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SPECIES COMPOSITION AND SIZE STRUCTURE OF EXPERIMENTAL BEACH SEIN BY-CATCH IN EION MOUSSA, NORTH GULF OF SUEZ, EGYPT

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ABSTRACT

The by-catch of the experimental beach seine operating in Eion Moussa coast, north Gulf of Suez during the period from autumn 2017 to summer 2018 was analyzed. The by-catch amount 3-5 Kg per haul composed of fin fish species (84.3%) and shrimp (15.7%). About 17 fin fish species belonged to 14 families composed of two categories 13 juvenile of the commercially important species (30.6 %) and 4 low valued species (69.4%). *Leiognathus berbis*, *Leiognathus elongates*, *Stolephorus pacificus* and *Istigobius ornatus* dominated the assemblage of 17 species and contributed 69.37% of all sampled fishes. About 41.19% of juvenile of the commercially important species were recruitment in summer 2018, 48.26% in autumn and spring and 10.55 % in winter.

Key Words: Experimental beach Seine, Juvenile fish, North Gulf of Suez, by Catch

1. INTRODUCTION

The importance of shallow coastal marine habitats as nursery grounds for juvenile fishes is well established in the literature and it has been shown that a large number of fish species are dependent on these habitats during these juvenile phases (Bennett, 1989).

Typically, the adults spawn elsewhere in the sea and after metamorphosis the juvenile fishes enter the nursery grounds to complete their life cycle. They remain in their nursery grounds for some time, often no more than a year before vacating it for their adult habitat (El-Mor, 2002).Shallow coastal habitats offer advantages over the marine environment in the term of protection from predators and as an abundant food supply *(*Clark, 1974; Cushing, 1975; Lenanton, 1982; Boesch and Turner, 1984*).*

The aim of the present work is to determine the structure of juvenile fish community inhabiting coastal shallow water of Eion Moussa, North Gulf of Suez to describe species composition, size structure of juvenile fishes and time of recruitment in the target area.

MATERIALS AND METHODS

The by-catch of about 3-5 Kg per haul were collected seasonally by Experimental beach seine operating in Eion Moussa coast during the period from autumn 2017 to summer 2018 was analyzed. The net is 6 meters long, 7 m width and 1.6 m height. It consists of a small bag with mesh size of 1-1.5 cm. The net was seasonally dragged on the bottom for a distance of about 100-300 m. The data were collected from 24 hauls from the four seasons. The fishes sampled were preserved immediately on capture by immersion in 5-10 % sea water formalin. On the return to the laboratory fish samples were sorted and species identification for each fish was carried out based on criteria given by (Randall, 1983; Whitehead *et al.*, 1984; Smith and Heemstra, 1986; Humann and Deloach, 2002; Allen and Steene, 2005 and Golani *et al.*, 2006). The total length (cm) and total weight (gm) of each fish species were measured.

The study area Eion Moussa Coast 29^0 52' 37" N, 32^0 39' 30" E (Fig. 1) is located 35 Km from the city of Suez, between Suez City and Ras Sider. The sandy beach of the region extends 15 Km long including the study area and consists of 12 oases, it is one of the tourist attractions of the distinctive nature that tourists visit on their way to Sharm El-Sheikh, the study area attracts amateur bird watches, especially the quail.

