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Food and Feeding Habits of *Lagocephalus scelertaus* (Clark & Gohar, 1993) in Derna Coast, Mediterranean Sea, Libya, and Hurghada Coast, Red Sea, Egypt

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الغذاء وعادات التغذية لنوع سمكة أبو نفاخ الفضي *Lagocephalus scelertaus* (Clark & Gohar, 1993) في ساحل درنة، البحر الأبيض المتوسط، ليبيا وساحل الغردقة، البحر الأحمر، مصر

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Abstract

A study of the food and feeding habits of the Lessepsian migrant puffer fish species *Lagocephalus sceleratus* (family Tetraodontidae) was carried out for two different populations; the first represented the native population on the Hurghada coast (Red Sea), while the other one representative to the migrant population in Derna coast, eastern Libyan Mediterranean Sea. The samples were collected monthly for the two populations 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. *Lagocephalus sceleratus* feeds on a wide variety of prey types: In Derna coast, feed on mollusks (51.6%), supplemented by crustaceans (21.4%), bony fish (19.3%), polychaeta (5.6%), and echinoderms (2.2%). In Hurghada, fish mainly feed on mollusks (59.7%), supplemented by crustaceans (19.2%), bony fish (13.8%), echinoderms (4.1%), and soft corals (3.1%). Mollusks, crustaceans, bony fish and echinoderms were found in all year round and in all length groups for *Lagocephalus sceleratus* in both stations. In the present study, mollusks, polychaeta and echinoderms decreased as the size increased, while crustaceans and bony fish increased as the fish size increased. The feeding activities were quite high during spring (79.2%) and autumn (69.6%) in Derna coast. While there is a maximal rate of feeding intensity recorded in winter (71.6%) and autumn (79.6%) in Hurghada coast for *Lagocephalus sceleratus*.

Keywords: *Food and feeding habits, Lagocephalus sceleratus, Derna coast, Mediterranean Sea, Libya, Hurghada coast, Red Sea, Egypt.*

الملخص

تمت دراسة العادات الغذائية لمجتمعين أسماك من سمكة الأرنب الفضي *Lagocephalus scelertaus* عائلة Tetraodontidae في ساحل درنه المطل على البحر المتوسط، ليبيا وساحل الغردقة المطل على البحر الأحمر، مصر. وتم التجميع الشهري من كلا المحطتين خلال الفترة من شهر يناير إلى ديسمبر 2022م. تم فحص حوالي 305 عينة من معدة عدد حوالي 161 من ساحل درنه وعدد 144 عينة من ساحل الغردقة. تم دراسة النظام الغذائي السنوي، والتغيرات الشهرية في تكوين النظام الغذائي، وتنوع النظام الغذائي وتمت دراسة شدة التغذية. وقد وجد أن سمكة الأرنب الفضي في ساحل درنة، شرق ليبيا تتغذى على مجموعة واسعة من أنواع الفرائس بنسب مختلفة مثل الرخويات بنسبة (51.6%)، والقشريات (21.4%)، والأسماك

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العظمية (19.3%)، والديدان عديد الأشـواك (5.6%)، والجلد شـوكيات (2.2%). وأما في سـاحل الغردقة تحتوي الرخويات بنسـبة (59.7%)، والقشـريات (19.2%)، والأسماك العظمية (13.8%)، وشـوكيات الجلد (4.1%)، والشـعاب المرجانية (3.1%). وتم العثور على العناصـر الغذائية من رخويات وقشـريات وأسماك وجلدشـوكيات طوال العام وفى كل الأطوال وفي جميع فئات الطول في كلا سـاحل درنة والغردقة. أيضـا في هذه الدراسـة انخفضت نسبة الرخويات والديدان الحلقية وشوكيات الجلد مع ازدياد حجم السمكة، بينما زادت نسبة القشريات والأسماك العظمية مع ازدياد حجمها. وكانت أنشطة التغذية مرتفعة نسبيًا خلال فصلي الربيع (79.2%) والخريف (69.6%) على ساحل درنة. بينما سُجلت أعلى معدلات كثافة التغذية في فصلي الشتاء (71.6%) والخريف (79.6%) على ساحل الغردقة بالنسبة لنوع سمك الأرنب الفضي.

الكلمات الدالة: الغذاء وعادات التغذية، سمكة الأرنب الفضي، ساحل درنة، البحر الأبيض المتوسط، ليبيا، ساحل الغردقة، البحر الأحمر، مصر.

