J. Black Sea/Mediterranean Environment
Vol. 24, No. 1: 38-50 (2018)

RESEARCH ARTICLE

Using unconventional sources of information for identifying critical areas for the endangered guitarfish in Greece

Ioannis Giovos[1]*, Archontia Chatzispyrou[2], Nickos Doumpas[1], Vasilis-Orestis Stoilas[1], Dimitrios K. Moutopoulos[3]

[1] iSea, Environmental Organisation for the Preservation of the Aquatic Ecosystems, Thessaloniki, GREECE
[2] Hellenic Centre for Marine Research, Institute of Marine Biological Resources and Inland Waters, Anavyssos, 19013, Attica, GREECE
[3] Technological Educational Institute of Western Greece, Department of Fisheries and Aquaculture Technology, Mesolonghi, GREECE

***Corresponding author:** ioannis.giovos@gmail.com

Abstract

Guitarfishes characterized by special life history traits and comprised a very fragile resource, whereas the insufficient scientific information makes them a group for major conservation concern of the world oceans. The present study aims to present new records on guitarfishes based on unconventional data collection comprised by citizen scientists' reports, social and mass media search, in-depth targeted interviews with expert fishermen and on official reconstructed fisheries statistics. This multiple-folds analysis represents a valuable case study for determining potentially important areas for these endangered species with scarcity of records in Greece. Results exhibited a high concertation of guitarfish sightings in two areas of the Greek Aegean part, both very close to published sightings from the Aegean coast of Turkey. We found that the axis of North to South, from Lesvos Island down to Rhodes Island is a critical area for guitarfish in the Eastern Mediterranean Sea. Additional information on guitarfish sightings will confirm our findings, enrich our knowledge on guitarfish occurrence in the Greek Seas and contribute in future recommendations on their protection, to avoid extinction of these rare batoids in the area.

Keywords: Rhinobatidae, eastern Mediterranean, hot spots, citizen science, Local Ecological Knowledge, *Rhinobatos rhinobatos, Glaucostegus cemiculus*

Received: 08.02.2018, **Accepted:** 24.02.2018

Introduction

Rhinobatos rhinobatos (common guitarfish) and *Glaucostegus cemiculus* (blackchin guitarfish) are two sympatric species with relatively wide, overlapping ranges in the subtropical waters of the eastern Atlantic and Mediterranean Sea. Across the Mediterranean basin, both species are distributed in most countries with the exception of Malta and France, where only *R. rhinobatos* are inhabited. In Greek waters, *R. rhinobatos* is characterized as "probably rare in the area under study as in the whole Mediterranean" (Corsini-Foka 2009) while Ferretti *et al.* (2013) suspect that the species has disappeared from the northern coastal waters of the basin, from the Alboran to the Aegean Sea. On the other hand, the status of *G. cemiculus*has been characterized as poorly understood with the reports from the Aegean Sea being limited; the earliest one being back from 1995 off Rhodes (Corsini-Foka 2009), whereas the most recent ones are referring to two large individuals caught in İzmir Bayin 2013 (Akyol and Capapé 2014), and a single capture in Kuşadası Bay (Filiz *et al.* 2016).

Both of the above species are enlisted as Endangered species in the IUCN Red List of Threatened Species and their fishing, in the EU countries, has been prohibited since 2015 (EU 2102/2015) while international conservation measures are also in place. Despite the importance and the conservation measures issued for the common and blackchin guitarfishes in the Mediterranean, there are still major gaps in the information about their biology, distribution, abundance and life history traits (Newell 2017). Given also that fish species nursery grounds have been affected by habitat degradation due to anthropogenic activities, guitarfishes are likely to extirpate from several areas (Newell 2017). In addition, a large part of their catches is poorly monitored, because they are often caught as by-catch or incidentally during various fishing activities (i.e. artisanal, industrial and recreational) and thus are discarded at sea. Furthermore, the official statistical authority of Greece report elasmobranch not on a species basis but by broader groups, which include several species (i.e. *Rhinobatidae*). Despite the strong conservation status that exist for these two species (Bradai and Soldo 2016; Notarbartolo di Sciara *et al*. 2016), the hyper-complexity of the fisheries legislation (Moutopoulos *et al.* 2017) accompanied with the ecosystem heterogeneity and the multi-species/gear nature of the Greek fisheries (Moutopoulos *et al.* 2015) reduce the effective implementation of policy guidelines and fisheries control and 'place at risk' fisheries management (Tingley *et al.* 2010). Such lack of information compromises the capacity to put in place effective policies, both in terms of stock assessment and fisheries management strategies (Beddington *et al*. 2007).

