

Monterey Bay Aquarium **Seafood Watch**[®]

Aquaculture Stewardship Council

Bivalves (Version 1.0)



Benchmarking equivalency draft results assessed against the
Seafood Watch Aquaculture Criteria

May 2013

Final Seafood Recommendation

ASC Bivalves

Criterion	Score (0-10)	Rank	Critical?
C1 Data	10.00	GREEN	
C2 Effluent	10.00	GREEN	NO
C3 Habitat	5.53	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	YELLOW	NO
6.2X Introduced species escape	-4.00	YELLOW	
Total	51.53		
Final score	6.44		

Final Score	6.44
Initial rank	YELLOW
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 is yellow, and with only one red criterion the final recommendation is 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” rank.

The final result of the ASC Bivalve equivalence assessment is a yellow “Good Alternative” recommendation. We do 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 we can defer to ASC Bivalve certification as an assurance that certified products meet at least a yellow “Good Alternative” recommendation.

In general, the ASC Bivalve standards:

- cover a range of shellfish species and production systems (e.g. suspended and on- or off-bottom culture) which have a variety of different potential impacts
- score moderate to good on all criteria except escapes
- like all farm-level standards may not robustly address cumulative impacts of multiple neighboring, local or regional farms.

Specifically, the ASC Bivalve standards:

- like all certification, require considerable data collection and combined with the farm-level certification process result in a good data score,
- 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 benthic deposition impacts, but not for other (e.g. intertidal) habitat impacts or the cumulative impacts of multiple farms,
- limit chemical use to relatively benign non-residual treatments, although some minor local impact is possible,
- do not robustly prevent ongoing impacts from the “escape” of non-native bivalve species by highly fecund larval dispersal,
- do not robustly prevent the introduction of pathogens or parasites, or prevent the amplification and dispersal of local pathogens and parasites from the farm site
- do not prohibit lethal predator control,
- are considered to require only hatchery or passive collection of seed, and do not allow the active collection and relocation of wild seed.

Table of Contents

Final Seafood Recommendation.....	2
Executive Summary.....	3
Introduction	5
Scope of the analysis and ensuing recommendation.....	5
Analysis	5
Scoring guide.....	6
Criterion 1: Data quality and availability	7
Criterion 2: Effluents.....	8
Criterion 3: Habitat	8
Factor 3.3X: Wildlife and predator mortalities.....	12
Criterion 4: Evidence or Risk of Chemical Use.....	14
Criterion 5: Feed	15
Criterion 6: Escapes	15
Factor 6.2X: Escape of unintentionally introduced species.....	17
Criterion 7. Disease; pathogen and parasite interactions.....	18
Criterion 8. Source of Stock – independence from wild fisheries.....	19
Overall Recommendation	21
References	23
Guiding Principles	22
Data points and all scoring calculations.....	23

Introduction

Scope of the analysis and ensuing recommendation

Species

Bivalve shellfish

Geographic coverage

ASC definition - The ASC Bivalve Standard applies globally to all locations and scales of filter-feeding bivalve aquaculture production systems

Production Methods

ASC definition - Bivalve aquaculture is defined by this Dialogue as active husbandry of bivalve shellfish from seed to harvest within a defined area and with defined ownership of the shellfish being cultured.

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 ASC Bivalves

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	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)	Yes	10	10
Total			90

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.

While there are few specific data collection requirements, certification to the standards necessitates monitoring and data collection on all aspects relevant to the Seafood Watch criteria.

The final score (average of relevant category scores) is 10 out of 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 ASC Bivalves

Effluent Rapid Assessment

C2 Effluent Final Score	10.00	GREEN
--------------------------------	--------------	--------------

Justification of Ranking

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), 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 ASC Bivalves

Habitat parameters	Value	Score
--------------------	-------	-------

F3.1 Habitat conversion and function		7.00	
F3.2a Content of habitat regulations	2.00		
F3.2b Enforcement of habitat regulations	3.25		
F3.2 Regulatory or management effectiveness score		3.25	
C3 Habitat Final Score		5.53	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. Explanatory tables and calculations can be found on page 14 of the assessment criteria.

