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Food Selectivity of an Arabian Peninsula's Cyprinid Fish, *Cyprinion acinaces*

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Abstract. The feeding habit of *Cyprinion acinaces* was studied. The fish was found to be a selective feeder. A positive selection for *Protococcus, Ulothrix, Spirogyra, Selenastrum, Ankistrodesmus* (Green algae); *Nitzschia, Navicula, Diatoma, Synedra* (Diatoms); *Anabaena, Nostoc* (Bluee green algae); *Closterium, Gonatozygon* (Desmids) and the rotifers and phytoflagellates was observed. Various other organisms were either negatively selected or completely avoided by the fish. The unaccessability of the prey to the fish and distastefulness of the prey items may influence the selectivity. Calorific value of the food item, cost of capture, filtering ability through the gill rakers and mobility of the fish may be factors responsible for the food selection of the fish.

Introduction

Investigating the feeding habits of fishes are important in helping us understand the role of the fish in the environment. Compared to the published literature on food selection of different fish species [1, p. 352; 2–6], the authors are not aware of any published information on the food and feeding habits of Arabian cyprinid fishes. *Cyprinion acinaces* is a species endemic to Saudi Arabia [7–8]. In this study we examined the feeding of *C. acinaces* in the field to determine if it displayed any food selection. This information is likely to be beneficial for establishing the interspecific feeding relationship among different important fishes.

Materials and Methods

Specimens of *C. acinaces* were collected in April 1985, by sein and scoop nets from Ain (Spring) Salaleem, Khayber (25° 42′ N, 39° 31′ E) Saudi Arabia. Fishes were collected between 8.00 and 10.00 am. From the collected sample, 60 specimens

(1^+ age group) varying from 140–175 mm in total length and 35.0 – 60.0 g in body weight were anaesthesized with MS-222 (100 mg/l) to prevent regurgitation. The guts of the fishes were removed and preserved in 10% formalin. From the same site a sample of the food organisms was taken. For Phytoplankton, the water sample from surface and water column (2 feet deep) was taken and preserved in 1.0% Lugol's solution. For zooplankton, 100 litres of water from the same depth was filtered using a plankton net (mesh size 60μ) and preserved in 10% formalin.

The gut contents were washed into a petridish with a known volume of water and mixed thoroughly. Food organisms in the environment and in the gut were identified to generic level [9, p. 1248; 10, p. 108]. Methods used by Jafri and Mustafa [11] were used for the analysis of gut contents and the food organisms in the environment. Relative abundance of food organisms was expressed on percentage basis. Percentage composition of food organisms in the environment and in the gut samples was calculated. The index of selection (electivity index) was calculated according to Ivlev's equation [12].

$$E = \frac{ri-pi}{ri+pi}$$

Where, E = the electivity index, ri = percentage of food items in the gut and pi = percentage of food items in the environment.

Values of electivity index can range from (–1) when the food items are completely ignored to (+1) when food items are highly selected. Value of zero implies that the food items are present in the diet in the same proportion as found in the environment, i.e. complete absence of selection of the food items.

Results

Results suggest that the *C. acinaces* is a selective feeder. Among the green algae, positive electivity values were found for *Protococcus, Ulothrix, Spirogyra, Selenastrum* and *Ankistrodesmus* (Fig. 1A). Negative electivity values were observed for the remaining genera (Fig. 1B). Of the various diatoms, positive electivity values were found for *Nitzschia, Navicula, Diatoma* and *Synedra.* A complete avoidance for *Cocconeis* was observed. For the blue-green algae, positive electivity values were found for *Anabaena* and *Nostoc* while *Polycystis, Tetrapedia* and *Merismopedia* had negative values. *Oscillatoria* and *Phormidium* were completely avoided. Among the desmids, *Gonatozygon* and *Closeterium* had positive values while *Staurastrum* was negative. All rotifers and phytoflagellates had positive values (Fig. 1A). Mosquito larvae were also found in the gut of *C. acinaces.*

