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Degradation Factors on Marine Fisheries in the Coastline of Dernah, East Libya

Ezz AL-Naser. A. Farag. Abziow

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Authors affiliation
Department of Environmental Sciences ,Faculty of Natural Resources and Environmental Sciences, University of Derna,Libya
e.ebziow@uod.edu.ly

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ABSTRACT

This study has been conducted in the period between 2016 and 2019 on along the Derna coast. Severe decline has occurred in the case of marine fisheries in the area, where the Region was subjected to many pressures and crises, such as the subsequent closure of the fishing season due to war conditions and the widespread use of explosives in fishing (recording 896 accidents during the study period). The entry of foreign fishermen into the maritime fisheries sector without a license has resulted in a loss of productivity. The entry of foreign fishermen into the maritime fisheries sector without a license has resulted in a loss of productivity . The entry of foreign fishermen into the maritime fisheries sector without a license has resulted in a loss of productivity. The area reported a production of 5943 kilograms of fish in 2019 and decreased volume production from in 2015(25950 kilograms). and a significant decline in the number of fishing boats along the Derna coastline in the fishing sector. Decline from 200 different boats in 2015 to just 67 in 2019, and a significant decline in the number of fishing boats along the Derna coastline in the fishing sector from 200 different boats in 2015 to just 67 in 2019. resulting in very high fish and crustacean prices and a large number of local Fishers for other, more profitable occupations. In this study 83 native fish species, 4 endemic to the Mediterranean Sea, 20 non-indigenous of Lessepsian origin and 2 range expanding taxa from Gibraltar were recorded.

عوامل تدهور الصيد البحرى فى ساحل درنه – شرق ليبيا

أ.عزالنصر عاشور أبزيو

اجريت هذه الدراسه على طول ساحل درنه خلال الفتره من 2016 وحتى 2019 وقد ظهر تدهور شديد فى حالة المصايد البحريه فى المنطقه حيث تعرضت المنطقه للعديد من المؤثرات والازمات مثل الاغلاق المتتالى للمصيد نظرا لظروف الحرب وانتشار استخدام المتفجرات فى الصيد (تسجيل 896 حادثه خلال فترة الدراسه) ودخول عناصر اجنبيه للعمل فى مجال الصيد البحرى دون ترخيص نتج عن ذلك انهيار فى الانتاجيه لتسجل المنطقه انتاج 5943 كيلو جرام سمك عام 2019م بانخفاض بنسبة 22.9% عن انتاج عام 2015م (25950 كيلوجرام) ونقصان شديد فى اعداد المراكب العامله فى مجال الصيد على طول ساحل درنه لتنخفض من 200 مركب مختلفة الانواع عام 2015م الى 67 مركب فقط عام 2019م والامر الذى ادى الى ارتفاع شديد فى اسعار الاسماك والقشريات وانتقال عدد كبير من الصيادين المحليين للعمل فى مجالات اخرى اكثر ربحا. وقد نتج عن هذه الدراسه القائمه الاخيره لانواع الاسماك المسجله فى ساحل درنه ورصد للانواع المهاجره والتى سجلت 83 نوع محلى , 4 متوطنه البحر المتوسط , 20 نوع مهاجر من قناة السويس و2 نوع امتد من مضيق جبل طارق على مدخل المتوسط من الاطلسى .

INTRODUCTION

Libya, situated in North Africa, occupies the eastern segment of the Arabic Maghreb region, situated between latitudes 22° and 32° N and longitudes 10° and 25° E (Metz 1989; Otman and Karlberg, 2017), Libya encompasses an area of approximately 1,775,500 square kilometers, making it the fourth largest country in Africa (Karlberg and Otman 2007). The northern boundary of Libya is defined by the Mediterranean Sea, while it shares its western borders with Tunisia and Algeria, its eastern border with Egypt, and its southern borders with Sudan, Nigeria, and Chad (FAO 2005; Otman and Karlberg, 2007).Among Mediterranean nations, Libya boasts some of the largest, most intriguing, and least explored marine basin areas (Coll et al., 2010; 2012). Its coastline, extending roughly 2,000 kilometres along the Mediterranean, experiencing relatively minimal anthropogenic influence (Badalamenti et al., 2011), this region is currently facing an invasion of new species in its waters, alongside other areas of the eastern Mediterranean (Elbaraasi et al., 2013). The degradation of oceanic and marine ecosystems is significantly attributed to improper trading practices and various detrimental activities, which have largely been overlooked due to their limited direct impact on human populations (Mor, 2023). Yin et al. (2022) identified several critical factors contributing to the decline of fisheries, including overfishing, pollution, climate change, dam construction, developmental activities, illegal shipping operations, and the introduction of invasive species. The Mediterranean Sea, a largely enclosed marine area surrounded by the continents of Europe, Asia, and Africa, is connected to the Atlantic Ocean through the Strait of Gibraltar, which measures fifteen kilometers in width and has an average depth of 290 meters, with a maximum depth of 950 meters. Additionally, since the opening of the Suez Canal in 1869, the Mediterranean has had a link to the Red Sea. Research indicates that approximately 1,255 fish species have been recorded in the Northeast Atlantic and the Mediterranean Sea (EU, 2008), with 540 species specifically identified in the Mediterranean region. Among these, 362 species are found in coastal habitats, including 62 species that are endemic to the area (Tortonese, 1963). Given the clear evidence of regional speciation within the Mediterranean, it is unreasonable to assume uniformity in species composition across the entire sea (Whitehead et al., 1984).

Numerous investigations have been undertaken in the waters surrounding Libya. The initial study was conducted by Vinciguera in 1881, who documented seventeen species while examining the ichthyofauna of the region. The early 20th century saw a rapid increase in the number of recognized species, as noted by Nini in 1914 and Tortonese in 1939. More comprehensive research was carried out in the latter half of the 20th century; for example, Aldebert and Pichot (1973) focused on certain flatfish species, while Duclerc (1973) concentrated on the Scorpaenidae family. Additional surveys produced checklists, such as one from the western region in 1972, which identified sixty-two species (Gorgy, 1972). In 1977, researchers had documented 39 species of cartilaginous fish and 185 species of bony fish. Zupanovic and El-Buni (1982) employed demersal fishing methods to assess the fish populations in Libyan waters, concluding that these populations exhibit a moderate potential for productivity. Their findings also indicated that Libya's ichthyofauna is largely linked to that of the eastern Mediterranean Sea, with a particular emphasis on the Levant Basin. In the eastern region of Libya, notably in Benghazi, a thorough survey of bony fish identified a total of 201 species distributed across seventy-one families and fifteen orders (Hassan and Silini, 1999). In 2007, Shakman and Kinzelbach examined the commercial fishery and species composition in Libya's coastal waters, providing researchers with updated information on both local and non-native fish species. Their findings included a new inventory of bony fish comprising approximately 104 species, contributing to a total of 304 taxa were recorded, including 271 species of natives, added by six endemic fish species to the Mediterranean, with 22 are of Lessepsian origin, and five are from Gibraltar. This updated data serves to monitor the various crises impacting fisheries along the coast of Derna in eastern Libya (Elbaraasi et. al., 2013).