1. Introduction

Almost all marine taxonomic groups are involved in the current hot spot for marine bio-invasions in the Mediterranean Sea (Por, 1978). Since the opening of the Suez Canal, the continual influx of Red Sea biota into the Mediterranean Sea has caught the attention of the scientific community (Por 1978; Galil, 2009; Golani, 2010). Invasive alien species are major contributors to human-caused environmental change in the Mediterranean Sea (Pejchar & Mooney, 2009). Numerous species have detrimental socioeconomic effects on the region; for example, *Lagocephalus sceleratus* has no commercial value, and its large populations are primarily maintained by intensive feeding on native commercial fishes and invertebrate stocks, such as cephalopods, which are economically significant in fisheries and locally exploited. Although they are not commercially significant, lessepsians nevertheless consume vast amounts of fish, macrophytes, and benthic invertebrates—all essential components of the marine food chain. The number of pufferfish species has expanded as a result of their recent migration across the Suez Canal to the Mediterranean Sea. Ten migratory and native species of the family Tetraodontidae are found in the Mediterranean Sea. However, the issue along Libya's eastern coast has only been the subject of a small number of studies (Ayas *et al*., 2019; Abziew & Ali, 2016; Shakman, 2008). The Lessepsian rabbit fish known as the silver stripe blaasop (*Lagocephalus sceleratus*; Tetraodontidae) has established itself in the eastern Mediterranean and is spreading rather quickly (Bilecenoglu *et al*., 2006; Kasapidis *et al*., 2007). It has a major effect on the surrounding ecology and is currently regarded as one of the worst invasive species in the Mediterranean Sea. Fisheries are similarly inconvenienced by it (Zenetos *et al*., 2005). The fish has become a major concern for artisanal fisheries in Libya due to its large population and ability to destroy gear with its powerful tetragons and attack fish caught in nets and lines. *L. sceleratus* contains tetradotoxin (TTX), a toxin that can be lethal to humans; it poses a significant risk to consumers as well (Morris & Vugia, 2021; Arakawa *et al*., 2010). This study is the first to examine the diet and feeding habits of *Lagocephalus scelertaus* (Clark & Gohar, 1993) on the coasts of Hurghada in the Red Sea, Egypt, and Derna in the Mediterranean Sea, Libya.

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2. Materials and Methods

2.1. Derna Coast

Sites of sample collection Derna coast. Derna is both a city and a harbor. It is located at Latitude 32° 16′ North and Longitude 22° 39′ East (Figure 1), 146 km west of Tobrok and 91 km east of Al-Baida city (Reynolds *et al*., 1995). The harbor is 35m deep. It offers modern harbor facilities and good protection along an otherwise very exposed coast. It is equipped with many berths and quays across different sections that serve commercial shipping, fishing craft, and sport fishing boats. The target species was caught using a trawling net, a trammel net, and a long line.

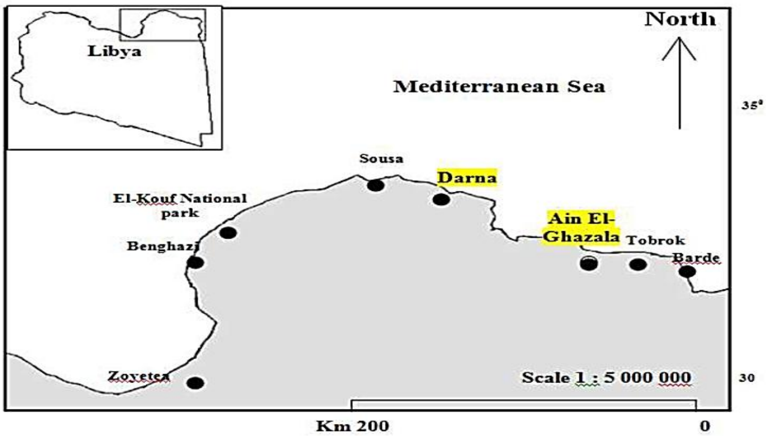

Figure 1. Derna coast site, Mediterranean Sea, eastern Libya

2.2. Hurghada Coast

Hurghada extends for about 36 km (22 mi) along the Red Sea coast, but does not reach far into the surrounding desert. Coordinates: 27°15′28″N 33°48′42″E (Figure 2).

