PRIMARY INDUSTRIES AND RESOURCES SA

FACT SHEET

FS

Aquaculture Potential of Australian Native Finfish

Aquaculture SA

Introduction

Over the last few decades there has been a rapid decline of our native finfish species within our river systems however demand for fish still continues. The aquaculture potential of our four main native finfish species, Murray cod (*Macculochella peeli*), silver perch *(Bidyanus bidyanus*), golden perch or callop (*Macquaria ambigua*) and catfish (*Tandanus tandanus*) therefore shows potential with each species demonstrating promising aquaculture characteristics (Appendix 1).

South Australia to this point in time has had relatively little success in the farming of freshwater native finfish. This can generally be attributed to the fact that SA has little freshwater availability when compared with other states. Consequently little information is available regarding best practice techniques to farm these fish in SA. Therefore until recently, there have been few attempts to culture native species of freshwater fish on a commercial scale in South Australia.

Status in other States

Hatchery production and aquaculture of native finfish, particularly Silver perch, has been occurring in other states of Australia for a number of years. Narrandera Inland Fisheries Research Station in New South Wales has developed techniques for the successful breeding of freshwater native finfish which have been distributed to a number of hatcheries located around New South Wales and Victoria (Appendix 2).

The Silver perch industry in NSW has increased substantially since 1994 with production levels increasing yearly. Silver perch farming in aquaculture ponds also occurs in Western Australia, Victoria and Queensland.

Murray cod aquaculture in ponds has been occurring in predominantly in NSW and also in Victoria. Murray cod has recently been recognised as a promising candidate for intensive recirculation aquaculture. It was originally thought that Murray cod would be unsuitable for aquaculture due to its aggressiveness however it has been proven that when cod are stocked within tank systems, competition between the fish declines.

Callop and catfish aquaculture has occurred in both NSW and Victoria on a limited basis using both recirculation systems and ponds.

Rules and Regulations

Before someone can venture into native finfish farming an aquaculture permit must be obtained through the Aquaculture SA within Primary Industries and Resources South Australia (PIRSA). This permit will record the applicant as a registered fish farmer and therefore enable them to stock ponds or dams or tanks with fish and sell their produce.

Before a permit may be granted by the Aquaculture SA for a land-based applications it may be required that approval be sought by the Department of Environment and Heritage (DEH), the Environment Protection Authority (EPA) and local councils.

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Site Selection

Whether you are looking at setting up an intensive or extensive native finfish farm or hatchery it is important that a suitable site is selected. The following factors are considered to be important when selecting a site to ensure biological, practical and economic feasibility of a fish farming venture.

Water Supply

The well being of fish is ultimately dependent on the abundance and quality of the available water.

♦ **Abundance**

A regular, abundant water supply to the ponds, tanks and hatchery site is absolutely essential for the maintenance of healthy fish stocks, and the efficient incubation of eggs and the rearing of larvae and juveniles. The quantity of water available will determine the holding capacity and production potential of a farm.

♦ **Quality**

A supply of good water is essential. Poor water quality will result in reduced survival and /or growth at all stages of a fish's life cycle. The water supply must be free from sewage and other dissolved wastes, heavy metals, oils, pesticides, herbicides, chlorine, methane, hydrogen sulphide and other poisonous substances. Waters of high turbidity caused by silt and clay colloids should be avoided because it may reduce fish growth rates and resistance to disease and may also affect gonadal development. High turbidity may also depress pond temperatures to well below those required for spawning. Turbid water impedes the observation of eggs and larvae in the hatchery and the suspended particles can clog filters.

♦ **Source**

Water for fish farms can be drawn from many sources such as runoff from catchment areas, rivers and creeks, small dams and lakes, irrigation canals and bores. The type, size, location and topography of a farm may determine the best or most practical source of water.

Bore water has the following features that make it very suitable particularly for hatcheries and use within recirculation systems.

- Regular dependable supply
- Free of pathogens,
- Free of organic, agricultural and industrial pollution
- Free of suspended particles and so allows observation of eggs and larvae and eliminates siltation on eggs
- Relatively constant temperature
- Free of undesirable fish and aquatic organisms

Some sources of bore water are deficient in oxygen and contain excess nitrogen and harmful gases such as methane and hydrogen sulphide. However these limitations can generally be overcome by storing and aerating the water in a reservoir prior to use.

