Egyptian Journal of Aquatic Biology & Fisheries
Zoology Department, Faculty of Science,
Ain Shams University, Cairo, Egypt.
ISSN 1110 – 6131
Vol. 29(4): 4733 - 4743 (2025)
www.ejabf.journals.ekb.eg

Size and Composition of Species Structure of the Experimental Beach Seine Trash Catch Category in the Great Bitter Lake, Suez Canal, Egypt

Ahmed S. Abd El-Naby
Fisheries Department, Faculty of Fish Resources, Suez University, Suez, Egypt

***Corresponding Author: dr_ahmedsamir83@yahoo.com**

ARTICLE INFO

Article History:
Received: May 28, 2025
Accepted: July 20, 2025
Online: Aug. 10, 2025

Keywords:
Species composition,
Size structure,
Experimental beach seine,
Great Bitter Lake,
Suez Canal

ABSTRACT

The Great Bitter Lake, Suez Canal trash collection via experimental beach seine from summer 2023 to spring 2024 was examined. For the catch of each journey, a total of 3– 5kg of fin fish (81.7%) and shrimp (18.3%) were caught in each haul. There were 22 finfish species in 12 families, which were divided into two groups: 8 small fishes (5494 individuals) (58.92%) and 14 juveniles of commercially important species (3829 individuals) (41.07%). Approximately 53.4% of the commercially significant species' juveniles were recruited in the spring of 2024, 21.7% in the winter, 15.1% in the summer, and 9.8% in the fall of 2023. In summer 2023, an estimated 51.8% of small fish species arrived, followed by autumn (30.5%), spring (2024) (12.7%), and winter (5.1%). *Rhabdosargus haffara*, *Diplodus noct*, *Rhabdosargus sarba*, *Sparus aurata*, *Alepes djedaba*, and *Liza caranita* and *Liza ramada* recruit young in spring. The juveniles of *Siganus rivulatus* and *Argyrosomus regius* recruit in summer and fall, while *Mugil cephalus*, *Liza aurata*, *Terapon puta*, and *Pomadosys stridens* recruit in winter. In fall and winter, recruitment is that of *Saurida undosquamis*.

INTRODUCTION

In addition to being a vital fishing and tourism destination in Egypt, the Bitter Lakes are also a crucial section of the Suez Canal, a key global waterway. Approximately 85% of the water in the Suez Canal is stored in the Bitter Lakes, which serve as the primary bodies of water along the canal (30°20′ N, 32°23′ E). The Bitter Lakes cover an area of roughly 250km².

Several pollution sources negatively impact the Bitter Lakes, including domestic wastewater from nearby settlements, thermal pollution from the cooling water discharged by the Abu Sultan power plant, and industrial and agricultural waste originating from the city of Ismailia via the Malaria Drain. This drain also collects agricultural runoff from cultivated lands on the western bank of the Great Bitter Lake **(Afifi, 1998; El-Saadany, 2002; Abdel-Azim *et al.*, 2017; Mohamed & Maghawry, 2022)**. These forms of pollution affect fish production, water quality, and the ecological boundaries of the lake.

The Nile Delta, the Suez Canal lakes, and the Egyptian Mediterranean coast are popular areas for beach seining, largely because these regions serve as major spawning grounds for various fish species **(El-Mor, 2002; Faltas & Akel, 2003; El-Sayed & Khalil, 2021)**. According to **Akel (2005)**, beach seining significantly increases the catch of undesirable species and results in the capture of large numbers of juveniles—small, economically valuable fish considered essential for sustaining future stocks.

Numerous studies have investigated the impacts of beach seines on coastal habitats, bays, and lakes that function as nurseries for commercial fish and invertebrates. Notable examples include mangrove habitats in Sharm El-Sheikh (**Ahmed *et al*., 2004**), Sharm El Moyia Bay, and the eastern Alexandria harbor (**Al-Sayes, 1992**).

