufficiently encouraged participation in that instance, which is why the **SG 100c has not been met**.

References

- LGPA, set out in Supreme Decree no. 430, 1991, of the Ministry of Economy.
- Decree with Force of Law no. 2442, 1978, stipulates the duties and powers in fisheries matters of the Ministry of Economy, Fishing Undersecretariat and SERNAPESCA.
- Ministry of Economy Decree no. 453, 1992, stipulates the election of the Regional Fishery Boards.
- Ministry of Economy Decree no. 85, 2003, stipulates the regulations for the election of the directors of the National Fishery Board.
- Ministry of Economy Decree no. 77, 2013, stipulates the procedure for the nomination and operation of the Technical Scientific Committees.
- Ministry of Economy Decree no. 87, 2015, modifies Ministry of Economy Decree no. 77, 2013, and stipulates the operation of the CCT.

Ministry of Economy Decree no. 95, 2013, and its modifications, stipulates the form of appointment of the members of the Steering Committees and operating standards.

Draft scoring range and information gap indicator added at Announcement Comment Draft Report stage

Draft scoring range	**≥80**
Information gap indicator	**Information sufficient to score PI**

Overall Performance Indicator scores added from Client and Peer Review Draft Report stage

Overall Performance Indicator score	
Condition number (if relevant)	

PI 3.1.3 – Long term objectives

PI 3.1.3		The management policy has clear long-term objectives to guide decision-making that are consistent with MSC Fisheries Standard, and incorporates the precautionary approach		
Scoring Issue		SG 60	SG 80	SG 100
a	Objectives			
	Guide post	Long-term objectives to guide decision-making, consistent with the MSC Fisheries Standard and the precautionary approach, are **implicit** within management policy.	**Clear** long-term objectives that guide decision-making, consistent with MSC Fisheries Standard and the precautionary approach are **explicit** within management policy.	**Clear** long-term objectives that guide decision-making, consistent with MSC Fisheries Standard and the precautionary approach, are **explicit** within **and required by** management policy.
	Met?	**Yes (All UoAs)**	**Yes (All UoAs)**	**Yes (All UoAs)**
Rationale				

Article 1B, LGPA, stipulates that the objective of fisheries regulation is the conservation and sustainable use of hydrobiological resources, through the application of the precautionary approach and an ecosystem approach in the regulation of fisheries and the safeguarding of marine ecosystems in which these resources exist.

For its part, article 1C, LGPA, expressly and explicitly stipulates that in order to achieve the conservation and sustainable use of hydrobiological resources, the fishing authority must always take into consideration when adopting management and administration measures, as well as to interpret and apply the law, the following considerations:
a) Establish long-term objectives for the conservation and administration of fisheries and the protection of their ecosystems, as well as the periodic evaluation of the effectiveness of the measures adopted.
b) Apply the precautionary principle in the administration and conservation of hydrobiological resources and the protection of their ecosystems, understanding as such: i) Caution is required in the administration and conservation of resources when scientific information is uncertain, unreliable or incomplete, and ii) The lack of sufficient, unreliable or incomplete scientific information should not be used as a reason to postpone or not adopt conservation and administration measures.
c) Consider the impact of fishing on associated or dependent species and the preservation of the aquatic environment.
d) Minimise discards of both the target and bycatch species and incidental fish catch.

Moreover, article 3, item c), LGPA, points out that when setting the annual catch quota, it must always manage or maintain the fishery at maximum sustainable yield.

The long-term objectives are clear and guide decision-making, are consistent with the MSC fisheries standard and the precautionary approach, and are explicit within the management policy. **SG60, SG80 and SG 100a are therefore met.**

References

- LGPA, set out in Supreme Decree 430, 1991, of the Ministry of Economy.

Draft scoring range and information gap indicator added at Announcement Comment Draft Report stage

Draft scoring range	**≥80**
Information gap indicator	**Information sufficient to score PI**

Overall Performance Indicator scores added from Client and Peer Review Draft Report stage

Overall Performance Indicator score	
Condition number (if relevant)	

PI 3.2.1 – Fishery-specific objectives

PI 3.2.1		The fishery-specific management system has clear, specific objectives designed to achieve the outcomes expressed by MSC's Principles 1 and 2		
Scoring Issue		SG 60	SG 80	SG 100
a	Objectives			
	Guide post	**Objectives**, which are broadly consistent with achieving the outcomes expressed by MSC's Principles 1 and 2, are **implicit** within the fishery-specific management system.	**Short and long-term objectives**, which are consistent with achieving the outcomes expressed by MSC's Principles 1 and 2, are **explicit** within the fishery-specific management system.	**Well defined and measurable short and long-term objectives**, which are demonstrably consistent with achieving the outcomes expressed by MSC's Principles 1 and 2, are **explicit** within the fishery-specific management system.
	Met?	**Yes (All UoAs)**	**Yes (All UoAs)**	**Yes (All UoAs)**
Rationale				

LGPA stipulates that the Management Plans must establish the short- and long-term objectives for the sustainable management of the fisheries.

The demersal crustaceans Management Plan covers the yellow squat lobster, red squat lobster and nylon shrimp resources throughout their distribution area. It was drafted by the CM-CD, revised by CCT-CD and made official by SUBPESCA by Resolution no. 3,423, 2016.

The purpose of the Management Plan is to have a sustainable fishery for demersal crustaceans in the biological-fishing, economic, social and environmental spheres. To achieve these objectives, it establishes goals and within each goal, objectives, an indicator, reference point and actions. The goals stated are the following:

Meta biological dimension:
Maintain the fishery around the MSY, protecting the juvenile and spawning fractions of each stock, with appropriate quality and timely research.

Environmental dimension goal:
Develop an environmentally sustainable production chain with all its components, and that contributes to improving society's perception of the crustacean industry.

Economic dimension goal:
To optimise the economic returns linked to the demersal crustaceans fishery in terms of fleet and plants operation.

Social dimension goal:
To improve the wellbeing conditions of all fishery actors, with an emphasis on working conditions, training and education.

Regarding Principle 1, in order to achieve the biological dimension goal, several objectives are stipulated, amongst which stands out the maintaining of fisheries around the MSY, according to the biological reference points stipulated by the CCT in: B_{MSY} = 40%BD_O; B_{LIM} = 20% BD_O; F_{MSY} = 45%.
The management actions to be applied for this objective are the Quota and the Biological Close Season.

The operation scenarios for the meeting of this objective are:

1. If the spawning biomass is greater than 40% of the BD_{MSY}, it is recommended that the variation of the quota with respect to the previous year does not exceed one 15%.
2. If the spawning biomass is less than 40% of the BD_{MSY} and that the recovery period associated with the use of the F_{MSY} is greater than a generational cycle, an F must be used that enables the fishery to recover to the maximum in a generational cycle.
3. In the event that the spawning biomass indicator passes from a state of overexploitation (lower than the 40% of the BD_{MSY}) to a fully operated one (around 40% of the BD_{MSY}), the respective value of F will be applied to the MSY, even if the increase exceeds 15%, indicated in paragraph 1.
4. If the spawning biomass is less than 20%, BD_{MSY}, the application of an extractive close season should be evaluated.

Regarding Principle 2, several objectives are stipulated in order to achieve the environmental dimension goal, amongst which can be highlighted the progressive reduction of discards in the fishery. For this purpose, a measure is proposed as a Discard Reduction Plan.

The Discard Reduction Plan for demersal crustacean fisheries was made official by SUBPESCA Resolution no. 1106, 2017. Within the framework of the Discard Reduction Plan, SUBPESCA stipulates by Ruling the target species and bycatch that may or may not be discarded and the species and incidental catch which must be immediately returned to the sea.

Meanwhile, the protection of the Vulnerable Marine Ecosystems was enacted by Resolution no. 451 de 2015 and its subsequent modifications, which stipulates areas associated with 115 seamounts, where it is prohibited to fish with gear that may impact the seabed.

Consistent with the foregoing, it is estimated that the short-term and long-term objectives of the demersal crustacean fisheries are consistent with the achievement of the results expressed by MSC Principles 1 and 2, are explicit in the Discard Reduction Plan for demersal and quantifiable crustacean fisheries, and therefore **comply with SG 60, SG 80 and SG 100a.**

References

- SUBPESCA Resolution no. 3,423, 2016, makes official the demersal crustacean Management Plan.
- SUBPESCA Resolution no. 451, 2015, stipulates the Vulnerable Marine Ecosystem Areas.
- SUBPESCA Resolution 1,106, 2017, stipulates the Discard Reduction Plan for demersal crustacean fisheries.

Draft scoring range and information gap indicator added at Announcement Comment Draft Report stage

Draft scoring range	**≥80**
Information gap indicator	**Information sufficient to score PI**

Overall Performance Indicator scores added from Client and Peer Review Draft Report stage

Overall Performance Indicator score	
Condition number (if relevant)	

PI 3.2.2 – Decision-making processes

PI 3.2.2		The fishery-specific management system includes effective decision-making processes that result in measures and strategies to achieve the objectives, and has an appropriate approach to actual disputes in the fishery		
Scoring Issue		SG 60	SG 80	SG 100
a	Decision-making processes			
	Guide post	There are **some** decision-making processes in place that result in measures and strategies to achieve the fishery-specific objectives.	There are **established** decision-making processes that result in measures and strategies to achieve the fishery-specific objectives.	
	Met?	**Yes (All UoAs)**	**Yes (All UoAs)**	
Rationale				

The decision-making process of the demersal crustacean fisheries for the adoption of management measures and the strategies to achieve the specific objectives of the demersal crustacean fishery are explicitly defined in the LGPA and in the Management Plan of the fishery.
The participation of each of the public institutions and auxiliary agencies of the administration, such as the Fishery Boards, Steering Committees and the CCT, is detailed in the LGPA.

