

# A Comparison of Monofilament Gillnet and Small Hook Longline Selectivity in a Multispecies Artisanal Fishery in the Algarve, Southern Portugal

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## Abstract

As part of ongoing studies concerned with the small-scale fisheries of the South of Portugal, experimental fishing was carried out with monofilament gillnets and small hook longlines within the same area. Sixty-two species were caught, of which 20 were common to both gears. Pronounced differences in terms of the relative importance of different species in the catches were observed. Size selection patterns also differed, with highly overlapped hook catch distributions and few species showing evidence for size selectivity. In contrast, strong selectivity was characteristic of species which tend to be "wedged" in gillnets. Whereas smaller stretched mesh sizes (particularly 40 and 50 mm) caught significant numbers of illegal sized fish, this was minimal in the longlines. Some implications for management are discussed.

## Introduction

Small-scale fisheries are of considerable importance in the Algarve (south of Portugal, from Spain to Cabo São Vicente). A total of 3 177 fishing boats classified in the 'local' category; less than 9 m in length and generally powered by an outboard engine, were registered along the Algarve coast between Vila Real de Santo António and Sagres in 1992 (IPIMAR/DGP, unpubl.). In addition, 324 larger 'coastal' category fishing boats which also use gillnets, trammel nets, hook and line gear, traps, and pots were registered in the fishing ports along this coastline of approximately 200 km (DGP, unpubl.). Boats are licensed to fish one gear or a combination of gears. Gillnets and trammel nets are the most widely used gears, with maximum lengths of 1 500 m and 2 500 m allowed for smaller boats. However, small hook longlines are also widely used, particularly for high value seabreams (Sparidae). Small-scale fisheries account for approximately 90% by value of the landings along the south and southwest coast of Portugal (GEPP 1992).

To the east of Cabo de Santa Maria, Faro (Fig. 1), the minimum legal stretched mesh size for gillnets is 60 mm year-round, while to the west 60 mm stretched mesh nets are allowed only between April 1 and September 30. The rest of the year the minimum legal mesh size is 80 mm. Small hook longlines consist of a mainline of 1.0 or 1.1 mm diameter and gangions of 0.5 or 0.6 mm diameter of variable lengths and spacing (most commonly 75 cm in length and 1.5 - 2.0 m spacing). They are usually baited with squid, razor shell clams (*Ensis siliqua*), or ghost shrimp (*Upogebia pusilla*) and are fished on the bottom at depths from 10 to 100 m.

Aspects of the biology, ecology, population dynamics, and fisheries of the species targetted by the small-scale fisheries are currently being studied by the National Institute of Fisheries (IPIMAR) and the University of the Algarve. Here we report on a comparison of the species and size selectivity of two of the most important gears used in this region.

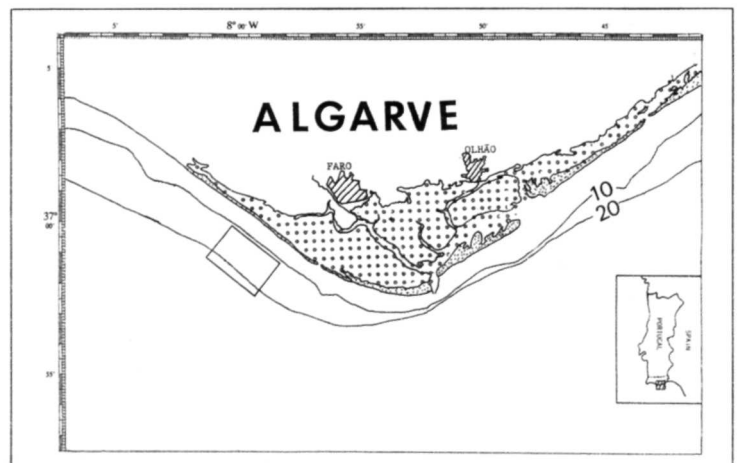


Fig. 1. Map of the Algarve (south of Portugal), showing 10 and 20 m isobaths and the fishing grounds (rectangular box).

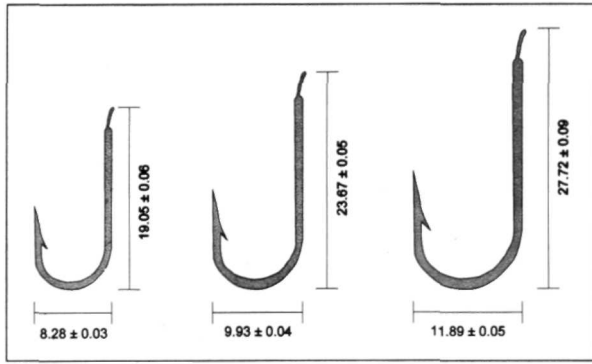


Fig. 2. Maximum width and maximum length of the 'Mustad' brand hooks used in the longlines. Values are means and standard errors based on sample sizes of 10.

