Scientific Research Publishing

Open Journal of Ecology, 2026, 16(3), 153-169
https://www.scirp.org/journal/oje
ISSN Online: 2162-1993
ISSN Print: 2162-1985

Status of Two Critically Endangered Guitarfish Species (*Glaucostegus cemiculus* Geoffroy Saint-Hilaire, 1817 and *Rhinobatos rhinobatos* Linnaeus, 1758) in the Coastal Waters of the Gaza Strip, Palestine

Abdel Fattah N. Abd Rabou[1], Abdel Fattah A. Qaraman[2], Norman A. Khalaf[3], Ghassan I. Abuhajjaj[4], Majed A. Jebril[5], Asmaa A. Abd Rabou[6], Mazen T. Abualtayef[6], Khalid A. Qahman[7], Eman A. Amodi[8], Jehad Y. Salah[9], Faten A. Al-Hamidi[10], Kefah F. Al-Sofy[11], Ola A. Abd Rabou[12], Othman A. Abd Rabou[13], Amal A. Abu Shammala[14], Rajaa H. Nashwan[15], Mariam M. Abu Raya[15], Shoroug A. Abu Raya[16], Saud S. Shawa[17], Sohaib M. Olwan[18], Mosab M. Olwan[19], Mohammed R. Al-Agha[20]

[1]Department of Biology & Biotechnology, Faculty of Science, Islamic University of Gaza, Gaza Strip, Palestine
[2]Dean of Scientific Research and Libraries, Israa University, Gaza Strip, Palestine
[3]Department of Environmental Research & Media, National Research Center, University of Palestine, Gaza Strip, Palestine
[4]Department of Alternative Medicine, Al-Modawy Medical Center, Ras Al-Khaimah, United Arab Emirates
[5]Department of Medical Laboratory Sciences, Faculty of Medical Sciences, Israa University, Gaza Strip, Palestine
[6]Department of Civil Engineering, Faculty of Engineering, Islamic University of Gaza, Gaza Strip, Palestine
[7]Environment Quality Authority, Gaza Strip, Palestine
[8]Department of Biodiversity, Environment Quality Authority, Ramallah, Palestine
[9]General Directorate of Fisheries, Ministry of Agriculture, Gaza Strip, Palestine
[10]Department of Media & Communication Technology, University College of Applied Sciences, Gaza Strip, Palestine
[11]Ministry of Public Works and Housing, Gaza Strip, Palestine
[12]Department of Smart Systems Engineering, Faculty of Engineering, Islamic University of Gaza, Gaza Strip, Palestine
[13]Department of Journalism and Media, Islamic University of Gaza, Gaza Strip, Palestine
[14]Department of Islamic Faith, Faculty of Fundamentals of Religion, Islamic University of Gaza, Gaza Strip, Palestine
[15]Department of Curricula and Teaching Methods, Faculty of Education, Islamic University of Gaza, Gaza Strip, Palestine
[16]Department of Primary Education, Faculty of Education, Islamic University of Gaza, Gaza Strip, Palestine
[17]Director of VETCO Veterinary Services Center, Gaza City, Gaza Strip, Palestine
[18]Department of Curricula and Teaching Methods, Ministry of Education, Gaza Strip, Palestine
[19]Department of Psychology, Faculty of Education, Islamic University of Gaza, Gaza Strip, Palestine
[20]Department of Marine Sciences, Faculty of Science, Islamic University of Gaza, Gaza Strip, Palestine
Email: arabou@iugaza.edu.ps

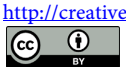
How to cite this paper: Abd Rabou, A.F.N., Qaraman, A.F.A., Khalaf, N.A., Abuhajjaj, G.I., Jebril, M.A., Abd Rabou, A.A., Abualtayef, M.T., Qahman, K.A., Amodi,

Abstract

Guitarfishes are large demersal elasmobranchs that inhabit shallow coastal

E.A., Salah, J.Y., Al-Hamidi, F.A., Al-Sofy, K.F., Abd Rabou, O.A., Abd Rabou, O.A., Abu Shammala, A.A., Nashwan, R.H., Abu Raya, M.M., Abu Raya, S.A., Shawa, S.S., Olwan, S.M., Olwan, M.M. and Al-Agha, M.R. (2026) Status of Two Critically Endangered Guitarfish Species (*Glaucostegus cemiculus* Geoffroy Saint-Hilaire, 1817 and *Rhinobatos rhinobatos* Linnaeus, 1758) in the Coastal Waters of the Gaza Strip, Palestine. *Open Journal of Ecology*, **16**, 153-169.
https://doi.org/10.4236/oje.2026.163010

Received: February 13, 2026
Accepted: March 8, 2026
Published: March 11, 2026



and continental shelf habitats worldwide. Exhibiting intermediate morphology between sharks and rays, they serve as important benthic predators but are highly vulnerable to overfishing, slow growth, and habitat degradation. The Mediterranean Sea hosts two native species: the Blackchin Guitarfish (*Glaucostegus cemiculus* Geoffroy Saint-Hilaire, 1817) and the Common Guitarfish (*Rhinobatos rhinobatos* Linnaeus, 1758), both of which have suffered severe population declines and are classified as Critically Endangered and Endangered, respectively. This study provides the first account of guitarfishes in the coastal waters of the Gaza Strip, Palestine, documenting their occurrence, fisheries, consumption, and educational use. Data were obtained from the General Directorate of Fisheries at the Ministry of Agriculture and local fishermen, complemented by photographic records. The Common Guitarfish dominates the local catch, is frequently sold in fish markets, and is widely used in university anatomy laboratories. In contrast, the Blackchin Guitarfish is larger, rarer, and less frequently captured. Guitarfishes are caught using a variety of demersal fishing gears, including specialized Guitarfish nets (*Sharak Al-Salafeeh*), gillnets, trawls, and longlines. Between 2009 and 2023, the average annual catch was 6,121 kg, peaking in 2021. Despite official recognition of their threatened status, local awareness remains limited, raising sustainability concerns. The findings underscore the urgent need for continuous monitoring, sustainable fishing practices, and enhanced conservation efforts to safeguard these endangered species in the Gaza Strip and the broader eastern Mediterranean.