The in-depth understanding of the quantitative and qualitative characteristics of these two guitarfishes in Eastern Mediterranean waters has not been thoroughly studied and only general studies on sharks and rays existed (Peristeraki and

Megalofonou 2007; Ferretti *et al.* 2008; Dulvy *et al.* 2016) with the exception of the latest report of FAO that reviews the published work on these two species in the Mediterranean Sea (Newell 2017).

Local Ecological Knowledge (LEK) (Johannes *et al*. 2000; Stephenson *et al.* 2016) is frequently used as an alternative source of information when empirical data are not available (Moutopoulos *et al.* 2017). Together with social media information, it can provide important sightings of species in areas where data are scarce, as well as for supplementing and validating scientific data to help empower marine scientists and managers with improved data (e.g., Johannes *et al.* 2000; Uprety *et al.* 2012; Giovos *et al.* 2016). LEK is gradually gaining attention for its flexibility to be transformed into quantitative data (Brotz *et al.* 2012) in order to evaluate changes in the structure and function of marine ecosystems (Bunce *et al*. 2008) and to be incorporated in ecosystem modelling (Ainsworth 2011). In our case LEK provides additional insights to the official records and potentially corrected the above-mentioned inherent limitations of our official data. There are many cases of successful use of LEK in biological and marine conservation studies (Haggan *et al.* 2007), especially with regards to creating marine protected areas (MPAs).

Thus, the aim of this study is to present new records on guitarfishes based on a multiple level approach. The official and meta-analytic fisheries statistics will be used in conjunction with the information derived from expert fisherman knowledge through in-depth targeted interviews with fishermen, divers and other sea users. This multiple-folds analysis performed represents a valuable case study for determining potentially important areas used by these two-endangered species in the eastern Mediterranean basin and provides a case study with well defined, useful and controllable insights for future suggestions on management measures, in order to prevent the extinction of these two endangered species.

Materials and Methods

Citizen Science Reports (CSR)

Data was collected during the citizen science project of iSea "Sharks and Rays in Greece and Cyprus", through social and mass media posts. In May 2017, iSea established an online data repository, where each interested citizen could easily upload information along with a clear picture of shark and ray species. A group on Facebook has been set up for facilitating these reports. The project's group on Facebook numbers ≈800 members up to date, with 400 actively engagedon a daily basis. Three articles and five press releases have been published in local and national press for promoting the project and educating the public, accompanied by a social media campaign on the iSea's social media platforms and pages. The current project utilizes a verified citizen science model as the most cost effective and accurate citizen science model (Gardiner *et al.* 2012).

Observers are requested to provide the photo of the specimen and information on the size (length and/or weight), the depth, the number of observed specimens, the exact location, the date and the type of observation. Only photo-identified observations are recorded in the database.

Social and Mass Media Search (SMS)
Web materials (including videos, social media posts, mass media articles etc.) were gathered through an exhaustive search using simple queries on Google Search. Assuming that the total posts regarding the two species of guitarfish existing in the web from Greece are n_w, we aimed to retrieve a number of videos as close as possible to n_w. The search was initiated using the generic query "Guitarfish" (and all common Greek names for these species) in Greek, followed by a second search round including the query: "Species name/Greece" following the protocol presented by Giovos *et al.* (2016). The resulting records were organized in an excel sheet that any possible valuable information was also recorded.

