citizen conservation

#Fish

Basic Information and Husbandry Guidelines for *Limia islai*, Tiger Limia

Issued: 07/2024 | *Limia islai* male | Photo: Manfred Schartl

Contents

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1. Characterisation

Scientific name: *Limia islai* (Rodriguez-Silva & Weaver, 2020)
Vernicular names: Tiger Limia (Englisch), Tigerkärpfling, Tiger-Limia (Deutsch)
Length: Females up to 5 cm
Citizen Conservation#Fish category: III
Threat status according to IUCN Red List: Critically Endangered (CR)
Accomodation: A fish that is easy to keep and also recommended for beginners. A freshwater aquarium from 54 liters (approx. 60 x 30 x 30 cm) with an air-operated sponge filter and a tuft of Java moss is suitable for keeping a group of 10-20 animals. Larger aquariums provide more stable water values, more design options and allow larger groups to be kept. Tiger Limias can be kept well at temperatures between 22 and 30 °C.
Equipment required: Aquarium, lighting, possibly heating element, filter, water thermometer, test kit for water parameters, aquatic plants
Feeding: Commercial flake food; live food

2. Why is *Limia islai* a Citizen Conservation species?

Limia islai lives in Lake Miragoane, the largest freshwater lake in the Caribbean, but habitat destruction and invasive species are causing problems for the Tiger Limia. | Bogdan Dyiakonovych, Shutterstock

The Tiger Limia (*Limia islai*) was only described in 2020 and is already considered critically endangered. The species is listed as "Critically Endangered" in the IUCN Red List due to its small distribution area and the causes of endangerment mentioned below. The population trend is given as "unknown" (Lyons & Rodríguez-Silva 2021).

The Tiger Limia lives exclusively in the 9-25 km² Lake Miragoane in the Caribbean island state of Haiti, which unfortunately makes the headlines primarily due to poverty, political instability and natural disasters. The ecological pressure on the creatures in the lake due to deforestation of the surrounding area, the discharge of pollutants and waste water, the release of exotic predatory fish and fishing with poison is enormous. The possibilities of counteracting the extinction of the Tiger Limia and other inhabitants of the lake are currently close to zero.

Lake Miragoane is the only place in the world where poeciliids have undergone adaptive radiation in a form similar to that known several times from cichlids in Africa. In addition to an endemic gambuse, nine species of the genus Limia have evolved. The occupation of different niches within a lake and the associated problems of speciation offer the opportunity to draw a unique evolutionary-biological comparison with similar processes in cichlids, should it prove possible to save these species.

To our knowledge, only two species of the genus Limia are represented in European aquariums. The Tiger Limia was first imported to the USA in 1998 and has been kept in small numbers in aquariums ever since. Without coordinated conservation breeding efforts, such lines have often disappeared again in the past. The effort required to keep and breed this species is extremely low, meaning that even novice aquarists can play their part in protecting the species.

3. Biology and Conservation

3.1 Taxonomy

Limia islai belongs to the family of poeciliids (Poeciliidae) within the order Cyprinodontiformes. The species was scientifically described in 2020 by R. Rodriguez-Silva and P.F. Weaver as *Limia islai*, but had already been known as an aquarium fish since 1998 (Kohler 2000).

Order: Cyprinodontiformes
Family: Poeciliidae
Genus: *Limia* Poey, 1854
Species: *Limia islai* Rodriguez-Silva & Weaver, 2020

Limia islai was named after Dominic Isla, who introduced the species to hobby aquarists.

3.2 Description

The body shape is compact and laterally flattened, especially in the area behind the cloacal opening. The mouth is upturned. The basic color is a light, yellowish olive with four to twelve vertical black stripes, reminiscent of a tiger pattern. The flank scales reflect a slightly metallic shimmer. The total length of adult females is usually 3.5 cm, but can reach up to 5 cm in individual cases. The males remain smaller.