Water supply from domestic supplies should be avoided because it contains chemicals such as chlorine which may be present at levels toxic to fish.

Soil

If ponds are to be used to culture fish it is important that the site for the construction of the ponds contains relatively impervious soil to eliminate or reduce the loss of water by seepage. Clay or clay-loam soils are ideal. Loamy soils can be well compacted and although they may leak slightly in the early stages, tend to seal after a period of time.

Ponds that must be constructed in sandy or other porous soils can be made watertight by lining the bottom and sides with clay. Products are available for sealing ponds, however they are costly and so cannot be used extensively.

It is advisable to have a proposed site surveyed for gravel or sand layers, rock strata and other soil characteristics that may interfere with good water holding qualities. If land has previously been used for crops, the soil should be tested for accumulated pesticide residues.

Topography

The area of land selected for a fish farm should be large enough to accommodate ponds or tanks, holding and storage facilities plus a hatchery/laboratory complex should you wish to breed your own fingerlings. The possibility of future expansion must be considered when selecting the land.

If ponds are to be used, the land should ideally be relatively flat and slope gently from the upper end, above which the source of water or reservoir should be sited. This is so water can be gravity fed into the ponds and thus reduce pumping costs. Drainage or an area for the

accumulation of surplus and waste water should be available.

Topography will determine the type of ponds to be constructed ie, excavation, levee or gully. It is advisable to have a topographic survey carried out to determine the feasibility of constructing a fish farm on a particular site and to ensure that he land available is used efficiently.

Suitability of Water Temperatures

Because fish are poikilotherms (cold blooded), temperature directly effects their activity and metabolic processes. Species differ in their temperature requirements and have different minimum and maximum lethal temperatures. The optimum temperature range for the four species of native finfish are between 23^0C and 28^0C.

Temperature is one of the most important environmental parameters controlling gonadal development. For example the early phases of egg development in some species of fish are known to be stimulated by low temperature and short photoperiod and inhibited by high temperature. Most species found in temperate regions probably require the seasonal temperature and photoperiod cycle for normal gonadal development.

Water Quality Requirements

Whether fish are grown out in ponds or within a recirculation system, ideal water quality must be maintained to ensure that optimum survival and growth rates are achieved.

It is recommended that oxygen levels be kept above 4.5ppm even though fish can withstand levels of oxygen as low as 2mg/l for short periods of time. pH should be maintained between 6.5 – 9.0 and alkalinity maintained between 100 – 400ppm to help reduce large pH fluctuations that can occur. Free ammonia levels should be kept at below 0.1mg/l especially under conditions of high pH.

Most fish will be able to withstand short periods of time outside the recommended ranges for water quality. However this may result in the fish becoming stressed which may lower growth and survival rates and cause the fish to become more susceptible to infections by various diseases.

Techniques employed to help manage water quality include aeration, water exchange and regulation of feeding and stocking density.

Other Factors

Other important factors that must be considered are:

- Susceptibility of the site to flooding
- Availability of electricity (three phase)
- Availability of suitable manpower to operate the farm
- Availability of transport for the dispatch of fry or fish for consumers
- Proximity to markets
- Ability to secure the site against poaching or vandalism.

Silver Perch *Bidyanus bidyanus*

General Information

Silver perch occur naturally in the Murray-Darling systems with other populations also found within south-eastern Queensland. They prefer to inhabit open waters rather than heavily snagged areas.

Abundance of Silver perch has declined over the past few decades due to habitat destruction and is now a protected fish in South Australia. It is therefore not permitted to take these fish from the wild.

Silver perch have been known to grow up to 6kg however fish over 3kg are now rare.

Silver perch have a number of characteristics that make it suitable for aquaculture. They are generally a hardy fish achieving survival rates of up to 90% and grow rapidly. They are non-cannibalistic in nature and readily school therefore allowing them to be reared in high densities.