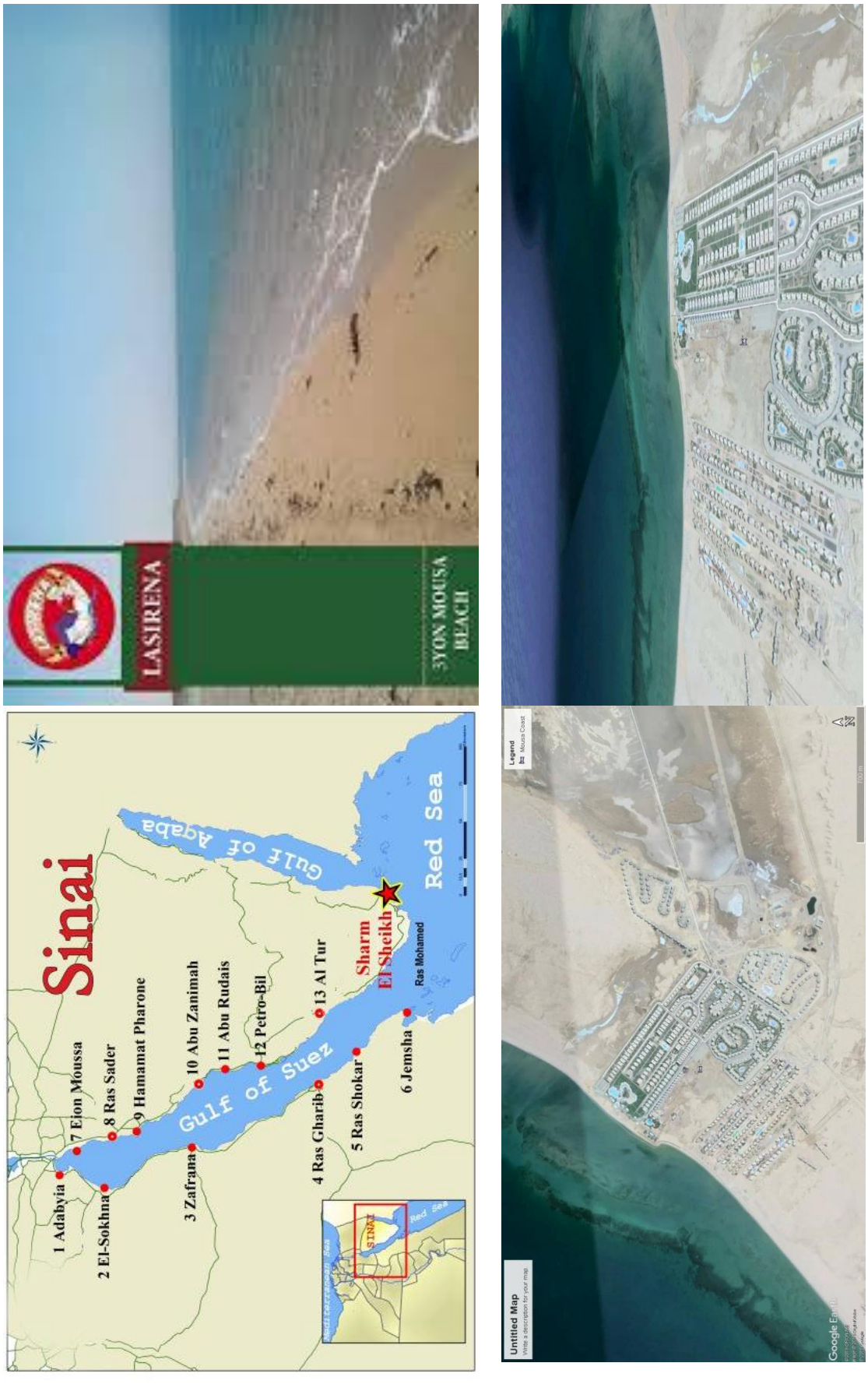

Figure 1. Map showing Eion Moussa sites, North Gulf of Suez, Egypt.

RESULTS

1- Species composition and overall abundance

The by-catch amounted 3-5 Kg per haul composed of fin fish species (84.3%) and shrimp (15.7%). In the present study, the shrimp is represented by *Metapenaeopsis stridulans*. A total of 3283 fish individuals have been collected in one year by the experimental beach seine from autumn 2017 to summer 2018. The fin fish species can be classified into categories:

Juvenile of the commercial important species and low valued species. Juvenile of the commercially important species constituted 30.6% of the total fin fish by-catch which were represented by 13 species belonging to 11 families such as: *Synodontidae* (8.98% of the total fin fish by-catch), *Nemipteridae* (4.41%), *Mullidae* (4.23%), *Sparidae* (3.68%) and *Heamullidae* (2.04%).They were the main components of juvenile of the commercial important species. Low valued species constituted 69.4% of the total by-catch which were represented by 4 abundant species belonging to 3 families; *Leiognathidae* (38.04%), *Engraulidae* (18.82%) and *Gobiidae* (12.51%) (Table 1).

2- Seasonally relative abundance and size composition

A total of 3283 fish juvenile individuals have been collected in one year by the experimental beach seine from autumn 2017 to summer 2018.

Juveniles of commercially important fish species were recoded all the year round with the abundance was higher in the seasons (autumn -summer). A total of 414 Juvenile fish were collected in summer followed by 336 Juvenile fish in autumn. Juveniles of commercially important fish species were rare both in spring and winter with 149 and 106 juvenile respectively.

