

Keeping Endearing Pygmy Angels

Many saltwater angels are too big for small tanks - but these little beauties are just right

By Scott W. Michael

Angelfish are considered by many to be the most beautiful fish associated with coral reefs. Many members of this family, known scientifically as the Pomacanthidae, grow too large for small and medium-size home aquariums. For example, most members of the genus *Pomacanthus* reach lengths in excess of 12 inches and require plenty of swimming room if they are to thrive in captivity. Yet there is one genus composed of smaller species, many of which readily acclimate to smaller aquariums. These are the members of the genera *Centropyge*, and to a lesser degree, *Paracentropyge*. These two genera are known commonly as pygmy or dwarf angelfish. We will look at the biology and aquarium care of these fish.

The genus *Centropyge* is the largest in the family Pomacanthidae. It is comprised of two subgenera and approximately 29 species. (A recent book on the angelfish family lists 32 species in this genus.) The largest *Centropyge* species attains a maximum length of 7 inches, with the average adult size being closer to 4 inches. The genus *Paracentropyge* is much smaller, with only three species.

Food habits and feeding behavior

About the Author

Twenty years of research experience has brought Scott Michael sponsorship and funding for projects as varied as the study of the draughtsboard shark in New Zealand, hammerheads in the Gulf of California, in addition to creatures as varied as frogfishes, green sunfish, and stingrays. He has worked alongside some of the worlds top marine animal experts, and published several well received scientific papers on his findings.

As a writer he is best known for his definitive work "Reef Fishes; a Guide to their Identification, Behavior, and Captive Care, Volume 1." He is also author of more than 60 popular articles for aquarium and dive magazines, was a contributing editor to a leading aquarium publication for two years, and for the past six years has had a regular monthly column in *Aquarium Fish Intl.* He was also been co-author of two marine CD ROM programs. He is a major contributor to and partner in perhaps the best known educational marine life and dive travel website <http://www.coralrealm.com/>. Scott was also a scientific consultant and filming assistant for the Mike DeGruy film, "Sharks: On Their Best Behavior," and also contributed to a Marty Snyderman film, "View From the Cage."

Scott lives with his wife Janine, herself an accomplished underwater photographer and active partner in his research, in their home on Lincoln, Neb. They share their home with their golden retriever, Ruby. The *Centropyge* feed mainly on microalgae and detritus. Detritus is decomposing organic particles, which include animal and plant remains, waste products, bacteria and other microorganisms. The microalgae of choice for most genus members are golden diatoms, but several species (e.g., the lemonpeel angel, *C. flavissima*) also consume large amounts of filamentous green algae.

Aquarists who like to grow macroalgae should be aware that some pygmy angels might devour their crop. One species that seems to be particularly fond of *Caulerpa* shoots is the flame angel (*C. loricula*). Several species also feed heavily on the feces of other fish. For example, the Japanese pygmy angelfish (*C. interrupta*) associates with schools of lyretail anthias (*Pseudanthias squamipinnis*) and planktivorous damselfishes to feed on their fecal material. In the aquarium, I have seen a number of pygmy angelfish engage in this feeding mode, known as coprophagy.

Sexuality and reproductive behavior

All pygmy angelfish are protogynous hermaphrodites (all males result from female sex change). Sexual metamorphosis is socially controlled, with the main factor affecting its occurrence being the presence of a dominant male. A female may engage in early sex change if there are many more females than males. For example, in one study in which 15 female and one male Potter's angelfish (*Centropyge potteri*) were placed in a large tank, one of the larger females changed sex within 30 days and divided the harem.

All pygmy angelfish that have been studied are harem. These groups are usually composed of a male, one to four mature females and up to nine immature females. Occasionally, a harem may contain up to seven adult females. The harem lives in a territory defended by the male, which tries to drive off bachelor males (which are females that have

engaged in early sex change). Occasionally, a bachelor male may succeed in hiding in the territory of a dominant male and will attempt to mate with the females in his harem.

Females do not maintain territories, but a dominance hierarchy exists among all harem members, with the male dominating all females, followed by the largest female, then the next largest female and so on. This is known as a size-based linear dominance hierarchy. When the male disappears, the dominant female will begin the sexual metamorphosis in order to take his position. A neighboring territorial male or a bachelor male may also take his place before the largest female can transform. It sounds like the script of a bad soap opera! Females will engage in "masculine" behaviors within a week after the dominant male dies and can be fully functional males within 20 days.

