MONTEREY BAY AQUARIUM®
Seafood WATCH

Naturland Standards for Organic Aquaculture (Version 05/2011)

Mussels

Naturland

Benchmarking equivalency results assessed against the Seafood Watch Aquaculture Criteria

May 2013

Final Seafood Recommendation

Naturland Standards for Organic Aquaculture - Mussels

Criterion	Score (0-10)	Rank	Critical?
C1 Data	8.75	GREEN	
C2 Effluent	10.00	GREEN	NO
C3 Habitat	6.53	YELLOW	NO
C4 Chemicals	10.00	GREEN	NO
C5 Feed	10.00	GREEN	NO
C6 Escapes	2.00	RED	NO
C7 Disease	8.00	GREEN	NO
C8 Source	10.00	GREEN	
3.3X Wildlife mortalities	-4.00	YELLOW	NO
6.2X Introduced species escape	-4.00	YELLOW	
Total	**57.28**		
Final score	**7.16**		

Final Score	7.16
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 Naturland Standards for Organic Aquaculture, assessed for mussels, have a final numerical score in the green category, but with one red criterion (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" ranking.

The final result of the equivalence assessment for Naturland Standards for Organic Aquaculture, assessed for mussels 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 the Naturland Organic Aquaculture Standards for mussel certification as an assurance that all certified products meet at least a yellow "Good Alternative" recommendation.

In general, the Naturland Standards for Organic Aquaculture:

- Contain overview requirements for all species and production systems certified under the standards (under Part A and Part B- Section I)
- Contain species-specific and production-specific standards (under Part B- Sections II through VII)
- Frequently use terms such as " prefer" or "minimize" which have no value in certification

Specifically for each criterion, the Naturland Organic Aquaculture Standards for mussels:

- require considerable data collection and combined with the farm-level certification process result in a high data score,
- receive high scores for the effluent and feed criteria due to the filter feeding nature of mussels
- have a minor potential for benthic habitat damage due to settlement of pseudofeces and mussel drop offs,
- prohibit antibiotics and other chemicals for non-vertebrates
- allow the potential for increasing the range of a non-native species by the broadcast spawning "escapes"
- certify open production systems that by their very nature allow escapes and the potential introduction of local pathogens and parasites,
- allow the capture and movement of wild mussel seed with associated risks of introducing non-native species
- do not prohibit lethal predator control

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Introduction

Scope of the analysis and ensuing recommendation

The Naturland Organic Aquaculture Standards consist of general regulations for organic aquaculture (and other forms of organic agriculture) and contain supplemental sections for specific species groups. This assessment is specific to relevant general standards (Part B – Section I) as well as Part B – Section IV supplementary regulations for the marine culture of mussels (e.g. *Mytilus edulis*) and macroalgae on ropes and frames.

Species

This assessment was conducted for the culture of a mussel species such as *Mytilus galloprovinciallis* outside its native range

Geographic coverage

Global

Production Methods

Marine ropes and frames.

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 to which the following scores relate 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 Naturland 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	Yes	7.5	7.5
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	7.5	7.5
Disease	Yes	7.5	7.5
Source of stock	Yes	7.5	7.5
Other – (e.g. GHG emissions)	No	n/a	n/a
Total			**67.5**

C1 Data Final Score	8.44	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 lack of specific requirements in many standards means that the data score is only 7.5 rather than 10 in many categories. Criterion 1 (Data) has a score of 8.44 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 Naturland 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

- For consistency, the full assessment was used across all species
- The cumulative impacts questions on regulations and enforcement were assessed according to the standards requirements in this respect
- No fertilizer use was considered unless specified in the standards
- Tilapia, salmon and cod effluent was assessed for cages, other species were assessed for high-exchange ponds as a worst-case scenario unless otherwise specified