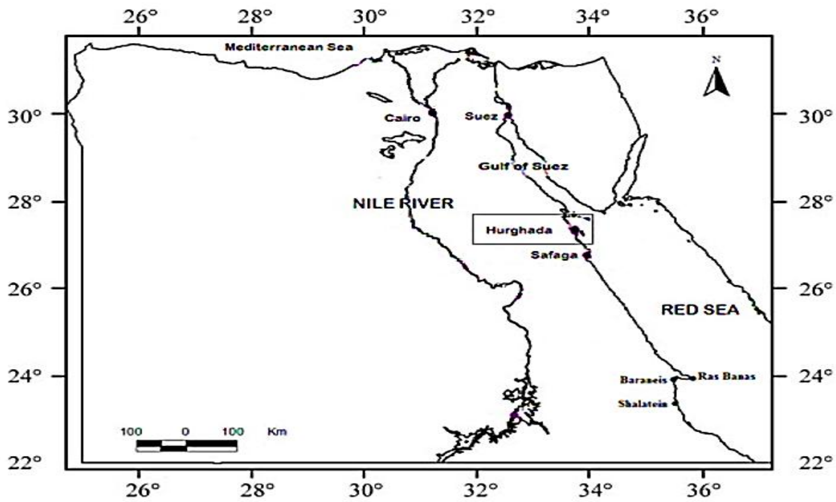

Figure 2. Hurghada coast site northern Egyptian Red Sea

Fishing operations in this area are conducted with artisanal long line, gillnets, and trammel nets at a depth of about 1–10 m. A gillnet seems to look like a trammel net. However, a gillnet has a single piece of mesh, while the trammel net has three pieces of mesh, one middle of small mesh size and two sides of larger mesh sizes.

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2.3. Collection of Samples

Monthly samples of puffer fish specimens were randomly collected from Derna coast and Hurghada coast during 12 months in 2022. The samples collected from Derna, Libya, will be transferred to the Fish Biology Laboratory at the Faculty of Sciences in Derna, and the samples collected from Hurghada, Egypt, will be transferred to the Fish Biology Laboratory, Department of Marine Sciences, Faculty of Science, Suez Canal University.

2.4. Methodology

Total length (TL) was recorded to the nearest cm, and total weight to the nearest for 161 fish samples from Derna coast and about 144 specimens from Hurghada coast. Each stomach was cut open longitudinally, and its contents scraped off and transferred into a small Petri dish containing a small amount of water. Degree of fullness of the stomach was assessed by visual estimation and classified as empty, trace, quarter, half full, three-quarters, and 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 and examined under binuclear microscope. The prey was sorted and identified to the lowest possible taxonomic level using keys and fields (Frimodt, 1995; Gobashi, 1996; Golani *et al.*, 2006). To analyze food and feeding habits of the two species, we used some indices following (Hyslop, 1980):

$$Percentage\ of\ numerical\ abundance\ (\%N) = \frac{Number\ of\ Prey}{Total\ number\ of\ Prey} \times 100\ \ldots.. \quad (1)$$

3. Results

3.1. Annual diet composition

The variety of food items was large. However, mollusks supplemented by crustaceans, bony fish, polychaeta, echinoderms and corals formed the major food groups for *Lagocephalus sceleratus* in both stations (Figure 3). In the Derna coast, mollusks made up 51.6% by volume of the bulk of the diet, which was represented by cephalopods, whereas crustaceans (21.4%) came in the second position of importance, such as shrimp. Bony fish (19.3%) such as *Siganus rivulatus*, *Sarpa salpa*, *Mullus surmulatus*, *Mullus barbatus, Engraulis encrasicolus*, *Liza ramada,* and *Dentex dentex*. Polychaeta (5.6%) followed by echinoderms (2.2%). On the Hurghada coast, mollusks made up 59.7% by volume composition of the bulk of the diet, which represented by cephalopods, bivalves and gastropods, whereas crustaceans (19.2%) came in the second position of importance, such as shrimp, crab, and lobster. Bony fish (13.8%) such as *Abudefduf sexfasciatus*, *Acanthurus nigrofuscus*, *Amphiprion bicinctus*, *Atherinomorus lacunou*, *Bothus pantherinus*, *Caranx sexfasciatus*, *Cephopholis miniata*, *Chaetodon lineolatus*, *Siganus lurids* and *Liza caranita*. Echinoderms (4.1%) followed by soft corals (3.1%).

