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"U. S. COMMENTS AND RECOMMENDATIONS FOR  
ESTABLISHING AN ADEQUATE ICNAF DATA BASE"

I. INTRODUCTION

The current high level of fishing intensity which includes virtually all species in the ICNAF area has generated an urgent need for more and better information on the status of stocks. The importance of comprehensive biostatistical data was once again emphasized at the 22nd annual meeting, but a memorandum by the Secretariat in February 1973, (Summ. Doc. 73/2) indicated that members have a long way to go just to meet the current minimum sampling standards even for the major species.

The need for more data on abundance and age-length structure of stocks is fairly obvious and the major deficiencies in relation to the minimum requirements for statistics and sampling are documented in ICNAF Summ. Doc. 73/2. There is also a need for better data in the form of better documentation of sampling and analytical methods, including evaluation of the sources and magnitude of sampling errors, to provide statistical measures of accuracy and precision which can then be used by scientists and commissioners for more objective appraisal of the margins of error associated with estimates.

Uncertainty about the validity of estimates of stock size and recruitment, which led to extended debate on quota levels during the 1973 Mid-Term Meeting, only serves to prevent effective action by ICNAF, and this uncertainty can be circumvented only by complete documentation of the data base and the nature of the estimates in written form suitable for critical evaluation by scientists of the Assessment Subcommittee.

The purpose of this document is to focus attention on critical areas where the data base needs strengthening most, and to suggest ways in which improvements can be made.

## II. CATCH AND EFFORT STATISTICS

There is need for a finer breakdown of catches by species and by area (e. g. 10' squares have been suggested by the Herring Working Group) in order to deal more effectively with the general problem of mixed species fisheries, and to permit more accurate assessments of abundance and stock structure of major species as well as total productive capacity of the fish resource as a whole.

Several examples will illustrate the problem. The Assessment Subcommittee at the January 1973 meeting and the Meeting of Experts on Effort Limitation in March 1973 had difficulty in estimating what part of the catches reported in Table 4 of the Statistical Bulletin was a by-catch of directed fisheries because catches were not broken down into sufficiently small units of area and not identified by fisheries. This is particularly important in those Subareas which have a highly mixed fish population. Finer breakdown of catches is also necessary for assigning catches to particular stocks of given species; this is critical, for example, in assessing the red and silver hake stocks. Finally a finer breakdown is necessary to sort out the mixed ground-fish category which is larger than some allocated quotas and may in fact prevent useful assessments on some species.

The degree of detail required in reporting catch statistics for each species should ideally be tailored to the unique characteristics of the stocks and areas involved. The present requirements can be considered adequate only for very large, homogeneous stocks and will not provide the necessary precision for the smaller stocks more restricted in area with which the Commission must also be concerned.

Along with a finer breakdown in catch records, there is a need for more precise concomitant data on fishing effort for assigning effort to a given species for use in estimating stock abundance. Effort should be reported in the same standard unit areas as the catches referred to above and it should also be precisely identified as to species sought and gear and fishing techniques used. If the fishing in an area is directed toward more than one species, this too should be clearly recorded in the statistics. Depth at which effort is expended should be reported also so that this can be utilized in deriving abundance indices. The present categories of vessel tonnage, class, and gear are too broad for the required precision in adjusting for relative catch abilities. In addition, within country standardizations for even finer factors, e. g. , day-night differences, are required in some areas for catch-effort analyses to provide well defined units of effort.

Next it is essential that we employ well defined statistical sampling designed for unbiased estimation of the age-length structure and abundance of stocks. There is potential for serious bias in these

estimates unless considerable care is taken to insure that appropriate randomization is used in selecting vessels and catches to be sampled, and then to appropriately weight these samples in a pooled estimate. The importance of this problem and the theoretical framework and practical methods for developing appropriate sampling designs, have been described in considerable detail in an FAO manual on sampling (Gulland, 1966).

So far, however, there have been few attempts to document existing sampling schemes in sufficient detail to permit even approximate evaluation of the sources and magnitude of sampling errors, and thus ICNAF does not yet have a measure of the importance of these errors in the overall reliability of assessments. A sampling design based on probability sampling is required not only to insure lack of bias but also to provide a statistically valid basis for measuring random sampling errors. Such an analysis presents a formidable computing task because data must be treated on an individual sample basis, and therefore modern data processing techniques are a necessity.

