



SOUTH AUSTRALIAN
SEAHORSE MARINE SERVICES

Application for
Authority to Export
Family Syngnathidae

A Public Submission to

Sustainable Fisheries Section
Department of the Environment and Heritage

Canberra

March 2004

Introduction

South Australian Seahorse Marine Services has been in operation since 1998. Over the last five years our breeding program has produced small numbers of captive bred seahorses that have been sold to the aquarium market world wide.

The facility is now also a public viewing facility offering tours of the “farm” so visitors can see the majestic Syngnathidae family and have an insight into a real working aquaculture facility. The theme of the public viewing facility is “education is conservation”.

Some of the species held at the facility are not currently under any breeding program, they are used solely at this stage for display purposes. However, any off-spring raised from these species will be offered to the aquarium market, until specific breeding programs for these species are implemented.

Broodstock are obtained by either collection of species available locally, or by purchase from licensed collectors from interstate. Any exotic species held here at the facility have been purchased from licensed importers and have undergone quarantine as per Australian Quarantine Regulations. Self-perpetuating broodstock with occasional fresh genetic input will be all that is required to maintain the breeding programs. Further permits will be sought from the relevant authorities when required.

The facility is managed by Tracy Warland, who has successfully captive bred *H. abdominalis* and *H. whitei* over the years taking each species to 4th generation. The facility also employs 3 full-time staff and one school based apprentice. Work experience students from local Universities, TAFE and other institutions often attend to gain “hands on” work experience as a component of their studies.

Over the last few years the organisation has begun an education program aimed at the aquarium hobbyist. Complete care instructions are issued with each sale. Tracy Warland’s book on how to care for seahorses is sold world wide, and two web-sites have been developed also focusing on the care of seahorses in the home aquarium.

Twelve monthly reports of the operation have been supplied to Aquaculture South Australia and the Commonwealth Department of the Environment and Heritage in regards to assessment of culturing operations, behaviour of animals under culture conditions, provision of food sources and culture techniques for foods, reproductive success, including spawning, rearing, mortality and sales records. The facility currently holds a Captive Breeding Declaration for *H. abdominalis* and *H. whitei*, which expires in 2006. These species will therefore not be assessed for the purposes of a Wildlife Trade Operation permit.

No wild caught broodstock (either harvested by the organisation or purchased from registered collectors) is sold. It is our intention to only make available for sale “tank raised” or “Captive Bred” specimens. Our only market will be the aquarium trade.

Resource assessments of harvest areas are undertaken by David Warland and any assisting divers during broodstock collections and details are submitted to Authorities. Details of harvest locations, animals harvested and relevant observations will be submitted after any collections. Animals are harvested by hand.

The current facility has been used for research and development over the last five years. A proposal to move the facility to a larger premises is currently being undertaken. The new facility will have an emphasis on tourism, which will incorporate a small public viewing aquarium.

Sustainable management of our natural resources, via small wild harvests will enable sufficient broodstock to be maintained and markets met. It is this organisations intent to have minimal impact on the environment.

We therefore seek and Authority to Harvest and Export under the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act), all “Captive Bred” or “Tank Raised” species of family Syngnathidae.

Syngnathids

The species listed below are currently held at the facility

Scientific Name

Common Name

Australian Species of Seahorse

Hippocampus abdominalis/
Hippocampus bleekeri

The Australian Pot Belly

Hippocampus breviceps

The Short Snouted Seahorse

Hippocampus whitei

White's Seahorse or The Sydney Seahorse

Hippocampus elongatus

The West Australian Seahorse

Hippocampus tuberculatus

The Knobby Seahorse

Hippocampus procerus

The Tropical Emperor

Pipefish

Stigmatopora argus
Stigmatopora nigra

The Spotted Pipefish

The Wide Bodied Pipefish

Sea Dragons

Phyllopteryx taeniolatus

The Common or Weedy Seadragon

Phycodurus eques

The Leafy Seadragon

Exotic Species

Hippocampus barbouri

The Tiger Snouted Seahorse

Hippocampus taeniopterus

The Common Seahorse

Hippocampus reidi

The Brazilian Seahorse

Hippocampus kuda

The Tiger Tail Seahorse

Note: The Facility currently holds Export authorities under the EPBC Act for all native species of seahorses, which expires on 30 June 2004. The Facility also holds a Captive Breeding Declaration for *H. abdominalis* and *H. whitei*, which expires in December 2006. These species will therefore be excluded from this current assessment. Yearly reports of