Some pygmy angelfish have a distinct spawning season. In subtropical areas this is usually in the summer, when water temperatures are their highest. In tropical seas, some species are reported to spawn in spring and summer, although most species spawn continuously throughout the year in these areas.

Pygmy angelfish spawn at dusk, usually from 15 to five minutes before sunset. In many species, females will move to a preferred spawning site (often a prominent rock or coral outcrop) and await the arrival of the male; note that some species, such as *C. argi*, *C. bispinosa* and *C. multicolor*, do not seek out conspicuous topographical features for spawning. Their pre-spawning and spawning behaviors consist of the following fixed action patterns: rushing and circling, soaring, mutual soaring, nuzzling, spawning and the after-chase. The spawning ascent is relatively low when compared to other pomacanthids.

Aquarium care

Pygmy angelfish will thrive in aquariums as small as 15 gallons but are best kept in larger tanks, unless they are being housed on their own (more on this later). An aquarium that contains one or more of these fish should be replete with hiding places, which can be created by loosely stacking artificial corals or live rock. It is also a good idea to place a layer of medium to large size pieces of coral rubble on the bottom. Try to arrange the more sizable chunks to form holes and passageways the fish can disappear into if threatened. Coral rubble will make cleaning the sand or crushed coral with a gravel vacuum more difficult. You will have to move all the larger pieces of rubble to one side, vacuum the detritus from the filter bed, then rearrange the rubble. For those species usually found in caves or overhangs, try creating this microhabitat in the aquarium.

These fish usually do not have to be fed as frequently as other angelfish because the algae and detritus will provide them with a natural food source. In fact, some individuals never take introduced food but sustain themselves on the algae and detritus in the tank. Feeding fresh greens (e.g., steamed spinach, broccoli), dried algae and a food that contains Spirulina algae will ensure their nutritional needs are met, especially in a tank devoid of algae growth.

Aggression and compatibility

When it comes to aggression and compatibility with other fish, there is interspecific variation in the genus *Centropyge*. Some species are typically very aggressive, whereas others are not. For example, all the members of the "argi complex" (*C. argi*, *C. acanthops*, *C. aurantonota*, *C. resplendens*) tend to be very belligerent not only to related species but any fish, especially those introduced to the aquarium after them. Because the members of this group are small, they are often housed in small aquariums, which is the worst thing you could possibly do if you plan on keeping passive fish (e.g., seahorses, pipefishes, batfishes, leopard wrasses, flasher wrasses, highfin shrimp gobies, fire gobies, dart gobies) in the same tank.

Angelfish in the argi complex are best kept in larger tanks with a lot of hiding places and no passive species. If you do keep them with less aggressive species, introduce them after these fish have been added and acclimated to the aquarium. Some other species that have a propensity to be aggressive are the flame, lemonpeel, halfblack, Potter's and multicolor angelfish (*Centropyge multicolor*).

If you want to keep more than one pygmy angelfish in the same aquarium, you will have greater success if your aquarium is 70 gallons or more and is packed with hiding places. When arranging decor, a series of coral heads is better for dispersing individuals throughout the tank than a long contiguous reef. Add all the individuals you intend to keep together (of course, after they have been quarantined) or add the smallest individuals first, followed by a larger specimen.

The goal is to have only one male per aquarium. In those species that display permanent sexual dichromatism, this should not be difficult, but in those species in which the sexes are indistinguishable, it can be a guessing game. Males are usually larger than females - at least the females in their harem. So, the greater the size discrepancy between two individuals, the more likely you are in acquiring a male and one or more females.

Also remember that in the absence of a male, females may change sex. Therefore, females held in a retail, quarantine or display tank too long before being exposed to a male may change sex. Although it was once thought that sex reversal was not possible, recent observations suggest that in some angelfish a transforming male may be able to revert back to the feminine sex. But a dominant male may kill a subordinate male or transforming female before they can complete this process.

