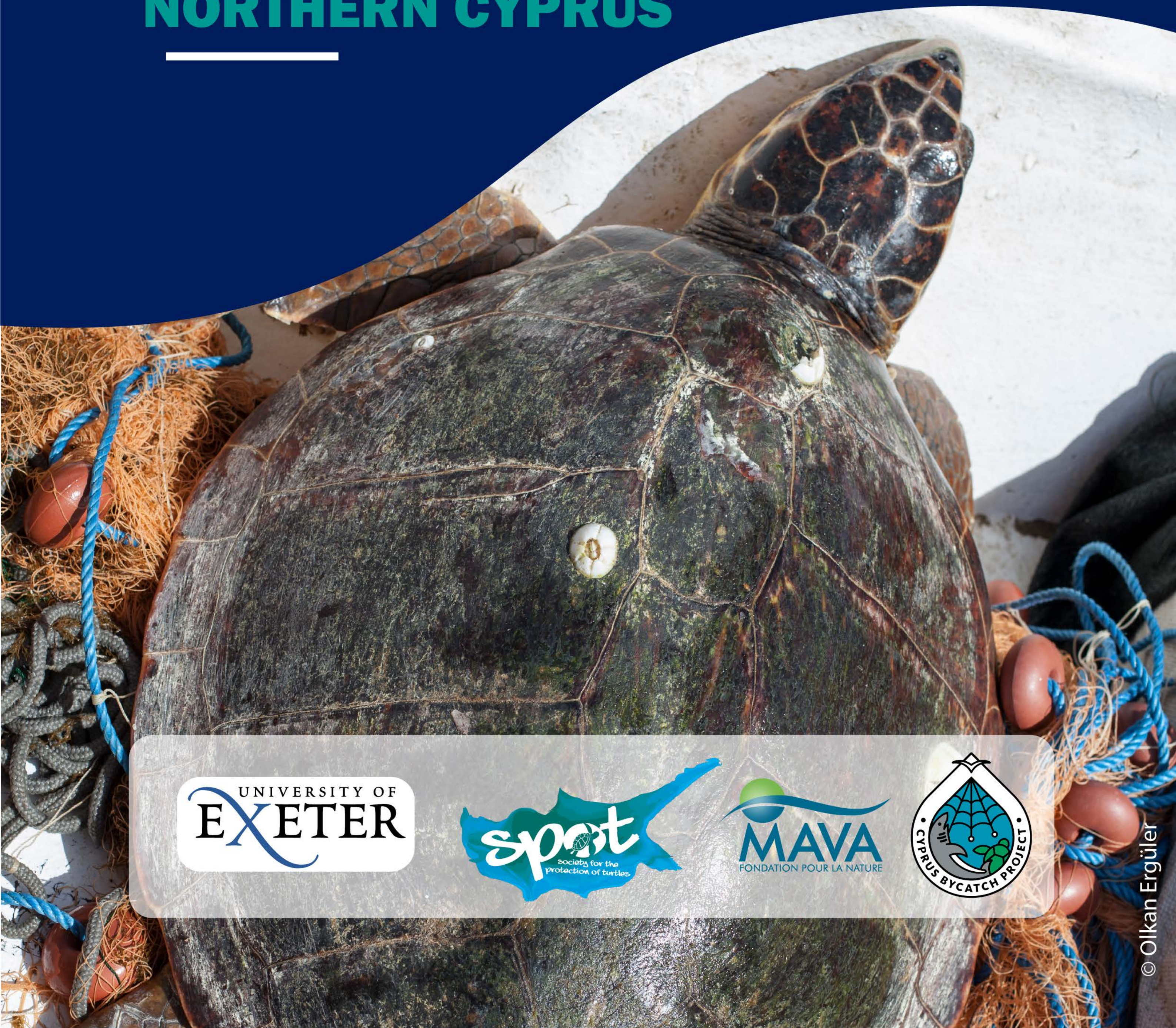
# CYPRUS BYCATCH PROJECT

**“Understanding multi-taxa ‘bycatch’ of vulnerable species and testing mitigation a collaborative approach in Cyprus”**

# TECHNICAL REPORT

**Results of Phase 1 (2018-2019) of the bycatch monitoring programme in**

# NORTHERN CYPRUS





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CYPRUS BYCATCH PROJECT

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Required citation:
Snape, R., Bengil, E., Beton, D., Çağlar, Ç., Palmer, J & Broderick, A. 2020. Cyprus Bycatch Project "Understanding multi-taxa 'bycatch' of vulnerable species and testing mitigation a collaborative approach in Cyprus". Technical Report: Results of Phase 1 (2018-20019) of the bycatch monitoring programme in Northern Cyprus. Society for Protection of Turtles (SPOT). Nicosia. Pp45.

# ACKNOWLEDGMENTS

SPOT is most grateful for the long-term collaboration that has been established with the Turkish Cypriot fishers. During this project, special thanks are owed to the head of the Turkish Cypriots Fishers Union Kemal Atakan, and Heads of Fisheries associations in the Lapta, Boğaz and Karpaz regions, Ertunç Birinci, Hakan Bener and Hür Alevkayası respectively. We thank all participating fishers equally for their efforts to support the project and for their resolve to improve the situation for Northern Cyprus's marine resources and marine biodiversity. For their permission to undertake onboard observations and full support in providing information, as well as their shared resolve to improve fisheries management, we thank the TRNC Ministry for Agriculture and Natural Resources Minister Dursun Oğuz, The Head of the Department for Animal Husbandry Gönen Vurana, and staff of the same office Kemal Şoforoğlu, Tunç Beyıt, Halil Ibrahım, Uğur Sencer, all of whom provided political support. The advice and support on strategies and logistics of this office has been invaluable. Thanks to Burak Ali Çiçek for his advice and collaboration. Together with these and other stakeholders, phase I of the Cyprus Bycatch Project has laid the ground for a better future and we look forward to building this together in phase II. We thank the hard working and resourceful fisheries observers (Annex I) who travelled to Northern Cyprus from Italy, UK, USA, to work intensively as observers with the Turkish Cypriot fishers, and to those staff who trained locally. Many thanks to Silem Sargın and Sude Çelik at Meritta Sea Turtle Rehabilitation Centre which treated a number of turtles that were encountered during this project. We are grateful to Olkan Ergüler for providing the photos that appear on the cover and title pages of the report. Finally, and crucially we thank the MAVA foundation for funding this important project.

The authors gratefully acknowledges the financial assistance of the European Commission, the EU LIFE Programme, and the MAVA Foundation for this publication. The contents of this document are the sole responsibility of the authors and cannot be regarded as reflecting the position of the funders mentioned above. The funder cannot be held responsible for any use which may be made of the information this document contains.



# 1. INTRODUCTION

The bycatch observation program of the Cyprus Bycatch Project aims to understand bycatch of vulnerable species across the island. The project is bi-communal, coordinated by Birdlife International. In the south of the island, Birdlife Cyprus and Enalia Physis direct the observation program, while north of the green line, SPOT directs the program with support from University of Exeter.

Separate technical reports have been prepared by the Cyprus Bycatch Project, one for each community, since the two fleets are separately regulated and have no overlap.

Data have been collected in Northern Cyprus by SPOT according to the GFCM methodology (FAO 2019) and in close coordination with the observer team in the south of Cyprus and with the observer programmes established under the separate MedBycatch Project, thus ensuring consistency. The data contained in this technical report are presented in a way that facilitates their incorporation into a regional Mediterranean-wide analysis.


# 1.1 CHARACTERISTICS OF THE AREA



Northern Cyprus has a coastline of approximately 396 km, over half of the coastline of GSA 25. The Turkish Republic of Northern Cyprus (TRNC) Ministry for Agriculture and Natural Resources Department for Animal Husbandry manages governance related to fishing in Northern Cyprus. Bottom trawling was permitted from 1993 to 1997 but was prohibited in 1998 due to observed environmental impacts (Ulman et al., 2015). There are no pelagic longline vessels in Northern Cyprus, although a small number of the vessels from the small-scale fleet (less than ten vessels) occasionally set pelagic longlines targeting swordfish. The fleet is therefore entirely a small-scale fishery (SSF) with all vessels under 12 meters in length.

The Department of Animal Husbandry maintains and manages a total of 14 fishing shelters for the safe mooring of professional fishing boats. These are Mağusa, Boğaz, Kumyalı, Şelonez, Apostolos Andreas, Yeni Erenköy, Balalan, Kaplıca, Tatlısu, Esentepe, Girne, Lapta, Kayalar and Yedidalga (**Figure 1**). The project operated in all shel-ters except for Kayalar, which is a small port with very few vessels.


*Figure 1: Locations of all fishing shelters of Northern Cyprus.*

Patrols and checks are made by the TRNC Coast Guard. The TRNC Hunters Federation employ a team of wardens who have responsibility for responding to calls on all forms of illegal hunting, including sea fishing. Both operate phonelines for reporting of illegal fishing activities.

Five Marine Protected Areas were identified in 2009 and are proposed as part of the Natura 2000 network of Specially Protected Areas, which include both marine and terrestrial habitats. These MPAs could become ratified on EU community aquis (the accmulated legislation, legal acts, and court decisions which constitute the body of European Union law), which is currently suspended in Northern Cyprus pending a positive outcome of negotiations between the two communities. They are therefore termed "potential Natura 2000 areas". However, terrestrial areas of these sites have already been implemented as SPAs in local legislation by the Department of Environmental Protection, which is under the Ministry for Tourism and Environment. None of the marine areas associated with the potential

Natura 2000 areas are yet considered by marine resource use legislation set out by the Department for Animal Husbandry, which is under the Ministry for Agriculture and Natural Resources. Management plans for the Potential Natura 2000 areas can be accessed at www.dogakoruma.eu. Due to a paucity of data on marine biodiversity and distribution of threatened species, the marine areas of the potential Natura 2000 sites, while not implemented, are not adequately reflective of conservation priorities (Snape et al. 2018a). While they do provide for the protection of nesting sea turtles at priority sites, Mediterranean monk seal (*Monachus monachus*) in the Karpaz and Korucam peninsula areas, and seabirds in the Karpaz peninsula, their management plans contain no information on fisheries and will be very challenging to implement in their current form. The island's only Marine IBA (Important Bird and Biodiversity Area) is around the Kleides islands in Karpaz Peninsula (BirdLife International 2020) where 5 – 20 pairs of Audouin's gull (*Larus audouinii*) and around 50 pairs of Mediterranean shag (*Phalacrocorax aristotelisdesmarestii*) breed. Audouin's Gull are thought to be in decline here (Hellicar et al., 2016).

Despite protective legislation for sea turtles, monk seals, cetaceans and a few elasmobranch species, bycatch mortality affects all four groups. Dolphin interactions with set nets and sea turtle mortalities occur on all coasts (Snape et al., 2018b; Snape et al., 2013), with particularly heavy sea turtle bycatch in Famagusta Bay (Snape et al., 2015). In 1998, incidental catches of sea turtles in Northern Cyprus and Turkey were examined (Godley et al., 1998), which raised cause for concern regarding sea turtle bycatch. However, no continuous effort was made to systematically monitor sea turtle bycatch until 2009, when a national stranding network was established in response to increased strandings of sea turtles. By 2013 it was clear that nearly all strandings result from fisheries bycatch in set nets and that at least 1000 turtles were being caught annually (Snape et al., 2013). During the ten years of stranding monitoring the project has gone from reporting on 30 – 60 stranded turtles to 200 – 350 sea turtles annually in recent years. Although the capacity and network of stranding monitoring has greatly increased, the number of turtles being recorded dead on the coast or caught in fisheries is concerning. In addition to greater coverage and public reporting of strands, increasing fishing effort and recovering sea turtle populations may also be contributing factors.

Small numbers (<5) of common bottlenose dolphins strand annually. Bottlenose dolphin (*Tursiops truncatus*) bycatch is confirmed through questionnaire surveys (Snape et al., 2018b). Bottlenose dolphins are acoustically recorded depredating at over a quarter of sets targeting red mullet, picarel and bogue (Snape et al., 2018b) and occur on all coasts. They are recorded almost daily at fish farms in Famagusta Bay, through an ongoing acoustic study (SPOT unpublished data). Curvier's beaked whales (*Ziphius cavirostris)* also strand occasionally (every few years), but no association with fisheries has yet been confirmed for those cases.

