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A PRELIMINARY ANALYSIS OF SPECIES - DIRECTIVITY OF EFFORT IN UK FISHERIES

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ABSTRACT

The effects of mixed fisheries cannot properly be assessed unless it is known to what extent effort is directed at one species or another, and to what extent that effort leads to catches of non-target species. These data are not routinely available. A preliminary analysis is made of the extent to which such information can be extracted from partially aggregated UK landings data, under the assumption that effort is directed at species comprising more than 50% of the value of landings.

INTRODUCTION

No attempt is at present made in the UK to record the species at which fishing effort is directed, partly because it is not entirely clear that such a "target species" is in fact a well-defined concept. Nevertheless, examination of catch data shows that very often a single species accounts for the great majority of the value of landings, not only for individual voyages, but even for partially aggregated blocks of effort (e.g. for all landings by vessels for a given size category/gear/fishing area/district of landing/time of year combination).

It is therefore of interest to consider whether effort, where this is the case, may be regarded as directed at the species accounting for the majority of the landed value, especially as this may yield useful information on the extent to which effort directed at one species leads to by-catches of others.

METHOD AND RESULTS

The analysis for species-directivity of effort of this sort is most likely to be successful if carried out on data for individual voyages (or even better, individual hauls). Such data are seldom readily accessible, and this paper reports the results of some preliminary analyses carried out on partially aggregated data, which had been prepared for another purpose. The levels of aggregation in these data are described by Shepherd and Garrod (in press). The UK landings for 1978 used here are described by about 1500 blocks of effort, containing on average about 40 voyages each.

Effort has been regarded as directed at a particular species if that species accounts for 50% or more of the value of the landings. A similar approach was successfully used some years ago by the Standing Committee on Research and Statistics of ICNAF (Anon, 1973): it was based on landed weight rather than value.

Data for blocks of effort thus identified as directed were collected and summarised. The percentage of the value of total UK landings accounted for by effort directed at particular species is shown in the first column of Table 1. In total, effort regarded as directed accounts for about 65% of total landed value, even with these partially aggregated data. With data for individual voyages the percentage accounted for would inevitably be higher. The second column of Table 1 shows the percentage of the total landed value of the individual species accounted for by effort directed at that species. Clearly the fisheries for Norway pout and sandeels, pelagic species and shellfish are almost entirely directed. Those for cod and plaice are mostly directed, whilst those for other demersal species are less so. This is not surprising. However, in the body of Table 1 we have summarised the landed weight of by-catch species, as a fraction of the landed weight of the target species, using only effort regarded as directed. In most cases the by-catch ratios are small, confirming that the separation of directed effort is fairly clear. There are, not surprisingly, moderate by-catches of haddock in the cod fishery, of cod and whiting in the haddock fishery, and so on. There is a high by-catch of plaice and "other demersal" species in the fishery for soles, as would be expected. The high by-catch of mackerel in this fishery is almost certainly an artefact produced by the aggregation of the data, as it arises from a single block of effort where landings of mid-water and bottom trawlers are not differentiated. This serves to stress the point that, by using partially aggregated data, this preliminary analysis must overestimate the extent of by-catches. Using less aggregated data the method should be even more successful in separating and characterising the fisheries directed at individual species.

Much more can of course be deduced from the data than these overall by-catch ratios. The variation with size of vessel and gear can be examined: an example of such an analysis for the cod fishery is shown in Table 2. Whilst there are differences between vessel categories, there is a high degree of overall consistency. Similarly, differences between fishing areas, times of year and so on could also be examined, for each species in turn.

DISCUSSION

We have demonstrated that, even working with somewhat unsuitable partially aggregated data, it is possible to account for the majority (65% by value) of the UK fish landings as the result of substantially directed fisheries. This must be an underestimate, since the aggregation produces a spurious mixture of fisheries, and consequent by-catch ratios in the "directed" fisheries must similarly be over-estimates of the true by-catches. We therefore conclude that there is considerable scope for the separation of fish landings data into substantially separate directed fisheries although the data may not have been collected with this intention. Furthermore, it is possible to characterise the by-catch ratios within these directed fisheries in as much detail as the data will allow. We recommend that this approach should be pursued for as many countries as possible, using the best available data (preferably for individual voyages).

