PIPEFISH HUSBANDRY AND PROPAGATION

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INTRODUCTION

Professional and home aquarists alike have long shared a tremendous interest in the husbandry and propagation techniques required to keep seahorses. Their unusual body shape and their uncanny facial resemblance to terrestrial horses are two key reasons for the great popularity of these animals. Often overlooked is the fascinating cousin of the seahorse, the pipefish.

Together with seahorses, pipefishes belong to the family *Syngnathidae*. Pipefishes inhabit warm and temperate seas, and several species are found in fresh water. These unusual fishes possess a long, tubular snout, terminating in a cylindrical mouth, and an elongated body, which ranges in length from 2.5 to 46 cm (1 to 18 in.) and is covered with rings of bony plates. Pelvic fins are absent, and the remaining fins are minute. Pipefishes feed on tiny crustaceans and may change colors in response to varying light conditions.

Pipefishes are, like seahorses, collected from the wild for the Chinese medicinal trade, although apparently in somewhat smaller quantities. Pipefishes are considered more medicinally potent than seahorses; ground and mixed with various herbs, they are used for “whole-body” treatment, whereas the less-potent seahorse is generally used to target specific ailments.

Most public aquariums displaying pipefishes do so as part of a major seahorse exhibit, portraying the pipefish as a potential evolutionary predecessor of the seahorse. Some other aquariums display local species of pipefish to illustrate “cryptic” behavior, the ability to camouflage themselves by changing color to blend into their surroundings.

METHODS

A pipefish questionnaire was prepared and sent to approximately 220 professional aquarists, amateur aquarists, and researchers. Areas covered in the questionnaire were husbandry, morphology, water quality parameters, food requirements, tankmates, propagation events, and disease observations and treatments.

Follow-up calls were made to questionnaire respondents, and additional contacts who had been recommended by respondents were interviewed by telephone. Internet searches and searches of scientific publications located in the library of the Scripps Institution of Oceanography turned up very little useful information. Word of mouth continues to be the aquarist’s most valuable source for useful information about specimen care in captivity.

RESULTS (Husbandry)

Feeding

The husbandry requirements of most pipefishes are similar to those of seahorses. Display tank sizes are kept relatively small to ensure that food concentrations can be maintained at sufficient levels for the animals to easily obtain adequate amounts. This is especially important for the smaller genera *Corythoichthys*, *Doryrhamphus*, *Dunkerocampus*, and *Halicampus*. These genera are usually maintained in coral sand with rubble habitats. This environment allows them plenty of areas in which to hide, and in

addition helps promote the growth of amphipods and other crustaceans, which provide an important alternate food source for the pipefish.

One of the most difficult tasks in maintaining pipefishes is to provide foods that they can readily consume and which provide adequate and appropriate nutrients. In the wild, these fishes consume large quantities of planktonic crustaceans. It follows that pipefishes maintained in captivity prefer live foods. Obtaining these much-needed live foods can be difficult, and to provide them exclusively and consistently is not always possible. Thus, *Artemia* are often provided, but *Artemia*, both juvenile and adult, must be soaked with nutrient enrichment formulas before feeding them out. Even with this enrichment, specimens fed only *Artemia* quite often deteriorate after a few months. With a little effort, pipefishes, like seahorses, can be trained to feed on frozen mysis shrimp and krill. These foods provide a more beneficial nutrient base and resemble the pipefish's natural prey. Many frequent feedings are required and the food must be kept moving to simulate live plankton.

Pipefishes, like seahorses, do not compete well for food against the more agile finned fishes. These shy animals rely on their cryptic ability to avoid predation and to approach their own prey. It is very difficult to provide enough food to sustain pipefishes while displaying them with other more active specimens. Even other somewhat slow moving species such as gobies and killifish easily out-compete the pipefish. On the other hand, pipefishes tend to out-compete their slower-moving seahorse cousins. Most of the facilities responding to the questionnaire have had success with a combination of live and frozen mysis shrimp and live and frozen *Artemia* (Table 1).

