



ASC Tropical Marine Finfish Standard

Version 1.0

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VERSION CONTROL, AVAILABLE LANGUAGE(S) AND COPYRIGHT NOTICE

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For comments or questions regarding the content of this document, please contact the Standards and Science Team of ASC via standards@asc-aqua.org.

Version control

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V1.0	June 26, 2019	December 26, 2019 ¹	

It is the responsibility of the user of the document to use the latest version as published on the ASC website.

Available language(s)

The Tropical Marine Finfish Standard document is available in the following language(s):

Versions(s)	Available languages
V1.0	English (official language)

In case of any inconsistencies and/or discrepancies between available translation(s) and the English version, the online English version (pdf-format) will prevail.

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¹ Audits can only be conducted at/after the effective date. Announcements of audits scheduled to be conducted at/after the effective date can be submitted before the effective date.

ABOUT THE AQUACULTURE STEWARDSHIP COUNCIL (ASC)

The Aquaculture Stewardship Council (ASC) is an independent, not-for-profit organisation that operates a voluntary, independent third-party certification and labelling programme based on a scientifically robust set of standards.

The ASC standards define criteria designed to help transform the aquaculture² sector³ towards environmental sustainability and social responsibility, as per the ASC Mission.

ASC Vision

A world where aquaculture plays a major role in supplying food and social benefits for mankind whilst minimising negative impacts on the environment.

ASC Mission

To transform aquaculture towards environmental sustainability and social responsibility using efficient market mechanisms that create value across the chain.

ASC Theory of Change

A Theory of Change (ToC) is an articulation, description and mapping out of the building blocks required to achieve the organisation's vision.

ASC has defined a ToC which explains how the ASC certification and labelling programme promotes and rewards responsible fish farming practices through incentivising the choices people make when buying seafood.

ASC's Theory of Change can be found on the [ASC website](#).

² **Aquaculture:** Aquaculture is the farming of aquatic organisms, including fish, molluscs, crustaceans and aquatic plants. Farming implies some form of intervention in the rearing process to enhance production, such as regular stocking, feeding, protection from predators, etc. Farming also implies individual or corporate ownership of the stock being cultivated (FAO).

³ **Aquaculture sector:** Represents a group of industries (e.g.: feed industry, farming industry, processing industry, etc.) and markets that share common attributes (i.e. aquaculture products).

THE ASC DOCUMENT AND CERTIFICATION SYSTEM

ASC is a full member of the [ISEAL Alliance](#) and implements a voluntary, independent third-party certification system⁴ consisting of three independent actors:

- | | | |
|------|----------------------------------|---------------------------------------------|
| I. | Scheme Owner | i.e. Aquaculture Stewardship Council (ASC) |
| II. | Accreditation Body | i.e. Assurance Services International (ASI) |
| III. | Conformity Assessment Body (CAB) | i.e. Accredited CABs |

Scheme Owner

ASC, as scheme owner:

- sets and maintains standards according to the ASC Standard Setting Protocol which is in compliance with the “ISEAL Code of Good Practice - Setting Social and Environmental Standards”. The ASC standards are normative documents;
- sets and maintains Implementation Guidance which provides guidance to the Unit of Certification (UoC) on how to interpret and best implement the indicators within the Standard;
- sets and maintains the Auditor Guidance which gives guidance to the auditor on how to best assess a UoC against the indicators within the Standard;
- sets and maintains the Certification and Accreditation Requirements (CAR) which adhere at a minimum to the “ISEAL Code of Good Practice - Assuring compliance with Social and Environmental Standards”. The CAR describes the accreditation requirements, assessment requirements and certification requirements. The CAR is a normative document.

These above listed documents are publicly available on the ASC website.

Accreditation Body

Accreditation is the assurance process of assessing the Conformity Assessment Body (CAB) against accreditation requirements and is carried out by an Accreditation Body (AB). The appointed AB of ASC is Assurance Services International (ASI, “*Accreditation Services International*” prior to January 2019) which uses the CAR as a normative document for the accreditation process.

Assessment findings of ASI-accreditation audits and an overview of current accredited CABs is publicly available via the ASI-website (<http://www.accreditation-services.com>).

⁴ **Third-party Certification System:** Conformity assessment activity that is performed by a person or body that is independent of the person or organisation that provides the object, and of the user interests in that object (ISO 17000)

Conformity Assessment Body

The UoC contracts the CAB which employs auditor(s) that conduct a conformity assessment (hereafter 'audit') of the UoC against the relevant standard. The management requirements for CABs as well as auditor competency requirements are described in the CAR and assured through ASI accreditation.

ASC Audit and Certification Process

The UoC is audited at Indicator-level.

An ASC audit follows strict process requirements. These requirements are detailed in the CAR. Only ASI-accredited CABs are allowed to audit and certify a UoC against ASC standards. As scheme owner, ASC itself is not - and cannot be - involved in the actual audit and/or certification decision of a UoC. Granted certificates are the property of the CAB. ASC does not manage certificate validity.

Audit findings of all ASC audits, including granted certificates, are made publicly available on the ASC website. These include the audit findings that result in a negative certification decision.

Note: in addition to the Standards, there are certification requirements that apply to UoCs seeking certification; these requirements are detailed in the CAR.

ASC Logo use

ASC-certified entities shall only sell their product carrying the ASC Logo if a Logo Licence Agreement (LLA) has been signed. It should be noted that obtaining certification does not automatically guarantee the granting of a logo licence agreement. On behalf of the ASC, the Marine Stewardship Council (MSC) Licensing Team will issue logo license agreements and approve logo use on products. For more information see: [ASC Logo](#). Unauthorised logo display is prohibited and will be treated as a trademark infringement.

STRUCTURE OF ASC STANDARDS

A Standard is “a document that provides, for common and repeated use, rules, guidelines or characteristics for products or related processes and production methods, with which compliance is not mandatory”.

ASC Standards are as follows designed:

- ASC Standards consist of multiple Principles – a Principle is a set of thematically related Criteria which contribute to the broader outcome defined in the Principle title;
- Each Principle consists of multiple Criteria – each Criterion defines an outcome that contributes to achieving the outcome of the Principle;
- Each Criterion consists of one or several Indicators – each Indicator defines an auditable state that contributes to achieving the Criterion outcome.

Both Principles and Criteria include Rationale statements providing a set of reasons (backed by reference notes if needed) as to why the Principle or Criterion is needed.

Metric Performance Levels

Several Indicators in the Standards require a Metric Performance Level (MPL). In such cases, the applicable MPL is directly listed after the Indicator (“Requirement” section).

SCOPE AND UNIT OF CERTIFICATION

Linked to the ASC Vision, the Scope of the ASC Tropical Marine Finfish Standard (hereafter “the Standard”) addresses the key negative environmental and social impacts associated with the aquaculture industry. An ASC-certified tropical marine finfish farm contributes to the ASC Vision by reducing, mitigating or eliminating these negative impacts.

The Scope of the Standard is translated into seven Principles that apply to every UoC:

- Principle 1 – Comply with all applicable national laws and local regulations
- Principle 2 – Conserve natural habitat, local biodiversity and ecosystem structure and function
- Principle 3 – Protect the health and genetic integrity of wild populations
- Principle 4 – Use resources in an environmentally efficient and responsible manner
- Principle 5 – Manage disease and parasites in an environmentally responsible manner
- Principle 6 – Develop and operate farms in a socially responsible manner
- Principle 7 – Be a good neighbour and conscientious citizen

The Criteria within the Principles apply to every UoC.

Unit of Certification (UoC)

The applicable UoC is determined by the CAB/auditor and adheres to the Standard’s Criteria UoC-requirements as outlined in the CAR.

Biological and geographic scope to which the standards apply

The ASC Tropical Marine Finfish Standard is applicable to Groupers (species in the genera *Epinephelus*, *Cromileptus*, *Plectropomus* and *Cephalophis*), Snappers (species in the genera *Lutjanus* and *Ocyurus*), Pompano (species in the genus *Trachinotus*), Barramundi (species in the genus *Lates*) and Croaker (species in the genus *Larimichthys*) and in all regions globally where these fish are cultured.

All species within scope of this Standard are listed in Appendix 6.

For species covered within the TMFF standard a risk assessment will be undertaken that determines the stock status of wild populations from available information from internationally recognised sources such as IUCN and CITES. If the risk assessment determines stock health is poor or declining, an evaluation of the risk that certified ASC supply chains are contributing to this threat (to include assessing the source verification of farmed and wild fish and mixing risk) will be undertaken and periodically reviewed by the ASC. ASC’s objective is to ensure that supply chain assurances are adequate to minimise the contribution of certified supply to that threat.

How to read this document

The following section of the document contains the full suite of principles, criteria, indicators and requirements for responsible Tropical Marine Finfish farming at marine sea cage grow-out sites.

Within each criterion, requirements tables are followed by a rationale section that provides a brief overview of why the issues are important and how the proposed requirements address them.

Definitions are provided in footnotes.

The Standard will be supplemented by an auditor guidance document detailing the methodologies used to determine if the Standard is being met, as well as guidance for producers to achieve compliance to the Standard.

Principle 1: Comply with all applicable national laws and local regulations

Principle 1 is intended to ensure that all farms aiming to be certified against the ASC Tropical Marine Finfish Standard meet their legal obligations as a baseline requirement. Adhering to the law will ensure that producers meet legal environmental and social requirements as well as legitimate land tenure rights, on which the effectiveness of the requirements will stand.

Criterion 1.1 Compliance with all applicable local and national legal requirements and regulations

INDICATOR	REQUIREMENT
1.1.1 Documents demonstrating compliance with all relevant local and national laws and regulations	Yes
1.1.2 Documents demonstrating compliance with all tax laws	Yes
1.1.3 Documents demonstrating compliance with all labour laws and regulations	Yes
1.1.4 Documents demonstrating compliance with regulations and permits concerning water quality impacts	Yes

Rationale - Aquaculture operations must, as a baseline, adhere to the national and local laws of the regions where production is taking place. Farm operations that intentionally or unintentionally break the law, violate a fundamental benchmark of performance for certified farms. It is important that aquaculture operations demonstrate a traceable pattern of legal and responsible behaviour.

Principle 2: Conserve natural habitat, local biodiversity and ecosystem structure and function

Principle 2 is intended to address potential impacts from Tropical Marine Finfish farms on natural habitat, local biodiversity and ecosystem function. Specifically, the key areas of benthic impacts, water quality impacts, interaction with critical or sensitive habitats and species, and interaction with wildlife are addressed within this principle.

Criterion 2.1 Benthic biodiversity and benthic effects⁵

INDICATOR	REQUIREMENT
2.1.1 Redox potential or total 'free' sulphide levels in sediment immediately outside of the Allowable Zone of Effect (AZE) ⁶ attributed to farm operations	Redox potential > 0 millivolts (mV) OR Sulphide ≤ 1,500 microMoles / l OR No significant difference ⁷ in redox potential or total 'free' sulphide levels in sediment at the edge of the AZE in comparison to control sites
2.1.2 Benthic faunal index score (choosing a suitable benthic index to the composition of the benthos being sampled)	AZTI Marine Biotic Index (AMBI ⁸) score ≤ 3.3, or Shannon-Wiener Index score > 3, or Benthic Quality Index (BQI) score ≥ 15, or Infaunal Trophic Index (ITI) score ≥ 25 OR No significant difference in benthic faunal index scores at the edge of the AZE in comparison to control site

⁵ A minimum of three benthic samples shall be taken at the edge of the AZE downstream from the predominant current and if control sites are needed, three samples shall be collected 100-1000m from the edge of the cage array with similar water depth and substratum as found on the farm (see ISO 12878:2012 for benthic sampling methodology). Samples should be taken during peak biomass. All collected samples must be analysed by an accredited laboratory and the sampling methodology must be approved by the laboratory conducting the analysis.