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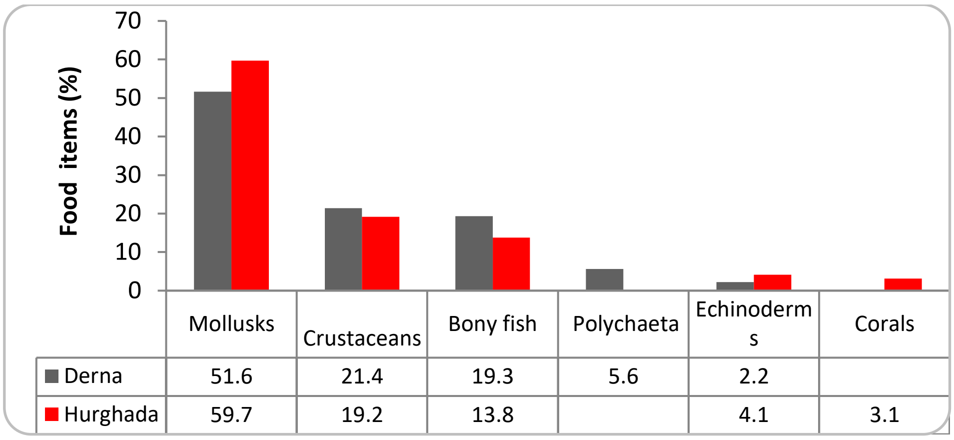

Figure 3. The diet composition of *Lagocephalus scelertaus* in Derna and Hurghada coasts during the period from January to December 2022.

3.2. Monthly Variations in Diet Composition

During the current study, food items were observed throughout the year. Throughout the year, the main food sources for *Lagocephalus scelertaus* were mollusks, crustaceans, bony fish, and echinoderms (94.5% in Derna and 96.8% in Hurghada) (Tables 1 & 2). Throughout the study period, Table 1 displayed monthly changes in the food content of 161 *Lagocephalus scelertaus* fish' stomachs on the Derna shore. In January, Polychaeta was not present. Mollusks had the highest nutritional content (63.9%) in January. Crustaceans are most abundant in May and June (32.6% and 34.1%, respectively). December is when bony fish have the highest values (22.6%). Poychaeta first appear in February (0.4%) and then increase in frequency in April (8.6%) and May (8.4%). The highest percentage of echinoderm food items (5.8%) occurs in March and in April (4.7%).

Table 1. Monthly variations in diet composition of 161 *Lagocephalus scelertaus* in Derna coast during the period from January to December 2022*

Months	No.	Food items				
		Mollusks	Crustaceans	Bony fish	Polychaeta	Echinoderms
Jan. (2022)	11	63.9	19.8	11.8	A	4.5
Feb.	15	55.8	19.2	20.7	0.4	3.9
Mar.	12	52.7	17.4	21.1	3.1	5.8
Apr.	18	48.6	17.1	21.1	8.6	4.7
May	13	46.4	32.6	10.2	8.4	2.4
Jun.	12	44.1	34.1	13.7	7.1	1.1
Jul.	12	54.3	23.2	15.9	4.8	1.8
Aug.	12	45.6	25.3	22.5	4.4	2.2
Sep.	15	57.5	22.3	13.1	4.4	2.7
Oct.	13	52.7	19.9	19.8	5.3	2.3
Nov.	15	59.9	15.1	20.4	1.1	3.5
Dec.	13	51.7	21.6	22.6	2.9	1.1
%	**161**	**51.6**	**21.4**	**19.3**	**5.6**	**2.2**

* Remarks: Data expressed as percentages. (A) No food in the month.

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Table (2) displays monthly changes in the diet composition for 144 *Lagocephalus scelertaus* stomach specimens on the coast of Hurghada over the course of the study. January and February did not have any soft corals. Mollusks had the highest nutritional content (60.1%) in January. Crustaceans were most abundant in May and June (34.6% and 34.8%, respectively). Bony fish had the greatest values (22.5%) in December. Echinoderms (5.6%) in March. March saw the first appearance of soft corals (5.7%).

