



## FEEDING HABITS OF THE SHARP SNOUT SEA BREAM, *DIPLODUS PUNTAZZO* (CETTI, 1777) (TELEOSTEI: SPARIDAE) FROM BENGHAZI COAST, EASTERN LIBYA

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**Abstract:** The feeding habits of 500 specimens of *Diplodus puntazzo* (family: Sparidae), inhabiting Benghazi Mediterranean coast, were studied monthly from September 2013 to August 2014. The annual diet composition, monthly variations in the diet composition, the variations of diet with length and the intensity of feeding were studied. *Diplodus puntazzo* feed on a wide variety of prey types: crustaceans (40.1%), cephalopods (22.1%), green algae (17.7%), mollusks (5.2%), polychaetes (1.1%) and sediments (13.7%). The crustaceans, cephalopods and green algae were the major food item all year round and it was found in all length groups. In the present study crustaceans, green algae and sediments increased as the size increased while cephalopods, mollusks and polychaetes decreased as the fish size increased. The feeding intensity was quite high in winter (78.5%).

**Key words:** Feeding habits, *Diplodus puntazzo*, eastern coast, Mediterranean Sea, Libya

### INTRODUCTION

Sparid fishes inhabit tropical and temperate coastal water. Fish individuals are swimming near the shore in shallow inlet and bays at moderate depth. Family Sparidae comprise about 22 genera in four subfamilies containing 41 species Bauchot and Smith (1983). 14 species were recorded in the Libyan coast, such as *Diplodus vulgaris*, *Pagrus pagrus*, *Diplodus puntazzo*, *Diplodus vulgaris*, *Lithognathus mormyrus*, *Oblada melanura*, *Sarpa salpa* and *Crenidens crenidens* (Al-Hassan and El-Silini, 1999). The sharp snout sea bream is one of the fishes in family Sparidae, is one of the most popular sparid fish species in the Mediterranean region and the Atlantic coast (Bauchot and Hureau, 1986), the fish had been characterized by high price value, a highly appreciated flesh and good market perspectives. Although the sharp snout sea bream found in a wide variety of locations that range from Atlanto-Mediterranean, from Bay of Biscay to South Africa., its status is considered endangered (Psomadakis *et al.*, 2012). From the available literature, it was found that few works have been published on the biology of Sparid fishes in the study area (Laith, 2003; Ben Abdallah *et al.*, 2005 and Ekwella, 2008). Laith (2003) studied asymmetry in some morphological characters of four sparid fishes in Benghazi coast. Frogliani (1977) stated that feeding biology of Sparid fish *Lithognathus mormyrus* in Central Adriatic, he concluded that the species feed on a wide variety of prey types: crustacean, polychaetes, molluscs and echinoderms, also Jardas (1996) studied the feeding biology for the same previous species in the same previous area and he stated that the species feed on crustacean, polychaetes, molluscs, Echinoderms, fish parts and sea grasses. Ali (2008) stated that feeding biology of Sparid fish *Pagrus pagrus* in Souse coast, eastern Libya, she concluded that the species feed on a

wide variety of prey types: crustacean, polychaetes, molluscs, echinoderms, fish parts, sea grasses and foraminifera. El-Mor and El-Maremie (2008) studied feeding habits of the nockt *Diplodus noct* in southern Sinai, Gulf of Suez, Red Sea Egypt, they stated that the species feed on a wide variety of prey types, fish parts, crustacean, sea grasses, mollusks, algae and copepods. The target species inhabits rocky substrate often covered with vegetation. Found also in sea grass meadow to depth of 50m. Young fish live in large schools in shallow waters. Omnivorous, feeds on shrimps, mollusks, worms and seaweeds (Golani *et al.*, 2006).

This is the first study so far on the feeding habits of *Diplodus puntazzo* (family Sparidae) in Libyan eastern coast. *Diplodus puntazzo* position in the trophic structure of the Libyan eastern coast is poorly understood. So the aim of the present study is defining the trophic relationships between *Diplodus puntazzo* with other invertebrates and fishes in this area, in order to understand the dynamic of this regional ecosystem. Beside results from feeding habits of *Diplodus puntazzo* may have direct implications for aquaculture.

