

## Non-Government Schools Animal Ethics Committee - STANDARD OPERATING PROCEDURES

<b>SOP No:</b>	14	
<b>SOP</b>	Aquaculture	
<b>Scientific Name:</b>	Varies	
<b>Category:</b>	4 only	
<b>Approved activities</b>	<b>Activity</b>	<b>Category</b>
	Aquaculture and related enterprises	4
<b>Approval Level:</b>	These activities only apply to Category 4 which needs the appropriate Animal Ethics Committee approval. <b>Where an activity is not listed in this SOP, approval must be sought from the Animal Ethics Committee and confirmed before it can be undertaken.</b>	
<b>Authority:</b>	<b>Government Schools</b> – Department for Education and Childhood Development Animal Ethics Committee <b>Independent and Catholic Schools</b> - Non-Government Schools Animal Ethics Committee	
<b>Authority Approval Date:</b>	1 August 2010	
<b>Last Update:</b>	3 July 2023	
<b>Disclaimer:</b>	<i>This document may be updated at any time. You should check the web site regularly to ensure that you are meeting the most recent recommendations. If you note any concerns with the information provided (inadequate, incorrect) please contact the relevant AEC</i>	
<b>Licensing Requirement:</b>	May be required – check with the Primary Industries and Resources South Australia (PIRSA) - Aquaculture	
<b>Compliance Requirement:</b>	The keeping of this species requires approval from the AEC. It is recommended that this Standard Operating Procedure be followed as a minimum in the provision of appropriate care and housing for this species.	

### General Information:

Aquaculture is the commercial farming of fish, molluscs, crustaceans, and aquatic plants, in natural or controlled marine or freshwater environments.

In South Australia, oyster farming and prawn farming are common in the aquaculture industry. Marron farming, a freshwater crayfish species, is most seen on Kangaroo Island.

There are various species of fish that are suitable for using in a schools' aquaculture enterprise (e.g. trout) Schools should select species most suited to their environment and resources. An appropriate housing system must be set up and established prior to acquiring any aquaculture species. Schools need to consider the following before selecting a species for their school-based aquaculture enterprise:

- Ability to thrive in captivity
- Suitable behaviour such as schooling and swimming near the water surface
- Capable of rapid and uniform growth
- Amenable to artificial feeding
- Efficient food conversion
- Non-cannibalistic
- Disease resistant
- Hardy
- High meat recovery
- Marketability

Refer to the Primary Industries and Regions South Australia (PIRSA) website for a list of prohibited fish declared noxious under the Fisheries Management Act 2007. **These species may not be held or traded in South Australia without specific authorisation.**

[www.pir.sa.gov.au/biosecurity/aquatics/aquatic\\_pests/noxious\\_fish\\_list](http://www.pir.sa.gov.au/biosecurity/aquatics/aquatic_pests/noxious_fish_list)

### Aquaculture permits:

To undertake Aquaculture in South Australia, schools need to have the correct permits and licensing before doing so. Schools may be required to provide

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information from their aquaculture enterprise to PIRSA relating to production numbers, chemical use etc.  
More information about aquaculture permits can be found through the PIRSA website. [www.pir.sa.gov.au/aquaculture](http://www.pir.sa.gov.au/aquaculture)

## Physical Attributes:

Depends upon the species used for commercial farming.

## Behaviour:

Varies with species and therefore other references will need to be consulted for the type of fish or other species (e.g. molluscs or crustaceans) you plan to keep. By close observation and research one can quickly become familiar with a species normal behaviour. This will aid in identifying any changes in normal behaviour that may suggest illness, inadequate diet, or insufficient water quality. Species used for aquaculture can die quickly so any abnormalities should be quickly acted upon by consulting with a relevant Aquaculture industry representative or Veterinarian.

When adding new fish to an established environment time and care must be taken to acclimatise the animals. Speak to an industry expert prior to adding any new fish to an established tank for advice. When first introduced, the tank should be closely monitored to ensure that temperature, pH, salinity, and oxygen levels are appropriate for the fish or other species and they are not displaying any signs of illness, abnormal behaviour, or aggression amongst groupings.