Adult monk seals occasionally strand on the north coast and where necropsies have been performed, mortality in set nets has been suspected (Beton et al., in press; **Plate I**). Monk seals breed regularly on the west coast and occasionally on the north coast and are sighted by fishers on all coasts relatively frequently. Questionnaire surveys show that they are occasionally caught in set nets.

Audouin's gull follow fishing vessels around the coast, where they collect discards. Particularly on the north coast, and are present throughout the year, with winter records of birds ringed in Greece. No bycatch of this species is suspected but they may be either i) in competition with fisheries around the breeding colony ) benefiting from fisheries discards. Tracking studies are required to understand this interaction and inform management in the Karpaz Marine IBA/ potential Natura 2000 site (**Plate II**). Fishers operating around the Kleides islands catch Mediterranean shags in set nets extremely rarely (discussions between the lead author and fishers), but low-level bycatch and resource competition is likely a threat to this colony. Again, tracking studies are required to understand their habitat use and inform fisheries management. Scopoli's shearwaters (Calonectris diomedea) have been recorded taking bait from demersal longlines during daytime setting (Plate III). Thousands of Scopoli's shearwater pass along the north coast in autumn when they are seen foraging (Flint 1999; Plate IV). There is therefore possibility of some sporadic shearwater bycatch on longlines particularly during autumn. However, daytime setting of longlines is rare so the potential for this interaction is low.

*Plate I: Adult monk sea stranded on the north coast in 2012. Fisheries bycatch was considered the likely cause of death. Other monk seal strandings are recorded in SPOT annual reports. Robin Snape.*

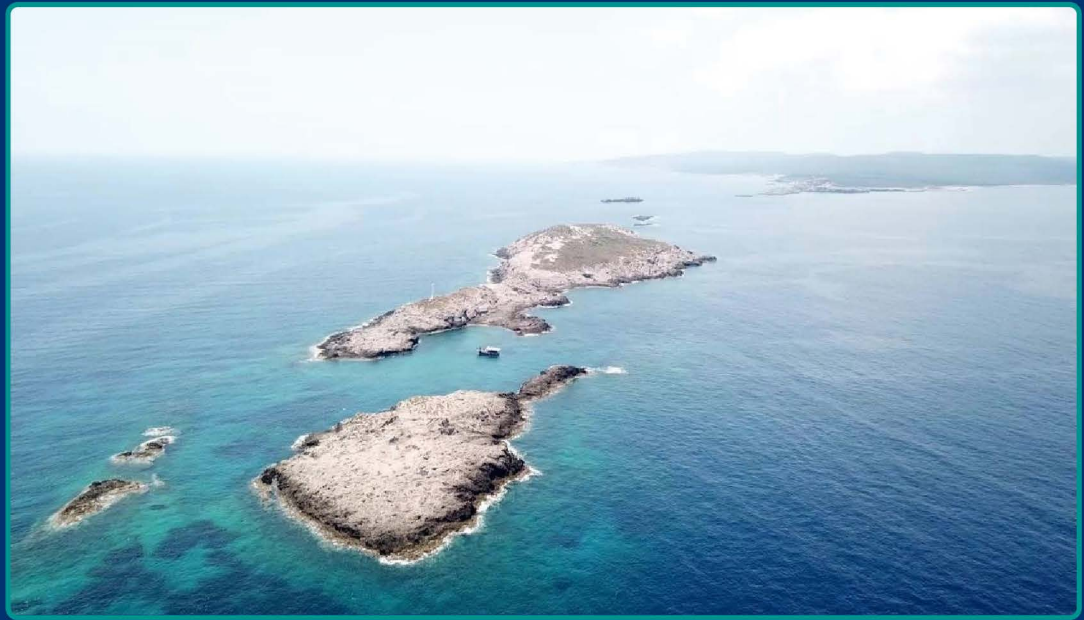

*Plate II: Kleides Islands Marine IBA and Potential Natura 2000 site. The islands support Cyprus' only colony of Audouin's gulls, which is also the most easterly outpost breeding site for this species. An important colony of Mediterranean Shag also uses the site, both species are protected by international conventions. Muddy Duck.*

Plate III. Scopoli's shearwaters taking bait from a demersal longline set in the afternoon, April 2011, Famagusta Bay. Robin Snape.

Plate IV. Shearwaters aggregating off Balalan (Figure 1) to feed on zooplankton held at the surface by a school of little tunny (*Euthynnus alletteratus*). Autumn 2018. Dağan Aydener.

Relatively little information is available on the distribution of elasmobranchs. Until quite recently there were no elasmobranch specific studies and the only knowledge of the fauna was from an overview on the fish diversity (Coker and Akyol (2014) and references therein). In 2019, a study was published by Akbora et al. (2019), reporting the presence of the smalltooth sand tiger (*Odontaspis ferox*), listed as critically endangered in the Mediterranean (IUCN Redlist 2020), which was caught by small-scale fisheries from Yedikonuk, Karpaz Peninsula. With this addition the number of species increased to 14, 7 sharks and 7 rays, of which 7 are species of conservation concern (Critically Endangered, Endangered, Vulnerable or Near Threatened) and 3 data deficient species based on International Union for the Conservation of Nature (IUCN) Redlist 2020. Due to this paucity of published studies, it is not possible to evaluate the current status of elasmobranch populations, and there is a clear need for studies in this area.

Due to the postponement of EU community aquis in Northern Cyprus, and the political isolation of the TRNC authorities, international regulations and conventions are not yet applicable in this region. The current fisheries constitution (Aquatic Production Law 27-2000) was ratified in 2000 and is therefore outdated, although some amendments and attached articles have been made. A new draft fisheries constitution includes improved and more extensive measures to protect threatened species. However, this has been in development for almost ten years and due to disagreements among stakeholders and political instability, challenges and delays have been faced in Ministerial signing-off of this updated constitution. The new draft legislation currently being debated provides limited protected areas around some monk seal caves and small dive sites. There is opportunity now to include more sweeping measures based on the results of recent studies, if the right environment can be created with stakeholders.

According to the current fisheries legislation (Fisheries Law 27-2000), regarding professional or amateur (recreational) fisheries, the following species are protected; Monk seal, Sandbar shark (*Carcharhinus plumbeus*), loggerhead turtle, green turtle, Leatherback turtle (*Dermochelys coricea*), Nile soft-shelled turtle (*Trionyx triunguis*), Basking shark (*Cetorhinus maximus*) and all Delphinidae (dolphin) sp. Regarding these aforementioned species, it is forbidden to kill, own, buy, market, display them for selling purposes or having any intentions to do so of any body parts, eggs or dried forms of the whole body (Fisheries Law 27-2000). The Law on Flora, Fauna and Wild Birds (Environment Law 18-2012) protects all these listed species or groups, as well as seabirds. Only the two elasmobranchs species listed above (*Carcharhinus plumbeus and Cetorhinus maximus*) are under any form of protection and trade and consumption of all other species is currently permitted. Furthermore, trade of elasmobranchs protected by international conventions in Republic of Cyprus, is suspected across the Green Line regulation (Council Regulation 866/2004) and this is something which SPOT and Enalia Physis are working to address through improved/observed monitoring of check point marine products trade.

For more detailed legislation regarding the regulations refer to Annex II.

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# 1.2 DESCRIPTION OF FISHING EFFORT

Northern Cyprus's fishing sector consists entirely of coastal fishing, with small-scale fishing vessels of 4 to 12 meters long, which use bottom set nets (including monofilament and multistrand trammel nets and gillnets), bottom set longlines and, rarely, pelagic longlines. Set nets target a great variety of demersal fish and are used by nearly all active vessels throughout the year. For example, gillnets of 18 - 22 mm target picarels (*Spicara spp.*) in spring and bogue (*Boops boops*) in summer and these are usually monofilament, while much larger, thick multistrand gillnets of 100 mm mesh target greater amberjack (*Seriola dumerili*) in spring. Multistrand trammel nets of 18 mm target striped red mullet (*Mullus surmuletus*) parrotfish (*Sparisoma cretense*) and recently a fishery has become established for the invasive red-sea goatfish (*Parupeneus forsskali*). Monofilamant trammel nets of 28 - 32 mm mesh target siga-nids (*Siganus spp.*) in shallow waters (< 20 m deep) and can also be used to target dentex, common pandora (*Pagellus erythrinus*) and groupers (*esp. Epinephelus aeneus and Epinephelus marginatus*) in deeper waters (30 - 90 m), or hake (*Merluccius merluccius*) in very deep waters (> 200m). These are some examples of the extremely diverse set net metiers that are deployed. Bottom-set/demersal longlines are used by many vessels, but are almost always secondary to set nets and tend to be used more seasonally or when set net target species are not in abundance, or when there are problems with set netting such as repeated dolphin depredation events. Pelagic longlines are used by a small number of vessels (less than 10; lead author personal observations) to target swordfish. They are set on drifting moorings and checked every day or so. Since the vessels are small, pelagic longlines are hard to operate and fishers tend not to use radar reflectors on the drifting moorings, resulting in major losses of equipment when large vessels cruise over them. Overall, more committed fishers, who fish as their only source of income, tend to maintain and use a wider selection of set net and longline types. While those who fish as a second job/part-time, tend not to invest in seasonally preparing target-specific and seasonal gears.

According to the TRNC Department for Animal Husbandry, during 2019, 498 professional fishing boats were moored in the fishing shelters of Northern Cyprus. All of these were SSF vessels < 12 m total length. Three hundred and forty of these vessels were licenced and therefore, considered active. **Table 1** shows the total number of registered and active vessels by region in 2019. These data are not available by port for the reporting period.

**Table 1: Fishing effort (total number of vessels and active vessels) in 2019. All vessels are SSF vessels.**

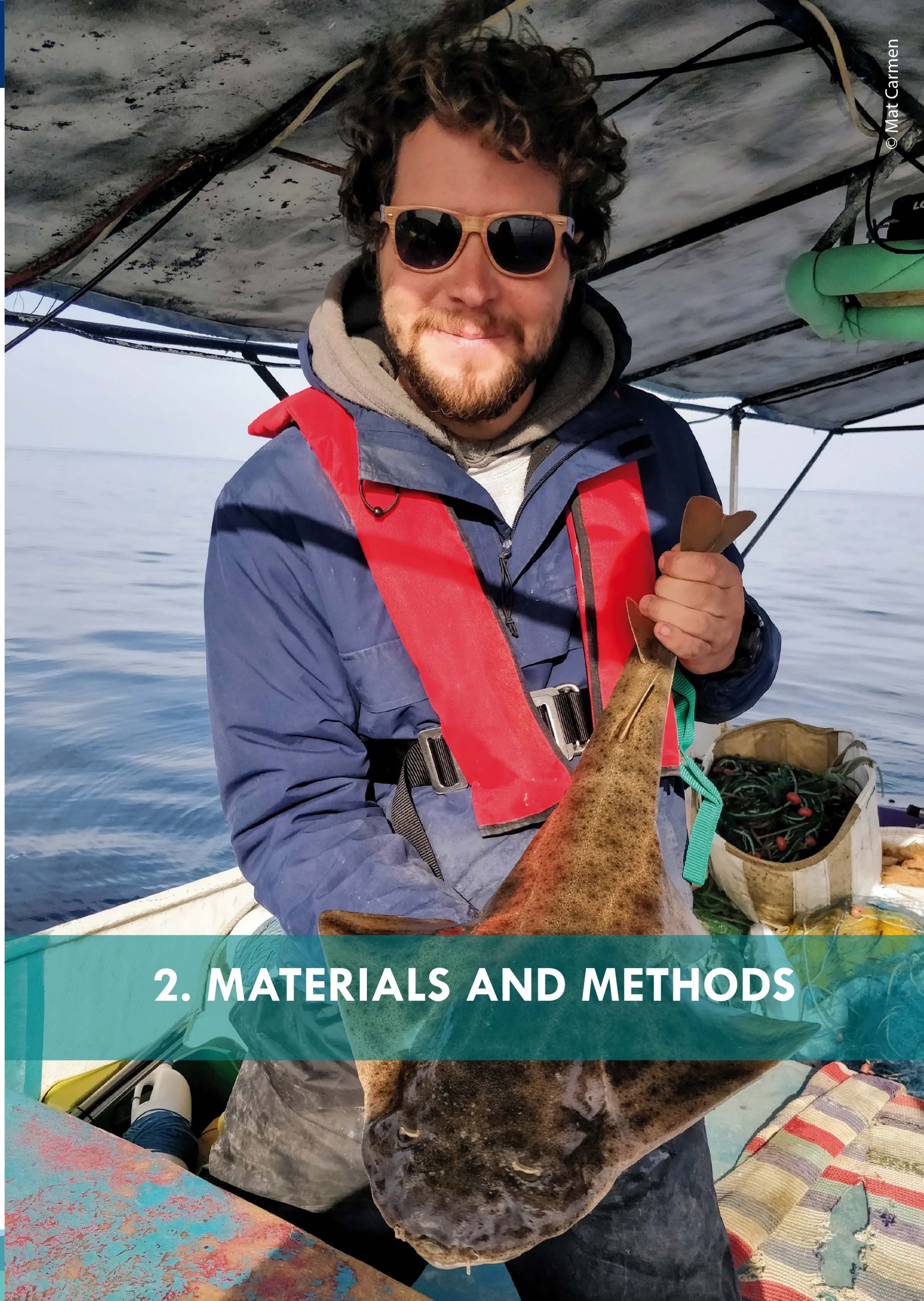
| Region | Vessels Registered in Ports | Active Vessels |
|---|---|---|
| Gemikonaği | 64 | 41 |
| Girne | 135 | 94 |
| Mağusa | 299 | 205 |
| Total | 498 | 340 |

Table 2. Estimated fishing effort for Northern Cyprus in 2019 (Source: TRNC Department for Animal Husbandry 2020).

| | |
|---|---|
| Trawlers | 0 |
| Longliners | 0 |
| Small-scale vessels (with and without engine) | 45,062 |
| Polyvalents | 0 |
| Purse-seiners | 0 |

In 2019, the fishing effort of the small-scale inshore fishery (0 – 12m length) was 45,062 days (**Table 2**). This is based on information provided to the TRNC Department of Animal Husbandry on the number of active days fishers fished during 2018. Such information is gathered when fishers collect their licences for the subsequent year.