Adult males develop a much narrower body shape compared to females, but later than other live-bearers, so that confusion can easily occur with subadults. As adults, males are also clearly characterized by the gonopodium (a modified fin in poeciliids that serves as a male reproductive organ) and a slightly more elongated dorsal fin.

The Tiger Limia differs from its close relative, the Humpbacked Limia (*Limia nigrofasciata*), in its smaller body size. The males of the Humpbacked Limia are significantly higher-backed and have an even more elongated dorsal fin. The differences in genital morphology are probably not accessible to the aquarist. In younger specimens, the differences are extremely slight.

Male of *Limia islai* with clearly recognizable gonopodium | Manfred Schartl

Females of *Limia islai* are less slender and have no gonopodium. | Manfred Schartl

For comparison: A male of the species *Limia nigrofasciata* | Manfred Schartl

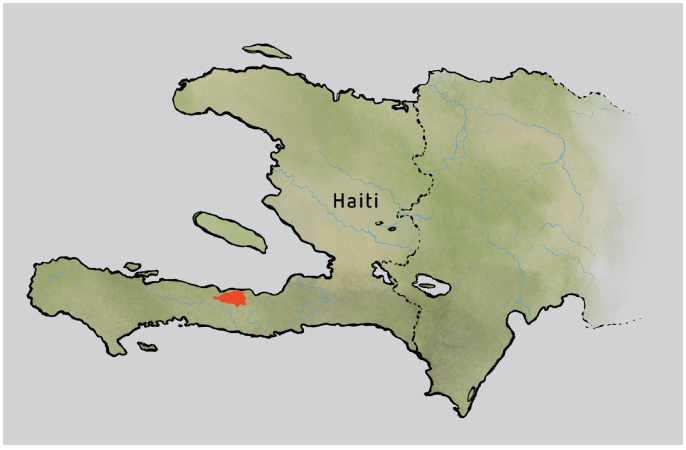
3.3 Occurrence and Habitat

The Tiger Limia is found exclusively in Lake Miragoane on the Tiburón Peninsula in southern Haiti, the western part of the Caribbean island of Hispaniola, and its tributaries.The lake has an area of only 25 km² at maximum water level and 9 km² at low water level. With a depth of up to 45 m, it is nevertheless the largest freshwater lake in the Caribbean (Lyons & Rodriguez-Silva 2021).

Meyer (2015) indicates the water values in February 2021 on the north bank as pH 6.9, GH 9 °dH, KH 7 °dH and a conductivity of 300 µS/cm. With a pH value of 7.1 and a conductivity of 250 µS/cm, the measurement results on the south bank were in the same order of magnitude. The water temperature fluctuated between 25 and 26 °C. Meyer describes the water as muddy with rocky shore sections. Vegetation included Water Lilies (*Nymphaea spp.*), Floatinghearts (*Nymphoides spp.*), Yellow Lotus (*Nelumbo lutea*), Hornwort (*Ceratophyllum spp.*) and Common Water Hyacinth (*Eichhornia crassipes*). The native accompanying fish include the Hispaniola Gambusia (*Gambusia hispaniolae*) and the powerful predatory cichlid *Nandopsis haitiensis*, both of which are endemic to the island and therefore only found here (Rodriguez-Silva et al. 2021). The bizarre Miragoane Gambusia (*Gambusia beebei*) is even endemic to the lake and could be a specialized hunter of the smaller Limia representatives (Hieronimus 2020).

The great zoological specialty of the lake, however, are the poeciliids from the genus *Limia*. Like the cichlids of Lake Tanganyika or Lake Malawi, the Darwin's finches of Galápagos or the lemurs of Madagascar, they have undergone the evolutionary process of adaptive radiation, resulting in nine independent species: In addition to the Tiger Limia and the aforementioned Humpbacked Limia, they include *Limia fuscomaculata, L. garnieri, L. grossidens, L. immaculata, L. mandibularis, L. miragoanensis* and *L. ornata* (Spikes et al. 2021).