stock introduced are supplied to the Commonwealth Department of the Environment and Heritage.

References:

Seahorses – An identification guide to the world's species and their conservation.
Sara A Lourie, Amanda CJ Vincent and Heather J Hall

Seahorses, Pipefish and their relatives – A comprehensive Guide to Syngnathiformes.
Rudie H. Kuitert

Licence and Permits

South Australian Seahorse Marine Services currently holds a Land Based Aquaculture Licence under the Aquaculture Act 2001 (the Act) and is subject to provisions of the Act. Yearly environmental monitoring reports are submitted and the licence is reviewed annually.

Wild harvests are done in accordance with Section 59 of the Fisheries Act 1982 and are also subject to provisions.

1. All specimens taken pursuant to the notice are for broodstock purposes only and may not be sold or traded without written consent from the Director of Fisheries.
2. Seadragons of the same sex must not be collected within five (5) kilometres of each other.
3. No more than 5 of each species of seahorse or pipefish can be collected within five (5) kilometres of any one collection site.
4. All specimens must be retained at the site endorsed on the land based aquaculture licence.
5. The exemption holder must provide a written report on the number of animals taken, specific location and their condition to the Director of Fisheries within 7 days of the completion of each harvest.
6. At least 24 hours before engaging in any harvests the exemption holder must contact PIRSA Fisheries Compliance Unit and inform them of the intent to harvest, the location of the intended harvest, the method of conducting the intended harvest, name of person who will be conducting the harvests, details of any boats used in the intended harvest. A Resource Assessment form is also completed at the conclusion of any Syngnathid harvests, these are then forwarded to Fisheries SA and the Commonwealth Department of the Environment and Heritage.
7. Whilst engaged in the exempted activity the exemption holder must be in possession of a copy of all permits and present them to a PIRSA fisheries compliance officer if requested.
8. The exemption holder must not contravene or fail to comply with the Fisheries Act 1982 or any regulations made under that Act, except where specifically exempted by this notice.
9. The exemption holder must not make collections from within any aquatic reserve declared under section 47 of the Fisheries Act 1982.



Breeding Records

Annual Production Figures

Twelve monthly reports are submitted to the Commonwealth Department of the Environment and Heritage and Aquaculture SA.

The breeding program for the last 8 months was put on hold, ensuring a lessening of stock held in the system. The re-circulating systems have been running for a period of 5 years and while regular cleaning was performed, a thorough dismantle and clean was required. The biological filtration systems also were in need of a major overhaul.

In February 2004, when the stock had been reduced (via sales and gender separation) the system was shut down, each piece of pipe work and tank was chlorinated and de-chlorinated, a new biological filter added and the system was re-started. The breeding program has now recommenced.

Fry Rearing Techniques

Pregnant males are isolated into Paternity Tanks, upon birth, the male is removed and the fry remain in this tank for at least one week. Tank sizes and design vary according to species. Several of the species held at the facility are pelagic – behaviour is free swimming with current in open water, while some are demersal – behaviour is resting on sea floor.

The Pelagic species are often raised in a pseudo kestrel tank similar to a “fish bowl” type nursery, while demersal species are raised in small glass or plastic aquariums from 10 litres to 30 litres.

Newly born fry are fed 3-4 times daily on atremia nauplii, rotifers and copepods enriched with Selco and various algae sp. Small sponge filters are used for filtration and water changes of approximately 10-20 % occur daily. Fry are then moved to grow-out tanks approximately 1 week after birth.

