MINOUW

Case study results

3.2: Balearic Islands set net fisheries

Contact person:
Elena Pastor

http://minouw-project.eu

Co-funded by the Horizon 2020
Framework Programme of the European Union

RESEARCH & INNOVATION
European Commission

ID•634495

Summary

The experiments aimed to establish if the above mentioned changes to the traditional net designs of trammel nets improves the species selectivity and reduces bycatch and discards in the tested fisheries.

An additional aim of the study was estimated the survival potential of the most important discard species at two temporal scales: immediate and short-term survival. Results with respect to juvenile spiny lobster (the target species) showed high survival potential after discarding and may therefore support a potential exemption from LO of this species with respect to article 15, paragraph 4b, of the CFP(EU Regulation, 1380/2013, European union(EU)

Case study results

Type of intervention

1. Testing of trammel nets constructed by two alternative netting materials a) traditional multifilament polyamide (PMF) and b) the more recently introduced multi-monofilament ethylene (MMT) netting, in a spiny lobster fishery. Comparison of catch and bycatch composition from an ecological as well as an economic perspective.
2. Testing of the performance of trammel nets modified by a "greca" (selvedge) as a bycatch reduction device in a spiny lobster fishery. Comparisons of catch and bycatch composition.
3. Testing the performance of two trammel net mesh sizes with respect to catch and bycatch a) the traditional 60 mm versus b) 80 mm, in cuttlefish fishery.Main activities carried out

Main activities carried out

The experiments conducted aimed to assess the effectiveness of the technological improvements that artisanal fishermen targeting spiny lobster with trammel nets are beginning to implement to reduce discards in Majorca and elsewhere in the Mediterranean. The studies aimed to provide detailed description of catches and revenue from the wanted and unwanted fractions of catches.
A total of 35 fishing trips, on commercial fishing boats targeting spiny lobster with trammel nets were surveyed in Majorcan waters from April to August in 2015 and 2016. Scientific sampling was conducted on board under the condition of minimal disruption to their activity. Each boat was rigged with two or three sets of trammel nets. A trammel net set consisted of between 10 and 30 netting walls each; approximately 100 m long and with a mesh size of 160 mm. Netting walls studied were either composed of standard polyamide multifilament (PMF) or a new polyethylene multi-monofilament (MMF). A total of 981 PMF and 499 MMF netting walls were sampled. Trammel nets were either composed of one or a combination of the two materials.

Additionally, conventional MMF nets were compared to MMF nets with an additional modification called "greca". A "greca" is a piece of net approximately 20 cm high made of a thicker nylon material with a mesh size of 45 mm that is sown to the bottom of the main net along its entire length. Trammel nets testing the effect of "greca" were composed of 10 netting walls alternating between 5 MMF with a "greca" and 5 MMF without a "greca". Data from a total of 14 trammel net deployments were recorded. In total, 70 netting walls with "greca" and 70 without were evaluated.

Catches were identified, measured; categorized (commercial, discards and reason for discarding) and the statistical differences among the different configurations were tested by means of Bayesian statistics.

Survival assessment

Lobster (*Palinurus elephas*) trammel net fishery

Survival was assessed at two temporal scales: immediate and short-term (7 days). The aim of the first method was to determine the immediate survival of the animals to be discarded when the gear arrived on deck. Animals to be discarded were identified and measured, and their survival status was assessed. Additionally, short-term survival was assessed for the target species only. Sixteen discarded specimens of undersized lobsters collected in Port d'Andratx between 26/5/16 and16/8/16 were transferred into small, aerated and refrigerated tanks and transported to an on shore laboratory (LIMIA facilities). At the laboratory the lobsters were placed in a 5000 liters fiberglass tank and supplied with a continuous flow of 100µm filtered and refrigerated water; the temperature was maintained below 18°C. The tank was also equipped with plastic tub shelters. The individuals were fed once per day with fish. The vitality status of the specimens was determined using a four-point vitality scale (Benoit et *al*, 2010).

