

# Interactions between Cetaceans and Small-Scale Fisheries around the Central Mediterranean Maltese Islands

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## Abstract

Cetacean depredation poses threats to both the socio-economic viability of fisheries as well as species conservation. This study is based in the Maltese Islands where the fishing sector has always been one of a small-scale nature with 93% of the vessels being less than 12 meters in length. Maltese fishers engage in small-scale fishing utilizing a variety of artisanal fishing gear including surface long lines, which are mainly used to target swordfish and tuna and bottom-long lines; trammel nets and entangling nets which are used to target groupers, various species of bream, red snappers and red porgies; and pots and traps which are generally used to capture octopus and bogue. This study, which aimed to analyze fishers' perception with respect to interaction occurrence between small-scale fisheries and cetaceans in Maltese waters, found that fishers claim that dolphin presence has increased in the past five years, particularly in the vicinity of Bluefin tuna, sea bream and sea bass fish farms locations. While the use of trammel nets remains by far the most popular gear type employed by Maltese fishers, this study showed that around 33% of the fishing gear deployed in the past year suffered damages which account to an average of €178.33 in damages per fisher, annually. It is therefore essential that proper monitoring is carried out in order to assess the factors that drive the interactions and the impact of dolphin depredation on the fishing sector.

New prevention and mitigation measures are proposed in order to try and reduce the risk of depredation by cetaceans in Maltese waters. This study provided first-hand insights which will aid in the execution of local fisheries management plans and subsequently, ecosystem-based fisheries management.

**Keywords:** Cetaceans; Small-scale fisheries; macrocephalus; Common bottlenose dolphin; Depredation; Maltese Islands

## Introduction

Dolphins exhibit foraging plasticity and utilize various foraging strategies to cover their cost of living [1]. They have also learned to exploit anthropogenic activities and especially fishing activities, by consuming from nets and discards at a low energy cost [2]. As a result, in the Mediterranean Sea, dolphin-fisheries interactions are considered to be a persisting issue, with socio-economic and ethical implications that further complicate fisheries management [3-4]. They are of major concern since they reportedly result in gear damage, increasing the cost of coastal fishing on a regional and global level [5].

This study delves into cetacean depredation, which is, the act of these large marine predators feeding on fisheries catches, a phenomenon that poses threats to both the socio-economic viability of fisheries and species conservation, stressing the need for mitigation [6]. The complex interrelationships between marine mega fauna and human impacts on the marine ecosystem make simultaneously managing the use of marine resources and protection of these species especially challenging [7]. However, fisher experience and knowledge is an important source of information for the study of fisheries complexity and should be taken into account during the design of fisheries management strategies [8].

This study is based on fishers who operate in Maltese waters. Found in the central Mediterranean, the Maltese islands lie c.80 km south of Sicily. Considered as being surrounded by warm waters, sea water temperatures reach an average of 14°C between December and February and 28°C in the summer months. The fishing sector in Malta has always been one of a small-scale nature with a long history of fishers engaging in traditional small-scale fishing practices. However, its cultural significance outweighs the economic importance which is equivalent to about 0.1 percent of the national gross domestic Product.

The European Maritime and Fisheries Fund defines Small Scale Fisheries as "Fishing carried out by fishing vessels of an overall length of less than 12 m and not using towed fishing gear" (EC) No 26/2004. Therefore, for the purpose of this study,

any vessel of overall length less than 12 m, operating in Malta's 12 Nautical Mile zone (a Fisheries Management Zone as per EC 1967/2006), and not using towed fishing gear was considered "small-scale". Most of the industry in Malta is composed of small-scale vessels. This small-scale fishing fleet has been noted to be facing degeneration such that Malta faced a decline of 30% in the number of vessels, ranking among the top EU countries experiencing such degeneration. Currently, the small-scale fishing fleet is composed of 916 fishing vessels, 41% of which are full-time registered vessels while 59% are part-time fishing vessels.

