



MINOUW

Case study results

3.3 Balearic Islands boat seine fisheries

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RESEARCH & INNOVATION

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Summary

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.

Case study results

Type of intervention

The experiments aimed to assess three different points of the CS

- 1.- To evaluate the fishermen’s perception of how the co-management plan is working.
 - To ensure high yields and to minimize fishery collapse risks.
 - To regulate the fishery using an adaptative management.
 - To determine the effort for the target species for the following month.
- 2.- To have a better knowledge of the fishery when proposing new measures for sustainable regulation of the fishery.
 - Determine % discards (target species and by-catch) for the fishing strategies practiced by the boat seine fleet.
 - Assess slipping practices, as well as its effect on target and discard species.
 - Determine the relative composition of the main target species (the goby *Aphia minuta* and *Pseudophya ferreri*) and the secondary target species (*Gymammodytes cicerellus* and *Crystallogobius linearis*).
- 3.- Assessment survival of the discarded fraction is important for the management of the resource. The main target species (*Aphia minuta* and *Pseudaphya ferreri*) of the transparent goby fishery are currently discarded when the quota is exceeded or when the sorting process is unworkable (slipping).
 - Estimate by-catch survival rates.
 - Estimate target species survival when the catch is released.

Main activities carried out

1. - Stakeholder’s perceptions:

To evaluate the stakeholder’s perceptions a framework survey was organized at the end of the 2015-2016 fishing season for the transparent goby fishery. A structured inquest was designed with 11 main open-ended questions organized in blocks to determine: the fishermen knowledge on the regulations (own perception of their knowledge and specific questions to test it); fishing operations; capture handling; perception on economic revenues; and satisfaction with the Survey Commission (SC). Additionally 6 questions addressed their preference on the management options (ranked from 1 to 10). The enquiry was send by the DGPM to SC members and fishermen guilds, some person to person interviews were also performed.

2.- Description of the fishery:

- A regular monitoring has been implemented on board 9 vessels during 2015-2016 fishing seasons.
- One technician went on board 4-6 times per month during the fishing season (December-April).
- The fishing operations were monitored (number of hauls, duration, slipping, and depth), the catch and by-catch (amount and species composition) were determined.
- Catch variability of the target species for the transparent goby fisheries was evaluated (2002-2015) following the evolution of landings during this period from the daily sales registers by boat in the central Fish wharf.

3.- Survival assessment:

The survival rate of both target and by-catch species was estimated experimentally.

- During 2015 long-term survival was monitored in LIMIA 90 L. aquariums. 13 random samples of fish from 13 fishing days were transported in a 90 L. container with sea water and continuous aeration to LIMIA facilities. 50-60 alive individuals from each one of the target species and the most common by catch species were placed in different 90 l aquariums, with continuous flow of marine water for one week. Fish was fed with frozen krill and *artemia* adults. Daily, death individuals were counted and removed from the aquariums.
- During 2016 short-term survival was assessed on arrival to harbor. A total of 19 sampling days were randomly selected along the fishing season and a total of 47 hauls were sampled. In each haul, we estimated separately for target and by-catch species:
 - a) Immediate mortality: Just at the moment the coded was aboard, a random sample of fish (target and by-catch separately) was placed into a 15 L. containers with sea water and continuous aeration. Time of the day, date, location, duration of the tow, sea condition, and depth and water temperature were recorded. Dead (unresponsive, no mobility, no reflex) animals were counted and separated from those alive in each the container.
 - b) Short term survival: At the end of the fishing journey, the containers with the collected samples were landed to port. Then the dead and alive individuals, from each container, were separated for later identification, counting and fish length measurement.
 - c) Motility: The swimming speed and the reaction to a sound stimulus of a sample of the individuals that came alive to port were estimated using video recording. Ten random individuals per haul were recorded in a circular arena measuring 23 cm in diameter. The entire trajectory of the individuals within the arena was recorded using a GoPro Hero 3 camera. The reaction to a stimulus was analyzed by dropping a metal piece near the arena. The fishes were given 5 minutes to acclimatize to the new container, after which the arena was video recorded for 10 min.

Main result

1.- Stakeholder's perception

- A total of 22 respondents answer the questionnaire representing 68% of the fleet.
- Most of the respondents were satisfied with the management measures (63.64%) and felt well represented in the Survey Commission (45.45%). However, the majority did not experience better economic revenue since the management plan was implemented (50%).
- Regarding the preference on the management measures, several fishermen suggested a reduction on the daily quota to 20 kg as well as to start the fishing season on January to avoid catching small fishes.
- The respondents claimed that the excess quota catch was reported to be returned to the sea (90.91%), or if the fish were dead, the catch was shared between boats already fishing that had not met their quota (18.18%).

2.- Description of the fishery

- The target species of the fishery are small gobies mainly *Aphia minuta*, *Pseudaphia ferreri* & *Christallogobius linearis* in different proportions depending on the fishing area.
- The transparent goby fishery is seasonal from December to April.
- The fishing boats engaged in the fishery are small boats (5-12 mts length, 20-155 hp.).
- Boats licensed to use seines are required to keep log-books that record daily catches and to deliver this log to the institutional authorities.
- In the monthly SC meeting, the values of the landings are checked against the minimum threshold for the daily capture by boat (Fixed annually prior of the beginning of the fishing season). If the threshold by boat is not reached some reduction on the effort is adopted such as reduction of the weekly fishing days or if the monthly yield is again under the threshold, the fishery must be closed.
- The daily sales registers in the central Fish Warf (2002-2015) show quite stable seasonal landings.

3. – Survival assessment of target species.

