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A comparative study of food and feeding habits of *Mullus surmuletus* (Linnaeus, 1758) and *Mullus barbatus* (L. 1758) in the Benghazi coast - eastern Libyan

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دراسة مقارنة العادات الغذائية والغذاء لسمكة التريليا الحجرية *Mullus surmuletus* والتريليا الرملية *Mullus barbatus* في ساحل بنغازي ، شرق ليبيا

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الملخص العربي
تمت دراسة العادات الغذائية لـ 450 عينة من تريليا الحجرية *Mullus surmuletus* و 411 من تريليا الرملية *Mullus barbatus* (العائلة : Mullidae) التي تسكن ساحل بنغازي علي البحر الأبيض المتوسط ، شهريًا في الفترة من يناير إلى ديسمبر 2022. حيث تم دراسة النظام الغذائي السنوي، والتغيرات الشهرية في تكوين النظام الغذائي، وتنوع النظام الغذائي وايضا دراسة شدة التغذية. وقد وجد ان سمكة تريليا الحجرية تتغذى على مجموعة واسعة من أنواع الفرائس: الجمبري بنسبة (51.9%)، مزدوجات الأرجل (17.3%)، عشارية الأرجل (10.2%)، الديدان متعددة الاشواك (7.9%)، متساوي الأرجل (5.8%)، ذوات الصدفتين (1.9%) وغيرها من طعام مهضوم او فرائس غير معرفه لتهالك انسجتها بنسبة (5.1%). اما عن سمكة التريليا الرملية تتغذى بشكل أساسي على الجمبري (47.9%)، مكملاً بعشاري الأرجل (17.5%)، ومزدوجات الأرجل (16.4%)، وذوات الصدفتين (5.9%)، والديدان متعددة الأشواك (5.1%)، متساوي الأرجل (4.2%)، وغيرها (3.1%). تم العثور على الجمبري ومزدوجات الأرجل وعشاري الأرجل ومتعددة الأشواك على مدار السنة وفي جميع المجموعات الطولية لتريليا الحجرية ، وتم العثور علي الجمبري وعشاري الارجل علي مدار السنة وفي المجموعات الطولية لتريليا الرملية . وفي الدراسة الحالية زادت التغذيه على الجمبري ومزدوجات الأرجل وعشاري الأرجل مع انخفاض اطوال السمكه بينما زاد عدد متعددات الأشواك ومتساويات الأرجل وثنائيات المصرع وغيرها مع زيادة حجم الأسماك بالنسبة التريليا الحجرية . في حين أن الجمبرى ومزدوجات الأرجل وعشريات الأرجل زادت مع زيادة الحجم بينما انخفضت ذوات الصدفتين ومتعددة الأشواك مع زيادة حجم الأسماك في

التريليا الرملية . وكانت أنشطة التغذية عالية جداً خلال فصل الشتاء (82.5%) والخريف (68.0%) لسمكة الحجرية وكانت أنشطة التغذية عالية جدًا خلال الشتاء (68.5%) والصيف (60.5%) والخريف (65.1%) لسمكة التريليا الرملية .

الكلمات الافتتاحية : مقارنة بيولوجية ، لعادات الغذائية والغذاء ، لسمكة التريليا الحجرية والرملية ، في ساحل بنغازي ، شرق ليبيا

Abstract:

The feeding habits of 450 specimens of *Mullus surmuletus* and 411 of *Mullus barbatus* (family: Mullidae), inhabiting Benghazi Mediterranean coast, were studied monthly from January to December 2022. The annual diet composition, monthly variations in the diet composition, the variations of diet with length and the intensity of feeding were studied. *Mullus surmuletus* feed on a wide variety of prey types: shrimp (51.9%) supplemented by amphipoda (17.3%), decapoda (10.2%), polychaeta (7.9%), isopoda (5.8%), Bivalvia (1.9%) and others (5.1%). In *M. barbatus* feed mainly on shrimp (47.9%) supplemented by decapoda (17.5%), amphipoda (16.4%), bivalvia (5.9%), polychaeta (5.1%), isopoda (4.2%), and others (3.1%). Shrimp, amphipoda, decapoda and polychaeta were found in all year round and in all length groups for *M. surmullus*. Shrimp, and decapoda were found in all year round and in all length groups for *M. barbatus*. In the present study shrimp, amphipoda and decapoda increased as the size decreased while polychaeta, isopoda, bivalvia and others increased as the fish size increased for *M. surmuletus*. While, shrimp, amphipoda and decapoda increased as the size increased while bivalvia and polychaeta, decreased as the fish size increased for *M. barbatus*. The feeding activities were quite high during winter (82.5%) and autumn (68.0%). There are minimal rate of feeding intensity recorded in spring (28.3%) and summer (44.7%) for *M. surmuletus* and the feeding activities were quite high during winter (68.5%), summer (60.5%) and autumn (65.1%). There are minimal rate of feeding intensity recorded in spring (36.1%) for *M. barbatus*.

