

# Feeding Habits of Golden Grey Mullet *Liza Aurata* (Risso, 1810) in the Bitter Lakes, Suez Canal, Egypt

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**Abstract:** A total of 544 fish specimens of the golden grey mullet *Liza aurata* (Risso, 1810) were random sampled monthly during the period from September 2019 to August 2020. They were obtained from fish landing site at Bitter Lakes. The diet composition of *L. aurata* during the period of study composed of polychaetes (49.9%) supplemented by crustaceans (20.0%), phytoplankton (15.7%), bivalves (11.0%) and sediments (3.5%). polychaetes, crustaceans, phytoplankton and bivalves were found in all months and sediments were disappear in July and August. Polychaetes, crustaceans and bivalves decreased as the fish size increased while, phytoplankton and sediments increased as the fish size increased. In the present study the feeding activities for *Liza aurata* were quite high during spring (72.3%) and summer (58.3%). were minimal rate of feeding intensity in autumn (33.1%) and winter (41.7%).

**Keywords:** Family Mugilidae, *Liza aurata*, feeding habits, Bitter Lakes, Suez Canal, Egypt.

## INTRODUCTION

The golden grey mullet *Liza aurata* (Risso, 1810) is a catadromous pelagic species. *L. aurata* is common in the shallow waters of the eastern Mediterranean and Black sea (Abdallah *et al.*, 2013). This species lives in brackish and marine waters, which correspond to lagoons, estuaries and rivers deltas (Jardas, 1996). It tolerates salinity extremes as well as important variations of the water quality (Thomson, 1990). Like most Mugilids, this species reproduces at sea, after which fry undertake a trophic migration shoreward to continue their development in food rich lagoons, rivers and even lakes (Thomson, 1990; El-Mor, 1993; Koutrakis, 1994). Few authors have studied the biology including food and feeding habits of *L. aurata* (Zismann *et al.*, 1975; El-Mor, 1993; Hotos *et al.*, 2000; Fazli *et al.*, 2008; Daryanabard *et al.*, 2009; Abdallah *et al.*, 2012; Stergiouk, 2017).

The aim of the present work is to investigate for the first time the feeding biology of *L. aurata* in Bitter Lakes, Suez Canal. These data will be valuable to those who involved in assessing and managements fisheries and Aquaculture of *Liza aurata*.

## MATERIALS AND METHODS

A total 544 specimens of *L. aurata* (Fig. 1) were sampled to study the feeding biology. Monthly samples of *L. aurata* were collected from September 2019 to August 2020 from trammel and gill nets landings in the Bitter Lakes, Suez Canal (Fig. 2). The total length (TL) ranged from 20.5 to 42.4 cm, and total weight (W) from 109.6 to 621.4 g. Fishes were dissected to study annual diet composition, variation in diet composition with length groups, monthly variation of diet composition and feeding intensity.



Fig. (1): The golden grey mullet *Liza aurata* (Risso, 1810)

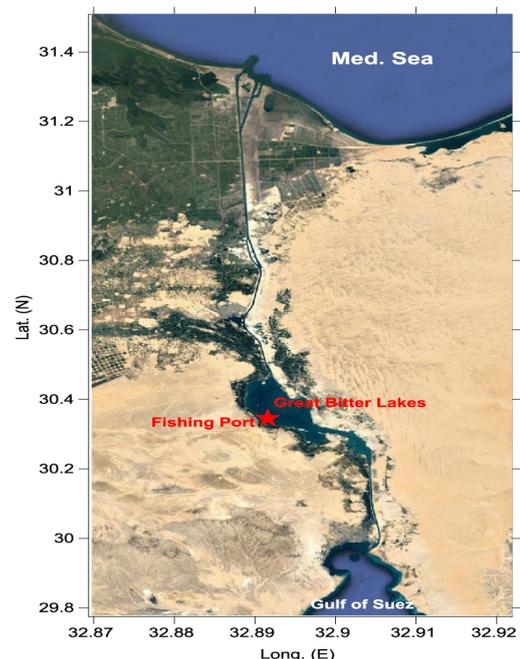


Fig. (2): The Bitter Lakes

Each fish was dissected and the alimentary tract was removed and preserved in formalin. The degree of fullness of the stomach was assessed by visual estimation and classified as empty, trace, quarter full (a%), half full, three quarters, full and completely full (b%) respectively as described by (Pillay, 1952).

