MONTEREY BAY AQUARIUM®
Seafood WATCH

Friend of the Sea
Mussels *(Version 01/04/2010)*

Benchmarking equivalency results assessed against the Seafood Watch Aquaculture Criteria

May 2013

Final Seafood Recommendation

Friend of the Sea - Mussels

Criterion	Score (0-10)	Rank	Critical?
C1 Data	7.50	GREEN	
C2 Effluent	10.00	GREEN	NO
C3 Habitat	6.27	YELLOW	NO
C4 Chemicals	8.00	GREEN	NO
C5 Feed	10.00	GREEN	NO
C6 Escapes	2.00	RED	YES
C7 Disease	4.00	YELLOW	NO
C8 Source	10.00	GREEN	
3.3X Wildlife mortalities	-4.00	YELLOW	NO
6.2X Introduced species escape	-5.00	YELLOW	
Total	**48.77**		
Final score	**6.10**		

Final Score	6.10
Initial rank	YELLOW
Red criteria	1
Final rank	YELLOW
Critical Criteria?	0

FINAL RANK

YELLOW

Scoring note – scores range from zero to ten where zero indicates very poor performance and ten indicates the aquaculture operations have no significant impact, except for the two exceptional "X" criteria for which a score of -10 is very poor and zero is good.

Summary

The final numerical score is in the yellow category, and with one red criterion, the final result remains a yellow "Good Alternative".

Executive Summary

The benchmarking equivalence assessment was undertaken on the basis of a positive application of a realistic worst-case scenario.

- "Positive" – Seafood Watch wants to be able to defer to equivalent certification schemes
- "Realistic" – we are not actively pursuing the theoretical worst case score. It has to represent reality and realistic aquaculture production.
- "Worst-case scenario" – we need to know that the worst-performing farm capable of being certified to any one standard is equivalent to a minimum of a Seafood Watch "Good alternative" or "Yellow" ranking.

The final result of the equivalence assessment for Friend of the Sea Mussel standards is a yellow "Good Alternative" recommendation. Seafood Watch does not consider all certified farms to be at that level, but the standards could allow a farm equivalent to a yellow Seafood Watch recommendation to be certified. This means Seafood Watch can defer to Friend of the Sea Blue Mussel certification as an assurance that certified products meet at least a yellow "Good Alternative" recommendation.

In general, the Friend of the Sea mussel standards:

- require an environmental impact assessment, but give no indication of limits or required actions resulting from it
- defer to local regulations whose content or requirements are unknown
- are complicated by the presence of "recommendations", "Important" and "Essential"
- like all certification standards, are not able to robustly manage the cumulative impacts of multiple neighboring, local or regional farms

Specifically for each criterion, the standards:

- require the collection of data for the relevant assessed criteria
- do not account for external feeding as it is not provided to cultured aquatic animals, and thus, the effluent and feed criteria are scored with 10
- certify farms can have moderate impacts on habitat functionality
- do not limit predator and wildlife mortality
- do not limit the use of chemicals
- allow non-native shellfish species and utilize production systems that involve a relatively high risk of escape from broadcast spawning
- does not consider the risk of escape of unintentionally transported species
- are limited with respect to the transmission of diseases and is scored based on assumption that disease and water exchanges still occur.
- allow the use of wild seed, without clear sustainability requirements

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The scope of the standards is all mussel species

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Benchmarking principles

The benchmarking equivalence assessment was undertaken on the basis of a positive application of a realistic worst-case scenario

- "Positive" – Seafood Watch wants to be able to defer to equivalent certification schemes
- "Realistic" – we are not actively pursuing the theoretical worst case score. It has to represent reality and realistic aquaculture production.
- "Worst-case scenario" – we need to know that the worst farm capable of being certified to any one standard is equivalent to a minimum of a Seafood Watch "Good alternative" or "Yellow" rank.

Benchmarking assumptions

A number of assumptions were made to enable an equivalence assessment to be made either in the face of differing language or units etc., or in the case of missing information or gaps in the standards. The assumptions enable consistency across all the standards being assessed.