Targeted interviews
After identifying some important areas in Greece based on the data retrieved from CSR and SMS we performed targeted interviews to marine users for utilizing their local ecological knowledge regarding the occurrence of guitarfish species. Credibility of the interviewers is critical when researchers are trying to retrieve information based on LEK (Davis and Wagner 2003). Therefore, we only selected marine users known to the project, with exhibited species identification abilities that regularly report their findings to the project, were interviewed. LEK can provide insights on perceptions of the fishery resources especially with regards to species composition, mean size, fishing areas, abundance patterns, catch rates as well as biological and ecological aspects of the target fisheries (Johaness *et al.* 2000), all of which are important for conservation and management strategies (Shackeroff and Campbell 2007). During October-December 2017, 17 interviews were conducted among the selected marine users in 15 areas around Greece. The interviews took place through Skype and telephone calls. To minimize any potential bias, all interviews were carried out by the same person, ensuring that questions were presented in an identical manner and freely answered with no prompt or influence. Interviewees, were asked if they have ever seen this species in their area and if yes in which areas, when in what type of substrate, their approximate size, the depth of the observation, if they have picture of their observations and if the species is considered rare in their area or not. If the response to the initial question was no, they were asked if they know anybody that has seen this species in their area, and if so if they could contact him/her to retrieve the available information. If the responders answered no to both questions they were asked if they were aware that the species was present in their area in the past and vanished now. The answers were organized in an excel file and further analyzed.

Official landings data

Official fisheries statistics are routinely collected by various independent sources (Moutopoulos and Koutsikopoulos 2014): (a) the Hellenic Statistical Authority (HELSTAT) monitoring all fishing vessels with engine power < 19HP and covering two periods (1928–1939 and 1964–2010); (b) the Agricultural Bank monitoring small-scale vessels with engine power ≤ 19 HP (since 1974); (c) and the National Company for the Development of Fisheries (ETAnAL) that reported the landings from trawlers and purse-seiners (available data exist since 2000); (d) the Ministry of Agriculture (not routinely involved in data collection). Among the aforementioned data sources, HELSTAT data were the only consistent data available in terms of taxonomic, spatial and temporal resolution, and form the basis for the dataset of FAO (Moutopoulos and Koutsikopoulos 2014). Data presented in this study included the annual landings of the studied species based on the reconstructed fisheries catches during 1950-2015 (updated series of Moutopoulos *et al.* 2015) and the annual average wholesale prices reported by ETAnAL and derived from the quantities of fish traded in the Piraeus market, the largest wholesale market of Greece during 1999-2010. It is worthy to mention that the reconstructed data series used here was incorporating both the reported and unreported catches (e.g. discards), which derived from all engined- and non-engined professional and recreational fishing vessels, a fact that will reduce the uncertainty in the evaluation of the guitarfish fisheries status.

Results

Interview surveys

In total four photo-identified and four without pictures observations of guitarfish individuals obtained through citizen scientists reports (Table 1) and another one through social and mass media search while in total 17 interviews of credible sea users from several areas around Greece were conducted. Results are presented in Figure 1.

Table 1. Guitarfish records collected in the context of the Citizen Science Project "Shark and Rays in Greece and Cyprus". All records refer one indivual each.

Date	Area	Species	Fishing gear/ observations	Depth (m)
22/8/2017	Chios Island	*R. rhinobatos*	Spearfishing	-
13/7/2017	Chios Island	*G. cemiculus*	Spearfishing	shallow
2016	Kos Island	*R. rhinobatos*	Shore-based fishing (surf casting)	shallow
2017	Kos Island	*G. cemiculus*	Shore-based fishing (surf casting)	shallow
9/7/1905	Kos Island	*G. cemiculus*	Shore-based fishing (surf casting)	shallow
22/5/2017	Kos Island	*G. cemiculus*	Spearfishing	-
15/8/2017	Laconian Gulf	*G. cemiculus*	Shore-basedfishing	2.5
2005	Lesvos Island	*Rhinobatos* sp.	Nets	40
2005	Lesvos Island	*Rhinobatos* sp.	Trawl	50

