

Basic Captive Propagation of Marine Fishes

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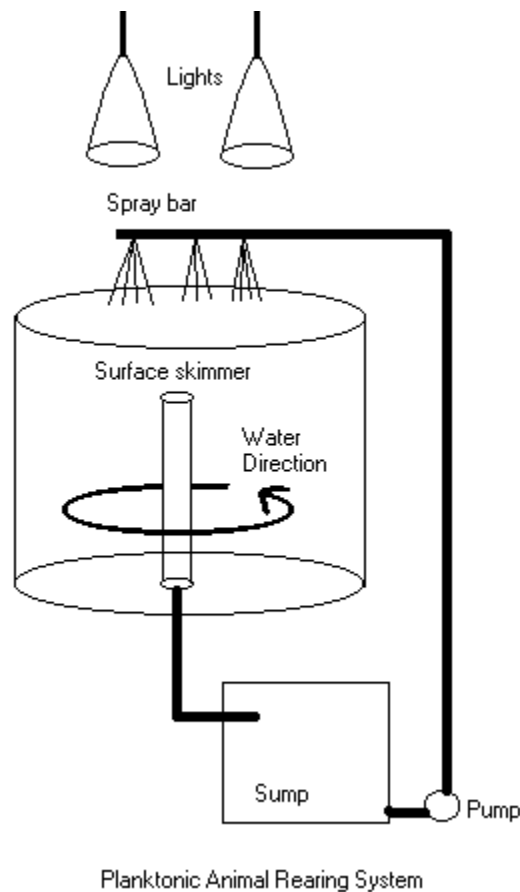


Few people would argue that breeding and raising marine fishes is a much more difficult undertaking than raising freshwater species. The primary reason is that most marine fish have tiny larvae with an extended planktonic development stage. Meeting the needs of these larvae in captivity is sometimes impossible. In many cases, the spawning of marine fish is an unplanned event, two fish in a hobbyist's tank simply pair off and spawn. This has been observed with triggerfish, angelfish, cleaner wrasses, hogfish and damselfish, but no young of these species have ever been raised by home aquarists. Aquarists should concentrate on the species outlined below that have been successfully raised by hobbyists in home aquarium situations. This is not to say that you might not be the first person to rear another species that is not listed here, but without extensive resources and experience, it is not a likely occurrence.

With the exception of the Banggai cardinalfish and some seahorses, raising all other marine fish larvae requires that the aquarist culture rotifers to use as a first food (Described in Chapter Five). For some marine fish larvae, even rotifers prove to be too large, and these fish must be raised using wild-collected plankton, or cultured copepods. Planktonic fish larvae do best when housed in special round *Carrousel* tanks that keep their food in suspension while keeping

the larvae themselves from hitting the sides of the tank. Home aquarists can duplicate such a system using a round opaque plastic container.

Since about 1975, commercial marine fish breeding businesses have produced limited number of captive raised ornamental marine fish and invertebrates for the pet trade. Clownfish and neon gobies were the first species to be produced, with small polyp stony corals and dottybacks becoming more common in the past ten years. Recently, captive raised Red Sea angelfish have begun to enter the trade in large numbers. Businesses in the Indo-Pacific have developed a technique where they use a fine mesh net to capture larval fishes that are close to metamorphosing from their planktonic into their juvenile forms. This avoids the major obstacle of feeding newly hatched fish larvae. The fish larvae they collect metamorphose very soon after being collected. The one drawback is that these firms never really know what species will develop; sometimes it might be a group of valuable angelfish, other times it might be jacks, groupers or other non-ornamental species.



It is unfortunate, but closing the life cycle of a marine fish species (e.g., raising them from eggs to the juvenile stage) is a very competitive venture, even for home aquarists. There are in fact people who try to keep their information a secret so that they can corner the market on one species or another. Recently, a researcher managed to close the life cycle of a species of pygmy angelfish. When asked what he used as a first food for the larvae he vaguely replied, “Oh, various things....”. He obviously was not going to disclose his methods at that time. He may have been waiting to publish a paper, or he may have wanted to use the information for a start-up venture breeding those fish commercially. Even worse than those who simply withhold information like this are the few people that intentionally give out incorrect information in order to slow down any advances by their competitors. There isn’t much you can do to avoid this sort of problem. It does help if you can verify the information you’ve been given with that from an independent source.

