EXPERIENCES AND CASE STUDIES IN THE IMPLEMENTATION OF DATA COLLECTION METHODS FOR ARTISANAL FISHERIES

by

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1. INTRODUCTION

This note is based on the experience gained during the design and implementation of data collection methods for artisanal fisheries in a number of countries under the FAO Technical Cooperation Programme, and other national and regional projects supported by UNDP and Government Cooperation Agencies. Its purpose is to illustrate some general approaches that have been introduced in a number of FAO member countries, and to highlight major constraints and problems that are found to be common in the design and implementation of statistical development activities. Specifically, the note is based on FAO field activities that, since 1994, have taken place in Asia (Cambodia, Myanmar), Africa (Gabon, Mozambique, Sao Tome and Principe, Sierra Leone, Tunisia), and Latin America (Guyana, Suriname, Venezuela).

In most of these countries the degree of exploitation of the fish resources by the artisanal sector was generally, not known to an acceptable level of accuracy. For instance, in some cases, and based on empirical data from the artisanal sector, there was reason to believe that the level of exploitation of some important resources had indicated the need for more accurate and timely statistical information, the lack of which was invariably attributed to the absence of a regularly operated, nationally sustained, appropriately focused, and cost effective data collection program. It was thus in this context that FIDI participated in the formulation and technical backstopping of field activities related to the development of data collection methods and computer-assisted systems for the statistical monitoring of artisanal fisheries.

2. MAJOR CONSTRAINTS IN THE STATISTICAL MONITORING OF ARTISANAL FISHERIES

Size of target statistical areas

In most cases, one of the major constraints for the statistical monitoring of artisanal fisheries is the size of the target statistical area which comprises long maritime coastlines, shorelines of main lakes, and several other important water systems of rivers and fresh-/brackishwater bodies. Thus, artisanal fisheries are often characterized by a great diversity as they extend over several morphological (or even climatic) zones, types of water bodies, types of resources, and exploitation practices. One of the early conclusions regarding data collection schemes and sampling scenarios was that the diversity of artisanal fisheries required the implementation of different methodological and operational approaches, each of which take into consideration specific conditions and each focusing on specific data requirements but, at the same time, each operating within an overall methodological and operational framework.

Fragmentary sampling schemes

During the recent years most national institutions have initiated a number of data collection activities with the view of increasing the knowledge of the artisanal fishery sector and also preparing the ground for an overall fishery statistical program operating on a regular basis. These activities included censuses at regional level as well as some limited sample-based data collection schemes for catch and fishing effort. Based on the experience gained from these activities, it has been generally accepted that it would not be feasible to record catch and effort from all landing sites and on a daily basis, and that in most parts of the country sample-based approaches in space and time (supported by one-time censuses), should be introduced. These ought to be well-defined so as to reduce the risks of bias, operationally simple in order to be sustainable and methodologically robust for adapting to local conditions and needs. A common constraint in all these data collection activities has been their fragmentary and piecemeal character, combined with a lack of statistical and computerization standards.

Need for increased computing power and skills

From the computerization viewpoint, most of the national agencies responsible for operating fishery statistical systems have placed particular emphasis in introducing computers in the early stages of data collection and statistical analysis. Although the degree of computer skills is rather uneven among user groups, the average level of computer literacy is promising and expected to increase in the short and medium term. However, there is evidence that future statistical systems will operate on a much larger scale and will thus call for a more powerful and effective computing configuration and an in-parallel upgrading of staff skills.

3. IMPLEMENTING STATISTICAL AND COMPUTERIZATION STANDARDS

National workshops have proved very useful during the initial development stages of large-scale data collection programs. Usually these are organized to take place within a week and are attended by national fishery experts responsible for statistical activities in national administrative areas such as regions and provinces. Experience has shown that these workshops are more effective when delivered in three phases. The first phase involves presentation of basic concepts and approaches commonly used in the statistical monitoring of artisanal fisheries. The participants are presented with a series of slides illustrating the use of sampling techniques in the formulation of CPUEs, boat/gear activity coefficients, and the derivation of total estimates for catch, fishing effort, prices and values. From the methodological viewpoint, emphasis is placed on the need for a sampling program to handle four different types of survey data related to sample landings, sample boat/gear activities, active fishing days, and extrapolating factors (total number of boats/gear) provided by frame surveys. The presentation also deals with operational and infrastructural aspects such as cost effectiveness of survey programs, means for increasing mobility of recorders and/or mobilization of field staff, and effective ways in distributing data collection effort and computer operations.

