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BIOLOGY OF FOOD AND FEEDING OF JUVENILE *DICENTRARCHUS PUNCTATUS* (BLOCH, 1792) ALONG PORT-SAID COAST ON THE MEDITTERRANEAN SEA, EGYPT

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ABSTRACT

A total of 909 specimens of *Dicentrarcus punctatus* were collected from by trawling along Port-Said coasts. The juvenile of *D. punctatus* could stay at the nursery grounds from June till December. The length-weight relationship, $W = 0.082\ L^{3.0943}$ as well as the condition factor of the juvenile fishes were studied. The correlation cofficient was very high, which proves the well-being of the studied species. The juvenile of *D. punctatus* are likly bottom feeders, they feed mainly on Mollusca together with Crustacea, as well as fish eggs and fish parts. Intensity of feeding was quite high during summer and early autumn which reflects high rate of feeding activity in this period o the year.

1. INTRODUCTION

Fishes of family Serranidae are littoral and sublittoral inhabitants which are found in all tropical and temperate seas. They are occurring in the shallow waters. Mostly benthic, exceptionally bathypelagic. Cheifly solitary at least when adult. Carnivorous, predators on fishes and inverteberates. *D. punctatus* and other serranids in temperate waters are valued as commercially important (Hureau & Monod, 1978).

Family Serranidae are recorded in the Egyptian Mediterranean waters and its production contributes a small percentage, ranged from 2.1 to 5 % (El-Rashidy, 1987). Fischer (1973) stated that members of genus Dicentrarchus are commonly known as seabass, they are euryhaline marine fishes. Both *Dicentrarcus labrax* and *D. punctatus* are usually mount among the landed catch of the Egyptain Mediterranean, because of their extreme euryhaline they enter the northern Delta Lakes for feeding , after 1990 the two species are only present at lake- sea connection.

El-Mor (2002) identified juveniles of *Serranus hepatus*, *Serranus scriba*, *Dicentrarchus labrax*, *D. punctatus* and *Epinephelus haifensis* from the catch of the trawling net along Port Said coast, Egyptian Mediterranean Sea.

The present study describes some biological aspects of juvenile *D. punctatus* from Port-Said coast. This study may be useful for fishery management purposes of the mentioned species beside determining the time of recuritment and defining the trophic relationships between the target species with other inverteberates and fishes in this area.. Also results from feeding habites of the *D. punctatus* may have a direct implication for aquaclture.

2. MATERIALS AND METHODS

The subsamples of by-catch (5 kg) were collected monthly from small bottom trawlers (first class boats) powered by 45-70 HP

engines operating in Port-Said coast during the period from January to December 2006. The trawlers have bag like nets towed along the soft bottom substrates. The net open by two metal frames calls Tabillia and a small cod end with mesh size of (1.5-2.5 cm). The net was dragged on the bottom for about 3000-5000 meters near Port-Said coast (31° 16' 39" N and 32° 16' 14" E). On the return to the Laboratory, fish samples were sorted and species identification for each fish species was carried out based on criteria given by Whitehead, *et al.*, (1986).

A total of 909 specimens of *D. punctatus* were collected during the period of study. The total lengths of all specimens of *D. punctatus* were measured to nearest cm. Total and gutted weights were measured to the nearest gm, then the length-weight relationship was calculated using power equation:

$$W = a L^{b}$$ (Beckman, 1948)

Where: W - fish total weight (gm), L - fish length (cm) ;

a - constant and equal the intercept of the straight line with y-axis ;

b- coefficient of allometery varying between 2 and 4 in different species (Bagenal and Tesch, 1978).

The total body weight is not constant throughout the year, due to variations in feeding activity. So, we have used both weights (total and gutted) in calculating the condition factor of the fish (Nikolsky, 1963).

Fulton's coefficient of condition or composite coefficient of condition was determined by the following formula:

$$K_{(F)} = 100 * W_t * L^{-3}$$ (Fulton, 1902)

Where: W_t - Total observed weight, L - observed length.