Additional research has examined various fishing methods in the region: bycatch from experimental beach seining in the Great Bitter Lakes **(Ahmed *et al*., 2004)**, bottom trawling in the Gulf of Suez **(El-Ganainy *et al*., 2006)**, and species structure and size composition in test beach seining at Eion Moussa, located north of the Gulf of Suez **(Abd El-Naby *et al*., 2018)**.

Shallow coastal habitats offer better predator protection and a more abundant food supply compared to open ocean environments **(Clark, 1974; Cushing, 1975; Lenanton, 1982; Boesch & Turner, 1984; Abdelrahman & Hassan, 2020)**.

The current study aimed to characterize the species composition, size structure of juvenile fishes, and recruitment period in the target area. Specifically, it investigates the structure of bycatch from experimental beach seining conducted in the shallow coastal waters of the Great Bitter Lake, Suez Canal.

MATERIALS AND METHODS

1. Description of the study area

According to the Suez Canal study area (Fayed) kilometric scale (30°19′34″ N, 32°17′55″ E), the Bitter Lakes are located between 99km from El-Deversoir to 130km near Ginifa (Fig. 1). The bottom floor of the study area generally consists of sandy-clay to sandy mud surface deposits. Due to the construction of buildings and jetties along the shore, the intertidal zone is primarily rocky.

The subtidal zone, which has a soft bottom, is mainly covered by seagrasses, predominantly *Halophila stipulacea*, and to a lesser extent, *Holodule uninervis*. Seaweeds such as red algae (*Rhodophyta*), including *Laurencia* sp., *Acanthophora* sp., and *Sarconema* sp., as well as green algae (*Chlorophyta*) like *Caulerpa prolifera* and *Ulva* sp., were not well represented. Large areas of the shallow-water Bitter Lakes are dominated by these grasses, which provide essential subtidal soft-bottom habitats for mollusks, juvenile fish, and crustaceans. Various crustaceans, including some crabs and invertebrates like jellyfish (*Cassiopeia* sp.), as well as echinoderms such as sea cucumbers and starfish, were also observed.

2. The experimental beach seine

The experimental beach seine net (Fig. 2) consists of two main parts: the net wings and the net bag. The net is 1.6 meters high, 7 meters wide, and 6 meters long. It contains a small bag with mesh sizes ranging from 1 to 1.5 cm.

Data were collected seasonally through 24 net pulls at Fayed (Great Bitter Lake) during the summer of 2023 and the spring of 2024. The net was dragged along the bottom for distances ranging from approximately 50 to 100 meters each season. Immediately after capture, the collected fish (9,323 specimens) were preserved in a 5–10% saltwater formalin solution.

Each fish specimen was measured for total weight (g) and length (cm). Once returned to the laboratory, the fish samples were sorted and identified to species level using identification guides and taxonomic standards developed by **Randall (1983)**, **Whitehead *et al*. (1984)**, **Smith and Hiemstra (1986)**, **Homan and De-Loach (2002)**, **Allen and Stein (2005)** and **Golani *et al*. (2006)**.

Fig. 1. Map of the study area

Fig. 2. The experimental beach seine

RESULTS

Species composition and overall abundance

Each haul's bycatch weighed between 3 and 5kg and consisted of finfish species (81.7%) and shrimp (18.3%). *Penaeus semisulcatus* was the sole shrimp species recorded in this study. Over the one-year sampling period, the experimental beach seine captured a total of 9,323 individual fish.

The finfish catch was categorized into two main groups: juvenile fish of commercially important species and small, non-commercial fish species. Juvenile commercial species accounted for 3,829 individuals (41.07% of the total finfish catch), while small fish species totaled 5,494 individuals.

Juvenile fish of commercial value belonged to 14 species from 8 families. These included: Mugilidae (50.7% of all juveniles of commercially important species), Sparidae (26.2%), Terapontidae (5.9%), Haemulidae (5.5%), Siganidae (5.3%), Carangidae (4.7%), Sciaenidae (1.3%), and Synodontidae (0.3%) (Fig. 3).