Juveniles of Low valued fish species were recoded all the year round with the abundance was higher in the seasons (autumn -winter). A total of 978 Juvenile fish were collected in autumn followed by 682 Juvenile fish in winter. Juveniles of Low valued fish species were rare both in summer and spring with 413 and 205 juvenile respectively.

The juvenile of *Saurida undosquamis* recruitment were in autumn (7.6%) and summer (8.6%) varying between 2.3 and 12.2 cm total length (Table 2). The juveniles of *Synodus variegates* were recruited in autumn (8.1%) and winter (6.3%) varying between 3.4 and 13.13cm T.L.

The juveniles of *Nemipterus japonicus* were present in the samples by-catch from spring (8.8%) to summer (13.8%) varying between 3.1 and 12.6 cm T.L. *Upeneus japonicas* was present in autumn (7.7%) and summer (4.6%), varying between 2.2 and 6.9 cm T.L. While 121 fish specimens collect from *Diplodus noct* in summer (41.6%), varying between 2.4 and 7.3 cm T.L. *Pomadasys stridens* (2.0 – 5.9 cm T.L.) was recorded during the period from winter (2.0%) to spring (14.4%). The juveniles of *Trachurus indicus* were present in samples from spring (5.9%) to summer (3.6%) varying between 3.3 and 7.5 cm T.L.

The juvenile of *Alepes djedaba* were recruitment in spring (3.7%) and summer (3.1%), varying between 4.3 and 9.4 cm T.L. About 36 fish specimens collected from*Liza carinata* in winter (1.3%) and spring (7.3%), varying between 2.1 and 5.8 cm T.L. The recruitment of *Terapon jarbua* took place in autumn (0.7%) and winter (2.5%), varying between 3.2 and 9.3 cm T.L.

The juveniles of *Siganus rivulatus* were present in fish samples in autumn (1.2%) and summer (0.5%) varying between 3.1 and 6.8 cm T.L. About 17 fish collected from Conger *cinereus* in spring (1.9%) and summer (1.2%), varying between 8.1 – 17.4 cm T.L.

The juveniles of *Fistularia commersonii* were recruitment in autumn (0.2%) and winter (1.3%), varying between 9.2 and 24.3 cm T.L. On the other hand The low valued fish species such as *leignathus berbis* were dominant in autumn (31.4%) and winter (50.8%), varying between 2.2 – 4.0 cm T.L. Also, *leignathuselongateus* were present in the samples during autumn (11.8%) and winter (35.8%), varying between 2.3 - 5.7cm T.L. About 618 fish collected from *Stolephorus punetifer* in spring (75.9%) and in summer (49.9%), varying between (2.0 – 5.1 cm), T. 2-Seasonally relative abundance and size composition

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Juveniles of Low valued fish species were recoded all the year round with the abundance was higher in the seasons (autumn -winter). A total of 978 Juvenile fish were collected in autumn followed by 682 Juvenile fish in winter. Juveniles of Low valued fish species were rare both in summer and spring with 413 and 205 juvenile respectively.

The juvenile of *Saurida undosquamis* recruitment were in autumn (7.6%) and summer (8.6%) varying between 2.3 and 12.2 cm total length (Table 2). The juveniles of *Synodus variegates* were recruited in autumn (8.1%) and winter (6.3%) varying between 3.4 and 13.13cm T.L.

The juveniles of *Nemipterus japonicus* were present in the samples by-catch from spring (8.8%) to summer (13.8%) varying between 3.1 and 12.6 cm T.L. *Upeneus japonicas* was present in autumn (7.7%) and summer (4.6%), varying between 2.2 and 6.9 cm T.L. While 121 fish specimens collect from *Diplodus noct* in summer (41.6%), varying between 2.4 and 7.3 cm T.L. *Pomadasys stridens* (2.0 – 5.9 cm T.L.) was recorded during the period from winter (2.0%) to spring (14.4%). The juveniles of *Trachurus indicus* were present in samples from spring (5.9%) to summer (3.6%) varying between 3.3 and 7.5 cm T.L.

The juvenile of *Alepes djedaba* were recruitment in spring (3.7%) and summer (3.1%), varying between 4.3 and 9.4 cm T.L. About 36 fish specimens collected from*Liza carinata* in winter (1.3%) and spring (7.3%), varying between 2.1 and 5.8 cm T.L. The recruitment of *Terapon jarbua* took place in autumn (0.7%) and winter (2.5%), varying between 3.2 and 9.3 cm T.L.