The following species are some of the more popular marine fish species that have raised by home aquarists over the years:

Banggai cardinalfish, (*Pterapogon kauderni*)

This fish was first discovered in 1933, but then was lost to science for many years. It was rediscovered in 1995, and it immediately took the marine aquarium hobby by storm. Uniquely patterned, with long flowing fins and a peaceful nature, they proved very popular with aquarists. Even better, this species is a paternal mouthbrooder, and the male incubated the eggs in his mouth after they hatch (usually for 20 to 25 days). The babies, if kept from being eaten by tankmates, are easily raised using enriched live baby brine shrimp as a first food (see Chapter Five). The primary issue with this species is that it is found in a very isolated location around the Banggai Islands in Indonesia, and is at risk of being over-collected for the aquarium hobby. Captive rearing by hobbyists and professional breeders would take some of this collecting pressure off the wild populations.

Aquarists have tried to determine a foolproof way to tell male from females in this species. The most often mentioned differences are that the males are supposed to have a longer trailing edge on their second dorsal fin, and a squarer jaw line. As with sexing most fish species, these are relative minor differences, and may not always be reliable. Aquarists interested in breeding this species can start by purchasing five individuals and setting them up in a 40 to 50 gallon aquarium. It is best to buy the five fish from at least two different pet stores, or buy them at different times. If you buy all the fish from one store, at the same time, there is a chance that the fish may be related (especially if they are captive raised). Diversifying your sources for the fish will just help enhance their

genetic variability, and may reduce problems resulting from inbreeding. Allow the fish to acclimate to their new surroundings and feed them well on nutritious foods such as live adult brine shrimp, frozen mysid shrimp and small krill. With some luck, at least two of the fish will eventually pair off. With five fish to start with, and assuming a random sex ratio, you will expect to have at least one male/female pair in the group about 94 percent of the time. The paired fish will become territorial, and the other three can then be removed. Courtship and breeding have not been fully documented, (it may occur at night) but a swelling of the male's mouth indicates that he is holding eggs. At some point in the next 25 days, the male will release the relatively large (1/4" long) fry. If any other fish or aggressive invertebrates are present, they may eat the young. Even the adult parents have been suspected of eating their young. The best survival rate is seen when the babies can be dipped up in a cup (never netted!) and moved into a mesh rearing basket, or a separate rearing tank. It is very important to feed the young fish with Selco enriched brine shrimp nauplii. They will grow and seem to do well if fed normally hatched brine shrimp, but long-term survival will be poor, and many of the babies will die between day 20 through day 40. As time goes on, some of the young fish will grow larger than others. Soon, the larger ones may start to fight with the smaller ones. If this happens, separating the fish into two or three similar sized groups will reduce the fighting problem. As juveniles, Banggai cardinalfish require little specialized care, and soon begin feeding on flake foods, diced krill and mysids.

Clownfish, (*Amphiprion spp.*)

The popular clownfish is the most commonly bred egg-laying marine fish species. Commercial companies have been producing tank-raised clownfish for the past 25 years. Home aquarists have also been successful in raising clownfish from time to time. In some instances, they actually were able to produce baby clownfish in commercial quantities and opened "basement clownfish farms". The single obstacle for home aquarists who wish to raise clownfish is access to adequate numbers of live rotifers that are used as a first food for larval clownfish. Chapter Five outlines one rotifer culture method. Read this over carefully, if this is not something you have the time and resources to do, you will not be able to raise clownfish in large numbers, and should concentrate your efforts on other species.

Most clownfish species are easy to sex, the males are always smaller than females, and these fish are hermaphroditic, so they can change sex if the need arises. Mated pairs are also routinely available, but at a higher price. Good clownfish species for beginners to try their hand at breeding include the false percula, (*Amphiprion ocellaris*) the tomato, (*Amphiprion frenatus*) and any of the skunk clowns.

