

Diversity and efficiency indices of small scale fisheries in the western Mediterranean (Minorca's Chanel, Balearic Islands)

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Summary

Small scale fisheries (SSF) are particularly linked to specific coastal ecosystems which because of their great diversity result in a high technical heterogeneity of fishing methods. In this study, we assess métiers' profiles in terms of catch and discard components and estimate related efficiency indices for abundance and biomass of the eight most prevalent SSF métiers in the Western Mediterranean. Target species efficiency in number is high for the European spiny lobster trammel net métier, while for the more coastal métiers where bycatch is a major component, like cuttlefish and red mullet trammel nets and sparidae longline, most of the catch is retained. John Dory and cuttlefish trammel net métiers stand out as the most efficient in terms of target species biomass. Overall 70% of the total catch is commercialized and discard of target species is negligible.

Introduction

Small scale fisheries are characterized high diversification of gears and techniques, reliance on a diverse catch and spatio-temporal rotation. In the Mediterranean, SSF involve the main part of the fishing sector, representing 83% of the fishing fleet (Sacchi 2011). Despite being the largest fisheries sector, some aspects of SFF have been poorly studied due to the difficulty of obtaining reliable quantitative data. The lack of quantitative data arises from the difficulty of establishing an efficient, representative onboard sampling program that persists in time and allows making meaningful management proposals for SSF. In order to shed some light in understudied aspects of SSF, this work aims to evaluate SSF's species diversity and efficiency in terms of the fraction of the retained and discarded catch characteristic of each métier.

Material and Methods

The eight most prevalent artisanal fisheries métiers practiced in the Northwestern Mediterranean were selected for study as follows: 1) trammel nets for cuttlefish (*Sepia officinalis*), surmullet (*Mullus surmuletus*), red scorpion fish (*Scorpaena scrofa*), and European spiny lobste (*Palinurus elephas*), (denominated SoTn, SsTn, PeTn and MsTn, respectively); 2) gillnets for John Dory (*Zeus faber*) (ZfGn) and 3) longlines for Grouper (*Epinephelus marginatus*), common dentex (*Dentex dentex*) and Sparidae species (Em_LL, Dd_LL and Sp_LL, respectively). The study area was the Minorca's Channel (Balearic Islands, Western Mediterranean). Data were obtained by observers sampling onboard during the period of 2003-2012, on a monthly basis with eight daily fishing trips per month over the different métiers depending on the season. For each set, catch was sorted by the fishermen and classified as: 1) target species (commercial species caught intentionally), 2) by-catch species (species caught unintentionally but with commercial value) and 3) discards (species or proportion of total catch thrown overboard, dead or alive, for different reasons). Furthermore, species data composition in number at species level, and individual length measures were recorded for fishes, crustaceans and mollusks. Biomass of all the organisms caught was estimated from known size-weight conversions based on own data and the available estimates from the literature of the species present in the study area (Morey et al. 2003). To assess the fishing efficiency among the selected métiers, some indices for abundance and biomass were developed quantifying different rates obtained from target, bycatch and discard components of the retained and discarded fractions of the capture.

Results and Discussion

The eight métiers sampled accumulated a total of 189 species, of which (22 elasmobranchs, 107 teleosteans, 9 cephalopods, 8 bivalves, 11 gastropods and 32 crustaceans).

All the métiers studied have in common that over 70% of the multispecies catch is commercialized producing low waste. In particular, there is little waste of target species, with a maximum to 4% of the *Z. faber* (fragile species), no discarding of target species in longline métiers and, live sublegal lobster discarding of 17% in the Pe_Tn métier. The bycatch discarded ranged from 7% in the Ms_Tn to 35% in longlines, Ss_Tn and Pe_Tn métiers (Fig. 1). Many of the discarded species are alive especially for longline catches. Although artisanal fisheries are considered quite selective and effective for target species, improvement on fishing dynamics is needed to further reduce discards.

Abundance and biomass efficiency indices defined to assess the ecological and commercial efficiency of the studied métiers indicate the most efficient métier in terms of target species abundance was Pe_Tn and the least efficient the Em_Ll métier (Figure 2a). In terms of target species weight, Zf_Gn and So_Tn were the most efficient while Em_Ll remained the least efficient (Figure 2b). When considering the efficiency of the métiers attending to the cost in terms of discards of commercializing an individual of the target species, the Ms_Tn métier stands out as extremely efficient in terms of abundance (Figure 1a) and Pe_Tn and Em_Ll are most efficient in terms of biomass (Figure 2b).

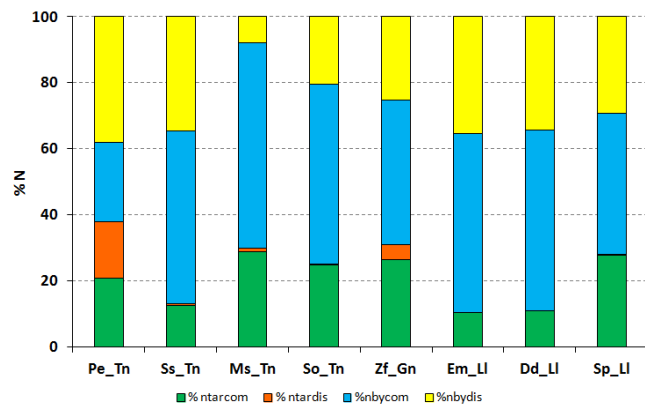


Figure 1. Metiers' catch profiles: Percentage (n%) of retained and discarded target and bycatch species.

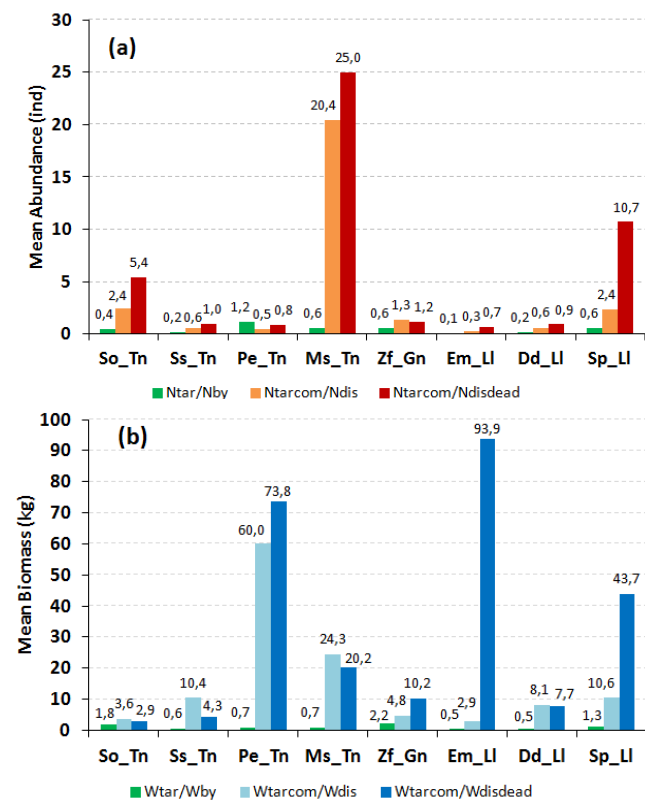


Figure 2. Mean efficiency indices for target species, bycatch and discards in terms of abundance (a) and biomass (b) by métier.

References

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