SMALL-SCALE GEAR COMPETITION AND OVERLAP FOR *DIPLODUS ANNULARIS* AND *SERRANUS CABRILLA*

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Abstract

In the present study, multivariate techniques were used to analyse competition and overlap between different fishing gears (gillnets : 22, 24, 26 and 28 mm bar length; longlines with hook sizes : 11>12>13>15), in terms of total length, weight and value, for *Diplodus annularis* and *Serranus cabrilla*. Cluster and multi-dimensional scaling analyses clearly indicated that gillnets with mesh sizes 26 and 28 mm and hook size 15, for *D. annularis*, and gillnets with mesh sizes 24, 26 and 28 mm, for *S. cabrilla*, caught larger individuals of higher value, the vast majority of which were sexually mature, than the remaining gears.

Keywords : fisheries, Aegean Sea

Introduction

Small-scale fisheries are of primary social and economic importance to Greece, accounting for 87.5% of the mean number of boats and 47.7% of the mean value of landings (1). In the present study, multivariate techniques were used to identify gear competition and overlap, in terms of total length, weight and value, between gillnets and longlines for *Diplodus annularis* and *Serranus cabrilla*.

Materials and Methods

Overall, 46 fishing trials were carried out in the coastal waters off Naxos Island (Cyclades), from October 1997 to October 1998, with gillnets (mesh sizes : 22, 24, 26 and 28 mm bar length; G_{22}, G_{24}, G_{26} and G_{28}, respectively) and longlines ("Mustad" round bent spade hooks of sizes 11>12>13>15; H_{11}, H_{12}, H_{13} and H_{15}, respectively). 1000 m of each mesh size and 250 hooks of each hook size were used. Fishing with all gears took place on the same day, at the same general area and at depths ranging from 4 to 90 m. Wholesale values are from reference 2, whereas market values were collected locally. Data were grouped in classes with different step per parameter (total length, TL : 0.5, 1, 2 and 3 cm; weight : 5, 10, 15, 20 and 25 g; wholesale and market value : 2, 5, 10 and 15 drh). The (number per class)¥(fishing gears) matrices were transformed to triangular matrices using the Bray-Curtis similarity index (3) and subjected to both clustering (group-average linking) and non-metric multi-dimensional scaling (MDS) techniques, using PRIMER (4).

Results and Discussion

Overall, 284 individuals of *D. annularis* and 466 individuals of *S. cabrilla* were caught. Both cluster (Fig. 1) and MDS (figures not shown) indicated the same groups per species for all parameters examined (weight and values : figures not shown), irrespectively of class step. Three groups (G_{22}+G_{24}; G_{26}+G_{28}+H_{15}; and H_{11}+H_{12}+H_{13}) were identified for *D. annularis* (Fig. 1a) and two (G_{24}+G_{26}+G_{28}; and G_{22}+H_{11}+H_{12}+H_{13}+H_{15}) for *S. cabrilla* (Fig. 1b).

