Journal of Advanced Zoology

*ISSN: 0253-7214*

*Volume **44** Issue **S-5 Year 2023** Page **511:517***

# Two New Fish Records from the Mediterranean Sea, of the Libyan coast: The undulate ray *Raja undulata* (Lac´ep`ede,1802) and the Atlantic wreckfish, *Polyprion americanus* (Bloch and Schneider,1801)

**Amani Fitori[1*], Alia Salem[2], Ali Al-Fituri[3], Jamila Rizgalla[4], Aldoushy Mahdy[5], Rashad E.M. Said[5]**

*[1]Department of Marine Resource, Faculty of Natural Resource, Tobruk University, Libya.*
*[2]Department of Zoology, Faculty of Science, Derna University, Libya.*
*[3]Marine Biology Research Center, Tripoli, Libya.*
*[4]Department of Aquaculture, Faculty of Agriculture, University of Tripoli, Tripoli, Libya.*
*[5]Zoology Department, Faculty of Science, Assiut Branch, Al-Azhar University, Egypt*
**Corresponding author's E-mail: Amani Fitori*

***Article History***

Received: 06 June 2023
Revised: 05 Sept 2023
Accepted: 14 Oct 2023



***Abstract***

*The discovery of new alien species in Libyan waters, whether introduced by Lessepsian migration from the Red Sea or the Atlantic Ocean, has recently received much attention. This shows that marine life is still thriving in Libyan waters. Raja undulata (SL: 47cm, TL: 51 cm), weighing 18 kg, was caught from Derna coast by a bottom trawl haul on 20th July 2022, at a depth of 100 m. On the other hand, a single Polyprion americanus specimen (SL: 79 cm, TL: 97 cm) weighing 16.447 kg was caught by longline on the coast of Tripoli on 19th June 2022, at a depth of 500 m. The present study aims to document the first record of Raja undulate and the second record of Atlantic wreckfish, Polyprion americanus, from Libyan waters. This observation is detailed in this note.*

**Keywords:** *Raja undulata, Polyprion americanus, New records(Range expansion), Libyan coast (North Africa), Mediterranean Sea (Endangered)*

## 1. Introduction

Despite the increasing impacts of climate change, pollution, overfishing, and ecosystem degradation, many marine regions are understudied in terms of biodiversity (Canonico et al. 2019). The Mediterranean Sea is a hotspot for marine biodiversity and is regarded as the largest and deepest enclosed sea on Earth (Goffredo and Dubinsky 2014). Due to its size and location within the three continents, the Mediterranean Sea experiences the effects of climate change (Garca-Martnez et al. 2019). The Mediterranean Sea is one of the most threatened marine ecosystems in the world, threatened not only by human activities and climate change but also by invasions of other organisms from the Red Sea and elsewhere. Mediterranean fish are very diverse and require regular checks. However, introduction rates appear to be increasing, and marine invasions have been observed on a significant scale in the Mediterranean (Golani 2010; Edelist et al. 2013; Samaha et al. 2016; Fitori et al. 2021; Fitori et al. 2022; Fitori et al. 2023). The study by Shakman et al. (2017) revealed four new records of fish species, *Seriola rivoliana, Seriola fasciata, Sphoeroides pachygaster, and Etrumeus golanii,* from the Libyan marine environment. In the Mediterranean, most cartilaginous families have a few species each. With 30 genera and 245 valid species, the Rajidae family is the most species-rich group of cartilaginous fish (Ebert and Compagno 2007). Rajidae has 17 species, making it one of the most diverse families. *Raja polystigma, Raja radula, and Raja rondeleti* are the only members of Rajidae that are not native to the Mediterranean (Goffredo and Dubinsky 2014). The undulate ray exhibits a scattered distribution across its whole range (Conant 2015). While occasionally seen in the Mediterranean Sea near Israel and Turkey, undulate rays are more frequently detected in the western region off southern

