

5.11 Shrimp Toolkit

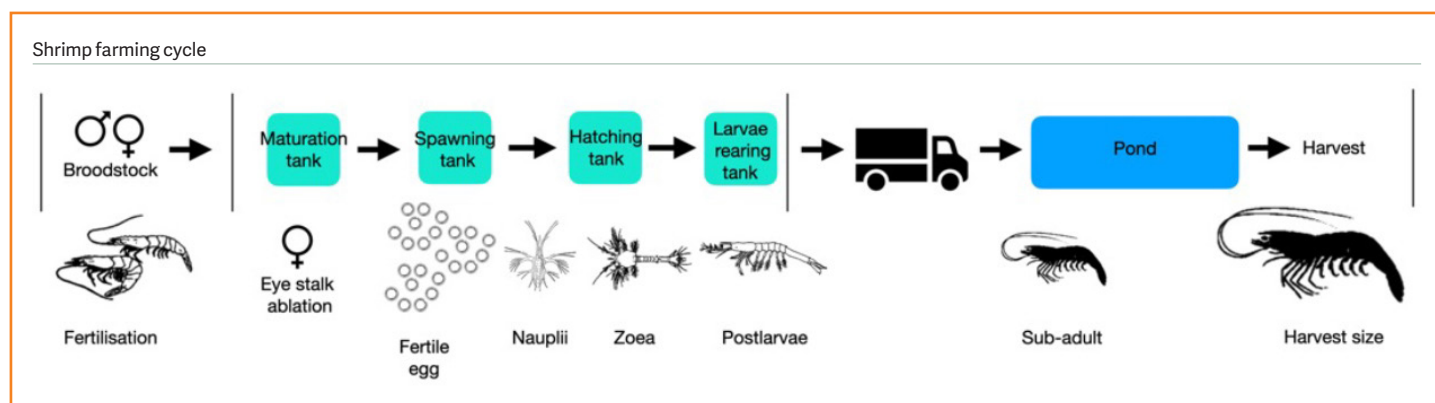
Introduction

Commercial marine shrimp farming began in the 1970s, to supply the shrimp market opportunities of the US, Japan, and Western Europe. Shrimp farming started as small-scale businesses in Southeast Asia, and is now a large-scale global industry. Approximately 80 per cent of farmed shrimp* come from two species – *Litopenaeus vannamei* (sometimes called *Penaeus vannamei*, or Pacific white shrimp) and, to a much smaller extent, *Penaeus monodon* (giant tiger prawn). In the tropics it takes three to six months to grow market-sized shrimp, and many farms grow two crops in a year (see figure for shrimp farming cycle). Shrimp are grown in earth ponds, sometimes with plastic or concrete liners, or in concrete ponds. They are grown in brackish or fresh water.

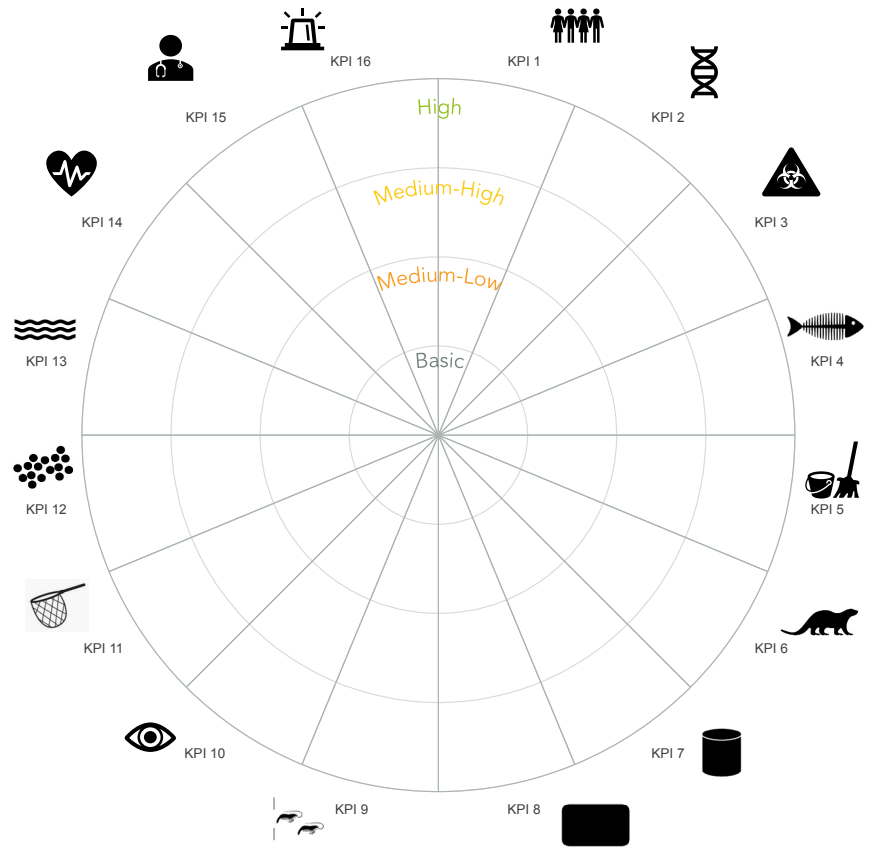
The most notable welfare concern in shrimp is eyestalk ablation, removal of one of the female shrimp's eyestalks, often before fertilisation. This reduces production of a hormone linked to reproduction. Although some shrimp species are able to mature in captivity without ablation, ablation has become established as a common practice in shrimp hatcheries.

