CATCH COMPOSITION, DISCARDS AND SELECTIVITY IN THE RED MULLET (*Mullus surmuletus*) GILLNET FISHERY OFF THE ASTURIAS COAST

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Introduction and objective

- The artisanal fishing fleet of Asturias (221 active fishing vessels in 2011) represent the 72% of the total regional fleet.
- Gillnets are a fishing gear frequently used by artisanal vessels in Asturias, being remarkable during the summer season the "*métier*" called "red mullet gillnet" that has *Mullus surmuletus* L., as target specie.
- The current allowed minimum mesh size for this gillnet in Asturias is 50 mm, and the maximum gear height permitted is 3 m.
- As gillnet is a multispecific gear, fishermen are facing the dilemma of knowing how to obtain the grater profit, combining its efficiency to capture the target specie and the main by-catch species of commercial interest.
- Taking this into account, there is an increasing tendency in the fishing sector to ask for the admission of a greater gear height to improve their economic yield.

- **With the purpose of knowing the effects of the gear height and mesh size on the discards generated, the catch composition and the selectivity and yield of the red mullet gillnet, the present study was carried out.**

Experimental fishing and sampling

- **Experimental fishings:**
  - Nº experimental fishing days: 18.
  - Date: between May and October 2010.
  - Location: near Port of Lastres, East coast of Asturias, Spain (Figure 1).
  - Fishing vessel: artisanal fishing vessel (9.5 m total length).
- **Experimental gears:**
  - Nº experimental gears: 2 gillnets (3 and 5 m high, respectively).
  - 1 gear = 20 sheets of 50 m long.
  - Sheets of 4 different stretched mesh lengths (53, 60, 75 and 87 mm) placed alternately in each experimental gear.
  - Distance between sheets: 3 m.

Figure 1. Geolocalization of the study area

- **Sampling:**
  - At least one person of the research team accompanied the fishermen each fishing day, in order to separate the catches coming on board from each type of sheet.
  - The catches were classified into: commercial catches (retained for sale: RS), catches retained to be used as bait in other fisheries (retained for bait: RB) and discards (D).
  - The definition of discards used in the present study is the adaptation that Kelleher (2005) did from the one of FAO (FAO, 1996).
    - The reason for discarding was reported by the fisherman for each discarded individual.
    - All captured organisms were identified, weighed and measured on port.

Catch composition and discards

- A total of 12 090 individuals (2 642.606 kg), belonging to 68 different species (57 fish, 4 echinoderms, 4 molluscs and 3 crustaceans) were caught.
- Most of the captured individuals were retained for bait purposes, but, in weight, most catches were commercialized (Table 1).
- From all the species included in the Spanish catalogue of endangered species only 3 specimens of one specie, *Charonia lampas*, were caught.
- There had been identified 5 reasons for discarding (Table 2):
  - Insufficient catch.
  - Damaged.
  - No commercial value.
  - Insufficient length.
  - Exceeded TAC.
- The RS, RB and D catch rate (Table 3) and the total catch of each category (Figure 2) for each net height and mesh size combination were analyzed.

Catch	No. species	% in weight	% in number	Main species (in no.)
Retained for sale (RS)	41	48.3	31.2	*Mullus surmuletus* *Merluccius merluccius*
Retained for bait (RB)	2	43.8	55.1	*Boops boops* *Trachurus trachurus*
Discarded (D)	54	7.9	13.8	*Polybius henslowi* *Boops boops*

Table 1: Total catch composition.

Discards	Insufficient catch	Damaged	No commercial value	Insufficient length	Exceeded TAC
In number	12.5	28.7	40.2	15.4	3.1
In weight	14.7	34.3	31.6	12.5	7.0

Table 2: Percentage of discarded catches by discards reason (in number and weight).