Clark's coefficient of condition was determined by the following formula :

$$K_{(C)} = 100 * W_g * L^{-3}$$ (Clark, 1928)

Where: W_g - gutted fish weight, L - observed length.

Stomachs contents of 909 spcimens of *D. punctatus* were examined for studying feeding, the possible seasonal variations of diet composition. Each fish was dissected and the alimentary tract was removed and preerved in 4% of formaline–seawaters until stomach analysis have been done.

The degree of distension of the stomach was assessed by visual estimation and classification as empty, trace, quarter full, half full, three quarter full, and completely full respectively as described by Pillay (1952), then the stomach was cut, opened longitudinally, and its contents were scraped off and transferred into a small peteri dish containing small amount of water. Food items were sorted out under binocular microscope. Food items were identified down to classes, and when possible to orders. A list of general diet composition was made. Food analysis were made by points of assessment method (Hyslop, 1980).

3. RESULTS

3.1. Length frequency distribution

Length frequency distribution of 909 juvenile *Dicentrarchus punctatus* were represented graphically in Figure (1). The juveniles of *D. punctatus* varied in size from 3.7 cm (in June) to 9.8 cm total length (in December). The smallest juveniles fish (3.7 cm) formed about 61.1% and the fish larger than 3.7 cm formed 38.9% of the total number (Figure,1).

The juveniles which appeared in July had a mode length of 5.2 cm, whereas that appeared in August were abundant and exhibited mode at 5.8 cm (Figure 1). Juveniles fish increased in length in the following months and performed modes at 6.7 cm in September (no=130) and at 7.7 and 8.2 cm in October (no=149). The number of individuals recorded in November was149, varying between 7.2 and 9.2 cm with a mode at 8.7 cm. In December, the number of juveniles was 142 and the mode attained in 9.8 cm. These data indicate that, the recruitment of juveniles continued from September till December, then larger juvenile

fish migrateto the deeper water, assuming the first recruitment to appeare in June, then we can say that juveniles probably stay for seven months in the area of collection.

3.2. Length-weight relationship and condition factor

A total of 909 of *Dicentrarchus punctatus* were used to calculate the length-weight relationships (Table 1 and Figure 2). The total length varied from 3.5 to 9.9 cm and the total body weight varied from 0.49 to 9.44 g.

$$W = a\ L^{b}$$

and both "a" and "b" for species were determined. They were 0.082 and 3.0943 respectively. It is clear that "b" value indicates isometric growth. The correlation coefficient "R^2" was 0.974 and (P) less than 0.01, So it is highly significant.

Values of "K_F" and "K_C" with intervals of 0.4 cm fish length, for *D. punctatus* are given in Table (1) and Figure (3). "K_F" values varied from 1.18 in smallest fishes (3.7 cm) to 0.95 in large ones (9.2 cm), whereas "K_C" varied from 0.91 to 0.90 respectively. Those concerned with monthly variation (Figure 4) recorded the highest reading in December (K_F, 1.03) and K_C in November, 0.99 , then decreased gradually to reach the lowest one in August (K_F, 0.87 and K_C, 0.74) .

3.3. Food and feeding habites

3.3.1. Annual diet composition

The variety of food items was large (Figure 5) . However, molluscs supplemented by crustacea formed most of the food itms for *D. punctatus*. Mollusca formed the major food items and constituted 48.3% of all food consumed. They were represented mainly by juvenile of bivalves and gastropods. Crustacea occupied the second class of importance in the food items, constituting 30.8%. Fish eggs , fish parts and digestive food ranked in descending orders and contributed 12.3, 4.1 and 3.9% respectively. Occasional items such as algae were rarely represented in stomach contents.

3.3.2. Monthly variations in diet composition

In all months of occurrence of *D. punctatus* in the nursery, molluscs and crustacea formed the main components of stomach content. The proportion of molluscs ranged from 55.3% in November to 42.4% in October (Table 2). Crustacea attained the maximum value in June (38.7%), then decreased to the minimal value in December (11.3%). Fish eggs were found in all months except November, ranging from 9.8% in June to 21.4% in October. Fish parts occurred in all months except in October and November and reaching their maximum value (9.2%) in December. On the other hand, Digestive food appeared in August by 3.1%, then increased in the following months and reaching their highest level (9.7%) in December. Algae occurred in September and October by the values 0.4 and 3.4 respectively.

