ASC SHRIMP STANDARD REVISION

Revision of Current Metrics
Data Overview document

Post Public Consultation

September 2020

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Shrimp Standard Revision

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Purpose

The purpose of this document is to present the acquired data for the revision of the ASC Shrimp Standard v.1.1 and the changes to the metric requirements where relevant. The first version of this document was used for the decision making process during the revision. This document has been updated with data received during the public consultation phase and includes all final conclusions, based on the (additional) data and public comments[1].

Background

The ASC Shrimp Standard v.1.1 is based on the decisions by the Shrimp Aquaculture Dialogue (ShAD) and sets requirements that define acceptable levels for the major social and environmental impacts of shrimp farming. The purpose of the ASC Shrimp Standard was and is to provide means to measurably improve the environmental and social performance of shrimp aquaculture operations.

The Standard currently covers species under the genus *Penaeus* (and previously *Litopenaeus*)[2] and is oriented towards the production of *P. vannamei* and *P. monodon.* Other species of shrimp are eligible for certification if they can meet the specified performance thresholds. A previous document has been composed to evaluate the necessity to specifically include *Penaeus stylirostris* (Blue Shrimp)*, Penaeus merguiensis* (Banana Prawn)*, Penaeus japonicus* (Kuruma Prawn) and *Penaeus ensis* (Greasyback Shrimp) within the ASC Shrimp Standard. It was concluded that specific metrics for these species are not necessary and certification can remain on the basis of metrics for *P. vannamei* and *P. monodon.*

Corresponding Metrics

The ASC Shrimp Standard consists of seven different principles regarding legal regulations, environmentally suitable sighting and operation, community interactions, responsible operation practices, shrimp health management, stock management and resources use. Principles are then divided into different criterions and indicators. Indicators with a corresponding metric requirement are listed in Table 1.

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[1] All public comments and answers can be found on the ASC website and are not included in this document.
[2] Based on the recent research regarding detailed phylogenetic analyses of several shrimp within the family Penaidae (Ma et al., 2011) and the review by Flegel (2007) the *Penaeus* genus will be used. It is recommended to also apply this change to *Penaues (Litopenaeus) vannamei* within the revision of the ASC Shrimp Standard.

Table 1 Species specific indicators within the ASC Shrimp Standard v.1.1

Indicator	Requirement	Metric	Additional Information
2.5.3	Water-specific conductance or chloride concentration in concentration in freshwater wells used by the farm or located on adjacent properties	< 1,500 mhos (conductance) Or < 300 mg/L chloride	For all freshwater wells
5.1.3	Annual average farm survival rate (SR) 1) unfed and non-permanently aerated pond 2) fed but non-permanently aerated pond 3) fed and permanently aerated pond	1)>25% 2)>45% 3)>60%	
5.1.4	Percent of stoked lost larvae that are specific pathogen free (SPF) of specific pathogen resistant (SPR) for all important pathogens	100%	if commercially available
6.2.2	Percent of total post larvae from closed loop hatchery	100%	Reachable within 6 year after publication of the ASC Shrimp Standard **(2020)**
7.2.1a	FM and FO used in feed to come from fisheries certified by a full ISEAL member	100%	Within 5 years following the date of standards publication **(2019)**
7.2.1b	Fishscource Score for the fisheries from which a minimum of 80% of the FM and FO by volume is derived a. Fishsource Criteria 4 b. Fishsource Criteria 1, 2, 3 and 5	a. 8 b. 6	**Interim solution**
7.2.2	Percentage of non-marine ingredients from sources certified by an ISEAL members certification scheme that addresses environmental and social sustainability	80%	Soy and palm oil within five years from the date of the standard publication **(2019)**
7.4.1	Feed Fish Equivalence Ratio (FFER)	1.35:1 1.9:1	*L. vannamei* *P. monodon*
7.4.2 a	economic feed conversion ratio (eFCR)		records available
7.4.2 b	protein retention efficiency (PRE)		records available
7.5.1	nitrogen effluent per ton of shrimp produced over a 12 month period	<25.2 kg/T <32.4 kg/T	*L. vannamei* *P. monodon*
7.5.2	phosphorous effluent per ton of shrimp produced over a 12 month period	<3.9 kg/T <5.4 kg/T	*L. vannamei* *P. monodon*
7.5.4	treatment of effluent water from permanently aerated ponds; concentration of settleable solids	<3.3 mL/L	evidence that discharge water goes through a treatment system
7.5.5	Percentage change in diurnal DO relative to DO at saturation in receiving water body for the waters specific salinity and temperature	<65%	