Proper nutrition is critical to the young pipefish's survival. Many facilities raise phytoplankton and rotifers as primary feed for the young. There are many additives now available to enhance the nutritional value of rotifers. These additives can be very effective at increasing the survival rate of the young. This is especially true for those species that are tiny at birth. Care must be taken not to allow excess additives to accumulate in the grow-out tank. They can easily pollute the tank and lead to a toxic tank syndrome, and total tank failure.

There should be two to three scheduled feedings per day, depending on the size of the young. It is important not to overfeed, as this can cause undue stress to the young and pollute the tank. Between all feedings, the bottom of the tank should be siphoned to prevent a build-up of waste materials. It is suggested that chopped pieces of mysis shrimp be added to the grow-out tank each day to stimulate the animals' production of enzymes needed to digest mysis shrimp later in life.

Disease

Pipefishes are subject to many of the same diseases, parasites, and other maladies as the seahorse. It is suggested that all routine quarantine protocols be strictly followed when working with these specimens. Outbreaks of *Cryptocaryon irritans* and *Gyrodactylus sp.* have been reported. Fortunately the normal treatments for these parasites have proven to be successful on adult specimens. Juveniles and smaller specimens should be treated with reduced doses. Fish TB was diagnosed at the London Zoo and treated with malachite green. This treatment was only successful on adults. Fungal outbreaks have been treated successfully with copper sulfate at the Birch Aquarium at Scripps.

The presentation of frozen foods can also lead to health problems. The Vancouver Aquarium has found that even a slight rancidity of the food can lead to immune system compromise, the results of which may not be observed until much later. Disease and treatment information provided by questionnaire respondents is presented in Table 2.

Tankmates

It is best to maintain pipefishes in tanks that closely simulate their natural environment. In the natural environment, however, food does not often present itself as occurs in a controlled setting; the pipefishes must forage for themselves using specialized feeding strategies. The specific techniques which have evolved to help the pipefish find shrimp in rocky coral rubble or seagrass beds may place the pipefish at a

disadvantage in the confines of the display or research tank. The relatively sedentary pipefish does not compete well with the fleeter and more agile finned fishes.

Most facilities contacted do, nevertheless, display pipefishes in community tanks. Tankmates in coral reef habitats tend to be invertebrates such as soft coral, snails, cucumbers, shrimp, scallops, and hermit crabs. Vertebrate tankmates included other pipefishes, seahorses, angelfish, surgeonfish, and anemonefish. Tankmates in temperate waters were algae, snails, seastars, tunicates, seahorses, surfperch, and other pipefishes (Table 3).

Pipefishes are susceptible to aggression from tankmates that nip, bite, or sting. Injuries caused by crabs, other fishes, and anemones can be very serious. For a fish born with poor mobility, any injury can be life threatening. Care must be taken to avoid the loss of pipefish specimens as a result of tankmate aggression.

Propagation

There is very little information available on the subject of captive pipefish propagation (table 4). The key to successful propagation of syngnathid specimens is in maintaining a healthy brood stock. Natural habitats and deep tanks that allow ample vertical space for the pipefish's courting dance are also important. Providing adequate nutrition, as previously discussed, leads to the production of larger, healthier offspring that are more likely to prove viable.

Once the offspring have been produced they should be removed from the adult tank and placed in grow-out tanks. If they are not, these tiny replicas of the slow moving adults will most likely end up in a filter system. The grow-out tank should be fairly small. This will ensure that the food remains concentrated. A mild filtration such as a sponge filter or its equivalent is recommended. At the Birch Aquarium at Scripps we use 25-liter pseudokreisels to raise the young. The psuedokreisel keeps the young pipefishes and their food supply constantly moving, simulating a planktonic environment.

