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The *Pelvicachromis pulcher*: A Local Aquarium Species

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ABSTRACT: A review was carried out on the *Pelvicachromis pulcher*, a local Aquarium fish that possesses a great ornamental value. The review aimed at eliciting interest in the culture of the species, as an additional aquarium fish for the development of the Ornamental fisheries industry in Nigeria. The study revealed that the *Pelvicachromis pulcher*, is widely distributed in southern Nigeria, western Cameroon and eastern Benin. They are a dwarf freshwater teleost fish, with males attaining a maximum length of approximately 12.5cm (4.9 in) and a maximum weight of 9.5g (0.34 oz), while the females are smaller and deeper bodied, with a maximum length of 8.1 cm (3.2 in) and a maximum weight of 9.4 g (0.33 oz). Their beautiful coloration makes them important ornamental fishes. Both sexes have a dark longitudinal stripe that runs from the caudal fin to the mouth and pink to red abdomens, the intensity of which changes during courtship and breeding. Their environmental requirements is 24-26°C temperature, acidic to neutral (pH 5.6 – 6.2, and soft water (12 – 22 mg/l – 1CaCO₃). They are secretive cave spawners, and exhibit vigorous parental care, but easily breed in captivity. They are omnivorous, and so easily manageable. However, its availability in the market is limited. This is as a result of certain constraints such as the absence of its Aquaculture, as very little is known about it and its economic importance where it occurs naturally, collection of fish from the wild for stocking tanks which is associated with risks in their area of occurrence.

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Pelvicachromis pulcher, (Boulenger, 1901) are commonly known as the Rainbow Krib, Kribensis, and other common names, including various derivatives and color morphs of the Kribensis, such as: Krib, Common Krib, Red Krib, Super-red Krib, Rainbow cichlid and Purple cichlid (Froese and Pauly 2006). The fish is a dwarf freshwater, cichlid commonly found in Nigeria and Cameroon (Froese and Pauly 2006). Stiasny *et al.* (2008) reported this dwarf species in southern Nigeria, western Cameroon and eastern Benin. *Pelvicachromis* is a subgenus of the complex, polyphyletic and heterogeneous *Pelmatochromis* (Steindachner, 1894); a group of African cichlids that grow to a maximum of about 10 cm total length.

Aquarium keeping is a global industry worth between 15 and 30 billion U.S. dollars (Cato and Brown, 2003; Tlusty *et al.*, 2013). In America in 2017, it was reported that, there were 12.5 million households keeping freshwater aquaria, and 2.5 million keeping saltwater aquaria housing 139.3 million individual freshwater, and 18.8 million saltwater organisms (American Pet Products Association, 2017). Aquarium industry is the mainstay for several Asian countries such as the rich Singapore and Malaysia. It

is also, a major foreign exchange earner for the developed countries such as the USA.

The *Pelvicachromis pulcher* are of immense commercial importance as aquarium fishes in the global aquarium fish trade (Thys, 1968; Ted, 2011; Berg 2016; Sharpe 2019). The species is a popular cichlid for the aquarium due to its beautiful colouration. It is very popular amongst aquarium hobbyists (Froese and Pauly 2006). The *Pelvicachromis pulcher* is one of the most popular fishes in the aquarium hobby. It has been used in aquariums since the 1960s, with a relatively recent flood of Krib exports from West Africa that has generated a lot of new interest (Ted, 2011).

Also, there are very few wild *P. pulcher*, as they are scarce (Hill, n.d.). This was linked with major threats to the capture of *P. pulcher* associated with the origins of this species such as; kidnaping, militancy, communal clashes in Cameroon and southern Nigeria (Opoku *et al.*, 2016).

Despite the global appreciation, backed by the scarcity of the species for stocking aquaria, and the economic potentials of its marketing, there is scarcity of information on *Pelvicachromis pulcher*, for establishing a sustainable mass production process for

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farmers. This review work therefore aims at harnessing available research information on the biology and culture of the *P. pulcher* that can enhance sustainable aquaculture of these species and/or elicit interest and create a leverage for interested fish culturists.

The Biology of Pelvicachromis Pulcher: Description:

The fish is a dwarf freshwater, cichlid (Froese and Pauly, 2006; Stiassny *et al.*, 2008). In the wild, male *P. pulcher* attains approximately, a maximum length of about 10 cm to 12.5 centimeters (4.9 in) and a maximum weight of 9.5 grams (0.34 oz) (Froese and Pauly, 2006; Stiassny *et al.*, 2008). The females are smaller and deeper bodied, growing to a maximum length of 8.1 cm (3.2 in) and a maximum weight of 9.4 g (0.33 oz) (Nwadiaro, 1985). Both sexes have a dark longitudinal stripe that runs from the caudal fin to the mouth and pink to red abdomens, the intensity of which changes during courtship and breeding. The dorsal and caudal fins may also bear gold-ringed eye spots or ocelli. Males show color polymorphisms in some populations collected at single localities (Heiligenberg, 1965). Juveniles are monomorphic until approximately six months of age (Martin and Taborsky, 1997).