Cuttlefish (*Sepia oficinalis*) trammel net fishery:

The status of the discarded captures was determined before they were returned to the sea, based on their liveliness. These data were used to estimate the immediate survival, detecting the probability of survival at the moment that the gear arrived on board. A subsample of animals was used to assess short-term survival. These animals were transferred to an on-board tank with sea water and continuous aeration and were transported to LIMIA facilities at the end of the fishing journey. The collected species were maintained separately in tanks according to the size of the individual, with continuous seawater overflow and controlled temperature. The status of the tested specimens was determined as in the lobster case at their arrival (Day 0) and after seven days at the laboratory. The survival of each specimen was checked daily.

Main results

- Regarding the MMF *vs* PMF comparison, the proportions of netting walls/panels with some marketable catch (PMF=31% vs. MMF=28%), the estimated mean revenue in the netting wall (PMF=41€ vs. MMF=42€), and the mean revenue for an average net (PMF=262€ vs. MMF=242€) were similar. In all three cases, the differences between PMF and MMF were not considered statistically relevant.
- Concerning the MMF *vs* PMF comparison at the netting panel level, the proportions of panels with unwanted catch were similar (PMF=50% vs. MMF=49%).
- Concerning the standard MMF *vs* MMF+greca comparison, the differences in the probability of obtaining some commercial catch were relevant (MMF=52% vs. MMF+greca=70%), but the estimated mean discarded weight was statistically relevant in the opposite direction (MMF=1.30 kg vs. MMF+greca= 0.62 kg).
- The estimated mean revenue when marketable items in MMF *vs* MMF+greca comparison were concerned did however not to differ. However, MMF+greca netting walls tended to retain some discarded fauna more frequently, but the overall mean weight of discards was smaller.
- High immediate survival was found for discarded undersized lobsters (100%), and during a seven days survival assessment, using captivity observation (94%), gave an asymptotic estimate of survival probability

Discussion of the results

Within the present study we compared three trammel net designs (PMF, MMF and MMF + *greca*) in terms of biomass, species composition and revenue of marketable catches and discards. The statistical analyses suggested no differences between PMF and MMF in terms of probability of obtaining commercial catch or in cumulative (across-species) biomass/catch weights. Similarly, the comparison between MMF+greca and MMF showed no differences for the marketable fractions. However, the results reported for the *greca* indicate that it affects the capture of some non-commercialized species. It reduces capture of rays but increases the capture of other smaller elasmobranches species within our study. The processes leading to this pattern remain elusive, but the phenomenon illustrates the need to more closely examine the operational mechanism of the trammel net. In this type of net, the netting wall is formed by a main net characterized by a smaller mesh size and a larger diameter thread at the centre with two further nets on either side, both with wider meshes sizes and smaller thread diameter.

When a fish tries to pass through this netting wall it pulls at the central panel, which is slack, and when it tries to escape through the wider lateral meshes, it becomes trapped. Because of the extra weight that the *greca* exerts on the netting wall, the meshes may acquire rhombic forms, and reduce the level of slack in the panel effecting the hanging ratio of the nets. Such circumstances could explain the differences in species composition mentioned above. Bigger and flatter fishes such as *Raja* spp. would have less chance to be trapped due to the tension of the panel and to the deformation of the meshes. In contrast, smaller elasmobranchs such as *S. canicula*, due to their fusiform morphology, would penetrate the exterior panels and become trapped more easily in the more tensioned netting walls fitted with *greca*.