Blast fishing, also known as dynamite fishing, refers to the unlawful practice of employing explosives to incapacitate or kill fish populations for the purpose of easy collection. This method has been identified as a significant contributor to the degradation of numerous marine ecosystems worldwide (Fox and Caldwell 2006; England, 2014), It leads to decline in fish stocks and their habitats are destructed. Furthermore, the processes involved in ecosystem recovery remain poorly understood and can take considerable time (Ulaş et al.). In Libya, this illicit activity was prohibited by Law No. 14 in 1989, specifically in section 2, articles (7), (14), and (15). Nevertheless, the practice persists, particularly following the events of 2011, when a surge in fishing activities occurred amidst a climate of lawlessness,

exacerbated by the proliferation of weapons and explosives in the aftermath of the uprising (Buzaid et. al., 2022). Mor (2023) identified several critical factors contributing to the degradation of fish habitats and the fisheries sector, including overfishing, inadequate coastal development, population growth, unregulated shipping, and climate change, all of which stem from various detrimental human activities. This study aims to elucidate the significant impacts of fisheries degradation specifically along the Dernah shores on the eastern coast of Libya.

The main objective of this research is to examine the challenges associated with habitat degradation and the condition of fisheries along the coastline of Dernah. By analyzing the various factors contributing to degradation that affect both the fisheries sector and the habitats and diversity of fish, the study aims to identify essential strategies for mitigating the extent of degradation in future investigations.

RESEARCH METHODOLGY

This study was performed between 2016 and 2019; in a survey aimed to find out the count and types of fishing units recorded and fishing gears used in each of four active landing sites Ras Al-hilal [32°52′58″N, 22°10′49″E](Buzaid, 2021), Dernah port [32° 16′ 00″ N, 22° 39′ 12″ E], Ras Attin [32°37' N-23°07' E] and Bumba Bay [32°25' N-23°06' E] (Reynolds et al., 1995 ; MBRC, 2005; Abu-Madinah, 2008), along the Derna coast in the eastern part of Libya (Fig. 1).

Primary and secondary data collection represent the two predominant methodologies employed in research studies (Korstjens & Moser, 2022). However, we collected important information about fishing vessels and fishing gear; according to method of Abziew, (2016) from local fishermen and fishermen's unions. that affected by many pressures and crises; such as the subsequent closure of the fishing season due to war crisis, and the widespread use of blast-fishing and the entry of un-licensed foreign fishermen into the fisheries sector (Buzaid et al., 2022). Taxonomically; fishes of this area were identified according to Whitehead et al., (1984), Fisher et al. (1987), Golani et al., (2006), Nelson (2006) and Ben Abdallah et al., (2009).

The Lessepsian fish species that recorded in the Mediterranean according to Azzurro et al. (2014) and Golani et al. (2017) as well.

Statically analyze

The collected data were examined and analyzed out by MS Excel 2010.

Figure (1). Map of Dernah coast, on the Mediterranean Sea, eastern Libya

RESULTS & DISCUSSION

Libya possesses the second largest continental shelf, encompassing approximately 65,000 km², and is home to some of the most productive fishing areas in the Mediterranean. Despite this potential, the fishing industry has remained largely underutilized until recent years, with less than 0.0025% of the Libyan population engaged in this sector (Serebetis 1952; Metz 1989; Reynolds et al. 1995; CMPE 2006; IUCN 2011). Nevertheless, the fishing industry continues to be a significant contributor to the national economy and supports a substantial export market (FAO, 2005).

Libya exhibits a significant degree of self-sufficiency in its fish supply, with an estimated per capita consumption of fresh fish products being relatively low at approximately 7 kg annually (FAO 2005). Notably, around 95% of the total fish catches are allocated for human consumption (European Commission 2009). According to Khalfallah et al. (2015), there has been a notable reconstruction of marine fisheries catches in Libya spanning from 1950 to 2010. However, since the outbreak of chaos and violence in 2011, the practice of

dynamite fishing has surged uncontrollably, exacerbated by the division of the country into two competing administrations that struggle to enforce regulations and manage oil ports. As a result, the safeguarding of fish stocks and the marine ecosystem has not been given adequate attention.

Experts have noted that the use of explosives, particularly those containing "gelatine," has devastating effects on fish populations, including the destruction of fish roe, larvae, and aquatic vegetation. Many of these explosives are homemade, leading to numerous fatalities and injuries among fishermen. Reports from Lana news agency in March highlighted the tragic deaths of three family members in Sirte due to blast fishing incidents (franch24.2018). This research indicates that artisanal fishing is crucial within the Libyan Exclusive Economic Zone (EEZ), while industrial fishing remains relatively insignificant. Since 2011, ongoing conflicts have resulted in a lack of oversight over fishing activities, which has likely led to a significant increase in illegal foreign fishing practices (Khalfallah et al., 2015).

State of fisheries sector

Fishing units of landing sites

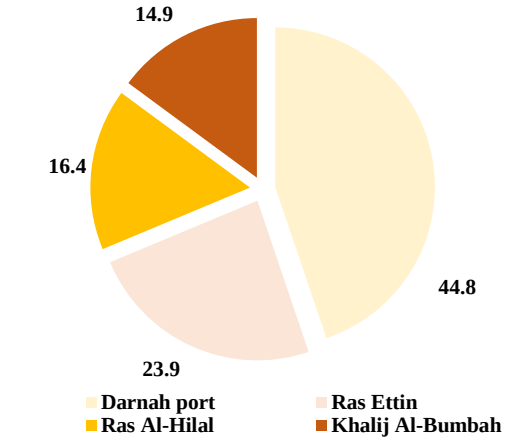
Most of them were concentrated in the Dernah port (44.8%) with 200 fishermen, Ras Attin site (23.9%) and (64) fishermen, Ras Al-hilal (16.4%) with 31 fishermen and (14.9%) with 25 of fishermen in Bumba Bay; in 320 fishermen as a total count (Table 1 & Figure 2& Figure3).