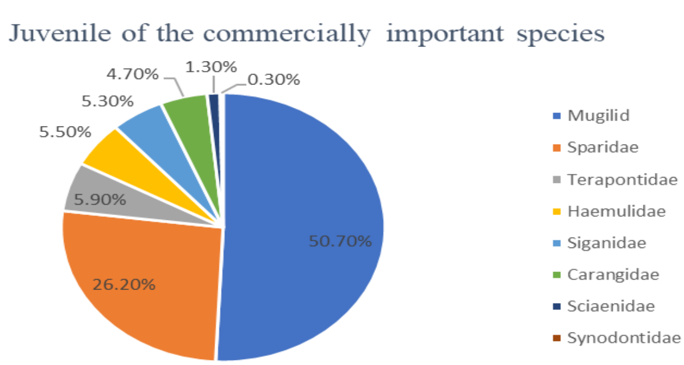

Fig. 3. Juvenile fish of important commercial species

A total of 897 juvenile *Liza caranita* (23.4%) were recorded, with total lengths (T.L.) ranging from 1.7 to 5.2cm. Approximately 645 individuals (16.8%) of *Liza ramada* were observed, ranging from 2.9 to 8.8cm T.L. *Mugil cephalus* accounted for 322 individuals (8.6%) with sizes ranging from 3.8 to 11.1cm T.L., while 76 individuals (1.9%) of *Liza aurata* ranged from 2.8 to 7.1cm T.L.

A total of 488 individuals (12.7%) of *Rhabdosargus haffara* were recorded, with lengths ranging from 3.3 to 6.4cm T.L. *Diplodus noct* accounted for 357 individuals (9.3%), ranging from 1.2 to 5.7cm T.L., and *Rhabdosargus sarba* contributed 113 individuals (2.9%) within a size range of 1.3 to 3.8cm T.L. *Sparus aurata* was represented by 49 individuals (1.3%) measuring between 3.2 and 7.8cm T.L.

Juveniles of *Terapon puta* (229 individuals, 5.9%) ranged in size from 1.8 to 3.6cm T.L., and *Pomadasys stridens* (211 individuals, 5.5%) ranged from 1.7 to 3.9cm T.L. *Siganus rivulatus* accounted for 205 individuals (5.3%), ranging from 0.8 to 3.3cm T.L., while *Alepes djedaba* totaled 77 individuals (2.0%) within a range of 1.7 to 4.3cm T.L. *Argyrosomus regius* was represented by 48 juveniles (1.3%) measuring between 5.4 and 11.6cm T.L., and *Saurida undosquamis* was the least common, with 12 individuals (0.3%) ranging from 2.2 to 11.4cm T.L.

Among the small fish species, eight dominant species from four families accounted for 58.93% of the total bycatch. These included species from the family Leiognathidae (36.6%), Atherinidae (30.1%), Engraulidae (21.8%), and Gobiidae (11.6%) (Table 1).

Table 1. Overall abundance (%) and species composition of fin fish in the bycatch collected by experimental beach seines operating in Fayed during the summer of 2023 and the spring of 2024

Juveniles of commercially important fish species				
Families	**Species**	**Abundance (No.**	**%)**	**Range of total length (cm)**
Mugilidae	*Liza caranita* (Valenciennes, 1836)	897	23.4	1.7- 5.2
	Liza ramada (Risso, 1827)	645	16.8	2.9-8.8
	Mugil cephalus (Linnaeus, 1758)	322	8.6	3.8-11.1
	Liza aurata (Risso, 1810)	76	1.9	2.8-7.1
		1940	50.7	
Sparidae	*Rhabdosargus haffara* (Fabricius, 1775)	488	12.7	3.3-6.4
	Diplodus noct (Valenciennes, 1830)	357	9.3	1.2-5.7
	Rhabdosargus sarba (Forsskål, 1775)	113	2.9	1.3-3.8
	Sparus aurata (Linnaeus, 1758)	49	1.3	3.2-7.8
		1007	26.2	
Terapontidae	*Terapon puta* (Cuvier, 1829)	229	5.9	1.8-3.6
Haemulidae	*Pomadasys stridens* (Forsskål, 1775)	211	5.5	1.7-3.9