3.3.3. Feeding habits in relation to fish size

Fishes were classified into six classes from 3.5 to 10.4 cm with 1 cm interval (Table 3). Molluscs and Crustacea dominated the food items in all size groups. The percentage of Mollusca in the diet declined from 65.4% in small fish (3.5-4.4 cm) to 33.5% in the medium-size juveniles (6.5-7.4 cm), then increasd to 50.2% in the largest juveniles (9.5-10.4 cm). Crustacea contributed 33.3% in small fish, increased to 34.6% in medium size fish (6.5-7.4 cm), then decreased in the following length groups and reaching 27.2% in the largest juveniles (9.5-10.4 cm). On the other hand, fish eggs were found in all length groups except length groups (7.5-8.4 cm) and (8.5-9.4 cm) and, ranging from 1.3% in small fish to 22.6% in the largest juveniles. Fish parts were absent in small sized fish , while diet being reduced 3.2% in size range

4.5-5.4 cm, and dcreasedto 1.2% in size 5.5-6.4 cm and reached their high level (3.2%) in medium size fish (6.5-7.4 cm). Digested food was frequently preent by 6.5 to 9.4 cm, ranging from 3.1 to 21.4%. Algae was occasionally observed in the size class (7.5-8.4 cm) by 0.5%.

3.3.4. Feeding intensity

The results of feeding activities were illustrated in Table (4). Intensity of feeding in *D. punctatus* clearly indicates a high rate of feeding activity. Fishes which stomachs half full, almost full and full of food amounted 70.7 %, whereas those with stomachs devoid or have trace of food were represented by 29.3 % of total specimens. The feeding activities were quite high during summer and early autumn.

Table (1): Average emperical, calcaulted weight and condition factor (k(f) & k(c)), per length groups of 909 dicentrarchus punctatus in port said coast, mediterranean sea. (trawling net).

Total length (cm)			Aver. Obser.	Cal.	Condition factor	
Range	Average	No.	weight (g) ± S.D.	weight (g)	K(F)	K(C)
3.5-3.9	3.7	69	0.60 ±0.08	0.49	1.18	0.91
4.0-4.4	4.3	38	0.71 ±0.11	0.77	0.89	0.78
4.5-4.9	4.7	64	0.88 ±0.11	1.01	0.85	0.69
5.0-5.4	5.2	61	1.19 ±0.17	1.37	0.86	0.73
5.5-5.9	5.8	60	1.73 ±0.18	1.91	0.89	0.83
6.0-6.4	6.2	47	2.15 ±0.27	2.34	0.90	0.85
6.5-6.9	6.7	102	3.46 ±0.37	2.98	1.15	1.05
7.0-7.4	7.2	66	3.89 ±0.57	3.70	1.04	0.94
7.5-7.9	7.7	109	4.84 ±0.22	4.54	1.06	0.93
8.0-8.4	8.2	70	5.57 ±0.35	5.50	1.01	0.92
8.5-8.9	8.7	89	6.25 ±0.39	6.57	0.94	0.88
9.0-9.4	9.2	40	7.41 ±0.31	7.79	0.95	0.90
9.5-9.9	9.8	94	9.81 ±1.99	9.44	1.04	1.01

Table (2): Monthly variation in diet composition of 684 Dicentrarchus punctatus from Port Said coast, Mediterranean Sea . (trawling net)

