ANALYSIS OF THE IMPACT OF THE FISHERY ON THE ADULT POPULATION OF EUROPEAN HAKE IN THE NORTHWESTERN MEDITERRANEAN

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Abstract

The impact of the fishery on the adult population of *Merluccius merluccius* was studied in two areas of the north-western Mediterranean. From the analysis of the commercial landings and of the corresponding size structures, appreciable differences in the exploitation pattern of the different fishing gears were evidenced.

Keywords : fisheries, demersal, population dynamics, fishes, Tyrrhenian Sea.

Introduction

The European hake, *M. merluccius*, (L., 1758), is one of the most important species exploited by the Mediterranean demersal fisheries. In order to improve the knowledge on the exploitation of this species, a study on the impact of different gears on the adult population was carried out following the activity of the fishing fleets in two north-western Mediterranean areas, the Catalan Sea and the northern Tyrrhenian Sea. This work has been carried out in the framework of investigations funded by the European Union, in particular the FAIR project 97-3522 ("Llucet").

Material and methods

In the years 1998-'99, on a monthly basis, information on landings, fishing effort and demographic structure of the European hake was collected by port and gear. In the Catalan Sea the fleet of Vilanova i la Geltrú was studied (traditional trawling, gillnet, longline), while in the northern Tyrrhenian Sea those of Porto Santo Stefano (traditional trawling, wide opening trawling and gillnet) and Marina di Campo (gillnet) were followed. Data were collected by different approaches : directly at the auction, from official archives, by samplings on board, by monitoring and inquires at the landing points, and by the distribution of log books. Length frequencies were obtained measuring (Total Length, TL, to the lowest 0.5 cm) representative samples of the monthly landings of each gear. In order to a better comparison of the results, a one year data period (January '99-December '99 for Vilanova, November '98-October '99 for the northern Tyrrhenian Sea) was subsequently chosen for all the foreseen analysis. The study was focused on the specimens bigger than 25 cm TL, considered to represent the adult population of *M. merluccius*, taking in account the biological characteristics of this species (1).

Results and discussion

Table 1 resumes the characteristics of the fleets targeting hake in the studied period. *M. merluccius* was one of the targets of the multispecific catch of trawling, while it was the most important objective of gillnet and longline, especially from autumn to spring.

During the one year period considered, a total of 150 tons of hake was estimated to be landed by the fleet of Vilanova, 435 by the fleets of Porto Santo Stefano and Marina di Campo (Tab. 1)

The adults of *M. merluccius* represented a percentage between 37 and 46% of the total landings of this species, with 55.3 and 199.1 tons in the two areas. Trawling resulted the gear accounting for the majority of hake landings, with the 95% and 83% of the total biomass landed, in the Catalan and Northern Tyrrhenian Sea, respectively (Tab. 1). The contribution of the artisanal gears, negligible for the total hake landings, was noticeable when the adults were considered : gillnet and longline of Vilanova represented the 15% of the biomass landed of this demographic fraction, gillnets of Porto Santo Stefano and Marina di Campo accounted for 34% in Northern Tyrrhenian Sea (Tab. 1 and Fig. 1). The predominance of trawling in providing the landings of hake was also due to the greater fishing effort performed by the fleet using this gear. For example, in the ports of northern Tyrrhenian Sea 31 trawlers worked in the studied year on average 5 days each week, in comparison with the 15 vessels with gillnet (Tab. 1) working on a seasonal basis and with large periods of inactivity due to the adverse weather conditions.