- The immediate mortality estimated was low (survival average value of 99.9%, CI 97.9-100%).
- The delayed mortality, which reached the asymptotic value in few hours (around 4 hours) was considerably high (survival average value of 47.2%) and presented a high variability (CI between 33.8% and 65.8%) depending on the environmental conditions.
- Post-release mortality was doubled when fishing depth increased in 32 m or when water temperature increased by 2.8 degrees.
- The swimming speed of the target species was significantly correlated with the estimated long-term survival.

4. – Survival assessment of by-catch species.

- A total of 53 different species were discarded, presenting a high estimated survival (immediate survival 97% , short-term survival 88.4%, and long term survival, 87,27).
- The most common by-catch species (*Pagellus acarne*, *Diplodus annularis* and *Pagellus erythinus*) were captured under the minimum legal size, therefore are affected by landing obligations.
- *Pagellus acarne* showed an immediate survival of 100%, a short-term survival (around 4 hours) of 72.8% and a long term survival of 78,57, *Diplodus annularis* had a immediate survival of 71.9%, and a short-term survival of 60.5% and *Pagellus erythinus* had a immediate survival of 100% and a short-term survival of 88.0%.

Discussion of the results

The legitimacy of regulations and enforcement could be improved by transferring more responsibility to user groups by including them in the decision making process resulting in co-management, which involves agreements between participants in the fishery and government regulatory agencies. The fundamental issue is what institutional arrangements are required for the sustainable utilization and management of common pool resources which are removable and suffer the effects of environmental variability and uncertainty. A common tool used is limiting access by issuing licenses and permits (i.e. rights to fish) to try to regulate fisheries (Mollett 1986), albeit the social aspects of fisheries and fisher behavior should be considered in the design of management systems (Wilén 1979, Healey 1985, Pringle 1985). The essence of co-management is that the government and the user groups share responsibility for managing the resource. In our case, the establishment and implementation of joint decision making has been tutored by the EU regulation. The main actors are represented, including society (ONG), scientists (research Institute), fishermen (Fishermen guilds), commercialization (Fishing Warf) and managers (DGPM). The approach chosen is adaptive management, with changes in the regulation

depending on the fishing results. As stated by McCay (1995) the specific models in each country reflect the broader institutional patterns and practices that prevail because fisheries management institutions do not originate in an institutional vacuum and must generally relate to their external political environment. In our case the EU policies determine the approach to the current management.

The survival study introduces an approach to assessing relative post-release mortality of the target species (*A. minuta* and *P. ferreri*) in the transparent goby fishery, and the environmental dependencies of fishing post-release mortality. To date, these species use to be returned to the sea when the maximum daily quota is exceeded by a boat or when the discarded fraction is high what technically hinders the fish sorting and promotes slipping. In these cases, survival of released fish remains unknown affecting the proper management of the fishery. In fact, the co-management committee revises periodically the daily catches and the fishing effort (Morales-Nin et al., 2017); however, they does not take into account the total mortality caused by fishing. The immediate mortality estimated in this study at the averaged environmental conditions was low (survival average value of 99.9%, CI 97.9-100%) but the asymptotic delayed mortality was considerably high (survival average value of 47.2%) and presented a high variability (CI between 33.8% and 65.8%). The wide range observed in the delayed mortality is caused by the high variability of environmental conditions. In fact, water temperature seems to have a major effect on survival. Conversely, the effect of depth was lower than the effect of temperature due, probably, to the fact that transparent goby fishery is carried out in relatively shallow waters (less 30 m depth). On the other hand, other factor that could be affecting the survival of the target species is their small body size. The fact of the size-specific mortality of discards, with smaller fish showing greater mortality, has been demonstrated in many studies (Suuronen et al 1996; Uhlmann et al 2016). Therefore, *A. minuta* and *P. ferreri*, given their small body size which had an average value of 2.34 ± 0.5 cm, could be considered as fragile species with a high sensitivity to fishing effect.

The most common by-catch species (*Pagellus acarne*, *Diplodus annularis* and *Pagellus erythinus*) are affected by the landing obligations because all of them were captured under their minimum legal size. However, these species showed a short-term survival higher than 60%. Therefore, 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 these individuals to the sea could provide substantial benefits to these stock, as these species are exploited by other small-scale fisheries in this area (for example, trammel net fisheries).

CONCLUSION

The success of the enquiry among the fishermen itself (68% of the registered fleet answered) showed that there was a positive attitude. The co-management implemented since 2013-2014 fishing season, would require a more active dissemination and divulgation among the fishermen because a sizeable portion of these fishermen did not feel well represented or were not even aware that a co-management commission had been set up (one answer). Some management measures could be refined in the future based on the answers to our questionnaire which for the first time gathered the fishermen opinions. In summary, the balanced relationship between the fishermen's initiative and the administrative regulatory capacity is necessary to maintain the community voice of the fishermen for the collective purpose of keeping the fishery sustainable.

Currently, some fishers, when the quota is exceeded, carry out a practice of sharing the catch with other boats already fishing that had not met their quota (Morales-Nin et al., 2017). The fishers claim that carry out this practice when fish are mostly dead, maximizing the use of the resource. Due to numerous requests from fishers, the local administration has been working on the regulation of this practice and soon the sharing of catch will be allowed to those boats that previously requested it. This practice is in accordance with the new EU discard policy (Regulation EU No 1380/2013 of the European Parliament and the Council on the Common Fisheries Policy) which aims to reduce the amount of discards returned

to the sea. In fact, the practice of sharing allows to reduce the discards of a catch that, due to its high sensitivity, suffers a high mortality by the fishing process and, in turn, to improve the profitability of fishing.

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
- Morales-Nin, B.; Grau, A.M.; Aguilar, J.S.; Gil, M.M. & Pastor, E.(2017). Balearic Islands boat seine fisheries: the transparent goby fishery an example of co-management. ICES, doi:10.1093/icesjms/fsw227.



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