The Ministry of Economy must stipulate the measures of the management measures, which the law assigns, stipulate the regulations of the law, as well as ensure the quality of research, submitting IFOP research reports for review by external evaluators in order to determine if they comply with the technical terms of reference and the technical quality of the research.

SUBPESCA must stipulate management measures, request information, establish the annual research programme, finance it and establish the technical terms of the projects to be contracted; request the opinion of the respective CCT, and different management measures.
The Steering Committee must draft and revise the Management Plan.
The CCT, in addition to giving its opinion on the design of the management measures and on the formulation of the Management Plan, must stipulate the Biological Reference Points and the range of the catch quota, where both its lower and upper limits must be managed or maintained within the MSY.

Consistent with the foregoing, the decision-making processes are stipulated and management **measures and strategies are derived from them in order to achieve the fishery's objectives. It is therefore estimated that SG** 60 and SG 80a are met.

b	Responsiveness of decision-making processes			
	Guide post	Decision-making processes respond to **serious issues** identified in relevant research, monitoring, evaluation and consultation, in a transparent, timely and adaptive manner and take some account of the wider implications of decisions.	Decision-making processes respond to **serious and other important issues** identified in relevant research, monitoring, evaluation and consultation, in a transparent, timely and adaptive manner and take account of the wider implications of decisions.	Decision-making processes respond to **all issues** identified in relevant research, monitoring, evaluation and consultation, in a transparent, timely and adaptive manner and take account of the wider implications of decisions.
	Met?	**Yes (All UoAs)**	**Yes (All UoAs)**	**No (All UoAs)**
Rationale				

One of the problems that existed in these fisheries, as in others, was the discarding of target and non-target species. Consequently, the authority processed a law to regulate this (Law 20.625). Then, during 2013 to 2017, a research programme was carried out in the demersal crustacean fisheries with the participation of the fishery's industrial and

small-catch fleet, in order to identify the reasons for the discard. With this information in March, 2017, the Demersal Crustacean Fisheries Discard Reduction Program was established, and during 2019, prior to the entry into force of the image recording cameras on board industrial vessels, SUBPESCA modified a series of fishery regulations that had an impact on the discard detected in the research. Similarly, the list of species is stipulated by annual Resolution, whether these are objectives or non-objectives that can be discarded, as well as species for immediate return and incidental captured must be treated.

On the other hand, the main management measures applied to demersal crustacean fisheries are: the biological closure, the regulation of fishing gear and the catch quota.

Consistent with the foregoing, the catch quota must be stipulated annually. In order to determine the aforementioned measure, SUBPESCA annually prepares a research programme in order to have the required information to establish the catch quota for the following year, which in the case of demersal crustacean fisheries contains at least the following research projects: Monitoring program, Direct evaluation of stocks (swept area) and Status and Indirect Evaluation of Stocks.

In accordance with the LGPA, in relation to the BRP, what is stipulated in the management plan, and the information of the investigation carried out by IFOP, as well as from other sources, the CM-CD must annually establish the status of the fisheries and propose the range in which the biologically sustainable quota (CBS) can be stipulated for the following year, which must always be managed or maintained within the MSY. All the CCT-CD information contained in the Minutes and the technical reports are available on SUBPESCA website.

It should be noted that for the determination of the CBS nylon shrimp status and proposal for 2021, it was not possible to use what was stipulated in the decision-making procedure, because according to what was indicated in CCT-CD Technical Report no. 2, 2020, which stipulates the proposed quota range for 2021, it is stated that the evaluation model used (Structured Age) continues to present inconsistencies in the estimation of biomass for both areas, the inconsistencies being greater for the northern zone. Considering the high level of uncertainty, the CCT did not take into account the last evaluations to determine the status and the recommendation of the quota for 2021, consistent with the above. A majority of its members chose to maintain the status quo of the nylon shrimp fishery stipulated for 2020, both regarding the range proposed for the establishment of the quota, as well as the status of the fishery.

Given that the evaluation model also presents a certain degree of uncertainty regarding the yellow squat lobster and red squat lobster fisheries, it was agreed that the IFOP establish a work plan to assess the status of the models used, for the three demersal crustacean fisheries.

In the Minutes of CCTCD Meeting no. 1/2021, January 21st, 2021, Juan Carlos Quiroz (IFOP) reported on the work plan of the 2021 consultancy. Later, in CCTCD session of no. 2/2020, April 29th, 2021, he presented a rescheduling of the Work Plan to be implemented between March and September, 2021, which encompasses the following aspects:

1. Process Audit (biological and fishing) codes and projections.
2. Consistency of CBA calculation (projection)
3. Peer review, including a workshop.
4. Adoption of the base model.

Consistent with the foregoing, it is estimated that the decision-making processes for the yellow squat lobster, red squat lobster and nylon shrimp fisheries acknowledge serious and other important issues identified in the investigation, such as monitoring and evaluations, in a transparent and timely manner, on the basis of which it is estimated that there is **compliance with SG60 and Sg80b**. There is **no compliance with SG100** since the indirect evaluation models used reveal uncertainties in their application and are expected to be corrected.

C	Use of precautionary approach			
	Guide post		Decision-making processes use the precautionary approach and are based on best available information.	
	Met?		**Yes (All UoAs)**	
Rationale				

All UoCs: Nylon Shrimp, Red Squat Lobster and Yellow Squat Lobster.

In its article no. 1C, the LGPA makes fishery management authority enforceable, whereby when adopting a management measure, as well as when interpreting and applying the law, the protection of ecosystems and the precautionary principle must be taken into account. This implies that greater caution must be exercised when handling, and when scientific

information is uncertain, unreliable or incomplete. The lack of information should not be a reason to postpone not adopting management measures, a situation that is fully applicable to demersal crustacean fisheries. Consistent with the foregoing, it is estimated that there is **compliance with SG80c**.

	Accountability and transparency of management system and decision-making process			
d	Guide post	Some information on the fishery's performance and management action is generally available on request to stakeholders.	**Information on the fishery's performance and management action is available on request**, and explanations are provided for any actions or lack of action associated with findings and relevant recommendations emerging from research, monitoring, evaluation and review activity.	Formal reporting to all interested stakeholders **provides comprehensive information on the fishery's performance and management actions** and describes how the management system responded to findings and relevant recommendations emerging from research, monitoring, evaluation and review activity.
	Met?	**Yes (All UoAs)**	**Yes (All UoAs)**	**Yes (All UoAs)**
Rationale				

In demersal crustacean fisheries, all information related to the decision-making process is public, in accordance with the LGPA, and is available on SUBPESCA website. All management measures and stipulated regulations must be published in the Official Gazette and are effective as of that date.

The minutes of the CM-CD and CCT-CD, National and Regional Fishery Boards are published on Fishing Undersecretariat website.

The management of fishing resources must be carried out in a transparent, responsible and inclusive manner, in accordance with the provisions of article 1C, LGPA.

Research carried out by both the IFOP and the Fisheries Research Fund, once the peer review has been carried out, must be published on their respective web pages.

Moreover, according to law 20,285 on transparency and access to public information, interested parties or affected parties may request from public institutions the information referring to their scopes of action, which must be responded to within the deadlines stipulated by law, with the possibility to appeal to the Council for Transparent, if the information provided is found to be not satisfactory.

Each March, Fishing Undersecretariat must publish a report on the status of the country's main fisheries (article 4A LGPA) in which the three demersal crustacean fisheries are found. Information for the immediate preceding year is provided on: The applicable management measures and the status of the fishery (status of the resource, discard, biologically acceptable catch range, and research carried out).

SERNAPESCA and the Office of Maritime Affairs has the same obligation to report every March (Articles 4B and 4C, LGPA), on auditing activities and actions. For its part, SERNAPESCA also publishes periodically and at least twice a month, on its website the quota control, indicating the allocations and catches made by each allocation unit for all the fisheries managed with a catch quota. At the beginning of the following year, it publishes on its website a report with the results from the end of the Quota Control. In addition, the information on the satellite positioning of all vessels is available, with a lag of 3 to 4 days.

Consistent with the foregoing, in demersal crustacean fisheries, all interested parties are exhaustively informed about the behaviour of the fishery and management actions. It is estimated that they **comply with SG 60, SG 80 and SG 100d.**

e	Approach to disputes			
	Guide post	Although the management authority or fishery may be subject to continuing court	The management system or fishery is attempting to comply in a timely fashion	The management system or fishery acts proactively to avoid legal disputes or rapidly

		challenges, it is not indicating a disrespect or defiance of the law by repeatedly violating the same law or regulation necessary for the sustainability for the fishery.	with judicial decisions arising from any legal challenges.	implements judicial decisions arising from legal challenges.
	Met?	**Yes (All UoAs)**	**Yes (All UoAs)**	**Yes (All UoAs)**

Rationale

The management system stipulated in the LGPA, applicable to demersal crustacean fisheries, acts proactively to avoid legal disputes, whereas:
Interested or affected parties participate through their representatives in the different participatory bodies, National and Regional Fishery Boards, Steering Committees and CCT, and through these become aware of the actions that the authority is taking in fishery management. They have the option of discussing the problems that in their opinion they could generate.