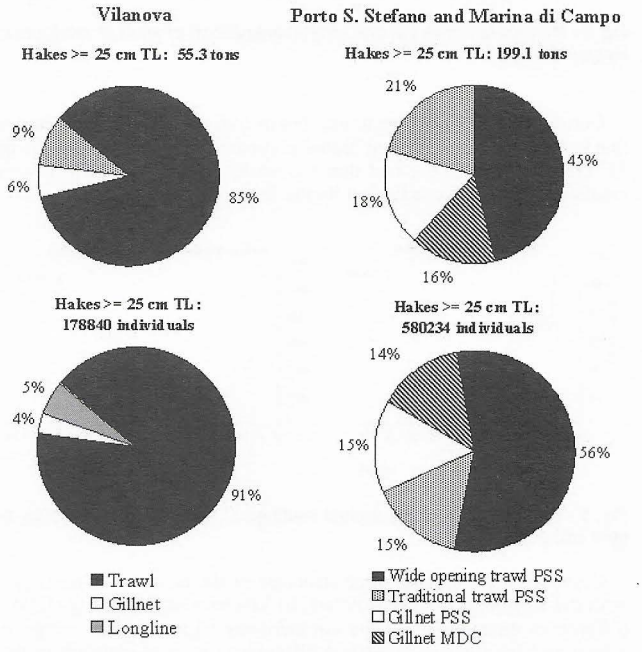

Fig. 1 - Composition of the annual landings of adults of *M. merluccius*, by gear and port

In spite of this, the landings per unit effort of adult hakes (LPUE, kg per fishing day per boat) of artisanal gears were higher respect those of trawling (Fig. 2). Moreover, in both areas it was observed a seasonal pattern in the LPUEs; trawling reached a maximum in the late spring-summer, while the artisanal gears showed, in general, the highest values in winter and autumn, with the exception of the peak in April showed by the gillnet of Porto Santo Stefano.

Table 1. Characteristics of the fishing fleets and annual landings of *M. merluccius*.

	N° of Boats	G.R.T. Total	G.R.T. Mean (± SD)	Kw Total	Kw Mean (± SD)	Hake Landings (tons) Total (%)	Hake Landings (tons) Adults (%)
a) Catalan Sea – Vilanova							
Trawl	26	918	35(±24)	4253	164(±152)	142.5 (95)	47.8 (86)
Longline	6	59	9(±6)	402	67(±31)	4.5 (3)	4.5 (9)
Gillnet	9	36	4(±2)	339	50(±38)	3.0 (2)	3.0 (6)
b) Northern Tyrrhenian Sea – Porto Santo Stefano and Marina di Campo							
Trad. trawling PSS	15	618	41(±30)	4272	305 (±138)	116.5 (27)	41.0 (21)
Wide op. trawling PSS	16	775	48(±12)	5461	390 (±116)	241.8 (56)	91.6 (45)
Gillnet PSS	5	62	12(±5)	627	125(±26)	35.3 (8)	35.2 (18)
Gillnet MDC	15	163	11(±5)	1855	124(±34)	41.1 (9)	31.3 (16)

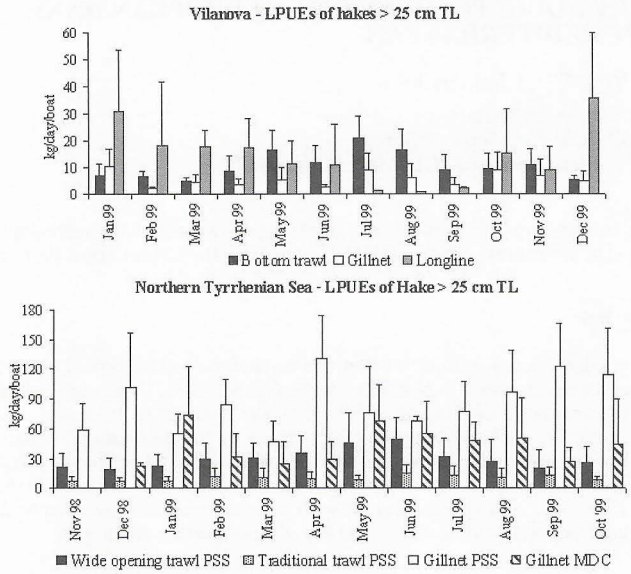

Fig. 2 - Monthly landings per unit effort (kg/day/boat) of adult *M. merluccius*, by gear and port.

Considering the landings in number of individuals, the contribution due to trawling resulted even higher compared to that in biomass (Fig. 1). This was due to the fact that the adults landed by trawling were smaller respect to those landed by the artisanal gears (Fig. 3).

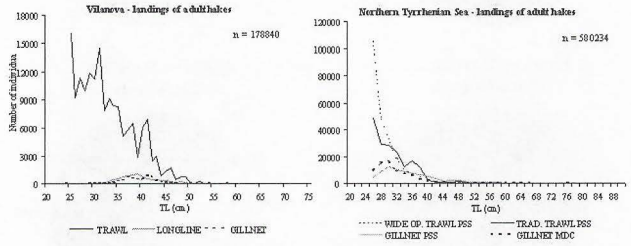

Fig. 3 - Size structure of the annual landings of adult of *M. merluccius*, by gear and port.