		Food items			Food items (%)		
Months	**No.**	**Mollusca**	**Crustacea**	**Fish eggs**	**Fish parts**	**Digestive food**	**Algae**
Jan.	-	-	-	-	-	-	-
Feb.	-	-	-	-	-	-	-
Mar.	-	-	-	-	-	-	-
Apr.	-	-	-	-	-	-	-
May	-	-	-	-	-	-	-
Jun.	**80**	51.5	38.7	9.8	-	-	-
Jul.	**80**	48.0	33.1	11.1	7.8	-	-
Aug.	**75**	47.4	32.7	12.4	4.4	3.1	-
Sep.	**100**	43.7	32.0	11.4	6.9	5.6	0.4
Oct.	**120**	42.4	29.7	21.4	-	3.1	3.4
Nov.	**100**	55.3	38.4	-	-	6.3	-
Dec.	**129**	49.5	11.3	20.3	9.2	9.7	-
Total	**684**	**48.3**	**30.8**	**12.3**	**4.1**	**3.9**	**0.5**

Table (3): The diet composition of different size classes in Dicentrarchus punctatus from Port Said coast, Mediterranean Sea. (Trawling net).

		Food items			Food items (%)		
Size groups (cm)	**No.**	**Mollusca**	**Crustacea**	**Fish eggs**	**Fish parts**	**Digestive food**	**Algae**
3.5-4.4	**80**	65.4	33.3	1.3	-	-	-
4.5-5.4	**100**	62.3	22.9	11.6	3.2	-	-
5.5-6.4	**82**	55.9	22.5	20.4	1.2	-	-
6.5-7.4	**120**	33.5	34.6	25.6	3.2	3.1	-
7.5-8.4	**110**	38.9	34.7	-	-	21.4	5.0
8.5-9.4	**112**	46.6	34.9	-	-	18.5	-
9.5-10.4	**80**	50.2	27.2	22.6	-	-	-

Table (4): Monthly variation in the intensity of feeding of Dicentrarchus punctatus from Port Said coast, Mediterranean Sea. (Trawling net)

		The degree of distension of the stomach (%)					
Months	**No.**	**Empty**	**Trace**	**1/4**	**1/2**	**3/4**	**Full**
Jan.	-	-	-	-	-	-	-
Feb.	-	-	-	-	-	-	-
Mar.	-	-	-	-	-	-	-
Apr.	-	-	-	-	-	-	-
May	-	-	-	-	-	-	-
Jun.	80	3.7	6.3	14.0	22.5	23.6	29.9
Jul.	80	2.2	2.5	13.6	14.5	22.9	44.3
Aug.	75	-	1.1	12.7	13.4	33.0	39.8
Sep.	100	-	1.9	12.8	13.9	3.5	67.9
Oct.	120	-	-	14.4	22.6	13.9	49.1
Nov.	100	22.5	26.5	14.8	23.3	12.9	-
Dec.	129	29.6	24.5	2.6	24.8	14.6	3.9