Relevant Content of Standards	How we applied it
<p>2.1.1 Acceptable levels of total free' sulfide in surficial sediment (0-2 centimeters from the surface) measured beneath the farm in comparison to control sites ≤ 1500 μM, monitoring every five years is required ≥1500 μM and ≥ 3000 μM, monitoring every year is required</p>	<p>Standards focus on off-bottom and suspended culture and do not specify restrictions for on-bottom or non-organic disturbance of intertidal habitats. In general, ecosystem services are not considered to be at high risk of loss, therefore scored 7 as the lowest score for maintaining ecosystem functionality.</p>
<p>2.1.2 Unacceptable levels of total free' sulfide in surficial sediment measured beneath the farm in comparison to control sites ≥ 3000 μM</p>	
<p>2.1.3 In cases where natural background sulfide levels exceed 3000 μM, the annual S concentrations should not significantly exceed levels measured at reference sites located outside the farm - Yes</p>	
<p>2.1.5 Allowance for bivalve aquaculture over areas that provide a particularly significant or essential biological or ecological function within the broader ecosystem None</p>	
<p>2.3.1 Allowance for harm to threatened/endangered species or the habitat on which they depend - None</p>	
<p>2.4.1 Evidence of environmental training, compliance to regional codes of practices or implementation of environmental management plans - Required</p>	

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
2.3.1 Allowance for harm to threatened/endangered species ¹⁰ or the habitat on which they depend - None	Score of 0.5 for Factor 3.2a question 1 because the standards do not require siting according to ecological principles or require an EIA, but do protect threatened or endangered species.
Standards 2.1 to 2.3 relating to clearance rates have supporting text relating to cumulative pelagic impacts, but do not robustly require cumulative impacts of multiple farms to be addressed (“should”)	Score of 0.25 for Factor 3.2a question 2 because measures relating to cumulative pelagic, benthic or intertidal habitat impacts are not addressed.
Standards 2.1 to 2.4 as above	Score of 0.5 for Factor 3.2a question 3 because nutrient benthic and pelagic effects are addressed, but not other direct habitat impacts of shellfish aquaculture.
2.3.1 Allowance for harm to threatened/endangered species or the habitat on which they depend - None	Score of 0.75 for Factor 3.2a question 4 because habitat for important species is protected, but not habitat for other important ecosystem services.
No standards relating to habitat restoration	Score of 0 for Factor 3.2a question 5

The final score for Factor 3.2a is 2 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
Presence of the standards and certification process	Score of 1 for Factor 3.2b question 1 because certification is considered to enforce the measures required in the standards
No robust standards enforcing zoning or other ecosystem based habitat siting plans	Score of 0.5 for Factor 3.2b question 2 because the enforcement relies on unknown enforcement of unknown local regulations for aquaculture.
Enforcement relating to cumulative impacts of multiple farms Not addressed by initiative	Score of 0.25 for Factor 3.2b question 3 because certification has no control over neighboring, local or regional farms contributing to cumulative habitat impacts and cumulative impacts are not robustly addressed.
Transparency of enforcement (certification) process	Score of 0.5 for Factor 3.2b question 4 because it is not yet known how transparent the ASC certification and audit process will be.
Achievement of control measures	Score of 1 for Factor 3.2b question 5 because all measures in the standards are requirements that must be met at audit.

The final score for Factor 3.2b is 3.25 out of 5

The final score for Factor 3.2 combines 3.2a and 3.2b resulting in a final habitat management score 3.25 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 5.53.

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 ASC Bivalves

Wildlife and predator mortality parameters	Score	
F3.3X Wildlife and predator mortality Final Score	-4.0	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.

F3.3X Wildlife and predator score. Explanatory tables can be found on page 18 of the assessment criteria.

Relevant Content of Standards	How we applied it
4.1.3 Only non-lethal management (e.g., exclusion, deterrents and removal) of critical species that are pests or predators - Yes 4.1.4 Allowance for the use of leadline or lead sinkers on predator netting - None 4.1.5 Allowance for the use of explosives - None	Lethal predator control of non-“critical” species is permitted. Scored -4 on the above assumption.

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 ASC Bivalves

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

Justification of Ranking

Explanatory tables and calculations can be found on page 20 of the assessment criteria.

Relevant Content of Standards	How we applied it
<p>4.1.1 Allowance for the application of mutagenic, carcinogenic or teratogenic pesticides on the farm or farmed animals - None</p> <p>4.1.2 Allowance for the application of chemicals that persist as toxins in the marine environment or on the farm or farmed animals – None</p> <p>"Control measures include... killing the fouling organisms (e.g., air drying or dipping in various caustic solutions such as brine, acetic acid or lime). Most of these solutions are components already found in seawater (salt or CaCo3) and, as long as they are handled and disposed of properly (allowing for appropriate dilution), there should be little impact to non-target organisms."</p>	<p>Scored 8 because chemical use is limited to relatively benign non-residual and benign treatments, although some minor local impact is possible.</p>

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 ASC Bivalves

Feed parameters	Value	Score	
No supplemental feed added	0.00	10	GREEN

Justification of Ranking

The feed criterion score is 10 out of 10 because no external feed is added.