Keywords

Guitarfishes, Blackchin Guitarfish, *Glaucostegus Cemiculus*, Common Guitarfish, *Rhinobatos Rhinobatos*, Catch and Bycatch Methods, Fisheries, Consumption, Educational Use, Gaza Strip, Palestine

1. Introduction

Guitarfishes or shovelnose rays or shovelnose sharks (family Rhinobatidae and order Rhinopristiformes) are large demersal elasmobranchs that occupy shallow coastal and continental shelf habitats worldwide [1] [2]. Characterized by their flattened bodies and elongated snouts, guitarfishes represent an evolutionary and ecological link between sharks and rays. Guitarfish have a flattened body and enlarged pectoral fins fused to the head (a ray-like feature), but retain a well-developed tail with two dorsal fins like many sharks. This intermediate body form is why people describe them as shark-like rays [3]. Owing to their coastal distribution [4], slow growth, late maturity, and low reproductive output, many guitarfish species are particularly vulnerable to anthropogenic pressures, especially fishing activities [5]. Consequently, guitarfishes are currently among the most threatened groups of cartilaginous fishes globally [6] [7]. The Mediterranean Sea supports two native guitarfish species: The Blackchin Guitarfish (*Glaucostegus cemiculus* Geoffroy Saint-Hilaire, 1817) and the Common Guitarfish (*Rhinobatos rhinoba-*

tos Linnaeus, 1758) [2] [8] [9]. Like other guitarfish species, the two species in question are demersal and closely associated with shallow sandy and muddy substrates, where they play an important ecological role as benthic predators, feeding primarily on crustaceans, mollusks, and small fishes [10] [11]. There are occasional records of other guitarfish species (e.g., Halavi Guitarfish *Glaucostegus halavi*) in the eastern Mediterranean [12], but these are rare and not considered established resident species; their regular occurrence hasn't been confirmed [13].

The Blackchin Guitarfish, also known as the Blackchin or Giant Guitarfish, is distributed in the eastern Atlantic Ocean and the Mediterranean Sea, with its Mediterranean range extending mainly along the southern and eastern coasts [14] [15], particularly off North Africa and the Levantine Basin [8] [9] [11] [16]. Adults and juveniles inhabit coastal waters and the continental shelf, generally at depths shallower than 100 m, where they are highly susceptible to fishing pressure. This species has undergone severe population declines throughout its range and is currently listed as Critically Endangered on the International Union for Conservation of Nature (IUCN) Red List, primarily due to intensive fishing, bycatch in trawl and net fisheries, and ongoing coastal habitat degradation [17]. The Common Guitarfish was historically widespread throughout the Mediterranean Sea but has experienced dramatic declines over recent decades [8]. Once common in both northern and southern Mediterranean waters, it is now considered rare and patchily distributed, with remaining populations mainly confined to the southern and eastern parts of the basin [8] [18]. Similar to the Blackchin Guitarfish, this species is highly vulnerable to coastal fisheries and habitat disturbance and is currently classified as Critically Endangered on the International Union for Conservation of Nature (IUCN) Red List [8].

Despite their critical conservation status, information on the distribution, abundance, and population trends of both guitarfish species remains limited in several parts of the Mediterranean, particularly in the eastern and southeastern basin. Improving regional knowledge of their occurrence and status is therefore essential to inform effective conservation and management measures aimed at preventing further population declines and potential local extirpations [16] [17]. Several studies on the distribution, biology, and ecology of guitarfish species in the Mediterranean Sea have been conducted across different countries. In Türkiye, these include Akyol and Capapé [11], Ismen *et al.* [19], Çek *et al.* [20], Demirhan [21], Başusta *et al.* [22]-[24], Filiz *et al.* [25], and Bengil *et al.* [26] [27]. In Tunisia, studies have been reported by Capapé *et al.* [10], Capapé and Zaouali [28], Diop [29], Enajjar *et al.* [30] [31], Rafrafi-Nouira *et al.* [32], and Taktek *et al.* [33]. Other Mediterranean countries with relevant research include Egypt [34] [35], Libya [36], Lebanon [37] [38], Syria [39], and Greece [40].

There are currently no published studies in the Gaza Strip addressing the biology, ecology or fisheries of guitarfishes in the local marine ecosystem. Nevertheless, some local research indicated that Gazans consume cartilaginous fishes, including guitarfishes, and other studies have documented the use of these species

in taxidermy or as educational models for cartilaginous fish dissection in biology courses at Palestinian universities in the Gaza Strip [41]-[43]. The present study aims to provide baseline information on the status of two guitarfish species—namely, the Blackchin Guitarfish (*Glaucostegus cemiculus* Geoffroy Saint-Hilaire, 1817) and the Common Guitarfish (*Rhinobatos rhinobatos* Linnaeus, 1758)—which are caught and monitored in the coastal waters of the Gaza Strip, Palestine. The importance of this study lies in the fact that it is the first to examine the status of guitarfishes found in the marine ecosystem of the Gaza Strip, from which they are caught for human consumption.

2. Methodology

This descriptive study was based on the collection of data and photographic records documenting the Blackchin Guitarfish (*Glaucostegus cemiculus* Geoffroy Saint-Hilaire, 1817) and the Common Guitarfish (*Rhinobatos rhinobatos* Linnaeus, 1758), both are caught in the coastal waters of the Gaza Strip, Palestine. Although the first species is very rare and scarce, the second species is caught more and sold openly in the markets. Information was obtained through communication with the General Directorate of Fisheries at the Ministry of Agriculture and with local fishermen. Data on guitarfish landings in the Gaza Strip were obtained from official records maintained by the General Directorate of Fisheries at the Ministry of Agriculture, the authority responsible for documenting all fisheries-related data in the Gaza Strip. The Gaza Strip, located in the southeastern Mediterranean Sea, extends approximately 42 km along the coast, covers an area of about 365 km^2, and supports a population exceeding 2.4 million inhabitants. The fishing sector comprises more than 4,500 fishermen operating over 1,800 vessels using a variety of fishing gears.

3. Results

3.1. The Catch or Bycatch of Guitarfish Species in the Gaza Strip

Guitarfishes (**Figure 1**) are widely distributed throughout the eastern Mediterranean Sea, including the coastal waters of the Gaza Strip, Palestine. Field surveys and fisheries observations indicate that the Common Guitarfish (*Rhinobatos rhinobatos* Linnaeus, 1758) is one of the cartilaginous fish species most frequently caught—either intentionally or as bycatch—and represents a prominent component of the local fishery. Both males and females are captured (**Figure 2**), with males distinguished by pelvic fin claspers that facilitate sperm transfer during mating. The Common Guitarfish is commonly sold in Gazan fish markets. In contrast, the Blackchin Guitarfish (*Glaucostegus cemiculus* Geoffroy Saint-Hilaire, 1817) is a larger demersal species that occurs less frequently in the same waters, typically exceeding 150 cm and occasionally surpassing 200 cm in total length. Both species are captured using demersal gears such as nets and longlines, often alongside other elasmobranchs in nearshore and continental shelf habitats. Although they co-occur, the Blackchin Guitarfish is considerably rarer than the Com-

mon Guitarfish. Morphologically, the Blackchin Guitarfish is larger, with a pointed wedge-shaped snout, brown dorsal coloration, and a distinct dark spot on the ventral surface of the snout. The Common Guitarfish, in contrast, has a smaller body (≈25 - 160 cm), a more rounded snout, and lacks the ventral dark spot.