Specific assumptions have been noted where relevant in the individual criteria sections below, but the following were applied to all standards:

- Anything referred to as "should", "recommend", "prefer", "minimize", "minor must" or any similarly non-specific language was ignored
- Any deferral to local or national regulations in a standard of global scope was ignored.
- Any aspirational intent not supported by robust standards was ignored (for example "You must prevent escapes" was ignored if there were not effective supporting standards to actually prevent escapes).
- Any standards based on a future timeframe were ignored.
- Assume standards are applicable globally unless the standards or the scheme's label specify or differentiate production regions. Assume the worst-case farm is in the worst country or region.

- Only “complete” production systems were assessed across all criteria – for example all criteria for tilapia are assessed for cages because this gives the lowest overall final score and rank, even though ponds would have a lower habitat criterion score.
- Requirements for animal health plans, veterinary supervision, or veterinary prescription of medications were ignored without further robust requirements in the standards

Scoring guide

- With the exception of the exceptional factors (3.3x and 6.2X), all scores result in a zero to ten final score for the criterion and the overall final rank. A zero score indicates poor performance, while a score of ten indicates high performance. In contrast, the two exceptional factors result in negative scores from zero to minus ten, and in these cases zero indicates no negative impact.

- **The full Seafood Watch Aquaculture Criteria that the following scores relate to are available here[1].**
- **The full data values and scoring calculations are available in Appendix 1**

[1] http://www.montereybayaquarium.org/cr/cr_seafoodwatch/sfw_aboutsfw.aspx

Criterion 1: Data quality and availability

Impact, unit of sustainability and principle

- *Impact: poor data quality and availability limits the ability to assess and understand the impacts of aquaculture production. It also does not enable informed choices for seafood purchasers, nor enable businesses to be held accountable for their impacts.*
- *Sustainability unit: the ability to make a robust sustainability assessment*
- *Principle: robust and up-to-date information on production practices and their impacts is available to relevant stakeholders.*

Criterion 1 Summary of scores for Friend of the Sea Blue Mussels

Explanatory tables for C1 can be found on pages 3-4 of the Seafood Watch assessment criteria.

Data Category	Relevance (Y/N)	Data Quality	Score (0-10)
Industry or production statistics	yes	10	10
Effluent	no	n/a	n/a
Locations/habitats	yes	10	10
Predators and wildlife	yes	0	0
Chemical use	yes	10	10
Feed	no	n/a	n/a
Escapes, animal movements	yes	10	10
Disease	yes	0	0
Source of stock	yes	10	10
Other – (e.g. GHG emissions)	yes	10	10
Total			**60**

C1 Data Final Score	7.50	GREEN

Justification of Ranking

Assumptions:

- The “Source of stock” and “Energy use” categories were considered “non-relevant” unless the scheme specifically required data collection on these aspects. Schemes could improve their score by requirements in this respect, but would not be penalized for not providing information on what would be considered universal practice.

Relevant Content of Standards	How we applied it
Not addressed by initiative	Industry or production statistics scored “10” because though they are not explicitly required, but it is considered that the farm-level certification process requires the collection of data regarding production statistics.
2- Site location	Thorough record keeping required. Location/habitat data quality and availability is scored “10”.
Predators and wildlife data is not required by initiative	Predators/wildlife data quality and availability is scored “0”.
6 - Hazardous Substances	Thorough record keeping required. Chemical use data quality and availability is scored “10”.
3.1. In order to avoid the dispersal of farmed material and the materials that form the installation itself the organization has implemented: 3.1.1 resistance standards of installation (nets, booms, anchoring weights and similar) compatible with site oceanographic features (tides, wave motion...) 3.1.2 installation maintenance and control schedules: anchoring systems, buoyancy systems, mussel rope integrity, surveillance and monitoring.	Thorough record of escapes and preventive measures are required. Escapes data quality and availability is scored “10”.
Disease Prevention and the Use of Drugs is not addressed by initiative	Disease data quality and availability is scored “0”.
4 - Procurement of Seed	Thorough record keeping required. Source of stock data quality and availability is scored “10”.
7.1 The organization must maintain a record of energy consumption updated at least annually.	Thorough record keeping required. Other data quality and availability is scored “10”.