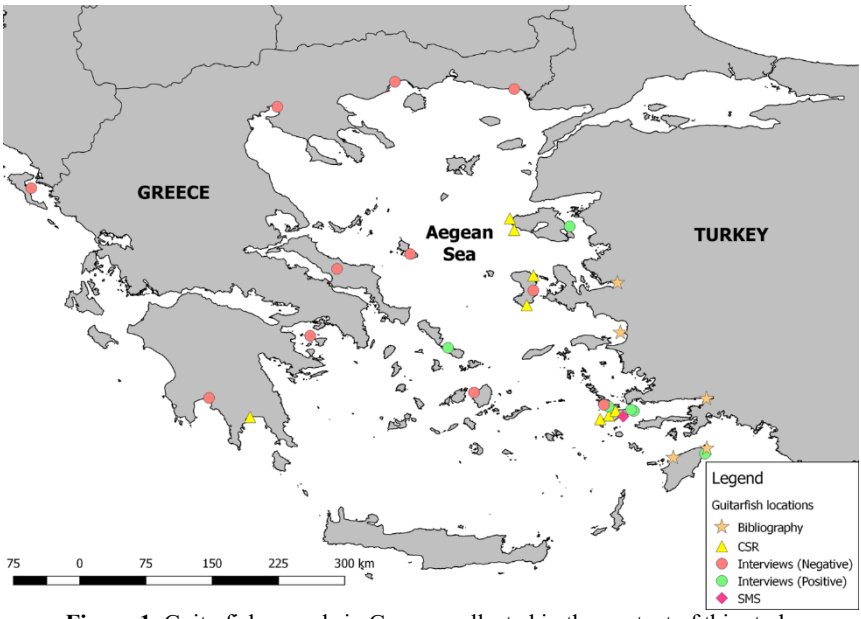

Figure 1. Guitarfish records in Greece, collected in the context of this study. Bibliography presents all the published record, CSR: citizen science records, Interviews (negative): all the targeted interviews contacted with a negative response regarding guitarfish observations by the interviewee, Interviews (positive): those with positive answers, SMS: social and mass media search records

Overall, the total number of records derived from all interview types (i.e. CSR, SMS and targeted interviews) depicted the occurrence of two hotspots of the guitarfish in the Greek part of the Aegean Sea; the Island of Chios and the two neighboring islands Kalymnos and Kos. Integrating all sources of information, namely CSR, SMS, targeted interviews and literature, posed interesting areas of the guitarfish distribution in the Greek waters in the axis of North to South, from Lesvos Island down to Rhodes Island.

Table 2 presents all published records of guitarfish from the eastern Mediterranean based on the exhaustive literature review of Newell (2017); in Figure 1 all Aegean Sea records are presented as Bibliography. The coasts of Turkey pose as an important area for the species distribution in the Eastern Mediterranean, especially in Iskederun Bay, whereas in Greek waters only two specimens have been found both in Rhodes Island, one of each species.

Table 2. Records of guitarfishes in the eastern Mediterranean Sea in published records

References	Date	Area	Species	N	Depth (m)
Başusta and Erdem (2000)	1994-1996	Iskenderun Bay	*R. rhinobatos*	1	
Abdel-Aziz *et al*. (1993)	1989-1990	Alexandria (Egypt)	*R. rhinobatos*	233	
Ogretmen *et al.* (2005)	2000-2001	Gokova Bay (Turkey)	*Rhinobatos* spp.	1	
Ismen *et al.* (2007)		Iskenderun Bay (Turkey)	*R. rhinobatos*	225	
Başusta *et al.* (2008)	2004-2005	Iskenderun Bay (Turkey)	*R. rhinobatos*	115	20-100
Corsini-Foka (2009)	1995	N.E. Rhodes (Greece)	*G. cemiculus*	1	40
Corsini-Foka (2009)	2008	N.W. Rhodes (Greece)	*R. rhinobatos*	1	70
Çek *et al.* (2009)	2005	Iskenderun Bay (Turkey)	*R. rhinobatos*	1	20-100
Gökçe *et al.* (2010)	2008-2009	Yumurtalik Bight (Turkey)	*R. rhinobatos*	1	13-14
Keskin *et al.* (2011)	2006-2007	N.E. Levantine Sea	*G. cemiculus*	1	65
Enajjar *et al.* (2012)	2002-2004	Gulf of Cabes	*G. cemiculus*	513	
Başusta *et al.* (2012)	2010-2011	Iskenderun Bay (Turkey)	*R. rhinobatos*	20	
Başusta *et al.* (2012)	2010-2011	Iskenderun Bay (Turkey)	*G. cemiculus*	262	
Akyol and Capape (2014)	2013	Izmir Bay (Turkey)	*G. cemiculus*	2	6-8
Yaglioglu *et al.* (2015)	2009-2010	Iskenderun Bay (Turkey)	*Rhinobatos* spp.		0-100
Lteif *et al.* (2016)	2012-2014	Lebanese waters	*G. cemiculus*	31	
Lteif *et al.* (2016)	2012-2014	Lebanese waters	*R. rhinobatos*	70	
Filiz *et al.* (2016)	2015	Kusadasi Bay (Turkey)	*R. cemiculus*	1	20
Lteif *et al.* (2016)	2012-2014	Lebanon	*R. rhinobatos*	67	10-110