Another way to possibly curb the aggressive tendencies of your pygmy angelfish is to house them with larger fish. They are less likely to engage in frequent bouts of aggression if potential predators are present. I'm not recommending keeping them with fish that could actually eat them. Instead, include some fish tankmates that are three to five times larger than they are (large angels, some butterflyfishes, large wrasses, large anemonefishes, surgeonfishes), and your Centropyge will be less likely to attack similar-size fish with reckless abandon. At the same time, keep in mind that some of the more timid pygmy angelfish may be affected negatively if intimidated by larger tankmates. They may refuse to feed and may hide all the time.

Selection and health

As far as durability is concerned, Centropyge and Paracentropyge species make great aquarium fish. Some of the more difficult species to keep include Colin's (*C. coloni*), golden (*C. aurantia*), Herald's (*C. heraldi*), peppermint (*C. boylei*), multibarred (*C. multifasciatus*) and purplemask (*C. venustus*). In some of these species, their survival in the aquarium may be related to how they were collected or the condition of the fish when they get to your aquarium. For example, the golden angelfish, a cryptic crevice-dweller, is often captured with sodium cyanide. Colin's angelfish occurs in deep water, and therefore is more likely to suffer from decompression-related maladies. One secret to keeping many of these more temperamental pygmy angelfish is to add them to a tank with lush filamentous algae growth. Many of these fish will browse on this plant material, which can help tide them over until they accept other aquarium fare.

Before purchasing a pygmy angelfish, examine the sides of the fish very carefully for raised scales or red areas. Some specimens, especially those taken from deeper water (e.g., multicolor angelfish), may be injured when they are brought to the surface. This can lead to internal infections that cause the sides of the fish to swell and then burst. This malady is often referred to as pygmy angel bloat. These fish may also suffer from parasitic infections, like saltwater ich (*Cryptocaryon irritans*), anemonefish disease (*Brooklynella hostilis*) and coral fish disease (*Amyloodinium ocellatum*).

Some species (e.g., *C. loricula*, *C. flavissima*, *C. multicolor*, *C. interrupta*, *C. jocularis*) are thought to be hypersensitive to copper-based medications. Therefore, it is best to administer an alternative treatment for these fish. Formalin is an effective treatment for some of the protozoan and dinoflagellate parasites. Hyposalinity treatment (reduced salinity bath) is an effective way to eradicate *Cryptocaryon*.

Pygmy angelfish should be kept at a specific gravity of 1.019 to 1.024. Ammonia and nitrite levels should be near zero, and nitrates should be kept below 100 mg/L nitrate-nitrogen (NO-N). There are kits that test nitrate-nitrogen (not to be confused with kits that test for nitrate ion). It has been suggested that high nitrate levels (i.e., greater than 160 mg/L) may encourage the development of head and lateral line erosion. This ailment, which is not uncommon in pygmy angelfish, may also result from the use of activated carbon (which may leach harmful products into the water or extract valuable trace elements from it) and a lack of vitamins C and A. Supplement their diets with green vegetables, such as spinach and broccoli - the latter was reported to reverse head and lateral line erosion in blue tangs (*Acanthurus coeruleus*).

Pygmy angelfish in reef tanks

A reef tank is a perfect environment for keeping more than one species of pygmy angelfish, because this type of aquarium is usually replete with hiding places (a must when trying to house multiple Centropyge species). But are these fish a threat to your invertebrates? Looking at their natural diets, it would seem as though they would pose no threat to sessile invertebrates. However, most of these angelfish do feed on detritus, and coral slime falls into this category. So, although they usually do not feed directly on coral polyps, they will graze on the slime they exude.

The coral species often used as a feeding substrate are the larger-polyped hard corals, like elegance (*Catalaphyllia jardinei*), open brain (*Trachyphyllia geoffroyi*), tooth (*Lobophyllia* spp.) and crater (*Cynarina* spp.), as well as zoanthids. The slime on tridacnid clam mantles is also a food source for pygmy angelfish. If you have one of these angels in an aquarium with corals or clams, and the invertebrate is constantly closed up, there is a good chance the angelfish is bothering it. Some pygmy angelfish will also nip at the oral disc of anemones, feeding on their feces, or will even eat dying corals or anemones. These angels will also pester feather duster and Christmas tree worms by nipping at their feathery feeding appendages.