Another possible source of conflicts between the users of the fisheries could be due to the areas of operation and the catch quotas; both aspects are clearly stipulated in the LGPA. In the case of fishing areas, the industrial fleet can only engage in its extractive activities outside the imaginary five-mile line, as measured from the coast: an area in which only small-catch vessels can operate. This situation is easily observable and auditable through the satellite positioning system on board the vessels, in relation to the distribution of quotas between sectors, which were established for 20 years, as a modification of the fishing law stipulated in 2013.

Notwithstanding the foregoing, if problems or conflict arise between users or between users and the authority, national regulation will find several ways to find a solution, both before the Courts as well as before government agencies.

Government Agencies: Users can appeal through government agencies, in accordance with the provisions of the administrative procedure law, Law 18,880, by submitting an administrative appeal for review, filed with the authority that issued the measure, or an appeal filed with a higher administrative authority, submitted to the institution to which the person who issued the measure is affiliated. Also, through government agencies, an appeal can be filed with the Comptroller General of the Republic, which constitutes the highest body of the State Auditor, which issues rulings.

Courts: users can resort to the courts of justice, through Appeals for Legal Protection or ordinary proceedings.

Both the decisions taken before the Courts and before government agencies must be addressed by the Authority, immediately.

Consistent with the foregoing, it is estimated that in demersal crustacean fisheries, there **is compliance with SG60, SG 80 and SG 100.**

References

- LGPA, set out in Ministry of Economy Decree no. 430, 1991.
- Law 18.880, Administrative procedure law that governs the acts of State administration bodies.
- Law 20.285, Law on access to public information.
- SUBPESCA Resolution no. 3,423, 2016 makes official the demersal crustaceans Management Plan.

Draft scoring range and information gap indicator added at Announcement Comment Draft Report stage

Draft scoring range	**≥80**
Information gap indicator	**Information sufficient to score PI**

Overall Performance Indicator scores added from Client and Peer Review Draft Report stage

Overall Performance Indicator score	
Condition number (if relevant)	

PI 3.2.3 – Compliance and enforcement

PI 3.2.3		Monitoring, control and surveillance mechanisms ensure the management measures in the fishery are enforced and complied with		
Scoring Issue		SG 60	SG 80	SG 100
a	MCS implementation			
	Guide post	Monitoring, control and surveillance **mechanisms** exist, and are implemented in the fishery and there is a reasonable expectation that they are effective.	A monitoring, control and surveillance **system** has been implemented in the fishery and has demonstrated an ability to enforce relevant management measures, strategies and/or rules.	A **comprehensive** monitoring, control and surveillance system has been implemented in the fishery and has demonstrated a consistent ability to enforce relevant management measures, strategies and/or rules.
	Met?	**Yes (All UoAs)**	**Yes (All UoAs)**	**No (All UoAs)**
Rationale				

For the monitoring, control and surveillance of the regulations and requirements stipulated for demersal crustacean fisheries, the following auditing tools are applied:

- Certification of the catch upon landing, issued by SERNAPESCA: this requirement applies to all industrial and small-catch vessels of a length equal to or greater than 12 metres. It enables control of the catch quotas to be maintained. In this case, by allocation unit and totals, which is complemented by the requirement of a weighing system provided by SERNAPESCA and with the information from the electronic fishing log, which reports the estimate for the catches per fishing set.
- Satellite positioning, in operation from departure to landing at the authorized port for disembarkation, is required for industrial vessels and all small-catch vessels of a length equal to or greater than 12 metres. It enables verification regarding vessels carrying out their activities in authorized areas and not entering prohibited areas such as those pertaining to EMV and, in the case of industrial vessels, not performing extractive activities in the areas reserved for small-catch fishing.
- Image Registration Cameras on board vessels, mandatory for the industrial fishing fleet and small-catch vessels of a length equal to or greater than 15 metres. It enables verification of compliance with the discard requirements, and their prior quantification, either of target species or of bycatch whose discarding is authorised, as well as the return of species whose retention is not authorized and the proper treatment of bycatch. The small-catch fishing fleet has postponed by law (Law 20.259) the requirement for image recording cameras until January 1st, 2024.
- All catches must comply with the catch traceability requirement, from catch to the sale of the products arising from it. This enables verification that the source of the catches and the products arising from the catches is legal.
- Scientific observers: SUBPESCA determines by a monthly ruling that vessels must have a scientific observer on board. This enables relevant scientific information for the fisheries monitoring program to be collected.
- Notwithstanding the foregoing, SERNAPESCA annually establishes a fisheries inspection programme in order to verify compliance with the various management measures and requirements stipulated. It focuses its actions through the risk analysis of non-compliance. The inspection actions carried out during the last three years are detailed in catch, in the point 7.4.1.12.

Consistent with the foregoing, it is estimated that demersal crustacean fisheries comply with the SG 60 and SG 80a. However, considering that the requirement of the image recording cameras is still not in force for the small-catch fishing fleet, and that the analysis of the images by Sernapesca displays an important lag, which if not solved in the short term will render its application inefficient, there is **compliance with SG 100a**

b	Sanctions			
	Guide post	Sanctions to deal with non-compliance exist and there is some evidence that they are applied.	Sanctions to deal with non-compliance exist, **are consistently applied** and thought to provide effective deterrence.	Sanctions to deal with non-compliance exist, are consistently applied and **demonstrably** provide effective deterrence.
	Met?	**Yes (All UoAs)**	**Yes (All UoAs)**	**No (All UoAs)**
Rationale				

The LGPA stipulates various penalties for non-compliance detected in the exercise of extractive fishing activity, processing, transportation, storage and sale of resources or products derived from fishing.

In the case of the fisheries of yellow squat lobster, red squat lobster and shrimp, which are administered with Tradable Fishing Licenses (LTP), of yellow squat lobster and red squat lobster in the southern area with Extraordinary Fishing Permits (PEP) and the three small-catch fisheries of region IV, through the small-catch extraction scheme (RAE), the law stipulates disciplinary penalties that are applied by SERNAPESCA, for the main breaches of the rights holders, such as exceeding the assigned quota, fishing with an unregistered vessel, not reporting catches, not certifying catches, discarding and carrying out activities in the small-catch reserve strip. These penalties are stipulated in articles 40B to 40 F, LGPA, for industrial fishermen and articles 55Ñ et seq, LGPA, in general terms. Depending on the breach, a fine is applied that is 2 or 3 times the tons of non-compliant catch multiplied by the Penalty Amount, which refers to the price of the first transaction of the resources and is stipulated annually by Ministry decree, in addition to deducting from its allocation the tons of non-compliant catch. For this type of breach, a penalty is stipulated, both for the shipowner who is the right holder, and for the captain of the offending vessel.

In addition to the foregoing, if an LTP holder accumulates 4 penalties in a period of 10 years, the validity of the Tradable Fishing License will not be renewed after its 20-year term.

The law also stipulates a series of penalties for these and other breaches by people other than LTP, PEP and RAE holders, or which are not classified as disciplinary penalties.

These breaches are reported by SERNAPESCA and the penalty is applied by the Courts of Justice, as indicated in articles 107 to 117, LGPA. The law also classifies some breaches as crimes, such as catching fish by using explosives, and hunting or catching any cetaceans, Heading X, LGPA.

In point 7.4.1.12 of this report, the penalties applied to non-compliance with the demersal crustacean fishery during the last three years, and reported by SERNAPESCA, are listed.

There is a wide variety of penalties to apply in the regulation, depending on the breaches and the type of right held by the offender, given that they are dissuasive, especially the disciplinary penalties, since offenders not only become creditors of the fine and the discount of their quota resources, and hence their fishing right loses value, since the penalties are accumulated even if there is a change of right holder.

It is estimated that the penalties are applied consistently and have a dissuasive effect, for which it is estimated that there is **compliance with SG 60 and SG 80**. **There is no compliance with SG100**, inasmuch as some breaches are still occurring and the effectiveness of the penalties for discarding, which are detected through the image recording cameras, is unknown.

C	Compliance			
	Guide post	Fishers are **generally thought** to comply with the management system for the fishery under assessment, including, when required, providing information of importance to the effective management of the fishery.	**Some evidence exists** to demonstrate fishers comply with the management system under assessment, including, when required, providing information of importance to the effective management of the fishery.	There is a **high degree of confidence** that fishers comply with the management system under assessment, including, providing information of importance to the effective management of the fishery.
	Met?	**Yes (All UoAs)**	**Yes (All UoAs)**	**No (All UoAs)**
Rationale				

Regarding demersal crustacean fisheries, according to the information provided by SERNAPESCA during the last three years (detailed in point 7.4.1,12, it can be inferred that there are no significant breaches by the holders of the Tradable Fishing Licenses, Extraordinary Fishing Permits and holders of the Small-Catch Extraction Scheme. Despite the audit action carried out by the control authority, no disciplinary penalties have been applied to the breaches regarded as the most serious in the administration of these fisheries. In the last three years, only complaints of non-compliance have been filed with the courts of justice, which do not apply in general terms to the holders of the allocation.