Figure 1. Two guitarfish species caught from the marine ecosystem of the Gaza Strip: (A) Blackchin Guitarfish (*Glaucostegus cemiculus* Geoffroy Saint-Hilaire, 1817) and (B) Common Guitarfish (*Rhinobatos rhinobatos* Linnaeus, 1758).

Figure 2. Both sexes of the Common Guitarfish (*Rhinobatos rhinobatos*) are captured from the marine ecosystem of the Gaza Strip: (A) Male and (B) Female.

3.2. Catch and Bycatch Methods of Guitarfishes in the Gaza Strip

Guitarfishes are generally caught or bycaught in demersal fishing grounds, often in combination with other rays, sharks, and benthic species. The following are the primary fishing methods for guitarfishes in the Gaza Strip:

1. Guitarfish nets (*Salafeeh nets* or *Sharak Al-Salafeeh*): The Gaza Strip is famous for the expertise of its local fishermen in making specialized nets with openings up to 12 cm, specifically designed for catching guitarfish at a distance of

between 3 and 5 miles from the shore using motorized boats known as Hasakas with motors. These nets, locally known as "*Salafeeh nets*" or "*Sharak Al-Salafeeh*" (Figure 3(A)), are used to target guitarfishes as well as other demersal batoids, including the Common Stingray (*Dasyatis pastinaca* Linnaeus, 1758) and the Pelagic Stingray (*Pteroplatytrygon violacea* Bonaparte, 1832).

2. Gillnets (bottom nets): They are widely used in nearshore waters and on the continental shelf, these nets primarily target various demersal fish species. Guitarfish—especially the Common Guitarfishes—are frequently caught as bycatch or as part of small-scale targeted fishing efforts.

3. Trawl nets: They are primarily employed on the continental shelf to capture mixed demersal species. They often catch guitarfishes alongside other sharks, rays, and bottom-dwelling fishes.

4. Trammel nets: These nets are primarily used to target squid and shrimp in the marine environment; however, according to the General Directorate of Fisheries at the Ministry of Agriculture and local fishermen, they occasionally capture small-sized specimens of the Common Guitarfish.

5. Bottom longlines: Longlines (Figure 3(B)) are commonly set along the seabed to capture large demersal fishes. These lines can catch both Common and Blackchin Guitarfishes, either intentionally or incidentally.

Figure 3. Fishing methods of Guitarfishes in the Gaza Strip: (A) Guitarfish nets (*Sharak Al-Salafeeh*) and (B) Bottom longlines.

3.3. Fisheries of Guitarfishes in the Gaza Strip

The Common Guitarfish (*Rhinobatos rhinobatos*) and the Blackchin Guitarfish (*Glaucostegus cemiculus*), constitute an important component of small-scale fisheries in the Gaza Strip. They are largely taken as bycatch in bottom fishing gear, although some targeted fishing occurs in nearshore waters. According to the General Directorate of Fisheries at the Ministry of Agriculture, the total annual catch of guitarfish in the Gaza Strip between 2009 and 2023 amounted to 6,121 kilograms, the vast majority of which were Common Guitarfish. Production was lowest in 2009 (1,491 kg) and peaked in 2021 (10,535 kg), showing an overall increasing trend with annual fluctuations (Table 1 and Figure 4). Overall, the figure reflects growth in production over time, with periodic variability that may be attributed to operational, economic, or environmental factors. No fish landings,

whether cartilaginous or bony, were recorded in the Gaza Strip during 2024, 2025 and beyond, due to the Israeli war that followed October 7, 2023, when the Israeli occupation closed the sea, prevented fishing and destroyed more than 90% of the fishing equipment. Common Guitarfishes are clearly displayed and sold in the fish markets of the Gaza Strip (Figure 5).

Table 1. Annual production quantities of guitarfish (*Rhinobatos rhinobatos* and *Glaucostegus cemiculus*) in the Gaza Strip, Palestine [Source: General Directorate of Fisheries at the Ministry of Agriculture, Gaza Strip].

Year	Quantity in kilograms
2009	1491
2010	2931
2011	8487
2012	4066
2013	6240
2014	5816
2015	5980
2016	5830
2017	4805
2018	4687
2019	7801
2020	6800
2021	10535
2022	8450
2023	7900
Annual production rate	**6121**

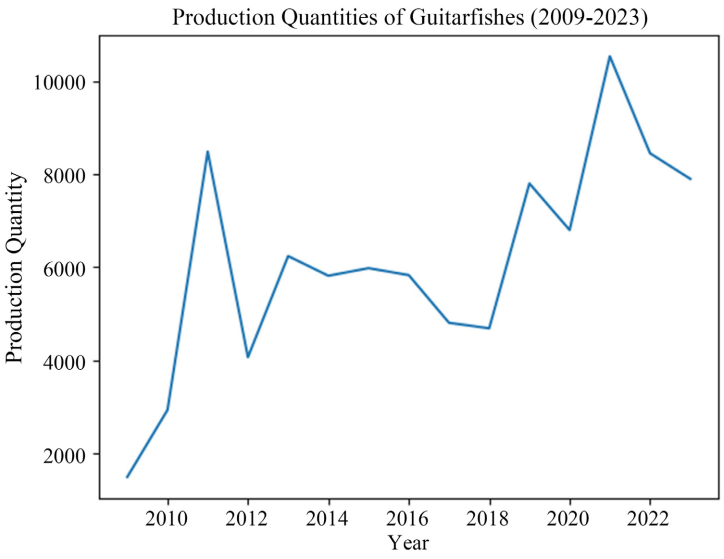


Figure 4. A graphic model showing the annual production quantities of guitarfishes (*Rhinobatos rhinobatos* and *Glaucostegus cemiculus*) in the Gaza Strip, Palestine.

Figure 5. Common Guitarfish are routinely displayed and sold in fish markets throughout the Gaza Strip.