## Environment:

All facilities used to house the animals must be operated in a manner that optimises conditions for that species. Suitable facilities for holding fish include ponds, raceways, tanks, cages, and aquaria. All facilities should be aerated. Tanks and aquaria should be aerated continuously with diffused air and ponds with mechanical aerators such as paddlewheels for around 8 hours/day. In circular, self-cleaning tanks, a constant flow of water must be used to facilitate the removal of solids and dissolved wastes, e.g. ammonia to supplement aeration. If tanks need to be static, e.g. during chemical treatment, fish should not be fed and water (10–30%) should be exchanged daily.

**Housing/Space:** The stocking density for fish is dependent on the water quality, the size of the fish, the temperature of the water and the oxygen supply. See table 1 below.

Table 1: The optimum stocking density for each of the housing types.

Housing type	Optimum stocking density
Tank	10 kg/m <sup>3</sup>
Cage	20 kg/m <sup>3</sup>
Pond	20 t/ha

**Covers or shelter for tanks:** Tanks should be placed undercover or in a building out of direct sunlight to provide an environment with low light intensity. During winter months the need to heat individual tanks can be avoided by keeping tanks in a closed environment where the air temperature of the room can be maintained. Heating should be used before the water temperature drops significantly. This reduces the amount of heating required and saves power and money.

**Water quality:** Maintenance of good water quality is the most important aspect of fish husbandry. Maintenance of good water quality requires the regular monitoring of temperature, dissolved oxygen, pH, and ammonia, and for marine and brackish water species; salinity.

**Temperature:** Fish are *ectotherms* because heat is obtained from outside the animal. Usually, the body temperature of ectotherms is close to that of their surroundings; they are often described as *poikilothermic* (having variable temperature). Temperature affects all chemical and biological processes. The metabolic rate of fish doubles for every rise of 10°C. Therefore, temperature

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has a direct effect on key factors such as growth, oxygen demand, food requirements and food conversion efficiency. The higher the temperature, the greater the requirement for oxygen and food and the faster the growth rate. Temperature partly determines the concentration of oxygen in water. The solubility of oxygen decreases with increasing temperature, and so concentrations are usually lower in summer. Silver perch have a temperature tolerance range of 2 to 38°C with optimum growth occurring between 23 to 28°C. During winter when water temperatures are lower, silver perch will require less food and have a slower growth rate. At temperatures below 10°C the fish may enter a state of torpor, with reduced appetite and activity. As the water temperature increases in spring and summer, the fish will require a larger quantity of food due to the increase in their metabolic rate. If the temperature is to exceed the critical level for a particular species, fish may become stressed, more vulnerable to disease, stop growing and can die.

**Dissolved oxygen:** Dissolved oxygen is the most critical and limiting variable in fish husbandry and culture. Like all animals, fish cannot live without oxygen. Although fish can survive at levels of 4 mg/L, they may suffer stress, reduced growth, and increased susceptibility to disease. Oxygen enters water through diffusion at the air-water interface and because of photosynthesis when there are plants in the water. For aquaria, tanks and raceways, dissolved oxygen is usually supplied through low pressure compressors or blowers (through diffusers like air stones). In ponds, paddle-wheel aerators are among the most efficient methods of transferring oxygen from the air to the water. This also helps with mixing water throughout the pond.

**Salinity:** Salinity refers to the total concentrate of all dissolved ions. Many Australian native fish tolerate a wide range in salinity, with freshwater species coping with up to 5 g/L and many estuarine species coping with salinity up to 10 g/L. Fish need to be given time to adjust to changing salinity.

**pH Level:** The desirable pH range of water for aquaculture species is around 6–9, depending on the species. A pH of 4 is lethal for most species while prolonged exposure to pH levels of above 10 is also lethal. Other variables that influence the water quality include alkalinity, hardness, turbidity and ammonium, nitrite, hydrogen sulphide and carbon dioxide levels.

**Water exchange:** Poor water quality can result from inadequate water exchange. Water exchange can be achieved through:

- Partial draining of the pond or tank and then replacing the lost water.
- Flow-through systems with the pond, tank or raceway remaining full through water entering and leaving the system at the same time from various locations.
- Recirculating systems.

**Filtration:** The maintenance of water quality in tanks and aquariums can be assisted through a filtration system. The different types of filtration include:

- mechanical
- chemical
- biological

**Cleaning:** Tanks should be cleaned regularly, by siphon or vacuum pump, to reduce problems with the accumulation of organic matter (uneaten food, faeces) and fouling organisms, bacteria, and algae. Filters need to be backwashed regularly to prevent build up and decomposition of accumulating waste material. Floors and drains associated with tank rooms should be cleaned and sterilised on a regular basis. Dilute pool chlorine or sodium hypochlorite (NaOCl 20 ppm) or caustic soda (NaOH 1%) are suitable cleaning agents for this purpose.