Eyestalks are removed by pinching the eyestalk between the thumb and index finger, by cauterising (using a heated pair of forceps at the base of the eyestalk), or by ligation (tying a thread or wire around the eyestalk and tightening the thread to disrupt the blood supply). There are management practices which have been used to avoid eyestalk ablation (see Benchmark, Resource 10).

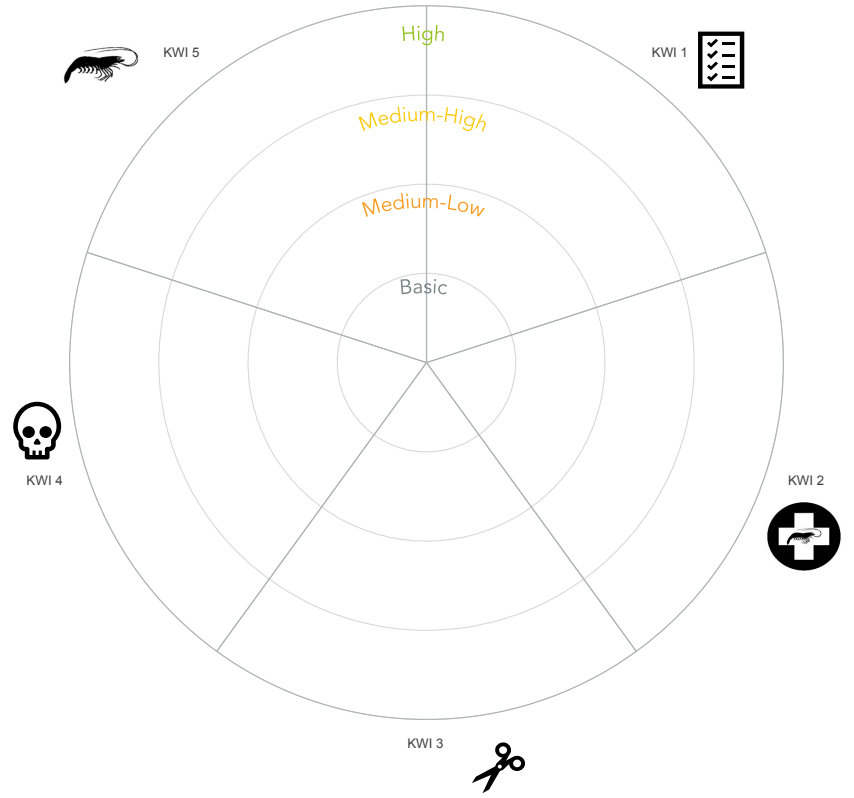
*Other farmed species: Banana prawn (*Penaeus merguensis*); Kuruma prawn (*Penaeus japonicus*); Blue shrimp (*Penaeus stylirostris*); Fleshy prawn (*Penaeus chinensis*); Indian white prawn (*Penaeus indicus*); Southern brown shrimp (*Penaeus subtilis*); Northern brown shrimp (*Penaeus aztecus*); Northern pink shrimp (*Penaeus duorarum*); Southern white shrimp (*Penaeus schmitti*), Redspotted shrimp (*Penaeus brasiliensis*); Green tiger prawn (*Penaeus semisulcatus*); Northern white shrimp (*Penaeus setiferus*); Western white shrimp (*Penaeus occidentalis*); and Southern pink shrimp (*Penaeus notialis*).



