

Basic Information and Husbandry Guidelines
for *Bedotia madagascariensis*,
Madagascan rainbowfish





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1. Characterisation

Scientific name: *Bedotia madagascariensis* (REGAN, 1903)

Vernacular names: Madagascan rainbowfish (Englisch),
Madagaskar-Ährenfisch (Deutsch), Zono (Madagassisch)

Length: Males up to 10 cm

Citizen Conservation#Fish category: III

Threat status according to IUCN Red List: Endangered (EN)

Accomodation: A fish that can be kept without problems and is also recommended for beginners.

For keeping a group of five adults an aquarium of 120 liters or more is suitable (approx. 80 x 40 x 40 cm). Larger aquariums up to 400 liters are better, in which also groups up to 10 animals can be maintained. The groups should preferably consist of more females than males. Water plants are used for egg laying. Water temperatures are constant at 24–25 °C. The species is tolerant to different water values (pH 7–8).

Equipment required: Aquarium, lighting, heater, filter, water thermometer, test kit for water parameters, mulm extractor, large stones and bogwood roots for structure and protection, planting, sand or gravel as substrate.

Feeding: Commercial flake food; frozen food (white, black and red mosquito larvae and brown shrimps); live food (artemia, white mosquito larvae)





2. Why is *Bedotia madagascariensis* a Citizen Conservation species?

Although the Madagascan rainbowfish is currently coping relatively well with the threats of habitat loss, hunting by invasive predators and overfishing thanks to its larger range, it is important to protect the species. About one-third of Madagascar's freshwater fish are endemic, meaning they can only be found there. According to the IUCN Red List, 80 percent of them are already considered endangered. Seven species are presumed to be already extinct. Programs that coordinate the breeding of the rare fish can counteract the extinction of further species. This makes it possible to buffer against events such as disease or habitat degradation to which the species cannot adapt as quickly and which may lead to its disappearance. Coordinated breeding can also prevent hybridization of closely related species.



The Pangalanes channel system is part of the original range of *Bedotia madagascariensis*.
| Pierre-Yves Babelon/Shutterstock



3. Biology and Conservation

3.1 Taxonomy

Bedotia madagascariensis belongs to the family Bedotiidae within the order Atheriniformes. The species was scientifically described as *Bedotia madagascariensis* by ichthyologist Charles Tate REGAN in 1903.

Order: Atheriniformes
Family: Bedotiidae
Genus: *Bedotia* (REGAN, 1903)
Species: *Bedotia madagascariensis* (REGAN, 1903)

The animal, on which the first scientific description is based, was brought from Madagascar to the Natural History Museum of Geneva by a Swiss. The ichthyologist REGAN was the first to name the genus *Bedotia* in 1903 after the then Geneva museum director and taxonomist Maurice Bedot.



Male *Bedotia madagascariensis* from Cologne Zoo | Thomas Ziegler



3.2 Description



Female *Bedotia madagascariensis* from Cologne Zoo | Thomas Ziegler

Bedotia madagascariensis has an elongated physique. Both sexes of the species possess two dark lateral stripes. In other species of the genus *Bedotia*, the stripes are either replaced by dark spot patterns or are completely absent in one or both sexes. From other species of the genus *Bedotia*, which also possess the dark stripes, *Bedotia madagascariensis* differs externally in the coloration of the caudal fin. It appears glaucous to iridescent at the base of the tail and has a continuous crescent-shaped black band with red or white tips at the posterior end (LOISELLE & RODRIGUEZ 2007). Males of the related and similar looking *Bedotia geayi* have a red spot on the chin that is absent in *B. madagascariensis*. (SCHÄFER 2021). *B. madagascariensis* exhibits sexual dimorphism: The unpaired fins of males are more colorful than those of females. In captivity, the species grows to about 10 cm in length. Wild animals usually remain smaller (LOISELLE & RODRIGUEZ 2007).



