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The new CFP introduces a discard ban in European waters, with an obligation to land all regulated species. The fishing management system in the Mediterranean is based on effort control and technical measures and this is raising some particular concerns about effective implementation of the discard ban. With the exception of bluefin tuna (*Thunnus thynnus*), there are no quotas in the Mediterranean and this regulation affects all regulated species with minimum landing size (Bellido *et al.* 2016).



The discard ban may lead to an increase in the amount of fish caught via land the juveniles that are now discarded. Thus one possible consequence of the new regulation may be an increase in marketing of fish below the minimum size. The opening of new markets by landing juveniles could worsen the population state of many Mediterranean fisheries. For the other hand the multispecific discards nature of the trawl discards constitute a challenge for design measures to reduce discards.

The history of the trawl fishery management in the Mediterranean has been developed under the auspices of the European Union and following the schema of the European Atlantic fisheries. It facilitate sampling schemas enforcing allocations of spatial biomass and abundance.

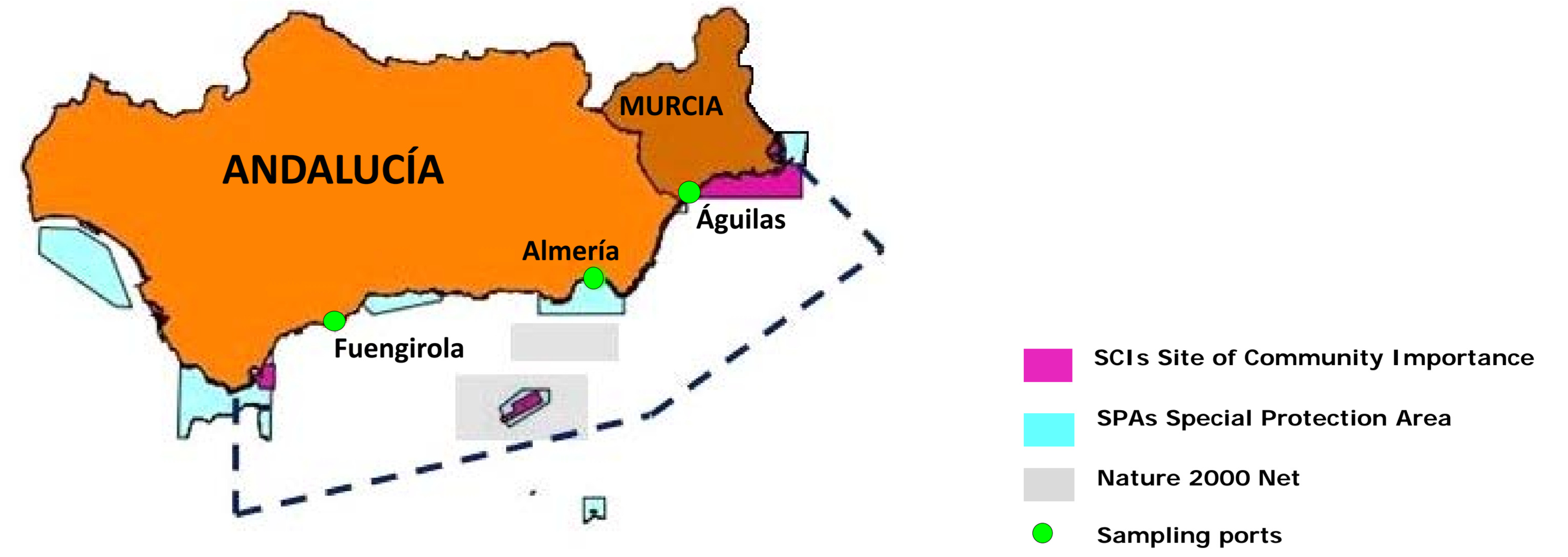
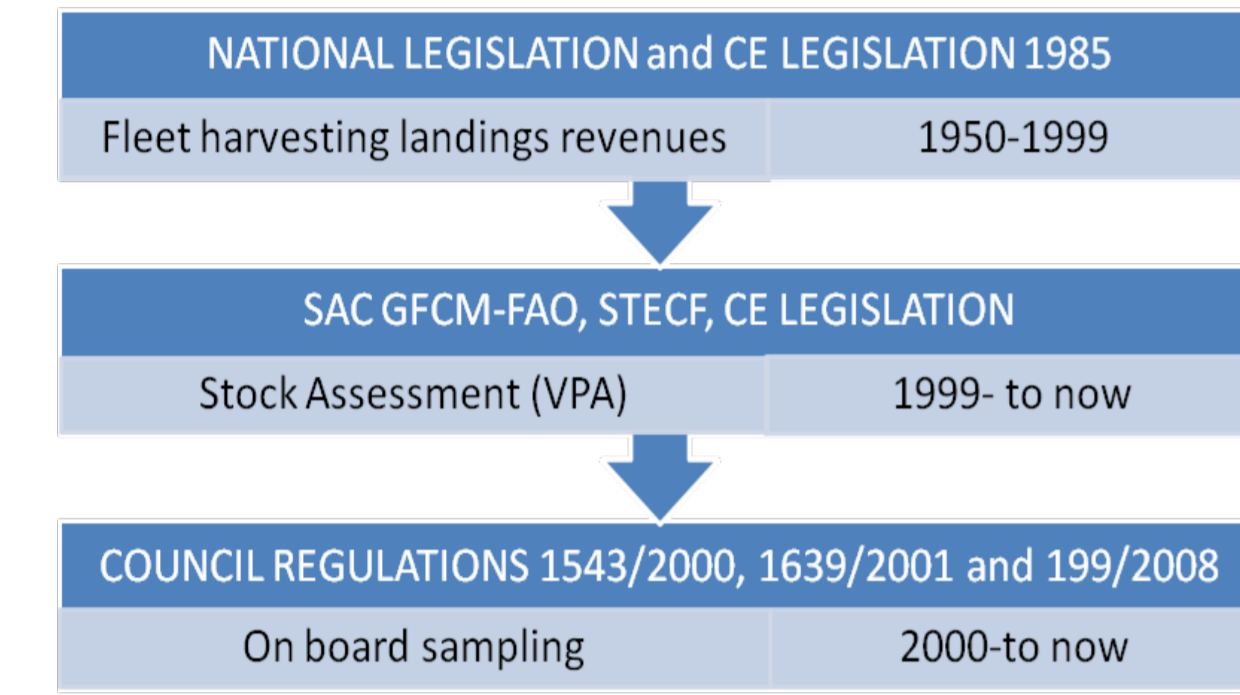