Criterion 2: Effluents

Impact, unit of sustainability and principle

- *Impact: aquaculture species, production systems and management methods vary in the amount of waste produced and discharged per unit of production. The combined discharge of farms, groups of farms or industries contributes to local and regional nutrient loads.*
- *Sustainability unit: the carrying or assimilative capacity of the local and regional receiving waters beyond the farm or its allowable zone of effect.*
- *Principle: aquaculture operations minimize or avoid the production and discharge of wastes at the farm level in combination with an effective management or regulatory system to control the location, scale and cumulative impacts of the industry's waste discharges beyond the immediate vicinity of the farm.*

Criterion 2 Summary of scores for Friend of the Sea Blue Mussels

Explanatory tables for C2 can be found on pages 8-12 of the Seafood Watch assessment criteria.

Effluent Rapid Assessment

C2 Effluent Final Score	**10.00**	**GREEN**

Justification of Ranking

Assumptions

- The Rapid assessment was used for shellfish (extractive species).

Mussel farming may have an impact beneath the farm (e.g. through pseudo feces, and assessed in the habitat criterion C3), but are unlikely to have an effluent impact beyond the farm area or allowable zone of effect. The score is 10 out of 10.

Criterion 3: Habitat

Impact, unit of sustainability and principle

- *Impact: Aquaculture farms can be located in a wide variety of aquatic and terrestrial habitat types and have greatly varying levels of impact to both pristine and previously modified habitats and to the critical "ecosystem services" they provide.*
- *Sustainability unit: The ability to maintain the critical ecosystem services relevant to the habitat type.*
- *Principle: aquaculture operations are located at sites, scales and intensities that cumulatively maintain the functionality of ecologically valuable habitats.*

Criterion 3 Summary of scores for Friend of the Sea Blue Mussels

Explanatory tables for C3 can be found on pages 13-16 of the Seafood Watch assessment criteria.

Habitat parameters	Value	Score	
F3.1 Habitat conversion and function		9.00	
F3.2a Content of habitat regulations	1.00		
F3.2b Enforcement of habitat regulations	2.00		
F3.2 Regulatory or management effectiveness score		0.80	
C3 Habitat Final Score		**6.27**	**YELLOW**
Critical?	NO		

Justification of Ranking

Assumptions:

- Assume farm is in high-value (or former high-value) habitat unless standards specify otherwise
- The cumulative impacts questions on regulations and enforcement were assessed according to the standards requirements in this respect

Factor 3.1. Habitat conversion and function

Factor 3.1 assesses the impact on ecosystem services at the farm site, or within an allowable zone of effect.

Relevant Content of Standards	How we applied it
2.2 **No critical alterations found to ecosystems**, such as rivers, lakes, bays, and estuaries 5.1 The sediment quality parameters in the area around installation must conform to current regulations. 5.2 Organizations operating in countries where water parameter regulations are not in place must demonstrate, via independent laboratory analysis carried out at least annually, **that the farming has a neutral or negligible impact on the seabed** by showing a non-significant variation of the following parameters: 5.2.1 communities of benthic macroinvertebrates 5.2.2 nitrogen and phosphorus content 5.2.3 oxygen concentration 5.2.4 Increase of sedimentation and the granulometric variation 5.2.5 deposits of organic matter	Standards limit habitat impacts to 'maintain functionality'. Minimal impacts are expected (scored as "9").

The final score for Factor 3.1 is 9 out of 10.

Factor 3.2. Habitat and farm siting management effectiveness (appropriate to the scale of the industry)

Factor 3.2a assesses the content of the management measures relating to site-specific and cumulative habitat impacts. See Appendix 1 for scoring questions.

Relevant Content of Standards	How we applied it
2.1 An Environmental Impact Assessment (EIA) or equivalent has been carried out with a positive outcome by the presiding authority, taking the following into consideration: 2.1.1 impact on the ecosystem Essential, and 2.1.2 impact on the countryside 2.2 No critical alterations found to ecosystems, such as rivers, lakes, bays, and estuaries. Cumulative impacts of the industry on ecosystem functionality are not addressed by initiative.	Farm location is based on ecological principles, requires an Environmental Impact Assessment Score of "1" in F3.2a Question 1
	Industry's current size and future expansion are not limited to an appropriate location nor are their cumulative impacts being addressed. Score of "0" in F3.2a Questions 2 and 3
	High-value habitats are not being avoided for aquaculture siting. Score of "0" in F3.2a Question 4

	Standards do not require the restoration of important or critical habitats. Score of “0” in F3.2a Question 5

The final score for Factor 3.2a is 1 out of 5

Factor 3.2b assesses the enforcement of the above measures. See Appendix 1 for scoring questions.