⁶ **Allowable Zone of Effect (AZE)** is defined under this Standard as 25 metres. For farm sites where a site-specific AZE has been defined using a robust and credible modelling system such as the SEPA AUTODEPOMOD and verified through monitoring, the site-specific AZE shall be used.

⁷ Significance measured at a 95% confidence interval.

⁸ <http://www.azti.es/en/ambi-azti-marine-biotic-index.html>

<p>2.1.3 For farms that use copper (Cu) nets or copper-treated nets, evidence of testing for copper levels in the sediment immediately outside of the AZE</p>	<p>Yes</p>
<p>2.1.4 Evidence that copper levels⁹ are < 34 mg Cu/kg dry sediment weight</p> <p>OR</p> <p>In instances where the copper (Cu) in the sediment exceeds 34 mg Cu/kg dry sediment weight, demonstration that the Cu concentration is not significantly different compared to background concentrations as measured at three reference sites in the water body⁵</p>	<p>Yes</p>

Rationale - Technical experts agree that the chemical proxy of redox potential and sulphide levels are good chemical indicators for benthic health. Given that both methods are valid, audited farms can choose their preference for one or the other. When considering benthic effects, experts recommended measuring effects at the edge of the AZE and away from the cages, at control sites of similar depth, sediment, and environmental parameters. Though an AZE is difficult to identify as a constant, experts discuss this in terms of 25 metres to 125 metres depending on a range of factors, including currents. In an effort to take a precautionary approach to permissible zone of benthic impact, the ASC Tropical Marine Finfish Standard defines the AZE as a distance of 25 metres from the cage array. For sites where a site-specific AZE has been determined using a valid modelling and video surveillance system, farms will use the site-specific AZE and sampling stations based on actual depositional patterns. Potential negative impacts on benthic biodiversity are also addressed in the ASC Tropical Marine Finfish Standard through the incorporation of an analysis of benthic faunal index at the edge of the AZE in comparison to control sites.

Copper (Cu) is an abundant trace element found in a variety of rocks and minerals. It is an essential micronutrient and is also necessary for a wide range of metabolic processes in animals and plants. At elevated levels however, copper becomes toxic. In situations where copper is used, the requirements ensure precautionary healthy levels of copper in the benthos.

A maximum level of copper concentration in the sediment outside of the AZE is built into the requirement to ensure that any benthic effect that may occur from the use of copper on the net pens is minimal. The variability in environmental factors makes it very difficult to identify a generic threshold of copper in the environment that can be used to define the environmental risk. However, experts suggest that the threshold of 34mg/kg sediment adequately protects the benthos. The level of 34 mg is also consistent with the level at which European regulation requires some action to ensure benthic health, and with

⁹ The testing for copper required under 2.1.4 is only applicable to farms that use copper-based nets or copper-treated nets. The same benthic sampling methodology used in 2.1.2 shall be applied, where the sample taken outside the AZE shall not differ significantly⁴ with the values found at the reference sites.

levels recognised by other jurisdictions as the level at which there may be possible environmental effect. Under the ASC Tropical Marine Finfish Standard, if copper levels in the sediment just outside the AZE are higher than the threshold, as may be the case in areas with naturally high levels of copper, the farm must demonstrate that the level just outside of the AZE is consistent with reference sites and the background levels in the area.

Criterion 2.2 Water quality in and near the site of operation

INDICATOR	REQUIREMENT
2.2.1 Weekly average saturation percentage ¹⁰ of dissolved oxygen (DO) ¹¹ on farm	≥ 70% ¹²
2.2.2 Maximum percentage of weekly samples from 2.2.1 that fall under 2 mg/litre DO	5%
2.2.3 Quarterly recording of TAN, NO ₃ , and TP levels on the farm and at a reference site ¹³	Yes
2.2.4 Evidence that the type of biocides used in net antifouling are approved according to legislation in the European Union, the United States, Australia, or Japan	Yes

Rationale - Water quality is essential for the health of farmed fish and wild species surrounding a farm. One component of water quality, dissolved oxygen (DO), is particularly critical for the survival and good performance of farmed finfish. As a result, most farms regularly measure DO. DO levels (in mg/l) naturally fluctuate in the environment. This is due to a range of factors, including temperature, time of day and the amount of organic material in the water. Low DO levels can also be a sign of excessive nutrient loading. DO provides a useful overall proxy for a water body's ability to support healthy biodiversity and supplements the benthic indicators that will also pick up excessive nutrient loading. Measuring DO as a percent saturation takes into account salinity and temperature at the farm site.

¹⁰ **Saturation percentage** (or **percent saturation**): Saturation percentage is the amount of oxygen dissolved in the water sample compared to the maximum amount that could be present at the same temperature and salinity.

¹¹ Averaged weekly readings from within the cages taken from two daily measurements (preferably around 6am and 3pm).

¹² Should a farm not meet the minimum 70 percent weekly average saturation requirement; the farm must demonstrate consistency of percent saturation with a reference site. The reference site shall be at least 500 metres from the edge of the net pen array, in a location that is understood to follow similar patterns in upwelling to the farm site and is not influenced by nutrient inputs from anthropogenic causes including aquaculture, agricultural runoff or nutrient releases from coastal communities.

¹³ **TAN** (Total Ammonia Nitrogen = total NH₃+ total NH₄⁺), **TP** (Total Phosphorus)

Additionally, compliance with the requirement will limit the number of low DO readings in the water column below 2 mg/l to less than a 5 percent incidence rate, which will allow for periodic natural fluctuations outside of the farms control.

Criterion 2.3 Interaction with critical or sensitive habitats and species

INDICATOR	REQUIREMENT
2.3.1 The farm shall assess the farm’s (potential) impacts on biodiversity and nearby ecosystems. The assessment shall contain at a minimum the components outlined in Appendix 1.	Yes
2.3.2 Allowance for the farm to be sited in a protected area ¹⁴ or High Conservation Value Areas ¹⁵ (HCVAs)	None ¹⁶
2.3.3 Allowance for siting in mangrove ecosystems ¹⁷ and other natural wetlands ¹⁸	None for farms built (with or without permits) after May 1999, except for pumping stations and inlet/outlet canals

¹⁴ **Protected area:** “A clearly defined geographical space, recognised, dedicated and managed through legal or other effective means, to achieve the long-term conservation of nature with associated ecosystem services and cultural values.” Source: Dudley, N. (Editor) (2008), Guidelines for Applying Protected Area Management Categories, Gland, Switzerland: IUCN. x + 86pp.

¹⁵ **High Conservation Value Areas (HCVA):** Natural habitats where conservation values are considered to be of outstanding significance or critical importance. HCVA are designated through a multi-stakeholder approach that provides a systematic basis for identifying critical conservation values—both social and environmental—and for planning ecosystem management in order to ensure that these high conservation values are maintained or enhanced (<http://www.hcvnetwork.org/>).

¹⁶ The following exceptions shall be made for Standard 2.3.2:

- For protected areas classified by the International Union for the Conservation of Nature (IUCN) as Category V or VI (these are areas preserved primarily for their landscapes or for sustainable resource management).
- For HCVAs if the farm can demonstrate that its environmental impacts are compatible with the conservation objectives of the HCVA designation. The burden of proof would be placed on the farm to demonstrate that it is not negatively impacting the core reason an area has been identified as a HCVA.
- For farms located in a protected area if it was designated as such after the farm was already in operation and provided the farm can demonstrate that its environmental impacts are compatible with the conservation objectives of the protected area and it is in compliance with any relevant conditions or regulations placed on the farm as a result of the formation/designation of the protected area. The burden of proof would be placed on the farm to demonstrate that it is not negatively impacting the core reason an area has been protected.

¹⁷ **Mangrove Ecosystems:** Mangrove forests are among the world’s most productive ecosystems. These are often called ‘tidal forests’, ‘coastal woodlands’ or ‘oceanic rainforests’. Mangroves are woody plants that grow in tropical and subtropical latitudes along the land-sea interface, bays, estuaries, lagoons, backwaters, and in the rivers, reaching upstream up to the point where the water still remains saline (Qasim, 1998). These plants and their associated organisms (microbes, fungi, other plants and animals), constitute the ‘mangrove forest community’ or ‘mangal’ (See Tomlinson PB (1986) The Botany of Mangroves. Cambridge, UK: Cambridge University Press. 413 p. for full list of true and associate mangrove plant species). The mangal and its associated abiotic factors constitute the mangrove ecosystem (Kathiresan and Bingham, 2001).

¹⁸ **Natural Wetland:** For the purpose of this standard, natural wetlands are non-artificial (i.e. not human made) areas of marsh, fen, peatland or water, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water the depth of which at low tide does not exceed six metres. They may incorporate riparian and coastal zones adjacent to the

(provided they have been permitted by authorities and an equivalent area is rehabilitated as compensation).

For farms built or permitted before May 1999, farmers are required to compensate/offset impacts via rehabilitation of at least 50% of the affected ecosystem.¹⁹

Rationale - The intent of the requirements under criterion 2.3 is to minimise the effects of fish farms on critical or sensitive habitats and species. The habitats and species to consider include marine protected areas or national parks, established migratory routes for marine mammals, threatened or endangered species, the habitat needed for endangered and threatened species to recover, eelgrass beds and High Conservation Value Areas (HCVAs) (as defined by a credible, multi-stakeholder internationally recognised process). These requirements are consistent with normal environmental assessment requirements in most jurisdictions.

The requirements under criterion 2.3 ensure a farm is aware of any nearby critical, sensitive or protected areas, understands the impacts it might have on those areas, and has a functioning plan in place to mitigate those potential impacts. They also ensure that extra care is taken in areas that are recognised for ecological importance through designation as a protected area. It would not allow production in these areas to be eligible for certification, unless compatible with the conservation goals of the area.

wetlands, and islands or bodies of marine water deeper than six metres at low tide lying within the wetlands'. Ramsar Wetland Definition (Ramsar, Iran, 1971), Classification and Criteria for Internationally Important Wetlands. Under the Convention on Wetlands, 'wetlands' are defined by Articles 1.1 and 2.1.

¹⁹ Consideration of local government programs for restoration and their effectiveness is advised. Mangrove areas preserved within the farm can be considered as part of the compensation (e.g. if a farm has 2ha, but they kept 1ha with mangroves inside the farm, they can be considered in compliance).