As mussel aquaculture does not utilize external feed inputs and is extractive, little to no effluent is released from the farm site. Potential impacts of pseudofeces beyond the farm site or an allowable zone of effect (AZE) are not considered significant in this assessment. The final score of Criterion 2 (effluent) 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 Naturland 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		7.00	
F3.2a Content of habitat regulations	3.50		
F3.2b Enforcement of habitat regulations	4.00		
F3.2 Regulatory or management effectiveness score		5.60	
C3 Habitat Final Score		**6.53**	**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
The suspended ropes and frames utilized by the global mussel culture industry have little direct habitat impact, yet the settlement of pseudofeces and mussel drop offs can have a significant impact on benthic habitats. The impacts are considered to be rapidly reversible and are not recognized to lead to long-term loss of ecosystem services. Without specific requirements in the standards, the lowest score for maintaining ecosystem functionality is allocated; ie. 7 out of 10).

Relevant Content of Standards	How we applied it
Section l 1.1. By selection of site and the method of management of the farm, the surrounding ecosystems shall not be adversely affected. In particular, negative impact caused by effluents as well as by escape of animals shall be prevented by adopting suitable preventive measures. Section I 1.3. Through appropriate design and management of the farm areas it shall be ensured that the water bodies in- side the operation retain their ecological functions depending on the respective	Score of 7 for F3.1 because the intentions of the standards are not supported by robust or specific habitat requirements. The score of 7 is the lowest score while ecosystem functionality is maintained.

geographical conditions (e.g. breeding ground for amphibians and water insects, resting place for migratory birds, migration routes for fish).	

The score for Factor 3.1 is 7 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 to manage site-specific and cumulative habitat impacts. See Appendix 1 for scoring questions.

Relevant Content of Standards	How we applied it
Section I 1.1 and 1.3 as above	Score of 0.75 out of 1 for F3.2a Question 1 because an EIA is not required by this initiative, however siting standards require farming operations to maintain full ecosystem function.
Is the industry's total size and concentration based on its cumulative impacts and the maintenance of ecosystem function? **Not addressed by initiative**	Score of 0 out of 1 for F3.2a Question 2 because the standards are farm-specific and therefore have no control over the cumulative impacts of neighboring or regional farms.
Section I 1.1 and 1.3 as above	Score of 0.75 out of 1 for F3.2a Question 3 because although ongoing and future expansion are not significantly spoken to directly within the initiatives, it is expected that any growth of a farm would comply with all previously set standards.
Section I 1.1 and 1.3 as above Section IV 1.3. Mussel cultures managed according to these standards form an important habitat for plants, invertebrates and fishes. All management measures esp. during harvest shall be directed towards protecting and supporting this special habitat.	Score of 1 out of 1 for F3.2a Question 4 because habitats with high levels of ecosystem functionality must be avoided.
Do control measures include requirements for the restoration of important or critical habitats or ecosystem services? **Not addressed by initiative**	Score of 1 out of 1 for F3.2a Question 5 because although the standards do not speak to restoration, F3.2a Question 4

	indicates that important or critical habitats are avoided and as such no restoration is necessary.

Factor 3.2a score is 3.5 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**
Naturland mandates inspection bodies to perform regular inspections of farmers and processors at least once every year. In addition to the annual tours of inspection, unannounced spot checks are also made. Inspection is performed by external, expert, state-approved inspection bodies. Naturland co-operates primarily with the following respected inspection bodies: BCS-Öko-Garantie GmbH IMO Institute of Marketecologie Lacon GmbH and Ökop-Zertifizierungsgesellschaft mbH Naturland provides inspection bodies with inspection documents and develops specific guidelines for complex areas like inspection of grower groups or the Naturland standards on social responsibility.	Score of 1 out of 1 for F3.2b Question 1 because farm inspections occur at least once every year. Inspection Bodies are listed on the Naturland website.
Section I 1.1 as above	Score of 1 out of 1 for F3.2b Question 2 because if siting does not function based on the ecosystem-based management plans included in the standards then farm are ineligible for certification.
Does the farm siting or permitting process take account of other farms and their cumulative impacts? **Not addressed by initiative**	Score of 0 out of 1 for F3.2b Question 3 because the standards are farm-specific and therefore have no control over the cumulative impacts of neighboring or regional farms.
Naturland Association, along with Naturland's marketing organisation, FiBL Research Institute of Organic Agriculture and the trading firm tegut..." are offering buyers of organic produce a new service. By means of a reliable tracing system, the customer can refer to the internet to find out where, by whom and how the organic product he or she has purchased was cultivated and processed.	Score of 1 out of 1 for F3.2b Question 4 because Naturland has an extensive system that allows full traceability of any product throughout its lifecycle.