3.4. Consumption of Guitarfishes in the Gaza Strip

Guitarfish are among the elasmobranchs caught in the coastal waters of the Gaza Strip, entering local fisheries either as targeted catches or bycatch. In fact, guitarfishes are not a staple in the diet in the Gaza Strip compared to other bony fishes, such as sardines, sea bream, tuna, tilapia, and mullet, which are more readily available in local fish markets and at more affordable prices. More specifically, the Common Guitarfish is one of the most important targeted cartilaginous fish species in the Gaza Strip, typically selling for around five US dollars per kilogram (**Figure 5**). In fact, the Common Guitarfish is the most popular and widespread cartilaginous fish among the Gazan population. According to local fishermen and the Gazan public, these fishes are often fried, and some Gazans prepare them in the popular and delicious local dish "*Sayadieh*", which consists of rice cooked with fish meat. In contrast, the Blackchin Guitarfish is rarely consumed in the Gaza Strip, comprising only a small fraction of the catch compared with the Common Guitarfish. This low representation is attributed to its scarcity in local marine waters, resulting in infrequent capture, either as a targeted species or as by-catch.

3.5. Use of Common Guitarfish in Dissection Labs and Preservation

The Common Guitarfish, exhibiting characteristics of both sharks and rays, is frequently used in university anatomy laboratories for vertebrate zoology studies. It

provides students with hands-on experience in the morphological, morphometric, and anatomical analysis of cartilaginous fishes (Figure 6). Dissections typically focus on paired and unpaired fins—particularly the pectoral and caudal fins—as well as head morphology, sensory line system, gill slits, the integumentary system, digestive system, respiratory system, circulatory system, and urinogenital system. In fact, the Common Guitarfish, naturally found in the coastal waters of the Gaza Strip, is frequently used in dissection and morphology studies due to its accessibility and manageable size. Its anatomy combines features of both sharks and rays, making it an ideal model for teaching cartilaginous fish morphology, fin structures, and internal systems. In addition to educational use, many specimens are also employed for taxidermy and long-term preservation in many Gazan universities. During a visit conducted approximately six years ago, researchers documented preserved specimens of the Common Guitarfish at the Maritime Museum of the General Directorate of Fisheries, Ministry of Agriculture, located about 150 m from the Gaza City shoreline. Small live specimens of the Common Guitarfish were also observed in their own aquaria within the museum corridors.

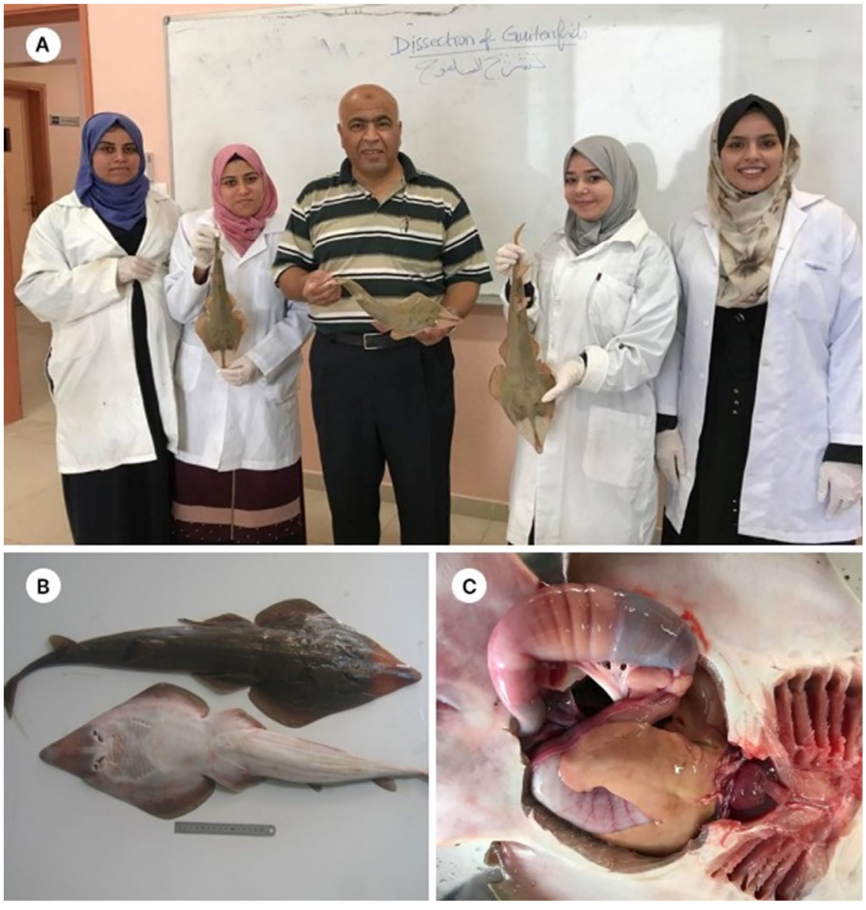


Figure 6. The Common Guitarfish (*Rhinobatos rhinobatos*) is used as an educational model at local universities, providing students with hands-on experience in the morphological, morphometric, and anatomical study of cartilaginous fishes.

3.6. Awareness of Guitarfish Conservation Status

Compared to the Common Guitarfish, the Blackchin Guitarfish is an extremely rare demersal species in the marine ecosystem of the Gaza Strip, as is the case throughout the eastern Mediterranean basin. While the General Directorate of Fisheries at the Ministry of Agriculture is aware of both species of guitarfishes and their global conservation status as critically endangered, most local fishermen remain unaware, which is reflected in continued fishing efforts targeting guitarfishes and other cartilaginous fishes. Only a small number of Gazan fishermen reported recognizing that these species, although caught locally, are globally endangered.

4. Discussion

The current results confirm that guitarfish constitute a constant element in the demersal fisheries of the Gaza Strip, as the Common Guitarfish (*Rhinobatos rhinobatos* Linnaeus, 1758) is the dominant species in the local catch, as revealed by several published studies [42]-[44]. This finding aligns with regional studies from the eastern Mediterranean and Levant Basin, where the Common Guitarfish is reported as one of the most frequently encountered Rhinopristiformes rays in coastal waters [7] [45]. In contrast, the Blackchin Guitarfish (*Glaucostegus cemiculus* Geoffroy Saint-Hilaire, 1817) was found to be considerably rarer in the Gaza Strip's waters, a pattern consistent with its low encounter rates across much of the Mediterranean Sea [46].