Of the 87 living cetacean species found in the world's oceans and seas, around eight species are considered to be residents of the Mediterranean Sea. Several naturalists have noted cetacean presence in Maltese waters, specifically the common bottlenose dolphins; however other species of cetaceans have been recorded in the seas around Malta. These include sperm whales (*Physeter macrocephalus*), Cuvier's whale (*Ziphius cavirostris*), Sowerby's whale (*Mesoplodon bidens*), the bottle-nosed dolphin (*Tursiops truncatus*), the striped dolphin (*Stenella coeruleoalba*), spotted dolphin (*Stenella frontalis*), rough toothed dolphin (*Steno bredanensis*) and many others (Savona-Ventura, n.d.). Fin whales have also been sighted in Maltese seas. Further mentioned the minke whale (*Balaenoptera acutorostrata*), the killer whale (*Orcinus orca*) possibly sighted off Malta years ago and the false killer whale (*Pseudorca crassidens*) also found rarely throughout the Mediterranean basin, and in particularly in Sicily and of Malta itself). In the recent past, there were a number of cetacean sightings, the latter identified as bottlenose dolphin (38%), striped dolphin (30%), common dolphin (24%) and sperm whale (2%). The most popularly occurring cetacean remains *Tursiops truncates* which has been appearing the Maltese waters for a number of years [9].

The realities occurring in different countries have been crucial to inform this study, as they provided a baseline on the type, frequency and impact of interactions. Such detail, together with the regional insights gathered from the parallel studies in Sicily and Spain, helped authors in orienting the Maltese depredation inquiry.

With an ever-increasing need to study dolphin population ecology coming from national/international directives, support from citizens to aid research may act as a practical, inexpensive solution to gathering extensive spatial-temporal data for regional-scale monitoring and for the development of management priorities.

This study is based on three research questions, namely;

- What is the fishers' perception of dolphin depredation in Maltese waters?
- What is the frequency of cetacean-fisheries interactions in Maltese waters?
- What is the impact of cetacean-fisheries interactions in Maltese waters?

Through this analysis, the authors will be filling in a current gap of knowledge on the status of dolphin depredation in the Maltese Islands. It is for this reason that we came into contact with the local fishers, who voluntarily shared their empirical knowledge, all of which were recorded in questionnaires that were carried out by native Maltese speakers. These will provide us with first-hand insights and will aid in the execution of local fisheries management plans and subsequently, ecosystem-based fisheries management.

## Research Methodology

The research methodology was based on pre-existing protocol outlined by the low impact fishers of Europe. The same methodology was carried out by other partners and outlined [10-11]. The same methodology was used since this study is being carried out in Spain, Sicily and Malta under the auspices of the low impact fishers of Europe and funded by the MAVA Foundation in order to understand the interactions between cetaceans and small-scale fisheries throughout the Mediterranean Sea. The questionnaires were administered through face-to-face interviews with fishers in different ports around Malta, using convenience sampling. A total of 38 questionnaires (33 of which were used for analytical purposes) were administered over an eight-month period, namely between July 2019 and February 2020 in six fishing ports. These include St. Paul's Bay, Marsaxlokk, Cirkewwa, Mġarr (Gozo), Marsaskala, Ġnejna, Msida and Mellieħa.

The questionnaires were carried to assess the opinion of full-time and part-time fishers, all of which were men. A wide spectrum of data on the SSF in Malta was collected. This included data on the port at which the vessel is berthed, the GT tonnage of the vessels, the Length over All (LOA) of the vessel, the engine power (kW) and the year of construction of the fishing vessels. The fishing gears utilized by both full-time fishers and part-time fishers were recorded in codes as per Table 1 (Annex).