Figure 1. Study Area.



Data used in the present work provide sampling done through the program of onboard observer commercial vessels IEO for the years 2011 and 2012, established based on the National Program for basic data collection (CE 199/2008). Information on catch composition, according to standardised sampling schemes followed in different places of the Northern Alboran Sea (Western Mediterranean).

To tackling the objective of how to eliminate discards in the trawl fishery, the main starting point will be to understand the factors that affect discards of juveniles by the own interest of the trawl fishery.

In order to characterise the factors that drive discards we modelled both; the probability of discarding and, conditional to presence, the abundance of discards against a number of environmental variables (Spatial: Longitude, Latitude, Depth and Harbour; Temporal: Season, Effective haul duration, Day of Sampling (Julyan Day); climatic and biotic subsurface environmental variables chl-a, NAO climatic index). These models were fitted using Bayesian splines (Fahrmeir and Land 2001) to allow non-linear relationships between the response variable and the covariates. Final models were selected by fitting all possible models and comparing them based on the Watanabe Akaike Information Criteria (Watanabe 2010) to choose the best model. Models residuals were validated by checking for the general assumptions as well as the absence of marked spatial autocorrelation.

For the sake of simplicity, this poster only shows the results obtained in the abundance models, size distribution and spatial allocations in the case of: *Mullus barbatus* (Red mullet), *Merluccius merluccius* (Hake), *Micromesistius poutassou* (Blue whiting) and *Trachurus trachurus* (Horse mackerel).

The discard ban and landing obligation should be accompanied by other measures to ensure their successful implementation, including the agreement of the fishing sector to comply with the rules and regulations.

Presented maps were drawn by plotting observed abundances in total numbers of individuals, total biomass in Kg and median DPUEs at each grid cell of 0.025 x 0.05 degrees (Lat x Long).

- Catches allocation could be based on life history traits. However they vary for a combination of socio-economic factors that incentive catches and provoke discards.
- Issues surrounding the allocation of fishing effort is to maximizing landing and minimize discards.
- The maximum discards both in abundance and biomass could not coincide with the maximum discard per unit of effort (DPUE). That is, areas with low effort can have low discards abundances and biomasses but high DPUE, and inversely areas with high effort present lower DPUEs. Thus it depend on a combination of sizes for market preferences, effort and abundances.
- The low discards of some target and by-catch species is a common practice in the Mediterranean fisheries. From the available information to date, discards of these species falls within the bounds of minimis exemptions in new CFP (Between 2 and 5%) for unavoidable catches
- It depend on the zones some species are discarded by their unmarketable sizes, while in others are marketable with independence of the Minimum Conservation Size.

