

Selection Of Food In Different Size Groups Of *Poecilia Latipinna* (Lesueur, 1821) From Eastern Province Of Saudi Arabia.

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Abstract: Food selection by the fish, *Poecilia latipinna* from Eastern Province, Al-Qateef, Saudi Arabia was studied by computing the electivity index (E) for different groups. The fish seems to be highly selective for certain genera of phytoplankton and or zooplankton depending upon the size groups. Selection varies proportionately with prey abundance. Small fishes generally feed on zooplankton while larger ones mostly on Phytoplankton. Some degree of stenophagism with respect to some organisms was evident. The factors like accessibility, tastefulness, filtering ability of gillrakers, structure of pharyngeal teeth etc. resulting the selection behaviour of fish have been briefly discussed.

Key words: Food Selection, *Poecilia latipinna*, Size groups, Electivity Index.

Introduction

Studies elucidating the nutritional spectra of fishes, such as the selection of food by the fish in their habitat, are helpful in understanding the general and inter-specific feeding relationship, and are considered important in the management of their population (Shamsi, 1984; Shamsi *et al.*, 1995; Al-Akel *et al.*, 1996; Olsen *et al.*, 2000). The study of diet may also be used to describe seasonal variation in nutritive value of the diet of fish population (Windell and Bowen, 1978; Getachew and Fernando, 1989). So dietary of a particular fish species could be more precisely defined on the basis of quantitative and qualitative changes in its food during its life span (Shamsi *et al.*, 1995 and Al-Akel *et al.*, 1996). Their nutritive values and seasonal

availability are essential to understanding the environmental impacts on the condition and the growth of the fish. Several investigators have directed their attention towards the selective feeding behaviour of fishes in their habitat. Considerable informations on food selection of various tropical fish species are available and notable contribution are those of Mills *et al.* (1984), Al-Akel *et al.* (1987), Al-Kahem *et al.* (1988), Gulbrandsen (1993), Fernandez *et al.* (1994), Shamsi *et al.* (1995) and Al-Akel *et al.* (1996).

To the best knowledge of the author there is no previous published work on the food and its selection of the aforesaid fish. The purpose of the present investigation is to examine the food selection of food resources by *Poecilia latipinna* from the Eastern Province, Al-Qateef region of Saudi Arabia. The informations are

likely to be beneficial for establishing the interspecific relationship among different fish size groups.

Materials and Methods

Fresh and healthy fish specimen were caught using sein and scoop nets in the early morning (8 - 9 am) from the Eastern Province, Al-Qateef, Saudi Arabia. Some physicochemical parameters were analysed (pH, dissolved oxygen, and morning temperature). From the collected sample, fishes (20.0-85.0 mm TL) were immediately anaesthetized with MS 222 (100 mg/L) to prevent regurgitation. At the same time and from the same place, the samples of Phytoplankton and Zooplankton were also collected. For phytoplankton the water sample was collected with the help of sampling bottle at different depth and preserved in 1% Lugol s solution. For zooplankton, 100 liters of water from the sampling site was filtered using a plankton net (mesh size 60 μ) and were preserved in 10 % of formaldehyde solution. The fishes were measured to the nearest millimeter and weighed to the nearest gram by Mettler (H-80), a sensitive balance and separated into four different groups. The gut contents of the fishes for each group was emptied in separate vials for identification of food organisms. The gut contents were poured in separate watch glasses with small quantity of water and mixed thoroughly. The food organisms in the guts and in the environmental sample were identified and counted separately using the keys of Ward and Whipple (1963); Needham and Needham (1964) and Tonapi (1980). The methods used for analysis of the results was drop method previously used by Pearsall *et al.* (1964). The same method was also used earlier by Jafri and Mustafa (1977);

Al-Kahem *et al.* (1988, 1990), Shamsi *et al.* (1995) and Al-Akel *et al.* (1996). The abundance of food organism was expressed in percentage of the total items counted in the sample. Sample was replicated and the mean was determined. The Electivity index was determined by the method of Ivlev (1961) as :

$$E = \frac{r_i - p_i}{r_i + p_i}$$

Where, E= the electivity index, r_i = percentage of food items in the gut and p_i = percentage of food organisms in the environment. According to Krebs (1989), this method was more sensitive to measure the food selection. The values of the index ranged from (-1) to (+1) which indicate the positive and negative selection of food, respectively.