Table 2. Monthly variations in diet composition of 144 *Lagocephalus scelertaus* in Hurghada coast during the period from January to December 2022*

Months	No.	Food items				
		Mollusks	Crustaceans	Bony fish	Echinoderms	Corals
Jan. (2022)	12	60.1	23.6	11.8	4.5	A
Feb.	11	55.8	19.7	20.7	3.9	A
Mar.	10	52.1	15.4	21.1	5.6	5.7
Apr.	13	50.6	19.1	21.1	4.5	4.7
May	13	49.4	34.6	10.9	2.7	2.4
Jun.	12	49.1	34.8	13.9	1.1	1.1
Jul.	11	55.3	25.2	15.9	1.8	1.8
Aug.	12	49.6	24.1	22.1	2.1	2.1
Sep.	14	57.5	24.3	13.1	2.7	2.4
Oct.	11	52.9	21.9	19.9	2.7	2.5
Nov.	15	57.9	15.1	20.4	3.5	3.1
Dec.	10	51.7	23.6	22.5	1.1	1.1
%	**144**	**59.7**	**19.2**	**13.8**	**4.1**	**3.1**

* Remarks: Data expressed as percentages. (A) No food in month.

3.3. Feeding Habit in Relation to Fish Size

The total length of *Lagocephalus scelertaus* population classified into 10 classes ranged from 15.5cm to 65.4 cm with a 4.9 cm interval in Derna coast (Table 3), and from 10.5 to 65.4 cm along the Hurghada coast (Table 4). Prey size differed between large-sized individuals, which had ingested large-sized prey, whereas the small-sized fish ingested small-sized prey. Mollusks, crustaceans, bony fish, and echinoderms were found in all length groups for *Lagocephalus sceleratus*. In the present study, mollusks, polychaeta, and echinoderms decreased as the size increased, while crustaceans and bony fish increased as the fish size increased. Polychaeta were recorded in food items by 18% in the length group 15.5- 20.4 cm, then decreased in the following length group to record the lowest value (7.4%) in the largest length group 55.5-60.4 cm and disappeared in the length group 60.5- 65.4 cm.

3.4. Feeding Intensity

In Derna coast, *Lagocephalus scelertaus* specimens with stomachs half full, almost full, and full of food ranked b% constituted 55.9% of all analyzed individuals, whereas those with stomachs that were empty or with traces of food and quarter full ranked a% represented 44.1% of the total specimens (Table 5). The feeding activities were quite high during spring (79.2%) and autumn (69.6%). There is a minimal rate of feeding intensity recorded in winter (38.6%) and summer (36.1%) (Table 6).

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Table 3. The diet composition of different size classes of 161 *Lagocephalus scelertaus* in Derna coast during the period from January to December 2022*

Size groups (cm)	No.	Food items				
		Mollusks	Crustaceans	Bony fish	Polychaeta	Echinoderms
15.5-20.4	18	**59.4**	2.1	13.1	**18.3**	**7.1**
20.5-25.4	14	**57.3**	3.9	15.1	**17.0**	**6.6**
25.5-30.4	13	**57.1**	6.3	15.9	**14.4**	**6.2**
30.5-35.4	12	**55.1**	9.6	18.9	**13.9**	**2.5**
35.5-40.4	21	**53.4**	12.9	19.7	**12.2**	**1.7**
40.5-45.4	20	**50.1**	13.9	23.6	**10.8**	**1.6**
45.5-50.4	14	**41.5**	22.3	25.6	**9.5**	**1.1**
50.5-55.4	21	**34.6**	25.4	29.9	**9.1**	**0.9**
55.5-60.4	17	**31.2**	29.1	31.6	**7.4**	**0.7**
60.5-65.4	11	**30.8**	34.7	33.9	**B**	**0.5**

*Remarks: Data expressed as percentages. (B) No food in the size occurred.

Table 4. The diet composition of different size classes of 144 *Lagocephalus scelertaus* in Hurghada coast during the period from January to December 2022*

Size groups (cm)	No.	Food items				
		Mollusks	Crustaceans	Bony fish	Echinoderms	Corals
10.5-15.4	15	**62.5**	2.9	19.3	**15.3**	B
15.5-20.4	13	**58.2**	3.9	26.6	**11.3**	B
20.5-25.4	11	**55.1**	6.5	27.9	**10.4**	B
25.5-30.4	12	**52.5**	8.7	29.9	**8.9**	B
30.5-35.4	18	**49.4**	9.1	31.7	**8.2**	1.7
35.5-40.4	13	**49.1**	10.1	33.4	**5.8**	1.6
40.5-45.4	14	**41.5**	27.3	25.6	**4.5**	1.1
45.5-50.4	12	**32.6**	32.5	29.9	**4.1**	0.9
50.5-55.4	17	**30.2**	34.1	31.6	**3.4**	0.7
55.5-60.4	11	**28.6**	35.7	32.9	**2.8**	B
60.5-65.4	8	**22.1**	33.6	41.8	**2.5**	B