As for their damaging sessile invertebrates, there seem to be patterns within the various pygmy species, but there is also a considerable degree of individual variation. For example, the cherubfish (*C. argi*) can typically be kept with most stony and soft corals without inflicting damage. However, an occasional specimen will begin picking at the tissue of elegance or

open brain corals or the polyps of *Xenia* or *Anthelia*. On the other hand, although most lemonpeel angelfish will nip at corals and should not be placed in the reef aquarium, occasional specimens will not develop this bad habit. The species that are less likely to cause damage to your invertebrates include the members of the argi complex: the African flameback (*C. acanthops*), Caribbean flameback (*C. aurantonota*), cherubfish and resplendent pygmy (*C. resplendens*). Other less-dangerous angelfish include Fisher's (*C. fisheri*), whitetailed (*C. flavicauda*) and multibarred. In my experience, the most risky species to add include the bicolor (*C. bicolor*), lemonpeel and keyhole (*C. tibicen*). The coral beauty (*C. bispinosa*), rusty (*C. ferrugatus*), Herald's, flame, halfblack, golden, multicolor, Colin's and purplemask fall somewhere in between the others in terms of sessile invertebrate compatibility.

No matter what species you are thinking of adding, remember that introducing any angelfish to your reef aquarium always entails some degree of risk. The corals least likely to be bothered by your pygmy angelfish are those that have some form of toxicity and are distasteful. These species, which are avoided by generalized predators, include some members (not all) of the following genera: *Lemnalina*, *Sinularia*, *Sarcophyton*, *Cladiella*, *Paralemnalia* and *Efflounaria*.

Pygmy angels are also less likely to cause problems if the tank is larger, and they are fed more frequently. Another technique that can reduce bad behavior is to regularly introduce pieces of romaine lettuce or sheets of freeze-dried algae to the aquarium. This gives the angels something to pick at other than the corals.

Captive breeding

Much has been written on this subject in the past few years, with most of the new information available being the result of the research efforts of Frank Baensch. He has written a number of fascinating articles on the subject (including a recent chapter for the new book, "Angelfishes," by Helmut Debelius, Rudie Kuiter and Hiroyuki Tanaka). Pygmy angelfish are great candidates for captive breeding for several reasons. They are small fish that do not swim high in the water column when they spawn (a 20-inch high tank will suffice). A male and one to several females can be kept together in a medium-size aquarium. They will spawn throughout the year, and a pair can reproduce for six to eight years. Also, many species are relatively hardy. Baensch reports that at least 15 species have been known to spawn in captivity (Debelius, 2003). Unfortunately, raising the fry presents the biggest challenge (as is the case with many marine species).

If you want to try and breed pygmy angels, the aquarium should be at least 75 gallons and should contain a lot of rockwork and/or artificial coral to provide ample shelter sites. Try to encourage filamentous and macroalgae growth, to provide a readily available natural food source, and feed the potential breeders a good flake food, a frozen prepared food for herbivores (with *Spirulina*), finely minced seafood and live or frozen brine shrimp at least twice a day. Baensch also suggests feeding fish roe.

Water temperature should be maintained between 82 and 84 degrees Fahrenheit. Add only one male per tank and two or three females, but be prepared to remove any individuals that are picked on by the dominant fish. To ensure spawning behavior, give the fish good water quality and a very good diet. If these conditions do not exist or deteriorate, courtship may occur, but the fish may never actually spawn. The lights should be put on a timer, so they turn off at the same time every day. If you use several lights on the tank, you can have them turn off synchronously to simulate dusk, but this is not necessary to induce spawning. These fish will begin courting about 90 minutes before the lights go off each night.

A number of pygmy angelfish are known to interbreed. In fact, some do so regularly. For example, the lemonpeel and halfblack commonly interbreed and even produce offspring that are capable of reproducing. The progeny of this cross spawning are regularly sold in the aquarium trade. Hybridization often occurs in areas where two closely related species co-occur and one is common, while the other is rare.

If provided with a good home, these fish should live for years in the home aquarium. Longevity records of six years have been reported for the keyhole angelfish in the wild, while lemonpeel, keyhole and coral beauties have been kept in captivity for more than 10 years. For the aquarist who would like to keep a member of this wonderful family, some of the pygmy angelfish are a wonderful choice! Happy fish-watching!