Once you have a pair of clownfish established in a breeding tank, (isolated from other fish and invertebrates) nesting and egg-laying will often start in just a month or two. Although clownfish have a symbiotic relationship with sea anemones, they are not required in order to spawn clownfish. Give the pair of clownfish a piece of PVC pipe on which to lay their eggs, this allows the nest to be moved to a rearing tank more easily. Depending on the water temperature, the eggs will eye-up (develop embryos with eyes) within six days, and will hatch out at between six and nine days. Nests can contain from 100 to 1200 eggs, with most nests consisting of around 300 eggs. The fish may breed as often as every 14 days (this may be tied to the 28-day lunar cycle). If the parent fish are not fed a nutritional diet, the eggs will be comparatively pale in color. These eggs, if they hatch at all, will normally not survive. The adults (usually the male) will fan the nest with their fins, and mouth at the eggs during the incubation period. Towards the end of this time, this activity will become more intense, presumably to help the larval clownfish to break free from their eggs.

The larval rearing tank should be 20 to 30 gallons in capacity, have no substrate on the bottom and be painted flat black on the outside ends, back and bottom. A black drape for the front is also advisable. Lighting must be from the top, at the center of the tank. Initially, no filtration is used, just light aeration. After the larvae grow, it helps to have established sponge filters operating in another tank that can be moved into the rearing tank to provide biological filtration.

The eggs always hatch between one and three hours after dark so be sure that the room that the rearing aquarium is in has a distinct 14-hour day and 10-hour night. Recovering the larvae can be done in two ways; dipping them up in a small cup, one at a time as they hatch (using a red lens on a small flashlight to see them) or if the nest can be moved to a rearing tank, they can be allowed to hatch there. To move a clownfish nest, it must be kept submerged at all times, and the rearing tank must be filled with water taken from the breeding tank (so as not to shock the eggs). Don't move the eggs until the day of the night you expect them to hatch. If you let the adults spawn and hatch their eggs naturally a few times, you should learn exactly how many days the eggs of your fish will need to incubate. Once the nest is oriented in the same position that it had been in the breeding tank, an airstone is adjusted to release a curtain of air bubbles near, but not touching the egg mass. This simulates the fanning and biting of the eggs normally provided by the adult fish. If the air is set to high, the eggs will be damaged. If the air is set too low, none or few of the eggs will hatch because the larvae become trapped inside the egg. Practice will show you how best to place the airstone.

Beginning on the first day, rotifers are added at a density of 2 to 3 rotifers per milliliter of tank water. A microscope or strong hand lens is needed to determine

this – simply count the number of rotifers you see in 20 drops (one milliliter) of tank water. Some aquarists will also filter algae cultures through coffee filters and rinse that into the rearing tank as well. This allows the rotifers in the tank to have food available which in turn keeps their nutritional level higher by the time the baby clownfish eat them. Beginning on day four, small amounts of finely ground flake foods and newly hatched brine shrimp can be added in conjunction with the rotifers. The rotifers can usually be discontinued around the tenth day. Be sure not to add too many brine shrimp nauplii at one time. Clownfish babies may eat too many and actually burst their stomachs.

Between the eighth and fifteenth days, the larval clownfish will metamorphose into juveniles. This is a very stressful time for the little fish and high mortality rates are often seen. Giving the little clowns various bits of shell and gravel at this time seems to help with the process.

While raising larval clownfish on a strictly artificial diet rarely works, there is one trick you might want to try if you do not have rotifers available to you, called *filter squeezing*. By setting up a number of sponge filters in other aquariums, populations of microorganisms will grow inside the sponge material. These sponges can then be squeezed out in the rearing tank for the first three to four days to provide some food for the larval clownfish. Since this type of food is not as nutritious for the larval clowns as rotifers are, you may need to sacrifice a large portion of the larvae in order to concentrate on raising fewer fish. Better to successfully raise 10 fish than try to raise 500 and lose them all.

Dottybacks, (*Pseudochromis* spp.)