Siganidae	*Siganus rivulatus* (Forsskål & Niebuhr, 1775)	205	5.3	0.8-3.3
Carangidae	*Alepes djedaba* (Fabricius, 1775)	177	4.7	1.7-4.3
Sciaenidae	*Argyrosomus regius* (Asso, 1801)	48	1.3	5.4-11.6
Synodontidae	*Saurida undosquamis* (Richardson, 1848	12	0.3	2.2-11.4
Total juveniles	**3829** **41.07%**			
Small fish are of low valued species				
Leiognathidae	*Leiognathus berbis* (Valenciennes, 1835) *Leiognathus elongatus* (Gunther, 1874)	1164 845 2009	21.2 15.4 36.6	2.1-3.7 2.2-3.9
Atherinidae	*Atherina boyeri* (risso, 1810) *Atherina lacunosa* (Forster, 1801)	1021 633 1654	18.6 11.5 30.1	1.9-3.7 1.7-2.9
Engraulidae	*Stolephorus punetifer* (Fowler, 1938) *Engraulis encrasicolis* (Linnaeus, 1758)	822 377 1199	14.9 6.9 21.8	0.9-2.2 0.8-2.7
Gobiidae	*Gobius niger* (Linnaeus, 1758) *Coryogalops ocheticus* (Norman, 1927)	411 221 632	7.5 4.1 11.6	05-0.9 0.8-1.1
Total small fish		**5494**	**58.92%**	
Total fish collected			**9323**	

Seasonally relative abundance and size composition

Throughout the year, a total of 3,829 juvenile fish belonging to commercially significant species were recorded, with peak abundance observed during the spring and winter seasons. Specifically, 2,043 individuals (53.4%) were collected in spring and 832 individuals (21.7%) in winter. In contrast, fewer juveniles were observed during the summer and fall, with 579 (15.1%) and 375 (9.8%) individuals collected, respectively.

In addition, 5,494 small, non-commercial fish specimens were identified over the course of the year, with the highest abundances occurring during the summer and autumn. A total of 2,847 individuals (51.8%) were collected in summer and 1,673 (30.5%) in fall. Spring and winter exhibited noticeably lower numbers, with 699 (12.7%) and 275 (5.1%) individuals, respectively (Table 2).

Table 2. By-catch collected by experimental beach seines operating in Fayed between the summer of 2023 and the spring of 2024, with respect to seasonal relative abundance and size composition.

Juveniles of commercially important fish specie			**Summer 2023**	**Autumn**	**Winter**	**Spring 2024**
Family	**Species**	**Abundance (No. %)**				
Mugilidae	*Liza caranita* (Valenciennes, 1836)	*897*	*122*	*58*	*62*	*655*
	Liza ramada (Risso, 1827)	*645*	*103*	*44*	*51*	*447*
	Mugil cephalus (Linnaeus, 1758)	*322*	*21*	*23*	*176*	*102*
	Liza aurata (Risso, 1810)	*76*		*33*	*40*	*3*
		1940				
Sparidae	*Rhabdosargus haffara* (Fabricius, 1775)	488	87		45	356
	Diplodus noct (Valenciennes, 1830)	357	67	2	43	247
	Rhabdosargus sarba (Forsskål, 1775)	113	45		11	55
	Sparus aurata (Linnaeus, 1758)	49			22	27
		1007				
Terapontidae	*Terapon puta (Cuvier, 1829)*	229		33	189	7
Haemulidae	*Pomadasys stridens* (Forsskål, 1775)	211		23	121	67
Siganidae	*Siganus rivulatus* (Forsskål & Niebuhr , 1775)	205	112	93		
Carangidae	*Alepes djedaba* (Fabricius, 1775)	177		44	56	77
Sciaenidae	*Argyrosomus regius* (Asso, 1801)	48	22	14	12	
Synodontidae	*Saurida undosquamis* (Richardson, 1848)	12		8	4	
Total juveniles		**336**	**106**	**149**	**414**	
	%	**33.43%**	**10.55%**	**14.83%**	**41.19%**	
Small fish are of low valued species						
Leiognathidae	*Leiognathus berbis (Valenciennes, 1835)*	1164	787	321	56	
	Leiognathus elongatus (Gunther, 1874)	845	581	222	42	
		2009				
Atherinidae	*Atherina boyeri (risso, 1810)*	1021	667	21		333
	Atherina lacunosa (Forster, 1801)	633	423	67		143
		1654				
Engraulidae	*Stolephorus punetifer* (Fowler, 1938)	822		534	112	176
	Engraulis encrasicolis (Linnaeus, 1758)	377		265	65	47
		1199				
Gobiidae	*Gobius niger* (Linnaeus, 1758)	411	213	198		
	Coryogalops ocheticus (Norman, 19 27)	221	176	45		
		632				
Total small fish		**5494**	**2847 (51.8%)**	**1673 (30.5%)**	**(%5.1) 275**	**(%12.7) 699**
Total fish collected		**9323**				

