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FEEDING HABITS OF THE COMMON DENTEX, *DENTEX DENTEX* (LINNAEUS, 1758) (TELEOSTEI: SPARIDAE) FROM BENGHAZI COAST, EASTERN LIBYA

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Abstract: The feeding habits of 500 specimens of *Dentex dentex* (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. *Dentex dentex* feed on a wide variety of prey types: crustaceans (35.1%), cephalopods (20.5%), fish parts (19.3 %), mollusks (6.1%), foraminifers (2.0%) and sediments (17.1%). The crustaceans, cephalopods and fish parts were the major food item all year round and it was found in all length groups. In the present study crustaceans, fish parts and sediments increased as the size increased while cephalopods, mollusks and foraminifers decreased as the fish size increased. The feeding intensity was quite high during the autumn (72.9%), spring (74.7%) and summer (60.7%).

Key Words: Feeding habits, *Dentex dentex*, 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, Dentex dentex, Diplodus vulgaris, Lithognathus mormyrus, Oblada melanura, Sarpa salpa* and *Crenidens crenidens* Al-Hassan and El-Silini (1999). The common dentex 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 (1990), the fish had been characterized by high price value, a highly appreciated flesh and good market perspectives. Although the common dentex found in a wide variety of locations that range from Europe to the Caribbean, its status is considered endangered Flgueiredo and Dos Santos (2002). 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.*, 200 and Ekwella, 2008). Laith (2003) studied asymmetry in some morphological characters of four sparid fishes in Benghazi coast. Froglia (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 seagrasses. 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.

This is the first study so far on the feeding habits of *Dentex dentex* (family Sparidae) in Libyan eastern coast. *Dentex dentex* 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 Dentex *dentex* with other invertebrates and fishes in this area, in order to understand the dynamic of this regional ecosystem. Beside results from feeding habits of *Dentex dentex* may have direct implications for aquaculture.

MATERIALS AND METHODS

Monthly samples of *Dentex dentex* 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 *Dentex dentex* were sampled for studying the feeding habits. Feeding Habits of the common dentex, *Dentex dentex* (Linnaeus, 1758) from Benghazi Coasts, Libya. Annual, diet composition, seasonal variations of diet, variations of diet with lengths and feeding intensity were estimated for each fish specimen total length measured to the nearest 0.1cm. 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,

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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 *Dentex dentex*.

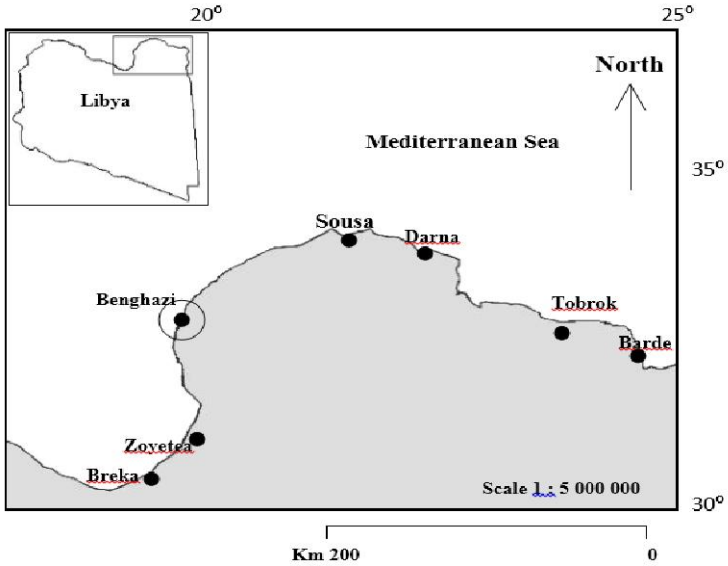

Figure 1: Benghazi fishing harbor, on the Mediterranean, Libya in this study.

RESULTS

Annual Diet Composition

The variety of food items was large (Fig. 2). However, crustaceans supplemented by cephalopod and fish parts formed the major food groups for *Dentex dentex*. Crustaceans made up of 35.1% by volume composition of the bulk of the diet which represented by small prawns and crabs, whereas cephalopod (20.5%) coming in the second position of importance such as *Sepia spp*. Fish parts (19.3%) including fish scales and bones this followed by Mollusks (6.1%) were composed of bivalves and gastropods. The other food items were foraminifers which constituting 2.0%, with small quantities of sediments (sand and clay) constituting 17.1%.