The second phase of the workshop deals with case studies and exercises which are worked out by the participants. During this phase, the participants operate a simulated artisanal fishery within a geographically limited area with a small number of operating fishing craft and gear. This set of data is used as a basis for the application of several sampling scenarios and the evaluation of the derived estimates. The third part of the workshop includes presentation of the standard FAO-FIDI software ARTFISH/ARTSER and hands-on exercises using the numerical data worked out during the second phase.

The meetings are usually concluded with technical discussions related to the applicability of the general statistical and computer concepts presented during the workshop on specific cases occurring in the national fisheries. During these discussions, suggestions may arise indicating that the presented approaches should first be implemented on a small-scale bases, that is developing and field-testing a prototype system in a geographically limited but representative district or region in the country.

4. COORDINATING A DATA COLLECTION PROGRAM

The diversity of artisanal fisheries requires a statistical monitoring program to be implemented in successive phases and be continually guided and supported by a representative managing group of users and developers. A first consideration concerns the minimum infrastructure required for performing a number of statistically-related management tasks including:

a) Planning of the system design and its initial implementation;

b) Enforcement of harmonized statistical and computer concepts throughout the target statistical area;

c) Preparation of planning and budgeting proposals for in-office and field activities;

d) Diagnostics on and critical evaluation of the performance of the statistical system;

e) Deciding on corrective actions of and when required; and

f) Coordinating linkages with higher-level fishery information systems at national and international level

At this stage it would seem appropriate to suggest that if several national agencies are to benefit from the introduction of a data collection program, then they should join forces with the view of complementing each other in the design and implementation of the central component of an overall statistical system. There is clear indication that basic statistical data such as catch, fishing effort, prices and values, are often of common utility to more than one institutions and should thus be the result of joint effort as regards data collection, storage, and basic analysis/reporting. Specific data collection activities of biological or socio-economic scope would continue to be the subject of activities focusing on specific institutional needs. These should be made fully compatible with the commonly operated central component of basic data, so as to allow for estimated or primary statistics to be drawn from a single data depository and thus reduce undesirable effects caused by incompatible, duplicating or conflicting information.

A second consideration concerns the type of statistical approach to be used in situations with specific data collection requirements. In this respect it should be underlined that application of different types of statistical approaches according to local needs, is a well-accepted practice in most national statistical programs, and it should present no significant difficulties if the overall methodological and operational framework is flexible enough to accommodate different data collection schemes and estimating methods. However, an important aspect is the compatibility between different approaches and the need to avoid fragmentary and uncoordinated application of concepts and standards in different statistical areas.

This means that although variations in methodology and operations are, in fact, a desirable feature of a decentralized and flexible statistical program, it should also be stressed that all of its sub-systems should be perfectly harmonized in terms of statistical and computer standards (such as species, boat/gears, geographical and time stratification, database structures, etc.) and be capable of exchanging information and become integrated unto an overall statistical program. Thus, the application of statistical standards and approaches could be effectively coordinated by a statistical committee or working group constituted of users and developers representing all parties involved in the operation and support of a large-scale statistical program.

Thirdly, an important aspect is computerization. Use of a single general-purpose software throughout the target statistical area should minimize development, testing, documenting and implementation costs, and at the same time, facilitate decentralization of computer operations. However, should there be a need for different computer systems operating concurrently in different places, these should be geared to produce fully compatible outputs permitting their interchange and eventual integration into an overall system. Again, identification and selection of appropriate software tools and enforcement of computerization standards should be more effective if it is part of the coordinating functions of the statistical committee or working group described above.

5. APPLICABILITY OF STANDARD SOFTWARE IN DATA COLLECTION SYSTEMS

In most cases, development of fishery statistical applications by national institutions is already underway, and with appropriate guidance and coordination, should greatly assist in addressing specific data integration, analysis and reporting needs. However, future systems development may be hampered by a combination of conditions. These range from a lack of satisfactory computer hardware, software, documentation, and adequately trained information technology professionals. FAO-FIDI's past experience with systems development of statistical data collection systems that were country-specific, indicated that a major investment of time and materials is required to produce a successful system. A fully operational system that has to undergo design/development, field testing and be supported by an effective kit of tutorial and operations guide, requires an investment of 1.5 - 2.0 years of a full-time professional systems developer, particularly if it is to be used in the Windows environment. If existing general-purpose systems are available and the necessary operational considerations are reasonably negligible, it is often more advantageous to utilize these rather than risk the costs with custom development.