DISCUSSION

An analysis was conducted on the bycatch from experimental beach seine fishing in the Great Bitter Lake of the Suez Canal. Serving as a breeding and nursery ground for several commercially valuable fish species, the Great Bitter Lake holds both biological and economic significance **(El-Mor, 1993; Al-Oraimi, 1996; Ahmed *et al*., 2004; Ahmed *et al*., 2013; Mohamed & Maghawry, 2022)**.

In the present study, finfish constituted the majority of the bycatch (81.7%), followed by shrimp (18.3%), with total catches ranging between 3– 5kg per fishing operation. **El-Mor (2002)** examined the size and species composition of experimental beach seine catches in Deversoir, Lake Timsah, and the Great Bitter Lakes, and reported 26 fish species across 20 families—15 of which were identified as migratory species from the Red Sea. Finfish in that study were represented by 22 species from 12 families. In a separate study, **Ahmed *et al*. (2004)** recorded 12 species from 11 families in the bycatch of experimental beach nets in the Suez Canal and Great Bitter Lakes.

Variations in fish richness are known to arise either from the distinctive characteristics of specific habitats or from inconsistencies in sampling methods, timing, and locations **(Bennett, 1989)**. In the current study, 14 juvenile species of commercial importance—representing 41.07% of the total finfish bycatch—were identified from eight families, including Mugilidae, Sparidae, Terapontidae, Haemulidae, among others. All fish families identified in this study were also listed in the comprehensive species records of the Great Bitter Lakes by **Ahmed *et al*. (2013)**.

Seasonal recruitment patterns were observed. Juveniles of *Rhabdosargus haffara*, *Diplodus noct*, *Rhabdosargus sarba*, *Sparus aurata*, *Alepes djedaba*, and *Liza carinata* were found to recruit in spring. *Siganus rivulatus* and *Argyrosomus regius* recruited in summer, while *Mugil cephalus*, *Liza aurata*, *Terapon puta*, and *Pomadasys stridens* recruited during winter. *Saurida undosquamis* juveniles appeared in both fall and winter.

These recruitment timings align with previously documented spawning seasons: November to February for *Rhabdosargus haffara*, *Diplodus noct*, *Rhabdosargus sarba*, and *Sparus aurata* **(Bauchot & Smith, 1984; Al-Oraimi, 1996)**, May to July for *Siganus rivulatus* and *Argyrosomus regius* **(Ben Tuvia, 1986; Abou-Shabana *et al*., 2012; El-Sayed & Khalil, 2021)**, May to August for *Saurida undosquamis* **(Sanders & Morgan, 1989)**, October to December for *Liza ramada* **(El-Mor, 1993)**, October to December for *Mugil cephalus* and *Liza aurata* **(El-Mor, 1993)**, September to November for *Terapon puta* and *Pomadasys stridens* **(Jeyaseelan, 1998)**, January to March for *Alepes djedaba* **(Shuaib & Ayub, 2011)**, and November to February for *Liza carinata* **(Hefny *et al*., 2016)**.

According to this study, the Great Bitter Lake should be preserved as a nursery ground, as juvenile fish are consistently captured there before reaching sexual maturity **(Lenanton, 1982)**.