### Feeding:

**Diet:** Commercial diets are available from several feed manufacturers for marine and freshwater fish including diets for larvae, juveniles, and adults. The commercial diet used should be designed for the target species, life-stage, and size. Commercial fish diets should be stored for as short a time as possible before use and kept cool and dry. If the diets are to be stored for longer than one month they should be kept in cool (<15°C), dry conditions or frozen. Silver perch are often fed fresh or frozen bait fish or aquatic plant material. This food needs to be stored frozen and care must be taken to ensure it is not contaminated and does not deteriorate.

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**Daily requirements:** Fish should be fed to optimise survival and growth. Each species should be fed appropriately. If fish are not feeding vigorously, excess feeding can adversely affect water quality. At such times feeding should be reduced or suspended until conditions improve.

- Breeding:** Species dependant. Schools should contact their Animal industry representative, PIRSA or local Veterinarian before undertaking any breeding.
- Handling:** Fish and other aquaculture species should only be handled under circumstances where they require an examination by an experienced staff member or by a Veterinarian.  
Equipment: A suitable net should be used to capture the fish.
- Hygiene:** After handling (where applicable) or working with any aquaculture species, thoroughly wash hands with soap and running water for at least 15 seconds. Dry hands with clean paper, towel, or an air dryer. Turn off the tap with the paper towel if possible.
- Signs of illness:** Husbandry plays a huge role in the health of a species used for aquaculture. Schools should regularly test water temperature, quality and pH and monitor food intake. Signs of illness are species specific.  
  
Signs of illness in fish include: skin lesions such as spots, fin erosion, gross colonies of bacteria, ulcers or growths, floating, listing, swelling of the body cavity and swimming upside down.
- Treatments:** Schools are encouraged to develop relationships with Veterinarians and Animal industry representatives familiar with species used for aquaculture. These contacts can be used for disease diagnoses, treatment options and dietary, husbandry and welfare advice. Veterinarians can also assist with emergencies, particularly where euthanasia is needed. Treatments must be documented in the appropriate records. Most species of aquaculture's health will deteriorate rapidly and so any sign of abnormal behaviour should be quickly acted upon.
- Euthanasia:** When an illness or injury is such that recovery is unlikely then the fish or other species involved must be euthanised. Only experienced staff should be undertaking fish euthanasia. Schools should contact their local Veterinarian to discuss emergency treatment options prior to an event occurring when keeping invertebrates. Any adverse event including death must be reported to the AEC using the ADVERSE EVENTS form. Forms must be returned to the AEC within 7 days of the event occurring.
- Disposal/fate planning:** When no longer required, fish must be rehomed. They must **NEVER** be released into the environment or waterways unless the site has an appropriate licence. Bodies must be disposed of correctly in accordance with local council regulations.
- Holiday and weekend care:** As they require specific conditions, care, and husbandry (e.g. pH, salinity, water levels, feeding frequencies) aquaculture set ups need to be checked **daily** and fed regularly over weekends and holiday periods. Special care must be taken at times of extreme heat as heating of the water can kill fish on mass. Extra checking is required during weather extremes. It is not recommended that fish or other species be taken off site for care during holiday periods unless approved by the school Principal.
- Objective:** To demonstrate the methods used in aquaculture enterprises.  
  
Schools are encouraged to contact PIRSA before undertaking any aquaculture activities. They must ensure they have adequate resources and staff to supervise the activities undertaken and plans for stock at the end of the activities. Staff must also have a good understanding of the relevant legislation relating to Aquaculture in South Australia.

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**Resources:**

**PIRSA**

**Includes licensing, animal health, disposal, and general information**  
[www.pir.sa.gov.au/aquaculture](http://www.pir.sa.gov.au/aquaculture)

**Australian Government – Aquaculture**

[www.agriculture.gov.au/fisheries/aquaculture](http://www.agriculture.gov.au/fisheries/aquaculture)

**Queensland Schools Animal Ethics Committee – Aquatic Animal Activities**

[education.qld.gov.au/curriculum/ Documents/sop-aquatic-animal-activities.pdf](http://education.qld.gov.au/curriculum/ Documents/sop-aquatic-animal-activities.pdf)

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