Reproduction

In there natural habitat silver perch require a rise in water level, coupled with water temperatures of about 23^0C to induce spawning, which normally occurs from mid-spring to late summer. Males mature at 2 – 3 years of age while females reach maturity at 3 – 4 years. During spawning females release on average 160,000 eggs which hatch within 36 hours. Fish larvae will commence feeding after five days once the yolk sacs have been absorbed.

As regular spawning of silver perch in dams is unreliable, Narrandera Fisheries Research Station in NSW have developed techniques to induce silver perch to spawn. Female broodstock are injected with human chronic gonadotrophin (HCG) and are placed into tanks with mature male where eggs are fertilised naturally. A large broodstock female weighing around 1.8kg has the potential to produce up to 500,000 eggs which are around 0.7 – 1.3 mm in diameter when released and between 2.3 – 3.0 mm approximately 15 minutes after fertilisation. Fertilised eggs will take around 30 hours to hatch under ideal temperature conditions. Larvae are then reared in ponds containing zooplankton until they pass through fry stage reach fingerling stage after around 3 – 4 months.

The hatchery stage of the operation is extremely specialised requiring broodstock fish, spawning and incubation facilities and a relatively high level of technical expertise. Most growers chose to purchase fingerlings from specialised hatcheries for grow out. Presently there are no hatcheries located in South Australia for silver perch however this may change in the future. The majority of hatcheries are located in New South Wales and Victoria and a list is provided at the end of this fact sheet.

Diet

Silver perch commence feeding around 6 days after fertilisation with larvae feeding on both phytoplankton and zooplankton.

During fingerling and adult stage, silver perch become omnivorous and will feed extensively on zooplankton, particularly larger ostracods. They will also consume shrimps and other crustaceans, filamentous algae, aquatic insects, molluscs and aquatic plants.

Artificial diets have been developed for both fingerling and adult silver perch This is in the form of a pellet which is made in proportion to the size of the fish's mouth during different stages of development. Fingerlings are fed up to 7.5% body weight per day and large fish are up to 3% body weight per day however this will depend on climate and management of the aquaculture system.

Pellets consist of approximately 32 - 36% protein coupled with lipids, carbohydrates, vitamins and minerals that provide the optimum dietary requirements necessary for silver perch growth. In well managed aquaculture ponds, food conversion ratios (FCR) of 1.5-2.0**:**1.0 (weight of fish produced **:** weight of feed consumed) can be expected. This ratio may be a little lower when fish are grown in recirculation systems.

Growth

The majority of silver perch is produced in ponds however currently there are some trials being undertaken in New South Wales and Victoria using recirculating systems. It will most likely be some time before conclusive results for recirculation system culture is obtained however initial results have indicated that silver perch aquaculture has greater economically viability using ponds.

Fingerlings that have been weaned onto commercial diets are available from a number of hatcheries located in New South Wales and Victoria. Recommended stocking rates for silver perch fingerlings in nursery ponds are 20,000 – 100,000 fish/ha. After 2 – 3 months fingerlings should be harvested, graded and restocked at 5,000 – 21,000 fish/ha in growout facilities. Results from research undertaken in New South Wales has shown the silver perch can be grown successfully at stocking densities of up to 10 tonne/ha.

With correct management techniques, it has been proven that silver perch will reach market size of 600 – 800g in approximately 18 months. This will depend however on local climatic conditions especially temperature and rainfall.

Marketing

Silver perch posses excellent eating qualities with a high meat recovery of 40% and white and finely textured flesh. Fish are purged in clean water before sale to remove the "muddy flavour" and ensure that a high quality product reaches the markets.

Fish are sold direct to restaurants and wholesale markets such and Sydney and Melbourne. Growers regularly receive $9 - $10 per kilogram farm gate for their live product.

Many fish between 600g and 800g are sold live however product is also sold chilled whole, gilled and gutted, and fillets. The New South Wales Silver Perch Growers Association also consider the fish to be an excellent smoked product.

Murray Cod *Maccullochella peeli*

General Information

The distribution of Murray cod occurs within the Murray-Darling region ranging from south-eastern Queensland, throughout Victoria a New South Wales and also South Australia.

The Murray cod is the largest freshwater fish in Australia. The largest fish ever to be caught in the wild weighed in at 113.5kg.