# 2. MATERIALS AND METHODS

Incidental bycatch was recorded according to standardised data collection procedures (following the GFCM protocol) by on board fisheries observers. Wherever feasible, bycaught specimens were sampled at sea (or, alternatively, at landing place), and data, including among others, species, body size measurements, weight, and sex determination were recorded. SPOT observers were placed on randomly selected vessels conducting typical fishing trips from the main ports (see **Fig.1** above) in the investigated area. However, the fishers were selected based on their willingness to participate in the Cyprus Bycatch Project and accommodate observers on board, and also were more likely to be involved if they were fishing regularly, thus facilitating regular monitoring. Thus, nearly all fishers participating were full-time fishers and fishing was their only source of income. The longstanding relationship and collaboration of SPOT personnel with fishers has helped in creating and maintaining a network of fishers throughout the monitoring program. SPOT's fisheries liaison officer maintained a list of participating fishers, organised permissions from the TRNC Department for Animal Husbandry for named observers to go onboard vessels of participating fishers and organised observations according to the schedules of fishers and the observer team.

Data collection was achieved through onboard observations and fishers' self-reporting using data sheets. Among the two methodologies used, onboard observations are considered the most effective and valid. Although it should be noted that self-reporting fishers were subsidised at a rate of five euro per fishing day for their completion of reports on each set deployed during each reporting fishing day. Good correspondence was maintained with them via telephone, with identification of many samples confirmed through images shared with our fisheries liaison officer through WhatsApp and Messenger applications.

Fifteen onboard observers (Appendix I) were recruited as experienced interns from overseas who travelled to Northern Cyprus and were hosted at SPOT's volunteer accommodation in Alagadi at no cost to themselves, for periods of three to five months, with vehicles, all equipment and basic bed and board provided. This method was decided upon at an early stage a) to get going quickly, b) to utilise SPOT/University of Exeter's existing resources and good recruitment record for international volunteers and c) due to relatively low local interest in working in the fisheries sector. For safety reasons, observers generally worked in groups of two. Two local staff were recruited, trained and participated in onboard data collection.

Onboard observations were undertaken from January 21, 2018 to October 17, 2019. Self-reporting was undertaken from May 5, 2018 to September 29, 2019. In total, 178 fishing days were sampled through onboard observations, while 721 fishing days were sampled through self-reporting. Nine vessels were sampled through self-monitoring while 23 vessels were sampled through onboard observations. Due to low availability of fleet activity data from government sources at the onset of the project, our aims were to cover as many fishing days as possible with the available funds and reach a minimum of 0.5 % coverage by onboard observations, increasing that to 2 % coverage through self-reporting. The GFCM guidelines consider 0.5 % fleet effort coverage to be minimal and 2 – 7 % to be optimal.

In order to create a snapshot of bycatch recording for 2019 for direct comparison with other fleets in the Cyprus Bycatch Project, data are presented for the year 2019. To provide a clearer picture of overall bycatch, using the full number of observations, data are also presented for the whole observation period. Fleet and effort statistics for 2019 are used for all extrapolations.

Organisms were identified to species level where possible. Identification of species was obtained from available identification guides, current literature and knowledge among our team, which includes experts on sea turtles and elasmobranchs. The methodology followed for data collection was based on the manual for monitoring incidental bycatch of vulnerable species published by FAO (2019). At the end of every fishing trip, onboard observation data were uploaded on a shared database and validated throughout the project. Self-monitoring data sheets were gathered from ports during regular port visits and collated.

Stranding monitoring was undertaken according to SPOT's long-term study, methods and results of which are presented in SPOT's annual reports (available on request).

Finally, we established an "incidental observation" bycatch database, to record bycatch observations that were made opportunistically, and not as part of a systematic monitoring effort. Specimens in press, social media, and reported by fishers not participating in systematic monitoring were collated. In each case we followed up with the fisherman the identification, and details of the metier in which the animal was caught and its fate. This database has become a long-term project of SPOT and some summary statistics are provided.


# 3. RESULTS



## 3.1 BYCATCH ANALYSIS

During the sampling period (2018 – 2019), 35 %, 27 %, 21 % and 17 % of the gear used was gillnets, trammel nets, combined gillnets-trammel nets and longlines respectively (**Table 3**). The main target and discarded species as well as the discards occurrence per gear type are shown in **Table 3.**

**Table 3: Main fishing gear per vessel group.**

| | Main gear | Frequency (%) of gear used | Catch composition (top 10) | Discards composition | Discards occurrence |
|---|---|---|---|---|---|
| Small-scale vessels (with and without engine) | Gillnets | 35.2 | *Boops boops, Spicara smaris, Mullus barbatus, Spicara meana, Seriola dumerili, Lagocephalus sceleratus, Serranus scriba, Pterois miles, Parupeneus forsskali, Scorpaena sp.* | *Lagocephalus sceleratus, Pterois miles, Muraena sp., Fistularia commersonii, Sargocentron rubrum* | Low |
| | Trammel Nets | 27.1 | *Siganus sp., Mullus barbatus, Sparisoma cretense, Epinephelus marginatus, Scyllarides latus, Dentex dentex, Boops boops, Pterois miles, Epinephelinae, Spicara smaris* | *Lagocephalus sceleratus, Pterois miles, Muraena sp., Fistularia commersonii, Sargocentron rubrum* | Low |
| | Combined Gillnets-Trammel Nets | 20.6 | *Boops boops, Sparisoma cretense, Mullus barbatus, Siganus sp., Pterois miles, Epinephelus marginatus, Spicara maena, Scorpaena sp., Scyllarides latus, Lagocephalus sceleratus* | *Lagocephalus sceleratus, Pterois miles, Muraena sp., Fistularia commersonii, Sargocentron rubrum* | Low |
| | Longlines | 17.1 | *Epinephelus marginatus, Epinephelus aeneus, Anguilla sp., Diplodus sargus, Pagrus pagrus, Muraena sp., Pagellus erythrinus, Seriola dumerili, Dentex dentex, Lagocephalus sceleratus* | *Lagocephalus sceleratus, Muraena sp., Batoids* | Low |

Onboard observations covered 37 % of planned fishing trips in the year 2019, and 79 % of the planned trips across the two years. Self-reporting covered 59 % of the planned fishing trips in the year 2019, and 80 % of the planned trips across the two years (**see Table 4**). Table 5 shows the total number of ports covered during the monitoring programme.

**Table 4: Sampling plan (fishing days covered). Overall, 899 fishing trips were sampled across the sampling period, representing 2 % of annual estimated fishing days. In 2019, 616 fishing trips were sampled, representing 1.4 % of estimated annual fishing effort. These are broken down below.**

| 4) SAMPLING PLAN ( 2018 - 2019 ) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | PLANNED | | | ACHIEVED | | | %COVERAGE | | |
| SSF | *by on board fishing observations* | *by number of questionnaires* | *by self-sampling operations* | *by on board fishing observations* | *by number of questionnaires* | *by self-sampling operations* | *by on board fishing observations* | *by number of questionnaires* | *by self-sampling operations* |
| | *225* | *0* | *900* | *178* | *0* | *721* | *79* | *0* | *80* |

| SAMPLING PLAN (2019 ONLY) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | PLANNED | | | ACHIEVED | | | %COVERAGE | | |
| SSF | *by on board fishing observations* | *by number of questionnaires* | *by self-sampling operations* | *by on board fishing observations* | *by number of questionnaires* | *by self-sampling operations* | *by on board fishing observations* | *by number of questionnaires* | *by self-sampling operations* |
| | *225* | *0* | *900* | *83* | *0* | *533* | *37* | *0* | *59* |

**Table 5: Total number of ports covered by the monitoring programme.**

| TOTAL NUMBER OF PORTS COVERED BY THE MONITORING PROGRAMME (2018-2019) | | | | |
|---|---|---|---|---|
| | number of on-board fishing observations | number of questionnaires | number of self-sampling operations | others |
| Gemikonaği | 17 | 0 | 156 | |
| Kayalar | 0 | 0 | 0 | |
| Lapta | 25 | 0 | 104 | |
| Girne | 5 | 0 | 0 | |
| Esentepe | 1 | 0 | 0 | |
| Tatlısu | 19 | 0 | 0 | |
| Kaplıca | 3 | 0 | 0 | |
| Balalan | 11 | 0 | 170 | |
| Yeni Erenköy | 22 | 0 | 227 | |
| Apostolos Andreas | 4 | 0 | 0 | |
| Şelonez | 0 | 0 | 0 | |
| Kumyalı | 10 | 0 | 28 | |
| Boğaz | 30 | 0 | 36 | |
| Mağusa | 31 | 0 | 0 | |



| TOTAL NUMBER OF PORTS COVERED BY THE MONITORING PROGRAMME (2019) | | | | |
|---|---|---|---|---|
| Gemikonaği | 13 | 0 | 131 | |
| Kayalar | 0 | 0 | 0 | |
| Lapta | 16 | 0 | 104 | |
| Girne | 3 | 0 | 0 | |
| Esentepe | 0 | 0 | 0 | |
| Tatlısu | 10 | 0 | 0 | |
| Kaplıca | 3 | 0 | 0 | |
| Balalan | 1 | 0 | 138 | |
| Yeni Erenköy | 10 | 0 | 135 | |
| Apostolos Andreas | 2 | 0 | 0 | |
| Şelonez | 0 | 0 | 0 | |
| Kumyalı | 8 | 0 | 0 | |
| Boğaz | 8 | 0 | 25 | |
| Mağusa | 9 | 0 | 0 | |

Elasmobranchs were the most abundant bycaught taxa among all vessel groups (93 %, n = 715; Fig. 2, Table 6), gear types and methodologies tested. The second most bycaught taxa were sea turtles (7 %, n = 51; **Fig. 2 Table 6**). No other vulnerable species taxa were observed to be bycaught by the observer program (**see Figure 2**). For distribution of all sea turtle and elasmobranch bycatch see Appendix III.