Notwithstanding the foregoing, the number breaches that can be observed through the image registration cameras concerning discards, and which qualify as disciplinary penalties, is still unknown, since according to a consultation with SERNAPESCA on the matter, and as Mr. Naranjo has pointed out in an email that: “To date, 8 findings have been

identified of operations that have a high probability of being engaged in unauthorized discards, which are in different phases of legal technical analysis with a view to soon issue the respective notification instructions. As it is at the stage of establishing the potential non-compliance, it is not possible to provide more details of the offenders, but it is possible to point out that they are associated with fishing fleets whose home port is in Coquimbo".

On the other hand, it should be taken into account that the owners of the demersal crustacean fisheries actively cooperate with the Authority through their participation in the Steering Committee, first by drafting the Management Plan for the fisheries and currently in the revision of the Plan that they are carrying out. Similarly, the entire fleet, both industrial and small-catch, actively participated in the investigation carried out to determine the causes of discard.

Consistent with the foregoing, it is estimated that there is evidence that shows that fishermen comply with the management system and when requested provide important information for the effective management of fisheries. It is therefore estimated that they **comply with SG 60, DG 80c**. **There is no compliance with SG 100**, and therefore the discard compliance will still be unknown.

	Systematic non-compliance			
d	Guide post		There is no evidence of systematic non-compliance.	
	Met?		**Yes (All UoAs)**	
Rationale				

According to the available information provided by SERNAPESCA, although there are still non-compliances, it is estimated that there are no systematic breaches in the demersal crustacean fishery. There is therefore **compliance with SG80d.**

References

The CAB shall list any references here, including hyperlinks to publicly-available documents.

Draft scoring range and information gap indicator added at Announcement Comment Draft Report stage

Draft scoring range	**≥80**
Information gap indicator	**Information sufficient to score PI**

Overall Performance Indicator scores added from Client and Peer Review Draft Report stage

Overall Performance Indicator score	
Condition number (if relevant)	

PI 3.2.4 – Monitoring and management performance evaluation

PI 3.2.4		**There is a system of monitoring and evaluating the performance of the fishery-specific management system against its objectives There is effective and timely review of the fishery-specific management system**		
Scoring Issue		SG 60	SG 80	SG 100
a	Evaluation coverage			
	Guide post	There are mechanisms in place to evaluate **some** parts of the fishery-specific management system.	There are mechanisms in place to evaluate **key** parts of the fishery-specific management system.	There are mechanisms in place to evaluate **all** parts of the fishery-specific management system.
	Met?	**Yes (All UoAs)**	**Yes (All UoAs)**	**No (All UoAs)**
Rationale				

According to the LGPA, there are mechanisms to evaluate some parts of the management system. Regarding the investigation, it is up to the Ministry of Economy to submit the reports of the investigation carried out by the IFOP, in order to determine if there is compliance with technical terms of reference stipulated by SUBPESCA, in addition to verifying the technical quality of the investigation carried out, as well as the results obtained. The reports of the external evaluators are public. (Art. 156A, LGPA). Similarly, the investigation commissioned by the Fisheries Research Fund must also be fined by external evaluators, who must be equally or more qualified than those carrying out the investigation. (Art. 96, LGPA).

Regarding management measures, article 1C stipulates that these must be reviewed every five years. Although there is no specific Fishing Undersecretariat document in which they are detailed, there is the Discard Reduction Plan for demersal crustacean fisheries, contained in the Technical Report R. Pesq. no. 124, 2019, point 4, addresses, amongst the aspects to be implemented by the evaluation of the management measures adopted and which enable the discard of the target species, the bycatch and incidental catch to be reduced. Consistent with the foregoing, and prior to the entry into force of the image recording cameras for auditing the discard, the following management measures were reviewed and modified during 2019: Modification of the yellow squat lobster and red squat lobster bycatch percentage in the catching of nylon shrimp (Decree no. 170 de 2019); Regulation of fishing gear for various species that cannot be trawled or purse-seined (Resolution no. 3917 de 2019) and establishment of catch percentages of these species as bycatch of demersal crustacean fisheries (Decree no. 45 de 2019); the minimum sole size is waived (Resolution no. 3.044 de 2019); mandatory return of crabs in trawling or longline fishing operations (Resolution no. 2820 de 2019).

In this same area according to the LGPA, management plans should be reviewed at least every 5 years. According to the minutes of the Steering Committee for this fishery, the review of the Management Plan began in mid-2020, and according to the latest minutes of the 2021, is still in process.

In their capacity as inspection bodies, both SERNAPESCA and the General Directorate of Maritime Territory must publish a report on the inspection actions carried out in March of each year.

Consistent with the foregoing, it is estimated that the management system has stipulated mechanisms in order to evaluate the fundamental parts of managemen**t, such as research and management measures, thus complying with SG 60 and SG 80a. SG100 is not complied** with since the part related to the audit does not have an evaluation mechanism.

b	Internal and/or external review			
	Guide post	The fishery-specific management system is subject to **occasional internal** review.	The fishery-specific management system is subject to **regular internal** and **occasional external** review.	The fishery-specific management system is subject to **regular internal and external** review.
	Met?	**Yes (All UoAs)**	**Yes (All UoAs)**	**Yes (All UoAs)**
Rationale				

In the case of a fishery whose main management measure is the catch quota, SUBPESCA must stipulate this annually and this therefore implies a regular review process.

According to its constitution, the remit of the CCT, an external organisation of SUBPESCA, includes making decisions on various aspects, amongst which can be highlighted the determining of the status and situation of fisheries and biological reference points, the proposing of the range in which the catch quota can be stipulated, the design of the management measures and the formulation of the management plan. Consequently, it regularly exercises the review of management measures.
Also, the CM-CD permanently implements the review of management measures applied to fisheries. During the last two years, it held 9 meetings during 2020 and in August 2021 has held 7 meetings.

Management evaluation has also been carried out occasionally, one notable example being the International Workshop held in Viña del Mar in 2014 on the review of fisheries BRP, including that of demersal crustaceans, with the participation of national and foreign experts from the United States, William Clark and Martín Dorn; from Spain, Carmen Fernández; Australia, Malcolm Haddon, Neil Klaer and Shijie Zhou; and New Zealand, Matthew Dunn.
For this year, a workshop and peer evaluation has been considered in relation to the IFOP Work Plan to improve the stock assessment of demersal crustacean fisheries.

Consistent with the foregoing, it is estimated that the specific management system for demersal crustacean fisheries is subject to regular internal and external reviews, therefore there is **compliance with SG 60, SG 80 and SG 100b.**
The CAB shall insert sufficient rationale to support the team's conclusion for each Scoring Guidepost (SG).

References

- LGPA, set out in Ministry of Economy Decree no. 430, 1991.

Draft scoring range and information gap indicator added at Announcement Comment Draft Report stage

Draft scoring range	**≥80**
Information gap indicator	**Information sufficient to score PI**

Overall Performance Indicator scores added from Client and Peer Review Draft Report stage

Overall Performance Indicator score	
Condition number (if relevant)	

7.4.3 References P3

Relevant links:
Every listed IFOP technical report is available at: https://www.ifop.cl/busqueda-de-informes/
Every listed minute of the CM-CD is available at: https://www.subpesca.cl/portal/616/w3-propertyvalue-52793.html
Every listed SERNAPESCA regulation is available at: http://www.sernapesca.cl/.
Every listed SUBPESCA regulation is available at: https://www.subpesca.cl/portal/615/w3-channel.html
Every listed SUBPESCA technical report (Informes Tecnicos R.PESQ) is available at: https://www.subpesca.cl/portal/618/w3-propertyvalue-53750.html
Every listed Technical Report or Minute from the CCT_CD is available at: https://www.subpesca.cl/portal/616/w3-propertyvalue-51147.html

8 Appendices

8.1 Assessment information

8.1.1 Previous assessments

This fishery was initially assessed against MSC Fisheries Certification Requirements version 1.3 and got the certificate on September 13, 2016. As a result of the pandemic and subsequent Covid-19 pandemic derogation issued by the MSC on March 2020, the certificate was extended for 6 months until March 13, 2022. The valid certificate, the annual lists of vessels included in the UoC, and all reports elaborated during the first certificate cycle (the initial assessment report and four surveillance reports) are available at the fishery-specific site at the MSC website: https://fisheries.msc.org/en/fisheries/chile-squat-lobsters-demersal-trawl-camanchaca-fishery/@@view.

As a result of the **initial assessment**, 13 conditions were set: 6 conditions on all UoAs (**C2 on PI1.2.3**, **C8 on PI 2.3.3**, **C9 on PI2.4.3**, **C10 on PI3.2.1, C11 on PI3.2.2** and **C12 on PI3.2.3**), 1 condition on UoC1 (**C1 on PI1.1.1**), 1 condition on UoAs1, 3 and 6 (**C3 on PI2.1.3**), 1 condition on UoAs 5 and 8 (**C4 on PI2.1.3**), 1 condition on UoA2 (**C5 on PI2.1.3**), 1 condition on UoAs 4 and 7 (**C6 on PI2.1.3**), 1 condition on UoA1 and 2 (**C7 on PI2.2.3**) and 1 condition on UoAs 2, 4 and 7 (**C13 on PI 3.2.4)**.

