THE FEEDING AND FATNESS OF *LABEO NILOTICUS* FORSK IN THE NOZHA-HYDRODROME

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INTRODUCTION

Labeo niloticus,, Forsk. is one of the most common species of family Cyprinidiae, that contributes by a considerable part to the catch of inland fisheries of A.R.E. However, few knowledge is available on the biology of that species. In addition to the few publications on the food and feeding, habits, nothing is known about the fatness and fat-content of this fish. A knowledge of these subjects is very important to understand the biology of the species. Thus the present investigation on the feeding and fatness of Labeo niloticus is a part of the study carried out on the biology of that species in the Nozha-Hydrodrome during 1968-1970 (Hashem, 1972).

MATERIALS AND METHODS

The materials used in this study were obtained from the commercial catch of the Nozha Hydrodrome during the period from October 1968, to April, 1969. Fish were caught mainly by gill and trammel nets with mesh-sizes from 16 to 20 mm. Small fish were obtained from the catch of seine nets. Fishing operations were carried out during night, and fish landing took place in the early morning. Fish dissection and other biological studies were carried out in the laboratory 2—3 hours after fish landing.

The gill nets were usually left in water for 10—12 hours, and the fish (catch) were removed in the morning. The fish death in the nets was estimated by 5-10% of the catch. On the other hand, the trammel nets, as well as the seine nets, were used, several times within the same night. The fish staying in the nets for a short time (less than one hour), were taken alive, after each fishing interval, to be kept in the fishing boats, till the early morning, when whole catch had to be delivered.

In this contribution the fullness of the intestine for 498 fish, ranging from 12 to 54 cm. in total length, was classified by using a four digit scale : empty, few, moderate and full. The fish were arranged into respective categories on the basis of assessments of the amount of food present in the alimentary canal. For each fish, the size, weight, and sex were recorded.

At the same time, the amout of fat on the intestines of these fishes was estimated according to an arbitrary scale modified from that suggested by Prosorovskaia (1952) for the fat-content of the Caspian roach.

For the purpose of studying the food of Labeo niloticus, the intestines of 50 fish were removed and preserved in 5% formalin solution. In the laboratory, each intestine was split and all the contents was washed into a glass petri-dish. This material was then examined with a low power binocular microscope. The different food items were identified to the major categories, and the data obtained were analysed by the various methods reviewed by Hyness (1950).

FEEDING INTENSITY

After fish dissection, the fullness of the intestine was estimated by the eye. The intestines were classified as empty, few, moderate, or full, according to the amount of food present in them. Each category was put as number and percentage with regards to all the fish examined. This arbitrary estimate of the fullness of the intestine was previously used by many investigators; Southern, 1935; Frost, 1939; Hartely, 1947; Bishai, 1955; Abdel-Malek, 1972; and many others.

When the fish (Labeo niloticus) were grouped according to their length, the large fishes (31—54 cm.) show a clear monthly variation in the intensity of feeding (Table 1). Fishes taken in October showed the biggest number of full intestines (32.1%), while the number of empty intestines were smaller (16.7%). On the other hand, fishes taken in winter (January and February) showed the highest number of empty intestines (45.0% and 42.5% respectively), while the number of full intestines were lower during these months (10%). From October through January and February the intensity of feeding gradually decreases, while from February through April an opposite trend was observed, i.e. the number of fall intestines gradually increases.

In case of small fish (Table 2), the previously mentioned trend of feeding intensity was not so obvious, like that of larger fishes. The data showed a high feeding intensity during autumn and early spring, and a moderate feeding intensity during winter. This indicates that although the small fish decrease their food intake during winter, their feeding activity seems to be still superior over the larger fish.

These data probably represent the trend of feeding of Labeo niloticus, but it is entirely possible that the method of capture did influence the amount of food present in the gut. Different methods of capture probably do not reflect the same ratio between full & empty intestines. The fish can digest

its food when still alive after being entangled in the nets, this would tend to increase the percentage of empty intestines in the sample. On the other hand, some fish may entangle in the nets just before they are landed. Also, it has to be mentioned that the small fishes being caught by seine nets may give some explanations for the small percentages of empty intestines recorded in Table (2).

TABLE (1).—MONTHLY VARIATION IN THE FEEDING INTENSITY OF LARGE LABEO NILOTICUS (31-54 CM) FROM THE NOZHA-HYDRODROME, (PERCENTAGE IN PARENTHESIS).

