Marine Stewardship Council (MSC) Public Comment Draft Report

Maruto Suisan rope grown Pacific oyster, Okayama fishery
On behalf of

Maruto Suisan

Prepared by

Control Union Pesca Ltd

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QA and QC

Stage	PCDR
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Glossary

Acronym	Definition
AAAQ	Appropriate Aquaculture Allowance Quantity
CAG	catch-and-grow
CAB	Conformity Assessment Body
CITES	Convention on International Trade in Endangered Species
COD	chemical oxygen demand
DO	dissolved oxygen
EMEX	Environmental Management of Enclosed Coastal Seas
ETP species	Endangered, Threatened and Protected Species
FA	Fisheries Agency
FC	Fishery Cooperative
FCA	Fisheries Cooperative Associations
FCR	Fisheries Certification Requirements
FGIP	Fishery Ground Improvement Plan
JF	collective name for all Okayama FCs
MAFF	Ministry of Agriculture, Forestry and Fisheries
MEC	ME-Certification Ltd.
MPA	Marine Protected Area
MoE	Ministry of the Environment
MSC	Marine Stewardship Council
TAC	Total Allowable Catch
TOC	Total Organic Carbon
T-N	Total Nitrogen
T-P	Total Phosphorus
T-S	Total Sulphur
UNCLOS	UN Convention on the Law of the Sea
UoA	Unit of Assessment
UoC	Unit of Certification
VME	vulnerable marine ecosystems

1　総括サマリー　日本語

この報告書は、認証審査機関(CAB)コントロールユニオンペスカ（CUP – 前身は ME Certification）によるマルト水産へ生産供給する岡山県の垂下式カキ漁業の MSC 本審査結果を示す、クライアント用ドラフト報告書(CDR)である。

今回の審査は、邑久町漁業協同組合のメンバーにより、岡山県内のかき幼生を捕獲しかき垂下式養殖により成長させる、かき漁業生産のみを対象としている。よってこの漁業は MSC において、生息域の人口改変を含むが移植のない、増殖 2 枚貝のキャッチ＆グロー（漁獲と育成）(CAG)漁業と定義される。この漁業は親資源量に影響を与えないため（むしろ自然界でのかき幼生を保護するため資源量よりも増加させる可能性がある）、原則 1 は採点対象とならない（4.3 を参考のこと）。この漁業では資源の移植がないため、遺伝子結果に関する採点項目も対象外となった。
この漁業は種ガキ（かき幼生）の捕獲のみによる（海底浚渫がない）キャッチ＆グロー（漁獲と育成）(CAG)漁業であり種の移植がないため、原則 2 の第 1 種と第 2 種の項目も採点対象とならない（4.1.1 を参考のこと）。かき生産管理は主に岡山県と漁業協同組合による共同管理で行われている。
漁業法や持続的養殖生産法、岡山県漁業調整規則が主に公的養殖管理の枠組みを担っている。管理規則の実施のための措置は詳細を各漁業組合の自主管理によるところがある。

全般的に、主なこの漁業の強みは以下が挙げられる。

1. 漁業の特徴からして ETP 種（スナメリ(*Neophocaena phocaenoides*) とアカウミガメ (*Caretta caretta*)）との接触影響が限られていること。
2. 養殖場は主に軟泥を底質とする場所に位置し、これは岡山県の養殖可能な地帯で最もよく見られるタイプの底質である。漁業協同組合はかき養殖場のある湾内においてアマモ場の繁殖活動に参加し、生息地の回復を促進している。
3. 岡山県によりかき養殖場の存在は生息地と環境への影響において“低リスク”とされている：かき養殖からの海洋環境への影響は小さく、水質や栄養塩レベル、赤潮発生について詳細なモニタリングが行われている。
4. 岡山県のかき養殖場付近の環境収容力は問題となる程度でなく、かき養殖により大きな影響を受けるものとは考えられない。以前、富栄養化が進んでいた瀬戸内海ではあるが、かき養殖は水質浄化機能を持ち富栄養化を緩和し水質を良好に保つとされてきた。
5. 漁業は共同管理が良好に機能しており、政府機関や研究機関、他の組合等との継続的な協働・諮問機能がある。

主なこの漁業の弱みとしては、漁業において ETP 種（スナメリとアカウミガメ）の接触・関連について記録が取られていないこと、 そして長期的な養殖場海底生態系への潜在的影響 のモニタリング結果が無いことである。これまでかき養殖は低影響、または環境によいという見方が、漁業特有の管理での詳細な情報収集を限定してきた可能性がある。
審査チームの暫定的な見解として、この漁業は MSC 認証基準を満たすと考えられる。

各原則の総合点を次の表に示す。

最終原則別得点	
原則	**得点**
原則１ – 対象種資源	採点なし
原則２ – 生態系	80.0
原則３ – 管理システム	84.6

改善条件が原則２に２つ提案された。

条件番号	改善条件	評価項目	以前に挙げられた条件に関連しているか？ (Y/N/NA)
1	ETP のモニタリング措置を含む邑久町独自の FGIP を公式化される。特に審査で判明した ETP 種への影響を緩和・削減するモニタリング機能を持つ漁業管理とその実行性、潜在的な効果に、定期的なレビューがあることを確実にする。 またこの定期的なレビューから、適切な代替手段が実践されること。	PI 2.3.2. e.	N/A 関連なし
2	漁業はデータ収集に取り組むかそれに協力し、より良い ETP 種への影響緩和の方策をはかるため、適切な措置についての情報収集を行うこと。科学者と連携し、収集したデータが適切であるか、効果に対し有効で利用価値があるか（例として）目撃・混獲の日付、場所、数、重量、状態、放流の有無など。認証された邑久町漁協のメンバー全員が利用可能なよう毎年 ETP について集められたデータをまとめ分析し、可能であれば、このデータがどのように ETP 影響の管理に使われたかを説明すること。	PI 2.3.3. b.	N/A 関連なし

また、別途、採点結果を維持するため、次の推奨事項が審査チームにより提言された。
PI2.4.3 のための推奨事項: 審査チームは漁業が主な生息地に不可逆的な害を与えることはないと判断する。溶存酸素と底質生態系への影響のモニタリングが行われている。しかし、養殖場の海底（とそこに生息する生物種）の潜在的な影響の長期的なモニタリング結果はない。 そのため、モニタリング計画を含む邑久町独自の FGIP を公式化すると共に、養殖が行われる地帯で適切なスケールにおいて、底質と海底の生態系を構成する種についてサンプリングを長期間設定・継続し、時系列で示すことでデータの質を改善することが提言される。この長期的モニタリングより養殖による海底への影響の傾向を把握すること、また、季節的に及ぼされる影響の傾向についても把握することが望まれる。

2 Executive Summary - English

This report is the Public Comment Draft Report (PCDR) for the MSC full assessment of the Maruto Suisan rope grown oysters, Okayama fishery, by the Conformity Assessment Body (CAB) Control Union Pesca (CU Pesca; formerly ME Certification), for Maruto Suisan.

The fishery under assessment consist of rope grown oysters on rafts by members of the Okucho Fisheries Cooperative that exclusively use oyster spat from within the Okayama prefecture.
This fishery is an enhanced 'catch and grow' bivalve fishery, using habitat modification, without translocation. Since the fishery has no impact on the parent stock (and may even enhance the natural stock biomass through additional spat fall), Principle 1 is not scored (see Section 4.3). The fishery does not involve translocations, so there was no need to score the fishery against the genetic outcome PIs. Since this fishery is a catch-and-grow fishery based solely on spat collection (as opposed to dredging), without translocation, Primary and Secondary species components are not scored (see Section 4.4.1). Management of oyster production in Japan falls mainly under the purview of the Okayama prefectural government and Fishery Cooperatives, through co-management. Laws such as the Fisheries Act, the Fisheries Resources Protection Act, the Sustainable Aquaculture Production Law and prefectural fisheries coordination rules provide the major frameworks of the management for aquaculture. The detail of implementation measures of the regulation among each fishery are devolved to FCs self-management.
In general, the key strengths of the fishery are:

1. There is limited interaction with ETP species (the Indo-Pacific finless porpoise (*Neophocaena phocaenoides*) and loggerhead turtle (*Caretta caretta*)), due to the nature of the fishery.
2. The oyster farms typically operate over soft muddy habitats, which is the most commonly occurring bottom substrate type in the grow-out areas around Okayama. The Fishery Cooperative takes part in an eelgrass restoration project, to ensure the recovery of eelgrass beds in the bays near the oyster cultures.
3. Oyster farms are regarded by the Okayama prefecture as 'low risk' with regards to habitat and the environment. Water quality and nutrient levels, as well as algal blooms, are monitored closely.
4. The carrying capacity of the oyster culture areas in Okayama is not deemed to be a limiting factor or likely to be heavily impacted by the oyster culture. The levels of eutrophication used to be high in the Seto Inland Sea, and oyster culture is seen as a way of reducing the level of eutrophication and improving the water quality.
5. The fishery is well managed in co-management, with continuous consultation and close cooperation between governmental agencies and the Fishery Cooperative.

The key weaknesses of this fishery are the lack of recordings of interactions with ETP species (Indo-Pacific finless porpoise and loggerhead turtle), and the lack of site-specific long-term monitoring of (potential) effects on the habitat (and associated benthic species) underneath the oyster rafts. The view that oyster culture is not only low-impact, but beneficial to the environment has resulted in limited information required from producers and limited fisheries-specific management to date.
The team's provisional determination is that the fishery meets the criteria for MSC certification.

Aggregate scores for each Principle are as shown in the following table:

Final Principle Scores	
Principle	**Score**
Principle 1 – Target Species	Not scored
Principle 2 – Ecosystem	80.0
Principle 3 – Management System	84.6

Two conditions have been proposed on Principle 2:

Condition number	Condition	Performance Indicator	Related to previously raised condition? (Y/N/NA)
1	Adopt the Okucho's own FGIP with ETP monitoring plans. Ensure that there is a regular review of the potential effectiveness and practicality of the way the fishery is conducted with the objective to monitor, manage and reduce or eliminate impacts on ETP species, explicitly referring to ETP species identified during the assessment. Ensure that based on this regular review alternative measures are implemented as appropriate.	PI 2.3.2. e.	N/A
2	The fishery should engage and assist in data-collection and research to obtain information to adequately measure trends and further support a strategy to manage impacts on ETP species. Liaise with scientists to ensure data gathered is relevant, robust and useful to include (for example) date and area of sightings and captures, numbers, length or weight as well as condition on release. Collate & analyse all data generated in relation to ETP on an annual basis for all certified members of the FC Okucho and, if applicable, show how the data is used in the management of impact on ETP species.	PI 2.3.3. b.	N/A

Also, to maintain the score above 80, the following recommendation was also issued by the team for PI 2.4.3: The team considers the fishery to cause no irreversible harm on the main habitats. Monitoring of dissolved oxygen and benthic impacts with regards to seafloor cultivation has taken place, but there is no site-specific long-term monitoring of (potential) effects on the habitat (and associated benthic species) underneath the oyster rafts. The recommendation therefore is to officially adopt the Okucho's own FGIP with benthic and substrate biodiversity monitoring plans and improve on the time series by developing and implementing appropriate habitat/benthic species sampling on an appropriate scale in the area where the fishery operates. This in-turn will allow for seasonal trends of habitat impacts from the fishery to be determined.

3 Authorship and Peer Reviewers

The assessment team for this assessment consisted of Yoko Tamura (P2, P3) and Cora Seip-Markensteijn (P2, Team Leader).

Ms Tamura is a fisheries and marine environment consultant working on broad topics on coastal management issues in Japan and globally. Her expertise spans coastal resources management, sustainable fisheries and international collaboration on marine conservation, and she has significant current knowledge of the country, language, policy and local fishery context. Previously, she worked as a technical expert for Japan International Cooperation Agency on oversea cooperation projects, and NGOs such as Conservation International and Sustainable Fisheries Partnership. Ms Tamura holds a MA in Marine Affairs from the University of Washington and a BSc. in Marine Resource Management from the Tokyo University of Marine Science and Technology. Yoko's previous MSC experience includes a full assessment of the Kyoto Danish Seine Fishery Federation flathead flounder fishery. She has also participated in various pre-assessments and surveillance audits mostly for Japanese fisheries. Yoko was responsible for both Principle 2 and Principle 3. Yoko is Japanese, and meets the requirement in table PC3 for: Current knowledge of the country, language and local fishery context.

Ms. Seip acted as Team Leader with overall responsibility for the assessment and assisted on Principle 2. Cora meets the Fishery Team Leader criteria in Table PC1. She has a Master's degree in Biology from Leiden University, and has passed the online fishery team leader training. Cora has also completed MSC traceability training and RBF training in the past 3 years. Previously, she worked for the Dutch Fish Product Board from 2007-2013 as Policy Officer, 'Nature and Spatial Planning'. Her work focused mainly on Natura 2000 procedures and shrimp and flatfish fisheries and included the Marine Framework Directive. She was also shellfish Policy Office and worked closely with the Dutch shellfish industry (mainly mussels, but also oysters, Ensis, and cockles). From 2013-2017 Cora has worked as an expert independent consultant to a broad cross-section of fishing organisations. Notable achievements include working on assessment of Dutch fisheries (both generic and specific) and their impacts, as well as working as an advisor with regards to spatial planning, and nature conservation laws.

None of the team members have a Conflict of Interest in relation to the fishery under assessment.

The peer reviewers for this full assessment were selected from a shortlist as compiled MSC Peer Review College. Two peer reviewers were selected from the following list:

- Andrew Hough
- Jo Akroyd
- Nick Caputi
- Steve Nelson

Dr Andrew Hough is a marine environmental consultant, with a PhD in marine ecology from the University of Wales, Bangor (1987-90). He has been involved in marine, coastal and freshwater environmental management since 1991, including management of fishery impacts on ecosystems and marine conservation biology, principally in European inshore waters. He was manager of Moody Marine operations within Moody International Certification from 1999 to 2011 with particular responsibility for the implementation of MSC Certification procedures and development of MSC methodologies. He has acted as lead assessor on a large proportion of MSC pre-assessments and main assessments during this time, and subsequently as team member and/or lead auditor for various

assessments. This has involved stock assessment analysis, evaluation of ecosystem effects and management effectiveness of groundfish, pelagic and shellfish fisheries in various administrations around the world. He now works as a freelance environmental/fishery management consultant and auditor, with consultancy projects including certification-related policy advice to the Association of Sustainable Fisheries.

Jo Akroyd is a fisheries management and marine ecosystem consultant with extensive international and Pacific experience. She has worked at senior levels in both the public and private sector as a fisheries manager and marine policy expert. Jo was with the Ministry of Agriculture and Fisheries in New Zealand for 20 years. Starting as a fisheries scientist, she was promoted to senior chief fisheries scientist, then Fisheries Management Officer, and the Assistant Director, Marine Research. She was awarded a Commemoration Medal in 1990 in recognition of her pioneering work in establishing New Zealand's fisheries quota management system. Among her current contracted activities, she is involved internationally in fishery certification of offshore, inshore and shellfish fisheries as Fisheries Management Specialist and Lead Assessor for the Intertek Fisheries Certification audit team. She has carried out the Marine Stewardship Councils' (MSC) certification assessment for sustainable fisheries. Examples include NZ (hoki, southern blue whiting, albacore, hake, scallops), Fiji (longline albacore) Japan (pole and line tuna, flatfish, snowcrab, scallops), China (scallops), Antarctica (Ross Sea toothfish fishery).

Dr Nick Caputi obtained his PhD from Murdoch University in 1989 with a thesis based on stock recruitment relationships for crustacean fisheries in Western Australia. From 1974 to 1998 he worked as a statistician for the Department of Fisheries (Western Australia) working on fisheries projects from all major commercial and recreational fisheries. Since 1998 he has been the Supervising Scientist of the Invertebrate Branch of the Department, which is responsible for research on rock lobster, pearl oyster, prawns, scallop, blue swimmer crab, deep sea crab and abalone. Seven of these fisheries have achieved the Marine Stewardship Council certification with the western rock lobster fishery being the first. Dr Caputi's research focus is stock assessment but he has also been involved with MSC P2 and P3 issues with over 40-years' experience and publication of over 60 peer-reviewed papers (18 as lead author), 25 reports and 18 book chapters. His research includes catch predictions based on pre-recruit abundance, environmental effects on recruitment, spawning stock-recruitment relationships, climate change effects on fisheries, harvest strategies and maximum economic yield. The management of the western rock lobster fishery is based on a bio-economic model and a length-structured stock assessment model. He has participated in 6 Center of Independent Experts' reviews of fisheries in the USA, on invertebrate fisheries and climate change. He has also participated in stock assessments in Mozambique on the shrimp fishery (1998-2004), rock lobster (2007) and artisanal shrimp (2003).

Steve Nelson has about 25 years of experience in coastal and fishery management. During this time, he has worked in management, scientific, and communication roles for US and international programs sponsored by federal, state, and local governments, academic institutions, NGOs, and private companies. He has technical expertise in fishery management, stock assessment, coastal ecology, biodiversity conservation, GIS and spatial analysis, climate change adaptation and resource economics. He is competent using state-of-the art methods, models and tools relevant to these disciplines and stays current with ongoing learning. He has experience working in the seafood industry with expertise in sustainability certification and product traceability. He was the fishery team leader for the MSC full assessment of the Bratsk Reservoir perch fishery. He also served as client advisor for MSC certifications of the Russian Alaska pollock fisheries in the Bering Sea and Sea of Okhotsk and a reviewer of the Lake Peipus perch and pike perch fishery in Estonia. Moreover, he assessed and peer reviewed numerous fisheries certified under the FAO Responsible Fishing Management label for stocks in Alaska, Iceland, and Gulf of Mexico. He earned a BA in economics from the University of Virginia and an MS in environmental biology (estuarine ecology) from George Mason University plus additional training in stock assessment.

4 Description of the Fishery

4.1 Unit(s) of Assessment (UoA) and Scope of Certification Sought

4.1.1 UoA and Proposed Unit of Certification (UoC)

Pesca confirms that the fishery under assessment is within the scope of the MSC Fisheries Standard (7.4 of the MSC Certification Requirements v2.0):

- The target species is not an amphibian, reptile, bird or mammal;
- The fishery does not use poisons or explosives;
- The fishery is not conducted under a controversial unilateral exemption to an international agreement;
- The client or client group does not include an entity that has been successfully prosecuted for a forced labour violation in the last 2 years;
- The fishery has in place a mechanism for resolving disputes, and disputes do not overwhelm the fishery;
- The fishery is not an introduced species-based fishery as per the MSC FCR 7.4.4.
- The fishery is enhanced see section 4.1.4;
- IPI stocks are not caught see description in Section 4.3;
- The fishery doesn't overlap with other fisheries, due to the nature of the farms, and the fact that they are located close to shore. The fishery is adjacent to oyster fisheries
- The fishery is defined as enhanced 'catch and grow' bivalve fishery, using habitat modification, without translocation.

UoA

Species	Pacific oysters (*Crassostrea gigas*)
Geographical range	Seto Inland Sea, Okayama Prefecture
Method of capture	Oyster seed collection on hanging scallop shells and oyster rope grown production and harvesting
Stock	Pacific oyster on the North Pacific Coast of Japan
Management Systems	Multilayer co-management system with the Fisheries Agency (FA) within the Ministry of Agriculture, Forestry and Fisheries (MAFF), Okayama prefectural government and Okucho Fisheries Cooperative.
Client group	Members of the fishery Cooperative Okucho (Okayama Prefecture) using only Okayama oyster seed for grow out.
Other eligible fishers	none

4.1.2 Final UoC(s)

(PCR ONLY)

4.1.3 Total Allowable Catch (TAC) and Catch Data

No TAC is set for this fishery. The fishery is managed based on the Appropriate Aquaculture Allowance Quantity (AAAQ), which limits the number of rafts. The number of rafts allowed within the Okayama prefecture by members of the Okucho Fishery Cooperative (FC) are 2650 rafts each year in 2019 – 2021, an increase from a maximum of 2148 rafts in 2016 -2019.

The recent production (harvest) by Members of the Okucho FC has been outlined in Table 1, together with the amounts of rafts used:

Table 1. Production data for the FC along with raft limits and raft numbers between 2014 -2018.
Note: this is the production for the whole of the FC, of which about 80% is based on Okayama seed. The administrative season runs from 1st April-31 March, and the total number of rafts used in 2018-2019 was not yet know at time of the site visit

	Year	Okayama
		Okucho FC
Oyster production (t)	2017-2018	1473
	2016-2017	1552
	2015-2016	1598
	2014-2015	1000
	2013-2014	1312
Amount of rafts used	2018-2019	-
	2017-2018	1309
	2016-2017	1285
	2015-2016	1246
	2014-2015	1236
	2013-2014	1247

4.1.4 Scope of Assessment in Relation to Enhanced Fisheries

The fisheries are a 'catch and grow' fishery, using habitat modification.
The criteria for determining whether the fishery is enhanced are shown in Table 2. The fishery qualifies for criteria Ai-Aiii (there is no hatch-and-catch), B, and C.
With regards to criteria Ai-Aiii: the system relies upon the capture of oyster spat from the wild environment. *C. gigas* is native to the geographic region of the fishery (Seto Inland Sea, Okayama Prefecture), and the spat collected comes from natural spat fall. The grow-out of the oysters takes place on the suspended oyster rafts and grown out on similar systems within the same water body. Spat collection makes use of floating devices that provide a surface area (suspended scallop shells) for the wild oyster spat to settle and grow on (Catch and Grow).
The collection of spat and further on-growing is also an enhanced fishery of the type HM (Habitat Modified). Natural oyster spat normally settles on substrates in the water or on the sea floor.

At no point is there augmentation of the food supply, nor does the fishery routinely require disease prevention involving chemicals or compounds with medicinal prophylactic properties, meeting criteria Bi and Bii. Habitat impacts (criteria C) are reversible (and will be further discussed under PI 2.4).

Table 2. MSC scope criteria for enhanced fisheries.

A	Linkages to and maintenance of a wild stock
i	At some point in the production process, the system relies upon the capture of fish from the wild environment. Such fish may be taken at any stage of the life cycle including eggs, larvae, juveniles or adults. The 'wild environment' in this context includes marine, freshwater and any other aquatic ecosystems.
ii	The species are native to the geographic region of the fishery and the natural production areas from which the fishery's catch originates unless MSC has accepted a variation request to include introduced species for the pilot phase.
iii	There are natural reproductive components of the stock from which the fishery's catch originates that maintain themselves without having to be restocked every year.
iv	Where fish stocking is used in hatch-and-catch (HAC) systems, such stocking does not form a major part of a current rebuilding plan for depleted stocks. Note: This requirement shall apply to the "current" status of the fishery. Wild stocks shall be managed by other conventional means. If rebuilding has been done by stocking in the past, it shall not result in an out-of-scope determination as long as other measures are now in place.
B	Feeding and Husbandry
i	The production system operates without substantial augmentation of food supply. In HAC systems, any feeding is used only to grow the animals to a small size prior to release (not more than 10% of the average adult maximum weight), such that most of the total growth (not less than 90%) is achieved during the wild phase. In catch-and-grow (CAG) systems, feeding during the captive phase is only by natural means (e.g., filter feeding in mussels), or at a level and duration that provide only for the maintenance of condition (e.g., crustacean in holding tanks) rather than to achieve growth.
ii	In CAG systems, production during the captive phase does not routinely require disease prevention involving chemicals or compounds with medicinal prophylactic properties.
C	Habitat and ecosystem impacts
i	Any modifications to the habitat of the stock are reversible and do not cause serious or irreversible harm to the natural ecosystem's structure and function. Note: Habitat modifications that are not reversible, are already in place and are not created specifically, for the fishery shall be in scope. This includes: Large-scale artificial reefs. Structures associated with enhancement activities that do not cause irreversible harm to the natural

4.2 Overview of the fishery

4.2.1 The Client fishery

Oyster farming in the Seto Inland Sea of Japan can be traced back to the 17th century when bamboo and stone structures were used to grow oysters including the native pacific oyster (*Crassostrea gigas*). The fishery in this assessment is managed by Okucho Fisheries Cooperative located in Harima nada (nada means "strait"), north of Shodo island in the Seto Inland Sea, and on the east coast of Okayama prefecture. In Okayama's Seto Inland Sea, there are 2 local ocean districts – the east part is called

Harima-nada, and the west part is called Bizan-seto locally. As the Seto Inland Sea is shallow in general, more than 85% of the area is less than 20m depth and more than 50% is less than 10m depth in Okayama.

Figure 1. Location of Okucho Fisheries Cooperative (FC)'s culture ground (red square), located in Okayama prefecture, within the Seto Inland Sea (Source: google map).

FC Okayama is comprised of 6 local FC's, each have their own area for spat collection and grow-out of the oysters within the Okayama prefecture. All 6 cooperatives subscribe to the Okayama Fisheries Improvement Plan (Okayama, 2017). This assessment focusses on Okucho FC. All producers included in this assessment are members of Okucho FC and register their information with this FC (e.g. the source of their seed).

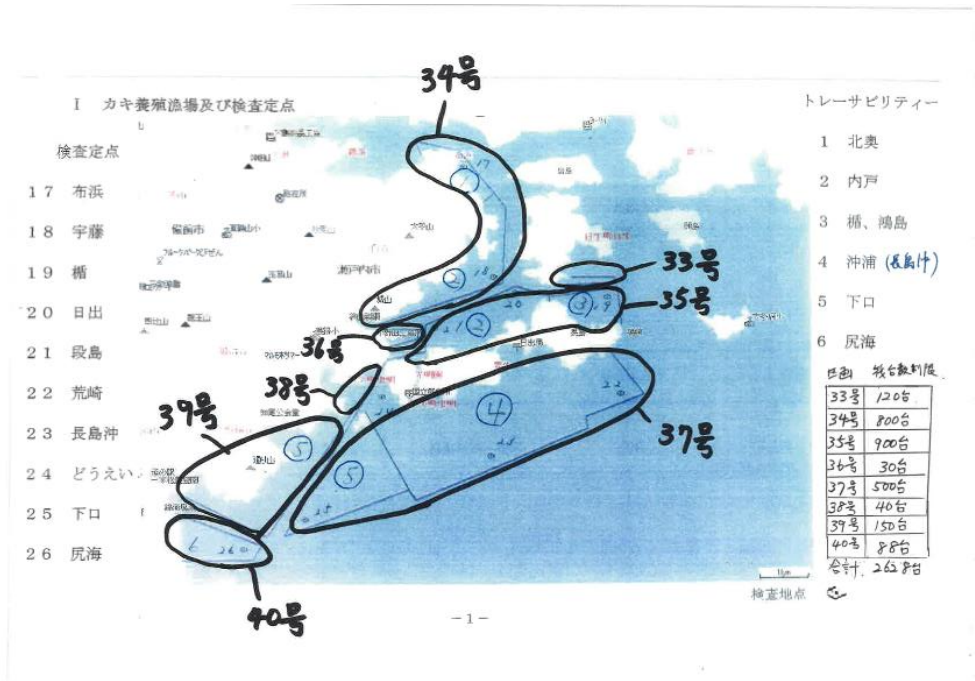


Figure 2. Okucho FC production area demarcated by license numbers allocated for aquaculture. Okucho is one of 6 fisheries cooperatives in all Okayama oyster-producers, and license number No. 34 to No. 41 allocated to FC by prefectural license (No. 41 is not used currently). Each licensed area has limited number of oyster culture rafts use, designated by prefecture. Source: Maruto Suisan Co., Ltd.

Okucho FC used to have around 100 members (predominantly households), but currently there are 71 official members, of which 66 are still active. Fishing rights are usually inherited. If there are no successors in a company, a person outside of the FC may become an apprentice to learn the practices of that particular oyster fishery. It is expected that after one year under apprenticeship an apprentice should show understanding of the work involved, and after verifying whether they have followed the FC rules and regulations, the senior members of the cooperative will decide if this new person may be admitted as a member. The number of members and licenses is nevertheless decreasing, due to lack of successors, and changes in the fisheries strategic outlook (consideration in focusing on other species).

There are different fishing rights provided by the prefecture for the waters near Okayama (e.g. also for small-scale coastal fisheries). For the oyster, a specific license is needed to make use of the water surface and -column. Licenses are renewed every 5 years, through the cooperative. (New) members commit themselves to the FC rules, in return for which the FC then ask the prefecture to grant the license for the next 5 years.

The FC has its own fisheries rules and regulations: this includes what members can and cannot do, and also rules on how many rafts are given out. The FC's committee that manage fisheries rights, proposes the method on how to divide the available sites amongst the members. E.g. a lottery of free areas, or allocation of areas, which is then discussed within the oyster fishermen's committee to make a final decision. The method and locations chosen depend on the information available: if e.g. nutrient measures show there are grow-out hotspots, there may be a lottery for the best spots. Although a degree of flexibility is required in case there are typhoons, and the fishermen need to move the rafts around to put them in sheltered areas.

4.2.2 Gear and operation of the fishery

3.2.2.1 Spat collection

In Okucho FC in Okayama, seeds are collected from late July to late August when oyster spawning is most active. Seed collectors are made of scallop shells suspended on metal wires, which are light and easy to haul with seeds attached (**Figure** 3). Scallop shells are purchased from traders and the producer builds the seed collectors, with spaces between shells of approximately 1 cm to 2 cm. Alternatively, producers can purchase the pre-assembled collectors from traders. FC staff monitor wild seed abundance at several monitoring sites with a test shell collector and plankton nets, and if abundant oyster seeds are found at some sites, they inform FC members and decide when and where to collect the seeds. Large scale seed collection is accomplished by suspending the chains of wired shells (1 m to 2 m length) from a bamboo framework, which is anchored to the bottom (Fujiya, 1970).

Figure 3. Oyster seed growing on rope hung scallop shells and seed collection frames with scallop shells. Photo taken at CU Pesca site visit.

Oyster seeds are brought inshore and after hardening on the racks for three months (when they are approximately 1.5 cm – 3 cm large). Scallop shells with little seed are discarded, for those selected for grow-out, the oyster seeds are removed, placed in baskets and washed.

3.2.2.2 Grow-out

Oyster seed are then transferred to raft and rope systems at the grow out sites in Okayama Prefecture. The grow-out sites utilise purpose-built bamboo (or in some minor cases plastic piping) raft systems with a typical dimension of 9 m x 25 m surface area. An elaborate system of wiring and supports are installed on the raft from which the culture ropes are suspended. Oysters are attached to the culture ropes suspended from the rafts. The rafts allow three-dimensional use of ocean space for dense cultivation and portable to avoid issues of red tides and parasite concentrations. The rafts are considered temporary structures and secured to the underlying seabed by a rope and anchor system at each of the four corners (**Figure** 6). The rafts typically last five years, and they are used throughout the year with no farrow period.

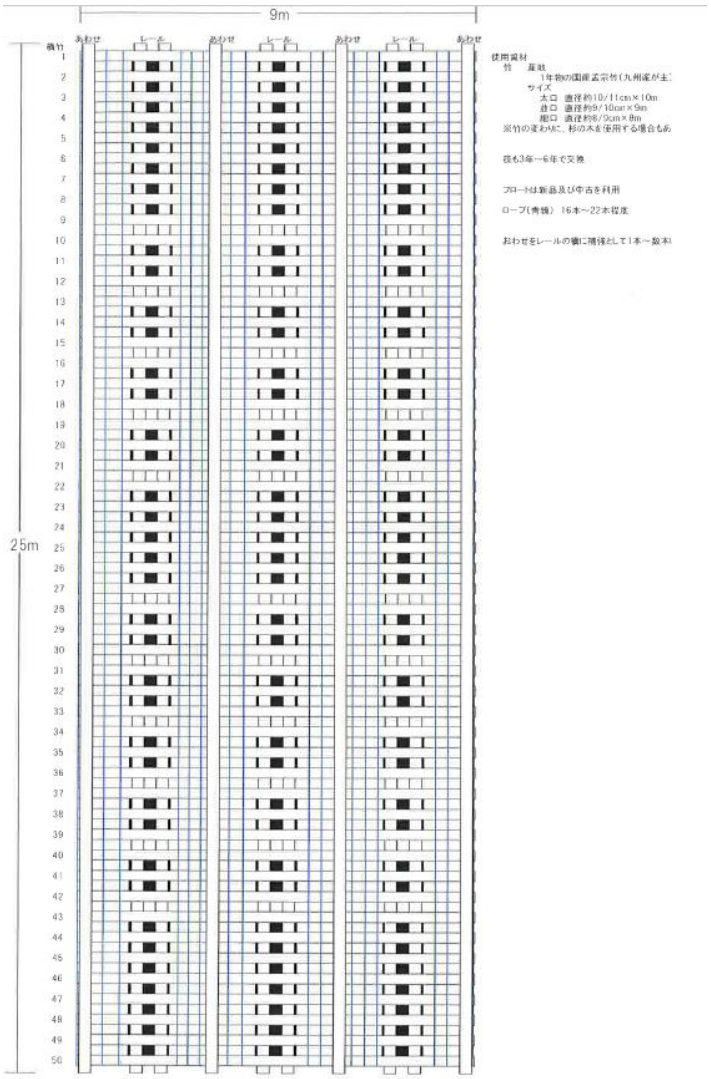


Figure 4. Typical oyster raft design with number of lines (left hand side)

The total number of rafts within Okayama prefecture is limited to 2148 rafts. Each of the six cooperatives within the prefecture is assigned a portion of this maximum in the corresponding fisheries license.

