MONTEREY BAY AQUARIUM®
Seafood WATCH

Food Alliance
Shellfish (Standard date 2010)

Benchmarking equivalency results assessed against the Seafood Watch Aquaculture Criteria

May 2013

Final Seafood Recommendation

Food Alliance Shellfish

Criterion	Score (0-10)	Rank	Critical?
C1 Data	10.00	GREEN	
C2 Effluent	10.00	GREEN	NO
C3 Habitat	7.67	GREEN	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	YELLOW	NO
6.2X Introduced species escape	-4.00	YELLOW	
Total	**53.67**		
Final score	**6.71**		

Final Score	6.71
Initial rank	GREEN
Red criteria	1
Final rank	YELLOW
Critical Criteria?	NO

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 for shellfish certified by the Food Alliance in the benchmarking equivalence assessment is yellow, and with one red ranking for escapes, the final result is a yellow "Good Alternative" recommendation.

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" rank.

The final result of the equivalence assessment for Food Alliance Shellfish 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 Food Alliance Shellfish certification as an assurance that certified products meet at least a yellow "Good Alternative" recommendation.

In general, the Food Alliance Shellfish standards:

- cover a range of shellfish production systems (e.g. suspended and on- or off-bottom culture) which have a variety of different potential impacts
- frequently defer to local regulations whose content or requirements are unknown
- are complicated by the presence of different "levels" in the criteria

Specifically, the standards:

- require the collection of data for the relevant assessed criteria
- have maximum scores for effluent and feed due to the lack of external feed provided for filter-feeding bivalve shellfish aquaculture
- have standards to prevent farms to be located in sensitive habitats, and partially address the cumulative impacts of multiple farms by requiring farms to participate in local and regional resource management plans
- do not specifically require the use of non-lethal methods to control predators, but explicitly protects threatened and endangered animals
- limit the use of chemicals that show acute mammalian toxicity and antibiotics
- allow non-native shellfish species and utilize production systems that involve a relatively high risk of escape
- do not consider the risk of escape of unintentionally transported species
- are not limited with respect to the transmission of diseases and is scored based on assumption that disease and water exchanges occur
- do not require seed should be obtained from hatcheries

Table of Contents

Introduction

Scope of the analysis and ensuing recommendation

Species
All species of currently-cultured shellfish

Geographic coverage
Global

Production Methods
All

A worst case scenario of a non-native species being cultured where it is only partly established and can increase its range has been assessed.

Analysis

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 Food Alliance Shellfish

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	10	10
Chemical use	Yes	10	10
Feed	No	n/a	n/a
Escapes, animal movements	Yes	10	10
Disease	Yes	10	10
Source of stock	Yes	10	10
Other – (e.g. GHG emissions)	No	n/a	n/a
Total			**70**

C1 Data Final Score	10.00	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.

Although the Food Alliance Shellfish Farm Evaluation Criteria do not explicitly require specific date collection, farm records are needed in the certification process. The level of monitoring and data collection necessary for certification has been deemed acceptable according to SFW Criterion 1, resulting in scores of 10 out of 10 for the relevant sections. The feed and effluents criteria are considered not relevant because species are extractive.

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 Food Alliance Shellfish

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).

The scope of the standards is for filter feeding shellfish which may have an effluent 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 Food Alliance Shellfish

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		7.00	
F3.2a Content of habitat regulations	4.50		
F3.2b Enforcement of habitat regulations	5.00		
F3.2 Regulatory or management effectiveness score		9.00	
C3 Habitat Final Score		**7.67**	**GREEN**
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. Explanatory tables and calculations can be found on page 14 of the assessment criteria

Relevant Content of Standards	How we applied it
• Upon inspection, the farm has made at least one improvement on the uplands or aquatic lands. • Actions are taken to minimize adverse effects on wildlife food, habitat structure, cover, and water resources. • Producer/manager has made habitat improvements in concert with nearby landowners, or on their own, to create large and/or connected patches of upland or tideland habitat. • Producer/manager has made habitat improvements as a part of a regional plan that includes other landowners.	Score F3.1 as "7" for moderate impacts while still maintaining habitat functionality.

