MACALISTER ELLIOTT AND PARTNERS LTD

MSC Public Comment Draft Report

Fishery for toothfish (*Dissostichus eleginoides*) by SARPC in Kerguelen

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REPORT SUMMARY

This report is the Public Comment Draft Report for the MSC assessment of the fishery for toothfish (*Dissostichus eleginoides*) in the Kerguelen EEZ; part of the EEZ of the Terres Australes et Antarctiques Françaises (TAAF) – the French territory in the Southern Ocean. Note that toothfish fisheries elsewhere in the TAAF EEZ apart from Kerguelen (i.e. Crozet) are *not* included in this assessment. The report was prepared by MacAlister Elliott and Partners Ltd. for the Syndicat des Armements Réunionnais de Palangriers Congélateurs (SARPC), which groups all the licence holders for the fishery.

The fishery operates by demersal longline. It is managed via an annual TAC (currently 5100 t) which is divided into six quotas for the six licence holders (seven vessels) in the fishery. The TAC is set by the administration of the TAAF, following scientific advice from the Museum National d'Histoire Naturelle (MNHN) as well as 'avis' from other parts of the French government. In practice, the TAC has been fixed at the same level for some years, but a recent stock assessment suggests that it is precautionary and conforms to CCAMLR risk-based reference points. As well as toothfish, several species of ray and grenadiers are taken as a retained bycatch. Other species are discarded. A recently introduced code of conduct aims to reduce non-toothfish catches by encouraging vessels to avoid areas and depth strata with high bycatch. Bycatch of birds (grey and white-chinned petrels) remains a concern, although the fishery has made big strides in recent years in reducing mortality rates. Nonetheless, the impact of the fishery on the small Kerguelen grey petrel population remains a concern.

The fishery operates in the CCAMLR area, but due to the 'declaration du président', France implements conservation measures and other CCAMLR regulations on a voluntary basis via its own management system (run by the TAAF). The fishery does have, however, a clearly defined and appropriate management structure, and all key CCAMLR measures are implemented in this fishery, including bird conservation measures, the observer system and protocols, the stock assessment methodology and reference points, VMS coverage, reporting of data to CCAMLR, estimates of IUU fishing etc.

Under the assessment, the aggregate scores for this fishery are as follows: Principle 1 – 83.1; Principle 2 – 82.0, Principle 3 – 85.9. No PI scored below 60. Therefore it is proposed that the fishery *should* be certified as MSC. This conclusion is subject to MSC and stakeholder review.

Six PIs scored in the range 60-80 and are therefore subject to conditions: one in Principle 1, three in Principle 2 and two in Principle 3. These are 1.2.4 (stock assessment), 2.1.1 (retained species outcome), 2.1.3 (retained species information), 2.3.1 (ETP species outcome), 3.2.1 (fishery-specific objectives) and 3.2.2 (decision-making processes). This leads to four conditions in total. These are summarized as follows:

PI 1.2.4 – stock assessment: By the end of the five-year certification period, the fishery must have in place a sustainable stock assessment process which i) evaluates the fishery

with reasonable regularity; ii) is used to inform decisions about the level of the TAC by TAAF and other stakeholders and iii) is presented for regular review by CCAMLR WG-FSA.

PI 2.1.1 and 2.1.3 – retained species: A monitoring system needs to be put in place for grenadiers and rays, appropriate to the scale of the fishery, which will provide indication of possible risks to the stocks. This may be by analysis of trends in CPUE or by some other suitable method. The assessment team needs to see evidence of the systematic implementation of the code of conduct. In addition, a process of review and revision of the code of conduct in the light of trends in the fishery is required.

PI 2.3.1 – grey petrels: Declines in bird mortality need to continue until all vessels are performing at the best possible level. In addition, a monitoring system is required to identify the level of risk posed by the fishery to the Kerguelen grey petrel population, including specific bycatch targets for grey petrels.

PI 3.2.1 and 3.2.2 – fishery management plan: Produce a management plan for this fishery, focusing on the management of the toothfish resource (i.e. Principle 1). The plan should set out for the short-term (~5-10 years), i) the objective of management; ii) how that objective will be achieved; i.e. how decisions on the TAC will be taken and iii) what information will be used and how it will be used.

In addition, the assessment team proposed one non-binding recommendation: to evaluate the effectiveness of the measures to reduce bird mortality, and the effectiveness of individual vessels, in relation to grey petrels specifically; and if necessary re-focus on those measures which reduce mortality of grey petrels in particular.

1. INTRODUCTION

1.1. GENERAL BACKGROUND

The Marine Stewardship Council (MSC) is a non-profit organisation which aims to use market mechanisms to support the long-term sustainability of marine fisheries. MSC has developed a standard for well managed and sustainable fisheries, and an associated methodology for assessing individual fisheries against the standard – the Certification Requirements. The standard and methodology is periodically updated. This assessment uses a previous version of the Certification Requirements (the FAM) because it was started before the Certification Requirements were introduced. Assessments are carried out by private companies (Certification Assessment Bodies – CABs) who are accredited to carrying out MSC assessments by the accreditation organisation Accreditation Services International (ASI).

Figure 1. Map of the TAAF EEZ, which includes both Kerguelen and Crozet. This assessment covers the toothfish fishery in Kerguelen. Note that the Kerguelen EEZ is contiguous with an Australian EEZ around Heard Island and Macdonald Island (HIMI).

This report is the Public Comment Draft Report for the French toothfish fishery (*Dissostichus eleginoides*), in the EEZ of the Terres Australes et Antarctiques Francaises (TAAF - French southern and Antarctic lands) around the island of Kerguelen in the

Southern Ocean (Figure 1). The report has been prepared by an assessment team from the CAB MacAlister Elliott and Partners Ltd. (MEP). The report will be available for comment on the MSC website, and MEP welcomes comments on the report at any time (contact details on the MSC website or at www.macalister-elliott.com).

1.2. CLIENT

The client for the fishery is the fishing company Syndicat des Armements Réunionnais de Palangriers Congélateurs (SARPC), based in Réunion. SARPC groups all the licence holders for this fishery.

1.3. UNIT OF CERTIFICATION (UOC)

1.3.1. Definition of the UoC

The unit of certification defines exactly what is being assessed and certified.

The unit of certification has been defined as follows: 'the toothfish fishery in the TAAF EEZ around Kerguelen'.

1.3.2. Possible uncertainties in the UoC

From the fisheries and management point of view it is clear that SARPC represents an obvious unit of certification. The vessels are all based in the same place, fish in the same area using the same techniques and submit to the same management regime. Furthermore, SARPC members are the only vessels permitted to fish in this area. Three potential questions arise, however, in regard to the unit of certification which are worth considering:

i) the toothfish fishery in other parts of the TAAF EEZ;
ii) the Australian part of the Kerguelen plateau (Heard Island EEZ) and
iii) the vessel (the Austral) used for scientific research at Kerguelen.

TAAF EEZ vs. Kerguelen EEZ: In the TAAF EEZ in total, there is fishing for toothfish in the EEZs around Kerguelen and around Crozet (see Figure 1). This assessment considers Kerguelen only. SARPC will have to show that a suitable traceability system is in place so that fish from Kerguelen and Crozet can be kept separate. Addition of Crozet to the UoC in the future will depend on assessment of this fishery under Principles 1, 2 and 3.

Australian EEZ: France and Australia share the Kerguelen plateau in their contiguous EEZs (see Figure 1) with France having about two thirds and Australia one third around Heard and Macdonald Islands (HIMI). From the stock structure point of view, the situation is somewhat complex. Rates of interchange between Kerguelen and HIMI 'stocks' may be significant. Tagging suggests that interchange of adult fish is not greater than a few percent (Guy Duhamel, MNHN, pers. comm.), but recruitment sources and

sinks are not known. This makes good scientific cooperation between the two sides particularly crucial. An annual bilateral scientific meeting has been held since 2008, as well as a joint symposium on the marine ecosystem and fisheries of the Kerguelen plateau in 2010. The HIMI toothfish fishery is already MSC certified (SCS 2012).

Austral: The Austral is a trawler which has been used for the two scientific research cruises around Kerguelen (POKER I and II[1]). Costs of these cruises were offset by allowing some commercial catch by the Austral, despite the fact that commercial fishing is normally only by longline, according to TAAF regulations. The Austral is not included in the UoC for this assessment and any future catch by the Austral cannot be sold as MSC-certified.

1.3.3. Licensed vessels

There are seven vessels licensed to fish in the TAAF EEZ, belonging to six fishing companies who make up the membership of SARPC (Table 1). An eighth vessel, the Austral is a trawler which is used for the POKER scientific campaigns, taking some commercial catch in order to part-fund the scientific work. This vessel and catch is not included in the UoC.

Table 1. Licensed vessels in the fishery.

Company	Vessel(s)	GRT total
Sapmer	Albius, Croix du Sud I	1654
Cap Bourbon	Cap Horn I	975
Comata	Ile de la Réunion	935
Armements Réunionnais	Ile Bourbon	847
Armas Pêche	Mascareignes III	808
Pêche-Avenir	St. André	1387

1.4. ASSESSMENT TEAM AND PEER REVIEWERS

The assessment team was made up of three experts with competences in fisheries assessment, marine ecology and fisheries management. All three experts had equal input on the scoring of each PI in each of the three Principles. For the purpose of drafting the rationales and reporting, each member of the team took responsibility for one of the Principles, and their drafts were then reviewed and revised by the other two team-members.

The assessment team was composed of the following individuals:

Dr. Jo Gascoigne: Jo is the Director for Fisheries Certification at MEP and a former research lecturer in marine biology at Bangor University. She has expertise in population dynamics research and modelling and in the fisheries and conservation of marine

[1] POKER = POissons KERguelen

invertebrates. She has been involved in several previous and ongoing assessments. Jo was responsible for Principle 1.

Dr. Terry Holt: Terry is an expert in marine ecology and the assessment of ecosystem impacts. He has been involved in several MSC assessments and pre-assessments, including the assessment of South Georgia toothfish fishery. He was responsible for Principle 2.

Dr. Sophie des Clers: Sophie specialises in fisheries socio-economics, although she also has a background in fisheries population modelling. She has also worked on the Falkland Islands on toothfish and other species.

The peer reviewers for the report are the following individuals:

Dr Chris Darby: CEFAS Fisheries Systems Modeller and Stock Assessment Co-ordinator

Dr Sue Jackson: Research Associate, Department of Botany & Zoology, University of Stellenbosch

CVs for all experts are available via this link.

1.5. PREVIOUS ASSESSMENTS UNDERTAKEN BY MEP

MEP has undertaken MSC assessments for the following fisheries (in addition to the present assessment):

- Euronor saithe
- Euronor and Cie des Pêches St. Malo Barents Sea cod and haddock
- Scapêche and Cie des Pêches St. Malo saithe
- DFFU / Doggerbank / UK Fisheries Ltd. saithe
- DFFU / Doggerbank / UK Fisheries Ltd. Barents Sea cod and haddock
- Normandy and Jersey lobster
- Tristan da Cunha rock lobster
- Menai Strait mussels
- Exmouth mussels
- SFSAG saithe (ongoing)
- Cornish sardines (auditor but not assessor)

MEP has not yet undertaken any re-assessments.

2. THE FISHERY

2.1. TARGET SPECIES AND POPULATION

The target species is Patagonian toothfish *Dissostichus eleginoides* (Figure 2). Patagonian toothfish (also sold as Chilean seabass) is a bentho-pelagic species which inhabits sub-Antarctic waters near the Antarctic Convergence in the Pacific, Atlantic and Indian Oceans (Reilly and Ward, 2002). The species geographic distribution ranges from 30°s in the Pacific, to Cape Horn, along the coast of Argentina, off southern Patagonia, South Georgia, the Falkland Islands, Shag Rocks and the islands of the Scotia Arc, to shelves and seamounts of the Indian sector, Kerguelen-Heard Ridge, Bouvet Islands and Macquarie Island (García de la Rosa *et al*, 1997). Some areas of uncertainty, however, concern the southern limit of distribution in the South Orkney/Antarctic Peninsula and southern Kerguelen Plateau areas, where the distribution may be confused with that of the Antarctic toothfish (*Dissostichus mawson*i) (CCAMLR, 1995).

D. eleginoides is found at depths of between 200 and 2,500 m, with individuals migrating to increasingly deeper water as they grow larger (Rogers *et al*, 2006). Around the Kerguelen Islands, the species can be found in shallow waters (<10 m) to at least 2,000 m depth. As the fish grow, they move to deeper waters.

Figure 2. Patagonian toothfish (*Dissostichus eleginoides*)[2]

The extent to which Patagonian toothfish populations are separated is poorly understood (CCAMLR, 1995). Studies have, however, demonstrated marked genetic differentiation between populations of Patagonian toothfish located in different geographic regions, namely the Falklands, South Georgia, Heard/McDonald Islands and Macquarie Islands. The genetic differentiation is thought to be influenced by ocean topography (such as the presence of deep-water channels), oceanic fronts (the Polar Front and Sub-Antarctic Front) and distance between ocean basins which may act as barriers to gene flow (Rogers *et al*, 2006). Within regions, however, a different pattern emerges depending on locality. Within the area of the Prince Edward and Marion Islands, Crozet Islands and Heard/McDonald Islands oceanic ridge systems and seamounts may act as oceanic ‘‘stepping stones”, promoting adult migration and/or larval dispersal and thus giving the region a homogenous genetic structure (Appleyard *et al*, 2004; Rogers *et al*, 2006).

[2] From www.wikipedia.org

The Patagonian toothfish is a long-lived species, living for more than 50 years and reaching more than 2 m in length and 95 kg in weight (North, 2002). Adult toothfish are active predators and scavengers that prey on fish, crustaceans, cephalopods and other invertebrates (Rogers *et al*, 2006), while postlarvae and juveniles consume zooplankton and small fish (Duhamel, 1981). The main predators of toothfish are sperm whales, sea lions and elephant seals (North, 2002). Patagonian toothfish are thought to spawn at about 1,000–1,500 m depth, and female fish produce between 50,000 and 500,000 large pelagic eggs which develop into pelagic larvae (references cited in Rogers *et al*, 2006). After approximately one year (CCAMLR, 1995; Des Clers *et al*, 1996) the juvenile toothfish become associated with the seabed in shallow (<140m) and probably inshore areas (North, 2002), moving to deeper waters as they grow older and become sexually mature (CCAMLR, 1995). The sex ratio of fish in the Australian EEZ is apparently spatially structured, with younger fish in shallow waters showing no sex bias, while larger males tend to be more common on the western slopes of the Plateau, indicating possible migrations associated with sexual maturity (Welsford *et al.*, 2011, cited in Candy et al. 2011).

The growth of Patagonian toothfish is fairly rapid for the first 10 years and males and females mature at 7 and 12 years respectively (Horn, 2002). Around the Kerguelen Islands, a general east–west deep-sea movement of adult fish occurs and spawning is restricted to the westerly zone early in winter each year (WG-FSA-05/27 in CCAMLR, 2011). Tagging experiments at Heard Island (Division 58.5.2) (Williams *et al*, 2002; WG-FSA- 07/48 Rev. 1 in CCAMLR, 2011) show long-distance movements of sub-adult/adult fish between zones (Heard to Kerguelen and also Crozet) although the proportion of exchange between stocks is unknown.

The development of the high-value fishery in the Kerguelen Islands commenced with the discovery of a large stock of Patagonian toothfish by USSR bottom trawlers in the 1984-1985 fishing season on the slopes of the Kerguelen shelf (Palomares and Pauly, 2011). In the late 1990s longlining was found to be a more effective method for catching Patagonian toothfish (Duhamel and Hautecoeur, 2009) and the bottom trawl fishery was completely replaced with a longline fishery in the 2000-2001 fishing season (Lord *et al*, 2006). A rapid expansion of the longline fisheries ensued and this was particularly the case for non-licensed longliners from non-CCAMLR member states (Kock, 2001), with illegal catches peaking between 1996 and 2004, reaching four times that of the regulated catch in 1997 (Agnew, 2000). In 2005, illegal fishing was combated and the fishery was limited to 7 French longliners (Pruvost *et al*, 2005).

2.2. GEOGRAPHY OF THE KERGUELEN EEZ

The Kerguelen plateau was formed by volcanism associated with the breakup of the Gondwana supercontinent, about 110 million years ago. It was thickly forested during the Cretaceous but since then has sunk below sea level, with the exception of two groups of uninhabited islands – Kerguelen in the north and Heard and McDonald in the south[3]. The plateau is divided between a French EEZ centred on Kerguelen and an Australian EEZ

[3] See http://en.wikipedia.org/wiki/Kerguelen_Plateau

centred on HIMI. The location of the Kerguelen plateau is shown in Figure 3 and Figure 4.

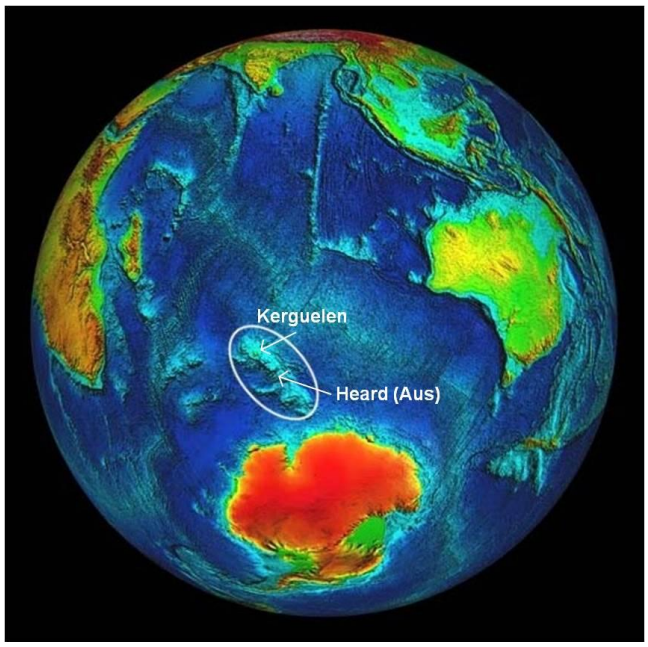


Figure 3. The Kerguelen plateau shown on a false colour bathymetric image.

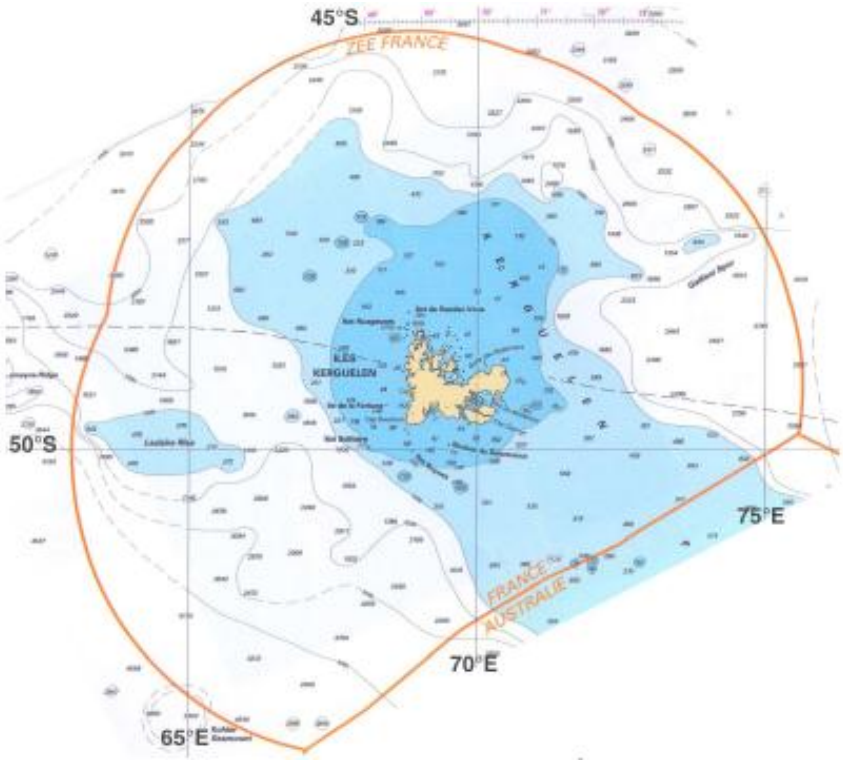


Figure 4. Chart of Kerguelen EEZ (Rélot-Stirnemann 2012)

2.3. FISHERIES MANAGEMENT STRUCTURE

2.3.1. CCAMLR

Living marine resources in the Southern Ocean have a general management framework in the form of CCAMLR – the Commission on the Conservation of Antarctic Marine Living Resources, established under the Convention of the same name. The Convention came into force in 1982, as part of the Antarctic Treaty System. The Commission is made up of representatives of member countries – which include all the nations with toothfish fisheries on their territory, as well as distant water fishing nations. CCAMLR has a Scientific Committee, made up of scientific representatives from the member countries of the Commission. The Scientific Committee functions by division into Working Groups (WG) which deal with different topics (e.g. WG-FSA for fish stock assessment, WG-IMAF for incidental mortality associated with fisheries etc.). The Scientific Committee and the Commission meets annually; working groups may meet annually or more or less often, as required. There is also a Secretariat for day-to-day administrative purposes, based in Hobart, Tasmania. Members of CCAMLR must generally accept the implementation in their fisheries of any conservation measures that have been adopted by CCAMLR, although there are some exceptions.

Like most other fisheries management organisations, CCAMLR divides its management area up into zones, based partly on biogeography, partly on politics and partly on convenience. A map of the CCAMLR zones is provided in Figure 5. There are three broad areas - Area 48 is the (extreme) South Atlantic, Area 58 the Southern Indian Ocean and Area 88 the South Pacific. Kerguelen shares Subarea 58.5 with Heard and McDonald Islands (Australia) – Kerguelen being Division 58.5.1 and the Australian zone Division 58.5.2.

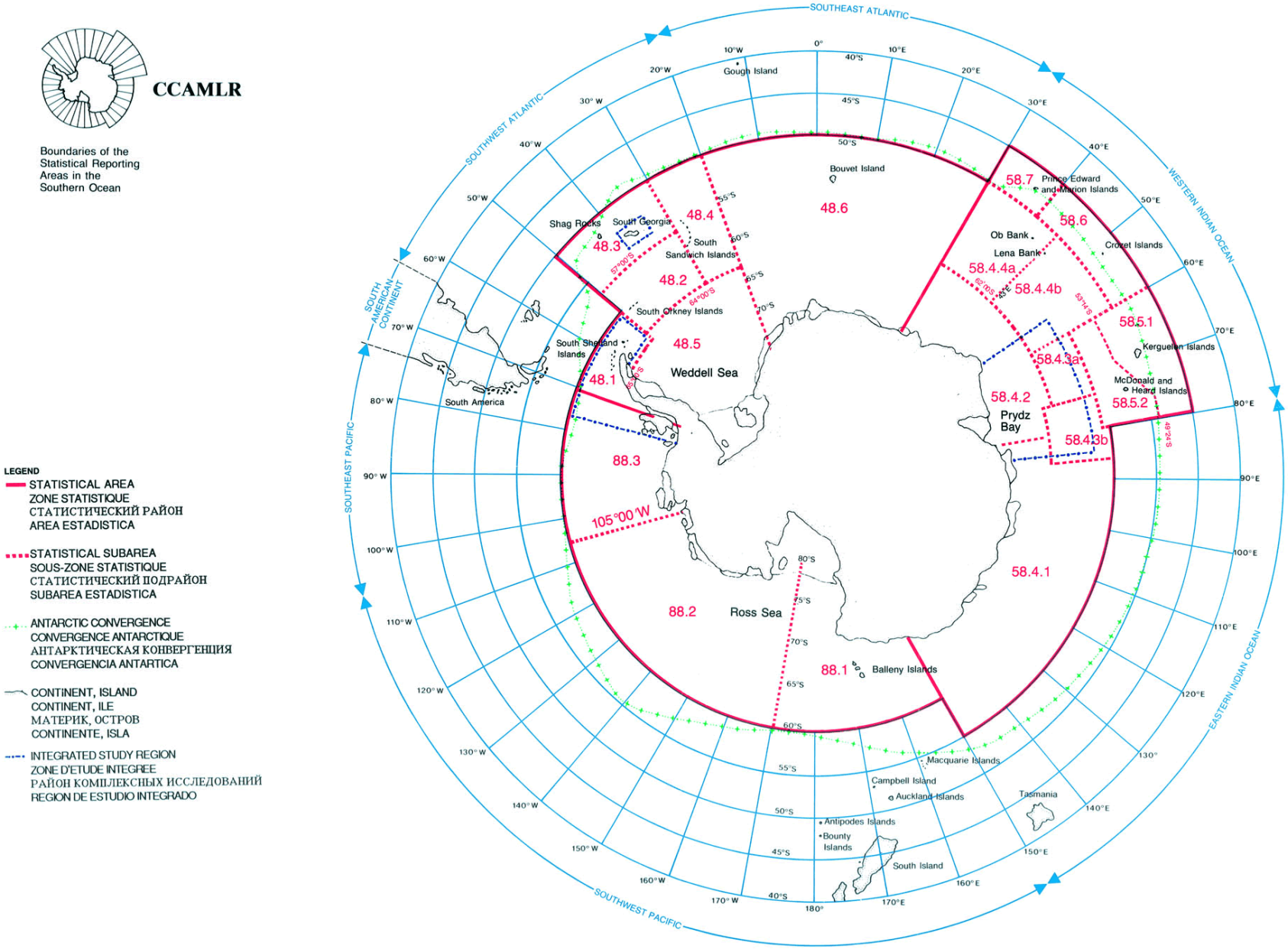


Figure 5. CCAMLR management zones

2.3.2. Fisheries management legal framework and the TAAF

Fisheries management in the waters of France and its overseas territories is framed by the Code Rural et des Pêches Maritimes (Livre IX, 2011), which has a specific section (Titre V) for overseas territories.

The archipelagos of Kerguelen (and Crozet) are uninhabited and part of the French austral and Antarctic territories (Terres Australes et Antarctiques Française - TAAF). The TAAF was created in 1955 as an administratively and financially autonomous territory – it was attached to the French colonial government in Madagascar until then. The TAAF are designated as a French 'PTOM' (pays et territoires d'outre-mer – overseas territories and countries) – these also include French Polynesia, St. Pierre and Miquelon, Wallis and Futuna, St. Martin and St. Barthélemy. The TAAF are associated with the EU, but the islands in the TAAF are not EU territory.

The TAAF are made up of the following territories:

- Kerguelen archipelago
- Crozet archipelago
- St Paul and Amsterdam Islands
- Adelie land (Antarctica)
- The îles Eparses (Glorieuses, Juan de Nova, Europa and Bassas da India in the Mozambique channel and Tromelin north of Réunion)

This whole area gives France (TAAF) a total EEZ of more than 2.5 million square kilometres, as well as responsibility for management of some ecologically very significant, and very contrasting, terrestrial and marine environments – from the mainland of Antarctica to the sub-tropics.

The TAAF administrative services are based in the Réunion Island headed by a nominated senior administrator appointed by the French central government, the Préfet. In relation to the fishery, management decision-making is the responsibility of the Préfet of the TAAF[4] who issues specific provisions through annual "arrêté de l'administrateur supérieur", which are published regularly in the TAAF official journal[5]. He/she is required to consider advice and opinions from various sources – this is described in detail below.

The main raison d'être of the TAAF administration is to exercise French sovereignty over the TAAF area. French sovereignty over Kerguelen and the other southern island groups has never been contested, but France nonetheless considers it important that it continue to be affirmed – the fishery is part of this, as is the scientific base on Kerguelen, the Marion Dufresne and satellite surveillance of the EEZ. A considerable part of the TAAF budget is spent in connecting and supplying the military garrisons on the îles Eparses, weather

[4] Décrêt no 2009-1039 du 26 août 2009 relatif aux conditions d'exercice de la pêche maritime dans les Terres australes et antarctiques françaises
[5] http://www.taaf.fr/Journal-officiel-des-TAAF

and scientific research stations on the various islands by boat – the Marion Dufresne from Réunion supplies Kerguelen, Crozet and St. Paul and Amsterdam, while the Astrolabe from Hobart supplies Adélie land. (The îles Eparses are supplied by military plane.)

The TAAF administration is also in charge of France's largest protected area[6], the réserve naturelle des Terres australes françaises that covers the TAAF sub-antarctic (Kerguelen and Crozet) and sub-tropical (Amsterdam and StPaul) archipelagos, for a total of 700 000 hectares and 1 570 000 hectares of the seas around them. The protection status for Kerguelen is illustrated in Figure 6.

2.3.3. Position of France within CCAMLR

France became a member of CCAMLR in 1980. Its national prerogative is officially recognised by a 'Déclaration du Président'. The declaration allows France, which as a different legal system from its neighbours in the area, to comply with measures of the CCAMLR Convention on its own terms, and to enforce CCAMLR regulations within its EEZ on a voluntary basis[7]. According to the declaration: '*conservation measures, whether national or adopted by the Commission in relation to the waters around Crozet and Kerguelen, will be applied by France. The observation and inspection system foreseen under the Convention will only be applied in these waters with French agreement and under conditions accepted by France.'*[8]. France also participates in data analysis, stock assessments, research and policy decision-making within CCAMLR in the same way as other signatories to the Convention. The conservation measures imposed by France on the fishery are in essence the same measures as are agreed by CCAMLR for the Heard Island and McDonald Island (HIMI) fishery and for other Patagonian toothfish fisheries in Antarctic waters.

[6] http://www.senat.fr/rap/r07-132/r07-1327.html
[7] See http://www.taaf.fr/Cadre-juridique-des-activites-de-peche
[8] Translation by MEP – the French version is the authoritative version.

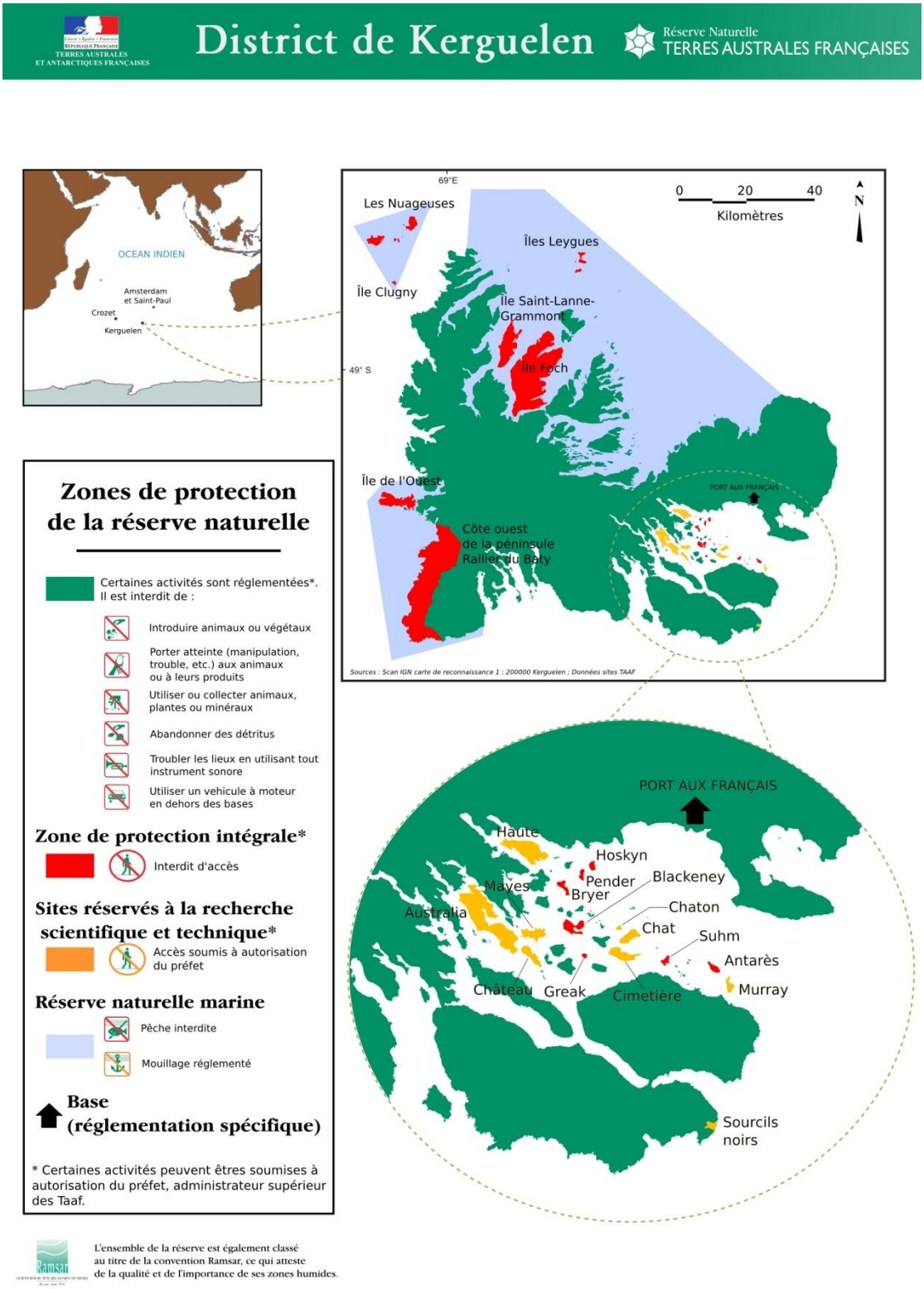


Figure 6. Environmental protection on and around Kerguelen[9]

[9] See http://www.taaf.fr/IMG/jpg/zp_ker.jpg

2.3.4. CCAMLR conservation measures

A large number of conservation measures (CMs) are in force for the CCAMLR zone; some general and others specific to certain species, zones or fishing seasons. A summary of the general regulations is provided in Table 2.

Because the position of France within CCAMLR is different from other members, quite a number of these regulations do not apply to the Kerguelen fishery. However, in all important cases, there is an equivalent French regulation for these areas. Detailed information on conservation measures in the French fishery is given in Table 2.

Table 2. CCAMLR Conservation Measures relevant to the Kerguelen toothfish fishery[10], and whether / how they apply to the Kerguelen fishery (TAAF 2012). (NB: Measures that do not apply to the fishery are not included here – this may be for example if they apply only to high seas areas or another EEZ, or only to trawl fisheries or other gear types, or if they relate to an activity (such as transshipping) that does not occur in the TAAF fishery. Some measures that do not directly apply have, however, been included, if they are relevant to this assessment.)

CM	Measure	Apply to French EEZ?	French equivalent?
10 - Compliance			
10-01	Marking of fishing vessels and gear	no	yes
10-02	Licensing and control of authorised fishing vessels	no	yes
10-03	Port controls for vessels transporting toothfish	no	yes
10-04	VMS on fishing vessels	yes but not obliged to forward the data to CCAMLR	
10-05	Catch documentation system for toothfish	yes	
10-06	Contracting Party (CP) IUU list	yes	
10-07	Non-CP IUU list	yes	
10-08	CP individual blacklist	yes	
25 - Reduction in incidental mortality			
25-02	Reduction in accidental mortality of seabirds during longlining	no	yes
26 – General environmental protection			
26-01	Limits on dumping of waste etc.	no	yes
32 – Closed seasons and areas			
32-13	No directed toothfish fishing in 58.5.1 (Kerguelen) outside TAAF EEZ	n/a – but relevant to assessment	
32-14	Closed areas in HIMI EEZ	n/a – but relevant to assessment	
32-18	No directed shark fisheries, and sharks to be	yes	

[10] Information from http://www.ccamlr.org/en/conservation-and-management/browse-conservation-measures

CM	Measure	Apply to French EEZ?	French equivalent?
	released alive where possible		
41 - Toothfish			
41-08	TACs for 2011/12 and 2012/13 for HIMI – 2730 t including discards, plus 3 seabirds per vessel limit	n/a – but relevant to assessment	
91 – Protected areas			
91-04	Framework for establishment of MPA network for CCAMLR area	yes	

2.3.5. Muséum National d'Histoire Naturelle

The French Natural History Museum (Muséum National d'Histoire Naturelle -MNHN) based in Paris is the scientific organisation responsible for providing management advice for this fishery. The TAAF fisheries are the only French fisheries managed using advice from the MNHN. The MNHN has a research laboratory that focuses mainly on the marine and fisheries ecology of the TAAF sub-Antarctic area, headed by Professor Guy Duhamel, a well-known expert. The lab maintains the PECHEKER database, which contains all the fisheries data available for Kerguelen, including historic data going back several decades. It also operates the periodic POKER research cruises. MNHN provides annual advice to TAAF on the management of the fishery.

2.4. THE KERGUELEN TOOTHFISH FISHERY

2.4.1. Fishing operations

Toothfish is fished by bottom-set longlines. Other fishing methods are not allowed, except with dispensation for the purpose of scientific research. Fishing is by bottom set longline, with hooks baited with mackerel, horse mackerel and squid. Fishing is forbidden in territorial waters, waters shallower than 500m and in protected areas. Lines are set from 500 m down to ~2000 m depth and are always deployed at night to mitigate bird mortality. Line setting above 500m depth is illegal. There are two fishing areas for the fleet – the Kerguelen plateau (CCAMLR area 58.5.1) and the area around Crozet Island (CCAMLR area 58.6) – see Figure 1. All boats fish continuously for several months at a time before landing the catch at Le Port in Réunion.

2.4.2. Fishing seasons

The TAAF operates on the basis of a fishing season, which runs from 1 September – 31 August. CCAMLR, meanwhile, operate a season from 1 December – 30 November (these have changed over CCAMLR's history). This can cause some minor discrepancies between the data sets. French data is converted to the CCAMLR season for reporting at

CCAMLR, in order to facilitate aggregation across the Kerguelen Plateau and comparison with other toothfish fisheries.

2.4.3. Other relevant fisheries

Within the CCAMLR area, toothfish are fished commercially in Subarea 48.3 (South Georgia), Subareas 58.6 (Crozet) and 58.7 (Prince Edward Island), and Divisions 58.5.1 (Kerguelen) and 58.5.2 (Heard and McDonald Islands HIMI). The fisheries are all longline fisheries, except for 58.5.2 which is a mixed trawl and longline fishery (although some trawling is permitted elsewhere for scientific assessment purposes). There is also some pot fishing, generally on an experimental basis, as well as some other exploratory fisheries. The South Georgia and HIMI fisheries are MSC certified (Moody 2009, SCS 2012). The certified fishery in the Ross Sea concerns a different species (*D. mawsoni*).

More information is given here on the HIMI fishery (58.5.2), since the EEZ is contiguous with Kerguelen (see Figure 1) and since the stock may be shared, or (more likely) part of a metapopulation. Information comes from SCS (2012).

Commercial fishing at HIMI by Australian vessels started in 1997. The fishery extends from 13 nautical miles offshore to the edge of the 200-mile EEZ; the area within 13 nautical miles of the islands is protected from fishing. In addition, the HIMI EEZ contains one of the largest Marine Protected Areas in the world which is closed to fishing, incorporating ~40% of the area shallower than 1,000 metres.

The HIMI fishery has been managed via Statutory Fishing Rights (SFRs), with each operator requiring a minimum quota holding of 25.5 % of the total number of SFRs (which limits the number of boats to a maximum of 3). The fishing season extends from 1 December to 30 November each year. Both longlining and trawling are permitted, unlike at Kerguelen where trawling is not permitted except for scientific purposes. Annual catches have generally exceeded 2000 t and were over 3500 t in the late 1990s. The estimated IUU catches were also large in this period, but have been zero since 2006/07. The TAC for 2011/12 was 2730 t.

2.5. MANAGEMENT OF THE FISHERY

2.5.1. Regulations

The regulations are set out annually in an arrêté of the TAAF – for the 2012-13 season, it is arrêté 20120-78 of 6 August 2012 (TAAF 2012). They can be summarised as follows:

1. Exploitation in space and time

- No fishing in territorial waters (12 nautical miles)
- Fishery closed 1 February – 15 March, to protect birds
- Annual TAC (currently 5100 tonnes) to be divided into quotas per fishing company
- Vessels must be licensed
- Only longlining is permitted at Kerguelen
- All vessels must have tamper-proof VMS system
- All vessels must have a 'contrôleur de pêche (fishing controller) on board [this individual has a dual role in enforcement and scientific data collection]
- All vessels must provide data
- Only one vessel in each sector and each vessel must remain in a given sector for a maximum of 10 days. A 'sector' is one degree of latitude by one degree of longitude.
- The first line in a given sector, if <1000m, must be between 3000 and 9000 hooks with minimum 5 hour soak time (a 'test' line). If the catch is >10% small toothfish (<60cm) then the vessel must move on 2.5 nautical miles or 100 m deeper.
- There is a 1.5 nautical miles buffer between the French and Australian EEZs, within which no fishing is permitted.
- Effort should be spread through the season – the administrator of the TAAF can ask fishing companies to alter their plans after advice from the MNHN.

2. Environmental regulations

- No fishing shallower than 500m
- All catch must be evaluated and declared in the factory – only rays being cut off hooks may be counted from the bridge.
- No scaring devices for marine mammals are permitted except by permission of TAAF and following a standard protocol from MNHN.
- All gear must be clearly marked with vessel identification.

- Live rays and crustaceans should be released live if possible.
- Sharks cannot be targeted and should be released alive if possible.
- Birds – the regulations follow the CCAMLR recommendations for reducing bird mortality, including weighting lines, using streamer lines, bird protectors during hauling, discarding of offal and food waste etc. Vessels cannot discard dead birds and must provide data on bird bycatch and mortality after each trip.
- Implement MNHN code of good practice for reducing bycatch (further details below).
- Lines must not be hauled in the presence of orcas (to avoid depredation). Hauling must stop if orcas are sighted.
- There must be no discarding of plastic, rubbish, hooks, bait or non-target species (except as set out above).
- No food, factory waste or offal can be discarded during setting and hauling (to avoid bird mortality).
- No discarding in waters <500m.
- Minimum size for toothfish of 60cm, with move-on rule

2.5.2. Setting the TAC and quotas

The TAC (as well as other regulations) is formally set by the administrator of the TAAF. He/she must take into account the scientific advice of MNHN, as well as the 'avis' (formal opinion) of three ministries of the French government – responsible for overseas territories, foreign affairs and fisheries, respectively.

The TAC for the Kerguelen fishery has been fixed at 5100 tonnes since 2008. It was originally fixed at this level because semi-quantitative analysis of catch rates suggested that the corresponding level of fishing mortality was allowing the stock biomass to recover from an unknown but high level of illegal fishing in the late 1990s and early 2000s. There is general agreement that the TAC will be fixed at 5100 tonnes until a good argument is put forward to change it (presumably coming from the stock assessment process in the long term).

Advice from MNHN was formerly based on a semi-quantitative analysis of fishing mortality and biomass estimates from the first POKER research cruise in 2006. For the last three years (starting in 2010), a more quantitative stock assessment has been run using the CASAL statistical stock assessment tool, which is generally used for CCAMLR fisheries. The MNHN stock assessment has not attempted to make recommendations about the level of the TAC from scratch, but has rather attempted to evaluated whether the current TAC level conforms to the CCAMLR reference points. In October 2012, the Kerguelen stock assessment was presented to the CCAMLR Working Group on Fish Stock Assessment (WG-FSA), which accepted it as a basis for TAC advice in the short term, and proposed a workplan for longer-term stock evaluation.

The division of the TAC into quotas for each boat done by TAAF on the basis of several criteria: the track record of the vessel, its success in catching its quota, compliance with regulations (as assessed by observers) and its performance in reducing incidental bird mortality.

The quotas per vessel for 2011/12 are given in Table 3.

Table 3. Quotas for Kerguelen for each vessel for the 2011/12 season.

Fishing company	Vessel	Quota Kerguelen tonnes
Pêche Avenir	St. André	655.08
SAPMER	Albius	728.99
SAPMER	Croix du Sud	707.21
Cap Bourbon	Cap Horn	833.28
Armements Réunionnais	Ile Bourbon	701.34
COMATA	Ile de la Réunion	753.77
Armas Pêche	Mascareignes III	720.33

2.6. LANDINGS

Landings (reported or estimated) from the start of the fishery in 1979 until 2011 are shown in Figure 7. The fishery was initially a trawl fishery but converted to longline over the period 1998-2002 – trawling is now banned except for scientific purposes.

In the decade 1995-2005, IUU fishing was a serious problem in the Kerguelen EEZ (Figure 7). IUU fishing for toothfish still occurs, but CCAMLR estimates of IUU in the French and Australian EEZs for 2010 and 2011 were zero (CCAMLR-XXX/34, 2011; CCAMLR-XXIX/44, 2010), although illegal toothfish fishing with gillnets still occurs 'occasionally' on the boundaries of the Kerguelen EEZ (CCAMLR-XXX/34).

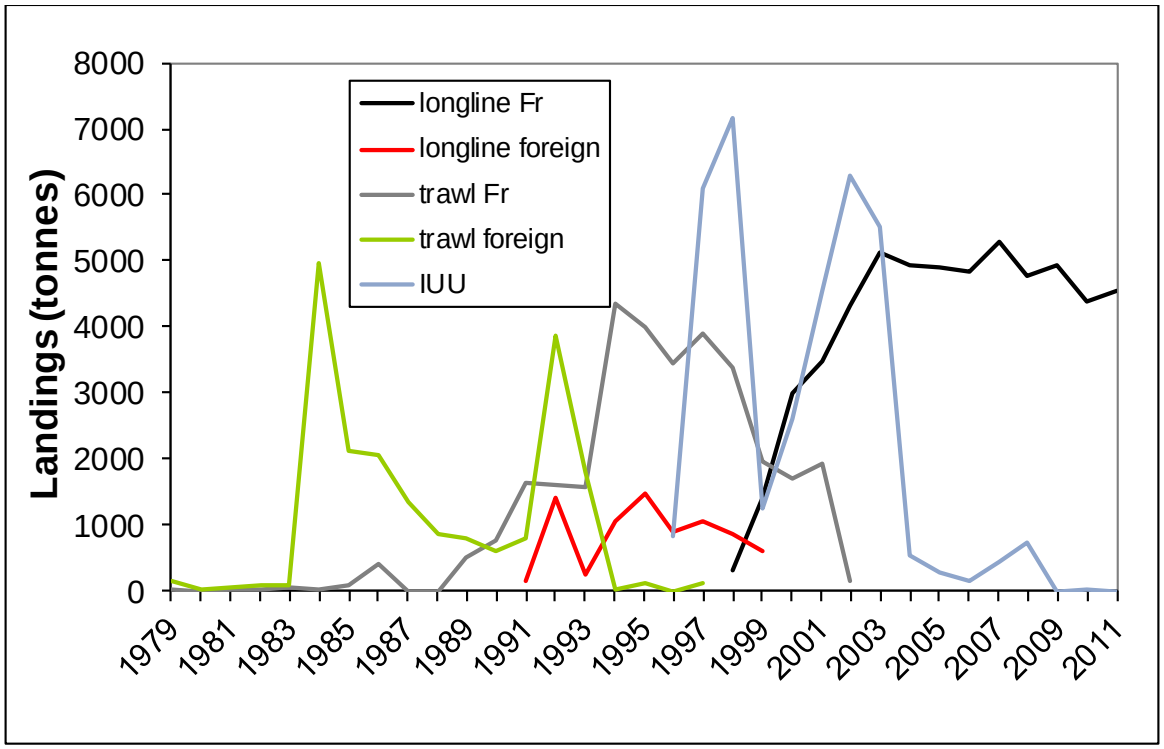


Figure 7. Toothfish landings from the Kerguelen EEZ, 1979-2011. Note that the IUU estimate covers the entire area of CCAMLR zone 58.5.1, not only the Kerguelen EEZ. IUU inside the Kerguelen EEZ itself has been estimated to be zero since 2005. French landings are from logbooks (cross-checked with quayside inspections). Foreign landings are mainly from Ukrainian (former USSR) vessels, reported to CCAMLR. Estimates of IUU are by CCAMLR. Fr = French. Years are CCAMLR years (1 Dec. to 30 Nov.) – i.e. 2011 is 1 Dec. 2010 to 30 Nov. 2011 (data from Rélot-Stirnemann 2012)

All these data sets are maintained in the database PECHEKER by MNHN, and in the CCAMLR database. There is also a small amount of landings from joint French-Japanese exploratory fishery (the Anyo Maru) and from the two POKER scientific campaigns, but the volumes are too small to register on the graph..