The upper limit for the number of rafts was determined in the Okayama Fishery improvement plan in 2010. This number was based on the amount of best and worst performing rafts, over an average of 5 years. The number of rafts has not changed since, but the number of rafts allowed has never been fully used.

Each year the Fisheries Agency (FA) conducts a count by plane to check number of rafts and their locations, and reports this to the FC. Infringements (too many rafts used, incorrect location of rafts) will be dealt with in discussions and through corrections first. The FC has never had to issue a fine.


Figure 5. Oyster rafts in the bay by Mushiake, Okayama (left), Mr. Matsumoto from Okucho FC showing oysters on the ropes. Photos taken at CU Pesca site visit.

Figure 6. Anchoring system used to retain the raft system. Photo taken at CU Pesca site visit.

To harvest the oysters, a vessel pulls alongside the rafts and oysters are hauled by crane using their line. Once vessel capacity is reached, the vessel transfers the catch to the port where the processing facility separates the oyster ready for shelling (**Figure** 7). Each FC member has employees called 'Uchiko' who are tasked to shell the oyster, and some of the refined products are then delivered to the Maruto Suisan Co as a stripped shellfish meat product (**Figure** 8). The grower may trade with other companies, not only with Maruto Suisan.

Figure 7. Oyster harvest entering the processing area from the vessel, and tumbler to separate oysters. Photos taken at CU Pesca site visit.

Figure 8. Oyster processing by Uchiko and stripped product in buckets. Photos taken at CU Pesca site visit.

4.2.3 Fishing areas and seasons

The grow-out of oysters on ropes is a year-round practice. Harvest of consumption-size oysters typically takes place in autumn-winter (October-March).

In Okayama the grow-out phase is one or two years and can be extended to three years. From the point of collection, seeded shells are kept in a “Restriction shelf” until summer of the first year. During “Restriction”, the hanging seeded shells are held in a shallow area of the bay to expose them to tidal influences, with only the strong seeds surviving. In spring, the seeded shells are removed from the restriction shelf and tied to ropes ready to be moved on to the rafts. In summer, the seeds are placed on rafts and moved to deeper area for a growing-out (“Hon-suika”, full-suspension system). After moving the rafts offshore (outside of bay) to allow for a full growth, they are harvested again in winter. The rafts are returned to the shore after the harvest, awaiting the next seed grow-out period. During this time, ocean floor cleaning and cultivation is practiced in the bay (see section 4.4.4.3)

4.3 Principle One

As per FCR:2.0 SB2.1, the team has assessed the extent of translocations, and the possible impact on the parent stock. The extent of translocations must be considered to ensure that the fishery enhancement programmes predominantly utilise stocks or populations that are native to the natural production area from which the fishery's catch originates (FCR: G7.7.4.1.b).
The method for the collection of seed in this enhanced catch and grow fishery are spat collectors (scallop shells in the water column). Seed collected this way is never relocated but grown out in the same spot to where it is caught. In Okayama, 80% of their seeds come from their parent oysters on site and 20% of seeds are purchased from Hiroshima and Miyagi. In this assessment, only the locally caught seed (the 80%) is included in the UoA. The FC keeps track of which producer is using only local seed or has a mixed seed supply. A list of members that only use Okayama sourced seed, and thus produce exclusively in Okayama grown oysters, will be included with the certificate. The certificate (as per the UoA) will only cover members of the fishery Cooperative Okucho (Okayama Prefecture) using 100% Okayama oyster seed for grow out.
Once the seed is transferred to the grow-out sites in Okayama and the oyster is growing on the ropes, transfer to another shore or prefecture during this aquaculture phase is prohibited. It is however possible to transfer within the fishery license area in the same FC. This is to assist in operational management e.g. to prevent typhoon damage, avoid parasitic/disease outbreaks. The oysters collected and moved, are of the same species and are all within the same geographic area. Based on this, the team have decided that translocations are not relevant to this fishery. The fishery is defined as **enhanced catch-and-grow (CAG) bivalve fishery without translocation.**
The team's evaluation of the parent stock is that, as the UoA under assessment involves the use of spat collectors and the grow-out of the collected oyster spat, the net effect is that the rope growing-activities will increase the local oyster stock biomass. It has therefore been assessed that the cultivation of oysters does not pose a risk to the productivity of the wild population.
The team conclude that, in accordance with the Fisheries Certification Requirements SB2.1.4 – *'If an enhanced CAG bivalve fishery does not involve translocations, and there is no evidence that it negatively impacts the parent stock, teams may choose not to score Principle 1'*, Principle 1 does not need to be included in this full assessment.

Additionally, for similar reasons, Genetic outcome PI 1.1.3 will not need to be scored as SB2.1.5.2 is not satisfied: SB2.1.5.2- 'Enhanced CAG bivalve fisheries that involve translocations shall also be scored against the Genetic outcome PI 1.1.3'.

4.4 Principle Two: Ecosystem Background

4.4.1 Designation of species under Principle 2

The fishery's impact of non-target species is analysed differently if the species is from a "managed" stock or not, or considered Endangered, Threatened or Protected (ETP). These are defined as follows:
Primary species (MSC Component 2.1):

- Species in the catch that are not covered under P1
- Species that are within scope of the MSC program, i.e. no amphibians, reptiles, birds or mammals
- Species where management tools and measures are in place, intended to achieve stock management objectives reflected in either limit (LRP) or target reference points (TRP). Primary species can therefore also be referred to as 'managed species'.

Secondary species (MSC Component 2.2):

- Species in the catch that are not covered under P1
- Species that are not managed in accordance with limit or target reference points, i.e. do not meet the primary species criteria
- Species that are out of scope of the programme, but where the definition of ETP species is not applicable (see below).

ETP (Endangered, Threatened or Protected) species (MSC Component 2.3) are assigned as follows:

- Species that are recognised by national ETP legislation
- Species listed in binding international agreements (e.g. CITES, Convention on Migratory Species (CMS), ACAP, etc.)
- Species classified as 'out-of scope' (amphibians, reptiles, birds and mammals) that are listed in the IUCN Redlist as vulnerable (VU), endangered (EN) or critically endangered (CE).

Both **primary** and **secondary** species are defined as 'main' if they meet the following criteria:

- The catch comprises 5% or more by weight of the total catch of all species by the UoC;
- The species is classified as 'less resilient' and comprises 2 % or more by weight of the total catch of all species by the UoC. Less resilient is defined here as having low to medium productivity, or species for which resilience has been lowered due to anthropogenic or natural changes to its life-history;
- The species is out of scope but is not considered an ETP species (secondary species only);
- Exceptions to the rule may apply in the case of exceptionally large catches of bycatch species.

4.4.2 Primary and secondary species

Suspended oyster farming produces predominantly oysters. When oyster densities are kept high, other organisms get little opportunity to grow along with them. It is nevertheless worth noting that fouling species do occur on ropes and shells of oysters. Other material is removed and returned to sea during harvesting operations. Mechanical removal of fouling species occurs when harvested shellfish are brought onto the vessel's deck during the harvest and subsequent hauling process, where these species are removed when the oysters are washed by trammels with sea water.
Since this fishery is a catch-and-grow fishery based solely on spat collection (as opposed to dredging), without translocation, Primary and Secondary species components don't have to be scored as per SB 3.1.1. The fishery will be assessed according to **Figure** 9.

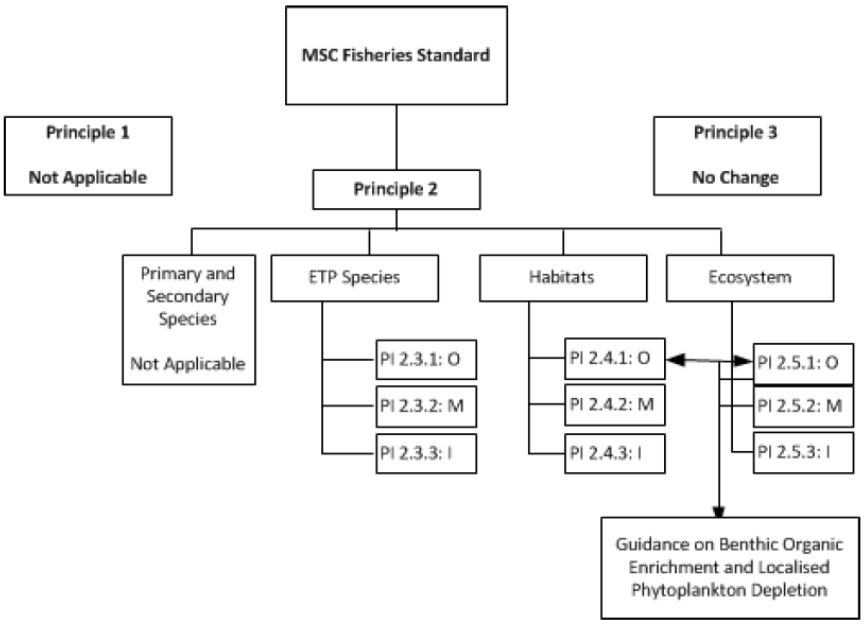


Figure 9. Enhanced catch and growth bivalve fishery based solely on spat-collection (source: Figure GSB5 in FCR 2.0 MSC, 2014)

Despite the consideration of primary and secondary species not being required, the client has provided information on fouling species in Table 3.

Table 3. Observed species attached on the cultured oyster shells

Species		
Polyplacophora ヒザラガイ	Starfish ヒトデ	Sponge カイメン
Thais (Reishia) bronni レイシガイ	Crab カニ	Sea pinapple ホヤ（エボヤ、シロボヤ、ユウレイボヤ）
Mediterranean mussel ムラサキイガイ	Sea urchin ウニ	Barnacle フジツボ
Green mussel ミドリイガイ	Sea cucumber ナマコ	Christmas tree worm カンザシゴカイ
Turban shell サザエ	Shrimp エビ	Ectoprocta コケムシ
noble scallop ヒオウギガイ	Gammaridea ヨコエビ	Sea anemone イソギンチャク
Lithophaga curta イシマテガイ	Pariambus typicus ワレカラ	Fish species (Triggerfish, etc.) 魚類 カワハギなど
Hediste ゴカイ	feather duster worms ケヤリムシ	
Polycladida ヒラムシ	Diopatra sugokai スゴカイ	

This is useful information as it becomes an indicator of carrying capacity in the area and understanding of the presence of introduced species. The fishery does not have any history of introducing new species to the area. Foreign import of oyster seeds was prohibited by the national and prefectural governments to prevent introduction of diseases.

Figure 10. Fouling species on shucked oysters (left), and tumbler to separate harvested oysters. Photos taken at CU Pesca site visit.

Figure 11. Fouling species, trammel and waste. Photos taken at CU Pesca site visit.

4.4.3 ETP Species

Effects on Endangered, Threatened and Protected (ETP) species are most likely to arise from the great quantities of rope in the water introduced by the rope grown culture. According to paragraph SA3.1.5 of the MSC Fisheries Standard v2.0, ETP species include:

- Species that are recognised by national ETP legislation. Japan designates legally protected marine species under the Fisheries Resources Conservation Act (Suisan Shigen Hogo Hou) (1951) Article 1. Species of National Natural Treasure are also legally protected.

  There are also species listed as Threatened I (Critical and Endangered) or Threatened II (Vulnerable) in the Red List and the Red Data Book of Japan (http://www.biodic.go.jp/english/rdb/rdb_e.html). The Red List is a compilation of endangered wildlife species of Japan, whereas the Red Data Book provides data on population status of the species included in the Red List. However, both have no legal definition but serve as the scientific basis for the promotion of endangered wildlife

conservation. Therefore, the species on these lists do not qualify as ETP species according to MSC criteria.

- Species listed in binding international agreements (e.g. CITES, Convention on Migratory Species (CMS), ACAP, etc.). However, the Convention on Migratory Species (CMS) has not been ratified or signed by Japan, although no species on either CMS or ACAP are recognized to interact with the fishery.
- Species classified as 'out-of scope' (amphibians, reptiles, birds and mammals) that are listed in the IUCN Redlist as vulnerable (VU), endangered (EN) or critically endangered (CE). Species included in Appendix 1 of the Convention on International Trade in Endangered Species (CITES) (https://cites.org/eng/app/appendices.php).
  Two species would qualify as 'out of scope' (see Table 4 below). The Indo-Pacific Finless Porpoise (*Neophocaena phocaenoides*) is classified as 'vulnerable' (VU) on the IUCN red list, designated as a protected species under the Fisheries Resource Conservation Act (1951), and also as a National Natural Treasure. The logger head turtle (アカウミガメ; *Caretta caretta*) is also an out of scope species and is categorised as VU on the IUCN red list.

Table 4. ETP species relevant to oyster aquaculture activities and possible risk of interaction. IUCN category: Threatened II (NT), Vulnerable (VU), Endangered (EN) or Critically Endangered (CR).

Species	CITES Appendix I	IUCN category	Japanese legal protection	Distribution / overlap with fishery	Risk of interaction
Indo-Pacific Finless Porpoise *Neophocaena phocaenoides* スナメリ	Yes	VU	• Designated as: Protected species under Fisheries Resources Conservation Act (1951) • National Natural Treasure	Widely distributed in Japan. India, Indonesia, China, etc. In Okayama, sightings are reported in Ushimado and Kasaoka coast within 2 km from the shore. Also enters brackish water.	Low - Encounters with fishing boats and set nets are reported. Oyster culture rafts may pose some risk to its migration when rafts are taken to the outside of the bay. However, the sonar in small cetaceans is highly sensitive to the local environment and ropes laden scallop shells and maturing oysters would be more easily detected than static nets.
Loggerhead turtle *Caretta caretta* アカウミガメ	Yes	VU	N/A	Within range, can occur in coastal areas outside breeding season	Low – entanglement is not reported as a risk, and it is unlikely for entanglement to occur on oyster lines due to the weight on the lines.

Oyster culture rafts instalments in coastal area may interfere with migration behaviours of Indo-Pacific finless porpoise (*Neophocaena phocaenoides*) and loggerhead turtle (*Caretta caretta*), and potentially with any other whale species that come into the area as well.

While entanglement cases are extremely rare, and where cases have occurred, they have generally occurred in mussel spat collectors or buoy lines connected to them (NOAA, 2017; Young, 2015). In comparison to mussel spat collectors, the rope grown oyster cultures use heavy lines that are constantly under tension, due to the scallop shells weighing them down. The lines on a raft are located closely together, which makes it unlikely for porpoise or turtles to swim between the lines and get entangled.

The Okucho FC no reported incidents of entanglement in their fishing gear, as discussed at the site visit. The team considers the encounter with inshore aquaculture gear is unlikely for these species,

and not likely to pose a risk due to the nature of the gear deployment (heavy lines with shells, spaced close together).
The Sea Turtle Association of Japan (Japan Sea Turtle Assoication – Nihon Umigame Kyogikai) did not provide any comments indicating risks at the announcement of the assessment, and no interactions with sea turtles were reported during the site visit.

There are other species that occur around the fishing grounds and are recognized under IUCN as 'at risk'. However, there are either not categorized as either VU, EN, CR, or are not out-of-scope species, and thus will not be as considered ETP in this assessment. These are:

- *Tachypleus tridentatus* (Japanese horseshoe crab; カブトガニ） is listed as CR and EN on IUCN red list but it is an invertebrate (arthropoda), not an "out of scope" species;
- *Zostera marina* (eelgrass) and *Zostera japonica* (dwarf eelgrass) are both categorized "Least concern" by IUCN, and are not out of scope species. Thus they are not considered as ETP in the assessment. However, they will be discussed under vulnerable habitats (VME).
- *Aetobatus narutobiei* (Naru eagle ray; ナルトビエイ) is ranked NT by IUCN, and not an out of scope species.

With regards to *Aetobatus narutobiei*, White et al (2013) points out that it was previously considered to be conspecific with *Aetobatus flagellum* (longheaded eagle ray). *Aetobatus flagellum* (and *Aetobatus narutobiei* by extension) is considered a pest species that predates heavily on farmed bivalve stocks and was culled annually as part of a 'predator control' program.
Due to the recent taxonomic and molecular work, *Aetobatus narutobiei* is now considered at similar risk as the already extinct long-spotted eagle ray (*Aetobatus narinari*), although no formal protection is in place yet (https://jp.mongabay.com/2014/07/日本の害魚駆除に脅かされる新種のトビエイ/), and this species is therefore also not considered as ETP species in this assessment. The team would like to note that practices to deter the rays have changed over the last few years. Instead of culling the rays, the FCs and fisheries research centres now focus on local efforts to prevent damage to the fisheries through research and the use of prevention devices, such as nets around the rafts. In trials, even just empty strings of rope between the oyster lines to deter the rays have proven to be effective (see Figure 12), and the addition of rope to the oyster lines is now practiced widely.

Figure 12. Ray deterrence through empty rope between the oyster lines (photos provided by Okuchi FC)

Oyster culture on ropes has limited interaction with fish species. To the extent that fish may use the rafts and the interstitial space between the rope grown oysters as breeding and refuge habitats, fish are not caught during the harvest of the oysters. There is therefore no effect on protected or endangered fish species, and these are not considered further in this assessment.

The Okucho FC has not regularly monitored for ETP species, but they are intending to do so. When ETP species are observed during fishing ground operations, members are required to record the location, time and date of the observations. Also, when endangered species are observed and/or identified during harvesting operations, the observations will be reported to the prefecture. Any incidentally encountered ETP species should not be harmed and should be released as necessary. There is already a clear obligation to report encounters with finless porpoises (*Neophocaena phocaenoides*), which involves recording the location and date of observations. The Okucho FC members intend to follow the same data reporting process for other ETP species as well (Seafood Legacy, 2019a).

4.4.4 Habitat

The MSC Principles and Criteria require that fisheries do not cause serious or irreversible harm to habitat structure and function. When assessing the status of habitats and the impacts of fishing, teams are required to consider the full area managed by the local, regional, national, or international governance body(s) responsible for fisheries management in the area(s) where the UoA operates (the "managed area" for short) (SA3.13.5, MSC FCRv2.0). The MSC also specifies that the team shall use all available information (e.g. bioregional information) to determine the range and distribution of the habitat under consideration, and whether this distribution is entirely within the 'managed area' or extends beyond the 'managed area' (SA3.13.5.1, MSC FCRv2.0).

The MSC FCRv2.0 requires habitats interacting with the fishery to be defined as 'commonly-encountered', 'minor, or as 'vulnerable marine ecosystems (VME)', as shown in Table 5.

Commonly encountered and VME habitats are treated as 'main' habitats, in that they are scored at SG60 and SG80, whereas minor habitats are scored at SG100 only. More information is provided in the following sections of the report.

Table 5. Habitat definitions as per the MSC Fisheries Certification Requirements v2.01.

Habitat type (FCR reference)	Definition
Commonly encountered (SA3.13.3.1)	A commonly encountered habitat shall be defined as a habitat that regularly comes into contact with a gear used by the UoA, considering the spatial (geographical) overlap of fishing effort with the habitat's range within the management area(s) covered by the governance body(s) relevant to the UoA.
Minor (SA3.13.3)	All other habitats
Vulnerable marine ecosystem (VME) (GSA3.13.3.2)	A VME shall be defined as is done in paragraph 42 subparagraphs (i)-(v) of the FAO Guidelines. This definition shall be applied both inside and outside EEZs and irrespective of depth. VMEs have one or more of the following characteristics, as defined in paragraph 42 of the FAO Guidelines:

	• Uniqueness or rarity – an area or ecosystem that is unique or that contains rare species whose loss could not be compensated for by similar areas or ecosystems • Functional significance of the habitat – discrete areas or habitats that are necessary for survival, function, spawning/reproduction, or recovery of fish stocks; for particular life-history stages (e.g., nursery grounds, rearing areas); or for ETP species • Fragility – an ecosystem that is highly susceptible to degradation by anthropogenic activities • Life-history traits of component species that make recovery difficult – ecosystems that are characterised by populations or assemblages of species that are slow growing, are slow maturing, have low or unpredictable recruitment, and/or are long lived • Structural complexity – an ecosystem that is characterised by complex physical structures created by significant concentrations of biotic and abiotic features

Habitat Performance Indicators are highly considered in suspended culture fisheries, under the MSC standard. The assessment team must consider the habitat impacts of bio-deposition and benthic organic enrichment and the ecosystem, and carrying capacity impacts of localized phytoplankton depletion from bivalve filtration (SB3.1.3.1).

The FCR guidance for organic enrichment (GSB3.1.3.1) notes that organic sediment build up underneath bivalve farms as a result of bivalve deposits leading to possible changes to benthic habitat and communities. The extent and severity of these habitat changes is most often site-specific and relate to a variety of factors including the following:

- Scale, duration, and intensity of shellfish production.
- Growing practices and methods.
- Concentration of suspended organic matter available for shellfish filtration.
- Water depth and sedimentation rate.
- Local currents and prevailing winds.

This will be discussed further in the sections below.

4.4.4.1 Habitat types

The MSC defines 'habitat' as 'the chemical and bio-physical environment, including biogenic structures, where fishing takes place' (Table GSA2, MSC FCRv2.01). For assessment purposes, the MSC requires that benthic habitats are described according to the following criteria (SA3.13.2 and Table GSA6, MSC FCR v2.01):

- characterising substratum - i.e. fine (mud, sand), medium, large or solid reef of biogenic origin;
- geomorphology - i.e. flat, low relief, outcrop or high relief; and
- biota (i.e., large erect, small erect/encrusting/burrowing, no fauna or flora, or flora)

The Substrate type map created by surveys conducted by Japan Coast Guard (2018) indicates that most substrate type under the culture area can be defined as mud or silt, with flat low relief and

burrowing infauna (Figure 13). This is therefore considered to be the only 'commonly encountered habitat' with regards to the oyster farms.

Muddy coasts are only found in environments that are calm with respect to wave conditions, or where there is abundant supply of fine sediments (e.g. where rivers supply abundant fine material to the coastal zone). They are normally vegetated - for example with seagrass or algae fronted by very flat slopes or tidal flats. If large amounts of fine sediments are supplied, mud flats and tidal flats develop. Biological processes such as the effect of the macrofauna living in the mud and algae growing on the sediment surface producing EPS (Extracellular Polymeric Substances) are of prime importance for mudflat stability and erodibility (Holland et al. 1974, and Nowell et al 1981).

Mud- and silt seabeds close to shore are likely to be robust to disturbance similarly to sand, and hold good benthic diversity in their natural state.
The equipment used for rope grown oyster aquaculture has minimal interaction with the seafloor. Only the four anchors (per raft) are placed on the muddy substrate. Each horizontal row of ropes is buoyed and anchored at either end, which supports the multiple ropes hanging vertically in between. The weight of the cultured oyster keeps the ropes vertical and stable. This means there is little concern about the physical impact of anchors or other fishery operations on the commonly encountered habitat (muddy seafloor).

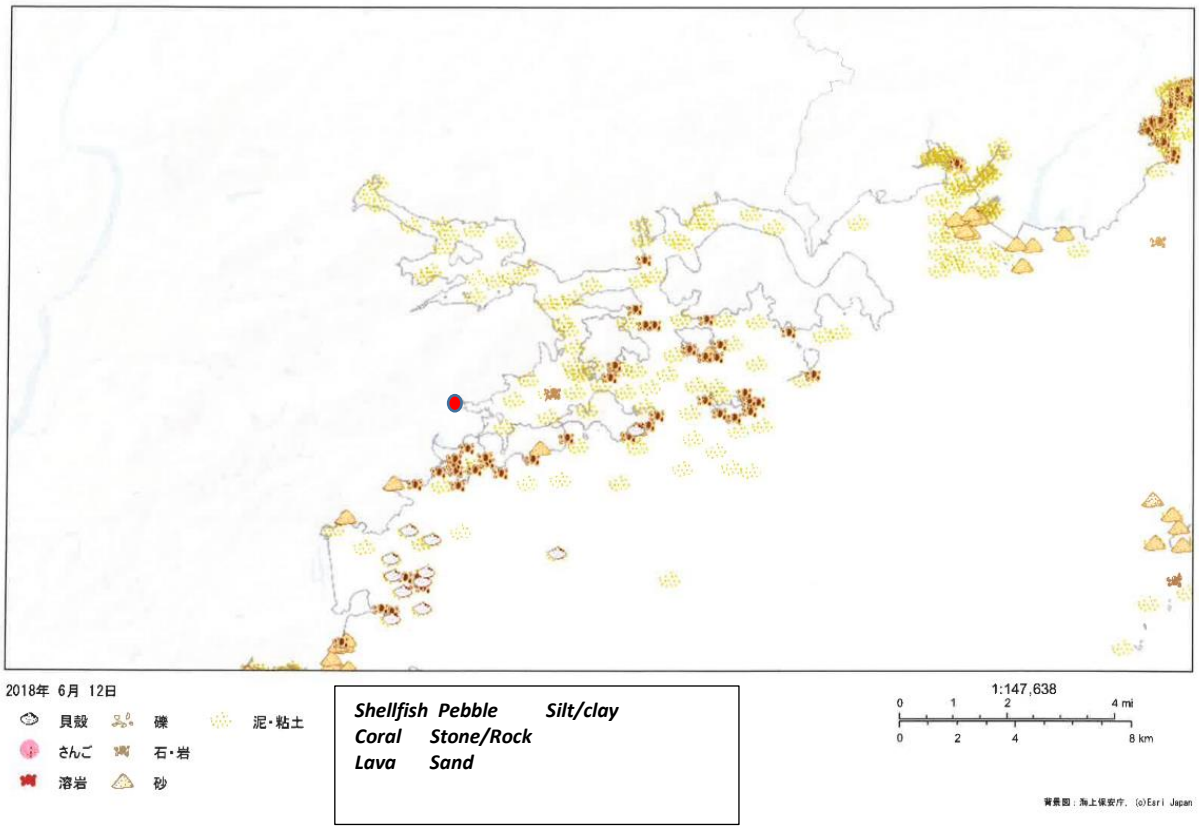


Figure 13. Substrate type map surveyed by Japan Coast Guard, 2018. With a red dot Mushiake, the landing site and location of Okucho FC is indicated.

As Figure 13 shows, there are also some stone/rocky areas near the fishing areas. These areas contain large boulders (> 60 mm), and igneous rock. The whole area is shaped by volcanic activity, and mountains surround the bay near Mushiake and the whole of the Seto Inland Sea. The relief depends on sedimentation in the area, varying from subcrop (rock protrusions from surrounding sediment <1 m) to irregular topography with mounds and depressions. Species associated with hard substrate (e.g.

mussels, sea squirts and sponges) can be found in these areas. These species also settle on the oysters, ropes and anchors of the nearby oyster cultures.
The fishery stays away from these areas, as the required seafloor cultivation (see section 4.4.4.4) is difficult to achieve in these areas. The stone/rock areas constitute 'minor habitats' for this fishery.

VMEs are defined according to FAO guidelines (see Table 5), with example groups including certain cold-water corals, some types of sponge-dominated communities, communities composed of dense emergent fauna forming an important structural component, and seep and vent communities comprised of endemic species. The VME concept was derived from concern over fishing impacts in deep sea areas beyond national jurisdiction, but the MSC requires that the VME definition be applied inside and outside Exclusive Economic Zones (EEZs) and irrespective of depth (SA3.13.3.2).
The MSC's intent is that, even though the FAO Guidelines were written for deep-sea fisheries, the Guidelines' VME characteristics also apply to non-deep-sea fisheries. Furthermore, when the FAO Guidelines are applied in shallow, inshore waters, the definition of VME could include other species groups and communities (e.g., seagrass beds, complex kelp-dominated habitats, biogenic reefs) (GSA3.13.4).

There is no definitive list of VME habitats within Japanese coastal waters. The sensitive habitat that could occur within or near the culture areas are seagrass beds, most likely to occur on fine sediments. Seagrass beds support high biodiversity, are vulnerable to disturbance and can include red listed species such as the eelgrass *Zostera japonica* (Least Concern and in increasing trend according to the IUCN Red List, 2019). The fishery's operation area is demarcated by the designated permit, and not operated above eelgrass beds. Fishermen participate in the seagrass rehabilitation project, as discussed in Section 4.4.4.2 below.

4.4.4.2 Loss of habitats and Eelgrass-bed enhancement activity

The Okayama Prefectural Plan for Environmental Conservation of the Seto Inland Sea (2016) states the goal for coastal conservation of the Seto Inland Sea as "to preserve important habitats such as seaweed/eelgrass beds, tidal flats, sand beach and salt marshes, which function as nursery grounds for diverse species, as well as promoting nutrients circulation and maintain water quality. Rehabilitation measures to increase these areas are necessary ".

A history of large-scale land reclamation, dredging for port construction, and declining sedimentation by rivers into the Seto Inland Sea have caused the continuous decline of tidal flat habitats. With it, Kai-Doko (shellfish grounds: naturally occurring shellfish beds), seaweed and seagrass habitats have severely declined in the Okayama prefecture. Mr. Tanaka, the director of the Satoumi Research Insitute, (an NGO -Satoumiken) who attended the site visit as a stakeholder, wrote in his paper (Tanaka, 2014) that in the Okayama prefecture, eelgrass beds have been reduced from 4300ha in 1930 to 540ha (a loss of 87.5%) in 1990. Since then, restoration activities have started in the prefecture and the eelgrass habitat has been increased to 2024ha in 2017, while the goal is to reach and maintain at 2085ha (see also Table 7, based on Okayama Fishery Promotion Plan 2017), based on previous recovery studies.
Due to the loss of eelgrass among other reasons, finfish catches have also plummeted, from 250 tonnes in the 1970's to around 25 tonnes in 2013 (Okucho FC, at site visit).
Okucho FC has been working on the eelgrass-bed restoration project to restore the ecosystem and increase the fishery production, in cooperation with the Okayama fishery department, the Okayama Coop (supermarket), and Satoumiken over the past five years (Tanaka, 2014). This habitat restoration contributes to the improvement of dissolved oxygen (DO) measurements in the area (since the plants produce oxygen).

4.4.4.3 Organic deposits from rafts and possible effects

Rope grown oysters do not touch the sea bottom. Some growth of organisms other than oysters may occur due to bio-fouling (e.g. sea squirts and barnacles). Some oysters may fall of the scallop shells and settle on the bottom and this might cause an impact of the fishery on the sea floor, especially in deeper areas where it can cause oxygen depletion. Major indirect impact of the farms might be the fact the oysters produce faeces and pseudo-faeces, with potential build-up of detritus underneath the farms. Therefore, smothering of habitat structure either by organic enrichment or shell debris needs to be considered. In the absence of strong currents, these deposits can increase sedimentation rates by reducing water flow across the seabed.

In 2018, the Okucho FC started to take measurements of DO within the aquaculture grounds at various depths to understand the impact of the oyster culture. The results show that in some areas the DO levels fall below 3mg/l at more than 5m depth, with the condition more prevalent in summer. Though this may be temporary, low level of DO generally creates an inhabitable environment for organisms. For benthic organisms such as fish, shellfish and macrobenthos, it presents critical issues of survival, as a DO below 5.0mg/l can put aquatic life under stress. As referred in Principle 3, the FC now has a draft target of maintaining the level of DO at over 4.0ml/l (5.7mg/l).

The Okayama prefecture fishery technology centre, the Okayama prefecture fishery department and Okayama JF (collective name for all Okayama FCs) collaborate on monthly water quality monitoring and the result of 2016 demonstrated low levels of DO at all levels within the water column and an alkaline pH at all sampling spots.

Similarly, the Department of National Land and Transportation also conducts Seto Inland Sea Integrated Water Quality Monitoring (MLT, 2018) in which they take water samples while they collect ocean debris and maintains an online interactive database of the Seto Inland Sea water quality and substrate, to show integrated data trends on pH, sulphide (Total Sulphide in soft mud), chemical oxygen demand (COD), total nitrogen (T-N), total phosphorus (T-P), Nitrite (NO_2) and Nitrate (NO_3), chlorophyll-a, etc, including data on the benthic substrate. In both the Harima strait and Bisan-seto region (see Figure 1), benthic substrate Total Sulphide (in soft mud) measurement were mostly maintained lower than 0.2 mg/g, which is the upper limit set as Japan's fishery-suitable water quality, since it is an indicator for maintaining good habitat for benthic organisms, although in Bisan-seto there was a slightly increase reaching close to 0.2 mg in 2017. Samples were not taken in 2018, due to a flood disaster event in Okayama and Hyogo. The Department of National Land and Transportation also reports that although nutrient influx from land is low, COD (a measure for oxygen consumption) is high. Large areas of water near the sea floor are found to be anoxic, as well as parts of the upper water column due to pollution. Together with substrate contamination, this is increasing the chance of red tide occurrence (Ministry of Land and Transportation, 2018).

In Okayama, Okucho FC's Hama (community-coastal area) plan indicates that substrate degradation from accumulated organic deposits on the seafloor has been threatening bottom-dwelling fish populations, suggesting the need for improvement of the substrate environment (Okayama Regional Fishery Recovery Committee, 2018). The Okayama Fishery Promotion Plan 2017 (Okayama Prefecture, 2017) pointed out that parts of the seafloor in Kojima-bay and off Hinase islands were degraded with accumulated organic muds, although the areas around Okucho FC lies outside of these areas.