## Materials and Methods

Experimental fishing was carried out with small hook longlines and monofilament gillnets in a restricted area at depths between 13 and 20 m (Fig. 1). The fishing grounds consist of a largely sandy bottom with patches of rocks, as well as natural and artificial reefs. In addition to longlines and gillnets, other gears used at these depths include trammel nets, demersal purse seines and spearfishing. Five stretched mesh sizes were used: 40, 50, 60, 70, and 80 mm (stretched). The heights of the nets were 2.5, 2.6, 2.7, 2.8, and 2.9 m. The total lengths of the gillnets used were 364, 350, 480, 650, and 650 m, corresponding to 7, 7, 10, 13, and 13 fleets of each mesh size. Fifteen sets were made between April 1993 and February 1994. The nets were fished before dawn and retrieved two and a half to five and half hours later. Catches for each mesh were standardized to 3 hours and 10 fleets.

The longlines used had the following characteristics: 1.10 mm monofilament mainline, 75 cm gangions of 0.50 mm monofilament, and 1.5 m spacing between hooks. Three hook sizes of 'Mustad' brand, round bent, spade end hooks were used. The hook number and mean dimensions (maximum width and maximum length) are given in Fig. 2. Three hundred hooks of each size were used giving a total longline length of 1 500 m. Hooks were baited with razor shell clam (*Ensis siliqua*) and the longlines were fished on the bottom in the morning. Soak times varied from one and a half to four hours, depending on the weather. A total of 45 sets were made between March 1994 and March 1995. No attempt to standardize the catches was made since the percentage of hooks which were still baited when the longline was retrieved was highly variable and not related to soak time.

## Results

The gillnets caught a total of 45 species of fish while the longlines caught 35 species of fish and two

species of cephalopods, with 20 species in common (Table 1). The total catch in numbers decreased with increasing hook size and mesh size. The number 11 hook caught the fewest species (24), while the number 13 hook and the 40, 60, 70, and 80 mm meshes caught the greatest number of species (27). Although seabreams (Sparidae) dominated the catches of both gears, there were significant differences. For the longlines, 177 common seabream *Diplodus sargus* accounted for 29% of the total catch by weight. In comparison, only two *D. sargus* were caught by the gillnets. Other seabreams such as *Pagellus acarne* and *Pagellus erythrinus* were important in the gillnet catch but were not caught at all by hooks. The most abundant species in the gillnets was *Diplodus bellottii*, particularly in the illegal mesh sizes of 40 and 50 mm. More weever fish (*Trachinus draco*) were caught by hooks than any other species.

For the hook gear the catch size distributions of the three hook sizes for each species were generally highly overlapped, with a wide range of sizes caught. The minimum size at first capture was in most cases not related to hook size. Of the species which were caught in sufficient numbers, *Boops boops*, *Diplodus annularis*, *Spondyliosoma cantharus*, and *Trachinus draco* showed no shifts in the catch size distributions for the three hook sizes. Small increases in mean size as a function of hook size were observed in four species (*Diplodus sargus*, *Diplodus vulgaris*, *Lithognathus mormyrus*, and *Serranus cabrilla*). Except for the black seabream, *Spondyliosoma cantharus*, which has a minimum legal size of 22 cm (total length), catches of immature or illegal-sized fish were minimal with the longlines (Erzini et al., in press).

For the gillnets, pronounced selectivity was observed in the case of species in which the majority of individuals are wedged rather than tangled (e.g., Santos et al. 1995). An example is *Diplodus vulgaris* (Fig. 3). For such species, mean size-at-capture increases with mesh size and in many cases the selection range also increases with mesh size. For species where tangling is important, selectivity is less obvious and catch distributions for the different mesh sizes are typically highly overlapped. An example of this case is the weever fish *Trachinus draco* (Fig. 4). In general the longlines tended to catch larger individuals, particularly for species which reach a relatively large size.

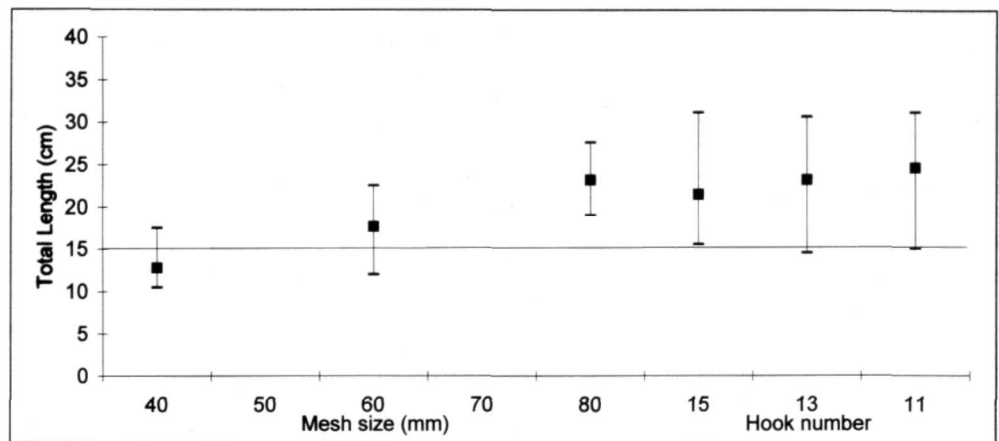


Fig. 3. Mean total lengths and ranges of *Diplodus vulgaris* caught by gillnets and longlines. The gillnet data are from Martins et al. (1992), with 58, 30, and 51 fish for the three mesh sizes. The minimal legal size is 15 cm TL (horizontal line).