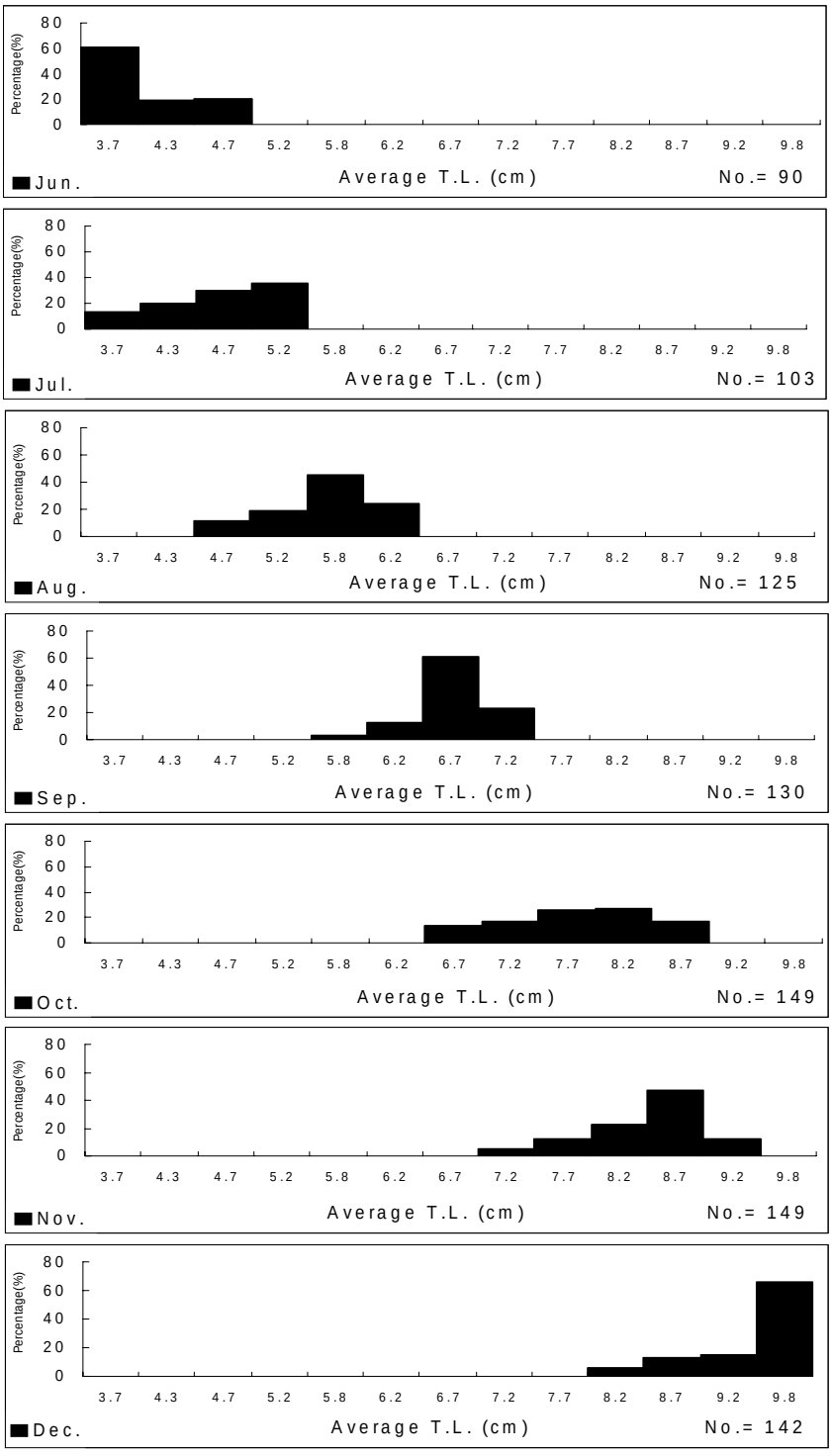

Fig. (1): Length frequency distribution for monthly samples of *Dicentrarchus punctatus* from Port Said coast, Mediterranean Sea. (Trawling net) (No. = Total number of individuals).

