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"Should ICNAF Coordinate an Annual Inventory of Groundfish Stocks with Research Vessels?"

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INTRODUCTION

In conversations and correspondence with many fishery biologists I have found considerable interest in the possible long-term as well as short-term benefits from an annual inventory of fish stocks by means of coordinated research vessel surveys. The purpose of this document is simply to stimulate discussion and consideration of the merits of such an annual inventory for the groundfish stocks in the ICNAF area. Eventually quantitative survey methods for pelagic species may also be developed, but this will depend upon further advances in acoustic techniques.

There is little doubt that bottom trawl surveys of proper design and sufficient intensity, would contribute to a more accurate and far more complete picture of the distribution, abundance and composition of groundfish populations than is now available from commercial statistics alone. In fact, it appears that research vessel surveys may be the only feasible way to obtain data on population structure in many cases; there are still a number of major stocks in the ICNAF area for which sampling of commercial landings is so inadequate that reasonable assessments are impossible.

A number of ICNAF countries have been conducting groundfish surveys for some time on an independent basis, and for the past three years the US and USSR have successfully carried out cooperative groundfish studies in addition to their independent research. The basic minimum catch data collected on these surveys are abundance by length groups for all or most species, and abundance-at-age for certain principal species. In addition to the similarity in data collected there seems to be general agreement on the type of sample design best suited to quantitative surveys; the same sampling scheme is presently being used on some of the more extensive surveys by the US, USSR and Canada. Also, it may be noted there is considerable geographic overlap in the above-mentioned surveys chiefly because of mutual interest in some of the same fishing grounds

In view of the obvious similarities in objectives and methods of existing groundfish surveys, and keeping in mind the great cost of an extensive survey, it seems likely that considerable benefits might be derived from pooling resources among ICNAF countries for an annual synoptic groundfish survey with a standardized trawling method. Such a survey could provide much more intensive and extensive coverage than would be possible for any one country, and yet the data would be directly comparable from one end of the survey area to the other and from one year to another; and with proper standardization and computer processing, at least the abundance by length groups for major stocks could be available to all member countries within six months after completion of a survey.

I call your attention to the recommendation by the assessment Subcommittee (ICNAF Comm. Doc. 70/3) to establish an ICNAF working group to investigate more thoroughly the feasibility of an integrated survey program. The most important single technical problem would appear to be the choice of a standard trawl. In order to deal effectively with this question and others, this working group should include gear experts as well as biologists who are directly involved with the planning and conduct of surveys.

In the remainder of this document I have briefly outlined the principal benefits to be derived from annual synoptic trawl surveys, and the survey methods required to achieve these benefits.

VALUE OF RESEARCH VESSEL SURVEYS

A prime stimulus for most surveys of course has been to fill the void left by commercial statistics with respect to discards and pre-recruits. By providing quantitative data on all species available to the trawl, surveys can yield a much more complete picture of the total groundfish biomass and how it changes in relation to exploitation and environmental factors. The value of recruitment predictions need not be elaborated upon here. I shall simply note as an example that US surveys have provided reliable haddock recruitment forecasts for Georges Bank two years in advance, and that the pre-recruit abundance data proved invaluable in interpreting the recent drastic decline of this stock (Grosslein, 1969a; Hennemuth, 1969). There is every reason to expect that equally useful recruitment predictions for other major stocks will be forthcoming from the same US surveys. In addition to prediction possibilities, a synoptic picture of the demersal distribution and abundance of juvenile fish may by itself provide important clues to factors affecting year class strength.

A well known source of bias in commercial abundance indices arises because commercial fishing practices change in response to market demand as well as fish availability, and the latter will be related to degree of aggregation as well as to absolute abundance. Improvements in efficiency of capture and

detection gear not infrequently confound time series of commercial abundance indices. Even when no technological changes occur, there can be changes in the methods and composition (and hence efficiency) of a traditional fleet in response to the influx of a large number of new vessels into the fishery. Survey abundance indices are free of such biases because they are based on a standardized fishing method, and because sampling is not restricted to areas of aggregation or affected by commercial operations.