**Table 1:** A list of fishing codes recorded in the 8 fishing ports where the questionnaire data was collected from.

Fishing gear code	Common name of fishing gear	Demersal/Pelagic/Both
GTR	Trammel Nets	Demersal
GTN	Combined Gillnets-trammel nets	Both
GNS	Set Gillnets	Demersal
FPO	Pots	Demersal

LLS	Set Longlines	Demersal
LTL	Troll lines	Pelagic
LLD	Drifting longlines	Pelagic
LHP	Handlines and pole-lines (Hand-operated)	Both
LHM	Handlines and pole-lines (mechanized)	Both
GND	Drifting gillnets	Pelagic
PS	Purse-seines	Pelagic
LA	Lampara nets	Pelagic

Data was also gathered on the characteristics of the fishing gear used. The type of gear used by the fishers was outlined and information on the fishing gear characteristics was collected. This included information on the material utilized such as nylon and monofilament, the mesh size of the fishing nets and the number and sizes of hooks utilised, the length and height of the gear and the days and times spent at sea. The cost of fishing gear was also collected.

The cetacean interactions were investigated by enquiring about the frequency of the encounters over the past five years including whether any incidental catch had been caught during these interactions. The fishers were also asked whether they have ever heard of any mitigation measures with regards to warding off cetaceans, whether they would benefit from this mitigation and whether they would be willing to participate in an online voluntary survey to inform on the locations at which they encountered cetaceans, for further research.

The frequency of encounters was also recorded and what species depredated the gear suffered was also noted. The questionnaire also identified which gear was mostly affected and which species are generally targeted using that type of gear. The type of incidental catch captured, and the frequency of incidental catch was also noted mainly focusing on what incidental catch species was captured such as dolphins, whales, sharks, turtles, birds or any others.

Further analysis was carried out to show which type of fishing gear encountered any interactions with dolphins and at which fishing areas these interactions occurred. The questionnaire was also used to collect data on the period of time, the number of hours at which these fishing activities were carried out and at what depth and distance these fishing activities occur, as well as the cetacean interactions encountered. The questionnaire was also used to obtain an idea of the target species that are captured with this gear, in order to understand what fishers were fishing for when they encountered the cetaceans.

Information on whether the interactions with cetaceans were positive, indifferent or negative was also recorded. The percentage of the negative interaction and the type of damage

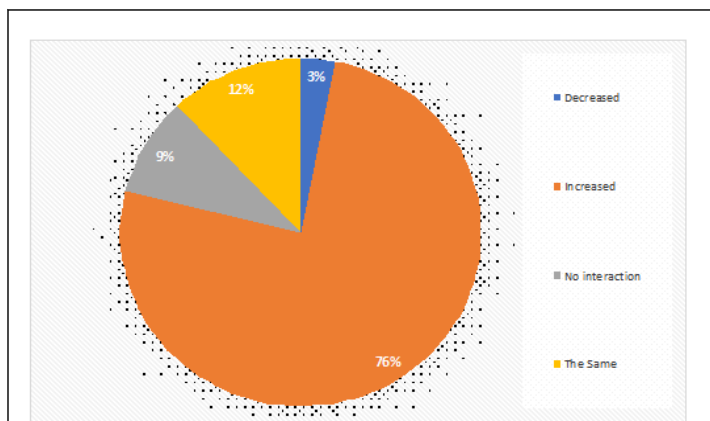
the fishing gear may have undergone due to a negative interaction was documented. This was classified through a typology of the interaction on the fishing catch such as the depredation of catch, scattering of prey, depredation of lures, holes (including the size of the holes), bite marks found on the catch or whether the cetacean only leaves the fish head. This questionnaire was also used to analyze the percentage of the reduction of the catch and whether the catch was completely lost due to the cetacean interaction, along with costs incurred from a negative interaction and the percentage of the gear that was damaged during the negative cetacean interaction.

## Results and Analysis

The results attained brought forward several characteristics related to the to the depredation phenomenon in SSF and enabled the researchers to understand which fisheries are mostly affected and how these interplay with the fisheries sector's socio-ecological resilience. The results showed that the fishing gear utilized by the respondents are mainly passive gear which included, trammel nets, gillnets, surface and bottom longlines. In term of fishing gear, trammel nets are by far the most popular gear type utilised, followed by set longlines, set gillnets and FAD purse-seines which are mainly used in the dolphinfish fishery.