While some of the survival rates with the new species are still quite low, breeding programs are still being researched for some species in regards to fry rearing tank designs, stocking densities, optimum raising parameters and food sources. It is envisioned that as this on-going research continues fry survival will increase.

Source of Parental Stock and Estimate of Additional Breeding Stock Requirements

Local species are sourced from waters within a 20km radius of Port Lincoln. Harvest sites are not returned to for a period of at least 5 years in line with current permit stipulations. Species from interstate/overseas are purchased from licensed collectors/importers.

The organisation has and still has as its mission to have small numbers of a variety of different species, with fresh genetics sources as required, with a maximum of ten (10) pairs being added to the broodstock every two years. The facility will only ever produce small numbers of a diverse range of species to the aquarium market.

During 2004 the facility will look to wild harvest *H. abdominalis*, *H. breviceps*, *H. elongatus*, *H. tuberculatus* and *H. whitei*. Collections will also be made for *Stigmatopora argus*, *Stigmatopora nigra*, *Phyllopteryx taeniolatus* and *Phycodorus eques* for broodstock enhancement.

Self-perpetuating broodstock, with the addition of small sustainable harvests to ensure genetic diversification will ensure the breeding program can continue for years to come. It is the organisations intention to only ever breed to fourth (4th) generation without the addition of fresh genetics.

Many of the adult broodstock sourced from interstate/overseas at this stage are for display purposes only, however if young are produced attempts are made to raise them.

During 2003/04 the following collections were made from the wild:

May 2003 – 1 Female Leafy Seadragon – *Phycodorus eques*

October 2003 – 2 pair Spotted Pipefish – *Stigmatopora argus*

Details of Breeding Methods and Procedures

Broodstock are placed in suitable breeding tanks, rather than specific breeding of one/two pair, a group of suitable aged/sized adults are placed in mating tanks where the selection process of mating is by natural selection.

Records of brood genetics and brood numbers are maintained to ensure minimum risk of genetic relationship during selection of self-perpetuating broodstock. Tanks are labelled and numbered and records maintained to indicate generation and genetics.

Broodsize and average fry size varies from species to species. However, it has been noted that fecundity is relevant to broodstock age/size, with brood numbers increasing as broodstock matures.

Observations

Juveniles:

Experimentation with stocking rates has enhanced growth rates, less stocking densities per tank has increased growth with juveniles reaching a saleable size in 5 ½ months, rather than 6 months. Sexual maturity is also occurring earlier when stocking densities are lessened. Sexual maturity is reached at age 5-6 months.

Trials on all the display species are expected to continue in the future and will be on going to further enhance fry survival rates. New fry rearing tanks are being trailed – experimentation with flow rates and water movement in a variety of different shaped tanks encouraging the pelagic species to remain in the water column – some of the species in-take air if the water movement is not sufficient to keep them within the flow. They end up floating sideways in the tank on the water surface, they usually die not long after this.

Foods

At present our facility cultures artemia, copepods, rotifers and when cultures are available species of mysid shrimp. Our fish are fed on live food grown in our own hatchery and terrestrial crustaceans and marine plankton (harvested from sea and land based breeding tanks).

Artemia are an excellent food source that can be easily hatched. They are utilised in two stages, firstly as nauplii suitable for juveniles, then as adult shrimp for later stages.

We use commercially available feed enhancement foods such as Spirulina and Algro as well as algae cultures *Tetraselmis sp*, *Chaetoceros sp*, *Isochrysis sp* and *Dunaliella sp*. Other food sources such as bran and rice flour are used to on grow artemia. Generally enrichment is fed to nauplii 12 hours prior to feeding.

Land based culture tanks supply most of the facilities needs, with some wild harvests to enhance culture stock. Plankton are screened, rinsed and fed to both juveniles and adults. Feed enhancement is constantly being researched and trials have commenced improving the nutritional profile of tank bred animals.