View of Lake Miragoane in Haiti | Rency Inson Michel, Wikimedia Commons



Lake Miragoane in Haiti in red | Jonas Lieberknecht

3.4 Biology and Behaviour

Tiger Limias between aquarium plants | Sebastian Wolf

Tiger Limias have a superior mouth. Rodriguez-Silva et al. (2022) investigated the volumetric food composition in situ during the rainy season: It consisted of 22.6 % algae, 13.3 % vascular plants, 3.7 % invertebrates, 2.3 % smaller fish and 58.1 % detritus (decomposing organic material, which may also have included parts of the so-called "Aufwuchs" – German „surface growth" or „overgrowth" – in the methodology of the study cited). In human care, Limia islai behaved in a markedly bottom-oriented manner for a poeciliid, while in others the orientation depended strongly on the setup and other factors such as the stocking.

Adult fish show pronounced schooling behavior, whereas juveniles usually keep to themselves until they have reached a size of approx. 1.8 cm. As with many related species, the males are constantly courting the females. However, while male Humpbacked Limia (*Limia nigrofasciata*) engage in extensive commentary fights in the open water, male Tiger Limia limit themselves to almost casual copulations without courtship. These "sneaked copulations" are already emphasized by Rodriguez-Silva & Weaver (2020) in the first description and were previously investigated by Keeney (2013). As the name of the family suggests, the females give birth to living offspring. Up to ten approximately 7 mm large young are born approximately every four weeks. The young already resemble their parents in appearance, i.e. they already have stripes and a yellow base color.

3.5 Threats

The occurrence in a single lake makes the Tiger Limia particularly vulnerable to habitat disturbance, of which there are numerous: The forest surrounding the water body is largely deforested, which increases the input of sediments and influences the seasonal dynamics in the lake itself by lowering the groundwater level (Lyons & Rodriguez-Silva 2021). Haiti is one of the poorest countries in the world and has no wastewater treatment in many regions, meaning that faeces, cleaning agents and other pollutants end up untreated in the lake (Lyons & Rodriguez-Silva 2021). Pesticides are not regulated and are deliberately discharged into the lake to catch food fish (Lyons & Rodriguez-Silva 2021).

The African tilapia *Oreochromis aureus* and *Coptodon rendalli* have long been known in the Lake Miragoane (Lyons & Rodriguez-Silva 2021), and *Oreochromis mossambicus* and the Eurasian Carp (*Cyprinus carpio*) have also been documented (Rodriguez-Silva et al. 2021). The long-term effects of these deliberately released food fish are difficult to assess.

Limia islai has been classified as "Critically Endangered" by the IUCN. | Kay Urban

3.6 Conservation Efforts

There was a temporary research project by the Stiftung Artenschutz at Lake Miragoane in 2022 (Stiftung Artenschutz 2023), and a working group led by Rodet Rodriguez-Silva at the University of Oklahoma regularly publishes on the lake's fish (z. B. Rodriguez-Silva & Weaver 2020, Rodriguez-Silva et al. 2021, Spikes et al. 2021, Rodriguez-Silva et al. 2022).

Following the assassination of the country's president in July 2021, the political situation is currently even more confusing and uncontrolled than before. In August 2021, the region around Lake Miragoane was hit by a severe earthquake. Earthquakes occur repeatedly in Haiti (e.g. particularly devastating in 2010) and, as in the entire Caribbean region, hurricanes are occurring with increased frequency and strength. Haiti has not only been hit hard by Covid-19, but cholera also repeatedly leads to epidemics. By all parameters, Haiti is the least developed country on the American continent. The Foreign Office of the Federal Republic of Germany has issued a travel warning and, like most Western countries, has closed its embassy. Conservation work on site is therefore hardly possible, so that the Tiger Limia can currently only be effectively helped in the aquarium.

