

## Scientific Notes

### Record of cleaning behavior by *Platydoras costatus* (Siluriformes: Doradidae) in the Amazon Basin, Brazil

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Records of cleaning symbiosis between freshwater fish are scarce. Here we report on juvenile catfish, *Platydoras costatus*, cleaning the piscivorous characin *Hoplias cf. malabaricus* in a stream of the rio Araguaia drainage in the Brazilian Amazon. The scarcity of records on cleaning behavior in freshwater systems seems to be in part a consequence of the few observational studies under natural conditions in the Neotropics. Otherwise, the rareness of this behavior in freshwaters is possibly related to the short evolutionary time available to the fish fauna to develop these complex interactions, when compared to the ocean environment.

Registros de simbiose de limpeza entre peixes dulcícolas são raros. No presente trabalho registramos um juvenil de *Platydoras costatus*, limpando uma traíra, *Hoplias cf. malabaricus* em um riacho do rio Araguaia, Bacia Amazônica. A escassez de registros de comportamento de limpeza em peixes de água doce parece ser uma consequência dos poucos estudos subaquáticos nos Neotrópicos. Por outro lado, a raridade deste comportamento em ambientes dulcícolas está possivelmente relacionada ao curto tempo evolutivo disponível para o desenvolvimento de interações complexas, quando comparada ao ambiente marinho.

**Key words:** Erythrinidae, *Hoplias cf. malabaricus*, piscivorous client, juvenile cleaner, rio Araguaia.

Cleaning symbiosis is defined as an interspecific cooperative interaction, in which a micro-carnivore (cleaner) forage on the body of other fishes (clients), the latter thus getting rid of ectoparasites and diseased tissue, and receives tactile stimulation (Losey, 1971, 1987; Côté, 2000). This type of complex interspecific interaction is widespread in the marine environment, especially coral reefs (Limbaugh, 1961; Losey, 1987; Côté, 2000). Although most records came from the Pacific, recent studies have shown that this interaction is well diversified in southwestern Atlantic (Sazima *et al.*, 2000, and references therein). On the other hand, records on cleaning activity in freshwaters are relatively rare, and include cleaners in several families, such as Callichthyidae (Wickler, 1956), Cyprinidae and Percidae (Abel, 1971), Centrarchidae (Sulak, 1975) Cichlidae (Ward & Wyman, 1977; Konings, 1989) and even Serrasalminidae, the piranhas (Sazima & Machado, 1990).

Here we report on an instance of a possible cleaning sym-

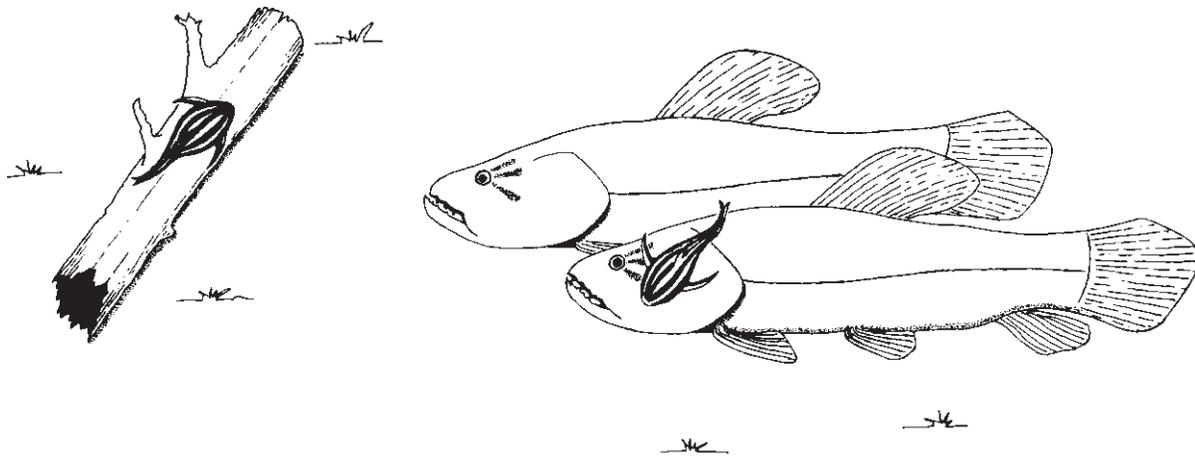
biosis between two freshwater fishes a juvenile catfish, *Platydoras costatus* (Doradidae) and *Hoplias cf. malabaricus* (Erythrinidae) in a tributary of the rio Araguaia, Amazon basin, Brazil. Additionally, we comment on some possible reasons for the apparent rareness of cleaning records in freshwaters and predict that additional instances of this interaction will be found with further studies in environments amenable to underwater observation.

Field work was done in São José dos Bandeirantes (13°41'S 50°47'W), Nova Crixá, Goiás, western Brazil, in a clearwater stream tributary of the rio Araguaia, Amazon basin, in May 2002. The study site was a still water stretch of the stream 20 m wide and 35 cm deep. The bottom was sandy, with submersed logs and trunks. We recorded the behavioral sequences from the stream bank at about 1.5 m from the fishes using "all occurrences" and "focal animal" sampling in 25 min of direct observation (Lehner, 1996). Size of fishes throughout the text refers to total length (TL).