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The stomach was cut opened longitudinally and its contents were scraped off and transferred into a small Petri dish contain a small amount of water. Food items were sorted out under a binocular microscope they were identified down to their groups. A list of general diet composition was made and food analyses were made by points of assessment (Hynes, 1950; Hyslop, 1980).

## RESULTS

### Annual diet composition

The variety of food item was large. However the diet composition of *Liza aurata* in Bitter Lakes during the period from September 2019 till August 2020 composed of polychaeta, Phytoplankton, crustacean, bivalves and sediments which formed the major food group for *Liza aurata* (Figure 3).

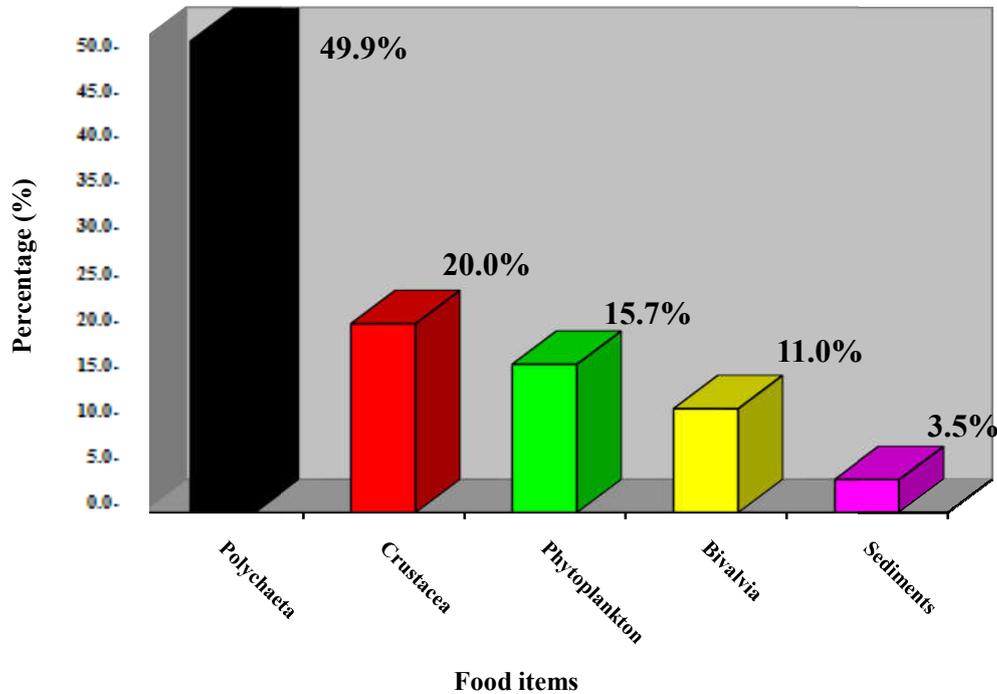


Fig. (3): The diet composition of *Liza aurata* from Bitter Lakes, Suez Canal



Fig. (4): The different food items in *Liza aurata* stomach

Polychaeta represent the main food item (49.9%) in *Liza aurata* stomach during the period of study, whereas crustacean (20.0%) coming in the second rank of importance were composed of Ostracoda and Copepoda, phytoplankton (15.7%) which represent by 6 genera, *Pleurosigma*, *Navicula*, *Synedra*, *Nitzchia*, *Amphora* and *Cyclotella*. Bivalvia constituting 11.0% this followed by small quantities of sediments (Sand, silt and clay) constituting 3.5%.

### Seasonally variations in diet composition

Seasonally variations in diet composition were studied for 544 specimens of *Liza aurata* in Bitter Lakes during the study period, In summer the fish preferred polychaetes (62.4%) and spring (51.8%). Crustacean recorded the highest rates (26.9%) in the autumn and winter (24.6%). Phytoplankton ingested by 16.8% in winter and bivalves (13.6%) in autumn. In spring the fish took sediments by (6.2%) (Table 1).

**Table (1):** Seasonally variations in diet composition of 544 *Liza aurata* from Bitter lakes, Suez Canal

Seasons	No. of fish	Polychaeta	Crustacea	Phytoplankton	Bivalvia	Sediments
Autumn	128	41.3	26.9	15.6	13.6	2.6
Winter	143	44.0	24.6	16.8	9.6	5.0
Spring	125	51.8	15.7	15.5	10.8	6.2
Summer	148	62.4	12.7	14.8	9.9	0.2

**Feeding habit in relation to fish size**

The total length of *Liza aurata* population classified into 11 classes ranged from 20.5cm to 22.4cm till 40.5-42.4 with 1.9 cm interval (Table 2). Prey size differed between large size individuals, which had

ingested the large size prey, whereas the small sized fish ingested the small size prey. Polychaetes, crustacean, and phytoplankton were found in all length groups of *L. aurata*.