Catch	Net height	Mesh size 53 mm	60 mm	75 mm	87 mm
Retained for sale (RS)	3 m	0.44	**0.66**	0.76	0.77
	5 m	0.37	**0.51**	0.73	0.78
Retained for bait (RB)	3 m	0.48	**0.26**	0.10	0.12
	5 m	0.56	**0.40**	0.14	0.13
Discarded (D)	3 m	0.08	0.08	0.14	0.11
	5 m	0.07	0.09	0.13	0.09

Table 3. Catch rates in relation with the total catch (in weight) for each net height and mesh size combination. Statistically significant differences are shown in bold ($p<0.05$).

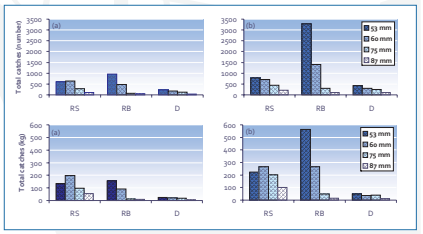

Figure 2. Total catch (retained for sale, RS; retained for bait, RB and discarded, D) in number and weight depending on the net height and mesh size: (a) 3 m high net; (b) 5 m high net.

Red mullet selectivity

- Intra-specific selectivity:
  - Five different models (normal location, normal scale, Log-normal, Gamma and Bi-modal) were tested by means of GILLNET Software (ConStat, 1998), based on the SELECT method.
  - Goodness of fit was evaluated by comparison of deviances, with the lowest deviance value corresponding to the best fitting model (Millar and Fryer, 1999).
  - The bi-modal function gave the best fit, with a deviance value of 44.59 for the 3 m gillnet and of 54.33 for the 5 m gillnet (Figure 3).
  - All net height and mesh size combinations observe the minimum landing size of 15 cm for red mullet.
- The CPUEs in number and weight were analysed (Table 4). The 3 m height and 60 mm of mesh size combination was the most efficient in weight.

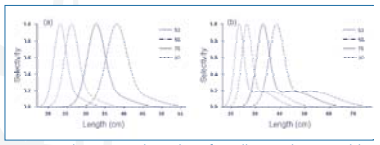

Figure 3. Selection curves by mesh size for *Mullus surmuletus* Bi-modal model. (a) 3 m high net; (b) 5 m high net.

CPUE	Net height	Mesh size 53 mm	60 mm	75 mm	87 mm
n/100 m	3 m	**8.27**	7.00	1.84	0.29
	5 m	6.11	4.49	1.42	0.27
kg/100 m	3 m	1.30	**1.60**	0.69	0.17
	5 m	1.10	1.07	0.55	0.12

Table 4. *Mullus surmuletus* CPUEs (n/100 m and kg/100 m) for each gillnet height and mesh size combination.

Conclusions and recommendations

The main species with commercial value captured were the objective species, the red mullet *M. surmuletus*, and the Atlantic hake *M. merluccius*. The two species characterized as "Retained for bait", *B. boops* and *T. trachurus*, represent a high percentage in catches, both in number and biomass. As stated by the fishermen, these species could change their category and be considered as discard depending on the year and the port, because it use as bait depends directly on other fisheries.

A high increase in retained for bait catches was observed when the 5 m net height was used. It was also observed that although the total catch increases with the increase of the net height, this did not happen for the objective species, *M. surmuletus*. So, it is not recommended to increase the net height in the gillnet for red mullet fishery.

Focusing on the 3m height net, and taking into account the retained for sale and retained for bait catch and the *M. surmuletus* CPUEs, it is recommended to avoid the use of the 53 mesh size net because it is the one with the higher retained for bait catch with no increase in the retained for sale catch or in the red mullet catch.

It is concluded that in small-scale fisheries, as the gillnet for red mullet, the study of discards is complex because of the high catch rate of species (as *B. boops* and *T. trachurus*) that could be considered discards or not depending on factors that has nothing to do with the fishery or even the market. Their catch rate depends both on the net height and the mesh size, so this study will be helpful for the development of an ecosistemic management of this artisanal fishery.

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