Compare to to the diversity in Benghazi, where more than this count of fishing workers were Libyans, Egyptians, Tunisians, Palestinians and Algerians and Africans as well such as in Benghazi port (MBRC, 2006 and Said, 2008); where the recent results were different, depending on the size, area, and the demographic difference in ports of Cyrenaica.

Table (1). Fishing units and fishermen in different fishing sites which operating along Derna coast (2016-2019).

Fishing sites	Count of fishing units (Average)	%	Count of fishermen
Derna Port	30	44.8	200
Ras El-Teen	16	23.9	64
Ras El-Helal	11	16.4	31
Gulf of Pomba	10	14.9	25
Total	**67**		**320**

Data obtained from General Authority for Developed of Fish Resources (Derna Office).



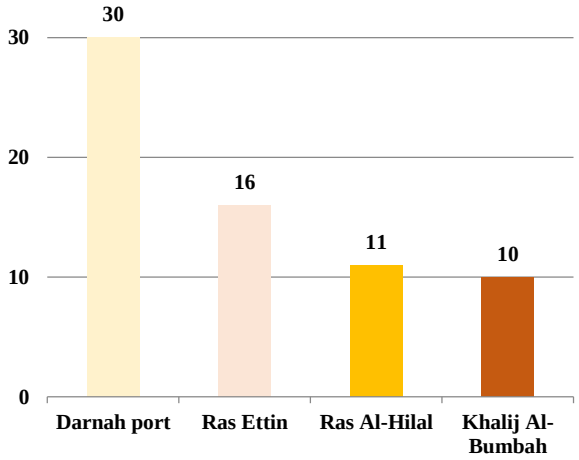


Figure (2): Counts and percentages of fishing units in different fishing sites on Dernah coastline during (2016-2019).

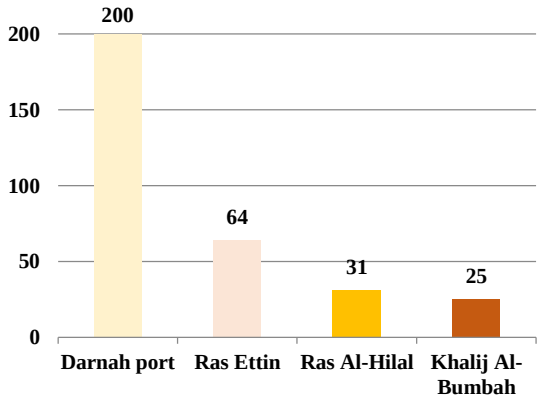


Figure (3): Counts of fishermen in different fishing sites on Dernah coastline during (2016-2019).

Blast-fishing

A total of 896 accidents during the study period were observed in the coastlines of Dernah port, Ras Al-hilal, Ras Attin and Bumba bay by 385 (43.0%), 233 (26.0%), 179 (20.0%) and 99 recoded accidents (11.0%) percent respectively (Figure 4). Blast fishing, an illicit method of fishing that employs explosives to easily eliminate fish stocks, has been prohibited worldwide, including in Libya, as stipulated in items No. (7), (14), and (15) of Law No. 14 of 1989. Nevertheless, this practice persists along Libyan coastlines, particularly due to its proliferation with little consequence, a situation exacerbated by the ongoing local conflicts that have inundated the country with weapons and explosives since 2011 (Buzaid et al., 2022). The regions affected by this destructive fishing technique require ages for recovery, and before fish populations can appear (UNEP, 2005).

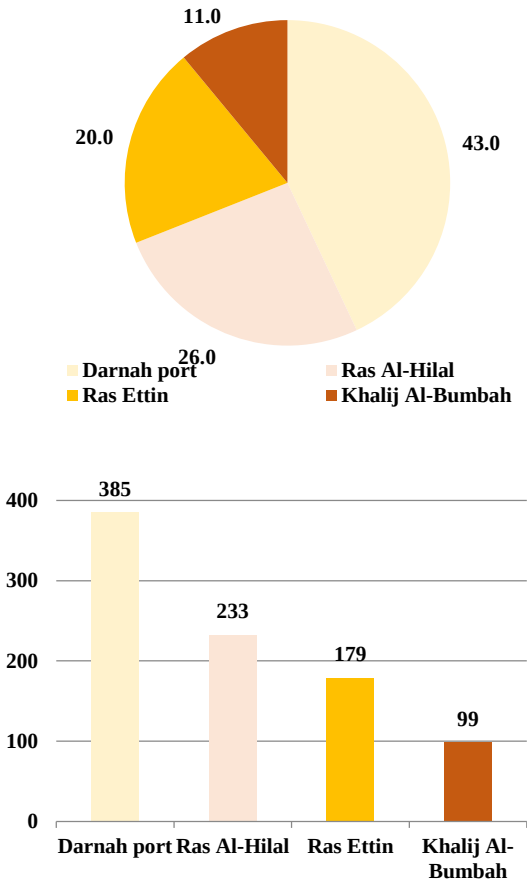


Figure (4) : The percentage of Blast fishing explosives use on the coast of Derna during the study period (2016-2019).

Data obtained from the organization of marine science and orgnasms nongovernmental organization (NGO) of Derna Office.

Figure (5) : The dynamites that used in Derna during the study period (2016-2019).

Source: Organization of marine sciences and organisms (OSMO, 2024).

Fishing fleets

In this work, about 67 fishing units were counted out in the active landing sites, the counted boats that were divided into four types: (**i**) Flouka by 65.7%, (**ii**) Mators (26.9%), (**iii**) Trawlers (4.5%) and (**iv**) Batah (2.9%) (Table 2 & Fig. 6). These pre-dominant percentages of fishing units are close to results of MBRC (2006) in ports of Benghazi, Abziew (2016) in Dernah and Buzaid et al., (2024) in Tubruk. In contrast, a significant record of 32 units of a trawlers was capturing the bulk of the fishing production in Benghazi coasts (Buzaid, 2008), and as indicated by Lamboeuf et al. (2000), in Al-Tamimi and Ain al-Ghazala, Flouka units were used in less than 50 m depth, while Batah boats are used at depths of up to 5 m depth.