The juveniles of *Siganus rivulatus* were present in fish samples in autumn (1.2%) and summer (0.5%) varying between 3.1 and 6.8 cm T.L. About 17 fish collected from Conger *cinereus* in spring (1.9%) and summer (1.2%), varying between 8.1 – 17.4 cm T.L.

The juveniles of *Fistularia commersonii* were recruitment in autumn (0.2%) and winter (1.3%), varying between 9.2 and 24.3 cm T.L. On the other hand The low valued fish species such as *leignathus berbis* were dominant in autumn (31.4%) and winter (50.8%), varying between 2.2–4.0 cm T.L. Also, *leignathuselongateus* were present in the samples during autumn (11.8%) and winter (35.8%), varying between 2.3 - 5.7cm T.L. About 618 fish collected from *Stolephorus punetifer* in spring (75.9%) and in summer (49.9%), varying between (2.0 – 5.1 cm), T.L.

While, *Istigobius ornatus* (2.0 – 4.3 cm), appeared in autumn (31.3%) (Table 2).

Table (1). Fin fish species composition and overall abundance (%) in the by-catch taken by experimental beach seine operating in Eion Moussa coast during the period from autumn 2017 to summer 2018.

Families		Species	Abundance (No. %)	Range of total length (cm)
1- Juveniles of commercially important fish species				
Synodontidae	*Saurida undosquamis* (Richardson, 1848)	171	2.3-12.2	13.7±1.07
	Brushtooth lizar fish	5.20%		
	Synodus variegatus (Lacepede, 1803)	157	3.4-13.3	14.1±1.79
	Variegated lizard fish	4.78%		
Nemipteridae	*Nemipterus japonicus* (Bloch, 1791)	145	3.1-12.6	16.8±1.49
	Japanese thread fin bream	4.41%		
Mullidae	*Upeneus japonicus* (Houttuyn, 1782)	139	2.2-6.9	10.4±0.87
	Japanese goat fish	4.23%		
Sparidae	*Diplodus noct* (Valenciennes, 1830)	121	2.4-7.3	11.8±1.16
	Red seabream	3.68%		
Haemulidae	*Pomadasys stridens* (Forsskal, 1775)	67	2.0-5.9	8.3±0.43
	Striped piggy	2.04%		
Carangidae	*Trachurus indicus* (Nekrasov, 1966)	51	3.3-7.5	10.8±1.19
	Arabian scad	1.55%		
	Alepes djedaba (Forsskal, 1775)	39	4.3-9.4	12.5±1.23
	Shrimp scad	1.18%		
Mugilidae	*Liza carinata* (Valenciennes, 1836)	36	2.1-5.8	8.1±0.30
	Keeled mullet	1.09%		
Terapontidae	*Terapon jarbua* (Forsskal, 1775)	29	3.2-9.3	10.6±1.28
	Jarbua terapon	0.88%		
Siganidae	*Siganus rivulatus* (Forsskal, 1775)	20	3.1-6.8	8.7±0.58
	Marbled spinefoot	0.60%		
Congridae	*Conger cinereus* (Ruppell, 1830)	17	8.1-17.4	15.8±2.33
	Long african conger	0.51%		
Fistulariidae	*Fistulariacommersonii* (Ruppelll, 1838)	13	9.2-24.3	18.4±1.89
	Bluespotted cornet fish	0.39%		
Total juveniles		1005	30.61	
2- Low valued fish species				
Leiognathidae	*Leiognathus berbis* (Valenciennes, 1835)	812	2.2-4.0	3.3±0.29
	Berber pony fish	24.73%		
	Leiognathus elongatus (Gunther, 1874)	437	2.3-5.7	4.1±0.47
	Slender pony fish	13.31%		
Engraulidae	*Stolephorus punetifer* (Fowler, 1938)	618	2.0-5.1	4.7±0.18
	Buccaneer anchovy	18.82%		
Gobiidae	*Istigobiusornatus* (Ruppelli, 1830)	411	2.0-4.3	4.3±0.09
	Ornate goby	12.51%		
Total of low valued fishes	2278	69.39 %		
Totals	3283			

Table (2). Seasonally relative abundance and size composition in the by-catch taken by experimental beach seine Operating in Eion Moussa coast during the period from autumn 2017 to summer 2018.