*Remarks: Data expressed as percentages. (B) No food in the size occurred

Table 5. Monthly variations in the intensity of feeding of 161 *Lagocephalus scelertaus* in Derna coast during the period from January to 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)	11	33.1	22.6	11.6	67.3	32.8	A	A	32.8
Feb.	15	9.3	5.0	44.2	58.5	1.5	40.0	A	41.5
Mar.	**12**	**11.4**	**A**	**A**	**11.4**	**13.1**	**48.3**	**27.2**	**88.6**
Apr.	**18**	**25.5**	**A**	**A**	**25.5**	**24.0**	**27.1**	**23.3**	**74.4**
May	**13**	**23.2**	**2.2**	**A**	**25.4**	**15.4**	**15.1**	**44.1**	**74.6**
Jun.	12	5.3	22.4	33.5	61.2	13.9	10.1	14.8	38.8
Jul.	12	21.2	22.7	26.3	70.2	8.7	A	21.1	29.8
Aug.	12	22.3	21.1	16.8	60.2	16.0	10.2	13.6	39.8
Sep.	**15**	**15.9**	**A**	**A**	**15.9**	**13.9**	**20.0**	**50.1**	**84.0**
Oct.	**13**	**20.0**	**12.0**	**2.3**	**34.3**	**11.3**	**11.2**	**43.2**	**65.7**
Nov.	**15**	**11.2**	**13.6**	**16.1**	**40.9**	**25.0**	**14.1**	**20.1**	**59.2**
Dec.	13	9.3	5.0	44.2	58.5	1.5	40.0	A	41.5
Average	**161**				**44.1±18.2**				**55.9±13.4**

*Remarks: Data expressed as percentages. (A)= No food in the month occurred.

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Table 6. Seasonal variations in the intensity of feeding of 161 *Lagocephalus scelertaus* in Derna coast 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	39	17.2	10.9	33.3	61.4	11.9	26.7	B	38.6
Spring	**43**	**20.0**	**0.7**	**0.0**	**20.8**	**17.5**	**30.2**	**31.5**	**79.2**
Summer	36	16.3	22.1	25.5	63.9	12.9	6.8	16.5	36.1
Autumn	**43**	**15.7**	**8.5**	**6.1**	**30.4**	**16.7**	**15.1**	**37.8**	**69.6**

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

In the Hurghada coast, *Lagocephalus scelertaus* specimens with stomachs half full, almost full, and full of food ranked b% constituted 56.4% of all analyzed individuals, whereas those with stomachs that were empty or with traces of food and quarter full ranked a% represented 43.7% of the total specimens (Table 7). The feeding activities were quite high during winter (71.6%) and autumn (79.5%). There was a minimal rate of feeding intensity recorded in spring (35.7%) and summer (38.6%) (Table 8).

Table 7. Monthly variations in the intensity of feeding of 144 *Lagocephalus scelertaus* in Hurghada coast during the period from January to December 2022*.

		The degree of distension of the stomach							
Months	**No. of fish**	**Empty**	**Trace**	**1/4**	**a %**	**1/2**	**3/4**	**Full**	**b %**
Jan. (2022)	**12**	**12.2**	**A**	**A**	**12.2**	**13.9**	**22.5**	**51.4**	**87.8**
Feb.	**11**	**20.0**	**12.0**	**2.3**	**34.3**	**11.3**	**11.2**	**43.2**	**65.7**
Mar.	10	33.1	22.6	11.6	67.3	32.8	A	A	32.8
Apr.	13	9.3	5.0	44.2	58.5	1.5	40.0	A	41.5
May	13	33.1	22.6	11.6	67.3	32.8	A	A	32.8
Jun.	12	9.3	5.0	44.2	58.5	1.5	40.0	A	41.5
Jul.	11	33.1	22.6	11.6	67.3	32.8	A	A	32.8
Aug.	12	9.3	5.0	44.2	58.5	1.5	40.0	A	41.5
Sep.	**14**	**12.5**	**A**	**A**	**12.5**	**12.1**	**48.3**	**27.1**	**87.5**
Oct.	**11**	**23.2**	**A**	**A**	**23.5**	**25.2**	**27.2**	**24.3**	**76.7**
Nov.	**15**	**23.2**	**2.2**	**A**	**25.4**	**15.4**	**15.1**	**44.1**	**74.6**
Dec.	**10**	**11.2**	**13.3**	**14.3**	**38.8**	**25.0**	**15.1**	**21.1**	**61.2**
Average	**144**				**43.7±16.1**				**56.4±14.4**

*Remarks: Data expressed as percentages. (A) = No food in the month occurred.