Month	No. of fish	State of Intestine			
		Empuy	Eew	Moderate	Full
October	84	14 (16.7)	18 (21.4)	25 (29.8)	27 (32.1)
November	96	20 (20.8)	26 (27.1)	31 (32.3)	19 (19.8)
December	65	17 (26.2)	26 (40.0)	13 (20.0)	9 (13.8)
January	20	9 (45.0)	4 (20.0)	5 (25.0)	2 (10.0)
February	40	17 (42.5)	12 (30.0)	7 (17.5)	4 (10.0)
March	12	3 (25.0)	4 (33.3)	3 (25.0)	2 (16.7)
April	19	2 (10.5)	2 (10.5)	8 (42.2)	7 (36.8)

TABLE(2).—MONTHLY VARIATION IN THE FEEDING INTENSITY OF SMALL LABEO NILOTICUS (12-30CM) FROM THE NOZHA HYDRODROME (PERCENTAGE IN PARENTHESIS).

Month	No. of Fish	State of Intestine			
		Empty	Few	Moderate	Full
October	9	1 (11.1)	2 (22.2)	2 (22.2)	4 (44.5)
November	36	8 (22.2)	6 (16.6)	11 (30.6)	11 (30.6)
December	50	13 (26.0)	8 (16.0)	16 (32.0)	13 (26.0)
January	37	9 (24.3)	12 (32.4)	10 (27.0)	6 (16.3)
February	14	3 (21.4)	3 (21.4)	5 (35.8)	3 (21.4)
March	5	—	2 (40.0)	2 (40.0)	1 (20.0)
April	9	1 (11.1)	2 (22.3)	3 (33.3)	3 (32.3)

FOOD ANALYSIS

On the basis of rough counts and judgeent by the eye, the food items in each intestine were listed as "common", "frequent" or "present". As the points method which was firstly used by Swynnerton and Worthington (1940), the most "common" item was represented by (+++), "frequent" item by (++) and a single (+) for "present" items (Table 3). The major groups of materials found in the intestines of Labeo niloticus are only listed in the table during various months. The identified food consisted chiefly of three major components ; inorganic particles (mud), organic detritus (mainly of plant origin), green and higher plant tissues.

TABLE (3).—MONTHLY DISTRIBUTION OF FOOD ITEMS IN THE INTESTINE OF LABEO NILOTICUS USING THE POINTS METHOD:
(+++) = common (++) = frequent (+) = present.

Food-item	Nov.	Dec.	Jan.	Feb.	March	April
Inorganic particles	+++	+++	++	+	++	++
Plant detritus . .	++	++	++	++	++	+++
Green Algae . . .	—	+	+	—	++	++
Higher plant tissues	+	+	—	—	+++	—
Animal detritus .	—	—	—	—	—	+
No of fish examined	10	17	7	2	8	6

All the points (+) gained by each food item in Table (3) were summed and scaled to a percentage to give the percentage composition of the food of all the fish examined (Table 4). From the table, it is evident that the inorganic particles and the plant detritus constituted the dominant food items. Each comprised about 34% of the food. The green algae and higher plant tissues were of secondary importance as food, their percentage occurrance was about 16 and 13 respectively. Moreover, they were occasionally found in the intestine of some fishes. The animal detritus was only represented by a small percentage (2.6).

TABLE (4).—PERCENTAGE COMPOSITION OF THE FOOD OF LABEO NILOTICUS IN THE NOZHA HYDRODROME DURING THE PERIOD FROM NOVEMBER 1968 TO APRIL 1969

Food items	Percentaeg
Inorganic particles	34.2
Plant detritus	34.2
Green Algae	15.8
Higher plant tissues	13.2
Animal detritus	2.6

The frequency of occurrence of particular food items is shown by the occurrence method. The numbers or percentage of fish are given, the guts of whcih contain the food item, regardless of the quantities of the individual component. The tabulated data may be a measure of the feeding selectivity and food availability to the feeding fish.

The occurrence method was applied by many investigators; Frost 1939; Frost and Went, 1940; Hartley, 1947 & 1948; Hynes, 1950; Bishai, 1965; Abdel Malek, 1972, and many others. According to this method, table (5) shows the percentage occurrence of food in different months. It has to say that some intestines contained more than one food item, so the total number of occurrece of food items were higher than the number of intestines present.

It is also apparent that inorganic particles and plant detritus were the most frequent foodstuffs. Green algae and higher plant tissues possessed the second class of importance. Animal detritus occurred rarely. These results further strenghten that previously obtained by the points method.

TABLE (5).—FREQUENCY OCCURRENCE OF FOOD ITEMS (IN %) IN DIFFERENT MONTHS FOR LABEO NILOTICUS MEASURED BY THE OCCURRENCE METHOD.