Results

The Selection of food organisms in terms of percentage of each food item in the gut (r_i) and in the environment (p_i) together with the index (E) of each group are given in Table (1). Negative values indicate the avoidance or unaccessibility of the food items. Positive values show the preference and acceptability of the food organisms.

The quantitative determination and the availability of the food items in the gut indicate that this species is a very selective feeder. Mainly the diet consisted of phytoplankton and zooplankton. For the phytoplankton, the groups of the food organisms represented by blue-green algae (Cyanobacteria), green algae (Chlorophyceae), desmids (Desmidiaceae) and diatoms (Bacillariophyceae). The zooplankton included Protozoans, Rotifers, Crustaceans, Cladocerans and Copepods.

Table 1. Mean Percentage of each planktonic food organism in the gut content (ri) of each group of fishes in the environment (pi) and the electivity index (E) of *Poecilia latipinna*.

Organism	PI	Gr. I		Gr. II		Gr. III		Gr. IV	
		ri	E	ri	E	ri	E	ri	E
Phormidium	3.43	7.55	+ 0.37	5.54	+ 0.23	5.29	+ 0.21	2.68	- 0.12
Tetrapedia	1.37	-		-		-		-	
Oscillatoria	2.64	4.04	+ 0.21	3.27	+ 0.11	2.94	+ 0.05	0.89	- 0.49
Merismopedia	1.58	-		-		-		-	
Rivularia	1.37	1.23	- 0.05	0.75	- 0.29	0.59	- 0.39	0.45	- 0.51
Polycystis	1.37	0.70	- 0.32	0.75	- 0.29	0.59	- 0.39	1.78	+ 0.13
Spirulina	1.32	2.46	+ 0.30	1.76	+ 0.14	3.53	+ 0.45	0.45	- 0.49
Aphanocapsa	1.43	-		-		-		-	
CYANOBACTERIA	14.52	15.98	-	12.07	-	12.94	-	6.25	-
Pediastrum	3.17	0.70	- 0.64	0.75	- 0.62	-	-	-	-
Kirchneriella	3.01	1.05	- 0.48	1.01	- 0.49	0.59	- 0.67	-	-
Ankistrodesmus	3.75	1.40	- 0.36	1.76	- 0.26	1.18	- 0.44	-	-
Characium	1.48	0.53	- 0.47	-	-	-	-	-	-
Coelastrum	3.38	7.38	+ 0.37	4.28	+ 0.12	3.23	- 0.02	-	-
Crucigenia	2.16	6.68	+ 0.51	5.04	+ 0.40	3.53	+ 0.24	4.02	+ 0.30
Draparnaldia	1.61	1.40	+ 0.09	0.75	- 0.21	-	-	1.34	+ 0.07
Oedogonium	1.48	0.35	- 0.62	-	-	-	-	-	-
Ophiocytium	2.27	-		-		-		-	
Protococcus	3.01	5.45	+ 0.29	4.28	+ 0.17	3.53	+ 0.08	1.78	- 0.26
Scenedesmus	1.85	1.05	- 0.27	1.01	- 0.29	0.59	- 0.52	-	-
Selenastrum	2.06	0.88	- 0.40	0.50	- 0.61	-	-	-	-
Tetraspora	2.96	2.11	- 0.16	2.01	- 0.19	1.76	- 0.25	0.45	- 0.74
Ulothrix	2.22	1.40	- 0.22	3.02	+ 0.15	2.35	+ 0.03	-	-
CHLOROPHYCEAE	33.95	30.38	-	24.41	-	16.76	-	7.59	-
Cocconeis	2.01	4.04	+ 0.33	2.77	+ 0.16	2.06	+ 0.01	0.89	- 0.39
Cyclotella	2.01	1.93	- 0.02	1.26	- 0.23	0.88	- 0.39	-	-
Cymbella	1.27	1.05	- 0.09	1.26	- 0.003	0.59	- 0.36	0.89	- 0.17
Diatoma	2.48	4.75	+ 0.31	4.28	+ 0.27	2.94	+ 0.08	6.70	+ 0.46
Eunotia	1.00	-		-		-		-	
Fragilaria	2.06	-		-		-		-	

Table I. contd.

Organism	PI	Gr. I		Gr. II		Gr. III		Gr. IV	
		ri	E	ri	E	ri	E	ri	E
Gyrosigma	1.85	-	-	-	-	-	-	-	-
Meridion	0.58	-	-	-	-	-	-	-	-
Navicula	2.27	4.75	+ 0.35	4.78	+ 0.36	5.29	+ 0.39	4.91	+ 0.37
Nitzschia	1.89	-	-	-	-	-	-	-	-
Surirella	0.79	0.70	- 0.06	1.26	+ 0.23	0.59	- 0.14	2.68	+ 0.54
Synedra	3.33	2.81	- 0.08	3.02	- 0.05	2.35	- 0.17	-	-
Tabellaria	1.43	4.40	+ 0.51	4.28	+ 0.49	2.35	+ 0.24	0.45	- 0.52
Amphora	1.48	-	-	-	-	-	-	-	-
BACILLARIOPHYCEAE	24.18	24.43	-	22.91	-	17.05	-	16.52	-
Closterium	2.27	3.87	+ 0.26	3.78	+ 0.25	3.23	+ 0.17	3.12	+ 0.16
Cosmarium	1.43	5.27	+ 0.57	4.53	+ 0.52	2.65	+ 0.29	1.43	- 0.03
Docidium	1.74	0.35	- 0.66	0.25	- 0.75	-	-	-	-
Gonatozygon	1.58	1.05	- 0.20	3.02	+ 0.31	5.0	+ 0.52	-	-
Mesotaenium	1.64	-	-	-	-	-	-	-	-
DESMIDIACEAE	8.66	10.54	-	11.58	-	10.88	-	4.64	-
Astasia	1.53	-	-	-	-	-	-	-	-
Chlamydomonas	2.22	7.91	+ 0.56	8.31	+ 0.58	10.88	+ 0.66	11.16	+ 0.67
Eudorina	1.27	6.68	+ 0.68	4.28	+ 0.54	3.82	+ 0.50	5.80	+ 0.64
Monas	0.74	-	-	-	-	-	-	-	-
Phacus	1.21	-	-	-	-	-	-	-	-
Volvox	1.11	1.23	+ 0.05	3.27	+ 0.40	2.35	+ 0.36	4.64	+ 0.60
Trinema	0.95	-	-	-	-	-	-	4.91	+ 0.68
Physarum	0.84	-	-	1.76	+ 0.35	3.53	+ 0.61	2.68	+ 0.52
PROTOZOA	9.87	15.82	-	17.62	-	20.58	-	29.01	-
Colurella	1.21	0.70	- 0.27	1.51	+ 0.11	2.35	+ 0.32	3.57	+ 0.49
Testudinella	1.43	0.53	- 0.46	1.51	+ 0.03	2.35	+ 0.24	4.46	+ 0.51
Brachionus	0.89	0.70	- 0.12	1.51	+ 0.26	2.35	+ 0.45	4.46	+ 0.67
Notholca	0.74	0.35	- 0.36	2.01	+ 0.46	3.53	+ 0.65	4.02	+ 0.69
Keratella	0.74	0.53	- 0.16	1.01	+ 0.15	1.76	+ 0.41	3.57	+ 0.66
ROTIFERS	5.01	2.81	-	7.55	-	12.34	-	20.08	-
Nauplius	0.26	-	-	-	-	0.59	+ 0.39	0.89	+ 0.55
Ceriodaphnia	0.47	-	-	-	-	0.88	+ 0.30	0.89	+ 0.31
Diaptomus	0.58	-	-	-	-	-	-	1.78	+ 0.51
Cypridopsis	0.53	-	-	1.76	+ 0.54	3.53	+ 0.74	4.46	+ 0.79
Canthocamptus	0.69	-	-	-	-	0.59	- 0.08	2.68	+ 0.59
Cyclops	0.74	-	-	-	-	0.59	- 0.11	0.89	+ 0.09
Eubranchipus	0.53	-	-	2.01	+ 0.58	3.23	+ 0.72	4.46	+ 0.79
CRUSTACEANS									
CLADOCEANS & COPEPODS	3.79	-	-	3.77	-	9.41	-	16.05	-

Selection in Various size Groups:**Group I (20.0-35.0 mmTL):**

The fishes of this size group feeds upon both plankton and the major diet was consisted of zooplankton. The fish preferred, Protozoans, Rotifers, Cladocerans and Copepods and are form about 65.14% of the total diet. Some of the phytoplanktonic organisms, like, *Polycystis* (Cyanobacteria), *Crucigenia* and *Draparnaldia* (Chlorophyceae), *Diatoma*, *Navicula* and *Surirella* (Bacillariophyceae), *Closterium* (Desmidiaceae) were taken positively by the fish (Table-1). The remaining either negatively taken or completely avoided.

Group II (35.0-50.0 mmTL) :

This group of fishes also feeds upon phyto-and-zooplankton items. About 42.33 % of the diet consisted of zooplankton.. For the phytoplankton, the items likes *Phormidium*, *Oscillatoria* and *Spirulina* (Cyanobacteria), *Crucigenia*, *Protococcus* and *Ulothrix* (Chlorophyceae), *Cocconies*, *Diatoma*, *Navicula*, and *Tabellaria* (Bacillariophyceae), *Closterium*, *Cosmarium* and *Gonatozygon* (Desmidiaceae) were positively taken by the fish and the others were avoided because of their distastefulness.

Group III (50.0-65.0 mmTL):

In this group of fishes, the major portion of the diet consist of phytoplankton (70.9 %). *Phormidium*, *Oscillatoria* and *Spirulina* (Cyanobacteria, 12.07 %); *Crucigenia*, *Protococcus* and *Ulothrix* (Chlorophyceae, 24.41 %) and *Cocconies*, *Diatoma*, *Navicula*, and *Tabellaria* among (Bacillariophyceae, 22.91%) and *Closterium*, *Cosmarium* and *Gonatozygon* (Desmidiaceae, 11.58%) were the food items taken positively by the fish while there was a negative approach towards the remaining food

items (Table 1). Some of the zooplanktonic organism were taken positively.

Group IV (65.0- 80.0 mmTL):

In this group of fishes phytoplanktonic organisms consisted 81.33 % in which Chlorophyceae was highest (30.38 %) which followed by Bacillariophyceae (24.43 %) and next to it was Cyanobacteria (15.98 %) of the total diet. The positive and negative selection of the food items in different size groups are given in Table 1. Complete avoidance of Rotifers, Cladocerans and Copods was evident. Only *Chlamydomonas*, *Eudorina* and *Volvox* were the only zooplanktonic organism taken positively while others were completely neglected by the fishes in this particular group.

Discussion

The differences between the relative abundance of certain planktonic food items in the gut and their relative percentage in the environment, were measured through the electivity indices which indicate the selective feeding behaviour of the fish. Food preference of *Poecilia latipinna* was found to be correlated to its size. Complete avoidance of some planktonic organisms by the fish, may either be due to their unaccessable to the fish, by virtue of their behaviour, or to their rejection as food because of distastefulness. The fish is able to orientate towards these organisms with the help of specialized taste buds (Nikolsky, 1963). Negative selection observed for a number of organisms indicate that either the organs were not specialized enough to seek out those food, or the intestine lack the adaptation to digest them easily (Shamsi , 1984).

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 values (Strauss, 1979, 1982 and Lazzaro, 1987). A comparison of electivity indices for phyto-and zooplankton reveals differences between the positive as well as negative sets of data pointing to the degree of selection and avoidance. The opportunistic feeding is also likely depend to an extent upon the relative density of food categories in the environment. Though the fish possess inclination towards particular food items, scarcity of such priority of food organisms below a critical level as a result of environmental condition, may force the fish to accept and thrive on some other available food resources. Bhatnagar and Karamchandani (1970), Shamsi (1984) and Oozeki *et al.* (1992) have reported a similar situation for *Labeo rohita*, *Puntius sophore* and in the striped mullet (*Mugil cephalus*).