As a result of the **first surveillance audit** performed in 2018, 2 conditions were closed: **C10 on PI3.2.1** (based on the fishery-specific objectives adopted in the MPDC) and **C13 on PI3.2.4** (based on evidence that direct surveys within the artisanal fishing area -5NM strip off the coast- were taking place).

As a result of the **second surveillance audit** performed in 2019, 2 conditions were closed: **C1 condition on PI 1.1.1** (based on the latest output of the stock assessment of the red squat lobster UPS performed by IFOP), and **C11 on PI3.2.2** (based on evidence that the management system had the capacity to respond to issues detected through research or consultation). Also, **a new condition (C14) on PI 1.2.4 was set to all UoAs** based on the doubts cast on whether the stock assessment is appropriate for these stocks and whether uncertainties are being taken into account. Exceptional circumstances were claimed for this condition, and the deadline was set at the first year of the second certificate cycle (September 2022).

Most of the P2-related conditions were closed as a result of the **third surveillance audit** performed in March 2020. **C3, C4, C5 and C6 on PI 2.1.3** (based on Evidence that the observer program in place provides sufficient data to detect any increase in risk level to any bycatch species caught by all fleets targeting demersal crustaceans, and also the evidence that EMS installed on board industrial fleets will help to ensure enforcement with recent regulations on discarding), **C7 on PI2.2.3** (based on the same evidence used for closing conditions on PI2.1.3), **C8 on PI2.3.3** (based on evidence that information collected by observers on incidental interactions with out-of-scope species allowed to measure trends and support a full strategy to managed ETP species). Also at that surveillance audit, condition on PI 1.2.3 was modified since despite progress on the original causes for setting this condition was acknowledged (and re-scored appropriately), the shortages of appropriate information to feed the stock assessments became clear and re-scoring was also performed. As a result, the PI score moved from 65 to 75 for most of the UoAs (in the case of UoA1 and UoA2 the score remained at 75) and the deadline of this condition was aligned with condition set on PI1.2.4 (September 2022) at the previous surveillance audit (so exceptional circumstances were also considered).

The **fourth surveillance audit** was performed in June 2021 and resulted in the closure of two conditions: **C12 on PI 3.2.3** (based on evidence of the implementation of the EMS on board the industrial vessels targeting demersal crustaceans -which will also become mandatory for artisanal vessels larger than 12m length in 2024-, and evidence that this system is helping on enforcing discard regulations and other relevant management measures applicable to this fishery), and **C9 on PI2.4.3** (based on information provided by the client allowing a spatial-temporal characterization of its fishing fleet, together with evidence that the Chilean government has proved transparency and ability to monitor VMS information for its commercial fishing fleets). The remaining 2 conditions on PI 1.2.3 and PI 1.2.4 were found to be ahead of target and on target, respectively. Due to Covid derogations the deadline for the closure of the Conditions is postponed to March 2024 and March 2023, respectively.

See **Table 8.1.1.1** for a summary of previous assessment conditions, and the year

Table 8.1.1.1– Summary of previous assessment conditions

#	UoA	Condition	PI	Year closed	Justification
1	UoA1	The red squat lobster stock in the southern fishing zone should be at or fluctuating around its target reference point	1.1.1	2SA (2019)	Latest output of the stock assessment performed by IFOP
2	All UoAs	The level of discarding in all UoCs should be fully quantified and landings of both squat lobster species should be fully differentiated in landings recorded in the dockside monitoring programme.	1.2.3	Still open. Exceptional circumstances accepted March 2024 is the new deadline for closing the Condition due to Covid-19 derogations.	

3	UoAs 1, 3 & 6	Information should be sufficient to estimate outcome status with respect to biologically based limits, and sufficient data should continue to be collected to detect any increase in risk level to main retained species.	2.1.3	3SA (2020)	Evidence that the observer program in place provides sufficient data to detect any increase in risk level to any bycatch species caught by all fleets targeting demersal crustaceans, and also the evidence that EMS installed on board industrial fleets will help to ensure enforcement with recent regulations on discarding
4	UoAs 5 & 8	Information should be sufficient to estimate outcome status with respect to biologically based limits	2.1.3	3SA (2020)	
5	UoA2	Qualitative information and some quantitative information are available on the amount of main retained species taken by the fishery.	2.1.3	3SA (2020)	
6	UoAs 4 & 7	Information should be sufficient to estimate outcome status with respect to biologically based limits	2.1.3	3SA (2020)	
7	UoAs 1 & 2	Sufficient data should continue to be collected to detect any increase in risk level to main bycatch species, Aconcagua and Chilean grenadiers	2.2.3	3SA (2020)	
8	All UoAs	Sufficient data should be collected to measure trends and support a full strategy to manage impacts on ETP species in particular corals	2.3.3	3SA (2020)	Evidence that information collected by observers on incidental interactions with out-of-scope species allowed to measure trends and support a full strategy to managed ETP species
9	All UoAs	Sufficient data should be collected to allow the nature of the impacts of the fishery on habitat types to be identified.	2.4.3	4SA (2021)	Information provided by the client allowing a spatial-temporal characterization of its fishing fleet, together with evidence that the Chilean government has proved transparency and ability to monitor VMS information for its commercial fishing fleets
10	All UoAs	Short and long term objectives, which are consistent with achieving the outcomes expressed by MSC's Principles 1 and 2, should be explicit within the fishery's management system.	3.2.1	1SA (2018)	Fishery-specific objectives adopted in the MPDC
11	All UoAs	Decision-making processes in the demersal crustacean fisheries should respond to serious and other important issues identified in relevant research, monitoring, evaluation and consultation, in a transparent, timely and adaptive manner and take account of the wider implications of decisions.	3.2.2	2SA (2019)	Evidence that the management system had the capacity to respond to issues detected through research or consultation
12	All UoAs	A monitoring, control and surveillance system should be implemented in the demersal crustacean fisheries on board of industrial and artisanal vessels and the system should demonstrate an ability to enforce relevant management measures in particular in reference to unreported catch and discards.	3.2.3	4SA (2021)	Evidence of the implementation of the EMS on board the industrial vessels targeting demersal crustaceans -which will also become mandatory for artisanal vessels larger than 12m length in 2024-, and evidence that this system is helping on enforcing discard regulations and other relevant management measures applicable to this fishery
13	UoAs 2, 4 & 7	A research plan for the artisanal fisheries should be implemented	3.2.4	1SA (2018)	Evidence that direct surveys within the artisanal fishing area -5NM strip off the coast- were taking place
14	All UoAs	(OPEN AT 2SA) By 2023 the client should demonstrate that the reliability of the assessment has been improved such that it can be	1.2.4	Still open. Exceptional circumstances accepted. March 2023 is the new deadline for	

		considered appropriate for the stock and for the harvest control rule, through accounting for uncertainties in the current model and/or an alternative approach. SG80 should be met at this stage		closing the Condition due to Covid-19 derogations.

8.1.2 Small-scale fisheries

According to what is established in the current fishing regulations, fisheries targeting yellow and red squat lobsters from the V to VIII region (Fishing Unit South, UPS) are managed with an individual quota system. The rights to develop the activity correspond to the Extraordinary Fishing Permits, PEP, which are granted by auction and allow the holder to capture a percentage of the quota that is established. There is no artisanal quota in the UPS.

On the contrary, there is a quota allocation system for artisanal fishers in Region IV, the Artisanal Extraction Regime (RAE). Artisanal rights are indefinite, transferable and associated with a vessel (which can be replaced by another one with an equal or lower level of effort). The highest proportion of the quota is assigned to 4 vessels and a smaller percentage as a residual quota to which all Vessels registered RAE (more details in **section 7.4.1.8**). Only two of these vessels (Chaffic I and Traüwun I) belong to AIP members (Rymar and Eric Aravena, respectively). However, there are 3 artisanal vessels included in the latest UoC: Punta Talca, Isla Tabón and Oriente (see **table 5.1.2.2**). These vessels fish got to an agreement with AIP members and they fish with their own RAE quota and they might complement it with industrial quota from the AIP member if they agree to do so.

Table 8.1.2.1 – Small-scale fisheries

Unit of Assessment (UoA)	Percentage of vessels with length <15m	Percentage of fishing activity completed within 12 nautical miles of shore
All UoAs	6.7% (see **table 5.1.2.2**)	All vessels using industrial quotas (LTPs or PEPs) operate between 5NM and 60 NM off the Chilean coastline. Only artisanal vessels catching their RAE are allowed to operate within the area of the 5NM, since this is an area preserved for artisanal fisheries. Currently, there are only 5 vessels fishing their RAE and included in the latest UoCs (see table 5.1.2.2).

8.2 Evaluation processes and techniques

8.2.1 Site visits

The CAB shall include in the report:

- An itinerary of site visit activities with dates.
- A description of site visit activities, including any locations that were inspected.
- Names of individuals contacted.

Reference(s): FCP v2.2 Section 7.16

If the client proceeds to announce the reassessment of the fishery, this ACDR will be published at the MSC website together with the announcement that the fishery is entering its first reassessment, in accordance with FCP7.12.1. Dates, type (on-site/off-site) and itinerary of the site visit will be detailed at the announcement of the fishery.

Thus, **this section will be completed at Client and Peer Review Draft Report**.