4.4.4.4 Seafloor cultivation

In Article 3 of the Sustainable Aquaculture Production Law, the Ministry of Agriculture, Forestry and Fisheries (MAFF) advises several improvement standards as a goal for Fishery Ground Improvement Plans (FGIP) required of the FCs. MAFF's guideline for establishment of FGIP goals states "If a fishery ground is originally not meeting the recommended environmental goals and if they are affected by other reasons than fisheries, skipping these goals in the FGIP may be necessary. However, it can also indicate that the ground is not appropriate for aquaculture in the first place, thus improvement should be planned to bring it up to standard while the operation is undertaken".

The Okayama Fishery Promotion Plan 2017 (Okayama Prefecture, 2017) promotes sea-floor cultivation practices to solve the ongoing issue of an imbalanced ocean ecosystem, represented by the co-existence of two contradictory issues in the Seto Inland Sea;
1. Existing sludge on the ocean floor from excessive nutrient accumulation, and
2. lack of nutrients in some areas, mostly in surface waters, which causes serious damages to traditional seaweed aquaculture.

The suggested sea-floor cultivation is designed to stir up the ocean floor to redistribute nutrients from the ocean floor more evenly in the water column. Other measures to resolve the imbalanced nutrient distribution and improve ecosystem function have been recommended by the government, such as bivalve propagation (assumed to be seeded from hatcheries) and oyster shell dust mixing into substrates, both of which have proven to be somewhat effective to improve the ecosystem (Okayama Prefecture, 2017).

Although existing short-term surveys in Okucho FC suggest rather favourable conditions of the substrates under the culture area (Oriental Techno Co., 2018), some studies also suggest that substrates under the culture areas show anaerobic conditions and tend to create acidic environments, which induces stagnant nutrient cycles with hydrogen sulphide accumulation (Okayama Prefecture, 2017).

Seafloor cultivation is done by dragging heavy, toothed dredges over the sea floor, with a potentially large impact on all benthic habitat types and benthic communities. There is extensive literature on dredge impacts worldwide. A paper by Mie Science Technology Promotion Centre indicated an adverse impact of seafloor cultivation activities on juvenile clam populations (Fujita, 2004). The dredged areas are comprised of mud and sand and do not include sensitive habitats such as eelgrass, which grows in shallower water with sandy substrates, closer to the islands or the shore. Muddy sandy bottom habitats are relatively resilient to disturbance (Seafood Legacy, 2019b).

The Okucho FC conducts only partial seafloor cultivation at the moment, in areas where rafts have been present for longer periods, with monitoring of the ecosystem impact. They have implemented a voluntary plan to monitor the impacts and effects for the coming years.

Figure 14. Sea-floor cultivation device (dredge) and device in operation. Source: Okucho FC.

In theory, sea floor cultivation is used to improve the seafloor ecosystem by aerating the hardened, potentially anoxic substrates and this practice is promoted by the Fishery Agency to improve the ocean environment. The monitoring presented by MAFF after the performance of sea floor cultivation showed the appearance of sand ripple waves on the surface, increasing counts of *Leptocardia* and presence of Japanese sand lance (*Ammodytes personatus*) (Fujita, 2004).
While this could be an alternative for a habitat renewal activity, the local impact of it is unknown as it largely depending on the substrates and organisms which inhabit in the area.

The client has provided the results of a macrobenthos survey by Oriental Techno Co. conducted in November 2018. Five surveys were conducted underneath the oyster culture sites, with the 5th survey taking place after the sea-floor cultivation, providing a reference area. In comparison with the control sites (without oyster rafts), the oyster culture area showed 38% less species biodiversity, but 1.5 times higher biomass (total wet weight of organisms). The results also show that the number of macrobenthos species increased at the cultivated site, while the total weight of those species waslower at the cultivated site than the non-cultivated sites. (Oriental Techno Co, 2018). These results show that aquaculture ground has less biodiversity overall than non-aquaculture sites, but seafloor cultivation after the aquaculture practice can increase the diversity of macrobenthos populations.

In the neighbouring Hyogo prefecture, at Murotsu FC's oyster hanging culture ground a monitoring survey of the benthos and ecosystem was conducted in 2017 at two sites, comparing seabed environment before and after oyster culture activities with three monitoring spots in each site (Oriental Techno Co. 2017). Benthic substrate samples were taken in July (before the start of the oyster culture) and October (after the start of the hanging culture) to compare the number and weights of benthic organisms. The results show some decreased number of benthic organisms in the seabed after oyster culture (-28% in number of species and -27% in total number). However, the number and wet weights of *Leptocardia* (ナメクジウオ), which is an indicator for favourable benthic environment had increased. Dominant species found on the seabed had changed from sea cucumbers to *Leptocardia* before and after oyster culture (Oriental Techno, 2017).
The study concluded that seabed area below the hanging culture maintained a favourable environment. Nevertheless, this study has only looked at one FC bottom habitat and for only four months of the aquaculture period, which is shorter than any usual aquaculture period, and cannot account for seasonal change in seabed diversity as a result. Continuous periodical monitoring survey under and outside of the culture area which is representative of the habitats encountered will be an important consideration to monitor the impact on habitats.

According to the newly developed Okucho FC Fishery Ground Improvement Plan (FGIP), section 5, Okucho FC will conduct dredging for each boundary while avoiding negative impacts on benthic organisms, based on the benthic monitoring results. Furthermore, areas that are dredged will be

monitored before and after dredging. If there are negative ecological impacts due to cultivation, Okucho FC may decide not to cultivate, and/or will develop and implement mitigation measures. The efficacy of these mitigation measures will be confirmed by the FGIP Planning Committee and the prefecture. If the producers decide to cultivate, they do so under the guidance of Okayama prefecture (Seafood Legacy, 2019b).

4.4.5 Environmental Conditions in Seto Inland Sea

The Seto Inland Sea is recognized as an "Enclosed coastal seas, where water pollution and eutrophication occur easily due to poor exchange of water", similar to Chesapeake Bay in the USA, and the Gulf of Mexico (Okayama Plans for Environmental Conservation for Seto Inland Sea, 2016). International cooperation to exchange information for conservation, civil activities and research is promoted through the International EMEX (Environmental Management of Enclosed Coastal Seas) center (https://www.emecs.or.jp). The Association for the Environmental Conservation of The Seto Inland Sea (https://www.seto.or.jp) helps implement the initiatives. Various research projects to understand the ecosystem balance and to aid in the recovery of Satoumi have been undertaken. Satoumi is the important sea-area which has been supporting culture and cultural exchanges through such things as fisheries and the distribution of products. It is an area which includes both nature and human-beings, as well as an area in which both high biological productivity and biodiversity are expected (Ministry of the Environment, 2019).

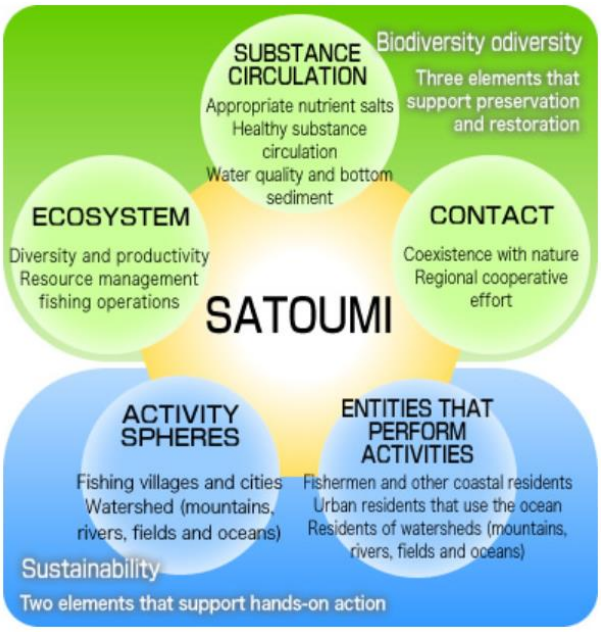


Figure 15. The five elements that build and constitute Satoumi. Source: Ministry of the Environment, 2019.

To achieve a healthy satoumi, historical benthic monitoring of the Seto Inland Sea has been conducted in collaboration with the EMEX centre, Association for the Environmental Conservation of the Seto Inland Sea (https://www.seto.or.jp) and the Ministry of the Environment (MoE). The MoE divides the entire Seto Inland Sea in 3 blocks (east, central, west), and for each block consolidates all monitoring data conducted in Seto Inland Sea. Large scale monitoring spanning 3-year was conducted 3 times in the past, starting from 1981. The comprehensive monitoring data focus on water quality (chemical oxygen demand (COD), total organic carbon (TOC), dissolved oxygen (DO), total nitrogen (T-N), total phosphorus (T-P), total sulphur (T-S), etc.), macro-benthos biodiversity and - species, and distribution of tidal flat and seaweed / seagrass habitats (Ministry of Environment, 2019).

The monitoring survey points cover the area just outside the target fishery ground as well. **Figure** 16 shows the locations of the survey points in Harima-nada (strait).

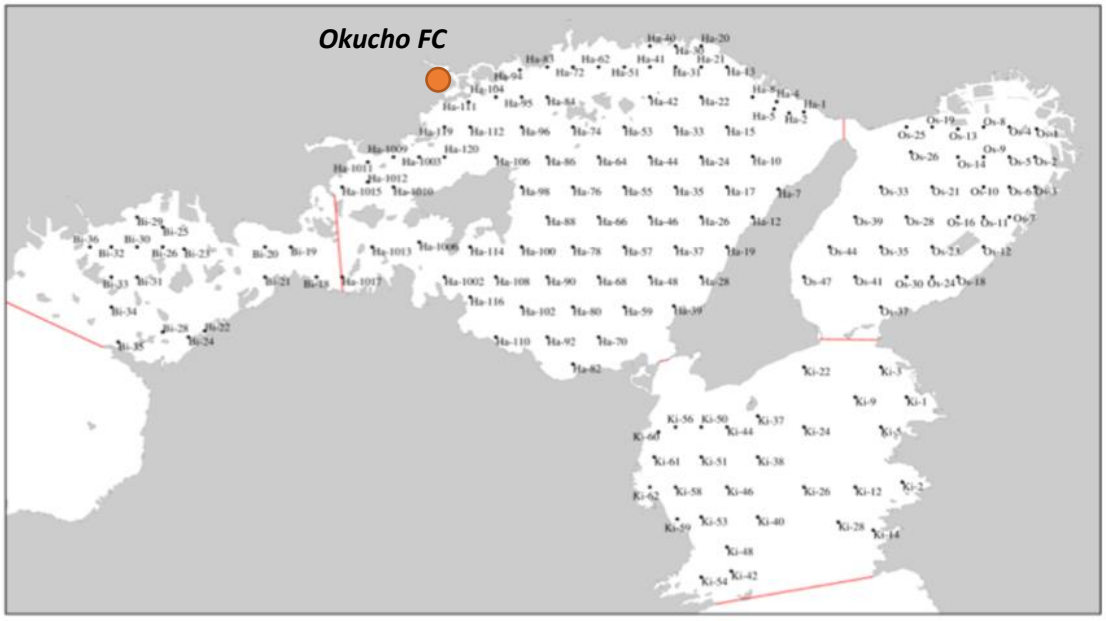
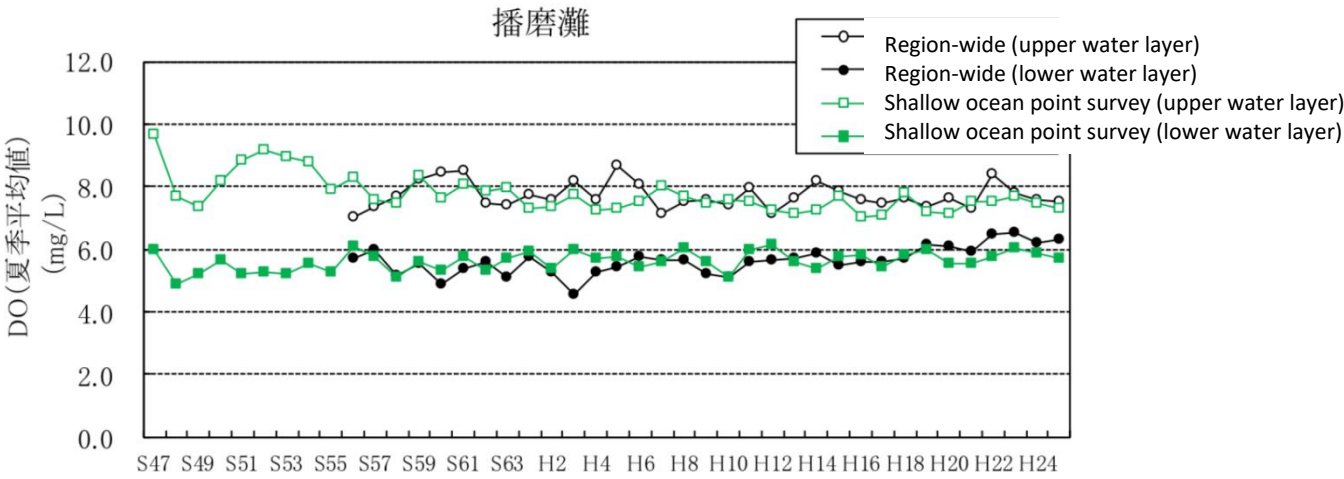


図２　平成 27 年度瀬戸内海環境情報基本調査（底質調査）の調査地点

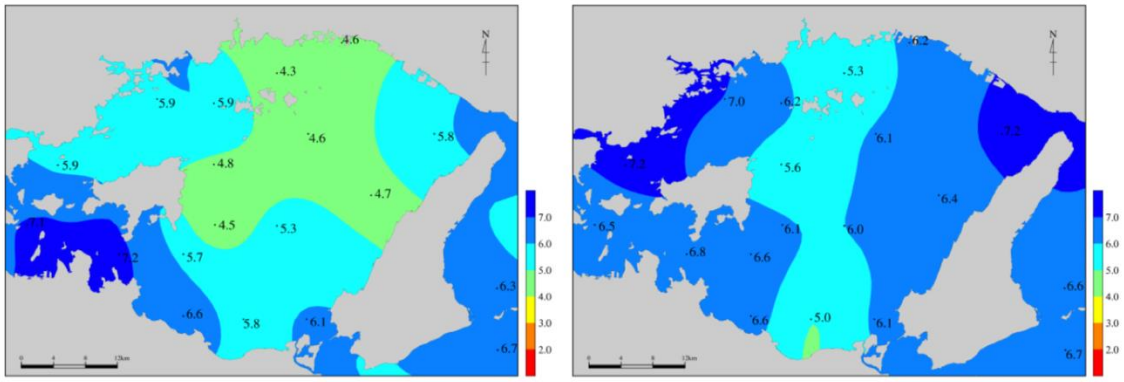
Figure 16. MoE water quality and benthic survey points around Okucho FC.



出典）広域総合水質調査結果（環境省）及び浅海定線調査結果（兵庫県・岡山県・徳島県・香川県）より作成

図 5-31　播磨灘における夏季 DO の推移

Figure 17. DO in Summer (average) measured with different methods, distinguishing between upper and lower water column. Source: region-wide general water quality monitoring (MoE) data (MoE, 2019). (H47=1972 to H24=2012). Region-wide means combined survey measurements for Hyogo, Okayama, Tokushima and Kagawa prefecture in Seto Inland Sea.



出典）広域総合水質調査（環境省）より作成

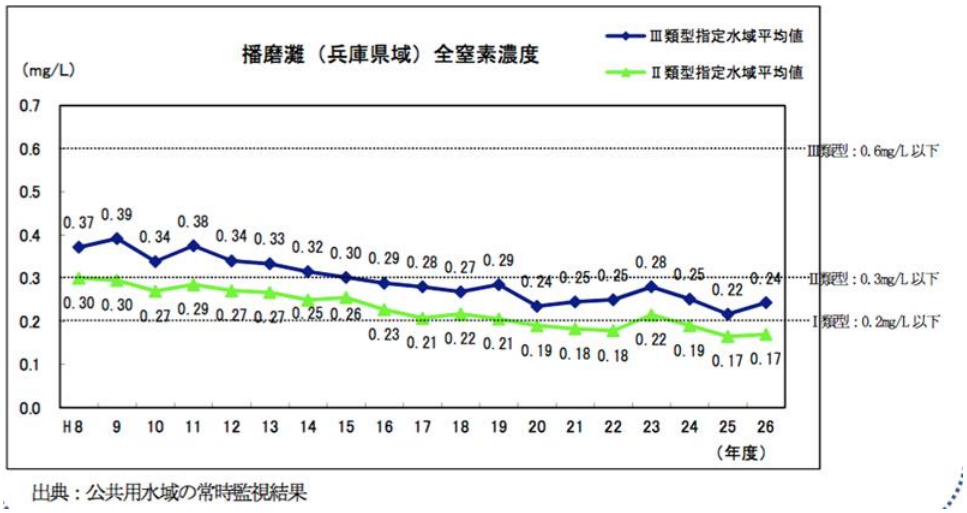
図 5-32 播磨灘における夏季 DO 分布の比較（下層）

Figure 18. DO measurement in Harima strait with historical comparison. The maps show a comparison of DO measurements of the lower water column in Harima strait, from 1981-1983 (left map) and 2009-2011 (right). Source: region-wide general water quality monitoring (MoE, 2019)

The DO measurements above show improvements in the water quality, compared to the past.

4.4.5.1 Nutrient flow

There is numerous research conducted to understand the nutrient flow within the Seto Inland Sea, mainly due to the history of serious red tide occurrences (1980's - 2000's). After the improvement efforts started with the designation of Seto Inland Sea Environmental Special Conservation Measure Law, the red tide phenomenon has decreased (Hayashi 2013) and the total nitrate level has also been reduced (**Figure** 19, **Figure** 20). The reduction measures against eutrophication have been so effective that some locals now complain about the nutrient levels being too low. Seaweed aquaculture in the area is now facing nutrient deficiency issues with decolouration of seaweeds.



出典：公共用水域の常時監視結果

Figure 19. Level of total nitrate in Harima strait, from 1996 to 2014. The blue line indicates type III designated regional water average, green line indicates type II regional water average. (MoE, 2019). (Type I: All-purpose and for nature conservation purpose, Type II: water recreation area and

for some fishery purposed area, type III is a lower criteria area for designated fisheries species other than II)

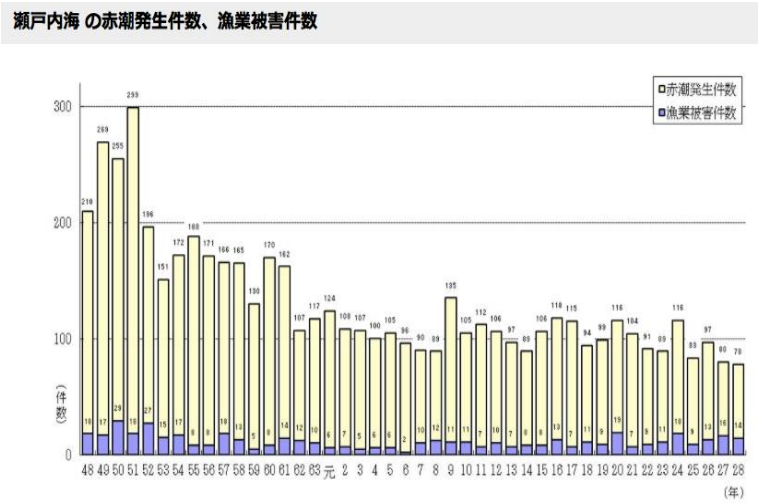


Figure 20. Number of red tide occurrences and economic damage to fishery operation in Seto Inland Sea. In the Japanese year 28 (2016), 14 cases of damage to fisheries have been recorded due to red tide occurrence (light yellow: number of red tide occurrence, blue: amount of economic damage to fishery). (MoE, 2019)

The DO level in lower levels of the water column and turbidity have been improving from 1973 to 2013, and Takagi (2016) suggests that the increase of these indicators has little direct relation with the decline of primary production and fishery production. A study in Okayama indicated there is no correlation between oyster mass mortality events and substrate DO level (Fujisawa, 2001). On the other hand, the Harima-strait Fishery Environment Maintenance Masterplan (**Figure** 21) indicates the presence of low-oxygen water mass covering the oyster aquaculture grounds in both Hyogo and Okayama (Anon 2014).

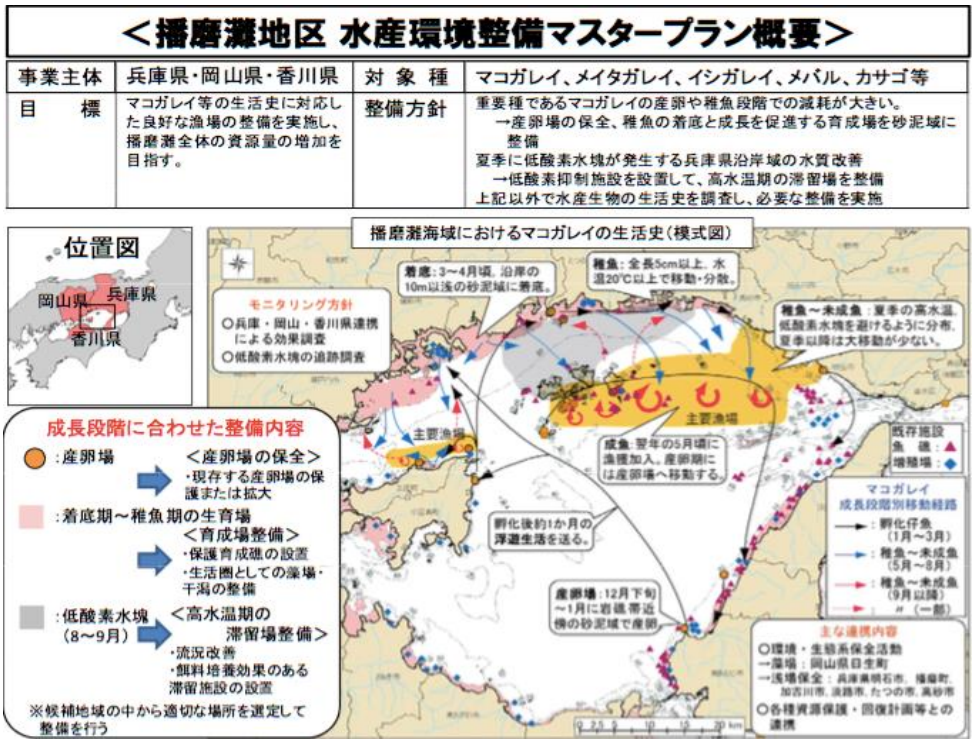


Figure 21. The grey area is indicated as low-oxygen water mass during August to September when water temperature is high. This generally overlaps with the oyster culture areas of targeted assessment farms. Source: Harima-strait Fishery Environment Maintenance Masterplan for commercial fish production promotion (Anon., 2014).

The Okayama Fishery Promotion Plan 2017 (Okayama Prefecture, 2017) indicates that the large-scale loss of tidal flats has been a contributing factor to the ecosystem imbalance, resulting in reduced plankton-feeding natural bivalve populations, allowing the plankton to bloom easily despite of the low nutrient level.

Overall, it seems that the water quality has been greatly improved over time through improvement works to reduce pollution discharge from land. However, coastal habitat protection and rehabilitation of marine biological ecosystem seemed to have been left behind, causing overall low biodiversity and imbalanced ecosystem function in the enclosed sea. During the site visit, Mr. Tanaka (from Satoumiken) mentioned the historical change and the reduction of biodiversity in entire Seto Inland Sea.

4.4.5.2 Carrying capacity

Whilst availability of food is commonly considered as a factor defining the carrying capacity of the environment for filter feeders, the abundance of wild filter feeding organisms attached on the oyster shells and in the culture areas (including fouling species such as mussels on aquaculture ropes) indicates that the enhanced populations of oysters are unlikely to be pushing the limits of carrying capacity.

Microalgae are an important component of the diet of coastal bivalves (Cloern, 1982), and thus abundance of the phytoplankton population relates to ecological carrying capacity. The amount of chlorophyll in a collected water sample (chlorophyll-a concentration) is often used as a proxy measure for biomass of pelagic microalgae (Carmichael et al., 2012).

To limit the impact and determine the efficacy of suspension culture operations, by law, each FC is obliged to determine and report their own Appropriate Aquaculture Resources Density (AARD) to the prefectural government. This is considered a control measure to limit ecosystem impacts from oyster hanging culture (see also Section 4.5.4.1)

The Okucho FC measures chlorophyll-a concentration in cooperation with Okayama Prefectural research centre about twice per month at ten sites as part of their ongoing monitoring. The results are also published by Okayama prefecture homepage (http://www.pref.okayama.jp/page/555075.html). In the oyster culture areas of Okucho FC, the average chlorophyll shows regular variation between 1 and 15 mg/m^3 (Figure 22), which is within the range observed in other ecosystems with bivalves (e.g. Philippart et al., 2014). Mean yearly chlorophyll-a measurements were 4.6 and 4.0 µg/l. Okayama prefecture sees indicators of chlorophyll-a between 1-3 µg/l as normal, more than 3 ug/l to be abundant (more than 10 µg/l is considered as red tide). This data indicates that the current density of oyster rafts does not exceed the ecological carrying capacity.

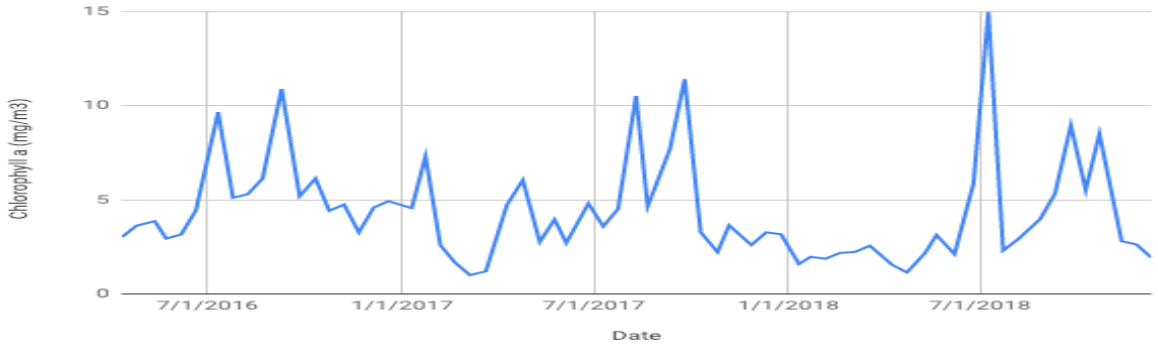


Figure 22. Chlorophyll measurements over time

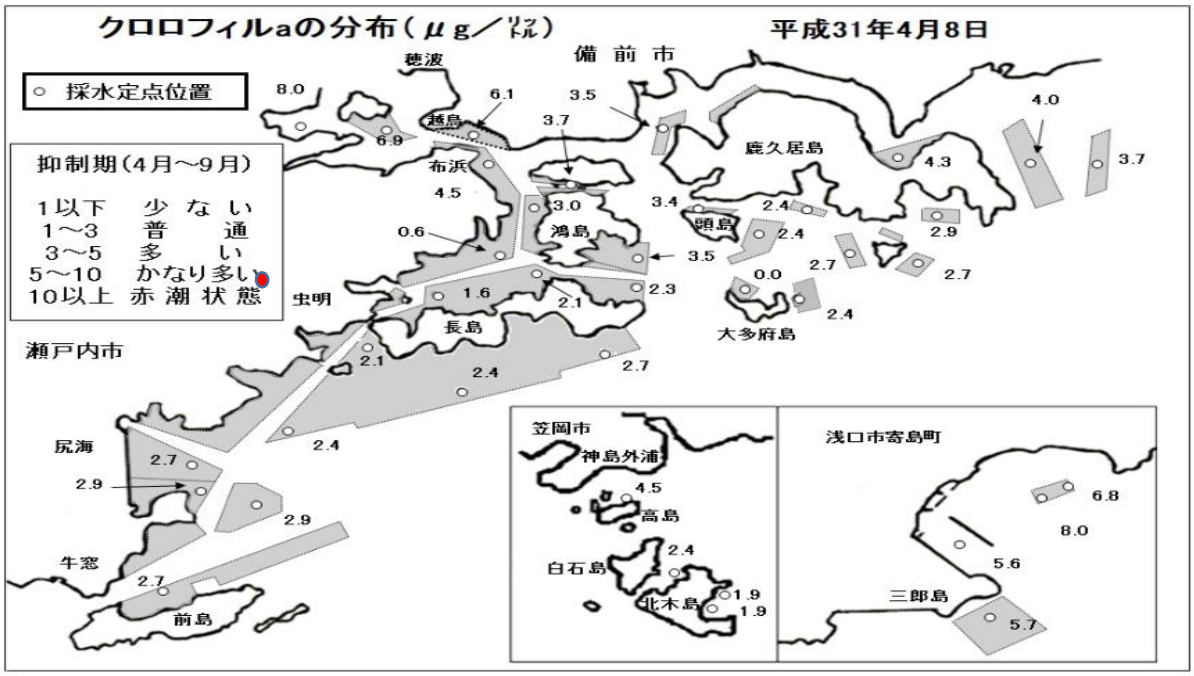


Figure 23. Location of the 10 Chlorophyll monitoring sites (location of Mushiake, landing site and location of FC Okucho in red). Data provided by Okucho FC and reported on Okayama Prefecture's homepage. (Okayama prefecture, 2019)

4.5 Principle Three: Management System Background

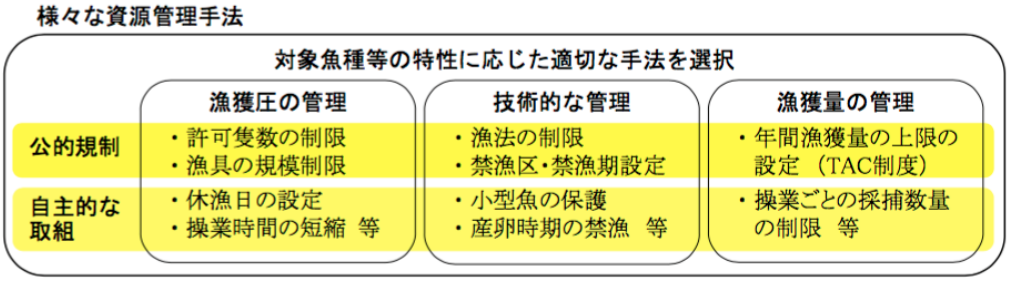
4.5.1 Legal and customary framework

In Japan's fisheries sector, the Ministry of Agriculture, Forestry and Fisheries (MAFF) sets the overarching legal framework, which is administered by the Fisheries Agency (FA). Whilst the international treaties and many of the widely distributed, commercially important TAC-designated species and all distant-water fisheries are managed directly by the MAFF and Fisheries Cooperatives (FCs), coastal fisheries management are responsibility of local prefectural government and FCs, operated with governor-issued licenses / fishery rights. Laws such as the Fisheries Act, the Fisheries Resources Protection Act, the Sustainable Aquaculture Production Law provide the major frameworks of the management and prefectural fisheries coordination rules for aquaculture.

Under the Fisheries Cooperative Association Law (1948, as amended), all individual fishermen with formal fishing licences in Japan are members of a Fishery Cooperative (FC). FCs are grouped together by prefecture, both regionally and nationally, to form Fisheries Cooperative Associations (FCAs). FCs work together with relevant government agencies to observe and implement management regulations set by government and also to feedback their opinions into the government policy.

Although the prefectural government requires some official management regulations on fisheries, the detail of implementation measures of the regulation among each fishery are delegated to FCs self-management, therefore the FC creates the Fishery Right Use Rules for its members to ensure smooth coordination and compliance suitable to the regional setting, as well as put into effect a monitoring system by peers, which generally works well. The prefecture provides guidance to the FC and approves their Fishery Right Use Rules and licenses, and now also requires the mandatory Aquaculture Ground Improvement Plan to be set by FCs for approval. This bilateral management system is called co-management and widely practiced in Japan (Figure 24).

Local branches of Fisheries Research Centres are available to provide scientific advice and monitoring support to help fishers understand water quality and resource-dynamics in response to requests and prefectural and national guidance, in order to help them attain sustainable and profitable harvest of the resources.



Various ways for fisheries resources management, by government and Fisheries Cooperative (FC)			
	Fishing Pressure Control (Input)	Technical Control	Catch control (Output)
Official Regulation (government)	Permit control Gear restriction	Fishing method Closed area, Closed season	(TAC, TAE,) AAAQ
Self-regulation (FCs)	(Off-fishing days) (Limit on operation time)	(Fish size limit Spawning area limit)	(Limit on catch per operation)

Figure 24. Basic strategy for fishery resources management in Japan with layers of official regulation and voluntary management, combining input control (fishing pressure), technical management and output control.

4.5.2 Licensing

For coastal waters, there are three categories of fishing rights: common or joint fishery right (Kyodo-Gyogyoken), demarcated fishery right (Kukaku-Gyogyoken) and set-net fishery right (Teichi-Gyogyoken). Demarcated fishing rights are granted for aquaculture (such as for oysters, seaweeds, fish) which use designated demarcated areas in the sea. The licences are issued by the prefecture to FCAs or directly to the individuals or companies (the priority is given in this order) with five-year terms. In Okucho FC, demarcated fishery rights for fishery ground No. 33-40 are currently granted by the Governor, with a maximum number of rafts allowed for each area, with a total of 2628 rafts for the 6 FCs in the prefecture. The total number of rafts allowed for Okucho FC members is 1309 (Table 1).