Keywords: Feeding habits, *Mullus surmuletus*, *M. barbatus*, eastern Libyan Mediterranean coast

1. Introduction

The knowledge of the food and feeding habits of a fish helps in finding out the distribution of a fish population and a thorough survey of literature indicates that such knowledge is highly essential for successful management of a fishery and such studies are undoubtedly important in any fisheries research program (Uibein, 2007). Family: Mullidae (Goatfish) is one of the most valuable and highly priced fish families in Libya that are mainly exploited by trawl fishery since it shares with about 13% of the total trawl landings in the Libyan Mediterranean water (Elbaraasi et al., 2019). Four out of the six genera of family Mullidae are present in the Mediterranean Sea; *Mullus, Upeneus*, *Pseudupeneus* and recently *Parupeneus* (Golani, 1994). The two-dominant species of family Mullidae, *Mullus surmuletus* and *Mullus barbatus* are among the major target species of the Libyan Mediterranean demersal fisheries (Elbaraasi et al., 2019). The striped red mullet (*Mullus surmuletus*, Linnaeus 1758) is a commercially important species of goatfish found in the Mediterranean Sea, eastern North Atlantic Ocean, and the Black Sea. They can be found on sand bottom and in water as shallow as 5 meters (16 ft) or as deep as 409 meters (1, is 342 ft). This species can reach a length of 40 centimeters (16 in) SL though most are only around 25 centimeters (9.8 in) (Ben-Tuvia, 1990). The greatest recorded total length 33.6 cm n 398.3 g in total was captured with trammel nets along the coast of Benghazi, Libya (Southern Mediterranean) on November 14, 2022 (Said et al., 2023). The target species feed on benthic organisms such as shrimps and amphipods, polychaetes, mollusks, and benthic fishes. Spawning occurs from May to July, eggs and larvae are pelagic (Frimodt, 1995 and Mahmoud, et al., 2017). *Mullus barbatus* , red mullet (Linnaeus, 1758) is a species

of goatfish found in the Mediterranean Sea, Sea of Marmara, the Black Sea and the eastern North Atlantic Ocean, where its range extends from Scandinavia to Senegal (Ben-Tuvia, A., 1990). They are fished, mostly by trawling, with the flesh being well regarded. It is a demersal fish and occurs at depths ranging from 10 to 328 m (30 to 1,080 ft) over muddy, sandy or rocky and gravel bottoms. The red mullet is carnivorous, the diet consisting mainly of polychaete worms, bivalve mollusks and crustaceans (Hureau, 1986). The barbells are sensory organs and are used to help locate prey. Spawning occurs from in April and May (Muus, and Nielsen 1999). Food and feeding habits of the two Mullus species were the main idea of several studies conducted from specimens caught off different Mediterranean areas (Froglia, 1988; Labropoulau and Eloftheriou, 1997; Badalamenti and Riggio, 1989 and Mahe et al., 2014). However, these two species did not have the same interest in the Libyan Mediterranean, since we couldn't find any article dealing with the feeding habits of *M. surmuletus* or *M. barbatus* from the Libyan Mediterranean water. Therefore, this work aimed at providing a detailed description of the feeding habits of the two species *M. surmuletus* and *M. barbatus* off the coast of eastern Libyan Mediterranean Sea that could help in providing basis for understanding trophic levels and interactions in the aquatic food web of the study area.

2. Materials and Methods

Samples were collected on board fishing trawlers from Benghazi coast eastern Libyan, Mediterranean Sea throughout the period of January to December 2022 (Fig. 1). A total of 450 specimens of *M. surmuletus* and 411 *M. barbatus* were examined.