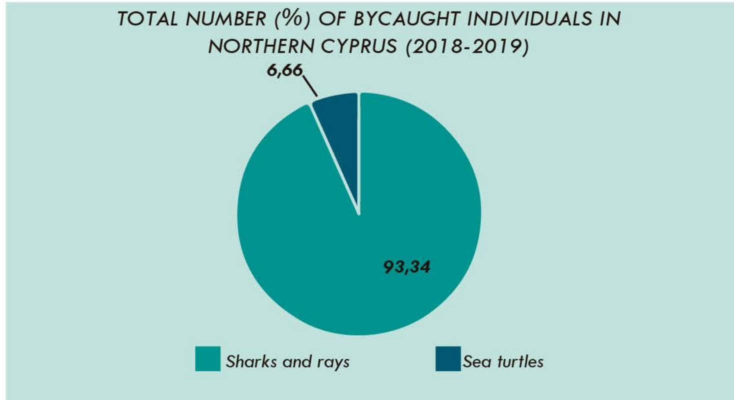



*Figure 2: Total number (%) of bycaught elasmobranchs (n=715) and sea turtles (n=51).*

## Details of elasmobranch bycatch

A total of 715 elasmobranchs of 23 different species were bycaught. The most abundantly caught species was *Dasyatis pastinaca* with 276 individuals caught across the study period (**Table 6**). This was followed by *Squalus blainville* with 113 individuals. *Raja asterias, Scyliorhinus canicula, Torpedo marmorata, Raja montagui* were relatively common with 25 to 30 individuals caught, although 41 *Torpedo sp*. were not identified, suggesting that this species could be more significant than reported and that perhaps further species were overlooked. *Mustelus mustelus, Dasyatis centroura, Dasyatis marmorata, Gymnura altavela, Squatina squatina, Pteroplatytrygon violacea, Raja clavata* and *Isurus oxyrinchus* were encountered relatively commonly with 4 to 14 individuals encountered (listed here in descending order of abundance). *Raja radula, Dipturus oxyrinchus, Taeniura grabata, Squatina oculata, Raja polystigma, Aetomylaeus bovinus, Glaucostegus cemiculus, Centrophorus granulos* and *Carcharhinus plumbeus* were all scarce with 1 to 3 individuals. It is noteworthy that six rhinobatid individuals and three *Squatina* individuals were not identified, there were therefore seven rhinobatids and eleven individuals of *Squatina* species.

## Details of sea turtle bycatch

A total of 51 turtles were caught of three species. Green turtles were most regularly caught with 37 individuals caught during the survey representing 72 % of all sea turtle bycatch where species were identified (**Table 6**). Ten loggerhead turtles were caught representing 20 % of the identified sea turtle captures. One leatherback turtle was also caught. Three individuals were not identified.
Sampling effort was significantly higher in summer (see **Figure 3**) than in other seasons and this is linked to the higher fishing effort during those months.

**Table 6. Number of individuals caught by species or nearest taxonomic group**

**NUMBER OF BYCAUGHT INDIVIDUALS PER SPECIES AND VESSEL GROUP (2018 - 2019)**

**SHARKS AND RAYS**

| | Dasyatis pastinaca | Squalus blainville | Raja asterias | Scyliorhinus canicula | Torpedo marmorata | Raja montagui | Mustelus mustelus | Dasyatis centroura | Dasyatis marmorata | Gymnura altavela | Squatina squatina | Pteroplatytrygon violacea | Raja clavata | Isurus oxyrinchus | Raja radula | Dipturus oxyrinchus | Taeniura grabata | Squatina oculata | Raja polystigma | Aetomylaeus bovinus | Glaucostegus cemiculus | Centrophorus granulos | Carcharhinus plumbeus | Unidentified batoid | Unidentified Torpedo sp. | Unidentified rhinobatid | Unidentified shark | Unidentified Dasyatis sp. | Unidentified Squatina sp. | Not identified | Total | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SFF | 276 | 113 | 34 | 33 | 25 | 25 | 14 | 13 | 11 | 8 | 6 | 5 | 4 | 4 | 3 | 2 | 2 | 2 | 2 | 2 | 1 | 1 | 1 | 70 | 41 | 6 | 5 | 3 | 3 | 0 | 715 | |

**SEA TURTLES**

| | Chelonia mydas | Caretta caretta | Dermochelys coriacea | Not identified | Total | Notes |
|---|---|---|---|---|---|---|
| SSF | 37 | 10 | 1 | 3 | 51 | |

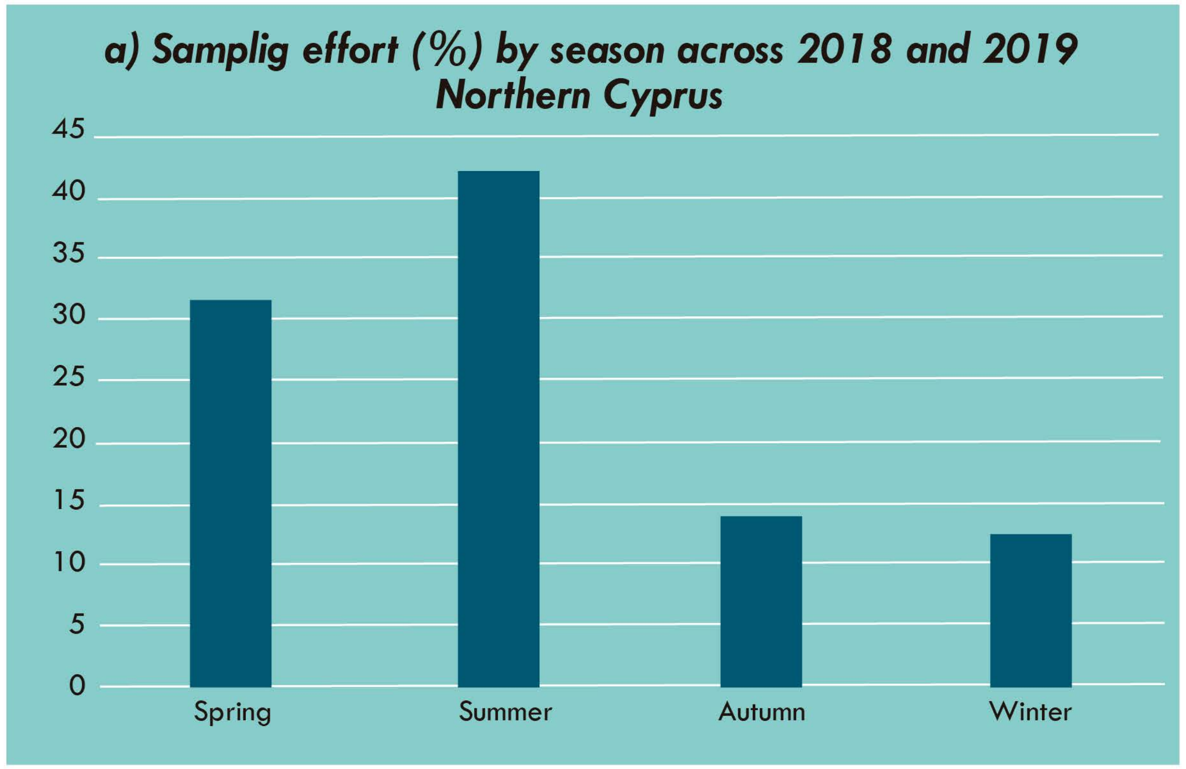
**NUMBER OF BYCAUGHT INDIVIDUALS PER SPECIES AND VESSEL GROUP (2019)**

**SHARKS AND RAYS**

| | Dasyatis pastinaca | Squalus blainville | Scyliorhinus canicula | Raja asterias | Raja montagui | Torpedo marmorata | Mustelus mustelus | Dasyatis centroura | Rhinobatidae | Gymnura altavela | Isurus oxyrinchus | Raja clavata | Pteroplatytrygon violacea | Squatina squatina | Aetomylaeus bovinus | Dasyatis marmorata | Raja polystigma | Squatina oculata | Carcharhinus plumbeus | Centrophorus granulos | Dipturus oxyrinchus | Glaucostegus cemiculus | Unidentified batoid | Torpedo sp. | Squatina sp. | Unidentified shark | Total | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SSF | 156 | 42 | 27 | 23 | 17 | 14 | 9 | 8 | 6 | 5 | 4 | 4 | 3 | 3 | 2 | 2 | 2 | 2 | 1 | 1 | 1 | 1 | 63 | 37 | 3 | 3 | 439 | |

**SEA TURTLES**

| SSF | Chelonia mydas | Caretta caretta | Dermochelys coriacea | Not identified | Total | Notes |
|---|---|---|---|---|---|---|
| | 25 | 5 | 1 | 3 | 30 | |



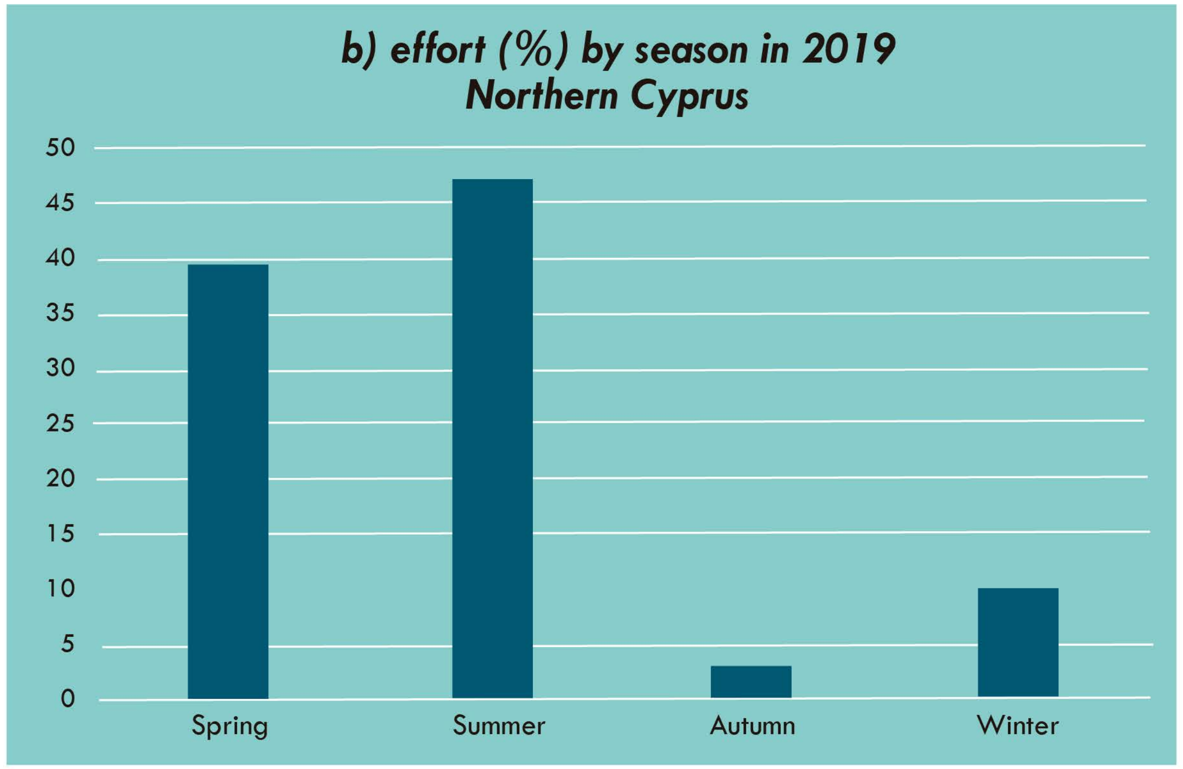




*Figure 3: Sampling effort (%) by seasons for a) the whole sampling period (n=899 trips) and b) 2019 only (n=616 trips).*

Since landing and trade in elasmobranchs is permitted for all species except *Carcharhinus plumbeus* (just one individual was caught and retained) and *Cetorhimus maximus* (no records of this species in Northern Cyprus nor during the project), most fishers were retaining elasmobranchs for sale or using them for bait/sustenance. Largely in response to the outreach of the project, a small proportion were released on hauling. If turtles were alive on hauling, they were safely released. Two green turtles went to a rehabilitation centre and were released after various periods of treatment. The rehabilitated turtles were assumed to have died, since had they been released in a comatic or part-drowned condition, we assume they would have suffered post-release mortality.

**Table 7: Number of individuals released alive per species and vessel group.**

| SHARKS AND RAYS | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Dasyatis pastinaca | Torpedo sp. | Raja asterias | Raja montagui | Scyliorhinus canicula | Mustelus mustelus | Dasyatis marmorata | Gymnura altavela | Squalus blainville | Dipturus oxyrinchus | Squatina oculata | Squatina Squatina | Raja montagui | Dasyatis sp. | Rhinobatid | Unidentified batoid | Not identified | Total | Notes |
| SSF | 50 | 23 | 19 | 17 | 7 | 5 | 4 | 2 | 2 | 1 | 1 | 1 | 1 | 3 | 2 | 2 | | 140 | |
| **SEA TURTLES** | | | | | | | | | | | | | | | | | | | |
| | Chelonia mydas | Caretta caretta | Dermochelys coriacea | | | | | | | | | | | | | | Not identified | Total | Notes |
| SSF | 22 | 6 | 1 | | | | | | | | | | | | | | 1 | 30 | |

Just 20 % of elasmobranchs were released alive and approximately 59 % of sea turtles were released alive (**Table 7**, **Fig. 4**). Minimum green turtle mortality was 41 % and minimum logger-head mortality was 40 %.

