The Amazon pufferfish, Colomesus asellus

Antoine Saucier and Alaa-Edine Bayech, November the 18th, 2023, Montreal, Canada.

This article on the Amazon pufferfish (APF) is in two parts: in the first, on pages 1 to 10, we offer a literature review that includes biology and aquarium books, aquarium magazine articles, scientific publications, selected internet references (databases, Wikipedia, YouTube) and testimonials from friends of the Maison du Poisson. In the second section, on page 10, we make our recommendations based on this review.



Photograph by Erling Holm, Royal Ontario Museum[1].

1 - Literature review

Introduction

Scientific name	*Colomesus asellus* (Müller and Troschel, 1849), from the Greek kolos = short and mesos = half [1]. The meaning of the word asellus is uncertain. It may refer to the Asellus genus of aquatic crustaceans in the Asellidae family [19], on which *Colomesus asellus* may feed [20].
Common name (in French)	Poisson-globe amazonien, poisson-ballon amazonien [11].
Common name (in English)	Amazon puffer [1].
Common name in Peru	Pez Globito [1] [12].
Common name in Brazil	Baiacu-de-agua-doce, Corrotucho [1].

The coloration of this fish is green on top, white on the underside, with black transverse stripes on the dorsal surface [27]. Its body is club-shaped ([17] page 7), the pelvic fins are absent, the anal fin is located very close to the tail and the eyes are large [12]. It can be distinguished by the presence of a large black spot on the underside of the caudal peduncle [1]. Males and females appear visually identical.

[1] This photograph is published with kind permission from M. Erling Holm.

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Colomesus Asellus is a tetraodontiform [3], from the Greek tetra = four and odous = tooth, and the Latin forma = shape. The common name tetraodon is also spelled *tétrodon* [21] in French. The Amazonian Pufferfish (APF) does indeed have four teeth, two at the top and two at the bottom ([12]), somewhat resembling a parrot's beak. These teeth, which are actually bony outgrowths [8], are capable of crushing the hard shells of their prey, enabling them to feed on aquatic and terrestrial insects [13] [14], molluscs and invertebrates [2].

There are at least 199 species of tetraodontiformes distributed in 28 genera, most of which are marine [4] [12]. There are 29 species of freshwater tetraodontiformes on three continents [12]. Tetraodontiformes are absent from cold waters ([17] page 6). There are only three species of the Colomesus genus in the Amazon basin [10] [12]. Two of these species inhabit freshwater rivers, *Colomesus asellus* (Amazon pufferfish, 13 cm [12]) and *Colomesus tocantinensis* (Tocantins River tetrodon, 3.5 cm [10]), which resembles the APF. These two species are the only freshwater puffers in South America. The third species, *Colomesus psittacus* (banded puffer, or parrot puffer, 29 cm [12]), inhabits the marine or brackish waters of northeastern Brazil.

If threatened, the APF may inflate by swallowing water (or air) into a thin-walled cavity opening ventrally from the stomach [12], making it more difficult for predators to swallow. Klaus Ebert[2] ([17] page 10) reports that a puffer can also inflate spontaneously for no apparent reason.

Another natural defense of APF is a potent neurotoxin, saxitoxin [4], which is concentrated in the liver and ovaries [12]. The term saxitoxin derives from the genus name of the clam (Saxidomus) from which it was first isolated [22]. The ingestion of saxitoxin by humans, usually following the consumption of shellfish contaminated by toxic algal blooms, is the cause of the disease known as paralytic shellfish poisoning [22]. Shortly after ingestion, saxitoxin attacks the nerves and causes progressive paralysis, blocking breathing and leading to suffocation ([17] page 7). The victim remains conscious throughout, but unable to speak ([17] page 7). There is no antidote to this poison ([17] page 7).

Importation of APF is sporadic and uncommon, largely due to seasonal changes in its wild habitat and the challenges associated with collecting it [6]. The vast sandy expanses where they are found in significant shoals exist for only part of the year, being inundated during the annual floods when the river rises and floods the surrounding forests [6].

According to the Red List of the International Union for Conservation of Nature, the conservation status of the APF is *Least concern* [1] [5]. It is therefore not a globally endangered species, although it may indeed suffer from pollution in certain regions of the Amazon [4].

It's worth noting that Pufferfish are being studied in genetics because their genome is around ten times shorter than the human genome, for the same number of genes [24]. The tetrodon genome is in some sense more compressed than the human genome, providing avenues of research for a better understanding of the human genome.