Official landings statistics

Guitarfishes were reported as *Rhinobatidae* group by the Hellenic Statistical Authority (HELSTAT) and subsequently recorded in FAO database since 1982, whereas landings of this species group were also routinely monitored by the Agricultural Bank of Greece (ABG) for the landings derived from the small-scale vessels, which did not monitor by HELSTAT, since 1974 (see Materials section). The reconstructed catches for *Rhinobatidae,* which incorporates the landings of *Rhinobatidae* monitored by HELSTAT and ABG and the discards estimated by Moutopoulos *et al.* (2015), ranged from 23.4 t (in 2010) to 221.8 t (in 1996) (Figure 2). The landings data estimated by HELSTAT and FAO ranged from 3 t (in 1992) to 117 t (in 1994). The contribution of *Rhinobatidae* catches to the total Greek catches ranged from 0.02% (during 1991-1992) to 0.14% (in 2001). It is worthy to point that since 2010 no data were recorded for *Rhinobatidae* by HELSTAT and subsequently by FAO. Almost 2/3 of the mean (1990-2010) annual landings that were reported by the official authorities were caught by trawls (65%), whereas the rest 30% were caught by the small-scale fishery. All the reported catches, both for trawlers and small-scales, were derived from GFCM-22 area (Aegean Sea) and especially by more than 90% from Northern Aegean (Thracian Sea and Thermaikos Gulf) and to a lesser extent from Central Aegean. The reported economic value of *Rhinobatidae* ranged from 3.34 € to 6.05 € according to the data reported by ETAnAL for the wholesale of Peiraeus during 1999-2010. It has to be noted that neither species were recorded in the MEDITS surveys, which overlapped both spatially and

temporally with the landings reported by ICES (2010). Species-specific records from the entire Aegean Sea are sparse.

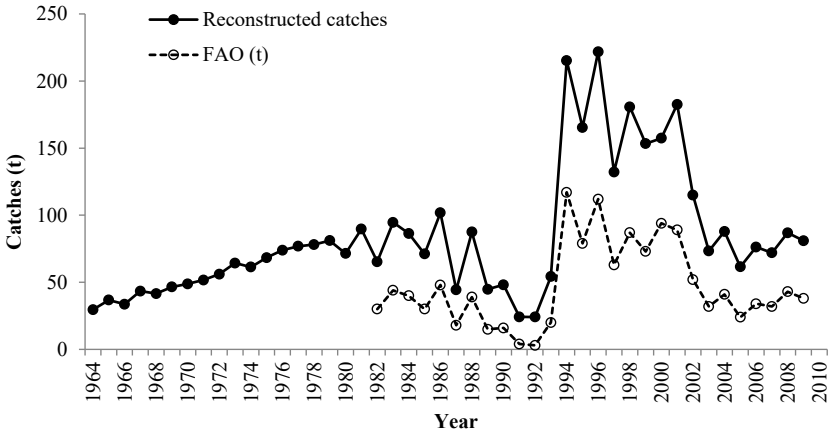

Figure 2. Catch data of *Rhinobatidae* recorded during 1950-2015 in the Greek waters

Discussion

In this study, we present, for the first time, information on two areas that potentially sustain small but existing populations of the endangered guitarfish species in Greece. As any other data collection methods, the information obtained from social media includes potential bias, which needs to be accounted for when utilizing such a methodology. In addition, as identification through photographic evidences is always ambiguous, further targeted researches are of high priority.