Murray cod prefer to live in slow flowing water and deep holes. They are a particularly territorial fish and individuals are quite often found in the same patches of water for many years. Numbers of Murray cod in the river systems have been reduced over the years due to habitat destruction and the regulation of river flow. Stock enhancement programs have been occurring within Victoria and New South Wales for several years to help in increasing numbers of this majestic fish.

Reproduction

In the wild Murray cod spawn during late spring till mid summer when the water temperature reaches around 20^0C. The female will lay up to 40,000 eggs on a submerged log other structures which may be present. The eggs are between 2.5 – 3mm in diameter, swelling to 3 – 4 mm after a few hours. The eggs will hatch approximately 6 – 13 days later, depending on temperature. Newly hatched larvae released are 6 – 9mm in length and remain near the spawning site usually forming large clumps. After several days the clumps disperse and the young cod begin swimming throughout the water column.

Males become reproductive mature at 5 – 6 years of age (440mm long, 1.4kg) where as females mature at 6 – 7 years of age (485mm long, 2.3kg).

Extensive studies have been completed on the spawning and artificial propagation of Murray cod fingerlings in Victoria and New South Wales. Fingerlings of Murray cod can be produced in larvae rearing ponds by introducing nesting boxes into the system. This can be in the form of pipes, metal drums or any other hollow object. Eggs can be collected from the nesting boxes and hatched within tanks. Alternatively, eggs can be left in the pond and allowed to hatch. Ponds should be fertilised to ensure that an adequate plankton bloom is present to feed the fish.

Once juvenile Murray cod reach around 3g they are harvested and weaned on to a dry 2mm starter pellet diet within a tank. 90% of fish can be weaned within a week providing correct management techniques are utilised. Fish that have not been weaned are usually returned to the pond. Alternatively weaned fingerlings can be purchased from hatcheries specified in Appendix 2.

Diet

As Murray cod grow their diet shifts from zooplankton to a wide variety of aquatic organisms including both vertebrates and invertebrates. Older fish feed mainly on crustaceans (shrimp and yabbies), bivalve molluscs and fish.

Under culture conditions fingerlings will readily take hatched brine shrimp, *artemia salina*, until they are weaned onto artificial diets. An extruded pellet which is high in protein is now available from for Murray cod aquaculture. Food conversion ratios have been reported as low as 0.8**:**1, however with good management techniques, growers can expect an FCR of 1.5-2**:**1.

Growth

Until recently it was initially thought that Murray cod would be unsuitable for intensive recirculation aquaculture due to its territorial and cannibalistic nature. Therefore in the past Murray cod have been extensively cultured in farm dams and ponds. Using this method, fish are stocked at a density of around 15 tonne per

hectare and reach 1.5kg – 3kg in around 18 months to 3 years depending on temperature.

Initial trials have however shown that Murray cod adapt extremely well within recirculation systems. When fish are stocked at high densities, the opportunities for Murray cod to establish territories is reduced and consequently they become a schooling fish.

The use of intensive recirculation systems over extensive pond production of Murray cod shows huge potential. The use of intensive system allows the grower to culture Murray cod within optimum temperature conditions therefore enabling them to produce a market sized fish of between 600g and 1.3kg in around 12 to 18 months.

Stocking rates in tank systems will vary and depend mainly on the capacity of the individual systems. In well developed systems that are highly advanced, stocking rates of up to 60kg/m^3 are obtained however most systems will achieve around 30 – 40kg/m^3.

As growth rates of Murray cod are variable, fish need to be continuously graded to ensure that cannibalism is kept to a minimum and fish grow at uniform rates. Cost of Murray cod production using recirculating systems can range anywhere between $8.00/kg to $14.00/kg depending on the system used and its production capacity.

Although Murray cod aquaculture using recirculation systems is currently in its embryonic stage, the potential for production of this species has just been recognised. Future research into the production of Murray cod using recirculation systems will provide best practice in management techniques that will enable growers to successfully produce this fish.

Marketing

Murray cod has excellent marketing attributes and is know world wide for its exceptional eating qualities. Murray cod has a firm white flesh and is sold live, chilled or gilled and gutted.