The final score for factor 3.1 is 7 out of 10

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

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

Relevant Content of Standards	How we applied it
• Copies of lease or ownership records of farm properties are held on site, and producer/manager consults those records to define farm boundaries. • Farm boundaries are set using the most current and detailed descriptions/maps. • Buffer strips of 10ft (3m) or more are put in place between newly positioned farm operations and sensitive habitats (e.g., SAV, surf smelt and sand lance spawning grounds). As documented by a pre-installation underwater survey, new floating aquaculture systems are not located above existing SAV. (Survey information can be provided by previous federal, state/provincial, private or contracted studies)	Farm siting process is based on ecological principles, and restoration measures are required. Score of “1” in F3.2a Questions 1 and 5
• Sensitive habitats are plotted yearly via detailed maps and accompanied with site photography and qualitative sampling. • Producer/managers actively seek alternatives to upland and near-shore modifications. Modifications are limited to high traffic access points. Native upland vegetation is promoted to increase stability of the uplands and shading of the near-shore.	Industry’s total size and concentration is based on its cumulative impacts, but the maintenance of ecosystem function is not being addressed. Score of 0.75 in F3.2a Questions 2 and 3
• Sensitive habitats are photographed, mapped or	High-value habitats are being

tracked at least every 2 years to determine localized increases or decreases adjacent to or within the farm site. • Producer/managers that have control over the uplands reduce the reliance of hardened bulkhead structures at farm sites and maintain upland vegetation that interacts with the near-shore environment in areas that they own/manage.	avoided for aquaculture siting. Score of 1 in F3.2a Questions 4

The final score for Factor 3.2a is 4.5 out of 5

Factor 3.2b

Relevant Content of Standards	How we applied it
• To become Food Alliance Certified and market shellfish products with Food Alliance's certification seal, an operation must score an average of 3.0 out of 4 overall in each of the six scored criteria areas.	Score of 1 for F3.2b Questions 1 through 5 because all the standards are considered to be enforced by audit.

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

The final score for Factor 3.2 combines 3.2a and 3.2b resulting in a final habitat management score 9 out of 10.

The final score for criterion 3 (C3) combines factors 3.1 and 3.2 (see criteria document for calculation) to give a score of 7.67.

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 Food Alliance Shellfish
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
Manager documents direct participation (or has participated in the last 5 years) in on-farm studies/testing of environmental interactions, and wildlife and aquatic habitat conservation strategies or concepts to evaluate their performance. Indicator species population information is tracked year-to-year to evaluate wildlife management strategies. Level 3: At least four apply from Level 2, and cultivated and non-cultivated areas are actively managed for the benefit of wildlife on a yearly calendar. At least two low impact and at least two high impact management practices apply: Low impact: Producer/manager can identify wildlife and plant species. - Mesh opening on blanket netting is kept at maximum size to increase sediment access while still protecting the cultured product and reducing entanglement of wildlife. - Netting is evaluated and maintained/repaired on a regular schedule. - Producer/manager communicates an understanding of wildlife corridors. - Standing deadwood is left for birds to use. - Native upland vegetation is preserved and promoted. - Designated paths are used when repeatedly traversing through SAV habitats. High impact: - Floating or raised blanket nets are not utilized so increased sediment access is provided to mobile species. - Field borders/buffer strips are maintained for diverse habitat (SAV, shellfish, mudflat). - Only non-lethal predator control methods are promoted and utilized.	Lethal predator control of non-"critical" species is permitted. Scored -4 on the above assumption

- SAV is not disturbed during migration or reproductive times (e.g., herring) in documented spawning areas. - Invasive non-native weeds are removed. - Eelgrass buffer strips or patches/areas are left or promoted to connect wildlife corridors and to potentially increase spawning areas. - Wildlife crops for food are planted (unprotected clams/oysters). - Incidental take of non-target species is reduced by selective harvesting - A written marine mammal interaction plan is in place.	

Final score for 3.3X is -4 out of -10

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 Food Alliance Shellfish

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
• No prohibited pesticides are used. • No growth-promoting hormones or other growth promotants are used. • No antibiotics are used.	Scored 8 because chemical use is limited to relatively benign non-residual and benign treatments, although some minor local impact is possible.

The final chemical use (C4) score is 8 out of 10

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 Food Alliance Shellfish

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	C5 score as “10”. No external 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 Food Alliance Shellfish

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
Level 4: As per Level 3, and manager has an advanced understanding of IPM principles and application, including bio-control and transfer limitations, and clearly manages the operation in order to prevent the establishment of invasive species, OR, no invasive species are on the farm. At least four of the following apply: - Manager has systematic inventory of invasive species occurrences. - Invasive species are a high priority in overall operation as reflected in farm plans and records. - Manager has advanced knowledge of life cycles and control is performed at most effective time. - With noxious plants, manager has planned re-vegetation with desirable plants to gain control of uplands. - Manager uses only local broodstock, triploid shellfish or harvests shellfish prior to known reproduction periods when growing native species in proximity to wild populations. - Manager uses predators of invasive species and other bio-control methods sanctioned by state/provincial and federal agencies. - Manager evaluates program each year for effectiveness using his or her own comprehensive control efficacy records. - Farm areas clearly show results of this comprehensive invasive species management program. Manager actively tries to coordinate with neighbors in control efforts that have an impact on the wider general area by developing a written coordinated plan.	Score of 0 out of 10 because the production systems are deemed High Risk System (cages, ropes etc.).