Juveniles are fed four to six times daily while adults and sub-adults are fed one to three times daily. The movement of live feed is an important stimulating trigger to induce feeding. Tank construction and substrate allow the seahorse to hunt the readily available food.

The seahorses once they have reached an age of approximately 8-10 weeks of age are trained to eat the frozen foods that are readily available for the aquarium market. A

variety of brine shrimp and mysid shrimp are purchased from Pet Wholesalers and fed out as a supplement to the seahorses.

The health, longevity and condition of seahorses within our captive breeding operation are at all times the foremost consideration. Extensive research in all facets of nutrition is an ongoing concern.

Description of Facilities

South Australian Seahorse Marine Services is located in Port Lincoln, South Australia. We operate our venture from a 27 metre x 9 metre galvanized shed located in an industrial estate approximately 2km from Boston Bay.

Ocean water is sourced from Boston Bay the water is chlorinated/dechlorinated and then filtered to 1 micron. Water cartage is achieved by a 1000 litre tank on the back of a small truck. Waste water is recycled via settlement ponds and biological filtration, once filtration is completed this water is used in the production of our live feed, until final discharge to the ocean compliant with the SA Environment Protection Authority regulations.

Our facilities are monitored 24 hourly and we have back-up power supply in the form of a generator in the event of a power failure. Every effort is made to ensure the temperature, water quality and oxygen supply is a constant.

Recirculation systems, filtered 3-4 times hourly through a passive flow particulate filter, foam fractionator, biological filter and UV filter, the water is stored in a sump/reservoir, passed through a chiller/heater and gravity fed to our tanks. Oxygen is supplied through aeration to each tank via air lines.

Three systems are utilised allowing optimum-keeping parameters to be maintained for all species within our breeding program, temperate, sub-tropical and tropical.

Water quality is tested daily and adjusted where necessary; approximately 5% of water is changed on a weekly basis. Tanks are siphoned daily to ensure minimum build up of debris and waste. UV filtration, foam fractionators and biological filtration ensure bacteria and pathogens are eliminated and quality maintained.

Stocking densities depend on the size and species of the fish varying from 1 per 1 litre (adult) to 10 per 5 litre (fry). Tanks contain adequate hitching posts – ropes and fish netting are used. These are removed cleaned and or replaced as necessary further enhancing the hygiene of the system.

Right: An example of some Algae culture tanks.



Pregnant males are isolated during gestation allowing them to rest, the young are maintained in the birthing tank for one week before being placed in a grow out tank. Isolation tanks are also maintained in the event of sickness or infection.

Quarantine tanks are used for any new species entering the facility (separate equipment is maintained for each tank) – new species must undergo an in-house quarantine period of six weeks before being acclimated to any re-circulation system.

Hatchery staff maintain a clean working environment, washing hands and equipment constantly. Tanks and pipe work are cleaned on a regular basis ensuring there can be no build up of pathogens or bacteria.

Tanks and Filtration

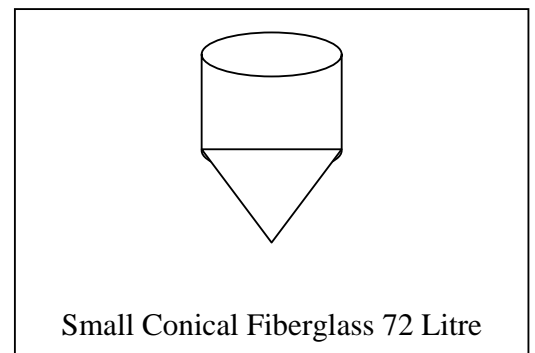
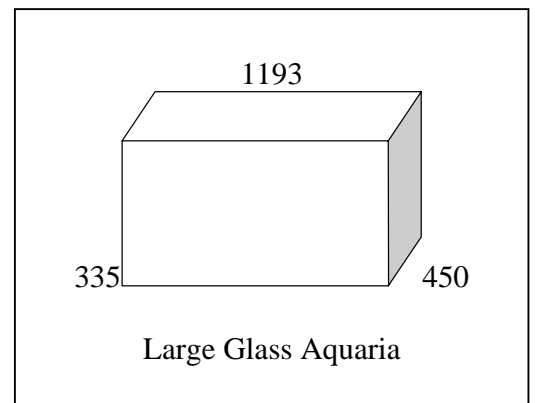
Tank design as with all other facets of this emerging industry, is constantly undergoing research and may vary from time to time. As our knowledge of this unique fish increases we adapt living conditions to suit. We use a variety of tanks for housing both broodstock and fry mainly glass aquaria and fibreglass conical designs.