Table 8. Seasonal variations in the intensity of feeding of 144 *Lagocephalus scelertaus* in Hurghada coast during the period from January to December 2022*

		The degree of distension of the stomach							
Seasons	**No. of fish**	**Empty**	**Trace**	**1/4**	**%**	**1/2**	**3/4**	**Full**	**%**
Winter	**33**	**14.5**	**8.4**	**5.5**	**28.4**	**16.7**	**16.3**	**38.6**	**71.6**
Spring	36	25.2	16.7	22.5	64.4	22.4	13.3	B	35.7
Summer	35	17.2	10.9	33.3	61.4	11.9	26.7	B	38.6
Autumn	**40**	**19.6**	**0.7**	**0.0**	**20.5**	**17.6**	**30.2**	**31.8**	**79.5**

*Remarks: Data expressed as percentages. (B)= No food in the season occurred.

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4. Discussion

The food and feeding habits of family Tetraodontidae have been studied by many authors (Uyeno & Yoshino, 1984; Sabrah *et al*., 2006; Kapiris *et al*., 2014; Ali *et al*., 2016; Artuz & Kubanc, 2015; Hussain *et al*., 2020; Morris & Vugia, 2021; Demirel *et al*., 2021; Ishag *et al*., 2022). This study indicates that different trends are present between the two populations in terms of the main preferred food item; nearly the same nutrients, with different percentages, are in the stomach of each. *Lagocephalus sceleratus* feeds on a wide variety of prey types: on the Derna coast, feed on mollusks supplemented by crustaceans, bony fish, polychaeta, and echinoderms; this agrees with the findings of Abziew & Ali (2016) and Hussain *et al.* (2020). In Hurghada feed mainly on mollusks supplemented by crustaceans, bony fish, echinoderms, and soft corals; this agrees with the findings by Sabrah *et al*. (2006) and Ali *et al*. (2015). In the Gulf of Suez, the target species feed on cephalopods such as squids and cuttlefish, crustaceans particularly crabs, and several species of bony fish (Sabrah *et al*., 2006). Also, past studies indicate that the diet of *L. sceleratus* is highly variable, but mostly carnivorous, as reported for several other Tetraodontidae species (Tortonese, 1986; Denadai *et al*., 2012; Mohamad & Fadhilah, 2013; Suvarna Devi & Sivan, 2017; Chartosia *et al*., 2021; Seetha *et al*., 2023; Ulman *et al*., 2023). Generally, the food extent demands and ability for food acquisition increase with fish development (Honda, 1984). Analysis of *L. sceleratus* diet in Turkey's Mediterranean Sea showed that the fish is carnivorous and crustaceans are its major food items (Aydin, 2011), the numbers and size prey taxa increased with size of the *L. sceleratus* due to the ability of larger fish to consume a wider range of prey sizes than smaller fishes, this phenomenon appeared to be true for *L. sceleratus* of the present study. The feeding intensity of *L. sceleratus* showed a significant difference in both stations. In Derna, the feeding activities were quite high during spring and autumn for *L. sceleratus* before and after the spawning season (Ishag et al., 2022). While in Hurghada, the activities were high during winter and autumn; this coincides with the spawning season at the end of spring and summer (Sabrah *et al*., 2006) and agrees with observations carried out on the target species from the Gulf of Suez, Egypt by Ali *et al*. (2015). During spawning time, fish need more energy input in order to meet the reproduction requirements (Froese & Pauly, 2000).

5. Conclusion

The present study has demonstrated that *L. sceleratus* exhibit some degree of selectivity in their feeding habits since they exploit, almost exclusively, mollusks, crustaceans, echinoderms, polychaeta, and bony fish. Therefore, the two populations of *Lagocephalus scelertaus* in Derna coast, Mediterranean Sea, Libya, and Hurghada coast, Red Sea, Egypt waters are specialist carnivores.

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