2.7. IUU FISHING

The history of this fishery has until recently been one of the 'wild west' and illegal exploitation. Until the mid-1990s, there was limited control of the waters around Kerguelen, and vessels of various nationalities fished for toothfish and other species there. This history of uncontrolled and illegal fishing has inevitably had an impact on the stock. In 1998, France ended all agreements with foreign fishing companies and took control of the TAAF EEZ. Since then, more than 20 vessels have been arrested and confiscated while fishing illegally in the zones; the most recent being the Honduran-registered *Apache* in 2005.

IUU fishing is now under control inside the Kerguelen EEZ (Figure 7). France has deployed considerable resources to achieve this situation, including a satellite surveillance system and surveillance patrols. The satellite surveillance has operated from

Réunion since February 2004. It is operated by CROSS – Centre régional opérationnel de surveillance et de sauvetage en mer, part of the Direction Régionale des Affaires Maritimes de la Réunion et des îles Eparses [Regional Centre for Sea Rescue and Surveillance (CROSS), Department of Maritime Affairs for Réunion and the îles éparses]. Maritime surveillance is provided by the French Navy (one dedicated patrol vessel and two surveillance frigates carrying helicopters) and the Department of Maritime Affairs (the patrol vessel Osiris).

Patrolling is carried out under a bilateral agreement with Australia (patrols are carried out by French vessels in Australian waters and vice-versa). In 2007 this agreement was strengthened to enable vessels undertaking cooperative surveillance missions to engage in policing operations under certain conditions (information from CCAMLR-XXX/34).

2.8. INTERACTIONS WITH OTHER FISHERIES AND NON-FISHERIES ACTIVITIES

There are currently no other fisheries at Kerguelen, and no other non-fisheries activities, apart from science. The archipelago is uninhabited except for a scientific research programme, and these seven longliners are the only fishing vessels licensed to fish in their EEZs. Interactions with the HIMI fishery are considered above.

3. ECOSYSTEM

3.1. ECOSYSTEM CONTEXT

3.1.1. Oceanographic drivers of ecosystem dynamics

The absence of land barriers has a profound influence on the dynamics of currents and biodiversity in the Southern Ocean. Within the latitude band of Drake Passage, the strong eastward flow of the Antarctic Circumpolar Current (ACC) connects each of the ocean basins (Rintoul *et al*, 2001). The ACC is the planet's largest current; it carries climate signals from one ocean basin to another and isolates the cold polar region from the warmer subtropics (Rintoul *et al*, 2010). The ACC is broken up into a number of circumpolar zones delimited by strong frontal systems which are characterised by increased biological productivity and biomass at all trophic levels of the pelagic ecosystem (Pakhomov and McQuaid, 1996; Rintoul *et al*, 2001). The two main fronts, the Sub-Antarctic and Polar Fronts, are shown in Figure 8. The fronts move seasonally: northwards in the southern hemisphere winter and southwards in the southern hemisphere summer; Kerguelen is situated within this dynamic frontal zone (see Figure 8).

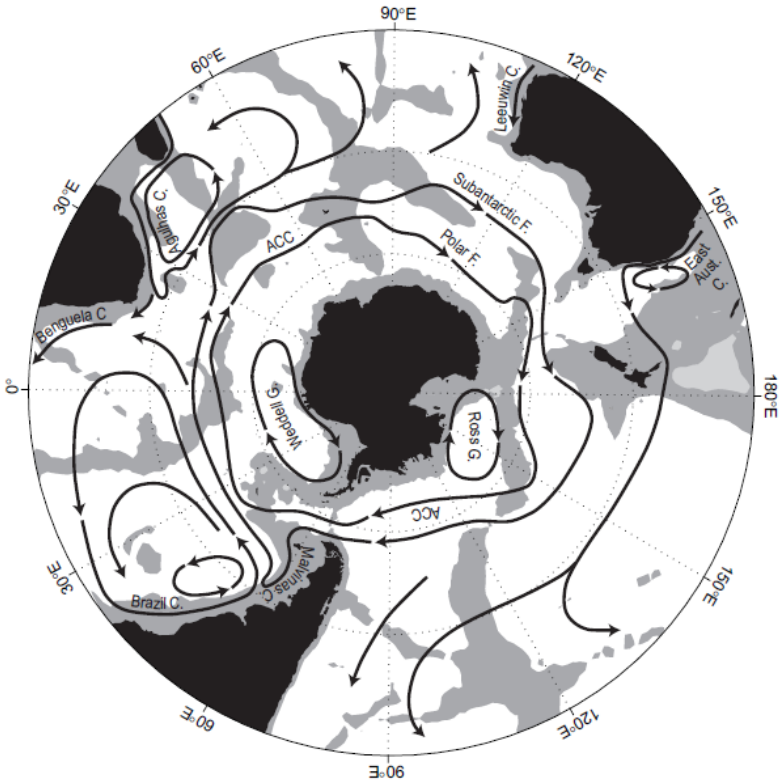


Figure 8. Schematic map of major currents in the southern hemisphere oceans south of 20°S. Depths shallower than 3500 m are shaded. The two major cores of the Antarctic Circumpolar Current (ACC) are shown, the Sub-Antarctic Front and Polar Front. Other abbreviations used are F for front, C for Current and G for gyre. (From Rintoul *et al*, 2001).

As a result of its isolation and the particular oceanographic conditions, the Southern Ocean harbours unique and distinct ecosystems. Phytoplankton biomass is generally low, despite high concentrations of macronutrients; this is at least partly due to the lack of the micronutrient iron (Rintoul *et al*, 2010). The Southern Ocean food web is characterized by a keystone species, Antarctic krill (*Euphausia superba*), which supports large populations of higher predators, including numerous species of pinnipeds, cetaceans, penguins, fish and marine birds.

The dependency on a single keystone species and the uniqueness of the Southern Ocean food webs and biogeochemical cycles make the system vulnerable to climate variability and change (Rintoul *et al*, 2010). A reduction in sea-ice in the southwestern Atlantic was, for example, thought be linked to a decline in krill (Atkinson *et al*, 2004). There is fragmentary evidence of changes in other components of the Southern Ocean food web, from phytoplankton to penguins and seals (Rintoul *et al*, 2010); however, the region is historically one of the most poorly sampled regions of the global ocean (Rintoul *et al*, 2012), and most biological and ecological time series are short, incomplete and limited in scope, making it difficult to assess and interpret long-term trends (Rintoul *et al*, 2010). Human activities such as exploitation of fisheries and oil and gas resources as well as Antarctic tourism further increase pressure on the Southern Ocean and are likely to continue to do so. In 2012, talks were held between CCAMLR member countries on the establishment of two large-scale marine reserve covering 1.6 million square kilometers for the protection of the Ross Sea and the East Antarctic. The talks broke down, however, because the scientific basis for defining the areas was not fully developed. The talks are set to resume in July 2013.

The Kerguelen Plateau is an elevated region of sea floor in the southern Indian Ocean approximately equidistant from Africa and Australia. The plateau extends for more than 2,200 km in a northwest-southeast direction, with depths from 1 to 4 km. The Kerguelen Islands are isolated land masses lying on the Kerguelen Plateau, located along the Antarctic Convergence Zone, where the icy waters of the Southern Ocean meet the warmer waters of the Indian Ocean (Figure 9). This manifests itself in the dynamic splitting and merging of the Antarctic Polar Front, local regions of upwelling, and downstream enrichment of productivity due to iron enrichments from the land masses. The oceanographic processes associated with the plateau result in regional enhancement of primary productivity, flowing up to abundant populations of zooplankton, squid and fish and giving the Kerguelen Plateau an abundant and diverse community of top predators (Hindell *et al*, 2011). The location of the islands is therefore a significant factor in their role as breeding site for birds and seals in this sector of the southern Indian Ocean, with penguins, petrels and seals representing significant components of the islands' ecosystem and surrounding waters. Unlike areas further south, Antarctic krill (*Euphausia superba*) are not the dominant component of the pelagic ecosystem in the Kerguelen area; this place is taken by the hyperid amphipod *Themisto gaudichaudii*, in both coastal and offshore waters (Cherel et al. 2005).

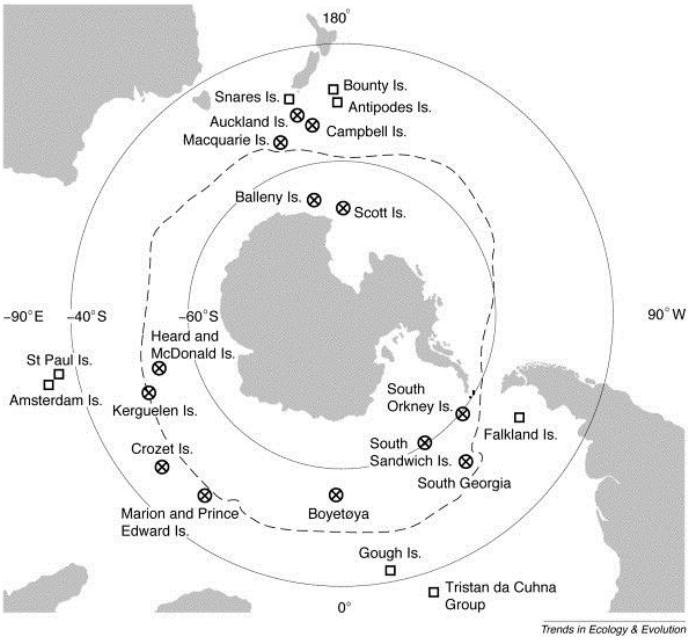


Figure 9. Antarctica and the Southern Ocean showing the locations of the sub-Antarctic islands and the Antarctic Convergence Zone (dashed line). From Bergstrom and Chown (1999)

3.1.2. Vulnerable Marine Ecosystems (VMEs)

CCAMLR has developed a protocol for monitoring and avoiding vulnerable marine ecosystems, which addresses fisheries impacts on a suite of vulnerable habitats (seamounts, hydrothermal vents, cold water coral reefs and sponge fields) and vulnerable benthic species (cnidarians, echinoderms (crinoids), tube worms, branching sponges, brachiopods and others)[11]. Various models and risk assessment strategies have been developed (Martin-Smith 2009, Sharp et al. 2009) to evaluate and mitigate these impacts. The CCAMLR VME project seems to be targeted mainly at new fisheries and has not been implemented specifically in the Kerguelen zone, although one of the objectives of the POKER research cruises is to map benthic ecosystems, include the VME species in particular, in order to develop a risk-based mitigation system. In addition, observers in the Kerguelen zone collect data on VMEs following CCAMLR protocol, but it is not clear to the assessment team how these data are used. Finally, a synthesis of existing knowledge on benthos at Kerguelen is reportedly underway (Prof. Guy Duhamel, MNHN, pers. comm.) as part of the marine protected area framework for Kerguelen.

[11] See http://www.ccamlr.org/en/document/publications/vme-taxa-classification-guide

3.2. BYCATCH

3.2.1. Main bycatch species

The fishery has a bycatch consisting of three groups of taxa:

- grenadiers (macrourids) – mainly *Macrourus carinatus* (grenadier à gros yeux, ridge-scaled rattail)
- rays – mainly *Bathyraja irrasa* with perhaps some *B. eatonii*(Nowara et al. 2009)
- *Antimora* spp. – mainly *A. rostrata* (antimore, blue antimora, blue hake, violet cod …)

The grenadiers are retained and the antimoras are discarded because they are of low value. The regulations (TAAF 2012) say that rays should be cut off the line if they are alive, but in practice most are retained; SARPC report that they are not usually alive, and it is not clear that it is very easy to tell in the time period available for making a decision. Discards, with the exceptions of sharks and rays, are required to be brought into the factory and evaluated before discard, with the catch reported in logbooks. Ray discards are estimated by observers. Trends in catch of these taxa are shown in Figure 10.

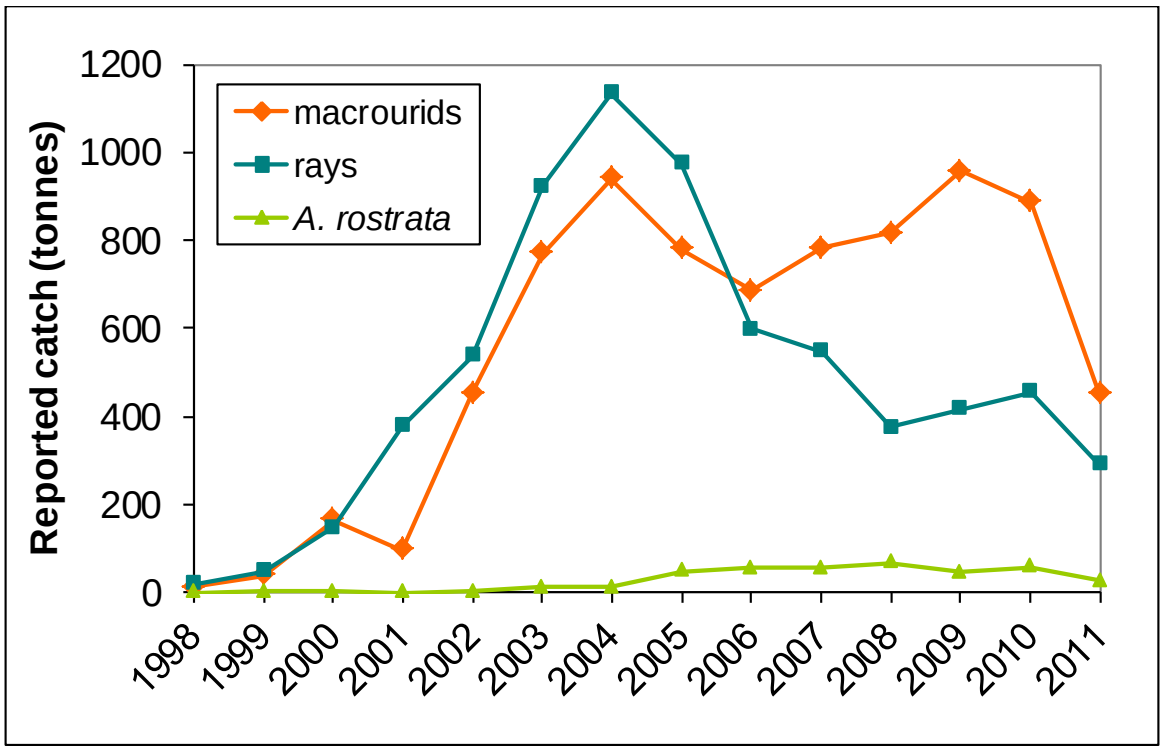


Figure 10. By-catch in the Kerguelen fishery (CCAMLR WG-FSA 2011, Appendix J). Note that the data set is incomplete before 2004.

The life history of these species is summarised below:

Macrourus carinatus: The geographical distribution of *M. carinatus* ranges from 35°S - 60°S in the southern Indian Ocean and to the south of Australasia (van Wijk et al. 2003). Eggs are released into the water column at spawning, with larvae experiencing long embryonic development and may be carried long distances in currents. Ontogenetic and seasonal migrations are exhibited with sexes moving separately to spawning grounds (Laptikhovsky, 2011). Length at first spawning is around 50cm, with maximum recorded length ~100cm (Cohen et al., 1990). They may live for 25 years (van Wijk et al., 2003). The species is relatively long-lived and slow growing, presumably due to the temperature of its surrounding environment; making it potentially vulnerable to high fishing pressure, although not much is known about its population dynamics.

Bathyraja eatonii: Eaton's skate was thought to have a circumpolar distribution in the southern hemisphere, but genetic analysis now suggests that it is confined to the Kerguelen plateau, with populations elsewhere being related species (Smith et al. 2008 – NEEDS TO GO IN REFS IF NOT THERE ALREADY). Published data on the life history are relatively sparse, but it is believed to be slow growing and late maturity, with a maximum size of around 100cm. IUCN assess the species as 'data deficient'.

Bathyraja irrasa: This species is also only known from the Kerguelen plateau. It is thought to have the slow growth rate, late sexual maturity and long lifespan characteristic of many other cold-water elasmobranchs, but very little is known for certain about its life history.

Antimora rostrata: The blue antimora has a circumglobal distribution from the tropics to high latitudes. It is a bathypelagic species, being mainly found below 1300m, and it appears to be a relatively abundant element of the fauna at this depth in many areas. It seems to feed mainly on invertebrates, including crustaceans and cephalopods. Maximum size is around 70cm[12].

3.2.2. Other bycatch species

In order to evaluate whether other vulnerable species may be occasional bycatch in the fishery, MEP reviewed the list of species taken in the POKER I and POKER II research cruises (2006 and 2010).

POKER lists three groups of species that were commonly encountered (noting this is a trawl survey not a longline survey): i) 'commercial' species; ii) plateau bycatch species (locally abundant) and iii) deep-water bycatch species (locally abundant). These are reviewed in Table 4.

[12] See http://www.fishbase.org/summary/Antimora-rostrata.html and references therein

Table 4. Abundant fish around Kerguelen, from POKER surveys.

Category	Species scientific name	Species common name	Comments
commercial all depths	*D. eleginoides*	toothfish / légine	target species
	Bathyraja eatonii	Eaton's skate	Ray bycatch species
commercial plateau	*Champsocephalus gunnari*	mackerel icefish	Not caught in the longline fishery
	Lepidonotothen squamifrons	grey rock cod	Mainly above ~350m[13] – no overlap with fishery
	Notothenia rossii	marbled rock cod	Only to 350m[14] – no overlap with fishery
	Channichthys rhinoceratus	unicorn icefish	Not reported as by-catch
commercial deep	*Bathyraja irrasa*	Kerguelen sandpaper skate	Ray bycatch species
	Macrourus carinatus	ridge-scaled rattail	Main macrourid species in bycatch
plateau by-catch	*Channichthys velifer*	sail icefish	Only to 150m[15] – NB: endemic to Kerguelen plateau
	Gobionotothen acuta	triangle rockfish	Only to ~300m
	Lepidonotothen mizops	toad notie	Only to ~250m
	Muraenolepis marmoratus	marbled moray cod	Zooplankton feeder – not likely to take longline bait
	Zanclorhynchus spinifer	Antarctic horsefish	Only to 400m
deep-water by-catch	*Alepocephalus cf. antipodianus*	Antipodean slickhead	Not reported as by-catch
	Antimora rostrata	blue antimora	Bycatch species
	Paradiplospinus gracilis	slender escolar	Not reported as by-catch
	Etmopterus spp.	Southern lanternshark	Occasional catch noted in observer report

Of these, the species that requires further analysis is the lanternshark. *Etmopterus* species inhabit deep water on the outer shelf and upper slope in the southern hemisphere. The species is recorded in the observer reports as *E. granulosus*, but seems more likely to be another species, e.g. *E. viator* (Straube et al. 2011). *Etmopterus*spp. are ovoviviparous, producing a litter of 10-13 pups (Last & Stevens, 1994). Males are thought to grow to ~70cm, and females ~80cm (Wetherbee, 1996). According to the 2007 IUCN Redlist

[13] See http://www.fishbase.org/summary/Lepidonotothen-squamifrons.html
[14] See http://www.fishbase.org/summary/Notothenia-rossii.html
[15] See http://www.fishbase.org/summary/Channichthys-velifer.html

Assessment (Kyne and Lamilla 2007), this species is listed as 'least concern'. It is taken in small amounts as bycatch in deepwater longline and trawl fisheries.

On this basis, given the small amount of catch and the 'least concern' ranking by IUCN, the team decided not to include the lanternshark as a 'main' bycatch species. The main retained bycatch species evaluated under PIs 2.1 were therefore grenadiers (*M. carinatus*) and rays (3 species) and the main discarded bycatch species evaluated under PIs 2.2 were *A. rostrata*.

3.2.3. Management of bycatch

The main tool for management of bycatch is a code of conduct (code de bonne conduit; Gasco and Duhamel 2011) prepared by MNHN in 2011 and integrated into the fisheries regulations in 2012 (TAAF 2012). This code is based on a close temporal and spatial analysis of haul-by-haul CPUE (catch per hook) for macrourids, rays and antimoras (as well as juvenile toothfish below the 60cm minimum size). The analysis proposes catch reduction targets of 20% for macrourids and 60% for rays and antimoras, and shows how this can be achieved by targeting a relatively small percentage of line sets in specific depth/area/season strata, which produce a large proportion of the total catch of these species. The code does not specifically ban fishing in given combinations of depth, area and season, but rather requires vessel skippers to use this data in deciding how and where to fish.

In addition to the code of conduct, there are specific regulations pertaining to bycatch:

- sharks and rays must be cut off the line, if alive and if possible
- bycatch aside from sharks and rays must be evaluated in the factory and the catch reported
- 'move on' rule: a haul of 2 tonnes or more requires the vessel to 'move on' at least 5 miles for at least 5 days (the same as for other CCAMLR fisheries).

3.3. INTERACTIONS WITH SEABIRDS

One of the main ecological concerns in relation to southern hemisphere longline fisheries has been incidental mortality of seabirds – albatrosses and petrels. In the early days of toothfish fishing, incidental mortality rates ran to many thousands of birds per year, and put populations in jeopardy. Since then, considerable progress has been made in eliminating this interaction by changing fishing practices – in which CCAMLR has played a leading role. Albatross mortality in longline fisheries has been eliminated (excluding IUU fisheries) by setting and hauling lines only at night. Mortality of petrels has, however, been more difficult to eliminate, because they forage at night.

3.3.1. Seabird species

At Kerguelen, two main species of petrels interact with the fishery: the grey petrel (*Procellaria cinerea*) and the white-chinned petrel (*Procellaria aequinoctialis*) (Figure 11). In recent years by-catches of *Macronectes* spp (giant petrels) have been very low and the last data available indicate a total of two observed deaths in this fishery, both *M. halli (*northern giant petrel*)*. ((CCAMLR WG-FSA 2011, Appendix J). Both this and the southern giant petrel *M. giganteus* (also listed by deLord et al, 2007 as a bycatch for fisheries around Crozet and Kerguelen) have a circumpolar distribution, appear likely to have increased in population in recent decades, and in 2009 were downlisted by IUCN to the status of "least concern" (Birdlife International, 2012c and d).

White-chinned petrels breed during the austral summer from November (egg laying) to April (fledging) and feed on fish, cephalopods and krill, whereas grey petrels breed during the austral winter from March to late September–early December and mainly feed on squid and fish (Barbraud *et al*, 2009; ACAP, 2009). Both are long-lived species with low fecundity, laying only one egg per year (Warham, 1990).

Figure 11. Left: Grey petrel (*Procellaria cinerea*)[16]; Right: white-chinned petrel (*Procellaria aequinoctialis*)[17]

[16] From www.wikipedia.org
[17] From www.acap.aq

The grey petrel has a circumpolar distribution, ranging between 32-58^{o} South, although females are known to forage further north than males, in waters north of the Subtropical Convergence, up to 1,460 km from their colonies on Sub-Antarctic islands (ACAP 2009; Birdlife International, 2012a). The species breeds on islands in the Tristan da Cunha group, the Prince Edward and Marion islands, the Crozet, Kerguelen and Amsterdam islands, the Campbell and Antipodes islands, and Macquarie Island (Birdlife International, 2012a). Although its population size is poorly known, Bell (2002) estimated the largest breeding population, thought to be on the Antipodes Islands, at 53,000 pairs in 2001. At Kerguelen the breeding population of grey petrels was estimated in 2004-6 at 1,900-5,600 breeding pairs, although this may have been an underestimate (Barbraud et al. 2009).

The white-chinned petrel is distributed widely in all southern oceans and forages north to the subtropics and south to the pack-ice edge off Antarctica. Outside the breeding season, individuals from the Kerguelen Islands also winter off the coasts of South Africa and Namibia over the Benguela Current. The species breeds on South Georgia, the Prince Edward Islands, Crozet, Kerguelen, Auckland Island and the Campbell and Antipodes Islands, and in small numbers in the Falkland Islands. For this species, population size is also poorly known but numbers have been recently estimated at 1,200,000 breeding pairs, down from 1,430,000 pairs in the 1980s – note that this is an order of magnitude larger than estimates of grey petrel populations. Kerguelen is considered a key breeding site for white-chinned petrels, which hosts most of the breeding population of the Southern Indian Ocean (Barbraud *et al*, 2009). Kerguelen's breeding population was estimated during the period 2004-6 at 186,000-297,000 pairs (Barbraud et al. 2009).

The grey petrel is listed as 'near threatened' on the IUCN Red List while the white-chinned petrel was moved from an IUCN listing of 'lower risk'/ 'near threatened' to 'vulnerable' in 2000 (Barbraud *et al*, 2009; Birdlife International, 2012a and b). Both species nest in burrows and are susceptible to predation by introduced mammalian predators (e.g. mice, cats and rats), breeding habitat disturbance by animals such as Antarctic fur seal and introduced rabbits and reindeer, climate fluctuations, plastic ingestion and persistent organic pollutants, as well as bycatch in longline fisheries (Barbraud *et al*, 2011; Birdlife International, 2012a and b).

Barbraud *et al* (2009) estimated that for the Kerguelen populations, any additional source of mortality that, respectively, approaches 300 and 31,000 individuals for grey petrels and white-chinned petrels would likely result in a decline. For white-chinned petrels in the Indian Ocean, the legal longline fishery for toothfish killed ~12,400 birds annually between 2001 and 2003 (Delord *et al*. 2005). This figure has dropped massively following the introduction of mitigation measures, but estimates do not take into account bycatch by IUU vessels or birds killed by fisheries in the more distant waters of the Benguela Current marine ecosystem where individuals from the Kerguelen Islands spend the winter (Birdlife International, 2012b). For grey petrels, a minimum of ~750 birds were killed annually in legal and illegal toothfish fisheries operating around Kerguelen up to ~2005 (Barbaud *et al*, 2009); again, this mortality rate has dropped enormously, at least in the legal fishery. Nonetheless, this mortality has had an impact on petrel

populations at Kerguelen, which may be exacerbated by the fact that it tends to target mature foraging females (references cited in Birdlife International, 2012a).

Clearly, therefore, the estimates of trends in mortality of petrels by this fishery, current mortality rates and efforts made to eliminate petrel bycatch, form a critical part of the assessment of this fishery against the MSC standard.

3.3.2. Seabird mortality rates at Kerguelen

Estimates of seabird mortality at Kerguelen from the toothfish fishery are given in Figure 12.

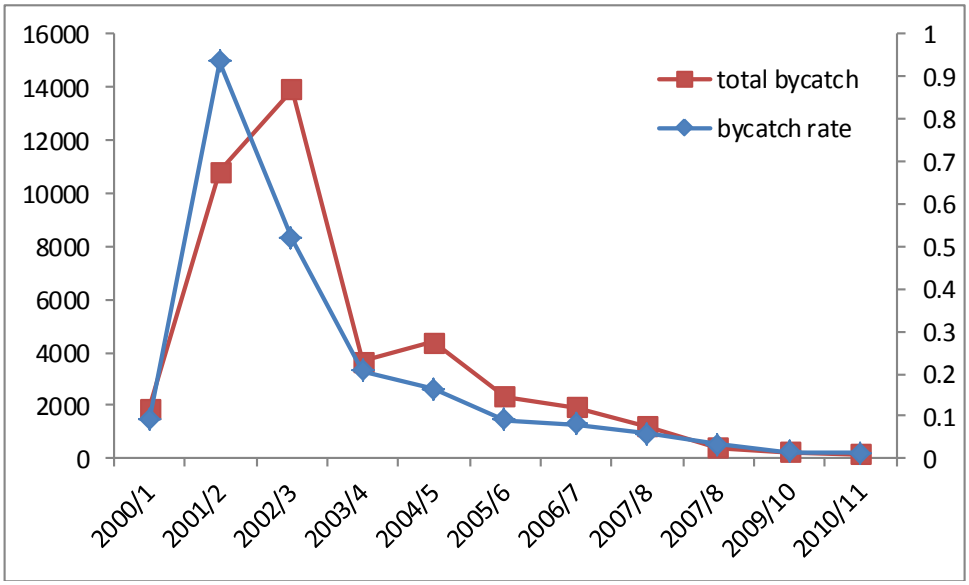


Figure 12. Total bycatch of seabirds and bycatch rate (catch per hook) at Kerguelen over time. Note that first four years of data include estimates of IUU fishing which are not likely to be very reliable.

The bird mortality figures for the 2010-2011 season (the most recent for which data are available) break down as in Table 5. Note that the estimated values relating to 'maximum sustainable mortality' are based on uncertain data and should be used with caution.

Table 5. Estimated mortality of grey and white-chinned petrels in the Kerguelen fishery, with demographic implications. Note that the assessment team found two figures for extrapolated mortality – one from the CCAMLR Scientific Committee report on Kerguelen (CCAMLR-SC 2011, Appendix J) and one from WG-IMAF 2011, Annex 8. Since these start with the same figures, it is not clear where the differences come from. Where relevant, both figures are given.

Estimate for Kerguelen fishery 2010-11	Grey petrels	White-chinned petrels
total observed mortality birds both species	49	
total observed mortality by species	7	42
total extrapolated mortality all spp. (CCAMLR)	155 / 193	
estimated total mortality by species (total extrapolated	22 / 28	133 / 165

Estimate for Kerguelen fishery 2010-11	Grey petrels	White-chinned petrels
mortality x proportion of observed mortality of that species)		
estimated total mortality which can be supported by population per year (Barbraud et al. 2009)	300	31,000
estimated total numbers killed by fishing on population (Barbraud et al. 2009)	262 / 268 *	**
% of fishing mortality on pop coming from this fishery	8.4% / 10.4% *	**
% of minimum estimate of maximum 'sustainable' mortality (180) coming from this fishery	12% / 16%	0.5%

*these figures take the improvement in this fishery and assume there has been no change in the other sources of fishing mortality

** an unknown number of white-chinned petrels from the Kerguelen population are taken as bycatch when overwintering in the Benguela current system

3.3.3. CCAMLR risk assessments for seabird bycatch

CCAMLR ranks each of its fishing areas according to a risk assessment of seabird bycatch (Waugh et al. 2008). This ranking is based on a risk-assessment process which considers:

- seabird foraging distribution
- seabird breeding numbers
- seabird catch rate
- implementation of conservation measures by the fishery

The risk assessment process is iterative, and therefore allows evaluation of i) the inherent risk associated with a given area; ii) the performance of the fishery (allowing management advice to be given) and iii) the effectiveness of the conservation measures (Waugh et al. 2008).

The area around Kerguelen is ranked as 'high risk' (ranking 5 out of 5) for seabird interactions in fisheries (Figure 13). This is for several reasons:

1. Kerguelen and Crozet are the only two remaining areas which report seabird bycatch in any numbers – all other CCAMLR fisheries report single figures or zero bycatch.
2. The fishery was relatively slow in implementing CCAMLR conservation measures, although they are all now implemented in full.
3. Kerguelen hosts very large and globally significant breeding populations of petrels.

4. The seasonality of the two species is opposite: white-chinned petrels breed in summer and have a relatively short peak in foraging in late summer (February-March). Grey petrels, conversely, breed in winter and have a longer foraging peak throughout the austral winter. This means that there is no straightforward means of avoiding the peak foraging period, in contrast to other fisheries (e.g. South Georgia – Moody 2009).

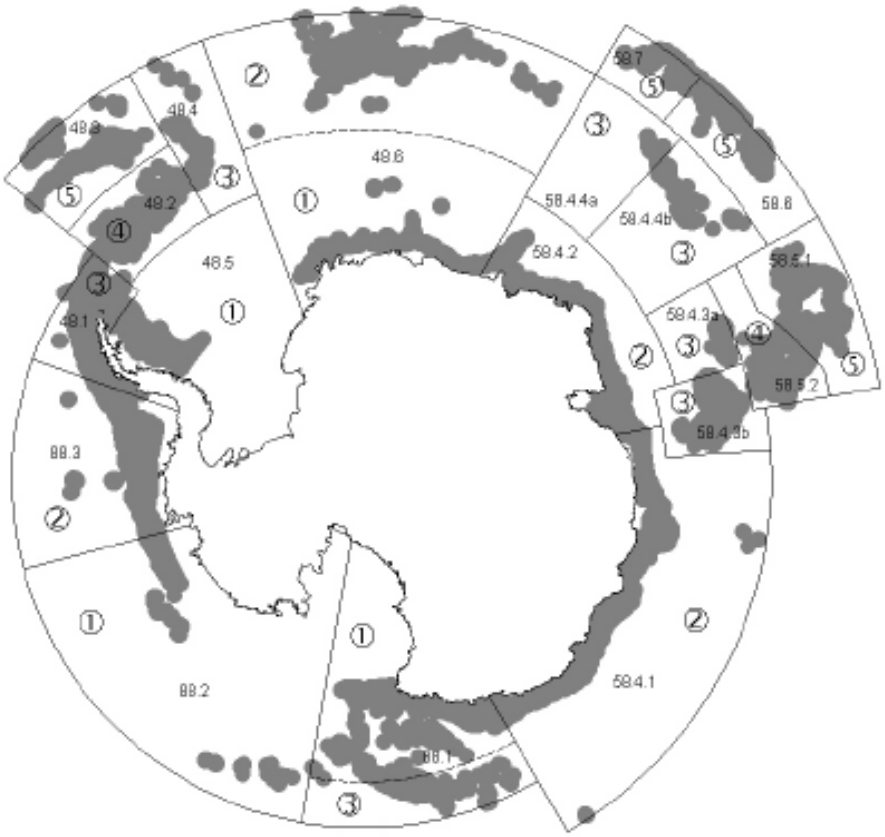


Figure 2: Assessment of the potential risk of interaction between seabirds, especially albatrosses, and longline fisheries within the Convention Area. 1: low, 2: average to low, 3: average, 4: average to high, 5: high. Shaded patches represent seabed areas between 500 and 1 800 m.

Figure 13. CCAMLR areas with risk ratings for seabird interactions in fisheries; from 1=low risk to 5=high risk (CCAMLR-SC 2009). Shaded areas represent seabed between 500 and 1800 m – i.e. toothfish fishing areas. Kerguelen is 58.5.1 on the extreme right of the map, with risk level 5.

Figure 14 shows the trends in bird mortality in the CCAMLR areas rated 'high risk' for seabird interactions. Note, however, that the Heard fishery is partly a trawl fishery and therefore not directly comparable with the others. In addition, the Heard area (58.5.2) is rated risk 4, while the others are rated 5.

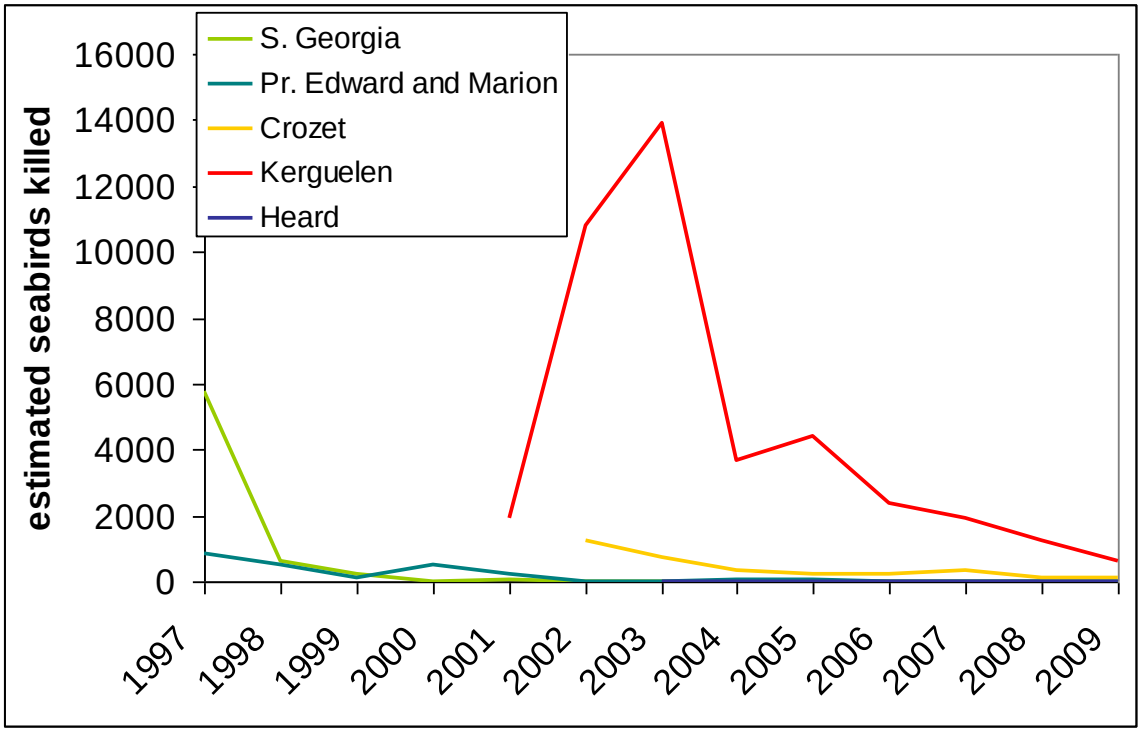


Figure 14. Estimated annual seabird mortality in the CCAMLR areas rated 4 or 5 for risk of seabird interactions. As noted in the text, Heard is not directly comparable with the other areas. The big peak in estimated mortalities at Kerguelen corresponds with the peak in IUU fishing (CCAMLR-SC 2009).

3.3.4. Management of seabird bycatch at Kerguelen

France has put in place an Action Plan for reducing bird mortality, which has been in operation since 2005 (reviewed in Marteau 2009). The initial focus of the Action Plan was i) a closed period at Kerguelen during the main period of foraging by white-chinned petrels (in 2012 this period was 1 Feb.-15 March; TAAF 2012) and ii) the implementation of all the various CCAMLR guidelines and requirements for reducing bird mortality, as set out in CCAMLR CM 25-02. These include:

- line weighting
- setting at night with minimal lights
- no dumping of offal / discards during setting and hauling
- remove hooks from offal
- streamer lines
- bird exclusion device during hauling if weather permits
- release alive if possible

All vessels now implement all the CCAMLR requirements as a matter of course, but it is still reportedly noticeable that some vessels have consistently higher bird bycatch than others. The focus of the Action Plan now is to bring all the vessels to the level of the best performing. Incentives for this have been put in place via the distribution of quota, which varies from 655 t to 833 t per vessels, depending partly on performance in relation to bird mortality. An assessment of the effectiveness of the French bird Action Plan is presented in Table 6.

Table 6. Assessment of effectiveness of actions in the French bird Action Plan (Marteau 2009).

Action	Effectiveness	Notes
Increase line immersion speed to 0.22-0.24 m/s	Very effective	CCAMLR CM 24-07
Defrosting bait so that it no longer floats	Effective	Observers check that bait is defrosted
Use of a line shooter to speed up line deployment	Unclear	Three vessels had line shooters as of 2010
Streamer lines	Effective if implemented properly	Must be at least 7m high to give coverage over 100m
Brickle curtain	Very effective	Tested in 2007, resulting in 44% drop in mortality – now mandatory
Seasonal closure 1 Feb.-15 March	Very effective	The préfet of the TAAF also has wider powers for seasonal and area closures for one, several or all vessels, if deemed necessary.
Line setting only at night with minimal lights	Very effective	Has eliminated albatross mortality – unfortunately petrels forage at night
No discarding offal etc. during fishing operations	Unclear	
Discards must not include hooks	Very effective	Difficult for observers to monitor. Crews have been educated on the issue.

3.4. INTERACTION WITH MARINE MAMMALS

In some areas, resident orca populations have learned that they can feed on the toothfish as the line is hauled. There are no negative impacts on the orcas from this behaviour, but it is obviously a problem for the fishery. At Crozet, where this behaviour has become entrenched in local populations, orca depredation rates can reach 20% or more (Roche et al. 2007), and has to be factored into the TAC. The same behaviour has been reported in sperm whales, but apparently not in this fishery. At Kerguelen, orca populations have not learnt this behaviour, and in order to prevent them from doing so, it is forbidden to engage in fishing activity in the presence of orcas (TAAF 2012).

4. STOCK STATUS AND ASSESSMENT

4.1. INFORMATION AVAILABLE

The information available on the toothfish stocks at Kerguelen is summarised in Table 7.

Table 7. Information available for input into Kerguelen toothfish stock assessment.

Information	Kerguelen
Basic biological information – length/weight, aging (scales), size at maturity, sex ratios, reproduction etc.	Yes – two research cruises – POKER I (2006) and POKER II (2010). Data from Heard also likely to apply (single stock or metapopulation).
Tagging data – migration, population structure	17,200 toothfish tagged since 2006, with 1,299 recaptures. Some evidence for long distance movements although most recaptures local (Rélot-Stirnemann 2012).
Genetic studies	Yes – joint France-Australian work suggests no genetic differentiation between Kerguelen and Heard
Fishery-independent biomass estimates	Yes but only down to 1000m – POKER I and POKER II random stratified trawl survey. Biomass extrapolations made using two methods (TRAWLCI and Australian method)
Catch and effort data for this fishery	Yes – from logbooks and observers
Catches for other fisheries, including IUU	Yes – catch data collected from other French and foreign fisheries back to 1979. Rates of IUU estimated by CCAMLR.
Standardised CPUE	Yes – longline CPUE standardised for month and year effects, also calculated separately by area
Length-frequency in catch	Yes – observers and quayside inspections
Catch at age	Yes – calculated from catch length-frequency and Australian size at age data (Rélot-Stirnemann 2011, 2012)
Estimate of depredation rate	Yes – observers

In addition, a joint French-Australian assessment of the toothfish stock across the whole Kerguelen plateau (treating it as one stock) includes catch, CPUE, survey and biological data from the HIMI EEZ. This stock assessment is considered in more detail below.

4.2. TRENDS IN CPUE

Trends in CPUE at Kerguelen are given in Figure 15. CPUE declined in the early days of the French fishery – probably due to very high IUU catches between 1997 and 2003 (see Figure 7). Since then, CPUE has stabilised and may be starting to increase. Note that

these data do not take into account depredation rates (by predators) – but a CCAMLR analysis (WG-FSA 2011, Appendix J) suggests that this makes very little difference at Kerguelen.

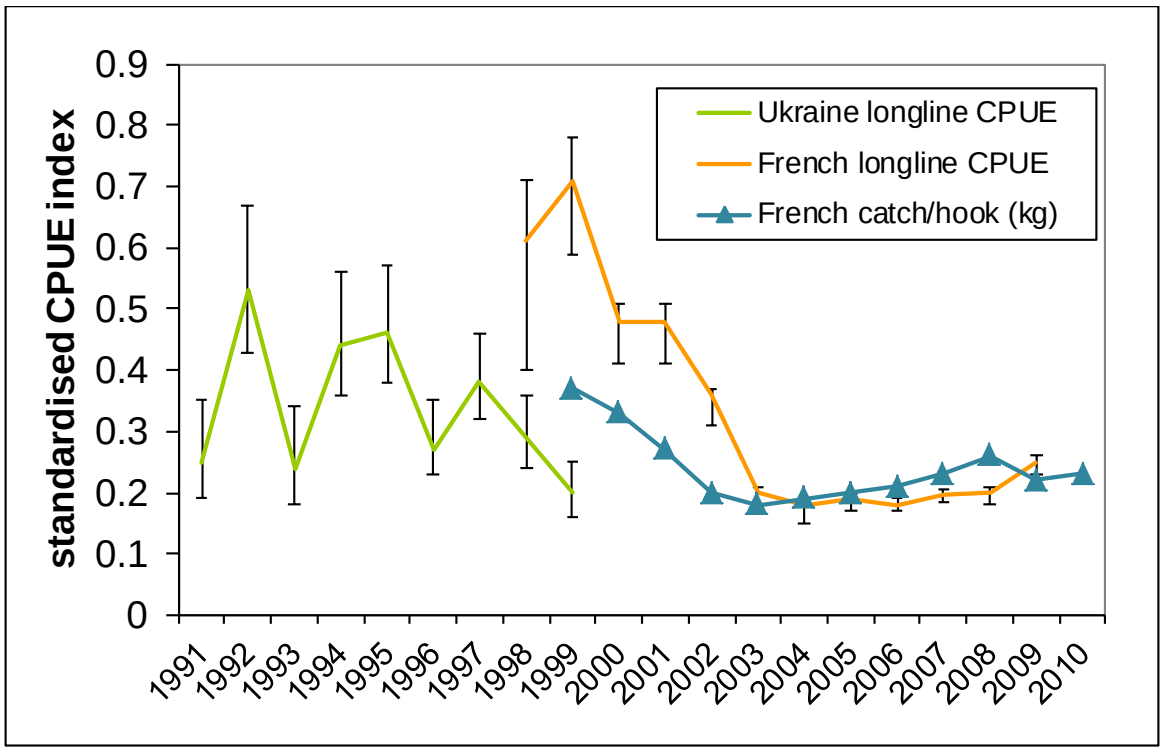


Figure 15. Trends in CPUE at Kerguelen. The green and orange data sets are GLMM standardised, taking into month, nationality, depth and number of hooks (fixed effects) and individual vessel (random effect), up to the 2008-9 season (Rélot 2010). The blue data set is non-standardised catch per hook (kg) for the French longline fleet (WG-FSA 2011, Appendix J). Overall trends in standardised CPUE since 2008-9 are not presented because the 2011 and 2012 stock assessment reports provide estimates only by area/depth (the stock assessment divides the Kerguelen EEZ into 4 area and 2 depth strata).