The majority of farmed and wild caught Murray cod is sold domestically however there is a keen interest for the product amongst the Asian countries. Murray cod is currently fetching between $15 - $30 on the market depending on supply from wild caught fisheries. With a good marketing strategy that is applied nationally, prices of Murray cod has the potential to remain at these prices once production starts to increase.

Callop *Macquaria ambigua*

General Information

Callop, also known as Golden perch or Yellowbelly occur naturally mainly in the Murray-Darling system, Lake Eyre drainage system and some coastal streams of southern Queensland and northern New South Wales. Their prefered habitat is within the warm sluggish waters within these regions.

The largest Callop caught on record weighed in at 23kg, however the majority of fish caught by professional fishermen range between 1kg and 3kg.

Callop are a hardy fish and can withstand extreme conditions. Females generally grow faster than males.

Aquaculture of callop has occurred extensively in farm dams on a limited basis. Although the potential culture of this species has been promising, at this stage it has been difficult to wean callop fingerlings onto an artificial pellet diet and has therefore limited the further development for the aquaculture of this species.

Reproduction

In natural populations, spawning of callop is occurs at night near the water surface during periods of rising water. This normally occurs during spring and early summer when the water temperature rises above 23^{0}C.

Females attain sexual maturity at four years of age when they reach around 1 – 1.5 kg in weight. Males reach sexual maturity within 2 – 3 years.

Females can hold eggs at an advanced stage of development for 3 – 5 months until conditions are suitable for spawning. If suitable conditions

do not occur, the eggs are reabsorbed. Up to 650,000 eggs may by produced by a female in season, depending on her size, and these are shed in a single spawning. Ripe eggs are 1.1mm in diameter, spherical and amber in colour. Water-hardened eggs are about 45mm in diameter and are smooth, transparent and semi-bouyant. The eggs are demersal, no-adhesive and float freely in the water column which aids in the dispersal of the species to various regions of the river. The eggs hatch after 24 – 33 hours, depending on temperature. Small fish are migratory and will travel up and down the river system.

Since 1972, considerable research of hormone-induced spawning techniques for callop has been conducted at the NSW Inland Fisheries Research Station at Narrandera. Callop spawn within 39 hours of being injected with hormones. Fertilised eggs are then collected and hatch after a 30 hour period of incubation. Newly hatched larvae are 3.2mm long, unpigmented, have no mouth, and are buoyant and float upside down. They will swim actively and commence to feed aver approximately 5 days and will develop adult features after 15 – 20 days of growth reaching around 12mm in length.

Diet

Callop are active predators that will feed on anything that moves. Young callop will feed on zooplankton, consisting mainly of copepods and cladocerans. Older fish will move on to yabbies, shrimps, molluscs, small fish and insect larvae.

High survival of callop fingerings under culture conditions depends on the presence of high densities of zooplankton at the time of the first feed. This is necessary in aquaria, tanks or earthen ponds. Callop will consume around 5 – 6% of body weight per day.

As briefly discussed previously there has been little success on weaning juvenile callop onto an artificial pellet food. To ensure the success and development of the industry suitable weaning techniques will need to be established. Recent research has demonstrated that callop can be weaned gradually using a plankton/crumble mix however further studies will need to be conducted to further establish these techniques.

Growth

Growth of callop varies and will depend on environmental conditions. In the wild, callop will reach 500 – 800g within about 2 to 3 years. Within farm dams, callop fingerlings stocked at 50mm in length will reach 215mm (135g) in around 13 months.

At this stage, growth rates and stocking densities for callop within recirculating systems is unknown. This is mainly due to the lack of a suitable artificial feed for this species.

Marketing

Callop flesh is white and firm and therefore the fish has a good market acceptance. Good quality fish receive around $17 - $20/kg for live product and between $10 - $15/kg for chilled product.

Callop often have a layer of fat under their skin which is responsible for the ”muddy” flavour that freshwater fish regularly has the reputation for. Fat tissues however can easily be identified and removed before cooking.

Catfish *Tandanus tandanus*

General Information

The catfish is native to the Murray-Darling system and prefers sluggish or still waters. Due to habitat destruction and overfish it is considered to be endangered in South Australia and therefore is a protected species.