4.5.3 Decision-making processes

4.5.3.1 Resource Management Plans / Voluntary management rules

The prefecture is required to consult Prefectural Fisheries Regulation Committees when granting the fishery rights. The renewal of these rights is usually based on the recommendation of the FCs to which the fishers belong, however if serious issues are found such as non-compliance with regional and internal rules, the renewal of these fishing rights can be denied.

Under the Sustainable Aquaculture Production Law article 4, the FC needs to create an Aquaculture Ground Improvement Plan as a prerequisite for acquiring a license on aquaculture leases, which needs to be approved by the prefectural Resources Management Policy/ Fisheries Ground Improvement Promotion Committee. Each FC's oyster operator's subgroups are coordinated through Okayama Prefecture East Fisheries Committee. Each FC has an obligation to report to this committee and gain approval for the planning and implementation of fishing ground improvement plans (for aquaculture). The Committee is made up of the members of FCAs (fishers), fishery compensation cooperatives/trust fund departments, the prefectural Fishery Department, scientists at the Fisheries Research Centres and appointed academics. The policy is reviewed every year for updates with any necessary changes following the guidance of the Fisheries Agency (FA). In theory, the resource management measures are decided by agreement of all FC members and revised with the consensus of the fishers.

Within the Okucho FC, all Oyster Aquaculture Producers Council general meetings are held in spring and autumn with additional ad-hoc meetings held as necessary. Decisions such as location of rafts within the demarcated fishery right in FC for each member are determined by lottery to ensure fairness is maintained.

The FC has a Fishery Right Management Council consisting of 11 representatives from each community in the FC. If a new fisher wants to obtain fishing rights (be granted a fishing license), he or she must have at least 1 year of experience working with one of the FC members, and must be approved by the committee to inherit the license from another member who may be retiring, or must request to be an additional member of FC to the Prefectural Committee (that is in charge of approving the Common Fishery Rights).

There are also "Oyster Basic Issue" meetings to discuss issues within the FC. The FC holds an election of officers to maintain the committee and councils every 3 years. The FC's management is also guided and checked by regular inspection by prefectural staff at the Agriculture and Fisheries department, FC guidance section once every 3 years. If any issue is found, an improvement guidance document is issued to the FC.

Table 6. Breakdown of Operational Management

Management instruments	Rules / function
Okayama Prefecture guideline • Fisheries Regulation Committees • Resources Management Policy/ Fisheries Ground Improvement Promotion Committee	License control (aquaculture ground limit), environmental data collection; 2/month survey of marine environment by the Fisheries Technical Centre
JF Okayama (FCA)'s Okayama Oyster Aquaculture Ground Improvement Plan Implementation through: • Okayama Prefecture East Fisheries Committee • Okayama Oyster Market Strategy Council	To comply with Sustainable Aquaculture Production Act article 4, Licence number and area admitted, species, Improvement goal/ to avoid increase of disease outbreak due to inappropriate management such as overcrowded production. Measures: Raft number limit as AAAQ: 2650 total, gear specification, report of disease /virus outbreak, die off rates, oyster shells disposal and recycle,
Okucho FC's Fishery ground improvement plan All Oyster Producer's Meeting (Okucho FC)	Voluntary rule in newly proposed FGIP **(currently in draft):** Under-raft DO measurement (monthly), Benthos monitoring (1/year), ETP species report. **The above needs confirmation by official government endorsement to be official FGIP**
FC activity for environmental conservation	Eelgrass restoration activities with NPOs and Okayama Coop (supermarket).

4.5.4 Long-term objectives

4.5.4.1 Resource (Carrying capacity)

Following the Law to Ensure Sustainable Aquaculture Production (1999) and the Basic Guidelines to Ensure Sustainable Aquaculture Production (1999) set by MAFF, Aquaculture Ground Improvement Programmes are developed and implemented by each FCA. Under this programme, each aquaculture operation must achieve AAAQ, which aims to limit the aquaculture operation size, with maximum limits being under the maximum historically operated level. The aquaculture operation size is measured based on the number of rafts used, collected seed numbers, or number of seed collectors.

The methodology for setting the AAAQ is as follows:

Producers should not increase the raft number compared to the past, based on the last 5 year's data (excluding the largest and smallest year). According to the governmental Guidline: 'Using the average of the three moderate years with the years 2006 - 2010 as a baseline, a reduction of (raft quantity, in this case) at least 5% should be implemented to set the AAAQ. If the above baseline is already more than 10% higher than the average of the three moderate years between 1996 - 2000, the AAAQ should be just below the baseline.'

Figure 25. Summary of national laws and basic plan, prefectural and local implementation measures for Law to Ensure Sustainable Aquaculture Production.

Okayama FCA has one generalized Okayama Oyster Aquaculture Ground Improvement Plan for all 6 FCs that produce oysters. To monitor the implementation of this, Okayama FCA maintains the Oyster Marketing Measures Committee to which all 6 FC's presidents attend regularly, to report environmental data, density and disease monitoring result required by the plan to the committee. This committee has set the following goal: "to avoid increase of disease outbreak due to inappropriate density of aquaculture". The measures to implement this consist of: raft number limit as AAAQ: 2650 (6 FCs total), gear specification, report of disease /virus outbreak, die off rates, proper oyster shell disposal and recycling.

4.5.4.2 Total Production

The Okayama Fishery Promotion Plan 2017 has set a goal to increase the total oyster aquaculture production from current projection for 2021 (Japanese year H33) from 3200 to 3500 tons (9% increase), number of producers should be also increased from 130 to 137, and a fishery production increase of 5% in 2021 as well. To achieve these goals, the plan commits to other specific goals to reach based on indicators of environmental rehabilitation, as described below.

（１） 数値目標

１経営体あたりの生産額（現況）の５%アップを目指します

漁業種類	現況[注１）			
	生産量	生産額	経営体数	１経営体あたりの生産額
漁船漁業	４，８４５トン	２５．７億円	８７０	２９５万円
ノリ養殖業	２．１億枚	１７．５億円	８２	２，１３５万円
カキ養殖業	３，７６１トン	３１．４億円	１５６	２，０１５万円
合　計	―	７４．６億円	１，１０８	―

注１）漁船漁業の生産量、生産額は、平成２２年から２６年の５中３平均値*、経営体数は２０１３年漁業センサス。ノリ養殖業、カキ養殖業は平成２３年度から２７年度の５中３平均値

漁業種類	平成３３年度の見込み			目標
	生産量	生産額	経営体数	１経営体あたりの生産額
漁船漁業	４，８００トン	２５．４億円	８２０	３１０万円
ノリ養殖業	１．５億枚	１２．３億円	５５	２，２４０万円
カキ養殖業	３，５００トン	２９．０億円	１３７	２，１２０万円
合　計	―	６６．７億円	１，０１２	―

＜生産量等の推移と予測＞

（1）生産量

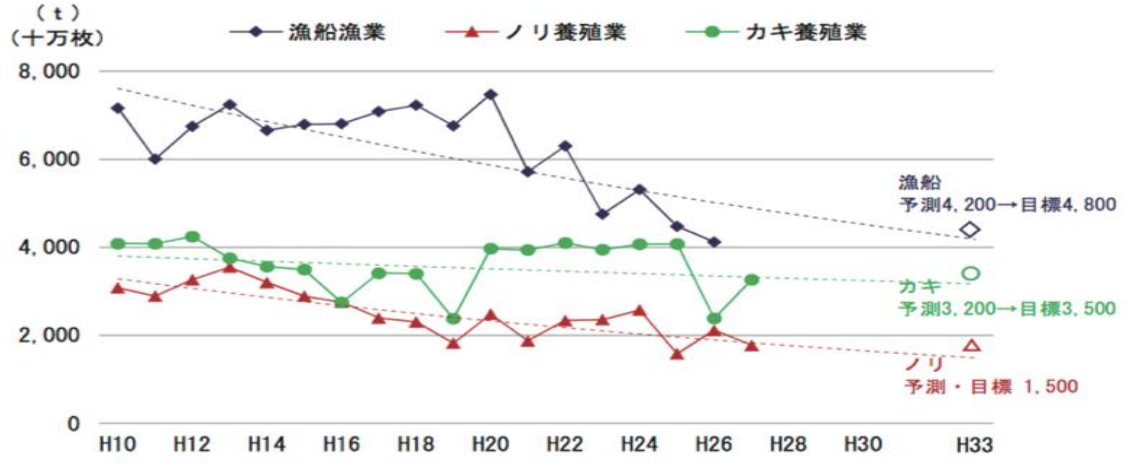


Figure 26. Oyster production quantity in Okayama. Green line represents total oyster production in Okayama prefecture, with estimated 3200 (unit -hundred thousand) in 2022 with objective to increase to 3500. Blue line represents coastal fishery production, estimated 4200t in 2022 with objective to increase to 4800t (Okayama Fishery Promotion Plan 2017).

4.5.4.3 Environmental indicators

The Fishery Basic Law Article 2 requires companies to ensure stable production of fishery products, while promoting aquaculture that does not disrupt the balance of the environment.

The FA' announcement (revised in 2014, the Japanese year H26) "Implementation guide of Sustainable Aquaculture Production Law", it recommends bivalve aquaculture operators should conduct monitoring on water temperature, salinity, dissolved oxygen (DO), chemical oxygen demand (COD), nutrients, chlorophyll, total sulphide (TS), and benthic organisms. AAAQ is set as the maximum sustainable aquaculture quantity (based on the carrying capacity) and is calculated and reviewed by the prefectural fisheries technical centres. The amount of TS should be below the maximum oxygen consumption rate (FA, 2016)
On the website of the Miyagi prefecture, it is explained that measuring of TS is an effective indicator for effects of settling organic substance accumulated on seafloor on benthic organisms. The fishery standard of Japan is: "Total sulphide measurements that is below 0.2mg/g in soft mud" as a standard for maintaining good benthic habitat (good for benthic organisms) on the ocean floors (Miyagi Prefecture fisheries department, 2019)

4.5.4.4 Biodiversity and ecology

As stated earlier in Section 4.4.4.2., the Okayama Prefectural Plan for Environmental Conservation of Seto Inland Sea 2016 states a goal for coastal conservation of the Seto Inland Sea as "to preserve important habitats such as seaweed/eelgrass beds, tidal flats, sand beaches and salt marshes which function as nursery grounds for fish and other diverse species, as well as promoting nutrients circulation and maintenance of water quality. Also, rehabilitation measures to increase these areas must be taken as necessary."

The Ministry of Environment has set a 7-year project with a goal of rehabilitating the Seto Inland Sea to enable a clean and rich ocean environment, supported by scientific research and benthic habitat rehabilitation that contributes to distribution of balanced nutrients and enhanced biodiversity (Ministry of Environment, Ocean Rehabilitation project to restore the richness of the ocean).

The Ministry of Environment plans to implement the above project with a timeline up to 2020, informed by various research and monitoring activities (habitats, macro-benthos organisms, ocean district-based water quality surveys), in collaboration with the public sector. This guides the overall ecosystem-based research activities in prefecture as well.

The Okayama prefecture has set basic policy and goals in its 5-year Okayama Fishery Promotion Plan 2017. As the river and ocean environments are interconnected, with many anadromous species that support ecosystem in Seto Inland Sea, the aim is to create: 1. Clean and abundant oceans through improvement of fishing grounds and fisheries resource management, 2. Attractive fishery products though stable production from aquaculture coupled with the dissemination of information on products, 3. Empowering fishing communities through safety measures and investment on next generation, 4. Rich and clean rivers through fisheries improvement and resource management.
Within goal 1, Okayama prefecture summarizes fisheries issues and recommend measures for each, with numerical targets to measure progress against some of those goals.

In particular, eelgrass and seagrass bed decline and the need for enhancement activity led by fishers have been raised, with the goal to increase from the current 2024ha to 2085ha. Tidal flats have declined and understanding of the benthic ecosystem and improvement measures are recommended. Water temperature has increased 1 degree in the past 30 years in the ocean environment, which has

resulted in changes in seasonal fish distribution and spawning activities, growth of cultured oyster, and more. This must be considered when planning production.

The Okayama Fishery Promotion Plan 2017 states that appropriate mitigation measures such as dredging, sedimentation, seafloor cultivation, benthic shellfish relocation, should be effectively combined for the management of ocean while giving consideration to harmony with other ecosystems. In addition, the Okayama Fishery Promotion Plan 2017 states that appropriate research and surveys to measure impacts on surrounding ecosystem must be implemented in parallel with the promotion of mitigation measures. The goal for seafloor rehabilitation / improvement activities by laying oyster shells is to increase from the current 2ha to 10ha, and the goal for ocean floor cultivation area is set to increase from current 0 to 140ha. (**Table** 7 below)

The Ministry of Environment survey results of seagrass and tidal flat area distribution in Seto Inland Sea (East ocean district) (MoE 2016), suggest there is an increase of seagrass / eelgrass habitats in Ushimado / Mushiake area, however the tidal flat area seem to be unchanged. Monitoring has not been conducted on oyster shell artificial habitats and cultivated seafloor areas. The means of measuring improvements against these targets are unknown

There are no monitoring results shown by this for areas of oyster-shell-laid artificial habitat and ocean floor cultivation areas. The methods to measure the improvement against these targets are unknown.

Table 7. Goals for seafloor rehabilitation / improvement activities by laying oyster shells is to increase from the current 2ha to 10ha, and the goal for ocean floor cultivation area is set to increase from current 0 to 140ha (Okayama Fishery Promotion Plan 2017)

（２）指標

基本方針	現況値	目標値
1　美しく豊かな海づくり		
藻場の面積 アマモ場及びガラモ場の合計面積[注1)]	２，０２４ｈａ	２，０８５ｈａ
海底環境の改善面積 カキ殻を使用した底質改良面積[注1)] 年間の海底耕うん面積[注1)]	２ｈａ ０ｈａ	１０ｈａ １４０ｈａ

Based on the Special Law for Environmental Conservation in Setrouchi inland Sea, Okayama has established the Okayama Plan for Environmental Conservation for Seto Inland Sea (2016) (http://www.pref.okayama.jp/uploaded/life/489683_3597988_misc.pdf). This plan commits to water quality and coastal biodiversity improvement for conservation of a productive ocean environment. As an imbalance of nutrient levels in the ocean is affecting the fishery, research to understand the relation between nutrients and fishery production are recommended by the Plan. Harima-strait Fishery Environment Maintenance Masterplan was also established regionally to jointly enhance commercially important fish populations in Seto Inland Sea, while considering ecosystem.

Ocean pollution and plastic contaminations are also pointed as serious issues in the plan. In 2014, the Ministry of Environment conducted coastal and seafloor clean-up surveys at 26 sites of Seto Inland Sea and identified high concentrations of ocean garbage off the Ushimado and Mizushima areas. Since September 2018, Okayama prefecture has started the Ocean Adopt Project to implement regular ocean clean-ups with volunteering beachgoers. The prefectural fisheries department is also

supporting this program. Department of National Land and Transportation also maintains regular cleaning boats operations throughout Seto Inland Sea to gather floating garbage.

4.5.5 Translocation and disease control management

The Law to Ensure Sustainable Aquaculture Production (1999) seeks to prevent the self-induced environmental deterioration around fish farms. This works to restrict aquaculture density and operations under the maximum historic level operated. JFs are tasked to create Aquaculture Ground Improvement Plans, jointly with neighbouring FCs based on the national policy, including measures to prevent spreading animal and plant pathogens. A Prefectural Governor can issue orders to restrict transportation, incineration, disinfection of designated introduced diseases to prevent the spread of the diseases. Nationally designated foreign-introduced diseases listed for oyster species applicable for aquaculture of oysters is "oyster herpes type 1 mutations amount infections （limited to μvar）" (マガキ属かき類 カキヘルペスウイルス 1 型変異額感染症（μvar に限る。). This has been announced by MAFF to prefectural governors in a 2016 (H28) announcement letter.

Although legally there is a measure for disease control, there is some evidence that implementation of this is insufficient. In 2011, an official alert on oyster seed disease control was released by FA, to all prefectures, FCAs, and fishery research centres. Although the information dissemination processes up to the FC level seems to have been effective, a survey (Takagishi et al, 2014) reports that the information dissemination was stopped at the FC level and that they did not sufficiently inform or alert individual operators or traders. It is also revealed that few prefectures or FCs keep up to date records of specific import and trade origin information of oyster spats, although in the past there were some cases of mass damage caused by imported foreign spats used in some prefectures. The researchers point out the lack of proactive risk management in spat translocation to prevent infectious disease spread. Only Okayama oyster seed is included in this assessment, there is no spat translocation.

4.5.6 Fishery-specific, short-term goals

The national government policy on FC's Fisheries Ground Improvement Plan (FGIP) states that it is fishermen's responsibility to keep aquaculture impacts within environment's natural capacity to decompose, and to maintain and improve aquaculture grounds for continued sustainable production. Therefore, FC is responsible for establishment of aquaculture grounds environmental monitoring including substrate, and appropriate aquaculture density. The current effective FGIP for the assessed oyster fishery in Okucho FC is the one created in coordination with all 6 FC's oyster producers in Okayama, namely Okayama FGIP.

Currently, the only goal they have described in Okayama FGIP is to "prevent increase of oyster death by disease caused by inappropriate management, such as dense aquaculture operations" with measures set as below.

Okayama FGIP has set a total limit on the number of rafts as the Appropriate Allowable Aquaculture Quantity (AAAQ), with the current limit number of 2650 for 6 FCs (valid from 2019 to 2021) determined based on the historical number of rafts over the last 5 years.

The total number of rafts in Okucho FC is determined by discussion with other FCs in Okayama Oyster Market Strategy Council and all-oyster producer's meeting within Okucho FC. Total raft number for Okucho FC alone was 1309 in 2018.

For each licenced aquaculture demarcated area, the maximum numbers of rafts admitted by prefecture are determined in FC's Fishery Right Use Rule (set in 2014 and renewed 2019), and the maximum allowed per license is 2590 rafts (licence 35-41, between 2014-2019) or 2650 (licence 33-41 between 2019-2024). The number of aquaculture rafts per operator has been limited by the FC's Fishery Right Use Rule to set the total amount of rafts to 22 per operator in 2018 (**Table** 8), with the use of a restricted layout to maintain low densities at each facility. The number of licenses is also controlled by Okucho FC and the FC's current policy is to maintain the number of licenses, continuing the traditional 'inheritance' measures to maintain the current scale of fisheries. Actual number of rafts used are 1309 currently and well within the limit of 2590 or 2650. (see 3.5.2 also for explanation of discrepancy between limit and actual numbers).

Table 8. Limit of number of oyster culture raft per operator and annual total rafts for Okucho FC. (For 2017, 1287 is the rafts total at the time of report to prefecture, and 1309 is after revising the limits per operator to 22/operator, due to decreased number of operators within Okucho FC.).

Number of oyster aquaculture operators and rafts number					
Year	**Japan years**	**Rafts**	**Operator(s)**		**Issue**
2013	H25	1243	71	1 Operator <18 rafts	
2014	H26	1236	71		Bad growth
2015	H27	1246	70		Seed scarcity
2016	H28	1285	67		
2017	H29	1287 (1309)	68	1 Operator <22 rafts	Shellfish poison (toxic algae)
2018	H30	1309	66		

Around 1965, raft numbers in Okucho FC alone had reached 3000 as there was no limit at the time. Water quality issues triggered the creation of the rule on limiting raft numbers. Okayama prefecture conducts an airplane flyover survey to count the rafts to check compliance once a year.

As the goals for the 2017 FGIP to 'maintain "appropriate" aquaculture density to keep aquaculture impacts within environment's natural capacity' were not specific and did not integrate other goals set by the prefecture in environmental aspects, Okucho FC has drafted its own Okucho FC Aquaculture Ground Improvement Plan in 2018 to supplement the Okayama's overall plan as a voluntary rule. The new goals proposed include the elements below, although the document is not yet official (Table 9).

Table 9. Improvement goals of aquaculture fishery ground in Okucho FC.

Indicator	**Benchmark**	
Water quality	DO	More than 4.0ml/l (5.7mg/l)
Substrate	Existence of benthos	Visual confirmation of benthic organisms such as polychaetes.

Additionally, macro-benthos monitoring will be conducted once a year to check the impact of seafloor cultivation.

Okucho FC also aims to regularly record and monitor an encounters or observations of ETP species in the aquaculture grounds. If the gear does interact with an ETP species, the fishers must swiftly release it with minimum harm, and work towards the conservation of species.

The FC also reported that it has been engaged in the eelgrass habitat restoration activities with an NGO (Satoumi-ken) and Okayama FC regularly for the past 5 years, although this is not incorporated in FGIP with a specified goal.

The Okayama Oyster Market Strategy Council promotes the implementation of the FGIP. In addition, Okucho FC holds an annual meeting with government officers and academics to confirm the status, results, and progress of FGIP (at least once a year, more often if needed). FC staff will engage in the monitoring activity and work in cooperation with the Fisheries Research Technical Centre of Okayama. The monitoring methods are monthly water temperature and DO measurement on surface and at 1m depth, as well as in the deepest area of fishery ground.

Ocean floor cultivation activities are conducted based on the precautionary monitoring of the benthic organisms,this is to minimise the impact onthe ecosystem. Measures will be developed if the activity is found to affect the biodiversity of benthic organisms. Macro-benthos monitoring inside and outside the culture grounds is conducted annually, on the designated observation points and control site (outside rafts).

The Okucho FC's own FGIP was recently drafted and is still pending approval. As it is a new initiative, its implementation or performance has not been verified. Therefore, it is considered that careful checks on the implementation and efficacy of these activities must be conducted in annual surveillances.

As specified in the FA's guide for Fishery Ground Improvement Plan, each FC needs to establish detailed measures on control of pests, diseases, precautionary measures for purchasing seed, and disposal of oyster shells after harvest in the plan. The Okucho's drafted FGIP, as in the Okayama FGIP, also commits to conduct the monitoring listed below to prevent pests and diseases:

- Number and scale of rafts of FC members
- Summarise reported die-off rates by different causes, and visually check any disease and poisoning occurrence near fisheries grounds.
- Procedures when dead oysters are discovered. Record of time and dates, disease, symptoms and report to related fisheries association and prefectural authorities.
- Disposal of dead oysters: Swiftly remove the dead individuals, record the rates of death, and dispose within a day of discovery
- Introduction of healthy seeds / seeds: Perform investigation into any disease occurrence at seed source areas (spat fall locations). If any disease case is seen to be developing, the FC will record environmental parameters daily, to closely monitor the developments.

4.5.7 Compliance and Enforcement

Monitoring and control rules are regulated in the above-mentioned FC's self-regulatory system (peer-monitoring), where each fisher participates in the day-to-day checking of operations of their designated fishing/aquaculture area. Prefectural and national governments also support the monitoring activity in cooperation with various agencies when necessary. The self-regulatory

mechanism, functions well within socially interconnected traditional FC systems for and the coastal fisheries' compliance rates are high in most of the aquaculture locations.

The Sustainable Aquaculture Production Law states that management status and environmental status at FC must be guided and checked by prefectural authorities. If an FC lacks appropriate maintenance, the prefecture needs to alert the FC to establish the FGIP the plan appropriately and when the area is substantially degraded, or if fishers do not observe this, they can publicly make an announcement.

There are a series of sanctions and penal codes established for illegal fishery operations in Japan. Article 143 of the Fisheries Act stipulates that a penalty of up to 200,000 Japanese Yen is charged for a removal of abalone, sea urchin, shellfish etc. without a fishery licence. Further to this, Article 67 stipulates the payment of up to 500,000 Japanese Yen and up to a year imprisonment can result for violation of compliance on committee decisions. Article 74 stipulates up to a six-month imprisonment and 300,000 Japanese Yen penalty payment for refusal to allow an inspection by fishery monitoring officers. There are other sanctions for non-reporting, reporting of false information, sales and possession of illegally caught products as well. There has been no case of violation for Okucho FC in the past 5 years.

5 Evaluation Procedure

5.1 Harmonised Fishery Assessment

A review of other MSC overlapping fisheries was completed prior to announcing the fishery. The fishery does not overlap with the other fisheries in the MSC programme. The only similar fishery in the North Pacific region is the 'Japanese scallop hanging and seabed enhanced fisheries'. Since this fishery has a similar production system, the available certification documents formed an important background resource for the assessment team - collating and reporting on available stock and fishery information, as well as highlighting areas of stakeholder and assessment team concerns.

5.2 Previous assessments

This is the initial assessment of the fishery.

5.3 Assessment Methodologies

This assessment was conducted in accordance with the MSC Fisheries Standard v2.0 and MSC Full Assessment Reporting Template: Enhanced bivalve fisheries 1.0. In terms of modifications to the Default Assessment Tree for enhanced bivalve fisheries, Principle 1 was removed (see section 4.3 for further explanation). The team evaluated that there was no evidence that the parent stock was negatively impacted, and so Principle 1 did not require scoring, as per SB2.1.4. For similar reasons, Genetic outcome PI 1.1.3 also does not require scoring (as SB2.1.5.2 is not satisfied SB2.1.5.2- '*Enhanced CAG bivalve fisheries that involve translocations shall also be scored against the Genetic outcome PI 1.1.3*'). And finally, since this fishery is a Catch-and-Grow fishery based solely on spat collection (as opposed to dredging), without translocation, Primary and Secondary species components does not require scoring as per SB 3.1.1.

5.4 Evaluation Processes and Techniques

5.4.1 Site Visits

The site visit was held at the offices of the Okucho Fisheries Cooperative in Mushiake, Okayama prefecture Japan, on the 1st and 2nd March 2019. The individuals met during the site visit and their roles in the fishery are listed in
Table **10**. The team was able to visit the rafts and witness the process from landing to auction (shelling, weighing, registration/documentation, and auction).

Table 10. List of attendees at the on-site meetings.

Full name	Date	Location	Organisation
Cora Seip	1st - 2nd March	Mushiake	CU Pesca
Yoko Tamura	1st - 2nd March	Mushiake	CU Pesca
Toru Tsuzaki	1st - 2nd March	Mushiake	CU Pesca (observer)
Shunji Murakami	1st - 2nd March	Mushiake	Seafood Legacy (client consultant)
Jocelyn Drugan	1st - 2nd March	Mushiake	Ocean Outcomes (client consultant)
Yasutaka Hanada	1st - 2nd March	Mushiake	Maruto suisan
Daisuke Tudumi	1st - 2nd March	Mushiake	Maruto suisan
Masaki Matsumoto	1st - 2nd March	Mushiake	Okucho Fisheries Cooperative (chairman)
Tetsuya Yamamoto	1st – 2nd March	Mushiake	Okucho Fisheries Cooperative (consultant)
Takashi Kawano	1st – 2nd March	Mushiake	Okucho Fisheries Cooperative (staff)
Takehiro Tanaka	1st March	Mushiake	Satoumiken (NGO)
Hiroshi Hayashi	1st March	Mushiaka	Okayama Prefecture (government)
Masaaki Hamazaki	1st March	Mushiake	Okayama Prefecture fishery technical center (government)
Shintaro Watarai	2nd March	Mushiake	Oyster producer (MSC team)
Hisashi Nozaki	2nd March	Mushiake	Oyster producer (MSC team)

5.4.2 Consultations

Apart from the stakeholders listed in Table 10, no other stakeholders contacted the assessment team with comments. The information provided by the participants to the site visit has been incorporated in this report.

5.4.3 Evaluation Techniques

a) Media announcements

The fishery's assessment was announced on the MSC website on the 29th January 2019. The MSC press release targeted a wide range of stakeholders within the sustainable seafood industry. Additionally, MSC Japan also sent out a separate press release, specifically targeting Japanese stakeholders.

b) Methodology for information gathering

Information for the assessment was gathered during the site visit and through separate consultation and correspondence with individual stakeholders. The client representatives listed in Table 10 were key in providing most of the information regarding the operation and management of the fishery. Catch data for the fleets under assessment were obtained from the fishery client.

c) Scoring

Scoring was agreed by the team via email correspondence and Skype calls. Consensus was reached for all scores. The scores were decided as follows:

How many scoring issues met?	SG60	SG80	SG100
All	60	80	100
Half	FAIL	70	90
Less than half, most not met	FAIL	65	85
More than half, many or most	FAIL	75	95

Note that where there is only one scoring issue in the SG, the issue can be partially scored – in this case the team used their judgement to determine what proportion of it was met, e.g. at the 100 level, a small part met = 85, about half met = 90, nearly all met = 95.

d) Decision rule for reaching the final recommendation: The decision rule for MSC certification is as follows:

- No PIs scores below 60;
- The aggregate score for each Principle, rounded to the nearest whole number, is 80 or above.

The aggregate score for each Principle is the sum of the weighted score of each Performance Indicator within that Principle.

e) Scoring elements: The set of scoring elements considered in the assessment is listed in Table 11.

Table 11. Scoring elements

Component	Scoring elements	Main/Not main	Data-deficient or not
Target species/ stock	Seto Inland Sea Pacific oysters (*Crassostrea gigas*)	Target	N/a (P1 not scored)
Primary species	none	n/a	Since this fishery is a catch-and-grow fishery based solely on spat collection, Primary and Secondary
Secondary species	none	n/a	

Component	Scoring elements	Main/Not main	Data-deficient or not
			species components do not have to be scored (SB 3.1.1.).
ETP species	Indo-Pacific Finless Porpoise *Neophocaena phocaenoides* and Loggerhead turtle *Caretta caretta*	n/a	No
Habitats	Subtidal, North Pacific coastal area (Seto Inland Sea coast): - Commonly encountered habitat (see Section 4.4.4.1) - VMEs (see Section 4.4.4.1 and 4.4.4.2) - Minor habitats (see Section 4.4.4.1)	 n/a n/a n/a	 No No No
Ecosystem	Seto Inland Sea, North Pacific coastal area (see Sections 4.4.5, 4.4.5.1 and 4.4.5.2)	n/a	No

f) Use of the RBF

The RBF was not used for this re-assessment, based on the following rationale:
The team concluded that, in accordance with the Fisheries Certification Requirements SB2.1.4 – '*If an enhanced CAG bivalve fishery does not involve translocations, and there is no evidence that it negatively impacts the parent stock, teams may choose not to score Principle 1*', Principle 1 does not need to be scored and consequently, RBF has not been used for PI 1.1.1.
Since this fishery is a Catch-and-Grow fishery based solely on spat collection (as opposed to dredging), Primary and Secondary species components does not have to be scored (SB 3.1.1.).
There is sufficient information about the interaction of the fishery with ETP species. The RBF is not needed to score 2.3.1.
Sufficient information is available to assess the impact of this fishery on habitat and ecosystem. E.g. benthic monitoring data are available, giving an overview of the habitats encountered by the UoC, and the associated species for these sites. Furthermore, studies have been conducted to assess primary production, and nitrogen flux in the oyster farms. Therefor the RBF is not needed for PI 2.4.1 and 2.5.1.

6 Traceability

6.1 Eligibility Date

The Eligibility Date has been set as the date of certification, pending the successful outcome of this evaluation. Product caught by Members of the Okucho fishery Cooperative (Okayama Prefecture) using only Okayama oyster seed for grow out after the date of certification will be eligible to enter further chains of custody.

6.2 Traceability within the Fishery

6.2.1 Seed source traceability

In Okayama, 80% of seeds come from their parent oysters on site and 20% of seeds are purchased from Hiroshima and Miyagi. In this assessment, only the producers that use 100% locally caught seed are included in the UoA. The FC keeps track of which producer is using only local seed or has a mixed seed supply. A list of members that only use Okayama sourced seed, and thus produce exclusively in Okayama grown oysters, will be included with the certificate.

6.2.2 Traceability after landing

Once harvested, the oysters go directly to processing: oysters are harvested, shucked and sold on the same day.

After landing, the oysters producers shuck the oysters by hand. The raw oyster meat is collected in a bucket with a cooling element and weighed by FC staff members. From that point on, the FC itself fulfils the role of the auctioneer (as well as other administrative tasks for its members, and promotion of the product) and securely takes possession of the oysters, and there is little chance of tampering from that point on. The FC however, never takes ownership of the oysters as the ownership changes hands at auction.

The bucket is labelled with a registration form that declares who the producers is (name) and the weight of the meat. The auctioneer (= FC staff) will check each bucket for the license information and seed-source list in order to confirm that this is 100% Okayama grown oyster, or if the producer has used a mixed seed source from other areas. In the future, the staff member will mark this down next to the producer name on the label if they are conforming with MSC, once certification of the fishery is finalised. Also, at weighing of the raw oysters. The FC staff also writes down the production area the oysters are from, and the raft location, but this is not included on the label, since there is the risk of confusing the raft number with the weight of the bucket. All information is kept by the FC in written and electronic format. The written labels are entered into the auction system, and the harvest data is reported to prefecture, which in turn reports the data to the national government (MAFF) as well. The logbook detailing the harvest is kept by the fishermen, as part of the traceability of the product, so that a batch can be retraced to a specific raft if needed (e.g. in case of food safety issues).

Figure 27. Raw oyster meat, labelled with name of the producer and weight of the bucket (left), collection of the buckets on the FC truck (right). Photos taken at CU Pesca site visit.

Once all buckets are weighed, labelled and collected, the truck with buckets is then brought to the auction house. Ownership changes at auction: the bidding process is quick, and when a bid is accepted, the auctioneer places the buyers label on the bucket, to mark who the product has been sold to.

Figure 28. Inspection of the oyster meat by buyers before the auction (under guidance of FC staff members). Photos taken at CU Pesca site visit.

The oysters are processed quickly after being sold at the auction (mostly steamed, sometimes frozen for further processing at another time). A large proportion is then is sold to supermarkets and wholesale.