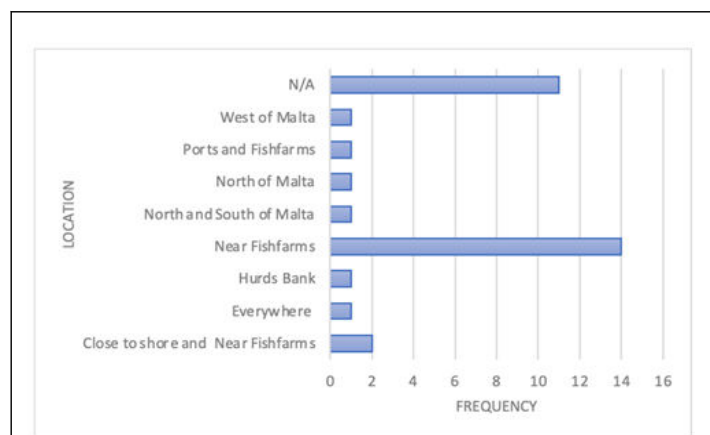
The analysis of the SSF fleet characteristics of the surveyed fishers was analyzed. Of these surveyed fishers, 19 are full-time and 14 are part-time fishers. The data on the vessel characteristics indicated that the average gross tonnage of the vessels analyzed was 3.558 GT and the average LOA was 7.2 m with an average main engine power of 101.89 kW. The range of the year of vessel construction ranged from 1923 to 2018.

The researchers also investigated the cetacean interaction characteristics which suggested that only common bottlenose dolphins (*Tursiops truncatus*) interacted with fishing gear. Approximately, 76% of the surveyed fishers agreed that the interaction increased over the past 5 years, 76% indicated that no interaction was recorded while only 12% agreed that dolphin encounters remained the same. Only 3% of the fishers agreed that the encounter frequency decreased (Figure 1).



**Figure 1:** The frequency of dolphin encounters by Maltese fishers in the last 5 years. The majority of fishers (76%) claim that dolphin encounters increased in the past 5 years; 12% of fishers claim that frequency of encounters remained roughly the same; 9% of fishers claimed that there were no interactions with dolphins; 3% of fishers claimed that dolphin encounters decreased in the last 5 years.

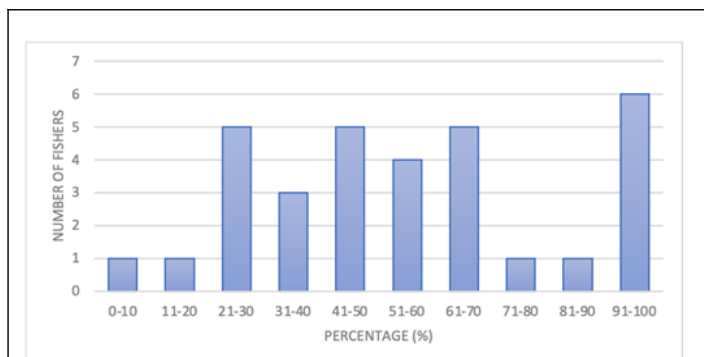
The results showed that 42% of the surveyed fishers encountered *Tursiops truncatus* mostly in fish farm vicinities. However, 33% of the fishers did not disclose any locations, since they were concerned on revealing fishing grounds they regularly exploit (Figure 2).



**Figure 2:** The location of dolphin encounters in Maltese waters. The highest frequency (14 encounters) occurred near fishfarms, followed by 11 encounters in locations which have not been disclosed by fishers.