4.3. STOCK ASSESSMENT

4.3.1. Stock assessment history

Prior to 2010, there was no formal stock assessment process as such. A one-off estimate of the biomass of toothfish at Kerguelen, down to 1000m, was made using the results of the POKER I research cruise in 2006, and the TAC of 5000 tonnes, increased to 5100 tonnes in 2010, was considered to be conservative on the basis of these estimates.

In 2010, work was started by the scientific authority (MNHN) on the development of a formal stock assessment model for Kerguelen, in collaboration with SARPC and with the Australian stock assessment scientists working on the HIMI stock. The aim of this work was eventually to bring Kerguelen in line with the stock assessment process used in other CCAMLR toothfish fisheries (e.g. HIMI, S. Georgia) and in the first instance to make a preliminary assessment of the current management regime against the CCAMLR

precautionary management rules. The stock assessment was improved in 2011 (Rélot-Stirnemann 2011), in collaboration with Australian scientists (Candy et al. 2011), and was updated in 2012 (Rélot-Stirnemann 2012). In 2011, a joint Kerguelen-HIMI stock assessment was presented to the CCAMLR Working Group on Statistics and Methods (SAM). In 2012, the Kerguelen stock assessment was formally submitted to the CCAMLR WG-FSA for peer review (Rélot-Stirnemann 2012). This stock assessment work was initially funded by SARPC, but is now funded by TAAF as part of the management of the fishery. MNHN is the organization responsible.

This stock assessment uses the stock assessment tool CASAL (C++ algorithmic stock assessment laboratory), which is the standard tool used by most CCAMLR toothfish fisheries. CASAL, which was developed by NIWA (New Zealand), is a generalised fish stock assessment model that can be age- or size-structured, and allows considerable flexibility in both inputs and outputs, depending on the species in question and the data sets available. As well as age or size structure, the population can be structured by sex, maturity or growth stages, and can incorporate multiple stocks, fishing areas and/or depths and fishing methods (these are treated as different 'fleets'). Time can also be structured in various ways, although the basic time step in the model is annual. Input data can include catch-at-age or catch-at-size from fisheries or surveys, fisheries-independent biomass indices, fisheries CPUE and tagging data. Estimation techniques include least-squares, maximum likelihood or Bayesian. CASAL can be used to generate estimates of various parameters of interest, and can also be used to undertake projections of future stock trajectories.

4.3.2. Structure of the model

The Kerguelen stock assessment model is currently structured as follows:

- 35 age classes (1 to 35+)
- Sexes combined, population move through year classes according to growth and maturity curves.
- Temporal structure: Year divided into three seasons following the CCAMLR fishing season (1 Dec. – 31 Nov.). The three seasons are 1 Dec–30 April, 1 May-30 Sept, 1 Oct-30 Nov. (The French fishing season runs from 1 Sept to 31 August, but the model follows the CCAMLR system in order to be more easily comparable with other assessments, and particularly in order to facilitation joint stock assessment work with Australian scientists.
- Spatial structure: four fishing areas (North, East, South and Skiff Bank – see Figure 16), and two depth zones (<1500m and >1500m) (Note: in CASAL this is done by creating several 'fleets' – one for each depth zone in each area – rather than by introducing spatial structure directly in the model);
- Analysis using Bayesian techniques.

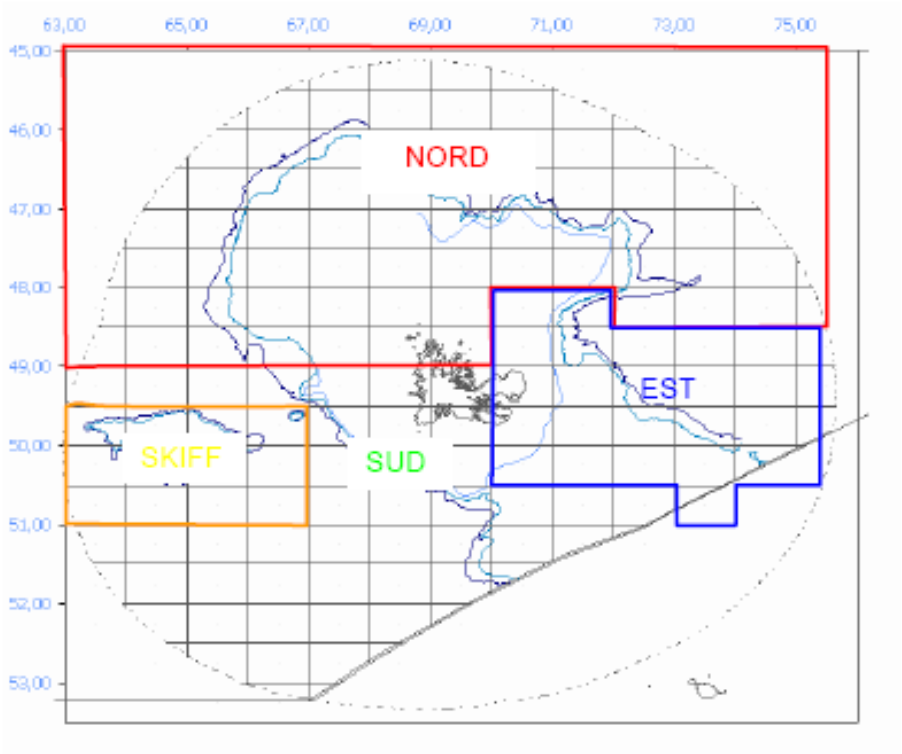


Figure 16. Spatial structuring of the model (Rélot 2010)

4.3.3. Structure of the fishery

Taking into account historic as well as current fishing activities at Kerguelen, seven fishing fleets can be identified (see also Figure 7):

- French longliners (current fishery)
- Ukrainian longliners
- French trawlers
- Ukrainian trawlers
- Franco-Japanese trial fishery on the Anyo Maru (1996)
- POKER I and II (2006, 2010) - scientific catch
- POKER I and II – post-survey commercial catch (a requirement to help fund the survey)
- IUU fishing

Each of these fleets (including the longline fleets divided by area and depth) is associated with a selectivity curve, which were modelled following Australian and New Zealand examples, either as normally distributed curves or as truncated ('plateau') normal curves. The selectivity curves for POKER were also adjusted to take into account that sampling was only possible down to 1000m. Selectivity curves for each fleet were kept constant throughout the year, since Australian work reportedly shows that seasonal variation in the

selectivity curves make little difference (see Rélot-Stirnemann 2012 and references therein).

4.3.4. Data sets used in the model

The model incorporates the following data sets:

- Legal catches from 1979-2012 by fleet and by CCAMLR year (or by season for the longline catches)
- Estimated IUU catches 1987-2012
- Estimated abundance by size class from POKER I and II
- French and Ukrainian longline CPUE from 1991-2012 (kg/hook), normalised using GLMM for month and year effects (trawl CPUE was not used because no data was available on trawl diameter)
- Commercial catch size structure
- Tag/recapture data from 2006-2012

Catch data were entered directly into the model (as fishing mortality on the relevant part of the population according to the relevant selectivity curve – fishing mortality was inflicted instantaneously at the mid-point of each season). The other data sets were used to estimated model parameter values.

The model also uses the following biological parameters:

- Length weight relationship from measurements made during POKER I
- Growth and maturity curves the same as those used at HIMI (considered likely that there is a metapopulation structure on the Kerguelen plateau)
- Natural mortality estimated at 0.155/year from Australian studies.
- Beverton-Holt stock recruit relationship, with the 'slope' parameter *h* set to 0.8.

4.3.5. Model analysis and problems

The model was analysed using Bayesian techniques. The stock assessment model has always (since 2010) suffered from the problem that the fisheries-dependent data and the fisheries-independent data are somewhat contradictory. The standardised CPUE data and the catch-at-length data suggest a lower biomass, while the POKER and tagging data suggest a higher biomass. Putting all the data sets together, the combined best estimate (minimum 'MPD' or marginal probability distribution in Bayesian-speak) of pre-fishing biomass B_0 is around 218,000 tonnes (Figure 17).

The problem of clashing data sets is exemplified by the CASAL model estimates of the biomass from the POKER surveys vs. the biomass estimated from the raw data following an Australian methodology (Rélot-Stirnemann 2011;). Rélot-Stirnemann (2012) notes that this problem remains unexplained.

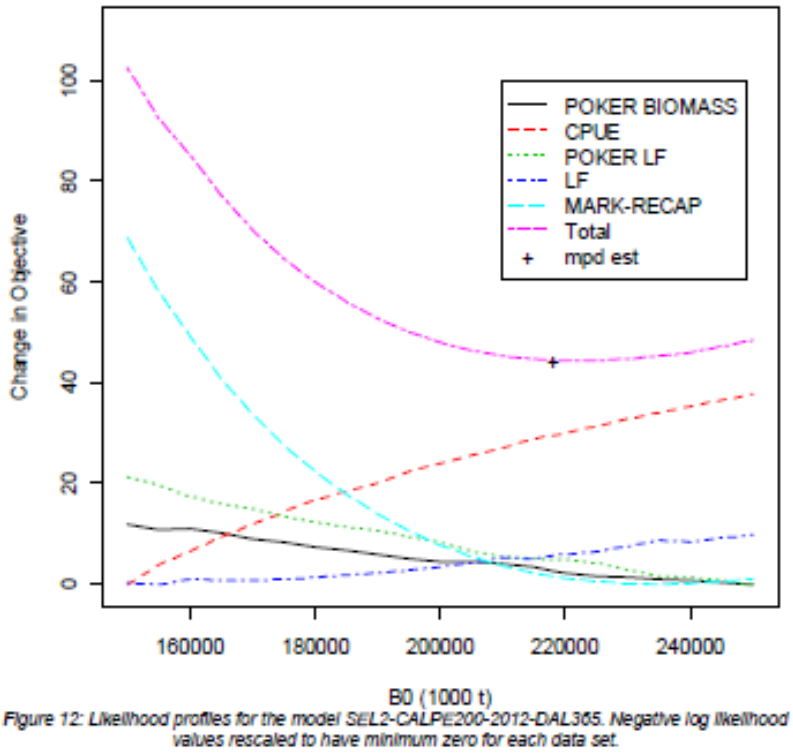


Figure 12: Likelihood profiles for the model SEL2-CALPE200-2012-DAL365. Negative log likelihood values rescaled to have minimum zero for each data set.

Figure 17. Output from Bayesian analysis of stock assessment model. Lines are likelihood profiles for each data set for a range of values of B_0 (x-axis). For each data set, the most 'likely' value of B_0 is found where the likelihood profile is minimised. The overall 'most likely' value of B_0, according to the model, is where the total set of likelihood profiles are minimised – i.e. where the MPD is minimised (black dot). It is clear from this figure that the CPUE data (red dashed line) largely contradicts the other data sets (Rélot-Stirnemann 2012, Figure 12).

Table 8. 'Observed' biomass from POKER (as computed from the raw data) vs. CASAL estimates (model output)

POKER survey	Observed biomass tonnes (CV)	CASAL model estimate (tonnes)
2006	121 432 (0.1804)	66 479
2010	82 659 (0.1525)	42 071

Another issue relates to the observed decline in CPUE for the French longline fleet from 2000-2005 (see Figure 15 above), which is not predicted by the model and which is difficult to explain. Since this period coincided with the peak in IUU activity, a possible explanation is that IUU catch was considerably higher than the estimated values used in

the model – unfortunately, however there are no concrete data against which to evaluate this hypothesis (but see sensitivity analyses described below).

4.3.6. Model outputs

Table 9 summarises the maximum likelyhood estimates for pre-exploitation biomass and recruitment, as well as spawning stock biomass in 2012.

Table 9. Summary of maximum likelyhood estimates for pre-exploitation biomass and recruitment, as well as spawning stock biomass in 2012.

B_0 ('000 t)	SSB 2012 ('000 t)	SSB 2012 / B_0 (%)	R_0 (million)
218	157	72	12

As well as estimating parameter values, CASAL can be used to run stochastic projections of future biomass based on various scenarios. In this case, projections were run to look at trends in SSB over 35 years, with a constant catch equal to the current TAC (5100 tonnes). The distribution of catch between fleets (geographic and depth zone for the French longliners) was defined from the distribution of catch from 2007-2011, and was kept constant through the 35-year projection horizon. The results of this exercise are shown in Figure 18.

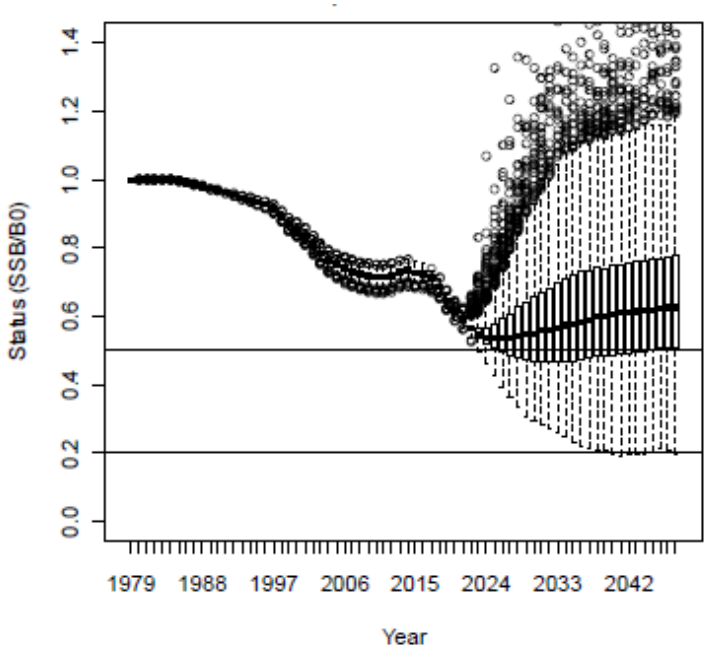


Figure 21: Projection results to status of spawning stock biomass relative to B_0 for SEL2-CALPE200-2012-DAL365 model with a constant annual catch of 5,100 tons. The thick and continuous line represents the SSB median. The two horizontal lines show CCAMLR decision rules.

Figure 18. 35-year projection of biomass under constant TAC of 5100 tonnes. The thick central line is the median outcome, other areas are assumed to be 50% and 75% quartiles and the dots outliers (although the reference does not state this explicitly). Biomass on the y-axis is given as a proportion of the estimated B_0 of 218,000 tonnes. The horizontal lines correspond to the CCAMLR reference points (Rélot-Stirnemann 2012).

These outputs can be compared to the CCAMLR reference points for toothfish, which are expressed in probabilistic terms (shown as the horizontal lines on Figure 18):

- Probability of depletion: The risk of B dropping below 20% of B0 over a 35-year harvesting period should be 10% or less;
- Level of escapement: B at the end of a 35-year harvesting period should be 50% of B0 with a probability of at least 50%.

The model output suggests that with the current TAC, the probability of the biomass dropping below 20% of pristine biomass is acceptably low (~2%), and the biomass at the end of 35 years should be at or above 50% of pristine biomass with a probability of 62% (Table 10). The model has not so far been used to try and calculate the maximum TAC that would conform to CCAMLR decision rules.

Table 10. Comparison of the two scenarios with the CCAMLR risk-based reference points.

	model projection (median)	CCAMLR reference point
Probability of depletion	0.002 (0.2%)	<0.1 (10%)
Level of escapement	0.62 (62%)	>0.5 (50%)

The biomass estimates which come out of this modelling exercise are broadly congruent with biomass estimates on the Australian part of the Kerguelen plateau (HIMI). B_0 estimates for the Australian EEZ are in the range of 100,000-300,000 tonnes, while the joint assessment gives an estimate of 297,000 tonnes, suggesting that B_0 might have been ~100,000 tonnes on the Australian side and 200,000 tonnes on the French side (which is approximately twice the area).

4.4. MODEL REVIEW AND CCAMLR ADVICE

In 2011, the model (Rélot-Stirnemann 2011) was presented to the CCAMLR WG-FSA informally, but was not reviewed by them in detail. In 2012, the model was formally submitted to WG-FSA (Rélot-Stirnemann 2012).

The report of WG-FSA (2012 – draft) concludes the following (explanatory notes in square brackets):

41. An integrated assessment using CASAL for the *D. eleginoides* fishery was presented in WG-FSA-12/09. The Working Group discussed several issues regarding model fits to catch rate, tagging and length-frequency data by the base model. Biomass estimates from the Poker surveys were substantially underestimated (by about half of the observed values), the estimated length-frequencies for the Poker surveys were bimodal compared to the unimodal observations, the CPUE estimates did not fit well the initial high observations of the time series when high levels of IUU fishing were reported, and tag-

recaptures from all release years tended to be overestimated in the first year of liberty and underestimated in subsequent years at liberty.

42. A series of sensitivity runs were conducted during the meeting to explore the effects of different data sources and assumptions on model outputs (Table 11). Three scenarios with fixing the year-class strength to 1, excluding CPUE data for the model fit, and assuming twice the observed levels of IUU catches in each year resulted in estimates of B0 ranging from 215 835 - 244 460 compared to 218 078 in the base case. SSB status [SSB in 2012 as a percentage of B0] was lower and ranged from 0.62 - 0.67 compared to 0.72 in the base case.

43. In addition to these sensitivity runs, the WG recommended to further investigate variable numbers of fisheries based on similarity in the data and selectivity estimates, investigate the effects of IUU catches, display the time series estimated for cryptic spawning biomass, and incorporate age data from Poker surveys and fisheries catches as it becomes available. Based on WG-SAM-11/18, tagging data should also be restricted to recaptures with 5 or less years at liberty.

Management Advice:

44. The Working Group agreed that the model described in WG-FSA-12/09 (and subsequent sensitivities run during the meeting on the request of the subgroup) is suitable for an interim management advice for the coming year of 5,100 tonne catch limit for 2013. An improved model should be presented next year for further review prior to further recommendations. The Working Group also recommended that for WG-FSA-2013 the Kerguelen assessment should:

i) Investigate using a simpler model with fewer fisheries (shallow water, deep water?) based on similarity of data

ii) use only five years at liberty tag data

iii) incorporate age data from Poker surveys and fisheries catches as it becomes available

iv) investigate selectivities, display the time series estimated for cryptic spawning biomass

v) better understand IUU fishing effects on unfished biomass estimate (increase the IUU values supplied to the model)

vi) compare results from a configuration with ycs=1, no CPUE data, to the base case.

45. No new information was available on the state of fish stocks in Division 58.5.1 outside areas of national jurisdiction. The Working Group therefore recommended that the prohibition of directed fishing for *D. eleginoides*, described in CM 32-13, remain in force.

Table 11. Values of B0, SSB, SSB status, and ratio of model estimates of Poker survey biomass to observed for four scenarios of the Kerguelen model for Division 58.5.1, including the base case (Scenario 1). In Scenario 2, year-class strength (YCS) was fixed to 1, Scenario 3 excluded CPUE data and Scenario 4 assumed twice the observed levels of IUU catches in each year.

Scenario	1. Base case	2. YCS fixed to 1	3. Without CPUE	4. IUU catches X 2
B0	218078	215835	244460	223179
SSB	156916	132750	158582	150441
Status SSB	0.72	0.62	0.65	0.67
Poker 1	0.55	0.57	0.57	0.55
Poker 2	0.51	0.84	0.87	0.51

The sensitivity analyses (Table 11 above[18]) are of interest in that they show:

- Under various assumptions, SSB status remains above the CCAMLR reference point level (0.50 – 50%), although it is reduced relative to the 'base case' set out above.
- None of the scenarios used in the sensitivity analyses were able to solve the problem of the underestimate of POKER biomass estimates by the model, although Scenario 2 (no recruitment variability) and Scenario 3 (CPUE excluded from the model) did improve the match to some extent, at least for POKER II.
- The effect on model output of doubling IUU catches was surprisingly small.

Based on the conclusions of the WG-FSA, the CCAMLR Scientific Committee came to the following conclusions:

3.2.29 In 2011/12, the catch limit of *D. eleginoides* set by France in its EEZ in Division 58.5.1 was 5 100 tonnes (season 1 September to 31 August), allocated to seven longliners. The catch for the current CCAMLR season reported to October 2012 was 2 957 tonnes.

3.2.30 The Scientific Committee noted that WG-FSA had reviewed an assessment of *D. eleginoides* in Division 58.5.1. The integrated assessment model, fitted using CASAL, included catch, CPUE and length-frequency data from the commercial fishery (1979–2012), IUU estimates, abundance estimates from scientific surveys and tagging data to derive estimates of yield. Several issues had been identified regarding model fits to catch rate, tagging and length-frequency data in the model.

3.2.31 A series of sensitivity runs were conducted during the WG-FSA meeting to explore the effects of different data sources and assumptions on model outputs. Three scenarios were run with the year-class strength fixed to 1, excluding CPUE data for the model fit, and assuming twice the observed levels of IUU catches in each year. This

[18] The WG-FSA report for 2012 is still in draft form

resulted in estimates of B_0 ranging from 215 835 to 244 460 tonnes compared to 218 078 tonnes in the base case; SSB status ranged from 0.62 to 0.67 compared to 0.72 in the base case.

3.2.32 The Scientific Committee welcomed the revised assessment and noted the progress made in the development of the model for this important exploited stock during the intersessional period. It endorsed the work plan for an improved stock assessment recommended by WG-FSA as outlined in SC-CAMLR-XXXI/04, paragraph 4.24(i) to (v).

Management advice:

3.2.33 The Scientific Committee agreed that the current catch limit of 5 100 tonnes for *D. eleginoides* in Division 58.5.1 could be used as management advice for 2012/13. It also agreed that a more robust stock assessment was required to provide advice on catch limits beyond 2012/13.

3.2.34 Prof. Duhamel noted that France intends to progress the work plan outlined by WG-FSA during the intersessional period and to present a more robust stock assessment model to the 2013 meeting of WG-FSA.

3.2.35 No new information was available on the state of fish stocks in Division 58.5.1 outside areas of national jurisdiction. The Working Group therefore recommended that the prohibition of directed fishing for *D. eleginoides*, described in CM 32-13, remain in force.

4.5. FUTURE WORK PLAN

MNHN intends to continue updating and refining the stock assessment, basing its work on the work plan proposed by WG-FSA and endorsed by the Scientific Committee of CCAMLR. This workplan is (for reference):

- Investigate using a simpler model with fewer fisheries
- Use only five years at liberty tag data
- Incorporate age data from Poker surveys and fisheries catches as it becomes available
- Investigate selectivities, display the time series estimated for cryptic spawning biomass[19]
- Better understand IUU fishing effects on unfished biomass estimate (increase the IUU values supplied to the model)

[19] Biomass that is not available to be sampled – e.g. by POKER (below 1000m) or by the fishery (above 500m).

- Compare results from a configuration with year class strength (YCS) =1, no CPUE data, to the base case.

To this end, MNHN have acquired a member of staff in Professor Duhamel's laboratory, who will take charge of the stock assessment for this fishery and will present a revised assessment to CCAMLR in 2013.

4.6. JOINT FRENCH-AUSTRALIAN STOCK ASSESSMENT

As noted above, as well as the stock assessment for Kerguelen, which has been greatly informed by interaction between French and Australian scientists, there has also been an explicit joint stock research programme, with a joint stock assessment for the whole Kerguelen plateau presented to CCAMLR WG-SAM in 2011 (Candy et al. 2011). The objectives of these process were, in broad terms, i) to test whether the model output was broadly congruent with the separate assessments; ii) to see whether additional data from HIMI could resolve the problems of data fit in the French assessment and iii) to see if further light could be shed on the levels and impact of past IUU fishing in both EEZs.

The structure and process for this stock assessment is basically the same as described above, so it is not further described here. The results of the assessment are given in Table 12. The estimated trend in biomass from 1982-2011 from this model is given in Figure 19. As already noted, the estimated B_0 of 297,000 tonnes over the whole plateau is broadly congruent with the French stock assessment (estimated B_0 in the French EEZ 218,000 tonnes) as well as the Australian assessment (range of estimated B_0 100,000-300,000), although suggesting that the lower biomass estimates for the Australian EEZ are perhaps more likely.

Table 12. Output from joint stock assessment for Kerguelen plateau (Kerguelen and HIMI EEZs) (Candy et al. 2011).

B_0 ('000 t)	SSB 2011 ('000 t)	SSB 2011 / B_0 (%)	R_0 (million)
297	176	59.4	19.8

In relation to the issues of data fit, the model did not resolve them entirely, but did provide a better fit to the data of POKER II (95%), although not POKER I (50%). It did not resolve the question of IUU fishing impacts.

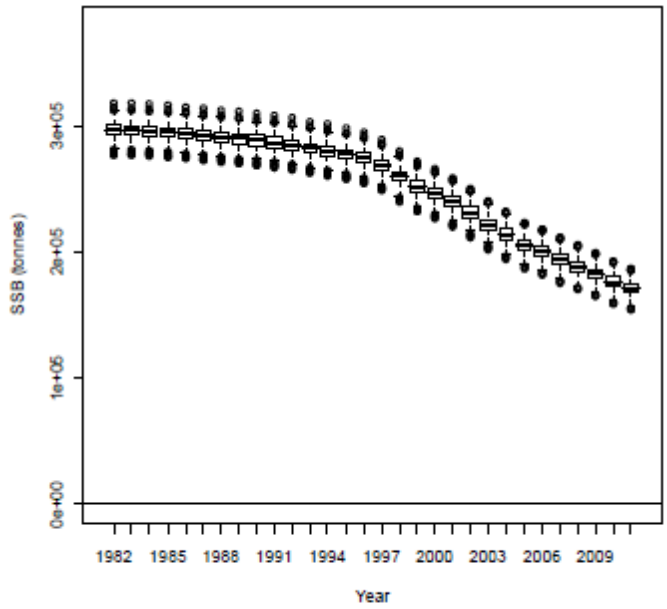


Figure 14. Spawning stock biomass (SSB) series box plots

Figure 19. Trends in total Kerguelen plateau toothfish biomass estimated from joint French-Australian stock assessment model (Candy et al. 2011, Figure 14).

5. MANAGEMENT SYSTEM

5.1. ORGANISATIONS INVOLVED IN MANAGEMENT

The organisations involved in management, and their functions, roles and responsibilities, are summarised in Table 13.

Table 13. Organisations involved in management of the Kerguelen toothfish fishery.

Organisation	Function	Role / Responsibilities
SARPC	Producer organisation for the Kerguelen toothfish fishery. Includes all licenced vessels.	Represents the interests of the fishery to TAAF and at CCAMLR. Provides funding for management (stock assessments, POKER).
TAAF Administration	In overall charge of Kerguelen, including EEZ.	Manage fishery: set level of TAC and regulations; monitoring and surveillance, including observers; also undertake some research
CCAMLR Scientific Committee	For French fishery, provide annual oversight but not direct management advice	Review data on fishery and give an opinion, propose directions for future.
CCAMLR WG-FSA (fish stock assessment)	Review stock assessments and provide advice	Reviewed Kerguelen stock assessment in 2012, undertook additional simulations and proposed a workplan for the coming year.
CCAMLR WG-SAM (statistics and methods)	Reviews data analysis and stock assessment methods	Joint French-Australian stock assessment presented to WG-SAM (Candy et al. 2011)
CCAMLR WG-IMAF (incidental mortality associated with fisheries)	Proposes and evaluates methods from reducing bird mortality, reviews mortality figures.	Report on implementation of French Action Plan presented to WG-IMAF (Marteau 2009), as well as annual bird data. NB: WG-IMAF will no longer meet regularly because the situation has improved.
MNHN	Research, stock assessment, scientific advice to TAAF	Conducts POKER surveys, analyses fisheries data, undertakes stock assessment (Rélot 2010, Rélot-Stirnemann 2011, Rélot-Stirnemann 2012), maintains PECHEKER database
Ministeres d'agriculture, d'outre-mer et des affaires étrangers	Consultees on the fishery. Foreign Affairs represents France at CCAMLR.	May provide an opinion ('avis') on the TAC.

5.2. LEGISLATIVE CONTEXT

The legal context for fisheries management and rights in France is given by the 'Code Rural et de la Pêche Maritime' (rural and marine fisheries code). Book IX of the code is dedicated to marine fisheries, and Chapter VIII of this book deals with the TAAF. Elements of Chapter VIII that are relevant to this fishery include[20]:

Article L981-1: Increases the maximum period between arresting an illegal fishing vessel at sea and delivering it to the authorities by the time required to navigate to a suitable port from the TAAF.

Article L981-2: The competent authority in charge of seizing illegal fishing vessels is the director of Affaires Maritimes in Réunion, and his/her deputies. Any funds accruing from sale of illegal vessels, gear or catch will go to the budget of the TAAF.
Article L981-4: No fishing, hunting of marine animals or any other exploitation of marine products, either on land or on board vessels, without authorisation. Authorisation come from the TAAF administration, who will determine how the resources are to be managed, including any bans on catch, harvesting or industrial or commercial exploitation of marine species, under conditions fixed by décret.

Article L981-5: A fee may be levied on the product fished. The amount is fixed by species by the administration of the TAAF, with a limit of €1820 per tonne.

Article L981-6: Any fishing or fish transport vessel entering or leaving the TAAF EEZ must notify the TAAF administration and declare the tonnage of fish onboard.

Article L981-7: There is a €300,000 fine for the following actions:

- Fishing without authorisation
- Exploiting fisheries products without authorisation
- Failing to signal entry or exit from TAAF EEZ and declare tonnage of fish on board
- To fish in infraction of any of the regulations

The maximum fine can be augmented by €75,000 for every tonne of fish on board above 2 tonnes.

- Article L981-8: €30,000 fine for keeping on board a fishing boat dynamic or explosive substances or poisons, except with authorisation for another use than fishing.
- Article L981-9: €45,000 fine for using the above substances for fishing.

[20] See http://www.taaf.fr/Cadre-juridique-des-activites-de-peche and follow links

- Article L981-10: €45,000 fine for stocking, transporting, putting for sale or selling products fished in infraction of the previous article.
- Article L981-11: €15,000[21] fine for contravening general regulations for French fisheries (Article L945-4)
- Article L981-12: Fines are cumulative.
- Article L981-11: Infractions are investigated either by officers of the police judiciaire, fisheries officers, district heads of the TAAF or contrôleurs de pêche on board vessels

General regulations for fisheries are set out in Article L945-4 of the code, and are summarised briefly here:

The following is forbidden:

- Fishing without authorisation (licence, permit or other)
- Fishing with a vessel not conforming to the licence
- Fishing in a closed area or depth or fishing for a species in a closed area, depth or season
- Fishing for a species subject to quota without authorisation and without any real link to the French state
- To offload or transship fisheries products without respect for any regulations (notifications, authorisations, designated ports and times etc.)
- To have any prohibited gear on board or have more gear than is authorised
- To have on board explosives, firearms or soporific or toxic substances which can be used for fishing
- To fish with illegal gear or methods
- To make, hold or sell illegal gear
- To use gear in an area where it is banned or to use gear which does not conform to resource management rules in that area
- Not to conform to requirements for declaration of the vessel, movements, fishing operations, catch, effort etc.
- Not to respect obligation on providing data for surveillance e.g. by satellite, as well as electronic logbooks
- To knowingly sell, stock, transport or buy fishing products caught in contravention to these regulations

[21] According to the most recent version of the code on legifrance.gouv.fr, this is been increased to €22,500

- To knowingly sell, stock, transport or buy fishing products caught in greater quantities than authorised
- To hold on board, transport, sell or buy fisheries products from IUU or non-professional vessels

Specifically for the TAAF, the conditions under which the fishery operates are set out in décret 2009-1039[22]. The décret sets out rules of access to the TAAF EEZ, the basis on which fishing licences can be given or removed and the rules for setting the TAC, quotas and other regulations. Key elements are the following:

- Licences are given by the TAAF administration, based on the legal, economic, financial and technical capacity of the vessel owner, including specifically:
    - a real economic link with the state, including a stable establishment on land
    - track record as a fishing company
    - market orientation
    - socio-economic equilibrium
    - participation in experimental fishing with the aim of reducing environmental impact
    - willingness to accept a contrôleur de pêche as required
    - the number of licences available based on the capacity of the resource.
- Licences are valid for one year.
- Licences can be given to foreign vessels under the same conditions as above, after consultation with the ministries of fisheries, foreign affairs and overseas territories.
- Exploratory or scientific fishing are not subject to these rules, and will be managed by the TAAF administration directly.
- Licences can be removed for the following reasons:
    - Vessel or fishing technique has been modified
    - Vessel has been sold or given away
    - Unused quota can be ceded alongside the licence.
- The TAAF administration will fix a TAC for a maximum period of three years, after recommendation from MNHN and consultation with the three ministries above.
- The TAC is divided into quotas by vessel, taking into account the following:
    - track record in this fishery
    - track record in other TAAF fisheries
    - respect of the regulations
    - market orientation
    - socio-economic equilibrium

[22] See http://www.taaf.fr/IMG/pdf/decret_2009-1039.pdf

    - participation in experimental fishing to reduce environmental impact
    - participation in other initiatives for protection of the resource and environment
- Unused quota can be transferred between vessels by permission of the TAAF administration
- When the TAC is used up, there will be no further fishing
- The TAAF administration will determine the regulations, based on advice from MNHN and in consultation with the above ministries, for the following:
    - temporary or permanent closed areas for some or all species
    - minimum sizes
    - proportion of catch below minimum size triggering move-on rule
    - treatment of bycatch
    - regulations for experimental and research fishing
    - requirements relating to elimination of catch of birds, repiles or mammals
    - technical restrictions on gear and vessels
    - fishing periods and seasons
    - authorisation or not of fishing methods
    - maximum proportion of bycatch species for particular fisheries or gears
    - bait
    - operations on board
    - discarding of catch, bycatch, factory waste or bait
    - tagging and tag recapture
    - observers, contrôleurs de pêche and supplies made available to them
    - landing sites
    - delimitation of areas closed to all fishing
    - recording of catch and tranmission of data to the authorities
    - surveillance data by satellite or other means
    - any conditions relating to the conservation, reproduction or recovery of fisheries resources
    - designation of sectors or sub-sectors within the EEZ and how these sectors should be fished
    - ban on discards of anything non-biodegradable

The role and function of the contrôleurs de pêche (observers) is also regulated by a décret (2001-21)[23]. This includes the following relevant elements:

- Each contrôleur is under the exclusive authority of the TAAF administration.
- S/he will receive directives from MNHN in relation the scientific management of the fishery.
- S/he will participate in the scientific monitoring of the resource by MNHN by assuring statistical and biological monitoring of the species caught; this may involve a particular scientific protocol.

[23] See http://www.taaf.fr/IMG/pdf/arrete_2001-21_modifie_fonctions_de_controleur_de_peche.pdf

- If an IUU vessel is spotted, the contrôleur will inform the TAAF and préfet of Réunion as soon as possible. The captain will cooperate with requests to observe the IUU vessel as far as it is safe to do so.
- Any authorised fishing vessel in the TAAF EEZ must have a contrôleur on board. The vessel must provide conditions for the contrôleur to fulfill his/her mandate, as well as providing accommodation and food as for the ship's officers.
- The captain must ensure that the contrôleur can communicate confidentially with the TAAF administration
- The contrôleur can:
    - visit all parts of the vsesel associated with fishing activities
    - see all documentation including licences, logbooks and authorisations
    - see all gear and fishing equipment, inspect gear and require it not to be used if it does not conform to the regulations
    - examine the catch and take samples
    - undertake biological and statistical analyses
    - ask the captain or any crew member for any help needed in exercising his/her functions
- In case of infraction, the contrôleur will give a verbal warming, transmitted to the administration
- The contrôleur will provide to the administration:
    - a weekly report
    - a final report providing all data collected during the trip
    - these documents are the property of the TAAF who will communicate them to MNHN on a confidential basis

5.3. MANAGEMENT OBJECTIVES

Décret 2009-1039 sets out management objectives for the TAAF fisheries:

Article 1: Les dispositions du présent décret ont pour objet d'assurer la conservation à long terme et l'exploitation optimale des ressources halieutiques dans les zones des Terres australes et antarctiques placées sous souveraineté ou sous juridiction française … L'exercice de la pêche par tous les navires battant pavillon français ou étranger est mené dans le souci de préserver les écosystèmes marins dans lesquels ces ressources se déploient.

[*The objective of the décret is to ensure the long term conservation and optimal exploitation of the fisheries resources in the zones of the TAAF under french sovereignty or jurisdiction … the fishery by all vessels, whether french or foreign flagged, will be undertaken with care to protect the marine ecosystems within which the resources are found*.][24]

[24] Unofficial translation by MEP.

The décret also notes various international conventions and agreements which are taken into account in the overall philosophy for fisheries management, including:

- MARPOL
- Conservation of Antarctic Marine Flora and Fauna (Canberra 1980)
- Law of the Sea
- French environmental code

6. FISHERY EVALUATION PROCESS

6.1. MSC STANDARD

This assessment follows the Fisheries Assessment Methodology and Guidance (FAM), version 2 from November 2009.

The MSC Standard is composed of three Principles, as follows:

- Principle 1: A fishery must be conducted in a manner that does not lead to over-fishing or depletion of the exploited populations and, for those populations that are depleted, the fishery must be conducted in a manner that demonstrably leads to their recovery;
- Principle 2: Fishing operations should allow for the maintenance of the structure, productivity, function and diversity of the ecosystem (including habitat and associated dependent and ecologically related species) on which the fishery depends.
- Principle 3: The fishery is subject to an effective management system that respects local, national and international laws and standards and incorporates institutional and operational frameworks that require use of the resource to be responsible and sustainable.

Each Principle is divided into a series of Performance Indicators (PIs). Each PI can be either related to 'outcome' (i.e. the current situation in regard to the element described in the PI), 'management' (i.e. the management objectives, strategy or rules for that element) or 'information' (i.e. the available knowledge about that element).

For each PI, there are three Scoring Guideposts (SGs). The lowest SG corresponds to a minimum requirement for certification, under the condition that the situation can be improved; the middle SG corresponds to a minimum requirement for certification without conditions, while the highest SG corresponds to an optimal or 'perfect' scenario. These three SGs are assigned scores of 60, 80 and 100. The consequences for each score are set out in Table 14.

Table 14. Categories of score for a PI, and the consequences of a given score for the overall outcome of certification.

Score	Consequence
< 60	If even one PI scores < 60, certification cannot be awarded
60 – 80	Certification is possible but with conditions: performance under any PI scoring between 60 and 80 must be improved to at least the 80 level within a time period specified by the assessment team
80 – 100	If all PIs score 80 or above, certification will be achieved without any conditions

Note that this assessment methodology (the FAM) differs from the methodology used in assessments prior to mid-2008, because PIs and SGs were previously defined by the CB. They are now set out in the FAM, and cannot be altered except under exceptional circumstances. The FAM was superseded by the 'Certification Requirements' in 2011, but because this reporting process was started before this point, MEP has continued to use the FAM. The wording of the standard itself has not changed.

The full set of PIs and SGs are set out in the assessment tree for this fishery, with the scores given for each PI and a detailed rationale for each score according to the SGs. The assessment tree is provided in Annex 1 of this report. The scores are also summarised in Section 8.

6.2. RISK-BASED FRAMEWORK (RBF)

The Risk-Based Framework (RBF) provides an alternative scoring framework for small scale and data deficient fisheries. The RBF was not used for scoring any PIs in this fishery.

6.3. ASSESSMENT PROCESS

The steps to follow in the assessment process are as follows:

1. Pre-assessment
2. Full assessment step 1: Preparation and scoping. This phase forms the start of the formal assessment process, and includes i) the formal notification of the assessment to MSC, stakeholders and public; ii) the selection and approval (including the possibility of stakeholder input) of team of experts and iii) selection of the appropriate assessment methodology.
3. Full assessment step 2: Data gathering and evaluation. In this phase the fishery is assessed using data from a variety of sources including: i) published and unpublished scientific data, reports and other similar sources; ii) a site visit by the expert team; and iii) stakeholder consultations via face-to-face interview, phone or email. On the basis of the information gathered, the fishery is scored against the standard (using the FAM or RBF). A preliminary assessment report is produced, which is reviewed by the client (Client Draft Report) and by two external peer reviewers (Peer Review Report). The resulting Public Comment Draft Report is then made available for stakeholder comment.
4. Full assessment step 3: Final report and objections procedure. In this phase, the CB produces a Final Report which must present and respond in full to all comments by reviewers and stakeholders. The Final Report is made available on the MSC website, and stakeholders are given the opportunity to object formally to the determination made by the CB. If such objections are received, the CB must respond in detail to the objector and to MSC. A final determination decision is then made, either by the CB or in the case of a formal objection by an external independent reviewer.

5. Ongoing review of certification. A certified fishery is audited every year and re-assessed every five years.

The publication of this Public Comment Draft Report on the MSC website marks the end of step 3 of the assessment process for this fishery.

6.4. ASSESSMENT OF THE SARPC TOOTHFISH FISHERY

Pre-assessment: The pre-assessment study for the SARPC toothfish lobster fishery was prepared by MEP in 2009. The outcome of the pre-assessment led the clients to decide to apply for MSC certification. MEP was selected as the CB for the full assessment, and the intention to proceed with full assessment was announced by MEP on the MSC website on 1 October 2009.

Full assessment: The team were nominated on 10 October 2009, revised on 18 November 2009 and confirmed on 15 October 2009. The decision to use the FAM without RBF was announced on 11 December 2009 and confirmed after 30 days. The site visit took place on 3-5 February 2010 in Paris and the scoring meeting on April 6-7 2011 in London. Further scoring was undertaken over the period October-November 2012, by remote meeting. The peer reviewers were nominated by MEP on the 26th February 2013 and approved on the 9th March 2013. The Client Draft Report was returned after review by the client on the 22nd February 2013 and by the peer reviewers on 3rd May 2013. Peer reviewer comments were incorporated, and it was placed on the MSC website for stakeholder review on the 5th June 2013.

The considerable delays in the full assessment process can be explained by a variety of factors: ongoing work on the stock assessment process, missing data, the (constructive) intervention of stakeholders and other engagements of the assessment team. When the full assessment process was started, it was not a requirement to recommence if 18 months elapsed between site visit and PCDR, as it is now, so this fishery is exempt from this requirement. Nonetheless, considerable efforts have been made to retain the engagement of stakeholders and to ensure that the report is up to date.

6.5. STAKEHOLDER CONSULTATIONS

As well as making announcements and documents available via the MSC website, as required by the MSC assessment process, MEP made direct contact with key stakeholders at key stages of the assessment process, to ensure that they were aware that the assessment was taking place and that they had the opportunity to comment or object to any part of the process. This process of contact was conducted primarily by email, backed up by telephone when there was difficulty in making contact by email. Two stakeholders participated in the site visit: Sian Prior of WWF and Jim Barnes of the Antarctic and Southern Ocean Coalition.

7. SCORING

7.1. SCORING METHODOLOGY

Each PI is scored with reference to the three scoring guideposts (SGs). During the site visit and scoring meeting, each PI was discussed in the light of all the information received from the client and from stakeholders during the site visit, as well as the scientific literature and the knowledge of the team members. The score and rationale was discussed by the team members and a consensus score arrived at.

Scores between 60 and 80 or between 80 and 100 were arrived at by a semi-quantitative method. For example, if the fishery achieves all the elements set out in SG 80, but only some of the elements in SG 100, the fishery would have been scored as shown in Table 15.

Table 15. Example of how the team decided on a score between 80 and 100 (the same principle would apply to a score between 60 and 80, as well as to SG with different numbers of elements).

Number of elements in SG 100 achieved by the fishery, out of four	Score	Number of elements in SG 100 achieved by the fishery, out of five	Score
0	80	0	80
1	85	1	80
2	90	2	85
3	95	3	90
4	100	4	95
		5	100

7.2. WEIGHTING

The FAM sets out how the score of each PI should be weighted. The weighting ensures that overall scores for each Principle are equally important in the overall score. Within each Principle, each component is weighted equally. Within each component, each PI is weighted equally. The aggregate score for each Principle, and the overall score, is thus a weighted average of the scores for each PI. The overall weighting for the FAM is shown in Figure 20.

Principle	Weight Level 1	Component	Weight Level 2	PI No.	Performance Indicator	Weight Level 3	Weight in Principle		
						Either		Or	
One	1	Outcome	0.5	1.1.1	Stock Status	0.5	0.25	0.333	0.1667
				1.1.2	Reference Points	0.5	0.25	0.333	0.1667
				1.1.3	Stock Rebuilding	--	--	0.333	0.1667
		Management	0.5	1.2.1	Harvest Strategy	0.25	0.125		
				1.2.2	Harvest Control Rules & Tools	0.25	0.125		
				1.2.3	Information & Monitoring	0.25	0.125		
				1.2.4	Assessment of Stock Status	0.25	0.125		
Two	1	Retained species	0.2	2.1.1	Outcome	0.333	0.0667		
				2.1.2	Management	0.333	0.0667		
				2.1.3	Information	0.333	0.0667		
		Bycatch	0.2	2.2.1	Outcome	0.333	0.0667		
				2.2.2	Management	0.333	0.0667		
				2.2.3	Information	0.333	0.0667		
		ETP species	0.2	2.3.1	Outcome	0.333	0.0667		
				2.3.2	Management	0.333	0.0667		
				2.3.3	Information	0.333	0.0667		
		Habitats	0.2	2.4.1	Outcome	0.333	0.0667		
				2.4.2	Management	0.333	0.0667		
				2.4.3	Information	0.333	0.0667		
		Ecosystem	0.2	2.5.1	Outcome	0.333	0.0667		
				2.5.2	Management	0.333	0.0667		
				2.5.3	Information	0.333	0.0667		
Three	1	Governance and Policy	0.5	3.1.1	Legal/Customary Framework	0.25	0.125		
				3.1.2	Consultation, Roles & Responsibilities	0.25	0.125		
				3.1.3	Long Term Objectives	0.25	0.125		
				3.1.4	Incentives for sustainable fishing	0.25	0.125		
		Fishery Specific Management System	0.5	3.2.1	Fishery Specific Objectives	0.2	0.1		
				3.2.2	Decision Making processes	0.2	0.1		
				3.2.3	Compliance & Enforcement	0.2	0.1		
				3.2.4	Research Plan	0.2	0.1		
				3.2.5	Management Performance Evaluation	0.2	0.1		

Figure 20. Weighting of Principles, components and PIs in the FAM (1). The alternative weightings for Principle 1, Component 1 depend on whether PI 1.1.3 is scored or not – in this case it was not so the first alternative was used.

8. ASSESSMENT RESULTS

This section summarises the results of the assessment of the SARPC toothfish fishery. The full assessment tree with scores and rationales for each PI is in Annex 1 of this report.

8.1. OVERALL RESULTS

The scores for each Principle (calculated as described above) are shown in Table 16.

Table 16. Scores for each Principle for the SARPC toothfish fishery assessment.

Principle	Aggregate score
Principle 1	83.1
Principle 2	82.0
Principle 3	85.9

8.2. PRINCIPLE 1

The scores for each PI, and the aggregate score for each component for Principle 1 are shown in Table 17.