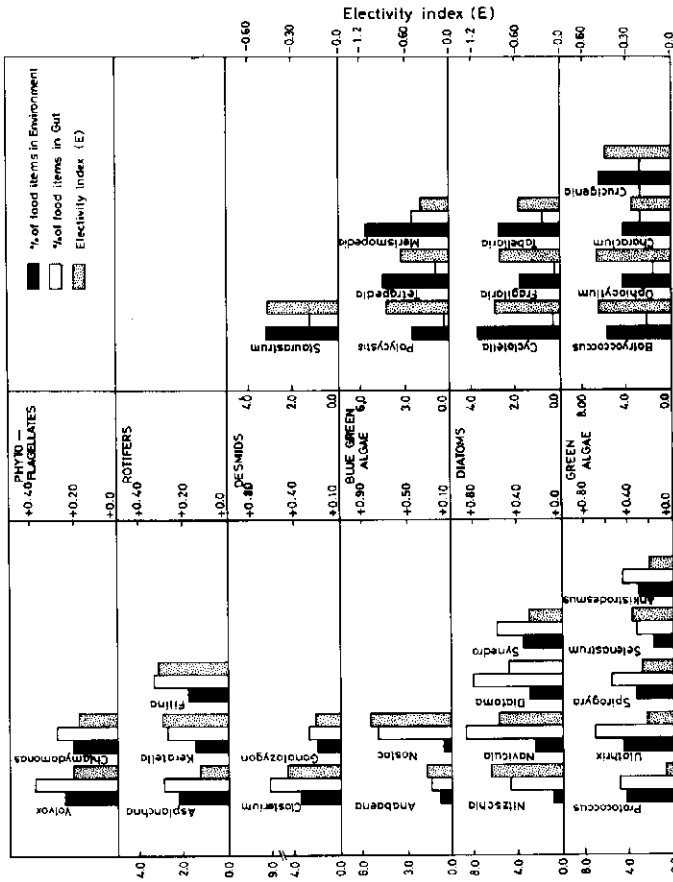

Fig. 1. Percentage composition of food items in the environment and gut of the *C. acinaces*. Positive electivity index values are shown in (A) while negative electivity values are shown in (B).

Some of the morphological characters noted during the study indicate that the body of the fish is compressed fusiform. The mouth aperture is narrow and subterminal with a protrusible maxilla and extensible mandible. These form a scoop-like structure. The caudal peduncle is long and the caudal fin is deeply forked. Pelvic and pectoral fins are widely separated. The pectoral is subfulcate. Gill rakers are short and widely spaced. The pharyngeal teeth are 2,3,5,–5,3,2.

Discussion

The data clearly indicate that *C. acinaces* is a selective feeder. Only a few of the food items (*Cocconeis, Oscillatoria* and Phormidium) present in the environment were not found in the gut of the fish. The avoidance of these organisms may be due to either unaccessability or to their distastefulness. The negative selection of some of the food items, such as *Botryoccoccus, Ophiocytium, Crucigenia, Fragilaria, Tabellaria, Polycystis* and *Tetrapedia* shows that they are not eaten by the fish as encountered in the environment. If fish were eating them as encountered, the electivity values should be zero. This may be due to the fish demonstrating a preference for other food items. The calorific value of an individual food item and its cost of capture influence the food selection by the fish. The fish may prefer to feed on those organisms for which the cost of capture is comparatively less than other items of the same calorific value [13, 14, 15].

The morphological characters of the fish indicate that *C. acinaces* is a very mobile fish and has considerable maneuverability. The protrusible premaxilla and extensible mandible form a scoop-like structure which may play a very important role because it makes the capture of prey effective and easy. Keast and Webb [16] have reported that such characters are essential for a selective planktivorous fish and lends considerable support to the present study. The collection of food items by the fish may also depend on the filtering ability of the gill rakers. The size and spacing of the gill rakers in this fish indicate that the fish could not ingest smaller food items as the interraker space is considerably wide and the items will probably pass out through them. Fryer and Iles [17]; Mallatt [18] and Robotham [19] have reported that the some fish species collect smaller food items by entrapping them in mucus to form food-mucus aggregates. Possibly, *C. acinaces* also ingest the food by making food-mucus aggregate, but it has to be investigated.

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الانتقاء الغذائي لسمك السيرينيون أسنيسي

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(أستلم في ١٨ ربيع الأول ١٤٠٨هـ، قُبل للنشر في ٢٣ شوال ١٤٠٨هـ)

ملخص البحث. لقد درس الانتقاء الغذائي لسمك «السيرينيون اسنيسي» وقد وجد أن هذا النوع اختياري الغذاء حيث لوحظ اعتماده على معظم العوالق النباتية وعدم تفضيله لأنواع أخرى، وأخيرا فلقد أشير في هذا البحث إلى العوامل التي تحدد الانتقاء الغذائي لهذا النوع.