Based on the comparison between the landings reported by FAO and the reconstructed ones (incorporating the unreported catches), the latter being by an average of 2.5 times higher. However, according to the guitarfish catch contribution to the total Greek catches, it seemed that no guitarfish directed fisheries currently exist in the Greek seas. Given that the main reason for discarding guitarfish in the Greek seas was the low commercial value, thus they do not comprise a significant income for fishers, measures towards minimizing fisheries exploitation can be effortlessly introduced in the Greek fishery. This was also enhanced by the remarkable drop of catches observed during the recent years (after 2004) that poses serious causes for concern, because recoveries of stocks from such depletion should take many years for the majority of species (Bonfl, 1994), and especially of species with long generations and low reproductive rates, such as guitarfish.

Newell (2017) in his exhaustive bibliography review presented several studies with records of guitarfish species from the Aegean Sea (Figure 1, Table 2).

Most of these records are coming from the Aegean coasts of Turkey, while two are recorded in Rhodes Island, Greece. Our records were almost exclusively concentrated in two areas, namely Kalymnos-Kos Island and Chios Islands (potentially Lesvos Island as well), which are very close to published records from the coast of Turkey, namely Izmir Bay, Kusadasi Bay and Gokova Bay. Given the average depths of this region (Figure 1), it is highly possible that the guitarfish stock is being shared by these two countries.

Alarmingly, all individuals of guitarfish found in the context of the study were captured by different fishing techniques. Two of those were released based on the reporters (presented in Figure 3) while the rest were fished, consumed or confiscated by the coast guards. Both guitarfish species are included in the Annex II of the Barcelona Convention and therefore included in the Recommendation GFCM/36/2012/1. The species cannot be retained on board, transhipped, landed, transferred, stored, sold or displayed or offered for sale, and must be released unharmed and alive, to the extent possible. Thus, most of our records are illegal catches of highly threatened species, raising the concern for the guitarfish conservation policy implementation in Greece.

Figure 3. Two specimens of guitarfish captured and released
A-*Rhinobatos rhinobatos* from Kos Island, B-*Glaucostegus cemiculus* from Gytheio

It is of imperative value for this work to continue. Future researches should focus on utilizing targeted ecological knowledge of residents in the two hotspots identified in the context of this study. Furthermore, field works are extremely important, along with biological sampling, for outlining the species distribution in the two areas and for accurately define the species, and confirm (or reject) the hypothesis of the common population between Turkey and Greece.

Acknowledgments

The authors would like to warmly thank all observers for reporting their findings to iSea and for sharing their photos and information. Furthermore, we would like to thank two 2 anonymous reviewers for their constructive comments and corrections on the manuscript.

References

Abdel-Aziz, S.H., Khalil, A.N., Abdel-Maguidö, S.A. (1993). Food and feeding habits of the common guitarfish, *Rhinobatos rhinobatos* in the Egyptian Mediterranean waters. *Indian Journal of Marine Sciences* 22: 287-290.

Ainsworth, C.H. (2011) Quantifying species abundance trends in the Northern Gulf of California using local ecological knowledge. *Marine and Coastal Fisheries* 3: 190-218.

Akyol, O., 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.

Başusta, A., Başusta, N., Sulikowski J.A., Driggers, W.B., Demirhan, S. A., Çiçek, E. (2012) Length-weight relationships for nine species of batoids from the Iskenderun Bay, Turkey. *Journal of Applied Ichthyology* 28:850-851. dx.doi.org/10.1111/j.1439-0426.2012.02013.x

Başusta, N., Demirhan, S.A., Çiçek, E., Başusta, A., Kuleli, T. (2008) Age and growth of the common guitarfish, *Rhinobatos rhinobatos* (Linnaeus, 1758), in Iskenderun Bay (northeastern Mediterranean, Turkey). *Journal of the Marine Biological Association of the United Kingdom* 88: 837-842.

Başusta, N., Erdem, U. (2000) A study on the pelagic and demersal fishes in Iskenderun Bay. *Turkish Journal of Zoology* 24: 1-19.

Beddington, J.R., Agnew, D.J., Clark, C.W. (2007) Current problems in the management of marine fisheries. *Science* 316: 1713-1716.

Bonfl, R. (1994) Overview of World Elasmobranch Fisheries. FAO Fisheries Technical Papers 341, FAO, Rome, 119 pp.

