

TRENDS IN SWORDFISH CATCHES OBTAINED FROM THE ITALIAN GILLNET FISHERY IN THE TYRRHENIAN SEA

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SUMMARY

The study of landing data is considered useful for a better understanding of the fishery and the stock. This is particularly important for the swordfish fishery, due to the high variability and the difficulty of at-sea observation, which usually covers a very low percentage of the activity.

The driftnet fishery is a traditional activity in the Tyrrhenian Sea which has been carried out in a stable manner during the last 15 years, even though it is now undergoing important and dramatic changes.

CPUE data and mean length (LJFL) are usually thought to be useful tools to follow the most relevant variation of the stock. In this paper, some critical observations are made concerning the factors affecting the yearly data, aimed at obtaining more detailed information to be used for fishery population dynamics.

RÉSUMÉ

L'étude des débarquements est jugée utile pour mieux appréhender la pêche et le stock ; ceci est particulièrement important pour la pêche à l'espadon, en raison de sa forte variabilité et des difficultés de l'observation en mer, qui ne couvre normalement qu'un pourcentage réduit de la pêche.

La pêche au filet dérivant est traditionnelle en Mer Tyrrhénienne, et se déroule de façon stable depuis une quinzaine d'années ; toutefois, elle fait face à l'heure actuelle à des changements importants et profonds.

Les données de CPUE et la taille moyenne (LJFL) sont normalement jugées être des moyens utiles pour suivre les variations les plus sensibles du stock. Le présent travail fournit quelques observations critiques sur les facteurs qui affectent les données annuelles, dans le but d'obtenir une information plus détaillée pour les besoins de la dynamique des populations de poissons.

RESUMEN

El estudio de los datos de desembarque se considera útil para llegar a un mejor conocimiento de la pesquería y del stock. Esto tiene particular importancia en el caso de la pesquería de pez espada, debido a su gran variabilidad y a la dificultad para hacer observaciones en la mar, que normalmente cubre un escaso porcentaje de la actividad ejercida.

La pesquería de redes de deriva es tradicional en el Mar Tirreno y se ha desarrollado de forma estable a lo largo de los últimos quince años. Ahora se enfrenta con grandes e importantes cambios.

En general se considera que los datos de CPUE y la talla media (LJFL) resultan útiles para hacer un seguimiento de los cambios mas relevantes en el stock. Este documento presenta algunas observaciones críticas sobre los factores que afectan a los datos anuales, con el fin de tener información mas detallada con destino a la dinámica de poblaciones de pesquerías.

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INTRODUCTION

Long-time series trends are usually considered useful tools to understand a fishery or a stock, but how many of them could approach the real situation at sea or represent it in a realist way?

The driftnet fishery, one of the most traditional activity to catch swordfish in Italy, has been deeply studied from 1984, after the first Italian 3-year Fishery Master Plan, issued by the Direction General for Fishery and Aquaculture. This research framework gave us the opportunity to follow in a very close way the evolution of the fishery and the related troubles and changes happened from 1990 (Di Natale *et al.*, 1992).

Nowadays, this fishing activity is facing a dramatic reduction, caused by the impact on protected species and the strong international pressure, but the activity has been conducted in a stable way till 1997, even considering the yearly changes and variations.

CPUE data are usually considered quite important to understand the quantitative evolution of production, catches and trends but, at the same time, CPUE can be biased by several factors, heavily affecting the final result, even by using standardised methods.

More or less the same problems affect several other data, even if collected as well as possible, like the size frequency. In the swordfish fishery case, this fact seems particularly important, due to the increasing fishing pressure on this species in all the Mediterranean Sea.

METHODS

As above reported, the main source of data has been the landing data survey conducted by Aquastudio from 1985 in several harbours along the Italian coast. Only data obtained from the most traditional area where the driftnet fishery is carried out have been used for this paper.

As a matter of fact, landing data were collected in the harbours of Ponza (Central Tyrrhenian Sea), Lipari and S. Agata Militello (Southern Tyrrhenian Sea), while the size frequencies include also fishes from Milazzo (Southern Tyrrhenian Sea), where most of the catches are marketed.

The driftnet fishing has been carried out in a stable way during the period taken into consideration, even if yearly changes have been reported so far. Usually, the net length changed every year, generally decreasing in the last four years, after the adoption of the conservation measures; furthermore, monthly changes are very common, due to the use of smaller mesh size in some sets of the net at the beginning of the fishing season.

Landing data were collected directly along the docks on a monitoring base for about 50% of the days during the fishing season (from March to September but, more frequently, from April to August), taking into account all the catches, including unmarketed fishes or those used for personal consumption. CPUE is referred to kg/1000 m net used.

Size frequencies (LJFL, UJFL, GG weight) were taken on landing, with the same time frequency and accuracy used for landing data, according to the availability of national or European research programmes.