Fig. 1: Male *Pelvicachromis pulcher* (Source: thekrib.com)



Fig. 2: Female *Pelvicachromis pulche* (Source: thekrib.com)

Distribution and Environmental Requirements: *Pelvicachromis pulcher* is native to Central Africa. In Western Africa, this species is known in Lower Guinea, Western Cameroon (Ndonga), Southwestern Nigeria (Cross River) (Lalèyè, *et al.*, 2010) and most recently in the Upper New Calabar River (Ibim and Gogo, 2013). *Pelvicachromis pulcher* occurs in warm (24–26 °C or 75–79 °F), acidic to neutral (pH 5.6–6.2), soft water (12–22 mg L⁻¹ CaCO₃ (Nwadiaro, 1985). It inhabits both slow- and fast-moving waters, but is only present where it can find dense underwater vegetation. Tank-raised specimens are normally more tolerant to alkaline conditions (in some instances, up to a pH of 8.5) than wild-caught ones (Berg, 2016). Populations of *P. pulcher* have also been found to occur outside its natural range in Hawaii, USA as a by-product of the ornamental fish trade (Yamamoto, 1992). *Pelvicachromis pulcher* is a demersal substrate spawner and is therefore usually found around dense underwater vegetation (Ted, 2011). It is so sturdy and easy to care for in captivity and the reason could be due to the fact that within its natural range, it encounters several different water conditions as, close to the sea, the Niger Delta's water is hard, alkaline, and slightly brackish, on the other hand, the streams that feed the delta are much less hard and alkaline, and they do not get any saltwater. The lowest-lying streams are actually soft and acidic blackwater habitats. A species forced to handle different environments and arbitrary alterations (brought on by varying water flow from streams) should be able to cope with diverse habitats. It generally occurs in freshwater and in brackish water, and is able to survive in anoxic conditions. It occurs in warm (24–26 °C or 75–79 °F), acidic to neutral (pH 5.6–6.2), soft water (12–22 mg L⁻¹ CaCO₃) (Staeck and Linke, 1994). It can survive a pH of up to 8.5 in tanks.

Nutrition: Mills and Ververs (1989) reported that *Pelvicachromis pulcher* feed on worms, crustaceans and insects. Contrarily, Nwadiaro (1985), observed that the main food items were diatoms, green algae, pieces of higher plants, along with blue-green algae. Invertebrates, though consumed, were found to be relatively uncommon food items for wild fish. Sharpe (2019), reported them to be omnivorous in nature, making feeding them in aquarium tanks easy, where they generally eat all kinds of live, fresh, and flake foods. Thus, in aquariums they accept flake or pellet foods, frozen brine shrimp, freshly hatched brine shrimp, daphnia, mosquito larvae, bloodworms, and even vegetables. Keeping them in good health would require giving them high quality flake food or cichlid pellet everyday as a staple and feeding them a variety of feed. They are bottom dwellers, so provision should be made for feeds that will sink, such as sinking

pellets. When conditioning fish prior to breeding, provide plenty of live foods to mimic the wild.

In aquarium tanks, they are to be fed 2 to 5 small pinches of food a day in smaller amounts, with vitamins and supplements added to their foods, rather than a large quantity once a day. This will keep the water quality higher over a longer time. (Clarice and David, n.d.).

Reproduction and Culture: In the wild, detail information on their reproductive biology is limited. However, the species are said to be secretive cave spawners (speleophils), they breed in holes excavated beneath aquatic and semi-aquatic plants (Wikimili, 2019). In captivity, artificial caves are readily accepted as breeding sites, however, these too are excavated prior to egg-laying. Kribensis cichlids are devoted parents that form monogamous pairs and raise their offspring together. During spawning, the female deposits 50 to 300 eggs, usually in the roof of a cave. The male fertilizes them and both parents guard the eggs, taking shifts to allow each other to feed. The male also spends a lot of his time guarding the surrounding area from intruders. It is noteworthy, however, that the female is predominantly responsible for fry care, while the male is primarily involved in territorial defence (Martin and Taborsky, 1997). As in all *Pelvicachromis* species, the gender ratio of female to male fry increases with pH (Heiligenberg, 1965; Rubin, 1985) This ratio is also known to vary at different locales in the wild. Male color polymorphism may be indicative of behavioral differences. For example, red males obtained from a single site were found to be more aggressive and more polygamous than yellow males obtained from the same site. In addition, the species have been demonstrated to engage in cooperative territorial defense where multiple males defend a single territory (Martin and Taborsky, 1997). When the eggs hatch after roughly three days, the tiny offspring will be moved to a pit or some other safe spot deemed suitable by the adults. At this stage, they are small enough to be moved inside their parents' mouths. In captivity (tanks), it is common for Kribs to start courting within a week of being introduced to the tank, and any coaxing from the aquarist is usually superfluous. If the couple seems reluctant to breed, the water temperature should be checked and more suitable caves should be provided for them to explore. Breeding takes place on the inside roof of a cave after a dance and display during which the female forms a vague 'L'-shape with her body. Spawning activity can sometimes be encouraged by pushing the temperature up a couple of degrees but to no higher than 27°C/80.6°F. Without caves present, expect nothing. Feeding them plenty of live, meaty