Relevant Content of Standards	**How we applied it**
Contact information requirement Enforcement is not addressed by initiative	Enforcement organizations or individuals are identifiable and contactable. Score of “1” in F3.2b Question 1 The farm siting enforcement process does not function according to the zoning or other ecosystem-based management plans; does not account for the cumulative impacts, and is not considered to be transparent. Score of “0” in F3.2b Questions 2, 3, and 4
The conformity with FoS requirements constitutes the evidence showing that the limits defined are being achieved.	Score of “1” in F3.2b Question 5

The final score for Factor 3.2b is 2 out of 5

The final score for criterion 3 combines factors 3.1. and 3.2 (Explanatory tables and calculations can be found on page 16 of the assessment criteria) to give a score of 6.27 out of 10.

Factor 3.3X: Wildlife and predator mortalities

A measure of the effects of deliberate or accidental mortality on the populations of affected species of predators or other wildlife.

This is an "exceptional" factor that may not apply in many circumstances. It generates a negative score that is deducted from the overall final score. A score of zero means there is no impact.

Factor 3.3X Summary of scores for Friend of the Sea Blue Mussels
Explanatory score tables for F3.3X can be found on pages 17-18 of the Seafood Watch assessment criteria.

Wildlife and predator mortality parameters	Score	
F3.3X Wildlife and predator mortality Final Score	**-4.00**	**YELLOW**
Critical?	NO	

Justification of Ranking
Assumptions:

- Assume score of -4 unless standards specify otherwise. This is based on an assumption that wildlife mortalities will occur if the standards do not specifically require non-lethal controls, but that in the large majority of cases, the mortality numbers will not significantly impact the predator populations.

Relevant Content of Standards	How we applied it
3.2 In order to avoid the entry of other organisms, such as birds or other predators, into the installation, the Organisation has implemented: 3.2.1 screens, filters, covering nets or Similar (Essential) 3.2.2 maintenance and control Procedures (Essential)	The standards allow lethal control. Scored -4 on the above assumption.

Criterion 4: Evidence or Risk of Chemical Use

Impact, unit of sustainability and principle

- *Impact: Improper use of chemical treatments impacts non-target organisms and leads to production losses and human health concerns due to the development of chemical-resistant organisms.*
- *Sustainability unit: non-target organisms in the local or regional environment, presence of pathogens or parasites resistant to important treatments*
- *Principle: aquaculture operations by design, management or regulation avoid the discharge of chemicals toxic to aquatic life, and/or effectively control the frequency, risk of environmental impact and risk to human health of their use*

Criterion 4 Summary of scores for Friend of the Sea Blue Mussels

Explanatory score tables for C4 can be found on pages 19-20 of the Seafood Watch assessment criteria.

Chemical Use parameters	Score	
C4 Chemical Use Score	**8.00**	
C4 Chemical Use Final Score	**8.00**	**GREEN**
Critical?	NO	

Justification of Ranking

Assumptions:

- Assume un-restricted use of critically important antibiotics unless specifically prohibited in the standards
- If antibiotics are prohibited but other chemicals are permitted, the score was based on any further standards limitations or the typical use for the species and production system (whichever was lower).

Relevant Content of Standards	How we applied it
6.1. The use of toxic and persistent chemical compounds (e.g. TBTs, Malachite Green, DDT) is not permitted. The use of hazardous substances must be carried out in compliance with safety regulations.	Score of 8 out of 10 because toxic or persistent chemicals would not be used, and chemical use in mussel farming is considered to typically be minimal.

Criterion 5: Feed

Impact, unit of sustainability and principle

- *Impact: feed consumption, feed type, ingredients used and the net nutritional gains or losses vary dramatically between farmed species and production systems. Producing feeds and their ingredients has complex global ecological impacts, and their efficiency of conversion can result in net food gains, or dramatic net losses of nutrients. Feed use is considered to be one of the defining factors of aquaculture sustainability.*
- *Sustainability unit: the amount and sustainability of wild fish caught for feeding to farmed fish, the global impacts of harvesting or cultivating feed ingredients, and the net nutritional gains or losses from the farming operation.*
- *Principle: aquaculture operations source only sustainable feed ingredients, convert them efficiently and responsibly, and minimize and utilize the non-edible portion of farmed fish.*

Criterion 5 Summary of scores for Friend of the Sea Blue Mussels

Explanatory score tables and calculations can be found on pages 21-26 of the Seafood Watch assessment criteria.