[2] Klaus Ebert is an aquarist with 45 years' experience in aquarium pufferfish maintenance ([17] page 6).

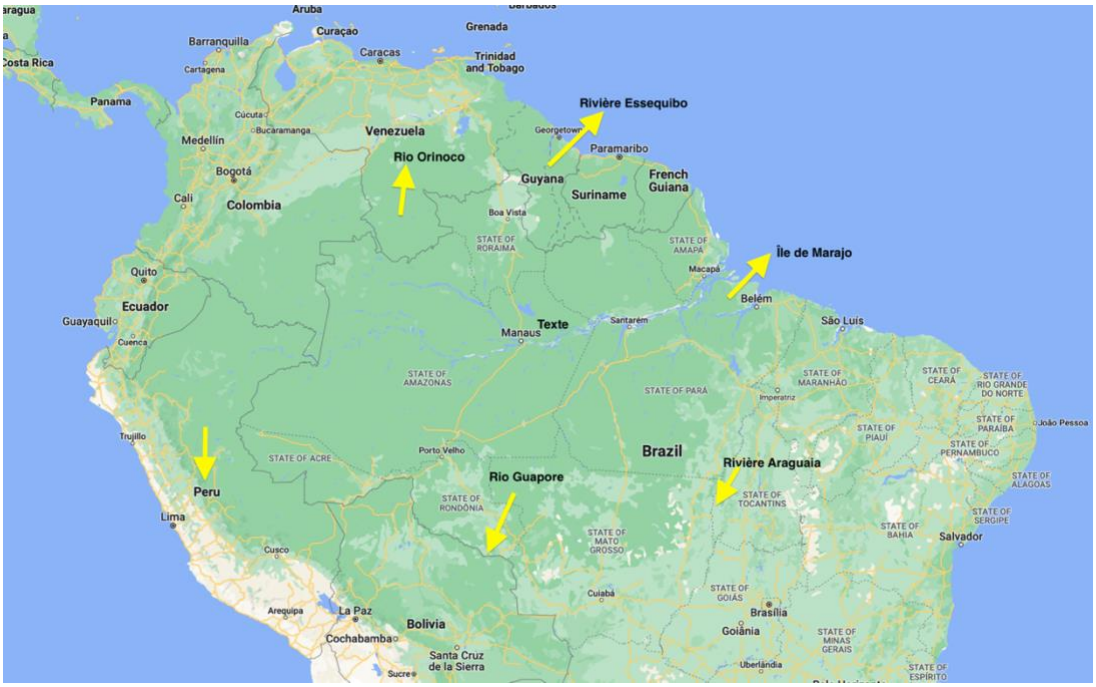
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Geographical distribution

The APF lives in South America (see map below) in the following regions [1]:

- Amazon basin from Peru to Marajo Island, including the Araguaia and Guaporé tributaries.
- Orinoco river basin near the mouth.
- Essequibo river basin.

Note that APF is absent from the Rio Negro [7].



Geographical distribution of the APF (map from Google Maps annotated by the authors).

Size

The maximum size of the APF is 12.8 cm in the wild [1], and 8 cm in the aquarium [8].

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Natural environment

The APF lives mainly in freshwater and estuaries, close to the bottom, and can tolerate brackish water [1]. Throughout its vast range, it is found in waters with a temperature of 22 °C to 28 °C and a pH of 5.5 to 7.2 [1]. It is a river fish, living in well-oxygenated water that is constantly replenished by tropical rains.

The APF typically inhabits open water in sandy shoals [6]. These areas are generally whitewater, i.e., areas of murky water bodies of turbid water rich in sediment, insects and crustaceans or molluscs on which APF feed [6]. In some parts of their range, they can also be found in areas of clear water, although this is less common [6].

Biology and behavior in the wild

Behavior in the wild

When conditions are good and water levels are low, it's relatively simple to collect these fish by hauling a long seine to the sandy shore [6]. A good haul can easily yield several dozen APF, as well as an assortment of sand-dwelling loricariids, medium-sized pimelodids and thousands of tiny freshwater shrimps [6]. APF can form groups of hundreds of individuals located near the bottom of muddy Amazon beaches during the dry season [12], suggesting the existence of some type of social or cooperative bonds between individuals of this species.