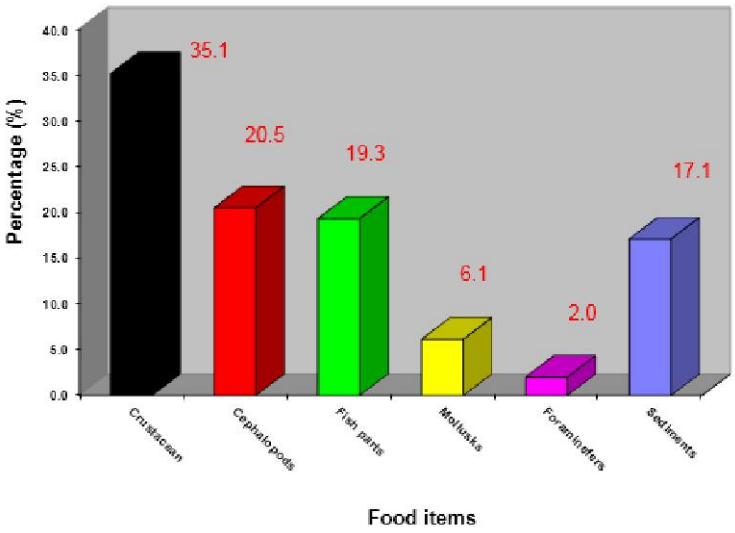

Figure 2: The diet composition of Diplodus *vulgaris* from Benghazi coast, eastern Libya during the period from September 2013 till August 2014.

Monthly Variations in Diet Composition

Food items were occurred in all year round during the study. Crustaceans, cephalopods and fish parts constituted the major food items all year round during the study (Table 1). Table 2 showed seasonally variations in diet composition for 500 specimens *Dentex dentex* in Benghazi coast during the study period, in autumn the fish preferred crustaceans (31.6%), cephalopods (24.3%) and fish parts (15.8%). In winter the fish ingested on crustaceans (39.5%), cephalopods (29.6%) and fish parts (17.0%). While crustaceans (34.5%), fish parts (15.5%) and cephalopods (14.6%) in spring. Crustaceans (35.0%), fish parts (28.8%) and cephalopods (13.4%) in summer.

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

Months	No.	Crustaceans	Cephalopods	Fish parts	Mollusks	Foraminefera	Sediments
Sep. (2013)	47	39.2	24.3	16.1	8.9	2.5	8.9
Oct.	42	22.5	27.7	15.7	11.9	3.2	18.9
Nov.	44	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.	47	30.3	32.7	17.9	A	A	19.1
Mar.	48	27.9	15.7	14.5	11.9	9.9	20.1
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.	28	33.3	11.6	55.1	A	A	A
%	500	35.1	20.5	19.3	6.1	2.0	17.0

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

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

Seasons	No. of fish	Crustaceans	Cephalopods	Fish parts	Mollusks	Foraminefera	Sediments
Autumn	133	31.6	24.3	15.8	10.2	2.9	15.1
Winter	139	39.5	29.6	17.0	0.8	0.0	13.1
Spring	122	34.5	14.6	15.5	10.8	4.8	19.7
Summer	106	35.0	13.4	28.8	2.7	0.1	20.1

Data expressed as percentage

Feeding habit in relation to fish size

The total length of *Dentex dentex* population classified into 11 classes ranged from 16.5cm to 38.4cm 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 fish parts were found in all length groups of *dentex dentex*.

In the present study crustaceans, fish parts and sediments increased as the size increased while cephalopods, mollusks and foraminifers decreased as the fish size increased. Crustaceans were found in all length groups *Dentex dentex*, they increased from 19.4% in size class (16.5- 18.4 cm) to 48.7% in size class (36.5-38.4cm). Cephalopods decreased from 43.6% in size class (16.5-18.4cm) to 3.1% in size class (36.5-38.4cm), fish parts increased from 13.1% in size class (16.5- 18.4cm) to 17.1% in size class (36.5-38.4cm), mollusks ingested in size class (16.5-18.4cm) by 13.1% decreased in the following length groups and recorded the lowest value 0.9% in size class (32.5- 34.4cm), then the food item disappeared in the following length groups. Foraminifers decreased from 10.8% in size class (16.5-18.4cm) to 4.4% in size class (28.5-30.4cm), then completely absent in the following lengths. Sediments increased from 6.1% in size class (18.5-20.4cm) to 31.2% in size class (36.5-38.4cm).