Feed parameters	Value	Score	
C5 Feed Final Score		**10.00**	**GREEN**
Critical?	NO		

Justification of Ranking

Relevant Content of Standards	How we applied it
Not addressed by initiative	F5 score as “10”. No feed is provided.

Shellfish aquaculture is extractive with the stock filtering natural plankton populations for nutrition. As external feed is not provided, a score of 10 out of 10 is assigned to this criterion.

Criterion 6: Escapes

Impact, unit of sustainability and principle

- *Impact: competition, genetic loss, predation, habitat damage , spawning disruption, and other impacts on wild fish and ecosystems resulting from the escape of native, non-native and/or genetically distinct fish or other unintended species from aquaculture operations*
- *Sustainability unit: affected ecosystems and/or associated wild populations.*
- *Principle: aquaculture operations pose no substantial risk of deleterious effects to wild populations associated with the escape of farmed fish or other unintentionally introduced species.*

Criterion 6 Summary of scores for Friend of the Sea Mussels

Explanatory score tables for C6 can be found on pages 27-30 of the Seafood Watch assessment criteria.

Escape parameters	Value	Score	
F6.1 Escape Risk		0.00	
F6.1a Recapture and mortality (%)	0		
F6.1b Invasiveness		5	
C6 Escape Final Score		**2.00**	**RED**
Critical?	NO		

Justification of Ranking

Assumptions

- Assume high exchange ponds and cages are high escape risk unless the standards require realistically effective prevention measures above industry norms.
- Assume worst case scenario species/location (e.g. non-native or heavily domesticated native)

Factor 6.1a. Escape risk

Relevant Content of Standards	How we applied it
There are no standards preventing broadcast spawning and therefore “escape” of mussels	The “escape” risk for shellfish is primarily due to broadcast spawning of the stock for which there are no practical prevention measures. For the purposes of this assessment, the “escape risk” is considered to be very high (score of 0 out of 10)

The initial escape risk score is 0 out of 10

Recapture and mortality

Relevant Content of Standards	How we applied it
Recapture and mortality of escapees are not considered in the initiative.	0% is considered because although the relative mortality of mussel larvae/spat "escapees" will be high, it will not significantly reduce the potential for ecological impacts in Factor 6.1b below

The recaptures and mortality score can improve the escape risk score, but in this case the escape risk remains high and scored 0 out of 10.

Factor 6.1b. Invasiveness

Part A or B

Relevant Content of Standards	How we applied it
4.1 Foreign invasive species must not be introduced without official authorisation from the presiding body	The standards do not limit the range of certifiable mussel species, and Standard 4.1 relies only on unknown local regulations or "presiding body" to limit the introduction of non-native mussel species. Factor 6.1a PART B is scored 1 for the culture of a non-native species which is partly established, and there is a potential to extend the species range or coverage.

Part B score is 1 out of 5

Part C

Relevant Content of Standards	How we applied it
There are no standards preventing the ecological impacts of "escaping" (i.e. broadcast spawning) of a non-native mussel species.	Scored 4 out of 5 for Factor 6.1b Part C because "escaping" non-native mussels will compete for food and habitat/substrate (see scores in Appendix 1)..

Part C score is 4 out of 5

The invasiveness score is 5 out of 10.

The final score for Criterion 6 (Escapes) combines the escape risk with the invasiveness score and is 2 out of 10 reflecting lack of standards to prevent the impact of farming a non-native broadcast spawning species without any robust controls or limitations.

Factor 6.2X: Escape of unintentionally introduced species

A measure of the escape risk (introduction to the wild) of alien species other than the principle farmed species unintentionally transported during live animal shipments.

This is an "exceptional criterion that may not apply in many circumstances. It generates a negative score that is deducted from the overall final score.

