

Maintaining and Spawning the Demonfish

Two words characterize the proper maintenance of demonfish: clean and hot!

By Wayne Leibel

In the last installment of this series, we looked at the taxonomy of the fishes commonly known to hobbyists as the "earth eaters." With the species now properly organized as to genera and identifying characteristics, we can move on to the topics of aquarium care and breeding.

Maintenance

Several articles have been written on the maintenance of these fish (Loiselle 1980), including my own (Leibel 1985a,b; 1987a,b; 1990b), so I will attempt to summarize my own approach to this topic. I have been known to make the observation that miniature cichlid fish of the genus *Apistogramma* are really just dwarf earth eaters, and I am most serious when making this remark. Much of the care needed by *Satanoperca* species is identical to that of the more finicky dwarf cichlids, albeit on a larger scale. In fact, I must confess that my initial interest in geophagine cichlids was a retreat from the demands of this oft-finicky group of miniature cichlids! *Apistos*, I'm afraid, don't eat trout chow with much relish, nor do they tolerate laxity in water-quality maintenance. Earth eaters are a bit more forgiving.

Two words characterize the proper maintenance of demonfish: clean and hot! The water must be kept clean and the fish warm. My preference is to maintain mixed colonies with non-cichlid dither fish (I like silver dollars [*Metynnis* sp.] or elongate hatchetfish [*Triportheus* sp.] for medium-sized cichlids, but any non-aggressive, rapidly swimming surface fish will do). The earth eaters (and tankmates) are kept in aquariums with relatively large surface areas (long and wide rather than high) and a substrate of fine (#0 to #1) sand or gravel for their sifting pleasure. And sift they do! Incessantly.

Earth eaters just do not seem happy in bare aquariums or with larger-sized gravel. They will still attempt to sift the gravel — and, in my earlier years, I performed many a pebble-ectomy on a sadly inconvenienced earth eater just trying to do its thing over an inappropriate substrate. Obviously, crushed glass is out!

In addition to the dither fish noted above, *Corydoras* sp. catfish or clown plecos (*Pekoltia* sp.), other inoffensive cichlids or even dwarf cichlids — if enough shelter is provided — can make up the community, but think twice about this if your intent is to breed the demonfish (see below).

Needless to say, aquatic plants don't stay rooted for long given the fish's propensity for constant substrate sifting. Either switch to plastic plants (yech!) or use plants that don't need to be rooted: floating water sprite or duckweed will cut down on top illumination and Java fern and/or Java moss will attach to the tangle of well-cured driftwood that I favor for shelter. The driftwood also leaches a modest amount of humic and tannic acids, which these fish seem to prefer — and I don't mind tea-colored water.

I prefer to keep my juruparoids in soft, acidic water in the 80- to 86-degree Fahrenheit range, hailing as they do from the equatorial regions of South America. Water processed through reverse osmosis or ion exchange resins (see part 5 [Smiling Acaras] of this series for more info) may be helpful depending on what comes out of your tap. If all of this is sounding vaguely like the prescription I gave for the smiling acaras, you've been reading and remembering the info I'm writing!

I repeat again: The water must be kept clean! These fish react to lax water maintenance with neuromast pitting and erosion ("hole-in-the-head" syndrome). This erosion, when caught in its earliest stages, is usually reversible through massive frequent water changes. My prescription for water management? Regular water changes (30 to 50 percent weekly) coupled with slow power filtration.

Juruparoids favor the slow-moving waters of the flooded varzea forest to the Amazon River proper. Instead of blowing the fish around with a mega-power filter, I would much rather use one or two small power filters (100 to 300 gallons per hour) that hang at opposite ends of the 4-foot-plus aquarium I prefer. This positioning promotes slow but steady circulation.

These days I use floss in combination with either of the commercially available chemical filtration media (e.g., PolyFilter or ChemiPure), but a good grade of activated charcoal in a nylon bag probably would work as well. I've also been using sponge blocks for biological filtration in the same power filters. However, given the incessant substrate sifting of these fishes, the floss clogs with particulates rather quickly and must be changed often. Just keep an eye on the strength of

your filter's output and when it slows, change the floss or clean the sponge block (with aquarium water, not tap water!).

For this reason, I think canister filters are not the appropriate choice for eartheaters. Obviously, undergravel filters are not recommended either. Given the higher temperatures I prefer to keep these fish at, you must have heavy aeration. And why use just an airstone when you could do some good with that air? Try a box filter or two (added mechanical filtration) or a large sponge filter (additional biological filtration). You can't keep the water clean enough for these fish.

The palate of these fishes is delightfully varied, and they are heavy eaters once purged of parasites, if necessary, by initial prophylaxis (see below). Because the fish do sift, I prefer pelleted prepared foods for their staple diet. It really doesn't matter what brand you choose, but I would stay away from goldfish pellets and trout chow. The former is inappropriate and the latter is incredibly messy.

One food that fits the bill is Tetra's DoroMarin, which was intended for marine fish. The pellets are very small, they sink and all my cichlids eat them with gusto. Obviously, no one food should be fed exclusively. I offer a variety of pelleted foods including those with Spirulina. Dried krill and high-quality flake foods are also excellent and will be taken from the surface avidly, but again, I believe it is important to encourage these fish to do what they have been evolutionarily engineered for: sifting!

As for frozen foods, I prefer to spend my dollars on bloodworms (*Chironomus* fly larvae), which are more nutritious (to my mind) than brine shrimp — which rupture during freezing and lose much of their digestible mass when thawed.

Live foods are relished, particularly blackworms (avoid *Tubifex*). One excellent and inexpensive food is red earthworms, which I use to condition cichlids. They are available from bait dealers and "worm farms" and are quite easy to culture. I direct you to Piparo (1984) for details on their husbandry.

Once they are eating, eartheaters do so with gusto. However, because most of the demonfish are wild-caught (few species are spawned regularly), some tips on acclimatizing wild fish seem in order. Newly imported cichlids, satanoperoids in particular, are often in terrible condition: emaciated, usually parasitized, and in need of some immediate and often pharmacologically supported aquarist care.

Think hospital aquarium, and a bare one at that. The first approach — heat. Temperatures of 85 to 90 degrees Fahrenheit will often turn a marginal fish into a survivor in a matter of a few days. Many wild parasites seem less thermally tolerant than their piscine hosts and will succumb to a week of such treatment. This is the approach taken by discus aficionados working with wild fish. I am not a purist, however, and thus have no hesitation in combining heat with drugs.

Demonfish are usual victims of export-associated breakdown. They are often emaciated, listless, pick at but reject all offered foods (live or otherwise) and produce white, stringy feces. Whether these symptoms are the result of Hexamita, Spironucleus or other insidious protozoans or bacteria is, practically speaking, irrelevant to me. My blockheaded approach: naladixic acid. Naladixic acid (sold as Naladin, Tetrid or Nalagram) is an incredibly useful aquarium pharmaceutical. It is a gram-negative antibiotic that is readily and rapidly absorbed into the bloodstream via the gills and is the prophylactic of choice for wild South American cichlids. It is particularly useful for turning around thin, pinched-belly fish that won't eat. It should be used as a 24-hour dip as per instructions. It is powerful stuff, so be conservative in your decision to use it. It may well be cumulatively liver-damaging and some fish can be killed by it.

In earlier articles (Leibel 1985, 1987) I advocated the use of dylox, a powerful anti-helminthic that kills flukes and other parasitic worms. I now believe it is dangerous to the fish. There are other solutions. Some of the medicated fish foods on the market pack several anti-helminthics in a palatable form that may be useful in eliminating worms in cases where your fish eat like pigs but are always skinny.

"Eating" is the operational word here. Many newly imported cichlids won't, so consider naladixic acid. Finally, I find that Aquarium Products' "Quick Cure," a dip mix of formalin and malachite green, is great for ich and other protistan "scrungees." I've used it in the field and in my aquariums and it gets the highest of marks for cichlids.

One juruparoid "disease" best left untreated, is the black, pimple-like ectoparasite that often decorates wild-caught fish. These are flatworms that use cichlids and other fishes as intermediate hosts in their life cycle. They generally do not harm the fish host, instead infecting their primary host, fish-eating birds that acquire the worms when they eat the fish. Unless one concurrently maintains a harem of herons in the fish room, the "disease" will not spread to other uninfected fish.

You might be wondering at this point: "Why go to all this trouble curing fish? Why buy diseased fish in the first place? Just

be patient and wait for some healthy ones to appear." Well, with the exception of *S. leucosticta*, *S. jurupari* and, possibly, *S. daemon*, the other *Satanoperca* don't appear very often. If the price is right, I'll often take my chances with marginal fish and very often succeed! But it's an educated gamble. I've been burned many a time as well.

Spawning the Demonfish

The juruparoids are the most difficult and frustrating of the geophagines to spawn. *Satanoperca jurupari* (as well as *S. leucosticta* and *S. pappaterra*) have been spawned with some regularity, but the "spotted demonfish" (*S. daemon*, *S. acuticeps* and *S. lilith*) have not. The trick with these fish, aside from keeping them clean, warm and well-fed, is patience. The fish apparently reach maturity at two to three years of age. They are also rather shy, nonaggressive fish and may be reproductively inhibited if forced to share an aquarium with other cichlids. (*Satanoperca acuticeps* and *S. lilith*, however, are exceptions to this "good citizen" rule — they can be exceptionally nasty with each other and with other cichlids, so watch out.)

I have had the good fortune to have witnessed the spawning of several pairs of *S. leucosticta* (Leibel 1987b), and more recently a pair of *S. pappaterra* (Leibel 1990). As far as we know, all the *Satanoperca* species are delayed mouthbrooders. That is, like the mouthbrooding acaras (*Bujurquina* sp.), they lay their eggs on a substrate, guard them briefly and then uptake them for further oral incubation. Certainly this is so for those that have been captively spawned, and anecdotal observation (e.g., catching female *Satanoperca* species in the wild that cough up eggs or fry) suggests that the same is true for *S. acuticeps* and *S. lilith*, which have yet to be captively spawned. *Satanoperca daemon*, however, may be an exception (see below).

In *S. leucosticta*, courtship commences with head-to-tail circling and slapping, gill flaring and genital butting — usually initiated by the ripe female. Soon, both parents begin scrubbing prospective egg receptacles. In the wild, Fred Cichocki (1976) reports that these fish favor movable platforms to hold their egg clutches, much in the same way some acaras do (see part 3, March 1992, of this series). Cichocki reported that in one case, it was the sole of a shoe(!), in a second it was a waterlogged block of wood, and in a third, it was a large leaf — all chosen as egg receptacles. In all three cases, the pairs being observed tugged the egg-bearing platforms to safety when the creature in mask and fins was noticed!

In the aquarium, where movable platforms are usually not available, immovable substrates — often smooth stones or even vertical slates — are acceptable. I don't recommend trying a pair of waterlogged, worn Reeboks, although it certainly might be entertaining!

After several hours of meticulous scrubbing, the first eggs are laid. The female expresses a line of 12 to 20 eggs at a time, with the male following closely behind, presumably fertilizing them. Each succeeding track of eggs intersects, eventually forming a tight plaque of 200 to 300 moderately large (2 x 1 millimeter), ovoid, amber-colored eggs attached via their long axes to the substrate. Egg-laying is completed within an hour or so.

Shortly after completion, the eggs are covered — by both parents — with a fine layer of sand or gravel. Interestingly, even if a vertical surface is chosen, the parents still attempt to cover them. Both parents guard the clutch for roughly 36 to 48 hours before chewing the fry free of their eggshells and gently uptaking them into their mouths for additional incubation. (Interested readers are directed to an earlier article of mine [Leibel 1987b] that includes a photographic sequence of these spawning events.)

The *Satanoperca* species that have been spawned have proven to be biparental mouthbrooders that cooperate fully in the incubation and rearing of fry. Fry are released about 48 hours (at 80 degrees Fahrenheit) after their uptake for mouthbrooding for 84 to 96 hours. The fry resorb their yolk sacs for an additional four days, at which time they feed voraciously on newly hatched brine shrimp and finely ground prepared foods.

The adults continue to shelter the fry for two to three weeks after hatching, offering them shelter in their mouths when they are threatened. When alarmed, the parents assume a head-down position (30- to 45-degree angle) and scull slowly backwards with open mouths. The fry respond to this parental behavior by schooling rapidly towards the mouth and diving deep into the throat. This behavior is apparently an innate, genetically programmed aspect of their behavioral repertoire, and we will explore this behavior further in the next installment of this series.

When danger has passed, the fry are released by spitting, or they are gently expelled through the gills to resume foraging under the parents' watchful eyes. Growth is moderate and lengths of 1.5 to 2 inches are attained within the first year. Fry should be removed within three weeks of release. Otherwise they will be eaten by the pair as they ripen and prepare for another spawning.

While *S. leucosticta*, *S. jurupari* and *S. pappaterra* (and a few of the "undescribed" *jurupari* look-alikes) have been captively

spawned several times, they are by no means "easy" fish. Moreover, *S. daemon* has been spawned only very infrequently and, to the best of my knowledge, *S. acuticeps* and *S. liliith* not at all! I have heard of two spawnings of *S. daemon* in this country, but in neither case were spawns observed or fry reared. The only published spawning account of this fish is Eckinger (1987) in the German Cichlid Association's (DCG) magazine, complete with a photo of happy parents and swarming fry!

Recently, Lee Newman of Vancouver, Canada, has had the Eckinger (1987) article translated by Philip Bruecker of the Vancouver Public Aquarium, because he was attempting to spawn *S. daemon*. In that article, no mention is ever made of mouthbrooding! In fact, the parents are described as having excavated the gravel so as to lay their eggs (the very end of egg laying was witnessed), which were then promptly covered over with 2 inches of gravel. The female — primarily — fanned the pile until about 76 hours after spawning, when the wrigglers were dug up, moved to another pit and again covered with 2 inches of gravel.

At six days post-spawn, the tiny free-swimming fry appeared over the gravel. The parents did not provide oral shelter. Rather, when threatened, the fry disappeared into the gravel heap. So, if nothing has been lost in either the story telling or the translation, *S. daemon* may well not be a delayed mouthbrooder.

The secret seems to be a very low pH of 4.5, with no measurable hardness! Breeders of several *Apistogramma* species, including the mythical *A. nijsseni*, have found that very acid water was needed to enable egg hatching, so I'm not really surprised at the report for *S. daemon*. Moreover, pH may well be the missing link in preventing that scourge of *daemon/acuticeps* husbandry: neotropical bloat.

Many of us who have attempted to work seriously with either of these *Satanoperca* species have been plagued with what has been tagged "neotropical bloat," in which an apparently healthy group of *S. daemon* or *S. acuticeps*, even those kept for several years, will break down seemingly at random — and with little warning — one by one. Heavy respiration and white stringy feces are the classic symptoms — the fish refuse food and often hang listlessly near the power filter return. The fish slowly bloats, its abdomen filling with fluid, and it dies a slow death several weeks later that is no doubt as agonizing for the fish as it is for the owner of that fish to watch.

I have had large colonies of *S. daemon* from several importations mixed together go (swelled) belly-up one by one while living with other cichlid fish (e.g., *S. leucosticta*) that remained fit. I'd cite lax water maintenance as the cause if it weren't for shared experiences by aquarists of considerably more meticulous bent than myself. Naladixic acid, if administered early in the game, may sometimes reverse incipient bloat in those fish. I tend not to get too attached to whatever *S. daemon*, *liliith* or *acuticeps* I acquire, because I view them as little time bombs.

Clearly, something is missing in their care — perhaps related to water chemistry. So the trick in spawning these fish is to first raise them successfully to maturity — no easy thing in itself — and then to induce spawning and successfully rear the fry! Want a challenge? Here you are.

The *Satanoperca geophagines* are an interesting and beautiful group of South American cichlids. Hopefully, some of you will take up the challenge and spawn these highly desirable cichlids. Little can compare to the aesthetic and aquaristic pleasure had in successfully raising a shoal of any one of the demonfish to healthy adulthood. It is truly a test of one's aquaristic virtuosity.