Criterion 2.4 Interaction with wildlife, including predators

INDICATOR	REQUIREMENT
2.4.1 Use of submerged acoustic deterrent devices (ADDs)	Not allowed
2.4.2 Number of mortalities ²⁰ of endangered or red-listed ²¹ animals in the farm lease area and adjacent areas due to farm operations, personnel or associates over the previous 2 years	0 (zero)
2.4.3 Allowance for intentional lethal action against predators/wildlife on the farm site	None, unless human safety is immediately threatened
2.4.4 All lethal incidents are recorded, categorised ²² and reported to ASC	Yes
2.4.5 In the event of any lethal incident, evidence that an assessment of the probability of lethal incident(s) has been undertaken and demonstration of concrete steps taken by the farm to reduce the risk of future incidences	Yes

Rationale - Scientific literature²³ about the use of acoustic deterrent devices (ADDs), also known as acoustic harassment devices (AHDs), to deter predators from marine aquaculture facilities shows three main conclusions. Firstly, ADDs have been demonstrated to damage the hearing capability of marine mammals (target and non-target species). Secondly, they have been demonstrated to force a change in the natural feeding or breeding behaviour of some marine mammals. And thirdly, over time and with regular use, ADDs begin to act as an incentive that actually attracts rather than deters the target species (e.g. seals) from the aquaculture facilities. Therefore, submerged ADD use is not allowed under these requirements.

²⁰ **Mortalities:** includes animals intentionally killed through lethal action as well as accidental deaths through entanglement or other means.

²¹ Species listed as endangered or critically endangered by the IUCN or on a national endangered species list.

²² Categorized by the reason of incident

²³ Fjalling, A., Wahlberg, M. and Westerberg H., 2006. Acoustic harassment devices reduce seal interaction in the Baltic Salmon-trap, net fishery. ICES Journal of Marine Science: Volume 63, Number 9 pp. 1751-1758.

B.C. Government, 1997, The environmental risks of salmon aquaculture, pp. 35-37.

Cox, T.M., Read A.J., Solow, A., Tregenza, N., 2001. Will harbor porpoises (*Phocoena phocoena*) habituate to pingers? J. Cetacean Res. Manage 3(1) 81-86.

While every effort should be made to avoid lethal action and to take appropriate measures prior to any lethal action, the safety of workers should not be compromised. In an instance where worker safety is at immediate risk, lethal actions are allowed under this Standard. However, 2.4.5 mandates that adaptive management fully investigates the reasons for lethal incidents, and therefore the farm should fully analyse the reasons why human safety was compromised, and put in place measures to prevent such risks recurring.

Criterion 2.5 Pond Effluents²⁴

INDICATOR	REQUIREMENT
2.5.1 Biological oxygen demand (BOD)	≤ 30 mg/l average and no higher than 50 mg/l
2.5.2 Total suspended solids	≤ 30 mg/l average and no higher than 50 mg/l
2.5.3 Total Ammonia Nitrogen	≤ 1 mg/l average and no higher than 1.5 mg/l
2.5.4 Evidence that all non-dietary chemicals used on the farm that are discharged to effluent are recorded and quantified	Yes

Rationale - There are a number of pollutants associated with discharges from aquaculture facilities. Fish farms can have high concentrations of suspended solids and nutrients, high BOD and low dissolved oxygen levels. Organic matter is discharged primarily from faeces and uneaten feed. Effluents with high levels of suspended solids, when discharged into receiving waters, can have a detrimental effect on the environment. Suspended solids can degrade aquatic ecosystems by increasing turbidity and reducing the depth to which sunlight can penetrate, thus reducing photosynthetic activity. Suspended particles can damage fish gills, increasing the risk of infection and disease. Nutrients are discharged mainly in the form of nitrate, ammonia and organic nitrogen. Ammonia causes two main

²⁴ Applicable to pond culture systems only. Samples should be taken at the point source two (2) hours after feeding, at least once per month. Farm must accumulate 6 months of data before initial site visit/farm audit

problems in water. First, it is toxic to aquatic life. Second, it is easily converted to nitrate which may increase plant and algae growth.

Some substances, like drugs and pesticides that may be present in the wastewater, may be introduced directly as part of the production process. An important source of the pollutants potentially present in aquaculture wastewater is the feed used on fish farms. Feed used at aquaculture facilities contributes to pollutant discharges in a number of ways: by-product faeces, ammonia excretions and, most directly, as uneaten feed (in dissolved and particulate forms). By limiting the amount of suspended solids in effluent the impact is greatly reduced.

Criterion 2.6 Sludge Disposal and Salinisation of Freshwater and Soil Resources

INDICATOR	REQUIREMENT
2.6.1 Evidence that sludge is not discharged directly into receiving waters or natural ecosystems ²⁵	Yes
2.6.2 Specific conductance or chloride concentration of sludge prior to disposal outside the farm	The specific conductance or chloride concentration values must not exceed those of the soil in the disposal area.
2.6.3 Allowance for discharging saline water to natural freshwater bodies. ²⁶	None
2.6.4 Water-specific conductance or chloride concentration in freshwater wells used by the farm or located on adjacent properties. ²⁷	For all freshwater wells (identified prior to full assessment), specific conductance may not exceed 1,500 mhos per

²⁵ Proper disposal includes delivery to a regulated or dedicated landfill or farmers may re-use the sludge. Evidence of the re-use needs to be available for the audit process. Examples of re-use methods allowed by the Standards are; as fertilizer or soil conditioner for the production of agriculture crops; as landfill; and other construction-related uses.

²⁶ Surface freshwater bodies adjacent to farm property or receiving waters discharged from the farm. Freshwater is characterised by a specific conductance of less than 1,500 µmhos per centimetre and a chloride concentration of less than 300 milligrams per litre. These values correspond to salinity inferior to 1 ppt. Farms that can demonstrate that surrounding waters and soils have a salinity of 2 and above using a hand-held refractometer will not be required to provide measurements of conductance or chloride concentration. Water bodies displaying freshwater conditions only during the peak rainy season are considered as brackish water bodies under these standards.

²⁷ Exceptions are made if it can be demonstrated that seawater intrusion or other phenomenon outside the control of the farmer is responsible for the increase.

	centimetre and/or chloride concentration may not exceed 300 milligrams per litre ²⁸
2.6.5 Soil-specific conductance or chloride concentration in adjacent land ecosystems and agricultural fields. ²⁹	No net increase when compared to the first year of monitoring.

Rationale - Aquaculture ponds can contain saline water and, if located above freshwater aquifers, infiltration through bottom soil may cause groundwater salinisation (Boyd et al. 2006). Lateral seepage beneath or through pond embankments can also cause soil and surface water salinisation near farms. All ponds seep to a certain extent; however, some seep worse than others. A literature review found that normal seepage from aquaculture ponds did not exceed 20 centimetres per month (Boyd 2009).

Farms must not extract freshwater from underground sources to dilute salinity in ponds due to the important volumes of freshwater that would be used for such activities. In coastal areas, pumping fresh groundwater can depress the water table, allowing saltwater to intrude into aquifers (Anonymous 1993). Salinisation of freshwater aquifers can interfere with water supplies and, in the case of shallow aquifers, cause crop root damage. In addition, land subsidence can result from excessive pumping of groundwater (Chen 1990).

The release of effluents can cause salinisation in surface freshwater bodies and non-saline soils near farms. Saline water should not be released in natural freshwater bodies. Many farms, especially those using intensive culture methods, accumulate sediments in ponds and canals, which are mechanically removed at times. Sediment disposal sites can cause salinisation of surface water if rainfall leaches salts from them and runoff enters freshwater bodies (Boyd et al. 1994). Saline runoff can also flow onto non-saline soil areas causing salinisation of surface soil. Water from sediment disposal areas can infiltrate and lead to the salinisation of freshwater aquifers. Dry sediments can be used for landfill or disposed of by being spread in agricultural areas, provided the salt content of sediment is not higher than in the soil of the disposal site.

This standard requires monitoring of chloride concentration or specific conductance levels in soil (including sediment disposal sites), surface water and groundwater near fish farms, as an increase will

²⁸ Specific conductance or chloride concentration must be monitored at a frequency adapted to possible fluctuations because of natural factors such as rain regime, and comparisons with first-year values.

²⁹ Soil salinity must be measured 25 metres within adjacent land ecosystems and agricultural fields every six months. If salt contamination is detected at the 25-metre station, the monitoring could be extended further out as necessary. No progressive increase of specific conductance or chloride concentration should be observed over the years when compared to the first year of monitoring.

indicate salinisation has taken place. Historical data on either will often not be available; thus, the first values taken at the onset of the certification program will serve as the reference point for each site.

Principle 3: Protect the health and genetic integrity of wild populations

The intention of Principle 3 is to ensure that farms do not harm the health, genetic make-up and biodiversity of wild aquatic populations. This principle addresses impacts associated with escapes, introduction and cultivation of exotic and transgenic species and the source of fingerlings. When species are introduced into an area, they may cause increased predation and competition, disease, habitat destruction, genetic stock alterations and in some cases, extinction.

Criterion 3.1 Culture of non-native species

INDICATOR	REQUIREMENT
3.1.1 Culture of hybrid and/or non-native species ³⁰	None ³¹ , unless the farmed species is ecologically established ³² in the region at time of publication of the ASC Tropical Marine Finfish Standard v1.0

Rationale - Accidental or intentional introductions of non-native species is a significant global environmental problem. Aquaculture is considered one of the major pathways for introducing non-native aquatic plants and animals that may become harmful invasive species. These requirements are in line with the FAO guidelines that permit the culture of non-native species only when they pose an acceptable level of risk to biodiversity. This Standard does not permit introductions of non-native species, unless the species is already established in the area at the time of the adoption of the Standard by the ASC, or a closed production system is used.

The use of alternatives to chemical treatments for farm management, such as the use of cleaner fish for sea lice control in salmon, is permitted and encouraged. However, any wrasse, cleaner fish or other species used for management during production must be native species in order to prevent introduction of new species area.

Criterion 3.2 Introduction of transgenic species

INDICATOR	REQUIREMENT
3.2.1 Culture of transgenic ³³ fish	Not permitted

³⁰ Includes non-native species for parasite control or other on- farm management purposes.

³¹ Except if produced in closed (land-based) systems with *de minis* chance for successful escapes.

³² Ecologically established references to fully self-sustaining population(s).

³³ **Transgenic:** An organism, with the exception of human beings, in which the genetic material has been altered in a way that does not occur naturally by mating and/or natural recombination. Source EFSA.

Rationale - Transgenic fish are not permitted under this Standard because of concerns about their unknown impact on wild populations. Genetically enhanced³⁴ Tropical Marine Finfish are not considered to be transgenic fish – neither are triploid or all-female fish.

Criterion 3.3 Escapes

INDICATOR	REQUIREMENT
3.3.1 Evidence of a well-designed, maintained and managed culture system, infrastructure and farm management ³⁵ to minimise escapes during grow-out and harvest.	Yes
3.3.2 The farm shall count all fish at every stocking, grading and harvest event with a counting accuracy of $\geq 98\%$ ³⁶	Yes
3.3.3 Total amount of known escapes ³⁷ allowed per production cycle	4% ³⁸ of stocked count based on $\geq 98\%$ counting accuracy
3.3.4 Number of known escapes and unexplained losses are documented and made public as well as	Yes

³⁴ **Genetic enhancement:** the process of genetic improvement via selective breeding that can result in better growth performance and domestication but does not involve the insertion of any foreign genes into the genome of the animal. Source: EFSA.