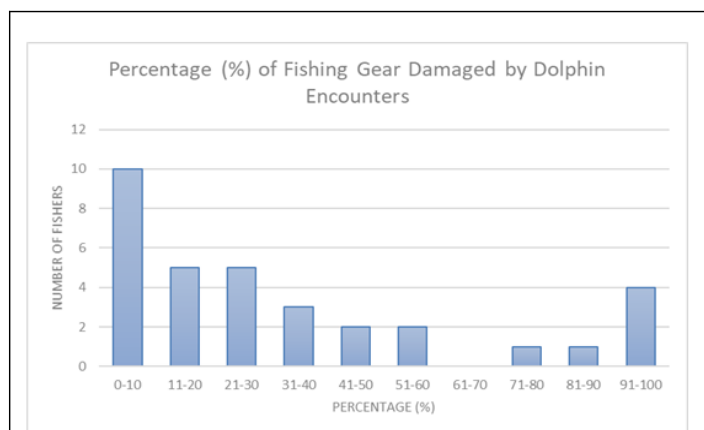
The researchers also analyzed percentage of catch that was depredated. The fishers identified that a catch was depredated due to the identification of bite marks on their catch or due to the presence of heads of fish which were depredated and captured in their gear. Some fishers complained that their catch decreases since dolphin presence tends to result in the scattering of their catch. Fishers also complained that natural and artificial lures were also depredated and nets were damaged due to the identification of holes made by the common bottlenose dolphins. The average reduction in catch sustained by fishers from one encounter is 59.22% suggesting that dolphin's depredation does result in catch losses. The vessel owner of survey vessel 18 refrained from answering and stated that the

percentage varies on every event. Six fishers stated that their catch decreases by 91% or over when dolphin pods are present, however only one fisher stated that his catch decreases by less than 10% (Figure 3).



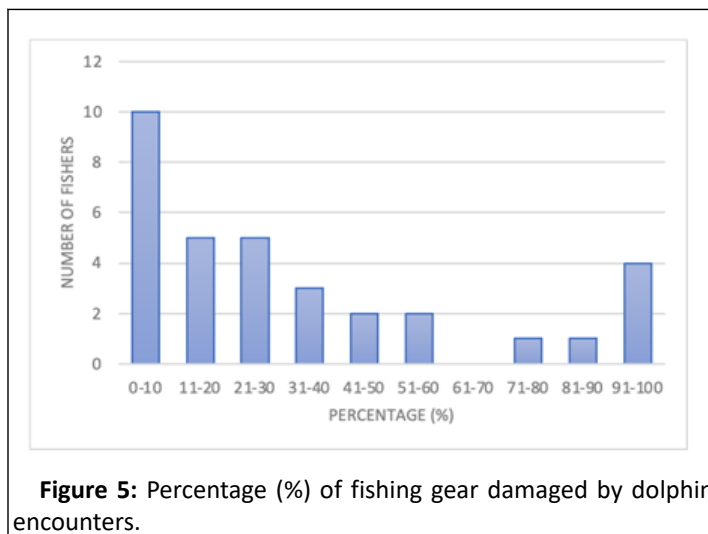
**Figure 3:** Reduction in catch per One Dolphin Encounter Event (%). Six fishers claimed that their catch decreased by 91% or higher when a dolphin encounter event occurred; five fishers claimed that their

Figure 4 indicates that most of the surveyed fishers agreed that only 10% of their fishing gear was damaged. However, the results show that 33% worth of damages due to dolphin interactions. It also shows that 10 fishers seemed to agree that the percentage of their gear that was damaged between 0-10%. Only 4 fishers seemed to complain that 91-100% of their gear was damaged (Figure 4).



**Figure 4:** Percentage (%) of Fishing Gear Damaged by Dolphin Encounters. Ten of the surveyed fishers claimed that 0-10% of their fishing gear was damaged by dolphin encounters; four fishers claimed 91-100% damage to fishing gear.

The costs incurred from the reduction in catch due to dolphin encounters was also investigated (Figure 5). Only 12 fishers answered this question since other fishers preferred not to answer. An average cost of €178.33 was calculated based on the data attained from the questionnaires. In general, costs ranged from €30 to €400. Five fishers seemed to agree that the costs incurred due to dolphin depredation was between €0-€100. Four fishers complained that the costs range from €101 to a maximum of €200. Only one fisher seemed to complain that costs range from €201 to €300 and two other fishers seemed to complain that costs range between €300 to €400.