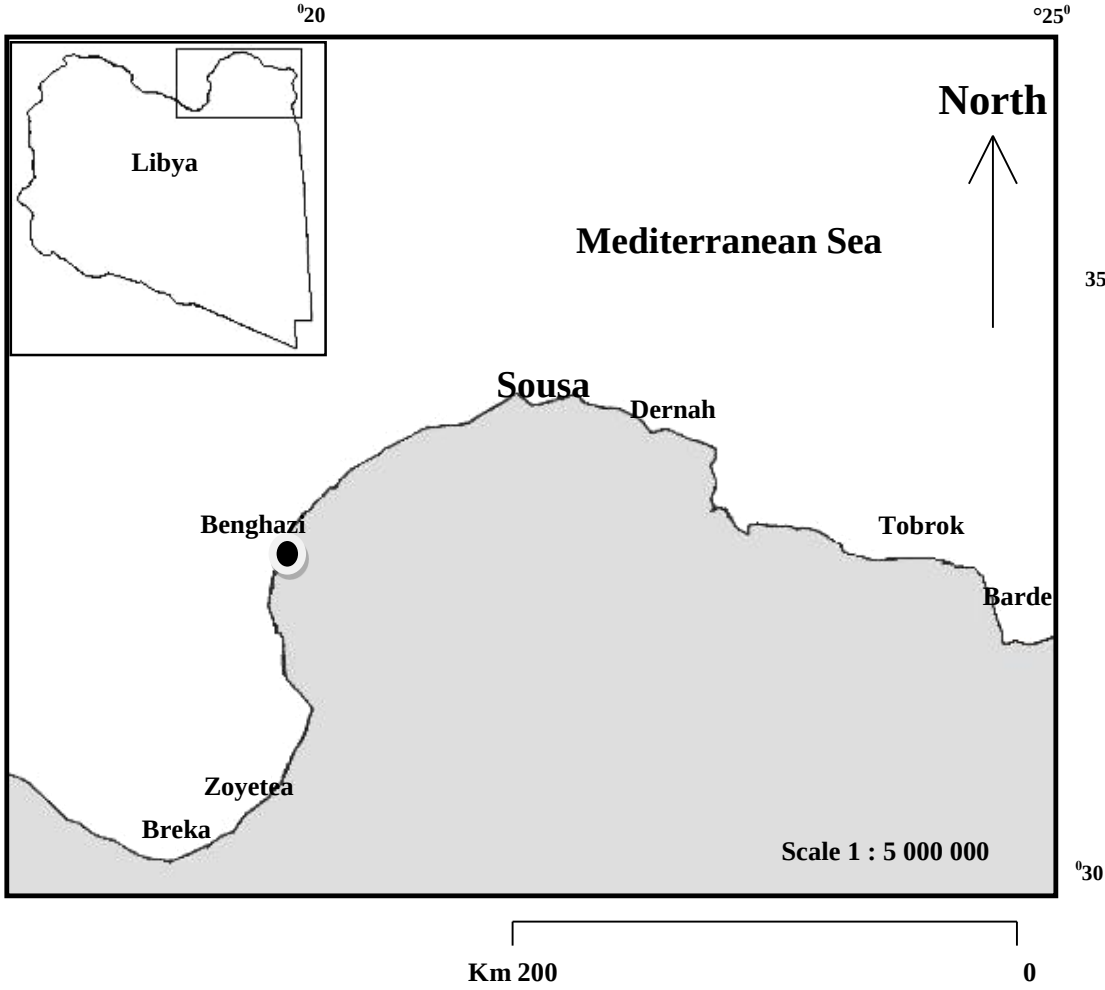

Figure 1. Map showing the collection site, Benghazi coast in the eastern Libyan Mediterranean coast

Total length (TL) was recorded to the nearest cm, and total weight to the nearest g. Each stomach was cut opened longitudinally and its content scraped off and transferred into a small Petri dish containing a small amount of water.

Degree of fullness of stomach was assessed by visual estimation and classified as empty, trace, quarter, half full,

three quarters and completely full respectively as described by **Pillay (1952).** Diet composition and feeding intensity were related to months and seasons during the study period. The stomach contents of fresh specimens were removed, examined under binuclear microscope.

The preys were sorted, and identified to the lowest possible taxonomic level using keys and fields (**Frimodt, 1995; Gobashi , 1996 and Golani et al. 2006).** In order to analyze food and feeding habits of the two species, we used some indices following: percentage of numerical abundance (%N = number of prey /total number of prey × 100) (**Hyslop, 1980**).