DISCUSSION

CPUE data (figure 1) are between 11.4 and 20.4 kg/km in Ponza, between 6.9 and 16.2 kg/km in Lipari and between 4.7 and 14.2 kg/km in S. Agata Militello. The data show very clearly many yearly changes but, at the same time, some similar peaks. Minor differences are due to specific situations (e.g. strikes during the best fishing period) and could be easily identified with a deep knowledge of the fishery.

From the graph obtained in the harbour of S. Agata Militello (Southern Tyrrhenian Sea), it is clear the effect of the strong increase in length of the driftnets around the 1986's (showed by the immediate increase of CPUE values, followed by a dropping in the whole Tyrrhenian sea. Then, after the length limitation measures adopted by the Italian Government, the CPUE value increased again, with some yearly droppings, due to unfavourable environmental conditions.

All the trends show a strong increasing pattern on the long period, even if with some differences, due to the various time scale and to the project holes on some years, when the monitoring was not carried out.

Figure 2 shows the mean length frequency of the swordfish landed in the same areas and in the same period. Even in this case, the peaks pattern is quite similar to that showed by the CPUE, smoothed in the last four years. It seems that, after a clear decrease before the 1990, the mean length increased suddenly, dropping after the high catches in 1992 and recovering again after the very bad fishing season in 1994. The values are between 123,8 (1990) cm and 137,4 cm (1992) in the Central Tyrrhenian Sea and between 122,7 cm (1990) and 137,4 cm (1992) in the Southern Tyrrhenian Sea. The correlation between the two areas is quite strong and both trends show a similar increasing pattern.

The effect of fishery on the mean length seems very clear and correlated, but are both values a reliable mirror of the situation at sea? The problem of the reliability of CPUEs and mean length data for the stock assessment of large pelagic species has been raised several times by various colleagues, but it is necessary to have long time series and a very detailed knowledge and memory of each fishing season to better classify the observations.

How many variables affect the CPUE data? For the driftnet fishery the list is not simple, but it is possible to propose a rough analysis:

environmental factors: a) good or bad weather during the best fishing period;
b) strong or slow currents in the fishing area;
c) high or low transparency in the fishing area;
d) thickness of the thermocline;
e) presence or absence of a suitable trophic chain;
f) seasonal evolution of the temperatures;
g) stability of the sea-fronts;
h) moon phases;

other factors: A) strikes or other temporary closures during the fishing period;
B) frequency of controls at sea by the Authorities;
C) presence or absence of pressure by environmental groups;
D) fishes lost or stolen;
E) position of each net at sea in correlation with the nearest nets (gear interactions);
G) damages caused by ships, large whales or manta rays;
F) unforecastable factors of various types.

As concerns the length frequency mean, it seems very important the accuracy of the measures, the use to have the same staff on the same place for a long time scale, the capability to detect all the catches, including those for personal consumption and the fishermen's will to let the scientists do their job. At the same time, the thickness of the body and the sexual dimorphism of the swordfish are not always reflected by the single length measure (size/weight ratio could be very different).

The combination of both series of problems create several doubts about the possibility to simply use the data as an index of the status of the stock, particularly in the case of the swordfish (*Xiphias gladius*), due to the behavioural characteristics of this species.

The trends showed by all the figures give a positive figure of the fishery and of the swordfish stock, but how fare or close are we from the reality? How many other factors are affecting the data, like the strong reduction of top-predators (due to other fishing activities) and the correlated highest number of swordfish reaching the adult stage? What is the influence of the high catch of juvenile swordfish in autumn, in various Mediterranean areas? Is the swordfish adopting a different reproduction strategy to face the high fishing pressure? (as a matter of fact, several juvenile swordfishes have been reported all over the year, creating doubts about the limits of the spawning season).

CONCLUSIONS

As stated in several previous papers (Di Natale *et al.*, 1996a, 1996b), all the possible available data are quite important for the management of the swordfish stock in the Mediterranean, which is under a clear increasing pressure, due to a strong and diffused market demand and to the development of new fisheries in non-traditional areas.

At the same time, as reported before, fishery data imply a high degree of variance, due to several factors, quite difficult to assess but, at the same time, quite able to strongly bias the final result. Not so many data files include non-numerical attachments, which are often very useful to better assess the outcome of each calculation, even if this fact means a higher degree of uncertainties.

Maybe, in the stock assessment, a new importance has to be devoted to the description of the "environment" around each fishery, as used by the old naturalists and fishermen, because is not every simple to put the Nature into numbers and models, without taking into consideration a very complex combination of factors (not only physical or environmental), able to strongly affect our understanding of the swordfish fishery.