Catfish are a relatively hardy fish and can withstand extreme conditions for short periods of time. They can reach sizes of 900mm (6.8kg) however a good sized catfish which can be caught is around 500mm (2kg).

Presently there has been limited attempts in commercially culturing catfish. This may be due to the reasonably slow growth rates that are attained in the wild and the unusual appearance of the fish.

Reproduction

Both male and female catfish reach sexual maturity after 3 – 5 years at a length of around 350 – 400mm. A water temperature greater that 24^0C is necessary for spawning to occur however flooding does not seem to be involved in reproduction. Spawning therefore occurs during spring to early autumn.

Catfish possess quite elaborate reproductive behaviours with the formation of male and female pairs. Catfish couples will construct a nest out of pebbles or excavate a depression in the mud up to 2m in diameter around 1 – 2 weeks before spawning occurs.

Spawning is often preceded by elaborate courtship behaviour with the male swimming rapidly back and forth over the nest to attract the female. The pair position themselves above the nest, the male nudging the ventral region of the female. The female then lays a few eggs which sink into the nest. This process is repeated several times before the female leaves the nest. Male catfish remain to guard and protect the nest.

Up to 20,000 eggs are laid by each female depending on the size of the fish. The eggs are spherical, non-adhesive, light greenish-yellow in colour and have a diameter of 2.3 – 3.1mm. Hatching will occur after approximately 7 days.

Currently hormone injection techniques to induce spawning have not been developed for catfish. Commercial hatcheries usually rely on natural spawnings in ponds or dams to obtain their fingerlings.

Diet

The catfish is a benthic species living and feeding mainly on the bottom. Young fish from 25mm – 100mm feed on zooplankton and earthworms. The adult fish are essentially carnivorous consuming molluscs and crustaceans. . As their nature of feeding causes water into become muddy, feeding appears to be assisted more by odour perception rather than by sight.

Presently there is no artificial diets developed for the catfish. However is has been indicated that they will take a sinking commercial pellet.

Growth

Catfish are produced extensively in dams usually for personal angling and consumption. Newly hatched fry are approximately 7mm long and have no barbels or pectoral fins. The barbels appear as tiny buds three days after hatching and are well formed after 7 days when the larvae is 12mm in length. It takes approximately 3 weeks for the young catfish larvae to reach juvenile status at a size of 15mm in length.

It has been reported that catfish will grow to about 60mm in 100 days and have attained 30 – 34cm in ponds without supplementary feeding in approximately16 months.

Marketing

It appears surprising that there has not been a reasonable development into the aquaculture of catfish especially considering the huge channel catfish industry in the United States of America. The channel catfish in the USA is not unlike the Australian native catfish where approximately 275,000 tonnes are farmed each year.

Due to its unusual appearance there has not been a great market acceptance for catfish in Australia. The catfish also has a very low percentage of meat recovery when filleted however the catfish is considered to be excellent eating with sweet, white flesh.

Harvesting and Post Handling

Fish can be harvested using a number of different techniques depending on the method and type of aquaculture.

Angling is a good method of harvest from aquaculture ponds when only small numbers of fish are required. However the most practiced method of harvesting native fish from an aquaculture pond is by netting with a seine net. This method will catch the majority of fish in the pond after several pulls. It is important that this method of harvesting commences during the morning when temperatures are cooler, and that water quality such as oxygen and pH, is suitable.

Harvesting from recirculation systems is a lot easier as the native fish are housed in tanks. Fish can be pulled out using a dip net and placed within purging facilities.

As freshwater native finfish have the reputation for possessing a “muddy” flavour it is important that purging occurs before they are shipped off to market or the processors. Purging will expel any compounds which cause the off taste and

ensure that a clean safe product reaches the market.

Purging is achieved by housing the fish in holding tanks filled with clean fresh water at a stocking rate of around 20kg/1000 litres. After 2–3 hours, a dose of 3 – 5 g/litre of salt is added under static conditions. This is repeated over 3 to 4 days by flushing the water once its quality deteriorates and repeating the salt bathing process.

Once purging has been completed the fish can then be sold live or processed as a freshly chilled whole product, gilled and gutted, or filleted.