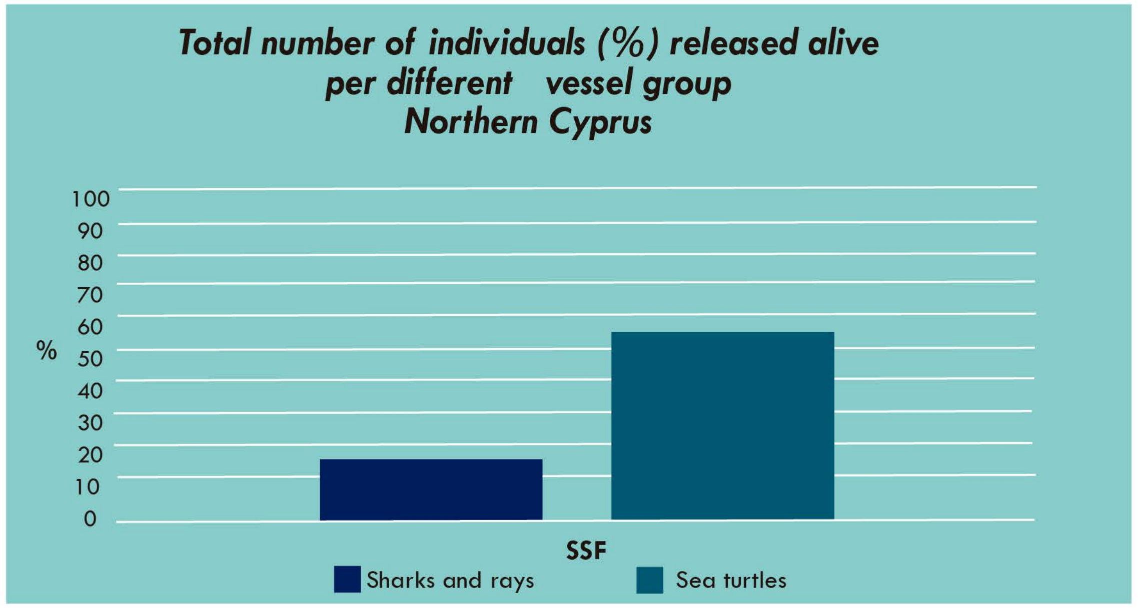



*Figure 4: Total number of individuals (%) released alive per different vessel group.*

## 3.2 ANNUAL BYCATCH RATE ESTIMATES

Estimated bycatch rate (T) during the sampling programme and estimated individuals caught by the fleet (I) were calculated using the data from sampled fishing trips collected across 2018 and 2019 and are presented in **Table 8.** This approach was taken because seasonal coverage of observed trips was good in both years, and some species were encountered in one year but not the other, therefore enabling a better overview of bycatch in the fleet using both years. The number of trips sampled, and individuals caught are also presented in detail above to enable a regional 2019 snapshot analysis against data collected in the MedBycatch Project, using this report.

Annual bycatch estimates are 35,839 elasmobranchs and 2,556 sea turtles. Although given caveats explained in the conclusion of this reports, these estimates should be considered conservative. The majority (%) of elasmobranch species captured are species of conservation concern in the Mediterranean and include many keystone and conservation flagship species.

Whilst no seabird bycatch was recorded, it should be noted that seabird bycatch is often characterised by zero inflated data (i.e. a high proportion of fishing trips with no bycatch), while infrequent mass-mortality events with a high number of individuals bycaught can also occur. Therefore, a high coverage is needed to get an accurate picture of the occurrence of seabird bycatch. It is crucial to take this into account when interpreting the results of any observation programme.

Other relevant considerations for all taxa when assessing annual bycatch rates include the fact that only certain fleet segments are covered by the observer programme, meaning that any interactions with marine taxa occurring in these fleet segments will not be recorded. In addition, there are limitations with certain data collection methodologies (lower accuracy for questionnaires vs on-board observations) and gaps in the temporal and/or spatial distribution of observations (and/or use of different methodologies) both of which are important when assessing bycatch rates.

**Table 8: Small-scale vessels: incidental catches rate and estimation using data from 2018 and 2019.**

| Group of vulnerable species | Bycatch of vulnerable species rate (T) | Estimation of individuals caught by that vessel group during the sampling year (I) | Probability % of catching a vulnerable species with that vessel group | Notes |
|---|---|---|---|---|
| *Marine mammals* | <0.00 | 0 | 0 | More observations are required to detect |
| *Sharks and rays* | 0.80 | 35839 | 0.00176 | |
| *Seabirds* | <0.00 | 0 | 0 | More observations are required to detect |
| *Sea turtles* | 0.06 | 2556 | 0.00013 | |
| *Dasyatis pastinaca* | 0.31 | 13834 | | |
| *Squalus blainville* | 0.13 | 5664 | | |
| *Raja asterias* | 0.04 | 1704 | | |
| *Scyliorhinus canicula* | 0.04 | 1654 | | |
| *Torpedo marmorata* | 0.03 | 1253 | | |
| *Raja montagui* | 0.03 | 1253 | | |
| *Mustelus mustelus* | 0.02 | 702 | | |
| *Dasyatis centroura* | 0.01 | 652 | | |
| *Dasyatis centroura* | 0.01 | 652 | 0 | More observations are required to detect |
| *Dasyatis marmorata* | 0.01 | 551 | 0.00176 | |
| *Gymnura altavela* | 0.01 | 401 | 0 | More observations are required to detect |
| *Squatina squatina* | 0.01 | 301 | 0.00013 | |
| *Pteroplatytrygon violacea* | 0.01 | 251 | | |
| *Raja clavata* | <0.00 | 200 | | |
| *Isurus oxyrinchus* | <0.00 | 200 | | |
| *Raja radula* | <0.00 | 150 | | |
| *Dipturus oxyrinchus* | <0.00 | 100 | | |
| *Taeniura grabata* | <0.00 | 100 | | |
| *Squatina oculata* | <0.00 | 100 | | |
| *Raja polystigma* | <0.00 | 100 | | |
| *Aetomylaeus bovinus* | <0.00 | 100 | | |
| *Glaucostegus cemiculus* | <0.00 | 50 | | |
| *Centrophorus granulos* | <0.00 | 50 | | |
| *Carcharhinus plumbeus* | <0.00 | 50 | | |
| *Unidentified batoid* | 0.08 | 3509 | | |
| *Unidentified Torpedo sp.* | 0.05 | 2055 | | |
| *Unidentified rhinobatid* | 0.01 | 301 | | |
| *Unidentified shark* | 0.01 | 251 | | |
| *Unidentified Dasyiatis sp.* | <0.00 | 150 | | |
| *Unidentified Squatina sp.* | <0.00 | 150 | | |
| *Chelonia mydas* | 0.04 | 1855 | | |
| *Caretta caretta* | 0.01 | 501 | | |
| *Dermochelys coriacea* | <0.00 | 50 | | |
| *Unidentified turtle* | <0.00 | 150 | | |



## 3.3 INTERACTIONS OF VULNERABLE SPECIES WITH FISHING ACTIVITIES

During the bycatch monitoring programme, interactions with the common bottlenose dolphin (*Tursiops truncatus*) were observed on 14 of the 178 trips. Average pod size was 3.4 individuals (range: 1 – 20). On six occasions observers noted that the dolphins were interacting with gear of the fisher or the gear of a fisher nearby, causing depredation on set nets and damaging gear. Acoustic studies in North Cyprus have shown that dolphins often depredate through the night and are rarely observed during hauling and that the economic losses are significant (Snape et al., 2018b).

One monk seal was observed close to the main breeding site in Northern Cyprus and was identified as an adult female. Possibly the female monitored by SPOT's long-term camera trap study at that site (Beton et al., in press).

Loggerhead turtles were seen on three trips, once in a harbour feeding on discards, once at the surface near the boat and once during hauling, when spoilt catch was attributed to the turtle. One adult male green turtle was observed during transit from a fishing site.

Audouin's gulls were observed on 48 (27 %) trips. Average group size was 3.2 individuals (range: 1 – 6). Comments included that birds were "present throughout the haul", "followed the boat increasing in numbers" and "ate discards". Mediterranean shags were present on 44 trips (25 %). No interactions were recorded, and the shags were generally moving along the coast or perched on the water, buoys or rocks. Group sizes were on average 2 individuals (range: 1 – 12). Yelkouan shearwater were observed during two trips, and mixed shearwater and unidentified shearwater groups were particularly notable on the 10th October 2018, when two groups were seen totalling 64 individuals, and on 16th October 2018 three groups totalling 38 individuals were observed, associated with aggregations of tuna at the surface. These observations support the observed autumn migration and foraging behaviour of this group (Flint 1999). Overall group sizes were on average of 13 individuals. An arctic skua was recorded on one occasion and many other seabird and migratory bird observations were made.

## 3.4 INCIDENTAL OBSERVATION BYCATCH DATABASE SUMMARY

Species recorded opportunistically/incidentally are presented in **Table 9.** Particularly noteworthy are additional counts of sea turtle *Caretta caretta, Chelonia mydas,* and the *elasmobranchs, Carcharhinus plumbeus* (just 1 recorded on observer trips), *Isurus oxyrinchus* (double the sample recorded through observed trips), *Hexanchus griseus* (absent from observed trips), *Odontaspis ferox* (absent from observed trips) and additional *Squatinas and Rhinobatids sp.* Note this *O. ferox* record was recently published (Akbora et al., 2019).

**Table 9. Additional records of bycatch events involving vulnerable species recorded through the incidental bycatch database during the study period.**

| SPECIES | COUNT 2018 - 2019 |
|---|---|
| *Aetomylaeus bovinus* | 3 |
| *Carcharhinus plumbeus* | 4 |
| *Caretta caretta* | 33 |
| *Chelonia Mydas* | 64 |
| *Dasyatis centroura* | 5 |
| *Dasyatis marmorata* | 1 |
| *Dasyatis pastinaca* | 10 |
| *Glaucostegus cemiculus* | 3 |
| *Hexanchus griseus* | 5 |
| *Isurus oxyrinchus* | 8 |
| *Mustelus mustelus* | 6 |
| *Odontaspis ferox* | 1 |
| *Raja montagui* | 4 |
| *Rhinobatos rhinobatos* | 1 |
| *Scyliorhinus canicula* | 1 |
| *Squalus blainville* | 22 |
| *Squatina oculata* | 2 |
| *Squatina squatina* | 5 |

*Plate V. Striped dolphin adult and calf caught in set nets in shallow waters off Karpaz in 2020. Both animals drowned. Ali Aygün*





Additionally, in 2020, two striped dolphins (*Stenella coeruleoalba*) were recorded in the incidental observation bycatch database. An adult and a calf entangled in trammel nets set in shallow waters (**Plate V**).

## 3.5 STRANDING DATA

Stranding data presented in **Table 10** concern sea turtles, seals and beaked whales during the study period 2018 - 2019. One common bottlenose dolphin stranding was in May 2020 and is presented here since it was considered an important record, highlighting the mortality through larynx strangulation (Gomercic et al., 2009) and secondary mortality through depredation in set nets for this species (**Plate VI**).

**Table 10. Stranding data.**

| Country | GSA | Group of vulnerable species | Species* | Family* | Genus* | Total number of individual(s) stranded | Total weight of individual(s) stranded* | Cause of death* | Notes |
|---|---|---|---|---|---|---|---|---|---|
| Cyprus | 25 | Cetacean | *Ziphius cavirostris* | Ziphiinae | Ziphius | 1 | 600 kg kg (est) | Unconfirmed | Gastrointestinal tract empty, no fisheries gear associated with respiratory system. |
| Cyprus | 25 | Cetacean | *Tursiops truncatus* | Delphinidae | Tursiops | 2 | 600 kg (est) | Internal entanglement of fishing nets from depredation effected both individuals. Larynx strangulation confirmed in the large adult. | One adult and a sub-adult. |
| Cyprus | 25 | Seal | *Monachus monachus* | Phocidae | Monachus | 1 | 8 – 15 kg (est) | Unconfirmed. Likely abandoned breeding cave during storm and became separated from parent. Although the female was in the area during monitoring. | |
| Cyprus | 25 | Marine turtle | *Chelonia mydas* | Cheloniidae | Chelonia | 90 | 500 - 1000 kg (generally over 5 kg each) | No Apparent Injuries/Unknown/ Entanglement-passive gear/ Unable to Assess/Pollution/ Debris/Mutilation/Disease/ Drowning/Decompression sickness | Most were in good condition, had full stomachs and were therefore considered to have drowned in set nets. |
| Cyprus | 25 | Marine turtle | *Caretta caretta* | Cheloniidae | Caretta | 84 | > 2000 kg (generally over 30 kg each) | No Apparent Injuries/Unable to Assess/Watercraft Interaction/ Power Plant Entrainment/ Unknown/Entanglement-passive gear/Mutilation/Pollution/ Debris/Drowning/ Decompression sickness | Most were in good condition, had full stomachs and were therefore considered to have drowned in set nets. |

Plate VI. Adult bottlenose dolphin stranded in 2020. Necropsy undertaken by SPOT found larynx strangulation to be the cause of death, mortality associated with sections of depredated net encircling the larynx and choking the animal.