**Table (2):** The diet composition of different size classes of *Liza aurata* from Bitter Lakes, Suez Canal

Size groups (cm)	No.	Food items				
		Polychaeta	Crustacea	Phytoplankton	Bivalvia	Sediments
20.5-22.4	55	55.6	38.5	0.1	5.8	B
22.5-24.4	67	55.5	38.4	0.2	5.9	B
24.5-26.4	38	55.2	38.1	0.8	5.9	B
26.5-28.4	45	54.5	37.9	1.9	5.7	B
28.5-30.4	36	53.8	37.9	3.4	4.9	B
30.5-32.4	67	53.5	37.7	3.1	4.1	1.6
32.5-34.4	44	53.3	36.9	4.4	2.7	2.7
34.5-36.4	45	49.1	36.7	11.5	B	2.7
36.5-38.4	36	44.5	35.1	17.3	B	3.1
38.5-40.4	67	38.7	34.6	21.1	B	5.6
40.5-42.4	44	22.4	32.1	38.7	B	6.8

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

Polychaetes, crustaceans and bivalves decreased as the fish size increased while, phytoplankton and sediments increased as the fish size increased.

Polychaetes were found in all length groups of *L. aurata*, they decreased from 55.6% in size class (20.5-22.4 cm) to 22.4% in size class (40.5-42.4 cm). Crustacean decreased from 38.5% in size class (20.5-22.4 cm) to 32.1% in size class (40.5-42.4 cm), phytoplankton increased from 0.1% in size class (20.5-22.4 cm) to 38.7% in size class (40.5-42.4 cm), Bivalves ingested in size class (20.5-22.4 cm) and represented by 5.8%, decreased in the following length groups and recorded the lowest value (2.7%) in size class (32.5- 34.4 cm), then completely disappeared in

the following lengths. Sediments were taken by 1.6% in fish length group (30.5-32.4 cm), and then increased with the increasing of fish size to 6.8% in length group (40.5-42.4 cm).

**Feeding intensity**

Fishes with stomach half full, almost full and full of food ranked b% constituted 51.3% of all analyzed individual, whereas those with stomach that were empty or with traces of food and quarter full ranked a% represented 48.7% of the total specimens. The feeding activities were quite high during spring (72.3%) and summer (58.3%). They were in minimal rate of during in autumn (33.1%) and winter (41.7%) (Table 3 & 4).

**Table (3):** Monthly variations in the intensity of feeding of 544 *Liza aurata* from Bitter Lakes, Suez Canal

Months	No. of fish	Empty	Trace	1/4	a %	1/2	3/4	Full	b %
<b>Sep. (2019)</b>	41	26.4	22.9	26.3	75.6	8.9	A	15.5	24.4
<b>Oct.</b>	43	26.4	21.1	16.8	64.3	16.0	2.0	17.7	35.7
<b>Nov.</b>	44	10.3	5.3	45.3	60.9	A	39.1	A	39.1
<b>Jan. (2020)</b>	51	24.0	28.0	A	52.0	24.0	24.0	A	48.0
<b>Feb.</b>	47	9.2	29.0	26.0	64.2	20.0	10.2	5.6	35.8
<b>Mar.</b>	49	23.3	A	A	23.3	15.4	15.2	46.1	76.7
<b>Apr.</b>	40	23.3	A	A	23.3	15.4	15.2	46.1	76.7
<b>May</b>	36	6.2	A	39.9	46.1	13.7	10.1	30.1	53.9
<b>Jun.</b>	53	20.0	21.4	A	41.4	10.0	4.0	44.6	58.6
<b>Jul.</b>	44	24.0	24.0	A	48.0	24.0	28.0	A	52.0
<b>Aug.</b>	51	20.0	10.2	5.6	35.8	9.2	29.0	26.0	64.2
<b>Average</b>	<b>544</b>				<b>48.7±19.9</b>				<b>51.3±20.7</b>

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

**Table (4):** Seasonally variations in the intensity of feeding of 544 *Liza aurata* from Bitter Lakes, Suez Canal

Seasons	No. of fish	The degree of distension of the stomach							
		Empty	Trace	1/4	a %	1/2	3/4	Full	b %
<b>Autumn</b>	<b>128</b>	21.0	16.4	29.5	66.9	8.3	13.7	11.1	33.1
<b>Winter</b>	<b>143</b>	14.4	20.3	23.5	58.3	21.3	18.5	1.9	41.7
<b>Spring</b>	<b>125</b>	14.0	0.4	13.3	27.7	13.4	24.5	34.5	72.3
<b>Summer</b>	<b>148</b>	21.3	18.5	1.9	41.7	14.4	20.3	23.5	58.3

