Dear Editor,

The type of catfish referred to as candirus, is a member of the Trichomycteridae and Cetopsidae families. The subfamilies Vandelliinae and Stegophilinae (Trichomycteridae) and Cetopsinae (Cetopsidae) are relevant to human medicine, including forensics. Herein, we present a brief essay on candirus and their relationship with human health and death. We examined published accounts and used our personal observations on the subject.

Candirus of the genus *Vandellia* are small (usually around 4-8 cm but can reach a size of 20 cm), have an elongated body, and their mouths contain sharp, needle-like teeth. The two most extensively studied *Vandellia* species feed on blood from the gill arteries of larger fish. These candirus may remain within the gill chamber of the fish host for up to 145 seg. There is no robust evidence that candirus react to ammonia or blood in water, but they allegedly enter the human urethra or other natural orifices to feed on blood. However, such cases are disputed due to the apparent lack of solid evidence.

However, cases of attacks on humans by a candirus that inflicts wounds on the body of the victim have emerged recently. This candiru was identified to be a part of a scientifically undescribed genus and species and is referred to here as the human-biting candiru. This candiru fastens itself to the victim’s body with its specialized teeth (and perhaps using interopercular spines) and feeds on blood. The fish is difficult to remove from the victim because of the forceful bite exerted by the powerful head muscles.

Upon forceful removal of the fish, the wound bleeds for a while. The lesion caused by the human-biting candiru is elliptical, similar to the wound inflicted by the blood-feeding *Vandellia cirrhosa* on the large arteries of its fish hosts.

Candirus of the subfamily Stegophilinae are small-sized fishes (about 10-15 cm) that semi-parasitize large fishes. They fasten to...

---

**FIGURE 1:** (A): The blood-feeding *Vandellia cirrhosa* from the subfamily Vandelliinae after a full meal of blood and (B): while taking blood from the gills of a fish host. Note the engorged belly of the candiru after a blood meal, and blood leaking from the gill opening of the fish host. (C): The carrion-eating candiru *Pareidodon microps* from the family Stegophilinae. (D): A close-up of the head. Note the shape of the mouth and compare it with that of the whale candiru. (E): The whale candiru *Cetopsis coecutiens* from the subfamily Cetopsinae. Photos by Ivan Sazima and Jansen Zuanon (A, B) and by Jansen Zuanon and Efrem J. G. Ferreira. (C, D, E).
their victim with the disproportionally expansible sucking disc-like mouth, bite, and spread the opercular and inter-opercular spines into the wound to remain attached, scraping off mucus or scales10,11 or taking blood12. Within the Stegophilinae subfamily, the candiru Pareiodon microps stands out as a species of forensic importance due to its carrion-eating habits2,11. This candiru is slender and long (Figure 1C) and is unlikely to be confused with the stouter carrion-eating whale candiru, despite the shape of its mouth (Figure 1D). This stegophiline candiru joins the whale candiru while feeding on dead vertebrates2,13, which may include humans.

The whale candiru of the subfamily Cetopsinae are unrelated to vandelliine candirus1. Cetopsine candirus are stockier and larger (up to about 30 cm) than vandelliine and stegophiline candirus (Figure 1E). Only two of about 35 species of whale candirus are carrion-eaters that tear off chunks of tissue with their specialized, pointed, razor-sharp teeth on the mandible1,14,15. These fishes penetrate the bodies of drowned or otherwise dead animals, including humans, and feed on viscera and musculature1,15. Whale candirus may attack live fish in gillnets and occasionally, humans1,7. Human corpses attacked by whale candirus have round deep holes on the body surface, which correspond to exit or entry holes1,15.

The two carrion-eating whale candirus display different behaviors when feeding1. Cetopsis candiru bites and makes a rotational movement along its vertical axis, tearing off an almost round piece of tissue and tunnels its way into the corpse1,7. Then, it proceeds to enter the body cavity, eating the corpse from the inside out1,15.

This candiru species display a feeding frenzy that may involve tens to hundreds of individuals1,12. However, the whale candiru Cetopsis coecatins bites quickly and tears off chunks of tissue and then withdraws to attack again1. Attacks by these two Cetopsis species cause deep lesions on human corpses, and the bite of the whale candiru is so strong that it leaves circular marks even on the skull bone of the victims15.

