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Studies on Feeding Behavior on a Population of Cichlasoma tuba (Pisces:Cichlidae) in Shallow Waters of the River Puerto Viejo

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Introduction

Observations on feeding behavior of freshwater fishes in tropical environments are few, and these observations usually appear only as marginal notes in taxonomical and/or ecological descriptions of such fishes.

The cichlid Cichlasoma tuba (Meek) is sympatric with at least a dozen other cichlids. Bussing (1975) considers that "the strongly compressed teeth of C. tuba and the development in some individuals of fleshy lipfolds presumably are feeding adaptations." Analysis of the stomach content made by that author in 33 adults revealed that this species is predominantly herbivorous (92% of volume of food ingested). Terrestrial leaves (40%) and bryophytes and algae (34%) are its main sources of nutrients.

The Site

C. tuba is known only on the Atlantic slope, where it is common in lowland rivers or large streams which have moderate to considerable current (Bussing, 1975). Our observations were made in a place that fits these physical characteristics: the riverside (with moderate current) of the Rio Puerto Viejo, near "La casa de Rafael", upstream from the OTS field station at La Selva. There is a log in this place which is partially submerged and is used as a boat shelter from time to time. There are also many large trees along the river. One can frequently observe how leaves that fall from these trees are quickly eaten by fishes (mainly cichlids). Once I could see five individuals of C. tuba eating the same leaf simultaneously.

Methods

During two days (July 16 and 17, 1981), I made some observations on the behavior of three species of common fishes in the site described above. The first one was a poecilid Brachyrhaphis parisimina (Meek), which was almost always swimming very close to the river bank (only a few centimeters away) eating floating organic particles. The second one was the characid Astyanax fasciatus (Cuvier) which I saw eating leaves and pieces of bread that I dropped on the surface of the water. The third one was Cichlasoma tuba (Meek) which ate only petioles of leaves that fell from trees before I started the experiments described below. The individuals of the deme of the latter species never ate whole leaves, but appeared to be selective for petioles. I threw petioles that I broke off whole leaves, and they always reacted with the same feeding interest as to naturally fallen leaves. They never ate leaves that were partially or totally complete, but they reacted with curiosity when I threw sticks that looked like petioles onto the water, although they never tried to eat these sticks.

Records of fishes that feed on leaves, flowers, and fruits are very common (Honda, 1974; Smith, 1981; and others) but I know of no observations of fishes that display selectively for petioles fallen from trees as a result of herbivore damage.

In order to see if there was variation in the feeding behavior of these fishes during a longer period of time, I placed whole leaves attached to cords in the river overnight, but the next morning these leaves remained intact.

C. tuba and A. fasciatus were below the semisubmerged log most of time, except when a possible (or actual) food item was dropped on the surface of the water. This attraction for the shade produced by objects into the water has been recently explained by Helfman (1981). This author showed that "there is a relative visual advantage for these fishes from two interacting phenomena: 1) the increment threshold response, whereby a sunlit viewer has a raised contrast perception threshold and therefore has difficulty responding to a shaded target; and 2) the veiling brightness effect, whereby particles between sunlit observer and shaded target scatter relatively bright light into the observer's eyes, further reducing the target's visual contrast." This author finally concludes that "a fish hovering in shade is better able to see approaching objects and is simultaneously more difficult to see." In fact, the fishes that I worked with, were afraid of human presence, so I had to lay on the ground for my observations since they rarely came out from the log shadow (even with the dropping of petioles) when I was standing up. On the other hand they never reacted to the sound and the surface disturbance produced by motor boats going through the middle of the river.

I dropped pieces of bread (18 times) on the surface of the water in the place described above, and in the first three cases only individuals of A. fasciatus came out from under the log and ate this food, but in all subsequent cases individuals of C. tuba swam quickly and ate the pieces of bread, while individuals of A. fasciatus never tried to eat that food although they were swimming nearby and approached small particles of bread left by C. tuba.

Discussion

These observations suggest not only that these fishes may get some visual and antipredator advantages from living in a shadow produced by an object in the water (as it was recently described by Helfman), but also that individuals of the species C. tuba may select particular sites where the effect of herbivores on a specific tree results in high levels of petiole availability. On the other hand, they did accept other kinds of food as pieces of bread, but only after individuals of A. fasciatus (which share their habitat) ate this food. Individuals of A. fasciatus were later supplanted by C. tuba individuals as bread eaters. Perhaps C. tuba is dominant over A. fasciatus when feeding on a shared resource.

Literature cited

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