

# How much we know about Brazilian subterranean aquatic fauna

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## Abstract

The first study concerning Brazilian subterranean fauna was the description of the phreatobitic fish *Phreatobius cisternarum* Goeldi, 1905, followed by the stygobitic fish *Pimelodella kronei* (Miranda Ribeiro, 1907). After that, biospeleological studies mainly focused on terrestrial taxa description, and in 1972 the first stygobitic invertebrate, *Aegla cavernicola* Türkay, 1972 (Decapoda, Aeglidae), was described. Here, we provided an overview of the Brazilian subterranean aquatic fauna knowledge. To date, ca. 270 troglotic species are described, of which 64 are aquatic (22 fishes; 42 invertebrates) and 13 have amphibian habits (all isopods). Considering aquatic species, 15 species were described between 1905 and 1999, 13 in the 2000s, 27 in the 2010s, and 9 in the 2020s. Furthermore, new stygobitic species were confirmed by experts but not published due to the deficit of trained specialists. Brazil has the second higher world diversity in stygobitic fishes, and data about habitat, biology, and ecology are available. Most of them are generalist carnivorous occurring in alluvial sediments, shallow base-level streams, flooded caves, lakes in the water table, upper vadose tributaries, or epikarst aquifers. Usually, they have small populations, but some species have large population sizes for the subterranean patterns. Some species have regression of the agonistic, cryptobiotic, and photophobic behaviors and regression of the circadian rhythms compared to their epigean relatives. Moreover, some species have morphological and behavioral intraspecific differences. Around 50 fish species have stygophilic populations, and some studies compared biological and morphological aspects of epigean and hypogean populations. There are available data about the habitat and natural history of the described stygobitic invertebrates, of which most are amphipods and planarians. Few phylogenetic relicts and epikarstic species were described. Usually, stygobites have restricted distribution in a micro-basin or are endemic within a unique cave and have small populations. Morphological and populational studies are available for few taxa (e.g., decapods and gastropods), as well as behavior studies. Community studies discuss species richness and distribution related to abiotic variables, lithology, and responses to disturbances; only a study is about epikarstic communities. For stygophilic species, there are mainly studies on distribution patterns and new records. Concerning amphibian species, five species were described in the 2010s and eight in the 2020s, with notes on their natural history and

habitat. The main threats to the subterranean aquatic fauna are pollution by pesticides, decreasing aquifer levels due to deforestation and water exploitation for irrigation, headwaters of rivers outside protected areas, suppression of habitats by mining and hydroelectrical activities, allied to the current dismantling and attacks to the Brazilian environmental policies. To date, 46 stygobites (16 fishes and 30 invertebrates) and five troglobitic amphibians are on the Brazilian Red List.

## **Keywords**

Communities, ecology, population, stygobite, stygophile, threats

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