Most pipefish propagation successes have occurred with the larger genera *Syngnathoides* and *Syngnathus*. Juveniles of these genera can feed on newly hatched *Artemia*. At the Birch Aquarium at Scripps we have the greatest success when the *Artemia* are hatched after just one day. The percentage of *Artemia* hatching is lower at this early stage, but they are smaller upon hatching and much easier for the newborn pipefish to swallow.

SUMMARY

In conclusion, it is painfully obvious that very little research has been done to determine the requirements for the propagation of pipefishes in captivity. What work has been done has involved only a small percentage of the approximately 190 known species.

When I questioned Mr. Pan Quong, Ascidian Aquarium Systems, Australia, on the subject of captive pipefish propagation, he said, "I'm sure we can propagate the pipefish, but at this time, I'm not, because there is no demand." He currently focuses on the propagation of the more lucrative seahorse specimens.

The demand for pipefishes is currently being met by collection from the wild. If this practice continues, we may see the same decline of pipefish populations that we have seen with seahorses. At this time it is not feasible for aquaculturists working for profit to attempt their propagation. As home aquarium systems and amateur aquarists become more sophisticated, and as more and more people explore alternative health care, we will almost certainly observe a dramatic increase in the demand for pipefishes, and hence in their collection from the wild. Captive propagation programs can reduce the impact on wild populations of the increasing demand for pipefishes in the pet and healthcare industries. The time is right for public aquariums and researchers to perfect propagation techniques for this fascinating pre-evolutionary relative of the seahorse.

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Table 1
Adult pipefish diets

Facility	Common Name	Feed
Aquarium of the Americas	Janss' pipefish	frozen & live mysis, frozen & live *Artemia*
Aquarium of the Americas	Chain pipefish	frozen & live mysis, frozen & live *Artemia*
Aquarium of the Americas	Bay pipefish	frozen & live mysis, frozen & live *Artemia*
Aquarium of the Americas	Banded pipefish	frozen & live mysis, frozen & live *Artemia*
Aquarium of the Pacific	Janss' pipefish	live mysis /*Artemia* / frozen small krill
Aquarium of the Pacific	Blue stripe pipefish	live mysis /*Artemia* / frozen small krill
Aquarium of the Pacific	Scribbled pipefish	live mysis /*Artemia* / frozen small krill
Aquarium of the Pacific	Many banded pipefish	live mysis /*Artemia* / frozen small krill
Birch Aquarium At Scripps	Bay pipefish	frozen mysis /*Artemia*
California Academy of Sci.	Alligator pipefish	frozen mysis, frozen & live *Artemia*
California Academy of Sci.	Banded pipefish	frozen mysis, frozen & live *Artemia*
London Zoo	Greater pipefish	frozen mysis, frozen & live *Artemia*
London Zoo	Candy pipefish	frozen mysis, frozen & live *Artemia*
Monterey Bay Aquarium	Bay pipefish	live adult *Artemia* / frozen small krill
National Aquarium, England	Deep snouted pipefish	frozen mysis
Shedd Aquarium	Alligator pipefish	frozen & live mysis, frozen & live *Artemia*
Shedd Aquarium	Blue stripe pipefish	frozen & live mysis, frozen & live *Artemia*
Shedd Aquarium	Australian banded pipefish	frozen & live mysis, frozen & live *Artemia*
Shedd Aquarium	Banded pipefish	frozen & live mysis, frozen & live *Artemia*
Waikiki Aquarium	Australian banded pipefish	graze on live rock

Table 2
Pipefish disease observations and treatments

Facility	Name	Disease observed	Treatment	Result
Birch Aquarium at Scripps	Bay pipefish *Syngnathus leptorhynchus*	Fungal	Copper sulfate	Successful
California Academy of Sciences	Banded pipefish *Doryramphus dactyliophorus*	Cryptocaryon	15-minute dip in Kent Marine RXP	Ongoing
London Zoo	Greater pipefish *Syngnathus acus*	Fish TB	Malachite green	Effective in adults
Monterey Bay Aquarium	Northern Bay pipefish *Syngnathus grisiolineatus*	Flukes	Fresh water bath/ formalin	Successful
Shedd Aquarium	Alligator pipefish *Syngnathoides biaculeatus*	Flukes	Droncit	Successful