3.3 Occurrence and Habitat

The species' range includes eastward-flowing streams of the Ivoloia River to the Manambolo River, including small streams that drain into the intervening coastal lakes of the Pangalanes Channel. The species occurs at an elevation of thirty meters above sea level. Recently captured juveniles in the Ikopa River, near the town of Antanimary, as well as adults in the Lanefitra River in Akadibe town many hundreds of meters west of the above area, suggest that these presumably displaced animals are now well established in the Betsiboka Basin (LOISELLE & RODRIGUEZ 2007).

In the wild, *B. madagascariensis* is found in clear rivers that are partially or completely shaded. The composition of the riparian vegetation does not seem to influence the occurrence of the species. In fact, it occurs even where only exotic plants grow. The madagascar rainbowfish prefers the calm sections of shaded currents, but can also swim against stronger currents.

The species is also found in blackwater rivers with low pH value. However, it avoids brackish water, although high salinity levels are tolerated in aquaria (ZIEGLER et al. 2020).



The Pangalanes channel system is part of the original range of *Bedotia madagascariensis*
| Pierre-Yves Babelon/Shutterstock



Range of *Bedotia madagascariensis* – Source: IUCN Red List
| Jonas Lieberknecht



3.4 Threats

One of the main factors leading to the threat to the species is the invasive blotched snakehead, *Channa maculata*, which, unlike other exotic predators, does not shy away from shallow water. However, snakeheads avoid fast-flowing water, allowing *Bedotia madagascariensis*, which copes well with these conditions, to escape there, at least in part. Prior to the introduction of the snakehead fish, there were few predatory fish such as other cichlids of the genus *Paratilapia*, flag tails of the genus *Kuhlia*, or eels of the genus *Anguilla* large enough to prey on *B. madagascariensis*. However, it is also eaten by piscivorous wading birds and the Madagascar pied kingfisher, *Corythornis vintsioides* (ZIEGLER et al. 2020).

Smaller fisheries catch the Madagascar rainbowfish for food purposes despite its small size. Predation pressure could have a negative impact on the species' lifespan in its natural range.



The blotched snakehead (*Channa maculata*) preys on *B. madagascariensis*. | FormosanFish/Shutterstock



Overfishing of stocks is a threat factor for Malagasy cichlids. | Jen Watson/Shutterstock

Due to the ongoing deforestation on the once green island of Madagascar, the habitat for many species is changing. Water pollution by particles carried from the soil, are the result. However, the species is also found in areas, where primary forest no longer exists. It is therefore more shade-dependent, rather than forest-dependent as previously thought (ZIEGLER et al. 2020).



3.5 Conservation Efforts

Bedotia madagascariensis is widely farmed in North America and Southeast Asia for the aquarium market. It is also kept in some European zoos. The combined ex situ population is probably many times higher than the population remaining in the wild.

In some European zoos *Bedotia madagascariensis* is kept, but also the related species *Bedotia geayi*. A molecular biology study at the Cologne Zoo revealed that the fish there is not *B. geayi*, as originally thought, but *B. madagascariensis* (ZIEGLER 2020). According to LOISELLE & RODRIGUEZ (2007), specimens of *B. madagascariensis* imported to France from Madagascar in 1953 were once incorrectly identified and thus entered institutional and private aquaria under false names. It was found that *B. geayi* was never exported from Madagascar and all supposed specimens of this species should actually be *B. madagascariensis*. A correct differentiation of the two species and thus the separate keeping and breeding is enormously important for the survival of both species. This is the only way to prevent the development of hybrids, which is especially important if the species is to be reintroduced into its natural habitat at a later date.



Bedotia madagascariensis offspring at Cologne Zoo | Thomas Ziegler



4. Husbandry

The information on keeping is based on the experiences in the Cologne Zoo (contributed by Thomas ZIEGLER).

With the general conditions given here *Bedotia madagascariensis* can be kept and propagated successfully. It is also possible to deviate from these husbandry conditions. In case of major deviations, please discuss them with the CC office beforehand. Please also inform the CC office about additional experiences. In this way the knowledge about the keeping and breeding of this species shall always be supplemented and updated.

4.1 Documentation Requirements

Bedotia madagascariensis is not subject to species protection laws in Germany, there are no legal reporting requirements.

CC collects the current population figures twice a year in order to document the population development and to manage the population.