The ASC Shrimp Standard does not yet provide a threshold for eFCR and the protein retention efficiency (PRE) but requires the farmer to provide the records for the data within the audit. The Rationale of the ASC Shrimp Standard v.1.1 states that the PRE ‘is a relatively undocumented parameter in the field, [thus] the ShAD has preferred not to set a requirement at this stage. This is a starting point on a critical issue and ASC will be able to set a requirement as information is collected if it proves to be a useful indicator of responsible shrimp production’. The PRE or PPV (protein productive value) evaluates the conversion efficiency of protein in the feed into body protein. Setting a limit for the PRE was an outcome of this revision.

Data Collection – Sample Size

Within the revision of the ASC Shrimp Standard v1.1 data from ASC certified and non-certified farms as well as literature data was taken into account. The data was compared and used to set new metric requirements within the revised standard. In order to determine the correct sample size a power analysis[3] was undertaken based on the knowledge from ASC certified farm data and a first literature review.

The power analysis and sample size determination has been conducted using R. Standard deviation within samples was estimated using data from the ASC certified farms. Standard deviation between samples was estimated based on the average of ASC certified farms and the average in the literature, based on an initial literature review. Significance level (type I error (α)) was set to 0.05 and the power (type II error (β)) was set to 80% based on the suggestions by Cohen (1992).

The resulting sample sizes can be seen in Table 2.

Table 2 Sample size calculation based on data from ASC certified farms and literature

Ind.	Requirement	n	Additional Information/ relevance
2.5.3	Water-specific conductance or chloride concentration	40	No literature data, assumption that variance would be ¼ of allowed maximum
5.1.3	Annual average farm survival rate (SR)		
	1) unfed and non-permanently aerated pond	77	Based on a low sample size (n=34) with very high fluctuations
	2) fed but non-permanently aerated pond	65	
	3) fed and permanently aerated pond	40	
5.1.4	SPF or SPR larvae	not relevant	
6.2.2	PL from closed loop hatchery	not relevant	
7.2.1a	FM/FO from certified source	not relevant	
7.2.1b	Fishsource Score	not relevant	
	Criteria 4		
	Criteria 1, 2, 3 and 5		
7.2.2	Non-marine ingredients from certified source	not relevant	
7.4.1	Feed Fish Equivalence Ratio (FFER)		
	P. vannamei	10	
	P. monodon	10	
7.4.2 a	economic feed conversion ratio (eFCR)	207	No distinction between species
7.4.2 b	protein retention efficiency (PRE)	49	
7.5.1	nitrogen effluent		
	P. vannamei	133	No literature data found thus assumed to be similar to *P. monodon*
	P. monodon	82	Very little literature data available
7.5.2	phosphorous effluent		
	P. vannamei	5	
	P. monodon	23	
7.5.4	concentration of settleable solids	17	very limited dataset as often not applicable for farms
7.5.5	Percentage change in diurnal DO	37	

[3] Power analysis is described in more detail by Cohen (1992).

Indicator 5.1.4 and 6.2.2 were deemed 'not relevant' for the revision as they are set at 100% for sustainability reasons and there is no intention to change these indicators. The feed related indicators (7.2.1a and b and 7.2.2) were also deemed 'not relevant' for this revision as these indicators are now covered by the ASC Feed Standard. Indicator 7.4.2 a and b (eFCR and PRE) are not metric indicators as such but require the farm to report on the eFCR and PRE. Both were therefore not taken into account for the determination of sample size. Best data availability for both ASC certified farms and literature was given for the survival rate in fed and permanently aerated ponds as well as FFER.