³⁵ Proper farm management regarding escape prevention includes, but is not restricted to:

- 1) assessing potential factors that can result in fish escapes (e.g. siting related to marine navigation, nets with appropriate net strength – including resistance to net biting from farmed fish and predators, net testing and maintenance, nets with appropriate net mesh size, appropriate mooring and cage-system robustness – including protection against floating debris and forecastable weather events, fish handling/transport procedures),
- 2) assessing the risks for the listed risk factors (under 1) and developing Standard Operating Procedures (SOP)
- 3) training staff to be aware of the (potential) risks and to follow escape prevention SOP to minimise escape risk(s)
- 4) record keeping and implementing corrective actions where identified
- 5) reviewing the escape prevention management system on a yearly basis, or when escape events occur, and revise where and when needed.

³⁶ Accuracy of the counting technology (taken from manufacturer spec sheets) shall be validated and documented (e.g. frequency of hand counts).

³⁷ Total amount of known escapes are all fish known to have escaped e.g. through handling errors.

³⁸ An exception (>4%) to this Standard may be made for an escape event that is clearly documented as being outside the farm’s control. Only 1 exception is allowed in a 9-year period and this time window starts at the beginning of the production cycle for which the farm is applying for initial certification. The farmer must demonstrate that there was no reasonable way to predict and/or mitigate the event that caused the escape.

reported to the relevant local authority and ASC on an annual basis

Rationale - A conservative approach demands that conscientious fish farmers strive to minimise the number of escapes of farmed cultured fish. Escapes can occur in large events that are immediately noticeable at a farm, smaller events that are still noticeable, and through slower, lower levels of losses of fish that might go unnoticed. The Standard mandates strict requirements for net pen maintenance and escape procedures while also requiring farms to collect data on stocking and recovery. The Standard also sets mass escape requirements, in order to prevent the certification of farms that allow mass escapes more than three times over a ten-year period. The requirements require transparency about unexplained losses to help the farm and the regulators understand trends related to the cumulative numbers of lost fish that go unnoticed during production.

Criterion 3.4 Source of fingerlings/seed-stock³⁹

INDICATOR	REQUIREMENT
3.4.1 Source of fingerlings	Hatchery only ⁴⁰
3.4.2 Traceability of all hatchery purchased fingerlings to their source	Yes
3.4.3 The fingerling supplier has a documented fish health and bio-security protocol or a comparable 3 rd party certificate	Yes
3.4.4 The receiving facility ⁴¹ has a documented bio-security protocol, including quarantining, with respect to purchased fingerlings	Yes

³⁹ This Standard defines seed/fingerling as entering an ASC certified farm to be ≤ 10g unless they come from an ASC certified farm/facility. A farm seeking certification would need to demonstrate through documentation that its fingerling or seed suppliers have met ASC requirements.

⁴⁰ Originating from closed-cycle (captive reared) broodstock.

⁴¹ The receiving facility includes private and/or government-run quarantine facility

3.4.5 All trans-national imported fingerlings must be accompanied by documentation required by importing countries (e.g. health certificate)	Yes
3.4.6 The farm shall not release deformed fish into the wild and will dispose them in a responsible manner.	Yes

Rationale - Due to the pressure facing wild fish stocks, only fingerlings that are produced in hatcheries may be used for grow-out purposes. This will eliminate the potential for fingerlings to be sourced from already pressured fisheries. The use of hatchery raised fingerlings also allows to use selective bred fingerlings which in turn have better production performance.

Biosecurity measures reduce disease transmission to the wild and between farms. These requirements aim to ensure that farms don't harm the health of farmed and wild populations by introducing disease through fingerling stocking.

Criterion 3.5 Broodstock Management

INDICATOR	REQUIREMENT
3.5.1 Allowance to use wild harvested broodstock of IUCN red-listed species classified as Endangered or Critically Endangered, for fingerling production.	None
3.5.2 Documented procedures are in place to limit non-controlled spawning of broodstock and evidence that these procedures are being followed	Yes

Rationale - Genetic diversity is an important conservation issue, as farmed fish have the potential to negatively impact the genetic diversity of wild populations through interbreeding. Genetic changes in captive bred or hatchery populations are likely in any stock of fish that is bred in captivity over several generations. Captive breeding may result in the mixing of genetically distinct stocks which may lower overall genetic diversity and reduce survival. Introducing a different strain of the same species (i.e., a population which is genetically different but still belonging to the same species) would therefore pose the risk of the different strain having an impact on the ecosystem. Hatcheries should therefore take all precautions necessary to limit uncontrolled spawning of their captive broodstock.

There is concern that the use of wild-caught seed or wild collections of juveniles can lead to adverse impacts (e.g. decline) on wild fish populations. Therefore, the harvest of wild-caught broodstock of threatened or endangered species is not allowed.

Principle 4: Use resources in an environmentally efficient and responsible manner

The culture of marine fish requires the use of resources including feed inputs (e.g. wild-forage fisheries, terrestrial plant and animal protein), non-therapeutic chemical inputs and consumables (e.g. building supplies and fuel), etc. Extraction, production and/or consumption of these resources has the potential to negatively impact marine and terrestrial ecosystems. For marine finfish farming, an important parameter is the use of fishmeal and fish oil, and the impacts that such use has on forage fish resources and marine food webs.

Criterion 4.1 Traceability and transparency of marine raw materials in feed

INDICATOR	REQUIREMENT
4.1.1 Evidence of traceability, demonstrated by the feed producer, of all fishmeal and fish oil ingredients ⁴²	Yes

Rationale - Traceability of forage fish resources and edible seafood processing by-products is required to ensure their authentic origin. Traceability is a necessary prerequisite to comply with the primary feed requirement under this principle. The farmer must have full knowledge of the source of the fishmeal (FM) and fish oil (FO) ingredients (i.e. 'FMFO' ingredients) used in the feed.

⁴² Traceability should be at a level of detail that permits the feed producer to demonstrate compliance with the requirements in this document. This Standard also assumes that the feed producer will make available to the farm a list of the FMFO ingredients, the inclusion rates of FMFO, and the sources of each FMFO ingredient.

Criterion 4.2 Efficient and optimised diets

INDICATOR	REQUIREMENT
4.2.1 Fishmeal Forage Fish Dependency Ratio (FFDR _m) for grow-out (calculated using formulas in Appendix 2)	(a) FFDR _m Barramundi ≤2.25 (now), 1.8 (3 years), 1.4 (6 years) (b) FFDR _m Grouper and Snapper ≤3.45 (now), 3.0 (3 years), 2.6 (6 years) (c) FFDR _m Pompano ≤2.8 (now), 2.4 (3 years), 2.0 (6 years) (d) FFDR _m Yellow Croaker ≤3.63 (now), 3.2 (3 years), 2.9 (6 years)
4.2.2 Fish Oil Forage Fish Dependency Ratio (FFDR _o) for grow-out (calculated using formulas in Appendix 2)	(a) FFDR _o Barramundi ≤2.75 (now), 2.3 (3 years), 2.0 (6 years) (b) FFDR _o Grouper and Snapper ≤3.55 (now), 3.0 (3 years), 2.6 (6 years) (c) FFDR _o Pompano ≤2.73 (now), 2.3 (3 years), 2.0 (6 years) (d) FFDR _o Yellow Croaker ≤4.05 (now), 3.8 (3 years), 3.5 (6 years)

Rationale - The Forage Fish Dependency Ratios (FFDR) contained in these requirements aim to support the trend toward lower inclusion rates and increasingly efficient use of marine resources, which are expected to continue. The ratios, one for fishmeal and another for fish oil, calculate the dependency on forage fisheries through an assessment of the quantity of live fish from small pelagic fisheries required to produce the amount of fishmeal or fish oil needed to produce a unit of farmed fish.

The Standard lays out a timeline for increasingly strict requirements over a period of 3 years and then again 6 years from the publication of the Standard to drive improvement. The proposed reduction of FFDR_m and FFDR_o from the date of the publication of the Standard will encourage producers to work towards better performance on a realistic timeframe.

After careful review of data from producers and feed companies, FFDRs for each species were established that will incentivise producers to make meaningful improvements in their farm practices. The ASC Standards seek to push best practice within each species sector. Although these FFDR numbers might be higher than those of some of the other ASC species, they are set at a level to encourage producers to further improve their practices in order to achieve ASC certification.

Criterion 4.3 Responsible origin of marine raw materials

Note: In November 2016 ASC published an Interim Solution for ASC Marine Feed Ingredients, which will replace indicators 4.3.1 and 4.3.2 of this Standard. This solution applies to all ASC's Standards, which have indicators for marine raw material origin, including this ASC Tropical Marine Finfish Standard. This interim solution thus applies until the ASC Feed Standard is available or until further official and public notice by ASC.

INDICATOR	REQUIREMENT
4.3.1 Timeframe for at least 90% fishmeal or fish oil used in feed to come from fisheries ⁴³ certified under an ISEAL member's accredited certification whose primary goal is to promote ecological sustainability	<i>see note above</i>
4.3.2 Prior to achieving 4.3.1 the fishmeal or fish oil used in feed must have a FishSource stock health score of 6.0 or higher or show evidence of being engaged in a credible and time bound fisheries improvement project (FIP)	<i>see note above</i>
4.3.3 Feed containing fishmeal and/or fish oil originating from by-products ⁴⁴ or trimmings from fish species which are categorised as vulnerable, endangered or critically endangered, according to the IUCN Red List of Threatened Species ⁴⁵	None
4.3.4 Feed ingredients which come from other fish from the same genus	None

Rationale - These indicators strive to ensure that marine-based feed ingredients come from responsible sources. A main concept of the proposed requirements is to align industry incentives to support processes that will lead to improved fisheries management, and then certification, of forage fisheries.

Ultimately, the requirements will use marine ingredients certified by a widely recognised authority, such

⁴³ This requirement applies to fishmeal and fish oil from forage fisheries and not to by-products or trimmings used in feed nor to non-fish EPA/DHA-sources (e.g. EPA/DHA produce by algae).

⁴⁴ Trimmings are defined as by-products when fish are processed for human consumption or if whole fish is rejected for use of human consumption, because the quality at the time of landing does not meet official regulations with regard to fish suitable for human consumption.

⁴⁵ International Union for the Conservation of Nature (IUCN) reference at <http://www.iucnredlist.org/static/introduction>.

as the Marine Stewardship Council (MSC) or another Standard, as the best option available to promote responsible catch. In addition to the MSC Standard, other Standards developed by an ISEAL member that promote the ecological sustainability of pelagic fisheries as a primary focus could qualify.

Given the current modest supply of MSC certified sources of fishmeal and fish oil, the ASC proposes to restrict fisheries currently known to have the poorest status from being used for fishmeal and fish oil used in the feed. This will be achieved by requiring the vast majority of marine ingredients to come from a fishery that receives a minimum score of 6 using the FishSource methodology. The Standard requires 90% of the fishmeal and fish oil to meet the FishSource score because the products are sold as blends, where the origin of fisheries can come from multiple fisheries (for further information see the scheme website: www.FishSource.com).

These Standards support the use of marine trimmings and by-products, as long as they don't originate from fisheries targeting endangered or vulnerable species. The ASC seeks to encourage the use of fishmeal and fish oil derived from by-products from phylogenetically distinct species. These represent underutilised resources.