All catch by members of FC Okucho is landed at the auction in Mushiake, Okayama prefecture.

Table 12. Traceability Factors within the Fishery:

Traceability Factor	Description of risk factor if present. Where applicable, a description of relevant mitigation measures or traceability systems (this can include the role of existing regulatory or fishery management controls)
Potential for non-certified gear/s to be used within the fishery	Low – The FC oyster rafts are all similar in set up and harvesting procedure, and the specifications for the rafts themselves, are described in the Okucho FC FGIP. The use of uncertified gear is therefore unlikely (unless new techniques are developed, at which point the client will have to inform the CAB).
Potential for vessels from the UoC to fish outside the UoC or in different geographical areas (on the same trips or different trips)	By having the UoA covering all the producers in a FC there is no risk of harvesting from unauthorised producers. The chances of UoA members harvesting from other non-certified FCs is considered low to non-existent.
Potential for vessels outside of the UoC or client group fishing the same stock	None – NA
Risks of mixing between certified and non-certified catch during storage, transport, or handling activities (including transport at sea and on land, points of landing, and sales at auction)	Low: the buckets are weighed, labelled and closed by the staff from the FC. After that point the producer is no longer involved (though ownership doesn't change until auction). If certification is obtained, the fisherman's name on the label will be accompanied by an MSC mark after checking by the FC staff whether the fishermen gets 100% oyster seed from within the Okayama prefecture.
Risks of mixing between certified and non-certified catch during processing activities (at-sea and/or before subsequent Chain of Custody)	No risk of mixing during processing: a producer is either MSC or not.
Risks of mixing between certified and non-certified catch during transhipment	N/A, there is no transhipment
Any other risks of substitution between fish from the UoC (certified catch) and fish from outside this unit (non-certified catch) before subsequent Chain of Custody is required	Low, although there is a risk at present of seed sourced from outside the UoA being mixed with seed sourced from within the confines of the UoA. In Okayama, 80% of the seeds come from their parent oysters on site and 20% of seeds are purchased from Hiroshima and Miyagi. Strict separation of stock by seed source will need to be applied to meet traceability requirements. This is done by only including 100% Okayama seed in the certification, which is registered by the FC, and can be checked and noted by staff members in preparation for the auction.

6.3 Eligibility to Enter Further Chains of Custody

The following products have been determined eligible to enter further certified chains of custody as MSC certified and carry the MSC ecolabel: Pacific oysters (*Crassostrea edulis*) caught by members of Okuchi Fisheries Cooperative (listed in Section 4.1.1) using only oyster seed caught in Okayama Prefecture and grown-out on rafts in Okayama Prefecture (Seto Inland Sea) after the eligibility date, pending a successful MSC assessment by the CU Pesca assessment team.

Subsequent Chain of Custody certification is required at first change of ownership. The point of change of ownership in this fishery is the point at which the oysters are sold at auction. Separate chain of custody is required at this point, as ownership has changed hands prior to the oysters arriving in the processing plants.

Ownership changes at point of sale, at the auction. The fishery only lands at Mushiake, Okayama Prefecture.

6.4 Eligibility of Inseparable or Practicably Inseparable (IPI) stock(s) to Enter Further Chains of Custody

No IPI stocks were identified in this assessment.

7 Evaluation Results

7.1 Principle Level Scores

The final principal scores are provided in Table **13**.

Table 13. Final Principle Scores

Final Principle Scores	
Principle	**Score**
Principle 1 – Target Species	Not scored
Principle 2 – Ecosystem	80.0
Principle 3 – Management System	84.6

7.2 Summary of PI Level Scores

Princi-ple	Compo-nent	Wt	Performance Indicator (PI)		Wt	Score
Two	Primary species					**Not scored**
	Secondary species					**Not scored**
	ETP species	0.2	2.3.1	Outcome	0.33	**80**
			2.3.2	Management strategy	0.33	**75**
			2.3.3	Information strategy	0.33	**70**
	Habitats	0.2	2.4.1	Outcome	0.33	**80**
			2.4.2	Management strategy	0.33	**85**
			2.4.3	Information	0.33	**80**
	Eco-system	0.2	2.5.1	Outcome	0.33	**80**
			2.5.2	Management	0.33	**85**
			2.5.3	Information	0.33	**85**
Three	Govern-ance and policy	0.5	3.1.1	Legal &/or customary framework	0.33	**95**
			3.1.2	Consultation, roles & responsibilities	0.33	**85**
			3.1.3	Long term objectives	0.33	**80**
	Fishery specific manage-	0.5	3.2.1	Fishery specific objectives	0.25	**80**
			3.2.2	Decision making processes	0.25	**85**
			3.2.3	Compliance & enforcement	0.25	**85**

Princi-ple	Compo-nent	Wt	Performance Indicator (PI)		Wt	Score
	ment system		3.2.4	Monitoring & management performance evaluation	0.25	**80**

7.3 Summary of Conditions

Table 14. Summary of Conditions

Condition number	Condition	Performance Indicator	Related to previously raised condition? (Y/N/NA)
1	Ensure that there is a regular review of the potential effectiveness and practicality of the way the fishery is conducted with the objective to monitor, manage and reduce or eliminate impacts on ETP species, explicitly referring to ETP species identified during the assessment. Ensure that based on this regular review alternative measures are implemented as appropriate.	PI 2.3.2. e.	N/A
2	The fishery should engage and assist in data-collection and research to obtain information to adequately measure trends and further support a strategy to manage impacts on ETP species. Liaise with scientists to ensure data gathered is relevant, robust and useful to include (for example) date and area of capture, numbers, length or weight as well as condition on release. Collate & analyse all data generated in relation to ETP on an annual basis for all certified members of the FC Okucho and, if applicable, show how the data is used in the management of impact on ETP species.	PI 2.3.3. b.	N/A

7.4 Recommendations

Although Recommendations are non-binding within the context of the MSC Certification Criteria, they are nonetheless an effective tool to help an assessment team and auditors to keep track on issues identified in the original assessment which may not at that stage need a condition but may do if the fishery discontinues a programme, for example. A condition can be raised at a future audit if the risks increase. In the case of this fishery under assessment it was proposed by reviewers to raise a condition on information for habitat. The assessment team decided that the information was adequate to score the relevant issues, as the fishery takes place over areas with mud, effects as a result of organic deposits are mostly local, and the effects of bio deposition are thought to be temporary. The fishery does not take place in sensitive areas (such as eelgrass)

Future audits will have to check whether the monitoring of dissolved oxygen and benthic impacts with regards to seafloor cultivation is effective.

Recommendation 1 for PI 2.4.3: The team considers the fishery to cause no irreversible harm on the main habitats. Monitoring of dissolved oxygen and benthic impacts with regards to seafloor cultivation

has taken place, but there is no site-specific long-term monitoring of (potential) effects on the habitat (and associated benthic species) underneath the oyster rafts. The recommendation therefore is to improve on the time series by developing and implementing appropriate habitat/benthic species sampling in the area where the fishery operates, which allows the possibility of trends to be determined, also allowing for seasonal trends of habitat impacts from the fishery to be discerned.

The client included a response to the Recommendation in their Client Action Plan (CAP):
As described in their FGIP, Okucho FC members will implement ongoing monitoring of dissolved oxygen levels and benthic impacts underneath the oyster rafts, ensuring coverage of seasons throughout the year. Their preliminary plan is to conduct monitoring in February or March during peak production (when oyster biomass is greatest), in June after any seafloor cultivation has taken place, and in November to capture seasonal variation. Benthic impact monitoring will involve enumeration and identification of benthic organisms underneath the rafts, as well as at a control site located away from the rafts. Okucho FC will periodically consult with the Okayama prefectural government and the Satoumi Research Institute to obtain scientific advice on monitoring with scientists regarding data collection and analysis, at least once during Year 1 and once during Years 2 and 3. and they will also share the monitoring results with their members.

7.5 Determination, Formal Conclusion and Agreement

(REQUIRED FOR FR AND PCR)

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Appendices

Appendix 1 Scoring and Rationales

Principle 1 scoring rationales: Principle 1 not scored, see Section 4.3

Principle 2 scoring rationales

Evaluation Table for PI 2.1.1 – Primary species outcome

PI 2.1.1		**The UoA aims to maintain primary species above the PRI and does not hinder recovery of primary species if they are below the PRI.**		
Scoring Issue		SG 60	SG 80	SG 100
a	Main primary species stock status			
	Guidepost	Main primary species are **likely** to be above the PRI OR If the species is below the PRI, the UoA has measures in place that are **expected** to ensure that the UoA does not hinder recovery and rebuilding.	Main primary species are **highly likely** to be above the PRI OR If the species is below the PRI, there is either **evidence of recovery** or a demonstrably effective strategy in place **between all MSC UoAs which categorise this species as main**, to ensure that they collectively do not hinder recovery and rebuilding.	There is a **high degree of certainty** that main primary species are above the PRI **and are** fluctuating around a level consistent with MSY.
	Met?	n/a	n/a	n/a
	Justification	Not scored as per SB 3.1.1.		
b	Minor primary species stock status			
	Guidepost			For minor species that are below the PRI, there is evidence that the UoA does not hinder the recovery and rebuilding of minor primary species

PI 2.1.1		The UoA aims to maintain primary species above the PRI and does not hinder recovery of primary species if they are below the PRI.		
	Met?	n/a	n/a	n/a
	Justification	Not scored as per SB 3.1.1.		
References		MSC, 2014: FCR, SB 3.1.1.		
OVERALL PERFORMANCE INDICATOR SCORE:				**n/a**
CONDITION NUMBER (if relevant):				**-**

Evaluation Table for PI 2.1.2 – Primary species management strategy

PI 2.1.2		There is a strategy in place that is designed to maintain or to not hinder rebuilding of primary species, and the UoA regularly reviews and implements measures, as appropriate, to minimise the mortality of unwanted catch.		
Scoring Issue		SG 60	SG 80	SG 100
a	Management strategy in place			
	Guidepost	There are **measures** in place for the UoA, if necessary, that are expected to maintain or to not hinder rebuilding of the main primary species at/to levels which are likely to above the point where recruitment would be impaired.	There is a **partial strategy** in place for the UoA, if necessary, that is expected to maintain or to not hinder rebuilding of the main primary species at/to levels which are highly likely to be above the point where recruitment would be impaired.	There is a **strategy** in place for the UoA for managing main and minor primary species.
	Met?	n/a	n/a	n/a
	Justification	Not scored as per SB 3.1.1.		
b	Management strategy evaluation			
	Guidepost	The measures are considered **likely** to work, based on plausible argument (e.g., general experience, theory or comparison with similar fisheries/species).	There is some **objective basis for confidence** that the measures/partial strategy will work, based on some information directly about the fishery and/or species involved.	**Testing** supports **high confidence** that the partial strategy/strategy will work, based on information directly about the fishery and/or species involved.
	Met?	n/a	n/a	n/a
	Justification	Not scored as per SB 3.1.1.		
c	Management strategy implementation			
	Guidepost		There is **some evidence** that the measures/partial strategy is being **implemented successfully**.	There is clear evidence that the partial strategy/strategy is being implemented successfully and is achieving its overall objective as set out in scoring issue (a).
	Met?		n/a	n/a

PI 2.1.2		**There is a strategy in place that is designed to maintain or to not hinder rebuilding of primary species, and the UoA regularly reviews and implements measures, as appropriate, to minimise the mortality of unwanted catch.**		
	Justification	Not scored as per SB 3.1.1.		
d	Shark finning			
	Guidepost	It is **likely** that shark finning is not taking place.	It is **highly likely** that shark finning is not taking place.	There is a **high degree of certainty** that shark finning is not taking place.
	Met?	n/a	n/a	n/a
	Justification	Not scored as per SB 3.1.1.		
e	Review of alternative measures			
	Guidepost	There is a review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of unwanted catch of main primary species.	There is a **regular** review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of unwanted catch of main primary species and they are implemented as appropriate.	There is a **biennial** review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of unwanted catch of all primary species, and they are implemented, as appropriate.
	Met?	n/a	n/a	n/a
	Justification	Not scored as per SB 3.1.1.		
References		MSC, 2014: FCR, SB 3.1.1.		
OVERALL PERFORMANCE INDICATOR SCORE:				**n/a**
CONDITION NUMBER (if relevant):				-

Evaluation Table for PI 2.1.3 – Primary species information

PI 2.1.3		Information on the nature and extent of primary species is adequate to determine the risk posed by the UoA and the effectiveness of the strategy to manage primary species		
Scoring Issue		SG 60	SG 80	SG 100
a	Information adequacy for assessment of impact on main species			
	Guidepost	Qualitative information is **adequate to estimate** the impact of the UoA on the main primary species with respect to status. OR If RBF is used to score PI 2.1.1 for the UoA: Qualitative information is adeqaute to estimate productivity and susceptibility attributes for main primary species.	Some quantitative information is available and is **adequate to assess** the impact of the UoA on the main primary species with respect to status. OR If RBF is used to score PI 2.1.1 for the UoA: Some quantitative information is adequate to assess productivity and susceptiblity attributes for main primary species.	Quantitative information is available and is **adequate to assess with a high degree of certainty** the impact of the UoA on main primary species with respect to status.
	Met?	n/a	n/a	n/a
	Justification	Not scored as per SB 3.1.1.		
b	Information adequacy for assessment of impact on minor species			
	Guidepost			Some quantitative information is adequate to estimate the impact of the UoA on minor primary species with respect to status.
	Met?			n/a
	Justification	Not scored as per SB 3.1.1.		
c	Information adequacy for management strategy			
	Guidepost	Information is adequate to support **measures** to manage **main** primary species.	Information is adequate to support a **partial strategy** to manage **main** Primary species.	Information is adequate to support a **strategy** to manage **all** primary species, and evaluate with a **high degree of certainty**

PI 2.1.3		**Information on the nature and extent of primary species is adequate to determine the risk posed by the UoA and the effectiveness of the strategy to manage primary species**		
				whether the strategy is achieving its objective.
	Met?	n/a	n/a	n/a
	Justification	Not scored as per SB 3.1.1.		
References		MSC, 2014: FCR, SB 3.1.1.		
OVERALL PERFORMANCE INDICATOR SCORE:				**n/a**
CONDITION NUMBER (if relevant):				**-**

Evaluation Table for PI 2.2.1 – Secondary species outcome

PI 2.2.1		**The UoA aims to maintain secondary species above a biological based limit and does not hinder recovery of secondary species if they are below a biological based limit.**		
Scoring Issue		SG 60	SG 80	SG 100
a	Main secondary species stock status			
	Guidepost	Main Secondary species are **likely** to be within biologically based limits. OR If below biologically based limits, there are measures in place expected to ensure that the UoA does not hinder recovery and rebuilding.	Main secondary species are **highly likely** to be above biologically based limits OR If below biologically based limits, there is either **evidence of recovery** or a **demonstrably effective partial strategy** in place such that the UoA does not hinder recovery and rebuilding. AND Where catches of a main secondary species outside of biological limits are considerable, there is either evidence of recovery or a, demonstrably effective strategy in place between those MSC UoAs that also have considerable catches of the species, to ensure that they collectively do not hinder recovery and rebuilding.	There is a **high degree of certainty** that main secondary species are within biologically based limits.
	Met?	n/a	n/a	n/a
	Justification	Not scored as per SB 3.1.1.		
b	**Minor secondary species stock status**			
	Guidepost			For minor species that are below biologically based limits', there is evidence that the UoA does not hinder the recovery and rebuilding of secondary species

PI 2.2.1		**The UoA aims to maintain secondary species above a biological based limit and does not hinder recovery of secondary species if they are below a biological based limit.**		
	Met?			n/a
	Justification	Not scored as per SB 3.1.1.		
References		MSC, 2014: FCR, SB 3.1.1.		
OVERALL PERFORMANCE INDICATOR SCORE:				**n/a**
CONDITION NUMBER (if relevant):				**-**

Evaluation Table for PI 2.2.2 – Secondary species management strategy

PI 2.2.2		There is a strategy in place for managing secondary species that is designed to maintain or to not hinder rebuilding of secondary species and the UoA regularly reviews and implements measures, as appropriate, to minimise the mortality of unwanted catch.		
Scoring Issue		SG 60	SG 80	SG 100
a	**Management strategy in place**			
	Guidepost	There are **measures** in place, if necessary, which are expected to maintain or not hinder rebuilding of main secondary species at/to levels which are highly likely to be within biologically based limits or to ensure that the UoA does not hinder their recovery.	There is a **partial strategy** in place, if necessary, for the UoA that is expected to maintain or not hinder rebuilding of main secondary species at/to levels which are highly likely to be within biologically based limits or to ensure that the UoA does not hinder their recovery.	There is a **strategy** in place for the UoA for managing main and minor secondary species.
	Met?	n/a	n/a	n/a
	Justification	Not scored as per SB 3.1.1.		
b	Management strategy evaluation			
	Guidepost	The measures are considered **likely** to work, based on plausible argument (e.g. general experience, theory or comparison with similar UoAs/species).	There is **some objective basis for confidence** that the measures/partial strategy will work, based on some information directly about the UoA and/or species involved.	**Testing** supports **high confidence** that the partial strategy/strategy will work, based on information directly about the UoA and/or species involved.
	Met?	n/a	n/a	n/a
	Justification	Not scored as per SB 3.1.1.		
c	Management strategy implementation			
	Guidepost		There is **some evidence** that the measures/partial strategy is being **implemented successfully**.	There is clear evidence that the partial strategy/strategy is being implemented successfully and is achieving its objective as set out in scoring issue (a).

PI 2.2.2		**There is a strategy in place for managing secondary species that is designed to maintain or to not hinder rebuilding of secondary species and the UoA regularly reviews and implements measures, as appropriate, to minimise the mortality of unwanted catch.**		
	Met?		n/a	n/a
	Justification	Not scored as per SB 3.1.1.		
d	Shark finning			
	Guidepost	It is **likely** that shark finning is not taking place.	It is **highly likely** that shark finning is not taking place.	There is a **high degree of certainty** that shark finning is not taking place.
	Met?	n/a	n/a	n/a
	Justification	Not scored as per SB 3.1.1.		
e	Review of alternative measures to minimise mortality of unwanted catch			
	Justification	There is a review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of **unwanted** catch of main secondary species.	There is a **regular** review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of **unwanted** catch of main secondary species and they are implemented as appropriate.	There is a **biennial** review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of **unwanted** catch of all secondary species, and they are implemented, as appropriate.
	Met?	n/a	n/a	n/a
	Guidepost	Not scored as per SB 3.1.1.		
References		MSC, 2014: FCR, SB 3.1.1.		
OVERALL PERFORMANCE INDICATOR SCORE:				**n/a**
CONDITION NUMBER (if relevant):				**-**

Evaluation Table for PI 2.2.3 – Secondary species information

PI 2.2.3		Information on the nature and amount of secondary species taken is adequate to determine the risk posed by the UoA and the effectiveness of the strategy to manage secondary species.		
Scoring Issue		SG 60	SG 80	SG 100
a	Information adequacy for assessment of impacts on main secondary species			
	Guidepost	Qualitative information is **adequate to estimate** the impact of the UoA on the main secondary species with respect to status. OR **If RBF is used to score PI 2.2.1 for the UoA:** Qualitative information is adequate to estimate productivity and susceptibility attributes for main secondary species.	Some quantitative information is available and **adequate to assess** the impact of the UoA on main secondary species with respect to status. OR **If RBF is used to score PI 2.2.1 for the UoA:** Some quantitative information is adequate to assess productivity and susceptibility attributes for main secondary species.	Quantitative information is available and **adequate to assess with a high degree of certainty** the impact of the UoA on main secondary species with respect to status.
	Met?	n/a	n/a	n/a
	Justification	Not scored as per SB 3.1.1.		
b	**Information adequacy for assessment of impacts on minor secondary species**			
	Guidepost			Some quantitative information is adequate to estimate the impact of the UoA on minor secondary species with respect to status.
	Met?			n/a
	Justification	Not scored as per SB 3.1.1.		
c	Information adequacy for management strategy			
	Guidepost	Information is adequate to support **measures** to manage **main** secondary species.	Information is adequate to support a **partial strategy** to manage **main** secondary species.	Information is adequate to support a **strategy** to manage **all** secondary species, and **evaluate** with a **high degree of certainty**

PI 2.2.3		**Information on the nature and amount of secondary species taken is adequate to determine the risk posed by the UoA and the effectiveness of the strategy to manage secondary species.**		
				whether the strategy is **achieving its objective**.
	Met?	n/a	n/a	n/a
	Justification	Not scored as per SB 3.1.1.		
References		MSC, 2014: FCR, SB 3.1.1.		
				n/a
CONDITION NUMBER (if relevant):				**-**

Evaluation Table for PI 2.3.1 – ETP species outcome

PI 2.3.1		The UoA meets national and international requirements for the protection of ETP species The UoA does not hinder recovery of ETP species		
Scoring Issue		SG 60	SG 80	SG 100
a	Effects of the UoA on population/stock within national or international limits, where applicable			
	Guidepost	Where national and/or international requirements set limits for ETP species, the effects of the UoA on the population/stock are known and **likely** to be within these limits.	Where national and/or international requirements set limits for ETP species, the **combined effects of the MSC UoAs** on the population/stock are known and **highly likely** to be within these limits.	Where national and/or international requirements set limits for ETP species, there is a **high degree of certainty** that the **combined effects of the MSC UoAs** are within these limits.
	Met?	n/a	n/a	n/a
	Justification	The identified ETP species are listed in Table 4. The Indo-Pacific Finless Porpoise (*Neophocaena phocaenoides*) is classified as VU on the IUCN red list, and included in Appendix 1 of the Convention on International Trade in Endangered Species (CITES). It is designated as a protected species under the Japanese Fisheries Resource Conservation Act (1951), and also as a National Natural Treasure. The loggerhead turtle (*Caretta caretta*) is also categorised as VU on the IUCN red list and included in Appendix 1 of CITES. However, for neither of these ETP species do specific limits exist in terms of total mortality permitted before a management response is required. Therefore, as per the MSC Fisheries Standard v2.0 SA3.10.1.1, since there is "no applicable national legislation or binding international agreement" that set limits with respect to the remaining ETP species, scoring issue (a) is not scored. Direct effects of the fisheries on all ETP species are scored in the following section, SI(b).		
b	Direct effects			
	Guidepost	Known direct effects of the UoA are likely to not **hinder recovery** of ETP species.	Known direct effects of the UoA are **highly likely** to not **hinder recovery** of ETP species.	There is a high degree of confidence that there are no significant detrimental direct effects of the UoA on ETP species.
	Met?	Y	Y	N
	Justification	Under this SI, only those effects of rope oyster cultivation that may reasonably be expected to affect ETP species are considered; therefore, the Assessment Team considered the possible direct effects of the UoA on ETP species to be entanglement in structures associated with oyster culture activities. As mentioned under scoring issue a), the Indo-Pacific finless porpoise and loggerhead turtle are the two elements classified as ETP species under the MSC definition. The oyster culture rafts may cause some disturbance to the species, but no entanglement has ever been reported. The sonar in small cetaceans is highly sensitive to the local environment and ropes laden with maturing oysters		

PI 2.3.1		The UoA meets national and international requirements for the protection of ETP species The UoA does not hinder recovery of ETP species		
		would be easily detected. Local fishermen commented that they have regular sightings of the porpoise population on the fishery grounds, near the UoA, when carrying out finfish activities (the porpoise even come up to the vessels to be fed some of the fish), though not around the oyster rafts. While entanglement in aquaculture gear is not unknown, cases are extremely rare, and where cases have occurred, they have generally occurred in mussel spat collectors or buoy lines connected to them (Young, 2015; NOAA, 2017). Where mussel spat collectors generally consist of long lines that move with the currents, rope grown oyster cultures use heavy lines that are constantly under tension, due to the scallop shells weighing them down. The lines on a raft are located closely together, which makes it unlikely (near impossible) for porpoise or turtles to swim between the lines and get entangled. With regards to Sea turtles, the sea turtle association of Japan has not alerted the team to any risks from this fishery on the sea turtle population in this region, and there seems no immediate or impending threats from the fishery (again, risk of entanglement and thus mortality is non-existent due to the nature of the fishery). The Okucho FC has not regularly monitored for ETP species, but intend to implement the following procedures, as per the 2018 changes to their FGIP: When ETP species are observed during fishing ground operations, Okucho FC members are required to record the location, time and date of the observations. Also, when endangered species are observed and/or identified during harvesting operations, the observations will be reported to the prefecture. Any incidentally encountered ETP species should not be harmed and should be released as necessary. There is already a clear obligation to report encounters with finless porpoises through the Okayama prefecture, and the Okucho FC members intend to follow the same data reporting process for other ETP species as well (recording the location and date of observations). Given the characteristics of the fishery (low disturbance, no chance of entanglement, and thus no mortality), the effect from the fishery is considered low. The fishery appears to have no direct effects on ETP species and given the evidence from other aquaculture farms globally is therefore highly likely to not hinder recovery of ETP species. SG 80 is met. However, the lack of a current recording mechanism and research specific to the UoA and the species identified means that a high degree of certainty is not apparent, so SG 100 is not met.		
c	Indirect effects			
	Guidepost		Indirect effects have been considered and are thought to be **highly likely** to not create unacceptable impacts.	There is a high degree of confidence that there are no significant detrimental indirect effects of the fishery on ETP species.
	Met?		Y	N

PI 2.3.1		**The UoA meets national and international requirements for the protection of ETP species** **The UoA does not hinder recovery of ETP species**
	Justification	Indirect effects on ETP species might include disturbance, noise and pollution (farm waste). Given the little amount of time an oyster farmer spends on one specific site, the effects due to disturbance and noise are deemed to be limited. As will be discussed under the habitat and ecosystem performance indicators, Okucho FC is involved in a long-term eelgrass propagation project and carries out periodical seafloor cultivation practices to maintain seafloor habitats. These projects aim to improve the ecosystem, mainly the water quality, and thus will likely also further limit (possible) indirect effects of the fishery to ETP species by reducing e.g. possible effects of low dissolved oxygen. With regards to waste (including defective material from the farms, like broken lines, or sinking flotation devices), there are currently no standardized written instructions on waste management, but vessel captains and fishery co-operative members follow social norms regarding waste retrieval and disposal. Garbage and worn or broken gear is not discarded at sea; it is normally brought back to land and disposed of following standard waste handling procedures. Oyster shells that remain after harvest are discarded in designated on-land areas. Based on the above, indirect effects are thought to be highly likely to not create unacceptable impacts. SG80 is met. However, no research or evidence has been identified to provide a high degree of certainty, so SG 100 is not met
References		NOAA, 2017; Okayama Red Data Book. 2009; Okayama Prefecture, 2017; Ocean Outcomes, 2019a; Japan Red Data Book; CITES; IUCN Red list; Young, 2015; personal comments of fishermen at site visit
OVERALL PERFORMANCE INDICATOR SCORE:		**80**
CONDITION NUMBER (if relevant):		**-**

Evaluation Table for PI 2.3.2 – ETP species management strategy

PI 2.3.2		**The UoA has in place precautionary management strategies designed to:** • **meet national and international requirements;** • **ensure the UoA does not hinder recovery of ETP species.** **Also, the UoA regularly reviews and implements measures, as appropriate, to minimise the mortality of ETP species.**		
Scoring Issue		SG 60	SG 80	SG 100
a	Management strategy in place (national and international requirements)			
	Guidepost	There are **measures** in place that minimise the UoA-related mortality of ETP species, and are expected to be **highly likely to achieve** national and international requirements for the protection of ETP species.	There is a **strategy** in place for managing the UoA's impact on ETP species, including measures to minimise mortality, which is designed to be **highly likely to achieve** national and international requirements for the protection of ETP species.	There is a **comprehensive strategy** in place for managing the UoA's impact on ETP species, including measures to minimise mortality, which is designed to **achieve above** national and international requirements for the protection of ETP species.
	Met?	n/a	n/a	n/a
	Justification	There are no national or international requirement for the protection of ETP species, thus a. is not scored.		
b	Management strategy in place (alternative)			
	Guidepost	There are **measures** in place that are expected to ensure the UoA does not hinder the recovery of ETP species.	There is a **strategy** in place that is expected to ensure the UoA does not hinder the recovery of ETP species.	There is a **comprehensive strategy** in place for managing ETP species, to ensure the UoA does not hinder the recovery of ETP species
	Met?	Y	Y	N
	Justification	MSC definitions: A "strategy" represents a cohesive and strategic arrangement which may comprise one or more measures, an understanding of how it/they work to achieve an outcome, and which should be designed to manage impact on that component specifically. A strategy needs to be appropriate to the scale, intensity and cultural context of the fishery and should contain mechanisms for the modification fishing practices in the light of the identification of unacceptable impacts.		

PI 2.3.2		**The UoA has in place precautionary management strategies designed to:** • **meet national and international requirements;** • **ensure the UoA does not hinder recovery of ETP species.** **Also, the UoA regularly reviews and implements measures, as appropriate, to minimise the mortality of ETP species.**		
		A "comprehensive strategy" (applicable only for ETP component) is a complete and tested strategy made up of linked monitoring, analyses, and management measures and responses. Until 2018 the Okayama FC Fisheries Ground Improvement Plan (FGIP) did not include consideration of ETP species. ETP species such as the finless porpoise and loggerhead sea turtle seem to be not considered for special protection by fishers, although (as noted under PI 2.3.1) with regards to the fishery under assessment, impacts seem to be low. There are no reported incidents of entanglement in the fishing gear, and the current measures (design of the oyster raft structure) minimise risk of ETP mortality. The Okucho FC has not regularly monitored for ETP species, but they have recently (2018) revised the FGIP to include ETP monitoring. Although the FGIP needs to be approved by the Okayama prefecture to make the changes official, Okucho FC intends to implement this themselves. The monitoring of ETP species, together with the current fishing methods constitute a strategy appropriate for the scale of the fishery and the area's characteristics and when implemented fully, constitute ongoing monitoring to ensure that no impact occurs: the oyster farmers will continue to use current methods/gears etc and are aware of the need to adapt/change these methods should they start interacting with ETP species. SG80 is met. As there is no 'comprehensive strategy', SG100 is not met.		
c	Management strategy evaluation			
	Guidepost	The measures are **considered likely** to work, based on **plausible argument** (e.g., general experience, theory or comparison with similar fisheries/species).	There is an **objective basis for confidence** that the measures/strategy will work, based on **information** directly about the fishery and/or the species involved.	The strategy/comprehensive strategy is mainly based on information directly about the fishery and/or species involved, and a **quantitative analysis** supports **high confidence** that the strategy will work.
	Met?	Y	Y	N
	Justification	Given that there are currently no/very limited interactions with ETP species, due to the nature of the fishery and the species involved (Indo-Pacific Finless Porpoise and loggerhead turtle), see also SI2.3.1, the strategy considers=that the oyster farmers will continue to use current methods/gears etc and are aware of the need to adapt/change these methods should the monitoring show interactions, or should they start interacting with new ETP species. Although not considered ETP, the way the fishers have started dealing with the eagle ray (*Aetobatus narutobiei*), see Section 4.4.3, where new measures to limit the damage done by the rays to the oyster culture are being used provides an objective basis for confidence that fishers can adapt/change their methods when new information on the interaction with (possible) ETP species becomes evident. SG80 is met.		