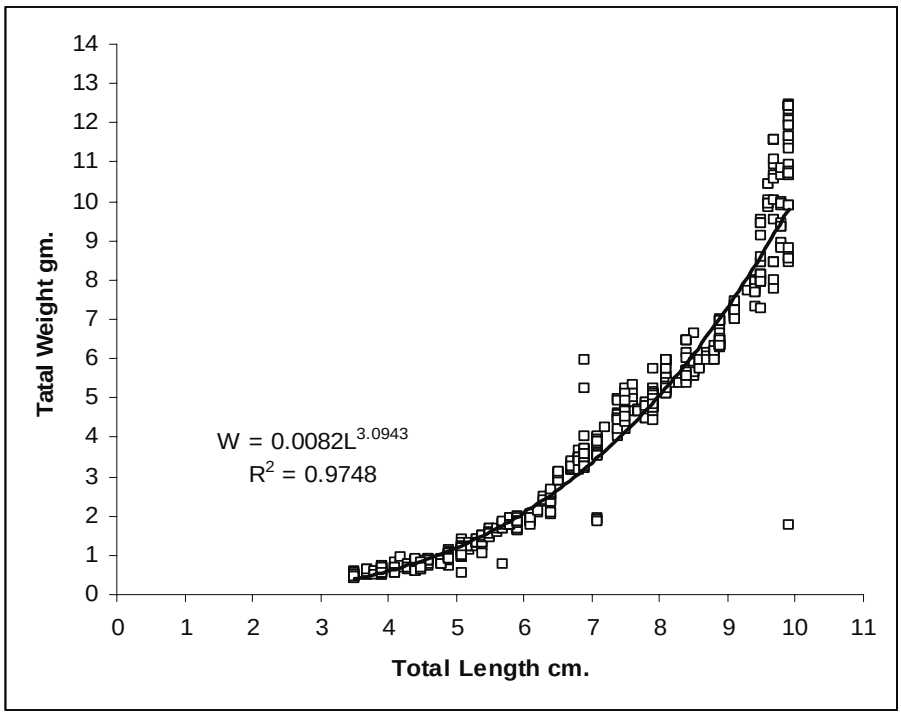

Fig. (2): Length- weight relationship of juveniles *Dicentrarcus punctatus* from Port Said.

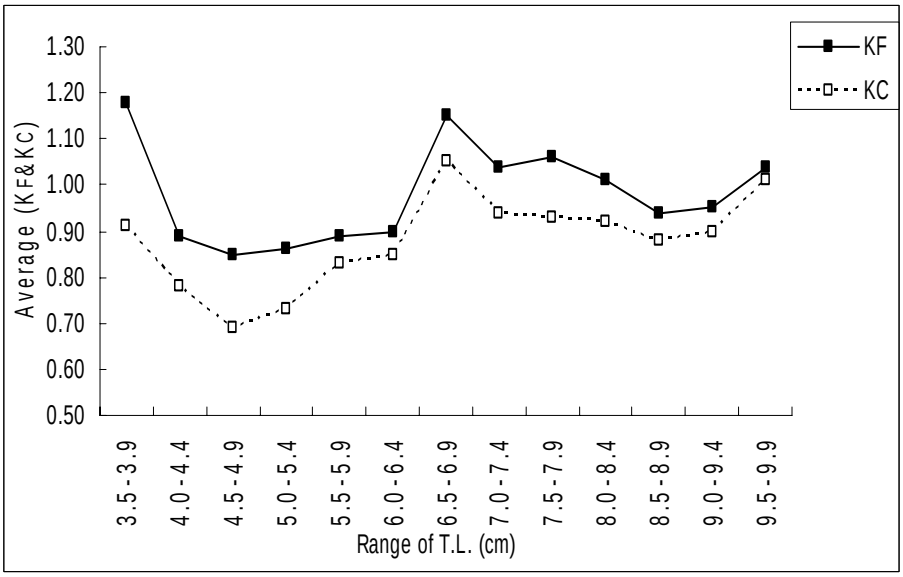

Fig. (3): Variation of mean (KF) and (KC) for different size groups of *Dicentrarchus punctatus* in Port Said coast, Mediterranean Sea. (Trawling net).

