TRAWLING EFFORT ESTIMATION IN TWO FISHING GROUNDS FROM THE CENTRAL AND NW MEDITERRANEAN: DIRECT *VS.* INDIRECT METHODOLOGIES

P. Sartor [1], J. Martin [3], A.M. De Biasi [1] *, L. Recasens [2], B. Reale [1], J. Cartes [2], S. De Juan [2], S. De Ranieri [1], M. Demestre [2]

[1] Centro Interuniversitario di Biologia Marina ed Ecologia Applicata, Viale N. Sauro 4, 57128 Livorno, Italy
[2] Institut de Ciències del Mar (CSIC), Pg. Marítim de la Barceloneta 37-49, 08003 Barcelona, Spain
[3] Mediterráneo Servicios Marinos, S.L., Nueva dársena pesquera s/n, 03008 Alacant, Spain - a.debiasi@cibm.it

Abstract

The otter trawl fishing effort from two fishing grounds, located in the Catalan and northern Adriatic Sea was estimated using direct and indirect methods. The direct estimation monitored the trawl fleet activity, whereas the indirect estimation was based on monitoring the trawl tracks on the sea floor by side scan sonar. A significant relationship between the two methods suggested the utility of the indirect estimation as indicator of fishing effort.

Keywords : Adriatic Sea, Western Mediterranean, Fisheries.

Introduction

A small-scale estimation of the spatio-temporal distribution of fishing effort on trawling grounds is of paramount importance to develop a management based on fishing effort control. The aim of the present work is to estimate fishing effort at the smallest scale possible by means of direct and indirect methods.

Methodology

The study, carried out during 2003 and 2004, analyses the fishing activity of two commercial trawling fleets that operate at Sant Carles de la RÃ pita (Catalan Sea, NW Mediterranean) and Fano (Adriatic Sea, Central Mediterranean).

To obtain a small-scale information on spatio-temporal pattern of fishing activity, different sampling methods have been considered. Firstly, fishing effort was directly estimated by: (i) monitoring daily landings per vessel at the auction, (ii) interviews with fishermen, and (iii) sampling on board. Data on fishing hours per month (h) were converted in Direct Effort Index, D.E.I. = (h ·s ·w) / A, where s is the mean trawling speed (4.6 km/h in the Catalan Sea and 5.5 km/h in the Adriatic Sea), w is the mean distance between the two doors of the gear (0.06 km), and A is the total surface of each study area.

Secondly, an Indirect Effort Index, I.E.I. was applied, following the temporal evolution of the trawl tracks on the bottom of a 1 km^2 area (S). Data were obtained by Side Scan Sonar (SSS) [1]. I.E.I was calculated as: (w ·L/2) / S, where L is the total length of the trawl tracks. The relationship between D.E.I. and I.E.I. was estimated with linear regression.

Results and Discussion

D.E.I.: three main periods of fishing activity have been identified. In the Catalan Sea: high effort season from September to February, low from March to June, fishing closure in July and August. In the Adriatic Sea: high fishing activity from January to June, low from July to December, fishing closure from August to middle September (Table 1).

Tab. 1. Direct and indirect estimates of the trawl effort (A= Adriatic Sea, B= Catalan Sea).

	A		B	
Month	**I.E.I.**	**D.E.I**	**I.E.I.**	**D.E.I.**
March '03	1.8	1.7		3.7
June '03			1.7	4.2
July '03	0.8	1.1	1.2	0.0
August '03		0.0	1.3	0.0
Sept. '03	0.2	0.0	1.5	5.3
Oct. '03	0.5	0.8		
Nov. '03	0.8	1.0	1.8	5.4
March '04	1.9			
June '04			1.1	2.3

I.E.I.: the images from SSS reflect the same pattern of fishing effort intensity obtained by the D.E.I.: high, low and cessation of fishing activity.

A significant relationship was highlighted by ANOVA between direct and indirect effort indices (test $F_{1,3}$: $p < 0.05$, $r = 0.923$ for the Adriatic fishing ground; test $F_{1,4}$: $p < 0.05$, $r = 0.818$ for the Catalan one). In the Catalan Sea the best fit between these two measures was obtained using the accumulate value of three previous months as D.E.I. values, while in the Adriatic Sea the best correlation was obtained considering the values from the same month. These differences are related with the permanence of the trawl tracks on the bottom, a factor that depends by the characteristics of the sediment and determines the relationship with the (real) effort carried out on the trawl ground [2, 3]. These results suggest that SSS may be used as an independent approach for estimating the commercial fishing effort, at least in small areas.

Acknowledgements. The study was carried out in the framework of the EU Project RESPONSE, Contract n° Q5RS 2002-00787. We thank all participants in this project.

References

1 - Krost P., Bernhard M., Werner F., Hukriede W. (1990) - Otter trawl tracks in Kiel Bay (Western Baltic) mapped by side-scan sonar. *Meeresforsch*, 32:344-353.

2 - Friedlander A.L., Boehlert G.W., Field M.E., Mason J.E., Gardner J.V., Dartnell P.1999. Sidescan-sonar mapping of benthic trawl marks on the shelf and slope off Eureka, California. *Fis. Bull*., 97:786-801.

3 - Sanchez P., Demestre M., Ramon M., Kaiser M.J. 2000. The impact of otter trawling on mud communities in the northwestern Mediterranean. *ICES J. Mar. Sci*., 57:1352-1358.