Table (2). Types and percentage of fishing boats which operating along Dernah coast during 2016-2019.

Types of fishing boats	The average no. of boats	%
Flouka	44	65.7
Mator	18	26.9
Trawling	3	4.5

Batah	2	2.9
Total	**67**	

Data obtained from The General Authority for the Developed of Fish Resources (Derna Office).

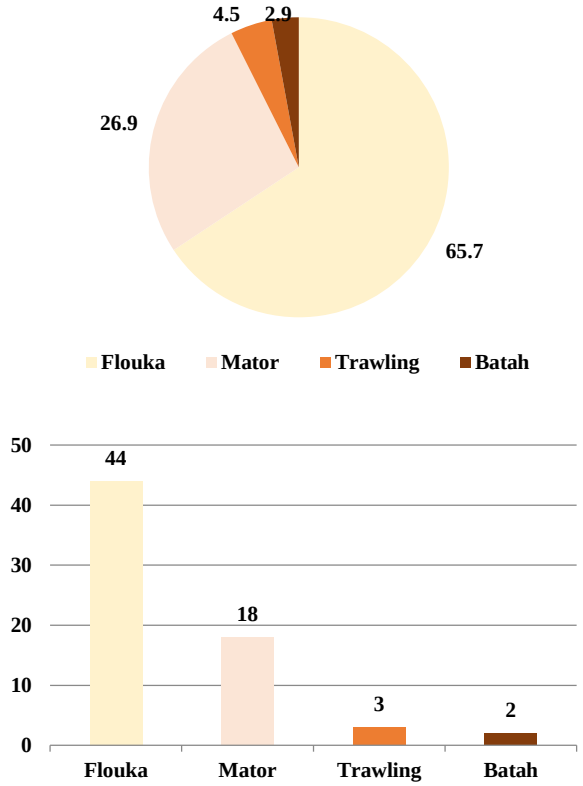


Figure (6): Counts and percentages of fishing units in different fishing sites on Dernah coastline during (2016-2019).

Fish production yield:

In 2007, the total fish production reached 39,314 kg, which saw a significant rise to 160,456 kg by 2010. However, this figure plummeted to its lowest point of 14,759 kg in 2011. Subsequently, production rebounded to 148,315 kg in 2013, only to decline again to 25,950 kg in 2015 (Abziow, 2016). The downward trend continued, culminating in a minimal output of 1,480 kg in 2017, before experiencing a modest increase to 5,943 kg in 2019 (Table 3 & Figure 4).

In General; the marine fisheries in the study area have experienced a significant decline, attributed to various environmental pressures and crises. Notably, the fishing season was interrupted due to wartime conditions, and the prevalent use of explosives in fishing led to 896 recorded incidents during the study period. Additionally, the unauthorized entry of foreign fishing vessels into the Libyan maritime fisheries sector has contributed to a decrease in productivity. In 2019, fish production was reported at 5,943 kilograms, reflecting a 22.9% reduction from the 25,950 kilograms produced in 2015. Furthermore, there has been a marked decrease in the number of fishing vessels operating along the Derna coastline, dropping from 200 boats in 2015 to merely 67 by 2019. This decline has resulted in soaring prices for fish and crustaceans, prompting many local fishermen to seek alternative, more lucrative employment opportunities.

Figure (7): The fishing units in Dernah landing sites Source: Organization of marine sciences and organisms (OSMO, 2024).

The research revealed the presence of 83 native species, among which 4 are endemic to the Mediterranean region, alongside 20 non-native species originating from the Lessepsian migration, and 2 taxa that are extending their distribution from Gibraltar. A significant number of these marine alien species exhibit highly invasive traits, thereby imposing substantial ecological stress on both marine and estuarine ecosystems (Sala et al., 2011). The main routes through which species are introduced into the Mediterranean Sea include the Suez Canal, maritime activities (such as the discharge of ballast water and sediments, anchoring practices, and biofouling), aquaculture (which includes both marine and brackish water species), and the commerce of live marine

organisms (covering aquarium trade, fishing bait, and seafood). This observation is consistent with recent evaluations of introduction pathways at the Pan-European scale (Katsanevakis et al., 2013a).

Table (3). Total annual fish production for Derna coast during 2016- 2019.

Year	Total fish production (Kg)
2016	2258
2017	1486
2018	*
2019	5943
Total catch	**9687**

* *Fish productivity was not recorded due to security conditions. Data obtained from General Authority for Developed of Fish Resources (Derna Office).*

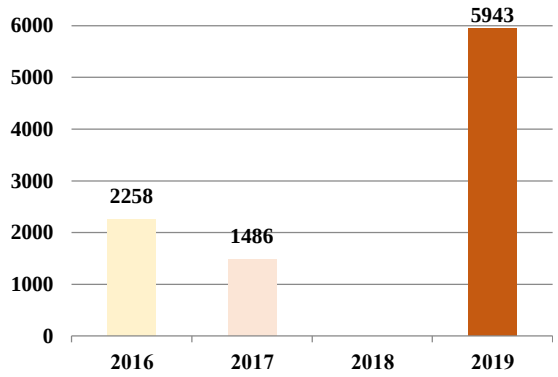


Figure (8) : Annual fish landing of Dernah coastline (2016 - 2019)

Ichthyofaunal wealth

Talking about 83 native, 4 endemic to the Mediterranean Sea, 20 non indigenous of Lessepsian origin and 2 range expanding taxa from Gibraltar, which observed here. The most commercially-important families of bony fishes in Dernah coastline; include Anguilids, Clupeids, Serranids, Sparids, Mugilids and so on.

About the recorded Red Sea migrants; take examples: *Herklotsichthys punctatus, Etrumeus golanii, Saurida lessepsianus, Atherinomorus forskalii, Hemiramphus far, Parexocoetus mento, Sargocentron rubrum, Fistularia commersonii, Alepes djedaba, Crenidens crenidens, Upeneus moluccensis, Upeneus pori, Liza carinata, Siganus luridus, Siganus rivulatus Scomberomorus commerson, Lagocephalus sceleratus and Lagocephalus suezensis*. Whereas the stretched species from the Atlantic Ocean via Gibraltar were two species: *Seriola fasciata* and *Seriola rivoliana.*

Looking below to the checklist of bony fishes species which were collected from the different sites in Derna coast (2016-2019) [**N** = *Native*; **E** = *Endemic of the Mediterranean Sea*; **A** = *Atlantic Ocean origin*; **L** = *Lessepsian species*].