Keepers agree to submit their current population numbers to the CC office on 3/1 and 9/1 of each year. A population reporting form will be provided by the CC office. Beginning in September 2023, reporting will be done through the Wild at Home online portal. Generally, offspring can be reported to the CC office at about six months of age, when the number of juveniles expected to reach adulthood becomes manageable. Spawn and very small juveniles do not yet need to be reported.

Generally, however, knowledge generation is a stated goal of CC and keepers are encouraged to forward data on husbandry and observations of the animals (such as spawning or hatching of juveniles) informally (e.g. by mail) to the CC office so that such information can be collected centrally. If an adult animal dies, please inform the CC office immediately and informally about the loss, so that a necropsy can be arranged if necessary (the commissioning may only take place in consultation with CC; in this case CC bears the costs). Information on handling and shipping dead fish is available from the CC office.

Losses of spawn or juveniles do not have to be reported unless there is suspicion that, for example, a disease is the reason for unusually high mortality rates. In case of doubt, consult the CC office.



Bedotia madagascariensis kept in an aquarium at Cologne Zoo
| Thomas Ziegler

4.2 Transport

If a change of location is imminent, no more feeding should be done one to two days before transport. Catching and transferring is done with a standard aquarium landing net.

For transport, juveniles can be packed in small groups, for adults it is recommended to pack them individually. Fish bags of appropriate size are used for this purpose. These are filled one-third with water and two-thirds with ambient air or pure oxygen (do not „inflate“ the bag with your mouth) and tightly closed with a rubber band. Water must be used from the aquarium in which the animals were previously kept so that water values and temperature remain stable.

The bags are packed in a thermostable box (Styrofoam or similar) and, if the bags do not fill the interior, fixed with filling material (e.g. bubble wrap, paper) so that they cannot slip around. In appropriate weather conditions, a heat or cool pack should also be inserted. Caution, direct contact of such heating or cooling elements with the fish bags must be prevented (e.g. by wrapping the pack in a cloth) to prevent overheating or undercooling of the water.

4.3 The Aquarium

For keeping a group of five adult animals an aquarium from 120 liters is suitable (approx. 80 x 40 x 40 cm). Larger aquariums up to 400 liters are better, in which also groups up to 10 animals can be maintained.

For the arrangement of an aquarium for *Bedotia madagascariensis* structures which are used for egg laying are suitable. In Cologne Zoo the aquarium is equipped with roots and pads made of nylon yarn.

The lighting of the aquarium can be done with commercial LED lights of medium brightness, *B. madagascariensis* has no special requirements for lighting.

The filter equipment of the aquarium should be lush and ensured with external or mat filters. All aquarium water should pass through the filter at least four times per hour to ensure consistently good water quality.

4.4 Water Chemistry and Temperatures

The species has proven to be tolerant of various water values. However, before stocking fish, the aquarium should be „run-in“ long enough so that stable water values and natural bacteria cultures could develop.

Good experiences in keeping and breeding have been made so far with the following water values:

Temperature: 24–25 °C
Carbonate hardness: 3° dH (KH)
Hydrotimetric concentration 5
230 Microsiemens
7,5 pH

A water change of 30–50 % should be done once a week.



4.5 Feeding

Bedotia madagascariensis is not very choosy when it comes to food, the diet is trouble-free. The animals can be fed, depending on the size, with commercial flake food, frozen food (white, black and red mosquito larvae, *Artemia* and brown shrimps) and with live food (*Artemia*, *Artemia nauplii*, white mosquito larvae).

The amount of food should be adapted to the stocking of the aquarium. Juveniles can be fed several times a day. Adult animals are also fed daily, with a fasting day once a week.

4.6 Propagation and Raising Juveniles

Females continuously laid eggs on aquatic plants or artificial nylon structures at Cologne Zoo without the need for special triggers to trigger this behavior. To achieve the best possible breeding success, the breeding group should not be too large. A group consisting of 2 males and 3 females has proven best.



Offspring of *Bedotia madagascariensis* | Thomas Ziegler

4.7 Husbandry Challenges

When grouping *Bedotia madagascariensis* one should pay attention to the sex ratio. Too many males can lead to stress in the group or even to the loss of animals.



5. Further Reading

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