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

Size groups (cm)	Food items						
	No.	Crustaceans	Cephalopods	Fish parts	Mollusks	Foraminefera	Sediments
16.5-18.4	33	19.4	43.6	13.1	13.1	10.8	B
18.5-20.4	39	20.7	36.9	21.9	11.8	2.6	6.1
20.5-22.4	33	22.5	36.6	22.6	10.3	1.1	6.9
22.5-24.4	45	25.1	36.4	18.9	8.8	0.9	9.9
24.5-26.4	55	27.3	25.4	26.1	8.5	0.7	12.1
26.5-28.4	67	29.1	15.7	20.9	7.9	9.6	16.8
28.5-30.4	37	41.1	11.1	21.5	4.7	4.4	17.2
30.5-32.4	45	43.6	10.1	26.5	1.1	B	18.7
32.5-34.4	32	45.4	7.7	16.1	0.9	B	29.9
34.5-36.4	67	47.1	5.3	16.6	B	B	31.1
36.5-38.4	47	48.7	3.1	17.1	B	B	31.2

Data expressed as percentage,
(B) No food in class occurred

Table 4: Monthly variations in the intensity of feeding of 500 *Dentex dentex* 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)	47	4.4	A	A	4.4	4.1	58.3	33.2	95.6
Oct.	42	23.2	A	A	23.2	15.4	15.4	46.1	76.9
Nov.	44	6.0	27.8	19.9	53.7	13.9	10.1	22.3	46.3
Dec.	45	26.2	22.7	36.3	85.2	8.9	A	5.9	14.8
Jan. (2014)	47	26.0	21.1	36.8	83.9	6.0	2.0	8.0	16.0
Feb.	47	20.0	15.0	45.1	80.1	A	20.0	A	20.0
Mar.	48	10.0	10.0	15.0	35.0	25.0	14.1	25.9	65.0
Apr.	38	23.2	A	A	23.2	15.4	15.4	46.1	76.9
May	36	16.0	2.0	A	18.0	12.0	20.0	50.1	82.1
Jun.	53	10.0	4.0	24.0	38.0	20.0	22.0	20.1	62.1
Jul.	25	24.0	18.0	A	42.0	24.0	24.0	10.1	58.1
Aug.	28	20.0	10.0	8.0	38.0	10.0	26.0	26.0	62.0
Average					43.7±21.1				56.3±20.3

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

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

Seasons	No. of fish	Empty	Trace	1/4	%	1/2	3/4	Full	%
Autumn	133	11.2	9.3	6.6	27.1	11.1	27.9	33.9	72.9
Winter	139	24.1	19.6	39.4	83.1	5.0	7.3	4.6	16.9
Spring	122	16.4	4.0	5.0	25.4	17.5	16.5	40.7	74.7
Summer	106	18.0	10.7	10.7	39.3	18.0	24.0	18.7	60.7

Feeding intensity

Fishes with stomach half full, almost full and full of food ranked b% constituted 56.3% of all analyzed individual, whereas those with stomach that were empty or with traces of food and quarter full ranked a% represented 43.7% of the total specimens (Table 4). The feeding activities were quite high during autumn (72.9%), spring (74.7%) and summer (60.7%). There are minimal rate of feeding intensity recorded in winter (16.9%).

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 common dentex, *Dentex dentex* (family Sparidae) found over rock rubble or sand bottoms, young frequently found on sea grasses beds and continual shelf (Abdel-Rahman and Abdel-Barr (2003), feeds on crustaceans, fishes and mollusks (Bauchot and Smith (1983).

In the current study *Dentex dentex* were found to consume a wide range of food items ranging from of crustaceans, supplemented by cephalopods and fish parts formed the major food group for the target species this is full agreement with Abdel-Rahman and Abdel-Barr (2003) and Osman and Mahmoud (2009).