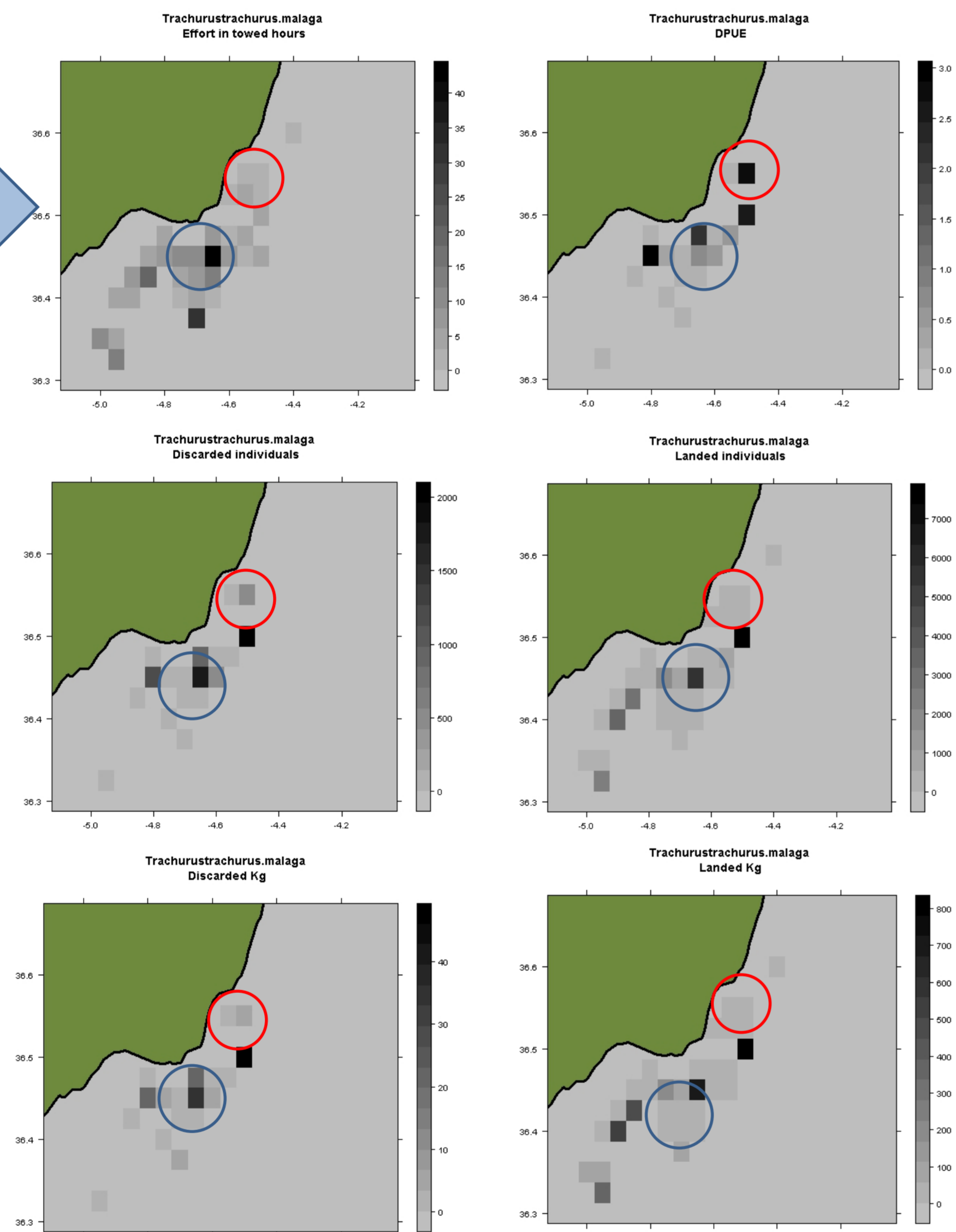


Figure 3. Maps of spatial sampling allocations, grid of 0.025 x 0.05 ° (LAT x LONG) of field observation on abundances, biomasses and Discard per Unit of Effort (DPUE) for *T. trachurus*. (Horse mackerel). Red circle, e.g. low effort with high DPUE. Blue circle e.g. high effort with low DPUE.