In relation to the survival probability of the non-marketable fraction, some animals in the catch are alive when they arrive on board and may survive if returned to the sea. The reasons for deciding that a given animal is not worth landing and can be returned to the sea are diverse. For example, adherence to the local management rules demands that undersized lobsters cannot be retained. The fraction of undersized lobsters (CL <90 mm) can be up to 80% in Sardinia (Italy) (*Secci et al., 1999*); however, in the current study this fraction was 25.5%, and a similar figure (21.5%) was reported by *Quetglas et al. (2004*). Considering the capture of undersized lobsters, one of the more relevant results reported here was the high survival probability of undersized *P. elephas* estimated after combining immediate and short-term survival in captivity. However, the probability of immediate survival of juveniles *P. elephas* was 100%, while that of Solea sp. was 62%. This result may be indicative of the potential survival of undersized individual if returned to the sea. Further, other non-marketable species were reported to have high survival (> 60%) when they were brought on deck: cuckoo ray (*Leucoraja naevus*) and the royale cucumber (*Parastichopus regalis*). *P. elephas* and *P. regalis* are both invertebrates, which may make them more resilient to asphyxiation and attacks from predators and scavengers. However, it is interesting that an elasmobranch species, *L. naevus*, also demonstrated a high survival. In contrast, other non-commercial species showed low survival capability. This is likely to be due to the prolonged soaking times of this fishery (up to 48 hours) that can result in exhaustion, asphyxiation and injury of animals caught in the net, as well as by predation from attracted predators and scavengers. As mentioned above, these prolonged soaking times are a deliberate part of the fishing practice. Therefore, alternative gear configurations and/or fishing tactics that reduce soaking time would be preferable and should be investigated.

Furthermore, based on the results from the survival experiments of undersized spiny lobsters, it is recommended that further research should be conducted that may support a potential exemption from the Landing Obligation of this species with respect to article 15, paragraph 4b, of the Common Fisheries Policy (EU Regulation 1380/2013). Returning ovigerous females and undersized lobsters to the sea could provide substantial benefits to this exploited stock.

How practical is it for fisherman to implement this improvement, technically and financially?

The reputed advantage of these MMF vs the traditional PMF, which has not been detected here, is the potential reduction of expenses related with repair and maintenance.
However, the addition of ‘selvedge’ or ‘greca’ to trammel nets is a relatively inexpensive and straightforward modification that fishermen can perform easily.

Is there sufficient evidence to support wider adoption of the method/technology?

The new design do not present an economic disadvantage such as a relevant reduction of revenue, nor an excessive cost, including the addition of greca, and consequently support its adoption.

CONCLUSION

The three trammel net designs (PMF, MMF and MMF+greca) showed no significant differences in revenue and weight for the wanted and unwanted marketable fractions in the spiny lobster fishery. Moreover, although the species composition of discards was different when using greca with some discard species being retained more frequently, the overall mean weight of discards in MMF+greca was smaller in relation to other trammel nets design.

In the cuttlefish fishery we examined, no significant differences were detected between 60 and 80mm mesh size of nets. Species composition is continuously changing and it is often difficult to determine the main target species of this fishery. So, it suggests a low selectivity of this gear. The revenues, corresponding to an apparently untargeted fraction, became higher than the revenues of the target species as the fishing season progressed, thus supporting its great importance for total revenues. In this study we report that the discard ratio in weight (47%) was higher than those reported for similar trammel nets. Conversely, the discard ratio in number of specimens reported here (40%) was smaller than in other studies.

Additional resources and links

- EU Common Fisheries Policy (CFP) Reform: https://ec.europa.eu/fisheries/cfp_en
- International Guidelines on Bycatch Management and Reduction of Discards: http://www.fao.org/fishery/nems/40157/en
- ICES WKMEDS Report 2014: Report of the workshop on methods for estimating Discard Survival. ICES CM 2014/ACOM:51
- Catanese G, Hinz H, Gil MdM, Palmer M, Breen M, Mira A, Pastor E, Grau A, Campos-Candela A, Koleva E, Grau AM, Morales-Nin B. (2018) Comparing the catch composition, profitability and discard survival from different trammel net designs targeting common spiny lobster (*Palinurus elephas*) in a Mediterranean fishery. PeerJ 6:e4707 https://peerj.com/articles/4707/
- Gil MM, Catanese G, Palmer M, Hinz H, Pastor E, Mira A, Grau A, Koleva E, Grau AM, Morales-Nin B (2018). Commercial catches and discards of a Mediterranean small-scale cuttlefish fishery: implications of the new EU discard policy. Scientia Marina, Special issue: Discards regulation vs Mediterranean fisheries sustainability, 155-164; http://scientiamarina.revistas.csic.es/index.php/scientiamarina/article/view/1774/2465

The MINOUW Consortium

Co-funded by the Horizon 2020
Framework Programme of the European Union

Beneficiaries:

Linked parties: