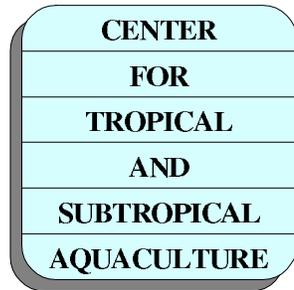

Raising the Silver Arowana (*Osteoglossum bicirrhosum*)

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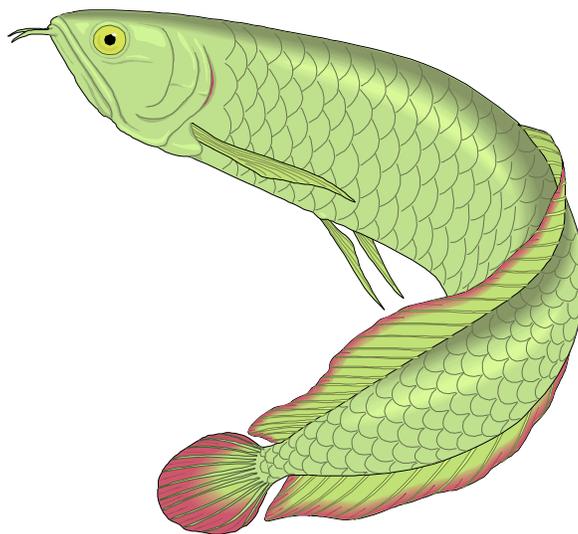
Background

Arowanas are large, majestic fish with enormous, pearly scales. The family Osteoglossidae emerged in the Jurassic Age and appears to have changed little in the last 150 million years. It is a unique and striking group of fishes and always very much in demand in the ornamental fish trade. To date, only three captive spawnings of these fishes have been documented.

The arowanas (sometimes spelled "aruanas" or "arrowanas") are one of the most valuable of ornamental fishes, commanding prices ranging into the hundreds or thousands of dollars per fish. Their common Chinese names, the "Dragon Fish" or "God Fish" give some idea of the mystique that is associated with these fishes.

The silver arowana (*Osteoglossum bicirrhosum*) from South America is the most common species of this primitive family, but newly hatched fry still typically retail for \$10 or more, while healthy adults typically retail for \$250 or more. Only the silver and the black

Silver Arowana



arowana (*O. ferreira*) can be transported with elaborate permitting. The most highly sought red and golden arowanas (*Scleropages formosus*) are endangered and at present can only be obtained on the black market. However, like the ubiquitous fake Rolexes, golden arowanas can be obtained throughout Southeast Asia because high profits offset the inevitable fines. A single golden arowana has a street value of about \$1,400 in Indonesia. We hope that our work with the silver arowana can lead to propagation of the other species, both for conservation and hobby purposes.

Spawning the Silver Arowana

In early 1991, we stocked an 8-foot-diameter aquaculture tank with 12 baby arowanas that measured 3 to 4 inches each; several still showed yolk sacs. The tank was equipped with flow-through fresh water and covered with nylon mesh. The latter is an important point. These fish will jump out of their tanks regardless of their age or size, so tanks should be covered at all times. The tank was stocked with mosquito fish, culled mollies and other live feeds on an average of twice a week. Five of the original 12 arowanas survived the three-year growout to sexual maturity. Mortality of the other seven fish occurred throughout the growout period, but was associated with storms (e.g., Hurricane Iniki) in most cases.

The five survivors are now approximately 4 feet long, which we think will be their maximum size. However, size data on arowanas are inconsistent. The respected reference *Exotic Tropical Fishes* lists the maximum size for silver arowanas as 18 inches and possibly larger. Aquarium-raised specimens will likely reach 18 inches to 2 feet.

The arowanas are not very particular about their water, at least in terms of water chemistry. Unlike many other Amazon fishes, the arowanas do not seem to require soft, acidic water for successful culture. We made no special effort to regulate temperatures, which changed seasonally and generally ranged in the 70s (Fahrenheit). Hardness and pH were not monitored systematically, but hardness probably averaged 60 mg per liter, and pH probably ranged from 7 to 8. We maintained a stringent level of tank cleanliness, especially for the young arowanas and during maturation and spawning. Our reliance on live and floating feeds, coupled with routine tank cleaning and the use of a flow-through system, helped to avoid fouling.

As the five fish began to show signs of approaching sexual maturity, they were transferred from the Mariculture Research and Training Center to the Hawaii Institute of Marine Biology's Coconut Island facility, where they could be watched more closely. At that time, the fish ranged from 24 to 30 inches in length. Moving fish of this size is a tricky job, and the atmosphere during such a process can best be described as rodeo-like. We used a pair of 3-foot diameter fiberglass tanks fitted with $\frac{3}{4}$ -inch plywood lids, which the largest of the arowanas seemed determined to dislodge. The move was made without any casualties, aside from a few minor injuries that were equally distributed among the fish and their handlers.

During 1993, the adult arowanas were fed primarily a floating trout chow, which they accepted readily. Floating feeds seem to be the only acceptable alternative to live feeds for these surface-feeding carnivores; they would not accept any sinking pellets that we offered.

During summer, clear indications of ovarian maturation became visible in two of the fish, and behavioral signs of pairing became evident. The largest two fish of the group became practically inseparable. In late October, we switched back to live feeds, using goldfish. By mid-November, the two females were evidently gravid. This led to a spawning in December 1993 and another in January 1994, both of which coincided with the new moon. Since all five fish were together at the time of these spawnings, we were not able to identify or separate the spawning pairs. Some evidence of violence—a few missing scales and a bloody lip—was noted among several of the fish at the time of the first spawn.

Larval Rearing

Arowana are mouthbrooders, with the males generally holding the eggs or fry for at least two months. The eggs are quite large at 4 to 5 mm in diameter. The fry are normally between 2 and 3 inches at hatching, and broods range from 12 to 30 fish. The young should be separated from the adults as soon as possible. This can be accomplished by prying open the mouth of the paternal fish and collecting the fry or by waiting until they are released naturally. The preferred method depends in part on the behavior of the parents. If they care for their young, the natural method is fine and reduces trauma to the parent. However, if they show signs of eating their progeny, their young should be removed by the latter method. Also, farmers who are repeatedly spawning these fish would find advantages in separating the young; at least in other mouthbrooders, the

presence of fry inhibits the development of the ovary toward the next cohort, so removing the fry probably reduces the interval between spawns.

Arowana fry grow rapidly on adult *Artemia* and baby livebearers such as mollies. Crowding fry during growout can lead to fighting and loss of stock, so the offspring should have ample room to grow. We recommend against using anything smaller or more crowded than the 8-foot-diameter tank stocked with 12 fry for growout. They should be raised in large, uncrowded tanks or ponds in which they are the largest fish. Our adult fish are now housed in an 18-foot diameter tank. Isolation of individual fish is usually unnecessary, but they can be rather severe with their pecking order, so it should be monitored. One technique that helps is the addition of one or more "target fish," such as a 6-inch goldfish, on which the young arowanas can focus their aggression.¹

Baby arowanas can be marketed at any time, even with the yolk sac showing; yolk-sac fry commonly appear in pet shops. Even with a yolk sac, these larvae are not delicate and are shipped worldwide in plastic bags, although it may be risky beyond 24 hours in transit under normal conditions.

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¹*The same concept was used in an episode of "The Outer Limits," in which a fake alien was concocted in order to bring quarrelsome world leaders into harmony.*