The initial escape risk score is 0 out of 10

Recaptures and mortality

Relevant Content of Standards	How we applied it
Not addressed by initiative. Likely to be high mortality of larval dispersal, yet very high initial potential “escape” numbers.	No score (zero)

The recaptures and mortality score can improve the escape risk score. The final escape risk is zero out of 10.

Factor 6.1b. Invasiveness

See criteria document page 29 for explanation of the factors and scoring questions for native and non-native species

Part B

Relevant Content of Standards	How we applied it
Level 1: Manager can show they rely on state or federal regulations for movement controls of shellfish for invasive species prevention and control. Purchased seed only comes from nurseries or hatcheries that have all required state/provincial and federal certification records. Otherwise, manager neither prevents establishment of, nor systematically controls, invasive species, and is not informed about the issue. Level 4: As per Level 3, and manager has an advanced understanding of IPM principles and application, including bio-control and transfer limitations, and clearly manages the operation in order to prevent the establishment of invasive species, OR, no invasive species are on the farm. At least four of the following apply: - Manager has systematic inventory of invasive species occurrences. - Invasive species are a high priority in overall operation as reflected in farm plans and records. - Manager has advanced knowledge of life cycles and control is performed at most effective time. - With noxious plants, manager has planned re-vegetation with desirable plants to gain control of uplands. - Manager uses only local broodstock, triploid shellfish or harvests shellfish prior to known reproduction periods when growing native species in proximity to wild populations. - Manager uses predators of invasive species and other bio-control methods sanctioned by state/provincial and federal agencies. - Manager evaluates program each year for effectiveness using his or her own comprehensive control efficacy records. - Farm areas clearly show results of this comprehensive invasive species management program. - Manager actively tries to coordinate with neighbors in control efforts that have an impact on the wider general area by developing a written coordinated plan.	Scored 1 out of 5 “Partly established, with the potential to extend the species range or coverage” because the standards rely on local regulations of unknown content.

Part A score is 1 out of 5

Part C

Relevant Content of Standards	How we applied it
Level 4: As per Level 3, and manager has an advanced understanding of IPM principles and application, including bio-control and transfer limitations, and clearly manages the operation in order to prevent the establishment of invasive species, OR, no invasive species are on the farm. At least four of the following apply: - Manager has systematic inventory of invasive species occurrences. - Invasive species are a high priority in overall operation as reflected in farm plans and records. - Manager has advanced knowledge of life cycles and control is performed at most effective time. - With noxious plants, manager has planned re-vegetation with desirable plants to gain control of uplands. - Manager uses only local broodstock, triploid shellfish or harvests shellfish prior to known reproduction periods when growing native species in proximity to wild populations. - Manager uses predators of invasive species and other bio-control methods sanctioned by state/provincial and federal agencies. - Manager evaluates program each year for effectiveness using his or her own comprehensive control efficacy records. - Farm areas clearly show results of this comprehensive invasive species management program. Manager actively tries to coordinate with neighbors in control efforts that have an impact on the wider general area by developing a written coordinated plan.	Factor 6.1b PART C scored on basic species life history (see scores in Appendix 1). Total score is 4 out of 5.

Part C score is 4 out of 5

Final invasiveness score combines Part A and Part C and is 5 out of 10

The final escapes score combines the escape risk score with the invasiveness score (explanatory score matrix can be found on page 30 of the assessment criteria) and is 2 out of 10.

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 Food Alliance Shellfish
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	2.00	
C6 Escape of unintentionally introduced species Final Score	**-4.00**	**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
Level 3: As per Level 2 and producer/manager actively prevents introduction and spread of invasive species. At least two of the following apply: - Producer/manager establishes a written policy or protocol for nuisance species management, with inventory of existing problems. - Steps are taken to deal with nuisance species by employing devices to lessen their effect (predator protection devices, fencing, etc.). - Steps are taken to deal with nuisance species by employing tactics such as fresh or saline water dipping, spraying or rinsing. Producer/manager communicates knowledge of nuisance species in the area and demonstrates the ability to identify, with some life history knowledge. - Producer/manager keeps long-term control efficacy records to improve avoidance or control program. - Producer/manager seeks additional knowledge	Standards encourage producers to work with local authorities and to develop inventories and records, but they do not prohibit the transwaterbody movements of shellfish seed. Assumed 50% movement for all shellfish standards. Factor 6.2xa is scored as 5.

(through seminars, publications, conferences etc.) to assist with avoidance or control program effectiveness. - Producer/manager works with state/provincial/federal agencies (e.g., Dept. of Natural Resources, Dept. of Agriculture, Dept. of Fish and Wildlife, Dept. of Fisheries and Oceans) to develop and implement avoidance or control plans. - Producer/manager discusses problems with neighbors to increase effectiveness of the control or avoidance effort.	

