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Feeding Behaviour of *Asprotilapia leptura*, an Epilithic Algal Feeding Cichlid Fish in Lake Tanganyika

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Yamaoka (1982) suggested the importance of interspecific differences in feeding behaviour for food resource partitioning in the African Rift Lake cichlid communities. In Lake Tanganyika two main methods in the feeding behaviour of epilithic algal scraping cichlids have been noted: grazing and browsing (Yamaoka, 1983). However, among the epilithic algal feeders, other methods could also be observed in nature (Yamaoka, 1987). One of them is performed by *Asprotilapia leptura* Boulenger, an inhabitant of the rocky shore. According to Takamura (1984), adult *A. leptura* feed on both filamentous and unicellular algae. In this paper, I describe the change in feeding behaviour of *A. leptura* with growth in its natural habitat.

Study area and methods

All underwater observations were conducted using SCUBA at the northwestern rocky shore (mostly < 4 m deep) at Luhanga (03°31′ S, 29°09′ E) from July through December, 1981. The main observation site was a 400 m^2 quadrat, described in Hori et al. (1983).

Adults of *A. leptura* take epilithic algae so swiftly that it is not easy to precisely grasp their feeding behaviour quantitatively by the naked eye. Therefore their feeding behaviour was partly recorded with a Eumig Nautica underwater 8 mm movie camera at 18 frames/sec. Quantitative observations with the naked eye were also conducted. Two parameters were used to analyze the behaviour. The first one was the speed of feeding (frequency of bites per second) and the second the number of bites (or pecks) during each feeding bout.

Results and discussion

A. leptura, endemic to Lake Tanganyika, has an elongate body for cichlids and its wide mouth is on the ventral side below the projecting snout. When feeding, this species adopts a posture whereby the ventral body surface is held parallel to the rock surface, which is then approached closely to within 2 mm. While in this posture, it generally took a series of hard taps of the mouth on the rather plain epilithic algal mat during each feeding bout. In each bite the mouth was swiftly and prominently protruded only ventrad, not rostrad. This feeding behaviour resembled a series of rapid pecks, and I therefore metaphorically termed it "pecking behaviour." In this case, a peck means a bite. During each series of pecks, the point pecked advanced gradually in almost a straight line, the distance of the total advancement amounting to a few cm.

This pecking behaviour neither corresponds to grazing nor browsing. *A. leptura* did not show any pressing of the mouth against rock surfaces as shown by grazers, nor did it show any swing of the head from side to side when feeding as exhibited by several browsers (Yamaoka, 1983).

Besides pecking, adults occasionally picked particles in the water column of the rocky shore. Juveniles, ca. 15 mm TL, generally picked particles in the water column within ca. 1 cm of the rocky substrate.

The results obtained by analyzing the 8 mm movie film recording 15 bouts of the pecking behaviour of one adult individual showed the mean number of pecks per second to be 6.2 (5/sec: 1 case, 6/sec: 10, 7/sec: 4). Young, ca. 50 mm SL, showed a similar pecking speed to that of adults (Yamaoka, pers. obs.). However, size-related differences were evident in the number of pecks during each bout (Fig. 1). Small individuals, 25–30 mm SL, showed fewer pecks in each bout, and 74.6% of the total bouts observed consisted of a single peck (or bite). This high rate of single peck seems related to the fact that free juveniles 30–40 mm TL feed mainly (ca. 75%) on crustaceans and insects (Mbomba, 1986) by detecting the prey individually. In adults, the range of the number of pecks in each bout increased greatly and the rate of a single peck became smaller (13.3%). Young, ca. 45 mm SL, showed an intermediate situation between smaller and adult individuals, and the rate of a single peck was 18.5%. The stomach content data on individuals, 50–60 mm TL, showed an intermediate feature (ca. 40%) in taking crustaceans and insects between them (Mbomba, 1986). Besides pecking, they often fed on particles floating in the water column 5–10 cm above the substrate.

