

AEC STANDARD OPERATING PROCEDURES

SOP No:	14
SOP	Aquaculture
Scientific Name:	Varies
Category:	4
Approval Level:	Category 4: Animal Ethics Committee
Authority:	Government Schools – Department for Education and Childhood Development Animal Ethics Committee Independent and Catholic Schools - Non Government Schools Animal Ethics Committee
Authority Approval Date:	1 August 2010
Last Update:	1 November 2013
Disclaimer:	<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>
Licensing Requirement:	May be required – check with the Department of Primary Industries and Resources South Australia (PIRSA) – Fisheries.
Compliance Requirement:	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.

Aquaculture will grow in importance as pressure increases on wild fisheries. At present the industry is dominated by oyster farming with prawn farming also making a valuable contribution. There are various species of fish that are suitable for using in a schools' aquaculture enterprise. Care should be taken to ensure that species that are most appropriate to the school environment are selected. Characteristics that need to be considered in the selection of species for a school-based aquaculture enterprise include:

- 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 following website for a list of prohibited fish list
http://www.pir.sa.gov.au/biosecurity/aquatics/aquatic_pests/noxious_fish_list

Aquaculture permits:

A person/ site must not carry on aquaculture except as authorised by an aquaculture licence granted by the Minister. An aquaculture permit is required whether fish are grown for human consumption, or used in the aquarium trade, for sale to other fish farmers or sale of fish for stocking farm dams or waterways. An aquaculture permit is not needed where a proponent keeps fish in a pet shop for sale or in an

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aquarium for exhibition, or where fish are maintained for non-commercial purposes, e.g. stocking a farm dam with fish for personal recreation use or consumption. More information about aquaculture permits can be found through the Primary Industries and Resources SA. <http://www.pir.sa.gov.au/aquaculture>

Physical Attributes:

Behaviour:

Varies with species and therefore other references will need to be consulted for the type of fish you plan to keep.

Environment:

All facilities used to house fish must be operated in a manner that optimises conditions for the particular fish 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.

- **Space:** The stocking density for fish is dependent on the prevailing water quality, the size of the fish, the temperature of the water and the oxygen supply. Table 1 lists the optimum stocking density for each of the housing types.

Table 1

Housing type	Optimum stocking density
Tank	10 kg/m ³
Cage	20 kg/m ³
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 relatively 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. 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 unlike *endotherms* (e.g. mammals) that generate their own body heat. 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 has a direct effect on important factors such as

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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 and 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 greatly 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 as a result 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 as low as 10 g/L. Fish need to be given time to adjust to changing salinity.
- **pH Level:** The desirable range for fish 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 different 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

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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:

- **Type:** Commercial diets are available from a number of 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.
- **Quantity and regularity:** 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:

Handling:

Fish must not be handled. A suitable net should be used to capture the fish.

Hygiene:

Signs of illness:

Signs of illness 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:

Euthanasia or human killing:

Where fish become so sick, diseased or injured that recovery is unlikely or undesirable on humane grounds, euthanasia should be carried out.

The preferred method of euthanasia is by a firm tap on the head with a suitable blunt object followed by rapid severing of the spinal chord. Any death must be reported to the Animal Ethics Committee using the appropriate form (see section relating to ADVERSE EVENTS). Forms are available on the relevant websites – see contact details below.

Disposal/fate planning:

Fish must not be released into natural waterways unless the site has an appropriate licence.

Holiday and weekend care:

As they require specific conditions – pH, salinity, water levels, feeding frequencies they 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 at these times.

Approved activities:

Observation, breeding, farming

Websites: Information:

www.pir.sa.gov.au
Fishwatch SA 1800 065 522