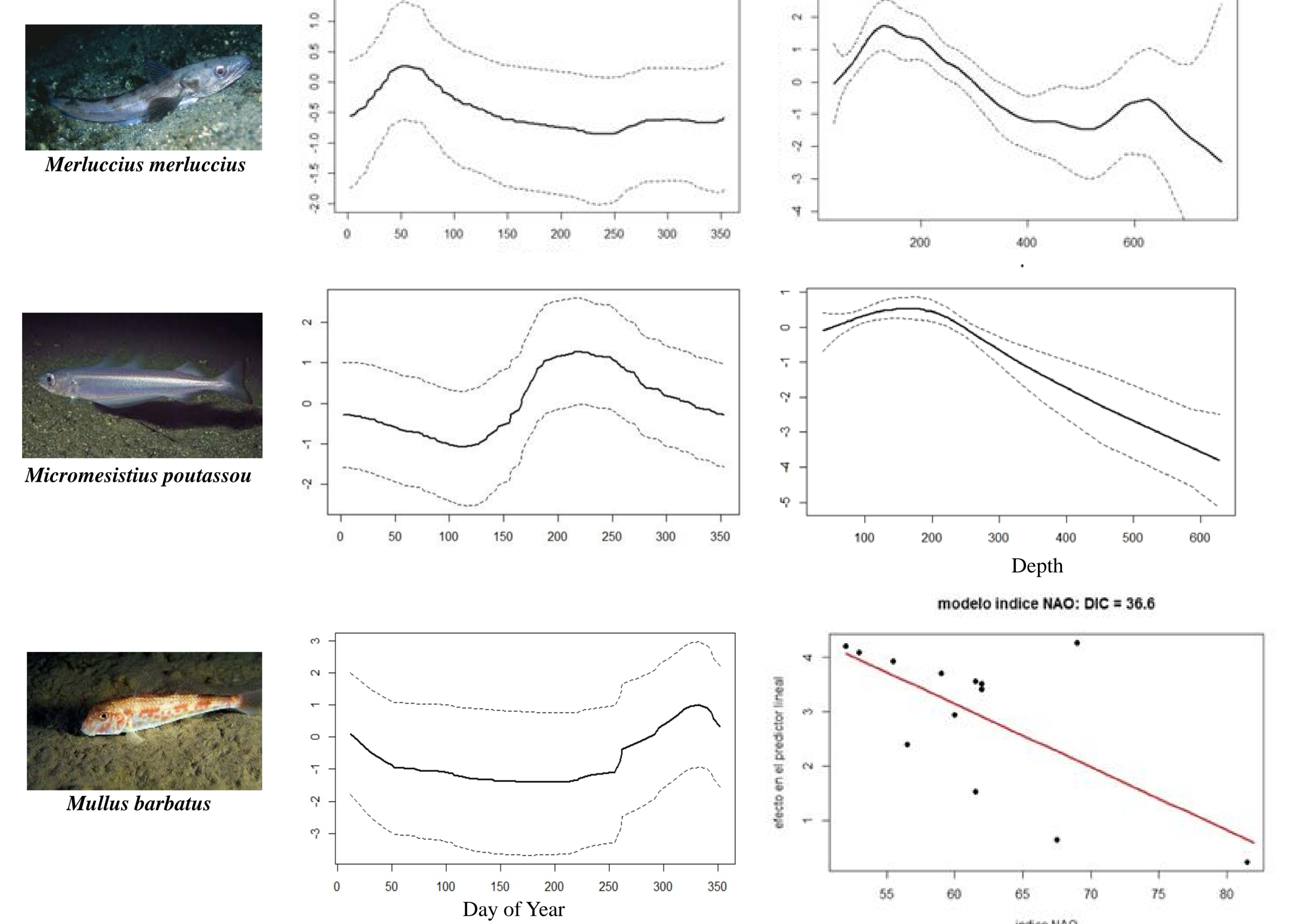


Figure 2. GAM models of fitted values of field observation on probability discard abundances of selected species. The vertical axis shows the fitted values.

Among the explanatory variables time of the year and depth were those that have more effect on discard. Since the Mediterranean Spanish fishery is a multispecies fishery, with some important target species, but also abundant by-catch species leading economic incomes. One of the most pressing management issues will be to establish a cooperative vessel management for vessel allocation to limit discards by port or region. Other explanatory environment variables, such as climatic indices (e.g. NAO) presented an adjust that related cold winters with higher discards e.g. *M. surmuletus*.