France and the Tyrrhenian Sea (Ellis et al. 2012; Serena 2005). Two undulate rays (Massut and Reones 2005) and one individual (Massut and Moranta 2003) were recorded from the continental shelf of the western Mediterranean in bottom trawl hauls from 88 and 131, respectively. The polyprionid wreckfish, *Polyprion americanus*, is widely distributed, including populations in the southern Pacific-Indian Ocean, the Atlantic Ocean, the Mediterranean Sea, and other areas outside of the tropics (Ball et al. 2000), but is absent from the Pacific coast of South America and the northern Pacific (Ho et al. 2021). Wreckfish are found in waters up to 1000 m deep but usually live on rocky or muddy bottoms at depths of 40–200 m (Fischer 1987). During the first half of their pelagic life, which lasts from hatching to a length of about 60 cm, juveniles live with flotsam near the coast (Fischer 1987; Pérez et al. 2019). The first description of *Polyprion americanus* was from Benghazi by Al-Hassan and El-Silini (1999). Libyan waters are among those in the Mediterranean that require further updating for new alien species (Shakman 2008). We still believe that the present observations of marine species along the Libyan coast are of great interest, so the present study aims to document the first record of *Raja undulate* and the second record of Atlantic wreckfish, *Polyprion americanus* **in** the Libyan waters.

## 2. Materials And Methods

The research was carried out in two Libyan coastal cities, Tripoli and Derna, on the Mediterranean coast. We analysed catches for the presence of rare fish species as part of an ongoing search of the Libyan coast by field sampling, specimen collection, species identification, data recording, rare species assessment, data analysis and reporting, and documentation. *Raja undulata*, which was caught on July 20, 2022, was found in the bottom-trawl haul catch from Derna, N 32°35'41", E 23°15'15". *Polyprion americanus*, which was caught on June 19, 2022, was found in the long line catch from Tripoli, N 33°22'42", E 14°32'28"' At each fishing date, fish were transported to the labs of the Department of Marine Resources, Faculty of Natural Resources, Tobruk University, Tobruk, Libya. Fresh fish were first photographed (Figures 1, 2), followed by weights and morphological measurements (Table 1). All measurements were made with digital callipers to the nearest 0.1 mm. Fish were identified using the morphological criteria based on the keys of Golani *et al*. (2007) and Last *et al*. (2016).

## 3. Results and Discussion

The undulate ray *Raja undulata* (Class: Chondrichthyes, Order: Rajiformes, Family: Rajidae) has a total length of 51cm and a standard length of 47 cm with a tail length of 10.3 cm. pale yellow-black topside with dark wavy bands lined by a twin row of white spots The margins are darker, and the underbelly is white (Figure 1, A–C, and Table 1). The fish features a wave-like front edge of the disc and widely rounded pectoral fins. The undulating margin of their disc is what gives the undulate rays their name. *Raja undulata* is quite reachable by coastal fishing (Figueiredo et al. 2020). In the Mediterranean region, there were 613 established alien species as of 2016, a 28% rise over the previous four years (Zenetos et al. 2017). In Libyan waters, there were 73 marine alien species as of 2019 (Shakman et al. 2019). According to Eschmeyer et al. (2010), from the Gulf of Trieste (in the northern Adriatic Sea) to the Gulf of Sidra in Libya, the Mediterranean Sea is inhabited by warm-temperate fauna. Due to substantial evaporation and only a small amount of freshwater inflow, the Mediterranean has a higher salinity than the surrounding northern Atlantic Ocean, particularly in its eastern portions (Eschmeyer et al. 2010).The caught wreckfish *Polyprion americanus* (Class: Actinopteri, Order: Acropomatiformes, Family: Polyprionidae) has a total length of 97 cm and a standard length of 79 cm, with a total weight of 16.5 kg. (Figures 2A–C and Table 2), with a somewhat slim body. The head length is about 32 cm, with proportionately large eyes measuring 7.4 cm in diameter. The caudal peduncle is 12 cm long, and the caudal peduncle is 10 cm deep. The pelvic fin has 2 spines and 4 rays, and the anal fin has 3 spines and 10 rays. On the other hand, the fish was characterised by a large body depth of 30 cm, which indicates the large size of the fish. The deepest part of the abdomen is near the middle. Fresh specimens have a grey ventral body and a tawny dorsal body, with all fins darkened except for the translucent membrane of the spiny dorsal fin. **The Atlantic wreckfish,** *Polyprion americanus* was first reported in the south-west Atlantic of southern Brazil by Barreiros *et al*. (2004). *Polyprion americanus* has been identified as a promising aquaculture species due to its widespread distribution on both sides of the Atlantic Ocean, in the Mediterranean, and in the western South Pacific (Roncarati *et al*. 2014; Sedberry *et al*. 1999). The Atlantic wreckfish, *Polyprion americanus* described for the first time in Benghazi city by Al-Hassan and El-Silini 1999 we still believe that the present second observation is of interest given it