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**Fig. 1.** Two juvenile catfish *Platydoras costatus*, one mouthing at the head of piscivorous erythrinid *Hoplias malabaricus*, and other poised under a submerged trunk in stream bottom.

Two juvenile Raphael catfishes, *Platydoras costatus*, about 7 cm TL were recorded foraging on the surface of a periphyton-covered submerged log. On the bottom near the log two traíras, *Hoplias cf. malabaricus*, about 30 cm TL were resting. After about 15 min of the observation session, one Raphael catfish moved directly to the nearest traíra, positioning itself on the flank of the larger fish. It stayed there for about 40 sec foraging in a way similar to that observed on the trunk. Afterwards, it moved towards the head of the traíra close to its mouth (Fig. 1), where it remained for another 15 sec probing the surface with its barbels and mouthing. Then the catfish returned to the back of the traíra for another 30 sec, moving along the fish body while touching it with its mouth and barbels. After this supposed cleaning session, the catfish left the traíra and returned to the log and resumed its foraging on it.

We observed no further interactions between *P. costatus* and *H. cf. malabaricus*, and the latter eventually drifted away. During our observation session, the traíras remained in the same position recorded initially {although a traíra chased an individual of *Hoplerythrinus unitaeniatus* about 12 cm TL that approached the resting couple}.

Although we observed a single event, this seems to be the first record of a freshwater catfish acting as a cleaner under natural conditions (but see Wickler, 1956, for a record of *Corydoras* as a cleaner under aquarium conditions). The cleaning behavior of this doradid catfish differs from that of some conspicuously patterned marine cleaners such as the labrids *Thalassoma bifasciatum* and *T. noronhanum* (Darcy *et al.*, 1974; Francini-Filho *et al.*, 2000). Both cleaners show clear preference for non-dangerous clients, and the latter one approach potentially dangerous clients mostly from behind and uses the “hit and run” cleaning behavior (Francini-Filho *et al.*, 2000). However, we observed that the doradid *P. costatus* does not seem to adopt any behavior that would indicate that it perceives its piscivorous client as a threat, which may indicate a specialized relation between the two fishes.

The strongly contrasting black and white coloration of young *P. costatus* may be regarded as a signal that allows for its recognition as a cleaner. Contrasting color pattern is recurrent among specialized marine cleaners, which attend potentially dangerous clients (Potts, 1973; Sazima *et al.*, 1999; Côté, 2000). The contrasting coloration of *P. costatus* (confer picture of juvenile in [www.fishbase.org](http://www.fishbase.org)) fades as it grows, the white lines becoming more yellowish and blurred ([www.fishbase.org](http://www.fishbase.org), see picture of adult). This ontogenetic change indicates that the cleaning behavior is probably restricted to the juvenile phase. *Platydoras costatus* is an omnivore tending towards carnivory (J. Zuanon, pers. obs.). The adult diet strengthens the view that *P. costatus* is a facultative cleaner, and that this catfish shifts its diet as it grows, as often observed in several marine fish species (see review in Côté, 2000). *Hoplias* is an ambush predator that forages mainly at twilight, and during daytime it mostly remains stationary in shallow marginal areas, camouflaged among plant detritus on the bottom (Sabino & Zuanon, 1998). The diurnal inactivity of this predator may have facilitated the cleaning interaction, in a way similar to that described for the possible evolution of cleaning symbiosis between cleaning gobies and some sharks and rays (Sazima & Moura, 2000).

The two species recorded here interacting are nocturnal (*P. costatus*) or crepuscular to nocturnal (*Hoplias cf. malabaricus*) (Burgess, 1989; Sabino & Zuanon, 1998). Our daytime record of cleaning activity strengthens the view that this interaction type is visually mediated, at least at its beginning (Côté, 2000). Additionally, the armor of lateral bony plates with hooks, as well as pectoral and dorsal spines, may provide additional protection for *P. costatus*, and may have facilitated the first steps in the evolution of a cleaning interaction with a potentially dangerous client.

The rareness of cleaning behavior among freshwater fishes is possibly related to the short evolutionary time available to the fish fauna to develop these complex interactions, when

compared to the ocean environment. Also, we believe that the relatively low number of records on complex interactions in freshwaters, including cleaning and mimicry, is due to the still few observational studies under natural conditions in the Neotropics (Sazima, 1986; Sabino & Zuanon, 1998; Sabino, 1999). Thus, we anticipate that new instances will be reported as additional studies, particularly underwater ones, proceed. The evidence that visual contact is of utmost importance for these interspecific interactions also indicates that these records are to be expected in clear waters (see Sazima, 1986, for this view). Additionally, local species richness will likely increase the occurrence of this type of interactions. In the Amazon area, clear waters and high fish species richness occur in the Xingu, Tapajós, Trombetas, and Tocantins drainages, and the lesser watersheds are promising candidates for the occurrence of additional instances of cleaning and other complex interactions between fishes.

### Acknowledgements

We thank André L. Q. Santos for logistic assistance; Christian Westerkamp for improving the English and for critical comments on the manuscript; Ivan Sazima and Andréa Araujo for critically reviewing the manuscript, and Rubem S. Ávila Jr. for the drawing.

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