Bradai, M.N., Soldo, A. (2016) *Rhinobatos rhinobatos*. The IUCN Red List of Threatened Species 2016: e.T63131A16527789 and e.T63132A81165103. Downloaded on 06 December 2017.

Brotz, L., Cheung, W.W., Kleisner, K., Pakhomov, E., Pauly, D. (2012) Increasing jellyfish populations: trends in large marine ecosystems. *Hydrobiologia* 690: 3-20.

Bunce, M., Rodwell, L.D., Gibb, R., Mee, L. (2008) Shifting baselines in fishers' perceptions of island reef fishery degradation. *Ocean and Coastal Management* 51: 285-302.

Corsini-Foka, M. (2009) Uncommon fishes from Rhodes and nearby marine region (SE Aegean Sea, Greece). *Journal of Biological Research* 12: 125-133.

Çek, S., Başusta, N., Demirhan, S.A., Karalar, M. (2009) Biological observations on the common guitarfish *Rhinobatos rhinobatos* from İskenderun Bay (Turkey, Eastern Mediterranean). *Animal Biology* 59: 211-230.

Davis, A., Wagner, J.R. (2003) Who knows? On the importance of identifying "experts" when researching local ecological knowledge. *Human Ecology* 31(3): 463-489.

Dulvy, N.K., Allen, D.J., Ralph, G.M., Walls, R.H.L. (2016) The Conservation Status of Sharks, Rays and Chimaeras in the Mediterranean Sea. (Brochure) IUCN, Malaga, Spain.

Enajjar, S., Bradai, M.N., Bouain, A. (2012) Age, growth and sexual maturity of the blackchin guitarfish *Rhinobatos cemiculus* in the Gulf of Gabès (southern Tunisia, central). *Cahiers de Biologie Marine* 53: 17-23.

Ferretti, F., Myers R.A., Serena, F., Lotze, H.K. (2008) Loss of large predatory sharks from the Mediterranean Sea. *Conservation Biology* 22: 952-964. doi:10.1111/j.1523-1739.2008.00938.x

Ferretti, F., Osio, G.C., Jenkins, C.J., Rosenberg, A.A., Lotze, H.K. (2013) Long-term change in a meso-predator community in response to prolonged and heterogeneous human impact. *Scientific Reports* 3: 1057.

Filiz, H., Bilge, G., Giannetto, D., Yapıcı, S. (2016) New sighting of the endangered species blackchin guitarfish, *Rhinobatos cemiculus*, in the South Aegean Sea. *Marine Biodiversity Records* 9:1-4.

Gardiner, M., Allee, L., Brown, P., Losey, J., Roy, H., Smyth, R. (2012) Lessons from lady beetles: accuracy of monitoring data from US and UK citizen-science programs. *Frontiers in Ecology and the Environment* 10: 471-476.

Giovos, I., Ganias, K., Garagouni, M., Gonzalvo, J. (2016) Social media in the service of conservation: a case study of dolphins in the Hellenic Seas. *Aquatic Mammals* 42(1):12-19. doi:10.1578/AM.42.1.2016.12

Gökçe, G., Çekiç, M., Filiz, H. (2010) Length-weight relationships of marine fishes off Yumurtalık coast (Iskenderun Bay), Turkey. *Turkish Journal of Zoology* 34: 101-104. doi:10.3906/zoo-0905-33

Haggan, N., Neis, B., Baird, I.G. (2007) Fishers' Knowledge in Fisheries Science and Management. Coastal Management Sourcebooks. UNESCO, Paris, France.

ICES (2010) Report of the ICES Advisory Committee, 2010. ICES Advice, 2010. Book 9. 299 pp.

Ismen, A., Yigin, C., Ismen, P. (2007) Age, growth, reproductive biology and feed of the common guitarfish (*Rhinobatos rhinobatos* Linnaeus, 1758) in Iskenderun Bay, the eastern Mediterranean Sea. *Fisheries Research* 84:263-269.

Johannes, R.E., Freeman, M.M., Hamilton, R.J. (2000) Ignore fishers' knowledge and miss the boat. *Fish and Fisheries* 1: 257-271.