## Discussion

Depredation of fishing gear by cetaceans is considered to be of great economic concern [3]. In the last few decades due to constant technological advancements in fishing gear, depredation has attracted international attention. Depredation is defined as the “the partial or complete removal of bait or captured fish in fishing gear” by aquatic organisms such as cetaceans, fish, birds, sharks and turtles. This phenomenon is generally recorded in stationary or passive gear such as pots and traps, bottom and surface longlines, gillnets and trammel nets and other line fisheries [12]. Even though it is most commonly recorded amongst passive gears, fishers carrying out mobile fisheries such as purse-seining, trolling and trawling techniques may still experience cetacean depredation.

The results achieved in this research paper indicated that out of all the Cetacean infraorder, the common bottlenose dolphins (*Tursiops truncatus*) was the only cetacean encountered. This fits the findings reported by Debono (2020), who utilized systematic surveys to denote the regular presence of bottlenose dolphins, with 59 dolphin pod sightings with a median of 12 individuals per pod, recorded between 2013 and 2016. Debono (2020) also states that this cetacean species is widely distributed in Maltese and Gozitan waters; however they are highly common in the southern regions of the Maltese Islands. Since most of the questionnaires were carried out at Marsaxlokk, 42.1% to be exact, all the respondents questioned in this area all reported that dolphins were encountered on several fishing trips.

The pie-chart in Figure 1, shows that 75% of the fishers have stated that dolphin encounters have increased immensely over the last 5 years. A study on the dolphin interaction with gillnets fisheries in Sardinia, carried out by Diaz Lopez (2006a), and showed that out of 317 days of observation, dolphins were observed for 330.6 hours. A quantitative assessment carried out by Pulcini, et al., (2013) in the Sicily Channel. This study seemed to indicate that there was a difference in the data collected from 1998 and the data collected in 2005, since dolphin populations seemed to increase in this region. According to Panigada and Labach (2018), bottlenose dolphins are commonly in the Strait of Sicily, making Malta a highly-vulnerable spot for dolphin

depredation as seen in Figure 1 (European MSP Platform, n.d.). This may be because bottlenose dolphins tend to feed on fish such as mackerel, bogue, squids anchovies and mullet which are all species that are captured in Malta.

The results shown in Figure 2 clearly demarcate that most of the *Tursiops truncatus* encounters with fishers occur in locations close to fish-farms. This echoes finds reported by Vella (2016) who showed that common bottlenose dolphins frequently forage very close to tuna fish-farms in the South-East of Malta resulting in the depredation of fishing gear. This occurrence was also the case in the Aegean Sea coastline whereby fishers identified the main target species of the fishery and recorded the damages on gill nets and trammel nets caused by dolphins, mainly the common bottlenose dolphin (*Tursiops truncatus*) [5].

Pace et al. (2012) also stated that fish farming activities can have effect on the common bottlenose dolphins’ grouping patterns. The latter study states that food patches can model the species social structure and their behavioral repertoire which can directly affect their long-term survival. Similarly, showed that common bottlenose dolphin pods interact regularly with fish farming activities in Greece, while Lopez (2006), confirmed that dolphin activity seems to increase around fish farms due to the abundant food supply in a concentrated area. This study thus suggests that the accumulation of dolphins is a result of opportunistic feeding of mackerel which is used as bait for tuna ranching. Such a behavioral feeding strategy results in an increase in the feeding rate of dolphins and a decrease in their energy in foraging activities.

When the researchers were conducting the questionnaires and collecting data, fishers commented that trammel nets and gillnets are also taken advantage of by dolphins, since they feed on the catch captured by these fishing gears. These fishers stated that they set their fishing gears during the night and the dolphins depredate the catch early in the morning prior to the retrieval of the fishing gear. A study on the Italian artisanal fisheries carried out by Lauriano [14]. Confirmed that trammel net and gillnets were the most vulnerable fishing gear to dolphin depredation. In fact this study showed that 72.2% of the fishing gear had been damaged by bottlenose dolphins, therefore resulting in a decrease in catch this result was also confirmed by Pardalou and Tsikliras (2020) who stated that trammel nets and gillnets that target *Mullus barbatus*, *Mullus surmuletus* and *Merluccius merluccius* are mostly depredated by *Tursiops truncatus*. The longline fishers that were questioned also stated that their swordfish longline mackerel bait is also depredated also resulting in a decrease in catch. According to Zollett and Read (2006) mackerel is the most depredated bait by dolphins.