8.2.2 Stakeholder participation

The CAB shall include in the report:

- Details of people interviewed: local residents, representatives of stakeholder organisations including contacts with any regional MSC representatives.
- A description of stakeholder engagement strategy and opportunities available.

Reference(s): FCP v2.2 Section 7.16

This section will be drafted at Client and Peer Review Draft Report and completed at Public Certification Report.

8.2.3 Evaluation techniques

This section will be completed at Client and Peer Review Draft Report.

The reassessment process will follow the MSC Fisheries Certification Process v2.2, and using the default assessment tree (Annex SA) of the MSC Fisheries Standard, v2.01. All public announcements will comply with FCP v2.2.

The assessment team has completed this ACDR using the information provided in the Client Document Checklist, and also all previous reports from the first certificate cycle, which are available at the fishery-specific site at the MSC website: https://fisheries.msc.org/en/fisheries/chile-squat-lobsters-demersal-trawl-camanchaca-fishery/@@view. Furthermore, the team members completing this ACDR have also been involved in all surveillance audits performed during the first certification cycle (some of them involved on-site visits), meaning that the team members were already familiar with this fishery before preparing this ACDR.

Each assessor drafted his/her own background and scoring sections (i.e. Earl Dawe prepared section 7.2, Edith Saa prepared Section 7.4, and José Ríos prepared Section 7.3 and all other sections -sections 3, 4, 5, 6 and 8-). These drafts were exchanged through email, so all team members had the chance to provide feedback on others sections. Specific meetings were held in case of disagreement on particular issues. All scores in this ACDR were adopted by consensus among all the team members. Once all background and scoring sections were agreed, the Team Leader compiled all documents in a single draft report which was shared among all team members for a final review and feedback.

Use of RBF

(i) Justification

A comprehensive list of all species impacted by all UoAs between 2016 and 2020 is presented in **section 7.3.1.1 of the ACDR report**. This list includes 85 different species and taxa of cnidarians, crustaceans, echinoderms, cartilaginous fish, jawless fish and teleost in the case of UoA1 (fishery targeting nylon shrimp in ZCN and ZCS, while for UoAs 6 & 7 (fisheries targeting yellow squat lobster in UPN) the list shortens to 19 species and taxa.

Among all these P2-species, only 3 species are at or above (in any year of the studied period) the designated threshold of 5% or 2% (for skates, rays, sharks and cardinalfish) to be classified as Main: Hooked tooth dogfish (*Aculeola nigra*), Aconcagua grenadier (*Coelorinchus Aconcagua*) and big-eye flounder (*Hippoglossina macrops*).

In 2019 and 2020, the relative contribution (in weight) of the hooked tooth dogfish to the total catch of UoA1 reached 1.5% (~2%), and 2.4% in the case of UoA2. So this species was classified as Main Secondary for the UoA targeting nylon shrimp (UoA1 and UoA2).

The relative contribution of the Aconcagua grenadier to the total catch of UoA1 between 2016 and 2020 has been consistently at or above 5%: 2015 (5.2%), 2017 (4.7%), 2018 (6.3%) and 2020 (4.5%). So this species was classified as Main Secondary for the UoA targeting nylon shrimp in ZCN and ZCS (UoA1).

The relative contribution of the big-eyed flounder to the total catch of UoAs 6 & 7 reached 8.5% in 2020. Despite the annual contribution of this species since 2016 was always around 1-2%, the team decided to classify this species as Main Secondary.

No main secondary species were found to be impacted by UoA3, UoA4, UoA5 and UoA8.

There are no biologically based limits established and the status remains unknown for all the Secondary species and taxa presented in section 7.3.1.1 of the ACDR report (see the detail of the different Secondary species and taxa for the different UoAs in Tables 7.3.1.1.9 - 7.3.1.1.14), regardless of whether they were classified as main on minor. Therefore, all secondary species were classified as Data Deficient species according to FCP7.7.3, and RBF shall be triggered for assessing their status. However, PF4.1.4 allows the team to avoid conducting RBF on 'minor' species when evaluating PI2.1.1 or 2.2.1 as far as final PI score is adjusted downward according to clause PF5.3.2. Due to the high number of different taxa to be assessed as minor secondary species the assessment team decided to take this option. However, **RBF shall be triggered to assess the three main secondary species: Hooked tooth dogfish, Aconcagua grenadier and big-eyed flounder.**

(ii) Activities

Due to the pandemic situation, at the time of preparing this report Chile is applying a 10-day quarantine to all foreigners entering the country. As 2 of the members of the audit team are foreigners, the decision has been made, together with the client, to carry out the visit remotely. Therefore, the PSA for the three main secondary species identified will be carry out with each stakeholder separately, during the video call to be held as part of the remote visit.

(iii) Consultation strategy

The team will follow requirements included in Annex PF regarding Announcement of the RBF and information gathering prior to the visit. This information will be shared with attendees straight after the announcement on the use of RBF, together with other supporting materials prepared to help stakeholders to understand the RBF process (Annex PF, a tailord guide on the use of the PSA, and a PPT on the MSC process and the use of the RBF and the PSA in particular).

The team will consult the following stakeholders in relation to the use of the RBF: the client, IFOP and Subpesca. The language of the consultation will be Spanish, and all the documents related to the RBF will be prepared in Spanish to facilitate engagement.

The information gathered during stakeholder consultations will be used to inform the scoring of the PSA.

8.3 Peer Review reports

To be drafted at Public Comment Draft Report stage

The CAB shall include in the report unattributed reports of the Peer Reviewers in full using the relevant templates.
The CAB shall include in the report explicit responses of the team that include:

- Identification of specifically what (if any) changes to scoring, rationales, or conditions have been made; and,
- A substantiated justification for not making changes where Peer Reviewers suggest changes, but the team disagrees.

Reference(s): FCP v2.2 Section 7.14

8.4 Stakeholder input

To be drafted at Client and Peer Review Draft Report stage

The CAB shall use the ‘MSC Template for Stakeholder Input into Fishery Assessments’ to include all written stakeholder input during the stakeholder input opportunities (Announcement Comment Draft Report, site visit and Public Comment Draft Report). Using the ‘MSC Template for Stakeholder Input into Fishery Assessments’, the team shall respond to all written stakeholder input identifying what changes to scoring, rationales and conditions have been made in response, where the changes have been made, and assigning a ‘CAB response code’.

The ‘MSC Template for Stakeholder Input into Fishery Assessments’ shall also be used to provide a summary of verbal submissions received during the site visit likely to cause a material difference to the outcome of the assessment. Using the ‘MSC Template for Stakeholder Input into Fishery Assessments’ the team shall respond to the summary of verbal submissions identifying what changes to scoring, rationales and conditions have been made in response, where the changes have been made, and assigning a ‘CAB response code’.

Reference(s): FCP v2.2 Sections 7.15, 7.20.5 and 7.22.3

8.5 Conditions

8.5.1 Summary of conditions closed under previous certificate

As a result of the **initial assessment** completed in September 2016, 13 conditions were set. Furthermore, a new condition (on PI 1.2.4) was set at the second surveillance audit performed in 2019, and Condition 2 on PI 1.2.3) was modified at third surveillance audit. See **Table 8.1.1.1** for a summary on these 14 conditions (see **section 8.1.1** for more details). For 2 out of those 14 conditions (Condition 2 on PI 1.2.3 and Condition 8 on 1.2.4), it was considered that time required for relevant research to be undertaken may take longer than the remaining certification period and the CAB determined that achieving a performance level of 80 may take longer than the period of certification (see **section below**). A summary of the justification to close the remaining 6 condition within the first certificate cycle are presented in **table 8.1.1.1**, together with the number of the surveillance audit and year when each of those conditions were closed.

8.5.2 Open Conditions at reassessment announcement

Table 8.5.2.1 – Open Condition 2 *(existing numbering from the first certificate cycle)*

Performance Indicator	**1.2.3**
Score	***75***
Justification	**3SA report (2020):** **SI(b).** *"However, there are concerns with the reliability of the assessment approach due to uncertainties in the model as well as the survey." (…) "The assessment team concluded that concerns regarding discarding of the target species have been resolved but the SG80 is still not met because of the concern remaining for the reliability of the assessment approach".*
Condition	By the second annual audit of the second certificate cycle, the client should demonstrate that the stock abundance and UoA removals are regularly monitored at a level of accuracy and coverage consistent with the harvest control rule. It will be also necessary to confirm that there is good information on all other fishery removals from the stock. *NOTE: The condition was modified at the third surveillance audit of the first certificate cycle and the deadline for closing the condition has been modified in accordance with MSC Covid-19 derogations.*
Condition start	September 2016
Condition deadline	March 2024 (due to the 1-year MSC conditions derogation due to the pandemic the deadline was postponed from March 2023 on to March 2024). *NOTE: Original deadline set at the PCR was September 2019 (3rd year of the first certificate cycle). However, exceptional circumstances (which also included the 6-month MSC derogation) were considered at 3SA after the condition was modified. The reasons for claiming exceptional circumstances were the same as for Condition 8 on PI 1.2.4 set at 2SA. A Variation Request on this matter (against FCP v.2.1 7.18.1.5) was approved by the MSC on August 21, 2020.*
Milestones	At third surveillance audit became apparent that there were concerns with the reliability of the assessment approach such that it cannot be concluded that abundance is regularly monitored at a level of accuracy and coverage consistent with the harvest control rule. As a result, milestones were revised to address SI(b): **Year 1 (2021/2022)**: During reassessment, the client shall provide evidence that the development of a more reliable approach for accurately monitoring stock abundance will be addressed through the review of the current assessment approach in line with condition 8. No re-scoring expected at this stage. **Year 2 (March 2023)**: By the first surveillance audit of the second certificate cycle, the client shall provide evidence that methods for developing a more reliable assessment approach for accurately monitoring stock abundance have been identified in line with condition 8. No re-scoring expected at this stage. **Year 3 (March 2024)**: By the second surveillance audit of the second certificate cycle, the client should demonstrate that a more reliable assessment approach for accurately