Factor 6.2X Summary of scores for Friend of the Sea Blue Mussels
Explanatory score tables for F6.2X can be found on pages 31-32 of the Seafood Watch assessment criteria.

Escape of unintentionally introduced species parameters	Score	
F6.2Xa International or trans-waterbody live animal shipments (%)	5.00	
F6.2Xb Biosecurity of source/destination	0.00	
C6 Escape of unintentionally introduced species Final Score	**-5.00**	**YELLOW**

Justification of Ranking
Assumptions

- Assume 50% shipping of non-secure stock for shellfish or mussel standards (due to common movement of seed in shellfish production).

Factor 6.2Xa International or trans-waterbody live animal shipments

Relevant Content of Standards	How we applied it
Not addressed by initiative	50% of international or trans-waterbody live animal shipment is assumed.

F6.2Xa is scored as "5"

Factor 6.2Xb Biosecurity of source/destination

Relevant Content of Standards	How we applied it
3.1. In order to avoid the dispersal of farmed material and the materials that form the installation itself the organization has implemented: 3.1.1. resistance standards of installation (nets, booms, anchoring weights and similar) compatible with site oceanographic features (tides, wave motion...) 3.1.2 installation maintenance and control schedules: anchoring systems, buoyancy systems, mussel rope integrity, surveillance and monitoring	Scored as 0 out of 10 because the biosecurity of the source and destination of seed is not addressed by the standards and wild caught sources (e.g. dredged mussel spat) and open systems with high risks are allowed.

F6.2Xa is scored as "0"

Criterion 7. Disease; pathogen and parasite interactions

Impact, unit of sustainability and principle

- *Impact: amplification of local pathogens and parasites on fish farms and their retransmission to local wild species that share the same water body*
- *Sustainability unit: wild populations susceptible to elevated levels of pathogens and parasites.*
- *Principle: aquaculture operations pose no substantial risk of deleterious effects to wild populations through the amplification and retransmission of pathogens or parasites.*

Criterion 7 Summary of scores for Friend of the Sea Blue Mussels

Explanatory score tables for C7 can be found on pages 33-34 of the Seafood Watch assessment criteria.

Pathogen and parasite parameters	Score	
C7 Biosecurity	4.00	
C7 Disease; pathogen and parasite Final Score	**4.00**	**YELLOW**
Critical?	**NO**	

Justification of Ranking

Assumptions

- Unless standards robustly specify otherwise, assume a score of 4 for species other than salmon based on the Seafood Watch criteria definition: "*Amplification of pathogens or parasites on the farm results in increased infection of wild fish, shellfish or other populations in the farming locality or region*".

Relevant Content of Standards	How we applied it
Not addressed by initiative	Scored 8 because mussel culture does not increase the likelihood of pathogen amplification compared to natural populations due to natural stocking densities, water quality, feed type and behavior (as specified in the Seafood Watch criteria).

The final score for Criterion 7 is 4 out of 10.

Criterion 8. Source of Stock – independence from wild fisheries

Impact, unit of sustainability and principle

- *Impact: the removal of fish from wild populations for on-growing to harvest size in farms*
- *Sustainability unit: wild fish populations*
- *Principle: aquaculture operations use eggs, larvae, or juvenile fish produced from farm-raised broodstocks thereby avoiding the need for wild capture*

Criterion 8 Summary of scores for Friend of the Sea Blue Mussels

An explanatory score table for C8 can be found on page 35 of the Seafood Watch assessment criteria.

Source of stock parameters	Score	
C8 % of production from hatchery-raised broodstock or natural (passive) settlement	100	
C8 Source of stock Final Score	**10.00**	**GREEN**

Justification of Ranking

Assumptions

- For the species covered by the standards in this assessment, assume 100% is source from hatcheries (because almost all are) except shrimp standards that do not specifically prohibit capture of wild postlarvae.

Relevant Content of Standards	How we applied it
Not addressed by the standards. 4.2 Naturally harvested seed must not come from over exploited populations 4.3 The natural seed harvesting method must not have a negative impact on the environment and the seabed.	Scored 10 because while passive natural settlement is the most common industry practice, active harvest of wild seed is permitted but the standards should prevent harvest from demonstrably unsustainable sources.

The final score for Criterion 8 is 10 out of 10.