PI 2.3.2		**The UoA has in place precautionary management strategies designed to:** • **meet national and international requirements;** • **ensure the UoA does not hinder recovery of ETP species.** **Also, the UoA regularly reviews and implements measures, as appropriate, to minimise the mortality of ETP species.**		
		As there is no comprehensive strategy, nor quantitative analysis carried out yet, SG100 is not met.		
d	Management strategy implementation			
	Guidepost		There is some **evidence** that the measures/strategy is being implemented successfully.	There is **clear evidence** that the strategy/comprehensive strategy is being implemented successfully and is achieving its objective as set out in scoring issue (a) or (b).
	Met?		Y	N
	Justification	As also discussed under SI 2.3.1, given the characteristics of the fishery (low disturbance, low chance of entanglement, and thus low chance of mortality), the effect from the fishery on ETP species is considered low, also given evidence from other rope grown shellfish fisheries. While entanglement of marine mammals and turtles in aquaculture gear is not unknown, cases are extremely rare (Young, 2015; NOAA, 2017). This seen as evidence that the strategy is being implemented successfully and is achieving its objective, since the strategy is the nature of the fishery. SG80 is met. However, since regular monitoring for ETP species has yet to be implemented by the FC, the team does not consider there to be clear evidence, and SG100 is not met.		
e	Review of alternative measures to minimize mortality of ETP species			
	Guidepost	There is a review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of ETP species.	There is a **regular** review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of ETP species and they are implemented as appropriate.	There is a **biennial** review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality ETP species, and they are implemented, as appropriate.
	Met?	Y	N	N
	Justification	Based on local knowledge, and (non-formalised) observations by fishermen, information on interaction (or lack thereof) of ETP species with the fishery is known. Best-practices are discussed by the Fisheries Committee (a committee within the FC). Given that there are currently		

PI 2.3.2		**The UoA has in place precautionary management strategies designed to:** • **meet national and international requirements;** • **ensure the UoA does not hinder recovery of ETP species.** **Also, the UoA regularly reviews and implements measures, as appropriate, to minimise the mortality of ETP species.**
		no indications of interactions with ETP species, the team has considered this to constitute a 'review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of ETP species', and SG60 is met. Okucho FC has recently revised the FGIP to include ETP monitoring in its plan, and this may lead to a regular review of the potential effectiveness and practicality of alternative measures to minimize UoA-related mortality, including clarification whether any additional measures are necessary. Currently the FC does not have such regular review opportunities for ETP species, and SG80 is not met.
References		MSC interpretation log: Scoring ETP Management (PI 2.3.2) when no interactions (FCR v2.0 - Annex SA PI 2.3.2, GSA 3.11.1) Okayama Prefecture, 2017; Ocean Outcomes, 2019a; personal comments of fishermen at site visit; MSC, 2014
OVERALL PERFORMANCE INDICATOR SCORE:		**75**
CONDITION NUMBER (if relevant):		**1**

Evaluation Table for PI 2.3.3 – ETP species information

PI 2.3.3		**Relevant information is collected to support the management of UoA impacts on ETP species, including:** • **Information for the development of the management strategy;** • **Information to assess the effectiveness of the management strategy; and** • **Information to determine the outcome status of ETP species.**		
Scoring Issue		SG 60	SG 80	SG 100
a	Information adequacy for assessment of impacts			
	Guidepost	Qualitative information is **adequate to estimate** the UoA related mortality on ETP species. OR If RBF is used to score PI 2.3.1 for the UoA: Qualitative information is **adequate to estimate productivity and susceptibility** attributes for ETP species.	Some quantitative information is **adequate to assess** the UoA related mortality and impact and to determine whether the UoA may be a threat to protection and recovery of the ETP species. OR If RBF is used to score PI 2.3.1 for the UoA: Some quantitative information is adequate to assess productivity and susceptibility attributes for ETP species.	Quantitative information is available to assess with a high degree of certainty the **magnitude of UoA-related impacts, mortalities and injuries and the consequences for the status** of ETP species.
	Met?	Y	Y	N
	Justification	As set out in 2.3.1, the team considers the fishery to have no direct effects on ETP species and, given the evidence from other aquaculture farms globally, is therefore highly likely to not hinder recovery of ETP species. Available information to assess the magnitude of UoA-related impacts in this fishery comes from self-reporting by oyster operators. Based on local knowledge, and (non-formalised) observations by fishermen, there are no recorded interactions of the fishery with ETP species which result in mortality or injury; hence the consequence for the status of ETP species from this fishery can be quantitatively assessed to be negligible. SG80 is met. However, there is no quantitative analysis carried out to ascertain a high degree of certainty of the full magnitude of UoA related and SG100 is not met.		
b	Information adequacy for management strategy			
	Guidepost	Information is adequate to support **measures** to manage the impacts on ETP species.	Information is adequate to measure trends and support a **strategy** to manage impacts on ETP species.	Information is adequate to support a **comprehensive strategy** to manage impacts, minimize mortality and injury of ETP species, and evaluate with a **high degree of certainty**

PI 2.3.3		**Relevant information is collected to support the management of UoA impacts on ETP species, including:** • **Information for the development of the management strategy;** • **Information to assess the effectiveness of the management strategy; and** • **Information to determine the outcome status of ETP species.**		
				whether a strategy is achieving its objectives.
	Met?	Y	N	N
	Justification	Based on the nature of the fishery, and the lack of interaction with ETP species reported by fishermen, information is deemed adequate to manage the impacts on ETP species. However, due to the current lack of monitoring, trends cannot be determined. Nevertheless, fishery related mortality can be estimated to be negligible: While entanglement in aquaculture gear is not unknown, cases are extremely rare, and where cases have occurred, they have generally occurred in mussel spat collectors or buoy lines connected to them (Young, 2015; NOAA, 2017). Where mussel spat collectors generally consist of long lines that move with the current, the rope grown oyster cultures use heavy lines that are constantly under tension, due to the scallop shells weighing them down. The lines on a raft are located closely together, which makes it unlikely (near impossible) for porpoise or turtles to swim between the lines and get entangled. There are no reported incidents of entanglement in the fishing gear, as discussed at the site visit. The information available is adequate to broadly understand the level of impact, and support measures (if they are necessary) to manage impacts on ETP species. SG60 is met. Since trends cannot be determined, SG80 is not met.		
References		Okayama Prefecture, 2017; Ocean Outcomes, 2019a; NOAA, 2017; Young, 2015; personal comments of fishermen at site visit		
OVERALL PERFORMANCE INDICATOR SCORE:				**70**
CONDITION NUMBER (if relevant):				**2**

Evaluation Table for PI 2.4.1 – Habitats outcome

[FOR CAG BIVALVE FISHERIES, TEAMS SHALL ALSO TAKE INTO ACCOUNT THE SPECIFIC IMPACTS ASSOCIATED WITH ENHANCED CAG BIVALVE FISHERIES, AND FOR SUSPENDED CULTURE SYSTEMS, SCORING SHALL CONSIDER THE HABITAT IMPACTS OF BIO-DEPOSITION AND BENTHIC ORGANIC ENRICHMENT (*FCR Annex SB 3.1.3, SB 3.1.3.1)*]

PI 2.4.1		**The UoA does not cause serious or irreversible harm to habitat structure and function, considered on the basis of the area(s) covered by the governance body(s) responsible for fisheries management.**		
Scoring Issue		SG 60	SG 80	SG 100
a	Commonly encountered habitat status			
	Guidepost	The UoA is **unlikely** to reduce structure and function of the commonly encountered habitats to a point where there would be serious or irreversible harm.	The UoA is **highly unlikely** to reduce structure and function of the commonly encountered habitats to a point where there would be serious or irreversible harm.	There is **evidence** that the UoA is highly unlikely to reduce structure and function of the commonly encountered habitats to a point where there would be serious or irreversible harm.
	Met?	Y	Y	N
	Justification	The type of habitat that the oyster farms operate in is soft mud (flat to low relief and burrowing infauna) and this is considered the only 'commonly-encountered habitat' in this assessment. It is the most commonly occurring bottom substrate type along the coast near Mushiake (Okayama), as shown in Figure 13. A history of large-scale land reclamation, dredging for port construction, and declining sedimentation by rivers into the Seto Inland Sea have caused the continuous decline of tidal flat habitats. With it, Kai-Doko (shellfish grounds: naturally occurring shellfish beds), and seaweed and seagrass habitats have severely declined in the Okayama prefecture. Because of this, the ocean environment in Seto Inland Sea is thought to be somewhat imbalanced with an overall reduced habitat ecological function. In the context of this PI, "serious or irreversible harm" for non-VME habitats is to be interpreted as reductions in habitat structure and function such that the habitat would be unable to recover at least 80% of its structure and function within 5 – 20 years if fishing on the habitat were to cease entirely (MSC FCR v2.0; SA3.13.4). Several reviews have examined the environmental impacts of bivalve mariculture, most notably Kaiser et al., (1998) and Keeley et al (2009). Ahmed and Solomon (2016) list competition for phytoplankton through filter-feeding, impact on the benthos, and bio-deposition and changes in seabed topography and sedimentation as the main possible impacts of oysters farming in subtidal areas (which includes rope-grown culture). The (possible) effects of filter-feeding will be discussed under the Ecosystem PIs. Physical impacts from the UoA are from the anchoring system which hold the rafts in place and bio-deposition / benthic enrichment from the oyster lines.		

PI 2.4.1		The UoA does not cause serious or irreversible harm to habitat structure and function, considered on the basis of the area(s) covered by the governance body(s) responsible for fisheries management.
		The oyster used in this fishery are kept in place by an anchor at each of the four corners of the raft. While these anchors could potentially impact the benthic habitat (mud) on which they are placed, the negative impacts as a result of smothering are likely to be extremely localised, being limited to the immediate area of the benthos on which they are placed. The anchors may even form new habitat for species associated with hard substrate (as evidenced by the fouling on the anchors and lines) but given that the rafts can be moved around during the grow-out phase of the oysters, this positive effect is only small and temporary. Overall, the spatial scale of any impacts is likely to be very limited. Rope grown oysters' lines do not touch the substrate. Growth of some epifaunal organisms other than oysters may occur through fouling (e.g. sea squirts and barnacles). Some oysters and epifauna may fall to the bottom and this may modify the substrates below the farm area. Major indirect impact of the farms is the production of faeces and pseudo-faeces by the oysters, with potential build-up of detritus underneath the farms. Therefore, smothering of habitat structure either by organic enrichment or shell debris needs to be considered. Keeley et al (2009) concluded that seabed effects (as a result of bio deposits and drop-off of shell and associated biota) are most pronounced directly beneath farm sites, reduce rapidly with distance, and are usually difficult to detect within 20-50m away. The most important factors influencing the magnitude of effects are water depth and current speeds; hence severity of effects is very much site-specific, and effects are minimised by locating farms in well-flushed areas, where species and habitats of special value are not present. In 2018, Maruto suisan started to take measurements of dissolved oxygen (DO) within the aquaculture grounds at various depths to understand the impact of the oyster culture. The results show that in some areas the DO levels fall below 3mg/l at more than 5m depth, with the condition more prevalent in summer. Though this may be temporary, low level of DO generally creates an inhabitable environment for organisms. For benthic organisms such as fish, shellfish and macrobenthos, it presents critical issues of survival, as DO below 5.0mg/l can put aquatic life under stress. As referred in Principle 3, the FC now has a draft target of maintaining the level of DO at over 4.0ml/l (5.7mg/l). In Okayama, Okucho FC's Hama (community-coastal area) plan also indicates that substrate degradation from accumulated organic deposits on the seafloor has been threatening bottom-dwelling fish populations, suggesting the need for improvement of the substrate environment. The Okayama Fishery Promotion Plan 2017 (Okayama Prefecture, 2017) pointed out that parts of the seafloor in Kojima-bay and off Hinase islands were degraded with accumulated organic muds, although the areas around Okucho FC lies outside of these areas. This information highlights the need to monitor the site-specific habitat of the farmed area and the culture's impact on the local biodiversity. To counter the effects from organic build-up (and accompanying low- or anoxic conditions), seafloor cultivation is practiced, as required by the Fishery Ground Improvement Plans (FGIP). Sea-floor cultivation practices aim to solve the ongoing issue of an imbalanced ocean ecosystem, represented by the co-existence of two contradictory issues in the Seto Inland Sea;

PI 2.4.1		The UoA does not cause serious or irreversible harm to habitat structure and function, considered on the basis of the area(s) covered by the governance body(s) responsible for fisheries management.		
		1. Existing sludges on the ocean floor from excessive nutrient accumulation, and 2. lack of nutrients in some areas, mostly in surface waters, which causes serious damages to traditional seaweed aquaculture. The sea-floor cultivation is designed to stir up the ocean floor to redistribute nutrients from the ocean floor more evenly in the water column. Seafloor cultivation is done by dragging heavy, toothed dredges over the sea floor, with a potentially large impact on all benthic habitat types and benthic communities. There is extensive literature on dredge impacts worldwide. A paper by Mie Science Technology Promotion Centre indicated an adverse impact of seafloor cultivation activities on juvenile clam populations (Fujita, 2004). However, scientific reviews also point out that soft sediments recover relatively quickly after physical disturbance (e.g. Kaiser et al, 1998). The dredged areas are comprised of mud and sand and do not include sensitive habitats such as eelgrass, which grows in shallower water with sandy substrates, closer to the islands or the shore. Muddy sandy bottom habitats are relatively resilient to disturbance (Ocean Outcomes, 2019b). Based on the first results of a macrobenthos survey by Oriental Techno Co. conducted in November 2018 under the UoA sites, the number of macrobenthos species increased at the cultivated site, while the total weight of those species was smaller at the cultivated site than the non-cultivated sites. (Oriental Techno Co, 2018). The results show that aquaculture ground has less biodiversity overall than non-aquaculture sites, but seafloor cultivation after the aquaculture practice can increase the diversity of macrobenthos populations. Since impacts are difficult to detect outside of 20m – 50m from the site itself (Keeley et al, 2009), any effect as a result of organic deposits are mostly local. The effects of bio deposition are also thought to be temporary (Keeley et al, 2013): Significant recovery is short term, occurring within the first few months of cessation of deposition. The benthos is mostly recovered in the medium to long term, within the timeframe of months to years. The team finds it therefore highly unlikely that the UoA would reduce structure and function of the commonly encountered habitats (mud) to a point where there would be serious or irreversible harm. SG80 is met. Site-specific research and long-term monitoring of potential build-up of organic material under and near the farms, and on the effects of seafloor cultivation has not been carried out, and given the lack of evidence, SG100 is not met.		
b	VME habitat status			
	Guidepost	The UoA is **unlikely** to reduce structure and function of the VME habitats to a point where there would be serious or irreversible harm.	The UoA is **highly unlikely** to reduce structure and function of the VME habitats to a point where there would be serious or irreversible harm.	There is **evidence** that the UoA is highly unlikely to reduce structure and function of the VME habitats to a point where there would be serious or irreversible harm.
	Met?	Y	Y	N

PI 2.4.1		The UoA does not cause serious or irreversible harm to habitat structure and function, considered on the basis of the area(s) covered by the governance body(s) responsible for fisheries management.
	Justification	There are several important considerations regarding the MSC's VME habitat requirement that were clarified through the MSC Interpretations website (https://mscportal.force.com/interpret/s/global-search/VME): • It is not the responsibility of an assessment team to identify habitats as VME within the fished area. Instead, VMEs need to be identified by a local, regional, national, or international management authority/governance body. • The history of fishing and when the VME was identified is critical to establishing what the 'unimpacted level' is; if a VME was already impacted by any fishery/UoA prior to its identification as a VME, and fishing impacts occurred prior to 2006, then the 'unimpacted level' is considered to be the status at the point of designation. The MSC's intent is that, even though the FAO Guidelines on VMEs were written for deep-sea fisheries, the Guidelines' VME characteristics also apply to non-deep-sea fisheries. Further, when the FAO Guidelines are applied in shallow, inshore waters, the definition of VME could include other species groups and communities (e.g., seagrass beds, complex kelp-dominated habitats, biogenic reefs) (GSA3.13.4). The only sensitive habitat that occurs within or near the oyster culture is seagrass, which will be regarded as the VME habitat for the UoA. A history of large-scale land reclamation, dredging for port construction, and declining sedimentation by rivers into the Seto Inland Sea have caused the continuous decline of tidal flat habitats.Kai-Doko (shellfish grounds: naturally occurring shellfish beds), and seaweed and seagrass habitats have severely declined in the Okayama prefecture. Mr. Tanaka, the director of (the Satoumi Research Insitute, an NGO) who attended the site visit as a stakeholder, wrote in his paper (Tanaka, 2014) that in the Okayama prefecture, eelgrass beds have been reduced from 4300 ha in 1930 to 540 ha (a loss of 87.5%) in 1990. Since then, restoration activities have started in the prefecture and the eelgrass habitat has been increased to 2024 ha in 2017, while the goal is to reach and maintain at 2085ha, based on previous recovery studies. Okucho FC has been working on the eelgrass-bed restoration project to restore the ecosystem and increase the fishery production, in cooperation with the Okayama fishery department, the Okayama Coop (supermarket), and the Satoumi Research Insitute (Satoumiken) over the past five years (Tanaka, 2014). This habitat restoration contributes to the improvement of dissolved oxygen (DO) measurements in the area (since the plants produce oxygen), and to improvement of the benthic habitats in general. The oyster culture rafts are placed outside the areas where eelgrass currently grown, which is in sandy and very shallow areas (up to around 4 meters depth). Possibly, with an increase in eelgrass areas, the oyster culture and eelgrass areas could start to overlap in the future. Currently, this is not an issue, and as stated above, the FC is involved in eelgrass restoration. Okayama prefecture checks the placement of the aquaculture rafts in the designated areas once a year by areal inspections. No infractions have been recorded, and no rafts are placed in or near the eelgrass beds.

PI 2.4.1		**The UoA does not cause serious or irreversible harm to habitat structure and function, considered on the basis of the area(s) covered by the governance body(s) responsible for fisheries management.**		
		The team is therefore confident that the UoA is highly unlikely to reduce structure and function of the VME habitats to a point where there would be serious or irreversible harm, and SG80 is met. However, due to the limited detailed mapping of the habitat the oyster culture sites, and lack of site-specific research and long-term monitoring, SG100 is not met.		
c	**Minor habitat status**			
	Guidepost			There is **evidence** that the UoA is highly unlikely to reduce structure and function of the minor habitats to a point where there would be serious or irreversible harm.
	Met?			N
	Justification	As Figure 13 shows, there are also some stone/rocky areas near the fishing areas, which constitute 'minor habitats' for this fishery. These areas contain large boulders (> 60mm), and igneous rock. The whole area is shaped by volcanic activity, and mountains surround the bay near Mushiake and the whole of the Seto Inland Sea. The relief depends on sedimentation in the area, varying from subcrop (rock protrusions from surrounding sediment <1 m) to irregular topography with mounds and depressions. Species associated with hard substrate (e.g. mussels, sea squirts and sponges) can be found in these areas. These species also settle on the oysters, ropes and anchors of the nearby oyster cultures. The fishery stays away from these areas, as the required seafloor cultivation (see section 4.4.4.4) is difficult to achieve in these areas. However, there is no evidence (no detailed mapping of the habitat in the oyster culture areas) of this, only anecdotal data, as relayed by the fishermen. This guidepost is therefore not met.		
References		Fujita, 2004; Ocean Outcomes, 2019b; Oriental Techno Co, 2018; Okayama Prefecture, 2017; Okayama JF. Okayama Oyster Aquaculture Ground Improvement Plan; Kaiser et al, 1998; Keeley et al, 2009; Keeley et al, 2013; Tanaka, 2014; Japanese Coast Guard, 2018		
OVERALL PERFORMANCE INDICATOR SCORE:				**80**
CONDITION NUMBER (if relevant):				**-**

Evaluation Table for PI 2.4.2 – Habitats management strategy

[FOR CAG BIVALVE FISHERIES, TEAMS SHALL ALSO TAKE INTO ACCOUNT THE SPECIFIC IMPACTS ASSOCIATED WITH ENHANCED CAG BIVALVE FISHERIES, AND FOR SUSPENDED CULTURE SYSTEMS, SCORING SHALL CONSIDER THE HABITAT IMPACTS OF BIO-DEPOSITION AND BENTHIC ORGANIC ENRICHMENT (*FCR Annex SB 3.1.3, SB 3.1.3.1)*]

PI 2.4.2		**There is a strategy in place that is designed to ensure the UoA does not pose a risk of serious or irreversible harm to the habitats.**		
Scoring Issue		SG 60	SG 80	SG 100
A	Management strategy in place			
	Guidepost	There are **measures** in place, if necessary, that are expected to achieve the Habitat Outcome 80 level of performance.	There is a **partial strategy** in place, if necessary, that is expected to achieve the Habitat Outcome 80 level of performance or above.	There is a **strategy** in place for managing the impact of all MSC UoAs/non-MSC fisheries on habitats.
	Met?	Y	Y	N
	Justification	In the context of this performance indicator (Source: MSC FCR v2.0; Table SA8): - "Measures" are actions or tools in place that either explicitly manage impacts on the component or indirectly contribute to management of the component under assessment having been designed to manage impacts elsewhere. - A "partial strategy" represents a cohesive arrangement which may comprise one or more measures, an understanding of how it/they work to achieve an outcome and an awareness of the need to change the measures should they cease to be effective. It may not have been designed to manage the impact on that component specifically. - A "strategy" represents a cohesive and strategic arrangement which may comprise one or more measures, an understanding of how it/they work to achieve an outcome, and which should be designed to manage impact on that component specifically. A strategy needs to be appropriate to the scale, intensity and cultural context of the fishery and should contain mechanisms for the modification fishing practices in the light of the identification of unacceptable impacts. A Fishery Ground Improvement Plan (FGIP) is required for each FC by the prefectural government to report each FC's detailed management to improve their management on the aquaculture site. The aquaculture sites are designated based on historical use of the sites. The new FGIP of Okucho includes seafloor cultivation, which is designed to stir up the ocean floor to redistribute nutrients from the ocean floor more evenly in the water column. The Okucho FC conducts only partial seafloor cultivation, within a limited area, and with only annual monitoring of the ecosystem impact. They plan to monitor the impacts and effects for the coming years, following this method: According to the Okucho FC Fishery Ground Improvement Plan (FGIP), section 5, Okucho FC will conduct dredging for each boundary while avoiding negative impacts on benthic		

PI 2.4.2		There is a strategy in place that is designed to ensure the UoA does not pose a risk of serious or irreversible harm to the habitats.		
		organisms, based on the benthic monitoring results. Furthermore, areas that are dredged will be monitored before and after dredging. If there are negative ecological impacts due to cultivation, Okucho FC may decide not to cultivate, and/or will develop and implement mitigation measures. The efficacy of these mitigation measures will be confirmed by the FGIP Planning Committee and the prefecture. If the producers decide to cultivate, they do so under the guidance of Okayama prefecture (Ocean Outcomes, 2019b). The plan has recently been established voluntarily, and still awaits official endorsement from Okayama Prefecture. At the site visit, prefecture officials said they were in favour of the changes. The FC is also involved in an eelgrass restoration project. The measures present in the new FGIP, and through the seagrass restoration project can be regarded as a (partial) strategy to ensure the UoA does not pose a risk of serious or irreversible harm to the habitats. SG 80 is met. However, there is no comprehensive strategy to manage the impact of all fisheries in the area, and SG 100 is not met.		
B	Management strategy evaluation			
	Guidepost	The measures are **considered likely** to work, based on plausible argument (e.g. general experience, theory or comparison with similar UoAs/habitats).	There is some **objective basis for confidence** that the measures/partial strategy will work, based on **information directly about the UoA and/or habitats** involved.	**Testing** supports **high confidence** that the partial strategy/strategy will work, based on **information directly about the UoA and/or habitats** involved.
	Met?	Y	Y	N
	Justification	Okucho FC conducts periodic monitoring of DO within and outside the fishery grounds, and once-a year ocean cultivation and substrate monitoring. Based on the first results of a macrobenthos survey by Oriental Techno Co. conducted in November 2018, the number of macrobenthos species increased at the cultivated site, while the total weight of those species was smaller at the cultivated site than the non-cultivated sites. (Oriental Techno Co, 2018). The results show that aquaculture ground has less biodiversity overall than non-aquaculture sites, but seafloor cultivation after the aquaculture practice may increase the diversity of macrobenthos populations. In another monitoring survey conducted by the same company in 2017 at Hyogo prefecture, Murotsu FC's oyster hanging culture ground, the results comparing before and after the oyster culture to understand impacts on benthic community from oyster farming, showed a rather favourable result on seabed from oyster farming. The results showed decrease in number of benthic organisms in the seabed after oyster culture (-28 % in number of species and -27 % in total number). However, the number and wet weights of Leptocardia (ナメクジウオ), which is an indicator for favourable benthic environment had increased. Dominant species found on the seabed had changed from sea cucumbers to Leptocardia before and after oyster culture (Oriental Techno, 2017).		

PI 2.4.2		There is a strategy in place that is designed to ensure the UoA does not pose a risk of serious or irreversible harm to the habitats.		
		The first results of the macrobenthos survey, combined with other monitoring data and comparisons provide some objective basis for confidence that the measures will work, SG80 is met. However, this does not constitute 'testing', due to the lack of site-specific research and long-term monitoring, and SG100 is not met.		
C	Management strategy implementation			
	Guidepost		There is **some quantitative evidence** that the measures/partial strategy is being implemented successfully.	There is **clear quantitative evidence** that the partial strategy/strategy is being implemented successfully and is achieving its objective, as outlined in scoring issue (a).
	Met?		Y	N
	Justification	The client has submitted DO measurement records for 2018. Also, a benthic organism and substrate monitoring was conducted by Oriental Techno. Co. in November 2018 for 5 aquaculture sites at the locations where the UoA operates. This report is available, providing some quantitative evidence of successful implementation of the partial strategy (the FGIP and monitoring of DO and benthos). However, the overall monitoring results and strategy are not fully evaluated yet, nor do they constitute a sufficiently long time-series to know whether the objectives are fully realised. Evaluation of the strategy is only planned at this point. Therefore, SG80 is met but SG100 is not met.		
D	**Compliance with management requirements and other MSC UoAs'/non-MSC fisheries' measures to protect VMEs**			
	Guidepost	There is **qualitative evidence** that the UoA complies with its management requirements to protect VMEs.	There is **some quantitative evidence** that the UoA complies with both its management requirements and with protection measures afforded to VMEs by other MSC UoAs/non-MSC fisheries, where relevant.	There is **clear quantitative evidence** that the UoA complies with both its management requirements and with protection measures afforded to VMEs by other MSC UoAs/non-MSC fisheries, where relevant.
	Met?	Y	Y	Y
	Justification	Cumulative impacts with other fisheries in the area are coordinated through prefectural FC meetings and by guidance from the prefectural government. The area designated as aquaculture fishery ground permitted by the government does not contain VMEs (the eelgrass areas lay outside the fishery grounds). The prefectural fisheries department conducts compliance monitoring (inspections by aircraft on raft placement and numbers) and periodic evaluation on its own - and the FC's self-management plan. Therefore, SG100 is met.		

PI 2.4.2	There is a strategy in place that is designed to ensure the UoA does not pose a risk of serious or irreversible harm to the habitats.	
References	Ocean Outcomes, 2019b; Oriental Techno Co, 2018; Okayama Prefecture, 2017; Okayama JF. Okayama Oyster Aquaculture Ground Improvement Plan; personal comments of prefectural policy officers at site visit, Oriental Techno. Co., 2017.	
OVERALL PERFORMANCE INDICATOR SCORE:		85
CONDITION NUMBER (if relevant):		-

Evaluation Table for PI 2.4.3 – Habitats information

PI 2.4.3		**Information is adequate to determine the risk posed to the habitat by the UoA and the effectiveness of the strategy to manage impacts on the habitat.**		
Scoring Issue		SG 60	SG 80	SG 100
A	Information quality			
	Guidepost	The types and distribution of the main habitats are **broadly understood**. OR If CSA is used to score PI 2.4.1 for the UoA: Qualitative information is adequate to estimate the types and distribution of the main habitats.	The nature, distribution and **vulnerability** of the main habitats in the UoA area are known at a level of detail relevant to the scale and intensity of the UoA. OR If CSA is used to score PI 2.4.1 for the UoA: Some quantitative information is available and is adequate to estimate the types and distribution of the main habitats.	The distribution of all habitats is known over their range, with particular attention to the occurrence of vulnerable habitats.
	Met?	Y	Y	N
	Justification	The substrate of the area has been mapped by the Coast Guard of Japan (see Figure 13). The client has submitted a 2018 DO monitoring results at aquaculture sites, and report of a substrate and benthic organism monitoring conducted by Oriental Techno. Co. in November 2018 for 5 aquaculture sites. The results of the substrate and benthic organism monitoring showed that aquaculture ground has less biodiversity overall (38% less species) than non-aquacultured sites, but seafloor cultivation after the aquaculture practice can increase the diversity of macrobenthos populations, at least for short period. The Okayama prefecture has summarised the general information on substrate and water quality issues in the Okayama Fishery Promotion Plan 2017. The Okayama prefecture designates certain areas as area as aquaculture fishery ground, which are defined in licenses. The aquaculture as carried out by the UoA is only permitted on the historically used area for oyster aquaculture, and fishermen are responsible to maintain their production area through self-management. Okayama prefecture checks the placement of the aquaculture rafts in the designated areas once a year by areal inspections. No infractions have been recorded, and no rafts are placed in or near the eelgrass beds. Based on all this, the nature, distribution and vulnerability of the main habitats in the UoA are considered to be known at a level of detail appropriate to the scale and intensity of the fishery. Therefore, SG80 is met. However not the full range of information is collected, thus SG100 is not met.		
B	Information adequacy for assessment of impacts			

PI 2.4.3		Information is adequate to determine the risk posed to the habitat by the UoA and the effectiveness of the strategy to manage impacts on the habitat.		
	Guidepost	Information is adequate to broadly understand the nature of the main impacts of gear use on the main habitats, including spatial overlap of habitat with fishing gear. OR **If CSA is used to score PI 2.4.1 for the UoA:** Qualitative information is adequate to estimate the consequence and spatial attributes of the main habitats.	Information is adequate to allow for identification of the main impacts of the UoA on the main habitats, and there is reliable information on the spatial extent of interaction and on the timing and location of use of the fishing gear. OR **If CSA is used to score PI 2.4.1 for the UoA:** Some quantitative information is available and is adequate to estimate the consequence and spatial attributes of the main habitats.	The physical impacts of the gear on all habitats have been quantified fully.
	Met?	Y	Y	N
	Justification	The monitoring conducted is adequate to understand the nature of the main impacts of gear use on the main habitats, including spatial overlap of habitat with fishing gear: the distribution of the main habitats in the areas with oyster culture are known, as well as the spatial extent of the interaction (including location of use of the fishing gear), and the timing of the fishery. The impacts of the fishery on the muddy habitat can be identified (see 2.4.1a). SG80 is met. The physical impacts of the gear have been quantified to some extent (e.g. in terms of biodiversity under the culture areas vs reference areas, and with seafloor cultivation vs no dredging) but not fully (e.g. specific habitat mapping did not occur, see also 2.4.1c and long-term monitoring is not carried out to allow for full quantification of habitat impacts). There is also evidence on the footprint from shellfish farms on their surrounding habitat (e.g. Keeley et al 2009). Therefore, SG80 is met, but SG100 is not met.		
C	Monitoring			
	Guidepost		Adequate information continues to be collected to detect any increase in risk to the main habitats.	Changes in habitat distributions over time are measured.
	Met?		Y	N
	Justification	Okayama government maintain a list of all raft leases and their locations. Since they are responsible for the permitting process, they determine increase in risk to the fishery, mostly through monitoring of raft numbers through the established AAAQ. However, site-specific research and long-term monitoring of potential build-up of organic material under and near the farms has not been carried out. However,		

PI 2.4.3		**Information is adequate to determine the risk posed to the habitat by the UoA and the effectiveness of the strategy to manage impacts on the habitat.**
		Okucho FC has included the plan to continuously collect DO- and substrate data into the FGIP (yet to be accepted by the prefecture but implemented voluntarily by the FC) to detect any increase in risks. Therefore, SG80 is met but SG100 is not met.
References		Ocean Outcomes, 2019b; Oriental Techno Co, 2018; Okayama Prefecture, 2017; Okayama JF. Okayama Oyster Aquaculture Ground Improvement Plan; Keeley et al, 2009; personal comments of prefectural policy officers and FC staff members at site visit
OVERALL PERFORMANCE INDICATOR SCORE:		**80**
CONDITION NUMBER (if relevant):		**-**

Evaluation Table for PI 2.5.1 – Ecosystem outcome

[FOR CAG BIVALVE FISHERIES, TEAMS SHALL ALSO TAKE INTO ACCOUNT THE SPECIFIC IMPACTS ASSOCIATED WITH ENHANCED CAG BIVALVE FISHERIES (*FCR Annex SB 3.1.3, SB 3.1.3.1)*]

PI 2.5.1		**The UoA does not cause serious or irreversible harm to the key elements of ecosystem structure and function.**		
Scoring Issue		SG 60	SG 80	SG 100
a	Ecosystem status			
	Guidepost	The UoA is **unlikely** to disrupt the key elements underlying ecosystem structure and function to a point where there would be a serious or irreversible harm.	The UoA is **highly unlikely** to disrupt the key elements underlying ecosystem structure and function to a point where there would be a serious or irreversible harm.	There is **evidence** that the UoA is highly unlikely to disrupt the key elements underlying ecosystem structure and function to a point where there would be a serious or irreversible harm.
	Met?	Y	Y	N
	Justification	With regards to the fishery under assessment, the key elements for the underlying ecosystem structure and function can be considered to be water quality and ecological carrying capacity. Oysters are known to improve water quality as filter-feeders and generally considered to have a positive effect on the water quality. Suspended culture, without additional feeding such as this UoA is usually considered as an environmentally friendly fishing method. Periodical water quality sampling in the wider area has been conducted by the prefectural research centre. The results of this sampling indicate a good water quality maintenance in the area nearby the oyster cultures. There have been several studies conducted to understand the nutrient flow within the Seto Inland Sea, mainly due to the history of serious red tide occurrences (1980's - 2000's). After the improvement efforts started with the designation of Seto Inland Sea Environmental Special Conservation Measure Law, the red tide phenomenon has decreased (Hayashi 2013) and the total nitrate level has also been reduced (**Figure** 19, **Figure** 20)). The reduction measures against eutrophication have been so effective that officials now notice that levels are "too low", which causes degradations in farmed seaweed quality, and has set the lowest limit of nutrients levels for the first time in Japan in 2019. To limit the impact and determine the efficacy of suspension culture operations, by law, each FC is obliged to determine and report their own Appropriate Aquaculture Resources Density (AARD) to the prefectural government. This is considered a control measure to limit ecosystem impacts from oyster hanging culture. The Okucho FC measures chlorophyll-a concentration in cooperation with Okayama Prefectural research centre about twice per month at ten sites as part of their ongoing monitoring to predict good occurrence of oyster juveniles in the sea. The results are also published by Okayama prefecture homepage (http://www.pref.okayama.jp/page/555075.html). If phytoplankton consumption due to culture activities exceeds ecological carrying capacity, significant changes to ecological processes, species, populations, or communities in the growing		

PI 2.5.1		The UoA does not cause serious or irreversible harm to the key elements of ecosystem structure and function.
		environment may occur. Chlorophyll- a concentration is a recognised measure of phytoplankton abundance. Monitoring of the concentration at regular intervals allows inferences to be made on whether the density oysters is exceeding the ecosystems capacity to maintain phytoplankton biomass. In the oyster culture areas of Okucho FC, the average chlorophyll shows regular variation between 1 and 15 mg/m3 (Figure 22), which is within the range observed in other ecosystems with bivalves (e.g. Philippart et al., 2014). Mean yearly chlorophyll-a measurements were 4.6 and 4.0ug/l. Okayama prefecture sees indicators of chlorophyll-a between 1-3ug/l as normal, more than 3ug/l to be abundant (more than 10ug/l is considered as red tide). This data indicates that the current density of oyster rafts does not exceed the ecological carrying capacity. As discussed under sections 4.4.4.3, 4.4.4.4, and PI2.4, the oyster farmers deal with accumulation of organic matter under the rafts by seafloor cultivation, which is designed to stir up the ocean floor to redistribute nutrients from the ocean floor more evenly in the water column. With regards to waste (including defective material from the farms, like broken lines, or sinking flotation devices), there are currently no standardized written instructions on waste management, but vessel captains and fishery coop members follow social norms regarding waste and disposal. Garbage and worn or broken gear is not discarded at sea; it is brought back to land and handed to a specialized waste collector who comes to pick up regularly. Oyster shells that remain after harvest are discarded in designated on-land areas. Based on the above, the UoA is highly unlikely to disrupt the key elements underlying ecosystem structure and function to a point where there would be a serious or irreversible harm. SG80 is met. However, the DO monitoring by Okucho FC in 2018 specifically targeting the aquaculture area under the rafts showed less than 4mg/l DO in summer, lower than the suitable standard. There is also a lack of site-specific research and long-term monitoring of potential build-up of organic material under and near the farms. The team therefore concludes that there is insufficient evidence to meet SG100.
References		Hideaki Maki, 2017; Ocean Outcomes, 2019b; Oriental Techno Co, 2018; Okayama Prefecture, 2017; Okayama JF. Okayama Oyster Aquaculture Ground Improvement Plan; Ministry of Environment, 2019; Takagi, 2016; personal comments of FC staff members at site visit
OVERALL PERFORMANCE INDICATOR SCORE:		**80**
CONDITION NUMBER (if relevant):		**-**

Evaluation Table for PI 2.5.2 – Ecosystem management strategy

[FOR CAG BIVALVE FISHERIES, TEAMS SHALL ALSO TAKE INTO ACCOUNT THE SPECIFIC IMPACTS ASSOCIATED WITH ENHANCED CAG BIVALVE FISHERIES (*FCR Annex SB 3.1.3, SB 3.1.3.1)*]

PI 2.5.2		**There are measures in place to ensure the UoA does not pose a risk of serious or irreversible harm to ecosystem structure and function.**		
Scoring Issue		SG 60	SG 80	SG 100
a	Management strategy in place			
	Guidepost	There are **measures** in place, if necessary which take into account the **potential impacts** of the fishery on key elements of the ecosystem.	There is a **partial strategy** in place, if necessary, which takes into account **available information and is expected to restrain impacts** of the UoA on the ecosystem so as to achieve the Ecosystem Outcome 80 level of performance.	There is a **strategy** that consists of a **plan**, in place which contains measures to **address all main impacts of the UoA** on the ecosystem, and at least some of these measures are in place.
	Met?	Y	Y	Y
	Justification	In the context of this performance indicator (Source: MSC FCR v2.0; Table SA8): - "Measures" are actions or tools in place that either explicitly manage impacts on the component or indirectly contribute to management of the component under assessment having been designed to manage impacts elsewhere. - A "partial strategy" represents a cohesive arrangement which may comprise one or more measures, an understanding of how it/they work to achieve an outcome and an awareness of the need to change the measures should they cease to be effective. It may not have been designed to manage the impact on that component specifically. - A "strategy" represents a cohesive and strategic arrangement which may comprise one or more measures, an understanding of how it/they work to achieve an outcome, and which should be designed to manage impact on that component specifically. A strategy needs to be appropriate to the scale, intensity and cultural context of the fishery and should contain mechanisms for the modification fishing practices in the light of the identification of unacceptable impacts. To limit the impact and determine the efficacy of suspension culture operations, by law, each FC is obliged to determine and report their Appropriate Aquaculture Allowance Quantity (AAAQ) to the prefectural government. This is considered a control measure to limit ecosystem impacts from oyster hanging culture. This is integrated in the FC's self-management plan and will be evaluated based on DO-measures under the rafts and annual benthic monitoring. This constitutes a strategy which contains measures to address all main impacts of the UoA on the ecosystem, and at least some of these measures are in place, like the determination of the AAAQ, the seafloor cultivation and DO monitoring.		