3. Results

1- Annual diet composition

The variety of food items was large. However, shrimp supplemented by amphipoda, decapoda, polychaeta, isopoda, bivalvia and others (digestive food) formed the major food groups for *M. surmuletus* (Fig. 2). Shrimp made up of 51.9% by volume composition of the bulk of the diet which represented by small prawns, whereas amphipoda (17.3%) coming in the second position of importance. decapoda (10.2%), polychaeta (7.9%) followed by isopoda (5.8%), Bivalvia (1.9%) . The other food items were fish parts, scales, small quantities of sediment and digestive food which constituting 5.1%.

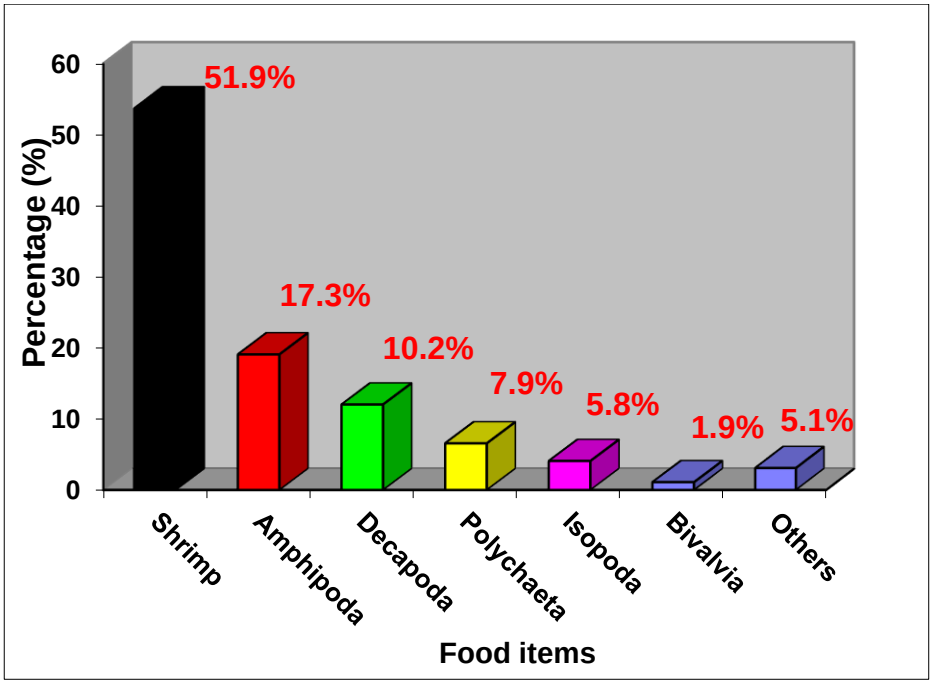

Fig. (2): The diet composition of *M. surmuletus* from Benghazi coast, eastern Libya during the period from January till December 2022.

In *M. barbatus* feed mainly on shrimp supplemented by decapoda, amphipoda, bivalvia, polychaeta, isopoda, and others (digestive food) (Fig. 2). Shrimp made up of 47.9% by volume composition of the bulk of the diet which represented by small prawns, whereas decapoda (17.5%) coming in the second position of importance. amphipoda (16.4%), Bivalvia (5.9%), polychaeta (5.1%) followed by isopoda (4.2%), The other food items were small quantites of sediment and digestive food which constituting 3.1%.