Table 3
Pipefish tankmates

Facility	Common name *Scientific name*	**Tank Co-habitants**
Aquarium of the Americas	Janss' pipefish *Doryramphus janssi*	Seahorses
Aquarium of the Americas	Chain pipefish *Syngnathus louisianae*	alone
Aquarium of the Americas	Bay pipefish *Syngnathus leptorhynchus*	With own species
Aquarium of the Americas	Banded pipefish *Doryramphus dactyliophorus*	alone
Aquarium of the Pacific	Janss' pipefish *Doryramphus janssi*	Pipefish, seahorse, shrimp, soft coral
Aquarium of the Pacific	Blue stripe pipefish *Doryramphus excisus*	Pipefish, seahorse, shrimp, soft coral
Aquarium of the Pacific	Australian pipefish *Corythoichthys intestinalis*	Pipefish, seahorse, shrimp, soft coral
Aquarium of the Pacific	Many-banded pipefish *Doryramphus multiannulatus*	Pipefish, seahorse, shrimp, soft coral
Birch Aquarium at Scripps	Bay pipefish *Syngnathus leptorhynchus*	Seahorse, seastars, tunicates
California Academy of Sciences	Alligator pipefish *Syngnathoides biaculeatus*	Snails, cucumbers, algae
California Academy of Sciences	Banded pipefish *Doryramphus dactyliophorus*	Snails, cucumbers, algae, shrimp
London Zoo	Greater pipefish *Syngnathus acus*	Scallops, hermit crab
London Zoo	Candy pipefish *Doryamphus multiannulatus*	Coral reef inverts / goby, clownfish
Monterey Bay Aquarium	Northern Bay pipefish *Syngnathus griseolineatus*	Dwarf perch, shiner perch
Shedd Aquarium	Australian banded pipefish *Corythoichthys intestinalis*	Other pipefish and seahorses

Shedd Aquarium	Blue stripe pipefish *Doryramphus excisus*	Other pipefish and seahorses
Shedd Aquarium	Alligator pipefish *Syngnathoides biaculeatus*	Other pipefish and seahorses
Shedd Aquarium	Banded pipefish *Doryramphus dactyliophorus*	Keep only in pairs; territorial
Waikiki Aquarium	Australian banded pipefish *Corythoichthys intestinalis*	Invertebrates/angelfish, surgeonfish

Table 4
Pipefish propagation

Facility	**Common name** ***Scientific name***	**Hatched**	**%Survival**
Aquarium of the Americas	Bay pipefish *Syngnathus leptorhynchus*	300	0 at two weeks
Aquarium of the Pacific	Janss' pipefish *Doryramphus janssi*	?	-0- recovered from display
Aquarium of the Pacific	Australian banded pipefish *Corythoichthys intestinalis*	20	-0-
Ascidian Aquarium Systems	Ring-back pipefish *Stipecampus cyanopterus*	Multiple successes	
Birch Aquarium at Scripps	Bay pipefish *Syngnathus leptorhynchus*	52	20
California Academy of Sciences	Alligator pipefish *Syngnathoides biaculeatus*	Eggs lost	-0-
London Zoo	Greater pipefish *Syngnathus acus*	80	-0-
National Aquarium, England	Greater pipefish *Syngnathus acus*	?	80 recovered from display
Shedd Aquarium	Alligator pipefish *Syngnathoides biaculeatus*	56	Lost at 6 weeks
Vancouver Aquarium	Northern Bay pipefish *Syngnathus griseolineatus*	?	-0-