In the present work, crustaceans, cephalopods and fish parts constituted the major food items all year round. In autumn the fish preferred crustaceans, cephalopods and fish parts. In winter the fish ingested on crustaceans, cephalopods and fish parts. While crustaceans, fish parts and cephalopods in spring. Crustaceans, fish parts 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 a 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, fish parts and sediments increased as the size increased while cephalopods, mollusks and foraminifers 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 spring and summer, these results coincide with the degree of stomach fullness in beginning spring, autumn and winter 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 winter, this coincide with the spawning season for target species (Golani *et al.*, 2006).

CONCLUSIONS

Dentex dentex feed on a wide variety of prey types: crustaceans, cephalopods, fish parts, mollusks, foraminifers and sediments. The crustaceans, cephalopods and fish parts were the major food item all year round and it was found in all length groups. The feeding intensity was quite high during the autumn, spring and summer. In the present study is defining the trophic relationships between *Dentex dentex* with other invertebrates and fishes in this area, in order to understand the dynamic of this regional ecosystem. Beside results from feeding habits of Dentex *dentex* may have direct implications for aquaculture.

REFERENCES

1. Bauchot ML and Smith LB (1983). FAO Species Identification Sheets for Sparidae. In: W. Fisher, G Fishery Purposes, Western Indian Ocean Fishing Area 51 Vol. 4, FAO, Rome, pp. 220-225.

2. Al-Hassan LA and El-Silini OA (1999). Chick list of bony fishes collected, from the Mediterranean coast of Benghazi, Libya Revista de Biologia, Marina Oceanografia 34, pp. 291-301.

3. Bauchot ML and Hureau JC (1990). Sparidae, in: G.C. Quero, C. Hureau, C. Karrer, A. Post, L. Saldanha (Eds.), Checklist of the Fishes of the Eastern Tropical Atlantic (CLOFETA) Vol. 2, JNICT, Lisbon; SEL, Paris, and UNESCO, Paris, pp. 790-812.

4. Flgueiredo JL de. and Dos Santos AP (2002). Yamaguti economica exclusive da regiao sudeste-sul do Brasil, in Levantamento com Rede de Meia-Aqua-Saio-Paulo Editora da Universidade de sao Paulo, Imprensa official do Estado in Portuguese, pp. 242.

5. Laith AJ (2003). Asymmetry in some morphological characters of four sparid fishes from Benghazi Libya, Oenological Studies 132 (3):83-88.

6. Ben-Abdallah AR, Alturky A and Fituri A (2005). Records of exotic fishes in the Libyan, J. Mar. Sci. 10, pp. 1-18.

7. Ekwella SA (2008). Environmental and biological studies on juvenile commercial fishes in El-Hamamh Coasts, El-Gabal-El-Akadar, Libya, M.Sc. Thesis, Marine Res Dep., Fac. of Nat. Res. and Envi. Scien., Univ. of Omar Al Mukhtar, pp. 109.

8. Froglia C (1977). Feeding of *Lithognathus mormyrus* (L.) in central Adriatic Sea (Pisces, Sparidae). Rapp. Comm. Int. Mer Médit. 24, 95-97.

9. Jardas I. 1996: Jadranska ihtiofauna. Školska knjiga, Zagreb, 533 pp.

10. Ali RR (2008). Biological studies on *Pagrus pagrus* from Sousa coast (El-Gabal El-Akadar), Libyia. M.Sc. Thesis, Marine Res Dep., Fac. of Nat. Res. and Envi. Scien., Univ. of Omar Al Mukhtar, pp. 181.

11. El-Mor M and E-Maremie HA (2008). Feeding Habits of the Nokt *Diplodus noct*, from Southern Sinai, Gulf of Suez, Red Sea, Egypt Arabian Aquaculture Society Journal, Vol. 3 No 1.

12. Pillay TVR (1952). A critique of the methods of study of food of fishes, J. Zool-Soc. India 4, pp.181-199.

13. Hyslop EJ (1980). Stomach content analysis: Review of methods and their application, J. Fish. Biol. 17, pp. 411-429.

14. Hynes HB (1985). The food of fresh water. The feeding of juvenile striped sea bream, *Lithognathus mormyrus* (L.) in the Central Adriatic Sea (Pisces, Sparidae). Rapp. Comm. Int. Mer Médit. 29, 107-108.