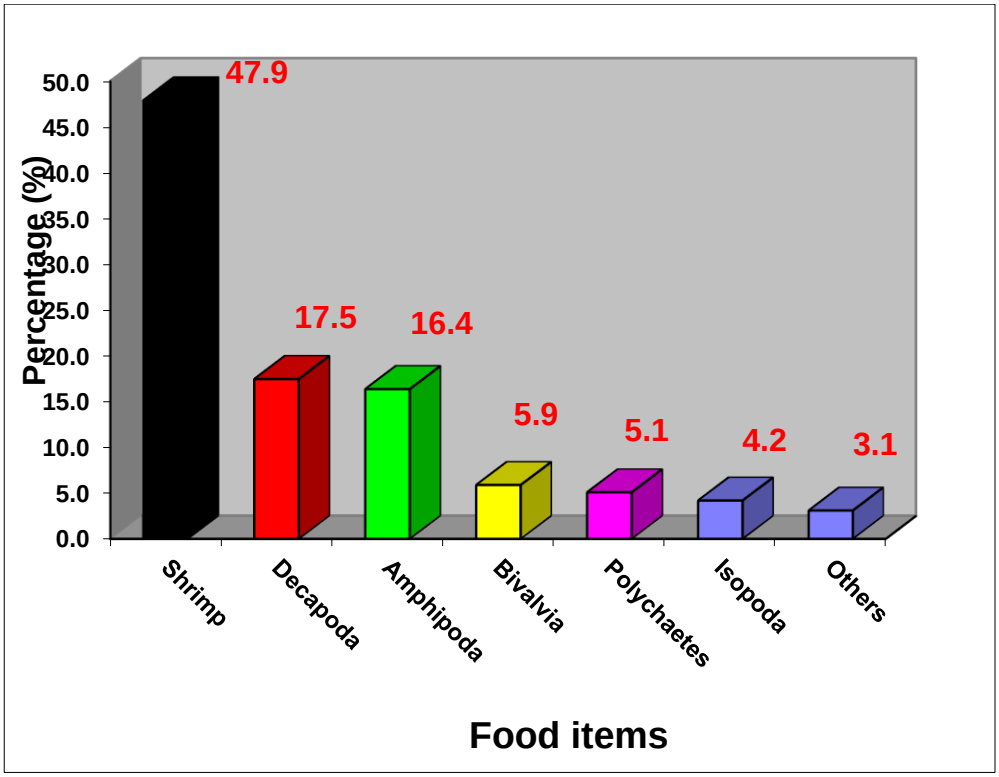

Fig. (3): The diet composition of *M. barbatus* from Benghazi coast, eastern Libya during the period from January till December 2022.

2- Monthly Variations in Diet Composition

Food items were occurred in all year round during the present study. Shrimp and Amphipoda constituted the major food items (69.2%) all year round during the study for *M. surmuletus* (Table 1). Table 1 showed monthly variations in diet composition for 450 stomach of specimens *M. surmuletus* in Benghazi coast during the study period, shrimp, amphipoda, decapoda an polychaeta were present all year round while isopoda was absent in January and February, Bivalvia also was absent in January , February and

December, white other food were absent in the period from January till April and October.

Table (1). Monthly variations in diet composition of 450 *Mullus sermulatus* from Benghazi coast, eastern Libya during the period from January till December 2022.

Food items								
Months	**No.**	**Shrimp**	**Amphipoda**	**Decapoda**	**Polychaeta**	**Isopoda**	**Bivalvia**	**Others**
Jan. (2022)	**39**	66.8	19.8	8.9	4.5	**A**	**A**	**A**
Feb.	**40**	61.5	16.2	11.9	10.4	**A**	**A**	**A**
Mar.	**34**	60.8	15.8	13.1	3.1	5.8	1.5	**A**
Apr.	**44**	57.9	15.1	10.8	7.8	6.7	1.8	**A**
May	**34**	44.6	32.6	7.2	8.4	5.4	1.5	0.3
Jun.	**39**	40.1	32.7	10.7	6.1	4.1	2.3	4.1
Jul.	**48**	51.4	15.7	11.9	9.9	7.8	2.3	1.1
Aug.	**28**	50.4	23.3	10.1	4.6	4.2	2.5	4.9
Sep.	**33**	56.3	12.3	10.5	7.1	2.7	3.2	7.9
Oct.	**53**	50.7	11.2	9.9	13.7	7.7	6.9	**A**
Nov.	**25**	41.7	5.1	12.1	10.2	9.4	5.1	16.4

Dec.	**33**	40.6	8.2	5.4	9.1	16.8	**A**	19.9
Average %	**450**	**51.9**	**17.3**	**10.2**	**7.9**	**5.8**	**1.9**	**5.1**

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

Food items were occurred in all year round during the present study. Shrimp, decapoda and Amphipoda constituted the major food items (81.8%) all year round during the study for *M. barbatus* (Table 2). Table 2 showed monthly variations in diet composition for 411 stomach of specimens *M. barbatus* in Benghazi coast during the study period, shrimp, decapoda and amphipoda, were present all year round while bivalvia was absent in November and December, polycheata and isopoda also were absent in January and February, white other food were absent in April and August.

Table (2). Monthly variations in diet composition of 411 *Mullus barbatus* from Benghazi coast,eastern Libya during the period from January till December 2022.