CONCLUSION

Using experimental beach seine sampling conducted from summer 2023 to spring 2024, this study examined seasonal variations in the composition of bycatch collected from the Great Bitter Lake (Suez Canal). The majority of the catch consisted of finfish, with a significant proportion of shrimp also recorded. The harvest included numerous small fish species as well as juveniles of commercially important species. Seasonal differences were observed, with small fish being more abundant during the summer, while spring emerged as a critical period for juvenile recruitment. Recruitment patterns varied among species depending on the season. These findings highlight the biological importance of the lake as a seasonal nursery habitat and emphasize the need for fisheries management strategies that account for seasonal dynamics in order to protect juvenile fish stocks.

REFERENCES

Abd EL-Naby, A. S.; El-Ganainy, A.; Mohamed, M. A. and El-Mor, M. (2018). Species composition and size structure of experimental beach seine by catch in Eion moussa, North Gulf of Suez, Egypt. Al Azhar Bulletin of Science 29(2): 39-47.

Abd-El-Azim, H. A.; Mehanna, S. F. and Belal, A. A. (2017). Impacts of Water Quality, Fishing Mortality and Food Availability on the Striped Piggy Pomadasys stridens Production in Bitter Lakes, Egypt. Ann Mar Sci 1(1): 019-027.

Abdel-Rahman, S. M. and Hassan, R. A. (2020). Assessment of trash fish composition in beach seine catches from Great Bitter Lake. Fisheries Research, 230, 105654. DOI: 10.1016/j.fishres.2020.10565

Abou-Shabana, N. M.; El-Rahman, S. H.; Al-Absawy, M. A. and Assem, S S. (2012). Reproductive biology of Argyrosomus regius (Asso, 1801) inhabiting the south eastern Mediterranean Sea, Egypt. Egy. J. Of Aqua. Res. 38(2):147-156.

Afifi, R. (1998). Evaluation for oil pollution situation in the aquatic environment of Suez Canal lakes. M. Sc. Thesis, Fac. Sci., Suez Canal Univ., Ismailia. 182 P.

Ahmed, A. I.; El-Kafrawy, S. B. and Mohammad, A. H. (2013). Status of fisheries resources of Bitter Lakes, Suez Canal, Egypt during 2007. The Global J. of Fisheries and Aqua. Res. 6(6): 22-33.

Ahmed, A.; El-Mor, M.; Gabr, H. and El-Shafai, A. (2004). Species composition and abundance of juvenile fishes in Great Bitter Lakes, Suez Canal Egypt. Egypt.J. Aquat. Biol. & Fish., Vol. (8): 195-211.

Akel, E. H. Kh. (2005). A Comparative Study On The Catch Characteristics Of Purse Seine Operating During Day Time In Abu Kir and El- Max Bays , Alexandria, (Egypt). 117-135.

Allen, G. and Steene, R. (2005). Reef Fish Identification - Tropical Pacific. New world publications, INO. Jack Sonville, Florida, USA. 619P.

Al-Oraimi, A. (1996). Fisheries and biological studies on Rhabdosargus haffara (family: Sparidae) in Suez Canal. M. Sc. Thesis, Fac. Sci., Suez Canal Univ., Ismailia. 105 P.

Alsadany, A. (2002). Geomorphological of the Suez Canal Lakes area and its applied importance. Ph.D. Thesis, Faculty of Arts, Zagazig University, Egypt. 409 P.

Al-Sayes, A. (1992). Design characters and improvements of commercial fisheries gear and methods used on the Mediterranean coast of Egypt .2nd Alex .Conf . Fd. Sci. Tech. 480- 496.

Bauchot, M. L. and Smith, M. M. (1984). Sparidae. In W. Fischer and G. Bianchi (eds.) FAO species identification sheets for fishery purposes. Western Indian Ocean (Fishing Area 51). vol 4,FAO, Rome spring.

Ben. Tuvia, A. (1986). Siganidae P. 964-966. In P.J.P. Whitehead, M.L. Bachout, J.C. Hurcan, J. Nilsen and E. Tortonese (eds). Fishes of the North eastern Atlantic and the Mediterranean vol.2. UNESCO, Paris. 1197-1204.