REFERENCES

ANON (1973). Report of the Assessments Subcommittee. ICNAF Redbook, 1973, Part I, pp 15, 29-30.

SHEPHERD, J. G. and GARROD, D. J., (in press). Modelling the response of a fishing fleet to changing circumstances, using cautious non-linear optimisation, J Cons. int. Explor. Mer.

Table 1. Relative landed weight

Effort directed at	Value as % of total	% of value of species accounted for	Cod	Had-dock	Plaice	Saithe	Soles	Whit-ing	Norway pout and sand-eels	Other demersal	Herr-ing	Macke-rel	Sprats and other pelagic	Crustacea	Mollusca
Cod	21	56	1.00	0.13	0.06	0.06	+	0.06	0.06	0.17	+	+	0.01	+	0.01
Haddock	7	25	0.31	1.00	0.01	0.06	–	0.23	–	0.12	–	+	+	+	+
Plaice	5	59	0.17	0.04	1.00	+	+	+	–	0.12	–	+	+	–	+
Saithe	1	11	0.09	0.10	+	1.00	–	0.02	–	0.07	–	+	+	–	–
Soles	+	14	0.28	–	0.44	–	1.00	0.24	–	1.09	–	0.68	0.08	+	0.07
Whiting	1	7	0.06	0.25	+	+	–	1.00	–	0.09	–	+	–	–	+
Norway pout and sandeels	+	75	+	+	–	+	–	+	1.00	+	–	–	–	–	–
Other demersal	2	13	0.07	0.02	0.05	+	0.03	0.10	–	1.00	+	0.03	0.03	0.03	0.06
Herring	2	95	+	–	–	+	–	+	–	+	1.00	0.15	0.02	–	–
Mackerel	13	97	+	–	+	+	+	+	–	+	+	1.00	0.04	+	+
Sprats and other pelagic	2	79	+	–	–	–	–	–	–	–	–	0.01	1.00	–	–
Crustacea	9	80	0.08	0.02	0.03	0.01	+	0.09	–	0.15	+	0.08	0.01	1.00	0.31
Mollusca	2	67	0.01	+	+	+	+	+	–	0.02	–	–	+	0.03	1.00
TOTAL	65														

Table 2. Relative landed weight for cod - directed effort (by vessel type)

	Cod	Had-dock	Plaice	Saithe	Soles	Whit-ing	Norway pout and sand-eels	Other demersal	Herr-ing	Macke-rel	Sprats and other pelagic	Crustacea	Mollusca
<40 ft, All gears	1.00	0.06	0.05	0.01	+	0.10	-	0.09	+	0.01	0.04	0.03	0.40
40-65 ft, Dem. trawl	1.00	0.10	0.05	0.01	+	0.17	0.12	0.18	+	+	0.02	0.01	+
40-65 ft, Dem. seine	1.00	0.05	0.26	-	-	0.04	-	0.15	-	-	-	-	-
40-65 ft Lining	1.00	-	-	-	-	-	-	0.58	-	-	-	-	-
65-80 ft, Dem. trawl	1.00	0.07	0.03	0.02	+	0.04	0.56	0.13	-	-	0.13	+	-
65-80 ft, Dem. seine	1.00	0.40	0.03	-	-	0.14	-	0.24	-	-	-	-	-
65-80 ft Lining	1.00	0.24	-	-	-	-	-	0.24	-	-	-	-	-
80-110 ft Trawl	1.00	0.05	0.09	0.05	-	0.03	-	0.17	-	-	-	-	-
80-110 ft Other	1.00	0.41	0.02	-	-	0.02	-	0.23	-	-	-	-	-
110-140 all	1.00	0.22	0.01	0.31	-	0.01	-	0.19	-	0.01	+	-	-
>140 Freshers	1.00	0.21	-	0.09	-	+	-	0.19	-	-	-	-	-
>140 Freezers	1.00	0.13	-	0.08	-	-	-	0.18	-	+	-	+	-
Average	1.00	0.13	0.06	0.06	+	0.06	0.06	0.17	+	+	0.01	+	0.01