Criterion 4.4 Responsible origin of non-marine raw materials in feed

INDICATOR	REQUIREMENT
4.4.1 Presence and evidence of traceability and a responsible sourcing policy for the feed manufacturer for feed ingredients which comply with internationally recognised moratoriums and local laws ⁴⁶	Yes
4.4.2 Documentation of the use of transgenic ⁴⁷ plant raw materials, or raw materials derived from genetically modified plants, in the feed	Yes
4.4.3 Percentage of non-marine ingredients from sources certified by an ISEAL Member's certification scheme that addresses environmental and social sustainability	80% for soy and palm oil within 5 years following the date of the publication of the ASC Tropical Marine Finfish Standard

Rationale - The ASC encourages the use of non-marine protein and lipid sources as a key method to reduce the dependence upon fishmeal and fish oil in the culture of marine fish. However, the sourcing of non-marine raw materials must take into account their culture areas and production methods - these

⁴⁶ Specifically, the policy shall include that vegetable ingredients, or products derived from vegetable ingredients, must not come from the Amazon Biome as geographically defined by the Brazilian Soya Moratorium.

⁴⁷ **Transgenic**: An organism, with the exception of human beings, in which the genetic material has been altered in a way that does not occur naturally by mating and/or natural recombination. Source EFSA.

must be sustainably secure and respect the environment within which they are raised. Products from conservation and biodiversity hotspots (for example the Amazon rainforest) must not be allowed under the Standard.

While the use of genetically modified organisms (GMOs) in feed is allowed, it must be acknowledged. Transgenic plants are commonly used in aquaculture and animal feeds throughout the world, yet some consumers and retailers want to be able to identify food products, including farmed fish, that are genetically modified or that have been fed genetically modified ingredients. Documentation of the use of GMOs (such as Roundup Ready soybeans) can be obtained from the feed manufacturer. This is not an onerous or unrealistic demand for a fish producer to make to their feed producer since the purchase, use and manufacture of a non-GMO sourced complete feed (i.e. organically certified feed) would require much more stringent documentation and disclosure by the feed manufacturer to meet that particular certification. The requirements ensure transparency (above one percent volume) around any transgenic material used in the feed in order to support informed choices by retailers and consumers.

Feed ingredients sourced from areas where significant ecological damage has occurred is a concern. Therefore, the Standard requires producers to source feed from feed producers who comply with any relevant, recognised crop moratoriums that, at the time of the writing of these requirements, includes only the Brazilian Soy Moratorium. Such moratoriums are temporary measures intended to protect defined geographic regions. Looking to the future, the Standard intends to incorporate a requirement for feed manufacturers to use soy or palm oil certified to an ISEAL member scheme. Because these schemes have just recently been launched, the requirement builds in a five-year window for this requirement to be met.

Criterion 4.5 Waste Management/Pollution Control

INDICATOR	REQUIREMENT
4.5.1 Evidence that non-biological waste (including net pens) from grow-out sites are either disposed of properly or recycled.	Yes
4.5.2 Evidence of appropriate storage and/or disposal of biological waste	Yes
4.5.3 Evidence of appropriate storage and/or disposal of chemical and hydrocarbon wastes	Yes
4.5.4 Spill prevention and response plan for chemicals/hydrocarbons originating from farming operations	Yes

4.5.5 For farms that clean nets on-land, evidence that net-cleaning sites have effluent treatment⁴⁸

Yes

Rationale - Fish farmers must act responsible for waste disposal and protect against harmful chemical and hydrocarbon spills. Farming operations must have sufficient prevention and response plans in place and farm employees must have the training necessary to properly dispose of waste, and prevent and manage chemical and hydrocarbon spills.

The purpose of these indicators is to ensure that all biological and non-biological waste produced by a farm is recycled, reused or disposed of properly and does not affect neighbouring communities. Proper handling and treatment of wastes may vary across farms depending on the remoteness of the farm site and the disposal and recycling options available in the region.

Criterion 4.6 Energy consumption and greenhouse gas emissions on farms

INDICATOR	REQUIREMENT
4.6.1 Presence of an energy use assessment verifying the energy consumption on the farm and representing the production cycle, as outlined in Appendix 3	Within two years of the initial audit (measured in kilojoule/t fish/production cycle)
4.6.2 Records of greenhouse gas (GHG ⁴⁹) emissions ⁵⁰ and evidence of an annual GHG assessment and reporting to ASC, as outlined in Appendix 3	Yes, within two years of the initial audit
4.6.3 Documentation of GHG emissions of the feed ⁵¹ used during the previous production cycle reported to ASC, as outlined in Appendix 3	Yes, within three years of the initial audit

⁴⁸ Treatment must have appropriate technologies in place to capture copper if the farm uses copper-treated nets.

⁴⁹ For the purposes of this Standard, GHGs are defined as the six gases listed in the Kyoto Protocol: carbon dioxide (CO₂); methane (CH₄); nitrous oxide (N₂O); hydrofluorocarbons (HFCs); perfluorocarbons (PFCs); and sulphur hexafluoride (SF₆).

⁵⁰ GHG emissions must be recorded using recognised methods, standards and records as outlined in Appendix 3.

⁵¹ GHG emissions from feed can be given based on the average raw material composition used to produce the fish (by weight) and not as documentation linked to each single product used during the production cycle. Feed manufacturer is responsible for calculating GHG emissions per unit of feed. Farm site then shall use that information to calculate GHG emissions for the volume of feed they used in the prior production cycle.

4.6.4 Evidence of a documented strategy to reduce GHG per unit of production (measured in kilojoule/t fish produced)

Yes, within three years of the initial audit

Rationale - Climate change represents perhaps the biggest environmental challenge facing current and future generations. Because of this, energy consumption used in food production has become a source of major public concern. The ASC recognises the importance of efficient and sustainable energy use. Therefore, these indicators will require that energy consumption in the production of fish should be monitored on a continual basis and that growers should develop means to improve efficiency and reduce consumption of energy sources, particularly those that are limited or carbon-based. The data collected in this process will help the ASC set a meaningful numerical requirement for energy use in the future. Energy assessments are a new area for producers. Requiring that farms do these assessments will likely raise awareness of the issues related to energy and build support for adding a requirement in the future related to the maximum energy of GHG emissions allowed.

Principle 5: Manage disease and parasites in an environmentally responsible manner

There are three primary mechanisms by which fish health management on marine fish farms may negatively impact the environment: proliferation of pests and parasites on the farm may create a vehicle for increased prevalence of diseases among wild fish; improper use of antibiotics or improper use of other therapeutants may result in development of resistance to the treatment; and use of some therapeutants may lead to contamination of farm effluents.

Criterion 5.1 Fish Health Management

INDICATOR	REQUIREMENT
5.1.1. Evidence of a veterinary approved Fish Health Management Plan (FHMP) ⁵²	Yes
5.1.2 Farm maintains a fish health management record keeping system	Yes

Rationale - Farming of fish can lead to an increased risk of aquatic diseases in the environment. Marine fish producers should naturally want to optimise fish health on the farm site, due to the dramatic impacts this has on economic viability. Farmed fish are susceptible to numerous diseases that have the potential to be amplified and transferred, thereby posing a risk to the health of fish and other marine organisms in adjacent ecosystems. One of the best ways to mitigate the risk of disease transfer to wild stocks is to reduce or eliminate the disease from happening initially. These requirements seek to ensure proactive health management on the farm through comprehensive health management plans and up to date record keeping systems.

⁵² An FHMP contains at a minimum the following elements: 1) listing (potential) diseases/parasites occurring in the region and (potential) means for these diseases/parasites to enter the farm, 2) identification of actions to reduce the risk of diseases entering the farm as well as spreading within the farm once established, 3) development of SOP's and training staff to implement the identified actions under (2), 4) monitoring and evaluation of the FHMP on a yearly basis, or after a disease/parasite event.

Criterion 5.2 Chemicals and treatments

INDICATOR	REQUIREMENT
5.2.1 Use of therapeutic treatments that are listed as critically important for human medicine by the World Health Organization ⁵³	Not permitted
5.2.2 Prophylactic use of antimicrobial treatments	Not permitted
5.2.3 On-farm documentation that includes, at a minimum, detailed information on all chemicals ⁵⁴ and therapeutants used during the most recent production cycle, the amounts used (including grams per kg of fish produced), the dates used, which group of fish were treated and against which diseases, proof of proper dosing, and all disease and pathogens detected on the site	Yes
5.2.4 Allowable farm level anti-parasiticide treatment (bath), not including freshwater or hydrogen peroxide	None
5.2.5 Number of treatments ⁵⁵ of antibiotics over the most recent production cycle	≤ 3

Rationale - The use of certain therapeutic treatments may impact the sustainable use of antimicrobials that are critical to human health or may have a damaging effect on the aquatic environment, both in terms of water quality and direct impact on flora and fauna. It is appropriate that a comprehensive fish health management plan is in place that tracks and investigates mortalities and includes either vaccination procedures or alternative methods approved by the farm's veterinarian or fish health expert. In the interest of environmental monitoring and product traceability, all chemical treatments must be recorded and made available to auditors.

With regards to the use of antibiotics, there is a global effort led by the WHO to ensure that antibiotics important for human medicine are used in a way that doesn't jeopardize their effectiveness in treating human diseases. These requirements seek to be in line with that effort. The requirements set a cap

⁵³ WHO Critical Microbials for Human Medicine, 5th edition, 2016. http://www.who.int/foodsafety/areas_work/antimicrobial-resistance/cia/en/

⁵⁴ Chemicals used for the treatment of fish

⁵⁵ A treatment is a single course medication given to address a specific disease issue and that may last a number of days.

on a maximum allowable number of treatments of antibiotics on certified farms, set a reasonable limit on what may be needed on a well-managed farm, and exclude any farms that fail to follow industry guidelines for prudent use of antibiotics. Additionally, the ASC holds the position that antimicrobial treatments that are critical to human health should not be allowed. These requirements have been adopted with the intent to further raise awareness within the aquatic veterinary community on the use of medically important antimicrobial drugs in food-animal production, and the public health risks associated with antibiotic resistance.

Criterion 5.3 Survival of Farmed Fish

INDICATOR	REQUIREMENT
5.3.1 All recovered mortalities are removed and disposed of in a responsible manner	Yes
5.3.2 Classification of mortalities	All recovered mortalities are recorded and classified by cause of death
5.3.3 When unexplained mortalities exceed $\geq 0.5\%$ / per day samples are submitted for analysis by a veterinarian or designated fish health expert	Yes
5.3.4 Evidence of a farm specific mortalities reduction program that includes defined annual targets for reductions in mortalities and reductions in unexplained mortalities	Yes

Rationale - Farms must keep detailed records of all mortalities and cause of death. The post-mortem analysis required in the Standard is essential to provide an early warning against emerging diseases. Repeated high mortality rates, or a high rate of unexplained mortalities, may indicate poor management or poor siting. The requirements focus on mortalities from viral disease and unknown causes, as they present a greater potential risk to wild fish populations and neighbouring farms. The farm must be able to demonstrate that it is working to reduce its mortalities, including monitoring disease presence and carrying out a farm-specific plan to reduce diseases and mortalities.

Principle 6: Develop and operate farms in a socially responsible manner

Principle 6 aims to address potential negative social impacts related to farm development and operation, including labour concerns.