Data embodied in Table-1 clearly indicate that smaller fishes mainly fed on zooplanktonic organisms. The selection of zooplankton depend on the size of fish, gill raker's structure, pharyngeal teeth's shape and fish's fast movements. The activeness of larger fishes slow down with the increase in size and weight, therefore, the access of larger fish to fast moving organism (zooplankton) become difficult. Hence, they may prefer to feed on those organisms (phytoplankton) which are procure easily. This view strengthen with the statement presented by Mustafa (1976) in *Esomus danricus*, Al-Kahem *et al.* (1988) in *Cyprinion mhalensis*; Mills *et al.*, 1989a and 1989b in yellow perch (*Perca flavescens*) and Shamsi *et al.* (1995) in *Puntius sophore*.

Food selection by the fish may also depend on the filtering ability of the gill rakers and the space between them. (Fryer and Iles, 1972; Mallatt, 1981; Robotham, 1982; Al-Kahem *et al.*, 1988, 1990 and Al-Akel *et al.*, 1996). It can be concluded that factors such as feeding opportunities, availability and abundance of food, unaccessability or distastefulness, anatomical or physiological adaptation of feeding equipments and mobility of the prey will influence the selection of food by the fish from its habitat. More or less similar conclusion have been drawn by Lewis *et al.* (1974), Mustafa (1976), Jafri & Mustafa (1977), Aravindan (1980), Al-Kahem *et al.* (1988,1990), Gulbrandsen (1993), Shamsi *et al.* (1995), and Al-Akel *et al.* (1996).

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الانتقاء الغذائي لسماك البوسيليا لاتيبينا *Poecilia latipinna*

علي بن سليمان العقل

قسم علم الحيوان - كلية العلوم - جامعة الملك سعود

ص . ب ٢٤٥٥ الرياض ١١٤٥١ - المملكة العربية السعودية

الملخص العربي: لقد درس ظاهرة الانتقاء الغذائي لسماك البوسيليا لاتيبينا والذي جمع من المياه العذبة في محافظة القطيف في المنطقه الشرقيه في المملكه العربيه السعوديه.

استخدمت في هذه الدراسة معادلة الانتقاء الغذائي وهي معادلة إلف (Ivelve's Index) حيث قدرت نسبة المادة الغذائية في القناة الهضمية لهذا الكائن وكذلك نسبتها في البيئة المائية التي يعيش فيها هذا النوع ، وبناء على هذه النتائج تبين أن سمك البوسيليا لاتيبينا اختياري التغذية لأنه يتغذى على أنواع مختلفة من العوالق النباتية والحيوانية ويعتمد انتقاؤه الغذائي على عدد من العوامل منها وفرة الغذاء سواء كان حيوانياً أو نباتياً وكذلك حجم الأسماك حيث لوحظ أن صغار هذا النوع تفضل العوالق الحيوانية مثل الأوليات والعجليات والقشريات وغيرها بينما تتغذى الأفراد الكبيرة على العوالق النباتية مثل الطحالب الخضراء المزرقه والطحالب الخضراء والدايتومات وغيرها .

وقد تبين أن اختيار الغذاء له ارتباط وثيق مع حجم الأسماك حيث أن الأسماك الصغيرة سريعة الحركة وبالتالي تستطيع اللحاق بالعوالق الحيوانية وافتراسها بينما لا تستطيع الأسماك كبيرة الحجم اصطياد تلك الفرائس وبالتالي تعتمد على العوالق النباتية فقط وقد يعزى تغذية هذا النوع من الأسماك على نمط معين من الغذاء إلى أن الأمعاء غير قادرة على هضم ذلك الغذاء وقد دلت هذه الدراسة أن اكتشاف العوالق الحيوانية أو العوالق النباتية وتفضيلها من أهم العوامل التي سيطرت على اختيار هذه الأسماك للمادة الغذائية بالإضافة إلى عوامل أخرى ذكورت في المناقشة.