		Food items						
Months	**No.**	**Shrimp**	**Decapoda**	**Amphipoda**	**Bivalvia**	**Polychaeta**	**Isopoda**	**Others**
Jan. (2022)	**41**	59.9	19.8	11.8	4.5	A	A	4.1
Feb.	**35**	51.8	16.2	15.7	10.4	A	A	5.9
Mar.	**32**	50.7	15.8	20.4	3.1	5.8	1.5	2.8
Apr.	**38**	48.6	15.1	20.7	7.8	6.7	1.1	A
May	**33**	44.6	32.6	7.2	8.4	5.4	1.5	0.3

Jun.	**32**	40.1	32.7	10.7	7.1	4.1	4.3	1.1
Jul.	**32**	44.3	15.7	11.9	2.8	7.8	5.4	12.2
Aug.	**22**	40.6	23.3	20.9	4.4	4.2	6.6	A
Sep.	**35**	51.5	12.3	21.6	4.8	2.7	3.2	3.9
Oct.	**53**	50.7	11.2	19.8	5.3	5.3	6.9	0.7
Nov.	**25**	49.9	5.1	21.4	A	4.5	5.1	14.1
Dec.	**33**	41.7	10.6	14.5	A	4.4	5.3	23.5
%	**411**	**47.9**	**17.5**	**16.4**	**5.9**	**5.1**	**4.2**	**3.1**

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

1- Feeding habit in relation to fish size

The total length of *Mullus surmulatus* population classified into 7 classes ranged from 12.5cm to 19.4 cm with 0.9 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. Shrimp, amphipoda, Polychaeta and isopoda were found in all length groups of *Mullus surmulatus*. In the present study shrimp, amphipoda and decapoda increased as the size increased while polychaeta and isopoda decreased as the fish size increased. Bivalvia was absent in the size groups from 12.5 till 17.7 cm then it appears in the major longitudinal groups of 17.5- 19.4 cm by 16.8% and 21.5%. While others or digestive food appears for the first time in length group 16.5-17.4cm by 0.7% then increased the following length groups

to record the highest value (17.2%) in the largest length group 18.5-19.4 cm.

Table (3). The diet composition of different size classes of 450 *Mullus surmulatus* from Benghazi coast, eastern Libya during the period from January till December 2022.

Size groups (cm)	No	Food items						
		Shrimp	Amphipoda	Decapoda	Polychaeta	Isopoda	Bivalvia	Others
12.5–13.4	67	44.8	11.3	13.1	14.7	16.1	B	B
13.5–14.4	66	44.9	13.3	21.9	13.3	6.6	B	B
14.5–15.4	60	45.4	13.3	21.6	13.3	6.5	B	B
15.5–16.4	68	52.5	17.4	18.9	8.8	2.5	B	B
16.5–17.4	61	52.6	17.9	19.1	8.5	1.7	B	0.7
17.5–18.4	68	52.3	17.9	B	7.9	1.6	16.8	3.6
18.5–19.4	60	52.7	18.1	B	7.1	1.6	21.5	17.2

Remarks : **Data expressed as percentage, (B) No food in size groups occurred**

Table (4). The diet composition of different size classes of 411 *Mullus barbatus* from Benghazi coast, eastern Libya during the period from January till December 2022.

Size groups (cm)	No.	Food items						
		Shrimp	Decapoda	Amphipoda	Bivalvia	Polychaeta	Isopoda	Others
11.5–12.4	77	41.8	12.3	15.1	14.7	16.2	B	B
12.5–13.4	76	43.9	15.3	17.9	13.3	9.6	B	B
13.5–14.4	69	44.4	17.3	18.6	13.3	6.5	B	B
14.5–15.4	66	49.5	18.4	22.2	8.1	1.9	B	B
15.5–16.4	59	52.9	19.7	25.1	B	1.7	B	0.7
16.5–17.4	64	54.8	23.9	B	B	1.1	16.7	3.6

Remarks : **Data expressed as percentage, (B) No food in size groups occurred**

The total length of *Mullus barbatus* population classified into 6 classes ranged from 11.5cm to 17.4 cm with 0.9 cm interval (Table 4). Prey size differed between large size individuals, which had ingested the large size prey, whereas the small

sized fish ingested the small size prey. Shrimp, decapoda and Polychaeta were found in all length groups of *Mullus barbatus*. In the present study shrimp, decapoda and amphipoda increased as the size increased while polychaeta and bivalvia decreased as the fish size increased. Isopoda was absent in all size groups from 11.5 till 16.4 cm then it appears in the large longitudinal groups of 16.5- 17.4 cm by 16.7%. While others or digestive food appears for the first time in length group 15.5-16.4cm by 0.7% then increased the following length group to record the highest value (3.6%) in the largest length group 16.5-17.4 cm.