Criterion 6.1 Freedom of association and collective bargaining⁵⁶

INDICATOR	REQUIREMENT
6.1.1 Evidence that workers have access to trade unions (if they exist) and union representative(s) chosen by themselves without managerial interference	Yes
6.1.2 Evidence that workers are free to form organisations, including unions, to advocate for and protect their rights	Yes
6.1.3 Evidence that workers are free and able to bargain collectively for their rights	Yes

Rationale - Having the freedom to associate and bargain collectively is a critical right of workers because it enables them to engage in collective bargaining over issues such as wages and other working conditions. Freedom of Association and the effective recognition of the right to collective bargaining is one of the core principles of the International Labor Organization's (ILO) "Declaration on Fundamental Principles and Rights at Work." The declaration was adopted in 1998 by the 86th International Labor Conference and has since been ratified by the overwhelming majority of ILO's 183 member nation-states.

⁵⁶ **Bargain collectively:** A voluntary negotiation between employers and organisations of workers in order to establish the terms and conditions of employment by means of collective (written) agreements.

Criterion 6.2 Child labour

INDICATOR	REQUIREMENT
6.2.1 Number of incidences of child ⁵⁷ labour ⁵⁸	None
6.2.2 Percentage of young workers ⁵⁹ that are protected ⁶⁰	100%

Rationale - The effective abolition of child labour is one of the core principles of the ILO “Declaration on Fundamental Principles and Rights at Work.” Adherence to the child labour codes and definitions included in this section indicates compliance with what the ILO and international conventions generally recognise as the key areas for the protection of children and young workers. Children are particularly vulnerable to economic exploitation, due to their inherent age-related limitations in physical development, knowledge and experience. Children and youth need adequate time for education, development and play. Therefore, they should not have to work or be exposed to working hours and conditions that are hazardous^{61,62} to their physical or mental well-being. To this end, the requirements related to what constitutes child labour will protect the interests of children and young workers at fish farms certified to these requirements.

⁵⁷ **Child:** Any person under 15 years of age. A higher age would apply if the minimum age law of an area stipulates a higher age for work or mandatory schooling. Minimum age may be 14 if the country allows it under the developing country exceptions in ILO convention 138.

⁵⁸ **Child Labour:** Any work by a child younger than the age specified in the definition of a child.

⁵⁹ **Young Worker:** Any worker between the age of a child, as defined above, and under the age of 18.

⁶⁰ **Protected:** Workers between 15 and 18 years of age will not be exposed to hazardous health and safety conditions; working hours shall not interfere with their education and the combined daily transportation time and school time, and work time shall not exceed 10 hours.

⁶¹ **Hazard:** The inherent potential to cause injury or damage to a person’s health (e.g. unequipped to handle heavy machinery safely, and unprotected exposure to harmful chemicals).

⁶² **Hazardous work:** Work that, by its nature or the circumstances in which it is carried out, is likely to harm the health, safety or morals of workers (e.g. heavy lifting disproportionate to a person’s body size, operating heavy machinery, exposure to toxic chemicals).

Criterion 6.3 Forced, bonded or compulsory labour

INDICATOR	REQUIREMENT
6.3.1 Number of incidences of forced, ⁶³ bonded ⁶⁴ or compulsory labour	None

Rationale - Forced labour such as slavery, debt bondage and human trafficking, is a serious concern in many industries and regions of the world. The elimination of all forms of forced or compulsory labour is one of the core principles of the ILO “Declaration on Fundamental Principles and Rights at Work.” Ensuring that contracts are clearly articulated and understood by workers is critical to determining that labour is not forced. The inability of a worker to freely leave the workplace and/or an employer withholding original identity documents of workers are indicators that employment may not be at-will. Adherence to these policies shall indicate that an aquaculture operation is not using forced, bonded or compulsory labour forces.

Criterion 6.4 Discrimination⁶⁵

INDICATOR	REQUIREMENT
6.4.1 Evidence of comprehensive ⁶⁶ and proactive anti-discrimination policies, procedures and practices	Yes
6.4.2 Number of incidences of discrimination	None

⁶³ **Forced (Compulsory) labour:** All work or service that is extracted from any person under the menace of any penalty for which a person has not offered himself/herself voluntarily or for which such work or service is demanded as a repayment of debt. “Penalty” can imply monetary sanctions, physical punishment, or the loss of rights and privileges or restriction of movement (e.g. withholding of identity documents).

⁶⁴ **Bonded labour:** When a person is forced by the employer or creditor to work to repay a financial debt to the crediting agency.

⁶⁵ **Discrimination:** Any distinction, exclusion or preference that has the effect of nullifying or impairing equality of opportunity or treatment. Not every distinction, exclusion or preference constitutes discrimination. For instance, a merit- or performance-based pay increase or bonus is not by itself discriminatory. Positive discrimination in favour of people from certain underrepresented groups may be legal in some countries.

⁶⁶ Employers shall have written anti-discrimination policies stating that the company does not engage in or support discrimination in hiring, remuneration, access to training, promotion, termination or retirement based on race, caste, national origin, religion, disability, gender, sexual orientation, union membership, political affiliation, age or any other condition that may give rise to discrimination.

Rationale - The elimination of discrimination in respect of employment and occupation is one of the core principles of the ILO “Declaration on Fundamental Principles and Rights at Work.” Unequal treatment of workers based on certain characteristics (such as sex or race), is a violation of a workers’ human rights. Additionally, widespread discrimination in the working environment can negatively affect overall poverty and economic development rates. Discrimination occurs in many work environments and takes many forms. A common form is discrimination against women workers.

In order to ensure that discrimination does not occur at fish farms certified to this requirement, employers must demonstrate their commitment to equality with an official anti-discrimination policy, a policy of equal pay for equal work, and clearly outlined procedures to raise, file and respond to a discrimination complaint in an effective manner. Evidence, including worker testimony, of adherence to these policies and procedures will indicate minimisation of discrimination. “Positive” discrimination (i.e. special treatment to protect the rights and health of particular groups of workers, or to provide opportunities for groups which have historically been disadvantaged) is allowed, and often required by laws related to such issues as maternity and affirmative action.

Criterion 6.5 Work Environment Health and Safety

INDICATOR	REQUIREMENT
6.5.1 Percentage of workers trained in health and safety practices, procedures ⁶⁷ and policies on a yearly basis	100%
6.5.2 Evidence that workers use Personal Protective Equipment (PPE) effectively	Yes
6.5.3 Presence of a health and safety risk assessment and evidence of preventive actions taken	Yes
6.5.4 Evidence that all health and safety-related accidents and violations are recorded and corrective actions are taken when necessary	Yes
6.5.5 Evidence of employer responsibility and/or proof of insurance (accident or injury) for 100% of worker costs in a job-related accident or injury when not covered under national law	Yes

⁶⁷ Health and safety training shall include emergency response procedures and practices.

6.5.6 Evidence that all diving operations are conducted in a manner that protects the health and safety of divers ⁶⁸	Yes
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Rationale - A safe and healthy working environment is essential for protecting workers from harm. It is critical for a responsible aquaculture operation to minimise these risks. One of the key risks to workers is hazards resulting from accidents and injuries. Consistent, effective and regular worker training in health and safety practices is an important preventative measure. When an accident, injury or violation occurs, the company must record it and take corrective action to identify the root causes of the incident, remediate, and take steps to prevent future occurrences of similar incidents. This addresses violations and the long-term health and safety risks. Finally, while many national laws require that employers assume responsibility for job-related accidents and injuries, not all countries require this and not all workers (in some cases migrant and other workers) will be covered under such laws. When not covered under national law, employers must prove they are insured to cover 100 per cent of worker costs when a job-related accident or injury occurs.

Criterion 6.6 Wages

INDICATOR	REQUIREMENT
6.6.1 The percentage of workers whose basic wage ⁶⁹ (before overtime and bonuses) is below the minimum wage ⁷⁰	0 (None)
6.6.2 Evidence that the employer is working toward the payment of basic needs wage ⁷¹	Yes

⁶⁸ Employer keeps records of farm diving operations and a list of all personnel involved. In case an external service provider was hired, a statement that the provider conformed to all relevant criteria must be made available to the auditor by this provider. All diving operations are logged using diving computers and records are kept electronically. Employer ensures that a safety diver or a diving buddy is present during all dives. Employer maintains evidence of diver certification (e.g. copies of certificates) for each person involved in diving operations. Divers shall be certified through an accredited national or international organisation for diver certification. Divers shall undergo annual medical exams certifying they are fit to dive, as well as monitoring of hips, shoulders and thorax through x-rays every 3 years.

⁶⁹ **Basic wage:** The wages paid for a standard working week (no more than 48 hours).

⁷⁰ If there is no legal minimum wage in a country, basic wages must meet the industry-standard minimum wage.

⁷¹ **Basic needs wage:** A wage that covers the basic needs of an individual or family, including housing, food and transport. This concept differs from a minimum wage, which is set by law and may or may not cover the basic needs of workers.

6.6.3 Evidence of transparency in wage-setting and rendering ⁷²	Yes
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Rationale - Wages and the process for setting wages are important components of the ILO core principles. For this reason, it is important to highlight under these requirements the importance of workers' basic wages meeting the legal minimum wage and being rendered to workers in a convenient manner. Unfortunately, minimum wage in many countries does not always cover the basic needs of workers. Unfairly and insufficiently compensated workers can be subject to a life of sustained poverty. Therefore, it is important for socially responsible employers to pay or be working toward paying a basic needs wage. The calculation of a basic needs wage can be complex, and it is important for employers to consult with workers, their representatives and other credible sources when assessing what a basic needs wage would be.

Certified farms shall also demonstrate their commitment to fair and equitable wages by having and sharing a clear and transparent mechanism for wage-setting and a labour conflict resolution policy⁷³ that tracks wage-related complaints and responses. Having these policies outlined in a clear and transparent manner will empower the workers to negotiate effectively for fair and equitable wages that shall, at a minimum, satisfy basic needs.

Criterion 6.7 Contracts (labour) including subcontracting

INDICATOR	REQUIREMENT
6.7.1 Percentage of workers who have contracts ⁷⁴	100%
6.7.2 Evidence of a policy to ensure social compliance of its suppliers and contractors	Yes

Rationale - Fair contracting is important to ensure transparency between the employer and employee and fairness in the employment relation. Short-term and temporary contracts are acceptable but cannot be used to avoid paying benefits or to deny other rights. The company shall also have policies and mechanisms to ensure that workers contracted from other companies for specific services (e.g. divers,

⁷² Payments shall be rendered to workers in a convenient manner.

⁷³ See Criterion 6.8.

⁷⁴ Labour-only contracting relationships or false apprenticeship schemes are not acceptable. This includes revolving/ consecutive labour contracts to deny benefit accrual or equitable remuneration. False Apprenticeship Scheme: The practice of hiring workers under apprenticeship terms without stipulating terms of the apprenticeship or wages under contract. It is a "false" apprenticeship if its purpose is to underpay people, avoid legal obligations or employ underage workers. Labour-only contracting arrangement: The practice of hiring workers without establishing a formal employment relationship for the purpose of avoiding payment of regular wages or the provision of legally required benefits, such as health and safety protections.

cleaning or maintenance) and the companies providing them with primary inputs or supplies have socially responsible practices and policies.

Criterion 6.8 Conflict resolution

INDICATOR	REQUIREMENT
6.8.1 Evidence of worker access to effective, fair and confidential grievance procedures	Yes
6.8.2 Percentage of grievances handled that are addressed ⁷⁵ within a 90-day timeframe	100%

Rationale - Companies must have a clear labour conflict resolution policy in place for the presentation, treatment and resolution of worker grievances in a confidential manner. Workers shall be familiar with the policy and its effective use. Such a policy is necessary to track conflicts and complaints raised, and responses to conflicts and complaints.