In terms of interaction damage and losses, Table 2, provides a summary of fishing gear damage from a single dolphin encounter, describes how the commonest depredation was ‘Bite Marks’ and in most cases, respondents suffered holes in their fishing gear. Similar issues were found in Sardinia by Diaz Lopez (2006) who reported that bottlenose dolphins biting and damaging nets and forming small holes on fish-farm cages were observed. Fishers interviewed in a study carried out by Bearzi et al. (2011), stated that dolphins damaged their gear and also damaged the fish entangled in the net

fatherly confirming this result. Further argue that feeding on fish from gillnets is not an inborn behaviour in the common bottlenose dolphin species, and that it is instead learned from

other conspecifics. In their study, this supported by the estimated age distribution of the affected animals which were all older than 7 years.

**Table 2:** Fishing gear damage from a single dolphin encounter.

<b>Fishing Gear Damage from a Single Dolphin Encounter</b>				
<b>Survey Vessel</b>	<b>Depredation on Catch</b>	<b>Scattering Prey</b>	<b>Lures Depredated</b>	<b>Holes</b>
1	Bite Marks; Fish head;	No	-	Yes
2	Bite Marks; Fish head;	Yes	-	Yes
3	Fish head;	No	-	Yes
4	Other	No	Empty Hooks	-
5	Bite Marks; Fish head;	Yes	-	Yes
6	Other	No	Eat the bait off the hooks	-
7	Bite Marks; Fish head;	Yes	-	Yes
8	Fish head;	No	-	Yes
9	Other	No	Empty Hooks	-
10	Other	No	Empty Hooks	-
11	Other	No	Empty Hooks	-
12	Bite Marks; Fish head;	Yes	-	Yes
13	Bite Marks; Fish head;	No	-	Yes
14	Bite Marks; Fish head;	No	-	Yes
15	Other	No	Empty Hooks	-
16	Bite Marks; Fish head;	Yes	-	Yes
17	Other	Yes	-	Yes
18	Other	Yes	Empty Hooks	-
19	Other	Yes	-	Yes
20	Bite Marks; Fish head;	No	-	Yes
21	Bite Marks; Fish head;	Yes	-	Yes
22	Other	No	Yes	-
23	Bite Marks	No	Yes	-
24	Fish head;	Yes	-	-

25	Bite Marks; Fish head;	Yes	Yes	-
26	N/A	Yes	-	-
27	Bite Marks	-	-	-
28	Bite Marks	-	-	-
29	Bite Marks	-	-	Yes
30	Bite Marks; Fish head;	Yes	-	-
31	N/A	-	Yes	-
32	N/A	Yes	Leaves Bite	-
33	Bite Marks	-	-	-

Figure 3 portrays that the average reduction in catch sustained by a fisher from one dolphin encounter event is 59.22% which implies that losses occur due to dolphin depredation. In fact, Zollet and Read (2006), confirm that dolphins engaging in depredation activities cause damage to fishing gear and decrease the value and quantity of catches. [14]. Carried out a depredation study in Sardinia and his results showed that the reduction in catch resulted in an estimated loss of €1168 per fishing vessel per fishing season. This was further confirmed by Rocklin, et al. (2009) who reported that bottlenose dolphins attacked, on average, 12.4% of the nets and damaged 8.3% of the catch. Apart from the damage caused due to dolphin interactions, an average of 33.43% (Figure 4) of the fishing gear, worth an average of €178.33 (Figure 5) in damages was also reported. Such costs, coupled with depleting fish stocks market changes and other socio-cultural factors, are compounding the already-existing burdens on small-scale fisheries in the Mediterranean.

