



TIDAL RHYTHMS OF FEEDING IN THE MANGROVE TOPMINNOW, *Aplocheilichthys spilauचना* (PISCES: CYPRINODONTIDAE)

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ABSTRACT

Sampling was carried out in a mangrove intertidal mud flat, east of Eagle Island, Port Harcourt, Nigeria. A seine net was used in sampling at spring tide and neap tide. Two positions at the site - downstream and upstream - were sampled at low and flood tides respectively. A total of 120 specimens of *Aplocheilichthys spilauचना* ranging from 35 mm to 50 mm total length (TL) were examined. Most specimens collected at low tide had empty stomachs; while most stomachs examined from the flood tide collection had contents. More stomachs contained polychaetes at spring than at neap tide; while mud algae occurred in more stomachs at neap tide than at spring tide. Stomach contents of specimens of *A. spilauचना* collected from another habitat, the fresh water transition zone of the New Calabar River, revealed the presence of winged ants. These differences in stomach contents of *A. spilauचना* from different habitats and at different tides indicate that this topminnow species is an opportunistic feeder and feeds on a range of food items depending on availability.

Keywords: aquarium fish, food habits, brackish water, sexual dimorphism

INTRODUCTION

Aplocheilichthys spilauचना, the mangrove topminnow, is a peculiar species of the family Cyprinodontidae. The species is specially adapted to utilizing intertidal habitats. Onwuteaka (1980), reported that the reproduction of (*A. spilauचना*) a point of interest.

The mangrove topminnow is both ecological and economically important to the people of the Niger Delta. This fish species though generally of small size, less than 100 mm TL (personal observation), has been reported to attain sizes of 120mm TL (Olaosebikan *et al.*, 1998). The species (Fig. 1) exhibits sexual dimorphism with the males appearing colourful and of larger sizes than females and could be used as aquarium fish. The mangrove topminnow is of commercial importance locally and is harvested from the creeks and, sold fresh or smoked in open markets. It is used by many households in the preparation of soups and stews as a source of affordable fish protein.

Not many studies have been done on the diet and feeding behaviour of *A. spilauचना*. A fresh water topminnow, *Epiplatys sexfasciatus* contained mainly insects (Hymenoptera, Coleoptera, Diptera,

and Orthoptera) in the stomachs (Inyang and Anozie, 1987). *Fundulus heteroclitus* is the American estuarine ecological equivalent species of *A. spilauचना*. At high tide *F. heteroclitus* move with the incoming tide on to the salt marshes to feed and at low tide they are found in the tidal creeks where they are preyed upon by important commercial species (Kneib and Stiven, 1978). These workers showed that the food of *F. heteroclitus* were mainly crabs, detritus, algae and also polychaetes, aerial insects and small crustaceans.

There are conflicting opinions on the food of *A. spilauचना*. Etuk (1986) mentioned the presence of insects – Hymenoptera, Dermaptera, Diptera and Odonota – as well as detritus and diatoms in the stomach of the fish; while Oyetayo (1987) reported that *A. spilauचना* is a bottom deposit feeder; containing detritus, sand grains, rotifers, algae, diatoms and vascular plant materials in the stomachs.

The aim of this study therefore was to determine the food types occurring in stomachs of *A. spilauचना* at spring tide and at neap tide; and the feeding behaviour of the species in both fresh and brackish-water habitats.



Fig. 1: Male (above) and female (below) specimens of the mangrove topminnow, *Aplocheilichthys spilauचना*

MATERIALS AND METHODS

Field Collection

The study site was situated on the East side of Eagle Island in Port Harcourt (Lat 4° 47' N and Long 7° 01' E). The site was a mangrove intertidal mudflat connected to a drainage creek. The vegetation consisted of mangrove trees such as *Avicennia* spp., *Rhizophora* sp. and nypa palm, *Nypa fruticans*. Sampling was carried out at two positions. The downstream position was sampled at low tide; while the upstream position was sampled on the flood tide.

The drainage creek area was deforested and covered with intertidal mud. The salinity of the water ranged from 5 to 20 ppt. At low tide, the depth of the water in the drainage creek was 0.3 m and the width was 0.5 m. At high tide the height of the water was between 1 m and 1.5 m.

Sampling was carried out during springtide and during neap tide. A seine net with mesh size 5 mm x 5 mm was used in seining at low tide (water) and on the flood tide, the positions of seining were downstream and upstream respectively. Floottide samples were taken 40 minutes after the onset of the floottide.

Thirty specimens each, ranging from 35 mm to 50 mm total length (TL) were selected from each collection, this gave a total of 120 specimens. In addition seven specimens were obtained from the freshwater transition zone of the New Calabar River. All specimens were preserved immediately after capture in 10% formalin as recommended by Ugwumba and Ugwumba (2007).

Laboratory Analysis

The total length in millimeters (mm) and weight in grammes (g) for all the specimens were measured. Weights of specimens from New Calabar River were not measured.

In determining the stomach contents, each specimen was placed in a petri-dish and dissected and the gut was drawn out into the petri-dish. The stomach and hindgut contents were examined under a compound microscope as described below.

Methods Used To Analyze Stomach Contents

Frequency of Occurrence method

The number of stomachs having a particular food item and the percentage of the food item was recorded.

Numerical method

A record was made of the number of individuals in each food category for all stomachs and the total expressed as a percentage of all the individuals in all food categories. Filamentous algae and diatoms were counted by taking a sub-sample of these from each stomach and the total number derived from this. The heads of polychaetes and insects were counted to obtain the number of each of these in each stomach.

Analysis of Hindgut Content

The number of hindgut having a particular food organism or organism parts was recorded.

RESULTS

Stomach and hindgut contents

Spring Tide Collections

Low Tide: The stomachs of 29 specimens of *A. spilauchena* collected at low tide (water) were empty, while one specimen had an aerial insect (Order Coleoptera) in its stomach (Fig. 2). The hindguts of six specimens contained filamentous algae, while hindguts contained polychaete setae. Undigested diatoms occurred in three hindguts; while digested diatoms or empty diatom shells were present in two hindguts.

Flood Tide: The stomach of 23 specimens contained polychaetes (Fig. 2) and the number of polychaetes per stomach ranged from one to five. Filamentous algae and diatoms each occurred in four stomachs. The stomachs of five specimens were empty. A few

hindguts contained filamentous algae, undigested and digested diatoms.

Neap Tide Collections

Low Tide: The stomachs of 28 specimens were empty while two specimens had stomach contents. Polychaetes occurred in one stomach, filamentous algae were present in two stomachs and diatoms occurred in two stomachs (Fig. 3). The hindguts contained mainly filamentous algae, undigested and digested diatoms, polychaete setae occurred in only one hindgut.

Flood Tide: The stomachs of 29 specimens had contents; polychaetes were present in 16 stomachs, filamentous algae occurred in 17 stomachs and diatoms occurred in 15 stomachs (Fig. 3). A few hindguts contained filamentous algae, polychaetes setae and digested diatoms.

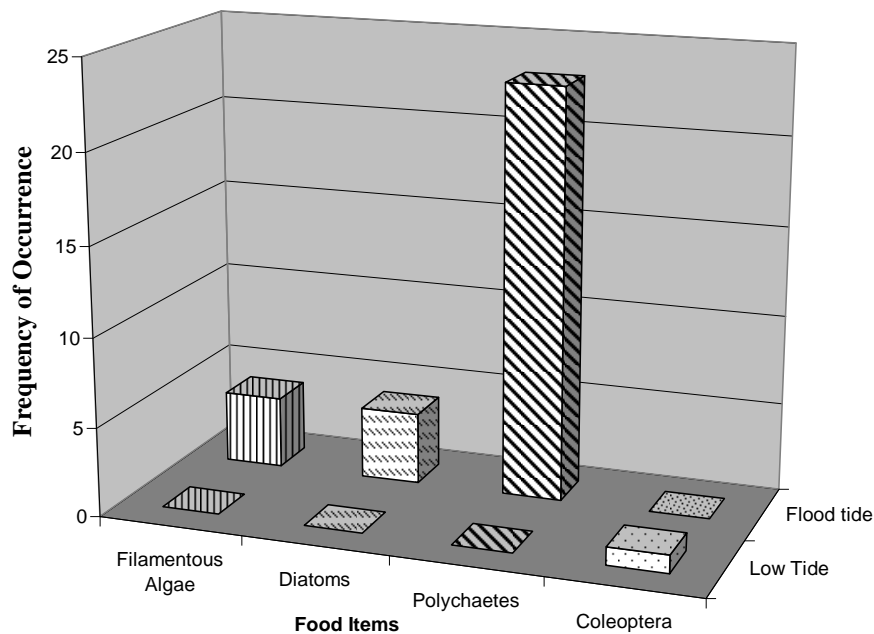


Fig. 2: The frequency of occurrence of different food items in stomachs of *Aplocheilichthys spilauchena* collected at spring tide