Required sample size for data form non-certified farms was therefore set at n = 40 for data covering both species. Species specific data should show a minimum sample size of n = 10 per species (see FFER). Data collection should be equally spread among the main producer countries.

The appropriate sample sizes could not be reached for chloride concentration/conductance and the effluent related criterions (7.5). These requirements were not updated in this revision process. The sample size for fed and non-permanently aerated ponds was slightly lower than required (n=36) as a result of the low sample size and respective comments during the public consultation phase, the survival rate for this farming system was not increased. Only 50% of the required data for FFER of *P. monodon* could be collected. Based on this limited data availability, it was decided to only slightly decrease the metric performance level.

ASC Certified Farms

Based on audit reports (initial audits, surveillance audits and recertification audits), the following metrics have been reported by ASC certified farms (Table 3).

Table 3 Data from ASC certified farms (as of March 2019)

Indicator	Requirement	Value	Sample Size	Remarks
2.5.3	Water-specific conductance (< 1,500 mhos)	1104.5 ± 1310.5	n = 136	
	Chloride concentration (< 300 mg/L)	113.0 ± 69.1	n = 19	
5.1.3	Annual average farm survival rate			
	unfed and non-permanently aerated pond (>25%)	33.4 ± 14.4	n = 31	Highest: 87.7 % Lowest: 25.3 %
	fed but non-permanently aerated pond (>45%)	62.9 ± 12.2	n = 94	
	fed and permanently aerated pond (>60%)	78.3 ± 9.7	n = 188	
5.1.4	SPF or SPR larvae (100%)	not extracted		
6.2.2	PL from closed loop hatchery (100%)	not extracted		
7.2.1a	ISEAL certified FM/FO (100%)	not extracted		
7.2.1b	Fishscource Score Criteria 4 (8)	7.1 ± 1.5	n = 125	
	Fishsource Criteria 1, 2, 3 and 5 (6)	6.3 ± 1.2	n = 110	
7.2.2	ISEAL certified non-marine ingredients (80%)	not extracted		
7.4.1	Feed Fish Equivalence Ratio (FFER)			
	(*P. vannamei: 1.35*)	0.9 ± 0.4	n = 210	
	(*P. monodon: 1.9*)	1.6 ± 0.4	n = 28	
7.4.2 a	eFCR	1.4 ± 0.4	n = 321	All species
	(*P. vannamei*)	1.5 ± 0.4	n = 147	
	(*P. monodon*)	1.7 ± 0.1	n = 5	
7.4.2 b	protein retention efficiency (PRE)	36.6 ± 7.4	n = 279	Unrealistic values (> 100 or < 1) excluded
	(*P. vannamei*)	34.6 ± 8.1	n = 138	
	(*P. monodon*)	33.4 ± 5.8	n = 4	
7.5.1	nitrogen effluent			
	(*P. vannamei:* <25.2 kg/T)	13.8 ± 9.9	n = 262	
	(*P. monodon*: <32.4 kg/T)	21.8 ± 9.9	n = 45	
7.5.2	phosphorous effluent			
	(*P. vannamei:* <3.9 kg/T)	2.2 ± 1.6	n = 233	several NCs
	(*P. monodon*: <5.4 kg/T)	2.7 ± 2.2	n = 33	
7.5.4	concentration of settleable solids (<3.3 mL/L)	1.8 ± 1.0	n = 54	n/a for most farms, measurements from n = 10
7.5.5	Percentage change in diurnal DO (<65%)	25.9 ± 17.3	n = 242	

Non-certified Farms

In order to evaluate the performance of ASC certified shrimp farms, it is crucial to compare these farms with non-certified farms. A request for data from non-certified farms was published on the ASC website and social media and send to stakeholders via email. Only very few, limited datasets have been received before the public consultation. This list (Table 4) has been updated to include data received during the public consultation. Farm data is mainly covering Indonesia (n = 126), Ecuador (n = 67), Bangladesh (n = 52) and Thailand (n = 44) covering a total of 307 farms.