In order to produce the desired estimates in an efficient way the collection processing and analysis of fishery statistics must be organized into a well integrated, computerized plan utilizing a standardized coding scheme for data on catch, effort, and age-length samples. It has become quite clear that the only way to implement such a plan is to establish a much larger central data processing unit at ICNAF headquarters. This unit must be capable of efficiently handling a greatly increased volume of fishery data in the form of individual sample records from all countries, and then providing up-to-date standard summaries and analyses of the catch-effort and age-length data base.

### III. RESEARCH VESSEL DATA

The need for appropriate sampling designs and full documentation of sampling methods to allow critical evaluation and admissibility of results is as important for research vessel data as for commercial fishery data. A major advantage of research vessel surveys is that they can avoid some of the principal sources of bias in commercial data, but this advantage can only be achieved if proper sampling designs are scrupulously followed. Thus, admissibility of research vessel results must also be based on certain standards of documentation of sampling techniques including exact methods of selecting stations, sampling catches, and gear and fishing parameters used.

Analysis of sampling variability using well established statistical methods and including estimates of confidence limits, are equally important.

In addition to the unique value of using research vessel surveys to provide measures of status of the total fish biomass (all species combined), the research data are especially important for recruitment predictions. In view of the importance of recruitment indices in predicting future abundance, it is essential that these indices be developed very carefully with full regard for the nature and magnitude of errors affecting research surveys. There is considerable room for improvement here, especially with respect to species such as sea herring and mackerel.

The United States, therefore, feels that the Commission must broaden the ICNAF Groundfish Survey Program into a more generalized research vessel program which would include surveys for pelagic as well as groundfish species, juveniles as well as adults, and which would promote still more effective pooling of research vessel resources. To accomplish this task, a permanent working group should be established within the Assessment Subcommittee to promote analysis, documentation and utilization of research vessel results for assessment of major stocks, and to formulate proposals for coordinated surveys. Integration of results from commercial and research vessel sampling in a properly coordinated study should provide more accurate assessments at less cost.

#### IV. IMPLEMENTATION

The United States is concerned that unless proper emphasis is provided by the Commission, the solution to the data base problem will be delayed. It therefore recommends that action proceed on the items listed below to fully implement new procedures by 1975.

1. Establish the necessary data processing capability and the appropriate staff within the ICNAF Secretariat to handle a greatly increased volume of catch, effort and sample data, and to provide up-to-date standard summaries and preliminary analyses of the data.

2. Change the statistical reporting requirements to more nearly provide the data required for adequate assessments by:

- (a) reporting catch and effort by species and species directed fisheries for 10 minute divisions of latitude and longitude and bi-weekly periods,

(b) reporting individual length frequency and age-length samples with appropriate identification of vessel, amount of catch and effort, etc., and information on adopting a standard method of sampling catch (e. g. length-frequency and age samples).

3. Establish a special working group within the Statistics and Sampling Committee, with considerable expertise in statistical methods and good representation from the Assessment Subcommittee with the objectives of:

(a) formulating a basic statistical sampling design for the collection, processing and preliminary analysis of ICNAF statistics, which will meet the more rigorous assessment needs outlined above, and which will serve as the framework for developing the ICNAF central data processing system,

(b) reviewing the current and proposed new minimum requirements for catch/effort statistics and age-length sampling in relation to the accuracy required and feasibility of handling the workload within the central ADP unit,

(c) documenting the sources and magnitude of sampling variation in the major fisheries, and evaluating the significance of sampling errors in terms of potential losses in yield as a result of errors in management decisions (e. g. quota estimates),

(d) formulating minimum standards for documentation of sampling methods, the data base and its analysis, including well defined (statistical) measures of sampling variation - to be used as a basis for judging admissibility of information (research vessel as well as commercial fishery data) in the Assessment Subcommittee.

4. Establish a more comprehensive, standardized research vessel survey program including commitments of all countries to participate.

5. Establish a permanent working group within ICNAF to promote greater analysis, documentation, and utilization of research vessel data.

6. Establish a basis for assessing penalties on countries which do not comply with the expanded data collecting program as proposed by ICNAF.