### MATERIALS AND METHODS

Monthly samples of *Diplodus puntazzo* were collected during the period from September 2013 to August 2014 by using gill and trammel nets from artisanal fishing in Benghazi fishing harbor 32°36'N and 20°03'E on the Mediterranean (Fig. 1). A total of 500 specimens of *Diplodus puntazzo* were sampled for studying the feeding habits. Feeding Habits of the sharp snout sea bream, *Diplodus puntazzo* (Cetti, 1777) from Benghazi Coasts, Libya Annual, diet composition, seasonal variations of diet, variations of diet with

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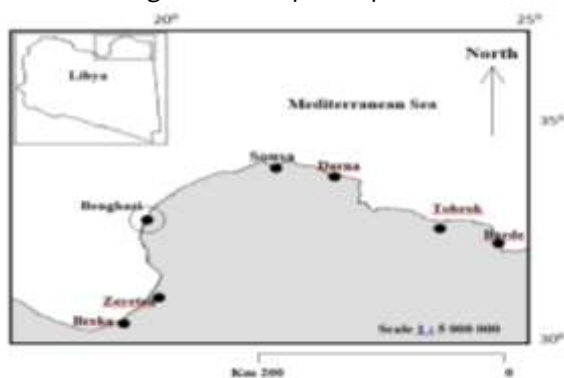
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lengths and feeding intensity were estimated in this study. For each fish specimen total length measured to the nearest 0.1 cm. Each fish was dissected and the alimentary tract removed and preserved in formalin. The degree of fullness of the stomach was assessed by visual estimation and classified as empty, trace, quarter full, half full, three quarters full and completely full respectively as described in Pillay (1952). Food items were identified to their groups. A list of general diet composition was made food analysis was made by points of assessment (Hyslop, 1980 and Hynes, 1985). The results were statistically analysis subjected to the further statistical treatment according to Godfriaux (1969) in order to give more precise information about food and feeding habits of *Diplodus puntazzo*.



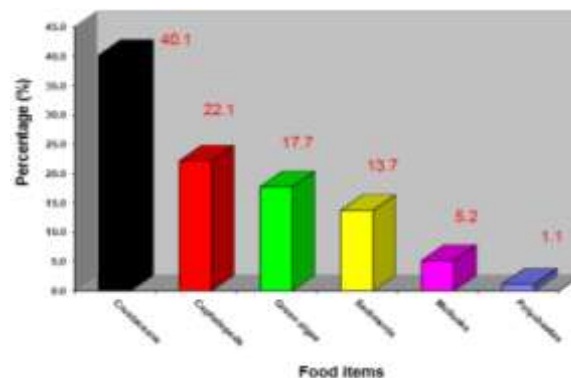
**Figure 1:** Benghazi fishing harbor, on the Mediterranean, Libya

## RESULTS

### Annual Diet Composition

The variety of food items was large (Fig. 2). However, crustaceans supplemented by cephalopod and green algae formed the major food groups for *Diplodus puntazzo*. Crustaceans made up of 40.1% by volume composition of the bulk of the diet which represented by small prawns and crabs, whereas cephalopods (22.1%) coming in the second position of importance such as *Sepia spp.* Green algae (17.7%)

including *Ulva spp.* and *Enteromorpha spp.* followed by Mollusks (5.2%) were composed of bivalves and gastropods. The other food items were polychaetes which constituting 1.1%, with small quantities of sediments (sand and clay) constituting 13.7%.



**Figure 2:** The diet composition of *Diplodus puntazzo* from Benghazi coast, eastern Libya during the period from September 2013 till August 2014.

### Monthly Variations in Diet Composition

Food items were occurred in all year round during the study. Crustaceans, cephalopods and green algae constituted the major food items all year round during the study (Table 1). Table (2) showed seasonally variations in diet composition for 500 specimens *Diplodus puntazzo* in Benghazi coast during the study period, in autumn the fish preferred crustaceans (31.6%), cephalopods (27.6%), sediments (15.1%) and green algae (12.5%). In winter the fish ingested on crustaceans (46.2%), cephalopods (29.6%), green algae (16.8%) and sediments (6.7%). While crustaceans (44.5%), cephalopods (18.0%), green algae (16.2%) and sediments (13.0%). in spring. Crustaceans (38.3%), green algae (25.5%), sediments (20.1%) and cephalopods (13.4%) in summer.

**Table 1:** Monthly variations in diet composition of 500 *Diplodus puntazzo* from Benghazi coast, eastern Libya during the period from September 2013 till August 2014.

Months	No.	Food items					
		Crustaceans	Cephalopods	Green algae	Mollusks	Polychaetes	Sediments
Sep. (2013)	41	49.2	24.3	6.1	8.9	2.6	8.9
Oct.	42	12.5	37.7	15.8	11.9	3.2	18.9
Nov.	33	33.1	20.8	15.5	9.9	3.1	17.6
Dec.	45	35.2	22.5	19.9	2.4	A	20.1
Jan. (2014)	47	53.1	33.6	13.3	A	A	A
Feb.	63	50.3	32.7	17.1	A	A	A
Mar.	48	57.9	25.7	16.5	A	A	A
Apr.	38	36.3	13.3	15.8	10.1	4.6	19.8
May	36	39.2	14.9	16.2	10.5	A	19.1
Jun.	53	35.5	13.3	12.9	8.1	0.2	30.1
Jul.	25	36.1	15.2	18.5	A	A	30.2
Aug.	29	43.3	11.6	45.1	A	A	A
%	500	40.1	22.1	17.7	5.2	1.1	13.7

**Remarks:** Data expressed as percentage, (A) No food in month occurred

**Table 2:** Seasonally variations in diet composition of 500 *Diplodus puntazzo* from Benghazi coast, eastern Libya during the period from September 2013 till August 2014.