These fish are being produced by commercial breeders in large numbers. In fact, the cost for tank raised fish of the rare Red Sea and Arabian species of dottyback is now much less than their wild collected counterparts. Obtaining a breeding pair of these fish is difficult. They are territorial and aggressive to members of the same and similar species. There must be cues present that allow two fish to form a breeding pair, but it isn't obvious what they are. One species, the Orchid dottyback, (*Pseudochromis fridmani*) is less territorial than most dottybacks, and is a good candidate for rearing in home aquariums. After a pair has formed in the aquarium, the female will lay a ball-shaped mass of eggs in a crevice. These are in turn guarded by the male during their five-day incubation period. The eggs hatch during the evening, and can then be dipped up a few at a time and moved to a standard rearing tank. Rotifers will work as a first food for the larvae. Newly hatched enriched live brine shrimp can be added after six to ten days. The larval dottybacks will metamorphose at between 25 and 32 days. At this time, it helps to have some substrate for the juveniles to make their homes in. The young fish also become territorial with one another at this time. As the fish

grow, they will need to be moved into separate tanks, or better yet, a compartmentalized rearing system.



Nine-day old golden damselfish

Epaulette shark, (*Hemiscyllium ocellatum*)

This species of shark is the best suited for captivity in aquariums the size likely to be owned by at least some home aquarists. A young pair can be safely housed in a 200-gallon tank, and like many sharks and rays, they can easily be sexed because the males have pelvic fins that are modified into elongate claspers. Once fertilized internally, the female will begin laying a series of eggs. In many instances, the first eggs will be empty, with no developing embryo. After time, if they are a fertile pair, eggs with a distinct yolk will start to be produced, followed by normally fertilized eggs. One female produced over 20 infertile eggs and eggshells before eventually producing some fertile eggs. Incubation time for the eggs can be lengthy, up to six months or more. Newly hatched juveniles may retain some internal yolk, so they may not need to feed when they first hatch. A good starter food for these young sharks are live grass shrimp or guppies impaled on a broom straw. The bamboo sharks, (*Chiloscyllium spp.*) are just as easy to breed, but they grow much larger, and are so common that there is not much market for them.

Jawfish, (*Opistognathus aurifrons*)

A few marine aquarists have reported rearing this species in their homes, but even the commercial breeders find the task difficult enough that it is not economically feasible for them to rear this species in captivity. The adult fish

need a lot of space, at least 50 gallons, and the aquarium needs a deep gravel layer for the jawfish to construct their burrows in. The male of the species is more brightly colored, and often larger than the female. The male mouthbroods the eggs until they hatch, when he then releases the planktonic larvae. In captivity, many males will eat their own eggs after a day or so. Artificial incubation of the egg masses has not yet proven successful. Rotifers may be just a little too large as a first food for the larvae and copepods may be required. When the larvae metamorphose, they become territorial and then require aquariums with a large amount of fine sand in which to form their burrows.

Neon gobies, (*Gobiosoma spp.*)

Various species of neon gobies from the Tropical Western Atlantic have been reared by home aquarists. They require live rotifers as a starter food, and are similar to larval clownfish, just a bit smaller, and thus a little more delicate. Some aquarists feel that adding filtered green water to the rearing tanks enhances the survival of goby larvae.

A pair of gobies can be set up in a ten-gallon aquarium with a short length of PVC pipe to serve as a shelter. Females are normally a bit larger and more robust than the males. If you want to hatch the eggs artificially, roll up a length of plastic film inside the PVC breeding pipe. The female will lay her eggs on the plastic that can then be easily removed and placed in a separate hatching tank. The pipe can be fitted with a second plastic sheet and added back to the adult's breeding tank, ready for the next batch of eggs.

Seahorses, (*Hippocampus spp.*)

Few fish have as strange of a reproductive process as does the seahorse. Most everyone knows that the female seahorse implants her eggs into the male's pouch, and it is he who then "gives birth" to the babies. This serves as a convenient way to tell male from female – the male has a leathery pouch on its belly while the female has regular body plates. Pregnant males are often available from pet stores, and these are usually the best bet for home aquarists who want to try to raise their own seahorses. Seahorses form long-term pair bonds (some people think they may mate for life) and simply putting a male and female together may not result in the proper bonding. Furthermore, seahorses are difficult to keep in good shape nutritionally speaking, and any young produced after they have been in captivity are generally weaker than those that resulted from a spawning that took place in the wild. Identifying seahorses by species can also be difficult, and it isn't unheard of for an aquarist to try to pair up two seahorses of different species. While we may not always be able to see the difference, the seahorses can, and a crossbreeding from such a mismatched pair like this usually does not occur.