Anguillida

Anguilla anguilla (Linnaeus, 1758) European eel (N)

Muraenidae

Muraena helena (Linnaeus, 1758) Mediterranean moray (N)
Conger conger (Linnaeus, 1758) European conger (N)

Clupeidae

*Alosa alosa (*Linnaeus, 1758) Allis shad (N)
*Herklotsichthys punctatus (*Rüppell, 1837) Spotback herring (L)
Sardina pilchardus (Walbaum, 1792) European pilchard (N)
*Sardinella aurita (*Valentines, 1847) Round sardinella (N)
Sardinella maderensis (Lowe, 1838) Madeiran sardinella (N)
Sprattus sprattus (Linnaeus, 1758) European sprat (N)
Etrumeus golanii (DiBattista, Randall & Bowen, 2012) Round *herring* (L)

Engraulidae

Engraulis encrasicolus (Linnaeus, 1758) European *anchovy* (N)

Gonostomatidae

*Cyclothone braueri (*Jespersen & Tåning, 1926) Garrick (N)
Cyclothone pygmaea (Jespersen & Tåning, 1926) pygmy *bristlemouth* (E)

Stomiidae

*Stomias boa (*Risso, 1810) Boa dragonfish (N)

Synodontidae

Synodus saurus (Linnaeus, 1758) Atlantic lizardfish (N)
Saurida lessepsianus (Russell, Golani & Tikochinski, 2015) (L)
Arctozenus risso (Bonaparte, 1840) Spotted barracudina (N)

Lestidiops jayakari (Boulenger, 1889) Pacific barracudina (N*)*
Paralepis coregonoides (Risso, 1820) Sharpchin *barracudina* (N)

Phycidae

Phycis blennoides (Brünnich, 1768) Greater forkbeard (N)
Phycis phycis (Linnaeus, 1766) Fork beard(N)

Atherinidae

Atherina boyeri (Risso, 1810) Big-scale sand smelt (N)
Atherina hepsetus (Linnaeus, 1758) Mediterranean sand smelt (N)
Atherinomorus forskalii (Rüppell, 1838) hardyhead *silverside* (L*)*

Belonidae

*Belone belone (*Linnaeus, 1761) Garfish *(N)*
Hemiramphidae
Hemiramphus far (Forsskål, 1775) Black-barred halfbeak (L*)*
Hyporhamphus picarti (Valenciennes, 1847) African halfbeak (N)

Exocoetidae
Cheilopogon heterurus (Rafinesque, 1810) Mediterranean flyingfish (N*)*
Parexocoetus mento (Valenciennes, 1847) African sailfin *flyingfish* (L*)*

Holocentridae

Sargocentron rubrum (Forsskål, 1775) Redcoat (L)

Fistulariida*e*

Fistularia commersonii (Rüppell, 1838) Blue-spotted Cornetfish (L*)*
Syngnathidae

Hippocampus guttulatus (Cuvier, 1829) Long-snouted seahorse (N*)*
Hippocampus hippocampus (Linnaeus, 1758) Short snouted seahorse (N*)*
Scorpaenidae

Scorpaena elongata (Cadenat, 1943) Slender rockfish (N)
Scorpaena loppei (Cadenat, 1943) Cadenat's rockfish (N*)*

Triglidae

Chelidonichthys cuculus (Linnaeus, 1758) Red gurnard (N*)*
Lepidotrigla cavillone (Lacepède, 1801) Large-scaled gurnard (N)
Lepidotrigla dieuzeidei (Blanc & Hureau, 1973) Spiny gurnard (N)
Trigla lyra (*Linnaeus*, 1758) Piper gurnard (N)

Moronidae

Dicentrarchus labrax (Linnaeus, 1758) European seabass(N)
Dicentrarchus punctatus (Bloch, 1792) Spotted seabass (N*)*

Serranidae

Epinephelus aeneus (Geoffroy Saint-Hilaire, 1817) White grouper (N*)*
Epinephelus caninus (Valenciennes, 1843) Dogtooth grouper (N*)*
*Epinephelus fasciatus (*Forsskål, 1775) Blacktip grouper (N*)*
Epinephelus marginatus (Lowe, 1834) Dusky grouper (N*)*
*Serranus cabrilla (*Linnaeus, 1758) Comber (N)
Serranus hepatus (Linnaeus, 1758) Brown comber (N*)*
Serranus scriba (Linnaeus, 1758) Painted comber (N)

Apogonidae
Apogon imberbis (Linnaeus, 1758) Cardinalfish (N

Carangidae

Alepes djedaba (Forsskål, 1775) Shrimp scads (L*)*
Caranx rhonchus (Geoffroy Saint-Hilaire, 1817) false scad (N*)*
Lichia amia (Linnaeus, 1758) Leerfish (N*)*
Seriola fasciata (Bloch, 1793) lesser amberjack (A*)*
Seriola rivoliana (Valenciennes, 1833) Longfin yellowtail (A*)*
*Trachurus mediterraneus (*Steindachner, 1868) *Mediterranean* horse mackerel (N*)*

Sparidae

Boops boops (Linnaeus, 1758) Bogue (N)
Crenidens crenidens (Forsskål, 1775) Karanteen seabream (L)
Dentex dentex (Linnaeus, 1758) Common dentex (N)
Diplodus annularis (Linnaeus, 1758) Annular seabream (N)
Diplodus cervinus (Lowe, 1838) Zebra seabream (N)
Diplodus puntazzo (Walbaum, 1792 Sharpsnout seabream (N)
Diplodus sargus (Linnaeus, 1758) White Seabream (N)

Diplodus vulgaris (Geoffroy Saint-Hilaire, 1817) Common two-banded seabream (N)
Lithognathus mormyrus (Linnaeus, 1758) Sand steenbras (N)
Oblada melanura (Linnaeus, 1758) Saddled bream (N)
Pagellus acarne (Risso, 1827) Axillary seabream (N)
Pagellus bellottii (Steindachner, 1882) Red pandora (N)
Pagellus bogaraveo (Brünnich, 1768) Blackspot seabream (N)
Pagellus erythrinus (Linnaeus, 1758) Common pandora (N)
Pagrus auriga (Valenciennes, 1843) Redbanded seabream (N)
Pagrus caeruleostictus (Valenciennes, 1830) Bluespotted seabream (N)
Pagrus pagrus (Linnaeus, 1758) Red porgy (N)
Sarpa salpa (Linnaeus, 1758) Salem (N)
Sparus aurata (Linnaeus, 1758) Gilthead seabream (N)
Spondyliosoma cantharus (Linnaeus, 1758) Black seabream (N)