According to Neale Monks[3] [8], the APF's good character in the aquarium is linked to its mode of reproduction: while most other freshwater puffers protect their eggs and fry, the APF simply scatters its eggs over the substrate, and the fry, once emerged, spend some time floating along the river as plankton. Since the APF protects neither its eggs nor its fry, Monks suggests that it has no reason to be territorial. He also emphasizes the nomadic nature of the APF, which migrates along rivers, often settling in lakes for part of the year. In this sense, the APF does not appear to be a fish that defends a fixed territory.

[3] Neale Monks (b. 1971) is a former paleontologist at the Natural History Museum in London, where he worked mainly on heteromorphic ammonites. He now writes about tropical fish and Macintosh computers [23].

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Food in the wild

The APF feeds mainly on small benthic aquatic animals, such as crustaceans, gastropods, and bivalves, which it crushes with its powerful jaws [12]. In a detailed study of the stomach contents of 49 APF, Pereira et al ([13], 2007) report that the APF feeds on aquatic insects (32% by volume), terrestrial insects (31%), fish (11%), plant matter (11%), sediments (11%), detritus (2%), algae (0.4%) and micro-crustaceans (0.1%).

In a more recent 2018 study, Bartolette et al [14] report that the APF feeds on mayflies (also called "mannes" in Quebec) (49% by volume), gastropods (25%), fish scales (8%), insect fragments (6%), chironomids (6%) and sediments (4%).

Breeding in the wild

According to Araujo-Lima et al ([7], 1994), APF reproduction appears to be similar to that of the pelagic puffers, with the parents not caring for the brood at all [8]. The same authors report that the larvae are mainly concentrated along the banks, but during floods they are passively transported to the lakes on the floodplain. They also point out that the small size of the larvae (2.7 mm) indicates that the eggs are small. Egg-laying in rivers requires high fecundity, as larvae suffer a high mortality rate, so APF probably lay many small eggs, like marine puffers [7].

Aquarium needs and behavior

Generalities and aquarium

According to Mike Tuccinardi [6], the APF is a popular aquarium fish because of its small adult size and very active behavior when in a group. According to this author, APF are most at home in groups of six or more. He also stresses the continual activity of APF and recommends a suitable swimming area and at least moderate current in the aquarium.

Monks [8] also points out that APFs are almost constantly moving swimmers in the aquarium, which distinguishes them from other puffer species. According to this author, what is most important for APFs in the aquarium is sufficient swimming space and a good current. Monks adds that decorations (caves, hiding places etc....) would be unimportant for APFs. However, Ebert [17] recommends keeping them in a planted community aquarium with plenty of hiding places.

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According to Monks [8], APFs are easy-to-keep hardy and generally very well behaved aquarium fish, and they are one of the most attractive, interesting and exciting puffer species to observe.

Water quality

According to Monks [8], APFs are robust compared with other puffer species, and they are less sensitive to nitrate than the Mbu puffer. However, he recommends good water quality. As the APF's range covers almost all northern South America, it is expected that this fish can cope with a wide range of water quality. As the APF is a river fish living in water that is constantly replenished by tropical rains, aquarium water should be well oxygenated. The APF is considered sensitive to low concentrations of oxygen in solution [2].

Feeding the Amazon puffer fish in the aquarium

According to Monks [8], APFs in aquariums are omnivorous and accept a wide variety of foods, e.g., bloodworms, snail-like snails, minced crustaceans (shrimps, squid, mussels) and live foods such as daphnia, earthworms, and sowbugs. Monks notes that APF interest in plant material varies from specimen to specimen, but that some specimens seem to enjoy spirulina flakes, seaweed wafers and frozen peas. Ebert ([17] page 11) considers mussel flesh to be the ideal food for puffers in general, as mussels are highly nutritious (they also contain plant matter) and readily available in frozen form. The same author ([17] page 11) notes that puffers tend to overeat, which can cause their death either directly through indigestion or indirectly by polluting the aquarium water. As they eat, APF scatter food crumbs which are eagerly consumed by other fish in the aquarium ([17] page 10).

According to Tuccinardi [6], the APF is known to have a very fast-growing beak that requires frequent feedings of hard-shelled food or regular "trimming" of the beak in captivity.

Jordan [25] says he has managed to keep the teeth of his three APFs at a normal length by feeding them small frozen blocks of bloodworms, which the APFs must chew to eat.

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Behavior in the aquarium

According to Monks [8], puffers generally have the reputation of being aggressive loners, but he considers the APF to be an exception. This observation is confirmed by Tuccinardi [6], who notes that APFs are not aggressive towards their aquarium mates and do well in a community aquarium.