KPI	Achievement
KPI1: People, training - Links to P11	<input type="radio"/>
KPI2: Genetics - Links to P2	<input type="radio"/>
KPI3: Biosecurity - Links to P5	<input type="radio"/>
KPI4: Removal of mortalities - Links to P5, P10	<input type="radio"/>
KPI5: Cleaning and disinfection - Links to P5, P10	<input type="radio"/>
KPI6: Control of other species - Links to P5, P7	<input type="radio"/>
KPI7: Tanks - Links to P5	<input type="radio"/>
KPI8: Enclosures, ponds, lagoons - Links to P5	<input type="radio"/>
KPI9: Escapes - Links to P5, P10	<input type="radio"/>
KPI10: Inspection - Links to P10	<input type="radio"/>
KPI11: Handling - Links to P11	<input type="radio"/>
KPI12: Feed - Links to P3	<input type="radio"/>
KPI13: Water quality - Links to P4	<input type="radio"/>
KPI14: Health, and health planning - Links to P5	<input type="radio"/>
KPI15: Medicines - Links to P5	<input type="radio"/>
KPI16: Emergency - Links to P9, P10	<input type="radio"/>
Basic level not achieved	
Basic (B)	
Medium-Low (ML)	
Medium-High (MH)	
High (H)	
Overall KPI achievement	



KWI	Achievement
	KWI1: Animal records - Links to P10 <input type="radio"/>
	KWI2: Shrimp health assessment - Links to P4, P5 <input type="radio"/>
	KWI3: Mutilations - Links to P5, P6, P7 <input type="radio"/>
	KWI4: On-farm mortality - Links to P5, P10 <input type="radio"/>
	KWI5: Slaughter - Links to P5, P11 <input type="radio"/>



Basic level not achieved	
Basic (B)	
Medium-Low (ML)	
Medium-High (MH)	
High (H)	

Overall KWI achievement

Overall achievement

Overall achievement

**KPI S1**

People, training - Links to P11		Observed?	Comment on observation	Achieved level?	Progress	Evidence/comment
Basic (B)	All people responsible for the care of shrimp have received appropriate training by others with experience in recognition of disease, or health and welfare problems.	<input type="radio"/>		<input type="radio"/>		
Medium-Low (ML)	Routine procedures are carried out by competent and trained people.	<input type="radio"/>		<input type="radio"/>		
Medium-High (MH)	A person or co-ordinator responsible for animal welfare aspects within the farm or company is identified.	<input type="radio"/>		<input type="radio"/>		
High (H)	People in the company are supported to have higher-level training or to achieve professional qualifications in animal welfare and aquaculture.	<input type="radio"/>		<input type="radio"/>		

**KPI S2**

Genetics - Links to P2		Observed?	Comment on observation	Achieved level?	Progress	Evidence/comment
Basic (B)	Shrimp species used are compliant with local and national legislation.	<input type="radio"/>		<input type="radio"/>		
	Use of non-indigenous shrimp species complies with introduction procedures of the regional, national and international importation guidelines.	<input type="radio"/>				
	The facility complies with all government regulations regarding importation of native and non-native stock of any age.	<input type="radio"/>				
	Wild juveniles are not deliberately stocked.	<input type="radio"/>				
Medium-Low (ML)	Shrimp genetic modification techniques are not used.	<input type="radio"/>		<input type="radio"/>		
Medium-High (MH)	Culture of transgenic shrimp (including the offspring of genetically-engineered shrimp) is not permitted.	<input type="radio"/>		<input type="radio"/>		
High (H)	As previous.	<input type="radio"/>		<input type="radio"/>		

**KPI S3**

Biosecurity - Links to P5		Observed?	Comment on observation	Achieved level?	Progress	Evidence/comment
Basic (B)	A biosecurity programme or plan (Resource 5) is in place.	<input type="radio"/>		<input type="radio"/>		
Medium-Low (ML)	High standards of biosecurity are maintained to avoid the spread of diseases between populations of shrimp.	<input type="radio"/>		<input type="radio"/>		
	People and vehicles go through disinfection and cleaning before, and after entering the site.	<input type="radio"/>				
	Feed and probiotics are stored to prevent contact with outside vectors of disease, such as birds and rodents.	<input type="radio"/>				
Medium-High (MH)	A pond liner is used.	<input type="radio"/>		<input type="radio"/>		
	The farm is protected (as far as is realistic) with fences to prevent entry of wild animals, including crabs, which may carry pathogens.	<input type="radio"/>				
High (H)	The biosecurity programme includes a risk assessment (which may be based on hazard analysis and critical control point (HACCP) training) of the primary pathogens and parasites likely to pose a risk to the species farmed.	<input type="radio"/>		<input type="radio"/>		