PI 2.5.2		There are measures in place to ensure the UoA does not pose a risk of serious or irreversible harm to ecosystem structure and function.		
		Japan (Okayama prefecture) monitors the water quality both with regards to ecological parameters (like nutrients, eelgrass occurrence, salinity, etc) and with regards to food quality (toxic algae and tracking of algal blooms) and through the co-management system and the data gathered, the fishery has a strategy to periodically measure and assess main impacts of the fishery on ecosystem, such as carrying capacity, and introduction of diseases. Through the licensing system (some of) the measures (like raft limits) have been applied to the oyster cultures. Therefore, SG100 is met.		
b	Management strategy evaluation			
	Guidepost	The **measures** are considered likely to work, based on plausible argument (e.g., general experience, theory or comparison with similar fisheries/ ecosystems).	There is **some objective basis for confidence** that the measures/partial strategy will work, based on some information directly about the UoA and/or the ecosystem involved	**Testing** supports **high confidence** that the partial strategy/strategy will work, based on information directly about the UoA and/or ecosystem involved
	Met?	Y	Y	N
	Justification	Objective confidence for the strategy comes from the measurement results on DO and benthic monitoring under the rafts where no serious impact is found with regards to short-term impact of the fishery to the benthic environment. Further, the maintenance of chlorophyll-a levels within normal bounds as reported through the AAAQ) provides evidence that the UoA is not depleting primary production excessively. This provides some objective basis for confidence that the partial strategy will work, and SG80 is met. However, since site-specific research and long-term monitoring of potential build-up of organic material under and near the farms has not been carried out, there is nothing that constitutes 'testing' in relation to the measures put in place for the oyster culture, so SG100 is not met.		
c	**Management strategy implementation**			
	Guidepost		There is **some evidence** that the measures/partial strategy is being **implemented successfully**.	There is clear evidence that the partial strategy/strategy is being implemented successfully and is achieving its objective as set out in scoring issue (a).
	Met?		Y	N
	Justification	Carrying capacity limits (AAAQ – implemented through a limited on the number of rafts) are reviewed, and compliance is checked by the Okayama prefectural government. The client has submitted their DO measurement records for 2018, as well as the benthic organism and substrate monitoring (Oriental Techno. Co., 2018), thus providing some evidence that the partial strategy is being implemented		

PI 2.5.2		There are measures in place to ensure the UoA does not pose a risk of serious or irreversible harm to ecosystem structure and function.
		successfully. SG80 is met. Since the monitoring is only relevant to a short time frame, long-term effects in relation to the oyster culture cannot be determined, there is no clear evidence that the strategy is achieving its objective. SG100 is not met.
References		Hideaki Maki, 2017; Ocean Outcomes, 2019b; Oriental Techno Co, 2018; Okayama Prefecture, 2017; Okayama JF. Okayama Oyster Aquaculture Ground Improvement Plan; Ministry of Environment, 2019; Takagi, 2016; personal comments of FC staff members at site visit
OVERALL PERFORMANCE INDICATOR SCORE:		**85**
CONDITION NUMBER (if relevant):		**-**

Evaluation Table for PI 2.5.3 – Ecosystem information

[FOR CAG BIVALVE FISHERIES, TEAMS SHALL ALSO TAKE INTO ACCOUNT THE SPECIFIC IMPACTS ASSOCIATED WITH ENHANCED CAG BIVALVE FISHERIES (*FCR Annex SB 3.1.3, SB 3.1.3.1)*]

PI 2.5.3		**There is adequate knowledge of the impacts of the UoA on the ecosystem.**		
Scoring Issue		SG 60	SG 80	SG 100
a	Information quality			
	Guidepost	Information is adequate to **identify** the key elements of the ecosystem.	Information is adequate to **broadly understand** the key elements of the ecosystem.	
	Met?	Y	Y	
	Justification	Information about the ecosystem services provided by the Seto Inland Sea, and basic information about the ecosystem in form of explanations about nutrient, carrying capacity, food web dynamics, biodiversity, habitats, resilience, biological regulation, genetic resources, trophic interactions and threatened species etc. are known. Water quality in Seto Inland Sea has been collected historically and there is good accumulated data to show the overall water quality. There is some broad understanding on the substrate distribution, the main sources of marine production, and species-distribution which are key elements of the ecosystem, with data collected by government agencies/research centres. Information is therefore adequate to broadly understand the key elements of the ecosystem. SG80 is met.		
b	Investigation of UoA impacts			
	Guidepost	Main impacts of the UoA on these key ecosystem elements can be inferred from existing information, but **have not been investigated** in detail.	Main impacts of the UoA on these key ecosystem elements can be inferred from existing information, and **some have been investigated in detail**.	Main interactions between the UoA and these ecosystem elements can be inferred from existing information, and **have been investigated in detail**.
	Met?	Y	Y	N
	Justification	With regards to ecosystem impacts, the main possible effect of oyster culture on rope grown culture are known. Although the fishery does not conduct research specifically targeting to measure ecosystem impacts of the fishery, there are numerous research papers (Takagi, 2016, Yamanoi et al, 2004 and 2005, Fujiya, 1990) related to oyster culture and water quality in the Seto Inland Sea for the long aquaculture history, and from similar fisheries elsewhere (like suspended cultures in Mie, Miyagi and Hokkaido) to understand the growth mechanism to stabilize the production of quality oysters. The main impacts of the fishery on certain key ecosystem elements such as water		

PI 2.5.3		There is adequate knowledge of the impacts of the UoA on the ecosystem.		
		quality and on the carrying capacity of the ecosystem (phytoplankton depletion due to filter feeding) can be inferred from existing information. Ecosystem elements closely related to juvenile oyster occurrence (chlorophyll-a abundance, water temperature) and growth (phytoplankton level), disease occurrence in relation to aquaculture in the Seto Sea are investigated well. SG80 is met. Not all main interactions between the UoA and these ecosystem elements have been investigated in detail (e.g. site-specific benthic enrichment, and the long-term impact of seafloor cultivation). SG100 is not met.		
c	Understanding of component functions			
	Guidepost		The main functions of the components (i.e., P1 target species, primary, secondary and ETP species and Habitats) in the ecosystem are **known**.	The impacts of the UoA on P1 target species, primary, secondary and ETP species and Habitats are identified and the main functions of these components in the ecosystem are **understood**.
	Met?		Y	N
	Justification	This PI can only be scored on ETP and Habitats as the other component are absent from the assessment. The fishery has good information on water quality, carrying capacity and oyster growth, and diseases associated with the oysters. The main functions of the two ETP species and the habitats in the ecosystem are known, as evident in some government documents and research papers. However, the impacts of the fishery on these are not fully identified nor understood. Therefore, SG80 is met, but SG100 is not met.		
d	Information relevance			
	Guidepost		Adequate information is available on the impacts of the UoA on these components to allow some of the main consequences for the ecosystem to be inferred.	Adequate information is available on the impacts of the UoA on the components **and elements** to allow the main consequences for the ecosystem to be inferred.
	Met?		Y	Y
	Justification	Some information is known on the components of the ecosystem (like ETP species and habitat) to infer some of the main consequences on the components (see e.g. Section 4.4.3 and 4.4.4). Sufficient information is available on UoA impacts on the components and ecosystem elements (like carrying capacity, nutrient cycles etc) to allow for inference of main consequences on the relevant ecosystems. Therefore, SG100 is met.		

PI 2.5.3		There is adequate knowledge of the impacts of the UoA on the ecosystem.		
e	Monitoring			
	Guidepost		Adequate data continue to be collected to detect any increase in risk level.	Information is adequate to support the development of strategies to manage ecosystem impacts.
	Met?		Y	N
	Justification	Adequate data on water quality with chlorophyll and plankton surveys, as well as benthic surveys (which are said to be continued) are conducted regularly to detect any increase in risk level. However, this information is not (yet) adequate to support the development of strategies to manage ecosystem impacts of the fishery, therefore SG80 is met but SG100 is not met.		
References		Hideaki Maki, 2017; Ocean Outcomes, 2019b; Oriental Techno Co, 2018; Okayama prefecture. 2016; Okayama Prefecture, 2017; Okayama JF. Okayama Oyster Aquaculture Ground Improvement Plan; Ministry of Environment, Ocean Rehabilitation project to realize richness of ocean; Ministry of Environment, 2019; Ministry of Land and Transportation, 2018; Takagi, 2016., Yamanoi et al, 2004 and 2005, Fujiya, 1990		
OVERALL PERFORMANCE INDICATOR SCORE:				**85**
CONDITION NUMBER (if relevant):				**-**

Principle 3 scoring rationales

[WHERE P1 IS NOT SCORED, TEAMS SHALL FOCUS P3 SCORING ON WHETHER OR NOT THE APPROPRIATE AND EFFECTIVE LEGAL AND/OR CUSTOMARY FRAMEWORK IS CAPABLE OF DELIVERING SUSTAINABLE FISHERIES IN ACCORDANCE WITH P2 PIs (*FCR Annex SB 4.1.2*). IN THIS SITUATION, TEAMS MAY REMOVE REFERENCES TO P1 IN THE EVALUATION TABLE BELOW]

Evaluation Table for PI 3.1.1 – Legal and/or customary framework

PI 3.1.1		**The management system exists within an appropriate legal and/or customary framework which ensures that it:** • **Is capable of delivering sustainability in the UoA(s); and** • **Observes the legal rights created explicitly or established by custom of people dependent on fishing for food or livelihood; and** • **Incorporates an appropriate dispute resolution framework.**		
Scoring Issue		SG 60	SG 80	SG 100
a	Compatibility of laws or standards with effective management			
	Guidepost	There is an effective national legal system **and a framework for cooperation** with other parties, where necessary, to deliver management outcomes consistent with MSC Principles 1 and 2	There is an effective national legal system and **organised and effective cooperation** with other parties, where necessary, to deliver management outcomes consistent with MSC Principles 1 and 2.	There is an effective national legal system and **binding procedures governing cooperation with other parties** which delivers management outcomes consistent with MSC Principles 1 and 2.
	Met?	Y	Y	Y
	Justification	Chapter 1, article 2 of the Fisheries Basic Act (2001), overarching framework for the management of fisheries in Japan requires conservation and management of fisheries resources to ensure its sustainable use as a component of marine ecosystem, following the recommendations of UN Convention on the Law of the Sea (UNCLOS). It also states national government responsibility to promote aquaculture and artificial propagation of fisheries resources in a sustainable fashion, with consideration to the balance with environment. Based on article 16 of the Act, the Fisheries Basic Plan (2012) sets a policy on aquaculture to establish overall improvement plan for low-impact sustainable aquaculture and requires the Fishery Cooperatives to work according to their own fisheries ground improvement plan (FGIP). The management includes numerical targets, like the Appropriate Aquaculture Allowance Quantity (AAAQ). The prefectural government is responsible for guiding and approving the FGIP, which should be established by Fisheries Cooperative(s) or aquaculture operator(s) as decreed by the Sustainable Aquaculture Production Law. The Law of Conservation and Management of Marine Living Resources aims to protect the surrounding ecosystem and habitat. These are generally in accordance with MSC Principle 2.		

		The Okayama prefectural fisheries department, prefectural fisheries technology centres, the Okayama Fisheries Cooperative Association (FCA) and the Okucho Fisheries Cooperative (FC) work in collaboration to implement management measures as set in the laws named above and has a systematic management and monitoring mechanism in general. Based on the above, SG100 is met.		
b	Resolution of disputes			
	Guidepost	The management system incorporates or is subject by law to a **mechanism** for the resolution of legal disputes arising within the system.	The management system incorporates or is subject by law to a **transparent mechanism** for the resolution of legal disputes which is **considered to be effective** in dealing with most issues and that is appropriate to the context of the UoA.	The management system incorporates or is subject by law to a **transparent mechanism** for the resolution of legal disputes that is appropriate to the context of the fishery and has been **tested and proven to be effective**.
	Met?	Y	Y	N
	Justification	Fisheries-coordination and meetings are well developed under the legal framework of MAFF, and resolution of legal disputes is dealt with in the consultation meetings, such as the Fisheries Policy Discussion Committee meetings. The committee minutes are openly available on the Fisheries Agency's website. The agenda and minutes of the Fisheries Policy Discussion Committee include decisions or revisions of basic policy to ensure sustainable aquaculture production and the MAFF is required to consult the coastal fishery promotion Committee. However, some researchers have pointed out that basic policies promoted by the Cabinet are sometimes determined by internal discussion of cabinet members (i.e. discussions in the Policy Reform Committee) and there is a lack of transparency in how the opinions raised by the Policy Discussion Council have been considered in the decision making (Sasaguchi, 2018). In general, with regards to the aquaculture management policy, the management system incorporates transparent mechanism for the scale and context of this UoA. However, the appropriateness is not tested nor proven. Therefore, SG80 is met but SG100 is not met.		
c	Respect for rights			
	Guidepost	The management system has a mechanism to **generally respect** the legal rights created explicitly or established by custom of people dependent on fishing for food or livelihood in a manner consistent with the objectives of MSC Principles 1 and 2.	The management system has a mechanism to **observe** the legal rights created explicitly or established by custom of people dependent on fishing for food or livelihood in a manner consistent with the objectives of MSC Principles 1 and 2.	The management system has a mechanism to **formally commit** to the legal rights created explicitly or established by custom of people dependent on fishing for food and livelihood in a manner consistent with the objectives of MSC Principles 1 and 2.
	Met?	Y	Y	Y

	Justification	The provision for Common Fishery Rights with the 1949 Fisheries Law demonstrates a clear commitment to traditional fisheries. The Fisheries Cooperative Law (1948) ensures the system of support for coastal fishermen by organizing socio-economic functions to promote their rights and the development of fisheries that contribute to the national economy. All fishermen with license in Japan needs to be a member of a FC under the law. There is a formal commitment and mechanism of support for people dependent on fishing for food and livelihood. Although its current implementation status is dependent on prefecture and FCs (for this fishery, it is implemented through the FGIP), the JFA has a renewed policy in place since 2011 to promote implementation of resources management at the FC fisher level. This is achieved by the establishment of "Guideline for creating Resources Management Policy and Resources Management Plan" (FA 2011), in which the prefecture is required to develop resources management policy for each fisheries species or fishing method under the national policy and guideline consistent with the objectives of MSC's P1 and P2. Further each of the Fisheries Cooperatives are required to develop their own Fishery Management Plan and measures for each fishery consistent with the prefectural policy. The resources management plan / fishery ground improvement plan created by fishermen (FC) needs to be annually submitted and evaluated to the prefectural resource management committee of the prefecture for approval. This mechanism ensures that the management system has the mechanism to formally commit to the legal rights created by customary fishermen in a manner consistent with the objectives of MSC Principles 1 and 2. Therefore SG100 is met
References		Fisheries Basic Act (2001), FA, 2016; Fisheries Cooperative Law, 1948; Sasaguchi, 2018, Fisheries Law (1949), FA 2011.
OVERALL PERFORMANCE INDICATOR SCORE:		**95**
CONDITION NUMBER (if relevant):		**-**

Evaluation Table for PI 3.1.2 – Consultation, roles and responsibilities

PI 3.1.2		The management system has effective consultation processes that are open to interested and affected parties. The roles and responsibilities of organisations and individuals who are involved in the management process are clear and understood by all relevant parties		
Scoring Issue		SG 60	SG 80	SG 100
a	Roles and responsibilities			
	Guidepost	Organisations and individuals involved in the management process have been identified. Functions, roles and responsibilities are **generally understood**.	Organisations and individuals involved in the management process have been identified. Functions, roles and responsibilities are **explicitly defined and well understood for key areas** of responsibility and interaction.	Organisations and individuals involved in the management process have been identified. Functions, roles and responsibilities are **explicitly defined and well understood for all areas** of responsibility and interaction.
	Met?	Y	Y	Y
	Justification	The organisational function and roles are clearly defined for both MAFF, the Okayama prefecture, and the Fisheries Cooperative Associations in legal or official documents (see below references), and in the statutes of the cooperative. These roles and functions are explicitly defined in documents and well understood for all areas of responsibility and interaction. The CAB interviewed key individuals representing each government and research centres relevant to their fishery at site visit. They have explained their roles and functions explicitly in interviews, which was consistent with the government documents and at a sufficient level relevant for the assessment. SG100 is met.		
b	Consultation processes			
	Guidepost	The management system includes consultation processes that **obtain relevant information** from the main affected parties, including local knowledge, to inform the management system.	The management system includes consultation processes that **regularly seek and accept** relevant information, including local knowledge. The management system demonstrates consideration of the information obtained.	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**.
	Met?	Y	Y	N

	Justification	There is a hierarchical and collaborative consultation-mechanism and process between prefectural guidance and the fisheries management implemented by FC. The FC regularly seeks and accepts information with regards to its FGIP, environmental data (e.g. nutrient monitoring), and disease control from the prefectural government. Various committees such as the Fisheries' Rights Committee and the Prefectural fisheries technical centres also lend support with scientific and technical aspects and provide scientific information. Within Okucho FC, the decision making-process appears quite transparent, but for some areas of the prefectural consultation process it was not clear how the management system demonstrates how information is used or not used, therefore SG80 is met but SG100 is not met.		
c	Participation			
	Guidepost		The consultation process **provides opportunity** for all interested and affected parties to be involved.	The consultation process provides **opportunity and encouragement** for all interested and affected parties to be involved, and **facilitates** their effective engagement.
	Met?		Y	N
	Justification	There are a number of organised committees to discuss important areas of management within the prefecture and FCAs, and they are open to provide comments on questions posed by fishers or stakeholders (NGOs). Within Okucho FC itself, there are several committees such as the All Oyster Aquaculture Producers Council, the Oyster Basic Issue Meetings and the Fishery-Rights Management Council. Each member of the FC has an opportunity to bring their issue before the council meeting. Although the FC does not proactively invite the opinions of all interested and affected parties, from a marketing perspective, the FC is open for social promotion and collaboration and is generally open to stakeholder-opinions. The consultation process provides opportunity, but not necessarily encouragement, hence SG80 is met but SG100 is not met.		
References		Okucho Fisheries Cooperative Article of Incorporation, Fisheries Coordination Rule of Okayama, Organization and Committees organogram of Okucho FC, MAFF Fisheries Law (1949), Fisheries Basic Act (2001), Okayama Fisheries Ground Improvement Plan, Okayama prefectural endorsement letter for Okayama FGIP, Okucho Fisheries Cooperative Association Website, Okayama prefecture Fisheries Department website.		
OVERALL PERFORMANCE INDICATOR SCORE:				**85**
CONDITION NUMBER (if relevant):				**-**

Evaluation Table for PI 3.1.3 – Long term objectives

PI 3.1.3		The management policy has clear long-term objectives to guide decision-making that are consistent with MSC fisheries standard, and incorporates the precautionary approach.		
Scoring Issue		SG 60	SG 80	SG 100
a	Objectives			
	Guidepost	Long-term objectives to guide decision-making, consistent with the MSC fisheries standard and the precautionary approach, are **implicit** within management policy.	Clear long-term objectives that guide decision-making, consistent with MSC fisheries standard and the precautionary approach are **explicit** within management policy.	Clear long-term objectives that guide decision-making, consistent with MSC fisheries standard and the precautionary approach, are **explicit** within **and required by** management policy.
	Met?	Y	Y	N
	Justification	Under the Sustainable Aquaculture Production Law article 4, the FC needs to create an Aquaculture Ground Improvement Plan, which needs to be approved by the prefectural government. The law requires the FC to set carrying capacity limits to achieve sustainable aquaculture, namely AAAQ, and other environmental goals, including the maintenance of habitat and genetic biodiversity when translocation occurs (not applicable to the fishery under assessment). Japan accepted the 1992 UN Convention on Biological Diversity. This formally commits Japan to the Precautionary Principle. Most recently, Japan's Basic Act on Biodiversity (No. 58 of June 6, 2008) clearly states the legal objective of conservation and sustainable use of its biodiversity. Okayama prefecture has produced the Okayama Fishery Promotion Plan 2017 with some numerical targets for eelgrass bed recovery and fishery production increase. The Okayama Plan for Environmental Conservation for Seto Inland Sea has also set long-term goals for environmental recovery and maintenance. The FA's declaration (revised in 2014) "Implementation guide of Sustainable Aquaculture Production Law", recommends bivalve aquaculture operators to conduct monitoring on water temperature, salinity, DO, COD, nutrients, chlorophyll, total sulfide (TS), and benthic organisms. It also requires setting AAAQ as the maximum sustainable aquaculture quantity (carrying capacity) as calculated and reviewed by the prefectural fisheries technical centres. These long-term objectives that guide decision-making are consistent with the MSC fisheries standard, and the precautionary approach is explicit within the high-level management policy up to the prefectural level. SG80 is met. However, it is not clear if it is required for all objectives. For example, the goal to maintain biodiversity seems limited to only freshwater and tidal flat areas, lacking management for ocean and fisheries species, and some FGIPs do not cover all guidance on setting their objectives, indicating that applying the precautionary approach is not fully required by management policy. SG100 is not met.		
References		Sustainable Aquaculture Production Law (1999), The Implementation Guide for sustainable Aquaculture production law (2014), Basic Act on Biodiversity (2008), Okayama Fishery Promotion Plan 2017, The Okayama Plan for Environmental Conservation for Seto Inland Sea.		
OVERALL PERFORMANCE INDICATOR SCORE:				**80**
CONDITION NUMBER (if relevant):				**-**

Evaluation Table for PI 3.2.1 Fishery-specific objectives

PI 3.2.1		**The fishery-specific management system has clear, specific objectives designed to achieve the outcomes expressed by MSC's Principles 1 and 2.**		
Scoring Issue		SG 60	SG 80	SG 100
a	Objectives			
	Guidepost	**Objectives**, which are broadly consistent with achieving the outcomes expressed by MSC's Principles 1 and 2, are **implicit** within the fishery-specific management system.	**Short and long-term objectives**, which are consistent with achieving the outcomes expressed by MSC's Principles 1 and 2, are **explicit** within the fishery-specific management system.	**Well defined and measurable short and long-term objectives**, which are demonstrably consistent with achieving the outcomes expressed by MSC's Principles 1 and 2, are explicit within the fishery-specific management system.
	Met?	Y	Y	N
	Justification	The Fisheries Basic Plan (2012) sets a policy on aquaculture to establish overall improvement plan for low-impact sustainable aquaculture and requires the Fishery Cooperatives to work according to their own fisheries ground improvement plan (FGIP). The management includes numerical targets, like the Appropriate Aquaculture Allowance Quantity (AAAQ). The prefectural government is responsible for guiding and approving the FGIP, which should be established by Fisheries Cooperative(s) or aquaculture operator(s) as decreed by the Sustainable Aquaculture Production Law. Okayama prefecture has produced the Okayama Fishery Promotion Plan 2017 with some numerical targets for eelgrass bed recovery and fishery production increase. The Okayama Plan for Environmental Conservation for Seto Inland Sea has also set long-term goals for environmental recovery and maintenance. The Law of Conservation and Management of Marine Living Resources (1996) aims to protect the surrounding ecosystem and habitat. The law named above are generally in accordance with MSC Principle 2, and contain both short and long-term objectives. SG80 is met. Based on the prefectural legislation, the Okucho FC has established its own FGIP with objectives to maintain carrying capacity (number of rafts as AAAQ), measurement of DO and of benthic organisms under rafts, and objectives on ETP species monitoring. However, the rational and numerical targets of the objectives set that should be used to measure the results of the monitoring do not seem to be demonstrably consistent with Principle 2 (biodiversity, ecosystem, ETP species), nor does the FGIP contain well defined and measurable short and long-term objectives. SG100 is therefore not met.		
References		All Okayama FC FGIP (effective until 3/31/2019), Okucho FGIP; The Okayama Plan for Environmental Conservation for Seto Inland Sea, The Law of Conservation and Management of Marine Living Resources (1996)		
OVERALL PERFORMANCE INDICATOR SCORE:				**80**
CONDITION NUMBER (if relevant):				**-**

Evaluation Table for PI 3.2.2 – Decision-making processes

PI 3.2.2		**The fishery-specific management system includes effective decision-making processes that result in measures and strategies to achieve the objectives, and has an appropriate approach to actual disputes in the fishery.**		
Scoring Issue		SG 60	SG 80	SG 100
a	Decision-making processes			
	Guidepost	There are some decision-making processes in place that result in measures and strategies to achieve the fishery-specific objectives.	There are **established** decision-making processes that result in measures and strategies to achieve the fishery-specific objectives.	
	Met?	Y	Y	
	Justification	The fishery-specific objectives, which are explicit in Okucho FC's FGIP, are created, amended and implemented by the Okayama Oyster market strategy council which holds annual meetings (more often id needed) with government officers and academics to review and confirm the contents and progress. If any environmental concerns or monitoring result show the need to amend the AAAQ or maximum allowed rafts numbers these will be discussed here. The FC staff engage in the monitoring activities, and work in cooperation with the Fisheries Research Technical Centre of Okayama. Okucho FC's Fishery Right Management Council also holds discussions with representing members from each district and make decisions on reduction or renewal of licenses. The maximum number of rafts admitted are set in the FC's Fishery Right-to-Use Rule with the accompanying license to allocate each demarcated aquaculture area. The Okayama prefecture, fisheries cooperative, and oyster council within the cooperative have regularly organized decision making and approval and evaluation system to ensure implementation of FGIP, which is developed under national and prefectural government guidance consistent with MSC principles 1 and 2. The detail of the decision making process of the resources management plan and voluntary management rules are also described in section 4.5.3.1. of the report. SG80 is met.		
b	Responsiveness of decision-making processes			
	Guidepost	Decision-making processes respond to **serious issues** identified in relevant research, monitoring, evaluation and consultation, in a transparent, timely and adaptive manner and take some account of the wider implications of decisions.	Decision-making processes respond to **serious and other important issues** identified in relevant research, monitoring, evaluation and consultation, in a transparent, timely and adaptive manner and take account of the wider implications of decisions.	Decision-making processes respond to **all issues** identified in relevant research, monitoring, evaluation and consultation, in a transparent, timely and adaptive manner and take account of the wider implications of decisions.
	Met?	Y	Y	N

	Justification	Okayama FCA and Okucho FC, in consultation with relevant research institutes or under prefectural guidance, respond to serious or important issues such as disease outbreak, seed stock-issues and plankton monitoring to take measures in a timely and adaptive manner. The process of decision-making is pre-determined and generally transparent. It takes account of the wider implications when measures are discussed. SG80 is met. However, the process does not seem to respond to all issues identified in research and monitoring, especially for ecosystem functions and interaction with other species, therefore SG100 is not met.		
c	Use of precautionary approach			
	Guidepost		Decision-making processes use the precautionary approach and are based on best available information.	
	Met?		Y	
	Justification	As said above, Okayama FCA and Okucho FC, in consultation with relevant research institutes or under prefectural guidance, respond to serious or important issues. The process of decision-making takes account of the wider implications when measures are discussed, which means that the Fisheries Committee looks at 'what if' situations before coming to a final verdict, thus applying the precautionary approach, which is also explicit within the high-level management policy up to the prefectural level. This guidepost is met. For example, to gain insight into the long-term effect of the sea-floor cultivation practice, which is recommended by prefecture and national government, FC Okucho has decided to conduct their own experimental practice so that they can stop if any adverse impact is found. To this end, the FC also monitors benthic impact (as described in section 4.4.4.4 and under PI 2.4.1a) to compare the before- and after-cultivation impact on the habitat. This is to build a long-term dataset before making determination of whether conducting seafloor cultivation hinders ecosystem function or is beneficial to their environment.		
d	Accountability and transparency of management system and decision-making process			
	Guidepost	Some information on the fishery's performance and management action is generally available on request to stakeholders.	**Information on the fishery's performance and management action is available on request**, and explanations are provided for any actions or lack of action associated with findings and relevant recommendations emerging from research, monitoring, evaluation and review activity.	Formal reporting to all interested stakeholders **provides comprehensive information on the fishery's performance and management actions** and describes how the management system responded to findings and relevant recommendations emerging from research, monitoring, evaluation and review activity.
	Met?	Y	Y	N
	Justification	The client fishery has provided habitat monitoring data with DO and biodiversity research upon request, presence of introduced species regulation and its implementation by government, raft number organization and management strategies, avoidance measures research for increasing rays in		

		the region, as shown in the report. Requested information on the fishery performance and findings and recommendations emerging from research and monitoring were presented when available and explanations were provided if the data is not available. SG80 is met. This information is not provided comprehensively or prepared in the form of reports for stakeholders. SG100 is not met.		
e	Approach to disputes			
	Guidepost	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 or fishery is attempting to comply in a timely fashion with judicial decisions arising from any legal challenges.	The management system or fishery acts proactively to avoid legal disputes or rapidly implements judicial decisions arising from legal challenges.
	Met?	Y	Y	Y
	Justification	The Okayama FCA and Okucho FC have their own mechanisms to discuss issues proactively through various committees' general meetings and ad-hoc, need-based meetings to proactively avoid the development of issues into disputes. If legal decisions are necessary the fishermen or FC can take the issue to the court, though usually internal discussions are sufficient to avoid legal disputes. The internal system is considered to work effectively within the FC, proven with a long history of fishery management with little legal challenges so far. SG100 is met.		
References		Sustainable Aquaculture Production Law, Okayama Fisheries Coordination Rule, Okucho FC's Fishery Right Management Council meeting minutes, Okayama FGIP, Okucho FGIP (in draft), interview with fishermen of Okucho, Okayama Fisheries Technical center staff, Okucho FC president, Okayama prefecture fisheries department staff.		
OVERALL PERFORMANCE INDICATOR SCORE:				**85**
CONDITION NUMBER (if relevant):				**-**