Sciaenidae

Argyrosomus regius (Asso, 1801) Meager (N*)*
Sciaena umbra (Linnaeus, 1758) Brown meager (N*)*
Umbrina cirrosa (Linnaeus, 1758) shi drum (N*)*
Umbrina canariensis (Valenciennes, 1843) Canary drum (N*)*

Mugilidae

Chelon labrosus (Risso, 1827) Thicklip grey mullet (N)
Liza aurata (Risso, 1810) Golden grey mullet (N)

Liza carinata (Valenciennes, 1836) Keeled mullet (L)
Liza ramada (Risso, 1827) Thinlip grey mullet (N)
Liza saliens (Risso, 1810) Leaping mullet (N)
Mugil cephalus (*Linnaeus*, 1758) Flathead grey mullet (N)

Mullidae

Mullus barbatus (Linnaeus, 1758) Red mullet (N*)*
Mullus surmuletus (Linnaeus, 1758) Surmullet (N)
Upeneus moluccensis (Bleeker, 1855) Goldband goatfish (L)
Upeneus pori (Ben-Tuvia & Golani, 1989) Por's goatfish (L)

Labridae

Coris julis (Linnaeus, 1758) Mediterranean rainbow wrasse (N)
Symphodus doderleini (Jordan, 1890) wrasse (E)

Blenniidae

Blennius ocellaris (Linnaeus, 1758) Butterfly blenny (N*)*
Salaria basilisca (Valenciennes, 1836) (E*)*

Gobiidae

Deltentosteus quadrimaculatus (Valenciennes, 1837)

Four-spotted goby (N)

Gobius niger (Linnaeus, 1758) Black goby (N)
Pomatoschistus tortonesei (Miller, 1969) Tortonese's goby (E*)*

Siganidae

Siganus luridus (Rüppell, 1829) Dusky spine foot (L)
Siganus rivulatus (Forsskål & Niebuhr, 1775 Marbled spinefoot (L)

Sphyraenidae

Sphyraena sphyraena (Linnaeus, 1758) European barracuda (N)
Sphyraena viridensis (Cuvier, 1829) Yellowmouth barracuda (N)
Sphyraena chrysotaenia (Klunzinger, 1884) Obtuse barracuda (L)
Sphyraena flavicauda (Rüppell, 1838) Yellowtail barracuda (L)

Scombridae

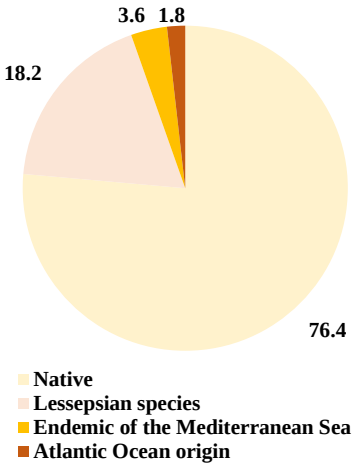
Scomberomorus commerson (Lacepède, 1800) Narrow-barred Spanish mackerel (L)
Thunnus alalunga (Bonnaterre, 1788) Albacore (N)

Soleidae

Microchirus ocellatus (Linnaeus, 1758) Foureyed sole (N)
Solea aegyptiaca (Chabanaud, 1927) Egyptian sole (N)
Solea solea (Linnaeus, *1758*) Common sole (N)

Tetraodontidae

Lagocephalus lagocephalus (Linnaeus, 1758) Oceanic puffer (N)
Lagocephalus sceleratus (Gmelin, 1789) Silver-cheeked toadfish (L)



Lagocephalus suezensis (Clark & Gohar, 1953) Suez pufferfish

Since its opening in 1869, the Suez Canal has facilitated the entry of at least 30 marine species from the Indo-Pacific region into the Mediterranean, a phenomenon known as Lessepsian migration, named in honor of Ferdinand de Lesseps (Por, 1978; Ben-Abdalla & Al-Turkey, 2005). Notably, around 65 fish species have been recorded in the Mediterranean, and the list of newly arrived species continues to expand (Golani, 2006).

The introduction of various species has resulted in considerable changes to the species composition within Mediterranean communities, leading to the formation of mixed Red-Mediterranean communities (Fishelson, 2000). Although it is clear that Lesepsian fish migrant species have had a significant impact on the eastern Mediterranean ecosystem, a thorough investigation to assess this influence is currently lacking. The Mediterranean biota is progressively transitioning towards a state characterized by 'tropicalization,' largely driven by the influx of numerous alien species with tropical origins and affinities (Bianchi & Mori, 2003). Libya, located in the Central Mediterranean Basin as outlined by the Marine Strategy Framework Directive (MSFD) (EU, 2008), encounters difficulties in obtaining comprehensive data on alien species, which are frequently limited and fragmented. This limitation is primarily due to the lack of long-term monitoring programs within national frameworks that address alien species. An inventory of exotic fish has recorded 16 introduced species (Ben-Abdallah et al., 2005), which has been further updated by Shakman & Kinzelbach (2007c), Milazzo et al. (2012), and Sghaier et al. (2013). All species identified in the current study are included in the checklist compiled by Hassan and El-Silni (1999) as well as the list by El-Baraasi et al. (2013).

4. CONCLUSION

The current investigation reveals a significant deterioration in marine fisheries along the Derna coast, attributed to various environmental pressures and crises. Notably, fishing activities were suspended in 2017 and 2018 due to wartime conditions and the prevalent use of explosives for fishing. The influx of unlicensed foreign fishermen has further exacerbated productivity losses, with blast fishing playing a critical role in this decline. However, a modest recovery was noted in 2019, with fish production reaching 5,943 kilograms, following a substantial decrease of 22.9% from 25,950 kilograms in 2015 to no production in 2018. This decline was primarily due to a drastic reduction in the number of operational vessels along the Derna coastline, which fell from 200 boats in 2015 to merely 67 in 2019.