Monks [8] points out that APFs are not territorial and show no aggressive behavior towards their own or other species, which distinguishes them from other freshwater puffers. Monks notes that APFs are nervous when kept alone and are "less neurotic" when kept in groups (he recommends three or more specimens). The same author observes that APF follow each other briefly during the day, often compete for food and settle in groups on the substrate for the night.

Ebert ([17] page 12) notes that individuals who are initially nervous and reluctant to accept food integrate better into a community aquarium than those who accept food immediately. The same author notes great variability in character from one individual to another, some being fearless while others are distinctly shy.

The APF's swimming action resembles that of a helicopter or hummingbird, with its pectoral and dorsal fins acting as propellers. The APF can even swim backwards ([17] page 8).

Breeding in the aquarium

According to Monks [8] and Ebert ([17] page 19), reproductive behavior has not been observed in the aquarium. Fry rearing will probably be very difficult [8].

Health

Monks [8] considers that APFs are hardy and, when ill, respond well to drugs (such as eSHa 2000 for fin rot (infection by the bacterium Pseudomonas fluorescens) and fungi) and heal quickly. Monks reports that APFs are very prone to ich (*Ichthyophthirius multifiliis*, white spot disease) and should be treated promptly if serious problems are to be avoided. Monks advises careful observation during treatment (he uses eSHa EXIT) as APFs tend to be sensitive to certain chemicals.

One of the characteristics of tetraodontiformes, and of the APF, is that their four teeth grow continuously ([17] page 9), rather like the Canadian beaver. The major health problem for APFs is the speed at which their teeth grow, which is very high for a puffer [8]. Monks points out that it is possible to slow tooth growth by changing the diet to include crunchy foods such as snails, but also says that most aquarists will need to trim teeth once or several times a year.

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The method recommended by Monks [8] for cutting the teeth of an APF is as follows:

1. Put the fish to sleep by placing it in a container of water to which clove oil (eugenol) has been added at a rate of 2 to 4 drops per liter. After a minute or so, the fish should be drowsy, so that it can be handled without squirming.

2. With wet hands, grasp the fish carefully and, using cuticle nippers, cut off the tips of the upper and lower parts of the "beak". Once you've finished, put the fish back in the net and hang the net in the aquarium so that the fish is bathed in the water current. Shortly afterwards, he'll be livelier than ever and ready for release.

Monks [8] points out that this operation, which may seem agonizing, is actually quite easy and much less stressful for the fish than having an oversized beak that prevents it from feeding properly. For more details on this operation, see [9] or the video [26].

Aquarium companions

According to Monks [8], the APF does not consider live fish as food, with the possible exception of live fry. However, Monks notes that the APF is a confirmed fin-eater and, when hungry, considers the fins of slow, long-finned fish as food. The same author therefore recommends avoiding keeping APF with angel fish, gouramis, Congo tetras, live bearers, corydoras, etc. Monks notes that the safest companions for APFs are fish that swim very fast, such as certain tetras, or fish that hide all day (like the Synodontis catfish).

Monks suggests that perhaps the ideal is to have a group of half a dozen companionless APFs in a 125-180 liter (35-50 gallon) aquarium.

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Testimonials from friends of La Maison du Poisson

Charles-René Bazinet [15]: One APF lives in a 120-gallon community aquarium. Aggression towards other fish has not been observed. The APF eats everything. The APF also eats Bug Bites pellets hard enough to sink its teeth into, as well as live snails. The APF spends a lot of time pacing the windows of the tank, except at feeding time.

Js Morin [16] says he has several APF that do not bother the other fish in his aquarium.

Antoine Saucier (August 2023) has a single 5-cm APF in a 27-gallon planted with Vallisneria, in the company of a few cardinal tetras, two black widow tetras and six leopard loaches (*Sewelia lineata*). APF attacks on other fish were not observed. The APF flees to the bottom of the aquarium as soon as one approaches. The APF seems to like swimming in the current of the pump and spends most of its time swimming along the glass, up and down or right and left, a bit like jogging.

To feed him and hopefully wear down his teeth, the APF is fed hard pellets, Bug Bites 1.4 to 2 mm and Bug Bites pellets 5 to 7 mm (food for cichlids). The APF can swallow the 1.4 to 2 mm pellets almost whole, but it has to chew the 5 to 7 mm pellets to eat them, which should help wear down its teeth. The APF also likes bloodworms and Mysis shrimps but doesn't seem to eat flakes. The APF doesn't like to eat Malaysian trumpet snails, which seem to be too hard, but it will crunch small snails of the *Physa* genus like popcorn.