represents Tripoli city, over 600 km away from its original record back in 1999, and not provided in the recently updated checklist of bony fishes along the Libyan coast by Elbaraasi et al. (2019).

The Mediterranean has been shown to have warmed four times faster than global warming between 1978 and 2003, making it one of the major marine ecosystems severely affected by climate change (Belkin 2009). Furthermore, increasing trends in temperature and salinity were documented by Said et al. (2011) in the Atlantic water flowing eastward along the Mediterranean during the years 1959–2008. As stated by Maiulyt et al. (2022) in their study on the precipitation events in the eastern Baltic Sea, there is still a lack of knowledge regarding how climate change may influence various regions. This rapid warming will severely impact marine biodiversity and unbalanced biogeochemical processes (Goffredo and Dubinsky 2014). Cold water upwelling along Morocco's Atlantic coast prevents fish from Western Africa from spreading and surviving. Most native fish species in the Mediterranean are of cold Atlantic origin, but warming in the eastern basin has prevented many of them from spreading. Therefore, endemism decreases eastward (Golani et al. 2006). This is consistent with current findings and supports the presence of the undulate ray *Raja undulata* (Lac'ep'ede 1802) and the Atlantic wreckfish *Polyprion americanus* (Bloch and Schneider 1801) in Libyan waters, which are moderate in terms of ecological and regional variation. Similar observations were documented on the cold-water species *Stereolepis doederleini* (Ho et al. 2021), *Pholis fangi* (Koeda and Muto 2019), and *Sebastes thompsoni* (Chou and Tang 2021), which were caught locally in northern and southwestern Taiwan. In conclusion, *Polyprion americanus* and *Raja undulata* have been observated in Libyan waters, which could be a notable introduction of a cold-water species dispersing to an eastern and warmer environment. Enhancing citizen science as a useful monitoring method to find new marine species in Libyan waters is advised in this context. Additionally, in citizen science and for better outcomes, attention must be paid to strengthening the connection between Libyan fishermen and scientists.

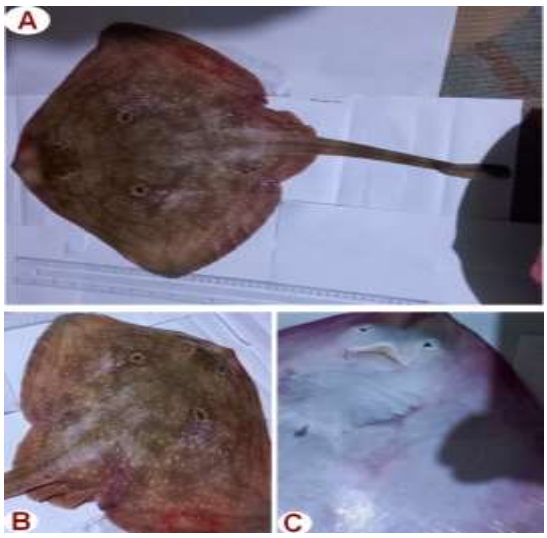


**Figure 1.** *Raja undulata* (A) caught by trawler haul at depth 100 m from Raas El Teen, Derna waters, Libya; B, C are dorsal and underside views of the disc.

**Figure 2.** Ship on-board *Polyprion americanus* (A)caught by longline at depth 500 m from Tripoli waters, Libya: (B, C) showing the big eye with enlarged head region.