This is how “Bio mit Gesicht” works: each article purchased bears a number. This enables the customer to “visit” the producer on the internet, where he or she is presented under Bio mit Gesicht (www.bio-mit-gesicht.de): Where is the farm/manufacturer? Who works there? What standards do they have to comply with? What else is there of interest?	
• The development of standards and their implementation are the core mission of any certified association for organic agriculture. Standards have to be proven to be workable. They have to adapt to changing conditions and extended to cover new areas. • These standards are regularly revised and updated, taking into account new technical or political insights. On numerous occasions, we present the standards to international audiences, and we are in a permanent communication about the content with technical experts, NGOs, scientific institutions, and consumers. • Naturland is one of the major global certification organizations for organic agricultural produce. Just as Naturland’s farmers and processors are subject to annual inspection, Naturland too is inspected once a year by neutral, qualified organizations, thereby proving that Naturland’s certification system fulfills the most stringent internationally recognized standards.	Score of 1 out of 1 for F3.2b Question 5 because farms must comply with the standards in order to achieve certification.

Factor 3.2b score is 4 out of 5.

When combined with the Factor 3.2a score, the score for Factor 3.2 is 5.6 out of 10.
The final score for Criterion 3 (C3) combines Factors 3.1 and 3.2 (see Seafood Watch assessment criteria document page 16 for calculation) to give a final score of 6.53 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 Naturland 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
1.4. While protecting the farm areas from predatory birds and other animal species, measures not harming the animals physically shall be preferred (e.g. nets, dummy raptors)	Score of -4 for F3.3X because lethal predator control is not prohibited, but mortalities are not considered likely to affect predator populations.

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 Naturland 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	**10.00**	
C4 Chemical Use Final Score	**10.00**	**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
5.1. The health of the organisms is, primarily, to be ensured by adopting preventive measures (e.g. optimized husbandry, rearing, feeding). Natural curative methods (ref. also 5.2.) shall be preferred in case of a disease. Use of conventional medicine is only permitted in vertebrates and after detailed diagnosis and remedial prescription by a veterinarian. In this case, at least twice the legally prescribed waiting period must be observed. Use of conventional medicine is not permitted in invertebrate organisms (e.g. molluscs, crustaceans). 5.2. Permitted treatments, also as prophylactics or routine (within the framework of statutory regulations): use of natural physical methods (in particular drying out, freezing out) use of not residue-building, inorganic compounds (e.g. hydrogen peroxide H2O2, common salt NaCl, lime CaCO3, quicklime CaO, sodium hypochlorite NaOCl) use of naturally occurring, not residue-building organic compounds (e.g. per-acetic acid, citric acid, formic acid, alcohol)	Score of 10 because the use of medicinal chemicals is not allowed on invertebrates, and although chemical treatments may be used for control of fouling organisms they are largely considered to be environmentally benign.

The final score for Criterion 4 is 10 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 Naturland Mussels
Explanatory score tables and calculations can be found on pages 21-26 of the Seafood Watch assessment criteria.

Feed parameters	Value	Score	
No supplemental feed added	0.00	10	GREEN

Justification of Ranking

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 Naturland 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

Factor 6.1a. Escape risk

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.