Diseases and Parasites

Like all fish, Australian natives are susceptible to a number of diseases and parasites. Most pathogens and parasites occur naturally in ponds and water supply (exception of bore water) and healthy fish are usually able to ward of any infections that may potentially occur.

However under aquaculture conditions fish can be placed under stress by transportation, harvesting and stocking at high densities. This may decrease their immunity to various diseases and therefore cause the fish to become more susceptible to infection.

Good husbandry and management techniques will decrease the chance for diseases to occur. It is suggested that all new stock that is introduced to the site should be bathed with regular salt baths of 5 – 10ppt for at least 1 hour before they are placed into culture ponds or tanks to help prevent the transfer of pathogens and parasites. Optimum water quality should be maintained and regular checks of stock should be conducted to monitor health.

Should a substantial number of mortalities occur or there is a presence of infection, the PIRSA Aquaculture SA should be notified immediately to arrange relevant testing and treatment of the fish.

To prevent the translocation of diseases into South Australia from other states it is policy that all fish that are brought into our state need to be certified of all notifiable diseases. The certification is undertaken in the state that the fish are sourced from and a copy of the certification must be sent to PIRSA Aquaculture SA.

Native Fish in Farm Dams

Many farm dam owners enjoy stocking native fish in their farm dams for angling and personal consumption. Fingerlings are available from a number of hatcheries that are listed in Appendix 2. Cost of fingerlings will depend on the species and the hatchery that you purchase them from however generally silver perch and callop fingerlings are generally cheaper than Murray cod and catfish fingerlings.

To import fish to South Australia from interstate, approval must be obtained in accordance with the Fisheries (Exotic fish, Fish Farmers and Fish Diseases) Regulations, 1984 under the Fisheries Act 1982, from the PIRSA Aquaculture SA, including the provision of a disease-free certification from an accredited fish disease laboratory.

To ensure optimum survival and growth the following stocking rates are recommended.

Perimeter (meters)	Area (hectares)	*Silver Perch Catfish*	*Callop*	*Murray Cod*
100	0.04	*25*	*25*	*25*
125	0.07	*25*	*25*	*25*
150	0.11	*50*	*25*	*25*
175	0.16	*50*	*50*	*25*
200	0.22	*75*	*50*	*25*
225	0.29	*100*	*75*	*50*
250	0.37	*125*	*100*	*50*
275	0.45	*150*	*125*	*75*
300	0.54	*200*	*125*	*75*
325	0.64	*225*	*150*	*100*
350	0.75	*275*	*200*	*125*
375	1.00	*350*	*250*	*150*

Silver perch, callop and catfish can be stocked within the same pond however due to the territorial nature of Murray cod it is advised that they are stocked separately.

Silver perch require dams that have plenty of weed, shrimp and aquatic insects while the other species prefer yabbies, aquatic worms, snails tadpoles, shrimps and other aquatic molluscs and crustaceans to feed upon.

Silver perch and callop will not breed in the farm dam however if logs are supplied for Murray cod or gravel for catfish, breeding may occur after five or so years.

All species are considered to be excellent fish for angling and can be taken on both bait such as yabbies, worms and grubs or artificial lures. Care should be taken however when handling catfish as their dorsal and pectoral spines can inflict nasty wounds.

Further Information

Further information can be obtained from:
PIRSA Aquaculture SA.
GPO Box 1625
ADELAIDE SA 5001
Ph: 08 8226 0314
Fax: 08 8226 0330
Web Site: www.pir.sa.gov.au

Inland Aquaculture Association of South Australia
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Appendix 1: Rating of native finfish and crayfish based on aquaculture characteristics. (Kibria et. al. (1997). Australian native freshwater fish and crustaceans: Environmental role and aquaculture potential. WORLD AQUACULTURE. 56 – 62.)