**Table 1.** Morphometric and meristic measurements of *Raja undulata* collected during the current study.

| Traits | Measurements (cm) |
|---|---|
| Total length | 51 |
| Standard length | 47 |
| Snout tip to second dorsal | 17.3 |
| Snout tip to first dorsal | 16.1 |
| Tail length | 10.3 |
| Snout tip to pelvic fin | 12.2 |
| Disk width | 16 |
| Disk length | 11 |
| Head width | 4.5 |
| Mouth width | 1.6 |
| Inter-nasal width | 0.8 |
| Snout tip to eye | 1.5 |
| Eye length | 0.6 |
| Spiracle length | 0.3 |
| Pelvic fin length | 7.4 |
| Caudal fin width | 3.6 |
| Caudal fin anterior edge | 4.3 |
| Caudal trunk width | 0.7 |
| First dorsal length | 1.5 |
| Second dorsal length | 1.1 |
| First dorsal posterior edge | 2.1 |
| First dorsal anterior edge | 1.3 |
| Second dorsal posterior edge | 0.5 |
| Second dorsal anterior edge | 0.9 |
| Inter-dorsal distance | 1.2 |
| 1$^{st}$ gill slit | 0.34 |
| 2$^{nd}$ gill slit | 0.33 |
| 3$^{rd}$ gill slit | 0.52 |
| 4$^{th}$ gill slit | 0.6 |
| 5$^{th}$ gill slit | 0.45 |

**Table 2.** Morphometric and meristic measurements of *Polyprion americanus* collected during the current study.

| Traits | Measurements (cm) |
|---|---|
| Total length | 97 |
| Standard length | 79 |
| Snout length | 10 |
| Head length | 32 |

| | |
|---|---|
| Length of upper jaw | 15.5 |
| Eye diameter | 7.4 |
| Body depth | 30 |
| Pectoral fin length | 14 |
| Pelvic fin length | 13 |
| Caudal peduncle depth | 10 |
| Caudal peduncle length | 12 |
| Spinous dorsal fin | 11 |
| Soft dorsal fin | 12 |
| Anal fin (3 spines and 10 rays) | - |
| Pelvic fin (2 spines and 4 rays) | - |

## 4. Conclusion

In conclusion, the observations presented in this study provide valuable insights into the presence of the undulate ray (Raja undulata) and the Atlantic wreckfish (Polyprion americanus) in Libyan waters. These findings are significant for several reasons.

Firstly, the presence of these two species in Libyan waters indicates a notable introduction of cold-water species into an eastern and warmer environment. This introduction can be attributed to several factors, including changes in sea temperature and oceanographic conditions. The rapid warming of the Mediterranean Sea, which has been occurring four times faster than global warming, is a significant driver of this phenomenon. This warming trend is contributing to shifts in marine biodiversity and biogeochemical processes.

Secondly, the observations highlight the importance of citizen science as a valuable monitoring method for detecting new marine species in Libyan waters. Engaging fishermen and local communities in the process of species identification and data collection can enhance our understanding of regional marine ecosystems. Strengthening the connection between fishermen and scientists is essential for the success of citizen science initiatives in this context.

Furthermore, the presence of these species in Libyan waters underscores the need for continued research and monitoring of marine biodiversity in the Mediterranean region. Climate change and warming trends are likely to have profound effects on the distribution and abundance of marine species. It is imperative to assess and address the ecological and regional variations resulting from these changes.

In summary, the observations of Raja undulata and Polyprion americanus in Libyan waters contribute to our understanding of the dynamic nature of marine ecosystems in the Mediterranean. They serve as a reminder of the ongoing impacts of climate change on marine life and the importance of collaborative efforts in marine research and conservation.

## Acknowledgement

We would like to thank Mr. Muhammad Ben Baraka and Mr. Muhammad Dawood for their cooperation and continuous assistance during the field trip.

## References:

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.

Ball, A. O., Sedberry, G. R., Zatcoff, M. S., Chapman, R. W., & Carlin, J. L. (2000). Population structure of the wreckfish Polyprion americanus determined with microsatellite genetic markers. Marine Biology, 137, 1077-1090.