The marked difference in abundance between the two species may reflect ecological, biological, and fisheries-related factors, including habitat preference, depth distribution, body size, and vulnerability to fishing gear. The Blackchin Guitarfish, which commonly exceeds 150 - 200 cm in total length, is known to inhabit deeper and less accessible demersal habitats compared to the Common Guitarfish, increasing its susceptibility to population depletion and reducing encounter frequency in artisanal fisheries [7] [47]. The morphological features described in this study, such as the snout shape and the distinctive dark spot on the ventral surface of the Blackchin Guitarfish's snout, support accurate species identification and are consistent with accepted taxonomic descriptions [47] [48].

Guitarfishes in the Gaza Strip are captured through multiple demersal fishing methods, including specialized guitarfish nets (*Sharak Al-Salafeeh*), gillnets, trawl nets, trammel nets, and bottom longlines. This diversity of capture techniques reflects the strong overlap between guitarfish habitats and commercially exploited demersal fishing grounds. Similar interactions between guitarfishes and bottom fishing gears have been widely documented throughout the Mediterranean and globally [35] [36] [38] [47] [49]-[51]. The use of locally designed guitarfish nets (*Sharak Al-Salafeeh*) illustrates an adaptive artisanal fishing strategy targeting large batoids, including guitarfishes and stingrays. While such specialization increases fishing efficiency, it also raises conservation concerns, as cartilaginous fishes exhibit slow growth, late maturity, and low fecundity, making them partic-

ularly vulnerable to sustained fishing pressure [6] [52]. Additionally, the frequent bycatch of juvenile Common Guitarfish in trammel nets and gillnets suggests ongoing recruitment removal, which can significantly reduce population resilience over time [53].

Guitarfishes, mainly Common Guitarfishes, form a component of small-scale fisheries in the Gaza Strip, predominantly caught as bycatch in bottom fishing gear operations [6] [54]. Between 2009 and 2023, the average annual catch of guitarfishes was 6,121 kilograms; with the Common Guitarfish being the most common species (see **Figure 5**). Annual production varied, ranging from 1,491 kilograms in 2009 to a peak of 10,535 kilograms in 2021, reflecting changes in fishing effort, gear efficiency, and environmental fluctuations [55]. The poor recording of clear landings of guitarfishes and other cartilaginous and bony fish species during 2024, 2025 and beyond highlights the vulnerability of fisheries in the Gaza Strip to prevailing social, political and military turmoil. In the aftermath of the Israeli war that followed October 7, 2023, the closure of the coasts, the ban on fishing, and the destruction of more than 90% of fishing equipment led to a clear halt in fishing activities, affecting local livelihoods and food security [56]. Despite this, the Common Guitarfish still occasionally appears in some fish markets, confirming its importance as a catch. Some local fishermen were able to risk their lives during the raging Israeli war to catch certain species of cartilaginous and bony fishes in the hope of filling a small part of the shortage of important fish protein in light of the severe famine imposed by the Israeli occupation on Gazans during its fierce war (Persona; Observations).

Although guitarfishes are not staple food fish in the Gaza Strip, the Common Guitarfish holds clear socioeconomic value, as reflected in its regular presence in local markets and its relatively high price compared to many small pelagic fishes. Similar consumption patterns have been reported across the Mediterranean, where elasmobranchs are often consumed opportunistically rather than forming the basis of daily diets [57] [58]. Cultural preparation methods, such as frying and incorporation into traditional dishes like *Sayadieh*, highlight the species' integration into local culinary practices. In contrast, the Blackchin Guitarfish contributes minimally to consumption due to its rarity in catches. This supports broader Mediterranean observations where large Rhinopristiformes rays are infrequently landed and poorly represented in markets due to population declines [46] [59].

Beyond their value for fisheries and consumption, Common Guitarfish (*Rhinobatos rhinobatos*) also play a significant role in academic education and scientific training in the Gaza Strip [41] [43]. Their intermediate morphology between sharks and rays makes them excellent teaching models for vertebrate zoology, comparative anatomy, and marine biology [60]. The use of guitarfishes and small sharks for educational purposes has been documented globally, particularly in regions where access to preserved specimens is limited [61]. Preservation of specimens in museum collections further enhances their long-term educational value and contributes to biodiversity documentation. Such collections are increasingly

recognized as critical tools for conservation awareness, baseline biodiversity assessments, and historical comparisons of species occurrence [62].

Although their critically endangered status is officially recognized, most Gazan fishermen remain unaware, resulting in continued fishing pressure [55]. From a conservation perspective, the increasing capture of guitarfishes and other cartilaginous species in the Gaza Strip—and potentially in neighboring countries—raises significant sustainability concerns, particularly as effective conservation measures have become increasingly challenging to implement. In the Israeli entity, as a precautionary measure, a potential nursery area was identified near the Mediterranean coast for the Blackchin Guitarfish, as described by Azrieli *et al.* [16]. This is due to the sharp decline in guitarfish species population throughout their known range in the Mediterranean [63]. In fact, both the Common Guitarfish and Blackchin Guitarfish are endangered in the Mediterranean due to overfishing and habitat degradation as pointed out by IUCN [64] and Soldo *et al.* [65]. As political, social, and economic conditions in the Gaza Strip improve, ongoing monitoring and the adoption of sustainable fishing practices will be critical to ensuring the long-term survival of endangered cartilaginous fishes including the two guitarfish species in question.

Acknowledgements

The authors thank the General Directorate of Fisheries at the Ministry of Agriculture and the Gazan fishermen for their support and cooperation in this modest study, the first of its kind in Palestine.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

References

[1] Moore, A.B.M. (2011) Elasmobranchs of the Persian (Arabian) Gulf: Ecology, Human Aspects and Research Priorities for Their Improved Management. *Reviews in Fish Biology and Fisheries*, **22**, 35-61. https://doi.org/10.1007/s11160-011-9222-x

[2] Newell, B.M. (2017) Status Review Report of Two Species of Guitarfish: *Rhinobatos rhinobatos* and *Rhinobatos cemiculus*. Report to National Marine Fisheries Service, Office of Protected Resources, 62 p.

[3] Nelson, J.S., Grande, T.C. and Wilson, M.V.H. (2016) Fishes of the World. 5th Edition, Wiley. https://doi.org/10.1002/9781119174844

[4] Whelan, R., Jabado, R.W., Clarke, C. and Muzaffar, S.B. (2017) Observations of Rays and Guitarfish (*Batoidea*) in Shallow Waters around Siniya Island, Umm Al-Qaiwain, United Arab Emirates. *Tribulus*, **25**, 76-90.