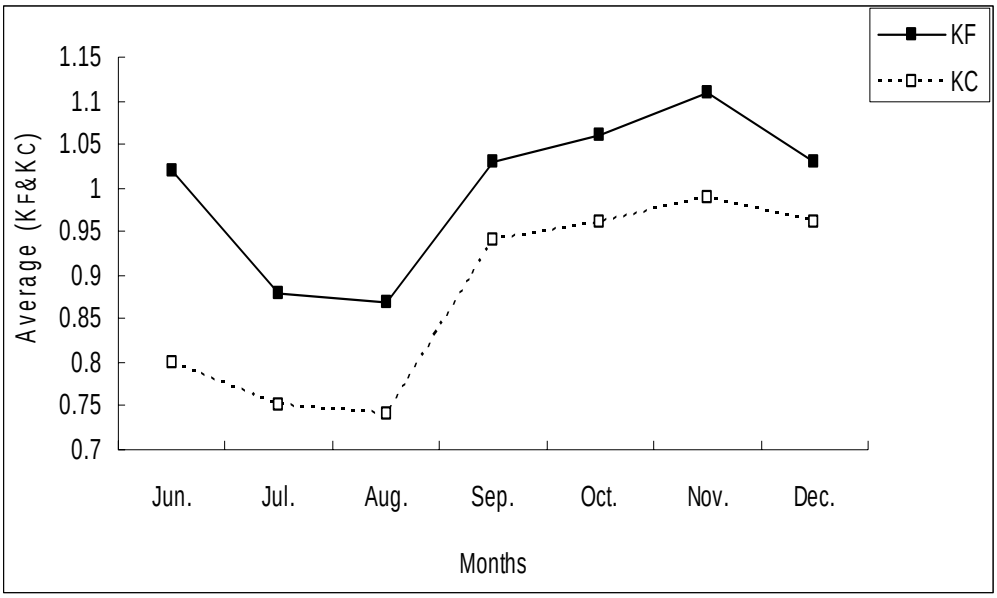

Fig. (4): Monthly variation of mean (KF) and (KC) of *Dicentrarchus punctatus* in Port Said coast, Mediterranean Sea. (Trawling net).

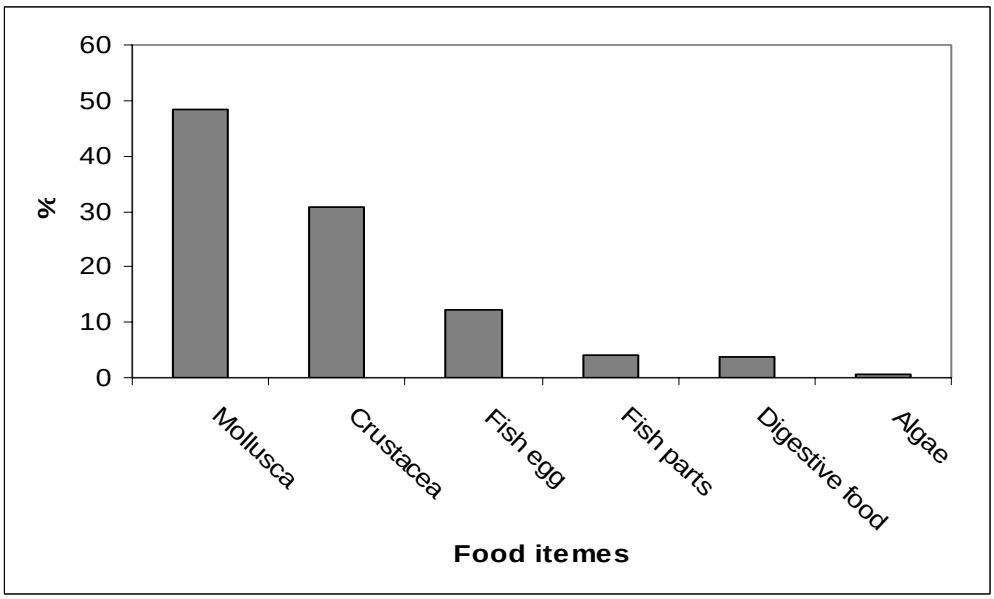

Fig. (5): Major food items of 684 *Dicentrarchus punctatus* from Port Said coast, Mediterranean Sea. (Trawling net).

4. DISCUSSION

The biological productivity of the southeastern Mediterranean has been greatly reduced after the erection of the Aswan High Dam, Egypt (completed in 1965) and the abrupt curtailment of the seasonal out-flow of the nutrient rich Nile flood water into the sea. Immediate effects were reflected in the disappearence of the fall phytoplankton bloom characteristic of the flood stream and the sharp decline in fisheries (Dowidar, 1988). The reduced rate of zooplankton production in the area is a direct consequence of the low phytoplankton crop (the main food for zooplankton), however the size of standing crop of zooplankton was greatly affected by grazing by fish. In the latter case the disappearance of the food bloom would alter the migration of these fishes to feeding grounds out of the Egyptian waters (Dowidar, 1984). Also, the sharp decrease of sardine catch in the following years since 1965 is correlated with the cessation of the floood water outflow and the subsequent reduction of primary and secondary production in the area. The trophic relation is evident proving planktonic food for larvae, juveniles and adult forms. El-Rashidy (1987) collected only 26 fish larvae from Port Said coast. This means tthat Poor larval recruitment resulting from reduced planktonic food production (Dowidar, 1988).