Score: 1 – 10 for each characteristic

Characteristics	Silver Perch	Golden Perch	Murray Cod	Catfish
Can be cultured legally	8	8	8	10
Biology, feeding, breeding behaviour and distribution known	9	7	5	9
Perceived market value	7	9	9	5
Possibility of captive breeding	8	8	8	9
Withstand high population densities in artificial situations	8	7	5	8
Utilise a wide range of readily available cheap sources of nutrients	9	5	7	9
Good tasting	7	8	9	9
Grow to marketable size in less than a year	9	8	8	9
Attractive appearance	6	7	8	5
Good processing and storage characteristics	8	8	8	8
Flourish in moderate or slow water flow rates	8	8	8	8
Flourish in moderate levels of dissolved oxygen	7	7	7	9
Withstand moderate levels of dissolved ammonia	7	7	7	8
Withstand variation in pH and salinity	7	8	7	7
Excellent levels of healthy omega 3 and omega 6 fatty acids	8	8	8	9
Carcass free of bones when prepared for human consumption	8	8	8	9
Carcass without poisonous and unpalatable parts	10	10	10	9
Attains early maturity	8	8	9	9
Closely related to species under intensive culture outside Australia	8	7	7	9
Less aggression and cannibalism	7	9		

Appendix 2: Hatchery Information

The following hatcheries will be able to provide you with fish depending on current availability. Fish will need to be certified disease free before they can enter South Australia.

For further information please contact the Aquaculture SA on (08) 8226 0314.

FISH SPECIES	HATCHERY	ADDRESS	CONTACT
Golden Perch and Silver Perch	Bowman Native Fish Hatchery	PO Box 177 GLOUCESTER NSW 2422	Ph: (02) 6558 7560 Fax: (02) 6558 7444
	Uarah Fish Hatchery	Old Wagga Road GRONG GRONG NSW 2650	Ph: (02) 6956 2147 Fax: (02) 6956 2245
	Wartook Native Fish Culture	RMB 7389A Roses Gap Road WARTOOK VIC 3401	Ph: (03) 5383 6306 Fax: (03) 5383 6246
	Crayhaven Aquacultural Industries	Pacific Highway NORTH ARM COVE NSW 2324	Ph: (02) 4997 3002 Fax: (02) 4997 3002
	Hanwood Fish Hatchery Pty Ltd	Mail Service 361 MURON QLD 4605	Ph: (07) 3168 1558 Fax: (07) 3168 2548
	Harrison's Fish Farm	Lot 25 Valcan Rd WATTYL GROVE WA 6107	Ph: (08) 9359 1103 Fax: (08) 9359 1103
	Murray Cod Hatcheries	RMB 626 Sturt Highway WAGGA WAGGA NSW 2650	Ph: (02) 6922 7360 Fax: (02) 6922 7619
Murray Cod	Uarah Fish Hatchery	Old Wagga Road GRONG GRONG NSW 2650	Ph: (02) 6956 2147 Fax: (02) 6956 2245
	Murray Cod Hatcheries	RMB 626 Sturt Highway WAGGA WAGGA NSW 2650	Ph: (02) 6922 7360 Fax: (02) 6922 7619
	POSAQUA	PO Box 17 KADINA SA 5554	Ph: (08) 8824 2252 Fax: (08) 8824 2339
	Franke's Fish	PO Box 373 ROBE SA 5276	Ph: (08) 8735 7249 Fax: (08) 8735 7249
	Wartook Native Fish Culture	RMB 7389A Roses Gap Road WARTOOK VIC 3401	Ph: (03) 5383 6306 Fax: (03) 5383 6246
	Hanwood Fish Hatchery Pty Ltd	Mail Service 361 MURON QLD 4605	Ph: (07) 3168 1558 Fax: (07) 3168 2548
	Murray Cod Hatcheries	RMB 626 Sturt Highway WAGGA WAGGA NSW 2650	Ph: (02) 6922 7360 Fax: (02) 6922 7619
Catfish	Bowman Native Fish Hatchery	PO Box 177 GLOUCESTER NSW 2422	Ph: (02) 6558 7560 Fax: (02) 6558 7444
	Crayhaven Aquacultural Industries	Pacific Highway NORTH ARM COVE NSW 2324	Ph: (02) 4997 3002 Fax: (02) 4997 3002
	Wartook Native Fish Culture	RMB 7389A Roses Gap Road WARTOOK VIC 3401	Ph: (03) 5383 6306 Fax: (03) 5383 6246
	Murray Cod Hatcheries	RMB 626 Sturt Highway WAGGA WAGGA NSW 2650	Ph: (02) 6922 7360 Fax: (02) 6922 7619