Family	Species	Autumn2017			Winter			Spring			Summer 2018		
	1- Juveniles of commercially important fish species	No.	%	Size(cm)	No.	%	Size(cm)	No.	%	Size(cm)	No.	%	Size(cm)
Synodontidae	*Saurida undosquamis* (Richardson, 1848) Brushtooth lizar fish	100	7.6	2.0-12.2							7.1	8.6	2.3-7.0
	Synodus variegatus (Lacepede, 1803) Variegated lizard fish	107	8.1	3.4-6.7	50	6.3	5.0-13.3						
Nemipteridae	*Nemipterus japonicus* (Bloch, 1791) Japanese thread fin bream							31	8.8	3.1-8.1	114	13.8	4.0-12.6
Mullidae	*Upeneus japonicus* (Houttuyn, 1782) Japanese goat fish	101	7.7	2.2-6.9							38	4.6	2.2-5.0
Sparidae	*Diplodus noct* (Valenciennes, 1830) Red seabream										121	14.6	2.4-7.3
Haemulidae	*Pomadasys stridens* (Forsskal, 1775) Striped piggy				16	2.0	2.0-4.0	51	14.4	2.0-5.9			
Carangidae	*Trachurus indicus* (Nekrasov, 1966) Arabian scad							21	5.9	3.3-5.0	30	3.6	3.3-7.5
	Alepes djedaba (Forsskal, 1775) Shrimp scad							13	3.7	4.3-7.0	26	3.1	4.0-9.4
Mugilidae	*Liza carinata* (Valenciennes, 1836) Keeled mullet				10	1.3	2.1-4.0	26	7.3	2.1-5.8			
Terapontidae	*Terapon jarbua* (Forsskal, 1775) Jarbua terapon	9	0.7	3.2-6.0	20	2.5	4.0-9.3						
Siganidae	*Siganus rivulatus* (Forsskal, 1775) Marbled spinefoot	16	1.2	3.1-6.8							4	0.5	3.1-5.0
Carangidae	*Conger cinereus* (Ruppell, 1830) Long african conger							7	1.9	8.1-15.0	10	1.2	8.1-17.4
Firstykaruude	*Fistulariacommersonii* (Ruppelll, 1838) Bluespotted cornet fish	3	0.2	9.2-20.0	10	1.3	9.2-24.3						
Total juveniles		336			106			149			414		
%		**33.43 %**			**10.55 %**			**14.83 %**			**41.19 %**		
	2- Low valued fish species												
Leiognathidae	*Leiognathus berbis* (Valenciennes, 1835) Berber pony fish	412	31.4	2.2-4.0	400	50.8	2.2-4.0						
	Leiognathus elongatus (Gunther, 1874) Slender pony fish	155	11.8	2.3-5.0	282	35.8	2.3-5.7						
Engraulidae	*Stolephorus punetifer* (Fowler, 1938) Buccaneer anchovy							205	57.9	2.0-5.1	413	49.9	2.0-5.0
Gobiidae	*Istigobiusornatus* (Ruppell, 1830) Ornate goby	411	31.3	2.0-4.3									
Total of low valued fish		978			682			205			413		2278
%		42.93 %			29.94 %			9.0 %			18.13 %		
Totals		1314			788			354			827		3283
%		40.03%			24.0 %			10.78%			25.19 %		
Total of low valued fish		978			682			205			413		2278

DISCUSSION

The by-catch of experimental beach seine net in Eion Moussa, North Gulf of Suez was analyzed. The north Gulf of Suez is biologically an economically valuable as a breeding and nursery ground for some commercially valuable fish species (El-Ganainy, 1992; El-Ganainy *et al.* 2006; Gab-Alla *et al.* 2007). In the Gulf of Suez, many fin fish species are caught by several fishing gears as by-catch which is defined as incidental catch and discarded or released catch (Clucas, 1997 and El-Ganainy, *et al.* 2006). In the present study the by-catch amounted 3-5 Kg per haul composed of fin fish species (84.3%) and shrimp (15.7%). The fin fish species were represented by 17 species, belonging to 14 families. El Mor, (2002) analyze the size and species composition of experimental beach seinein Deversoir, lake Timsah and Great Bitter lakes, Suez canal, He was identified 26 fish species representing 20 families, among these 15 species are known to be Red Sea immigrant species. Ahmed *et al.,* (2004) studied the by-catch of experimental beach seine in great Bitter lakes, Suez Canal, they were identified 12 species belonged to 11 families. El-Ganainy *et al.,* (2006) were studied the bottom trawl discards in the Gulf of Suez, they were collected 51 fish species. It is known that the differences in fish richness are attributed to either unequal collection (different sites, methods and season) or reduction of number owing to specific condition of certain habitat (Bennett, 1989). In the present study, 13 juveniles of the commercially important species were represent 30.6% of total fin fish by-catch of the gear, belonged to 11 families such as *Synodontidae, Nemipteridae, Mullidae, Sparidae* etc. Further, the update list of fin fish species in north Gulf of Suez waters given by El-Ganainy *et al.,* (2006) included all fish families recorded in the present work.