The Tiger Limia has been present in the aquarium hobby in Europe and the USA since 1998, but has not yet achieved widespread distribution. Prior to its scientific description in 2020, it was identified as *Limia ornata* (Meyer 2015), referred to as *Limia garnieri* or confused with the Humpbacked Limia (De Jong & Poeser 2020) or even regarded as a hybrid form of Humpbacked Limia and Perugia's Limia *(Limia perugiae*) (Rodriguez-Silva & Weaver 2020). Before the species was implemented in Citizen Conservation two zoological institutions in Germany kept the species (Leipzig Zoo, NaturaGart Ibbenbüren). Coordinated breeding efforts do not yet exist. Citizen Conservation is making a start here.

Stiftung Artenschutz

Data on the population biology of viviparous fish in Lake Miragoane is being collected and the fish population studied as part of a project by the Stiftung Artenschutz.

Haiti is repeatedly hit by severe earthquakes, most recently in August 2021. | arindambanerjee, Shutterstock.com

4. Husbandry

The information on keeping is based on the experience of NaturaGart Ibbenbüren (contributed by Holger Kraus) and Jannis Göttling. The Tiger Limia can be kept and bred successfully under the conditions described here. Procedures deviating from these conditions are also possible. Please discuss any major deviations with the CC office beforehand. Please also inform the CC office of any additional experiences. In this way, the knowledge about keeping and breeding this species should be constantly supplemented and updated.

4.1 Documentation Requirements

The Tiger Limia is not subject to any species protection laws in Germany and there are no legal reporting requirements.

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

The owners must submit their current inventory figures to the CC office on March 1 and September 1. A form for reporting stock numbers is provided by the CC office. In future, the report is to be submitted online on the wildlife management platform "Wild at Home".

In principle, offspring can be reported to the CC office at around six months of age, when the number of juveniles expected to reach adulthood becomes manageable. Very small juveniles do not yet have to be reported. In principle, however, knowledge generation is a declared goal of CC, and keepers are encouraged to forward data on keeping and observations of the animals (such as the birth of juvenile fish) to the CC office at any time informally (e.g. by email) or collectively with the stock report so that such information can be collected centrally.

In cases of illness, a veterinarian who is familiar with fish should be consulted to discuss the possibility of sending in samples and treating the affected fish. Unfortunately, the dissection of dead fish the size of a Tiger Limia rarely yields meaningful results, so this option is usually not available.

4.2 Transport

If a change of location is imminent, stop feeding one day before transportation. Catching and transferring can be done with a standard aquarium net.

Tiger Limias can be packed in groups for transportation. Fish bags of the appropriate size are used for this. These are filled to one third with water and two thirds with ambient air or pure oxygen (do not "inflate" the bag with your mouth) and closed tightly with a rubber band. The water from the aquarium in which the animals were previously kept must be used so that the water values and temperature remain stable.

The bags are packed in a thermostable box (polystyrene 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 used. Caution, direct contact with the fish bags must be avoided (e.g. wrap the pack in a cloth) to prevent overheating or hypothermia of the water.

The transport bag must be brought up to the temperature of the new aquarium before insertion. Water from the new tank should then be poured into the transport bag in small increments to acclimatize the fish to the environment of their new home. After about half an hour to an hour, the fish can be transferred to the holding tank using an aquarium net. The water from the transport bag is discarded to minimize the risk of introducing pathogens.

In November 2023, a group of Tiger Limia were safely packed and handed over to the Gymnasium Lerchenfeld in Hamburg.
I Tim Olsson

4.3 Aquarium

The aquarium should be at least 60 x 30 x 30 cm or 54 l for a breeding group of 10-20 animals. As with other bottom-oriented fish, the surface area is more important than the volume.

Larger aquariums provide more stable water values, more design options and allow larger groups to be kept.