Table 4 Data from non-certified farms. This Table biased towards Indonesia.

Indicator	Requirement	Value	Sample Size	Remarks
2.5.3	Water-specific conductance (< 1,500 mhos)	9160 ± 19376	n = 6	very high fluctuations
	Chloride concentration (< 300 mg/L)			
5.1.3	Annual average farm survival rate			
	unfed and non-permanently aerated pond (>25%)	17.2 ± 10.6	n = 134	values between 61% - 1%
	fed but non-permanently aerated pond (>45%)	30.7 ± 19.9	n = 36	
	fed and permanently aerated pond (>60%)	62.3 ± 16.5	n = 104	
5.1.4	SPF or SPR larvae (100%)	0 %		general information from Ecuador
6.2.2	PL from closed loop hatchery (100%)	0 %		general information from Ecuador
7.2.1a	ISEAL certified FM/FO (100%)	94.7 ± 21.9 %	n = 17	
7.2.1b	Fishscource Score Criteria 4 (8)			
	Fishsource Criteria 1, 2, 3 and 5 (6)			
7.2.2	ISEAL certified non-marine ingredients (80%)	80.7 ± 7.3 %	n = 52	
7.4.1	Feed Fish Equivalence Ratio (FFER)			
	(*P. vannamei: 1.35*)	1.2 ± 0.6	n = 99	Calculated from FCR, based on FM content of 20%
	(*P. monodon: 1.9*)	1.6 ± 0.3	n = 5	
7.4.2 a	eFCR			
	(*P. vannamei*)	1.4 ± 0.4	n = 99	
	(*P. monodon*)	1.5 ± 0.3	n = 5	
7.4.2 b	protein retention efficiency (PRE) (*P. vannamei*) (*P. monodon*)	42.6 ± 9.5	n = 6	
7.5.1	nitrogen effluent			
	(*P. vannamei:* <25.2 kg/T)	22.5 ± 4.0	n = 6	
	(*P. monodon*: <32.4 kg/T)	5.2	n = 1	
7.5.2	phosphorous effluent			
	(*P. vannamei:* <3.9 kg/T)	3.4 ± 0.8	n = 6	
	(*P. monodon*: <5.4 kg/T)	3.3	n = 1	
7.5.4	concentration of settleable solids (<3.3 mL/L)	0.8 ± 0.7	n = 4	
7.5.5	Percentage change in diurnal DO (<65%)	13.1 ± 10.3	n = 25	

Literature Research

The global aquaculture production has risen continuously in the last decades and was at a total of 80,031 thousand tonnes in 2016 with about 7,862 thousand tonnes of crustaceans (FAO, 2018b). In 2016 about 72,000t of shrimp were certified under the ASC Shrimp Standard. The amount doubled to about 144,000t at the end of 2018[4].

Shrimp and prawn farming has been identified as one of the aquaculture practices with the greatest environmental impact (Hall et al., 2011). It is thus indispensable to drive the shrimp aquaculture towards more environmentally sustainable practices. Penaeid shrimp have been researched and farmed since the early 1970s with an initial focus on *P. monodon* switching to *P. vannamei* and *P. stylirostris* due to several farming advantages and the increasing market demands (Briggs et al., 2004). Data from the literature research can be seen in Table 5

[4] Based on ASC audit reports (asc-aqua.org)