KPI S4

Removal of mortalities - Links to P5, P10		Observed?	Comment on observation	Achieved level?	Progress	Evidence/comment
Basic (B)	Frequent removal of dead or moribund shrimp from the edges of the pond, or if present, from the mortality removal system.	<input type="radio"/>		<input type="radio"/>		
Medium-Low (ML)	Records are kept showing that mortalities are removed consistently.	<input type="radio"/>		<input type="radio"/>		
Medium-High (MH)	Removal of dead/moribund shrimp from the surface or the mortality removal system occurs:	<input type="radio"/>		<input type="radio"/>		
	a) At least twice a week, unless adverse weather conditions mean this would involve danger to personnel.	<input type="radio"/>				
	b) At least daily for land-based systems.	<input type="radio"/>				
High (H)	The cause of death of shrimp is recorded.	<input type="radio"/>		<input type="radio"/>		
	Veterinary (or appropriate local non-veterinary expertise) advice is sought if the cause of death is not clear.	<input type="radio"/>				



KPI S5

Cleaning and disinfection - Links to P5, P10		Observed?	Comment on observation	Achieved level?	Progress	Evidence/comment
Basic (B)	Vermin are controlled through appropriate and effective measures.	<input type="radio"/>		<input type="radio"/>		
	Only approved pest control substances and chemicals permitted by law are used.	<input type="radio"/>				
Medium-Low (ML)	Written cleaning and disinfection protocols are implemented.	<input type="radio"/>		<input type="radio"/>		
	Equipment can be thoroughly cleaned and disinfected.	<input type="radio"/>				
	Net cleaning does not unnecessarily compromise the welfare of the shrimp.	<input type="radio"/>				
Medium-High (MH)	A list of permitted disinfectants and detergents used on the shrimp farm, and their safety data sheets, is available.	<input type="radio"/>		<input type="radio"/>		
	The areas around the tanks, ponds and buildings are kept clear of debris and non-essential equipment.	<input type="radio"/>				
High (H)	The most humane effective baiting method is adopted, and pest control baits are only accessible to the targeted species.	<input type="radio"/>		<input type="radio"/>		



KPI S6

Control of other species - Links to P5, P7		Observed?	Comment on observation	Achieved level?	Progress	Evidence/comment
Basic (B)	If lethal predator control is used, it is compliant with local and national legislation.	<input type="radio"/>		<input type="radio"/>		
	No lethal methods are applied to predator species listed as endangered or critically endangered on the IUCN Red List or those species that are protected by local or national laws.	<input type="radio"/>				
	A basic monitoring programme is in place for documenting the frequency of visits, variety of species and number of animals interacting with the farm.	<input type="radio"/>				
Medium-Low (ML)	Humane precautions are taken to protect shrimp from other animals that could cause them harm, including bringing in disease.	<input type="radio"/>		<input type="radio"/>		
	Staff are trained in humane control methods.	<input type="radio"/>				
Medium-High (MH)	The farm uses non-lethal methods of control to protect shrimp from other animals.	<input type="radio"/>		<input type="radio"/>		
	The farm has a predator control plan in place.	<input type="radio"/>				
	Any lethal methods used are only used as a last resort, when all non-lethal methods have failed.	<input type="radio"/>				
	The site maintains a list of species occurring within the vicinity of the site that are classified as endangered or threatened under regional laws and/or are on the IUCN Red List.	<input type="radio"/>				
High (H)	The site records the species and numbers of all avian, mammalian and reptilian mortalities resulting from predator control actions.	<input type="radio"/>		<input type="radio"/>		
	As previous.	<input type="radio"/>				