	monitoring stock abundance has been developed in line with condition 8. SG80 should be met at this stage. *NOTE: Deadlines for milestones have been modified in accordance with the two MSC Covid-19 derogations (6-month + 1 year) applicable to this condition*
Progress on Condition	Most aspects of this condition were addressed at 3SA (2019), with respect to quantifying discards and differentiating between squat lobster species (see previous surveillance audit report). Only the concern regarding reliability of the assessment approach is not yet resolved and this aspect is directly related to condition 8. Milestones were reviewed at 3SA (2019).
Progress status	At 4SA, this condition was found to be '**AHEAD TARGET**' due to the MSC-Covid 19 derogations.
Carrying over condition ☒	Original deadline set at the PCR was September 2019 (3rd year of the first certificate cycle). However, exceptional circumstances (which also included the 6-month MSC derogation) were considered after the condition was modified at 3SA (2020). At that stage, the team considered that time required for relevant research to be undertaken may take longer than the remaining certification period. Thus, a variation was requested against FCPv2.1 7.18.15 and the MSC sent its approval on August 21, 2020.
Closing the condition during the reassessment	The Condition is expected to be closed by the second surveillance audit of the second certificate cycle (March 2024). Annual milestones are presented above

Table 8.5.2.2 – Open Condition 8 *(existing numbering from the first certificate cycle)*

Performance Indicator	**1.2.4**
Score	**70**
Justification	**2SA Report (2019):** **SG(a).** *"While this model is appropriate in principle, its application for these crustacean resources does not provide reliable evaluations of stock status in recent years or of predicted SB and F for the upcoming year (upon which to estimate Acceptable Biological Catch -CBA-). As a result, the projected status may be found to be in error based on the model results of the following year. A consequence of this, is that management actions, including whether or not to implement the HCR could be unwarranted, as was the case for Red Squat Lobster South based on the 2017 assessment. Therefore, the assessment is not appropriate for the stock or (especially) for the HCR".* **SG(c).** *"There are many uncertainties with the fishery data and survey data that are not taken into account, including uncertainties associated with catchability of trawls used in the fishery and in the survey. There is also uncertainty regarding changes in trawl catchability over time and inconsistency in the application of assumptions regarding trawl catchability".*
Condition	By 2023 the client should demonstrate that the reliability of the assessment has been improved such that it can be considered appropriate for the stock and for the harvest control rule, through accounting for uncertainties in the current model and/or an alternative approach. SG80 should be met at this stage. *NOTE: Deadline for closing the condition has been modified in accordance with the 6-month MSC Covid-19 derogation applicable to this condition (the 1-year derogation is not applicable to conditions on PI 1.2.4)*
Condition start	September 2018
Condition deadline	March 2023 (due to the 6-month MSC Derogation due to the pandemic the deadline was postponed from September 2022 on to March 2023). *NOTE: Deadline set at 2SA (2019) was September 2022. At that stage, the team already considered that time required for relevant research to be undertaken may take longer than the remaining certification period.*
Milestones	**Year 1 (2021/2022):** During reassessment, the client shall provide evidence that the plan to review the current assessment approach with input from external experts toward

	providing a more reliable assessment approach that accounts for uncertainty in the current approach (Sic) and is appropriate for the stock and for the harvest control rule (S!a) has been implemented and the review has identified methods for developing an improved or alternative assessment approach that is expected to improve the assessment of stock status. No re-scoring expected at this stage. **Year 2 (March 2023):** By the first surveillance audit of the second certificate cycle, the client should demonstrate that the reliability of the assessment has been improved such that it can be considered appropriate for the stock and for the harvest control rule, through accounting for uncertainties in the current approach and/or by developing an alternative approach. SG80 should be met at this stage. *NOTE: Deadlines for milestones have been modified in accordance with the 6-month MSC Covid-19 derogation applicable to this condition.*
Progress on Condition	At 4SA (20202), the team found that progress made in this condition met the requirement of the revised milestone for year 1. At the July 20 meeting of CCT-CD (Acta No 4 2020) it was agreed to conduct a remote peer review including external expert participation. It was noted that inclusion of external expertise would require securing appropriate funding. At the Nov.12 2020 meeting of CCT-CD (Acta No 6) severe problems were identified with the nylon shrimp assessment such that the assessment was not considered informative and it was noted that a review of the evaluation procedure was urgently requited. It was noted that this would be addressed in the first meeting of CCT-CD in 2021. A letter from IFOP detailed the work plan to be addressed in three sessions of the CCT-CD toward reviewing and improving the assessment process during 2021 (IFOP/DIR/2021/ N°247). This included a commitment, during the July 2021 meeting, to the preparation of the peer review process, with the identification of the leader and the experts who will participate in the review. Milestones were reviewed at 3SA (2019) as part of remedial action for the progress being found behind target.
Progress status	Based on the above-noted developments the audit team concludes that a plan has been proposed during 2021 with the aim of improving the current model or developing a more reliable alternative approach. As a result, the status of this condition is "**ON TARGET"** because of the MSC Covid-19 derogation.
Carrying over condition ☒	Original deadline set at 2SA (2019) was set on September 2022. At that stage, the team considered that time required for relevant research to be undertaken may take longer than the remaining certification period.
Closing the condition during the reassessment	The Condition is expected to be closed by the first surveillance audit of the second certificate cycle (March 2023). Annual milestones are presented above.

8.5.3 Conditions

To be drafted at Client and Peer Review Draft Report stage

The CAB shall document in the report all conditions in separate tables.

Reference(s): FCP v2.2 Section 7.18, 7.30.5 and 7.30.6

Table X – Condition 1

Performance Indicator	
Score	*State score for Performance Indicator.*
Justification	*Cross reference to page number containing scoring template table or copy justification text here.*
Condition	*State condition.*
Condition deadline	*State deadline for the condition.*

Exceptional circumstances ☐	*Check the box if exceptional circumstances apply and condition deadline is longer than the period of certification (FCP v2.2 7.18.1.6). Provide a justification.*
Milestones	*State milestones and resulting scores where applicable.*
Verification with other entities	*Include details of any verification required to meet requirements in FCP v2.2 7.19.8.*
Complete the following rows for reassessments.	
Carried over condition ☐	*Check the box if the condition is being carried over from a previous certificate and include a justification for carrying over the condition (FCP v2.2 7.30.5.1.a).* *Include a justification that progress against the condition and milestones is adequate (FCP v2.2 7.30.5.2). The CAB shall base its justification on information from the reassessment site visit.*
Related condition ☐	*Check the box if the condition relates to a previous condition that was closed during a previous certification period but where a new condition on the same Performance Indicator or Scoring Issue is set.* *Include a justification – why is a related condition being raised? (FCP v2.2 7.30.6 & G7.30.6).*
Condition rewritten ☐	*Check the box if the condition has been rewritten. Include a justification (FCP v2.2 7.30.5.3).*

8.6 Client Action Plan

To be drafted at Public Comment Draft Report stage

The CAB shall include in the report the Client Action Plan from the fishery client to address conditions.

Reference(s): FCP v2.2 Section 7.19

8.7 Surveillance

To be drafted at Client and Peer Review Draft Report stage

The CAB shall include in the report the program for surveillance, timing of surveillance audits and a supporting justification.

Reference(s): FCP v2.2 Section 7.28

Table 8.7.1 – Fishery surveillance program

Surveillance level	Year 1	Year 2	Year 3	Year 4
e.g. Level 5	e.g. On-site surveillance audit	e.g. On-site surveillance audit	e.g. On-site surveillance audit	e.g. On-site surveillance audit & re-certification site visit

Table 8.7.2 – Timing of surveillance audit

Year	Anniversary date of certificate	Proposed date of surveillance audit	Rationale
e.g. 1	e.g. May 2018	e.g. July 2018	e.g. Scientific advice to be released in June 2018, proposal to postpone audit to include findings of scientific advice

Table 8.7.3 – Surveillance level justification

Year	Surveillance activity	Number of auditors	Rationale
e.g.3	e.g. On-site audit	e.g. 1 auditor on-site with remote support from 1 auditor	e.g. From client action plan it can be deduced that information needed to verify progress towards conditions 1.2.1, 2.2.3 and 3.2.3 can be provided remotely in year 3. Considering that milestones indicate that most conditions will be closed out in year 3, the CAB proposes to have an on-site audit with 1 auditor on-site with remote support – this is to ensure that all information is collected and because the information can be provided remotely.