The initial escape score is 0 out of 10 for Factor 6.1a due to broadcast spawning.

Factor 6.1b. Invasiveness
The culture of mussels is highly likely to occur within the species natural range, but it is possible (within the scope of the standards) for the mussel spat to be relocated to culture areas where the species is not native, or local populations are not present. The broadcast and subsequent settlement of mussel spat could therefore result in some substrate modification and competition for food.

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, for the potential for mussel aquaculture to introduce or extend the range of a non-native mussel species.

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 Naturland 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 (%)	50	
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

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

Relevant Content of Standards	How we applied it
2.1 If seeds are collected from wild stocks, care should be taken that collecting activities will not cause lasting damage to the ecosystem. The collecting area shall be identifiable. Therefore, it has to be clearly identified by maps, site plans etc. Collecting activities shall be documented and traceable to the respective collecting area (time of collection, quantity of seed collected, name of the collector(s) etc.). Collection shall not exceed the sustainable quantity in a given area. 2.1. As stock, species naturally occurring in the region shall be preferred. The risk of escaping or introduction of species not naturally occurring in the region in open waters (e.g. by marketing as livestock) must be prevented.	The movement of spat or seed from a collection area to a culture site is common practice in mussel farming. Standard 2.1 does not specify how the introduction of species should prevented (e.g. no movements of mussel spat), therefore for the purposes of this assessment 50% of the mussel spat is assumed to have been transported (Score of 5 for Factor 6.2Xa). and

Factor 6.2Xb Biosecurity of source/destination

Relevant Content of Standards	How we applied it
International or transwaterbody movements of live fish or ova **Not addressed by initiative**	neither the source (i.e. collection site) nor the destination (i.e farming site) are biosecure (although they are considered to have best management practices in terms of minimizing the risk of transfer of non-native species) leading to a score of 2 out of 10 for 6.2Xb.

The final score for 6.2X combines 6.2Xa and 6.2Xb and results in a final deduction score of -4 out of -10 for the risk of introducing non-native species during movements of mussel seed.

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 Naturland 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	8.00	
C7 Disease; pathogen and parasite Final Score	**8.00**	**GREEN**
Critical?	**NO**	

Justification of Ranking

Relevant Content of Standards	How we applied it
5.1. The health of the organisms is, primarily, to be ensured by adopting preventive measures (e.g. optimized husbandry, rearing, feeding). Natural curative methods (ref. also 5.2.) shall be preferred in case of a disease. Use of conventional medicine is only permitted in vertebrates and after detailed diagnosis and remedial prescription by a veterinarian. In this case, at least twice the legally prescribed waiting period must be observed. Use of conventional medicine is not permitted in invertebrate organisms (e.g. mollusks, crustaceans). The stock shall be regularly inspected with respect to its status of health. Dead organisms shall be removed from the holding system immediately. 1.1. Mussels have to be regarded as indicator organisms. Therefore, their microbiological and chemical status reflects water quality. Water quality shall be class 1 (A)18 (18 The number of faec. Escherichia coli in mussel tissue is regarded as a valid measure for water quality in marine mussel culture (Class 1(A): 3 faec. E.coli counts/g tissue).Water quality shall be determined at least monthly by an independent institution. Results have to be documented continually 1.2. The mussel cultivation must be subjected to maximum possible turnover of water from the open sea. Mussel culture in immediate proximity to shore or close	Score of 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).

to nutrient-rich inflows is not permitted.	

The final score for Criterion 7 is 8 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 Naturland 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

Relevant Content of Standards	How we applied it
2.1. If seeds are collected from wild stocks, care should be taken that collecting activities will not cause lasting damage to the ecosystem. The collecting area shall be identifiable. Therefore, it has to be clearly identified by maps, site plans etc. Collecting activities shall be documented and traceable to the respective collecting area (time of collection, quantity of seed collected, name of the collector(s) etc.). Collection shall not exceed the sustainable quantity in a given area. 2.2. Mussel larvae are allowed for stocking if they have settled on substrate which has been especially introduced for this purpose.	Score of 10 because the source of seed is from passive settlement, or if wild caught is from a controlled area for which the sustainability can be specifically monitored.