**KPI S7**

Tanks - Links to P5		Observed?	Comment on observation	Achieved level?	Progress	Evidence/comment
Basic (B)	The tanks on the farm are compliant with local and national requirements on land and water use.	<input type="radio"/>		<input type="radio"/>		
Medium-Low (ML)	Inlets and outlets are designed to prevent both shrimp escape and ingress of wild stock. Tanks have lids or are covered with appropriate netting to prevent shrimp escaping.	<input type="radio"/>		<input type="radio"/>		
Medium-High (MH)	If nets are used, they are a suitable size for the shrimp in the tank to prevent escapes and to prevent shrimp from becoming entangled.	<input type="radio"/>		<input type="radio"/>		
High (H)	Tanks measuring over 5m in diameter have oxygen and/or water level alarms fitted.	<input type="radio"/>		<input type="radio"/>		

**KPI S8**

Enclosures, ponds, lagoons - Links to P5		Observed?	Comment on observation	Achieved level?	Progress	Evidence/comment
Basic (B)	Enclosures or ponds on the farm are compliant with local and national authorities on land and water use.	<input type="radio"/>		<input type="radio"/>		
Medium-Low (ML)	The location of enclosures allows an adequate flow of clean water. Enclosures are designed and sited so they are not likely to be damaged by adverse weather conditions.	<input type="radio"/>		<input type="radio"/>		
Medium-High (MH)	If used, enclosure nets are regularly checked for holes and fouling, and are well maintained.	<input type="radio"/>		<input type="radio"/>		
High (H)	Biofouling is not allowed to build up on enclosure nets.	<input type="radio"/>		<input type="radio"/>		

**KPI S9**

Escapes - Links to P5, P10		Observed?	Comment on observation	Achieved level?	Progress	Evidence/comment
Basic (B)	Effective screens, nets or barriers of appropriate mesh size are used for the smallest animals present, and are double-screened when non-indigenous species are present.	<input type="radio"/>		<input type="radio"/>		
Medium-Low (ML)	Perimeter pond banks or dykes are of adequate height and construction to prevent breaching if exceptional flooding occurs.	<input type="radio"/>		<input type="radio"/>		
Medium-High (MH)	Trapping devices to sample for escapes are in place, and the results recorded (mesh traps on pumped water systems).	<input type="radio"/>		<input type="radio"/>		
High (H)	As previous requirement.	<input type="radio"/>		<input type="radio"/>		

**KPI S10**

Inspection - Links to P10		Observed?	Comment on observation	Achieved level?	Progress	Evidence/comment
Basic (B)	The farmer inspects the shrimp at a frequency which is at least the legal base requirement (in large pond systems, or with poor water clarity, observation of the shrimp is recognised to be difficult).	<input type="radio"/>		<input type="radio"/>		
Medium-Low (ML)	Shrimp are inspected at regular intervals, at least twice daily, weather permitting (in large pond systems, or with poor water clarity, observation of the shrimp is recognised to be difficult).	<input type="radio"/>		<input type="radio"/>		
Medium-High (MH)	Shrimp are observed at least once a day during feeding (in large pond systems, or with poor water clarity, observation of the shrimp is recognised to be difficult).	<input type="radio"/>		<input type="radio"/>		
High (H)	As previous requirement.	<input type="radio"/>		<input type="radio"/>		

**KPI S11**

Handling - Links to P11		Observed?	Comment on observation	Achieved level?	Progress	Evidence/comment
Basic (B)	Handling of shrimp prior to transport is kept to a minimum, and done in ways which minimise distress to the shrimp.	<input type="radio"/>		<input type="radio"/>		
Medium-Low (ML)	Changes in water temperature and pH during handling, which could compromise shrimp welfare, are avoided.	<input type="radio"/>		<input type="radio"/>		
	When hand nets are used they are:	<input type="radio"/>				
	a) of a suitable size;	<input type="radio"/>				
	b) designed to avoid physical damage; and	<input type="radio"/>				
	c) kept clean, in good repair and disinfected before use.	<input type="radio"/>				
Medium-High (MH)	Handling of shrimp prior to transport does not result in shrimp being out of water for more than 15 seconds.	<input type="radio"/>		<input type="radio"/>		
High (H)	As previous.	<input type="radio"/>		<input type="radio"/>		