Comparing the demographic structure of the landings of each gear with the Kolmogorov-Smirnov test, in Vilanova significant ($p<0.001$) differences emerged in all the comparisons with trawling, while for gillnet and longline no statistical differences were evidenced; in this port the adult hake landings of trawling were mostly composed of specimens till 35 cm TL, while the majority of those caught by artisanal gears ranged from 35 to 45 cm TL. In the northern Tyrrhenian Sea, significant ($p<0.001$) differences emerged from all the comparisons; landings of adult hakes by traditional trawling differed from those of wide opening trawling for the greater importance of specimens > 30 cm TL in the landings of the first gear; gillnet of Marina di Campo was mostly represented by specimens till 40 cm TL, while in the gillnet of Porto Santo Stefano the specimens of bigger sizes resulted more important (Fig. 3).

References

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Introduction

The common sole, *Solea vulgaris*, Quensel 1806, is undoubtedly the most important flatfish in the Mediterranean Sea, both for its abundance and economic value. According to FAO statistics (1) the annual landings of *S. vulgaris* in this area increased from about 4500 tons in 1972 to about 10000 tons in 1992. The fishing activity is mostly carried out with towed gears (bottom and beam trawling), even if passive gears (set nets) are commonly employed to fish this species. Although common sole has been currently object of studies, basic information on the exploitation of this resource is still lacking in the Mediterranean area. The aim of this paper is to provide information on technical aspects and on catch composition of the common sole fishery performed by means of gill net by the artisanal fleet of Livorno (Eastern Ligurian Sea).

Material and methods

Data on the structure of the artisanal fleet of Livorno were collected from the official archives at the harbour office ("Capitaneria di Porto"). At the same time, interviews with fishermen were performed in order to identify the boats using gill net, to know the technical characteristics and the fishing activity of this gear.

From January to December 2000, a monthly sampling on the gill net commercial landing was performed. At the landing site, for 4-8 days each month, the biomass landed of *S. vulgaris* and of the accessory species was registered. Moreover, the size of a representative sample of common sole was measured (Total Length, TL, to the nearest 0.5 cm below). Trips of researchers on board of commercial vessels were carried out to obtain information on the discard in this type of activity.

Results and discussion

In the studied period, the artisanal fleet of Livorno accounted for 63 vessels (mean gross tonnage of 4.1 tons ± 2.7 s.d., mean total length of 7.7 m ± 2.6 s.d. and mean engine power of 54.4 Hpa ± 41.4 s.d.); only four boats employed gill net regularly, while the other fishing units utilised this type of gear only occasionally and jointly with trammel net. These four boats employed a gill net of about 3500 m length during each trip; the length of the net varied from 1000 to 5000 m, according to the weather conditions. The gear was built by a single mono-filament panel 3 m high with a 82 mm stretched mesh size. The technical features of a single sheet of net (135 m) are shown in Table 1.

The fishing ground was localised in the surroundings of Livorno, from the harbour to the mouth of the Arno river, on sandy-muddy bottoms. The nets, placed between 4 and 40 m depth, were lowered into the sea at dusk and pulled in at dawn.

The mean monthly landing of *S. vulgaris*, standardised to 1000 m of net per fishing day, was characterised by high variability (Fig. 1), due to the influence of the meteo-marine conditions on the yields of this type of fishery. However, from March to October, noticeable yields were observed, with values ranging from a minimum of 1.5 kg/1000m /day in June to a maximum of 2.6 kg/1000m /day in September.

The size composition of the landing of *S. vulgaris* did not show differences among the seasons (Fig. 2). The distributions were uni-modal with modal class ranging from 26 to 28.5 cm TL. The majority of the specimens, comprised between 23 and 35 cm TL, was larger than the minimum legal size of commercialisation (20 cm TL, EU regulation 1626/94) and of the size at first maturity (25 cm TL) (2).

As regards the catch composition, *S. vulgaris* was the most important species reaching 34.4% of the total biomass caught (from 28% in summer to 38% in winter, Fig. 3). Among the commercial species, it is worth of noting *Raja asterias* (21.1% of the total catch), *Squilla*