8.8 Harmonised fishery assessments

To be drafted at Announcement Comment Draft Report stage
To be completed at Public Certification Report stage

The MSC Fisheries Certification Process v2.2 (FCP) sets out procedures for ensuring consistency of outcomes in overlapping fisheries (see Annex PB of the FCP). The intention of this process is to maintain the integrity of MSC fishery assessments. To assess the harmonisation requirements per PI, the team applied the table GPB1 in FCP2.2.

For this reassessment, overlapping fisheries have been identified as those MSC-certified or in-assessment fisheries operating with the Chilean waters and targeting demersal crustaceans using trawl. The only identified overlapping fishery is presented in **Table 8.9.1**, together with the relevant PIs identified as requiring harmonisation. A summary of the information supporting the decision of which PIs are subject to harmonisation is presented in **Table 8.9.2**, together with information on the harmonisation process and outcome.

The scores given to the PIs subject to harmonisation at overlapping fisheries are presented in **Table 8.9.3(a)** -for P1 scores-, **Table 8.9.3(b)** -for P2 scores-, and **Table 8.9.3(c)** -for P3 scores. There are no scoring differences.

Table 8.9.1 – Overlapping fisheries: Status and PIs to harmonise. Source: MSC website consulted on 12/08/2021

Fishery name	Certification status and date	PI to harmonise
Chile squat lobsters Camanchaca trawl fishery (Henceforth referred as 'Camanchac fishery' or overlapping fishery)	Certified since February 8, 2017	**P1**: All PIs (applicable only to UoAs targeting Southern stocks of red and yellow squat lobsters: UoA5 & UoA8). **P2**: PI 2.1.1(a) - main components, only applicable to UoA5 &UoA8; PI 2.2.1(a)- main components, applicable only to UoA5 & UoA8; PI 2.3.1(a)- recognition of any limits, applicable to all UoAs; 2.4.1(b)- VME recognition, applicable to all UoAs; 2.4.2(a)(c) at SG100, applicable to all UoAs). **P3**: PI3.1.1 (all UoAs), PI3.1.2 (all UoAs), PI 3.1.3 (all UoAs), PI 3.2.1 (all UoAs), PI 3.2.2 (all UoAs), 3.2.3(a)&(b) (applicable only to UoAs targeting industrial fleets: UoA1, UoA3, UoA5, UoA6, UoA8), PI 3.2.4 (applicable only to UoAs targeting industrial fleets: UoA1, UoA3, UoA5, UoA6, UoA8).

Table 8.9.2– Overlapping fisheries

Supporting information
Apart from using the harmonisation requirements listed in Table GPB1 in FCP 2.2., P2-PIs and P3-PIs were assessed in respect to Table provided in the MSC directions for harmonisation between overlapping fisheries (see https://mscportal.force.com/interpret/s/article/What-are-the-MSC-requirements-on-harmonisation-multiple-questions-1527586957701). **P1**: The two target stocks targeted by UoA5 and UoA8 (red squat lobster UPS and yellow squat lobster UPS) are also the stocks targeted by the two UoAs assessed in the Camachaca fishery. Hence, harmonisation on all PIs is required for these UoAs. However, the other UoAs included in the overlapping fishery are either targeting a different species (Nylon shrimp) or different stocks of squat lobsters (UPN), so harmonisation is not required for all those UoAs. **P2**: The team considers that P2-PIs identified are in accordance with Table GPB1 and guidance on harmonisation provided by the MSC (see the link provided above). It is important to highlight that UoAs of the overlapping fishery include the full fleets, while the UoAs considered in the Camanchaca fishery are limited to a sub-set of vessels selected by the client.

P3: All the UoAs included in the two overlapping fisheries are part of the same larger fishery, managed by the same jurisdiction (Chilean EEZ) and subject to the same management arrangements, so most of the P3-PIs shall be harmonised. However, unlike for the overlapping fishery, the UoAs considered in the Camanchaca fishery do not include the full fleet. The UoAs considered in the Camanchaca fishery are limited to a sub-set of vessels selected by the client and do not include artisanal vessels. In the case of PI3.2.3 on compliance and enforcement, there are some differences between the MCS arrangements applicable to industrial and artisanal fleets, and therefore harmonisation on SG(a)&(b) is not required for 'artisanal UoAs'. Scoring on PI3.2.3(c)&(d) depends on the compliance of the fleets included in the UoAs, so harmonisation is not required even between UoAs including industrial fleets. Finally, PI 3.2.4 there are some differences on the management arrangements between the artisanal and the industrial fleets, so harmonization with artisanal UoAs is not required.

The two overlapping fisheries are being reassessed by the same CAB and assessment team, and this has also been the situation since the first surveillance audit (the Chile squat lobsters and nylon shrimp modified trawl fishery requested the transfer from another CAB to BV before its first surveillance audit). Therefore, the most relevant scores and the timing on the conditions had been harmonised throughout the first certificate cycle. Although the AIP fishery was initially assessed using the MSC Fisheries Standard v1.3., while the Camanchaca fishery was assessed using v2.0, so some differences in scoring resulted from the use of different default assessment trees (e.g. some P1-PIs).

Also, preliminary outcomes for this reassessment have been applied consistently on the two overlapping fisheries. Both fisheries are being reassessed using MSC Fisheries Standard v2.01

Was either FCP v2.2 Annex PB1.3.3.4 or PB1.3.4.5 applied when harmonising?	**No**
Date of harmonisation meeting	**NA**

If applicable, describe the meeting outcome

Since the two overlapping fisheries are being reassessed by the same CAB and assessment team, there was no need to organize harmonisation meetings with other teams or CABs.

The preliminary outcomes for this reassessment have been applied consistently on the two overlapping fisheries.

Table 8.9.3(a) –P1 scores at overlapping fisheries. Source: ACDRs of the two fisheries, currently in preparation.

	Red squat lobster (Sourthern zone)		**Yellow squat lobster (Southern Zone)**	
	Camanchaca	AIP	Camanchaca	AIP
	UoA1	UoA8	UoA2	UoA5
PI 1.1.1	**90**	**90**	**90**	**90**
PI 1.1.2	**NA**	**NA**	**NA**	**NA**
PI 1.2.1	**95**	**95**	**95**	**95**
PI 1.2.2	**65**	**65**	**65**	**65**
PI 1.2.3	**75**	**75**	**75**	**75**
PI 1.2.4	**70**	**70**	**70**	**70**

Table 8.9.3(b) – P2 scores at overlapping fisheries. Source: ACDRs of the two fisheries, currently in preparation.

	Camanchaca	AIP

	All UoAs	All UoAs (or, where applicable, only UoA5 and UoA8 - see table 8.9.1-)
PI 2.1.1(a) -main spp.-	Red squat lobster (UoA1): 100 Yellow squat lobster (UoA2): 100 Chilean hake (UoA2): 80	Red squat lobster (UoA8): 100 Yellow squat lobster (UoA5): 100 Chilean hake (UoA5): 80
PI 2.2.1(a) -main spp.-	No main secondary spp impacted	No main secondary spp impacted for UoAs targeting squat lobsters in UPS (UoA5 and UoA8)
PI 2.3.1(a) -limits recognition-	No ETP species subject to legal limits	No ETP species subject to legal limits
PI 2.4.1(b) -VME recognition-	Seamounts, geothermal vents, methane emergence areas, sponge fields, cold-water coral reefs, and several VME-forming species: sponge field, soft corals, black corals, stony corals, hydrocorals, gorgonians, actinias, deep-sea starfish, unidentified starfish	Seamounts, geothermal vents, methane emergence areas, sponge fields, cold-water coral reefs, and several VME-forming species: sponge field, soft corals, black corals, stony corals, hydrocorals, gorgonians, actinias, deep-sea starfish, unidentified starfish
PI 2.4.2(a) -at SG100-	SG100 is met	SG100 is met
PI 2.4.2(c) -at SG100-	SG100 is not met	SG100 is not met

Table 8.9.3(c) –P3 scores at overlapping fisheries. Source: ACDRs of the two fisheries, currently in preparation.

	Camanchaca	AIP
	All UoAs	All UoAs (or, where applicable - see table 8.9.1-, only industrial UoAs)
PI 3.1.1	**100**	**100**
PI 3.1.2	**85**	**85**
PI 3.1.3	**100**	**100**
PI 3.2.1	**100**	**100**
PI 3.2.2	**95**	**95**
PI 3.2.3	**80**	**80**
PI 3.2.4	**90**	**90**

Table 8.9.4 – Rationale for scoring differences

If applicable, explain and justify any difference in scoring and rationale for the relevant Performance Indicators (FCP v2.2 Annex PB1.3.6).
NA
If exceptional circumstances apply, outline the situation and whether there is agreement between or among teams on this determination.
NA

8.9 Objection Procedure – delete if not applicable

To be added at Public Certification Report stage

The CAB shall include in the report all written decisions arising from the Objection Procedure.

Reference(s): MSC Disputes Process v1.0, FCP v2.2 Annex PD Objection Procedure

9 Template information and copyright

This document was drafted using the ‘MSC Reporting Template v1.2’.

Template version control

Version	Date of publication	Description of amendment
1.0	17 December 2018	Date of first release
1.1	29 March 2019	Minor document changes for usability
1.2	25 March 2020	Release alongside Fisheries Certification Process v2.2

A controlled document list of MSC program documents is available on the MSC website (msc.org).

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