The feeding behaviour of *A. leptura* was briefly described by Mbomba (1986) who called it nibbling. However, "nibble" etymologically means to bite

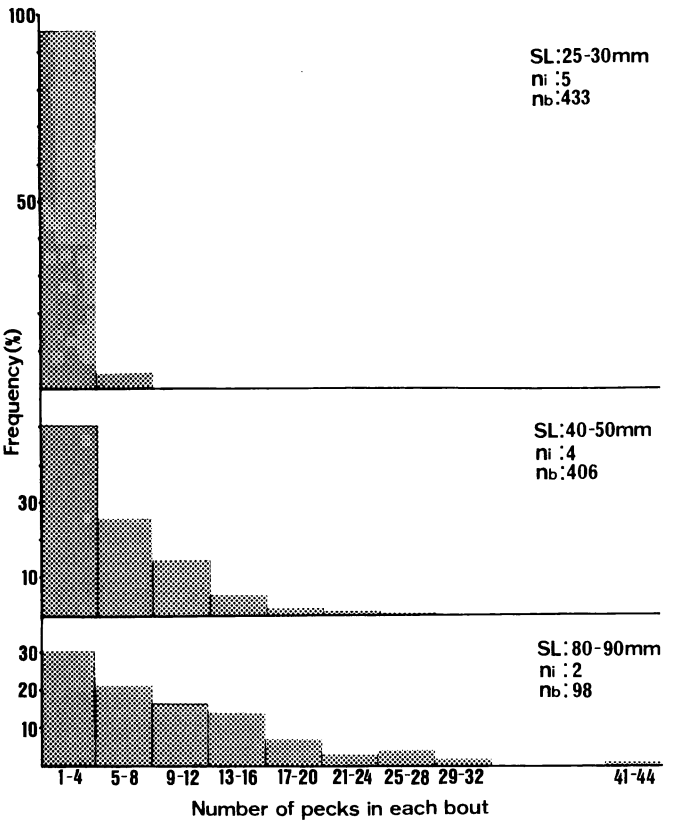

Fig. 1. Frequency distribution of the number of pecks in each feeding bout in three developmental stages of *Asprotilapia leptura*. ni, number of individuals observed; nb, number of bouts observed.

gently (Klein, 1967) and seems to include the nuance of shyness. This contrasts with the hard "pecking" of *A. leptura*. According to Fryer (1959) and Fryer and Iles (1972), *Labeotropheus* spp. in Lake Malawi showing a considerably similar jaw morphology to *A. leptura* (Yamaoka, 1987) also take epilithic algae by "nibbling." However, there is a clear difference between the feeding behaviour of *Labeotropheus* spp. and *A. leptura*. In *Labeotropheus* spp., the mouth is kept pressed against the rock surface throughout a series of nibbles (Fryer, 1959; Fryer and Iles, 1972), while in contrast, *A. leptura* never pressed the mouth against the rock surface when feeding. Therefore, it is unsuitable to call the feeding behaviour of *A. leptura* nibbling. Yamaoka (1987) called the feeding behaviour of *A. leptura* "tapping."

The difference in the feeding behaviour between *Labeotropheus* spp. and *A. leptura* seems to be related to the degree of the fixation of their jaw dentition, although other jaw structures are considerably similar between them. That is, the jaw teeth are fixed in *Labeotropheus* spp. (Trewavas, 1935), while those of *A. leptura* are flexibly implanted on the alveolar (Yamaoka, 1987), allowing a considerable degree of movement. This movable implantation of the jaw teeth can be regarded as an adaptation for absorbing the shock caused by "pecking" against the rock surface.

Greenwood (1983) suggested that *Ectodus*, *Aulonocranus*, *Callochromis*, *Xenotilapia*, *Grammatotria* and *Asprotilapia* constitute a monophyletic assemblage. Among these, only *Asprotilapia*, *A. leptura* being its only member, is herbivorous. The remaining five genera are omnivorous or predacious (Poll, 1956; Brichard, 1978). Though *A. leptura* is an epilithic algal feeder, its intestinal coiling pattern is simple and different from that observed in the genera *Petrochromis*, *Tropheus*, *Simochromis* and *Pseudosimochromis*, the main constituents of Tanganyika epilithic algal feeders. This shows that *A. leptura* is phylogenetically different from them (Yamaoka, 1985). These suggest that the rapid pecking found in

A. leptura is unique for epilithic algal feeders and its feeding behaviour is placed under phylogenetic restraint.

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タンガニーカ湖産付着藻類食性カワスズメ科魚類 *Asprotilapia leptura* の摂食行動

山岡耕作

タンガニーカ湖に固有な付着藻類食性カワスズメ科魚類 *Asprotilapia leptura* の摂食行動を記載した．成魚は摂食を行う岩面に約 2 mm まで接近し，頭部腹面に位置する口を素早く連続的に突出し（平均突出回数 6.2/秒）岩面を打つ特徴的な摂食行動を示した．これを「pecking」と呼んだ．小型個体は，摂食に際して連続突出回数が少なくなり，単発の突出頻度が高くなる傾向を示した．

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