Consequently, the prices of finfish and shellfish surged, prompting many local fishermen to seek alternative, more lucrative employment opportunities. Additionally, this study identified 83 native fish species, including 4 endemics to the Mediterranean, 20 invasive species from the Red Sea, and two expanding taxa from Gibraltar, highlighting the biodiversity present in the region. Talking about the blast-fishing; to shorten the recovery period and enhance the restoration process, extensive human intervention is essential, particularly when recovery is deemed necessary. Initially, it is crucial to formulate a comprehensive fisheries management action plan. This plan should encompass either a temporary or permanent prohibition or suspension of fishing activities in the impacted regions, with the aim of restoring both the ecological and economic value of the coastal ecosystem. The involvement of governmental bodies, organizations, and local authorities—especially fishermen's unions, coast guards, marine resource offices, and civil society organizations—is vital to ensure effective oversight and enforcement of regulations in areas where violations are prevalent.

In the end; the paramount objective is to enhance "community awareness" regarding the dangers and detrimental influences affecting marine ecosystems and fisheries within the region. This approach involves leveraging the religious, moral, and tribal values of the local community, as these elements are often more effective and resonant than traditional legal measures in addressing these issues.

REFERENCES

Abu-Madinah, H. M. 2008. The Libyan harbours – A study in the Economic geography, The international house of books, Benghazi, Libya, 2nd ed., 368 pp.

Aldebert, Y., & Pichot, P. 1973. Observations sur les Heterosomes de Méditerranée oriental/secteur Tuniso-libyen/CIESM. *Journées Ichtyologie*, Rome. 57-60.

Al -Hassan, L. A., & El-Silini, O. A. 1999. Check-list of bony fishes collected from the Mediterranean coast of Benghazi, Libya. *Revista de Biologia Marina y Oceanografía*, *34*(2), 291-301.

Azzurro, E., Tuset, V. M., Lombarte, A., Maynou, F., Simberloff, D., Rodríguez-Pérez, A., & Solé, R. V. 2014. External morphology explains the success of biological invasions. *Ecology letters*, *17*(11), 1455-1463.

Abziew, E. A. F. 2016. Fisheries statues in Derna coast, Eastern Libya. *Int. J. Adv. Res. Biol. Sci*, *3*(4), 109-116.

Ben-Abdalla, A. R.; Kasim, A. A.; Al-Turkie, A. A. and Ben-Moussa, M. N. 2009. Guide to bony fishes in Libyan waters, *Marine biology Research Center* Tajoura'a 237 pp.

Bianchi, C. N., & Morri, C. 2003. Global sea warming and "tropicalization" of the Mediterranean Sea: biogeographic and ecological aspects. *Biogeographia–The Journal of Integrative Biogeography*, *24*(1), 319-327.

Ben Abdallah, A. R., Al-Turky, A., & Fituri, A. A. 2005. Exotic fishes along the coast of Libya (Arabic with English abstract). *Libyan Journal of Marine Science*, *10*, 48-56.

Ben-Abdalla, A. R.; Kasim, A. A.; Al-Turkie, A. A. and Ben-Moussa, M. N. 2009. Guide to bony fishes in Libyan waters, Marine Biology Research Center Tajoura'a 237 pp.

Badalamenti, F., Ben Amer, I., Dupuy De La Grandrive, R., Foulquie, M., Milazzo, M., Sghaier, Y., Bouras, I.; Saied, A.; Sherief, M.; Maamouri, F; Elagil, E. A. & Limam, A. 2011. Scientific field survey report for the development of Marine Protected Areas in Libya. 31pp.

Buzaid, E. M. 2021. Gillnet (Mashruah) selectivity for some fishes between Susah and Ras Al-Hilal Coasts, Libya. The second international Scientific Conference For Marine Science Technology 09-10/03/2021 Sabratha – Libya, Masarat Journal, University of Sabratha, 146 – 78.

Buzaid, E. M., Berfad, M. A., & Swaiei, A. A. 2022. Blast-fishing (Julatina): Effects on seawater properties and fish composition in some locations in the Libyan coast-Experimental study. Alriyadah Journal for Research and Scientific Activities,Special issue of the Third International Scientific Conference for Marine Science Technology 02-03/07/2022 Sabratha – Libya, 58-73.

Buzaid, E. M. K.;Wisam Bo Awina, W.; Bo Awina, S. and Ali, A. F. 2024. Study of survey in four fish-landing ports in Tubruk coast, Libya. Journal Total Sciences, Higher institute of Sciences and Technology, Reqdalen, Libya. Jan.2024, 8(29); E1 - E20

CMPE. 2006. Etude du Marché Libyen. Centre Marocain de Promotion des Exportations 45 p.

Coll, M., Piroddi, C., Steenbeek, J., Kaschner, K., Ben Rais Lasram, F., Aguzzi, J., Ballesteros, E.; Bianchi, C. N.; Corbera, J.; Dailianis, T.; Danovaro, R.; Estrada, M.; Froglia, C.; Galil, B. S.; Gasol, J. M.; Gertwagen, R.; Gil, J.; Guilhaumon, F.; Kesner-Reyes, K.; Kitsos, M-S.; Koukouras, A.; Lampadariou, N.; Laxamana, E.; López-Fé de la Cuadra, C. M.; Lotze, H. K.; Martin, D.; Mouillot, D.; Oro, D.; Raicevich, S.; Rius-Barile, J. I.; Saiz-Salinas, J. I.; San Vicente, C.; Somot, S.; Templado, J.; Turon, X.; Vafidis, D.; Villanueva, R.; Voultsiadou, E. & Voultsiadou, E. 2010. The biodiversity of the Mediterranean Sea: estimates, patterns, and threats. *PloS one*, *5*(8), e11842.

Coll, M., Piroddi, C., Albouy, C., Ben Rais Lasram, F., Cheung, W. W., Christensen, V., Karpouzi, V. Guilhaumon, F.; Mouillo, D.; Paleczny, M. Palomares, M. L.; Steenbeek, J.; Trujillo, P.; Watson, R. & Pauly, D. 2012. The Mediterranean Sea under siege: spatial overlap between marine biodiversity, cumulative threats and marine reserves. *Global Ecology and Biogeography*, *21*(4), 465-480.

Duclerc, J. 1973. Les Scorpaenidés de l'Est tunisien et de Libye. *Journées Ichthyol*, Rome, CIESM. 73-74.