Table 5a
Tank Parameters

Facility / specimen	**Specimen size**	**Tank size**	**Temperature**
Aquarium of the Americas Janss' pipefish	6 to 10 cm	115L 208L	74 to 76 F
Aquarium of the Americas Chain pipefish	8 to 15 cm	208L	76 to78 F
Aquarium of the Americas Bay pipefish	8 to 25cm	198L	55 to58 F
Aquarium of the America Banded pipefish	13 to 17cm	115L	74 to 76 F
Aquarium of the Pacific Janss' pipefish	14 cm	270L	25 to 26 C
Aquarium of the Pacific Blue stripe pipefish	7.5cm	270L	25 to 26 C
Aquarium of the Pacific Australian pipefish	12cm	270L	25 to 26 C
Aquarium of the Pacific Many-banded pipefish	12cm	270L	25 to 26 C
Birch Aquarium at Scripps Bay pipefish	25cm	175L	15 to 18 C
California Academy of Sciences Alligator pipefish	20 cm	350 L	25 C
California Academy of Sciences Banded pipefish	10cm	135L	25 C
London Zoo Greater pipefish	30cm	1500L	15 to 20 C
London Zoo Candy pipefish	12cm	2500L	25.5 to 26.5C
Monterey Bay Aquarium Northern bay pipefish	33 cm	775L	10 to 14 C
Shedd Aquarium Australian banded pipefish	8 to 14 cm	10 gal	74 F

Facility / specimen	Specimen size	Tank size	Temperature
Shedd Aquarium Blue stripe pipefish	5 to 10cm	10 gal	74 to 78 F
Shedd Aquarium Alligator pipefish	7.5 to 20 cm	55 gal	74 to 76 F
Shedd Aquarium Banded pipefish	8.5 to 14.4cm	10 gal	74 to 78 F
Waikiki Aquarium Australian banded pipefish	15 cm	1160L	25 to 28 C

Table 5b
Tank Parameters

Facility / specimen	**PH**	**Sal. (ppt)**	**Filtration**
Aquarium of the Americas Janss' pipefish	8.0	28	Closed, UG filter, flush bio-filter
Aquarium of the Americas Chain pipefish	8.0	28	Closed, UG filter
Aquarium of the Americas Bay pipefish	8.0	28	Closed, UG filter, flush bio-filter,
Aquarium of the America Banded pipefish	8.0	28	Closed, UG filter
Aquarium of the Pacific Janss' pipefish	8.1/ 8.25	33/ 34	Closed, cartridge, bio-tower
Aquarium of the Pacific Blue stripe pipefish	8.1/ 8.25	33/ 34	Closed, cartridge, bio-tower
Aquarium of the Pacific Australian pipefish	8.1/ 8.25	33/ 34	Closed, cartridge, bio-tower
Aquarium of the Pacific Many-banded pipefish	8.1/ 8.25	33/ 34	Closed, cartridge, bio-tower
Birch Aquarium at Scripps Bay pipefish	8.2	35	Open, sand filter
California Academy of Sciences Alligator pipefish	8/ 8.4	33/ 35	Closed, live rock
California Academy of Sciences Banded pipefish	8/ 8.4	33/ 35	Closed, live rock
London Zoo Greater pipefish	8/ 8.1	28/ 32	Closed, Mech. / bio.
London Zoo Candy pipefish	8.05	33/ 34	Closed, trickle tower, UV
Monterey Bay Aquarium Northern bay pipefish			Open
Shedd Aquarium Australian banded pipefish	8.0/ 8.5	32/ 33.5	Closed, sponge filter

Facility / specimen	PH	Sal. (ppt)	Filtration
Shedd Aquarium Blue stripe pipefish	8.0/ 8.5	32/ 33.5	Closed, sponge filter
Shedd Aquarium Alligator pipefish	8.0/ 8.5	32/ 33.5	Closed, wet/dry filter, skimmer, UV
Shedd Aquarium Banded pipefish	8.0/ 8.5	32/ 33.5	Closed, sponge filter
Waikiki Aquarium Australian banded pipefish	7.8/ 8.0	35	Open, live rock with UGF