Table 5 Data from scientific literature

Indicator	Requirement	Value	Sample Size	Remarks
2.5.3	Water-specific conductance (< 1,500 mhos)	no data		
	Chloride concentration (< 300 mg/L)	no data		
5.1.3	Annual average farm survival rate			
	unfed and non-permanently aerated pond (>25%)	no data		only covered in one paper without mentioning survival rate
	fed but non-permanently aerated pond (>45%)	60.3 ± 14.1	n = 15	
	fed and permanently aerated pond (>60%)	81.8 ± 15.9	n = 52	
5.1.4	SPF or SPR larvae (100%)	100%		seldom mentioned
6.2.2	PL from closed loop hatchery (100%)			not mentioned in research
7.2.1a	ISEAL certified FM/FO (100%)	38.4 ± 7.2	n = 39	average FM or protein content in diet, origin of FM not mentioned
7.2.1b	Fishscource Score Criteria 4 (8)			
	Fishsource Criteria 1, 2, 3 and 5 (6)			
7.2.2	ISEAL certified non-marine ingredients (80%)	52.4 ± 0.0	n = 7	average protein from non-marine ingredients, origin not specified
7.4.1	Feed Fish Equivalence Ratio (FFER)			calculated based on FCR and either mentioned FM/protein content in diet or 25% FM (based on FAO average)
	(*P. vannamei: 1.35*)	1.4 ± 0.6	n = 27	
	(*P. monodon: 1.9*)	2.3 ± 1.3	n = 38	
7.4.2 a	eFCR			
	(*P. vannamei*)	1.4 ± 0.3	n = 27	
	(*P. monodon*)	1.5 ± 0.8	n = 38	
7.4.2 b	protein retention efficiency (PRE)			
	(*P. vannamei*)	no data		
	(*P. monodon*)	21.5 ± 11.4	n = 16	
7.5.1	nitrogen effluent			
	(*P. vannamei:* <25.2 kg/T)	no data		
	(*P. monodon*: <32.4 kg/T)	39.0 ± 15.4	n = 7	calculated based on N input and formula used in ASC Standard
7.5.2	phosphorous effluent			
	(*P. vannamei:* <3.9 kg/T)	no data		
	(*P. monodon*: <5.4 kg/T)	6.5 ± 2.9	n = 7	calculated based on P input and formula used in ASC Standard
7.5.4	concentration of settleable solids (<3.3 mL/L)	no data		
7.5.5	Percentage change in diurnal DO (<65%)	34.1 ± 16.4	n = 15	

The following articles and papers have been consulted in order to obtain data. No paper provided information for all indicators, some did not yield any useful information. Papers cover both on farm research as well as laboratory based research on new feed ingredients, optimal water quality etc. Literature data is therefore taken as an indication of what is possible but does not necessarily represent feasible practices.

Ahmmed, F., Ahmmed, M.K., Shah, S., Banu, G.R., 2018. Use of indigenous beneficial bacteria (*Lactobacillus spp.)* as probiotics in shrimp (*Penaeus monodon*) aquaculture. Agric. Livest. Fish. 5, 127–135.

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Boyd, C.E., Mc Nevin, A.A., Racine, P., Tinh, H.Q., Minh, H.N., Viriyatum, R., Paungkaew, D., Engle, C., 2017. Resource Use Assessment of Shrimp, *Litopenaeus vannamei* and *Penaeus monodon*, Production in Thailand and Vietnam. J. World Aquac. Soc. 48, 201–226. https://doi.org/10.1111/jwas.12394

Briggs, M., Funge-Smith, S., Subasinghe, R., Phillips, M., 2004. Introductions and movement of *Penaeus vannamei* and *Penaeus stylirostris* in Asia and the Pacific. FAO RAP Publ. 75, 1–12.