[5] Zubair, M.A., Islam, M.S., Khan, S., Hosssain, N. and Haque, A.B. (2025) From Nets to Knowledge—Fishers Unveil Threatened Guitarfish Catch Drivers and Fishing Grounds. *Aquatic Conservation: Marine and Freshwater Ecosystems*, **35**, e70062. https://doi.org/10.1002/aqc.70062

[6] Dulvy, N.K., Fowler, S.L., Musick, J.A., Cavanagh, R.D., Kyne, P.M., Harrison, L.R., *et al.* (2014) Extinction Risk and Conservation of the World's Sharks and Rays. *eLife*,

3, e00590. https://doi.org/10.7554/elife.00590

[7] Last, P.R., White, W.T., de Carvalho, M.R., Séret, B., Stehmann, M.F.W. and Naylor, G.J.P. (2016). Rays of the World. CSIRO Publishing, 832 p.

[8] Dulvy, N.K., Allen, D.J., Ralph, G.M. and Walls, R.H.L. (2016) The Conservation Status of Sharks, Rays and Chimaeras in the Mediterranean Sea [Brochure]. IUCN Species Survival Commission Shark Specialist Group, IUCN Centre for Mediterranean Cooperation, 12 p.

[9] Grossmark, Y., Azriali Zohar, B., Barash, A. and Portman, M.E. (2024) Incorporation of Human-Wildlife Interactions in Ecosystem-Based Management to Enhance Conservation of Endangered Guitarfish. *Conservation Biology*, **38**, e14327. https://doi.org/10.1111/cobi.14327

[10] Capapé, C., Guélorget, O., Vergne, Y. and Quignard, J.P. (2007) Reproductive Biology of the Blackchin Guitarfish *Rhinobatos cemiculus* (Chondrichthyes: Rhinobatidae) from the Southern Mediterranean Sea. *Scientia Marina*, **71**, 321-329.

[11] Akyol, O. and Capapé, C. (2014) Distribution of Blackchin Guitarfish *Rhinobatos cemiculus* E. Geoffroy Saint-Hilaire, 1817 (Elasmobranchii: Rhinobatidae) with First Records from İzmir Bay (Turkey, Northeastern Aegean Sea). *Turkish Journal of Zoology*, **38**, 460-465. https://doi.org/10.3906/zoo-1307-32

[12] Souissi, B.J., Golani, D., Mejri, H., Salem, M.B. and Capapé, C. (2007) First Confirmed Record of the Halave's Guitarfish, *Rhinobatos halavi* (Forsskål, 1775) (Chondrichthyes: Rhinobatidae) in the Mediterranean Sea with a Description of a Case of Albinism in Elasmobranchs. *Cahiers de Biologie Marine*, **48**, 67-75.

[13] Mendez, L., Bacquet, A. and Briand, F. (2022) Guide of Mediterranean Skates and Rays. The Mediterranean Science Commission (CIESM). https://www.ciesm.org/Guide/skatesandrays/

[14] Chaikin, S., Belmaker, J. and Barash, A. (2020) Coastal Breeding Aggregations of Threatened Stingrays and Guitarfish in the Levant. *Aquatic Conservation: Marine and Freshwater Ecosystems*, **30**, 1160-1171. https://doi.org/10.1002/aqc.3305

[15] Schwartz, N., Morick, D., Azrieli, B., Scheinin, A., Tchernov, D. and Aroch, I. (2024) Serum Chemistry, Thyroxine Concentration, and Blood Cell Morphology of Wild, Young Blackchin Guitarfish *Glaucostegus cemiculus* Sampled on the Eastern Mediterranean Coastline. *Journal of Aquatic Animal Health*, **36**, 281-299. https://doi.org/10.1002/aah.10228

[16] Azrieli, B., Cohen, E., Livne, L., Ramon, D., Tsemel, A., Bigal, E., *et al.* (2024) Characterising a Potential Nearshore Nursery Ground for the Blackchin Guitarfish (*Glaucostegus cemiculus*) in Ma'agan Michael, Israel. *Frontiers in Marine Science*, **11**, Artcle 1391752. https://doi.org/10.3389/fmars.2024.1391752

[17] Kyne, P. M., Jabado, R. W., Bizzarro, J. J., Bennett, R. H., Carlson, J., Charvet, P., Derrick, D., Dharmadi, Dulvy, N. K., Ebert, D. A., Fernando, D., Fordham, S., Herman, K., Lewis, J., Marshall, A., Pollom, R., Rigby, C. L. and Sherley, R. B. (2019). *Glaucostegus cemiculus*. The IUCN Red List of Threatened Species 2019: e.T63131A124453862. International Union for Conservation of Nature.

[18] Ferretti, F., Myers, R.A., Serena, F. and Lotze, H.K. (2013) Loss of Large Predatory Sharks from the Mediterranean Sea. *Conservation Biology*, **27**, 952-964.

[19] Ismen, A., Yıgın, C. and Ismen, P. (2007) Age, Growth, Reproductive Biology and Feed of the Common Guitarfish (*Rhinobatos rhinobatos* Linnaeus, 1758) in İskenderun Bay, the Eastern Mediterranean Sea. *Fisheries Research*, **84**, 263-269. https://doi.org/10.1016/j.fishres.2006.12.002

[20] Çek, Ş., Başusta, N., Demirhan, S.A. and Karalar, M. (2009) Biological Observations

on the Common Guitarfish *Rhinobatos rhinobatos* from İskenderun Bay (Turkey, Eastern Mediterranean). *Animal Biology*, **59**, 211-230. https://doi.org/10.1163/157075609x437727

[21] Demirhan, S. A., Çek, Ş., Başusta, A. and Başusta, N. (2010) Maturity and Reproductive Cycle of the Common Guitarfish, *Rhinobatos rhinobatos* (Linnaeus, 1758), in İskenderun Bay (Northeastern Mediterranean). *Rapports et Procès-Verbaux des Réunions de la Commission Internationale pour l'Exploration Scientifique de la Méditerranée*, **39**, 492.

[22] Başusta, N., Başusta, A. and Özbek, E.Ö. (2016) Cartilaginous Fishes and Fisheries in the Mediterranean Coast of Turkey. In: Başusta, N., Keskin, C., Turan, F.T. and Öztürk, B., Eds., *The Turkish Part of the Mediterranean Sea*, Turkish Marine Research Foundation (TUDAV), 248-274.

[23] Başusta, N., Başusta, A., Tıraşın, E.M. and Sulikowski, J.A. (2020) Age and Growth of the Blackchin Guitarfish *Glaucostegus cemiculus* (Geoffroy Saint-Hilaire, 1817) from Iskenderun Bay (Northeastern Mediterranean). *Journal of Applied Ichthyology*, **36**, 880-887. https://doi.org/10.1111/jai.14144

[24] Başusta, N., Hisli, O., Tonay, A.M., Yamaner, G., Gönülal, O., Saraçoğlu, C., Türkozan, O., Barraud, T. and Gürses, R.K. (2024) Legally Protected Species in Turkish Seas according to the Fisheries Legislation between 1973-2023 and Some Recommendations. *Journal of the Black Sea/Mediterranean Environment*, **30**, 200-236.