2-

3- Feeding intensity:

M. surmuletus specimens with stomach half full, almost full and full of food ranked b% constituted 55.9% of all analyzed individual, whereas those with stomach that were empty or with traces of food and quarter full ranked a% represented 44.2% of the total specimens (Table 5). The feeding activities were quite high during winter (82.5%) and autumn (68.0.7%). There are minimal rate of feeding intensity recorded in spring (28.3%) and summer (44.7%) (Table 6).

Table (5). Monthly variations in the intensity of feeding of 450 *M. surmuletus* from Benghazi coast, eastern Libya during the period from January till December 2022.

Months	No. of fish	The degree of distension of the stomach							
		Empty	Trace	1/4	a %	1/2	3/4	Full	b %
Jan. (2022)	39	11.4	A	A	11.4	13.1	48.3	27.2	88.6
Feb.	40	23.2	A	A	23.2	15.4	15.4	46.1	76.9
Mar.	34	6.0	30.1	39.9	76.0	13.9	10.1	A	24.0
Apr.	44	26.2	22.7	26.3	75.2	8.9	A	15.9	24.8
May	34	26.0	21.1	16.8	63.9	16.0	2.0	18.0	36.0
Jun.	39	10.0	5.0	45.1	60.1	A	40.0	A	40.0
Jul.	48	10.0	4.0	44.0	58.0	20.0	22.0	A	42.0
Aug.	28	24.0	24.0	A	48.0	24.0	28.0	A	52.0
Sep.	33	20.0	10.0	8.0	38.0	10.0	26.0	26.0	62.0
Oct.	53	10.0	10.0	15.0	35.0	25.0	14.1	25.9	65.0
Nov.	25	23.2	A	A	23.2	15.4	15.4	46.1	76.9
Dec.	33	16.0	2.0	A	18.0	12.0	20.0	50.1	82.1
Average	450				44.2±13.6				55.9±16.7

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

Table (6). Seasonally variations in the intensity of feeding of 450 *M. surmuletus* from Benghazi coast, eastern Libya during the period from January till December 2022.

		The degree of distension of the stomach							
Seasons	No. of fish	Empty	Trace	1/4	%	1/2	3/4	Full	%
Winter	112	16.9	0.7	B	17.5	13.5	27.9	41.1	82.5
Spring	112	19.4	24.6	27.7	71.7	12.9	4.0	11.3	28.3
Summer	115	14.7	11.0	29.7	55.4	14.7	30.0	B	44.7
Autumn	111	17.7	6.7	7.7	32.1	16.8	18.5	32.7	68.0

Remarks : Data expressed as percentage (B) = No food in season occurred

M. barbatus specimens with stomach half full, almost full and full of food ranked b% constituted 57.6% of all analyzed individual, whereas those with stomach that were empty or with traces of food and quarter full ranked a% represented 42.5% of the total specimens (Table 7). The feeding activities were quite high during winter (68.5%), summer (60.5%) and autumn (65.1.7%). There

are minimal rate of feeding intensity recorded in spring (36.1%) (Table 8).

Table (7). Monthly variations in the intensity of feeding of 411 *M. barabatus* from Benghazi coast, eastern Libya during the period from January till December 2022.

Months	No. of fish	The degree of distension of the stomach							
		Empty	Trace	1/4	a %	1/2	3/4	Full	b %
Jan. (2022)	41	11.4	A	A	11.4	13.1	48.3	27.2	88.6
Feb.	35	33.1	22.6	11.6	67.3	32.8	A	A	32.8
Mar.	32	5.3	22.4	33.5	61.2	13.9	10.1	14.8	38.8
Apr.	38	21.2	22.7	26.3	70.2	8.7	A	21.1	29.8
May	33	22.3	21.1	16.8	60.2	16.0	10.2	13.6	39.8
Jun.	32	9.3	5.0	44.2	58.5	1.5	40.0	A	41.5
Jul.	32	20.0	12.0	2.3	34.3	11.3	11.2	43.2	65.7
Aug.	22	25.5	A	A	25.5	24.0	27.1	23.3	74.4
Sep.	35	21.3	9.9	7.4	38.6	9.4	26.0	26.0	61.4
Oct.	53	11.2	13.6	16.1	40.9	25.0	14.1	20.1	59.2
Nov.	25	23.2	2.2	A	25.4	15.4	15.1	44.1	74.6
Dec.	33	15.9	A	A	15.9	13.9	20.0	50.1	84.0

Aver age	**41 1**	**42.5± 11.9**		**57.6± 14.8**

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

Table (8). Seasonally variations in the intensity of feeding of 411 *M. barabatus* from Benghazi coast, eastern Libya during the period from January till December 2022.