**KPI S12**

Feed - Links to P3		Observed?	Comment on observation	Achieved level?	Progress	Evidence/comment
Basic (B)	Feeding is of a quality, quantity and feeding frequency suitable for the shrimp stage of development.	<input type="radio"/>		<input type="radio"/>		
	Feeds and feeders meet manufacturers' recommendations, good aquaculture husbandry practices, and local regulatory requirements, and must provide adequate access for all shrimp.	<input type="radio"/>				
Medium-Low (ML)	Shrimp probiotics are only used at the appropriate growth and nutrition stage to prevent overuse.	<input type="radio"/>		<input type="radio"/>		
	All feeding systems are checked for proper operation daily.	<input type="radio"/>				
	In the event of a supply failure, the farms can provide feed within 24 hours.	<input type="radio"/>				
Medium-High (MH)	Food is fed in such a way that shrimp can eat without undue competition (in large pond systems observation of the shrimp is recognised to be difficult).	<input type="radio"/>		<input type="radio"/>		
High (H)	A documented chain of custody and traceability for fisheries products in feed is kept.	<input type="radio"/>		<input type="radio"/>		

**KPI S13**

Water quality - Links to P4		Observed?	Comment on observation	Achieved level?	Progress	Evidence/comment
Basic (B)	The site is compliant with regulations or permit requirements concerning water quality and water quality impacts.	<input type="radio"/>		<input type="radio"/>		
	If pesticides or shrimp treatments are used, their use is compliant with local and national requirements.	<input type="radio"/>				
	The site is compliant with local and national requirements for discharges, including hazardous chemicals, sludge or aquaculture waste.	<input type="radio"/>				
Medium-Low (ML)	The farmer recognises visual indicators of poor water quality as well as behavioural indicators of poor water quality (in large pond systems, or with poor water clarity, observation of the shrimp is recognised to be difficult).	<input type="radio"/>		<input type="radio"/>		
Medium-High (MH)	Water quality is monitored sufficiently frequently (and if necessary, daily) for the time of year, the system, and the lifecycle stage of shrimp.	<input type="radio"/>		<input type="radio"/>		
	If water quality departs from the local accepted range (Resource 6) investigation and rectification takes place.	<input type="radio"/>				
High (H)	Equipment used to test water quality is calibrated, for example by using a dissolved oxygen (DO) meter, pH meter, refractometer and/or chemical test kits.	<input type="radio"/>		<input type="radio"/>		

**KPI S14**

Health, and health planning - Links to P5		Observed?	Comment on observation	Achieved level?	Progress	Evidence/comment
Basic (B)	A procedure is in place to deal with an outbreak of important transmissible disease, including geographically appropriate OIE-listed diseases.	<input type="radio"/>		<input type="radio"/>		
Medium-Low (ML)	Infectious, parasitic and metabolic diseases, injury, and conditions causing distress, are prevented and controlled through good management, good animal care, biosecurity, and genetic selection.	<input type="radio"/>		<input type="radio"/>		
	The aquaculture system does not depend on prolonged or routine use of pharmaceuticals.	<input type="radio"/>				
Medium-High (MH)	A H&W plan is in place (Resource 4).	<input type="radio"/>		<input type="radio"/>		
	Broodstock have appropriate disease-free status and meet regional, national and international importation guidelines.	<input type="radio"/>				
High (H)	The H&W plan is reviewed and updated annually and is authorised by a specialist aquaculture veterinarian (or if local veterinary expertise is not available, appropriate local non-veterinary expertise).	<input type="radio"/>		<input type="radio"/>		

**KPI S15**

Medicines - Links to P5		Observed?	Comment on observation	Achieved level?	Progress	Evidence/comment
Basic (B)	Any drug or other agent used to treat shrimp is compliant with all local guidelines and applicable local legislation.	<input type="radio"/>		<input type="radio"/>		
	Medication is only administered strictly in accordance with the prescription instructions.	<input type="radio"/>				
	Hormones and antibiotics are not used as growth promoters.	<input type="radio"/>				
	Preventive (prophylactic) use of antimicrobials is not permitted.	<input type="radio"/>				
Medium-Low (ML)	Medicines are stored securely and in the recommended conditions (label instructions).	<input type="radio"/>		<input type="radio"/>		
	Medicine use is recorded (Resource 3).	<input type="radio"/>				
	The company has access to a veterinarian experienced in aquaculture (or, if local veterinary expertise is not available, appropriate local non-veterinary expertise).	<input type="radio"/>				
Medium-High (MH)	Any antimicrobial classified as being of 'high' or 'medium' importance for human medicine defined as Highest Priority Critically Important Antimicrobials (HPCIA) is not permitted for use in aquaculture unless under veterinary advice (or if local veterinary expertise is not available, appropriate local non-veterinary expertise).	<input type="radio"/>		<input type="radio"/>		
	Persons using medicines have relevant experience and training.	<input type="radio"/>				
High (H)	The number of treatments of antibiotics over the most recent production cycle ≤ 3 .	<input type="radio"/>		<input type="radio"/>		
	An antimicrobial stewardship plan is in place, and is complied with (see OIE 2016, Resource 9). It is reviewed annually, and is linked to existing regional or national antimicrobial stewardship schemes.	<input type="radio"/>				