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.

Naturland Standards for Organic Aquaculture - Mussels

Criterion	Score (0-10)	Rank	Critical?
C1 Data	8.75	GREEN	
C2 Effluent	10.00	GREEN	NO
C3 Habitat	6.53	YELLOW	NO
C4 Chemicals	10.00	GREEN	NO
C5 Feed	10.00	GREEN	NO
C6 Escapes	2.00	RED	NO
C7 Disease	8.00	GREEN	NO
C8 Source	10.00	GREEN	
3.3X Wildlife mortalities	-4.00	YELLOW	NO
6.2X Introduced species escape	-4.00	YELLOW	
Total	**57.28**		
Final score	**7.16**		

Final Score	7.16
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	7.5	7.5
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	7.5	7.5
Disease	Yes	7.5	7.5
Source of stock	Yes	7.5	7.5
Other – (e.g. GHG emissions)	No	n/a	n/a
Total			**70**

C1 Data Final Score	8.75	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?	mostly	0.75
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?	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
		3.5

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?	No	0
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
		4.25

F3.2 Score (2.2a*2.2b/2.5)	**5.60**

C3 Habitat Final Score	**6.53**	**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	**10.00**

C4 Chemical Use Final Score	10.00	GREEN
Critical?	NO	

Criterion 5: Feed

5.1. Wild Fish Use

Factor 5.1a - Fish In: Fish Out (FIFO)

Fishmeal inclusion level (%)	0
Fishmeal from by-products (%)	0
% FM	0
Fish oil inclusion level (%)	0
Fish oil from by-products (%)	0
% FO	0
Fishmeal yield (%)	22.5
Fish oil yield (%)	5
eFCR	0
FIFO fishmeal	0.00
FIFO fish oil	0.00
Greater of the 2 FIFO scores	0.00
FIFO Score	**10.00**

Factor 5.1b - Sustainability of the Source of Wild Fish (SSWF)

SSWF	0
SSWF Factor	0

F5.1 Wild Fish Use Score	**10.00**

5.2. Net protein Gain or Loss

Protein INPUTS	
Protein content of feed	0
eFCR	0
Feed protein from NON-EDIBLE sources (%)	0
Feed protein from EDIBLE CROP soruces (%)	0
Protein OUTPUTS	
Protein content of whole harvested fish (%)	0
Edible yield of harvested fish (%)	0
Non-edible by-products from harvested fish used for other food production	0

Protein IN		0.00
Protein OUT		0
Net protein gain or loss (%)		0
	Critical?	NO
F5.2 Net protein Score	**10.00**	

5.3. Feed Footprint

5.3a Ocean area of primary productivity appropriated by feed ingredients per ton of farmed seafood

Inclusion level of aquatic feed ingredients (%)	0
eFCR	0
Average Primary Productivity (C) required for aquatic feed ingredients (ton C/ton fish)	*69.7*
Average ocean productivity for continental shelf areas (ton C/ha)	*2.68*
Ocean area appropriated (ha/ton fish)	0.00

5.3b Land area appropriated by feed ingredients per ton of production

Inclusion level of crop feed ingredients (%)	0
Inclusion level of land animal products (%)	0
Conversion ratio of crop ingedients to land animal products	*2.88*
eFCR	0
Average yield of major feed ingredient crops (t/ha)	*2.64*
Land area appropriated (ha per ton of fish)	0.00

Value (Ocean + Land Area)	**0.00**

F5.3 Feed Footprint Score	**10.00**

C5 Feed Final Score	**10.00**	**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	0

escape site	
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	8.00	
C7 Disease; pathogen and parasite Final Score	**8.00**	**GREEN**
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**