Port Said has large fishing area on the Mediterranean coast of Egypt and the entrance of Lake Manzalah are extremely important nursery grounds for many commercial fishes such as mullets, sea bass, sea bream, sardines and also shrimps.

In the present study, *Dicentrarchus punctatus* dominated numerically the assemblage of 35 species providing 18.9% of trash fish catch numerically (0.8-1 kg), about 3-4% of total catch of the gear. This species is of commercial importance (El-Mor, 2002).

In the current study, the juvenile of *D. punctatus* were presented for seven months during the period from June till December and recruitment of juveniles continued from June till July then larger juvenile fish migrate from December to deeper water for feeding or escaping from capture. This is in agreement with El-Emary, 1987 who was reported that the spawning seasons of *D. punctatus*, in Alexandria, Mediterranean Sea which start from January till April. Small juvenile fish typically appear in the nursery grounds 2-4 months after spawning, these juveniles remain there from three months to one year, before vacating the nursery to the adult habitat (Bennett, 1989).

The length-weight relationship of *D. punctatus* was studied. Beckman (1948), equation was used where the value of the exponent “b” in the general equation of length weight relation is usually used to show the robustness of the fish. Also it is used as an indication of fish condition (Le-Cren, 1951). For many fish species, this value varies between 2 and 4 and often close to 3 (Lagler, 1956 ; Chuganova, 1959). In the presented work, the value of “b” for *D. punctatus* was found to be 3.0943. It is clear that “b” value is isometric growth. it is highly significant (P) less than 0.01.

The condition factor which measures the relation between length and weight and expresses the well-being or fatness of fish was studied in the present work. The condition factors (K_F and K_C) for *D. punctatus* were quite similar, being high in small-sized fishes, decreased to the low value in the largest sized fishes. This supports the observation of Ahmad (1992), who suggested that the same pattern in juvenile *Sardinella maderensis* , *Rhabdosargus haffara* inhabiting two shallow water habitats, Sharm El-Mayia Bay and the Mangrove of wadi-Kid, the northern Egyptian Red Sea.

On the other hand, the monthly increase in condition factor of juveniles fish may be affected by the feeding activities which may show their reflection on the body condition, either during the same month or a month

latter (Ahmad, 1992). In the current study, these penomenon appears to be right for *D. punctatus* where, the highest values of condition factor were recorded in late autumn and winter months. These resultes agree with the degree of fullness in stomachs.

A wide spectrum of food items in the stomach of juveniles commercial fishes was reported by many authers. They concluded that carnivore juveniles turnover their feeding to herbivore in the adult stage, whereas the carnivores species feed on the small prey size which increase as the fish size increase (Pillay, 1953; Fouda, 1992 ; Ahmed 1992 and El –Mor, 2002).

In the current study, on studying the feeding habits of juveniles *D. punctatus*, tiny Mollusca (bivalve and gastropoda) suplemented by small crustacea (juvenile prawn and tiny crabs), were constituted 79.1% of the main bulk. The fishes in the diet (Fish part and fish eggs) were 16.4%. Digested food (3.9%) and algae (0.5%) were ingested by small quantity in the diet. This in agreement with El-Emery (1987) and Sharaf (1987) whose studied the feeding habits of *Dicentrarchus labrax* in the Egyption Mediterranean and Suez Canal and they found that the juveniles of *D. labrax* feed on tiny mollusca, Crustacea (prawn and crab) and fish parts (small fish, fish eggs, scales and bones)..

The inteensity of food varied considerably from one month to another. The feeding activities of *D. punctatus* were quit high during summer and early autumn. In all months, molluscs and crustacean organisms formed the main component in the diet of *D. punctatus* constituting 79.1%.

Mollusca and crustaceans were found in all length groups, but they declined as the size increased. On the other hand, fish eggs and fish parts increased with size, however they were absent in large juveniles.

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