Seasons	No. of fish	Crustaceans	Cephalopods	Green algae	Mollusks	Polychaetes	Sediments
Autumn	116	31.6	27.6	12.5	10.2	3.0	15.1
Winter	155	46.2	29.6	16.8	0.8	B	6.7
Spring	122	44.5	18.0	16.2	6.9	1.5	13.0
Summer	107	38.3	13.4	25.5	2.7	0.1	20.1

Remarks: Data expressed as percentage, (B) No food in month occurred

**Feeding habit in relation to fish size**

The total length of *Diplodus puntazzo* population classified into 11 classes ranged from 12.5cm to 34.4cm with 1.9 cm interval (Table 3). Prey size differed between large size individuals, which had ingested the large size prey, whereas the small sized fish ingested the small size prey. Crustaceans, cephalopods and green algae were found in all length groups of *Diplodus puntazzo*.

In the present study crustaceans, green algae and sediments increased as the size increased while cephalopods, mollusks and polychaetes decreased as the fish size increased. Crustaceans were found in all length groups *Diplodus puntazzo*, they increased from 20.8% in size class (12.5- 14.4 cm) to 43.7% in size class (32.5-34.4cm). Cephalopods decreased from 36.6% in size class (12.5-14.4cm) to 3.1% in size class (32.5-34.4cm), green algae increased from 21.9% in size class (12.5- 14.4cm) to 39.1% in size class (32.5-34.4cm),

mollusks ingested in size class (12.5-14.4cm) by 9.8% decreased in the following length groups and recorded the lowest value 0.9% in size class (28.5- 32.4cm), then the food item disappeared in the following length groups. Polychaetes decreased from 10.8% in size class (12.5-14.4cm) to 0.4% in size class (24.5-26.4cm), then completely absent in the following lengths. Sediments increased from 5.1% in size class (14.5-16.4cm) to 14.2% in size class (32.5-34.4cm).

**Feeding intensity**

Fishes with stomach half full, almost full and full of food ranked b% constituted 49.2% of all analyzed individual, whereas those with stomach that were empty or with traces of food and quarter full ranked a% represented 50.8% of the total specimens (Table 4). The feeding activities were quite high during winter (78.5%). There are minimal rate of feeding intensity recorded in autumn (43.4%), spring (47.7%) and summer (27.0%).

**Table 3:** The diet composition of different size classes of *Diplodus puntazzo* from Benghazi coast, eastern Libya during the period from September 2013 till August 2014

Size groups (cm)	No.	Food items					
		Crustaceans	Cephalopods	Green algae	Mollusks	Polychaetes	Sediments
12.5-14.4	31	20.8	36.6	21.9	9.8	10.8	C
14.5-16.4	39	22.5	34.4	22.6	11.8	3.6	5.1
16.5-18.4	33	25.1	30.4	24.9	10.3	3.1	6.2
18.5-20.4	44	27.3	25.7	26.1	8.8	1.9	10.2
20.5-22.4	55	29.1	21.1	27.9	8.5	0.7	12.7
22.5-24.4	67	31.1	18.1	29.5	7.9	0.6	12.8
24.5-26.4	37	33.8	17.7	30.5	4.7	0.4	12.9
26.5-28.4	47	37.4	15.3	33.1	1.1	C	13.1
28.5-30.4	32	37.9	11.1	36.6	0.9	C	13.4
30.5-32.4	67	39.7	9.3	37.1	C	C	13.9
32.5-34.4	48	43.7	3.1	39.1	C	C	14.2

Remarks: Data expressed as percentage, (C) No food in class occurred

**Table 4:** Monthly variations in the intensity of feeding of 500 *Diplodus puntazzo* from Benghazi coast, eastern Libya during the period from September 2013 till August 2014.