food can also induce spawning behavior. Despite being tolerant of a wide range of water parameters, they are more inclined to spawn in soft and acidic water (Berg, 2016). When the pair spawn, there can be some defensive behavior from the male, who protects the immediate area while the female tends to the young. For the first nine to ten days she may make no appearance at all and will hide away while the male patrols. At this stage, removing any community bottom dwellers would be wise because they may be struck by the defensive male if they stumble into the target area.

When their eggs hatch, first food for the fry is usually tiny organic matter, but they are soon large enough to eat powdered flakes and newly hatched brine shrimp. After five to ten days, the fry are usually large enough to be brought out of the cave to attend feeding excursions. However, they will still spend each night inside the cave where they were born, or any other cave deemed safe enough. The female also starts taking the offspring out on small trips around the tank, hastily scurrying them back into their hiding spot as soon as she perceives any possible danger in the environment. Before letting the fry out, the female always scouts the territory to make sure it's safe. Ideally, the fry should stay with their parents until they are at least ½-inch (1.5-cm) long. Removing them too soon can make the male harass the female to death, as he'll want to spawn again and she won't be physically ready at this point.

Also, Kribs become aggressive while protecting their young, egg and fry. This aggression is usually not a problem if the aquarium is large enough. Giving a couple their own breeding aquarium is therefore the best solution in some situations.

Since its introduction to the hobby in the 1960s (Ted, 2011), it's been popular among aquarists. However, studies on the culture of the species is scarce, however, information from a handful hobbyist experiences (Ted, 2011; Berg 2016; Sharpe 2019), who worked on them describe the culture based on their personal. Ted (2011), reported that, this fish is one of the best choices for new comers into ornamental fish breeding, as a result of its manageable size, entertaining, beauty and easy breeding.

Ted (2011), further stated that, breeding the fish is quite easy, as a result of the fact that, the *P. pulcher* withstands several variety of conditions due to the nature of its natural environment. Thus, to breed them, 2 or more couples (obtained from the wild or artificially bred) depending on the size of the tank will be required, as well as several caves to act as potential

spawning sites (upturned clay flowerpots with a small piece of the rim removed work particularly well). An air-powered sponge filter is necessary for gentle filtration. It is important to note that raising a group of 6 or more juveniles together is best for pairing as they would pair naturally.

Problems associated with P. pulcher Culture in Nigeria: Problems with culture of this species in Nigeria include:

Inadequate information: Not much study has been done on the fish so keeping the fish and breeding it is done intuitively. Information on the reproductive biology, feeding habits, diet, etc. required for the culture are inadequate to undertake large scale culture of *P. pulcher*. Adequate information will generate more interest to both local and foreign researchers, who will in turn provide more information for the mass production and marketing of the species.

Inadequate market: Lack of awareness for the value of aquarium fishes generally is a threat to their culture in Nigeria. Not many homes and offices in Nigeria have. The aquariums in these places have exotic species and this makes it expensive and restricted to the rich. If more people can understand the value, more of it would be cultured and made available increasing the market for it. It would also provide foreign exchange earnings for the Government as this species available locally are in high demand abroad.

Inbreeding: is a phenomenon that describes the production of offspring from the mating or breeding of individuals or organisms that are closely related genetically. For this species, problems for inbreeding are not documented but shorter lifespan, poor coloration, etc. could be possible problems. Inbreeding occurs because of inaccessibility to the wild by interested fish farmers. When distance as well as insecurity are considered by these aqua-culturists (mostly foreign) they sit back and breed with the available fish stock leading to inbreeding.

Inaccessibility and Insecurity: as pointed out earlier, the fish are found in areas of civil unrest. Southern Nigerian States like Rivers, Bayelsa and Delta are popular for security threats especially. This makes *P. pulcher* culture difficult because to avoid inbreeding, juveniles from the wild are needed from time to time. Researchers and Aquaculturists stand the risk of kidnap when visiting such areas and this needs to be checked for successful culture in Nigeria.

Conclusion: *Pelvicachromis pulcher* is a local aquarium fish species that is very popular among major aquarists, with its popularity increasing daily

globally. This is because of its beauty, hardiness, easy adaptation to several water conditions, not easily susceptible to diseases, ease of keeping, among others interesting features. However nothing is being done to produce them in large quantities to meet the global demand in Nigeria. Therefore, this study will contribute immensely to the development of research and culture techniques that will lead to large scale Aquaculture production of the species to meet the high global demand.

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