Overall Recommendation

The overall recommendation is as follows:

The overall final score is the average of the individual criterion scores (after the two exceptional scores have been deducted from the total). The overall ranking is decided according to the final score, the number of red criteria, and the number of critical scores as follows:

- **Best Choice** = Final score ≥6.6 AND no individual criteria are Red (i.e. <3.3)
- **Good Alternative** = Final score ≥3.3 AND <6.6, OR Final score ≥ 6.6 and there is one individual "Red" criterion.
- **Red** = Final score <3.3, OR there is more than one individual Red criterion, OR there is one or more Critical score.

Criterion	Score (0-10)	Rank	Critical?
C1 Data	7.50	GREEN	
C2 Effluent	10.00	GREEN	NO
C3 Habitat	6.27	YELLOW	NO
C4 Chemicals	8.00	GREEN	NO
C5 Feed	10.00	GREEN	NO
C6 Escapes	2.00	RED	NO
C7 Disease	4.00	YELLOW	NO
C8 Source	10.00	GREEN	
3.3X Wildlife mortalities	-4.00	GREEN	NO
6.2X Introduced species escape	-5.00	YELLOW	
Total	**48.77**		
Final score	**6.10**		

Final Score	6.10
Initial rank	YELLOW
Red criteria	1
Final rank	YELLOW
Critical Criteria?	NO

FINAL RANK

YELLOW

Guiding Principles

Seafood Watch™ defines sustainable seafood as originating from sources, whether fished[2] or farmed, that can maintain or increase production in the long-term without jeopardizing the structure or function of affected ecosystems.

The following **guiding principles** illustrate the qualities that aquaculture must possess to be considered sustainable by the Seafood Watch program:

Seafood Watch will:

- Support data transparency and therefore aquaculture producers or industries that make information and data on production practices and their impacts available to relevant stakeholders.
- Promote aquaculture production that minimizes or avoids the discharge of wastes at the farm level in combination with an effective management or regulatory system to control the location, scale and cumulative impacts of the industry's waste discharges beyond the immediate vicinity of the farm.
- Promote aquaculture production at locations, scales and intensities that cumulatively maintain the functionality of ecologically valuable habitats without unreasonably penalizing historic habitat damage.
- Promote aquaculture production that by design, management or regulation avoids the use and discharge of chemicals toxic to aquatic life, and/or effectively controls the frequency, risk of environmental impact and risk to human health of their use
- Within the typically limited data availability, use understandable quantitative and relative indicators to recognize the global impacts of feed production and the efficiency of conversion of feed ingredients to farmed seafood.
- Promote aquaculture operations that pose no substantial risk of deleterious effects to wild fish or shellfish populations through competition, habitat damage, genetic introgression, hybridization, spawning disruption, changes in trophic structure or other impacts associated with the escape of farmed fish or other unintentionally introduced species.
- Promote aquaculture operations that pose no substantial risk of deleterious effects to wild populations through the amplification and retransmission of pathogens or parasites.
- promote the use of eggs, larvae, or juvenile fish produced in hatcheries using domesticated broodstocks thereby avoiding the need for wild capture
- recognize that energy use varies greatly among different production systems and can be a major impact category for some aquaculture operations, and also recognize that improving

2 "Fish" is used throughout this document to refer to finfish, shellfish and other invertebrates.

practices for some criteria may lead to more energy intensive production systems (e.g. promoting more energy-intensive closed recirculation systems)

Once a score and rank has been assigned to each criterion, an overall seafood recommendation is developed on additional evaluation guidelines. Criteria ranks and the overall recommendation are color-coded to correspond to the categories on the Seafood Watch pocket guide:

Best Choices/Green: Are well managed and caught or farmed in environmentally friendly ways.

Good Alternatives/Yellow: Buy, but be aware there are concerns with how they're caught or farmed.

Avoid/Red: Take a pass on these. These items are overfished or caught or farmed in ways that harm other marine life or the environment.

