

DETERMINATION OF EFFECTIVE FISHING EFFORT IN A MEDITERRANEAN TRAWL FISHERY

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Abstract

The use of fishing effort limitations as a management tool should be based on a precise knowledge of their effects on fishing mortalities. The aim of this study was to develop an approach to analyse this relationship for Mediterranean hake and striped red mullet trawl fisheries. Thus, estimates of fishing effort directed to these species, by "métier", were obtained from a data base including disaggregated data on daily catches by boat covering a nine years period. They were related to fishing mortality values derived from VPA, showing significant correlations, which permitted to calculate for the first time in the area, catchability coefficients for both species.

Keywords: Fishing effort, trawl fisheries, Balearic islands

Material and methods

Fishing effort

One of the components of the fishing effort, the fleet capacity, was calculated from official fleet census. The second component, the fleet activity, was analysed by means of a relational database containing detailed information on weight and specific composition of daily landings by boat for the period 1983-1991. This database, built up from the receipts of daily sales realised in the central auction wharf of Palma, contains information on 40522 trips, divided over 294511 records including each one data on species name, vessel code, day of capture and landed weight. From the database was calculated the actual number of fishing days of all the fleet by year, which permitted to obtain realistic values of total nominal fishing effort (GRT*fishing days or HP*fishing days). Moreover, analysing the specific catch composition of each trip, it was possible to estimate the number of fishing days in which each considered species, hake or striped red mullet, were the target species. It was found that only the trips where the hake landings were >10Kg could be considered to be directed to hake, because lower values corresponded to hauls performed on slope grounds targeting red shrimp or on shallow shelf areas targeting red mullet. In the case of striped red mullet, due to its more restricted bathymetric distribution, it was considered that the presence in the landings of this species indicated that at least part of the effort was directed to this species. Data on vessels characteristics and the relative specific composition of their landings were analysed using clustering techniques (UPGA algorithm and Euclidean distances were considered), which permitted to split the fleet in three different "métiers". The weight of discards of commercial demersal species are negligible in this fishery, so landings data can be considered as representative of total catches and, subsequently, a good indicator of the exploited biocenosis.

Fishing mortalities

The fishing mortalities in the period 1980-1991 were estimated from VPA by using COHORT software programme ANACO (1). Partial fishing mortalities by "métier" were calculated as:

$F_{\text{partial}} = F_{\text{total}} C_{\text{fleet}}/C_{\text{total}}$; where F is total fishing mortality by year, C_{fleet} is the catch in weight by a "métier" and C_{total} is the total catch in weight

From the fishing mortalities and the catch number by age, a weighted global fishing mortality by year was calculated (2).

Results and conclusions

In general, no relationships were found between fishing mortality rates and fishing effort when effort was measured as total number of fishing days of the fleet, standardised either by vessel tonnage or HP. This was not a surprising result since most of Mediterranean trawl fleets are heterogeneous and they exploit several fishing grounds and target different species. So the total effort can be only considered as a nominal effort and not an effective effort measure, relevant in terms of fishing mortality rates of a single species. On the other hand, when the estimates of effort directed to each target species were used significant correlations between f and F were found.

For hake the best correlation ($r^2=0,84$) was obtained when estimates of fishing days targeting this species were standardised by the GRT of the fleet (Figure 1).

For striped red mullet the best estimate of effective effort was merely the number of trips targeting this species (Figure 2), with $r^2=0,90$. Including a dependency on either the tonnage or the HP gives a worse fit ($r^2=0,84$). This is due to the fact that smaller vessels use a type of gear which permits them to fish on hard bottom grounds where this species is mainly distributed, thus increasing their efficiency.

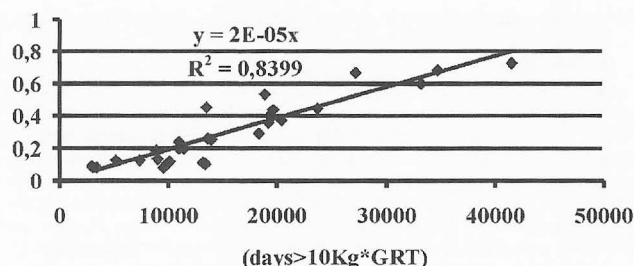


Figure 1.

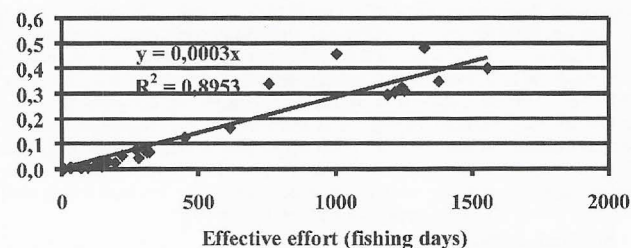


Figure 2.

The estimated catchability values for both species were 0,0003 for striped red mullet and 0,00002 for hake as can be seen in figures 1 and 2.

The main conclusion is that in the Mediterranean trawl fisheries, due to their multispecific nature, management measures limiting the total effort of the fleets can fail in their objective of reducing fishing mortalities in single stocks. Thus, methods to identify the fleet components that really contribute to the effective effort exerted on each stock would be required.

References

- (1) Mesnil, B., 1988. Logiciels pour l'évaluation des stocks de poissons. *FAO Doc. Tech. Pêches*, 101, Suppl. 3: 78 pp.
- (2) Sheperd, J. G., 1983. Two measures of overall fishing mortality. *J. Cons. Int. Explor. Mer.*, 41: 76-80.