Feeding frenzies of C. candiru on dead vertebrates may be joined by the carrion-eating catfish piracatinga, also known as Calophysus macropterus, of the family Pimelodidae7,13. This long-whiskered catfish also has razor-sharp teeth, appropriate to tear pieces of flesh off dead bodies, including those of humans15.

Finally, it is important to remember that reports on candirus and their relationship to human health and death are biased by imprecision, second- and third-hand accounts, misconceptions, and folk tales1,2,7,8,9. Due to the above-mentioned biases, several accounts of the impact of candirus on people are dubious or at least imprecise, even in some scientific reports and books.

**CONFLICT OF INTEREST**

The authors declare that there is no conflict of interest.

**REFERENCES**

1. de Pinna MCC. Cetopsididae. In: Queiroz, LJ, Torrente-Vilara G, Ohara VM, Pires TSH, Zuanon J, Doria CRC, editors. Peixes do Rio Madeira vol. II. Itupeva: Dialeto Latin America Documentary; 2013a. p. 96-106.
2. de Pinna MCC. Trichomycteridae. In: Queiroz, LJ, Torrente-Vilara G, Ohara VM, Pires TSH, Zuanon J, Doria CRC, editors. Peixes do Rio Madeira vol. II. Itupeva: Dialeto Latin America Documentary; 2013b. p. 142-79.
3. Lesimann W, Queiroz T, Camargo LMA. Child injured by suspected catfish (Cetopsis sp.) bite in river, Humaitá, Amazonas, Brazil. Rev Soc Bras Med Trop. 2020;53:e20190458.
4. Valente-Aguiar MS, Falcão AC, Magalhães T, Dinis-Oliveira RJ. Cadaveric ichthyofauna of the Madeira River in the Amazon basin: the myth of man-eating piranhas. Forensic Sci Med Pathol. 2020;16(2):345-51.
5. Zuanon, J. & Sazima I. Vampire catfishes seek the aorta not the jugular: candirus of the genus Vandellia (Trichomycteridae) feed on major gill arteries of host fishes. Aqu J Ichthyol Aqu Biol. 2004;8(1):31-6.
6. Spotte S, Petry P, Zuanon J. Experiments on the feeding behavior of the hematophagous candiru Vandellia cf. plazaii. Env Biol Fish. 2001;60(4):459-64.
7. Goulding, M. 1980. The fishes and the forest-explorations in Amazonian natural history. Berkeley: University of California Press; 1980. 280 p.

8. Spotte S. Candiru-life and legend of the bloodsucking catfishes. Berkeley: Creative Arts Book Company; 2002. 322 p.

9. Bauer IL. Candiru-a little fish with bad habits: need travel health professionals worry? A review. J Travel Med. 2013;20(2):119-24.

10. Baskin JN, Zaret TM, Mago-Leccia F. Feeding of reportedly parasitic catfishes (Trichomycteridae and Cetopsidae) in the Rio Portuguesa basin, Venezuela. Biotropica. 1980;12(3):182–6.

11. Do Nascimento C. Morphological evidence for the monophyly of the subfamily of parasitic catfishes Stegophilinae (Siluriformes, Trichomycteridae) and phylogenetic diagnoses of its genera. Copeia 2015;103(4):933–60.

12. Burgess WE. An Atlas of Freshwater and Marine Catfishes. Neptune City: TFH Publication; 1989. 784p.

13. Beltrão H, Porto-Braga TM, Schwartz-Bensaken Z. Alternative bait usage during the piracatinga (Calophysus macropterus) fishery in the Manacapuru region, located at the lower Solimões-Amazonas River, Amazon basin, Brazil. Pan-Am J Aquat Sci. 2017;12(3):194-205.

14. Vari RP, Ferraris Jr. CJ, de Pinna CC. The Neotropical whale catfishes (Siluriformes: Cetopsidae: Cetopsinae), a revisionary study. Neotrop Ichthyol. 2005;3(2):127-238.

15. Rocha MS, Zuanon J. Pimelodidade. In: Queiroz, LJ, Torrente-Vilara G, Ohara VM, Pires THS, Zuanon J, Doria CRC, editors. Peixes do Rio Madeira vol. III. Itupeva: Dialeto Latin America Documentary; 2013, p. 78-129.