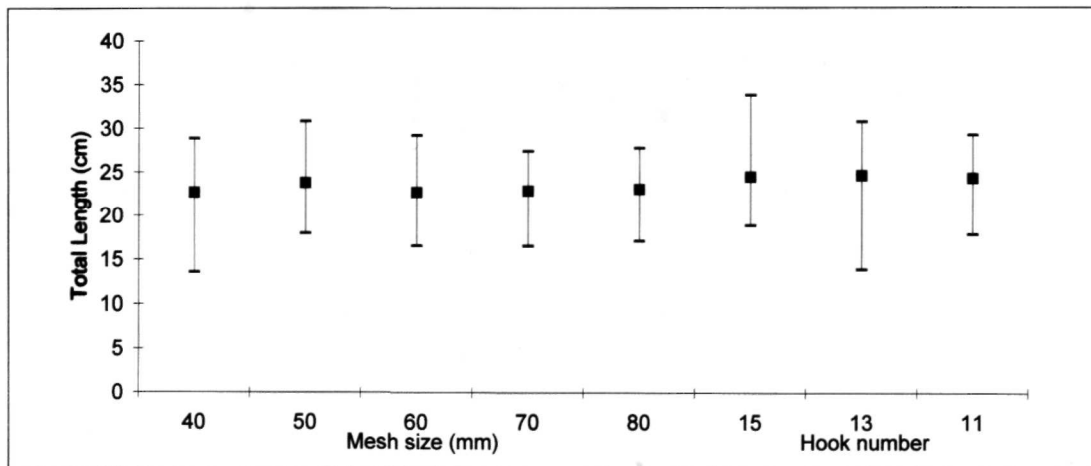


Fig. 4. Mean total lengths and ranges of *Trachinus draco* caught by gillnets and longlines. There is no minimal legal size.

## Discussion

Species selectivity of gillnets and longlines differed considerably. Several factors may have contributed to these differences. First of all, whereas the longlines were fished in daytime, gillnets were set before sunrise and consequently caught species such as *P. acarne* which move inshore during the night and return to deeper waters at dawn. Many pelagic species and soles are not generally susceptible to hook and line gear. The use of only one kind of bait also probably reduced the species diversity of the longline catches. Certain species are targeted with specific baits. For example crabs are used locally to catch valuable large red seabreams such as *Pagrus pagrus* and *Pagrus aurata*, with few other species caught on this bait.

The majority of the species in these artisanal fisheries are small, with maximum reported standard lengths of 45 cm or less (Whitehead et al. 1984). Thus it is not surprising that there appears to be a limited size range of hooks which are appropriate for this fishery. The significant decreases in efficiency for the number 11 hook indicate that the smaller number 13 hook, which is favored by local fishers, may indeed be the optimal size. Smaller hooks such as the number 15 are generally not used for practical reasons (e.g., difficult to bait, tendency to straighten with a good sized fish). Although the hooks differed substantially in size, there was no relationship between minimum size at first capture and hook size, with highly overlapped catch distributions for most species. The apparent lack of size selectivity for some of the species caught by longline may be due to the limited size range in the study area and/or insufficient numbers sampled (Erzini et al., in press).

The fact that very few illegal-sized fish were caught by the longline suggests that this gear is less harmful than certain other gears such as the demersal purse seine and gillnets and that there is no need for controlling the size of hook used in this fishery. The only exception was the black seabream *Spondyliosoma cantharus* which has a minimum legal size of 22 cm TL. This may be inappropriate for the south of Portugal given the observed size-frequency distributions and size-at-maturity data for this species in this area.

Selectivity of gillnets is currently being evaluated for the most important species (e.g., Santos et al. 1995) and work on defining the

optimal mesh size for this multispecies fishery is continuing, with biological studies as well as more research on gear selectivity and assessment of these resources. For a better comparison of these gears, experimental fishing should be carried out during the same time of the day, and in the same area and depths. Different baits should also be used and the small-scale fishers should be surveyed in order to obtain data on fishing effort, fishing grounds, and baits used during the year. The results of this preliminary study suggest that these gears are quite different in terms of catch composition and catch-per-unit-effort. With further studies, we hope to achieve a better understanding and consequently contribute to the management of the small-scale fisheries of the Algarve.

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