Criterion 6.9 Disciplinary practices

INDICATOR	REQUIREMENT
6.9.1 Incidences of excessive or abusive disciplinary actions	None
6.9.2 Evidence of a functioning disciplinary action policy whose aim is to improve the worker ⁷⁶	Yes

Rationale - The rationale for discipline in the workplace is to correct improper actions and maintain effective levels of worker conduct and performance. However, abusive disciplinary actions can violate workers' human rights. The focus of disciplinary practices shall always be on the improvement of the

⁷⁵ **Addressed:** Acknowledged and received, moving through the company's process for grievances, corrective action taken when necessary.

⁷⁶ If disciplinary action is required, progressive verbal and written warnings shall be engaged. The aim shall always be to improve the worker; dismissal shall be the last resort. Policies for bonuses, incentives, access to training and promotions are clearly stated and understood, and not used arbitrarily. Fines or basic wage deductions shall not be acceptable disciplinary practices.

worker. Fines or basic wage deductions shall not be acceptable as methods for disciplining workforce. A certified farm shall never employ threatening, humiliating or punishing disciplinary practices that negatively impact a worker’s physical and mental⁷⁷ health or dignity.

Criterion 6.10 Working hours and overtime

INDICATOR	REQUIREMENT
6.10.1 Incidences, violations or abuse of working hours ⁷⁸ and overtime laws	None
6.10.2 Overtime is limited, voluntary, ⁷⁹ paid at a premium rate and restricted to exceptional circumstances	Yes

Rationale - Abuse of overtime working hours is a widespread issue in many industries and regions. Workers subject to extensive overtime can suffer consequences in their work-life balance and are subject to higher fatigue-related accident rates. In accordance with better practices, workers in certified farms are permitted to work—within defined guidelines—beyond normal work week hours but must be compensated at premium rates.⁸⁰ Requirements for time off, working hours and compensation rates as described should reduce the impacts of overtime.

Criterion 6.11 Living conditions for employees accommodated on the farm

INDICATOR	REQUIREMENT
6.11.1 Farm employees accommodated on the farm have access to clean, sanitary, safe and suitable living conditions	Yes

⁷⁷ **Mental Abuse:** Characterised by the intentional use of power, including verbal abuse, isolation, sexual or racial harassment, intimidation or threat of physical force.

⁷⁸ In cases where local legislation on working hours and overtime exceed internationally accepted recommendations (48 regular hours, 12 hours overtime), the international standards will apply.

⁷⁹ Compulsory overtime is permitted if previously agreed to under a collective bargaining agreement.

⁸⁰ **Premium rate:** A rate of pay higher than the regular work week rate. Must comply with national laws/regulations and/or industry standards.

6.11.2 Existence of separate sanitary and toilet facilities for men and women; with the exception of work sites with fewer than 10 employees or where married couples are working and accommodated together

Yes

Rationale - The protection of the workers that reside or live on the farm's property is an integral part of the employer's responsibility. Farms must provide clean, safe and sanitary living quarters with access to clean water and nutritious meals. Accommodation facilities must provide for the needs of those (presumably, but not exclusively, women) who can be considered at risk of sexual or privacy harassments.

Principle 7: Be a good neighbour and conscientious coastal citizen

Principle 7 aims to address any broader off-site potential social impacts associated with Tropical Marine Finfish production, including interactions with local communities.

Criterion 7.1 Community engagement and effective conflict resolution

INDICATOR	REQUIREMENT
7.1.1 Evidence of regular and meaningful ⁸¹ consultation and engagement with community representatives and organisations	Yes
7.1.2 Presence and evidence of an effective ⁸² policy and mechanism for the presentation, treatment and resolution of complaints by community stakeholders and organisations	Yes
7.1.3 For new farms ⁸³ , evidence of engagement and consultation with surrounding communities about potential social impacts from the farm.	Yes

Rationale - Fish farms must respond to human concerns that arise in communities located near the farm, and to concerns related to the farm's overall operations. In particular, appropriate consultation must be undertaken within local communities so that risks, impacts and potential conflicts are properly identified, avoided, minimised and/or mitigated through open and transparent negotiations. Communities shall have the opportunity to be part of the assessment process (e.g. by including them in the discussion of any social investments and contributions by companies to neighbouring communities). Channels of communication with community stakeholders are important. Regular consultation with community representatives and a transparent procedure for handling complaints are key components of this communication. Negative impacts may not always be avoidable. However, the process for addressing them must be open, fair and transparent, and must demonstrate due diligence. A company shall share with neighbouring communities any pertinent information about any potential health and safety risks or changes in access to resources.

⁸¹ **Regular and meaningful:** meetings shall be held at least bi-annually with elected representatives of affected communities. The agenda for the meetings should in part be set by the community representatives. Participatory Social Impact Assessment methods may be one option to consider here.

⁸² **Effective:** in order to demonstrate that the mechanism is effective, evidence of resolutions of complaints can be given.

⁸³ A 'new farm' is defined as an aquaculture operation where construction was completed after the publication date of the ASC Tropical Marine Finfish Standard or a farm that underwent a significant expansion after said publication date.

Appendix 1. Biodiversity-focused impact assessment

Requirement 2.3.1 requires the farm to demonstrate that a biodiversity-focused environmental impact assessment has been undertaken for the farm.

The assessment shall include habitats and species that could reasonably be impacted by the farm. For example, seagrass meadows near the farm could be impacted by organic loading from the farm.

The assessment shall incorporate:

1. Identification of proximity to critical, sensitive or protected habitats and species:
 - a. This includes key wild species within the marine environment around the farm.
 - b. Special attention must be given to:
 - i. species listed as vulnerable, endangered and/or critically endangered on the IUCN Red List of Threatened Species or
 - ii. national threatened/endangered species lists
 - iii. areas that have been identified as HCVAs,
 - iv. areas that have been identified as important for conservation/biodiversity
 - c. Sensitive species may include non-threatened species of high economic value in the area that may be affected by the Tropical Marine Finfish farm (e.g. lobsters or octopus)
 - d. Special attention must be given to the presence of sea grass meadows up to 500m from the AZE outwards, as farms are not allowed to be located closer than 500m from seagrass meadows Error! Bookmark not defined.
2. Identification and description of the potential impacts the farm might have on biodiversity, with a focus on those habitats or species
3. Description of strategies and current and future programme(s) underway on the farm to eliminate or minimise any identified impacts the farm may have, and for the monitoring of outcomes of said programs and strategies

Where damage of sensitive habitats has been caused by the farm (as defined in the impact assessment) previously and where restoration is possible and effective; restoration efforts will or have resulted in a meaningful amount of restored habitat; either through direct on-farm restoration or by an off-farm offsetting approach. Grandfathering of historical losses is allowed.

Reporting

The impact assessment report needs to be written in English and made public on the ASC via the regular publication of the audit assessment document done by the CAB.

Appendix 2. Forage Fish Dependency Ratio calculation

Forage Fish Dependency Ratio (FFDR) is the quantity of wild fish used per quantity of cultured fish produced. This measure can be calculated based on fishmeal (FM) and/or fish oil (FO). The dependency on wild forage fish resources shall be calculated for both FM and FO using the formulas noted below, and then the higher of the two values shall be applied to the Standard. This formula calculates the dependency of a single site on wild forage fish resources, independent of any other farm.

$$\text{FFDR FM} = \frac{\text{\% fishmeal in feed from forage fisheries (e FCR)}}{24}$$

$$\text{FFDR FO} = \frac{\text{\% fish oil in feed from forage fisheries (e FCR)}}{5.0 \text{ or } 7.0, \text{ depending on source of fish}}$$

Where:

1. Economic Feed Conversion Ratio (eFCR) is the quantity of feed used to produce the quantity of fish harvested.

$$\text{eFCR} = \frac{\text{Feed, kg or mt}}{\text{Net aquaculture production, kg or mt (wet weight)}}$$

2. The percentage of fishmeal and fish oil excludes fishmeal and fish oil derived from fisheries' by-products.⁸⁴ Only fishmeal and fish oil that is derived directly from a pelagic fishery (e.g. anchoveta) or fisheries where the catch is directly reduced (such as krill or blue whiting) is to be included in the calculation of FFDR. Fishmeal and fish oil derived from fisheries' by-products (e.g. trimmings and offal) should not be included because the FFDR is intended to be a calculation of direct dependency on wild fisheries.
3. The amount of fishmeal in the diet is calculated back to live fish weight by using a yield of 24%.⁸⁵ This is an assumed average yield.
4. The amount of fish oil in the diet is calculated back to live fish weight by using an average yield in accordance with this procedure:
 - a. Group A: Fish oil originating from Peru and Chile and Gulf of Mexico, five percent yield of fish oil.

⁸⁴ Trimmings are defined as by-products when fish are processed for human consumption or if whole fish is rejected for use of human consumption because the quality at the time of landing do not meet official regulations with regard to fish suitable for human consumption. Restrictions on what trimmings are allowed for use under the standard are under 4.3.3.

⁸⁵ Reference for FM and FO yields: Péron, G., et al. 2010. Where do fishmeal and fish oil products come from? An analysis of the conversion ratios in the global fishmeal industry. Marine Policy, doi:10.1016/j.marpol.2010.01.027.

- b. Group –B: Fish oil originating from the North Atlantic (Denmark, Norway, Iceland and the UK) seven percent yield of fish oil.
 - c. If fish oil is used from other areas than mentioned above, they should be classified as belonging to group A if documentation shows a yield less than or equal to six percent, and into group B if documentation shows a yield more than six percent.
5. FFDR is calculated for the grow-out period in the sea as long as the fingerling phase does not go past 50 grams per fingerling. If the fingerling phase goes past 50g then FFDR is calculated based on all feed used from 50 grams and onwards. If needed, the grow-out site shall collect this data from the fingerling supplier.

Appendix 3: Energy Records and Assessment

Subsections

- A. Energy use assessment and greenhouse gas (GHG) accounting for farms
- B. GHG accounting for feed

Appendix 3A. Energy use assessment and GHG accounting for farms

The ASC encourages companies to integrate energy use assessments and GHG accounting into their policies and procedures across the board in the company. However, this requirement only requires that operational energy use and GHG assessments have been done for the farm sites that are applying for certification.

Assessments shall follow either the GHG Protocol Corporate Standard or ISO 14064-1 (references below). These are the commonly accepted international requirements, and they are largely consistent with one another. Both are also high level enough not to be prescriptive and they allow companies some flexibility in determining the best approach for calculating emissions for their operations.

If a company wants to go beyond the requirement and conduct this assessment for their entire company, then the full protocols are applicable. If the assessment is being done only on sites that are being certified, the farms shall follow the GHG Protocol Corporate Standard and/or ISO 14064-1 requirements pertaining to:

- Accounting principles of relevance, completeness, transparency, consistency and accuracy
- Setting operational boundaries
- Tracking emissions over time
- Reporting GHG emissions

In regard to the operational boundaries, farm sites shall include in the assessment:

- Scope 1 emissions, which are emissions that come directly from a source that is either owned or controlled by the farm/facility.
 - For example, if the farm has a diesel generator, this will generate Scope 1 emissions. So will a farm-owned/-operated truck.
- Scope 2 emissions, which are emissions resulting from the generation of purchased electricity, heating, or cooling.