15. Godfriaux BL (1969). Food predatory demersal fish in Hauraki Gulf. I. food and feeding habits of the *snaper Chrysophyrs auratus*, N. Z. Mar. Fresh Res. 3, pp. 518-544.

16. Blaber SJM (1974). Field studies of diet of Rhabdosargus *holubi*, J. Zool. Lond. 173, 1974, pp. 407-417.

17. Coetzee PS and Baird D (1981). Age, growth and food of *Cheimerius nufar* (Eherenberg, 1820) (Sparidae) collected off st. Croix Island, Algoa Bay. S. Afr. G. Zool, 16, pp. 137-143.

18. Wassef EA and Eisawy A. 1985. Food and feeding habit, of wild and reared gilthead bream *Sparus aurita* (L.), Cybium 9 (3), pp. 233-242.

19. Rosecchi E. 1987. L'alimentation de *Diplodus annularis Diplodus sargus, Diplodus vulgaris* et *Sparus aurata* (Pisces, Sparidae) dans le golfe due lion et lagunes littoral Rev. Trav. Inst. Peches. Marit. 49 (3-4), pp.125-414.

20. Rosecchi E and Nouaze y. 1987 L'utilization des alimentaries dans L, analyse des contenus stomacaux, Rev Trav. Inst. Peches. Marit. 49 (3-4), pp. 111-123.

21. Papaconstantinou C and Caragitsou E. 1989. Feeding interaction between two sympatric species *Pares pagrus* and *Phycis phycis* around Kastellorizo Island (Dodecenese, Greece) Fish Res. 7, pp. 329-342.

22. Harvath ML, Grimes CB and Huintsman GR. 1990. Growth mortality, reproduction and feeding of knobbed porgy *Calamus nodosus*, along the south eastern United State coast, Ball. Mar. Sci. 46 (3), pp. 677-687.

23. Buxton CD, Clarke JR. 1992. The biology and bronze bream *Pachynetopon grande* (Teleostei: Sparidae) from the south-east Cape coast, South Africa, S. Afr. G. Zool. 27 (1), pp. 21-

24. Castriota L, Finoia MG and Andaloo F. 2005. Trophic interactions between *Xyrichtys novacula* (Labridae) and juvenile *Pares pagrus* (Sparidae) in the central Mediterranean Sea, Electronic Journal Ichthyology 2, pp. 54-60.

25. Abdel-Rahman M and Abdel-Bar B. 2003. Biological studies on fisheries of family Sparidae in Alexandria waters. Ph.D. Thesis. Alex. Univ. Dep. Of Oceanography.

26. Osman E and Mahmoud M. 2009. Feeding biology of *Diplodus sargus* and *Diplodus vulagaris* (teleostei, Sparidae) in Egyptian Mediterranean waters. W. J. of F. and Mar. Sci. 290-296.

27. Honda H. 1984. Food acquisition patterns in some demersal telosts, Tohoku. J. Aqric. Res. 35 (1), pp. 33-54.

28. Vassilopoulou V. 1989. Some biological parameters on the red porgy (*Pagrus pagrus*) in the Kastellorizo area, FAO Fisheries 412, pp. 108-115.

29. Motaref S. 2014. Characterization and biological study on some species of family Sparidae in Ain El-Ghazala Gulf of eastern Libya. M.Sc. Thesis, Zoology Dep. Faculty of science. Univ. of Omar Al Mukhtar, 2013. pp. 154.

30. Pajuelo JP, Lorenzo JM, Mendez M, Coca J, Ramos AG. 2002: Determination of age and growth of the striped seabream *Lithognathus mormyrus* (Sparidae) in the Canarian archipelago by otolith readings and back calculation. Sci. Mar. 66, pp. 27-32.

31. Kallianiotis A, Torre M, Argyri A. 2005: Age, growth, mortality, reproduction, and feeding habits of the striped sea bream, *Lithognathus mormyrus* (Pisces: Sparidae), in the coastal waters of the Thracian Sea, Greece. Sci. Mar. 69, 391-404.

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