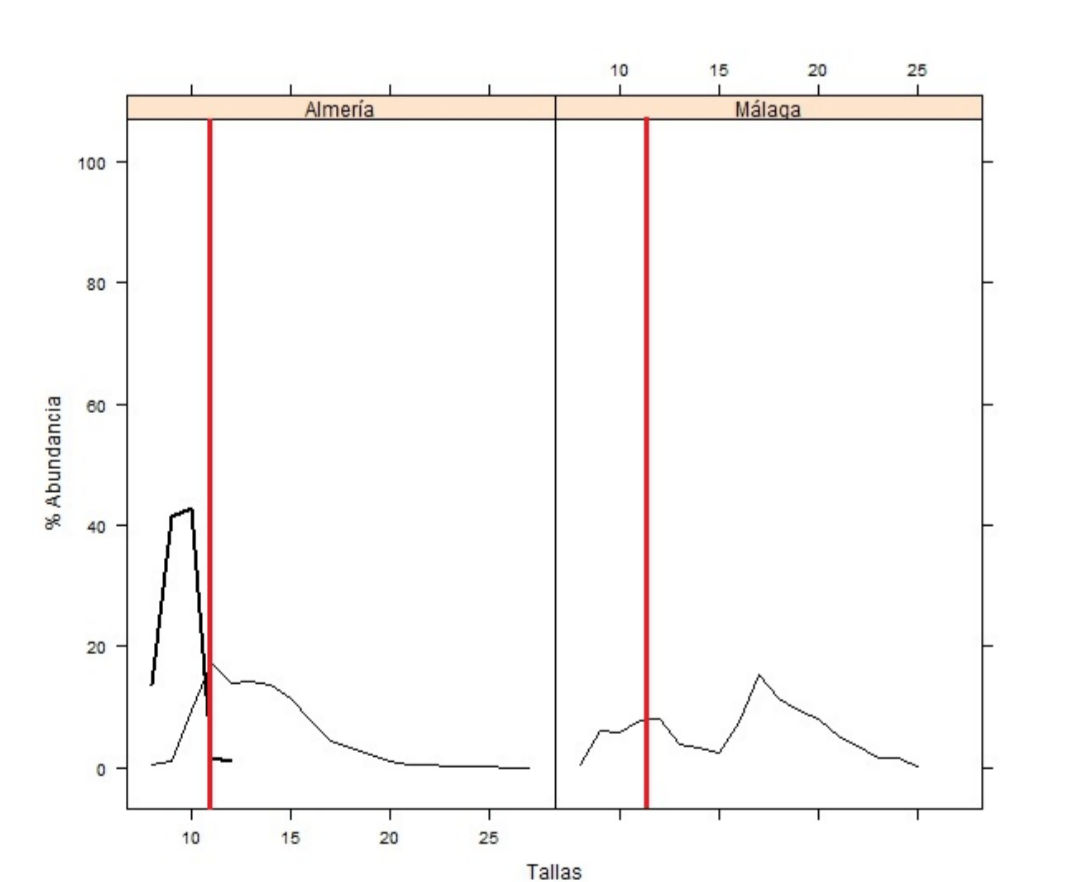


Figure 5. Differences between zones in landed and discards size distribution for *M. surmuletus* (Red mullet). In bold discards, red line Minimum Conservation Size (MCS).