Elbaraasi, H., Bograra, O., Elsilini, O., & Bojwari, J. 2013. First record of the Bermuda sea chub,

Kyphosus saltatrix (Actinopterygii: Perciformes: Kyphosidae), in the coastal waters of Libya. *Acta Ichthyologica et Piscatoria*, *43*(3), 251-253.

EU.2008. Directive of the European Parliament and the Council Establishing a Framework for Community Action in the Field of Marine Environmental Policy (Marine Strategy Framework Directive). European Commission. Directive2008/56/EC, OJ L 164..

European Commission .2009. Trade Sustainability Impact Assessment (SIA) of the EU-Libya Free Trade Agreement. European Commission, Brussels. 119 p.

Fishelson, L. 2000. Marine animal assemblages along the littoral of the Israeli Mediterranean seashore: The Red-Mediterranean Seas communities of species. Italian Journal of Zoology, 67(4), 393-415.

Golani, D. Öztürk, B. and Basusta B. 2006. Fishes of the Eastern Mediterranean ,Turkish Marine Research Foundation, 264 pp.

IUCN. 2011. Towards a Representative Network of Marine Protected Areas in Libya. IUCN, Gland, Switzerland and Málaga, Spain. 68 p

Katsanevakis, S., Zenetos, A., Belchior, C., & Cardoso, A. C. 2013. Invading European Seas: assessing pathways of introduction of marine aliens. *Ocean & Coastal Management*, *76*, 64-74.

Khalfallah, M., Belhabib, D., Zeller, D., & Pauly, D. 2015. Reconstruction of marine fisheries catches for Libya (1950-2010).

Korstjens, I. and Moser, A., 2022. Series: Practical guidance to qualitative research. Part 6: Longitudinal qualitative and mixed-methods approaches for longitudinal and complex health themes in primary care research. European Journal of General Practice, 28(1), pp.118-124.

Kuriqi, A., Pinheiro, A.N., Sordo-Ward, A., Bejarano, M.D. and Garrote, L., 2021. Ecological impacts of run-of-river hydropower plants—Current status and future prospects on the brink of energy transition. Renewable and Sustainable Energy Reviews, 142, p.110833.

Lamboeuf M., and Reynolds J.E. 1994. The fishing fleet of Libya: preliminary results of the 1993 frame survey. TBN No. 16. Lythgoe, J.

Lamboeuf, M. 2000. Artisanal fisheries in Libya, census of fishing vessels and inventory of artisanal fishery métiers. FAOCOPEMED-MBRC pp 42.

Law no. 14, 1989. The technical regulation of Law No. 14 on the Exploitation of Marine Resources, Concerning Utilisation Of Marine Wealth, General Secretariat Of Marine Wealth, Libya, 40 pp.

MBRC, 2005. Atlas of the Mediterranean Sea, Marine Biology Research Center (MBRC), Tajura'a, Libya. 110 pp.

Metz, H.C..1989. Libya, a country study. Federal Research Division, Library of Congress,Washington, D.C. 351 p.

Milazzo, M., Azzurro, E., & Badalamenti, F. 2012. On the occurrence of the silverstripe blaasop *Lagocephalus sceleratus* (Gmelin, 1789) along the Libyan coast. BioInvasions Records, 1(2), 125-127.

Mor, K. 2023. The Issue of Habitat Degradation and the Quality of Fishing in Southern Region of India. Journal of Survey in Fisheries Sciences, 10(1S), 6008-6014.

Nini, E. (1914). Min. Colonie Uf. Marina Roma (in Tortonese, 1939).

Nelson, J. 2006. Fishes of the World. 4th edition. Wiley, Inc., 601pp.

Otman, W., & Karlberg, E. 2007. *The Libyan economy: economic diversification and international repositioning*. Springer Science & Business Media. DOI: 10.1007/3-540-46463-8.

Por, F.D. 1978. *Lessepsian migration: The influx of Red Sea Biota into the Mediterranean by way of the Suez Canal*. (Vol. 23). Springer Science & Business Media.Berlin: Springer Verlag. p 228.

Reynolds, J. E., Abukhader, A., & Ben Abdallah, A. 1995. The marine wealth sector of Libya: a development planning overview. FAO, Tripoli/Rome. 122 p.

Serebetis C.D .1952. Report to The Government of Libya on Fisheries of Libya. FAO, Rome. 63 p.

Shakman, E., & Kinzelbach, R. 2007 A. Commercial fishery and fish species composition in coastal waters of Libya. *Rostocker Meeresbiologische Beiträge*, *18*, 63-78.

Shakman, E. A., & Kinzelbach, R. 2007 B. Distribution and characterization of Lessepsian migrant fishes along the coast of Libya. *Acta Ichthyologica et Piscatoria, 37(1),* 7-15.

Sala, E., Kizilkaya, Z., Yildirim, D., & Ballesteros, E. 2011. Alien marine fishes deplete algal biomass in the eastern Mediterranean. *PloS one, 6*(2), e17356. DOI:10.1371/ journal.pone.0017356

Tortonese, E. 1939. Appunti di ittiologia libica: Pesci di Tripoli. *Annali Museo Libico Storia Naturale, 1,* 359-375.

Tortonese, E. 1963. Elenco riveduto dei Leptocardi, Ciclostomi, Pesci cartilaginei e ossei del Mare Mediterraneo. *Annali. Mus. Civ. Stor. Nat. Giacomo Doria, 74,* 156-185.

UNEP. 2005 . Ad Hoc Open Ended working group on protected areas. Secrariat of the convention on biological diversity . Italy.

Vinciguera, D. 1881. Risoltati itiologici dele crociere del" Violante" *Anali Museo Civico Storia Naturale, Genova 18,* 465-590.

Whitehead, P. J. P.; Bauchot, M. L.; Hureau, J. C.; and Tortonese, E. (EDS) .1984-1986. Fishes of the north-eastern Atlantic and the Mediteranean. Vols. I, I, II, 1473 p., UNESCO, Paris.

Yin, S., Yi, Y., Liu, Q., Luo, Q. and Chen, K., 2022. A review on effects of human activities on aquatic organisms in the Yangtze River Basin since the 1950s. River, 1(1), pp.104-119.

Zupanovic, S., & El-Buni, A. A. 1982. A contribution to demersal fish studies off the Libyan coast. *Bulletin of the Marine Research Centre, Tripoli, Libya*, *3*, 78-122.