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 ASC Bivalves

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

Factor 6.1a. Escape risk

Explanatory score table can be found on page 28 of the assessment criteria

Relevant information	How we applied it
The “escape” of bivalve shellfish is different from many other forms of aquaculture due primarily to larval dispersal, but there are no standards relating to preventing or reducing the risk of escape	Scored 0 as an open system with high potential for larval dispersal

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 score remains 0 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 A or B

Relevant Content of Standards	How we applied it
3.3.1 Evidence of responsible introduction of non-native cultivated species - Required	Scored 1 out of 5 because “responsible” introduction of non-native species is poorly defined and there is the potential for a non-native species to be only partly established and increase its range or coverage.
3.1.1 Allowance for the illegal introduction of a non-native species, pest or pathogen attributable to the farm within 10 years prior to assessment - None	
3.4.1 For hatchery produced seed, documentation of efforts made to address genetic concerns specific to species and geographic region where the seed will be out-planted (See Appendix II for guidance) - Required	
3.5.1 Allowance for farming of transgenic animals - None	

Part A (or B) score is 2.5 out of 5

Part C

Relevant Content of Standards	How we applied it
There are no standards to limit the direct impact of escapees (e.g. competition for food or space, habitat modification etc)	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 or B, and Part C and is 4 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 ASC Bivalves

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-biosecure stock for shellfish or mussel standards (due to common movement of seed in shellfish production) unless standards specify otherwise.

Factor 6.2Xa International or trans-waterbody live animal shipments

Explanatory score table can be found on page 31 of the assessment criteria.

Relevant Content of Standards	How we applied it
3.1.1 Allowance for the illegal introduction of a non-native species, pest or pathogen attributable to the farm within 10 years prior to assessment – None	Standards rely on unknown local legal requirements and undefined “established protocols”. They do not prohibit the transwaterbody movements of shellfish seed, and historic requirements are no guarantee of future compliance. Assumed 50% movement for all shellfish standards.
3.1.2 Documentation of compliance with established protocol or evidence of following appropriate best management practices for preventing and managing disease and pest introductions with seed and/or farm equipment - Required	
3.2.1 Excluding larval collection, evidence that purchased or collected wild seed is not harvested from an open-access, unregulated source - Required	

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 ASC Bivalves

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”*

Explanatory score table can be found on page 34 of the assessment criteria

Relevant Content of Standards	How we applied it
3.1.2 Documentation of compliance with established protocol or evidence of following appropriate best management practices for preventing and managing disease and pest introductions with seed and/or farm equipment	Scored 4 out of 10 because standards rely on unknown protocols and the production system is open to introduction of local pathogens and parasites and discharge of pathogens.

The final disease criterion (C7) score 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 ASC Bivalves

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.

Explanatory score table can be found on page 35 of the assessment criteria

Relevant Content of Standards	How we applied it
3.2.1 Excluding larval collection, evidence that purchased or collected wild seed is not harvested from an open-access, unregulated source - Required	Score 10 based on assumption of hatchery or natural passive settlement.

The final source of stock score (C8) 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.

ASC Bivalves

Criterion	Score (0-10)	Rank	Critical?
C1 Data	10.00	GREEN	
C2 Effluent	10.00	GREEN	NO
C3 Habitat	5.53	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	YELLOW	NO
6.2X Introduced species escape	-4.00	YELLOW	
Total	51.53		
Final score	6.44		

Final Score	6.44
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 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 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

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.

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	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)	Yes	10	10
Total			90

C1 Data Final Score	10	GREEN
----------------------------	----	--------------

Effluent Rapid Assessment

C2 Effluent Final Score	10.00	GREEN
--------------------------------	-------	--------------

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?	Moderately	0.5
2 - Is the industry's total size and concentration based on its cumulative impacts and the maintenance of ecosystem function?	Partly	0.25
3 - Is the industry's ongoing and future expansion appropriate locations, and thereby preventing the future loss of ecosystem services?	Moderately	0.5
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)	Mostly	0.75
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?	Moderately	0.5
3 - Does the farm siting or permitting process take account of other farms and their cumulative impacts?	Partly	0.25
4 - Is the enforcement process transparent - e.g. public availability of farm locations and sizes, EIA reports, zoning plans, etc?	Moderately	0.5
5 - Is there evidence that the restrictions or limits defined in the control measures are being achieved?	Yes	1
		3.25

F3.2 Score (2.2a*2.2b/2.5)	2.60
-----------------------------------	-------------

C3 Habitat Final Score	5.53	YELLOW
	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 5: Feed

Effluent Rapid Assessment

C5 Feed Final Score	10.00	GREEN
---------------------	-------	-------

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
	3.5

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 (%)	5.00	
F6.2Xb Biosecurity of source/destination	4.00	
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