The APF was once observed pulling its eye back into its head, which looks weird as it has no eyelid! This phenomenon was also observed by Ebert ([17] page 10) for puffers in general.

Antoine Saucier (October, November 2023) Ten APF of about 2 cm, including the first, were installed in a 50-gallon aquarium planted with 18 dawn tetras (*Aphyocharax paraguayensis*). APFs are fed almost exclusively with 5-7 mm Bug Bites pellets. APF seem to prefer the larger pellets to the smaller 1.4 to 2 mm Bug Bites pellets. Competition to eat a pellet seems to stimulate the APFs' appetite, as they compete to eat each pellet. Note that APFs do not bite each other when competing for a granule. By giving the pellets away just a few at a time, they are eaten quickly and before they have time to soften in the water, which should promote wear and tear on their beaks. You can sometimes hear the crunching sound of the pellet being eaten. There is no aggression between the APFs or with the tetras, which are in fact quite aggressive with each other. The first APF, the largest, became less fearful than in the previous aquarium, where it was alone. It has begun to prefer the smaller Bug Bites granules (1.4 to 2 mm). The two smaller APFs are reluctant to eat the granules. It seems more difficult to find acceptable food for the smaller APFs, but it was observed that bloodworms are usually accepted.

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2 - Recommendations of La Maison du Poisson

Scientific name: *Colomesus asellus*.
Common names: Amazon puffer, *Poisson-globe amazonien* in French.
Maximum size 12,8 cm. Water: temperature from 22ºC to 28ºC, pH from 5.5 to 7.2, well oxygenated.

General: The Amazon pufferfish (APF) has a range that covers the whole of northern South America, and is therefore adapted to a wide range of water qualities. As the APF inhabits tropical rivers, it needs clean, well-oxygenated water. Its level of activity in the aquarium is much higher than that of most other puffer species. This swimming frenzy can become stressful for aquarists who aspire to calm. The APF should therefore be provided with sufficient swimming space, and possibly a current. Ebert [17] recommends a planted community aquarium with hiding places.



Intra-species sociability: Since APFs are found in the wild in groups of several hundred individuals, it seems preferable to have them live in groups. In the aquarium, APF can become fearful if they live alone, and less fearful if they live in a group. We also note that APF behavior varies according to their number: the more numerous they are, the more active they tend to be and the more they explore the aquarium. Keeping APFs in groups also seems to stimulate their appetite, as they compete to eat food as quickly as possible.

Inter-species sociability: Many report that APFs are not aggressive with each other or with other fish in the aquarium, which is very rare in the puffer family. The APF is more insectivorous than molluscivorous, unlike other puffer species. Although APFs feed mainly on insects and gastropods in the wild, it should be borne in mind that around 10% of their diet consists of fish and fish scales. To ensure the cohabitation of APFs with other fish species, it is therefore wise to choose species that swim fast or that can defend themselves. Slow, long-finned species risk being nibbled. For example, we have seen APFs bite the fins of discus. If the aquarium is large enough, cohabitation with other fish should not be a problem. An aquarium that is too small could lead to attacks caused by constant proximity.

Food: As APF are mainly insectivores, it might be ideal to offer them an insect-based food. APFs usually readily accept chironomid larvae (bloodworms), which are actually insect larvae. In the aquarium, APFs accept a wide variety of foods, e.g., bladder or ramshorn snails (note that snails of the *Melanoide* genus, e.g., the Malaysian trumpet snail, are too hard), minced crustaceans (shrimps, squid, mussels), mysid shrimps and live foods such as daphnia, earthworms, and woodlice. Small APFs are more difficult to feed than large APFs because of their small mouths. One of the main difficulties is finding a food that will keep the APF's teeth at a normal length. To date, this problem does not seem to have been solved. It may therefore become necessary to trim your APF's teeth periodically. One possible solution is to give APFs hard granules to chew, such as Bug Bites insect-based granules (size 1.4-2 mm or 5-7 mm), which they like to eat. If a small number of pellets are fed at a time, they will be eaten before they soften, which should help to wear down the teeth. Another approach [25] is to have APF chew a frozen piece of bloodworm. The exact mechanism of APF tooth wear in the wild is apparently not well known. It is possible that APF grind periphyton on rocks or submerged branches, so it might be useful to offer APF rocks or pieces of wood coated with a nutritive gelatine [18] (of the Repashy type).

Note: APFs are cute to eat, but you should never eat them or feed them to your cat, as their body contains a deadly neurotoxin.

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