### 3.6 NON-INDIGENOUS SPECIES

As is the case in the south of Cyprus, in terms of biomass, discards were composed mostly of non-indigenous species, although discarded catch was not routinely analysed. The most common non-indigenous species were *Lagocephalus sceleratus, Sargocentron rubrum, Fistularia commersonii* and *Pterois miles. L. sceleratus* was the most common and abundant non-indigenous species in the catch. In a separate study of the Cyprus Bycatch Project, developing mitigation technology for sea turtle bycatch, fishers in Famagusta bay caught over a tonne of *L. sceleratus* and over half a tonne of *P.miles* in one fishing season using only the provided experimental trammel nets. Both species were more frequent in shallow waters (10 - 30 m) while targeting siganids than in deep waters (70 – 90 m) while targeting *Pagrus pagrus. L. sceleratus* was greater than the combined landings of either target species. The TRNC authorities subsidise fishers, providing payment on return of *L. sceleratus* tails, which is a welcome incentive to fishers.



## 4. CONCLUSIONS

During the 2-year sampling period (2018 - 2019), the main impacted vulnerable taxa were elasmobranchs and sea turtles, with tens of thousands and thousands of individuals (respectively) caught annually in Northern Cyprus. While incidental reporting of bycatch observations and strand monitoring have shown striped dolphins to be impacted by bycatch, and common bottlenose dolphins to be impacted by secondary mortality through larynx strangulation during depredation in set nets. The latter has been found to be a significant source of bottlenose dolphin mortality in Croatia (Gomercic et al., 2009) and could pose a significant threat across the Mediterranean (Snape et al., 2018b).

The Cyprus Bycatch Project bycatch monitoring program has brought to light the existence of an impressive diversity of elasmobranch species in Northern Cyprus and confirmed that they are heavily under threat from small-scale fisheries. Many of the recorded elasmobranch species were recorded in Northern Cyprus for the first time during the project, and through the Cyprus Elasmobranch Research and Conservation Network (CERECON) project in 2020, which supports further targeted onboard observations, more species are being added to the island checklist. Our program has also confirmed significant sea turtle bycatch, most concerning of which is the bycatch of Mediterranean green turtles, since green turtles are more restricted in their numbers and range in the Mediterranean than loggerhead turtles, and so are at great risk of extinction. The project also resulted in the first record of bycatch of a leatherback turtle for Northern Cyprus (Plate VII) and one of just a few of records for the island. Judging by the very excited and shocked reaction of the fishers, this is an extremely scarce occurrence.

Plate VII: Adult leatherback turtle caught in gillnets off Karpaz by a self-reporting fisher.

Just because there was no bycatch recorded from a small sample of observations does not mean seabirds are not being bycaught.
In order to obtain sufficient data, high survey efforts are needed in order to reliably conclude whether seabirds are being bycaught.

Through self-reporting we managed to increase coverage of the monitoring programme up to 2 %, (0.4 % onboard observer and 1.6 % self-reporting), which is impressive for a small-scale fleet. The wide coverage resulted in some exceptional records. However, a caveat of the reliance on self-reporting fishers, despite subsidies, exists: there is potential, on busy, hot and stressful fishing days, that some records may not have been logged. To exemplify the uncertainty, we compare rates among onboard observer and mixed methods for green turtles. The bycatch rate for green turtles calculated from combined onboard observations and self-reporting, is 0.04, whereas the bycatch rate calculated from onboard observations only is 0.11. Using the onboard observer data exclusively, there is an increase of 143 % in our bycatch estimate, increasing the total extrapolated estimate from 1855 individuals to 4506 individuals. A remedy could be to filter data from fishers who were less reliable, but, doing so might introduce other biases. Either result is plausible, but, based on this example, it is likely that the results of our extrapolations should be considered as conservative.

When working with small-scale fisheries, it is also difficult to select vessels to include in a study in a random way. We worked mostly with full-time fishers because we wanted to cover as many trips as possible. However, many fishers have second jobs. There is concern that part-time fishers (who although less active, are more numerous) may be fishing differently. Particularly, they may choose not to invest in a range of selective gears. They are also likely to soak their sets overnight where feasible. Siganid fishing is very popular and convenient for such fishers since a) the landings are valuable, b) sets are close to shore and in shallow waters, so there is no need for a big boat or powerful winch, c) sets can be left overnight because the fish stay alive in the trammel nets and so do not spoil. This arrangement suits part time fishers who can set nets in the late afternoon, retrieve them early in the morning, continue in a daytime job and be with family and friends during social hours. This style of fishing, which we know happens a lot, was perhaps overlooked, and may result in elevated rates of both sea turtle bycatch and mortality through prolonged soaking. Targeted observations of part-time fishers as well as full time fishers may therefore be important in sample design.

A final flaw was the lack of reliable information on the number of active fishing days per year. Rather than relying on government statistics (which for SSF are likely to be less accurate than industrial fisheries), a better approach would be to use questionnaires or to track a subset of fishers with GPS data loggers through the season. Placing time-lapse cameras at ports might also allow an understanding of how regularly vessels were making trips from different coast. This dependence on government estimated vessel activity, will lead to some variation between extrapolated estimates among small-scale fleets in different countries.

Mitigation trials of LED lights have already gone through phase I trials, with 88 sets of experimental gear showing 70 % reduced green turtle bycatch and 40 % reduced loggerhead turtle bycatch. In addition, working with UK based company FishTek, a third generation LED is now being trialled in Northern Cyprus. The cost per LED has been reduced from just over £20 per light to £7 pound per light and on full-scale production, the LED is said to be available at £5 per light. Using flashing rather than continuous light to improve battery performance, improving efficiency and reducing handling times has also brought costs of implementation down markedly in recent years. When targeting siganids, the major source fishery of green turtle bycatch, fishers are using on average, just over 1.5 km of net (onboard observer data), which will cost them £750 to equip with current LEDs. That might still be too great an expense for voluntary uptake. However, siganids are a valuable fish and the LED trials have also shown in an increase in landings. During 88 sets in 2019, on average, 4.77 ± 3.46 kg of *Siganus sp.* were caught per km2 of control net per hour and 5.39 ± 3.93 kg per km2 of LED net per hour, which represents a 13% increase in weight per unit effort between treatments. Although these data are not yet published and the trials are ongoing, the results are very positive. At this rate we estimate the fishers could make up the outlay cost of the investment in one season, through increased landings and reduced expenses associated with sea turtle bycatch. The cost of subsidising or providing this equipment is relatively low and could feasibly be considered.

*Siganus sp.* are also non-indigenous, although have been present for more than half a century. A conundrum exists between supporting this economically valuable area of the fishery in Northern Cyprus, and closing it to protect sea turtles, since bycatch of green turtles is particularly heavy in these gears. An additional complexity is that *Siganus sp.* are very damaging to benthic ecology, over grazing and creating a decline in biogenic habitat complexity, biodiversity and biomass, and so targeted siganid fisheries has been called for as a conservation measure in the region (Sala et al., 2011). Therefore alternative (e.g. baited traps or switching from trammel nets to gill nets) or modified gears (e.g. using LED lights) to target this species, as well as reduced soak times, seem to be the best approach for mitigating the significant green turtle bycatch we are seeing. Ultimately though, closed areas might be needed if trials of these measures fail to bring bycatch of green turtles down to adequately sustainable levels.

Technical mitigation measures for elasmobranchs are not clear for this fishery and not likely to be available soon. The most urgent requirement is the update of legislation to international norms. In 2018, SPOT submitted a list of threatened elasmobranchs recorded in Cyprus that should be added to their new draft constitution. Market and fisheries checks are also needed, as well as more detailed reporting of fish moving across the Green Line. Endangered elasmobranchs are regularly displayed and even shown on social media to attract customers (**Plate VIII**). Although, the practice of displaying and sharing vulnerable species in social media as trophy items and as advertisement has been notably reduced recently, at least in part because of awareness raising efforts of Cyprus Bycatch Project. It has been pleasing to see videos taken by fishers addressed to the project team, releasing angel sharks and bull rays, with messages about their conservation. As well as addressing trade, continued education of fishers on handling and identification of elasmobranchs, encouraging them to release them, and agreeing limits on fishing areas, soak times, gear types and fishing intensity could all be useful in safeguarding this group. All these measures could also benefit sea turtles and other fauna.

*Plate VIII. Vulnerable elasmobranchs displayed on social media of restaurateurs. This practice seems to have halted which we believe is linked to our Cyprus Bycatch Project campaigns.*

**Table 11: Potential mitigation measures.**

| Group of vulnerable species concerned | Sharks and Rays | Sharks and Rays | Sea Turtles | Sea Turtles | All - inc cetaceans, seabirds and seals |
|---|---|---|---|---|---|
| Main species concerned (if any) | All | All | Green and loggerhead turtles | Loggerhead turtles | |
| The vessel group(s) interested | Small scale | Small scale | Small scale | Small scale | All |
| The fishing gear(s) | Trammel net | Demersal longline | Siganid trammel nets | All trammel nets | All |
| Area(s) where mitigation measures should be implemented (e.g. port, depth zone, GSA, country, etc.) | All ports, Northern Cyprus | All ports, Northern Cyprus | All ports, Northern Cyprus Esp Famagusta Bay | All ports, Northern Cyprus Esp Famagusta Bay | All ports, Northern Cyprus |
| Short explanation on the choice of the area (e.g. most impacted, high presence of vulnerable species, nursery area, spawning area, breeding area, etc.) | Further study is needed to pinpoint spawning areas, however all coast should be conside-red as such for many species. | Further study is needed to pinpoint spawning areas, however all coast should be conside-red as such for many species. | Currently not clear whether numbers of turtles caught in Fama-gusta Bay are higher because of high effort in this sheltered area, or because of genuinely high numbers of turtles in the area. Regional analysis of catch rates is needed, and more habitat use studies. However, turtles do tend to favour the bay and catch rates seem high there. Strands are high there. | Loggerheads tracked from Cyprus and other countries have chosen to reside in Famagusta Bay. There are good/ preferable habitats for them here. It is also an important nesting area | |
| Period(s) where mitigation measures should be implemented (e.g. the whole year, a season, a month, a quarter, or any period of the year, etc.) | March - August | March - August | Year -round. Esp. May 1 -July 31 | Year-round esp. Mar - Sept during breeding and migration. | |
| Short explanation on the choice of the period (e.g. highest density of vulnerable species, nursery period, spawning period, breeding period, etc. | Highest encounter rate during this period and spawning of angelsharks, bullrays encountered. | Highest encounter rate during this period and spawning of angelsharks, bullrays encountered. | Turtles metabolically more active, feeding more and more prone to bycatch. Fishing pressure highest. Although siganids are targeted through the year. | Turtles metabolically more active, feeding more and more prone to bycatch. Fishing pressure highest. Turtles migrate into the bay from other countries to breed. E.g. tag return from Italy and tracking of breeding males to Egypt and Tunisia foraging sites. | |
| Suggestion on possible mitigation measure that could be applied (e.g. pingers, circle hooks, TED, grids, spatio-temporal measures, etc.) | Update and implementa-tion of legislation. Eliminating legal trade. Education and training on handling. MPAs/Mari-ne Spatial Planning/No take zones. | Update and implementa-tion of legislation. Eliminating legal trade. Education and training on handling. MPAs/Marine Spatial Planning/No take zones. | LED lights under development show strong results. Traps baited with algae in Lebanon could be as profitable as trammel nets if used in the correct way. Reduced soak times and switching trammel for gillnets could be trialled. Expanding network of educated fishers. Improved handling and working with rehab centres to reduce post-release mortality. MPAs/Marine Spatial Planning/No take zones. | LED lights under development show strong results. Traps baited with algae in Lebanon could be as profitable as trammel nets if used in the correct way. Reduced soak times and switching trammel for gillnets could be trialled. Expanding network of educated fishers. Improved handling and working with rehab centres to reduce post-release mortality. MPAs/Marine Spatial Planning/No take zones. | Review and implement legal framework. Develop cooperatives to provide better management opportunities and establish co-manage-ment. Most fishers are in favour of some closed areas and these should be urgently established. MPAs/Marine Spatial Planning/No take zones. |



## STRENGTHS

-Relatively cheap to execute because fishers do most of the data gathering.