## Conclusions and Recommendations

In this study, questionnaires were utilized to understand the perception of dolphin depredation phenomenon and how fishers are mostly affected by the latter in the Maltese islands. The regular presence of bottlenose dolphins seemed to have increased over the last 5 years, with most dolphin encounters occurring near fish-farms. This has also been confirmed in a study carried out by Bonizzoni et al. (2013) which showed that bottlenose dolphins increased in the 20 km radius from fish farm activities, due to the presence of uneaten fish feed, accumulation of smaller prey and detritus. Trammel nets fishing gear seemed to be the most popular gear type employed by Maltese fishers. However, this study also showed that an average of 33.43% of the fishing gear resulted in damages worth an average €178.33 per year in damages was also reported. This results in an increased pressure on artisanal fishers that is already highly burdened by other threats (Said et al. 2018). Although other species and external factors other than dolphins could have been responsible for part of the damage. A study carried out by [14]. Focusing on the Italian artisanal fishery

seemed to indicate that 72.2% of the cases analyzed resulted in damage to fish while 66.4% of the cases seemed to have gear damage due to the cetacean interactions. This shows that this phenomenon is a regional issue. In addition, questionnaires carried out during this study could have been perceived by some fishermen as an opportunity to influence future decision-making regarding monetary compensation for the impact of depredation and therefore, economic values cited by fishers may be slightly inflated or erroneous overall.

Nonetheless, the reporting of cetacean depredation can be deemed to be a decent start in analyzing the current status of dolphin depredation in the Maltese Islands. Depredation is generally not reported in fisheries statistics and this is considered to be a source of mortality that is not taken into consideration for current fish stock assessments which are highly essential in the management of fisheries [16]. There is an obvious need to closely monitor the depredation of gear and amalgamate it with fisheries management and provide proper mitigation measures [12]. It is essential that dolphin depredation is recorded and given to STECF to provide proper consultations to the European Commission with regards to the proper management and conservation of marine resources [13].

The authors of this study evaluated a number of recommendations which could be taken into consideration. First and foremost, more studies and investigations need to be carried out in this field. For example, the implementation of floating laboratories, such that finds of the questionnaires are triangulated with the on-site investigations. Who proposed that surveys are carried out on a regular basis to determine the cetacean interaction frequency, through continuous and ongoing research? This would provide a more holistic picture of the current status of dolphin depredation and its effects on the small-scale fisheries in the Maltese Islands. Further studies on the damage done to fishing gear should be carried out to assess the level of depredation fishing gears undergo.

Prevention and mitigation measures can also be carried out. For example, since acoustic devices may not be as successful since cetaceans may get used to certain acoustic frequencies and it may augment their capability to find fishing gear, it may

be beneficial to utilise acoustic devices that emit random pulses that occur over a broader frequency range as suggested by Accobams (2019). Another mitigation measure that can be utilized to decrease interactions is the communication of cetacean hotspots with other fishers to decrease chances of depredation as suggested by [17-20]. Monitoring surveys at sea can also be beneficial to assess which areas are mostly considered to be cetacean breeding and feeding grounds. The use of fishing gears or bait with unpleasant tastes and smells could also be considered to be an option [15,17]. Have also carried out a project known as the "Paraped" project which was focused on constructing masking nets in order to protect longline fishing gear. Another project helmed by [15]. Described another measure known as the "DEPRED" mitigation device this is a device has two main goals. These include the startling of predators when they are in the vicinity of the fishing gear to protect captured fish. The prototype of the "DEPRED" device includes the eight one meter long streamers that are constructed from tarpaulin and they are fixed on a PVC tube of a 2 cm diameter. The upper streamers function as a form of a deterrent to cetaceans while the lower 4 streamers are weighted, and they cover the captured providing it a protective effect. There are several other varieties of the umbrella-and-stones technique; however even though depredation prevention was successful this prototype had a detrimental effect on the catches. Ultimately cetacean presence in Maltese waters could be exploited for the local coastal economy, which includes activities such as dolphin watching, merchandising, and fishing tourism, as a diversification activity for fishers [26-30].

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