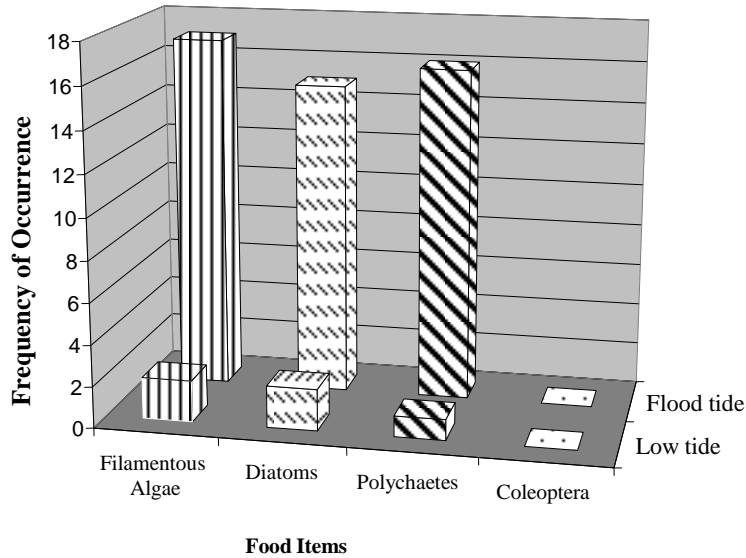


Fig. 3: The frequency of occurrence of different food items in stomachs of *Aplocheilichthys spilauchena* collected at neap tide

Stomach Contents of Specimens of *A. spilauchena* from New Calabar River

Seven specimens from the fresh water transition zone of the New Calabar River all had only winged ants in their stomachs.

DISCUSSION

The Diet of *A. spilauchena* from Different Habitats

Polychaetes, filamentous algae and diatoms were present in the stomachs of *A. spilauchena* collected from the study site; while the specimens collected from the fresh water transition zone of the New Calabar River contained winged ants in their stomachs. Etuk (1986) reported the presence of insects consisting of species of the orders Hymenoptera, Diptera, Dermaptera, and Odonata. He also reported the presence of detritus and diatoms in *A. spilauchena* stomachs collected from a fresh water swamp. Oyetayo (1987) reported that vascular plant material, detritus and grains were the main items which occurred in stomach of *A. spilauchena* collected from a creek (Nembe waterside) in Port Harcourt. These differences in the stomach contents of *A. spilauchena* from different habitats indicate that the species is an opportunistic feeder and feeds on a wide range of food depending on availability.

Feeding behaviour with respect to tidal Rhythms

Chi-square test was used in comparing the difference between the number of empty stomach at low tide with the number of stomachs with contents

at flood tide and a chi-square value of 39.08 was obtained. Comparison was also made between number of stomachs with polychaetes at spring and neap tides and a chi-square value of 3.6 was obtained.

Most specimens of *A. spilauchena* collected at low tide had empty stomach; while flood tide collections had contents. The difference is highly significant ($p < .001$) using the chi-square test. This shows that the feeding of the mangrove topminnow is dependent at least indirectly on the tide. Field observations showed that fish moved along with the tide into the channels to feed.

Although the greater number of stomachs with polychaetes on the spring compared to neap tide was significant at 0.1-probability level, it was observed that polychaetes occurred more frequently in the stomachs of the mangrove topminnow at spring than at neap tide. This is because swarming polychaetes were more abundant at spring than at neap tides (field observation).

Polychaetes were highly important in the diet of the mangrove topminnow at the main study site, since they occurred more frequently in the stomach of the specimens especially in the spring tide collection. In contrast, more stomachs contained mud algae at neap tide than at spring tide. The presence of undigested mud algae and setae in the faeces however, suggest that these food items were not nutritionally important to the mangrove topminnow.

Field observation shows that the mangrove topminnow is a mid-water /surface feeder. The fish fed on the swarming forms of polychaetes, and not on

polychaetes in the mud. However, it depended on benthos fauna for food supply. Many mangrove fish species depend on benthic fauna for their food.

CONCLUSION

Aplocheilichthys spilauchena is an opportunistic feeder and feeds on a wide range of food items depending on availability during different tidal cycles and also at different habitats. The feeding behaviour observed in the mangrove topminnow at Eagle Island indicates that feeding and food preferences are tied to the natural tidal rhythms that also influence the availability of food for the species. However, in any other non-tidal habitat the topminnow will adjust to what is available. Further studies on the propagation of the mangrove topminnow in captivity will provide a basis for its commercial production for the ornamental fish industry.

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