**KPI S16**

Emergency - Links to P9, P10		Observed?	Comment on observation	Achieved level?	Progress	Evidence/comment
Basic (B)	Written plans are in place to deal with emergencies such as power failure, flooding, freezing, failure of feed supply, or chemical or effluent spillage.	<input type="radio"/>		<input type="radio"/>		
Medium-Low (ML)	Contacts and emergency phone numbers, and contact numbers in cases where the emergency can affect animal and human health, are available at each site.	<input type="radio"/>		<input type="radio"/>		
Medium-High (MH)	If generators are used for back-up power (generators may not be present on many farms), they are tested under conditions of load at least 4 times a year.	<input type="radio"/>		<input type="radio"/>		
High (H)	Plans have been developed in consultation with a specialist veterinarian (or if local veterinary expertise is not available, appropriate local non-veterinary expertise).	<input type="radio"/>		<input type="radio"/>		
	Plans are updated annually to cover circumstances such as potentially zoonotic or notifiable disease.	<input type="radio"/>				

**KWI S1**

Animal records - Links to P10		Observed?	Comment on observation	Achieved level?	Progress	Evidence/comment
Basic (B)	Records are kept of details of the origin of shrimp stock, and the estimated numbers of shrimp in each tank or enclosure.	<input type="radio"/>		<input type="radio"/>		
Medium-Low (ML)	Records are kept of the estimated current stocking densities of shrimp in each tank or enclosure.	<input type="radio"/>		<input type="radio"/>		
Medium-High (MH)	Records are kept of staff observation and checking times (in large pond systems, or with poor water clarity, observation of the shrimp is recognised to be difficult).	<input type="radio"/>		<input type="radio"/>		
High (H)	As previous requirement.	<input type="radio"/>		<input type="radio"/>		

**KWI S2**

Shrimp health assessment - Links to P4, P5		Observed?	Comment on observation	Achieved level?	Progress	Evidence/comment
Basic (B)	The farmer is aware of basic indicators of shrimp health, such as the shrimp are swimming actively, and their morphology is normal (in large pond systems, or with poor water clarity, observation of the shrimp is recognised to be difficult).	<input type="radio"/>		<input type="radio"/>		
Medium-Low (ML)	Shrimp samples are taken regularly (using netted samples) allowing adjustment of the feed regime to prevent overfeeding and underfeeding.	<input type="radio"/>		<input type="radio"/>		
Medium-High (MH)	Shrimp health is assessed once a week (using netted samples) after stocking.	<input type="radio"/>		<input type="radio"/>		
	Shrimp health is assessed for the following:	<input type="radio"/>				
	o Their guts are full	<input type="radio"/>				
	They have no adhering organisms	<input type="radio"/>				
	There is no cloudiness in the muscle	<input type="radio"/>				
	The muscle to gut width ratio is 3:1	<input type="radio"/>				
	The hepatopancreases are large and dark	<input type="radio"/>				
	The gill is white or greyish	<input type="radio"/>				
	There is no melanisation (black to brownish spots)	<input type="radio"/>				
	There is no moulting residue on the shrimp heads	<input type="radio"/>				
o There are no cuts or twists on the body	<input type="radio"/>					
High (H)	As previous requirement.	<input type="radio"/>		<input type="radio"/>		

**KWI S3**

Mutilations - Links to P5, P6, P7		Observed?	Comment on observation	Achieved level?	Progress	Evidence/comment
Basic (B)	Any mutilations involving the removal or alteration of sensitive tissue of shrimp are compliant with all local guidelines and applicable local legislation.	<input type="radio"/>		<input type="radio"/>		
Medium-Low (ML)	As previous requirement.	<input type="radio"/>		<input type="radio"/>		
Medium-High (MH)	To avoid eyestalk ablation, the company is trialling methods of avoiding eyestalk ablation by adjusting feed, male-female ratios, and the number of broodstock females (see example, Benchmark, Resource 9).	<input type="radio"/>		<input type="radio"/>		
High (H)	Mutilations involving the removal of sensitive tissue are not carried out – including eyestalk ablation.	<input type="radio"/>		<input type="radio"/>		