Table 17. Scores for each PI, and aggregate scores for each component for Principle 1 for the SARPC toothfish fishery.

Component	PI	Score
Outcome	*Mean outcome*	*85*
	Stock status	80
	Reference points	90
	Stock rebuilding	n/a
Harvest strategy (management)	*Mean harvest strategy*	*81.3*
	Harvest strategy	80
	Harvest control rules and tools	90
	Information/monitoring	80
	Assessment of stock status	75

8.3. PRINCIPLE 2

The scores for each PI, and the aggregate score for each component for Principle 2 are shown in Table 18.

Table 18. Scores for each PI, and aggregate scores for each component for Principle 2 for the SARPC toothfish fishery.

Component	PI	Score
Retained species	*Mean retained*	*71.7*
	Outcome	60
	Management	85
	Information	70
By-catch	*Mean bycatch*	*86.7*
	Outcome	90
	Management	85
	Information	85
ETP species	*Mean ETP*	*85*
	Outcome	75
	Management	90
	Information	90
Habitat	*Mean habitats*	*81.7*
	Outcome	85
	Management	80
	Information	80
Ecosystem	*Mean ecosystems*	*85*
	Outcome	80
	Management	90
	Information	85

8.4. PRINCIPLE 3

The scores for each PI, and the aggregate score for each component for Principle 3 are shown in Table 19.

Table 19. Scores for each PI, and aggregate scores for each component for Principle 3 for the SARPC toothfish fishery.

Component	PI	Score
Governance and policy	*Mean governance and policy*	*88.75*
	Legal and/or customary framework	90
	Consultation, roles and responsibilities	85
	Long term objectives	100
	Incentives for sustainable fishing	80
Fishery-specific management system	*Mean fishery-specific management*	*83.0*
	Fishery-specific objectives	75
	Decision-making process	70
	Compliance and enforcement	100
	Research plan	80
	Monitoring and management performance evaluation	90

9. DRAFT CERTIFICATION RECOMMENDATION

9.1. RECOMMENDATION

The fishery did not receive any scores below 60 and the weighted average score for each principle is 80 or above. The preliminary conclusion of this assessment is therefore that the fishery **should** be certified under the MSC standard. This conclusion is subject to stakeholder review and the certification determination by the MEP Certification Committee.

9.2. CONDITIONS AND RECOMMENDATIONS

Six PIs scored below 80, and are therefore subject to conditions. These are 1.2.4 (stock assessment), 2.1.1 (retained species outcome), 2.1.3 (retained species information), 2.3.1 (ETP species outcome), 3.2.1 (fishery-specific objectives) and 3.2.2 (decision-making processes).

These PIs, issues, conditions and timetable are set out in Table 20. Two of the PIs scoring <80 related to retained species, and two related to the fishery-specific management system. These pairs of PIs identify essentially the same issues in each case, and have therefore been grouped together into single conditions. There are therefore four conditions in total.

Table 20. Conditions on the fishery

Condition 1 – Sustainable stock assessment process	
PI	**1.2.4 – stock assessment**
Issues	1. The stock assessment was only deemed by CCAMLR WG-FSA to be robust enough to provide management advice in the very short term. They have proposed a workplan for 2013. 2. The stock assessment has so far been done on an ad hoc, year to year basis, with various sources of funding. There is no structure that provides firm assurance that the process will continue in the long term.
Condition	By the end of the five-year certification period, the fishery must have in place a sustainable stock assessment process which i) evaluates the fishery with reasonable regularity; ii) is used to inform decisions about the level of the TAC by TAAF and other stakeholders and iii) is presented for regular review by CCAMLR WG-FSA.
Timetable	Year 1: Implement WG-FSA workplan. Start to put in place resources (financial and human) to ensure that the stock assessment process is sustainable. Year 2: Finalise the establishment of a sustainable, long term stock assessment process, which will i) evaluate the resource on a regular basis; ii) provide the main input into scientific advice on management, notably the level of the TAC; and iii) work with CCAMLR WG-FSA and other bodies as appropriate.

	Year 3 and ongoing: Continue stock assessment process as integrate part of fisheries management system
Condition 2 – Systematic monitoring of grenadiers, rays and bycatch code of conduct	
PIs	**2.1.1 and 2.1.3 – retained species outcome and information**
Issues	1. There is no systematic monitoring of the stock status of grenadiers and rays (e.g. via trends in CPUE). 2. The code of conduct for bycatch is new, and there is not yet evidence i) that it is being systematically implemented or ii) that it is successful in reducing the rate of bycatch.
Condition	A monitoring system needs to be put in place for grenadiers and rays, appropriate to the scale of the fishery, which will evaluate trends in stock biomass for these stocks, and provide indication of possible risks to the stock. This may be by analysis of trends in CPUE or by some other suitable method. The assessment team needs to see evidence of the systematic implementation of the code of conduct. In addition, a process of review and revision of the code of conduct in the light of trends in the fishery is required.
Timetable	1. Monitoring of grenadiers and rays: Year 1: Consult with MNHN on a monitoring systems for grenadiers and rays, including resource requirements. Year 2: Finalise and implement the monitoring system for grenadiers. Year 3 and on: Continue implementation. Review management as required in the light of monitoring results. 2. Implementation of code of conduct Year 1 and on: Provide evidence that the code of conduct is being implemented systematically by all SARPC members (e.g. examples of decisions taken, data on bycatch). 3. Review and revision of code of conduct Year 3: After two years of data, work with MNHN to review the results of the code of conduct in terms of reduction in bycatch rates. Year 4: Revise code of conduct as required in the light of monitoring and review results.
Condition 3 – Targets and best practice for grey petrels	
PI	**2.3.1 – ETP species outcome (grey petrels)**
Issue	The greatest risk from the fishery to an ETP species has been identified to be for grey petrels: while their bycatch is small, their population is also small and vulnerable.
Condition	Declines in bird mortality need to continue until all vessels are performing at the best possible level. In addition, a monitoring system is required to

	identify the level of risk posed by the fishery to the Kerguelen grey petrel population, including specific bycatch targets for grey petrels.
Timetable	Year 1: Continued implementation of bird action plan by all vessels. Establish system within SARPC to lower performing vessels to learn from best performers. Start discussion with TAAF and bird experts on requirements for monitoring and bycatch targets for the Kerguelen grey petrel population. Year 2: Implementation of bird action plan by all vessels. Finalise plan for grey petrel monitoring, and bycatch targets for grey petrels. Year 3: Implement monitoring programme, and evaluate population status and bycatch impacts. Revise bycatch targets as required. Year 4: If bycatch targets are not met, develop a second action plan which identifies the main causes of ongoing bycatch and how to address them. Year 5 and on: Implement second action plan if required
Condition 4 – Management plan	
PIs	**3.2.1 Fishery-specific objectives and 3.2.2 Decision-making processes**
Issue	The decision-making process for the TAC is not transparent, and it is poorly defined. Specifically, it is not clear what short-term objectives are used in setting the TAC, nor how the information provided, including the stock assessment, is used.
Condition	Produce a management plan for this fishery, focusing on the management of the toothfish resource (i.e. Principle 1). The plan should set out for the short-term (~5-10 years), i) the objective of management; ii) how that objective will be achieved; i.e. how decisions on the TAC will be taken and iii) what information will be used and how it will be used.
Timetable	Year 1: Consultation on management plan between SARPC, TAAF and MNHN. Methods and means for drafting plan agreed. Year 2: Draft plan and present for review to stakeholders Year 3: Finalise plan Year 4 and on: Implement plan

The assessment team also proposed two non-binding recommendation, in relation to PI 1.2.3 (stock status information) and PI 2.3.3 (management measures for grey petrels).

Recommendation 1:
Both peer reviewers queried whether tag returns in this fishery might be lower than those on the Australian side, and whether this makes the data less useful overall. It is therefore recommended by the assessment team, that SARPC investigate the utility of equipping all the vessels with tag detectors, as is reported standard in the HIMI zone.

Recommendation 2:
It would be useful to evaluate the effectiveness of the measures to reduce bird mortality, and the effectiveness of individual vessels, in relation to grey petrels specifically; and if necessary re-focus on those measures which reduce mortality of grey petrels in particular.

10. HARMONISATION WITH HIMI FISHERY

The Kerguelen fishery operates on a shared stock, or shared metapopulation, with the HIMI fishery, so some consideration of the management of the Australian fishery is required. The HIMI fishery is MSC certified, presupposing that the stock status management meet the requirements of the MSC standard.

The Australian fishery had conditions on Principle 1 which require it to integrate the Australian and French stock assessment, such that TACs take into account exploitation rates over the whole stock (or metapopulation) (SCS 2012). As we have set out above, this process has already started (see Candy et al. 2011) and the joint stock assessment, although uncertain, conforms with the output of the individual stock assessments, as well as the current level of each TAC. There has been considerable cooperation between France and Australia in developing the stock assessment for the French EEZ, and the Australians have provided considerable technical support in developing the CASAL stock assessment model for the French side. It is also noteworthy that when the Australian fishery was scored, the situation in relation to stock assessment on the French side was much less good than it is now. On this basis, the assessment team felt that the situation has progressed such that conditions on this fishery to cooperate with Australia are not required under the standard, and are not needed to move the situation forward. Full details are given in the rationales for Principle 1.

In relation to Principle 2, the situation is somewhat different since the Australian fishery is a mixed trawl-longline fishery, while the French fishery is only a longline fishery. The Australian fishery had one condition which relates to habitats – more of an issue for a fishery which includes trawlers. For Principle 3, clearly the management system is different so no harmonisation is required.

11. CHAIN OF CUSTODY

11.1. VESSELS IN THE UNIT OF CERTIFICATION

The vessels in the UoC are given in Table 1, which is re-pasted here for reference:

Company	Vessel(s)	GRT total
Sapmer	Albius, Croix du Sud I	1654
Cap Bourbon	Cap Horn I	975
Comata	Ile de la Réunion	935
Armements Réunionnais	Ile Bourbon	847
Armas Pêche	Mascareignes III	808
Pêche-Avenir	St. André	1387

11.2. POINTS OF LANDING

All toothfish must be landed in Réunion. They land at only one site: Le Port on the northwest corner of the island. On disembarkation, the catch is weighed by an authorised third party surveyor (independent of SARPC members and of TAAF). This data is provided to the fishing company and to the TAAF administration, and is checked against logbook records.

11.3. PROCESSING

The catch is processed and packed on board and landed frozen. Nearly all the product is landed as headed, gutted and tailed for export, with a small amount of fillet (~1% of the total) which is sold mainly on the local market. The processed catch is packed in boxes, except for very large specimens which may be packed in bags and repacked in boxes on shore.

The boxes and bags are labelled on board. The label specifies:

- date of production
- name of vessel
- species
- fishing zone (58.5.1 for Kerguelen and 58.6 for Crozet)
- type of product

If repacking on shore the same information is retained.

11.4. TRACEABILITY WITHIN THE FISHERY

The fact that the catch is processed and labelled on board, with only minimal repacking on shore, should ensure traceability of product through the system until it leaves SARPC hands. Product which is labelled 'toothfish' and 'Kerguelen (58.5.1)' will be MSC; other product will not be MSC.

11.5. CHAIN OF CUSTODY RISK ASSESSMENT

Risk of mixing species on board: Nearly all the catch is toothfish, and there is no reason why the other retained species (grenadier) should be mis-labelled as toothfish – they are very easy to distinguish and grenadier is much lower value. This is evaluated as low risk

Risk of mixing product from different zones on board: Vessels may visit Kerguelen and Crozet in the same trip, and the main risk to traceability is that product from Crozet may be mislabelled as from Kerguelen. However, since the two areas have separate quotas, it is essential that vessels report catch from the correct area, and this is checked by the contrôleur de pêche. Reporting Crozet catch as from Kerguelen would be a significant infringement of the fisheries regulations. Catch is weighed on disembarkation, and this data is cross-checked with logbooks, so that it is not possible to label a box as one area and report it in the logbook as another area. Therefore this is evaluated as low risk.

Risk of mixing product on shore: No other toothfish is landed at Réunion, so it is not likely that Kerguelen toothfish would be confused with toothfish. Repacking is minimal and labels are retained. This is evaluated as low risk.

Overall, therefore the chain of custody for this fishery is evaluated as low risk.

11.6. TARGET ELIGIBILITY DATE

The target eligibility date for this fishery is set at the 1st January 2013 which falls within the 2012/13 fishing season and is within 6 months of publication of this Public Comment Draft Report.

ANNEX 1 – ASSESSMENT TREE

Principle 1

A fishery must be conducted in a manner that does not lead to over-fishing or depletion of the exploited populations and, for those populations that are depleted, the fishery must be conducted in a manner that demonstrably leads to their recovery.

1.1 Outcome

1.1.1 Stock status

The stock is at a level which maintains high productivity and has a low probability of recruitment overfishing

SG 60: It is likely that the stock is above the point where recruitment would be impaired.

SG 80: It is highly likely that the stock is above the point where recruitment would be impaired. The stock is at or fluctuating around its target reference point

SG 100: There is a high degree of certainty that the stock is above the point where recruitment would be impaired. There is a high degree of certainty that the stock has been fluctuating around its target reference point, or has been above its target reference point, over recent years.

Score	**80**

Rationale

1. Data sources

Catch data:
Catch is known or estimated for all the fisheries that have existed on the stock back to 1979. Estimates of IUU catches have also been made by CCAMLR (CCAMLR-XXIX/44 for 2010 and CCAMLR-XXX/34 for 2011).

The catch of the main fisheries from 1996-2011 is given in Table 21. Other catches, not included in this table are: catch by foreign longliners (1997): 107.5 t; joint Franco-Japanese experiment longline campaign by the Anyo Maru (1996): 260.5; catches from the POKER 1 survey (2006): scientific 7.43 t, commercial 252.8 t; catches from POKER 2 (2010): scientific 4.66 t, commercial 228.3 t.

Table 21. Catch of main fisheries 1996-2011 (Rélot-Stirnemann 2012). 1996 was selected because it is the first year for which any significant IUU fishing is estimated, and because it marks more or less the end of legal non-French fisheries in the Kerguelen EEZ (hence these are not included below).

Year	French trawlers	French longliners	IUU
1996	3456		833
1997	3883		6094
1998	3366	291	7156
1999	1950	1435	1237
2000	1710	3004	2600
2001	1934	3495	4550
2002	159	4294	6300
2003		5117	5518
2004		4912	536
2005		4900	268
2006		4493	144
2007		5279	451
2008		4448	720
2009		4833	0
2010		4710	22
2011		4546	0

CPUE:

CPUE is calculated for the French longline fishery (from ~2000), stratified by area and depth and standardised by GLMM for year and month fixed effects (Figure 21). CPUE declined up to 2003/4, presumably due to IUU catches. Since then it has been stable or shown an increasing trend (Figure 21). It is important to note that for toothfish longline fisheries, CCAMLR does not consider that CPUE alone is a good proxy for biomass, because of attraction of the fish to the bait (WG-SAM 2011, Moody 2009). It is clear that the stock assessment model fit (line in Figure 21) does not explain much of the variability in observed (standardised) CPUE (points in Figure 21). This is discussed further below.

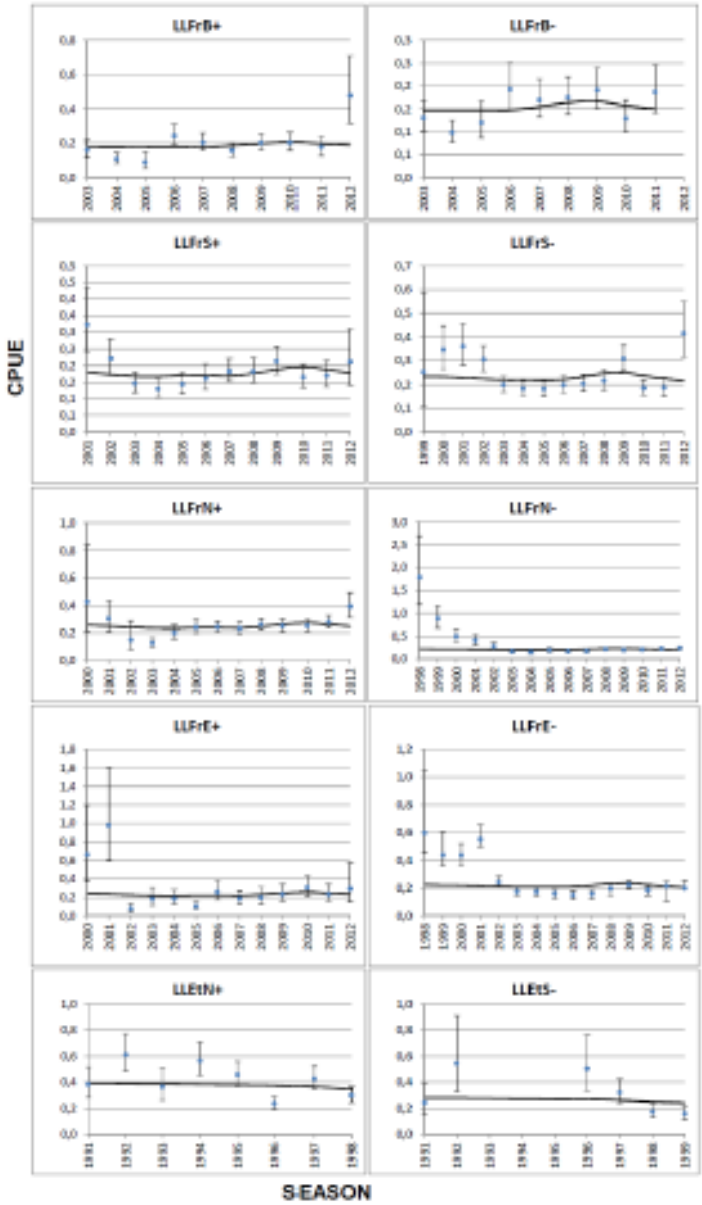


Figure 15: estimated CPUE series from GLMM model with bars corresponding to +/- one standard error of the estimate and the fitted series obtained from CASAL model. Panel headings: LL = Long-liners, Et = foreign, Fr = French, N = North, S = South, E = East, B = Skiff Bank, + =>1,500 m, - = >1,500 m.

Figure 21. Estimated CPUE series from GLMM model with bars corresponding to +/- one standard error of the estimate and the fitted series obtained from CASAL model. Panel headings: LL = Longliners,Et = foreign, Fr = French, N = North, S = South, E = East, B = Skiff Bank, + =>1,500 m, - =>1,500 m (Rélot-Stirnemann 2012, Figure 15).

Catch at size/age:

Catch at length is shown for the Kerguelen fishery in Figure 22 up to 2010. The modal length in catch has been stable or perhaps slightly decreasing over recent years, although increases may reflect changes in fishing practice as much as in population structure. Size

at maturity appears to be around 40-60cm[25], so the majority of fish caught by the fishery are mature.

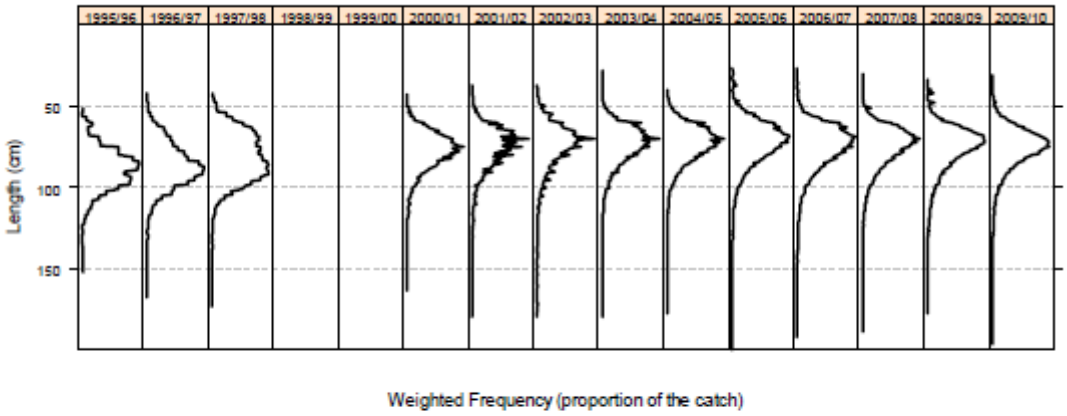


Figure 3: Catch-weighted length frequencies for *Dissostichus eleginoides* caught by longline in the French EEZ in Division 58.5.1 (source: fine-scale and STATLANT data, and the length–weight relationship was taken from observations on *D. eleginoides* in Division 58.5.2).

Figure 22. Catch length-frequency for Kerguelen longline toothfish, 1995-2009. Taken from CCAMLR-SC 2010, Appendix J.

The POKER research cruises have provided data on the length-weight relationship, size at maturity and aging (from scales), but work to put this together into a size/age relationship for the Kerguelen population is still underway (Rélot-Stirnemann 2012). The stock assessment uses the same size/age relationship as for the HIMI population to infer catch at age – probably a reasonable approach since there appears to be a metapopulation system over the whole Kerguelen plateau (Candy et al. 2011).

Fisheries-independent survey data:

There have been two recent fisheries-independent surveys of fish biomass by trawl – one in 2006 (POKER I) and one in 2010 (POKER II), run by MNHN. These surveys covered the Kerguelen plateau in some detail, but could only survey down to 1000m; i.e. for toothfish they function as a survey of recruits and the younger part of the population. The surveys have allowed MNHN to estimate toothfish biomass above 1000m by area, as well as provided biological data. The biomass estimates, however, vary depending on how you extrapolate from the trawl data, as set out in the main body of the report. There is also considerable variability between the two surveys. Taking the method used in the stock assessment, the data suggest that toothfish biomass above 1000m declined between 2006 and 2010, contradicting the CPUE trends in the fishery which improved in nearly all areas over the same period. The fishery is, however, exploiting a lower depth stratum from 500m – 2000m approximately. Since the fishery is exploiting older fish than are surveyed in POKER, then a direct effect of the fishery on the change in biomass seen between POKER I and POKER II can be ruled out. Possible explanations could be as follows:

- The variability in the trawl survey data is very high;

[25] See http://www.littoralsociety.org/userfiles/doccenter/Patagonian%20Toothfish.pdf

- Recruitment is variable – potentially POKER I coincided with a large recruitment which is now moving through the fishery;
- Overfishing by IUU vessels led to a decline in recruitment which is only now becoming apparent.

Clearly, only further surveys and fisheries-dependent data will allow MNHN to distinguish between these possibilities. A POKER survey is scheduled to be held every three years from now on. There is also an annual survey on the Australian side, and the two teams of scientists are working together to elucidate stock trends and dynamics across the entire plateau (Candy et al. 2011).

Tag-recapture data:
French scientists from MNHN run a joint tagging programme with the Australians across the whole Kerguelen plateau. SARPC vessels are required to tag and release one fish for each tonne of fish caught. The number of fish tagged and the tag returns to date are given in Table 22.

Table 22. Tag-recapture data used in the 2012 stock assessment (Rélot-Stirnemann 2012)

Table 4: Number of tagging data used in the model.

Tagged fish			Recaptured tagged fish			
Year	Number	2007-2008	2008-2009	2009-2010	2010-2011	2011-12
2006-2007	2 262	15	72	60	43	5
2007-2008	2 033		29	41	34	6
2008-2009	4075			54	145	18
2009-2010	4 306				66	27
2010-2011	4 524					0
Total	17 200	15	101	155	288	59

One uncertainty in this data set relates to the tag detection rate for the French fishing boats – unlike the Australian vessels, French crews do not have tag detectors on board.

For the purposes of the stock assessment, the detection rate is estimated to be ~90%.

Depredation:
Fishing is forbidden at Kerguelen in the presence of orcas (TAAF 2012), so there is no issue with depredation, in contrast to Crozet.

2. Stock assessment model output

Until 2010, there was no formal stock assessment for the Kerguelen fishery – the TAC was maintained at a level considered sustainable based on the estimated stock biomass from POKER I and trends in CPUE. It was agreed that the TAC would not be increased above this precautionary level (5100 t), so a formal stock assessment was not considered necessary.

However, a more formal stock assessment process was initiated in 2010 by MNHN, SARPC and the TAAF, and the stock assessment model was refined and updated in 2011 and 2012. MNHN worked in collaboration with Australian scientists on the model, both to benefit from their expertise and because the Kerguelen and Heard Island stocks are connected. (As noted above, other joint research has been going on for some time, including a tagging programme.)

The Kerguelen stock assessment model follows the standard pattern for a CCAMLR toothfish stock assessment, using a Bayesian approach with the modelling package CASAL. The details of the model are discussed below (PI 1.2.4). The most recent assessment (Rélot-Stirnemann 2012) estimates 2012 biomass (B_{2012}) at 72% of the virgin biomass B_0 - however it is important to note that the estimates of both B_{2012} and B_0 from the model are subject to considerable uncertainty (also discussed below). The previous preliminary assessment from 2011 estimated B_{2011} at 59% of B_0, and the initial analysis in 2010 suggested that B_{2010} was in the range of 30-50% of B_0, depending on the details of the model used. It is a stretch to consider that these estimates reflect a real trend in biomass; it is more likely that the assessment estimates have improved year on year since they use improving data (i.e. longer time series, more tagging and age-at-length data, plus the data from POKER II which become available in 2011).

3. Stock in relation to reference points

Taking the default MSC references points (TRP = 40% B_0, LRP = 20% B_0), the stock appears to be well above this level (most recent estimate 72% B_0), even allowing for considerable uncertainty in the stock biomass estimates.

CCAMLR uses probabilistic reference points based on 35-year projections of future stock trajectories under constant catch. These are as follows:

1. Probability of depletion (LRP): The risk of biomass dropping below 20% of B_0 in the long term should be below 10%
2. Avoidance probability (TRP): The probability of biomass remaining above 50% of B_0 in the long term should be greater than 50%

These probabilities are estimated in the 2012 model for 35-year stock biomass projections under a constant catch of 5100 tonnes (Table 22, Figure 23). Probability of depletion is estimated at 0.2%, while avoidance probability is estimated at 62%. Thus according to this stock assessment both these reference points are also met with a reasonable margin for error. The results of projections (from bootstrapping) are shown in Figure 23. Given the assumptions, the model predicts a more or less stable biomass over the long term, but without very strong predictive power at present.

Table 23. Comparison of output of 2012 stock assessment model to CCAMLR reference points (Rélot-Stirnemann 2012). SEL2-CALPE200-2011R-DAL365-fixB0 is the model configuration used for management advice.

	SEL2-CALPE200-2011R-DAL365-fixB0	Management rule of the CCAMLR
Probability of depletion	0.002 (0.2%)	< 0.1 (10%)
Avoidance probability	0.62 (62%)	≥ 0.5 (50%)

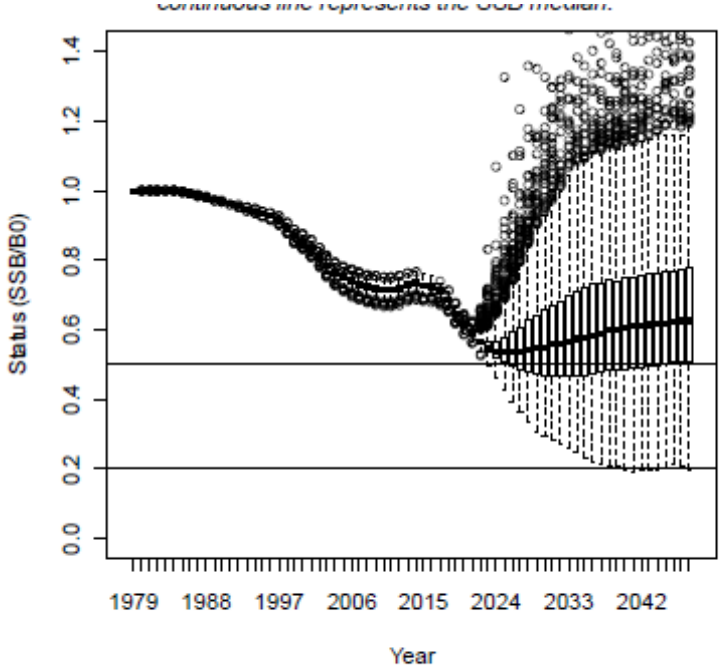


Figure 21: Projection results to status of spawning stock biomass relative to B_0 for SEL2-CALPE200-2012-DAL365 model with a constant annual catch of 5,100 tons. The thick and continuous line represents the SSB median. The two horizontal lines show CCAMLR decision rules.

Figure 23. Projections from stock assessment model (model as above) assuming constant TAC 5100 t (Rélot-Stirnemann 2012, Figure 21).

4. HIMI stock

Since the stock may be shared across the Kerguelen plateau, the HIMI stock has to be taken into account as well. The situation in the Australian EEZ is broadly similar: i.e. although the stock assessment is rather uncertain, the available data suggest that the stock status is good and the TAC is precautionary. It is noteworthy that the two stock assessments use a very similar methodology (facilitating comparison) and that some preliminary work has been done towards a joint stock assessment (Candy et al. 2011) – described in more detail below. The HIMI fishery is MSC-certified and scored '80' on this PI, taking the French stock status into account.

5. Conclusions

Based on the above analysis, we can draw the following conclusions:

1. The stock assessment suggests that biomass is well above the 40% default target reference point – even if there is significant uncertainty in biomass estimates. The projections suggest likewise that the CCAMLR reference points are being met, also with a large margin for error.

2. The TAC is a relatively low proportion of the estimated biomass (~3-4%) meaning that fishing mortality on the stock is low according to the stock assessment.

From these points, the assessment team concluded that the stock is 'highly likely' to be above the point of impaired recruitment, and that it is above or fluctuating around the target reference points.

There are, however, considerable uncertainties in the stock assessment, summarised as follows:

- The two estimates of biomass from POKER are rather different, and both these estimates conflict with results from the CASAL model (see below);

- The fisheries-independent data (POKER surveys, tagging results) appear to conflict to some extent with the fisheries-dependent data (notably the longline CPUE). One explanation for this might be that the CCAMLR estimates of IUU fishing are an underestimate, although simulations carried out during the most recent CCAMRL meeting suggest this may not be the whole explanation (discussed further below).

There are also uncertainties relating to the level of connectivity across the Kerguelen plateau, and the extent to which the stock assessments in each EEZ should in an ideal world be merged.

It is therefore not possible to conclude that there is a 'high degree of certainty' about the stock status, as required for the SG100 guidepost. The score is therefore 80.

1.1.2 Reference points

Limit and target reference points are appropriate for the stock.

SG 60: Generic limit and target reference points are based on justifiable and reasonable practice appropriate for the species category.

SG 80: Reference points are appropriate for the stock and can be estimated. The limit reference point is set above the level at which there is an appreciable risk of impairing reproductive capacity. The target reference point is such that the stock is maintained at a

level consistent with BMSY or some measure or surrogate with similar intent or outcome. For low trophic level species, the target reference point takes into account the ecological role of the stock.

SG 100: Reference points are appropriate for the stock and can be estimated. The limit reference point is set above the level at which there is an appreciable risk of impairing reproductive capacity following consideration of relevant precautionary issues. The target reference point is such that the stock is maintained at a level consistent with B_{MSY} or some measure or surrogate with similar intent or outcome, or a higher level, and takes into account relevant precautionary issues such as the ecological role of the stock with a high degree of certainty.

Score	**90**

Rationale

Three sets of reference points can be applied to this fishery: i) the default MSC biomass reference points (TRP=40% B_0 and LRP=20% B_0); ii) the CCAMLR risk-based reference points, used in the 2011 and 2012 stock assessments to check whether current management is precautionary; and iii) the ad hoc reference points used to set the fixed level of the TAC- this are TRP = 50% B_0, LRP = lowest point in longline CPUE time series.

Both the MSC default reference points (40% and 20% B_0) and the CCAMLR probabilistic reference points are met according to the most recent stock assessment: biomass is estimated at 72% of B_0 in 2012 and 59% in 2011, and the long-term stock biomass projections meet CCAMLRs requirements in terms of probabilities of maintaining biomass at >50%B_0 (should be >50%, estimated at 62%) and risk of depletion (should be <10%, estimated at 0.2%). Even if the default biomass target reference point is increased to 50% B_0 to take into account the relatively slow growth and long life span of toothfish (and to be consistent with CCAMLR), the estimated biomass is well above this point. This 50% target reference point should be consistent with B_{MSY}, although B_{MSY} has not been estimated formally for this stock (or for many other toothfish stocks as far as we can tell).

The assessment team was not fully briefed on the full history behind the development of CCAMLR's reference points, but notes that these reference points are used for the toothfish fisheries where CCAMLR provides management advice, including toothfish fisheries that are MSC certified (South Georgia, HIMI). It seems that these reference points were based on reference points originally designed for krill, but were adapted for toothfish by reducing the long-term target biomass to 50% of B_0 as opposed to the 75% used for krill, since toothfish, unlike krill, are neither a low-trophic-level species nor (probably) a keystone species in the ecosystem (SCS 2012). The choice of a 35-year reference period as the basis for projections is reasonable for a long-lived species. Precaution is built in to the reference points and decision rule in three ways: i) the target of 50% of unfished levels is above the 40% level often used as a default estimate of B_{MSY}

(e.g. by MSC); ii) the use of constant catch projections in both reference points will produce more conservative catches than projections that allow updating of catches to reflect any forecast changes in biomass over the projection period; iii) the choice of a long projection period is precautionary because the range of projections will progressively widen and this uncertainty in turn requires a lower constant catch to meet the reference points, since they are expressed in probabilistic terms (SCS 2012).

The assessment team concluded that these reference points could on this basis be regarded as 'appropriate for the stock'. The 50% TRP is precautionary and consistent with MSY. SG80 is therefore met.

SG100 requires that the limit reference point is precautionary. As noted above, we have three options for LRPs, but only two are used (or have been used) in management: i) the lowest point in the CPUE time series and ii) the CCAMLR 'probability of depletion' reference point. CCAMLR notes that by itself, a longline CPUE trend is not necessarily a good proxy for toothfish biomass – all else being equal, however, the general improvement in CPUE in the fishery since 2003-4 (see rationale for PI 1.1.1) at least shows that the stock is probably rebounding from overfishing by IUU vessels. The CCAMLR LRP is intended to be a precautionary reference point – i.e. the objective is to minimise risk to the stock over the long term rather than to trigger action at a point when the risk is high. This reference point was not used in setting the TAC level in the first place, but has been used to assess that the TAC is precautionary (Rélot-Stirnemann 2012). On this basis, the team decided that this element of SG100 is met.

SG100 requires for the TRP that it is set at a higher level than B_{MSY}, taking into account ecological issues with a 'high degree of certainty'. The 50% B_0 reference point is probably a reasonable precautionary TRP given the life history of toothfish, but probably cannot be described with any certainty as a higher level than B_{MSY}, particularly given that B_{MSY} has not been formally evaluated for this stock (or for toothfish stocks in general as far as we can tell). There certainly cannot be anything described as a 'high degree of certainty' (see Rationale for PI 1.2.4). Therefore this element of SG100 is not met.
Overall, for Kerguelen, one element of SG100 is met and one is not met, giving an overall score of 90. The HIMI fishery also scored 90.

1.1.3 Stock rebuilding

Where the stock is depleted, there is evidence of stock rebuilding

SG 60: Where stocks are depleted rebuilding strategies which have a reasonable expectation of success are in place. Monitoring is in place to determine whether they are effective in rebuilding the stock within a specified timeframe.

SG 80: Where stocks are depleted rebuilding strategies are in place. There is evidence that they are rebuilding stocks, or it is highly likely based on simulation modeling or previous performance that they will be able to rebuild the stock within a specified timeframe.

SG 100: Where stocks are depleted, strategies are demonstrated to be rebuilding stocks continuously and there is strong evidence that rebuilding will be complete within the shortest practicable timeframe.

Score	**n/a**

Rationale

The Kerguelen stock appears to be above TRP levels, therefore this PI is not scored. Rebuilding is not required for the HIMI stock either.

1.2 Harvest strategy (management)

1.2.1 Harvest strategy

There is a robust and precautionary harvest strategy in place

SG 60: The harvest strategy is expected to achieve stock management objectives reflected in the target and limit reference points. The harvest strategy is likely to work based on prior experience or plausible argument. Monitoring is in place that is expected to determine whether the harvest strategy is working.

SG 80: The harvest strategy is responsive to the state of the stock and the elements of the harvest strategy work together towards achieving management objectives reflected in the target and limit reference points. The harvest strategy may not have been fully tested but monitoring is in place and evidence exists that it is achieving its objectives.

SG 100: The harvest strategy is responsive to the state of the stock and is designed to achieve stock management objectives reflected in the target and limit reference points. 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. The harvest strategy is periodically reviewed and improved as necessary.

Score	**80**

Rationale

The harvest strategy is defined as 'a combination of monitoring, stock assessment, HCR and management actions'.

Monitoring: The various data sets used for monitoring the stock are described in the rationale for PI 1.1.1 above – both fisheries-dependent and fisheries-independent data sets are available. In addition, the activities of the vessels, including catches, are monitored by observers who follow CCAMLR observer protocols[26]. The monitoring in place to counter

[26] See http://www.ccamlr.org/en/science/information-technical-coordinators-and-scientific-observers-0

IUU fishing is described in the rationale for PI 3.2.3 below – it is significant, and estimates of IUU fishing in the Kerguelen EEZ are ~zero. Similar data sets and monitoring systems are in place on the Australian side (SCS 2012).

Stock assessment: A stock assessment has been conducted every year since 2010, following the standard CCAMLR toothfish stock assessment model and process (see 1.1.1 above). In terms of the harvest strategy, it is probably fair to say that the stock assessment process is not yet fully bedded in as part of the strategy – the assessment has been used to assess whether the strategy (in particular the TAC) is set at a precautionary level according to CCAMLR reference points, rather than directly to influence the harvest strategy. The stock assessment does suggest that the previously agreed TAC is precautionary and consistent with reference points. It is still not yet completely clear, however, to what extent the stock assessment is an integral part of the harvest strategy in the long term. The stock assessment up to 2012 was conducted by a consultant who was employed on a seasonal basis; however as of 2012, MNHN has a full-time member of staff who will be allocated to modelling and stock assessment for the fishery, suggesting that there is a long-term commitment to the process. On the Australian side, the stock assessment process is more advanced, although the stock assessment is still rather uncertain (SCS 2012). Australian stock assessment scientists have provided input and support to MNHN in initiating a formal stock assessment process for the French fishery, and some work has been done towards a joint stock assessment (Candy et al. 2011).

Harvest control rule: The harvest control rule is in the form of a TAC, which appears to be set at a precautionary level (see rationales for PI 1.1.1 and PI 1.2.2). The situation is the same for the HIMI fishery.

Management actions: The management actions for this fishery conform to the requirements of CCAMLR for a CCAMLR toothfish fishery: i.e. there is a TAC, a minimum size (60cm TL), no fishing shallower than 500m to protect juveniles, 100% observer coverage following CCAMLR observer protocols and quayside inspections on landing. The vessels fill out logbooks, and logbook data are checked against landings / sales data. There are also a considerable number of management actions in relation to Principle 2 issues, also following CCAMLR standards. The situation is basically the same on the Australian side, except that the closed areas are more extensive (SCS 2012).

The team considered that since the TAC appears to be precautionary and the CPUE is improving, the harvest strategy is responsive to the state of the stock. Monitoring, science and management are closely coordinated (there is a close working relationship between MNHN, TAAF and SARPC), and these elements work together to achieve management objectives (sustainable and precautionary management of the stock, elimination of IUU fishing). While the stock assessment is still subject to considerable uncertainties, the team concluded that the outcome of the stock assessment, despite some considerable uncertainties, provides evidence that the harvest strategy is achieving its objectives. SG80 is thus met.

SG100 requires that the harvest strategy has been designed to meet objectives reflected in the reference points. This is not the case – the TAC was set at its current level before there was any formal stock assessment process. However, it is not fair to say that it is simply fortuitous that the stock assessment suggests that the TAC is precautionary according to the CCAMLR definitions; the TAC was set at a conservative level even considering rather simple metrics such as the TAC as a proportion of estimated biomass (<5%), noting that the biomass was estimated from POKER I before there was a formal stock assessment (even though this estimate has turned out to be rather optimistic).

The stock assessment was evaluated by the CCAMLR Working Group on stock assessment (WG-FSA) in 2012 (see main report), and they concluded i) that the TAC appeared to be within CCAMLR reference points but ii) that the stock assessment provided an appropriate basis for providing management advice only in the very short term, because of the considerable uncertainties that remain (described in detail below). In any case, it is not clear that the harvest strategy has undergone or will undergo any significant revision. Therefore no part of SG100 is met.

In relation to the Australian part of the stock, the team considered i) that the harvest strategy is at a similar or higher level of sophistication to the French strategy; ii) that there is a good measure of scientific cooperation between the two sides and iii) that both strategies are precautionary and therefore should lead to precautionary management on the whole stock. The situation on the Australian side therefore did not change the overall score from 80.

1.2.2 Harvest control rules and tools

There are well defined and effective harvest control rules in place

SG 60: Generally understood harvest control rules are in place that are consistent with the harvest strategy and which act to reduce the exploitation rate as limit reference points are approached. There is some evidence that tools used to implement harvest control rules are appropriate and effective in controlling exploitation.

SG 80: Well defined harvest control rules are in place that are consistent with the harvest strategy and ensure that the exploitation rate is reduced as limit reference points are approached. The selection of the harvest control rules takes into account the main uncertainties. Available evidence indicates that the tools in use are appropriate and effective in achieving the exploitation levels required under the harvest control rules.

SG 100: Well defined harvest control rules are in place that are consistent with the harvest strategy and ensure that the exploitation rate is reduced as limit reference points are approached. The design of the harvest control rules take into account a wide range of uncertainties. Evidence clearly shows that the tools in use are effective in achieving the exploitation levels required under the harvest control rules.

Score	90

Rationale

All the key elements of a harvest strategy are in place for the Kerguelen stock. There is a harvest control rule in the sense that there is a TAC, although the stock assessment has not up till now been used to set the TAC, but rather to check that the TAC is sustainable and precautionary, and to evaluate it against CCAMLR reference points.

It has been agreed between the stakeholders in the fishery (basically TAAF, MNHN and SARPC) that the TAC will remain fixed for now at 5100 tonnes, which is compatible with CCAMLR reference points. It is assumed that since a formal stock assessment process is now apparently in place, any discussion about increasing the TAC will in future be based on projections of stock status in relation to CCAMLR reference points (see condition under 1.2.4 below).

Nonetheless, the HCR for the moment is well-defined – i.e. that the TAC shall remain at 5100 tonnes until there is good reason (and agreement among all stakeholders) for increasing it. This HCR takes into account uncertainties in the sense that i) the reference points are precautionary and ii) the stock assessment suggests that the stock status with a constant TAC at this level is well within reference points (although it is clear that estimates derived from the stock assessment are uncertain – compare for example the difference in estimates of B_{2011}/B_0 in 2011 (0.59) and B_{2012}/B_0 in 2012 (0.72), although noting that both estimates are within reference points).

SG100 requires that the HCR has been 'designed' with uncertainties in mind and that evidence clearly shows that the tools in use (the TAC mainly) are effective in achieving the exploitation rate required. Given the significant uncertainties remaining in the stock assessment, and the analysis of WG-FSA that it is appropriate for management use only in the very short term, it is probably not reasonable to say that the system has been designed to take account of uncertainty. Evidence does suggest, however, (observers, CCAMLR estimates of IUU) that the appropriate exploitation rate implied by the TAC is being met in practice. Aside from the TAC, other tools are i) limited licences; and ii) ban on fishing above 500m (to protect juveniles).

The situation on the Australian side is similar to that on the French side (SCS 2012) – the stock assessment operates in the same way and has similar sources of uncertainty (although error bars are perhaps a bit smaller). The fishery is managed via a TAC (2730 t in 2011/12) which is also set using CCAMLR reference points. The relative levels of the TACs are consistent with estimates of the share of biomass in each jurisdiction (approx. two thirds in the French EEZ and one third in the Australian EEZ), and there is scientific cooperation. The team could therefore see no reason to change the score based on a consideration of the Australian management regime.

Thus overall, SG80 and half of SG100 is met, giving an overall score of 90.

1.2.3 Information / monitoring

Relevant information is collected to support the harvest strategy

SG 60: Some relevant information related to stock structure, stock productivity and fleet composition is available to support the harvest strategy. Stock abundance and fishery removals are monitored and at least one indicator is available and monitored with sufficient frequency to support the harvest control rule

SG 80: Sufficient relevant information related to stock structure, stock productivity, fleet composition and other data is available to support the harvest strategy. Stock abundance and fishery 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. There is good information on all other fishery removals from the stock.

SG 100: A comprehensive range of information (on stock structure, stock productivity, fleet composition, stock abundance, fishery removals and other information such as environmental information), including some that may not be directly relevant to the current harvest strategy, is available. 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 the inherent uncertainties in the information [data] and the robustness of assessment and management to this uncertainty.

Score	**80**

Rationale

The information available for Kerguelen is set out in Table 7 of the main report and summarised here:

- Basic biological information from POKER I and POKER II, plus information from Australian research in their part of the Kerguelen EEZ;
- Tagging data from Kerguelen and HIMI;
- Genetic studies;
- Fisheries-independent biomass surveys from POKER, but only down to 1000m;
- Fisheries catch and effort data, including catch for past fisheries at Kerguelen and estimated IUU catch;
- Standardised CPUE for French longline fishery (month and year effects), separately by area and depth stratum;
- Catch at length, from observers and quayside sampling;

- Catch at age, estimated from catch and length and otolith aging;
- Estimate of orca depredation rate from observers.

There is, therefore, reasonably good data, including fisheries-dependent data (estimated catches back to 1979, standardised CPUE time series by area since ~2000), fisheries-independent data (research cruises) and biological data (tagging, aging, reproduction, genetic studies). Stock structure and productivity is thus relatively well understood, as is the fleet composition and fishing behaviour (limited licences, VMS, 100% observer coverage). Other data sets are more uncertain: biomass estimates from the POKER cruises remain subject to considerable uncertainty, as do estimates of IUU fishing (set out in main report). More of a problem is that the various data sets provide conflicting information on trends in stock biomass – notably CPUE trends and POKER data. Further fisheries-independent data may help to clarify this problem – a POKER cruise is planned to take place every three years from now on. There is a possibility that data sets might also be reconciled if estimates of IUU fishing are increased, although preliminary attempts at WG-FSA suggest that this is not the whole story (see main report).

Given that the harvest strategy appears to be relatively precautionary, the team considered that SG80 was met for Kerguelen. SG100, however, requires i) a comprehensive range of information, ii) a high degree of certainty in data and iii) a good understand of uncertainties and their impact on management. The team did not consider that any of these requirements are met: for example, fisheries-independent biomass estimates are still extremely uncertain (see PI 1.1.1). and are only available down to 1000m (i.e. sampling probably less than half the total biomass), the impact of this and other uncertainties on the outcome of the stock assessment remains to be fully quantified.