Briggs, M.R.P., Funge-Smith, S.J., 1994. A nutrient budget of some intensive marine shrimp pondsin Thailand. Aquac. Fish. Manag. 25, 789–811. https://doi.org/https://doi.org/10.1111/j.1365-2109.1994.tb00744.x

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Fan, L., Wang, A., Miao, Y., Liao, S., Ye, C., Lin, Q., 2016. Comparative proteomic identification of the hepatopancreas response to cold stress in white shrimp, *Litopenaeus vannamei*. Aquaculture 454, 27–34. https://doi.org/10.1016/j.aquaculture.2015.10.016

Huang, Z., Li, X., Wang, L., Shao, Z., 2014. Changes in the intestinal bacterial community during the growth of white shrimp, *Litopenaeus vannamei*. Aquac. Res. 1–10. https://doi.org/10.1111/are.12628

Li, Y., Wei, L., Cao, J., Qiu, L., Jiang, X., Li, P., Song, Q., Zhou, H., Han, Q., Diao, X., 2016. Oxidative stress, DNA damage and antioxidant enzyme activities in the pacific white shrimp (*Litopenaeus vannamei*) when exposed to hypoxia and reoxygenation. Chemosphere 144, 234–240. https://doi.org/10.1016/j.chemosphere.2015.08.051

Liang, Z., Liu, R., Zhao, D., Wang, L., Sun, M., Wang, M., Song, L., 2016. Ammonia exposure induces oxidative stress, endoplasmic reticulum stress and apoptosis in hepatopancreas of pacific white shrimp (*Litopenaeus vannamei*). Fish Shellfish Immunol. 54, 523–528. https://doi.org/10.1016/j.fsi.2016.05.009

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Ullman, C., Rhodes, M.A., Davis, D.A., 2019. Feed management and the use of automatic feeders in the pond production of Pacific white shrimp *Litopenaeus vannamei*. Aquaculture 498, 44–49. https://doi.org/10.1016/j.aquaculture.2018.08.040

Wyban, J., 2009. World Shrimp Farming Revolution : Industry Impact of Domestication , Breeding and Widespread Use of Specific pathogen-free *Penaeus vannamei*, in: Browdy, C.L., Jory, D.E. (Eds.), The Rising Tide, Proceedings of the Special Session on Sustainable Shrimp Farming, World Aquaculture 2009. Baton Rouge, Louisiana.

Xie, S. Wei, Liu, Y. Jian, Zeng, S., Niu, J., Tian, L. Xia, 2016. Partial replacement of fish-meal by soy protein concentrate and soybean meal based protein blend for juvenile Pacific white shrimp, *Litopenaeus vannamei*. Aquaculture 464, 296–302. https://doi.org/10.1016/j.aquaculture.2016.07.002

Recommendations

As previously mentioned within the sample size determination, some of the indicators are not relevant for the revision as they are now covered by the ASC Feed Standard (7.2.1a, 7.2.1b, 7.2.2). Requirements for SPF larvae and origin of PL (5.1.4, 6.2.2) will also stay at 100%. The new metric indicators for the revised ASC Shrimp Standard will be informed by Table 6.

Table 6 shows the average and quartiles (Q[5]) (either Q_1 (lowest 25%) or Q_3 (highest 25%), depending on the requirement[6]).