[25] Filiz, H., Bilge, G., Giannetto, D. and Yapıcı, S. (2016) New Sighting of the Endangered Species Blackchin Guitarfish, *Rhinobatos cemiculus*, in the South Aegean Sea. *Marine Biodiversity Records*, **9**, Article No. 13. https://doi.org/10.1186/s41200-016-0009-6

[26] Bengïl, E.G.T., Bengïl, F. and Özaydın, O. (2020) Feeding Ecology and Reproduction Biology of *Glaucostegus cemiculus* (Geoffroy Saint-Hilaire, 1817) from the Eastern Aegean Sea. *Regional Studies in Marine Science*, **33**, Article ID: 100952. https://doi.org/10.1016/j.rsma.2019.100952

[27] Bengil, E.G.T., Başusta, A. and Başusta, N. (2018) Length-Weight Relationships of *Glaucostegus cemiculus* (Geoffroy Saint-Hilaire, 1817) from the Aegean Sea and Northeastern Mediterranean Coasts of Turkey. *Journal of the Black Sea/Mediterranean Environment*, **24**, 1-9.

[28] Capape, C. and Zaouali, J. (1994) Distribution and Reproductive Biology of the Blackchin Guitarfish, *Rhinobatos cemiculus* (Pisces: Rhinobatidae), in Tunisian Waters (Central Mediterranean). *Australian Journal of Marine and Freshwater Research*, **45**, 551-561. https://doi.org/10.1071/mf9940551

[29] Echwikhi, K., Saïdi, B., Bradai, M. N. and Bouain, A. (2013) Elasmobranchs Longline Fisheries in the Gulf of Gabès (southern Tunisia). *Cahiers de Biologie Marine*, **54**, 5950604.

[30] Enajjar, S., Bradai, M.N. and Bouain, A. (2012) Age, Growth and Sexual Maturity of the Blackchin Guitarfish *Rhinobatos cemiculus* in the Gulf of Gabès (Southern Tunisia, Central Mediterranean). *CBM-Cahiers de Biologie Marine*, **53**, 17-23.

[31] Enajjar, S., Bradai, M.N. and Bouain, A. (2008) New Data on the Reproductive Biology of the Common Guitarfish of the Gulf of Gabès (Southern Tunisia, Central Mediterranean). *Journal of the Marine Biological Association of the United Kingdom*, **88**, 1063-1068. https://doi.org/10.1017/s0025315408001550

[32] Rafrafi-Nouira, S., El Kamel-Moutalibi, O., Reynaud, C., Boumaïza, M. and Capapé, C. (2015) Additional and Unusual Captures of Elasmobranch Species from the Northern Coast of Tunisia (Central Mediterranean). *Journal of Ichthyology*, **55**, 836-848. https://doi.org/10.1134/s0032945215060181

[33] Taktek, I., Marouani, S., Karaa, S. and Jarboui, O. (2020) Records of Elasmobranch Species from the Kerkennah Archipelago in Tunisia (Central Mediterranean). *INSTM Bulletin*: *Marine and Freshwater Sciences*, **47**, 51-62.

[34] Abdel-Aziz, S., Khalil, A. and Abdel-Maguid, S. (1993) Reproductive Cycle of the Common Guitarfish, *Rhinobatos rhinobatos* (Linnaeus, 1758), in Alexandria Waters, Mediterranean Sea. *Marine and Freshwater Research*, **44**, 507-517. https://doi.org/10.1071/mf9930507

[35] Ragheb, E. and Hasan, M.W.A. (2021) First Record of *Pteroplatytrygon violacea* (Bonaparte, 1832) with Annotation of Cartilaginous Fishes By-Catch by Gill Nets (Egyptian Mediterranean). *Egyptian Journal of Aquatic Research*, **47**, 387-392. https://doi.org/10.1016/j.ejar.2021.09.002

[36] Buzaid, E.M. (2019) Biometric study of Common Guitarfish *Rhinobatos rhinobatus* in Dernah Coast, Libya (June-December 2016). *International Journal of Pharmacy & Life Sciences*, **10**, 6388-6396.

[37] Lteif, M., Khalaf, G., Jarraya, M., Mouawad, R. and Lenfant, P. (2014) The Status of the Cartilaginous Fish Species in the Lebanese Coastal Waters. *International Congress on "Estuaries and Coastal Marine Protected Areas" ECPA*, İzmir, 4–6 November 2014, 51-54.

[38] Lteif, M., Mouawad, R., Khalaf, G., Lenfant, P. and Verdoit-Jarraya, M. (2016) Population Biology of an Endangered Species: The Common Guitarfish *Rhinobatos rhinobatos* in Lebanese Marine Waters of the Eastern Mediterranean Sea. *Journal of Fish Biology*, **88**, 1441-1459. https://doi.org/10.1111/jfb.12921

[39] Hamwi, N., Ali-Basha, N. and Altajer, H. (2024) Population Growth Assessment of Common Guitarfish *Rhinobatos rhinobatos* and Vulnerability to Fishing along the Syrian Coast in the Eastern Mediterranean Sea. *International Journal of Oceanography & Aquaculture*, 8, Article ID: 000344.

[40] Giovos, I., Chatzispyrou, A., Doumpas, N., Stoilas, V.O. and Moutopoulos, D.K. (2018) Using Unconventional Sources of Information for Identifying Critical Areas for the Endangered Guitarfish in Greece. *Journal of the Black Sea/Mediterranean Environment*, **24**, 38-50.