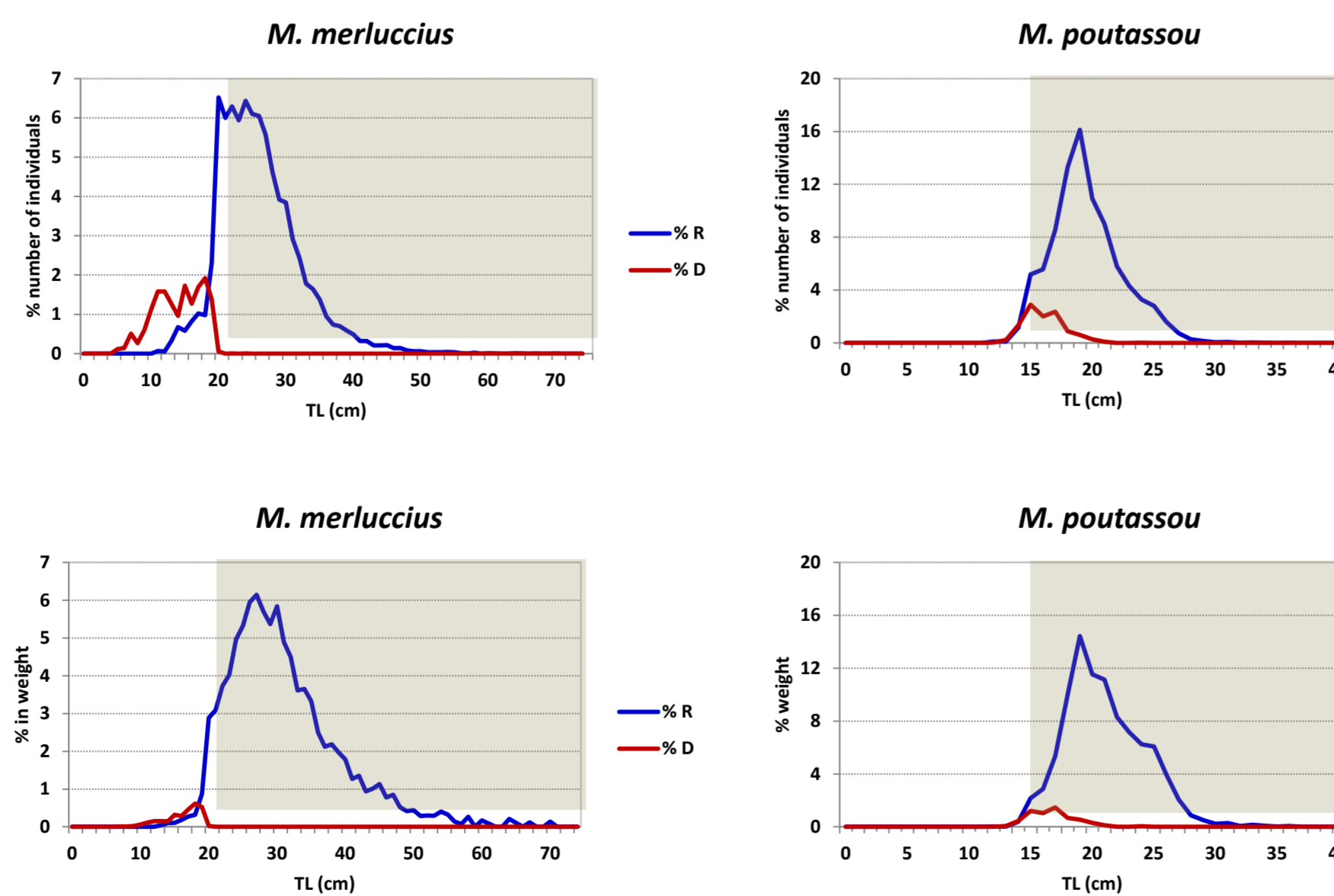


Figure 6. Size distribution of landing and Discarded fraction with indication of Minimum Conservation Size (MCS). Some species has discards in abundance that become negligible in weight.

The main causes of discards, for both target and bycatch species, are associated to the seasonality of the catches and recruitments in turn associated to the changes on the spatial distribution of habitat preferences along their ontogeny. Environmental variables did not reveal significant effects, showing that operational oceanography standard products must be not enough to assess discards, and therefore products providing information on specific ecological processes to discards must be designed with this purpose. In Bycatch species, such as sea breams, mackerels and bogue, discards were also highly dependent of the port and boat (fleet/boat strategies, boat power, and market preferences). The higher discards corresponded to these bycatch pelagic or benthopelagic species.