Quantification of emissions is done by multiplying activity data (e.g. quantity of fuel or kwh consumed) by an emission factor (e.g. CO₂/kwh). For non-CO₂ gases, you then need to multiply by a Global Warming Potential (GWP) to convert non-CO₂ gases into the CO₂-equivalent. Neither the GHG Protocol nor the ISO require specific approaches to quantifying emissions, so the ASC provides the following additional information on the quantification of emissions:

- Farms shall clearly document the emission factors they use and the source of the emission factors. Recommended sources include the Intergovernmental Panel on Climate Change (IPCC) or factors provided by national government agencies such as the United States Environmental Protection Agency (USEPA). Companies shall survey available emission factors and select the one that is most accurate for their situation, and transparently report their selection.
- Farms shall clearly document the GWPs that they use and the source of those GWPs. Recommended sources include the IPCC 2nd Assessment Report, on which the Kyoto Protocol and related policies are based, or more recent Assessment Reports.

References (relevant at time of publication of Standard):

- www.emissionfactors.com
- GHG Protocol Corporate Standard Website:
<http://www.ghgprotocol.org/Standards/corporate-Standard>
- GHG Protocol Corporate Standard Document:
<http://www.ghgprotocol.org/files/ghgp/public/ghg-protocol-revised.pdf>
- ISO 14064-1 available for download (with fee) at
http://www.iso.org/iso/catalogue_detail?csnumber=38381
- Some information on ISO 14064-1 is at
<http://www.iso.org/iso/pressrelease.htm?refid=Ref994>
- IPCC 2nd Assessment Report: <http://www.ipcc.ch/pdf/climate-changes-1995/ipcc-2nd-assessment/2nd-assessment-en.pdf>
- All IPCC Assessment Reports:
http://www.ipcc.ch/publications_and_data/publications_and_data_reports.shtml#1

Appendix 3B. GHG accounting for feed

The requirement requires the calculation of the GHG emissions for the feed used during the prior production cycle at the grow-out site undergoing certification. This calculation requires farms to multiply the GHG emissions per unit of feed, provided to them by the feed manufacturer, by the amount of feed used on the farm during the production cycle.

The feed manufacturer is responsible for calculating GHG emissions per unit feed. GHG emissions from feed can be calculated based on the average raw material composition used to produce the fish (by weight) and not as documentation linked to each single product used during the production cycle.

The scope of the study to determine GHG emissions should include the growing, harvesting, processing and transportation of raw materials (vegetable and marine raw materials) to the feed mill and processing at feed mill. Vitamins and trace elements can be excluded from the analysis. The method of allocation of GHG emissions linked to by-products must be specified.

The study to determine GHG emissions can follow one of the following methodological approaches:

1. A cradle-to-gate assessment, taking into account upstream inputs and the feed manufacturing process, according to the GHG Product Standard
2. A Life Cycle Analysis (LCA) following the ISO 14040 and 14044 requirements for life cycle assessments

Should the feed manufacturer choose to do a cradle-to-gate assessment:

1. It shall incorporate the first three phases from the methodology, covering materials acquisition and processing, production, and product distribution and storage (everything upstream and the feed manufacturing process itself).

Should the manufacturer follow the ISO 14040 and 14044 requirements for Life Cycle Assessment:

1. Feed manufacturers may follow either an ISO-compliant life cycle assessment methodology or the GHG Protocol product Standard.

Regardless of which methodology is chosen, feed manufacturers shall include in the assessment:

- Scope 1 emissions, which are emissions that come directly from a source that is either owned or controlled by the farm/facility.
- Scope 2 emissions, which are emissions resulting from the generation of purchased electricity, heating or cooling.
- Scope 3 emissions, which are emissions resulting from upstream inputs and other indirect emissions, such as the extraction and production of purchased materials, following the Scope 3 Standard.

Quantification of emissions is done by multiplying activity data (e.g. quantity of fuel or kwh consumed) by an emission factor (e.g. CO₂/kwh). For non-CO₂ gases, you then need to multiply by a Global Warming Potential (GWP) to convert non-CO₂ gases into CO₂-equivalent. The ASC provides the following additional information on the quantification of emissions:

- Farms shall clearly document the emission factors they use and the source of the emission factors. Recommended sources include the IPCC or factors provided by national government agencies, such as the USEPA. Companies shall survey available emission factors and select the one that is most accurate for their situation, and transparently report their selection.
- Farms shall clearly document the GWPs that they use and the source of those GWPs. Recommended sources include the IPCC 2nd Assessment Report, on which the Kyoto Protocol and related policies are based, or more recent Assessment Reports.

References:

- www.emissionfactors.com
- GHG Product Standard: <http://www.ghgprotocol.org/files/ghgp/public/ghg-protocol-product-standard-draft-november-20101.pdf>
- Scope 3 Standard: <http://www.ghgprotocol.org/files/ghgp/GHG%20Protocol%20-%20Scope%203%20Standard%20-%20Stakeholder%20Comments%20-%20November%202010.xlsx>
- ISO 14044 available for download (with fee) at: http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=38498
- Some information on ISO 14064-1 is at: <http://www.iso.org/iso/pressrelease.htm?refid=Ref994>
- IPCC 2nd Assessment Report: <http://www.ipcc.ch/pdf/climate-changes-1995/ipcc-2nd-assessment/2nd-assessment-en.pdf>
- All IPCC Assessment Reports: http://www.ipcc.ch/publications_and_data/publications_and_data_reports.shtml#1

Appendix 4: Participant List – Technical Expert Group Meeting

Tropical Marine Fin Fish Dialogue 12 – 14 December 2016 Sudamala Hotel, Sanur, Bali, Indonesia		
Name	Company / Organisation	Country
Dan Fisk	Australis	Vietnam
Josh Goldman	Australis	United States
Felix Wai	Aquaculture Technologies Asia Ltd	Hong Kong SAR
Steven Chan	Aquaculture Technologies Asia Ltd	China
Troy Keast	Philipps Seafood	Indonesia
Joep Kleine Staarman	Barramundi Asia	Singapore
Timothy Hromatka	Fin Fisher Pte	Singapore
Santhana Krishnan	Maritech	India
Ravi Fotedar	Curtain University	Australia
Trevor Anderson	Australian Barramundi Farmers Association	Australia
Tatam Sutarmat	TBA	Indonesia
Cut Desayna	WWF	Indonesia
Ernest Chiam	Consultant	Malaysia
Chee Kiat Ng	Marine Fish Farmers Association of Malaysia	Malaysia
Colin Brannen	ASC	United States
Geoffrey Muldoon	WWF	Australia

Absent members

Richard Knuckey	Finfish Enterprises P/L	Australia
Steve Davies	Marine Products Australia	Australia
David Cahill	National Aquaculture Group	Saudi Arabia

Appendix 5: Participant List – Inaugural meeting of the Grouper, Snapper, and Barramundi Dialogue

Grouper, Snapper & Barramundi Dialogue 9-10 October 2013 The Northam All Suite Penang, Malaysia		
Name	Company/Organization	Country
YB. Dr. Afif b. Bahardin	State Exco for Agriculture & Agro-based Industries, Rural Development & Health	Malaysia
Carol Phua	WWF-Malaysia	Malaysia
Geoffrey Muldoon	WWF Coral Triangle Global Initiative	Australia
Merrielle Macleod	WWF-US	USA
Peter Scott	Independent Consultant	Philippines
Tang Twen Poh	Stanton Emms	Malaysia
Olav Jamtøy	GenoMar AS / Trapia Malaysia Sdn Bhd	Malaysia
Mohamed Razali Mohamed	Aquagrow Corporation Sdn Bhd	Malaysia
Gangaram Pursumal	WWF-Malaysia	Malaysia
Ernest Chiam	WWF-Malaysia	Malaysia
Alistair Yong	WWF-Malaysia	Malaysia
Nadiah Rosli	WWF-Malaysia	Malaysia
Liew Hui Ling	WWF-Malaysia	Malaysia
Christina Yung Tze Moi	Better Prospects Sdn Bhd	Malaysia
Mylene Mace	Aquagrow Corporation Sdn Bhd	Malaysia
Dato' Goh Cheng Liang	Marine Fish Farmers Association Msia (MFFAM) / GST Fine Foods Sdn Bhd	Malaysia
Kamaruddin bin Harun	MFFAM	Malaysia
Mohd Addin Aarif	MFFAM	Malaysia
Noraisyah Abu Bakar	Department of Fisheries Penang	Malaysia
Che Zulkifli bin Che Ismail	Department of Fisheries-FRI Pulau Sayak	Malaysia
Suffian Mustafa	Department of Fisheries	Malaysia
Cheah Guan Seng	BE-BIOMS/B / Penang Aquaculture Association	Malaysia
Kimberly Lim	Palawan Aquaculture Corporation	Philippines
Elsie Tech	Palawan Aquaculture Corporation	Philippines
Badrudin	Ex-DG Aquaculture	Indonesia
Effendy Wong	UD Sondoro	Indonesia
I Wayan Sudja	Indonesian Mariculture Association (ABILINDO)	Indonesia
Dedy Yaniharto	Masyarakat Aquaculture Indonesia (MAI)	Indonesia
Imam Musthofa	WWF-ID	Indonesia
Candhika Yusuf	WWF-ID	Indonesia
Nur Ahyani	WWF-ID	Indonesia
Indah Sukmayanti	DG Aquaculture	Indonesia
Dwi Murtono	PT Pura Baruna Lestari	Indonesia
Arfiana Budiati Jindan	DG Aquaculture	Indonesia
Felix G. Ayson, DSc	SEAFDEC Aquaculture Department	Philippines
Renato B. Bocaya	Finfish Hatcheries Inc. / Alsons Aquaculture Corp.	Philippines
Troy Keast	Director of Aquaculture and Sustainability, Phillips Foods Asia	Indonesia
Ngo Tien Chuong	WWF-Vietnam	Vietnam
Thuong	Vinh Hoan	Vietnam
Nguyen Huu Dung	Nha Trang University	Vietnam
Dr Roger Chan Eng Nai	Aqua Ceria Group	Vietnam
Alissala Thian	Press Buletin Motions	Malaysia
Arafat Esah	Press Buletin Motions	Malaysia

Appendix 6: Species in Scope

The following species are considered within the scope of this Standard:

Cephalopholis miniata
Cromileptes altivelis
Epinephelus akaara
Epinephelus chlorostigma
Epinephelus coioides
Epinephelus corallicola
Epinephelus fuscoguttatus
Epinephelus lanceolatus
Epinephelus malabaricus
Epinephelus polyphekadion
Larimichthys crocea
Lates calcarifer
Lutjanus argentimaculatus
Lutjanus argentiventris
Lutjanus erythropterus
Lutjanus goldiei
Lutjanus johnii
Lutjanus rivulatus
Lutjanus russellii
Lutjanus sebae
Ocyurus chrysurus
Plectropomus laevis
Plectropomus leopardus
Plectropomus maculatus
Plectropomus melanoleucus
Plectropomus oligacanthus
Trachinotus blochii
Trachinotus carolinus
Trachinotus falcatus
Trachinotus ovatus