**KWI S4**

On-farm mortality - Links to P5, P10		Observed?	Comment on observation	Achieved level?	Progress	Evidence/comment
Basic (B)	Basic mortality data (from overall survival) is recorded (In large pond systems, or with poor water clarity, observation of the shrimp is recognised to be difficult).	<input type="radio"/>		<input type="radio"/>		
Medium-Low (ML)	As previous requirement.	<input type="radio"/>		<input type="radio"/>		
Medium-High (MH)	Mortality data is analysed (from survival data), and the following shrimp annual average farm survival rate (SR): thresholds are used:	<input type="radio"/>		<input type="radio"/>		
	1) Unfed and non-permanently aerated pond systems SR >25%	<input type="radio"/>				
	2) Fed but non-permanently aerated pond systems SR >45%	<input type="radio"/>				
	3) Fed and permanently aerated pond systems SR >60%	<input type="radio"/>				
	The cause of adverse trends in survival are investigated and acted on.	<input type="radio"/>				
High (H)	A procedure is in place to investigate unexplained mortality.	<input type="radio"/>		<input type="radio"/>		
	If morbidity and mortality levels increase, and other signs indicate the shrimp have been affected by disease, a diagnostic investigation is conducted to identify the causative agent.	<input type="radio"/>				

**KWI S5**

Slaughter - Links to P5, P11		Observed?	Comment on observation	Achieved level?	Progress	Evidence/comment
Basic (B)	Shrimp are killed adopting local legally-approved methods.	<input type="radio"/>		<input type="radio"/>		
Medium-Low (ML)	A recognised method to induce insensibility is adopted (see Resource 2).	<input type="radio"/>		<input type="radio"/>		
Medium-High (MH)	As previous requirement.	<input type="radio"/>		<input type="radio"/>		
High (H)	Internationally recognised best practice methods for killing are adopted, including consideration for electrical stunning.	<input type="radio"/>		<input type="radio"/>		

Notes: Shrimp

ASC (2019): [Shrimp Standard \(Version 1.1\)](#)

ASC (2019): [Shrimp Audit Manual Standard \(Version 1.1\)](#)

Barr, S., Laming, P.R., Dick, J.T.A., and Elwood, R.W., (2008): Nociception or pain in a decapod crustacean? (Animal Behaviour 75:745-751)

Benchmark: [Setting a New Benchmark for Shrimp Welfare](#)

BAP (2014): [Aquaculture Facility Certification, Finfish, Crustacean, Mollusk Hatcheries and Nurseries](#)

Charity Entrepreneurship (2020): [Shrimp welfare](#)

Elwood, R.W., (2012): Evidence for pain in decapod crustaceans (Animal Welfare 21(S2):23-27)

FAO Fisheries & Aquaculture Department (2006-2018): [Cultured Aquatic Species Information Programme. Penaeus vannamei. Cultured Aquatic Species Information Programme \(text by Briggs, M\)](#)

FAO (2020): [Globefish Trade Statistics: Shrimp](#)

Jackson, et al., (2003): Nitrogen budget and effluent nitrogen components at an intensive shrimp farm (Aquaculture, Volume 218, Issues 1-4)

Kir, M. and Kumlu, M., (2006): Acute Toxicity of Ammonia to *Penaeus semisulcatus* Postlarvae in Relation to Salinity (Journal of the World Aquaculture Society, 37(2):231-235)

Monterey Bay Aquarium (2004): [Farmed Shrimp Report](#)

Páez-Osuna, F. (2001): The environmental impact of shrimp aquaculture: a global perspective (Environmental Pollution 112:229-231)

Páez-Osuna, F. (2001): The Environmental Impact of Shrimp Aquaculture: Causes, Effects, and Mitigating Alternatives (Environmental Management Vol. 28, No. 1)

RSPCA Australia: [What is the most humane way to kill crustaceans for human consumption?](#)

Sustainable Fisheries Partnership (2011): [Working towards sustainable shrimp feed \(video\)](#)

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