Factor 6.2Xb Biosecurity of source/destination

Biosecurity score for the source and destination of any shellfish (seed/spat/juvenile etc.) movements is 2 out of 10 for open locations with best management practices to prevent the introduction or loss of unintended transported organisms. Score 2 out of 10.

The final score for Factor 6.2X combines 6.2Xa and 6.2Xb giving a deduction of -4 out of -10

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 Food Alliance Shellfish

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
Level 4: As per Level 3, and producer/manager has an advanced understanding of, and clearly manages the operation in order to prevent, the establishment of disease. At least three of the following apply: - Producer/manager has systematic inventory of state or federal reportable shellfish infectious disease occurrences and observable unexplained mortality events. - Infectious disease prevention is a high priority in overall operation as reflected in farm plans and records, including a Shellfish High Health Plan (SHHP) customized to farm operations. The SHHP is reviewed annually. - Producer/manager actively tries to coordinate with neighbors in control efforts that have an impact on the wider general area by developing a written coordinated plan. - When appropriate, producer/manager works with state/provincial/federal/tribal agencies (e.g., Dept. of Natural Resources, Dept. of Agriculture, Dept. of Fish and Wildlife, Dept. of Fisheries and Oceans) to develop and implement shellfish infectious disease control plans. - Purchased seed only comes from nursery or hatcheries that have a professional assistance program and site records on hand aiming at identifying causes of unexplained mortality.	Scored 4 out of 10 because standards rely on unknown control plans and the production system is open to introduction of local pathogens and parasites and discharge of pathogens.

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 Food Alliance Shellfish

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 sourced 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
Level 1: Manager can show they rely on state or federal regulations for movement controls of shellfish for invasive species prevention and control. **Purchased seed only comes from nurseries or hatcheries that have all required state/provincial and federal certification records.** Otherwise, manager neither prevents establishment of, nor systematically controls, invasive species, and is not informed about the issue.	Score C8 as "10" for 100% of production from hatchery-raised broodstock

Shellfish culture either relies on hatchery- born stock or natural passive settlement. As such a score of 10 out of 10 is assigned to this criterion.

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	10.00	GREEN	
C2 Effluent	10.00	GREEN	NO
C3 Habitat	7.67	GREEN	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	YELLOW	NO
6.2X Introduced species escape	-4.00	YELLOW	
Total	**53.67**		
Final score	**6.71**		

Final Score	6.71
Initial rank	GREEN
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.

Appendix 1 - Data points and all scoring calculations

This is a condensed version of the criteria and scoring sheet to provide access to all data points and calculations. See the Seafood Watch Aquaculture Criteria document for a full explanation of the criteria, calculations and scores. Yellow cells represent data entry points.

Criterion 1: Data quality and availability

Data Category	Relevance (Y/N)	Data Quality	Score (0-10)
Industry or production statistics	*Yes*	10	10
Effluent	Yes	10	10
Locations/habitats	Yes	10	10
Predators and wildlife	Yes	10	10
Chemical use	Yes	10	10
Feed	No	Not relevant	n/a
Escapes, animal movements	Yes	10	10
Disease	Yes	10	10
Source of stock	Yes	10	10
Other – (e.g. GHG emissions)	No	Not relevant	n/a
Total			**80**

C1 Data Final Score	10	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,	Yes	1

including an EIAs requirement for new sites?		
2 - Is the industry's total size and concentration based on its cumulative impacts and the maintenance of ecosystem function?	Mostly	0.75
3 – Is the industry's ongoing and future expansion appropriate locations, and thereby preventing the future loss of ecosystem services?	Mostly	0.75
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 agreements such as the Ramsar treaty)	Yes	1
5 - Do control measures include requirements for the restoration of important or critical habitats or ecosystem services?	Yes	1
		4.5

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?	Yes	1
3 - Does the farm siting or permitting process take account of other farms and their cumulative impacts?	Yes	1
4 - Is the enforcement process transparent - e.g. public availability of farm locations and sizes, EIA reports, zoning plans, etc?	Yes	1
5 - Is there evidence that the restrictions or limits defined in the control measures are being achieved?	Yes	1
		5

F3.2 Score (2.2a*2.2b/2.5)	**9.00**	
C3 Habitat Final Score	**7.67**	**GREEN**
	Critical?	NO

Exceptional Factor 3.3X: Wildlife and predator mortalities

Wildlife and predator mortality parameters	Score	
F3.3X Wildlife and Predator Final Score	**-4.00**	**YELLOW**
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 (%)	0.00	
F6.2Xb Biosecurity of source/destination	10.00	
F6.2X Escape of unintentionally introduced species Final Score	**-4.00**	**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**