Food item	Nov.	Dec.	Jan.	Feb.	March	April
Inorganic particles . . .	100	49.1	85.7	100	75	100
Plant detritus	60	76.5	85.7	100	75	100
Green Algae	—	5.9	14.3	—	75	66.7
Higher plant tissues . .	10	29.4	—	—	100	—
Animal detritus	—	—	—	—	—	33.3
No. of fish examined . .	10	17	7	2	8	6

FATNESS (FAT-CONTENT)

The most accurate method for determining the fat-content is the chemical analysis, but under field conditions it is often necessary to use a simplified technique.. In some fish species the fat accumlates in large amounts on the intestine of the fish during the feeding period. Several assessments of the fatness of such fishes on various scales of units have been done. The most detailed of these was made by Prozorovskaia (1952), who suggested six unit scale (from O to V) for estimating the fat-content of the Caspian roach (Rutilus rutilus caspicus). With small modifications, the Prozoroviskaia scale is suitable for use with many Cyprinirae and other groups of fish. Using this modified scale, the amount of fat on the intestines of Labeo niloticus ranging in length from 31 to 54 cm, was monthly estimated and the number of fish in each stage of fatness was recorded in Tabll 6.

It is clear that the highest percentage of fish attained the IVth stage of fatness in October and November. During December, January and February stage III was recorded for a big number of fishes. In March and April, the majority of fish were found in stage II. Therefore, the amount of fat on the intestines of Labeo niloticus gradually decreases from October through March and April. This indicates that the fat-content of this fish is gradually expended during the relatively cold period.

Also it has to be mentioned that small fishes of lengths less than 30 cm were always found in the O or 1st stage of fatness, i.e., there is no accumulation of fat on the intestines of these young fishes, and if present, it is of very small amounts.

DISCUSSION & CONCLUSIONS

The present study showed that the amount of food taken by the fish varies according to the month. The percentage of full intestines gradually decreases from October through January and February, then it increases again in March and April. At the same time, the percentage of empty intestines increases during winter. This is attributed to a drop in the feeding activity of the fish during that relatively cold period. This means that Labeo niloticus in the Nozha Hydrodrome continues to feed during winter, but at a lower rate than in other seasons. The data also indicate that small fishes continue their feeding activity in winter at a more pronounced rate than larger fishes.

TABLE (6).—MONTHLY VARIATION IN THE FATNESS OF LARGE LABEO NILOTICUS (31-54 CM) FROM THE NOZHA HYDRODROME (PERCENTAGE IN PARENTHESIS).

Month	No. of Fish	Stage of fatness				
		I	II	III	IV	V
October	84	15 (17.9)	17 (20.2)	20 (23.8)	24 (28.6)	8 (9.5)
November	96	16 (16.7)	20 (20.8)	22 (29.9)	30 (31.3)	8 (8.3)
December	65	8 (12.3)	15 (23.1)	24 (36.9)	13 (20.0)	5 (7.7)
January	20	3 (15.0)	4 (20.0)	7 (35.0)	5 (25.0)	1 (5.0)
February	40	6 (15.0)	12 (30.0)	15 (37.5)	7 (17.5)	— —
March	12	2 (16.7)	7 (58.3)	3 (25.0)	—	—
April	19	3 (15.8)	14 (73.7)	2 (10.5)	—	—

Labeo niloticus feeds on decomposing vegetable substances, algae, and higher plant tissues. The decomposing organic matter is the most common item, where its overall percentage is about 34% of the total intestinal contents as measured by the occurrence method. Together with the above mentioned food items, the fish swallow great quantities of mud, which indicates that the fish always feed on the bottom. This is confirmed by the fact that the fish posses a ventral protractile mouth with much developed lips forming a sort of sucker.

So, it can be concluded that Labeo niloticus is a herbiverous bottom feeder. This coincides with the finding of Boulenger (1907), who pointed out that "the fish are essentially herbiverous, feeding chiefly on algae and decomposing vegetable substances and also on diatoms and other minute organic substances contained in the mud which they swallow in great quantities".

The present investigation also showed that the amount of internal fat on the intestines of Labeo niloticus measuring from 31 to 54 cm, is subjected to seasonal changes. Maximum values were found in October (the last month of warm weather), while minimum values were observed in early spring. This emphasizes the idea that the intestinal fat is expended on the different metabolic activities of the fish during the relatively cold season, when a reduction in the feeding activity of the fish was observed.

It is also worth to indicate that no or little fat was found on the intestines of young fishes. This also confirm the finding that young individuals, decrease their feeding activities during winter, but not to the level of big fishes. This means that the young fish continue to feed in winter but at a relatively lower rate than in other seasons.

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