Months	No.of fish	The degree of distension of the stomach							
		Empty	Trace	1/4	a %	1/2	3/4	Full	b %
Sep. (2013)	41	26.2	22.7	36.3	85.2	8.9	A	5.9	14.8
Oct.	42	20.0	15.0	45.1	80.1	A	20.0	A	20.0
Nov.	33	4.4	A	A	4.4	4.1	58.3	33.2	95.6
Dec.	45	23.2	A	A	23.2	15.4	15.4	46.1	76.9
Jan. (2014)	47	16.0	2.0	A	18.0	12.0	20.0	50.1	82.1
Feb.	63	23.2	A	A	23.2	15.4	15.4	46.1	76.9
Mar.	48	10.0	10.0	15.0	35.0	25.0	14.1	25.9	65.0
Apr.	38	20.0	10.0	8.0	38.0	10.0	26.0	26.0	62.0
May	36	26.0	21.1	36.8	83.9	6.0	2.0	8.0	16.0
Jun.	53	26.2	22.7	36.3	85.2	8.9	A	5.9	14.8
Jul.	25	20.0	15.0	45.1	80.1	A	20.0	A	20.0
Aug.	29	6.0	27.8	19.9	53.7	13.9	10.1	22.3	46.3
Average					50.8±17.1				49.2±18.3

Remarks: Data expressed as percentage (A) = No food in month occurred

**Table 5:** Seasonally variations in the intensity of feeding of 500 *Diplodus puntazzo* from Benghazi coast, eastern Libya during the period from September 2013 till August 2014

Seasons	No. of fish	The degree of distension of the stomach							
		Empty	Trace	1/4	%	1/2	3/4	Full	%
Autumn	116	16.9	12.6	27.1	56.6	4.3	26.1	13.0	43.4
Winter	155	20.8	0.7	0.0	21.5	14.3	16.9	47.4	78.5
Spring	122	18.7	13.7	19.9	52.3	13.7	14.0	20.0	47.7
Summer	107	17.4	21.8	33.8	73.0	7.6	10.0	9.4	27.0

Remarks: Data expressed as percentage

## DISCUSSION

The food and feeding habits of sparid fishes have been studied by many authors (Blaber, 1974; Coetzee and Baird, 1981; Wassef and Eisawy, 1985; Rosecchi, 1987; Rosecchi and Nouaze, 1987; Papaconstantinou and Caragitsou, 1989; Harvath et al., 1990; Buxton and Clarke, 1992; Abdel-Rahman and Abdel-Barr, 2003 and Osman and Mahmoud, 2009).

The sharp snout sea bream, *Diplodus puntazzo* (family Sparidae) found over rock rubble or sand bottoms, young frequently found on sea grasses beds and continual shelf (Bauchot and Hureau, 1986), feeds on crustaceans, cephalopods, polychaetes and mollusks (Golani et al., 2006).

In the current study *Diplodus puntazzo* were found to consume a wide range of food items ranging from of crustaceans, supplemented by cephalopods and green algae formed the major food group for the target species this is full agreement with Golani et al., (2006).

In the present work, crustaceans, cephalopods and green algae constituted the major food items all year round. In autumn the fish preferred crustaceans, cephalopods, sediments and green algae. In winter the fish ingested on crustaceans, cephalopods, green algae and sediments. While crustaceans, cephalopods, green algae and sediments in spring. Crustaceans, green algae, sediments and cephalopods in summer, this is full agreement with Abdel-Rahman and Abdel-Barr (2003). Generally, the food extent demands and ability for food acquisition increase with fish development (Honda, 1984).

Abdel Rahman and Abdel Barr, (2003) studied the feeding habits of the common dentex, *Dentex dentex* is in Alexandria waters on the Mediterranean Sea and they concluded that the numbers and size prey taxa increased with size of the common two banded sea bream due to the ability of larger fishes to consume wide range of prey sizes than smaller fishes, this phenomenon appeared to be done for the target species in present work, in the present work, crustaceans, green algae and sediments increased as the size increased while cephalopods, mollusks and

polychaetes decreased as the fish size increased, which is in agreement with Osman and Mahmoud (2009).

The monthly variation in the condition factors fish is affected by the feeding activity which may show there reflection on the body condition (Vassilopoulou, 1989), this phenomenon appears to be correct for species in the present work. The highest condition factor values ( $K_f$  and  $K_c$ ) were recorded in winter, these results coincide with the degree of stomach fullness due to food availability (Metraf, 2014). This supports observations describe in the Canary Island (Pajelo et al., 2002), in Mediterranean waters off Alexandria, Egypt Osman and Mahmoud (2009) and coastal waters of Thracian Sea, Greece (Kallianiotis et al., 2002), while there are minimal rate of feeding intensity recorded in summer and autumn, this coincide with the spawning season for target species (Golani et al., 2006).

## CONCLUSIONS

*Diplodus puntazzo* feed on a wide variety of prey types: crustaceans, cephalopods, green algae, mollusks, polychaetes and sediments. The crustaceans, cephalopods and green algae were the major food item all year round and it was found in all length groups. The feeding intensity was quite high during winter.

In the present study is defining the trophic relationships between *Diplodus puntazzo* with other invertebrates and fishes in this area, in order to understand the dynamic of this regional ecosystem. Beside results from feeding habits of *Diplodus puntazzo* may have direct implications for aquaculture.

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