Evaluation Table for PI 3.2.3 – Compliance and enforcement

PI 3.2.3		Monitoring, control and surveillance mechanisms ensure the management measures in the fishery are enforced and complied with.		
Scoring Issue		SG 60	SG 80	SG 100
a	MCS implementation			
	Guidepost	Monitoring, control and surveillance **mechanisms** exist, and are implemented in the fishery and there is a reasonable expectation that they are effective.	A monitoring, control and surveillance **system** has been implemented in the fishery and has demonstrated an ability to enforce relevant management measures, strategies and/or rules.	A **comprehensive** monitoring, control and surveillance system has been implemented in the fishery and has demonstrated a consistent ability to enforce relevant management measures, strategies and/or rules.
	Met?	Y	Y	N
	Justification	Okucho FC has a well-established peer-monitoring and enforcement mechanism, with designated committees established to report and discuss compliance issues with rules and regulations set within the FC. As a result, no major monitoring infraction issues seem to have arisen in the recent past. The prefecture is also providing guidance, in collaboration with FA and the Japan Coast Guard, and police stations. However, the assessment team has not been provided with any consolidated strategic documents that demonstrate consistent monitoring and surveillance functions in an organized manner, therefore SG80 is met but SG100 is not met.		
b	Sanctions			
	Guidepost	Sanctions to deal with non-compliance exist and there is some evidence that they are applied.	Sanctions to deal with non-compliance exist, **are consistently applied** and thought to provide effective deterrence.	Sanctions to deal with non-compliance exist, are consistently applied and **demonstrably** provide effective deterrence.
	Met?	Y	Y	N
	Justification	Sanctions are clearly prescribed in the cooperative rules and prefectural policy, in accordance to the Fisheries Law (1949). Okucho FC has a well-established peer-monitoring and enforcement mechanism, with a compliance committee established to report and discuss issues when members' non-compliance is found. Thus so far the issues were solved within the FC and no legal sanction has been applied in the past 5 years. SG80 is met because the current system seems to work effectively but without demonstration and lack of recorded evidence SG100 is not met.		
c	Compliance			

	Guidepost	Fishers are **generally thought** to comply with the management system for the fishery under assessment, including, when required, providing information of importance to the effective management of the fishery.	**Some evidence exists** to demonstrate fishers comply with the management system under assessment, including, when required, providing information of importance to the effective management of the fishery.	There is a **high degree of confidence** that fishers comply with the management system under assessment, including, providing information of importance to the effective management of the fishery.
	Met?	Y	Y	Y
	Justification	The organisation and placement of the aquaculture rafts in the designated areas and in the prescribed manner are checked once a year by aerial inspections. No infractions have been recorded. Moreover, the way the rafts are placed within the designated also means that rafts are constantly checked by peers. Members needs to comply with FC rules to be able to carry out their work. Therefore, there is a high degree of confidence that fishers comply with the management system. Members provide important information for management to be effective for their own benefits under this system. SG100 is met.		
d	Systematic non-compliance			
	Guidepost		There is no evidence of systematic non-compliance.	
	Met?		Y	
	Justification	There is no reported systematic non-compliance for this fishery and no incentive for non-compliance is thought to exist in the current situation. Therefore, SG80 is met.		
References		Okayama Fisheries Coordination Rule, Okucho FC's Fishery Right Management Council meeting minutes, Okayama FGIP, Okucho FGIP (in draft), interview with fishermen of Okucho, Okayama Fisheries Technical center staff, Okucho FC president, Okayama prefecture fisheries department staff. Raft location decision meeting minutes, raft location tables, compliance monitoring check sheet.		
OVERALL PERFORMANCE INDICATOR SCORE:				**85**
CONDITION NUMBER (if relevant):				**-**

Evaluation Table for PI 3.2.4 – Monitoring and management performance evaluation

PI 3.2.4		**There is a system of monitoring and evaluating the performance of the fishery-specific management system against its objectives. There is effective and timely review of the fishery-specific management system.**		
Scoring Issue		SG 60	SG 80	SG 100
a	Evaluation coverage			
	Guidepost	There are mechanisms in place to evaluate **some** parts of the fishery-specific management system.	There are mechanisms in place to evaluate **key** parts of the fishery-specific management system	There are mechanisms in place to evaluate **all** parts of the fishery-specific management system.
	Met?	Y	Y	N
	Justification	The prefectural government performs regular evaluations of the FC administration records (documents and reports). Based on the information provided, the government determines if the aquaculture operation can be continued. The prefectural fisheries technical centres also provide regular evaluation of environmental data jointly collected or provided by the FC. Not all parts of the fishery-specific management system are evaluated, such as contribution to the overall environmental policy of the Seto Inland Sea, therefore SG80 is met but SG100 is not met.		
b	Internal and/or external review			
	Guidepost	The fishery-specific management system is subject to **occasional internal** review.	The fishery-specific management system is subject to **regular internal** and **occasional external** review.	The fishery-specific management system is subject to **regular internal** and **external** review.
	Met?	Y	Y	N
	Justification	Okucho FC receives annual accounting audits by the Prefectural Fisheries Cooperative, and this record verification operation is considered an external audit. The content of the fisheries management system, such as the management measures and its effectiveness, are regularly reviewed internally through committee meetings and council discussions, however it rarely receives external reviews. SG80 is met but SG100 is not met.		
References		Okayama Fisheries Coordination Rule, Okayama FGIP, Okucho FGIP (in draft), Okucho FC meeting minutes, Interview with Okucho FC president and Okayama prefecture fisheries department staff.		
OVERALL PERFORMANCE INDICATOR SCORE:				**80**
CONDITION NUMBER (if relevant):				**-**

Appendix 2 Conditions

Condition 1

Performance Indicator	PI 2.3.2. The UoA has in place precautionary management strategies designed to: • meet national and international requirements; • ensure the UoA does not hinder recovery of ETP species. Also, the UoA regularly reviews and implements measures, as appropriate, to minimise the mortality of ETP species. PI 2.3.2. e. There is a **regular** review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of ETP species and they are implemented as appropriate.
Score	Overall score 75, PI 2.3.2 e scored at SG60
Rationale	Based on local knowledge, and (informal) observations by fishermen, information on interaction (or lack thereof) of ETP species with the fishery is known. Best-practices are discussed by the Fisheries Committee (a committee within the FC). Given that there are currently no indications of interactions with ETP species, the team has considered this to constitute a 'review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of ETP species', and SG60 is met. Okucho FC has recently revised the FGIP to include ETP monitoring in its plan, and this may lead to a regular review of the potential effectiveness and practicality of alternative measures to minimize UoA-related mortality, including clarification whether any additional measures are necessary. Currently the FC does not have such regular review opportunities for ETP species, and SG80 is not met.
Condition	Ensure that there is a regular review of the potential effectiveness and practicality of the way the fishery is conducted with the objective to monitor, manage and reduce or eliminate impacts on ETP species, explicitly referring to ETP species identified during the assessment. Ensure that based on this regular review alternative measures are implemented as appropriate.
Milestones	**Year 1**: Implement ETP monitoring as per the FGIP, and describe how the ETP monitoring will lead to a regular review of the potential effectiveness and practicality of alternative measures to minimize UoA-related mortality (Score: 60) **Year 2-3**: Conduct ETP monitoring and by the end of the 3rd year provide evidence of the monitoring results being used in the evaluation of the fishing practices and interaction with ETP species (SG80 is met).
Client action plan	Okucho FC members will implement ongoing monitoring of incidental encounters and catches of ETP species, as explicitly described in their Fishery Ground Improvement Plan (FGIP). When ETP species are observed during

	fishing operations, they will record the location, time, date, and condition of the animal. They will share the recorded observations with the Okayama prefectural government and fishery coop members, and with environmental organizations upon request. Any incidentally encountered ETP species will not be harmed and will be released as necessary. Okucho FC will consult with the Okayama prefectural government and the Satoumi Research Institute to obtain scientific advice scientists regarding data collection and analysis. They will do so at least once during Year 1 and once during Years 2 and 3. If monitoring results suggest that measures for minimizing fishing mortality of ETP species are needed, they will develop and implement such measures, and share the information with the prefectural government. They Okucho FC will periodically review the measures, including consideration of alternative measures, on an annual basis. The client has reached out to the Fisheries Division of the Okayama prefectural government (岡山県の水産課), which has some scientific capacity, to explain the ETP issue and request their support. As needed, they will work with the Fisheries Division to identify the appropriate entity to review their ETP monitoring data, if not the division itself. Review of collected data will take place at the annual Okucho FGIP meetings, which is attended by government officials. There is also an FGIP implementation committee (計画推進委員会) that will help ensure that fishers are collecting data.
Consultation on condition	Fulfilment of this condition depends mainly on the client himself, as we need to ensure sufficient data collection from the UoA. However, the client will consult with scientists as needed, to ensure data being collected is useful and representative of the fishery.

Condition 2

Performance Indicator	PI 2.3.3. b **Information adequacy for management strategy** Information is adequate to measure trends and support a **strategy** to manage impacts on ETP species.
Score	Overall score 70, PI 2.3.3 b scored at SG60
Rationale	Based on the nature of the fishery, and the lack of interaction with ETP species, information is deemed adequate to manage the impacts on ETP species. However, due to the current lack of monitoring, trends cannot be determined. Nevertheless, fishery related mortality can be estimated to be negligible: While entanglement in aquaculture gear is not unknown, cases are extremely rare, and where cases have occurred, they have generally occurred in mussel spat collectors or buoy lines connected to them (Young, 2015; NOAA, 2017). Where mussel spat collectors generally consist of long lines that move with the

	current, the rope grown oyster cultures use heavy lines that are constantly under tension, due to the scallop shells weighing them down. The lines on a raft are located closely together, which makes it unlikely (near impossible) for porpoise or turtles to swim between the lines and get entangled. There are no reported incidents of entanglement in the fishing gear, as discussed at the site visit. The information available is adequate to broadly understand the level of impact, and support measures (if they are necessary) to manage impacts on ETP species. SG60 is met. Since trends cannot be determined, SG80 is not met.
Condition	The fishery should engage and assist in data-collection and research to obtain information to adequately measure trends and further support a strategy to manage impacts on ETP species. Liaise with scientists to ensure data gathered is relevant, robust and useful to include (for example) date and area of capture, numbers, length or weight as well as condition on release. Collate & analyse all data generated in relation to ETP on an annual basis for all certified members of the Okucho FC and, if applicable, show how the data is used in the management of impact on ETP species.
Milestones	**Year 1**: Implement ETP monitoring as per the FGIP (Score: 60) **Year 2-3**: Conduct ETP monitoring and by the end of the 3rd year provide evidence of the monitoring results being analysed in relation to ETP species (SG80 is met).
Client action plan	As described for the Condition 1 action, Okucho FC members will implement ongoing monitoring of incidental encounters and catches of ETP species, as described in their FGIP. When ETP species are observed during fishing operations, they will record the location, time, date, and condition of the animal. They will periodically consult with the Okayama prefectural government and the Satoumi Research Institute scientists regarding data collection and analysis and share the results with their members and other stakeholders upon request. If measures are developed to minimize fishery mortality of ETP species, they will use the monitoring data to evaluate effectiveness of those measures. The client has reached out to the Fisheries Division of the Okayama prefectural government (岡山県の水産課), which has some scientific capacity, to explain the ETP issue and request their support. As needed, they will work with the Fisheries Division to identify the appropriate entity to review their ETP monitoring data, if not the division itself. Review of collected data will take place at the annual Okucho FGIP meetings, which is attended by government officials. There is also an FGIP implementation committee (計画推進委員会) that will help ensure that fishers are collecting data.
Consultation on condition	Fulfilment of this condition depends mainly on the client himself, as we need to ensure sufficient data collection from the UoA. However, the client will

	consult with scientists as needed to ensure data being collected is useful and representative of the fishery.

Appendix 3 Peer Review Reports

Peer reviewer 1

Summary of Peer Reviewer Opinion

Is the scoring of the fishery consistent with the MSC standard, and clearly based on the evidence presented in the assessment report?	Yes	The scoring is generally consistent with the MSC standard and based on the evidence presented. However The rationale and scoring for some SI,s under P3 have some inconsistencies that may be easily remedied with clearer or revised justification	Thank you. Inconsistencies in P3 have been addressed (see PIs below).
Are the condition(s) raised appropriately written to achieve the SG80 outcome within the specified timeframe? [Reference: FCP v2.1, 7.18.1 and sub-clauses]	No	Both conditions, as written, are more like a client action plan without a time line nor are they "following the narrative of the SG80.. The guidance for the condition is given in FCPv2.01 G7.18.Table G9 eg by the 4th annual surveillance	Thank you. The timeline is addressed in the milestones accompanying the condition (e.g. see condition 2: milestone Year 1: Implement ETP monitoring as per the FGIP (Score: 60)). We have also followed the narrative of SG80, but provided specification where possible (without providing advice), given that 'alternative measures' as used in SIe are defined in our scoring as 'the fishing practices'. For a comparison see e.g. PI 2.3.2. e: 'There is a regular review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of ETP species and they are implemented as appropriate.' which has become the condition: 'Ensure that there is a regular review of the potential effectiveness and practicality of the way the fishery is conducted with the objective to monitor, manage and reduce or eliminate impacts on ETP species, explicitly referring to ETP species identified during the assessment. Ensure that based on this regular review alternative measures are implemented as appropriate.'
Is the client action plan clear and sufficient to close the conditions raised?	Yes	If followed they will meet the SG 80 in the timeframe.	no response required

[Reference FCR v2.0, 7.11.2-7.11.3 and sub-clauses]			
Enhanced fisheries only: Does the report clearly evaluate any additional impacts that might arise from enhancement activities?	Yes	The report clearly outlines the enhanced fishery operation and justifies P1, P2.1 and P2 2.2 not needing to be scored	no response required
Optional: General Comments on the Peer Review Draft Report (including comments on the adequacy of the background information if necessary)	N/A	This is a well written and well structured report with good descriptions of the fishing operation and its impacts. Good explanations and references are given for Governance and management. Having a Japanese member on the team would have been a great asset	Thank you. Ms Tamura is the Japanese team member for this fishery, this has been made more explicit in section 3 'Authorship and Peer Reviewers' .
Optional: General Comments on the Peer Review Draft Report (including comments on the adequacy of the background information if necessary)	N/A	MSC document version is confusing. In section 5.3 it says the assessment was conducted in accordance with MSC FS v 2.01. However section 4 of the report quotes and uses FCR v 2.	This has been amended. The announcement for this fishery took place before 28th February 2019, and has been assessed using FCR v2.0

Performance Indicator	Has all available relevant information 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 Please support your answers by referring to specific scoring issues and any relevant documentation where possible. Please attach additional pages if necessary. Note: Justification to support your answers is only required where answers given are 'No'.	CAB Response	CAB Response Code
1.1.1	Yes	Yes	NA	FS v 2.01 SB2.1.4CAG enhanced fishery with no translocations and no negative impact on parent stock. The team chose not to score P1 which is appropriate.	no response required	
1.1.2	Yes	Yes	NA	As above	no response required	
1.1.3	Yes	Yes	NA	As above	no response required	
1.2.1	Yes	Yes	NA	As above	no response required	
1.2.2	Yes	Yes	NA	As above	no response required	
1.2.3	Yes	Yes	NA	As above	no response required	
1.2.4	Yes	Yes	NA	As above	no response required	
1.2.5	Yes	Yes	NA	As above	no response required	

Performance Indicator	Has all available relevant information 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 Please support your answers by referring to specific scoring issues and any relevant documentation where possible. Please attach additional pages if necessary. Note: Justification to support your answers is only required where answers given are 'No'.	CAB Response	CAB Response Code
1.2.6	Yes	Yes	NA	As above	no response required	
2.1.1	Yes	Yes	NA	FS v 2.01 SB3.1.1Enhanced CAG based solely on spat collection shall not be scored for Primary and secondary species.	no response required	
2.1.2	Yes	Yes	NA	As above	no response required	
2.1.3	Yes	Yes	NA	As above	no response required	
2.2.1	Yes	Yes	NA	As above	no response required	
2.2.2	Yes	Yes	NA	As above	no response required	
2.2.3	Yes	Yes	NA	As above	no response required	
2.3.1	Yes	Yes	NA	Agreed as N/A no limits set for the identified ETP species	no response required	

Performance Indicator	Has all available relevant information 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 Please support your answers by referring to specific scoring issues and any relevant documentation where possible. Please attach additional pages if necessary. Note: Justification to support your answers is only required where answers given are 'No'.	CAB Response	CAB Response Code
2.3.2	Yes	Yes	No	Scoring agreed. The condition needs to be written as per FCP 7.18.1.2and G18 Table G9	see our response to the general comment: we believe the condition is formulated in line with the requirements and guidance.	Not accepted (no score change)
2.3.3	Yes	Yes	No	Scoring agreed. The condition needs to be written as per FCP 7.18.1.2and G18 Table G9	see our response to the general comment: we believe the condition is formulated in line with the requirements and guidance.	Not accepted (no score change)
2.4.1	Yes	Yes	NA	Scoring agreed	no response required	
2.4.2	Yes	Yes	NA	Scoring agreed	no response required	

2.4.3	Yes	No (non-material score reduction expected)	NA	Monitoring of dissolved oxygen and benthic impacts with regards to seafloor cultivation has taken place, but there is no site-specific long-term monitoring of (potential) effects on the habitat (and associated benthic species) underneath the oyster rafts.	This has been addressed in the rationale for PI2.4.3b: The impacts of the fishery on the muddy habitat can be identified (see 2.4.1a). SG80 is met. The physical impacts of the gear have been quantified to some extent (e.g. in terms of biodiversity under the culture areas vs reference areas, and with seafloor cultivation vs no dredging) but not fully (e.g. specific habitat mapping did not occur, see also 2.4.1c and long-term monitoring is not carried out to allow for full quantification of habitat impacts). There is also secondary source evidence on the footprint from shellfish farms on their surrounding habitat (e.g. Keeley et al 2009) to support the conclusions. Overall, there is sufficient information available to identify the main impacts of the UoA on the main habitats, meeting SG80, but the lack of longer time-series prevents physical impacts of the gear on all habitats to be quantified fully (therefore not meeting SG100).	Not accepted (no score change)
2.5.1	Yes	Yes	NA	Scoring agreed	no response required	
2.5.2	Yes	Yes	NA	Scoring agreed	no response required	
2.5.3	Yes	Yes	NA	Scoring agreed	no response required	
2.6.1	Yes	Yes	NA	The oysters collected and moved, are of the same species and are all within the same geographic area. Based on this, the team decided that translocations are not relevant to this fishery. I agree	no response required	

Performance Indicator	Has all available relevant information 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 Please support your answers by referring to specific scoring issues and any relevant documentation where possible. Please attach additional pages if necessary. Note: Justification to support your answers is only required where answers given are 'No'.	CAB Response	CAB Response Code
2.6.2	Yes	Yes	NA	As above	no response required	
2.6.3	Yes	Yes	NA	Scoring agreed	no response required	

3.1.1	Yes	No (scoring implications unknown)	NA	SI c. It is not clearly described just how the management system has a mechanism to generally respect/observe/formally commit… "in a matter consistent with the objectives of MSC P1 and P2"	Thank you for your comment. The explanation for 3.1.1(c) has been added below. "Although its current implementation status is dependent on prefecture and FCs (for this fishery, it is implemented through the FGIP), the JFA has a renewed policy in place since 2011 to promote implementation of resources management at the FC fisher level. This is achieved by the establishment of "Guideline for creating Resources Management Policy and Resources Management Plan"(FA 2011), in which the prefecture is required to develop resources management policy for each fisheries species or fishing method under the national policy and guideline consistent with the objectives of MSC's P1 and P2. Further each of the Fisheries Cooperatives are required to develop their own Fishery Management Plan and measures for each fishery consistent with the prefectural policy. The resources management plan / fishery ground improvement plan created by fishermen (FC) needs to be annually submitted and evaluated to the prefectural resource management committee of the prefecture for approval. This mechanism ensures that the management system has the mechanism to formally commit to the legal rights created by customary fishermen in a manner consistent with the objectives of MSC Principles 1 and 2. Therefore SG100 is met."	Not accepted (no score change)
3.1.2	Yes	No (scoring	NA	SI a. No evidence is provided to show that functions/roles responsibilities are "well	For this PI, references are provided besides the score, such as "Okucho Fisheries	Accepted (no score change)

Performance Indicator	Has all available relevant information 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 Please support your answers by referring to specific scoring issues and any relevant documentation where possible. Please attach additional pages if necessary. Note: Justification to support your answers is only required where answers given are 'No'.	CAB Response	CAB Response Code
		implications unknown)		undertstood". This is required for SG80 and SG100	Cooperative Article of Incorporation, Fisheries Coordination Rule of Okayama, Organization and Committees organogram of Okucho FC, MAFF Fisheries Law (1949), Fisheries Basic Act (2001), Okayama Fisheries Ground Improvement Plan, Okayama prefectural endorsement letter for Okayama FGIP, Okucho Fisheries Cooperative Association Website, Okayama prefecture Fisheries Department website." The CAB has also added a sentence to SI a that "the CAB interviewed key individuals representing each government and research centres relevant to their fishery at site visit. They have explained their roles and functions explicitly in interviews, which was consistent with the government documents and at a sufficient level relevant for the assessment."	
3.1.3	Yes	Yes	NA	Scoring agreed	no response required	

Performance Indicator	Has all available relevant information 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 Please support your answers by referring to specific scoring issues and any relevant documentation where possible. Please attach additional pages if necessary. Note: Justification to support your answers is only required where answers given are 'No'.	CAB Response	CAB Response Code
3.2.1	Yes	Yes	NA	Scoring agreed	no response required	

3.2.2	No (scoring implications unknown)	No (scoring implications unknown)	NA	Sia It is not clear how the decision making processes result in measures and strategies to achieve the fishery-specific objectives. Examples would be beneficial. SI c Again examples would be helpful	The CAB in review of the peer review comments have amended SI a as follows: The fishery-specific objectives, which are explicit in Okucho FC's FGIP, are created, amended and implemented by the Okayama Oyster market strategy council which holds annual meetings (more often id needed) with government officers and academics to review and confirm the contents and progress. If any environmental concerns or monitoring result show the need to amend the AAAQ or maximum allowed rafts numbers these will be discussed here. The FC staff engage in the monitoring activities, and work in cooperation with the Fisheries Research Technical Centre of Okayama. Okucho FC's Fishery Right Management Council also holds discussions with representing members from each district and make decisions on reduction or renewal of licenses. The maximum number of rafts admitted are set in the FC's Fishery Right-to-Use Rule with the accompanying license to allocate each demarcated aquaculture area. The Okayama prefecture, fisheries cooperative, and oyster council within the cooperative have regularly organized decision making and approval and evaluation system to ensure implementation of FGIP, which is developed under national and prefectural government guidance consistent with MSC principles 1 and 2. The detail of the decision making process of the resources management plan and voluntary	Accepted (no score change)

Performance Indicator	Has all available relevant information 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 Please support your answers by referring to specific scoring issues and any relevant documentation where possible. Please attach additional pages if necessary. Note: Justification to support your answers is only required where answers given are 'No'.	CAB Response	CAB Response Code
					management rules are also described in section 4.5.3.1. of the report. For SIc, the following text has been added: For example, to gain insight into the long-term effect of the sea-floor cultivation practice, which is recommended by prefecture and national government, FC Okucho has decided to conduct their own experimental practice so that they can stop if any adverse impact is found. To this end, the FC also monitors benthic impact (as described in section 4.4.4.4 and under PI 2.4.1a) to compare the before- and after-cultivation impact on the habitat. This is to build a long-term dataset before making determination of whether conducting seafloor cultivation hinders ecosystem function or is beneficial to their environment.	

Performance Indicator	Has all available relevant information 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 Please support your answers by referring to specific scoring issues and any relevant documentation where possible. Please attach additional pages if necessary. Note: Justification to support your answers is only required where answers given are 'No'.	CAB Response	CAB Response Code
3.2.3	No (scoring implications unknown)	No (scoring implications unknown)	NA	l SI d The justification at SG80 is a repeat of the SG and no evidence is provided	The CAB in review of the peer review comments have amended SI d as follows : The client fishery has provided habitat monitoring data with DO and biodiversity research upon request, presence of introduced species regulation and its implementation by government, raft number organization and management strategies, avoidance measures research for increasing rays in the region, as shown in the report. Requested information on the fishery performance and findings and recommendations emerging from research and monitoring were presented when available and explanations were provided if the data is not available.	Accepted (no score change)
3.2.4	Yes	Yes	NA	Scoring agreed	no response required	

Peer reviewer 2

Summary of Peer Reviewer Opinion

Is the scoring of the fishery consistent with the MSC standard, and clearly based on the evidence presented in the assessment report?	Yes	The overall assessment is clear with scoring consistent with MSC standards and based on the evidence presented	Thank you.
Are the condition(s) raised appropriately written to achieve the SG80 outcome within the specified timeframe? [Reference: FCP v2.1, 7.18.1 and sub-clauses]	Yes	The 2 conditions raised are appropriately written to achieve SG80.	Thank you.
Is the client action plan clear and sufficient to close the conditions raised? [Reference FCR v2.0, 7.11.2-7.11.3 and sub-clauses]	Yes	The client action plan is sufficient to close the conditions.	no response required
Enhanced fisheries only: Does the report clearly evaluate any additional impacts that might arise from enhancement activities?	Yes	The fishery is an enhanced catch and grow bivalve fishery based on spat collection without translocation with no impact on parent stock. Report evaluates the impacts arising for the enhancement activities.	no response required
Optional: General Comments on the Peer Review Draft Report (including comments on the adequacy of the background information if necessary)	N/A	Background information provided was adequate	Thank you.

Performance Indicator	Has all available relevant information 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** Please support your answers by referring to specific scoring issues and any relevant documentation where possible. Please attach additional pages if necessary. Note: Justification to support your answers is only required where answers given are 'No'.	CAB Response	CAB Response Code
1.1.1	Yes	Yes	NA	Enhanced CAG bivalve fishery without translocation and no negative impact on parent stock	no response required	
1.1.2	Yes	Yes	NA	Enhanced CAG bivalve fishery without translocation and no negative impact on parent stock	no response required	
1.1.3	Yes	Yes	NA	Enhanced CAG bivalve fishery without translocation and no negative impact on parent stock	no response required	
1.2.1	Yes	Yes	NA	Enhanced CAG bivalve fishery without translocation and no negative impact on parent stock	no response required	
1.2.2	Yes	Yes	NA	Enhanced CAG bivalve fishery without translocation and no negative impact on parent stock	no response required	

Performance Indicator	Has all available relevant information 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** Please support your answers by referring to specific scoring issues and any relevant documentation where possible. Please attach additional pages if necessary. Note: Justification to support your answers is only required where answers given are 'No'.	CAB Response	CAB Response Code
1.2.3	Yes	Yes	NA	Enhanced CAG bivalve fishery without translocation and no negative impact on parent stock	no response required	
1.2.4	Yes	Yes	NA	Enhanced CAG bivalve fishery without translocation and no negative impact on parent stock	no response required	
1.2.5	Yes	Yes	NA	Enhanced CAG bivalve fishery without translocation and no negative impact on parent stock	no response required	
1.2.6	Yes	Yes	NA	Enhanced CAG bivalve fishery without translocation and no negative impact on parent stock	no response required	
2.1.1	Yes	Yes	NA	Enhanced CAG bivalve fishery based only on spat collection does not need to be scored for primary and secondary species	no response required	

Performance Indicator	Has all available relevant information 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** Please support your answers by referring to specific scoring issues and any relevant documentation where possible. Please attach additional pages if necessary. Note: Justification to support your answers is only required where answers given are 'No'.	CAB Response	CAB Response Code
2.1.2	Yes	Yes	NA	Enhanced CAG bivalve fishery based only on spat collection does not need to be scored for primary and secondary species	no response required	
2.1.3	Yes	Yes	NA	Enhanced CAG bivalve fishery based only on spat collection does not need to be scored for primary and secondary species	no response required	
2.2.1	Yes	Yes	NA	Enhanced CAG bivalve fishery based only on spat collection does not need to be scored for primary and secondary species	no response required	
2.2.2	Yes	Yes	NA	Enhanced CAG bivalve fishery based only on spat collection does not need to be scored for primary and secondary species	no response required	
2.2.3	Yes	Yes	NA	Enhanced CAG bivalve fishery based only on spat collection does not need to be scored for primary and secondary species	no response required	

Performance Indicator	Has all available relevant information 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** Please support your answers by referring to specific scoring issues and any relevant documentation where possible. Please attach additional pages if necessary. Note: Justification to support your answers is only required where answers given are 'No'.	CAB Response	CAB Response Code
2.3.1	Yes	Yes	NA	Scoring agreed	no response required	
2.3.2	Yes	Yes	Yes	Scoring agreed	no response required	
2.3.3	Yes	Yes	Yes	Scoring agreed	no response required	
2.4.1	Yes	Yes	NA	Scoring agreed	no response required	
2.4.2	Yes	Yes	NA	Scoring agreed	no response required	
2.4.3	Yes	Yes	NA	Scoring agreed - Need to specify 'N' in Met? Row for 2.4.3B as this is indicated in the Justification	This has been amended.	Accepted (no score change)
2.5.1	Yes	Yes	NA	Scoring agreed	no response required	

Performance Indicator	Has all available relevant information 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** Please support your answers by referring to specific scoring issues and any relevant documentation where possible. Please attach additional pages if necessary. Note: Justification to support your answers is only required where answers given are 'No'.	CAB Response	CAB Response Code
2.5.2	Yes	No (non-material score reduction expected)	NA	It is not clear that the justification for SIa for SG 100 contains an explanation that justifiies that there are measures to address all the main impacts of the UoA	This has been amended, by adding the following to the existing rationale: With regards to the fishery under assessment, the main impacts on the ecosystem can be considered to be related to water quality, organic deposition (with possible effects on benthic communities, and anoxic or low dissolved oxygen as a result), and ecological carrying capacity. As discussed under sections 4.4.4.3, 4.4.4.4, and PI2.4, the oyster farmers deal with accumulation of organic matter under the rafts by seafloor cultivation, which is designed to stir up the ocean floor to redistribute nutrients from the ocean floor more evenly in the water column and dissipate the concentration within the site. Carrying capacity is discussed in section 4.4.5.2 and PI2.5.1. Available data indicates that the current density of oyster rafts does not exceed the ecological carrying capacity.	Accepted (no score change)

Performance Indicator	Has all available relevant information 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** Please support your answers by referring to specific scoring issues and any relevant documentation where possible. Please attach additional pages if necessary. Note: Justification to support your answers is only required where answers given are 'No'.	CAB Response	CAB Response Code
2.5.3	Yes	Yes	NA	Scoring agreed	no response required	
2.6.1	Yes	Yes	NA	Not scored as there is no translocation	no response required	
2.6.2	Yes	Yes	NA	Not scored as there is no translocation	no response required	
2.6.3	Yes	Yes	NA	Not scored as there is no translocation	no response required	
3.1.1	Yes	Yes	NA	Scoring agreed	no response required	
3.1.2	Yes	Yes	NA	Scoring agreed	no response required	
3.1.3	Yes	Yes	NA	Scoring agreed	no response required	
3.2.1	Yes	Yes	NA	Scoring agreed	no response required	
3.2.2	Yes	Yes	NA	Scoring agreed	no response required	
3.2.3	Yes	Yes	NA	Scoring agreed	no response required	

Performance Indicator	Has all available relevant information 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** Please support your answers by referring to specific scoring issues and any relevant documentation where possible. Please attach additional pages if necessary. Note: Justification to support your answers is only required where answers given are 'No'.	CAB Response	CAB Response Code
3.2.4	Yes	Yes	NA	Scoring agreed	no response required	

Appendix 4 Stakeholder submissions

No stakeholder comments were received prior to publication of the PCDR.

Appendix 5 Surveillance Frequency

Table 15. Surveillance level rationale

Level	Rationale
6	N/A: Default level

Table 16. Timing of surveillance audit

Year	Anniversary date of certificate	Proposed date of surveillance audit	Rationale
1	**November 2019**	**November 2020**	**N/A as it is proposed that the first surveillance is conducted on the certificate anniversary date.**

Table 17. Fishery Surveillance Program

Surveillance Level	Year 1	Year 2	Year 3	Year 4
Level 6	On-site surveillance audit	On-site surveillance audit	On-site surveillance audit	On-site surveillance audit & re-certification site visit

Appendix 6 Objections Process

(REQUIRED FOR THE PCR IN ASSESSMENTS WHERE AN OBJECTION WAS RAISED AND ACCEPTED BY AN INDEPENDENT ADJUDICATOR)