Remarks: Data expressed as percentage

## DISCUSSION

The food and feeding habits of mullet fishes have been studied by many authors (Valet *et al.*, 1970; Brusle, 1981; Ferrari and Chierigato, 1981; Mohammad, 1982; Andaloro, 1983; Wijeyaratne and Costa, 1986; Papisassi, 1989; El-Mor, 1993 and Rasheed, 2008).

The golden grey mullet *Liza aurata* found over rock rubble or sand bottoms, young frequently found on algae, sea grasses beds and continual shelf (El-Mor, 1993), feeds on diatoms, polychaetes, crustaceans, algae, mollusks, bivalves and sediments (Mohammad, 1982).

In current study *L. aurata* were found to consume a wide range of food items ranging from polychaetes supplemented by crustaceans, phytoplankton, bivalves and sediments which formed the major food group for

the target species this finding is in full agreement with Mohammad (1982) and El-Mor (1993). Also, the present results were similar to that of Papisassi (1989), who studied the composition of the diet in the golden grey mullets in different localities in the Gulf of Kissamos, Greece and found that the species feed on diatoms, crustacean, polychaetes, foraminifera, green algae with fragment quantities of sediments. In the present work, polychaetes recorded the highest values in all seasons; this is full agreement with Brusle (1981). Generally, the food extent demands and ability for food acquisition increased with fish development (Honda, 1984).

Brusle (1981) studied the feeding habits of *Liza aurata* and they concluded that the numbers and size prey taxa increased with size of the striped 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 the present work. Also, the attained results showed that Polychaetes, crustaceans and bivalves decreased as the fish size increased while, phytoplankton and sediments increased as the fish size increased, which is in agreement with El-Mor (1993). In the present study the feeding activities for *Liza aurata* were quite high during spring (72.3%) and summer (58.3%). There are minimal rate of feeding intensity recorded in autumn (33.1%) and winter (41.7%), this is full agreement with Andaloro (1983) and Bat *et al.* (2005).

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## عادات التغذية لسمكة الهليلي في البحيرات المرة وإمكانية التفريخ المستحث باستخدام الحقن الهرموني

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تعتبر عائلته البوري family mugilidae من العائلات السمكية الهامة في شرق البحر المتوسط وقناة السويس من ناحية مصاندها أو إنتاجيتها في الاستزراع البحري توجد اسماك هذه العائلة في معظم بحار ومحيطات العالم خاصة في مياه البحر المتوسط. تعيش اسماك هذه العائلة متوسطه الحجم سابحة مجتمعة وتشتمل العائلة علي ٦٤ نوع تعيش في المياه المعتدلة والاستوائية ويتركز منها ثمانية أنواع في الحوض الشرقي للبحر المتوسط. تعتبر سمكه الهليلي *Liza aurata* من اسماك العائلة البورية الهامة وهي سمكه تهاجر من البحر إلي النهر للتغذية وتعود للبحر لإتمام عملية التكاثر وتكمله دوره الحياة. في هذه الدراسة تم عمل قاعدة بيانات بيولوجيه لتغذية سمكه الهليلي في البحيرات المرة في قناة السويس تمهيدا لتنظيم مصاندها واستزراعها مستقبلا. وبدراسة العلاقة بين طول ووزن أسمكه وجد أن أطوال وأوزان الأسماك كالتالي:

$$L = \text{total length (cm)} (20.5 - 42.4 \text{ cm})$$

$$W = \text{total weight (gm)} (109.6 - 621.4 \text{ gm})$$

تتكون القاعدة الغذائية لسمكة الهليلي علي: الديدان عديدة الأشواك، والقشريات والهائمات النباتية وثنائية المصراع مع كمية من الرسوبيات. وقد شكلت الديدان عديدة الأشواك القشريات و الهائمات النباتية لجزئ الأعظم في معدة الأسماك. وقلت نسب الديدان عديدة الأشواك والقشريات وثنائيات المصراع بزيادة طول السمكة بينما الهائمات النباتية والرسوبيات تتناقص بزيادة الطوال السمكة ولوحظ أن السمكة لها نشاط غذائي كبير في الربيع والصيف.