Criterion 1: Data quality and availability

Data Category	Relevance (Y/N)	Data Quality	Score (0-10)
Industry or production statistics	*yes*	10	10
Effluent	No	n/a	n/a
Locations/habitats	Yes	10	10
Predators and wildlife	Yes	0	0
Chemical use	Yes	10	10
Feed	No	n/a	n/a
Escapes, animal movements	Yes	10	10
Disease	Yes	0	0
Source of stock	Yes	10	10
Other – (e.g. GHG emissions)	yes	10	10
Total			**60**

C1 Data Final Score	7.50	GREEN

Criterion 2: Effluents

C2 Effluent Final Score	10.00	GREEN
	Critical?	NO

Criterion 3: Habitat

3.1. Habitat conversion and function

F3.1 Score	7

3.2 Habitat and farm siting management effectiveness (appropriate to the scale of the industry)

Factor 3.2a - Regulatory or management effectiveness

Question	Scoring	Score
1 - Is the farm location, siting and/or licensing process based on ecological principles, including an EIAs requirement for new sites?	Yes	1
2 - Is the industry's total size and concentration based on its cumulative impacts and the maintenance of ecosystem function?	No	0
3 – Is the industry's ongoing and future expansion appropriate locations, and thereby preventing the future loss of ecosystem services?	No	0
4 - Are high-value habitats being avoided for aquaculture siting? (i.e. avoidance of areas critical to vulnerable wild populations; effective zoning, or compliance with international	Yes	1

agreements such as the Ramsar treaty)		
5 - Do control measures include requirements for the restoration of important or critical habitats or ecosystem services?	No	0
		2

Factor 3.2b - Siting regulatory or management enforcement

Question	Scoring	Score
1 - Are enforcement organizations or individuals identifiable and contactable, and are they appropriate to the scale of the industry?	Yes	1
2 - Does the farm siting or permitting process function according to the zoning or other ecosystem-based management plans articulated in the control measures?	No	0
3 - Does the farm siting or permitting process take account of other farms and their cumulative impacts?	No	0
4 - Is the enforcement process transparent - e.g. public availability of farm locations and sizes, EIA reports, zoning plans, etc?	No	0
5 - Is there evidence that the restrictions or limits defined in the control measures are being achieved?	No	0
		1

F3.2 Score (2.2a*2.2b/2.5)	**0.80**

C3 Habitat Final Score	**4.93**	**YELLOW**
	Critical?	NO

Exceptional Factor 3.3X: Wildlife and predator mortalities

Wildlife and predator mortality parameters	Score	
F3.3X Wildlife and Predator Final Score	**-2.00**	**GREEN**
Critical?	NO	

Criterion 4: Evidence or Risk of Chemical Use

Chemical Use parameters	Score	
C4 Chemical Use Score	**8.00**	
C4 Chemical Use Final Score	**8.00**	**GREEN**
Critical?	NO	

Criterion 6: Escapes

6.1a. Escape Risk

Escape Risk	**0**

Recapture & Mortality Score (RMS)	
Estimated % recapture rate or direct mortality at the escape site	0
Recapture & Mortality Score	0
Factor 6.1a Escape Risk Score	**0**

6.1b. Invasiveness

Part A – Native species

Score	0

Part B – Non-Native species

Score	**1**

Part C – Native and Non-native species

Question	**Score**
Do escapees compete with wild native populations for food or habitat?	to some extent
Do escapees act as additional predation pressure on wild native populations?	no
Do escapees compete with wild native populations for breeding partners or disturb breeding behavior of the same or other species?	no
Do escapees modify habitats to the detriment of other species (e.g. by feeding, foraging, settlement or other)?	to some extent
Do escapees have some other impact on other native species or habitats?	no
	4

F 6.1b Score	**5**

Final C6 Score	**2.00**	**RED**
	Critical?	**NO**

Exceptional Factor 6.2X: Escape of unintentionally introduced species

Escape of unintentionally introduced species parameters	Score	
F6.2Xa International or trans-waterbody live animal shipments (%)	5	
F6.2Xb Biosecurity of source/destination	0	
F6.2X Escape of unintentionally introduced species Final Score	**-5.00**	**YELLOW**

Criterion 7: Diseases

Pathogen and parasite parameters	Score	
C7 Biosecurity	4.00	
C7 Disease; pathogen and parasite Final Score	**4.00**	**YELLOW**
Critical?	NO	

Criterion 8: Source of Stock

Source of stock parameters	Score	
C8 % of production from hatchery-raised broodstock or natural (passive) settlement	100	
C8 Source of stock Final Score	**10**	**GREEN**