The present ARTFISH/ARTSER MS DOS version 2.0, developed by FIDI in 1994, is a general-purpose system designed to handle sample-based surveys operating with varying sampling scenarios and estimation approaches. Its data management component (ARTFISH) caters for stratification in space and time, organization of collected data into databases of primary statistics according to the data collection schemes in use, and the derivation of total estimates for catch, fishing effort, prices and values. Its reporting component (ARTSER) operates with estimated data and provides users with consolidated tabulations, graphical presentations and interfaces with commonly used applications software.

FIDI has in its plans the implementation of a fully integrated ARTFISH/ARTSER Windows version which will be ready for distribution by the end of 1997. Functionally, the Windows version is expected to offer the known advantages of better screen handling, more flexible selection of system configuration and options, easy integration with other software applications, etc. Moreover, the Windows version is expected to offer users a complete suite of statistical services including:

1. **ARTPLAN:** A survey planner that will assist in the design of a sample survey

   This software component will operate on parameters supplied by users and generate a simulated fishery which will then be used for testing and evaluating alternative sampling scenarios. This technique can be effectively used in order to anticipate commonly occurring shortcomings related to accessibility to landing sites, time schedule of sampling, frequency sample size, mobility and cost-benefit tradeoffs.

2. **ARTFISH/ARTSER for Windows**

   Functionally this component will follow the same methodological approach used by its MS DOS equivalent. However, it will provide enhanced system functions, more transparent handling of data inter-relations, and much improved reporting features and integration with internationally utilized computer standards (MS Access, MS Excel, MS Word, MS Powerpoint, etc.)

3. **ARTHELP:** Help and Tutorial enhancements

   The above two components will be fully described and supported by a comprehensive set of documents, slides, and graphics which will be interactive and provide users with tutorial and help functions to the depth of knowledge they are willing and able to obtain.

4. **ARTBIEC:** Bio-economic component

   This will consist a number of supplementary modules, each focusing on a specific applications sector. It is envisaged that special procedures should be developed for linking the ARTFISH estimates with samples of length-frequency and other important biological data, whereas other modules will provide linkages to socio-economic information.

The above plan envisages the collaboration of FIDI with other fishery institutions that may show interest and willingness in participating in the system development. The multi-lingual requirements of the software, the amount of work required for the fourth component (ARTBIEC), and the obvious advantages of a jointly issued product (dissemination, installation, training, technical advice, troubleshooting), have already been taken into consideration and potential partners (such as ORSTOM, DANIDA) will shortly be contacted in this respect.

6. SUMMARY OF FINDINGS

- Statistically-related management tasks are performed more effectively if designated to a national fishery statistical committee or work group with responsibilities and *modus operandi* as regards system design, development, implementation maintenance, and support;

- Prior to implementing a large-scale system at national level it would be advantageous to develop a prototype system in a geographically limited but representative area. Based on experiences gained from the prototype system, stepwise expansion of the system in other areas may be necessary, by first considering new methodological requirements and operational/logistical constraints;

- Enforcing harmonization of statistical and computer standards (statistical classifications, database structures) throughout the target statistical area; and

- Selection of a single general-purpose applications software to handle the basic primary data (catch, fishing effort, prices and values). Consideration be given to new computer requirements resulting from the implementation of large-scale data collection operations.

EXAMPLE OF FISHING LOG BOOK*

The schematic flow of catch and effort statistics on the Japanese Squid DRIFT NET Fishery:

Fishing Log Book	Skipper's Report	Data Check	Computerize Analysis

FISHING LOG BOOK SHEET

Description of Vessel, Gear, etc. | Duration | Name of Respondent

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Operation (Deploy Net)

Date	Location of Set Net		Tan Used	Catch (kg)	
	Lat.	Long.		Squid	Others

Fishing Effort

- Name of Vessel (License No.)
- Size of vessel
- Horsepower
- Crew
- Mesh Size
- Tan Length
- No. of Operations
- Deployed Tans, etc.

Catch (Processed weight)

- Flying squid
- Other squids
- Albacore
- Pacific Pomfret
- Sharks (multiple)
- Skipjack
- Tuna
- Yellowtail, Billfishes, etc.

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* Hayase, S. 1994. Catch and Effort Statistics for the Japanese Squid Drift Net Fishery. In: Status of Fishery Information and Statistics in Asia. Volume II. Proceedings of the Regional Workshop on Fishery Information and Statistics in Asia, Bangkok, Thailand, 18-22 January 1994. SEAFDEC, Bangkok, Thailand, June 1994.