Turning now to the question of accuracy of survey indices, it is clear that in spite of the fact that survey indices are unbiased in the sense noted above, sampling errors are large because of the inherently large variability of trawl catches. This is one of the most troublesome characteristics of trawl catch data, which results in reaching rather rapidly a point of diminishing returns between accuracy of indices and cost. However, evaluation of accuracy has not yet reached the point where we can precisely clarify this relationship. In any case one advantage of surveys is that with proper sample design, valid estimates of statistical precision can be readily obtained. The precision achieved in surveys comparable to the joint US-USSR studies is basically encouraging (Grosslein and Sauskan, 1970).

Still another advantage worth noting is the synoptic nature of a research survey. Establishing closed areas and seasons requires fairly precise information on distribution, and this is best supplied from synoptic type surveys. Furthermore, when it comes to interrelationships between fish distribution and hydrography, we are often dependent on the hydrographic observations made concurrently on fishery surveys.

SOME REQUIREMENTS OF A COORDINATED GROUNDFISH SURVEY

Standardization of survey methods is essential at least within integral parts, if not the entire, ICNAF area. For example, the same trawl should be fished with the identical rigging, duration and speed-of-haul; and ideally trawl performance and speed over the bottom should be monitored electronically throughout the survey. Also, the same basic sample design must be used, catches must be sampled in a standard manner, and catch and station data recorded on standard logs to facilitate processing and reporting of results. The problems of establishing and maintaining standard procedures are considerable, and therefore adequate advance planning, testing of vessel and gear performance, and briefing of scientific personnel are very important.

While it is obvious that the survey trawl chosen should have high efficiency for most of the major groundfish species, efficiency may have to be compromised with factors such as size and durability. Further evaluation of this question will be required before a final choice of trawl is made. However, it

must be recognized from the start that it will be impossible for one trawl to satisfy everyone completely, and the longer we wait the harder it will be to reach agreement. This is because the major benefits (particularly evaluation of accuracy of abundance indices) of a survey will not be realized until a time series of at least several years has been established; and as each year goes by, the independent survey series of each country tends to become more valuable and thus harder to interrupt.

With respect to sampling design it appears that the stratified random sample design is the best choice for a survey with the objective of producing quantitative abundance indices (Grosslein, 1969b). This design provides fairly uniform distribution of stations throughout a survey region, insures some trawling in all important depth zones, and allows for flexibility in allocating stations among strata according to abundance and distribution of priority species. Random sampling within each stratum provides estimates of sampling error, and insures that every habitat is sampled with probability proportional to its area.

The optimum time for an ICNAF survey would appear to be summer. Good weather is an important consideration from the standpoint of the accuracy and completeness of sampling, as well as the enthusiasm of scientists. Furthermore, a summer survey would provide the maximum time for processing data, and in all likelihood a fairly complete report of standard form could be completed before the next annual meeting.

REFERENCES

Grosslein, M.D. 1969a. Haddock recruitment predictions from bottom-trawl catches of 0-group fish in Subarea 5 and Division 4X. Ann. Meet., June 1969, ICNAF Res. Doc. 69/89, Ser. No. 2255.

1969b. Groundfish survey program of BCF, Woods Hole. U.S. Fish and Wildlife Service, Commercial Fisheries Review, Vol. 31, Nos. 8-9, pp. 22-30.

and V.I. Sauskan. 1970. USA-USSR cooperative groundfish survey, fall 1969. Ann. Meeting, June 1970, ICNAF Res. Doc. 70/80, Serial No. 2428.

Hennemuth, R.C. 1969. Status of the Georges Bank Haddock Fishery. Ann. Meeting, 1969, Res. Doc. 69/90, Ser. No. 2256.

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