[41] Abd Rabou, A.F. (2020) The Palestinian Marine and Terrestrial Vertebrate Fauna Preserved at the Biology Exhibition, Islamic University of Gaza, Bombarded by the Israeli Army in December, 2008. *Israa University Journal for Applied Science*, **4**, 9-51. https://doi.org/10.52865/hfrs6095

[42] Abd Rabou, A.F.N., Elkahlout, K.E., Elnabris, K.J., Attallah, A.J., Salah, J.Y., Aboutair, M.A., *et al.* (2023) An Inventory of Some Relatively Large Marine Mammals, Reptiles, and Fishes Sighted, Caught, By-Caught, or Stranded in the Mediterranean Coast of the Gaza Strip-Palestine. *Open Journal of Ecology*, **13**, 119-153. https://doi.org/10.4236/oje.2023.132010

[43] Abd Rabou, A.N., El-Kichaoui, A.Y., El-Bashiti, T.A., Abdel Aziz, I.I., Elnabris, K.J., Aliwaini, S.H., *et al.* (2025) On the Mummified Marine and Terrestrial Vertebrate Fauna Adorning the Biology Department Museum at the Islamic University of Gaza, Gaza Strip, Palestine, before the Israeli War on October 7, 2023. *Open Journal of Ecology*, **15**, 528-568. https://doi.org/10.4236/oje.2025.159030

[44] Abd Rabou, A.N. (2013) Priorities of Scientific Research in the Fields of Marine Environment and Fishery Resources in the Gaza Strip—Palestine. *Priorities of Scientific Research in Palestine*: *Towards a National Directory of Scientific Research*, Gaza Strip, 25-26 March 2013, 481-522.

[45] Golani, D., Öztürk, B. and Başusta, N. (2006) Fishes of the Eastern Mediterranean.

Turkish Marine Research Foundation, 260 p.

[46] Dulvy, N.K., Pacoureau, N., Rigby, C.L., Pollom, R.A., Jabado, R.W., Ebert, D.A., *et al.* (2021) Overfishing Drives over One-Third of All Sharks and Rays toward a Global Extinction Crisis. *Current Biology*, **31**, 4773-4787.e8. https://doi.org/10.1016/j.cub.2021.08.062

[47] Compagno, L.J.V. (1984) FAO Species Catalogue. Vol. 4: Sharks of the World. FAO Fisheries Synopsis No. 125, 655 p.

[48] Serena, F. (2005) Field Identification Guide to the Sharks and Rays of the Mediterranean and Black Sea. FAO Species Identification Guide for Fishery Purposes. Food and Agriculture Organization of the United Nations (FAO), 97 p.

[49] Stevens, J., Bonfil, R., Dulvy, N.K. and Walker, P.A. (2000) The Effects of Fishing on Sharks, Rays, and Chimaeras (Chondrichthyans), and the Implications for Marine Ecosystems. *ICES Journal of Marine Science*, **57**, 476-494. https://doi.org/10.1006/jmsc.2000.0724

[50] Cavanagh, R.D. and Gibson, C. (2007) Overview of the Conservation Status of Cartilaginous Fishes (Chondrichthyans) in the Mediterranean Sea. IUCN, 42 p.

[51] Bradai, M.N., Saidi, B. and Enajjar, S. (2018) Overview on Mediterranean Shark's Fisheries: Impact on the Biodiversity. In: Türkoğlu, M., Önal, U. and Ismen, A., Eds., *Marine Ecology—Biotic and Abiotic Interactions*, InTech, 211-230. https://doi.org/10.5772/intechopen.74923

[52] Musick, J.A., Burgess, G., Cailliet, G., Camhi, M. and Fordham, S. (2000) Management of Sharks and Their Relatives (Elasmobranchii). *Fisheries*, **25**, 9-13. https://doi.org/10.1577/1548-8446(2000)025<0009:mosatr>2.0.co;2

[53] Heupel, M., Carlson, J. and Simpfendorfer, C. (2007) Shark Nursery Areas: Concepts, Definition, Characterization and Assumptions. *Marine Ecology Progress Series*, **337**, 287-297. https://doi.org/10.3354/meps337287

[54] Kyne, P.M., Jabado, R.W., Rigby, C.L., Dharmadi, Gore, M.A., Pollock, C.M., *et al.* (2020) The Thin Edge of the Wedge: Extremely High Extinction Risk in Wedgefishes and Giant Guitarfishes. *Aquatic Conservation: Marine and Freshwater Ecosystems*, **30**, 1337-1361. https://doi.org/10.1002/aqc.3331

[55] Hamza, W., El-Haweet, A. and Ktari, M. (2021) Artisanal Fisheries and Bycatch of Guitarfishes in the Eastern Mediterranean. *Journal of Fish Biology*, **98**, 789-801.

[56] Belhabib, D., Cheung, W.W.L. and Pauly, D. (2015) Food Security and Global Fisheries: An Overview of the Challenges. *Marine Policy*, **51**, 28-35.

[57] Saad, A. and Sabrah, M. (2015) Fisheries and Fish Markets in the Eastern Mediterranean. *Mediterranean Marine Science*, **16**, 123-135.

[58] FAO (2022) The State of Mediterranean and Black Sea Fisheries 2022. Food and Agriculture Organization of the United Nations (FAO)/General Fisheries Commission for the Mediterranean, 154 p. https://www.fao.org/3/cc3370en/cc3370en.pdf

[59] Notarbartolo di Sciara, G., Bradai, M.N., Morey, G., Brahim, K., Camara L., Litvi-nov, F., Dulvy, N. Doumbouya, F., Ducrocq, M., Heenan, A. and Sidi, N. (2016) *Glaucostegus cemiculus*. The IUCN Red List of Threatened Species 2016: e.T63132A104009894. International Union for Conservation of Nature.

[60] Carrier, J.C., Musick, J.A. and Heithaus, M.R. (2012) Biology of Sharks and Their Relatives. 2nd Edition, CRC Press, 666 p.

[61] Taskin, M., Ajmi, N., Bagci, K., Yurddas, E., Suzer, B., Altun, S., *et al.* (2022) The Common Guitarfish *Rhinobatos rhinobatos*: A Descriptive Anatomical Study and Proposed Dissection Techniques. *Anatomia, Histologia, Embryologia*, **51**, 818-822. https://doi.org/10.1111/ahe.12860

[62] Suarez, A.V. and Tsutsui, N.D. (2004) The Value of Museum Collections for Research and Society. *BioScience*, **54**, 66-74. https://doi.org/10.1641/0006-3568(2004)054[0066:tvomcf]2.0.co;2

[63] Moore, A. (2017) Are Guitarfishes the Next Sawfishes? Extinction Risk and an Urgent Call for Conservation Action. *Endangered Species Research*, **34**, 75-88. https://doi.org/10.3354/esr00830

[64] IUCN (2020) The IUCN Red List of Threatened Species: *Rhinobatos rhinobatos* & *Glaucostegus cemiculus*. International Union for Conservation of Nature (IUCN). https://www.iucnredlist.org

[65] Soldo, A., De Sabata, E. and Clo, S. (2025) Recent Records of Critically Endangered Common Guitarfish *Rhinobatos rhinobatos* (Linnaeus, 1758) in the Northern Mediterranean. *Annales*: *Series Historia Naturalis*, **35**, 169-196.