-Obtain reliable information on the interaction of vulnerable species with speci-fic fishing gear.

-Helpful in providing valuable information on the mortality by fishing gear.

-Can be used for increasing the knowledge on the biology (e.g. data on sex and maturity) of the species impacted by bycatch at a relatively low cost.

-May give an indication of an underlying seasonal or temporal trend in mortality, providing data that can be matched to seasonally and temporally variable fishing activities to build an evidence base.

-Bycatch occurrence and absence data are very useful in flagging up bycatch hotspots.

-Combination of the methodologies of the monitoring program can be used to provide positional data and information on fleet segments that could not be provided with the same precision through, one methodology alone.

## WEAKNESSES

-Methods very dependent on the confidence of the collaboration of fishers and with the fishing industry in general.

-Fishers, like all humans, are likely to forget or miss-report specific details, such as numbers, over time (self-reporting weakness).

-Not every fisher will photograph or note down the details of every vulnerable species and they may be more likely to report live than dead specimens.

-Monitoring program and collection of data dependent on weather conditions.

-High irregularity of by-catches, extrapolations using a limited observer survey, questionable methods regarding self-monitoring and government statistics on fleet activity. Data might lead to high biases.

-Correct species identification is a major issue because fishers are not scientifically trained in proper identification techniques and thus the reporting form should be accompanied by a clear and easy identification guide.

## OPPORTUNITIES

-Support the employment of observers and establish long term observer program to build up data over time and monitor changes.

-Know the extent of the problem in each specific fishery, and then to be able to mitigate negative impacts on vulnerable species.

-Utilization of the existing research results to optimise use of mitigation techniques.

-Great deal of information now available for planning phase II. Although extrapolation process is not perfect, we know the key problematic gears to address.

-Good place from which to input into national legislation framework.

-Need to gather information on fleet activity has been highlighted.

-The value of remote vessel monitoring has been highlighted.

-Groundwork laid for SSF-co-management and a blank canvas to work from given the current low level of government interference.

## THREATS

-Data gathered can be inaccurate and biased, particularly when the bycatches of vulnerable species to be reported by fishers are perceived to be the subject of controversial issues, potentially leading to increased regulation.

-Having invested in 23 participatory fishers, the other three hundred or so feel like they are missing out on something/abandoned. It may be hard to work with the wider fleet now.

-Further ministerial instability and government collapse leading to further delay of legislation updates beyond 2022.

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# 6- ANNEXES

## ANNEX I – ONBOARD OBSERVERS TRAINED AND WORKING IN THE PROJECT

| |
|---|
| Şerife Ebeler |
| Dilber Barakalı |
| Jason Savin |
| Mat Carmen |
| Josie Palmer |
| Peter Slater |
| Rupert Stacey |
| Nicky Allen |
| Alex Scott |
| Ben Tullis |
| Charlie Sleddon-Plant |
| Amie Wheeldon |
| Matt Ormandy |
| Riccardo Mattea |
| Emma Lokuciejewski |

## ANNEX II – SUMMARY OF ADDITIONAL FISHERIES REGULATIONS RELEVANT TO THE PROJECT

There are two legislations, one that applies to professional and other to amateur (recreational) fisheries. In terms of protecting vulnerable species, regulations on the species that are listed in Table A (below) apply to both parties. It is prohibited to kill, own, buy, market, display for sell purposes or having any intentions to do so of any body parts, eggs or dried forms of the whole body is forbidden.

It is forbidden to sell or market species that were caught by use of any types of explosives (bomb, dynamite, torpedo or similar explosives), stunners, drugs or deadly (fish weed, propane tank, drum, any device that produce high noise), harmful or poisonous substances (caustic lime, etc.) (Fisheries regulations 27/2000).

*According to professional fisheries regulations:*

Any type of fisheries is banned from coast to 5 m depth. But between 1 October – 31 March only monofilament nets equal or above 84 mesh size are permitted from the coast. The ratio between by-catch to total catch should not exceed 5 % of the total catch. If the by-catch species is one individual then this limit can be disregarded. Percentage of undersized individuals of horse mackerel and sardines should not exceed 15 %, and in case of other species 5 % of the total amount of the species. Percentage of undersized individuals between 10 and 30 kg of blue-fin tuna should not exceed 5 % of the total amount of the species. (Fisheries Regulation of Rules on Prohibition of Traps and Specific Fisheries Bans combined with

[(23.7.2013 – R.G.122 – Appendix III – A.E.401 numbered regulation), combined with (10.12.2013 – R.G.199 – Appendix III – A.E.645) numbered regulation]).

*According to the amateur (recreational) fisheries regulations:*
It is banned to dive, using light and any type of fisheries at caves where Mediterranean Seal inhabit. If this marine mammal is observed, it is mandatory to provide information to the Department of Animal Husbandry. Fisheries of groupers between 1 June – 15 July, 15 April – 31 July Brown mearge, 16 July – 15 August Tuna and 1 October – 31 January Swordfish is banded. There are no other bans for other species. (Amateur (recreational) fisheries regulations, combined with [(30.3.2006 – r.g.59 – Appendix III – a.e.175 numbered regulation), (13.4.2010 – r.g.60 – Appendix III – a.e.241), (6.1.2011 – r.g.3 – Appendix III – a.e.9), (26.2.2013 – r.g.32 – Appendix III – a.e.93), (10.12.2013 – r.g.199 – Appendix III – a.e.644) and (14.11.2014 – r.g. 228 – Appendix III – a.e. 661) numbered regulation]).

**Table A. List of species that are forbidden to target, kill, sell, buy, or own**

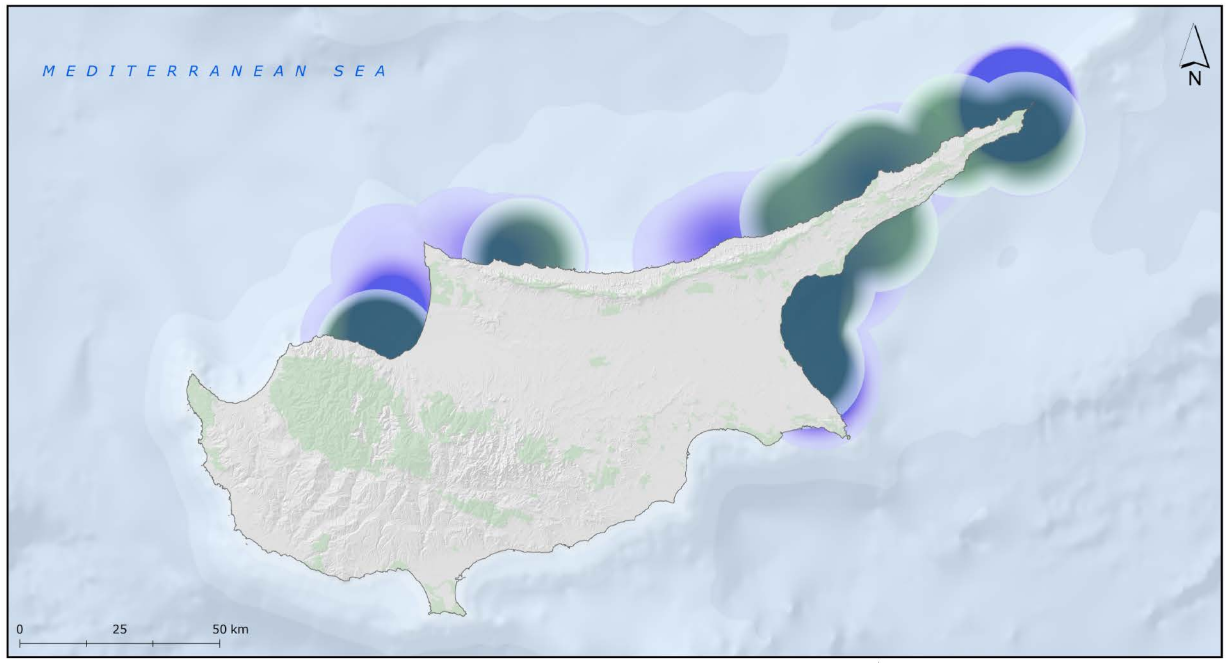
| COMMON NAME | LATIN NAME |
|---|---|
| Dolphins | *Delphinidae* |
| Mediterranean Monk Seal | *Monachus monachus* |
| Sandbar Shark | *Carcharhinus plumbeus* |
| Basking shark | *Cetorhinus maximus* |
| Loggerhead turtle | *Caretta caretta,* |
| Green turtle | *Chelonia mydas* |
| Leatherback turtle | *Dermochelys coricea* |
| African/Nile softshell turtle | *Trionyx triunguis* |

**Table B: Minimum landing sizes of the marine organisms fished in Northern Cyprus (Fisheries Regulations (27/2000 Sayılı Yasa)- APPENDIX I).**

| SCIENTIFIC NAME | COMMON NAME | MINIMUM LANDING SIZE (CM) |
|---|---|---|
| *Coryphaena hippurus* | Dolphin fish | 40 |
| *Licia amia* | Leer fish | 30 |
| *Mugil spp* | Mullet | 13 |
| *Merluccius merluccius* | Hake | 20 |
| *Sparus auratus* | Seabream | 20 |
| *Dicentrachus labrax* | Sea bass | 25 |
| *Solea vulgaris* | Common sole | 20 |
| *Pagrus pagrus* | Red seabream | 18 |
| *Lophius spp.* | Angler-fish | 30 |
| *Polyprion americanus* | Wreck fish | 45 |
| *Symphodus spp.* | Wrasse | 12 |
| *Diplodus annularis* | Annular seabream | 12 |
| *Trachurus spp.* | Horse mackerel | 15 |
| *Sciaena umbra* | Brown mearge | 45 |
| *Diplodus vulgaris* | Two-banded sea-bream | 18 |
| *Mugil spp.* | Mullet | 16 |
| *Xiphias gladius* | Sword fish | 130 |
| *Pagellus erythrinus* | Common pandora | 15 |
| *Scomber japonikus* | Chup mackerel | 18 |
| *Ephinephelus aeneus* | Waker | 45 |
| *Pagellus bogaraveo* | Red seabream | 33 |
| *Oblada melanura* | Saddled bream | 12 |
| *Lithognathus mormyrus* | Striped bream | 20 |
| *Umbrina cirrosa* | Corb | 25 |
| *Seriola dumerili* | Yellow tail | 30 |
| *Ephinephelus marginatus* | Grouper, Dusky, Perch | 45 |
| *Thunnus thynnus* | Blue-fin tuna, Tunny | 90 |
| *Sarda sarda* | Atlantic bonito | 25 |
| *Serranus spp.* | Painted comber | 12 |
| *Sarpa sarpa* | Saupe | - |
| *Dentex dentex* | Dentex | 20 |
| *Diplodus puntazzo* | Sharpsnout sea-bream | 18 |
| *Siganus spp.* | Rabbitfish | 15 |
| *Diplodus sargus* | White bream | 23 |
| *Auxis thazard, Auxis rochei* | Frigate mackerel | 40 |
| *Sphyraena spp.* | Barracuda | 60 |
| *Scomber sp.* | Atlantic mackerel | 20 |
| *Thunnus alalunga* | Albacore | 60 |
| *Pagellus acarne* | Axillary seabream | 17 |
| *Euthynus alletteratus* | Little tunny, Bonito | 45 |
| *Scomber sp.* | Atlantic mackerel | 20 |
| *Thunnus alalunga* | Albacore | 60 |

Su Ürünleri Avciliğinda Tuzaklarin Yasaklanmasi Ve Belirli Avcilik Yasaklarina Ilişkin Kurallar Tüzüğü [(23.7.2013 – R.G.122 – Ekiii – A.E.401 Sayili Tüzük), (10.12.2013 – R.G.199 – Ekiii – A.E.645 ) Sayili Tüzükle Birleştirilmiş Şekli.]
Amatör (sportif) su ürünleri avciliği tüzüğü [(30.3.2006 – r.g.59 – ek iii – a.e.175 sayili tüzüğün), (13.4.2010 – r.g.60 – ek iii – a.e.241), (6.1.2011 – r.g.3 – ek iii – a.e.9), (26.2.2013 – r.g.32 – ek iii – a.e.93), (10.12.2013 – r.g.199 – ek iii – a.e.644) ve (14.11.2014 – r.g. 228 – ek iii – a.e. 661) sayili tüzüklerle birleştirilmiş şekli.