		The degree of distension of the stomach							
Seasons	**No. of fish**	**Empty**	**Trace**	**1/4**	**%**	**1/2**	**3/4**	**Full**	**%**
Winter	**109**	**20.1**	**7.5**	**3.9**	**31.5**	**19.9**	**22.8**	**25.8**	**68.5**
Spring	**103**	**16.3**	**22.1**	**25.5**	**63.9**	**12.9**	**6.8**	**16.5**	**36.1**
Summer	**86**	**18.3**	**5.7**	**15.5**	**39.4**	**12.3**	**26.1**	**22.2**	**60.5**
Autumn	**113**	**18.6**	**8.6**	**7.8**	**35.0**	**16.6**	**18.4**	**30.1**	**65.1**

Remarks : Data expressed as percentage

4- Discussion

The food and feeding habits of family Mullidae have been studied by many authors (Froglia, 1988; Badalamenti and Riggio, 1989; Labropoulau and Eloftheriou, 1997; Muus and Nielsen, 1999; Mahe et al., 2014 and Mahmoud et al., 2017). The presence of many benthic and epibenthic organisms of the gut content of *M. surmuletus* and *M. barbatus* caught off the Libyan Mediterranean coast, such as shrimp, decapods, polychaets and amphipods, implies that both species normally feed on zoo benthos. This study indicates that different trends are present between the two species in terms of the main preferred food item. The same nutrients, with different percentages, are in the stomach of each**.**In the case of the striped red mullet, it counts almost mainly on shrimp, amphipoda, decapoda, polychaeta, isopoda, bivalvia and others (digestive food) this agrees with the findings of Dulcic

(2002). On the other hand, shrimp, decapoda, amphipoda, bivalvia, Polychaeta, isopoda abd others was the most important food item for *M. barbatus*. This pattern was in agreement with the results of (Machias and Labropoulou , 2001) who reported that the species mainly fed mainly on crustacean, polychaetes, molluscs, shrimp, and a bit less on teleosts. In the meantime, our results contradicted the findings of some studies in the Mediterranean such as Gharbi and Ktari (1979) who noted that red mullet caught in the Gulf of Tunis fed on crustaceans (amphipods, decapods, and isopods) and less intensively on polychaetes and molluscs. Also, Layachi et al., (2007) reported that specimens from the Mediterranean coast of Morocco consumed amphipods, polychaeta, and bivalves while decapods, isopods and nematodes were secondary preys.

Generally, the food extent demands and ability for food acquisition increase with fish development (Honda, 1984).

Although both species use barbells to detect their prey items, *M. burbutus* dig deeper (Ben- Eliahu and Golani, 1990) and take a broad range of shrimp and polychaeta species.

The feeding intensity of *M. surmuletus* and *M. barbatus* showed some seasonal changes. The feeding activities were quite high during winter and autumn for *M. surmuletus* before and after the spawning season in spring and summer (Frimodt, 1995 and Mahmoud, et al., 2017). While in *M. barbatus* the activities were high during winter, summer and autumn this coincide with the spawning season in spring (Muus, and Nielsen 1999) and in agreement with observations carried out on red mullet from the Gulf of Lions (northwestern Mediterranean) by (Bautista-Vega, 2008). During spawning time, fish need more energy input in order to meet the reproduction requirements (Pauly and Christensen, 2000).

5. Conclusion

The present study has demonstrated that *M. surmuletus* and *M. barbatus* and exhibit some degree of selectivity in their feeding habits since they exploit, almost exclusively, Polychaeta and Crustacean such as shrimp, amphipoda and decapoda, respectively. Therefore, the two red mullet species; *M. surmuletus* and *M. barbatus* from the Libyan Mediterranean waters are specialist zooplanktivorous.

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