Table 6 Summary of data from literature and certified and non-certified farms

Ind.	Requirement	certified farms		non-certified farms		Literature		Proposed Requirement
		average	Q	average	Q	average	Q	
2.5.3	Water-specific conductance (< 1,500 mhos)	1104.5 ± 1310.5	555.0	9160 ± 19376	0.2	no data		no changes
	Chloride concentration (< 300 mg/L)	113.0 ± 69.1	58.1	no data		no data		no changes
5.1.3	Annual average farm survival rate							
	unfed and non-permanently aerated (>25%)	33.4 ± 14.4	30.9	17.2 ± 10.6	20.7	no data		no changes
	fed but non-permanently aerated (>45%)	62.9 ± 12.2	70.0	30.7 ± 19.9	41.5	60.3 ± 14.1	68.0	no changes
	fed and permanently aerated (>60%)	78.3 ± 9.7	84.5	62.3 ± 16.5	71.5	81.8 ± 15.9	94.4	>65%
7.4.1	Feed Fish Equivalence Ratio (FFER)							
	(*P. vannamei: 1.35*)	0.9 ± 0.4	0.7	1.2 ± 0.6	1.1	1.4 ± 0.6	1.1	1.3
	(*P. monodon: 1.9*)	1.6 ± 0.4	1.4	1.6 ± 0.3	1.5	2.3 ± 1.3	1.2	1.8
7.4.2a	eFCR							
	(*P. vannamei*)	1.5 ± 0.4	1.2	1.4 ± 0.4	1.2	1.4 ± 0.3	1.2	no req.
	(*P. monodon*)	1.7 ± 0.1	1.6	1.5 ± 0.3	1.3	1.5 ± 0.8	1.1	no req.
7.4.2b	protein retention efficiency (PRE)							
	(*P. vannamei*)	34.6 ± 8.1	41.0	42.6 ± 9.5	47.4	no data		>30%
	(*P. monodon*)	33.4 ± 5.8	37.4	no data		21.5 ± 11.4	23.9	
7.5.1	nitrogen effluent							
	(*P. vannamei:* <25.2 kg/T)	13.8 ± 9.9	3.2	22.5 ± 4.0	20.7	no data		no changes
	(*P. monodon*: <32.4 kg/T)	21.8 ± 9.9	21.6	5.2		39.0 ± 15.4	35.8	no changes
7.5.2	phosphorous effluent							
	(*P. vannamei:* <3.9 kg/T)	2.2 ± 1.6	0.6	3.4 ± 0.8	3.4	no data		no changes
	(*P. monodon*: <5.4 kg/T)	2.7 ± 2.2	3.1	3.3		6.5 ± 2.9	3.9	no changes
7.5.4	concentration of settleable solids (<3.3 mL/L)	1.2 ± 1.0	1.8	0.8 ± 0.7	0.4	no data		no changes
7.5.5	Percentage change in diurnal DO (<65%)	25.9 ± 17.3	11.3	13.1 ± 10.3	6.5	34.1 ± 16.4	20.0	no changes

[5] Q_1 = 1st Quartile, Q_3 = 3rd Quartile; the first quartile is defined as the middle number between the median of the dataset and the smallest number, the third quartile is defined as the middle number between the median of the dataset and the highest number in the dataset.

[6] Indicators with a requirement above a certain metric limit (e.g., survival rate) show the data for the 3rd Quartile, whereas indicators with a requirement below a certain metric limit (e.g., FFER) show the data for the 1st Quartile.

Based on the low sample size and the fact that the ASC is currently working on the Aligned ASC Farm Standard, which will combine all existing ASC Standards into one ASC Farm Standard, it was decided to not update the effluent related indicators (7.5.) within the revision of the ASC Shrimp Standard. The effluent related indicators will be revised for all species and farming purposes within the ASC Farm Standard, based on the environmental impact. The collected data will be used for the revision.

The additional data and comments received during the public consultation in spring 2020 shows that the survival rate is one of the biggest issues for non-certified farms. It is thus proposed to not change the survival rate for category one (unfed and non-aerated) and two (fed but non-permanently aerated). The proposed increase by 5% for category three (fed and aerated) is justified and will be executed.

FFER is proposed to be decreased by 0.05 for *P. vannamei* and 0.1 for *P. monodon* to account for the improved feed formulation (and thus better resource use) and also to slowly start aligning the values for the two species.

The protein retention efficiency (PRE) is a measure of the amount of protein provided in the feed that is retained in the harvested shrimp. The ASC Shrimp Standard v1.1 required farmers to report on the PRE in order for the ASC to collect data and potentially form this into a requirement within the revision. The provided data suggests that in more than 80% of the reported cycles PRE is well above 30% with only a few farms having a PRE of slightly below 20% (one farm has a PRE of 4.7%). The top farmers (based on Q_3) have a PRE of above 40% for *P. vannamei* (certified and non-certified farms) and just below that at 37.4% for *P. monodon* (certified farms, low n). Literature values are lower but based on feeding trials with deliberately non-optimal feed.

In order to slowly transition into this requirement and improve the use of protein as a resource, it is therefore suggested to set the requirement at 30% for all certifiable shrimp species

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