Barreiros, J. P., Machado, L., Hostim-Silva, M., Sazima, I., & Heemstra, P. C. (2004). First record of Polyprion oxygeneios (Perciformes: Polyprionidae) for the south-west Atlantic and a northernmost range extension. Journal of fish biology, 64(5), 1439-1441.

Belkin, I. M. (2009). Rapid warming of large marine ecosystems. Progress in Oceanography, 81(1-4), 207-213.

Canonico, G., Buttigieg, P. L., Montes, E., Muller-Karger, F. E., Stepien, C., Wright, D., & Murton, B. (2019). Global observational needs and resources for marine biodiversity. Frontiers in Marine Science, 6, 367.

Chou, T. K., & Tang, C. N. (2021). Southward range extension of the goldeye rockfish, Sebastes thompsoni (Actinopterygii: Scorpaeniformes: Scorpaenidae), to northern Taiwan. Acta Ichthyologica et Piscatoria, 51(2), 153-158.

Conant, T. A. (2015). Endangered Species Act status review report: undulate ray, Raja undulata.

Elbaraasi, H., Elabar, B., Elaabidi, S., Bashir, A., Elsilini, O., Shakman, E., & Azzurro, E. (2019). Updated checklist of bony fishes along the Libyan coasts (southern Mediterranean Sea). Mediterranean marine science, 20(1), 90-105.

Ebert, D. A., & Compagno, L. J. (2007). Biodiversity and systematics of skates (Chondrichthyes: Rajiformes: Rajoidei). Environmental biology of fishes, 80, 111-124.

Edelist, D., Rilov, G., Golani, D., Carlton, J. T., & Spanier, E. (2013). Restructuring the S ea: Pro found shifts in the world's most invaded marine ecosystem. Diversity and distributions, 19(1), 69-77.

Ellis, J. R., McCully, S. R., & Brown, M. J. (2012). An overview of the biology and status of undulate ray Raja undulata in the north-east Atlantic Ocean. Journal of Fish Biology, 80(5), 1057-1074.

Eschmeyer, W. N., Fricke, R., Fong, J. D., & Polack, D. A. (2010). Marine fish diversity: history of knowledge and discovery (Pisces). Zootaxa, 2525(1), 19-50.

Figueiredo, I., Maia, C., & Carvalho, L. (2020). Spatial distribution and abundance of the by-catch coastal elasmobranch Raja undulata: Managing a fishery after moratorium. Fisheries Management and Ecology, 27(5), 454-463.

Fischer, W. (1987). Fiches FAO d'identification des especes pour les besoins de la peche.(Rev 1). Mediterranee et mer Noire. Zone de Peche 37. Vertebres, 2.

Fitori, A., Mahdy, A., Said, R. E., & Al-Faturi, A. (2021). The first record of the lessepsian migrant Pteragogus trispilus Randall 2013 (Osteichthyes: Labridae) off the Libyan coast, east Mediterranean Sea. The Egyptian Journal of Aquatic Research, 47(4), 381-385.

Fitori, A., Ali, E. F., & Golani, D. (2022). First record of the Brassy Chub Kyphosus vaigiensis (Pisces: Kyphosidae) from the Mediterranean coast of Libya. Acta Adriatica, 63(1), 123-126.

FITORI, A., El FITURI, A., & GOLANI, D. (2023). The probable first record of the Silver grunt, Pomadasys argenteus (Forsskål, 1775) from the Mediterranean Sea. Cah. Biol. Mar, 64, 179-181.

del Carmen García-Martínez, M., Vargas-Yáñez, M., Moya, F., Santiago, R., Muñoz, M., Reul, A., ... & Balbín, R. (2019). Average nutrient and chlorophyll distributions in the western Mediterranean: RADMED project. Oceanologia, 61(1), 143-169.

Goffredo, S., & Dubinsky, Z. (Eds.). (2013). The Mediterranean Sea: Its history and present challenges. Springer Science & Business Media.

Golani, D. (2010). Colonization of the Mediterranean by Red Sea fishes via the Suez Canal-Lessepsian migration. Fish invasions of the Mediterranean Sea: change and renewal, 145, 188.