Bennette, B. A. (1989). The fish community of a moderately exposed beach on the south western cope coast of South Africa and an assessment of their habitat as a nursery for juvenile fish Estuar. Coast. Shelf Sci., 28: 293- 305.

Boesch, D. F. and Turner, R. E. (1984). Dependence of fishery species on salt marshes: The role of food and refuge. Estuaries, 7: 460-468.

Clark, J. (1974). Coastal ecosystem. In ecological conditions for management of coastal zone. Washington D.C. condition foundation.

Cushing, D. H. (1975). Marine ecology and fisheries Cambridge: Cambridge University Press, 278 PP.

El-Ganainy, A.; Yassien, M. and Ibrahim, E. (2006). Bottom trawl discards in the Gulf of Suez, Egypt. ICES CM/K: 07.

El-Mor, M. (1993). Fisheries and biological studies on some fish species of family Mugilidae inhibiting the Suez Canal. M. Sci. Thesis. Faculty of Science, Suez Canal University, Egypt. 94 P.

El-Mor, M. (2002). Ecological and biological studies on commercial juvenile fishes from Port Said coast. Ph.D. Thesis, Suez Canal. M.Sc. Thesis, Faculty of Sci., Suez Canal Univ., 121, pp.

El-Sayed, M. A. and Khalil, M. T. (2021). Bycatch species diversity and population structure in experimental beach seine fishery along the Suez Canal region.

Marine Science Journal, 30(4), 120-134.DOI: 10.1016/jsm.2021.04.005.

Faltas and Akel, (2003). Investigation of beach seine catch of Abu Qir Bay (Egypt). Bull. Nat. Inst. Oceanography. & Fish., ARE, 29:

Golani, D.; Ozturk, B. and Basusta, N. (2006). The Fishes of the eastern Mediterranean. Turkish Marine Research Foundation (TUDAV), Istanbul, turkey. 59pp.

Hefny, A.; Abass, O.; El-halfawy, M.; Abu El-Regal, M. and Ramadan, A. (2016). Reproductive Biology of Keeled Fish Liza Carinata (Valenciennes, 1836) from Suez Bay, Egypt. International J. of Aquaculture, 6(21):1-15.

Humann, P. and DeLoach, N. (2002). Reef Fish Identification, Florida Caribbean Bahamas. New world publication, FL 32207, USA. 548P.

Jeyaseelan, M. J. P. (1998). Manual of Fish Eggs and Larvae from Asian Mangrove Waters. United Nations Educational, Scientific and Cultural organization. Paris, 193P.

Lenanton, R. C. J. (1982). Alternative non-estuarine nursery habitats for some commercially and recreationally important fish species of south-western Australia. Aust. Mar. Fresh w. Res., 33(5): 881 – 900.

Mohamed, A. A. and El-Maghawry, S. M. (2022). Species composition and size structure of fish bycatch from beach seine fishery in Great Bitter Lake, Egypt.

Egyptian Journal of Aquatic Biology & Fisheries, 26(3): 45-58.

DOI: 10.21608/ejabf.2022.152406

Randall, J. E. (1983). Red Sea Fishes IMMER publishing Co. London, 192pp.Sanders, M.J. and Morgan, G.R. (1989). Review of the fisheries resources of the Red Sea and Gulf of Aden. FAO fish. Tech. Rep (304): 138 P.

Shuaib, N. and Ayub, Z. (2011). Length-Weight Relationship, Fecundity, Sex-ratio and Gonadal Maturation in shrimp scad, Alepes djedaba (Forsskal, 1775) landing at the Karachi Fish Harbour, Karachi, Pakistan. International Fisheries symposium.

Smith, M. M. and Heemstra, P. C. (1986). Smith's sea fishes published by springer. Vsrlag Co. pp. 1047.

Whitehead, P. J. P.; Hureau, J. C.; Nielsen, J. and Tortonese, E. (1984). Fishes of the North-Eastern Atlantic and Mediterranean published by the United Nations Educational, Scientific and cultural Organization, United Kingdom, UNESCO, pp.1473.