## ANNEX III-MAPS SHOWING LOCATIONS OF BYCAUGHT INDIVIDUALS RECORDED THROUGH ONBOARD OBSERVATIONS.




LEGEND

Turtles

0

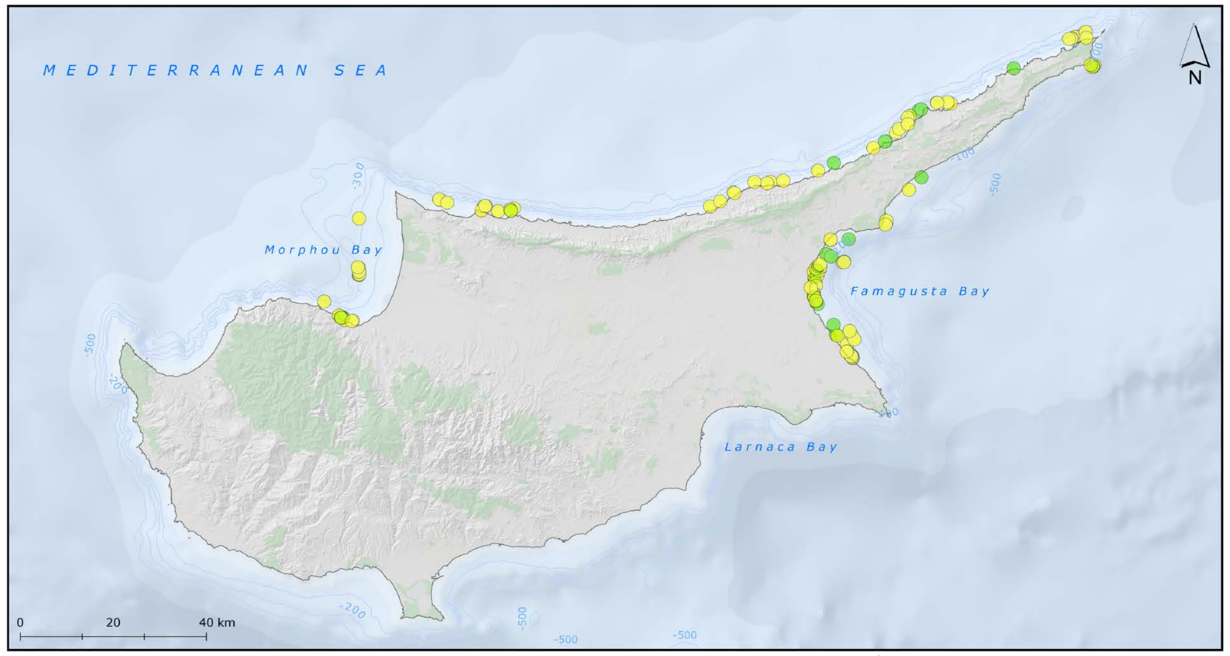
Elasmobranchs

0.03

0.63

Funded by:

**Positions:** Refered to World Geodetic System 1984 Datum
**Projection:** Mercator




LEGEND

Elasmobranchs    Isobaths

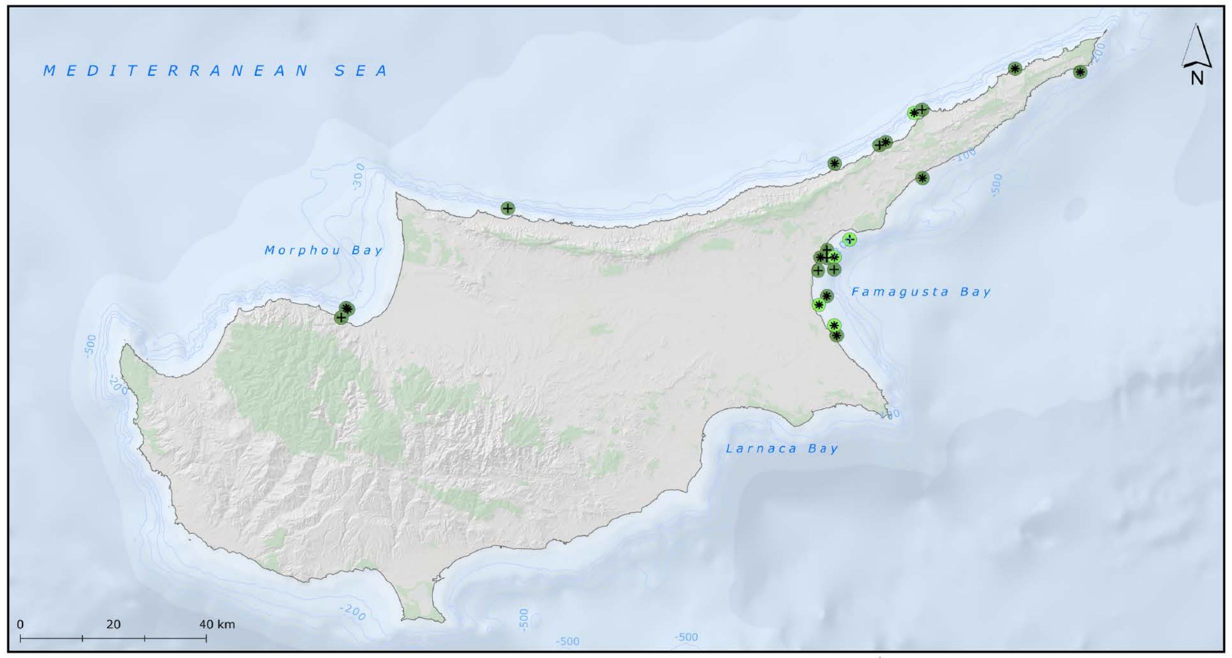
Sea Turtles

Funded by:

**Positions:** Refered to World Geodetic System 1984 Datum
**Projection:** Mercator







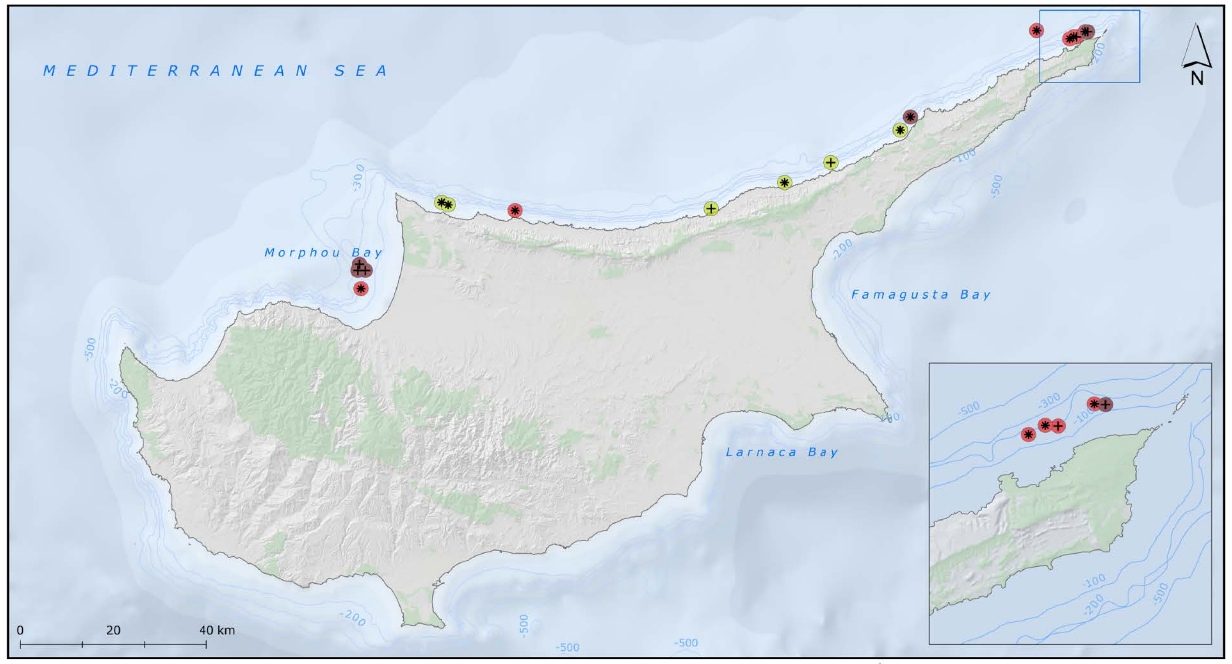

LEGEND

*Caretta caretta*    ✱ Released    Isobaths

*Chelonia mydas*    + Not Released

Funded by:

**Positions:** Refered to World Geodetic System 1984 Datum
**Projection:** Mercator




LEGEND

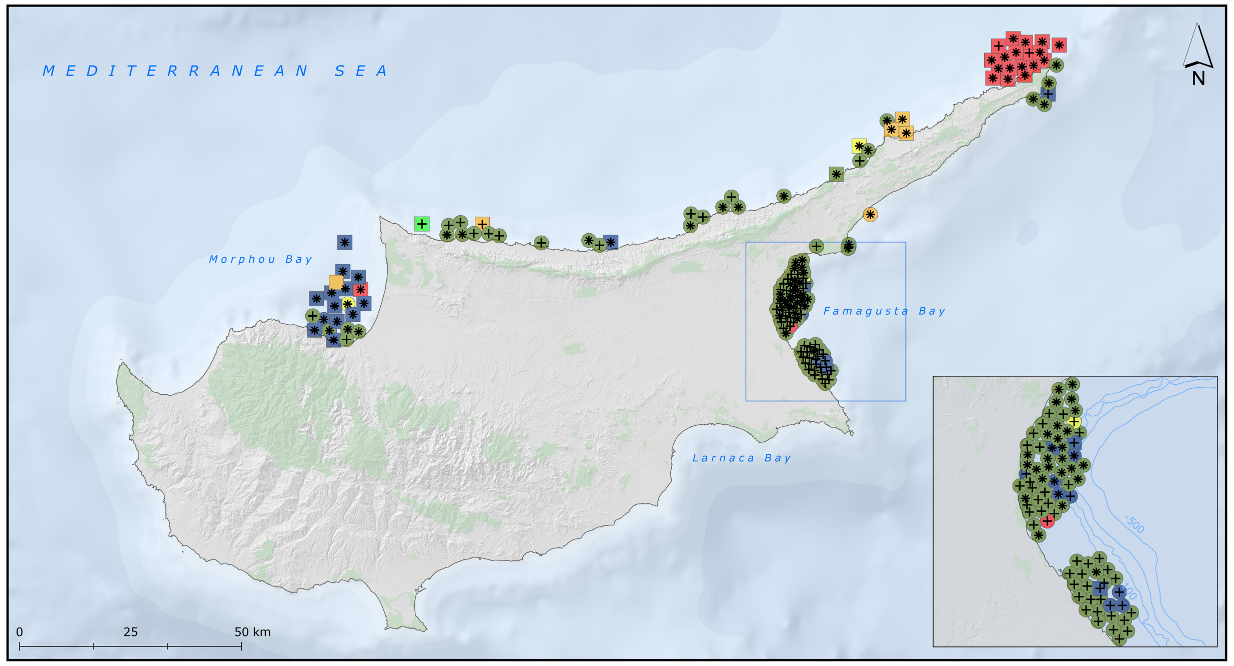
*Mustelus mustelus*    ✱ Released

*Scyliorhinus canicula*    + Not Released

*Squalus blainville*

Funded by:

**Positions:** Refered to World Geodetic System 1984 Datum
**Projection:** Mercator




LEGEND

- Aetomylaeus bovinus
- Dasyatis marmorata
- Dasyatis pastinaca
- Dipturus oxyrinchus
- Gymnura altavela
- Raja asterias
- Raja montagui
- Squatina oculata
- Squatina squatina
- Torpedo marmorata
- Torpedo sp.
- Released
- Not Released
- Isobaths

Funded by:

**Positions:** Refered to World Geodetic System 1984 Datum
**Projection:** Mercator

spot
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