Golani, D., Ozturk, B., & Basusta, N. (2007). Fishes of the eastern Mediterranean. Israeli Journal of Aquaculture-Bamidgeh, 59.

Ho, H. C., Tang, C. N., & Cheng, C. M. (2021). A southward range extension of a wreckfish, Stereolepis doederleini (Actinopterygii: Acropomatiformes: Polyprionidae), to tropical water off eastern Taiwan. Acta Ichthyologica et Piscatoria, 51(4), 365-370.

Koeda, K., & Muto, N. (2019). An unexpected distribution record of the cold water fish Pholis fangi (Pholidae) from southern Taiwan. Zootaxa, 4702(1), 87-93.

Last, P. R., Séret, B., Stehmann, M. F. W., & Weigmann, S. (2016). Family Rajidae. Rays of the World. CSIRO Publishing, Clayton South VIC, 204-363.

Mačiulytė, V., Rimkus, E., Valiukas, D., & Stonevičius, E. (2023). Long-term precipitation events in the eastern part of the Baltic Sea region. Oceanologia, 65(1), 141-150.

Massutí, E., & Moranta, J. (2003). Demersal assemblages and depth distribution of elasmobranchs from the continental shelf and slope off the Balearic Islands (western Mediterranean). ICES Journal of Marine Science, 60(4), 753-766.

Massutí, E., & Reñones, O. (2005). Demersal resource assemblages in the trawl fishing grounds off the Balearic Islands (western Mediterranean). Scientia Marina, 69(1), 167-181.

Pérez, E., Linares, F., Rodríguez Villanueva, J. L., Vilar, A., Mylonas, C. C., Fakriadis, I., ... & Álvarez-Blázquez, B. (2019). Wreckfish (Polyprion americanus). new knowledge about reproduction, larval husbandry, and nutrition. promise as a new species for aquaculture. Fishes, 4(1), 14.

Roncarati, A., Cappuccinelli, R., Stocchi, L., & Melotti, P. (2014). Wreckfish, Polyprion americanus (Bloch and Schneider, 1801), a promising species for aquaculture: Proximate composition, fatty acid profile and cholesterol content of wild Mediterranean specimens. Journal of food Composition and Analysis, 36(1-2), 104-110.

Said, M. A., Gerges, M. A., Maiyza, I. A., Hussein, M. A., & Radwan, A. A. (2011). Changes in Atlantic Water characteristics in the south-eastern Mediterranean Sea as a result of natural and anthropogenic activities. Oceanologia, 53(1), 81-95.

Samaha, C., zu Dohna, H., & Bariche, M. (2016). Analysis of Red Sea fish species' introductions into the Mediterranean reveals shifts in introduction patterns. Journal of Biogeography, 43(9), 1797-1807.

Sedberry, G. R., Andrade, C. A. P., Carlin, J. L., Chapman, R. W., Luckhurst, B. E., Manooch III, C. S., ... & Ulrich, G. F. (1999). Wreckfish Polyprion americanus in the North Atlantic: fisheries, biology, and management of a widely distributed and long-lived fish. In American Fisheries Society Symposium (Vol. 23, pp. 27-50).

Shakman, E., Eteayb, K., Taboni, I., & Abdalha, A. B. (2019). Status of marine alien species along the Libyan coast. Journal of the Black Sea/Mediterranean Environment, 25(2).

Shakman, E. A. (2008). Lessepsian migrant fish species of the coastal waters of Libya: Status, biology, ecology (Doctoral dissertation, Rostock, Univ., Diss., 2008).

Shakman, E. A., Abdalha, A. B., Talha, F., Al-Faturi, A., & Bariche, M. (2017). First records of seven marine organisms of different origins from Libya (Mediterranean Sea). BioInvasions Record, 6(4

Zenetos, A., Çinar, M. E., Crocetta, F., Golani, D., Rosso, A., Servello, G., ... & Verlaque, M. (2017). Uncertainties and validation of alien species catalogues: The Mediterranean as an example. Estuarine, Coastal and Shelf Science, 191, 171-187