In the current study, the juveniles of *Saurida undosquamis, Upeneus* japonicas and *Siganus rivulatus* recruitment in summer and autumn months. The juveniles of *Synodus variegatus, Terapon jarbua, Fistularia commersonii,Leiognathus berbis* and *Leiognathus* elongates recruitment were in autumn and winter months. The juvenile of *Nemipterus japonicas, Trachurus indicus,Alepes djedaba, Conger cinereus and Stolephorus punetifer* recruitment were in spring and summer months. The juveniles of Liza *Carinata* and *Pomadasys stridens* recruitment were in winter and spring.

The juveniles of *Diplodus noct* recruitment was in summer while the juvenile of *Istigobius ornatus* recruitment was in autumn. This is in agreement with spawning seasons of the previous species for instance: March till June for *Saurida undosquamis* (Sanders and Morgan, 1989), may till August for *Upeneus japonicas* (Wahbeh and Ajiad, 1985), May till July for *Siganus rivulatus* (Ben Tuvia, 1986). August till October for *Synodus variegatus* (Allen and Adrim, 2003), August till November for *Terapon jarbua* (Jeyaseelan, 1998), June till August for *Fistularia commersonii* (Watson and SandKnop, 1996). May tell August for *Leiognathus berbis* and *Leiognathus elongates* (Lee *et al.* 2005), January till April for *Nemipterus japonicas* (Russel, 1990), January till May for *Trachurus indicus* (Sanders and Morgan, 1989), February till June for *Alepes djedaba* (Shuaib and Ayub, 2011), from November till March for *Conger cinereus* (Castle, 1984), November till February for *Stolephorus punetifer* (Tiews *et al.* 1971), November till February for Liza *carinata* (Hefny*et al.* 2016)and for *Pomadasys stridens*(Ben tuvia and Mckay, 1986), from march till may for *Diplodus noct* (Bauchot and Smith, 1984) and from July till September for *Istigobius ornatus* (Hurdy and Hoese, 1985). The damage caused by the trawling net effected badly on stock resources of North Gulf of Suez coast, which can be considered as nursery ground in which small fish individuals were caught before Sexual maturation (lenanton, 1982). Therefore, it is necessary to consider restrictions to trawling and illegal fishing gears operating in nursery grounds, north Gulf of Suez.

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الملخص العربي

التركيب النوعي والحجمي للصيد الجانبي لشبكة الجرف التجريبيه في عيون موسي شمال خليج السويس - مصر

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الصيد الجانبي (الأسماك المصاده في كيس الشبكه Code end) بواسطة شباك الجرف التجريبية تم دراسته وتحليله في عيون موسي شمال خليج السويس خلال الفترة من خريف ٢٠١٧ وحتي صيف ٢٠١٨. كان وزن كل جرفة من ٣ الي ٥ كيلوجرام وكان يتكون من أنواع الأسماك ذات الزعانف بنسبة ٨٤,٣% والجمبري بنسبة ١٥,٧% .

في هذا البحث تم التعرف علي ١٧ نوع سمك تنتمي الي ١٤ عائلة وكانت الأسماك تتكون من قسمين ، صغار الأسماك التجارية الهامة بنسبة ٣٠,٦% وكانت ١٣ نوع و ٤ أنواع أسماك صغيرة غير هامة تشكل نسبة ٦٩,٤% وتشمل علي ٤ أنواع وهم "عريانه نوعين والأنشوجه نوع والجوبي نوع" وكانت هي الانواع السائدة تشكل ٦٩,٣% من حجم الصيد الجانبي للأسماك وكان هناك حوالي ٤١,١٩% من صغار الأسماك التجارية الهامة تتوارد في المنطقة في الصيف وحوالي ٤٨,٢٦% في الخريف والربيع وحوالي ١٠,٥٥% في فصل الشتاء.