In the simplest case, an aquarium with an air-operated sponge filter, a tuft of Java moss (*Taxiphyllum barbieri*) and, depending on the ambient temperature, a heating rod will suffice. The lighting can be based on the selected planting. Breeding also works without substrate, but as poeciliids like to search the substrate and eat detritus, we recommend an aquarium with substrate. A design with fine-grained substrate, aquatic plants, roots and stones according to taste is therefore also possible without any disadvantages for the well-being and breeding success of the fish. It is important that weedy areas are available as a retreat for the offspring and open water for the adult fish. They like to seek shelter under overhanging structures.

For larger aquariums, sufficiently dimensioned external filters or Hamburg mat filters should be used.

4.4 Water Chemistry and Temperatures

Like many other poeciliids, the Tiger Limia is relatively robust in terms of water parameters. Nevertheless, a run-in phase should be waited for until the water values have stabilized, especially in the case of stocked aquariums.

Tiger Limia can be kept well at temperatures between 22 and 30 °C, with night-time drops to 18 °C being unproblematic. The following water values have so far proved suitable:

pH: 7 – 8
Carbonate hardness: 3 – 6 °dH
Hydrotimetric concentration:6 – 12 °dH
Conductivity: 200 – 650 µS / cm

The weekly water change for a 60-liter aquarium should comprise 50 % of the volume, while only 20 % is necessary for a larger tank with a low stocking density (e.g. 250 l). Large temperature differences between the tank water and the change water should be avoided, especially when changing large volumes of water.

4.5 Feeding

Most commercially available flake foods are suitable as basic food. Products with an increased plant content are advantageous. For the Malawi cichlids, which are similar in terms of nutritional ecology, there are flake foods containing various types of algae, which are ideal for Tiger Limia.

Stones overgrown with vegetation, dried fresh water shrimps (*Gammarus*) and live food (e.g. *Artemia* nauplii, *Moina* or pond food of a suitable size) supplement the diet. Frozen food is rather poorly tolerated.

The amount of food depends on the number of fish kept in the tank. As there are always a few young fish in a well-running breeding tank, feeding small quantities several times a day is recommended, but certainly not essential. If you decide to do this, an automatic feeder can be helpful. Individual fasting days or even a long weekend without feeding will not harm even young Tiger Limia, but are also not in line with their natural way of life. In the wild, most poeciliids spend most of the day foraging for food, constantly ingesting small and tiny food particles.

4.6 Propagation and Raising Juveniles

Under good husbandry conditions, the females give birth to young fish every four weeks without any further intervention by the keeper. Tiger Limia do not chase after their offspring, at least if they are regularly given animal food and sufficient cover. They accept crushed flake food from the start (and also like *Artemia nauplii*), so the keeper does not need to take any further measures.

Female Tiger Limia are viviparous. | Sebastian Wolf

4.7 Socialization

Breeding groups of dwarf shrimps of the species *Neocaridina davidi* do well in aquaria with Tiger Limia. Socialization with the Tabasco Mud Turtle (*Kinosternon acutum*) and presumably also other aquatic turtles with little appetite for fish is unproblematic. Concerning other poeciliids: when kept together with *Girardinus metallicus* and later *Girardinus uninotatus*, a shoal of previously nervous Tiger Limia was much more relaxed.

Keeping them together with species that prey on young fish should be avoided. This includes most cichlids, for example.

As appealing as a biotope aquarium in which you can directly compare Humpback and Tiger Limia may sound, it is not a good idea. There is a risk of the two species interbreeding, which should not happen under any circumstances in terms of a conservation breeding project.

Girardinus metallicus for example, is suitable for socialization. | Sebastian Wolf

4.8 Husbandry Challenges

Unfortunately, skewed sex ratios with an excess of male fish occur regularly. In other fish, many different external influences are known to be the cause, such as temperature, pH value, salt content or nutrition. So far, none of these factors have been confirmed for the Tiger Limia. In practice, a slightly lower proportion of females is sufficient to maintain and grow a breeding stock.

Tiger Limia are robust and reproductive. Even beginners to the aquarium hobby will soon be able to celebrate their first successes when keeping them in a species tank.

5. Further Reading

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