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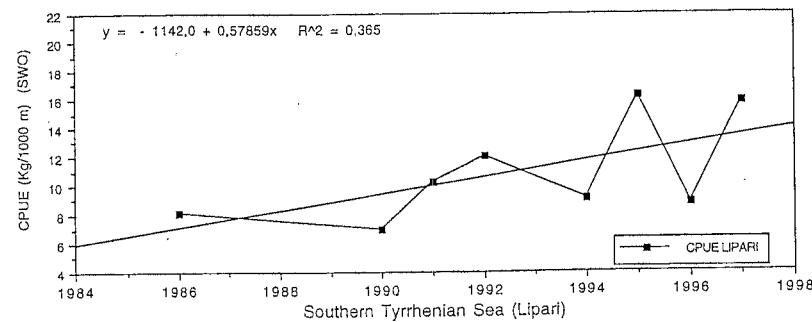
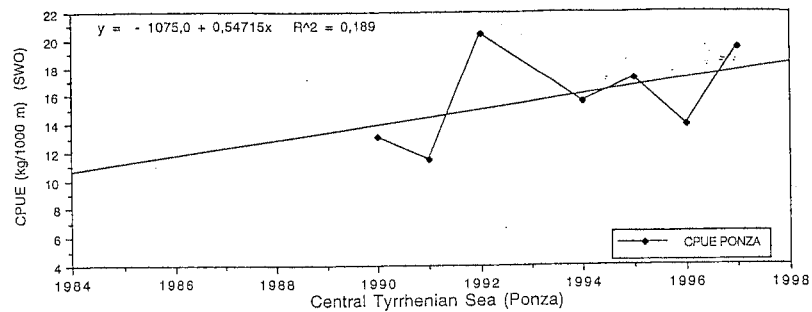


FIGURE 1 - CPUE data from the driftnet fishery in three monitored Italian harbours (Ponza, Lipari and Sant'Agata Militello) in the Tyrrhenian Sea for the period 1985-1997.

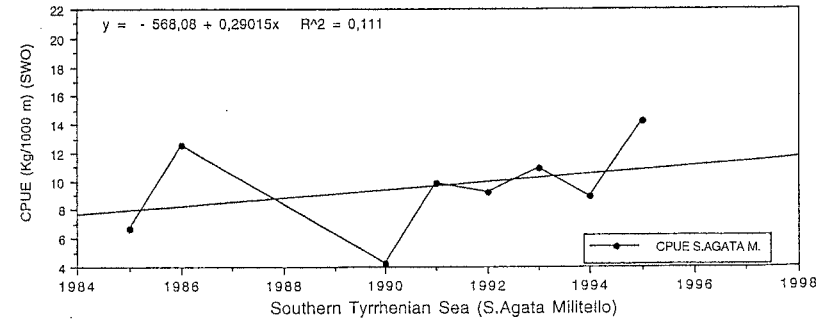


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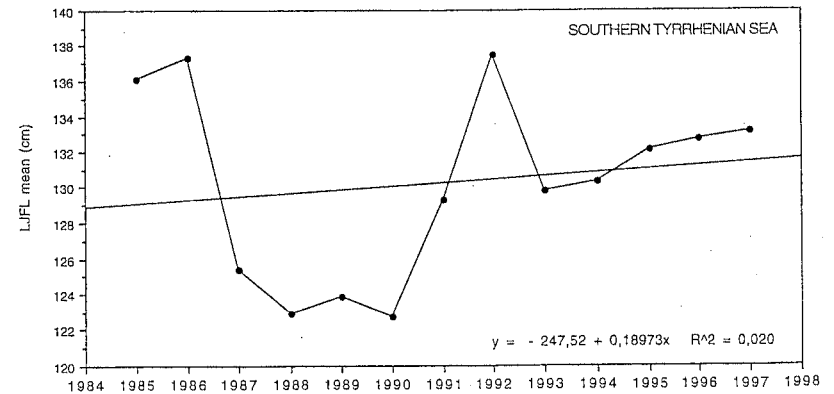
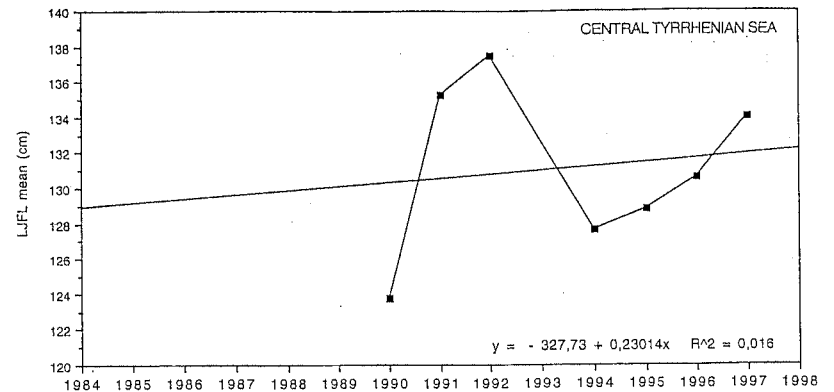


FIGURE 2 - Mean length (LJFL) of the swordfish (*Xiphias gladius*) catches from the driftnet fishery in the Southern and Central Tyrrhenian Sea for the period 1985-1997.