DATA-RECORDING SYSTEM AND SAMPLING STRATEGY IN THE WESTERN INDIAN OCEAN PURSE-SEINE FISHERY

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INTRODUCTION

The present data-recording system used in the Seychelles to compile the tuna purse-seine statistics in the WIO was established by ORSTOM at the beginning of the fishery (1982/3) for the French fleet, and then extended to the Seychelles Fishing Authority (SFA) and Madagascar in 1991-92 for all fleets. After several modifications, it has been working efficiently for the last ten years, making it possible to build a very comprehensive tuna database for the purse-seine fleets since the beginning of the fishery.

The extension to Madagascar started in 1992, within the framework of the Regional Tuna Project. A specific laboratory, the(Unité Statistique Thonière d'Antsiranana (USTA) was installed, the work being done in collaboration between ORSTOM, the Direction des Ressources Halieutiques (DRH) and the Centre National de Recherche Océanographique (CNRO) and the Association Thonière (AT).

In 1993 a first attempt to establish that system in Mombassa (Kenya) was made by the Oficina Española de Pesca (OEP), but logistical problems did not allow the activities to continue during 1994. In 1995 the system has been improved and efficiently re-established.

This paper gives a general overview of the data collection system, and explains the sampling strategy used in the WIO to collect tuna purse-seine statistics.

DATA COLLECTION

This system is based on logbook recoveries and sampling at transhipment.

Logbook return and well map recovery

The logbook is recovered by the samplers every time a boat arrives in port. Logbooks contain the basic daily information on estimated catch by species, position, school type, fish detection and environmental data, as is traditionally demanded in most fishing agreements. Together with logbooks, well maps are also collected to identify the origin (date and position) of every set stored on board the vessel, in order to help in defining the strata to be sampled.

Sampling strategy

* *Area selection*: First the catch from the logbook is plotted on fortnight maps (1° x 1° square), separating log- and free-school catches. From these maps, three sampling criteria are selected: 1° square, fortnight and log and free schools. This procedure is used in order to allocate the sampling strategy to cover the maximum of significant strata and to avoid over-sampling some of them.

* *Well selection*: Once the strata to be sampled are determined, the selection of the well to be sampled is established by the following priorities:

  (a) wells containing catch from squares not sampled following the fortnight map.

  (b) wells with no mixed catch from log and free schools.

  (c) wells with no mixed catch from different fortnights.

  (d) wells with catch from no more than five degrees distance.

  (e) wells with catch from not more than five different dates.

If there are wells matching the first priority criteria, a second selection is followed:

  (f) wells with earlier catch.

  (g) wells with closer catch.

Sampling technique

Two types of sampling are simultaneously conducted in every selected well:

* *Specific composition sampling* is done at least two times per well, usually at the beginning and the end of the length-frequency sampling. It consists of counting the number of fish by species and commercial category during a certain time at unloading.

* *Length-frequency sampling* is performed once in every sampled well, for the different species present. A certain number of fish are measured, using fork length (LF) to the nearest centimetre for fish under 1 metre long; and using snout to first dorsal fin base length (LD1) to the nearest half centimetre for fish over 1 metre. The size of the sample is generally some 100-150 fish, but may be adapted in relation to the hetereogeneity of the strata.

As an example, some 35% of the 800 strata fished (1° square-fortnight-school type) transhipped in Victoria were sampled (probably much more in Diégo where the fishery is quite concentrated) during 1994; for the whole WIO purse-seine fishery, 660 species composition and 1,900 size composition (750 yellowfin, 635 skipjack, 470 bigeye and 40 albacore) samplings where completed in Victoria, Diégo and Port-Louis.

Collection of transhipment forms

After each boat finishes transshipping, a transshipment record is collected from the companies with the actual weight unloaded, by species and commercial category. A vessel unloading only part of the catch (partial transhipment), may finish the transhipment in another harbour or at the same place but several weeks later. Tracing the different transshipments is necessary to build up the total transhipment statistics of the boat.

DATA CODING AND DATA ENTRY

Once all the forms have been collected (logbook, transhipment record, species composition and length-frequency sampling), the data are coded manually in the proper form following a code table that transforms all the information into numerical entries. A different person reviews the coded data, to avoid errors before entering the data into the computer. The coding is necessary to standardize concepts and to facilitate computer processing.