The pregnant male should be set up by itself in a bare rearing tank with just a heater and an established sponge filter to maintain water quality. Try not to move a male when he is too close to term, as they will sometimes abort the fetuses if they are stressed at that time. These premature young, although they look normal, rarely survive.

Once the baby seahorses have been released, the male should be returned to the main aquarium with the female. Starting on day two, the babies should be fed newly hatched enriched brine shrimp nauplii. Remember that the nauplii are strongly attracted to light. Be sure that the nauplii do not converge to a brightly lit point in the tank where the baby seahorses cannot find and eat them. Even with enrichment products, it seems that brine shrimp nauplii are lacking in some nutritional element needed by the baby seahorses. Fed strictly on baby brine shrimp, the seahorses often experience nearly 100 percent mortality before they reach an age of eight weeks. If these same babies are fed just a few larval mysid shrimp every day, (along with their normal ration of brine shrimp) this mortality rate is greatly reduced.

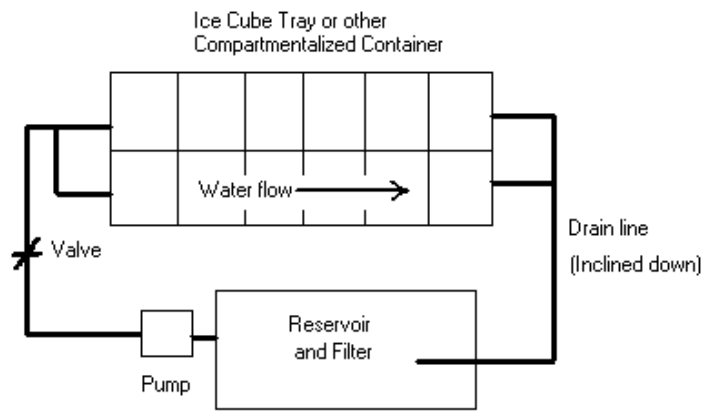
An adequate food supply is usually an issue when raising seahorses, especially with the larger species that can produce broods of over 300 babies. Although it sounds cruel, if resources are limited, it is sometimes better to euthanize a percentage of the young at the very start so the remaining ones will have enough food.

Other species

Reports of other marine fish being spawned in home aquariums are not that rare, but confirmation of their life cycle being completely closed is less common. Table 10 lists some of the species that have been reported to lay fertile eggs in small home-style aquariums. As far as can be determined, home aquarists have not routinely been able to rear any of these species to the juvenile stage. These species however, would be considered a good starting point for advanced aquarists who are interested in being the first to rear a species, and who have sufficient time and resources to make a good attempt.

Black Spotted Pufferfish	<i>Arothron nigropunctatus</i>
Cardinalfish	<i>Apogon spp.</i>
Cherub Fish	<i>Centropyge argi</i>
Cleaner Wrasse	<i>Labroides dimidiatus</i>
Clown Triggerfish	<i>Balistoides conspicillum</i>
Coral Catfish	<i>Plotosus lineatus</i>
Damselfish (various spp.)	<i>Pomacentrus spp.</i>
Firefish	<i>Nemateleotris magnifica</i>
Flame Angelfish	<i>Centropyge loriculus</i>
Frogfish	<i>Antennarius spp.</i>
Green Chromis	<i>Chromis caerulea</i>
Lionfish	<i>Pterois volitans</i>
Mandarin Dragonet	<i>Synchiropus splendidus</i>
Pipefish	<i>Doryrhamphus spp.</i>
Porcupine fish	<i>Diodon holocanthus</i>
Spanish Hogfish	<i>Bodianus rufus</i>
Striped Blenny	<i>Meiacanthus spp.</i>
Yellow Tang	<i>Zebrasoma flavescens</i>

**Marine Fishes Reported to Have Been Spawnd,
(But not Routinely Raised) by Hobbyists in Captivity.**



Rearing System for Larval Animals that Need to
be Isolated From One Another