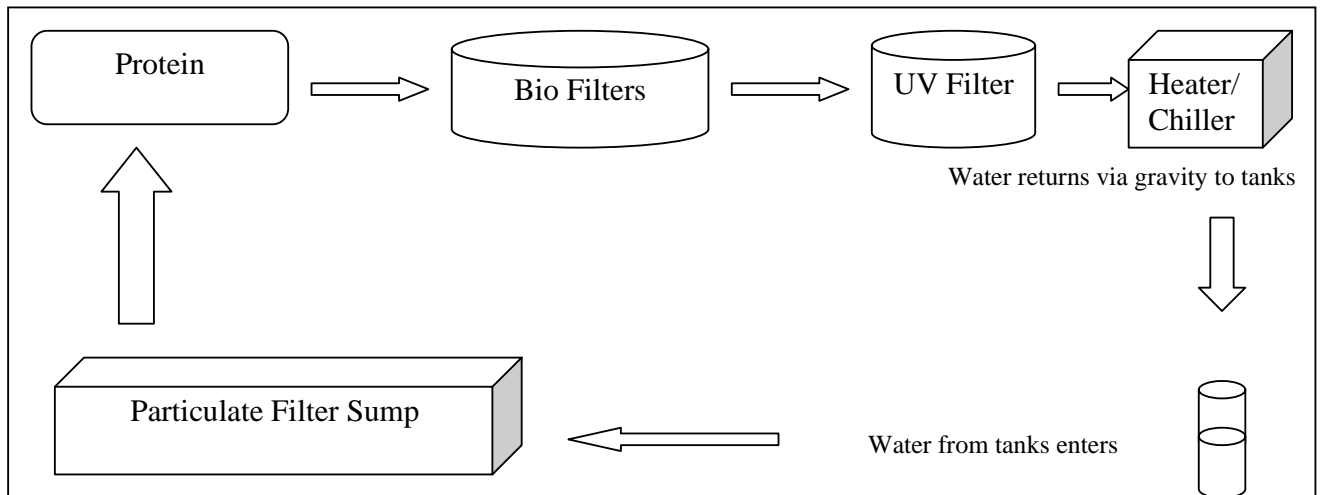
Substrate in tanks consists of various size fish net and ropes. These animals require sufficient “hitching” places. No gravel or any other medium is used at the base of tanks. Conical design suits live feed grow-out tanks for each of harvests.

All tanks are filtered via biological filtration, UV filtration and temperature is maintained via heater/chiller. Water testing daily ensures any fluctuations in water quality are small and these are dealt with immediately.

Water is filtered via 105/250/250/500µm screens and flows to a particulate filter (passive flow) any large solids are removed via filter medium. This filter also acts as a sump. Water is then pumped to a protein skimmer. Water then travels through mechanical filtration medium into biological filter, through UV filter and finally heater/chiller before being gravity fed to stock holding tanks.

The small glass aquariums used in the facility are filtered via canister filters (run by a small in water power head) or air operated sponge/corner filters. Similar filters are also used on quarantine/sick bay tanks.





Basic water flow design for Seahorse Holding tanks – Not to scale