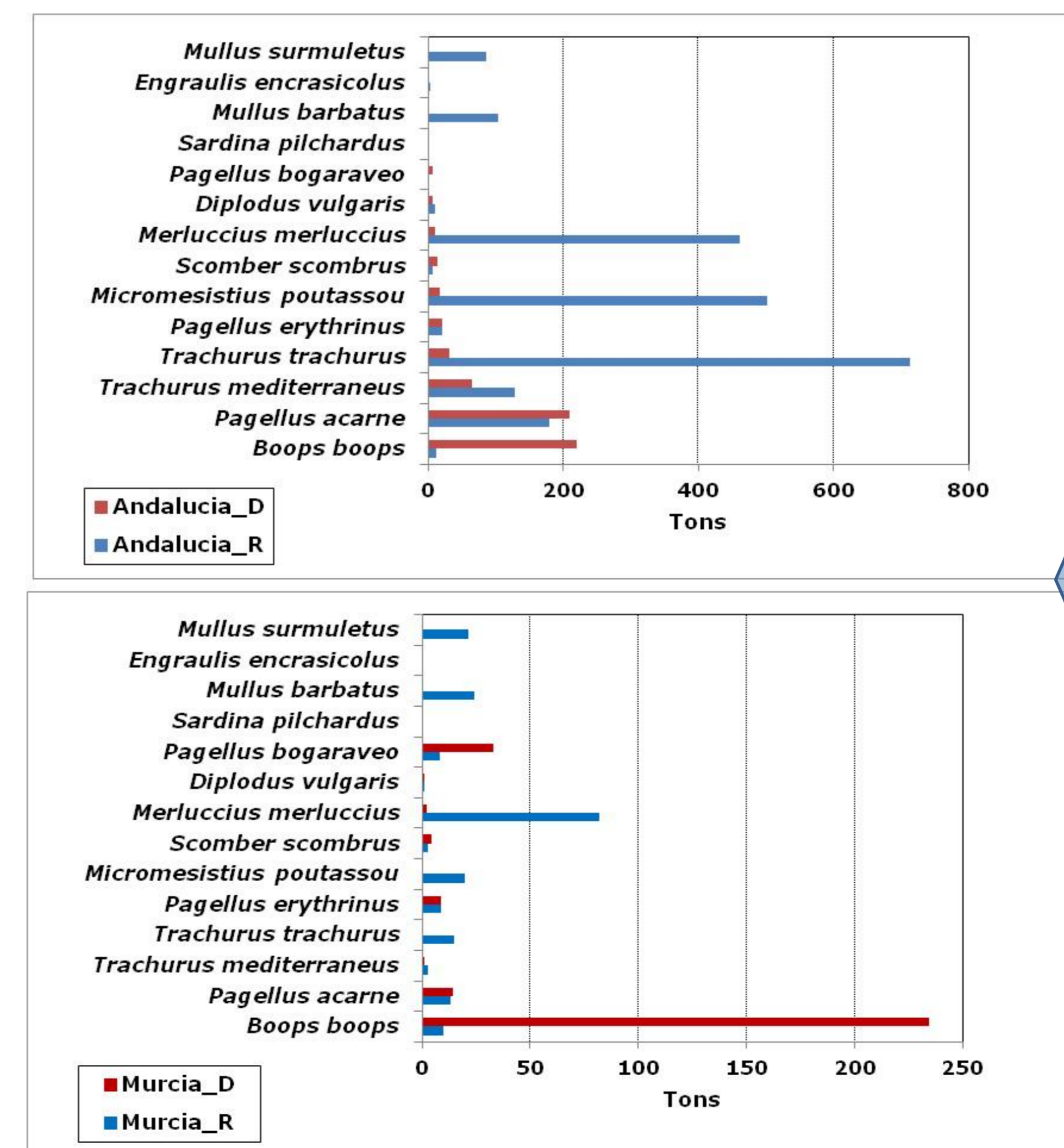


Figure 4. Landed and Discarded tons averaged for the years 2011-2012 for fish target and by-catch species of the trawl fishery in northern Alboran Sea.

The use of landed discards will be limited to purposes other than human consumption (meals and fish oils, animal feed, cosmetics, pharmaceuticals and food additives). Exceptions (minimis) from the landing obligation (EU, 2013) are also introduced. Member states may carry out pilot projects to avoid, minimize and eliminate unwanted catches (EU, 2013).

Thus one of the issues of the Mediterranean trawl fishery is the low quantities fished by trip and the low storage capacity, both at vessel and port scale, that make hardly implement reuse process, that could be interesting for the secondary food industry and financeable.

One possible consequence of the new regulation may well be an increase in the illegal marketing of fish below the minimum size. The landing of juveniles is prohibited in the current regulation, and thus for their commercialization via the black market, they have to be hidden from the normal landing, storage and transportation procedures for the human consumption market. The new CFP, will only can hidden marketing juveniles for human consumption procedure, that is the last step of the black market chain. The previous steps (landing, storage and transportation) are legal, which can make it easier to commercialize them on the black market, a simple change of direction of the truck taking them to their final destination being all that is needed.

## References

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