Recommendation
Both peer reviewers queried whether tag returns in this fishery might be lower than those on the Australian side, and whether this makes the data less useful overall. It is therefore recommended by the assessment team, that SARPC investigate the utility of equipping all the vessels with tag detectors, as is reported standard in the HIMI zone.

1.2.4 Assessment of stock status

There is an adequate assessment of the stock status

SG 60: The assessment estimates stock status relative to reference points. The major sources of uncertainty are identified.

SG 80: The assessment is appropriate for the stock and for the harvest control rule, and is evaluating stock status relative to reference points. The assessment takes uncertainty into account. The stock assessment is subject to peer review.

SG 100: The assessment is appropriate for the stock and for the harvest control rule and takes into account the major features relevant to the biology of the species and the nature of the fishery. The assessment takes into account uncertainty and is evaluating stock

status relative to reference points in a probabilistic way. The assessment has been tested and shown to be robust. Alternative hypotheses and assessment approaches have been rigorously explored. The assessment has been internally and externally peer reviewed.

Score	**75**

Rationale

The details of the stock assessment are set out in the main report and also summarised in PI 1.1.1. The stock assessment evaluates stock status in relation to pristine biomass B_0, and also evaluates the harvest strategy in relation to CCAMLR reference points.

The uncertainties in the stock assessment can be summed up as follows:

Major uncertainties:

- Fisheries-independent biomass estimates from the POKER cruises are extremely uncertain, and vary considerably between POKER I and POKER II and depending on the extrapolation method used. It is also important to note that these reflect biomass only down to 1000m, while the fishery operates considerably deeper than this (and toothfish may live deeper still).
- Trends in CPUE data and trends in fisheries-independent biomass estimates appear to conflict with each other, meaning that model likelihood profiles have to be smoothed out to get a sensible result.
- Estimates of past IUU fishing are uncertain.

Minor uncertainties:

- The size-at-age relationship used in the model is taken from the Australian part of the Kerguelen plateau
- For the tagging data, the tag detection rate was estimated at 90%. Some of the tagging data could not be used due to data storage problems.

The Bayesian approach allows all available data to be used, and data sources to be weighted according to the perceived level of uncertainty and the extent to which they conflict with other data sources. This is a relatively subjective process – however, MNHN was working in cooperation with Australian scientists who are extremely experienced in using CASAL, so it is assumed that this was done in the most appropriate way.

For SG60, the stock assessment estimates stock status in relation to reference points (CCAMLR probabilistic reference points and biomass reference points), and identifies major sources of uncertainty, so this is met.

For SG80, the assessment must be 'appropriate to the stock and the harvest control rule'. A review of the 2012 stock assessment by CCAMLR WG-FSA concluded:

3.2.33 The Scientific Committee agreed that the current catch limit of 5 100 tonnes for *D. eleginoides* in Division 58.5.1 could be used as management advice for 2012/13. It

also agreed that a more robust stock assessment was required to provide advice on catch limits beyond 2012/13.

Thus WG-FSA consider that the stock assessment is appropriate for the HCR only in the short term (until next season), after which a more robust stock assessment is required. Therefore, it is reasonable to conclude that this element of SG80 is not met.

The other elements of SG 80 are: i) that stock status is evaluated in relation to reference points (which is met as set out above), ii) that uncertainty is taken into account (which is met, in that the evaluation of stock status suggests that the harvest strategy is very precautionary) and iii) that there is peer review (which is met as set out above).

Therefore the overall score is 75.

It is important to note, however, that the fishery is committed to progressing with this work according to the workplan proposed by CCAMLR – as noted in the Scientific Committee report for 2012:

3.2.34 Prof. Duhamel noted that France intends to progress the work plan outlined by WG-FSA during the intersessional period and to present a more robust stock assessment model to the 2013 meeting of WG-FSA.

The workplan can be summarised as:

- Investigate using a simpler model with fewer fisheries
- Use only five years at liberty tag data
- Incorporate age data from Poker surveys and fisheries catches as it becomes available
- Investigate selectivities, display the time series estimated for cryptic spawning biomass[27]
- Better understand IUU fishing effects on unfished biomass estimate (increase the IUU values supplied to the model)
- Compare results from a configuration with year class strength (YCS) =1, no CPUE data, to the base case.

Condition

A score <80 requires a condition. The stock assessment process needs to continue to the point where it can provide management advice (on the appropriate level of the TAC) over the long term. The assessment team notes the following:

- The fishery has made enormous strides over the last three years in this regard.
- Stock assessment needs to be a ongoing process.

[27] Biomass that is not available to be sampled – e.g. by POKER (below 1000m) or by the fishery (above 500m).

- The workplan endorsed by CCAMLR and agreed by MNHN scientists is an appropriate way to move forward.
- MNHN now has the expertise available on a full-time basis to address this workplan.
- Fishery stakeholders are committed to continuing the stock assessment process and implementing the workplan.
- It is vital that the process of setting the TAC is informed by the stock assessment and the CCAMLR reference points in the future. This does not, of course, mean that the TAC must always be set at the maximum level recommended by the stock assessment.

By the end of the five-year certification period, the fishery must have in place a sustainable stock assessment process which i) evaluates the fishery with reasonable regularity; ii) is used to inform decisions about the level of the TAC by TAAF and other stakeholders and iii) is presented for regular review by CCAMLR WG-FSA.

Principle 2

Fishing operations should allow for the maintenance of the structure, productivity, function and diversity of the ecosystem (including habitat and associated dependent and ecologically related species) on which the fishery depends.

2.1 Retained species

2.1.1 Outcome status

The fishery does not pose a risk of serious or irreversible harm to the retained species and does not hinder recovery of depleted retained species.

SG 60: Main retained species are likely to be within biologically based limits or if outside the limits there are measures in place that are expected to ensure that the fishery does not hinder recovery and rebuilding of the depleted species. If the status is poorly known there are measures or practices in place that are expected to result in the fishery not causing the retained species to be outside biologically based limits or hindering recovery.

SG 80: Main retained species are highly likely to be within biologically based limits, or if outside the limits there is a partial strategy of demonstrably effective management measures in place such that the fishery does not hinder recovery and rebuilding.

SG 100: There is a high degree of certainty that retained species are within biologically based limits. Target reference points are defined and retained species are at or fluctuating around their target reference points.

Score	**60**

Rationale

As set out in the main report, the bycatch species for this fishery are the following (Pruvost et al. 2009):

- *Antimora rostrata*
- Grenadiers (*Macrourus carinatus* mainly)
- Rays (*Bathyraja irrasa*, *B. eatonii*)
-

A. rostrata is discarded, so is dealt with under 2.2. The only retained species are therefore the grenadiers (*M. carinatus*) and the rays. Grenadier catch in 2011 was 451 t, compared to 4546 t of toothfish – i.e. ~10%. Ray catch in 2011 was 289 t – i.e. ~6%.

1. Grenadiers

A key objective of the two POKER research cruises was to assess the populations of fish bycatch species (retained and discarded). The data presented in the two POKER reports are, unfortunately, mainly in graphical form, making comparisons somewhat qualitative. However, it is possible to conclude that between POKER I (2006) and POKER II (2010), there were no strong, visible changes in biomass or distribution of *M. carinatus* on the Kerguelen plateau. For *M. carinatus*, the POKER I survey produced an estimated biomass of 6,100 tonnes (SD 2,200 t) across the French part of the Kerguelen plateau, excluding Skiff Bank where the species was not abundant. Similar estimates for POKER II are not yet available.

Fishbase reports that the species is found from 200-1200m, concentrated between 5-800m[28]. CPUE data for this fishery (for macrourids in general, but thought to be mainly *M. carinatus*), however, give a completely different picture, with maximum catch being around 1400m (Figure 24).

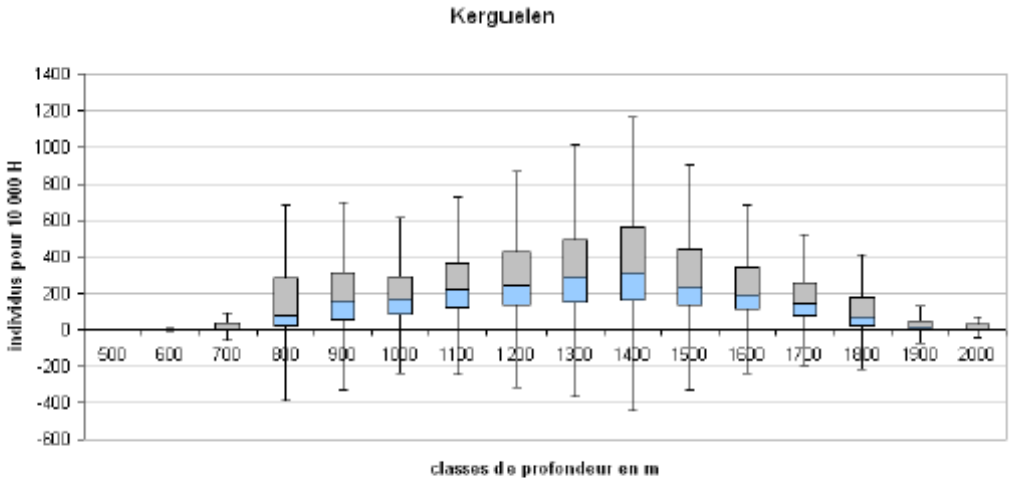


Figure 17 : Représentation des taux de capture de Grenadier en fonction de la profondeur par tranche de 100m à Kerguelen.

Figure 24. Catch rate of macrourids by depth for 10,000 hooks at Kerguelen (Gasco and Duhamel 2011). Data is from the commercial fishery (PECHEKER database).

This suggests that POKER data is not good at sampling this species – at least in relation to the portion of the population that is vulnerable to fishing. The biomass estimate from POKER I is therefore probably a significant underestimate of the total biomass around Kerguelen. (These data also suggest that the prohibition on fishing shallower than 500m will make no difference to impacts on macrourids.)

An approximate estimate from these data is that POKER was able to sample ~20% of the total population, although of course it is important to bear in mind that POKER (using a trawl) may well have been sampling a different part of the population to the fishery. This very rough estimate of biomass gives a figure of the order of 33,000 t, of which a catch of 451 t in 2011 represents ~1.5%.

[28] See http://www.fishbase.org/summary/Macrourus-carinatus.html

Spatial distribution around Kerguelen seems to be patchy, with high densities around the edge of the shelf to the west and southwest of the island; these data show that a relatively small proportion of the sets are responsible for much of the catch of macrourids (Figure 25). Specifically, 'high density sets' (those corresponding to catches of >500 individuals per 10,000 hooks (all except the blue in Figure 25) represent 12% of hauls and 37% of the total catch.

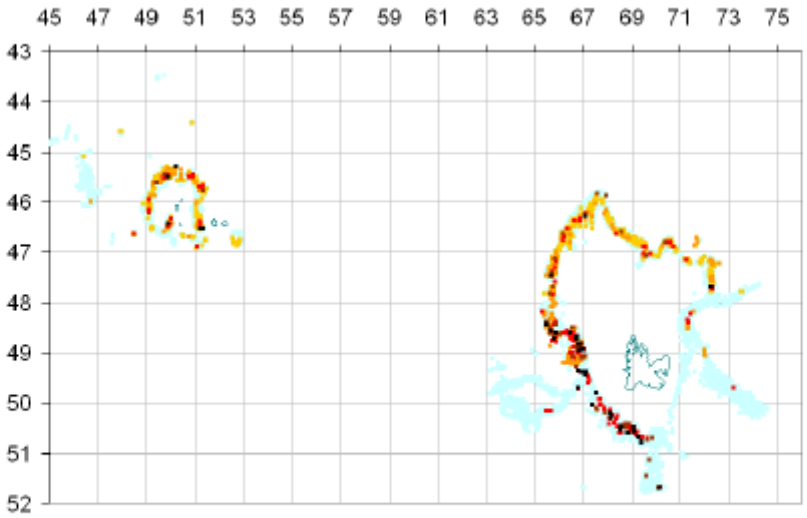


Figure 19 : Distribution spatiale des densités de Grenadiers par maille de deux minutes de degré. Le gradient utilisé représente, du plus clair au plus sombre, des densités croissantes.

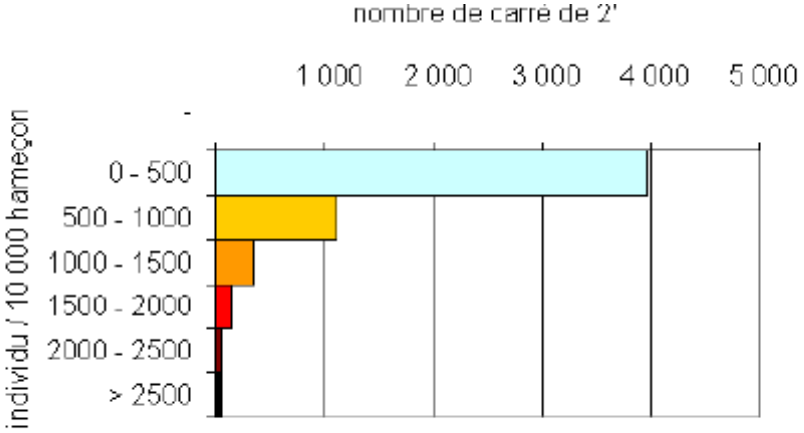


Figure 20 : Distribution du nombre de mailles de deux minutes sans interpolation.

Figure 25. Top: spatial distribution of macrourids around Kerguelen. Bottom: colour coding for density, expressed as catch of individuals per 10,000 hooks (blue: 0-500), yellow 500-1000, orange 1000-1500, red 1500-2000, dark red 2000-2500, black >2500) and frequency in the data set.

2. Rays

As for the macrourids, the POKER data suggest no change in biomass for the three ray species between 2006 and 2010 – judging by Figure 26, POKER is likely to be more successful at sampling the rays. POKER II gives estimates of 19,750 t (confidence intervals 9656 t, 34,100 t) for total biomass of *B. eatonii* on the Kerguelen plateau (French EEZ). Estimates for *B. irrasa* are not given.

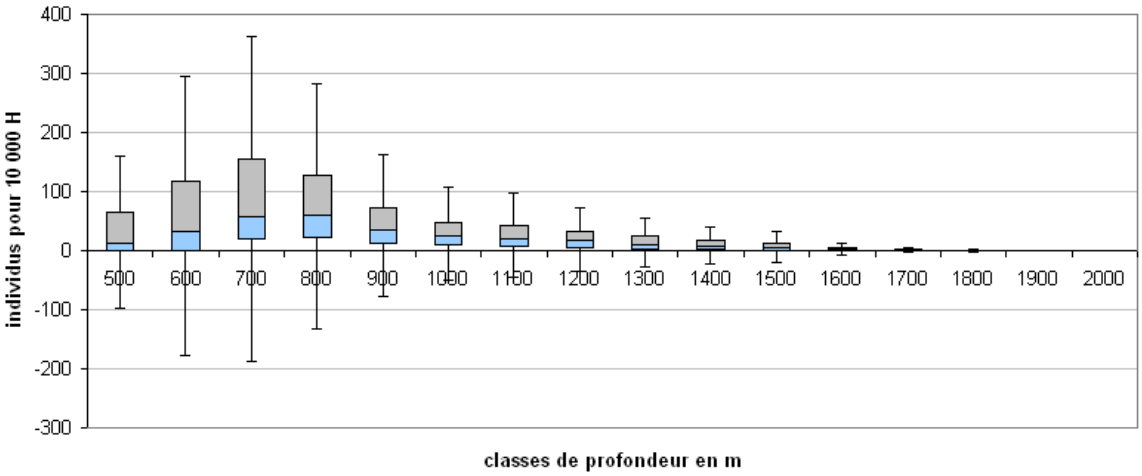
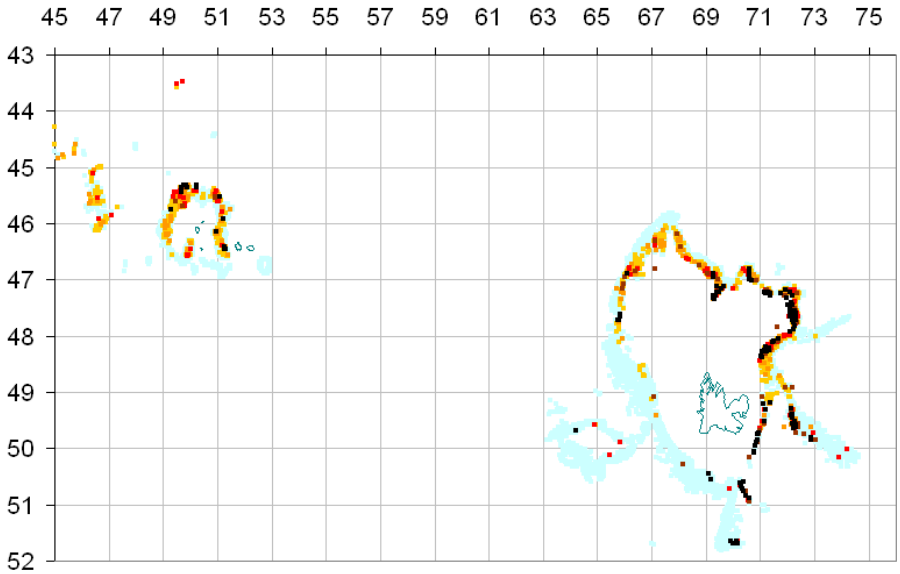


Figure 26. Catch rate of rays by depth for 10,000 hooks at Kerguelen (Gasco and Duhamel 2011).

Figure 26 suggests that the prohibition on fishing shallower than 500m is likely to have resulted in some reduction in impact on ray populations (although perhaps not on *B. irrasa* which is reported to live deeper than the other species; Pruvost et al. 2009).

Spatial distribution of catch of rays around Kerguelen is also patchy, as can be seen in Figure 27.



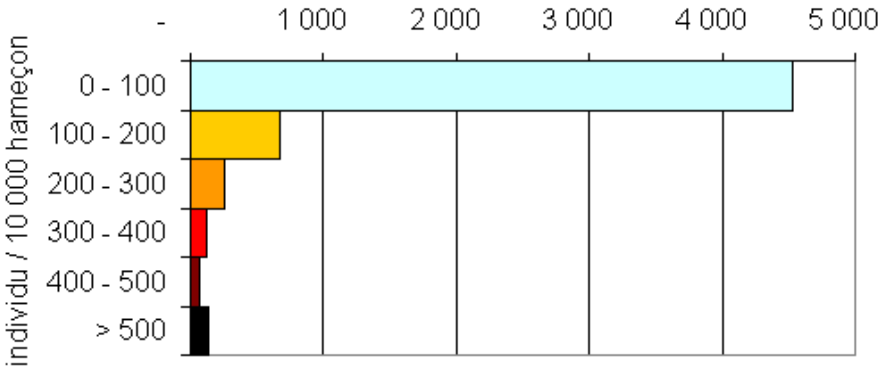


Figure 27. Top: spatial distribution of rays around Kerguelen. Bottom: colour coding for density, expressed as catch of individuals per 10,000 hooks (blue: 0-500), yellow 500-1000, orange 1000-1500, red 1500-2000, dark red 2000-2500, black >2500) and frequency in the data set.

This patchy distribution means that only 10% of the sets (all those other than the blue ones in Figure 27) result in 60% of the total catch of rays.

3. Management of bycatch

The code of practice (Gasco and Duhamel 2011) provides objectives and strategies for catch reduction for macrourids and rays (and antimoras), based on these analyses; this is detailed in the rationale for PI 2.1.2. In addition, there is a move-on rule for bycatch species (a haul of 2 tonnes or more requires the vessel to move away at least 5 miles for at least 5 days). These management rules are described in detail in 2.1.2 below.

4. Conclusions

SG60 requires that the main retained species are likely to be within biologically-based limits, or that measures are in place to avoid fisheries-related impacts on the population. Since the catch relative to the overall biomass is low, according to POKER II estimates of biomass, and since measures are in place (the code of conduct, required in the regulation), then the team concluded that this is met.

SG80 requires that the stock status is 'highly likely' to be within biologically-based limits. The team did not consider that this was met because not enough quantative information was provided on stock status for either macrourids or rays. The team assumes that a time series of CPUE data is available for these species (as per the data presented in Gasco and Duhamel 2011). However, there does not appear to be any kind of systematic analysis of these data to provide a quantitative index of stock status. In addition, since the code of practice is new, it is not yet 'demonstrably effective'. The overall score is therefore 60.

5. Condition

A score <80 requires a condition. A monitoring system needs to be put in place for grenadiers and rays, appropriate to the scale of the fishery, which will evaluate trends in stock biomass for these stocks, and provide indication of possible risks. This may be by analysis of trends in CPUE or by some other suitable method.

The assessment team needs to see evidence of the systematic implementation of the code of conduct. In addition, a process of review and revision of the code of conduct in the light of trends in the fishery is required.

2.1.2 Management strategy

There is a strategy in place for managing retained species that is designed to ensure the fishery does not pose a risk of serious or irreversible harm to retained species.

SG 60: There are measures in place that are expected to maintain the main retained species at levels which are highly likely to be within biologically based limits, or to ensure the fishery does not hinder their recovery and rebuilding. The measures are considered likely to work, based on plausible argument (eg, general experience, theory or comparison with similar fisheries/species).

SG 80: There is a partial strategy in place that is expected to maintain the main retained species at levels which are highly likely to be within biologically based limits, or to ensure the fishery does not hinder their recovery and rebuilding. There is some objective basis for confidence that the partial strategy will work, based on some information directly about the fishery and/or species involved. There is some evidence that the partial strategy is being implemented successfully

SG 100: There is a strategy in place for managing retained species. The strategy is mainly based on information directly about the fishery and/or species involved, and testing supports high confidence that the strategy will work. There is clear evidence that the strategy is being implemented successfully, and intended changes are occurring. There is some evidence that the strategy is achieving its overall objective.

Score	**85**

Rationale

A Code of Good Conduct for avoiding bycatch has been put in place. The code was drafted by MNHN (2011), based on analysis of POKER and CPUE data. The fisheries regulations include respecting this Code of Good Conduct, so it can be regarded as mandatory (TAAF 2012; Annex 2 point 3):

Afin de limiter les prises accessoires d'espèces de poissons non ciblées, le capitaine veillera à mettre en œuvre les préconisations figurant dans le document de travail du MNHN de juillet 2011 proposant un code de bonne conduite destiné à réduire l'impact de la pêcherie en matière de captures accessoires.

Il est notamment recommandé :

- d'éviter les zones à fortes densités d'espèces non ciblées ;
- d'utiliser les informations disponibles sur la distribution bathymétrique des prises accessoires afin de limiter l'effort de pêche aux profondeurs à forte densité d'espèces non ciblées ;
- de ne pas poursuivre la pêche dans les zones à forte densité d'espèces non ciblées.

[*In order to limit bycatch of non-target fish species, the captain will make sure that the requirements of the MNHN working document of July 2011 proposing a code of good conduct are put into practice, in order to reduce the impact of the fishery in relation to bycatch.*
Specifically, it is recommended:

- *to avoid zone with high densities of non-target species*
- *to use available bathymetric information on bycatch in order to limit fishing effort at depths with high densities of non-target species*
- *not to continue fishing in zones with high density of non-target species*]

The code itself is relatively straightforward:

- Avoid high density zones using the maps provided.
- Monthly analysis of bycatch in comparison with previous years (presumably by MNHN?), with this data provided back to the vessels.
- Use the information provided (see 2.1.1 above) on the depth distribution of bycatch species to restrict fishing effort in high bycatch depth zones as far as possible.
- The captain should not remain in zones of high bycatch density (defined as >500 individuals per 10,000 hooks for macrourids and >100 individuals per 10,000 hooks for rays and antimoras).

The code also sets objectives for bycatch reductions over three years, including an objective of a 20% reduction in macrourid catch and a 60% reduction in ray catch at Kerguelen.

As well as the code of conduct, there is a move-on rule in place which requires vessels which catch >2 tonnes of to move away at least 5 miles for at least 5 days (TAAF 2010):
Si au cours d'une pêche dirigée sur la légine (*Dissostichus eleginoides*) la capture accessoire sur une ligne de *Macrourus* spp., *Sominosus* spp. ou de raies est égale ou supérieure à 2 tonnes, le navire ne pêchera plus par le même mode de pêche dans un rayon de 5 milles nautiques du lieu où la capture accessoire a excédé 2 tonnes pendant un

minimum de cinq jours. Pour toute autre espèce de capture accessoire la capture ne devra pas excéder 1 tonne. …

[*If during directed toothfish fishing, the bycatch on one line of* Macrourus *spp.,* Somniosus *spp. or rays is equal to or above 2 tonnes, the fishing vessel will not fishing any further using the same fishing technique within a radius of 5 nautical miles from the place at which the catch exceeded two tonnes for a minimum of 5 days. For all other bycatch species, the catch should not exceed one tonne.]*
(It was not clear to the team why Somniosus *spp. is included in this rule, since the team could find no evidence that these species are ever caught in any quantities. There is a prohibition on targeting sharks, which must be discarded alive. This issue is dealt with under 2.2 below.*]

This move-on rule is the same as is set out in CCAMLR Conservation Measure 33-02 which applies to the Australian zone (SCS 2012), which states that "*if, in the course of directed fishing, the by-catch of in any one haul of Channichthys rhinoceratus, Lepidonotothen squamifrons, Macrourus spp., Somniosus spp. or skates and rays is equal to, or greater than 2 tonnes*," then the vessel must move on 5 n miles for a period of at least five days. If any vessel catches *equal to, or greater than 1 tonne of a by-catch species of any other bycatch species for which by-catch limitations apply under this conservation measure*, it should move on (SCS 2012).

The assessment team considered that the code and move on rule constituted a 'strategy' for restricting fisheries impacts on *M. carinatus* and rays. An Australian assessment in EEZ shows that fishing mortality on these species from toothfish fisheries (longline and trawl combined) is within sustainable limits (Zhou et al. 2009). There is therefore an objective basis for considering that this strategy will work, particularly given that efforts are being made to reduce fishing effort on bycatch species further. Since there is 100% coverage of observers with a brief to ensure compliance, the team assumes that there is no issue in relation to implementation. SG80 is therefore met.

In relation to SG100, the team considered that the move-on rule plus code of conduct constituted a 'strategy', meeting the first part. However, since the code of conduct is extremely new, plus data on the populations of these species are limited, it is not possible to say that there is 'high confidence' that it will work, or 'evidence' (as yet) that it is achieving its objective. The overall score is therefore 85.

2.1.3 Information / monitoring

Information on the nature and extent of retained species is adequate to determine the risk posed by the fishery and the effectiveness of the strategy to manage retained species

SG 60: Qualitative information is available on the amount of main retained species taken by the fishery. Information is adequate to qualitatively assess outcome status with respect to biologically based limits. Information is adequate to support measures to manage main retained species

SG 80: Qualitative information and some quantitative information are available on the amount of main retained species taken by the fishery. Information is sufficient to estimate outcome status with respect to biologically based limits. Information is adequate to support a partial strategy to manage main retained species. Sufficient data continue to be collected to detect any increase in risk level (e.g. due to changes in the outcome indicator scores or the operation of the fishery or the effectiveness of the strategy).

SG 100: Accurate and verifiable information is available on the catch of all retained species and the consequences for the status of affected populations. Information is sufficient to quantitatively estimate outcome status with a high degree of certainty. Information is adequate to support a comprehensive strategy to manage retained species, and evaluate with a high degree of certainty whether the strategy is achieving its objective. Monitoring of retained species is conducted in sufficient detail to assess ongoing mortalities to all retained species.

Score	**70**

Rationale

Quantitative catch data is available for this fishery going back around 15 years (see main report). These data can be considered accurate and verifiable (see discussion of monitoring and enforcement below). The information is sufficient to support a clear strategy to manage impacts on bycatch species (Gasco and Duhamel 2011). SG60 is therefore met.

As noted in the rationale for PI2.1.1 above, the information available (trends in CPUE by area and depth) are probably sufficient to estimate population status in relation to biologically-based indicators, and to estimate risk-level on a regular basis, as has been done in the Australian HIMI EEZ (Zhou et al. 2009). The assessment team could, however, find no evidence that CPUE data for macrourids and rays are regularly analysed in this way. These elements of SG80 are therefore not met.

Two elements of SG80 are therefore met, while two are not met, giving an overall score of 70.

Condition

A score <80 requires a condition. The condition is the same as for 2.1.1 above.

2.2 By-catch

2.2.1 Outcome status

The fishery does not pose a risk of serious or irreversible harm to the by-catch species or species groups and does not hinder recovery of depleted by-catch species or species groups.

SG 60: Main by-catch species are likely to be within biologically based limits, or if outside such limits there are mitigation measures in place that are expected to ensure that the fishery does not hinder recovery and rebuilding. If the status is poorly known there are measures or practices in place that are expected result in the fishery not causing the by-catch species to be biologically based limits or hindering recovery

SG 80: Main by-catch species are highly likely to be within biologically based limits or if outside such limits there is a partial strategy of demonstrably effective mitigation measures in place such that the fishery does not hinder recovery and rebuilding

SG 100: There is a high degree of certainty that by-catch species are within biologically based limits

Score	**90**

Rationale

The main bycatch species which is discarded is *A. rostrata*. No other main bycatch species were identified (see main report).

Only a qualitative comparison is possible between POKER I and POKER II data with the information currently available. Since *A. rostrata* is a deep-water species living mainly between 1300m and 2500m according to Fishbase[29]), POKER data are unlikely to be informative. POKER II does attempt to estimate *A. rostrata* biomass around Kerguelen, but the estimate has wide enough confidence intervals that it is not very informative (1288 t; CIs 522 t, 21842 t).

A. rostrata has a circumglobal distribution, except for the north Pacific Ocean, and since it lives at depths below the direct impact of human activity, the team considered that it was highly unlikely that the fishery was having any direct impact on the population around Kerguelen. SG80 is therefore met.

[29] Judging by *M. carinatus*, however, the information in Fishbase for these species is questionable.

SG100 applies to all bycatch species. A sample of observer reports reviewed by the assessment team suggested occasional catches of *Etmopterus* sp.– a lanternshark[30] (assessed as 'least concern' on the IUCN redlist). According to fisheries regulations (TAAF 2012) sharks may not be targeted and must be cut off alive. Only sharks and rays may be discarded in this way – all other bycatch must be brought on board, sorted in the factory and reported in logbooks. Therefore the team was confident that fisheries impacts on other bycatch species are therefore very minimal. Nonetheless, it is not possible to say that all bycatch species are within biologically based limits. SG100 was considered partly met, leading to a score of 90.

2.2.2 Management strategy

There is a strategy in place for managing bycatch that is designed to ensure the fishery does not pose a risk of serious or irreversible harm to the by-catch species or species groups and does not hinder recovery of depleted by-catch species or species groups.

SG 60: There are measures in place, if necessary, which are expected to maintain main bycatch species at levels which are highly likely to be within biologically based limits or to ensure that the fishery does not hinder their recovery. The measures are considered likely to work, based on plausible argument (e.g general experience, theory or comparison with similar fisheries/species).

SG 80: There is a partial strategy in place, if necessary, for managing bycatch that is expected to maintain main bycatch species at levels which are highly likely to be within biologically based limits or to ensure that the fishery does not hinder their recovery. There is some objective basis for confidence that the partial strategy will work, based on some information directly about the fishery and/or the species involved. There is some evidence that the partial strategy is being implemented successfully.

SG 100: There is a strategy in place for managing and minimising bycatch. The strategy is mainly based on information directly about the fishery and/or species involved, and testing supports high confidence that the strategy will work. There is clear evidence that the strategy is being implemented successfully, and intended changes are occurring. There is some evidence that the strategy is achieving its objective.

Score	**85**

Rationale

The general strategy for managing bycatch (retained and discarded) is set out in the rationale for PI 2.1.2 above, and consists of the move-on rule and the code of conduct.

In relation to the code of conduct for rays and antimoras specifically, the strategy proposes objectives of a 60% reduction in catches at Kerguelen. For antimora, the data

[30] The assessment team wondered whether the intention of specifying *Somniosus* in the move on rule was to target this taxon. However, in either case it would appear to make no difference since catches of both taxa are negligible to zero.

presented in the code of conduct suggest that the 5% of sets corresponding to a catch of >100 individuals per 10,000 hooks represent 45% of the catch, while the 10% corresponding to a catch of >50 individuals represent 60% of the catch. It is therefore suggested that these large reductions in bycatch can be achieved with a small but targeted change in fishing activity, as proposed in the code.

In addition, it is important to note:

- Sharks may not be targeted.
- Rays and sharks should be discarded if alive, and should be cut off hooks before arriving on deck. (For rays at Kerguelen, the fishing companies report anecdotally that this practice does not seem to work very well, although in other toothfish longline fisheries, such as South Georgia, it is reportedly quite successful; Endicott and Agnew 2004).
- Other bycatch species, even if eventually discarded, must be brought into the factory, sorted, and the catch reported in logbooks.

The assessment team considered that this constituted a strategy which is being implemented (first and last parts of SG100). There is, however, insufficient information at the population level to provide 'high confidence' that it will work, and the strategy is too new for there to be evidence that it is achieving its objective. The overall score is therefore 85, as for PI 2.1.2.

2.2.3 Information / monitoring

Information on the nature and amount of bycatch is adequate to determine the risk posed by the fishery and the effectiveness of the strategy to manage bycatch

SG 60: Qualitative information is available on the amount of main bycatch species affected by the fishery. Information is adequate to broadly understand outcome status with respect to biologically based limits. Information is adequate to support measures to manage bycatch

SG 80: Qualitative information and some quantitative information are available on the amount of main bycatch species affected by the fishery. Information is sufficient to estimate outcome status with respect to biologically based limits. Information is adequate to support a partial strategy to manage main bycatch species. Sufficient data continue to be collected to detect any increase in risk to main bycatch species (e.g. due to changes in the outcome indicator scores or the operation of the fishery or the effectiveness of the strategy).

SG 100: Accurate and verifiable information is available on the amount of all bycatch and the consequences for the status of affected populations. Information is sufficient to quantitatively estimate outcome status with respect to biologically based limits with a high degree of certainty. Information is adequate to support a comprehensive strategy to manage bycatch, and evaluate with a high degree of certainty whether a strategy is achieving its objective. Monitoring of bycatch data is conducted in sufficient detail to assess ongoing mortalities to all bycatch species.

Score	85

Rationale

Quantitative information is available on bycatch, included those species which are discarded. The information does not appear to be analysed in a quantitative way (e.g. via trends in CPUE over time), but it is sufficient to make an assessment that the fishery is likely to be low-risk for these species. A strategy is in place for management. The key element – the code of conduct – is based on good information about species distribution by area and depth. Sufficient data continue to be collection to evaluate changes in risk (catch and CPUE in time and space, POKER research cruises, Australian analyses).

For SG100, accurate and verifiable data is available on bycatch, and these data are detailed (e.g. in space and time). Because of the lack of information on the populations and the lack of analysis of the data, however, the team did not consider that there was a 'high degree of certainty' in population status or whether strategy objectives were being met. Overall, the score given is 85.

Recommendation

The team recommends that further information is sought, either from a desktop review or from field studies, on the survivorship of rays at Kerguelen after being cut off the line, to elucidate the apparent differences between Kerguelen and South Georgia, which could relate to the species mix, the ecosystem or fishing practices, or a mixture. On the basis of the this information, the conservation strategy for rays could be reviewed.

2.3 ETP species

2.3.1 Outcome status

The fishery meets national and international requirements for protection of ETP species. The fishery does not pose a risk of serious or irreversible harm to ETP species and does not hinder recovery of ETP species.

SG 60: Known effects of the fishery are likely to be within limits of national and international requirements for protection of ETP species. Known direct effects are unlikely to create unacceptable impacts to ETP species

SG 80: The effects of the fishery are known and are highly likely to be within limits of national and international requirements for protection of ETP species. Direct effects are highly unlikely to create unacceptable impacts to ETP species. Indirect effects have been considered and are thought to be unlikely to create unacceptable impacts

SG 100: There is a high degree of certainty that the effects of the fishery are within limits of national and international requirements for protection of ETP species. There is a high degree of confidence that there are no significant detrimental effects (direct and indirect) of the fishery on ETP species.

Score	75

Rationale

The fishery potentially interacts with three ETP species: i) grey petrels (*Procellaria cinerea*), ii) white-chinned petrels (*Procellaria aequinoctialis*) and iii) orcas (*Orcinus orca*). Mortality of albatross has been eliminated across the CCAMLR area (with the exception of illegal fisheries) by setting and hauling lines only at night. Bycatch of giant petrels (*Macronectes* spp.) is negligible.

1. Birds – issues

The Kerguelen EEZ is assessed by CCAMLR in the highest risk level (level 5) for seabird interactions with fisheries (see main report). The Kerguelen archipelago is an important breeding site for numerous species of seabirds, including albatross, petrels and penguins, and while the chicks are in the nest, the parents forage in proximity to the archipelago – i.e. in the waters around Kerguelen.

A second problem for bird interactions in the Kerguelen EEZ is that the two species of petrels concerned have different breeding strategies. White-chinned petrels breed in the austral summer and are foraging around Kerguelen in large numbers for quite a limited period in February and March. Grey petrels, conversely, breed during the austral winter and are present in the EEZ for a more prolonged and less defined period over the winter months (Delord et al. 2010). The strategy of concentrating fishing only in the winter months, which has proved successful in eliminating bird bycatch in other fisheries (e.g. South Georgia; Moody 2009), will therefore not work for Kerguelen. Overall, Kerguelen remains perhaps the most problematic area for bird bycatch in the southern hemisphere. It is noteworthy that this is the only EEZ in the CCAMLR zone which still reports any bird bycatch from its longline fisheries on a systematic basis – reports from all other areas are generally zero.

2. Birds - management

France has put in place an Action Plan for reducing bird mortality, which has been in operation since 2005 (reviewed in Marteau 2009). The initial focus of the Action Plan was i) a closed period at Kerguelen during the main period of foraging by white-chinned petrels (in 2012 this period was 1 Feb.-15 March; TAAF 2012) and ii) the implementation of all the various CCAMLR guidelines and requirements for reducing bird mortality, as set out in the main report. The Action Plan has achieved a reduction in total bird mortality at Kerguelen from nearly 2000 in 2006-7 to less than 200 in 2010-11. All vessels now implement all the CCAMLR requirements as a matter of course, but it is still reportedly noticeable that some vessels have consistently higher bird bycatch than others. The focus of the Action Plan now is to bring all the vessels to the level of the best performing. Incentives for this have been put in place via the distribution of quota, which varies from 655 t to 833 t per vessels, depending partly on performance in relation to bird mortality (although other factors are also taken into account – see main report).

Bird bycatch data is reviewed annually by the CCAMLR Working Group on Incidental Mortality (IMAF). In 2011, IMAF noted (WG-IMAF 2011):

3.14 The Working Group applauded the substantial progress made by France and reiterated its previous advice (SC-CAMLR-XXVIII, Annex 7, paragraph 3.54) that full implementation of best-practice would further reduce seabird by-catch [i.e. all vessels reaching the standard of the best-performing vessels].

In fact, CCAMLR has now concluded that there is no longer a need for WG-IMAF to meet regularly to discuss the issue of bird mortality, although the group will still meet periodically as required (WG-IMAF 2011, section 10).

3. Grey petrels

Grey petrels breeds on the islands of Tristan da Cunha, Prince Edward and Marion, Crozet, Kerguelen, Amsterdam, Macquarie and the Campbell and Antipodes islands, with the largest breeding population on the Antipodes Islands estimated at ~53,000 pairs (2001). At Kerguelen the breeding population of grey petrels has been estimated at 1,900-5,600 breeding pairs (Birdlife International, 2012a). They are listed by IUCN as 'near threatened'.

Barbraud et al. (2009) analysed the population dynamics of grey petrels breeding on Kerguelen. They estimate that the population can support additional fishing mortality of 180-530 animals before it starts to decline (noting that the grey petrel may suffer mortality from other fisheries apart from this one - e.g. from tuna longline fisheries).
The most recent extrapolated data on total mortality of grey petrels from this fisheries is given in Table 24 for the last two years:

Table 24. Extrapolated mortality of grey petrels from this fishery, and consequences for the population. Note that the assessment team found two figures for extrapolated mortality – one from the CCAMLR Scientific Committee report on Kerguelen (CCAMLR-SC 2011, Appendix J) and one from WG-IMAF 2011, Annex 8. Since these start with the same figures, it is not clear where the differences come from. Where relevant, both figures are given.

estimate for Kerguelen fishery	2009-10 season	2010-11 season
total observed mortality birds both species	60	49
total observed mortality grey petrels	15	7
total extrapolated mortality all spp. (CCAMLR)	264	155 / 193
estimated total mortality grey petrels (total extrapolated mortality x proportion of observed mortality that is grey petrels)	60	22 / 28
total mortality which can be supported by population (Barbraud et al. 2009)	180-530 per year	
total estimated fishing mortality on population (Barbraud et al. 2009)	300	262 / 268 *
% of fishing mortality on pop coming from this fishery	20%	8.4% / 10.4% *

% of minimum estimate of maximum 'sustainable' mortality (180) coming from this fishery	33%	12% / 16%

*these figures take the improvement in this fishery and assume there has been no change in the other sources of fishing mortality

From Table 24, we estimate that this fishery imposes 12-16% of the minimum estimate of maximum 'sustainable' fishing mortality on this population of grey petrels, and represents 8-10% of the total fishing mortality, assuming no change in the other fisheries which have impacts on this population. The team concluded that since all French and CCAMLR requirements are being met, the fishery was operating within national and international standards for the protection of grey petrels, and concluded that the current mortality rate is not likely to cause an 'unacceptable impact' (the decline of the population). Therefore SG60 is met for grey petrels. It was not, however, possible to say that impacts are 'highly unlikely' to be unacceptable, as required by SG80. Indirect impacts may include discarding of hooks – this is, however, now banned, although the Action Plan (Marteau 2009) notes that it is difficult for observers to monitor. Two elements out of three of SG80 are therefore met, giving a score of 70 for grey petrels.

4. White-chinned petrels

The white-chinned petrel is distributed widely around the southern hemisphere, foraging north to the subtropics and south to the pack-ice edge off Antarctica. Outside the breeding season, individuals from Kerguelen winter off South Africa and Namibia over the Benguela Current. The species breeds on South Georgia, the Prince Edward Islands, Crozet, Kerguelen, Auckland, the Campbell and Antipodes Islands and in small numbers in the Falkland Islands. Total numbers have been estimated at 1,200,000 breeding pairs, down from 1,430,000 pairs in the 1980s – an order of magnitude larger than estimates of grey petrel populations. Kerguelen is a key breeding site for white-chinned petrels, with the islands' breeding population estimated at 186,000-297,000 pairs (Barbraud et al. 2009). The white-chinned petrel is listed on the IUCN Red List as 'vulnerable'.

Barbraud et al. (2009) estimate a maximum 'sustainable' mortality for the white-chinned petrel population at Kerguelen of ~31,000 birds – two orders of magnitude greater than for grey petrels. It is therefore immediately clear without going through the quantitative exercise in Table 24 above that the mortality rate imposed by this fishery on white-chinned petrels (estimated total mortality 204 in 2009/10 and 133-165 in 2010/11) is highly unlikely to have any significant impact at the population level.

For white-chinned petrels, it is reasonable to conclude that it is 'highly unlikely' that the fishery creates unacceptable impacts for this population, so SG80 is met. For SG100, there is a high degree of certainty that the fishery is acting within national and international requirements, but it is not possible to say that there are 'no significant detrimental effects' at all. Therefore the score for white-chinned petrels is 90.

5. Orcas

The problem with orcas is 'depredation' – orcas feeding on the toothfish as the line is hauled. This does not, as far as anyone can tell, cause any problems for the orcas (probably the reverse), but it is obviously a problem for the fishery. In some areas such as Crozet, where this behaviour has become entrenched in local populations, orca depredation rates can reach 20% or more (Roche et al. 2007). The same behaviour has been reported in sperm whales, but apparently not in this fishery.

At Kerguelen, most orca populations have not learnt this behaviour, and there are strong efforts in the fishery to prevent them from doing so. If orcas are seen, it is forbidden to start hauling lines, and if a line is in the middle of being hauled, it will be buoyed off and hauling will not be restarted until the orcas have gone (TAAF 2012). No lethal or non-lethal scaring methods are permitted.

The issue with orcas is therefore only indirect impacts, which are avoided by the fishery. The score is therefore 100.

6. Overall score

Grey petrels scored <80 so the overall score cannot be higher than 75.

7. Condition

A score <80 requires a condition. Declines in bird mortality need to continue until all vessels are performing at the best possible level. In addition, a monitoring system is required to identify the level of risk posed by the fishery to the Kerguelen grey petrel population, including specific bycatch targets for grey petrels.

2.3.2 Management strategy

The fishery has in place precautionary management strategies designed to: - meet national and international requirements; - ensure the fishery does not pose a risk of serious or irreversible harm to ETP species; - ensure the fishery does not hinder recovery of ETP species; and - minimise mortality of ETP species.

SG 60: There are measures in place that minimise mortality and injury, and are expected to achieve the ETP Outcome PI 80 level of performance or above. The measures are considered likely to work, based on plausible argument (e.g. general experience, theory or comparison with similar fisheries/species).

SG 80: There is a strategy in place for managing the fishery's impact on ETP species, including measures to minimise mortality, which is designed to achieve the ETP Outcome PI 80 level of performance or above. There is an objective basis for confidence that the strategy will work, based on some information directly about the fishery and/or the species involved. There is evidence that the strategy is being implemented successfully.

SG 100: There is a comprehensive strategy in place for managing the fishery's impact on ETP species, including measures to minimise mortality, that is designed to achieve above the ETP Outcome PI 80 level of performance. The 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. There is clear evidence that the strategy is being implemented successfully, and intended changes are occurring. There is evidence that the strategy is achieving its objective.

Score	**90**

Rationale

There is an Action Plan in place to reduce bird mortality in the Kerguelen fishery. Marteau (2009) presented to CCAMLR a review of the success of the Action Plan, as well as an evaluation of all the elements of the Action Plan. The figures for trends in bird mortality are given in the main report and in 3.1.1 below. Marteau's assessment of the effectiveness of the different elements of the Action Plan is given in the main report.

Other measures in place are a guidance committee (comité de pilotage) which includes scientists and SARPC, which evaluates the effectiveness of measures as well as the logistical difficulties of implementation and how to overcome them. There is also a programme of education for crew members, which is part of the role of the observers. Some collaboration between SARPC and New Zealand fishing professionals has also helped in implementing some of the above actions on SARPC vessels (Marteau 2009).

The focus of actions now have turned from implementing all the above actions (which has been achieved) to bringing all the vessels up to the best-performance level. This is probably related to details of how the above measures are put in place on a given vessels. TAAF encourages vessels to improve by incorporating performance in relation to bird mortality as an element in the decision-making on quotas for each vessel.

The assessment team concluded that this constitutes a 'comprehensive strategy', which is designed to reduce bird mortality to zero, or as close as possible. There is clearly an objective basis for thinking that the strategy will work, based on the enormous decline in bird bycatch already achieved in this fishery, plus the other examples of CCAMLR fisheries where bird bycatch has been eliminated. It is clear that the strategy is being implemented and that intended changes are occurring.

On this basis, most of SG100 is met. The one element on which the team had reservations was that while the strategy objectives are expressed in terms of overall bird bycatch, it is clear (see analysis in relation for 3.1.1) that at the population level impacts are much more likely for grey petrels than for white-chinned petrels, even though most of the bycatch is made up of white-chinned petrels. The team would like to see a (semi)-quantitative analysis of the effectiveness of bycatch measures and individual vessels in relation to grey petrels specifically. On that basis, the team felt that the second element of SG100 was not quite met, giving a score of 90.

Recommendation

It would be useful to evaluate the effectiveness of the above measures, and of individual vessels, in relation to grey petrels specifically, and if necessary re-focus on those measures which reduce mortality of grey petrels in particular.

2.3.3 Information / monitoring

Relevant information is collected to support the management of fishery 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.

SG 60: Information is adequate to broadly understand the impact of the fishery on ETP species. Information is adequate to support measures to manage the impacts on ETP species. Information is sufficient to qualitatively estimate the fishery related mortality of ETP species.

SG 80: Information is sufficient to determine whether the fishery may be a threat to protection and recovery of the ETP species, and if so, to measure trends and support a full strategy to manage impacts. Sufficient data are available to allow fishery related mortality and the impact of fishing to be quantitatively estimated for ETP species.

SG 100: Information is sufficient to quantitatively estimate outcome status with a high degree of certainty. Information is adequate to support a comprehensive strategy to manage impacts, minimize mortality and injury of ETP species, and evaluate with a high degree of certainty whether a strategy is achieving its objectives. Accurate and verifiable information is available on the magnitude of all impacts, mortalities and injuries and the consequences for the status of ETP species.

Score	**90**

Rationale

The observers (contrôleurs de pêche) must observe a minimum of 25% of line sets and hauls, and record data on bird bycatch. From these data, the total mortality rate for each species is estimated by extrapolation. The information is accurate and comprehensive enough to provide quantitative estimates of impacts from the fishery over time, as well as within years and by area.

Population-level data is also available, providing estimates for both petrel species on the maximum level of mortality than can be sustained by the population. Putting these data sets together allows an estimate of the impact of the fishery at the population level with reasonable confidence. Some data are, however, still missing in order to assess overall population outcome with a high degree of certainty: notably ongoing estimates of mortality on the population from other fisheries, including tuna fisheries, South African and Namibian hake fisheries and IUU fisheries. It is also difficult to estimate population-

level impacts with certainty in small populations such as that of the grey petrel. Nonetheless, the information supports a comprehensive strategy to manage and reduce impacts on ETP species (birds).

On this basis, while the first element of SG100 is not met, the second two elements are met, giving a score of 90.

2.4 Habitat

2.4.1 Outcome status

The fishery does not cause serious or irreversible harm to habitat structure, considered on a regional or bioregional basis, and function.

SG 60: The fishery is unlikely to reduce habitat structure and function to a point where there would be serious or irreversible harm.

SG 80: The fishery is highly unlikely to reduce habitat structure and function to a point where there would be serious or irreversible harm.

SG 100: There is evidence that the fishery is highly unlikely to reduce habitat structure and function to a point where there would be serious or irreversible harm.

Score	**85**

Rationale

The fishing method is longlining, which is not considered to have significant impacts on benthic ecosystems, although lines can move so impacts will not be zero. The report 'Shifting Gears' on ecosystems impacts of fisheries (Chuenpagdee et al. 2003) ranks the relative impact of demersal longlines on marine ecosystems at 30/100, better than all other methods of demersal fishing.

Trawling is banned in the Kerguelen EEZ, except for scientific research (POKER), and a small amount of commercial fishing associated with POKER to offset costs. All habitat shallower than 500m is closed to fishing – this represents a significant area of ~30,000 square nautical miles (as estimated from maps in POKER reports – this seems to be somewhere around 15-20% of the total EEZ, but this is an approximate estimate).

The team concluded that it is on this basis 'highly unlikely' that the fishery will cause serious or irreversible harm to habitat structure and function at Kerguelen. Sharp et al. (2009) note that there is a lack of direct evidence about the impact of demersal longlines, particularly on sensitive benthic species such as corals, sponges and crinoids. The team considered that the large closed area (<500m) constitutes some 'evidence' but that since habitats may vary deeper than 500m, the evidence is only partial, so SG100 is not fully met. The score is 85.

2.4.2 Management strategy

There is a strategy in place that is designed to ensure the fishery does not pose a risk of serious or irreversible harm to habitat types.

SG 60: There are measures in place, if necessary, that are expected to achieve the Habitat Outcome 80 level of performance. The measures are considered likely to work, based on plausible argument (e.g general experience, theory or comparison with similar fisheries/habitats).

SG 80: 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 some objective basis for confidence that the partial strategy will work, based on some information directly about the fishery and/or habitats involved. There is some evidence that the partial strategy is being implemented successfully.

SG 100: There is a strategy in place for managing the impact of the fishery on habitat types. The strategy is mainly based on information directly about the fishery and/or habitats involved, and testing supports high confidence that the strategy will work. There is clear evidence that the strategy is being implemented successfully, and intended changes are occurring. There is some evidence that the strategy is achieving its objective.

Score	**80**

Rationale

The key measures in place for habitat protection in the Kerguelen EEZ are:

- no trawling except for scientific purposes;
- closed area <500m (~~15-20% of EEZ).

Although these measures are not complicated, the team considered that they were likely to achieve a good measure of protection for benthic habitats, and therefore should be considered to constitute a 'partial strategy', with an objective basis for considering will achieve at least the 80 outcome level (see rationale for PI 2.4.1). The strategy is being implemented – vessel location is tracked at all times with VMS, with persistent breakdown requiring that the vessel cease fishing, and fishing outside the permitted zone leading to sanction (TAAF 2012). SG80 is therefore met.

CCAMLR has proposed a more elaborate strategy for evaluating and mitigating benthic impacts, under CM 22-06 on vulnerable marine ecosystems (VMEs). This requires members to evaluate the spatial footprint of their fisheries and undertake a risk assessment based on the footprint and the presence of 'VME taxa' (see main report). VME taxa are benthic species considered vulnerable to fishing, including stony corals, gorgonian, sea pens and other cnidarians, sponges, tunicates, bryozoans, brachiopods, tube worms, crinoids and other echinoderms, chemosynthetic (hydrothermal vent) organisms and others. A framework for these assessments is proposed in Sharp et al. (2009), and it has reportedly been applied in the Australian HIMI EEZ in some form (SCS 2012).

For the moment, no attempts have been made at this kind of assessment in the Kerguelen EEZ. Benthic samples have, however, been collected and analysed under the POKER I and POKER II campaigns, reportedly with the long term aim of using the CCAMLR VME framework to identify areas which require protection (Guy Duhemel, MNHN, pers. comm.). MNHN has also collected benthic samples which have been brought up in the longlines (via the observers), which support habitat mapping and also help to identify the species which are potentially most vulnerable. A synthesis of the available information (from the fishery, scientific research cruises, historical data and coastal surveys carried out by the IPEV research station on Kerguelen) is also reportedly underway as part of the MPA designation process. The assessment team has not, however, seen any information arising from this reported evaluation process, so cannot comment on its detail, procedures or conclusions.

On the basis that the implementation of the management strategy proposed by CCAMLR is still in the early stages at Kerguelen, and there is so far little direct published information on either the impacts of the longlines, or the distribution of habitats and VME species, the team concluded that no element of SG100 is for the moment met. The score is therefore 80.

2.4.3 Information / monitoring

Information is adequate to determine the risk posed to habitat types by the fishery and the effectiveness of the strategy to manage impacts on habitat types.

SG 60: There is a basic understanding of the types and distribution of main habitats in the area of the fishery. Information is adequate to broadly understand the main impacts of gear use on the main habitats, including spatial extent of interaction.

SG 80: The nature, distribution and vulnerability of all main habitat types in the fishery area are known at a level of detail relevant to the scale and intensity of the fishery. Sufficient data are available to allow the nature of the impacts of the fishery on habitat types to be identified and there is reliable information on the spatial extent, timing and location of use of the fishing gear. Sufficient data continue to be collected to detect any increase in risk to habitat (e.g. due to changes in the outcome indicator scores or the operation of the fishery or the effectiveness of the measures).

SG 100: The distribution of habitat types is known over their range, with particular attention to the occurrence of vulnerable habitat types. Changes in habitat distributions over time are measured. The physical impacts of the gear on the habitat types have been quantified fully.

Score	**80**

Rationale

Down to ~1000m depth, there is reasonable information about the distribution of habitats in the Kerguelen EEZ, from the two POKER cruises. Below 1000m, recent information is limited to analysis of organisms that are brought up on the longlines. It is reported (Guy Duhamel, MNHN, pers. comm.) that there are some older data from surveys undertaken by the French polar research and supply vessel Marion Dufresne – these data are undergoing review and analysis by MNHN.

Although the impact of the gear has not been measured directly at Kerguelen, the CCAMLR impact / risk assessment process has been carried out for some other toothfish longline fisheries. There have been efforts for the New Zealand Ross Sea toothfish longline fishery, for example, to evaluation in a systematic way the spatial footprint of the fishery on key vulnerable taxa, such as stony corals (Sharp et al. 2009), concluding that 0.088% of stony corals may have been lethally impacted by longline gear in the most heavily fished areas, and 0.008% of the population at the scale of the entire fishery. Overall, however, systematic analyses of this kind are rare, and empirical data on habitat impacts of longlines even rarer (Sharp et al. 2009), so that assessments have tended to depend on broader, more generalised meta-analyses such as Shifting Gears (Chuenpagdee et al. 2003). It is reasonable to infer that the benthic impacts of gear are of the same order in this fishery. The distribution of fishing in space and time is well understood (see for example Gasco and Duhamel 2011) and is tracked in detail using VMS, as well as by observers.

Overall, although the habitat data remains patchy, the team considered that sufficient data were available relative to the scale, intensity and likely impacts of the fishery, and that the ongoing process of analysis of new and old data by MNHN, as well as the ongoing POKER campaigns (every three years from now on) is likely to result in a reasonable ability to detect increases in risk or in impacts. SG80 is therefore met.

No part of SG100 is met. The overall score is therefore 80.

2.5 Ecosystem

2.5.1 Outcome status

The fishery does not cause serious or irreversible harm to the key elements of ecosystem structure and function.

SG 60: The fishery is unlikely to disrupt the key elements underlying ecosystem structure and function to a point where there would be a serious or irreversible harm.

SG 80: The fishery 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.

SG 100: There is evidence that the fishery 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.

Score	**80**

Rationale

An ecosystem model of the Kerguelen ecosystem suggests that overall it is relatively biomass-poor compared to other sub-Antarctic ecosystems (Pruvost et al. 2005), but includes a high proportion of low-lived, slow-growing species, including toothfish. Toothfish appear to play an important role in the ecosystem, according to the model. The results of the POKER research campaigns also suggest that toothfish makes up a significant proportion of the total fish biomass, at least down to ~1000m: ~50% in POKER I and ~30% in POKER II. Bycatch species are less significant parts of the biomass: rays making up 5-10% and *M. carinatus* <5% (according to the POKER II data).

Toothfish is not usually considered to be a keystone species in other sub-Antarctic ecosystems (e.g. S. Georgia; Moody 2009), although it is certainly important in terms of overall biomass. It is also important to note that the Kerguelen ecosystem may not be comparable with other toothfish areas because it is not driven by krill populations, as further south (Pruvost et al. 2005). Toothfish is a high trophic level species (top predator), so ecosystem-level impacts associated with a reduction in biomass due to fishing are less likely than for a low trophic level species. In any case, biomass estimates from the most recent stock assessment suggest that the current biomass is around two thirds of B_0, although as is made clear above, this assessment remains very uncertain (see rationales for Principle 1).

As set out in the rationales under 2.3 above, the population-level impacts perhaps most likely to arise from this fishery are for grey petrels. In terms of the ecosystem, however, there are other bird species that play the same role; the ecosystem model distinguishes surface seabirds and diving birds, of which the most important components are petrels and penguins respectively. The population of white-chinned petrels at Kerguelen is two orders of magnitude greater than the population of grey petrels. The ecosystem model notes that four species: white-chinned petrels, South Georgia diving petrels (*Pelecanoides georgius*), Antarctic prion (*Pachyptila desolata*) and the common diving petrel (*Pelecanoides urinatrix*) together make up more than 70% of the biomass of surface seabirds at Kerguelen – as noted in 2.3 above, the fishery does not have any significant population-level impacts on any of these species.

Given that the toothfish population appears to be healthy – even though the assessment is uncertain it puts the population status within CCAMLR precautionary reference points with a wide margin – ecosystem impacts due to reduction in toothfish biomass seem unlikely. Other elements of protection for the ecosystem are in place: rules to minimise bycatch and the capture of juvenile toothfish, the closed area <500m and the ban on trawling. The team concluded that the fishery is highly unlikely to cause serious or

irreversible harm to ecosystem structure and/or function. Evidence is, however, circumstantial, so no score above 80 could be given.

2.5.2 Management strategy

There are measures in place to ensure the fishery does not pose a risk of serious or irreversible harm to ecosystem structure and function.

SG 60: There are measures in place, if necessary, that take into account potential impacts of the fishery on key elements of the ecosystem. The measures are considered likely to work, based on plausible argument (eg, general experience, theory or comparison with similar fisheries/ ecosystems).

SG 80: There is a partial strategy in place, if necessary, that takes into account available information and is expected to restrain impacts of the fishery on the ecosystem so as to achieve the Ecosystem Outcome 80 level of performance. The partial strategy is considered likely to work, based on plausible argument (eg, general experience, theory or comparison with similar fisheries/ ecosystems). There is some evidence that the measures comprising the partial strategy are being implemented successfully.

SG 100: There is a strategy that consists of a plan, containing measures to address all main impacts of the fishery on the ecosystem, and at least some of these measures are in place. The plan and measures are based on well-understood functional relationships between the fishery and the Components and elements of the ecosystem. This plan provides for development of a full strategy that restrains impacts on the ecosystem to ensure the fishery does not cause serious or irreversible harm. The measures are considered likely to work based on prior experience, plausible argument or information directly from the fishery/ecosystems involved. There is evidence that the measures are being implemented successfully.

Score	**90**

Rationale

The main ‘key element’ identified above that may be impacted by the fishery is the toothfish population itself. As set out under Principle 1, the fishery is controlled and the population status appears to be good. This suggests, logically, the ecosystem impacts from this element are addressed. Measures are also in place to minimise impacts on other elements of the ecosystem, including bycatch species and habitats. The control of IUU in the Kerguelen EEZ is also an important issue in terms of minimising ecosystem impacts.

Overall, the team considered that this could be said to constitute a 'partial strategy' which can be reasonably expected to work, given what is known about sub-Antarctic ecosystems (see rationale for PI 2.5.1). The measures are being implemented, as set out above and under PI 3.2.3. SG80 is therefore met.

For SG100, there is no ecosystem management plan specifically for Kerguelen, so the first two components are not met. There is, however, information directly about the ecosystem in question (Pruvost et al. 2005), as well as strong evidence that the measures are being implemented. Therefore the last two components are met, giving an overall score of 90.

2.5.3 Information / monitoring

There is adequate knowledge of the impacts of the fishery on the ecosystem. Information is adequate to identify the key elements of the ecosystem (e.g. trophic structure and function, community composition, productivity pattern and biodiversity).

SG 60: Main impacts of the fishery on these key ecosystem elements can be inferred from existing information, but have not been investigated in detail.

SG 80: Information is adequate to broadly understand the functions of the key elements of the ecosystem. Main impacts of the fishery on these key ecosystem elements can be inferred from existing information, but may not have been investigated in detail. The main functions of the Components (i.e. target, by-catch, retained and ETP species and habitats) in the ecosystem are known. Sufficient information is available on the impacts of the fishery on these Components to allow some of the main consequences for the ecosystem to be inferred. Sufficient data continue to be collected to detect any increase in risk level (e.g. due to changes in the outcome indicator scores or the operation of the fishery or the effectiveness of the measures).

SG 100: Information is adequate to broadly understand the key elements of the ecosystem. Main interactions between the fishery and these ecosystem elements can be inferred from existing information, and have been investigated. The impacts of the fishery on target, by-catch, retained, ETP and habitats are identified and the main functions of these Components in the ecosystem are understood. Sufficient information is available on the impacts of the fishery on the Components and elements to allow the main consequences for the ecosystem to be inferred. Information is sufficient to support the development of strategies to manage ecosystem impacts.

Score	**85**

Rationale

The available data for evaluating ecosystems impacts of the fishery is set out in Table 25.

Table 25. Data available for ecosystem analysis at Kerguelen.

Fishery-dependent data Kerguelen	Fishery-independent data Kerguelen	Data from other analogous ecosystems
Catch, effort, CPUE and stock assessment for toothfish Catch, effort and CPUE (although CPUE not well analysed) for bycatch species Observer reports for bird mortality and impacts on VME species VMS data for spatial distribution of impacts Tagging data to evaluate population structure of toothfish	POKER I and II cruises: • biomass estimates for toothfish and bycatch species • habitat maps down to ~1000m Ecosystem model (Pruvost et al. 2005) Data on bird populations (e.g. Barbraud et al. 2009) Monitoring of other elements of ecosystem e.g. marine mammals, oceanography via Kerguelen research station of the Institut Polaire Francais Paul Emile Victor[31]	Research cooperation with Australians across whole Kerguelen plateau (e.g. toothfish – Candy et al. 2011, skates – Pruvost et al. 2009, top predators – Hindell et al. 2011) Assessment of VMEs and footprint of toothfish longlining (SCS 2012, Moody 2009) Assessment of role of toothfish in Antarctic ecosystems (e.g. Pinkerton et al. 2007) Considerable general research on Antarctic ecosystems – see e.g. CCAMLR Science[32].

On this basis, the key elements of the ecosystem can be identified, and impacts of the fishery can be inferred with reasonable confidence, although for the most part they have not be directly investigated. Basic ecological information (food, general habitat requirements, biomass to an order of magnitude) is available for the key elements of the ecosystem likely to be impacted by the fishery (toothfish and other large benthic fish, birds, VME species), and ecosystem models (Pruvost et al. 2007) allow us to infer their main function in the ecosystem. Data continue to be collected – for example, POKER cruises will take place every three years. SG80 is therefore met in full.

In relation to SG100, population-level data is only available for two of the key elements: toothfish and birds. Therefore, it is not possible to say that the interactions shaping ecosystems have been investigated fully at a quantitative level – analysis remains qualitative and/or inferential. Likewise it is not possible to distinguish quantitatively between some components of the ecosystem from the ecosystem model, which is quite general (e.g. 'large benthic fish' are one component, although toothfish are distinguished). Information is, however, sufficient to support measures and strategies for minimising the impacts of the fishery on the ecosystem, as set out in PI 2.5.2. The last component of SG100 is therefore met, giving an overall score of 85.

[31] See http://www.institut-polaire.fr/
[32] See http://www.ccamlr.org/en/publications/ccamlr-science

Principle 3

The fishery is subject to an effective management system that respects local, national and international laws and standards and incorporates institutional and operational frameworks that require use of the resource to be responsible and sustainable

3.1 Governance and policy

3.1.1 Legal and/or customary framework

The management system exists within an appropriate and effective legal and/or customary framework which ensures that it: - Is capable of delivering sustainable fisheries in accordance with MSC Principles 1 and 2; - Observes the legal rights created explicitly or by custom of people dependent on fishing for food or livelihood; and - Incorporates an appropriate dispute resolution framework.

SG 60: The management system is generally consistent with local, national or international laws or standards that are aimed at achieving sustainable fisheries in accordance with MSC Principles 1 and 2. The management system incorporates or is subject by law to a mechanism for the resolution of legal disputes arising within the system. Although the management authority or fishery may be subject to continuing court 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. The management system generally recognises and respects the legal rights created explicitly or by custom of people dependent on fishing for food or livelihood in a manner consistent with the objectives of MSC Principles 1 and 2.

SG 80: The management system is generally consistent with local, national or international laws or standards that are aimed at achieving sustainable fisheries in accordance with MSC Principles 1 and 2. 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 fishery. The management system or fishery is attempting to comply in a timely fashion with binding judicial decisions arising from any legal challenges. The management system observes the legal rights created explicitly or by custom of people dependent on fishing for food or livelihood in a manner consistent with the objectives of MSC Principles 1 and 2.

SG 100: The management system is generally consistent with local, national or international laws or standards that are aimed at achieving sustainable fisheries in accordance with MSC Principles 1 and 2. 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.

The management system or fishery acts proactively to avoid legal disputes or rapidly implements binding judicial decisions arising from legal challenges. The management system is formally committed to the legal rights created explicitly or by custom on people dependent on fishing for food and livelihood in a manner consistent with the objectives of MSC Principles 1 and 2.

Score	**90**

Rationale

1. Summary background of management system

Although the fishery is in the CCAMLR Convention area and France is a member of CCAMLR, the fishery is not under the direct jurisdiction of CCAMLR, because of the French 'opt out' prerogative (see above la Déclaration du Président[33]). The fishery is managed by the French state through the government office of the TAAF ('terres australes et antarctiques françaises' – French southern and Antarctic lands), which has implemented CCAMLR measures on a voluntary basis.

The system for management of TAAF fisheries is set out in décret n° 2009-1039 of 26 August 2009. The decree implements the French mainland system of fisheries management, and gives the TAAF administrator (the Préfet) the ultimate decision-making role in the fishery, including:

- setting the level of the TAC, including dividing it into quotas by whatever means seems appropriate (zone, season, vessel etc.);
- giving authorisations to fish;
- determining the rules and regulations for fishing activities in the TAAF zone.

These decisions are made following scientific advice and recommendation from the MNHN. The Ministries in charge of fisheries, foreign affairs and overseas territories and vessel owners and a Consultative Council advising the préfet are also invited to offer an opinion before decisions are taken.

Licences to fish and shares of the TACs are awarded to a limited number of fishing companies and specific fishing vessels on an annual basis and are non-transferrable. They can be suspended or removed in case of infraction, and are not automatically transferrable if a vessel is upgraded or replaced.

[33]See http://www.taaf.fr/Cadre-juridique-des-activites-de-peche

2. Consistency with CCAMLR management system

Despite the French 'opt out' from CCAMLR, it is clear from the evaluation of Principles 1 and 2 above that the management system is in essence consistent with that set out by CCAMLR. In relation to Principle 1, the stock assessment follows the usual CCAMLR structure, and evaluates the harvest strategy in relation to CCAMLR precautionary reference points. In relation to Principle 2, CCAMLR measures for minimising incidental mortality of seabirds are fully implemented, and measures are also in place in relation to bycatch and Vulnerable Marine Ecosystems (VMEs). Therefore the team concluded that the fishery was consistent with both national (French) and international (CCAMLR) standards in relation to issues concerning Principles 1 and 2.

2. Dispute resolution

Disputes relating to management of the fishery, including fishing rights for instance to challenge a suspension following an infringement, would be taken up through the French legal system, which prevails and has a specific "administrative" legal system to resolves disputes that individuals or companies may have with government decisions. The French system is considered effective where it has been tested. CCAMLR has a dispute resolution mechanism, which could be called upon if there was a unilateral decision to increase the TAC by either France or Australia for their share of the resource that impacted the other fleet and could not be resolved on a bilateral basis. Dispute resolution at the CCAMLR level has not been tested. For this reason, in agreement with the assessors of the Australian fishery, the team considers the score of 90 appropriate.

3. Commitment to legal rights

There are no indigenous people at Kerguelen. The rights of SARPC members are assured by the limited licensing system, on the basis of clearly defined criteria and conditions (Chapitre 1er, décret n° 2009-1039). Licences cannot be removed without just cause and without due process.

3.1.2 Consultation, roles and responsibilities

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.

SG 60: Organisations and individuals involved in the management process have been identified. Functions, roles and responsibilities are generally understood. The management system includes consultation processes that obtain relevant information from the main affected parties, including local knowledge, to inform the management system.

SG 80: 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. The management system includes consultation processes that regularly seek and accept relevant information, including local knowledge. The management system demonstrates consideration of the information obtained. The consultation process provides opportunity for all interested and affected parties to be involved.

SG 100: 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. The management system includes consultation processes that regularly seek and accept relevant information, including local knowledge. The management system demonstrates consideration of the information and explains how it is used or not used. The consultation process provides opportunity and encouragement for all interested and affected parties to be involved, and facilitates their effective engagement.

Score	**85**

Rationale

The organisations involved in management and their roles and responsibilities, are set out in Table 13 of the main report. Their roles and responsibilities are clear, defined in legislation (décret 2009-1039) and are fully understood by all participants.

The fishery is managed by the TAAF from the small island territory of La Réunion and therefore the main actors know each other well. Should a person, a group of individuals or special interest group be concerned, there are opportunities to be heard through current participants in the management systems, the offices of the local and sub-national (regional) governments, the members of French parliament elected representatives and directly through the TAAF services that are in charge of fisheries management, environmental conservation or foreign affairs.

As described on the TAAF website, six vessel-owning companies take part in the fishery. The vessel owners are locally organized into the "Syndicat des armateurs réunionnais de la pêche congélateur" (SARPC), the client group for this assessment, coordinate their contribution and collaborate to the research and fisheries management information collection.

Inputs of information into the management system are the following:

- Stock assessment
- Logbooks and quayside catch weight data
- Observer reports
- MNHN scientific advice

- CCAMLR Conservation Measures and annual reports (Working Groups, Scientific Committee and Plenary Report)
- Control and Surveillance of catches and potential IUU activities

The final decision on the level of the TAC, as well as other regulations, is the responsibility of the administrative head of the TAAF (the "préfet"), but it is set out in the 2009 décret that he/she must take into account the scientific advice of MNHN, as well as the views of the ministries of fisheries, overseas countries and territories, and of foreign affairs. The préfet's decision is informed by a Consultative Council that brings together scientists and other resources persons nominated by the various ministries (also advising on the management of the Nature Reserve) that meets twice a year. Local knowledge from the vessel skippers and fishing companies is taken into account, in the past in particular regarding activities of IUU vessels, which were successfully eliminated out of the fishery through close industry-government collaboration. Information from SARPC is taken into account (logbooks, observer reports etc.) as part of the scientific assessment process, and the companies are also represented on the French delegation to CCAMLR every year. SARPC have no say over the level of the TAC, and the TAAF did not formally explain what and how information was used (or not used) in setting the TAC in the past. The decision-making process that led to a TAC increased from 5000t to 5100t for the 2009-10 season was not justified, but it was decided according to scientific advice and after consultation with the Foreign Affairs, Fisheries and Overseas ministries, and vessel owners (TAAF, 2009a arrêté 2009-75). However, the certification process was initiated by the industry association SARPC in 2009, which has also part-funded the POKER research cruises, the observer programmes and the provision of stock assessment expertise in order to meet CCAMLR standards. Current participants are therefore fully informed and involved in discussing the scientific basis of the management measures.

There are relatively few stakeholders in this fishery, because of its size and remote location. Most are involved in the management system in some way, as set out above. The engagement of NGOs is facilitated via participation in CCAMLR (with observer status), and for example, was mobilised with the Australian and French industry associations and others in the region to fight against IUU activities. There is extensive scientific cooperation between Australia and France in relation to the management of the shared stock (see for example Candy et al. 2011) that includes the private sector operators who co-sponsored the first international Symposium on the Kerguelen Plateau in 2010 (Duhamel and Welsford, 2011).

However, the current consultation process does not explain how relevant information, including local knowledge is used or not used, and there is no formal consultation process that provides opportunity and encouragement for all interested and affected parties to be involved, and facilitate their effective engagement. Therefore, only the first part of SG100 is met and a score of 85 is proposed.

3.1.3 Long term objectives

The management policy has clear long-term objectives to guide decision-making that are consistent with MSC Principles and Criteria, and incorporates the precautionary approach

SG 60: Long-term objectives to guide decision-making, consistent with MSC Principles and Criteria and the precautionary approach, are implicit within management policy.

SG 80: Clear long-term objectives that guide decision-making, consistent with MSC Principles and Criteria and the precautionary approach, are explicit within management policy.

SG 100: Clear long-term objectives that guide *decision*-making, consistent with MSC Principles and Criteria and the precautionary approach, are explicit within and required by management policy.

Score	**100**

Rationale

There are three sources of long-term objectives for management policy: CCAMLR and France/TAAF.

1. CCAMLR

CCAMLR has long-term objectives for harvesting of marine resources in the Convention area, as set out in Article II paragraph 3 of the CCAMLR Convention[34]:

Any harvesting and associated activities in the area to which this Convention applies shall be conducted in accordance with the provisions of this Convention and with the following principles of conservation:

(a) prevention of decrease in the size of any harvested population to levels below those which ensure its stable recruitment. For this purpose its size should not be allowed to fall below a level close to that which ensures the greatest net annual increment;

(b) maintenance of the ecological relationships between harvested, dependent and related populations of Antarctic marine living resources and the restoration of depleted populations to the levels defined in sub-paragraph (a) above; and

(c) prevention of changes or minimisation of the risk of changes in the marine ecosystem which are not potentially reversible over two or three decades, taking into account the state of available knowledge of the direct and indirect impact of harvesting, the effect of

[34] CCAMLR Convention: http://www.ccamlr.org/en/organisation/camlr-convention-text

the introduction of alien species, the effects of associated activities on the marine ecosystem and of the effects of environmental changes, with the aim of making possible the sustained conservation of Antarctic marine living resources.

Although France participates in CCAMLR on its own terms, it has effectively signed up to CCAMLR's key long-term conservation objectives; including the precautionary reference points (implementation of paragraph a), and the ecosystem approach to fisheries management and the bird mortality action plan (implementation of paragraphs b and c), as set out in the rationales for Principle 2. This is manifested in various ways: compliance with CCAMLR reference points, implementation of actions to reduce bird bycatch, cooperation in research on VMEs and other aspects of the ecosystem. It is clear that there are French measures are in place equivalent to CCAMLR Conservation Measures in each case (see Table 2 of main report).

2. France / TAAF

The EU Marine Strategy Framework Directive has been transposed into the French Environment Code (articles L. 219-9 à L. 219-18 et R. 219-2 à R. 219-17) that set out two priorities, an integrated management of the sea and coastal areas, and the protection and conservation of marine environment. France published its national integrated maritime policy at the end of 2009, the Blue Book - A national strategy for the sea and oceans (France, 2009). The French strategy is built around four priorities, i) Invest in the future – research, education, awareness; ii) Develop a sustainable economy of the sea – sustainable resource use, fisheries, shipbuilding, shipping, ports, marine recreation; iii) Promote the maritime dimension of the overseas territories – local authorities and stakeholders, assets and responsibilities, marine resources and economic development; and iv) Assert France's place on the international scene – international governance, contribution to EU integrated maritime policy, responsibilities, defence and security. The Strategy applies to all French overseas territories including (explicitly) the TAAF (also art. L219-2 of the Code de l'Environnement). Therefore, overarching objectives of the European directive apply, even though the TAAF are not part of the EU but only associated as an overseas territory (see http://www.outre-mer.gouv.fr/?les-taaf.html).

A key objective with regards to the TAAF territories is to maintain French sovereignty. In this context, France recognises the need to be seen as a responsible custodian of the area. France regards itself as the guarantor to the international community of the preservation of the sub-Antarctic ecosystem in the TAAF area (see http://www.outre-mer.gouv.fr/?les-relations-internationales-et-la-cooperation-regionale.html). In this context, France has worked to establish its largest national protected area, a well-managed fishery in the Kerguelen EEZ and to eliminate IUU fishing.

The objective for the management of fisheries in the TAAF zone is set out in décret 2009-1039 from the Ministry of Agriculture and Fisheries on conditions on fishing activities in the TAAF. Article 1 of the décret says:

Les dispositions du présent décret ont pour objet d'assurer la conservation à long terme etl'exploitation optimale des ressources halieutiques dans les zones des Terres australes et

antarctiques placées sous souveraineté ou sous juridiction française situées au large des côtes des îles Saint-Paul et Amsterdam, de l'archipel Crozet, de l'archipel Kerguelen et des îles Tromelin, Glorieuses, Juan de Nova, Bassas da India et Europa. L'exercice de la pêche par tous les navires battant pavillon français ou étranger est mené dans le souci de préserver les écosystèmes marins dans lesquels ces ressources se déploient.

[The objective of this decree is to guarantee the long-term conservation and optimal exploitation of the fisheries resources in the TAAF zone under French sovereignty or jurisdiction situated around the coasts of St. Paul and Amsterdam, the Crozet archipelago, the Kerguelen archipelago and the Tromelin, Glorieuses, Juan de Nova, Bassas da Indian and Europa islands. Fishing activity by all vessels whether French or foreign flagged will be operated with respect for the preservation of the marine ecosystems of which the resource is a part.]

The team concludes that clear, long-term objectives to guide decision-making, are explicit in the management system. These long-term objectives are 'required by' the management system and SG100 is met in full.

3.1.4 Incentives for sustainable fishing

The management system provides economic and social incentives for sustainable fishing and does not operate with subsidies that contribute to unsustainable fishing

SG 60: The management system provides for incentives that are consistent with achieving the outcomes expressed by MSC Principles 1 and 2.

SG 80: The management system provides for incentives that are consistent with achieving the outcomes expressed by MSC Principles 1 and 2, and seeks to ensure that negative incentives do not arise

SG 100: The management system provides for incentives that are consistent with achieving the outcomes expressed by MSC Principles 1 and 2, and explicitly considers incentives in a regular review of management policy or procedures to ensure that they do not contribute to unsustainable fishing practices.

Score	**80**

Rationale

Fishing licences are awarded to individual vessels annually through an "arrêté" of the French government representative (TAAF préfet) on the legal basis provided by the Décret n° 2009-1039 (du 26 août 2009 relatif aux conditions d'exercice de la pêche maritime dans les Terres australes et antarctiques françaises et pris pour l'application de l'article 3 de la loi n° 66-400 du 18 juin 1966 modifiée sur l'exercice de la pêche maritime et l'exploitation des produits de la mer dans les Terres australes et antarctiques

françaises). Conditions of the fishing licence include payment of a licence fee (730 €/t of toothfish caught for 2011-12 season[35] – TAAF, 2011), the collection and provision of detailed information regarding the fishing vessel, gear, crew, company, prior participation to research activities, prior fishing activities, and environmental protection measures (refuse disposal, to limit bird and fish incidental mortality and others). Detailed licence conditions stipulate to provision of information including directly to CCAMLR (at least 4-hourly VMS position) and of scientific data.

Each vessel has a controller on-board. The non-observance of licence conditions carries penalties (e.g. month-long suspension of fishing activities if caught fishing in waters shallower than 500m), but most importantly, infractions can jeopardize annual licence renewal. The attribution of annual fishing licences based on historical records provides fishing companies with some measure of certainty that as long as they observe licence conditions and perform catch their fishing, they will continue to have access to the resource. Taken together, these conditions give SARPC members a clear positive incentive for good stewardship of the resource.

There were some capital subsidies in the fishery in relation to conversion of trawlers to longliners in early 2000, which were according to CCAMLR's recommendations that toothfish fishing should be carried out by longline in deeper waters only. Overall, the team could not find evidence of subsidies leading to unsustainable practices. Instead, the team noted that the fishing companies in SARPC have invested significant financial resources to support the sustainable management of the resource, including through the application for MSC certification: for example, in co-funding the POKER scientific campaigns, international symposium on the Kerguelen Plateau, stock assessments in 2010 and 2012 and various other research activities.

There is no evidence of a regular review of incentives in the fishery by managers, so the overall score is 80.

3.2 Fishery-specific management system

3.2.1 Fishery-specific objectives

The fishery has clear, specific objectives designed to achieve the outcomes expressed by MSC's Principles 1 and 2.

SG 60: Objectives, which are broadly consistent with achieving the outcomes expressed by MSC's Principles 1 and 2, are implicit within the fishery's management system.

SG 80: 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's management system.

[35] For a first sale price of €1200/t see http://www.clicanoo.re/351034-peche-australe-statu-quo-en-attendant-un-troisieme-coup-de-poker.html

SG 100: 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's management system.

Score	**75**

Rationale

Long-term objectives specific to the Kerguelen toothfish fishery are clearly set out in the French national legislation (art. 1 Décret n° 2009-1039, France 2009 see above). They are to ensure the resource conservation and its optimal exploitation (Principle 1) and specifically for fishing activities to preserve marine ecosystems where the resources are found (Principle 2). Other objectives are to support long-term involvement of vessels owners and their contribution to data collection and research are indicated by the annual licence renewal criteria (art. 8 and 9).

The short-term objective is reported to be to increase CPUE (MNHN pers. comm.[36]), following the impression that the stock needed to recover after high past rates of IUU. The most recent stock assessment (2012) results suggest that recovery has been achieved. However, the official in charge of Fisheries at TAAF has been quoted to say that a third research cruise (POKER III) was being planned before the TAC for toothfish could be increased in the interest of precaution[37]. Presumably over the next few years, short-term objectives in relation to Principle 1 will be reformulated as the stock assessment becomes more reliable as a source of information about stock status. For the moment, therefore, specific short-term objectives for Principle 1 remain implicit, although the longer-term objectives around sustainable and precautionary exploitation are explicit.

In relation to Principle 2, objectives are more explicit, and are set out in the management plan for birds and the code of good conduct for bycatch and interactions with orca (depredation). Principle 2 short-term objectives also focus on gathering more information – as per the objectives for the ongoing POKER research campaigns (set out in (unpublished) POKER reports for 2006 and 2010). Longer-term objectives for the protection of the ecosystem are explicit.

The score overall is 75, because while long-term objectives are explicit for Principles 1 and 2, short-term objectives for Principle 1 (how the TAC will be set over the next few seasons) remain poorly defined.

Condition

The condition for this PI is to produce a fisheries management plan for this fishery, focusing on the management of the toothfish resource itself (i.e. Principle 1). The plan should set out for the short-term (~5-10 years), i) the objective of management and ii)

[36] http://www.actualites-news-environnement.com/24386-POKER-II-retour.html
[37] http://www.clicanoo.re/351034-peche-australe-statu-quo-en-attendant-un-troisieme-coup-de-poker.html

how that objective will be achieved (i.e. how the TAC will be set, what information will be used etc.).

3.2.2 Decision-making processes

The fishery-specific management system includes effective decision-making processes that result in measures and strategies to achieve the objectives

SG 60: There are informal decision-making processes that result in measures and strategies to achieve the fishery-specific objectives. 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

SG 80: There are established decision-making processes that result in measures and strategies to achieve the fishery-specific objectives. 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 use the precautionary approach and are based on best available information. Explanations are provided for any actions or lack of action associated with findings and relevant recommendations emerging from research, monitoring, evaluation and review activity.

SG 100: There are established decision-making processes that result in measures and strategies to achieve the fishery-specific objectives. 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. Decision-making processes use the precautionary approach and are based on best available information. Formal reporting to all interested stakeholders describes how the management system responded to findings and relevant recommendations emerging from research, monitoring, evaluation and review activity.

Score	**70**

Rationale

There are clearly established decision-making processes in this fishery, as can be seen by the example of the TAC: the MNHN provides advice (including stock assessment) to three Ministries (ministries in charge of fisheries, foreign affairs and overseas territories). The ministries and vessel owners provide opinions for the préfet of the TAAF decides. In his/ her decisions, the préfet is supported by a Consultative Council that meets twice a year. The MNHN also makes presentations to the Conseil Consultatif that is able to discuss recommendations and in turn make recommendations to the préfet.

Likewise for Principle 2 issues, there is a process for taking and implementing decisions – for example in relation to the recent code of good conduct for bycatch, advice is provided by MNHN, based on their own research and on CCAMLR good practice, following which TAAF takes the decision to incorporate the code into the regulations. These and other decisions have resulted in measures and strategies to achieve the objectives – even if some of the objectives are somewhat vague.

Decisions have been made in response to important issues identified in research and more widely annually within CCAMLR – stock management, bird mortality, and bycatch, VMEs etc. While the fishery has not always been at the forefront of decision-making within CCAMLR (e.g. in relation to birds) it has to be noted that until the mid-2000s, eradication of IUU was an absolute priority, and limited human and financial resources were available to focus elsewhere. Likewise, decision-making has not always been transparent, but this has certainly improved greatly over the last few years – for example in relation to the peer review of the stock assessment by CCAMLR WG-FSA done in 2011 and 2012.

SG80 requires that decisions are precautionary and are based on the best-available information. While the TAC is said to be precautionary, the basis and decision-making process by which a TAC of 5100t was arrived at in 2009 is unclear. There are no underlying explicit short-term objectives or management plan. There is no publicly available advice or specific requirement on TAAF to follow advice from MNHN (including the stock assessment) or anyone else. There is likewise no requirement for TAAF to explain the basis and decision-making process for the TAC.

Overall, therefore, SG60 and the first two elements of SG80 are met, but the remaining two elements of SG80 are not met, giving a score of 70.

Condition

The fishery needs to be managed through an established and transparent decision-making process, which clearly describes the information used to take decisions. This may be part of the fisheries management plan as set out in the condition for PI 3.2.1 above.

3.2.3 Compliance and enforcement

Monitoring, control and surveillance mechanisms ensure the fishery's management measures are enforced and complied with.

SG 60: Monitoring, control and surveillance mechanisms exist, are implemented in the fishery under assessment and there is a reasonable expectation that they are effective. Sanctions to deal with non-compliance exist and there is some evidence that they are applied. 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

SG 80: A monitoring, control and surveillance system has been implemented in the fishery under assessment and has demonstrated an ability to enforce relevant management measures, strategies and/or rules. Sanctions to deal with non-compliance exist, are consistently applied and thought to provide effective deterrence. 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 no evidence of systematic non-compliance

SG 100: A comprehensive monitoring, control and surveillance system has been implemented in the fishery under assessment and has demonstrated a consistent ability to enforce relevant management measures, strategies and/or rules. Sanctions to deal with non-compliance exist, are consistently applied and demonstrably provide effective deterrence. 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. There is no evidence of systematic non-compliance.

Score	**100**

Rationale

The fishery has eight vessels operating over very large area of remote waters. As part of its fishing licence obligations, each fishing vessel has on board at all times a 'contrôleur de pêche' (fisheries controller) in charge of enforcement as well as collection of scientific data (TAAF, 2009b). Regarding enforcement, controllers ensure that the vessel respects all fisheries regulatory obligations, international, national and territorial (Title I art. 3 TAAF, 2001) and report on any suspected IUU activities from vessels seen in the zone (art. 5). On board, controllers have access to all fishing equipment, gear and products for inspection. At the end of each season, the controller also advises the captain on the number of hooks that can be shot in order to avoid a quota overrun (TAAF, 2009b Annex III). Controllers contact TAAF fisheries and the Préfet of La Réunion (Head of Police services) immediately in case of any irregularity. They submit a weekly report and a final report and data files at the end of each trip to TAAF for onward communication to the MNHN. The team found no evidence of contraventions other than minor.

Vessels must have tamper-proof VMS in working order and must also report information on fishing activities and VMS to CCAMLR. Position information is also used in real-time to move away from interactions with species caught incidentally (rays), undersized toothfish, birds, orcas and whales.

The catch is frozen, weighed and labelled on board, and weighed by an independent third-party surveyor on disembarkation. The data is provided to TAAF and MNHN and cross-checked against the fishing logbooks.

There is satellite surveillance in the Kerguelen EEZ, patrols by the French navy and the fisheries surveillance vessel Osiris. France and Australia carry out joint surveillance activities and have agreements, which allow cooperation such as some sharing of police powers in each other's waters. France submits an annual report to CCAMLR (2012). IUU fishing within the TAAF EEZ has been nil for some years but still takes place to a small extent on the high seas (CCAMLR, 2012).

On this basis, SG100 is met.

3.2.4 Research plan

The fishery has a research plan that addresses the information needs of management

SG 60: Research is undertaken, as required, to achieve the objectives consistent with MSC's Principles 1 and 2. Research results are available to interested parties.

SG 80: A research plan provides the management system with a strategic approach to research and reliable and timely information sufficient to achieve the objectives consistent with MSC's Principles 1 and 2. Research results are disseminated to all interested parties in a timely fashion.

SG 100: A comprehensive research plan provides the management system with a coherent and strategic approach to research across P1, P2 and P3, and reliable and timely information sufficient to achieve the objectives consistent with MSC's Principles 1 and 2. Research plan and results are disseminated to all interested parties in a timely fashion and are widely and publicly available.

Score	**80**

Rationale

A number of research plans relate to the fishery and inform management, although there is no formal fishery-specific research plan. The MNHN has research plans in place for each POKER cruise (most recent in 2010, next in 2013 – planning in preparation), which are informed by the needs of the fishery and associated ecosystems (for example, the bycatch code of conduct came out of the research conducted in POKER II, one of the objectives of which was to evaluate key habitat areas for bycatch species).

Several research institutes conduct research at Kerguelen under the auspices of the Institut Polaire Français Paul Emile Victor (IPEV[38]). Research programmes relating to the fishery include oceanography, benthic mapping, climate change monitoring and behaviour and ecology of seabirds[39]. There is also a management structure for scientific research in the Antarctic – the Scientific Committee on Antarctic Research (SCAR), which has three standing scientific groups and four scientific research programmes. The life sciences group coordinates research into Antarctic biodiversity, ecosystem structure and function and ecosystem change (among other things[40]). Coordination between the various groups is ensured through the TAFF that provides all logistic authorisation and support and its consultative council that vets all applications, programmes and provides some funding.

At international level, the first Symposium on the Kerguelen Plateau organised by MNHN in 2010 was well attended by scientists from Australia, New Zealand, South-Africa. Coordination is effected through the scientific research channels, direct contacts between scientists and CCAMLR in particular. For example, much of the research carried out by MNHN and under the various IPEV programmes is published in the Journal CCAMLR Science. French scientists are active participants of CCAMLR Working Groups (WG on Ecosystem Monitoring and Management, on Incidental Mortality Associated with Fishing, on Fish Stock Assessment).

On this basis, the team concluded that there is a strategic approach to research at Kerguelen, including the research sufficient to inform management (coming notably from MNHN and elsewhere), as is required for SG80. However, since the plan is piecemeal from various sources rather than one single overarching plan, it can probably not be called 'comprehensive', as is required for SG100. Results are disseminated to interested parties (e.g. to SARPC, TAAF and in CCAMLR Science) but are not always 'widely and publically available', as required for SG100 – for example, the POKER reports are not public.

The overall score is therefore 80.

3.2.5 Monitoring and management performance evaluation

[38] see http://www.institut-polaire.fr/ipev/l_institut/ses_missions
[39] see http://www.institut-polaire.fr/ipev/programmes_de_recherche/en_cours/%28region%29/2
[40] see http://www.scar.org/researchgroups/lifescience/

There is a system for 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.

SG 60: The fishery has in place mechanisms to evaluate some parts of the management system and is subject to occasional internal review.

SG 80: The fishery has in place mechanisms to evaluate key parts of the management system and is subject to regular internal and occasional external review.

SG 100: The fishery has in place mechanisms to evaluate all parts of the management system and is subject to regular internal and external review.

Score	**90**

Rationale

1. Internal review

Performance of fishing arrangements and all regulatory obligations of the management system may be revised or augmented each year as part of the vessel fishing licences and statistical information reviewed by the TAAF. During the fishing season, activities may also be modified on the basis of advice or instructions from the fishery controller. The TAC may be reviewed, on the basis of the MNNH advice, at least every three years (TAAF, 2009a), which will coincide with the new regime of POKER research surveys. However, there are currently no mechanisms in place to evaluate all part of the management system internally.

2. External review

The fishery performance and its management are presented every year as part of the French report to CCAMLR, including Principle 1 (stock status) and key aspects of Principle 2 (e.g. bird and other bycatch). For the first time in 2012, CCAMLR WG on Fishery Stock Assessment peer reviewed and made recommendations for the stock assessment model and agreed with the current TAC of 5100t (CCAMLR WG-FSA, 2012). In addition, there has been a level of mutual oversight with Australia on exploitation and research over the whole Kerguelen plateau.

Overall, the team concluded that more or less all parts of the management system have been subject to regular internal review and periodic external review. The score is therefore 90.

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ANNEX 3 – SUMMARY OF STAKEHOLDER INPUT

1. Before the site visit

WWF expressed concern that the assessment team did not include sufficient direct experience of the management of toothfish fisheries. The team was changed to include Dr. Sophie des Clers, who has such experience in the Falkland Islands.

2. During the site visit

Two stakeholders attended the site visit: Sian Prior from WWF, and Jim Barnes from ASOC. They had three key concerns:

- Lack of a formal, peer-reviewed stock assessment
- Bird bycatch and mortality; whether France lags behind other toothfish fishing nations in implementation of best practice
- The extent to which life history parameters (such as growth rates and natural mortality) can be extrapolated between different areas, and the extent to which an over-estimate of natural growth and mortality rates might impact on the accuracy of stock assessments.

The stock assessment issue has been extensively addressed since the site visit, as described in the report. Bird bycatch has also improved considerably, although there is still work to do. The issue of life history is a particular concern with Antarctic toothfish, but may also be an issue here to some extent. The French stock assessment uses parameters mainly extrapolated from the Australian HIMI EEZ.

3. After the site visit

After MEP's email to stakeholders regarding the UoC, on 29 November 2012, feedback was received from the WWF Antarctic and Southern Ocean Initiative on 19 December 2012, as follows:

We accept the proposal for a new UoC which would only include the Kerguelen stock and exclude the Crozet stock. However we wish to emphasise the importance of gathering information on the Crozet stock for the purposes of future fishing management decisions. In addition, it will be particularly important in assessing the Kerguelen stock that the issue of a shared stock with the Heard Island and MacDonald Islands (HIMI) fishery is taken into account. The recent certification report for the HIMI fishery raises the issue of a shared stock with the Kerguelen stock as a key matter that still needs work and by the 4th annual audit there must be in place a robust and precautionary harvest strategy and stock assessment for the whole of the Kerguelen Plateau including the French Kerguelen Island fishery.

Also, we wish to highlight that, though a decision is being taken to assess the stocks separately, the decision will raise a number of concerns / issues / questions with respect to the Chain of Custody for labelling and claims of MSC fish that will need to be addressed if the SARPC fishery is certified. Bearing in mind that there is a considerable distance between the Crozet and the Kergeulen Islands, we don't know, for example, if toothfish can be fished from the two areas on the same trip? Whether they are fished on the same trip or not, there is the possibility of confusion between fish from the two areas following landing and the onward distribution process which must be addressed.

MEP notes that it is proposed by SARPC, TAAF and MNHN that the stock assessment process be extended to Crozet in the next few years. The issue of the shared stock was also highlighted by one of the peer reviewers, and MEP notes that considerable amount of collaboration is already in place between France and Australia on this question, including a joint stock evaluation, a joint tagging programme and extensive Australian input into the French stock assessment (see discussion and references in the report). In relation to chain of custody, MEP has reviewed the situation and has concluded the following (see report Section 11.5):

Vessels may visit Kerguelen and Crozet in the same trip, and the main risk to traceability is that product from Crozet may be mislabelled as from Kerguelen. However, since the two areas have separate quotas, it is essential that vessels report catch from the correct area, and this is checked by the contrôleur de pêche. Reporting Crozet catch as from Kerguelen would be a significant infringement of the fisheries regulations. Catch is weighed on disembarkation, and this data is cross-checked with logbooks, so that it is not possible to label a box as one area and report it in the logbook as another area. Therefore this is evaluated as low risk.

ANNEX 4 – PEER REVIEWER REPORTS WITH RESPONSES

PEER REVIEW 1

Overall Opinion

Has the assessment team arrived at an appropriate conclusion based on the evidence presented in the assessment report?	Yes/No Yes	Conformity Assessment Body Response
Justification: The peer review did not disagree with the indicator categories within which each of the performance indicators had been placed by the assessment team. Minor subjective differences as to the level of the scores allocated are noted. The different scores would not indicate either changing a score to below 60, the threshold under which certification cannot be awarded, the requirement for additional conditions or a case against those specified within the report.		

Do you think the condition(s) raised are appropriately written to achieve the SG80 outcome within the specified timeframe?	Yes/No Yes	Conformity Assessment Body Response
Justification: The conditions raised are appropriate in each case. Some of their specification (conditions 2 and 3) could be more focused in order to help the stock managers, industry and scientists achieve the SG80 objectives and comments on the text are presented in the peer review report.		*See specific comments and responses below*

If included:

Do you think the client action plan is sufficient to close the conditions raised?	Yes/No Yes	Conformity Assessment Body Response
Justification: As noted above the conditions raised are appropriate for each case but the specification of conditions 2 and 3 could be more focused to enable those carrying out the analysis to progress the work. The plan of action and the time frame set out is appropriate to achieving the work.		

General Comments on the Assessment Report (optional)

The assessment team, stock managers, industry and scientists have produced a thorough summary of the fishery, ecosystem and management. The here were no major problems found during the peer review and comments are provided where clarification or references to information is needed to enhance the understanding of the information and reasoning behind the assessment.

Performance Indicator Review

Performance Indicator	Has all the relevant information available been used to score this Indicator? (Yes/No)	Does the information and/or rationale used to score this Indicator support the given score? (Yes/No)	Will the condition(s) raised improve the fishery's performance to the SG80 level? (Yes/No/NA)	Justification .	Conformity Assessment Body Response
1.1.1	Yes	Yes	N/A	As noted in the report, there is considerable uncertainty in the stock estimates from the CASAL model, but the indications all point to the stock being well above any potential BMSY and BLIM reference levels. There is conflict within the data sources as to recent trends but all information is included within the assessment and consequently reflected within the uncertainty associated with the biomass estimates. No explanation has been provided for the undershoot of TAC, in almost all recent years. Linkage with the Heard Island stock may not only be related to the movement of fish and tags. It may also be relevant in terms of the recruitment across the plateau. The potential linkage should be considered in any long term work plan.	We put the question on the undershooting of the TAC to SARPC members. It seems that various companies have had operational difficulties in recent years – for example, Peche Avenir had a disastrous engine room fire during the 2012-13 season, and various similar (although less dramatic) problems have been encountered. The fishery is operationally difficult because the area is very remote and the weather very rough. If a vessel has to put in for repairs, the round trip to Mauritius is several weeks. In relation to Heard Island, it seems likely that the stocks are connected both via recruitment and via migration of adults, although data are limited, particularly in relation to recruitment sources and sinks. Australian and French scientists have worked closely together – they share survey and biological data and their stock assessments follow the same methodology.

Performance Indicator	Has all the relevant information available been used to score this Indicator? (Yes/No)	Does the information and/or rationale used to score this Indicator support the given score? (Yes/No)	Will the condition(s) raised improve the fishery's performance to the SG80 level? (Yes/No/NA)	Justification .	Conformity Assessment Body Response
1.1.2	Yes	Yes	N/A	The reasoning behind the score is appropriate. However, given that BMSY is not estimated by the CASAL assessment method a score of 100 is unlikely to be achieved, whereas under the MSC 40% threshold it could be; which is an interesting discussion for the future.	Point taken – the score depends to some extent on which reference points you select to score against. But the default MSC 40/20% reference points should probably only be used when there are no other explicit reference points in the management system, and in that case would score 100 anyway.
1.1.3	N/A	N/A	N/A	Rebuilding is not required for this or its potential joint stock	
1.2.1	Yes	Yes	N/A	The harvest strategy is based on the CCAMLR HCR, although as yet the TAC is retained at a precautionary level as the assessment used to set the TAC is not yet stable. The score is therefore appropriate.	

Performance Indicator	Has all the relevant information available been used to score this Indicator? (Yes/No)	Does the information and/or rationale used to score this Indicator support the given score? (Yes/No)	Will the condition(s) raised improve the fishery's performance to the SG80 level? (Yes/No/NA)	Justification .	Conformity Assessment Body Response
1.2.2	Yes	Yes	N/A	The score of 90 may be over-optimistic but the indicator is at least 80. A lower score might be appropriate because of the apparent lack of a mechanism for reducing the TAC as reference levels are approached as required in the description of the indicator. Although this is not required at the current stock status it may better that provision for adjustment of even the provisional TAC is included within any future short term management plan as CPUE has been declining and the TAC has not been achieved, according to the table of catches, for the majority of recent years.	Actually, if we did not think that the TAC will be reduced as the limit reference point is approached, then the fishery would fail at the 60 level, never mind the 80! The increase in the score from 80 to 90 came from the following at SG100: *Evidence clearly shows that the tools in use are effective in achieving the exploitation levels required under the harvest control rules* – which the assessment team agreed with, on the basis that the information about the fishery is good. See comment on TAC above.
1.2.3	Yes	Yes	N/A	The score is appropriate. Although there is discussion of the relatively low movement of tags between this and the adjacent stock, there does not seem to have been consideration to potential recruitment linkage and the effect that this would have on recruitment based limit reference levels.	Good point – I think this is because not much is known about recruitment, except that juvenile fish recruit initially into inshore areas. Both fisheries are excluded from inshore areas, so do not sample the smaller size classes. Once there is a longer time series of stock assessments for both the French and the Australian side, then it will be possible to start comparing estimates of recruitment and age classes, and start to estimate the level of stock connectivity.

Performance Indicator	Has all the relevant information available been used to score this Indicator? (Yes/No)	Does the information and/or rationale used to score this Indicator support the given score? (Yes/No)	Will the condition(s) raised improve the fishery's performance to the SG80 level? (Yes/No/NA)	Justification .	Conformity Assessment Body Response
1.2.4	Yes	Yes	Yes	A score below 80 is appropriate. The stock assessment was reviewed at FSA 2012 and considered a major step forward but still work in progress. The work to be undertaken within the condition reflects the comments and discussions during the FSA review at which the contact with the scientists from Australia and New Zealand was strengthened and will allow useful guidance and collaboration across the two stocks.	Yes – and also on the French side, the recruitment of a full-time modeller to MNHN will give impetus to the work, including the ongoing collaboration with the Australians.

Performance Indicator	Has all the relevant information available been used to score this Indicator? (Yes/No)	Does the information and/or rationale used to score this Indicator support the given score? (Yes/No)	Will the condition(s) raised improve the fishery's performance to the SG80 level? (Yes/No/NA)	Justification .	Conformity Assessment Body Response
2.1.1		Yes	Yes	The condition for 2.1.1 and 2.1.3 is relevant to the required improvement of the indicator but is weakly defined. The condition refers to monitoring of the by-catch, which is already in place within the observer scheme. It is the magnitude of the scale of impact on the dynamics of the populations that needs to be established within the condition. Within any analysis to satisfy the condition care should be taken in any use of commercial cpue to develop indices of population trends (unless from a controlled experiment such as the test lines for juvenile abundance). Move on rules and by catch limits, such as those within the code of practice, will influence catch rates. The industry note that a grenadier or skate on a hook is a wasted toothfish catch; consequently fishers behavior will have a strong impact which could a be greater influence than population changes. Fishbase seems to be used as evidence for scoring; it is a database that is often too generic and should be used with care.	Good point – by monitoring we did not mean data collection, which is already in place (via observers but mainly via fisheries logbooks, since these species are retained – as well as via the 3-yearly POKER cruises). Rather, we meant systematic analysis of these data to establish a time series by which trends in biomass can be evaluated. We take the point that CPUE is affected by fisher behaviour, and particularly so when external regulations are imposed – although these issues can often be dealt with within an assessment model. But bear in mind also that there is (or should be) a period of several years of fishery-dependent data, pre-code of conduct, that has not to our knowledge been fully analysed. Ultimately, however, these issues are not our problem – it is up to the fishery / MNHN to figure out how to deal with the condition. In relation to Fishbase, we do try to use data from Fishbase with caution – see for example the rationale for 2.1.1, *M. carinatus*, where it is clearly wrong. The wording of the condition has been revised as follows:

Performance Indicator	Has all the relevant information available been used to score this Indicator? (Yes/No)	Does the information and/or rationale used to score this Indicator support the given score? (Yes/No)	Will the condition(s) raised improve the fishery's performance to the SG80 level? (Yes/No/NA)	Justification .	Conformity Assessment Body Response
					A monitoring system needs to be put in place for grenadiers and rays, appropriate to the scale of the fishery, which will evaluate trends in stock biomass for these stocks, and provide indication of possible risks ~~to the stock~~. This may be by analysis of trends in CPUE or by some other suitable method. The assessment team needs to see evidence of the systematic implementation of the code of conduct. In addition, a process of review and revision of the code of conduct in the light of trends in the fishery is required.
2.1.2	Yes	Yes	N/A	The management is in place it just needs time to establish.	Exactly.
2.1.3	Yes	Yes	Yes	This indicator and its condition are linked to 2.1.1. Note the comment on the analysis of cpue from toothfish vessels in 2.1.1	See comment above.
2.2.1	Yes	Yes	N/A	The route to scoring the indicator is appropriate. The comment about fishbase is valid as it is often too generic (see 2.1.1).	See comment above. We have not used Fishbase information for scoring – only to establish that the POKER data is unlikely to be informative for *A. rostrata*.

Performance Indicator	Has all the relevant information available been used to score this Indicator? (Yes/No)	Does the information and/or rationale used to score this Indicator support the given score? (Yes/No)	Will the condition(s) raised improve the fishery's performance to the SG80 level? (Yes/No/NA)	Justification .	Conformity Assessment Body Response
2.2.2	Yes	Yes - for the score of 85 noted in the body of the text, not the 80 in the box.	N/A	A factor which has been shown to be significant to bycatch rates within toothfish catches is soak time this should also be examined in case it can be used within the code of conduct especially if it affects survivorship of skates and rays to allow release at the surface.	Oops – the score has been corrected. Luckily 85 was used to calculate aggregate scores. Since the score is above 80, the assessment team cannot include examination of soak time as a condition, but will discuss it with MNHN at the next opportunity.
2.2.3	Yes	Yes	N/A	With regard to the recommendation for a study on survivorship of rays see the comment on soak time above.	See above

Performance Indicator	Has all the relevant information available been used to score this Indicator? (Yes/No)	Does the information and/or rationale used to score this Indicator support the given score? (Yes/No)	Will the condition(s) raised improve the fishery's performance to the SG80 level? (Yes/No/NA)	Justification .	Conformity Assessment Body Response
2.3.1	Yes	Yes	Yes, possibly	The condition definition seems weak, it will improve the performance relative to the current indicator score but to what extent is not clear. More guidance is needed to the management team within the condition specification. There is discussion of temporal difficulties due to the no overlap in the timing of the breeding of the species of petrel, but no information on whether there is a spatial aspect that could be utilised. Information on why specific boats still have a high mortality rate and the difference in rates between vessels would have been useful to the determination as to whether the condition will be successful in lowering mortality and raising the score.	In defining conditions, we are not allowed to be prescriptive to managers about how conditions are met, so they are necessarily vague – effectively a re-statement of SG80. It would have been useful to have had more specific data on bird bycatch – notably data by vessel and spatial data – however we were not provided with these data. In fact, a significant component of the delay in this assessment was in trying to obtain data by species rather than total bird bycatch all species lumped together. We therefore have no information on i) which vessels are performing badly, ii) why they are performing badly and iii) whether there are bird 'hotspots' which could be avoided. TAAF, however, must have these data, from observer reports. In order to audit against this condition, however, the audit team will have to be provided with bird bycatch by vessel, so the situation should become more clear over the next few years. In relation to spatial data – again, we are not allowed to comment on how the targets should be reached – just that appropriate targets should be set and attained.

Performance Indicator	Has all the relevant information available been used to score this Indicator? (Yes/No)	Does the information and/or rationale used to score this Indicator support the given score? (Yes/No)	Will the condition(s) raised improve the fishery's performance to the SG80 level? (Yes/No/NA)	Justification .	Conformity Assessment Body Response
2.3.2	Yes	Yes	N/A		
2.3.3	Yes	Yes	N/A		
2.4.1	Yes	Yes	N/A	The score of 85 is probably low. Studies of the impact of longlines are available from CCAMLR 2012 and elsewhere showing very limited impact of the gear. The work suggested in 2.4.2 should improve the score in 2.4.1	The other peer reviewer thought that this score was too high, so perhaps we are about right …
2.4.2	Yes	Yes	N/A	The score is appropriate and will increase as more information is analysed and published.	
2.4.3	Yes	Yes	N/A	As for 2.4.2 the score is appropriate but the review could have provided more details – for instance it has been noted that that longline impact is likely to be similar to other fisheries elsewhere but does not state what the conclusions from those studies were. This section is the weakest part of the report and review.	A bit more detail has been added, including quantitative estimates of area impact, taking examples from elsewhere.

Performance Indicator	Has all the relevant information available been used to score this Indicator? (Yes/No)	Does the information and/or rationale used to score this Indicator support the given score? (Yes/No)	Will the condition(s) raised improve the fishery's performance to the SG80 level? (Yes/No/NA)	Justification .	Conformity Assessment Body Response
2.5.1	Yes	Yes	N/A	The scores for 2.5 are appropriate to the amount of published information and will improve towards the highest indicator status as more information is analysed and disseminated.	
2.5.2	Yes	Yes	N/A		
2.5.3	Yes	Yes	N/A		
3.1.1	Yes	Yes	N/A	The scores in section 3 are appropriate and the review presents a fishery with relatively clear objectives and a management structure that with some refinement and further analysis of information will go a long way to achieving them. However this was not the perception when reading the Report Summary which notes with reference to the French regulations "Nonetheless, most of the key CCAMLR measures are implemented in this fishery…." The summary could be more positive	The report summary has been reviewed and revised.
3.1.2	Yes	Yes	N/A		
3.1.3	Yes	Yes	N/A		

Performance Indicator	Has all the relevant information available been used to score this Indicator? (Yes/No)	Does the information and/or rationale used to score this Indicator support the given score? (Yes/No)	Will the condition(s) raised improve the fishery's performance to the SG80 level? (Yes/No/NA)	Justification .	Conformity Assessment Body Response
3.1.4	Yes	Yes	N/A	The score seems low for the review text presented in which the only negative was the lack of evidence of a regular review.	True – the trouble is that the regular review is the only difference between SG80 and SG100, so if it's not done, none of SG100 is met.
3.2.1	Yes	Yes	Yes	The condition requires the setting out of procedures and objective for the short-term management of the stock while the assessment is developed. The rationale and scoring, given the absence of this information, is appropriate.	Yes – and the assessment team felt that in the longer term, it would be appropriate for the management of the stock to be more explicit – as per your comment in relation to harvest control rules under PI 1.2.2.
3.2.2	Yes	Yes	Yes	Linked to 3.2.1 this condition will provide information to clarify the decision making process.	See comment above
3.2.3	Yes	Yes	N/A		
3.2.4	Yes	Yes	N/A		
3.2.5	Yes	Yes	N/A		

Any Other Comments

Comments	Conformity Assessment Body Response
MSC Peer Review Report General	
There is continual reference in the report text to "see below" or "described above" which is not helpful to the reviewer or the recipients.	This is an irritating report-writing tick of the assessment team leader, who has done her best to eliminate it except where it really serves a useful purpose.
The report seems rushed in the editing with missing references particularly and comments retained within it.	This has been corrected.
SCS 2012 which is continually referred to is assumed to be the CCAMLR Scientific committee report and therefore needs the correct reference format and the reference.	No – it's the MSC Public Certification Report for the HIMI toothfish fishery, written by the CB Scientific Certification Systems (SCS). The reference is included. It is possibly a bit lazy to assume that our colleagues at SCS have done a good job (although I'm sure they have – noting that the report has been peer reviewed and accepted) but conversely, we need to ensure that the two assessments are harmonised – i.e. that we take the same approach as them.
The CCAMLR harvest control rules for setting TAC are occasionally confused with reference levels. There seems to be an understanding of their usage but this does not come across within the report text which needs checking. Specifics	We take the point – but they do imply reference levels, in as much as for a given stock and assessment model, there is a maximum TAC than can be set within the rules. It's just that the reference level is not fixed, but depends on the amount of uncertainty in the assessment model. However, reference points have been set in this way in other fisheries (see for example South African hake).
1.3.2 Possible uncertainties in the UoC	
"Rates of interchange between Kerguelen and HIMI 'stocks' may be significant. However, the existing scientific information does not suggest that rates of mixing are greater than a few percent (Guy Duhamel, MNHN, pers. comm.), making separate management of the two parts of the plateau rational from a biological as well as a political point of	Point taken – this paragraph has been revised, particularly since the discussion with Prof. Duhamel was now several years ago. The French and Australian scientists have worked and continue to work closely together.

view…..” These statements in obviously in contradiction to each other and yet it is not made clear why. In addition mixing of adult/immature fish is not the only biological linkage which could result in a problem. Recruitment could be linked across the areas making the stock a unit and management in each area dependent on the other. This does not seem to have been discussed. A recommendation/support for continuation of the joint analysis across the areas would seem appropriate linked to that of the HIMI stock.	
2.3.4. CCAMLR conservation measures Within Table 2 comparison is made between the CCAMLR CM and the French equivalent legislation. The text notes “However, in most cases, there is an equivalent French regulation for these areas” and in the Report Summary “Nonetheless, most of the key CCAMLR measures are implemented in this fishery, including…” . The authors seem to indicate a problem but none is outlined in detail and no conclusion drawn?	This wording has now been revised – as has the summary per the comment above.
2.6. LANDINGS The paragraph is confused mixing descriptions of the data sources, the figure and database, clarification as needed as to what is being referred to.	Yes – this is because some of the text intended for the figure legend had crept into the main text. Corrected.
CCAMLR maintains its own data base of detailed haul by haul information submitted by Members from their vessels and observers. The STATLANT database is the FAO data base to which CCAMLR provides an annual aggregated summary of Members total catches by region.	Corrected.

2.7. IUU FISHING	
"Figure 7 shows that IUU fishing is now under control inside the Kerguelen EEZ" the figure shows the data therefore "It is considered that IUU fishing is now under control inside the Kerguelen EEZ.	'IUU fishing is now under control inside the Kerguelen EEZ (Figure 7).'
3.1.1. Oceanographic drivers of ecosystem dynamics	
"In 2012, talks were held between CCAMLR member countries on the establishment of a large-scale marine reserve covering 1.6 million square kilometres for the protection of the Ross Sea in the East Antarctic. The talks broke down, however, over concerns about fishing restrictions."	
The Ross Sea and East Antarctic MPA's are two separate proposals – despite the Ross Sea being in east of the Antarctic, and the discussions were not finished it was not just fishing that was a problem but the science basis. Therefore??	
"In 2012, talks were held between CCAMLR member countries on the establishment of two large-scale marine reserve covering 1.6 million square kilometers for the protection of the Ross Sea and the East Antarctic. The talks broke down, however, because the scientific basis for defining the areas was not fully developed. The talks are set to resume in July 2013."	OK
3.1.2. Vulnerable Marine Ecosystems (VMEs)	
CCAMLR has developed a protocol for monitoring and avoiding vulnerable marine ecosystems, which addresses…..	OK
The paragraph text switches between CCAMLR and the French zone and it is not clear which is being referred to	Clarified

within each sentence. Clarification is needed. 3.2.1. Main bycatch species …… Ray discards are estimated. ……. Figure 10. The method of estimation is omitted so that the quality of the information in the figure could not be determined. 4.3.1. Stock assessment history This stock assessment uses the stock assessment tool CASAL (C++ algorithmic stock assessment laboratory), which is the standard tool used by most CCAMLR toothfish fisheries 4.3.4. Data sets used in the model I would have been useful to note why the natural mortality estimate differs from that used in the Ross Sea and South Georgia? 4.3.6. Model outputs Table 10 and Table 23. 0.002 is 0.2%, 2% is 0.02 clarification needed for consistency with the text. **ANNEX 1 – ASSESSMENT TREE** 1.1.1 Stock status Fisheries-independent survey data: What is the Australian method – reference needed? Tag-recapture data	by observers OK Ross Sea is a different species. For South Georgia I don't know. The natural mortality rate used is taken from information used in the HIMI assessment. From the information provided to us, we are not able to evaluate how M was determined (or more likely estimated?) in these two other fisheries. It may be something of interest to discuss with your Australian colleagues at the next CCAMLR meeting? Yes – good point. It doesn't say – it just gives the two different estimates.

The tagging information was not covered in the main text of the report where a section describing the results would have been be useful. In order to evaluate the quality of the information used it would be useful to know how the tagging information e.g. number of fish tagged vs return rates etc. compare with the results in the Australian zone?	We don't have these data, unfortunately. We could move the results to the main body of the report, but this would be inconsistent with the structure of the rest of the report, where an overview is given in the main body of the report and data is provided in the rationales. Further to the comparison with Australia, the other reviewer picked up on this point as well, and we have included a recommendation to consider putting tag detectors on board.

PEER REVIEW 2

Overall Opinion

Has the assessment team arrived at an appropriate conclusion based on the evidence presented in the assessment report?	Yes	Conformity Assessment Body Response
Justification: None of the PI-specific concerns I outline below move a score into a different category. The uncertainties around stock assessment are highlighted and dealt with in the Conditions.		

Do you think the condition(s) raised are appropriately written to achieve the SG80 outcome within the specified timeframe?	Yes	Conformity Assessment Body Response
Justification: They are specific and their outcomes well-defined.		

If included:

Do you think the client action plan is sufficient to close the conditions raised?		Conformity Assessment Body Response
Justification: The Action Plan is specific, and sets achievable time frames for each of the four conditions that are appropriate to the urgency of each management shortfall for the fishery. For Condition 3, I was unable to trace the cross-reference to the 2013 ACAP meeting in Annex 1 of the Peer Review Report. Given that this meeting has already taken place, was this recommendation followed? Please give feedback or revise this requirement – it is indeed essential that ACAP be involved. For Condition 4, please give citation for draft memo issued by TAAF, for clarity.		The ACAP 2013 meeting was held from May 6-10 – this peer review was reviewed by the assessment team during this exact period. Therefore, no recommendations from the 2013 meeting were available. The TAAF staff are closely involved with ACAP – see for example the list of participants for the 2013 meeting (http://www.acap.aq/index.php/en/advisory-committee/cat_view/128-english/15-advisory-committee/413-ac7/414-ac7-meeting-documents and choose 'list of meeting participants'), with Dr Marteau from TAAF as an advisor – as is Dr Weimerskirch who has carried out much of the seabird research at Kerguelen with Dr Marteau. The actions taken by this fishery are under close scrutiny by TAAF, and through them by ACAP. Regarding the two annexes to the Action Plan, we accidentally excluded them, for which we apologise. They have now been included as part of the Action Plan in the report.

General Comments on the Assessment Report (optional)

MEP are to be complimented on a very comprehensive, and well-presented and thorough report.

I have one main concern that is shared by the CA and that influences a number of PIs: the limitation of fishery-independent (POKER biomass cruise) stock assessment data to areas shallower than 1000m. Depths over this threshold are precisely where the oldest, most reproductively important fish occur. Possibly there are logistical difficulties about sampling at these depths. Are there ways these might be overcome? Attraction of fish to long-line bait seems to carry the risk that purely long-line-based population surveys will over-estimate biomass at greater depths, and these are what are currently being used?

The assessment team understands that there are major logistical constraints to sampling by trawl below 1000m, such that trawl swept area cannot be considered reliable below this depth (difficulty of keeping the trawl on the bottom, or being certain that it is on the bottom). This means that quantitative sampling by trawl is really not possible below 1000m. The attraction of fish to longline bait means that longline CPUE can be a problematic measure of biomass, as the reviewer correctly notes. However, other metrics are available that feed into the stock assessment. Particularly important is catch at length (age) by depth - the maximum and median age classes sampled by the fishery at depth provide information on the stock age structure, which obviously changes in response to fishing pressure. This measure is likely to be more reliable than changes in CPUE.

Performance Indicator Review

Performance Indicator	Has all the relevant information available been used to score this Indicator? (Yes/No)	Does the information and/or rationale used to score this Indicator support the given score? (Yes/No)	Will the condition(s) raised improve the fishery's performance to the SG80 level? (Yes/No/NA)	Justification	Conformity Assessment Body Response
Example:1.1.2	No	No	NA	The certifier gave a score of 80 for this PI. The 80 scoring guidepost asks for a target reference point that is consistent with maintaining the stock at Bmsy or above, however the target reference point given for this fishery is Bpa, with no indication of how this is consistent with a Bmsy level.	
1.1.1	Yes	Yes, with 1 exception (see Justification column)	NA	p. 74: Interpretation of the length-frequency graph from the CCAMLR Fishery Report Appendix J is incorrect. This graph shows a *decline* in modal length of approximately 20cm over a 15-year period, from ~85cm to ~65cm, not an increase. See correct interpretation on p. 3 of original report. This incorrect interpretation may influence scoring of this PI.	Oops. We reviewed the scoring of this PI based on correcting this error, but it has not changed. Most likely the error crept in during writing the report – i.e. after the scoring process had taken place and scores were decided. The score was 80, and was not given higher based on the conclusion that there was no 'high degree of certainty' and these data reinforce that conclusion.
1.1.2	Yes	Yes	NA	I agree with the justification given by the CA	
1.1.3	Yes	Yes	NA	Rebuilding not required	
1.2.1	Yes	Yes	NA	I agree with the justification given by the CA	

Performance Indicator	Has all the relevant information available been used to score this Indicator? (Yes/No)	Does the information and/or rationale used to score this Indicator support the given score? (Yes/No)	Will the condition(s) raised improve the fishery's performance to the SG80 level? (Yes/No/NA)	Justification	Conformity Assessment Body Response
1.2.2	Yes	Yes	NA	I agree with the justification given by the CA	
1.2.3	Yes	Yes	NA	I agree with the justification given by the CA	
1.2.4	Yes	Yes, partially	Yes	With the exception of the point raised under PI 1.1.1., I agree with the justification given by the CA. However, I am concerned about the assessment method for spawner stock biomass (SSB), hence recruitment potential. This conforms to standard M.S.C. methodology, but biomass-based estimates ignore the disproportionately large contribution to recruitment made by large old fecund females. Equal weighting of all spawners, small and large, leads to over-estimation of recruitment, a bias that is exacerbated for long-lived species such as the Patagonian toothfish. Because Spawner Stock Biomass is used in the stock assessments for the Kerguelen toothfishery, these assessments are vulnerable to this bias. Moreover, estimates of SSB are declining (Fig. 19, p. 50), as are modal lengths of fish landed. The 2010/11 modal length of the catch is at the length for male sexual maturity (63cm), and below that for female maturity (85cm), so the highest catch size class is now that for	1. Age-structured models Unfortunately, the new modelling expert recruited by MNHN for this fishery is not yet in post, so we were unable to find out whether the long-term intention is to move to an age-structured model. We agree that it would be better, but that it may take several years for the current stock assessment model to be convincing enough that further complexity can be added. This is certainly an issue to watch over the course of audits and re-certification. 2. Fishery-independent data SG80 is as follows: SG 80: The assessment is appropriate for the stock and for the harvest control rule, and is evaluating stock status relative to reference points. The assessment takes uncertainty into account. The stock assessment is subject to peer review. The scoring is based on the fact that the stock assessment is appropriate for the HCR only in the short-term, failing the first element of SG80, so that the score given is 75. In relation to the lack of fishery-

Performance Indicator	Has all the relevant information available been used to score this Indicator? (Yes/No)	Does the information and/or rationale used to score this Indicator support the given score? (Yes/No)	Will the condition(s) raised improve the fishery's performance to the SG80 level? (Yes/No/NA)	Justification	Conformity Assessment Body Response
				fish as they enter sexual maturity. Given the 2014 stock assessments recommended by the CCAMLR WG on FSA to advise on TAC, can a question be put to the MHNH about whether or not they intend to use combined approaches to model recruitment, including models sensitive to the age-structure of the population? These might improve the assessment of stock status. I agree that the lack of fishery-independent data for depths greater than 1000m is problematic (see general comments above). Is this not grounds for lowering this score? Might it be suggested that the fishing fleet / TAAF / MHNH invest in tag detectors for the seven participating vessels? It seems that the lack thereof also detracts from the quality of data used for stock assessment models.	independent data below 1000m, the question would be whether the stock assessment takes into account this uncertainty. Based on the facts 1. that the outcome of the assessment is rather precautionary and 2. that data do exist to evaluate the portion of the stock below 1000m (see response above), the assessment team sticks to the conclusion that this element is met. The score therefore remains at 75. 3. Tag detectors We have now included a recommendation (under PI 1.2.3) for SARPC to consider putting tag detectors on board.
2.1.1	Yes	Yes, partially	Yes	I agree with the justification given by the CA	
2.1.2	Yes	Yes	NA	I agree with the justification given by the CA	
2.1.3	Yes	Yes	Yes	I agree with the justification given by the CA	

Performance Indicator	Has all the relevant information available been used to score this Indicator? (Yes/No)	Does the information and/or rationale used to score this Indicator support the given score? (Yes/No)	Will the condition(s) raised improve the fishery's performance to the SG80 level? (Yes/No/NA)	Justification	Conformity Assessment Body Response
2.2.1	Yes	Yes	NA	I agree with the justification given by the CA	
2.2.2	Yes	Yes	NA	I agree with the justification given by the CA	
2.2.3	Yes	Yes	NA	I agree with the justification given by the CA	
2.3.1	Yes	Yes	Yes	I agree with the justification given by the CA	
2.3.2	Yes	Yes	NA	I agree with the justification given by the CA	
2.3.3	Yes	Yes	NA	I agree with the justification given by the CA	
2.4.1	Yes	Yes	N/A	The ranking of demersal long-line impacts given by Chuenpadgee *et al.* (2003) was "moderate", not low. They merely stated that this gear has less impact than other high-impact demersal gear, such as trawls. See question in general comments about gear loss. [Also note spelling of this author's name; ref not listed in reference list.]	It's spelt Chuenpagdee - we all got it wrong. Reference included. The reviewer is correct – but we don't say that it is ranked low, we say that it is ranked better than other methods of demersal fishing.
2.4.2	Yes	Yes	N/A	I agree with the justification given by the CA	

Performance Indicator	Has all the relevant information available been used to score this Indicator? (Yes/No)	Does the information and/or rationale used to score this Indicator support the given score? (Yes/No)	Will the condition(s) raised improve the fishery's performance to the SG80 level? (Yes/No/NA)	Justification	Conformity Assessment Body Response
2.4.3	Yes	Partially	N/A	Give the lack of fishery-independent information, inlcuding habitat maps, from depths greater than 1000m, I do not consier the element for SG80 is satisfied: "Sufficient data are available to allow the nature of the impacts of the fishery on habitat types to be identified…. Sufficient data *continue* to be collected to detect any increase in ris to habitat" (italics mine).	1. Work is ongoing, within logistical constraints – observers record benthos brought up on the longlines, and older survey data are being incorporated into the database at MNHN. POKER cruises will continue every 3 years, so habitats shallower than 1000m will be monitored – it is reasonable to assume that any observed patterns in habitat damage from the fishery can be extrapolated deeper – at least qualitatively. 2. SG80 requires work to be 'at a level of detail relevant to the scale and intensity of the fishery'. Given that this is a fishery that is not considered likely to have significant habitat impacts (see rationale for 2.4.1, based on a relatively low impact gear and a relatively low fishing intensity) the assessment team felt that the information available and the research in progress was adequate.

Performance Indicator	Has all the relevant information available been used to score this Indicator? (Yes/No)	Does the information and/or rationale used to score this Indicator support the given score? (Yes/No)	Will the condition(s) raised improve the fishery's performance to the SG80 level? (Yes/No/NA)	Justification	Conformity Assessment Body Response
2.5.1	Yes	Yes	N/A	I am generally concerned with the assumption that because a species occupies a high trophic level, it is not a "keystone" species (p. 80). Although this statement is qualified later on p. 114, I caution assuming that reduction of a top predator will not have ecosystem-wide effects. The SCS cited on p. 80 is not a peer-reviewed study but a fishery assessment. Given the distinct nature of the Kerguelen plateau ecosystem, the fact that toothfish biomass may be as much as 50% of total finfish, and their wide diet, I suggest a precautionary approach for scoring this PI.	Point taken. We lazily cite the MSC assessment reports instead of the references cited therein. But overall, we think that the scoring is precautionary. The POKER cruises every three years represent a considerable investment in research into the marine ecosystem around Kerguelen, at least down to 1000m, and on this basis we could have scored higher – but we felt that the process was too new to provide a reasonable time series. We have adjusted the wording of the rationale a bit to give a more nuanced explanation of our thinking.
2.5.2	Yes	Yes	N/A	I agree with the justification given by the CA	
2.5.3	Yes	Yes	N/A	I agree with the justification given by the CA	
3.1.1	Yes	Yes	N/A	I agree with the justification given by the CA	
3.1.2	Yes	Yes	N/A	I agree with the justification given by the CA	
3.1.3	Yes	Yes	N/A	I agree with the justification given by the CA	

Performance Indicator	Has all the relevant information available been used to score this Indicator? (Yes/No)	Does the information and/or rationale used to score this Indicator support the given score? (Yes/No)	Will the condition(s) raised improve the fishery's performance to the SG80 level? (Yes/No/NA)	Justification	Conformity Assessment Body Response
3.1.4	Yes	Yes	NA	A review of the efficacy of incentives to, for example, reduce bird bycatch, is recommended.	In general, it seems as if penalties in terms of quota should provide a pretty strong incentive to do better – however the assessment team was not given bird bycatch data by individual vessel or company, so we were not able to assess this directly.
3.2.1	Yes	Yes	Yes	Loss of gear is not mentioned as a possible risk to habitats and ecosystems. Might this be incorprated into Conditions?	The fishing companies say (as fishing companies always do) that gear is not lost. It is part of the observer's duties to report lost gear, and the observer reports we saw did not include any incidents, although we were only provided with a subset.
3.2.2	Yes	Yes	Yes	See comments about stock assessment models used for setting TAC (PI 1.2.4)	See comments above
3.2.3	Yes	Yes	N/A	I agree with the justification given by the CA	
3.2.4	Yes	Yes	N/A	I agree with the justification given by the CA	
3.2.5	Yes	Yes	N/A	I agree with the justification given by the CA	

Any Other Comments

Comments	Conformity Assessment Body Response
Typos: p. 101 (PI 2.2.2) the box containing the MSC definition of the management strategy has truncated the contents of the box so that only the first sentence is visible. p. 80 – second para from bottom. Wording confusing: should the first "2011" be omitted from the sentence that reads "…: 2011 biomass is estimated at 72% of B_0 in 2012 and 59% in 2011" ?	Corrected – thank you.

ANNEX 5 – CLIENT ACTION PLAN

Condition 1 – Sustainable stock assessment process			
Conditional Requirement	**Actions**	**By Whom**	**When Completed**
1.2.4 Stock Assessment By the end of the five-year certification period, the fishery must have in place a sustainable stock assessment process which i) evaluates the fishery with reasonable regularity; ii) is used to inform decisions about the level of the TAC by TAAF and other stakeholders and iii) is presented for regular review by CCAMLR WG-FSA.	1. Implement WG-FSA work plan (2012) and submit a report to WG-FSA 2013 and if necessary to WG-FSA 2014 in order to finalise the establishment of a sustainable, long term stock assessment model. 2. Get the stock assessment model approved by CCAMLR scientific committee 3. Resources (financial and human) will be put in place to ensure that the stock assessment process is sustainable. 4. Continue stock assessment process as integrate part of fisheries management system. (including data from Poker 3)	MNHN SARPC TAAF DPMA MAE MNHN SARPC TAAF DPMA MAE MNHN DPMA TAAF SARPC MNHN DPMA TAAF SARPC	By the end of 2014 (Year 2 of certification) By the end of 2016 (Year 4 of certification) By the end of 2016 (Year 4 of certification) Ongoing basis Poker 3 at the end of 2013 (Year 1 of certification)

Condition 2 – Systematic monitoring of grenadiers, rays and bycatch code of conduct			
Conditional Requirement	**How Meet**	**By Whom**	**When Completed**
<u>2.1.1 and 2.1.3 – retained species outcome and information</u> A monitoring system needs to be put in place for grenadiers and rays, appropriate to the scale of the fishery, which will provide indication of possible risks to the stock. This may be by analysis of trends in CPUE or by some other suitable method. The assessment team needs to see evidence of the systematic implementation of the code of conduct. In addition, a process of review and revision of the code of conduct in the light of trends in the fishery is required.	1. Finalise the implementation of the monitoring system for grenadiers and skates by-catch. 2. Assessment of the code of good practice in terms of reduction in by-catch rates. 3. Revision of the code of good practise and issuance of conservative measures if necessary	MNHN With data provided by TAAF observer collected on SARPC Fishing Vessels DPMA MNHN TAAF DPMA SARPC MNHN TAAF DPMA SARPC	Fully operational by 2014. (Year 2 of certification) By the end of 2014. (Year 2 of certification) By the end of 2015. (Year 3 of certification)

Condition 3 – Targets and best practice for grey petrels			
Conditional Requirement	**How Meet**	**By Whom**	**When Completed**
2.3.1 – ETP species outcome (grey petrels) Declines in bird mortality need to continue until all vessels are performing at the best possible level. In addition, a monitoring system is required to identify the level of risk posed by the fishery to the Kerguelen grey petrel population, including specific bycatch targets for grey petrels.	1. Continue implementation of bird action plan by all vessels. 2. Establish system within SARPC with agreement of TAAF to allow lower performing vessels to learn from best performers. 3. Continuation of the Assessment of the Kerguelen grey petrel population. Results will be presented to ACAP 2013 (see Figure A)	TAAF SARPC SARPC TAAF TAAF	Ongoing process By the end of 2014 and further (Year 2 of certification) By the end of 2014 (Year 2 of certification)

Condition 4 – Management plan			
Conditional Requirement	**How Meet**	**By Whom**	**When Completed**
<u>3.2.1 Fishery-specific objectives and 3.2.2 Decision-making processes</u> Produce a management plan for this fishery, focusing on the management of the tooth-fish resource (i.e. Principle 1). The plan should set out for the short-term (~5-10 years), i) the objective of management; ii) how that objective will be achieved; i.e. how decisions on the TAC will be taken and iii) what information will be used and how it will be used.	1. Finalising and approving the plan of management of the fishery which is based on the draft memo issued by TAAF (see Figure B) 2. Assess the implementation of the Management plan as stated by the TAAF and approved by all stakeholders 3. Review and improvement of the management plan	TAAF SARPC MNHN DPMA DGEOM MAE TAAF SARPC MNHN DPMA DGEOM MAE TAAF SARPC MNHN DPMA DGEOM MAE	By the end of 2014 (Year 2 of certification) By the end of 2016. (Year 4 of certification) By mid- 2018 (Year 5 of certification)

Figure A: Conservation status of the grey petrel – Kerguelen Islands

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TERRES AUSTRALES
ET ANTARCTIQUES FRANCAISES

Note
Etat de conservation du pétrel gris *Procellaria cinerea* :
Le cas des îles Kerguelen

I) Présentation de l'espèce :

a. La reproduction

Le Pétrel gris *Procellaria cinerea* est une espèce coloniale qui niche pendant l'hiver austral. Les oiseaux se reproduisent chaque année dans des terriers. 93 % des oiseaux qui effectuent une reproduction avec succès font une nouvelle tentative de reproduction dès l'année suivante. Dans les Terres australes françaises (Kerguelen, Crozet, Saint Paul et Amsterdam), la période de reproduction s'étend de mars à août. Les oiseaux arrivent sur les colonies dès le début du mois de mars et pondent entre la fin du mois de mars et le début du mois d'avril.

L'incubation dure 55 à 65 jours et les œufs éclosent en majorité entre la fin du mois de mai et le début du mois de juin. La période d'élevage, d'une durée très variable, est la plus longue connue au sein des différentes espèces de Pétrels (de 120 à 160 jours). A Crozet et à Kerguelen, les poussins quittent le nid vers le mois de septembre.

En fonction des sites de reproduction (Terres australes françaises, îles Marion, îles de Nouvelle Zélande, etc.) et en fonction des années, on constate des différences dans les dates d'envol des poussins. Ces modifications pourraient être la conséquence de la pauvreté et de la variabilité des ressources alimentaires durant l'hiver austral.

b. Les pays concernés par la reproduction

Le pétrel gris est largement distribué et niche dans les îles subantarctiques appartenant à l'Afrique du Sud, la France, la Nouvelle Zélande et l'Australie, ainsi que sur les îles d'Amsterdam (France), de Gough et du groupe de Tristan da Cunha (Royaume-Uni). Les données sur les effectifs des populations sont encore fragmentaires. **Il y a aujourd'hui un manque crucial d'informations relatives aux effectifs populationnels dans la plupart des sites de reproduction (Tableau 1)**

L'ensemble des effectifs de pétrels gris hébergé en France se situe dans les Terres Australes Françaises et plus particulièrement dans l'archipel de Kerguelen et de Crozet.

Tableau 1 : ***Distribution de la population globale de P. cinerea.***

Australie	France	Nouvelle Zélande	Afrique du Sud	Royaume Uni
<1%	Environ 10% ?	Environ 65% ?	Environ 5% ?	Environ 20% ?

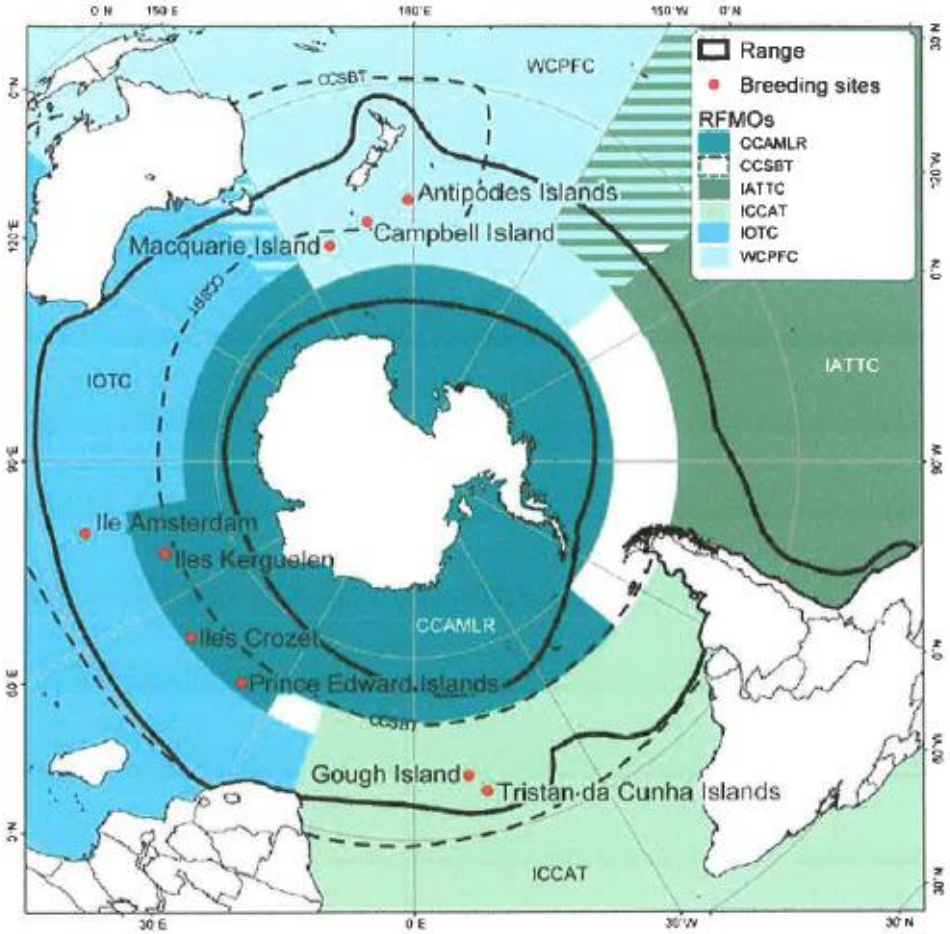

Figure 1 : ***Localisation des sites de reproduction et limites approximatives de l'aire de distribution de P. cinerea. Les limites des zones de compétence des Organisations Régionales de Gestion des Pêches (ORGP) [Regional Fisheries Management Organisations, RFMOs thonières et celles de la CCAMLR] sont également représentées.***

Sources :

CCAMLR – Convention sur la Conservation de la Faune et la Flore Marines de l'Antarctique (Commission for the Conservation of Antarctic Marine Living Resources)

CCSBT– Convention pour la Conservation du Thon rouge du Sud (Convention for the Conservation of Southern Bluefin Tuna)

IATTC (CITT) – Commission Interamericaine du Thon Tropical (Inter-American Tropical Tuna Commission)

ICCAT (CICTA) – Commission Internationale pour la Conservation des Thonides de l'Atlantique (International Commission for the Conservation of Atlantic Tunas)

IOTC (CTOI) – Commission des Thons de l'Ocean Indien (Indian Ocean Tuna Commission)

WCPFC (CPPCO) – Commission des Peches du Pacifique Centre et Ouest (Western and Central Pacific Fisheries Commission)

La plus grande population est probablement celle des îles Antipodes (Nouvelle Zélande), qui ont abrité en 2001 environ 53 000 couples reproducteurs (estimation moyenne). Plus de 10 000 couples se sont reproduit sur l'île de Gough en 2001 (R. Cuthbert) et plusieurs milliers sur les îles Crozet, les îles Kerguelen et les îles du Prince Edward. Les îles Macquarie, Amsterdam, Campbell et Tristan abritent de bien plus petites populations, avec un seul couple observé sur l'île Inaccessible en 1983, dont la reproduction n'a pas été confirmée. **Ces estimations sont basées uniquement sur les sites qui bénéficient d'un suivi à long terme puisque la population globale de pétrels gris est actuellement inconnue.**

Tableau 2 : Méthode de suivi et estimation de la taille des populations (nombre de couples reproducteurs par an) pour chaque site de reproduction. Ce tableau est basé notamment sur des données non publiées du CNRS de Chizé, ou du Tasmanian Department of Primary Industries and Water DPIW (Ile Macquarie).

Site de Reproduction	Juridiction	Années du suivi	Méthode de suivi	Précision du suivi	Nombre de couple reproducteurs annuel (dernier dénombrement)
Macquarie Island 54°37' S, 158°51' E	Australie	2003, 2004, 2006, 2007	A	Elevée	74 (2007)
Ile d'Amsterdam 37°51' S, 77°31' E	France	Années 1980	F	Moyenne	5-10 (années 1980) [28]
Iles Crozet 46°26'S, 51°47'E	France				
Ile de la Possession		2005	F	Moyenne	Plusieurs dizaines (2005)
Ile de l'Est		1982	F	Faible	2 000-9 000 (1984) [29]
Iles Kerguelen 49°09'S, 69°16'E					
Golfe du Morbihan		2006	C	Moyenne	3 400 (IC 95 % 1 900-5 600) (2006) [30]
Péninsule Jeanne d'Arc	France	-	-	-	Plusieurs dizaines (2006) [30]
Ile du Port		-	-	-	?
Ile St Lanne Gramont		-	-	-	?
Presqu'île Joffre		-	-	-	?
Campbell Island 52°32'S, 169°8'E Campbell Island Dent Island Jacquemart	Nouvelle Zélande	Pas de suivi	-	-	Plusieurs centaines ? [11]
Antipodes Islands 49°42'S, 178°47'E Antipodes Island	Nouvelle Zélande	2001, 2009	A	Moyenne	53 000 (32 000-73 000) (2001) [27]
Bollons Island		Pas de suivi	-	-	?
Prince Edward Islands 46°38'S, 37°55'E Marion Island Prince Edward Island	Afrique du Sud	?	-	-	Plusieurs milliers (Années 1980 ?) [31]
Tristan da Cunha Tristan Island 37° 7'S, 12° 17'W	Royaume Uni	1974	?	?	50-100 (1974) [23]
Inaccessible Island		Pas de suivi	-	-	?
Gough Island 40° 21'S, 09° 53'W	Royaume Uni	2001	-	-	10 000-25 000 (2001) [R. Cuthbert in ?]
Total pour tous les sites bénéficiant d'un suivi					***> 50 000 ?***

Le dénombrement effectué sur la partie Est de Kerguelen (Golfe du Morbihan) en 2004/2005 et 2005/2006 permet d'estimer la population de pétrels gris entre 2900 - 4400 (estimation minimale) et 3900 - 5800 (estimation maximale) couples reproducteurs. Cette estimation est beaucoup plus faible que la population estimée auparavant (5000 à 10 000 couples reproducteurs; Weimerskirch et al. 1989). D'après les dernières extrapolations, la taille de la population totale pour Kerguelen serait comprise entre 10 050 et 13 700 individus.

Sur les 31 sites prospectés sur la période 2004 - 2006, les terriers de pétrels gris n'ont été détectés que sur une minorité de sites et principalement le long des côtes. Ainsi, les terriers de pétrels gris étaient présents uniquement sur 9 des 18 îles du golfe du Morbihan prospectées, ce qui confirme que l'espèce est absente ou très peu abondante dans le reste de la partie Est de Kerguelen. Cette espèce est donc très peu abondante et niche d'une manière très localisée sur Kerguelen.

Très peu d'estimations fiables sont disponibles sur cette espèce (Schulz et al. 2005), cependant la population de Kerguelen représente probablement plus de 50% des effectifs reproducteurs au niveau de l'Océan Indien (del Hoyo et al. 1992), mais moins de 10% de la population mondiale.

c. Tendances démographiques

Sur la plupart des sites de reproduction, il n'y a pas de données actuellement disponibles concernant les tendances démographiques. Robertson et Bell (1984) ont estimé la taille de la population à environ 10 000 à 50 000 couples aux îles Campbell et Antipodes dans les années 1980. Toutefois, des travaux plus récents, basés sur l'extrapolation de comptages de terriers à l'aide de mailles de recensement, ont suggéré qu'un total de 32 000 à 73 000 couples s'était reproduit en 2001 sur la seule île des Antipodes. Des travaux pour obtenir de nouvelles estimations de la taille de la population sur les îles Antipodes sont actuellement menés. A l'inverse, l'estimation de plusieurs centaines de milliers de couples reproducteurs sur l'île de Gough, proposée par Richardson (1984), a été revue à la baisse, avec une estimation actuelle plus réaliste, chiffrant la population à 10 000 - 25 000 couples reproducteurs en 2001.

Il n'existe pas de programme de suivi démographique pour les autres populations, à l'exception de Kerguelen, où le programme actuel de capture/marquage/recapture, en place depuis les années 1980, permet d'obtenir certaines informations sur les paramètres démographiques (H. Weimerskirch, données non publiées), et sur l'île de Macquarie, que l'espèce occupe à nouveau après une absence de plus de 80 ans. La présence de 8 couples reproducteurs y a été confirmée en 2000, puis de 74en 2007. La plus petite population, résidant sur l'île d'Amsterdam, ne comptait que 5 à 10 couples lors de la dernière estimation dans les années 1980.

<u>Estimation des paramètres démographiques sur la population de pétrels gris de Kerguelen *(d'après Barbraud et al, 2006).*</u>

L'âge le plus précoce de première reproduction observée est de 4 ans. En moyenne, les pétrels gris de Kerguelen se reproduisent à l'âge de 7 ans (écart-type = 1.5 ans). La majorité des individus se reproduisent pour la première fois à l'âge de 6 à 8 ans (75% des individus) et l'âge maximum de première reproduction observée est de 9 ans.

En moyenne le succès reproducteur sur la période 1986-2005 a été de 41.3% (± 12.4%). Le succès reproducteur ne montre aucune tendance à l'augmentation ou à la diminution (P = 0.17).

II) Sites de reproduction : les menaces à terre

Actuellement, la prédation par les espèces introduites représente la menace terrestre la plus sérieuse pour les populations de *P. cinerea*. Le rat noir *Rattus rattus* est présent sur de nombreuses îles, ainsi que la souris domestique *Mus musculus* sur l'île de Gough.

Tableau 3 : Résumé des menaces connues susceptibles d'influencer la population sur les sites de reproductions de P. cinerea (Tableau basé sur les informations fournies au groupe de travail 'Sites de Reproduction' Breeding Site Working Group) de l'ACAP en 2008.

Site de reproduction	Perturbation humaine	Prélèvement par l'homme	Catastrophes naturelles	Parasites ou agents pathogènes	Dégradation ou perte de l'habitat	Prédation (espèces introduites)	Contamination
Ile Macquarie	non	non	non	non	Moyen [a]	Moyen [b]	non
Ile d'Amsterdam	non	non	non	Faible [c]	non	Faible [d]	non
Îles Crozet Ile de la Possession	non	non	non	non	non	non [e]	non
Iles Kerguelen	non	non	non	non	Faible [f]	Faible [f]	non
Iles Campbell	non	non	non	non	non	non [g]	non
Iles Antipodes	non	non	non	non	non	non [h]	non
Iles du Prince Edward	non	non	non	non	non	non [i]	non
Tristan da Cunha	non	non	non	non	non	? [j]	non
Ile Gough	non	non	non	non	non	? [j]	non

a) Statut de protection des colonies de pétrels gris dans l'archipel Kerguelen

En France, toutes les colonies de reproduction de ce pétrel sont strictement protégées.

Les archipels Crozet et Kerguelen sont classés en réserve naturelle nationale depuis octobre 2006. Certains sites au sein de la réserve bénéficient d'un statut de protection intégrale (Archipel Crozet à l'exception de l'île de la Possession ; certains îlots et secteurs côtiers à Kerguelen notamment dans de nombreux sites où niche le pétrel gris).

Le plan de gestion de la réserve naturelle a été validé en mars 2011 pour une durée de 5 ans. Ce plan prévoit notamment de cartographier et de dénombrer l'ensemble des colonies d'oiseaux et en particulier des pétrels gris et pétrels à menton blanc. Il prévoit également d'étudier la mise en place de programmes d'éradication d'espèces (chats, rats et souris) afin de favoriser la reproduction des espèces hypogées (pétrels gris compris).

III) La distribution en mer

La distribution du pétrel gris est circumpolaire. Elle couvre les eaux subantarctiques et antarctiques, majoritairement entre 32° et 58°S, mais s'étend plus au nord au niveau du courant de Humboldt, jusqu'a 18°S sur la côte est de l'Amérique du Sud. Les données issues de la capture accidentelle par les pêcheries (by-catch) suggèrent que les femelles vont se nourrir plus au nord que les mâles durant la période de reproduction (c'est-a-dire durant l'hiver austral), dans les eaux situées au nord de la convergence subtropicale, parfois jusqu'à 1 460 km de leurs colonies situées sur les îles subantarctiques. Des études récentes, menées à Kerguelen, ont démontré que les oiseaux reproducteurs

allaient se nourrir à l'est de l'archipel, parfois jusqu'à 2 000 km des colonies, et que la même zone géographique était exploitée durant l'été par les oiseaux non reproducteurs (H. Weimerskirch,).

L'espèce est principalement pélagique et son aire de distribution océanique recoupe les zones de compétence de toutes les Organisations Régionales de Gestion des Pêches concernées, à savoir l'Accord relatif aux pêches dans le sud de l'océan Indien (Southern Indian Ocean Fisheries Agreement, SIOFA), l'Organisation des Pêches de l'Atlantique du Sud-Est (South-East Atlantic Fisheries Organisation, SEAFO), la Commission des Pêches pour le Sud-Ouest de l'Ocean Indien (South-West Indian Ocean Fisheries Commission, SWIOFC), ainsi que l'organisation nouvellement constituée, l'Organisation Régionale de Gestion de la Pêche du Pacifique Sud (South Pacific Regional Fisheries Management Organisation, SPRFMO). La SEAFO, la SWIOFC, et le SIOFA ont pour objectifs d'assurer la conservation à long terme et l'utilisation durable des ressources halieutiques autres que les thonidés et apparentés, et sont principalement responsables de l'organisation de la pêche au chalut et des pêcheries traditionnelles. Toutefois, la SEAFO et le SIOFA gèrent également l'organisation des pêcheries qui ciblent des espèces pélagiques comme la légine australe *Dissostichus eleginoides*. La SPRFMO couvreà la fois la pêcherie pélagique et la pêcherie démersale en haute mer, et devra veiller à la compatibilité, pour les stocks chevauchants, entre les mesures prises par les Etats côtiers dans leurs Zones Economiques Exclusives et les mesures prises par l'organisation en haute mer..

IV) Les menaces en mer **(source ACAP)**

a) Situation en dehors des zones françaises

Les pêcheries à la palangre constituent la principale menace pesant sur le pétrel gris. Le pétrel gris a été la quatrième espèce la plus affectée par les pêcheries néo-zélandaises entre 1998 et 2004, et la deuxième la plus tuée par la pêche à la palangre démersale (après le pétrel à menton blanc *P. aequinoctialis*). 13 % de toutes les prises accidentelles liées à la pêcherie dans les eaux de Nouvelle Zélande, et envoyées pour autopsie entre 1996 and 2005, étaient des individus de pétrels gris. En 2006/2007, comme lors des premières années du suivi, la majorité des individus tués était des femelles capturées en hiver sur la côte est de l'île du Nord de la Nouvelle Zélande. En outre, les individus tués par les pêcheries japonaises au thon dans les eaux australiennes entre 1988 et 1995 étaient en majorité des femelles adultes. L'impact de cette mortalité sélective en fonction du sexe sur la population reproductrice est inconnu. Il a également été reconnu que l'espèce a souffert de la pêche à la palangre en Argentine, le long du plateau patagonien (0 a 0,9 % de tous les oiseaux tués entre 1999 et 2001), et de la pêche à la légine australe autour des îles du Prince Edward (1 % du total des oiseaux tués entre 1996 et 2000, plus de 80 % des cadavres examinés étant de sexe mâle). Bien que le pétrel gris ai été observé autour des bateaux de pêche traditionnelle à la Légine australe dans le sud du Chili, la mortalité aviaire liée à cette activité ne concerne que le pétrel à menton blanc *P. aequinoctialis*. En outre, une mortalité accidentelle non négligeable pourrait également se produire dans les eaux internationales du secteur sud de l'océan Indien mais les données sur la mortalité liée à la pêche sont limitées pour ce secteur [Huyser et al. 1999 in 18].

A noter que pour les ORP tels que SIOFA, SEAFO, SPRFMO (…), les données sur la mortalité accidentelle sont quasi inexistantes.

b) *Situation dans la ZEE de Kerguelen*

i) Période 1996 à 2005

On estime qu'un minimum de 755 *P.cinerea* ont été tués annuellement par la pêche à la légine australe, légale ou illégale, autour des îles Kerguelen entre 1996 et 2003.

A l'aide des estimations du nombre maximum de couples reproducteurs sur Kerguelen (3900 à 5800) et d'un modèle matriciel, il est possible d'estimer la taille de la population totale pour Kerguelen entre 10 050 et 13700 individus. Avec une survie adulte de 0.944 (sans l'effet des facteurs environnementaux et de l'effort de pêche) et un âge moyen de première reproduction de 7 ans, le taux de croissance maximum de la population selon la méthode des invariants démographiques est estimé à 1.068.

A partir de ces estimations, la mortalité additionnelle minimale à partir de laquelle la population de pétrels gris de Kerguelen risque de décliner se situe entre 340 et 466 individus par an. Il faut également prendre en compte un biais vraisemblable lié au sex-ratio des oiseaux capturés accidentellement. Il n'existe pas de données pour Kerguelen mais l'étude menée en Nouvelle Zélande montre une mortalité différentielle envers les femelles : 90% femelles/10% mâles (Bartle, 1990), ce qui implique un abaissement significatif du seuil minimum.

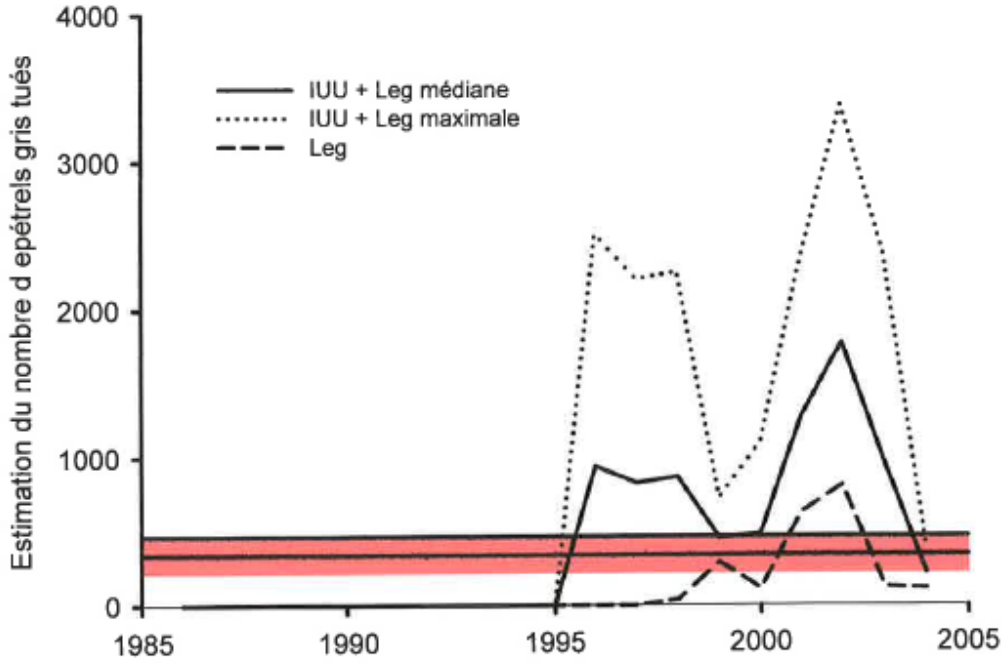

Figure 2 : ***Estimation du nombre de pétrels gris tués (secteur 58.5.1 ; médiane en trait plein, maximale en trait pointillé) par la pêcherie à la légine. Les lignes horizontales noires représentent les valeurs minimum et maximum au-delà desquelles le nombre d'oiseaux tués peut occasionner un déclin de la population. La zone colorée représente la zone à risque en prenant en compte l'abaissement de la valeur minimum en tenant compte d'un biais dans le sex-ratio des oiseaux capturés.***

On voit sur la figure 2 que le nombre de pétrels gris tués par la pêcherie légale à la légine dépasse ces valeurs minimales en 2001 et 2002. Si l'on considère les estimations du nombre de pétrels gris tués par la pêcherie légale et la pêcherie illégale, ces valeurs minimales ont été largement dépassées de 1996 à 2003.

ii) Situation actuelle de la mortalité des pétrels gris dans les ZEE françaises de Kerguelen

La France a présenté lors de la XXVIIème réunion de la CCAMLR, un plan d'action visant à réduire considérablement la mortalité accidentelle dans les ZEE françaises.
Ce plan est intitulé « plan d'action visant à réduire les captures accidentelles d'oiseaux de mer dans les ZEE françaises incluses dans les sous-zones statistiques 58.5.1 et 58.6 ».

Le plan d'action proposé par la France est composé de 5 parties :

A- Prescription de mesures conservatoires :

Toutes les mesures mises en place sont présentées et détaillées dans l'annexe.

B- Réglementation :

Afin de limiter les captures accidentelles d'oiseaux, l'organisme gestionnaire de la pêcherie, les Terres australes et antarctiques françaises (TAAF), met en place chaque année une réglementation stricte prenant en compte les recommandations CCAMLR.

C- Education et formation :

Afin de poursuivre la sensibilisation des différentes parties prenantes, les pêcheurs, les professionnels de la pêche, l'organisme gestionnaire de la pêcherie, les scientifiques et les contrôleurs de pêche se réunissent au sein d'un comité de pilotage plusieurs fois par an.
Sur les bateaux, et afin de toucher l'ensemble de l'équipage, une sensibilisation est développée à bord en début de chaque marée.

D- Collecte de données :

La collecte de données est principalement assurée par les contrôleurs de pêche embarqués. Cette collecte a été amplifiée afin d'enregistrer le plus possible de données pertinentes pour la compréhension des causes de la mortalité aviaire, mais également pour fournir les données au format voulu par la CCAMLR.

E- Recherche-développement :

Les données récoltées par les contrôleurs de pêche, concernant la mortalité aviaire, sont analysées régulièrement par le CNRS-Chizé (France). De nouvelles études ont enrichi les données récoltées, ce qui a permis d'analyser l'efficacité des mesures conservatoires.

Ce plan a notamment permis :

- De diminuer la mortalité aviaire dans les ZEE françaises (58.1 & 58.6) de 80.2% entre les campagnes 2007/2008 et 2011/2012 ;
- De diminuer le taux de capture accidentelle de 83,07% entre 2007/2008 et 2011/2012 pour la ZEE de Kerguelen (58.1) ;
- La mise en place d'un système d'effarouchement et de protection du type Rideau de Brickle ayant permis de diminuer de 85.1 % le nombre d'oiseaux capturés au virage sur la période 2007/2008 à 2011/2012.

Concernant les pétrels gris, ce plan a permis de diminuer de manière très significative le nombre d'oiseaux tués. Sur la période 2009/2010 à 2011/2012, le nombre de pétrels gris tués est passé de 56 à 16, soit une diminution de 71,4%.

Contrairement aux années 2001 et 2002, le nombre de pétrels gris tués accidentellement par les bateaux français est très éloigné du seuil critique de 340 oiseaux (cf. Figure 2).

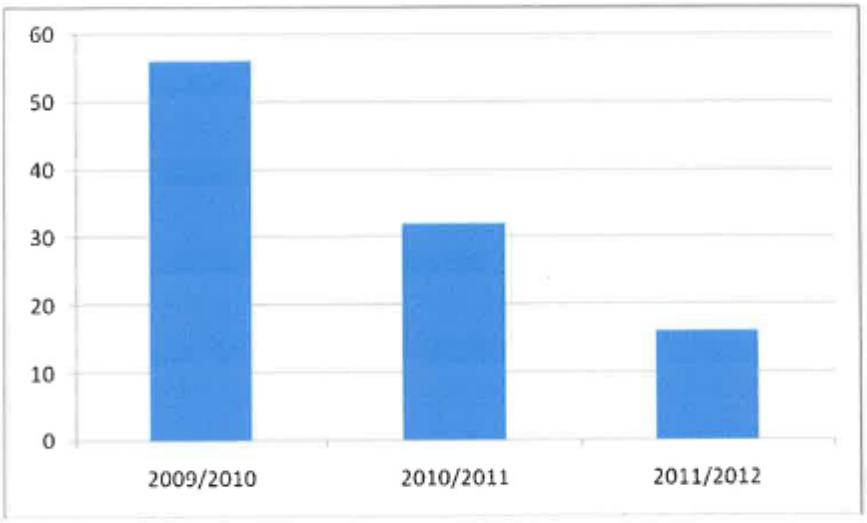

Figure 3 : Evolution du nombre de pétrels gris tués dans la ZEE de Kerguelen sur la période 2009/2010 à 2011/2012 ;

Les niveaux de captures actuels dans la ZEE de Kerguelen ne représentent donc plus une menace pour la population de pétrels gris.

Afin de suivre les paramètres démographiques de cette population, un inventaire des pétrels gris a été mené sur les îles de Kerguelen (Golfe du Morbihan) en 2010 et 2011. Ces données visent à affiner les données sur la taille de la population de pétrels gris estimée en 2006 par Barbraud et al. Ce travail d'inventaire sera poursuivi en 2012/2013. L'analyse de ces données sera présentée à l'ACAP en 2013.

Figure B: Kerguelen Fishery Management Plan

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PLAN DE GESTION DES RESSOURCES MARINES EXPLOITABLES DE KERGUELEN

1) HISTORIQUE

Les ressources marines exploitables dans les eaux de Kerguelen sont suivies statistiquement et biologiquement par le Muséum National d'Histoire Naturelle de Paris depuis 35 ans. Dès la création des zones économiques exclusives le 3 février 1978, la France s'est préoccupée de la gestion de ses ressources halieutiques. Après une période (1970-1978) d'exploitation de ces eaux par une flotte de pêche soviétique,, la France a dans un premier temps interdit toute pêche du 1er juin 1978 au 15 septembre 1979 afin d'assurer une période de repos et de reconstitution des fonds et de mettre en place un suivi des stocks exploités.
Des accords ont ensuite été conclus entre la France, l'URSS et la Pologne autorisant la pêche aux poissons avec une limitation de quota et un contrôle des opérations par des observateurs français embarqués. La légine australe *Dissostichus eleginoides* était alors considérée comme une simple prise accessoire de la pêche au chalut de fond. Les carnets de pêche vérifiés par les contrôleurs de pêche embarqués et les données biologiques recueillies simultanément aux activités de pêche par ces derniers ont permis de faire évoluer les méthodes de pêche par une règlementation stricte permettant d'assurer une gestion saine de la ressource.
Du fait de la recrudescence de la pêche illicite, et d'une biomasse en nette diminution, les accords de pêche avec les Etats tiers ont tous été interrompus dès 1998.

2) EVALUATION DE LA BIOMASSE DES ESPECES EXPLOITEES

Des essais de campagnes d'évaluation de la ressource halieutique ont eu lieu ponctuellement en 1979 puis en 1983 lors des campagnes de pêche exploratoire française (chalutiers *Jutland – Austral*). Par la suite, du fait d'accords bilatéraux, des campagnes conjointes franco-soviétique (1987 - 1988 programme « SKALP » des chalutiers Skif et Kalper), puis franco-japonaise (1996 - campagne du palangrier Anyo Maru 22) ont eu lieu à Kerguelen.
Afin notamment de répondre aux demandes répétées de la CCAMLR d'un état actualisé de la biomasse, des campagnes d'évaluation halieutique baptisées POKER (campagnes « POKER 1 et 2» du chalutier Austral) ont été menées en 2006 et en 2010.
Ces campagnes qui devraient dorénavant avoir lieu régulièrement tous les 3 ou 4 ans, consistent à réaliser pendant une période de trente jours sur zone, toute une série de sondages aléatoires, indépendants de la pêcherie, par chalutage selon la méthode de l'aire balayée (« swept area method »).
Les résultats de ces campagnes ont permis au Muséum National d'Histoire Naturelle de confirmer les données acquises par les contrôleurs de pêche embarqués, montrant un état satisfaisant du niveau de la biomasse, et d'une attribution raisonnée d'un Total Admissible de Capture (TAC) se situant aux alentours de 5100 tonnes de légine à Kerguelen.
La prochaine campagne POKER 3 aura lieu de la mi-août 2013 à fin septembre 2013 selon les mêmes protocoles que les deux campagnes précédentes et avec le même navire.

Les résultats de la modélisation du stock de légine de Kerguelen sont présentés au comité scientifique de la CCAMLR à partir de 2011. En 2012, le comité scientifique de la CCAMLR valide les résultats de l'analyse découlant de cette modélisation et encourage la France à poursuivre ses efforts de modélisation. Les résultats analysés de la campagne POKER III devraient pouvoir être disponibles dans le courant du premier semestre 2014.

3) GESTION DES RESSOURCES HALIEUTIQUES

a) En vertu de la Convention des Nations Unies sur le Droit de la Mer signée le 10 décembre 1982 à Montego Bay (art 55 et s.), l'Etat côtier possède des droits souverains dans sa zone économique exclusive, notamment aux fins de conservation et de gestion des ressources naturelles. Il a également juridiction pour protéger et préserver l'environnement marin.

b) En pratique, ceci a conduit la France à développer un concept de gestion intégrant les différents aspects d'une gestion durable tenant compte de l'écosystème. Cette démarche était d'autant plus nécessaire et justifiée que la France démontre depuis plus de 50 ans son intérêt pour la recherche dans les îles subantarctiques, confirmé par des séries de données ininterrompues et un premier rang mondial en matière de publications scientifiques.

c) Pour la mise en œuvre de ce concept de gestion, il convenait tout d'abord de s'affranchir de la pression néfaste de la pêche illégale, non contrôlée et non réglementée (INN). L'action de répression intra ZEE a permis une diminution notable de ces activités de pêche INN, des captures illicites engendrées et des dommages collatéraux à l'environnement occasionnés. A titre d'illustration, les captures estimées de la pêche INN sont passées d'une moyenne de 12 800 tonnes par an de 1996 à 2003 à une moyenne annuelle de 2600 tonnes de 2004 à 2008. Ces résultats sont principalement à mettre à l'actif des arraisonnements et confiscations réalisés par la Marine nationale dans les ZEE françaises : 23 au cours de la dernière décennie. Ils n'ont été obtenus qu'au prix d'un engagement lourd, couteux et persistant des moyens de surveillance de l'Etat composé de moyens maritimes de la marine et des affaires maritimes ainsi qu'un dispositif de surveillance par satellite. Ce renforcement des mesures répressives à l'égard de la pêche INN dans les eaux sous juridiction française a porté ses fruits : aucune action de pêche illicite n'a été constatée à l'intérieur des zones économiques depuis 2008 même si une activité est encore reconnue à leurs marges.

d) En matière de gestion de la ressource et de la pêche, la France met en œuvre de façon rigoureuse dans ses ZEE les recommandations rendues par l'organisme scientifique compétent (Muséum National d'Histoire Naturelle, MNHN). Ce mode de gestion se concrétise par la mise en œuvre d'une réglementation contraignante pour les armements, par une limitation de l'effort de pêche et le strict respect de quotas.
Au-delà de cette approche générale, il apparaît que la France met en œuvre l'ensemble des mesures de conservation de la CCAMLR, notamment par une large transposition en droit interne, mais aussi par une mise en application scrupuleuse *in situ*.
L'observation de la réglementation est plus particulièrement sévère, puisque les observateurs systématiquement embarqués sur les navires français dans les ZEE de Kerguelen et de Crozet sont des agents assermentés, investis de la capacité de relever les infractions : ils s'assurent donc d'une application rigoureuse des règlements. Les protocoles d'observations scientifiques, notamment relatifs à la mortalité aviaire et,aux captures accessoires, sont ainsi scrupuleusement respectés.

e) La gestion de la pêche et la protection des écosystèmes marins reposent essentiellement sur les données recueillies par les contrôleurs de pêches embarqués et l'analyse qui en est faite par le Muséum National d'Histoire Naturelle.
Les contrôleurs de pêche sont sélectionnés et formés par l'administration des Terres australes et antarctiques françaises (TAAF) et le MNHN. Agents assermentés auprès du Tribunal d'Instance de Saint-Pierre de la Réunion, leur rôle consiste à :
- assurer la pérennisation de la récolte des données statistiques et biologiques ;

- contrôler la bonne tenue du carnet de pêche (Logbook) ;
- participer aux campagnes de marquage de poissons ;
- répertorier et identifier les mammifères marins ;
- lutter contre la pêche illicite ;
- sensibiliser les équipages à la lutte contre la mortalité aviaire, les prises accessoires et les VME.

Les navires de pêche australe sous licence TAAF, embarquent tous un contrôleur de pêche qui reste à bord de l'appareillage jusqu'à la débarque des produits pêchés.
Le contrôle des quantités à la débarque est effectué par des agents de l'Etat du port à La Réunion, assistés d'une société d'experts maritimes qui fait l'inventaire détaillé de tout ce qui a été pêché et qui est débarqué.

f) Outre les programmes de recherche fondamentale dont la France rend compte chaque année dans ses rapports, plusieurs programmes de recherche appliquée sur les interactions entre la pêche et l'environnement sont menés sous le contrôle des organismes scientifiques compétents (notamment le Muséum National d'Histoire Naturelle - MNHN, le Centre National de la Recherche Scientifique – CNRS) et de la réserve naturelle des Terres australes. Plusieurs études scientifiques sur la mortalité aviaire ont été effectuées, en partenariat notamment avec les scientifiques néo-zélandais. Les résultats ont permis de mettre en place un plan national d'actions dont les résultats sont très significatifs (diminution de l'ordre de 90% de la mortalité aviaire entre 2005 et 2012 dans les ZEE françaises). En parallèle, plusieurs études sur la dynamique des populations d'oiseaux marins (pétrels à menton blanc, pétrels gris…) impactés par la pêcherie ont étés conduites. Ces études sont complétées par des dénombrements des colonies présentes sur l'archipel Crozet et Kerguelen ce qui permet de définir les tendances de population. L'ensemble de ces données permet également d'alimenter les réflexions sur la conservation de ces espèces dans les enceintes internationales (ACAP…) et leurs déclinaisons nationales. Enfin, un programme de recherche appliquée sur la pêche au casier (ORCASAV) afin de réduire les interactions avec les orques a également eu lieu en 2010 à Crozet *(*sous l'égide scientifique de l'Ifremer et du MNHN)

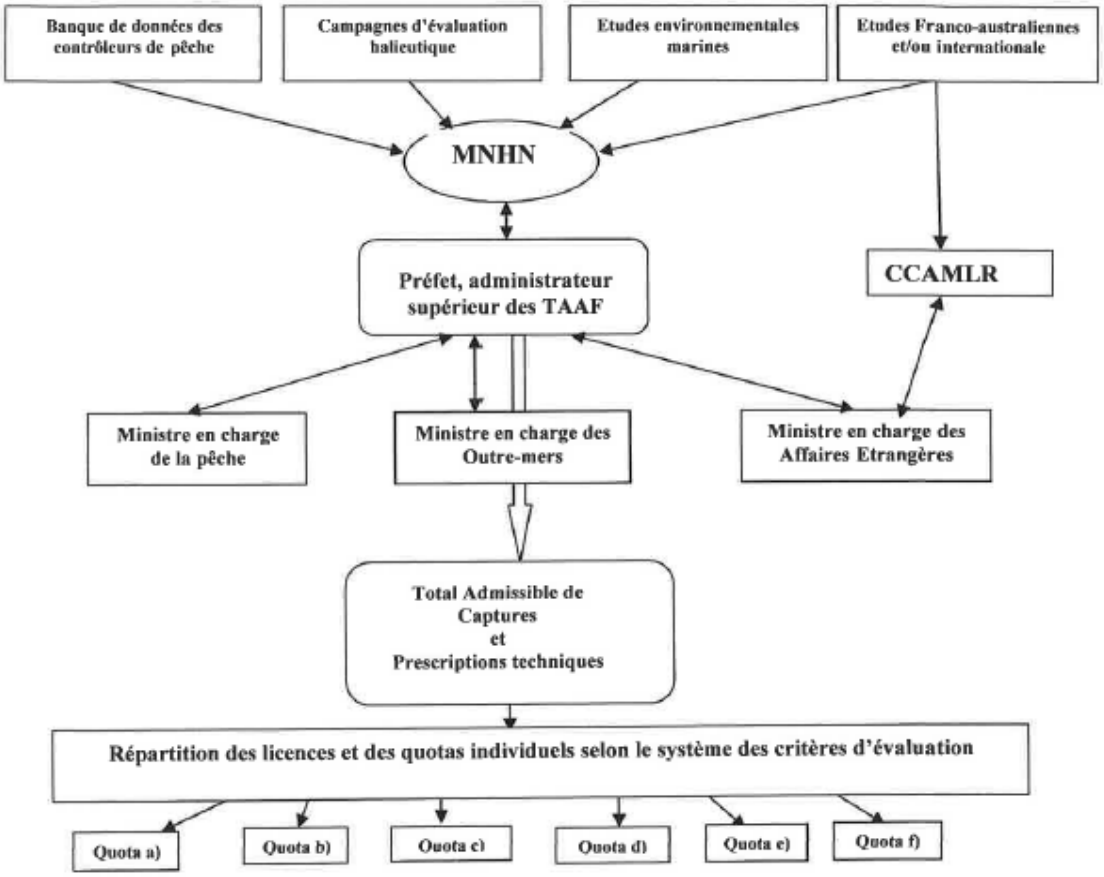
g) Le gouvernement français a classé les îles Kerguelen et Crozet « réserve naturelle » par décret du 3 octobre 2006 (CCAMLR/XXVI/BG21). Cette réserve naturelle terrestre et marine couvre plus de 22 000 km² (cf. annexes I et II). Toute activité de pêche est formellement interdite dans les eaux territoriales et toute activité maritime soumise à autorisation dans les parties plus sensibles. Le plan de gestion validé en mars 2011 pour une période de 5 ans, prévoit la mise en place de 90 actions de conservation, englobant notamment les moyens de lutte contre les captures accidentelles et accessoires. Ce plan prévoit également le développement de programmes de connaissances des milieux terrestres et marins et la mise en place d'indicateurs de gestion permettant d'évaluer la pertinence des actions menées.

h) La notion de ZEE comporte une dimension « économique ». Il appartient à cet égard à l'Etat riverain d'assurer une exploitation raisonnée et durable des ressources, dans un objectif de pérennité des entreprises et des emplois Cette dimension économique et sociale est également intégrée au concept de gestion des ZEE de Kerguelen et de Crozet. L'unité de juridiction permet ainsi de combiner les différents objectifs d'une pêcherie raisonnée.

i) Une coopération avec l'Australie en vertu d'un accord bilatéral signé le 24 novembre 2003 à Canberra permet désormais de mutualiser les moyens de surveillance ainsi que les connaissances scientifiques sur les ressources halieutiques exploitées et les écosystèmes recueillies dans les deux ZEE limitrophes. Des avancées significatives ont été réalisées au cours de ces dernières années à l'issue de réunions annuelles communes (scientifiques, professionnels et administrations) des deux partenaires, qui ont donné lieu à un symposium co-organisé et des publications (The Kerguelen Plateau – Marine Ecosystem and Fisheries, 2010).

4) PROPOSITION DE TAC – REPARTITION EN QUOTAS

Le Préfet, administrateur supérieur des TAAF, est l'autorité administrative qui détermine les modalités de gestion de la ressource, concernant notamment les interdictions applicables à la capture, à la récolte et à l'exploitation industrielle et commerciale des espèces marines animales et végétales, dans les conditions fixées par le décret 2009-1039 du 26 août 2009.
Afin d'assurer la réalisation de cet objectif, l'administrateur supérieur fixe chaque année par arrêté des totaux admissibles de captures par espèces ou groupes d'espèces pour des zones, des périodes d'activité et des engins donnés, après recommandation du Muséum national d'histoire naturelle et avis du ministre des affaires étrangères, du ministre chargé de la pêche maritime et du ministre chargé de l'outre-mer.



Les quotas de pêche sont répartis au mérite entre les différents armements en prenant en compte des critères d'évaluation objectifs suivants :
- historique dans la pêcherie,
- équilibre socio-économique, capacité de pêche,
- participation à des campagnes de recherche ou d'évaluation halieutique,
- lutte contre la mortalité aviaire,
- respect de la règlementation et initiatives tendant à la protection de l'environnement.

Chaque navire est évalué annuellement en fonction de ces critères sur la base de sous-critères détaillés. Les totaux admissibles de capture sont ensuite répartis en quotas entre les armements ayant satisfait aux obligations de demande de licence.
Les arrêtés encadrant l'exercice de la pêche sont publiés au Journal Officiel des TAAF et sont consultables sur le site http://www.taaf.fr

5) OBJECTIFS DES TERRES AUSTRALES ET ANTARCTIQUES FRANCAISES

L'objectif prioritaire des Terres australes et antarctiques françaises est d'assurer la conservation à long terme et l'exploitation optimale des ressources halieutiques dans les zones placées sous souveraineté ou sous juridiction française situées au large des côtes de l'archipel Crozet et de l'archipel Kerguelen en préservant les écosystèmes marins dans lesquels ces ressources se déploient.

5.1. Gestion durable du stock de légine.

La gestion durable du stock consiste à assurer son renouvellement à moyen et à long terme conformément aux recommandations du Comité Scientifique de la CCAMLR.

Avec le niveau de Total Admissible de Capture actuel, la France respecte les règles de niveau de capture correspondant aux critères du Comité Scientifique de la CCAMLR. (cf Rapport Relot 2012)

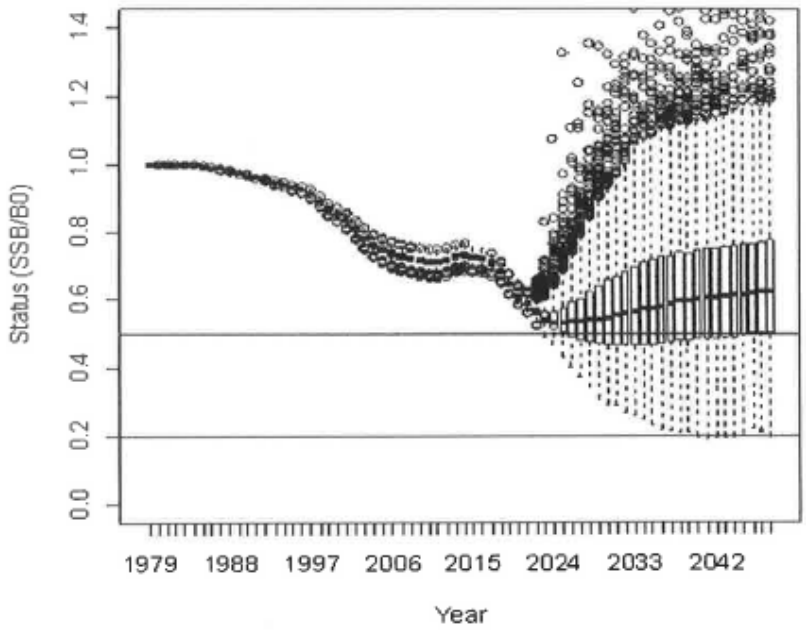


Figure 21: Projection results to status of spawning stock biomass relative to B_0 for SEL2-CALPE200-2012-DAL365 model with a constant annual catch of 5,100 tons. The thick and continuous line represents the SSB median. The two horizontal lines show CCAMLR decision rules

5.2. Poursuite de la diminution de la mortalité aviaire.

La collaboration étroite entre les scientifiques, les gestionnaires et les professionnels de la pêche a permis de diminuer considérablement la mortalité accidentelle d'oiseaux.
Ces efforts se sont traduits par la mise en place d'un plan national d'actions composé de 5 parties :

- mise en place des mesures conservatoires ;
- réglementation ;
- éducation et formation ;
- collecte de données ;
- recherche et développement.

Ce plan qui est toujours en cours a permis de diminuer la mortalité aviaire dans les ZEE françaises (58.5.1 & 58.6) de 77,5% entre les campagnes 2007/2008 et 2010/2011 (-86,5 % entre les campagnes 2006/2007 et 2010/2011).

5.3. Limitations des prises accessoires.

La pêche à la palangre, seule pêche autorisée actuellement pour l'exploitation de la légine australe dans la zone économique française est responsable de prises accessoires d'autres espèces de poissons : principalement des raies, grenadiers et antimores.
Après quatre années d'analyse et de suivi des données de prises accessoires, un code de bonne conduite a été testé depuis 2011, avec pour objectif de diminuer de 60% sous trois ans le nombre de prises accessoires de raies et d'antimores à Kerguelen.

La limitation des prises accessoires de grenadiers est plus complexe : cette espèce commercialisable est ciblée par la profession, et n'est pas considérée par les pêcheurs comme accessoire. Le stock de grenadier pourra être réévalué, à l'issue des résultats de la campagne Poker III qui se tiendra en aout -septembre 2013.
Les captures de raies et de grenadiers sont soumises à taxation afin de limiter les prises.

5.4. Poursuite des études afin de limiter la déprédation par les mammifères marins.

Afin d'éviter au mieux une déprédation par les mammifères marins (orques et cachalots), une procédure d'alerte entre navires, coordonnée par les contrôleurs de pêche embarqués, est activée.
Un protocole permettant d'éviter de « récompenser » les orques consiste notamment à l'application des actions suivantes : i) virage rapide des lignes, ii) déplacements à plus de 60 milles marins, iii) ballonnage immédiat en présence d'orques.
Les études sur la déprédation conduites par le CEBC de Chizé se poursuivent et permettront de mieux cibler le comportement des mammifères marins et permettre d'optimiser l'exploitation de la ressource.

5.5. Interdiction de rejet à la mer.

La conception des navires, pourtant récents, ne permet actuellement pas d'interdire tout rejet à la mer des déchets de production et des prises accessoires. Les rejets sont toutefois interdits pendant toute opération de pêche. Des mesures sont prévues en collaboration étroite avec les armements afin de parvenir à terme à une absence totale de rejet.

ANNEX 6 – STAKEHOLDER COMMENTS ON PCDR WITH RESPONSES