The data entry is done through the fisheries computer package ORSTHON, developed over ten years by the ORSTOM Delegation in Seychelles. The package has two main modules: ORSTHON 1 for data entry and verification, and ORSTHON 2 for data processing and generation of statistics and graphics of catch, CPUE, size composition, *etc.* It is now available in French and English.

The data entry package is a double-entry system to avoid input errors. After entry several tests are performed automatically to check the validity and the consistency of the information gathered from the different entries. Once the data have been successfully entered and validated, the information is merged into a database that stores the fishery statistics.

DATA PROCESSING

The logbook and transhipment information as well as the original samples (which are considered as the main source of raw data) are stored in the original database and processed following different raising procedures contained in ORSTHON 2.

First, the catch estimates obtained from logbooks are raised with the information obtained from the transhipment records. Raising factors are obtained automatically calculating the difference in the catch from the logbook and the transhipment form, taking into account when necessary partial unloadings. All subsequent computations can be done either with or without raising the catch.

The catch figures are then corrected for species composition using ratios obtained from both the species composition and size sampling. The data is raised using the sampling strata explained above (*i.e.* fortnight, 1° x 1° square and type of school), or pooled in larger strata (5° square).

The module ORSTHON2, apart from producing the basic catch and effort statistics and the length-frequency distribution of the catch, creates different outputs with processed information and graphic facilities for subsequent analyses (stock assessment and environmental studies) and fisheries management.

Since 1994, the Regional Tuna Project has organised a working group on tuna statistics in order to aggregate the data (logbooks and sampling) collected in the different transhipment harbours: Victoria and Diégo (all fleets), port-Louis (Mauritian fleet) and Mombassa (Spanish fleet). This is necessary in order to avoid data duplication (which may represent some 50% of the trips!) as well as to complete the sampling coverage.

From the database, it is possible to produce catch and effort and size distribution statistics by 5° square by month, as requested by IPTP. The catch data produced by this routine is raised as explained above (mixed or unknown species are distributed by special procedures in one of the four standard species according to where and when they were caught). The effort unit used in the IPTP files is the number of searching days, estimated as the days at sea corrected with the time spent at sets. It is important to note that before computing the effort (searching days) in the IPTP files, it is standardised, *i.e.* the days at sea and the fishing time are adjusted with a "standardization factor" (one per boat) to

eliminate size and technology differences between fishing boats.

CONCLUSION

The sampling scheme and the statistical process developed in Seychelles have been fundamental for a proper coverage of the activities of the purse-seine fleet operating in the WIO since 1982. The extension of the scheme to different harbours where there are regular transhipment activities is the second step, for which the co-operation between all bodies involved in tuna research and fisheries management is fundamental for the optimisation of the statistical coverage of the tuna purse-seine fleet in the WIO.

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FOREWORD

Since 1985, the Indo-Pacific Tuna Development and Management Programme (IPTP), a UNDP/FAO regional programme, has been convening and sponsoring the Expert Consultations on Indian Ocean Tunas, to provide a forum for the dissemination of research results and the exchange of information on the status of the tuna stocks and tuna fisheries in the Indian Ocean.

The latest meeting, the 6th Expert Consultation on Indian Ocean Tunas, was held in Colombo, Sri Lanka, on 25-29 September, 1995. It was attended by 51 scientists from the national institutions of 20 countries and representatives of two international bodies responsible for tuna management in other oceans, in addition to staff from FAO and IPTP, and 62 national reports and scientific papers were presented, a record for these Consultations. The increasing participation of scientists from nations bordering the Indian Ocean is particularly encouraging, as a measure of the interest that the tuna fisheries are generating in the nations of the region. the collection of working documents presented in this volume is a significant sample of the most recent research on Indian Ocean tunas and the status of the fisheries.

This volume includes the working documents made available to the participants in the Consultation. Frequently, comments made during the discussions that followed each presentation put the results presented in context; these discussions are summarised in the companion volume, *Report of the Sixth Expert Consultation on the Indian Ocean Tunas* (IPTP/95/GEN/23), published earlier this year by IPTP. Since the working documents formed the basis for the discussions and conclusions reached by the Consultation, they are reproduced here in substantially the same form in which they were presented at the meeting, with editorial changes.

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