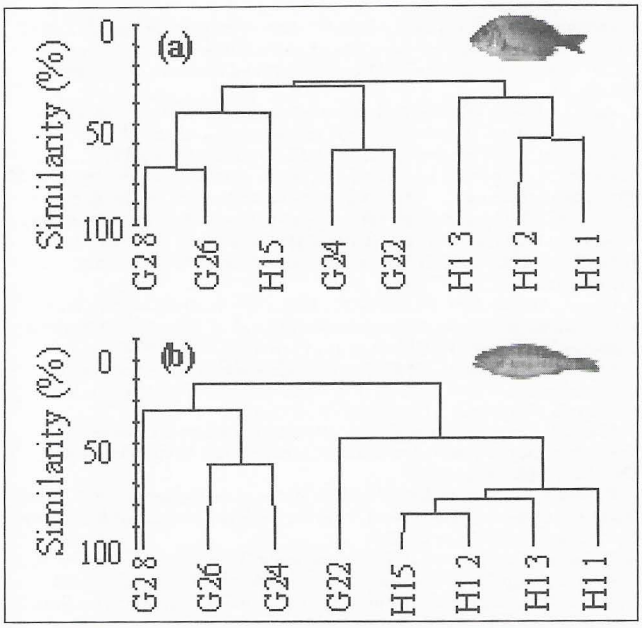

Figure 1. Dendrograms of group-average clustering for (a) *Diplodus annularis* and (b) *Serranus cabrilla*, using Bray-Curtis similarity matrices (based on length, step=1 cm), Cyclades 1997-1998. G_{22}, G_{24}, G_{26}, G_{28} : gillnets with mesh sizes 22, 24, 26 and 28 mm, respectively; H_{11}, H_{12}, H_{13}, H_{15} : longlines with hook sizes 11, 12, 13 and 15, respectively.

For *D. annularis*, group G_{26}+G_{28}+H_{15} generally caught larger individuals of higher value when compared to those of the remaining ones (Fig. 2). The greatest fishing pressure was expended on small sized and valued classes (Fig. 2). The percentages of individuals with TL<TL_{m50} (i.e., length at 50% maturity) caught in groups G_{22}+G_{24} and H_{11}+H_{12}+H_{13} were 35.3 and 15.0%, respectively, whereas that of group G_{26}+G_{28}+H_{15} was the lowest, 1.9% (Fig. 2).

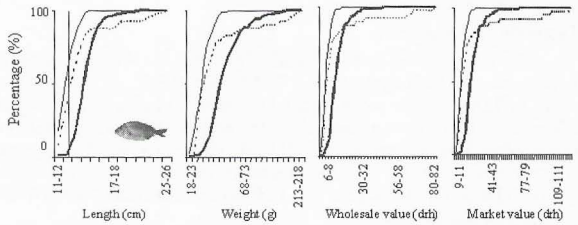

Figure 2. *Diplodus annularis*. Cumulative frequency distributions of total length, weight, wholesale value and local market value, for the groups identified by multivariate analysis : G_{22}+G_{24} (---------), G_{26}+G_{28}+H_{15} (----------), and H_{11}+H_{12}+H_{13} (- - -) (for symbols see Fig. 1), Cyclades 1997-1998. Vertical line indicates length at 50% maturity (L_{m50}=12.5 cm; from reference 5).

For *S. cabrilla*, group G_{24}+G_{26}+G_{28} caught larger individuals and of higher value when compared to group G_{22}+H_{11}+H_{12}+H_{13}+H_{15} (Fig. 3). Although both groups competed for some size classes (Fig. 3), group G_{24}+G_{26}+G_{28} caught considerably fewer individuals with TL<TL_{m50} than group G_{22}+H_{11}+H_{12}+H_{13}+H_{15} (21.6 and 58.0%, respectively).

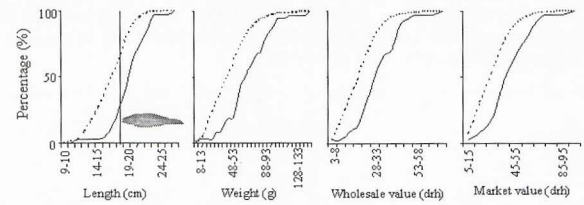

Figure 3. *Serranus cabrilla*. Cumulative frequency distributions of total length, weight, wholesale value and local market value, for the groups identified by multivariate analysis : G_{24}+G_{26}+G_{28} (---------) and G_{22}+H_{11}+H_{12}+H_{13}+H_{15} (- - -) (for symbols see Fig. 1), Cyclades 1997-1998. Vertical line indicates length at 50% maturity (L_{m50}=17.5 cm; from reference 1).

The results clearly indicated the strong multi-gear nature of the Greek small-scale fisheries, one of the main factors responsible for the failure of the technical regulations currently in force, and thus the importance of Marine Protected Areas as one of the most promising management tool (for an extended discussion see : 1, 6).

References

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