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Recent Fishing Effort in the NRA

by NAFO Secretariat

Introduction

The analyses of fishing effort can provide a useful tool to determine a number of supplementary and complimentary statistics helpful in the assessment of commercial fish stocks. This paper presents information on fishing effort derived from summary VMS information in the form of contour plots provided by the Secretariat to the Working Group on the Ecosystem Approach to Fisheries Management (WGEAFM).

Methods

Fishing effort was derived from an analysis of position reports transmitted every two hours from commercial fishing vessels according to the methods outlined in Thompson and Campanis (2007). Recent work has shown that a more restrictive range of speeds reduces bias in to determine of fishing (trawling) effort (Thompson, 2008). For this reason, a vessel was said to be fishing when it was moving at 2.00 - 3.99 kts. The duration of an identified fishing position is two hours and is controlled by the transmission interval also of two hours.

The number of fishing positions per 1 minute square was determined for three-month time periods and plotted for the central part of the NRA centering on the Grand Banks and Flemish Cap.

An estimation of swept area with in a prescribed time span of one year was calculated from the hours of fishing by assuming that the trawl covers a width of 50 m and is towed at 2.5 kts (1.852 km/hr). The maximum percentage of ground trawled each year is then calculated by dividing the swept area by the area of a one minute square ($1.852 \times 1.314 = 2.43 \text{ km}^2$).

Results

Position information has been transmitted from commercial fishing vessels since 2003. The data displayed here is from 1 Jan 2003 to 15 Dec 2007 and is shown by year (Figure 1) and by quarter (Figure 2).

hours per year	Tow speed km/hr	trawl width (km)	swept area of trawl (km ²)	Percent coverage ¹
100	1.852	0.05	9.25	380%
10	1.852	0.05	0.93	38%
1	1.852	0.05	0.09	3.8%

Table 1. Calculations to estimate the swept area at different levels of fishing effort.

¹ Assuming no overlapping tows.

One question that can be asked is: How much of the seabed is trawled each year? This question can be answered only approximately from this analysis by assuming that tows do not overlap. In reality, most tows are undertaken on known grounds and hence many of the tows would repeatedly cover the same ground. The area of a 1 minute square at these latitudes is approximately 2.43 km². At the highest limits of observed fishing effort of over 100 hours per year per minute square, the trawls would cover an area equivalent to 3.8 times the area of the square. Moderate levels of 10 hours per year per minute square cover around 38% leaving a minimum of two-thirds of the area

untrawled. At the lower effort end, which applies to much of the fished area, there is only a few percent of the area towed each year. Of course, in reality, fishers have favourite fishing grounds and the same patch of ground would be towed repeatedly and many times each year. Therefore, the proportion of unfished ground in an area would be much higher that the above given estimates.

Discussion

The purpose of this paper is to present the information in the form of maps to the Scientific Council. No attempt is here made to interpret the maps in the light of existing fisheries. It is however clear that there are marked season and annual differences in location and intensity of fishing effort. Probable next steps are to identify the fisheries with respect to gear and target species, and to undertake a comprehensive spatial analysis using the appropriate spatial models and statistics.

Vulnerable marine ecosystems (VMEs) are defined as areas containing a high proportion of long-lived slowgrowing species that are vulnerable to being destroyed by destructive fishing gears. It may therefore be expected that a VME can not exist in an area that has been subject to intense or moderate trawling. There are of course certain rather small areas where fishing intensity is high and it might be more surprising to find VMEs. However, it is shown that in most cases the intensity of fishing within much of the area fished is not that great. This is the explanation as to why many VMEs could exist in a scattered form throughout the fished area.

References

Thompson, A.B., and G. Campanis. 2007. Information on fishing on and around the four closed seamount areas in the NRA. NAFO SCR Doc. 07/6, Serial No. N5346, pp. 10.

Thompson, A.B. 2008. Requirements to estimate fishing effort from VMS transmissions. NAFO SCR Doc. 08/30, Serial No. N5530, pp. 4.







Figure 1. Mapping of annual fishing effort (hours per minute square per quarter, log10 scale) for 2003 - 2007 estimated from VMS data and assuming that a vessel steaming at a speed of 2.00 - 3.99 knots is trawling. (Note that the label in the figures of 2 - 4 knots means more than 2.0 and less than 4.0 knots.)

Figure 2 (next 4 pages). Mapping of quarterly fishing effort (hours per minute square per quarter) for 2003 - 2007 estimated from VMS data and assuming that a vessel steaming at a speed of 2.00 - 3.99 knots is trawling. (Note that the label in the figures of 2 - 4 knots means more than 2.0 and less than 4.0 knots.)

