Keskin, C., Turan, C., Ergüden, D. (2011). Distribution of the demersal fishes on the continental shelves of the Levantine and North Aegean Seas (Eastern Mediterranean). *Turkish Journal of Fisheries and Aquatic Sciences* 11: 413-423.

Lteif, M., Mouawad, R., Sharif Jemaa, S., Gaby Khalaf, G., Philippe Lenfant, P., Verdoit-Jarraya, M. (2016) The length-weight relationships of three sharks and five batoids in the Lebanese marine waters, eastern Mediterranean. *Egyptian Journal of Aquatic Research* 42: 475-477.

Moutopoulos, D.K., Dimitriou, E., Katselis, G., Koutsikopoulos, C. (2017) Typology of illegal fishing in transitional waters: Fisheries infringement records from Mesolonghi-Etolikon lagoons (Ionian Sea, Greece). *Ocean and Coastal Management* 141: 20-28.

Moutopoulos, D.K., Koutsikopoulos, C. (2014) Fishing strange data in national fisheries statistics of Greece. *Marine Policy* 48: 114-122.

Moutopoulos, D.K., Tsikliras, A.C., Stergiou, K.I. (2015) Reconstruction of Greek fishery catches by fishing gear and area (1950-2010). Fisheries Centre Working Paper #2015-11, University of British Columbia, Vancouver, 14pp.

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 pp.

Notarbartolo di Sciara, G., Bradai, M.N., Morey, G., Brahim, K., Camara L., Litvinov, F., Dulvy, N., Doumbouya, F., Ducrocq, M., Heenan, A., Sidi, N. (2016) *Glaucostegus cemiculus*. The IUCN Red List of Threatened Species 2016: e.T63132A104009894. http://dx.doi.org/10.2305/IUCN.UK.2016-3.RLTS.T63132A104009894.en. Downloaded on 06 February 2018.

Öğretmen, F., Yılmaz, F., Koç, H.T. (2016) An investigation on fishes of Gökova Bay (Southern Aegean Sea). *BAÜ Fen Bil. Enst. Dergisi* 7(2): 19-36.

Peristeraki, P., Megalofonou, P. (2007) Sharks and rays. In: SoHelFI, 2007, State of Hellenic Fisheries, (eds., Papaconstantinou, C., Zenetos, A., Vassilopoulou, V., Tserpes, G.), HCMR Publ., pp. 433-439.

Shackeroff, J.M., Campbell, L.M. (2007) Traditional ecological knowledge in conservation research: problems and prospects for their constructive engagement. *Conservation and Society* 5: 343.

Stephenson, R.L., Paul, S., Pastoors, M.A., Kraan, M., Holm, P., Wiber, M., Mackinson, S., Dankel, D.J., Brooks, K., Benson, A. (2016) Integrating fishers' knowledgeresearch in science and management. *ICES Journal of Marine Science* 73: 1459-1465.

Tingley, D., Ásmundsson, J., Borodzicz, E., Conides, A., Drakeford, B., Runar Eðvarðsson, R., Holm, D., Kapiris, K., Kuikka, S., Mortensen, B. (2010) Risk identification and perception in the fisheries sector: comparison between the Faroes, Greece, Iceland and UK. *Marine Policy* 34: 1249-1260.

Tsikliras, A.C., Moutopoulos, D.K., Stergiou, K.I. (2007) Reconstruction of Greek marine fisheries landings and comparison of National with FAO statistics. In: Reconstruction of Marine Fisheries Catches for Key Countries and Regions (1950-2005) (eds., Zeller, D., Pauly, D.), Fisheries Centre Research Reports 15(2), University of British Columbia, pp.121-137.

Uprety, Y., Asselin, H., Bergeron, Y., Doyon, F., Boucher, J.F. (2012) Contribution of traditional knowledge to ecological restoration: practices and applications. *Ecoscience* 19(3): 225-237. doi.org/10.2980/19-3-3530.

Yaglioglu, D., Deniz, T., Gurlek, M., Erguden, D., Turan, C. (2015). Elasmobranch bycatch in a bottom trawl fishery in the Iskenderun Bay, northeastern Mediterranean. *Cahiers de Biologie Marine* 56: 237-243.