

## The Structure and Function of the OECS Fishery Database

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### INTRODUCTION

One of the envisioned functions of a regional office for the coordination of research, monitoring, management, and development of the fisheries of the OECS member states was the creation of a data centre for fisheries information. Such a data centre will have several roles:

1. To create and manage a database of fisheries statistics to which member states report, and in turn, can refer to for regional information. This database may eventually include information other than fisheries statistics, such as reference lists of fisheries research projects in the region. In addition a bibliographic reference file is being constructed.
2. To serve as a focal point for fisheries assessment methodology serving the member states.
3. To coordinate information collection for the region and liaise as necessary with other international data centres (e.g., ICCAT, FAO).

The principal tasks of my consultancy were to outline both sensible database structures and achievable and useful goals for the handling and dissemination of regional fisheries statistics, as well as to train the OECS Fisheries Data Manager in the use of the computer facilities of the Fisheries Unit. This report describes the nature of products the OECS and its member states can expect from the data centre activities of the Unit. The immediate uses of these products are reviewed. Then the structure of the computer database and envisaged data collection and reporting procedures will be described. Finally, suggestions for immediate goals and tasks of the data centre are given.

The first step in the construction of a database is the determination of the sorts of output or products which are required. The collection and uses of fisheries statistics is quite varied the world over from rough estimates of the fishing activity in a newly developing fishery, to detailed biological studies and assessment analyses such as those routinely performed for the North Sea or western North Atlantic. The chosen uses of the information depends, of course, on resources for analyzing and utilizing the data and the types of management and policy decisions required.

In the eastern Caribbean, the greatest need appears to be for pictures of the structure of the fisheries, the magnitudes of catches through the seasons, their economic importance, evidence for over or underexploitation of various stocks,

and the likely impact of development initiatives in the region. Many of the traditional assessment methods developed for temperate water fisheries are inappropriate or need modification to be useful in the Caribbean. It will be necessary to do some detailed studies of particular sectors of a fishery using or developing appropriate statistical and analytical methods for the project and this sort of work should be strongly encouraged. However, the immediate need is for providing a wider view of the general bioeconomic situation for eastern Caribbean fisheries which can guide management, development, and research in the immediate future. In order to accomplish this objective, the OECS Fisheries Unit must try to organize the fisheries statistics for the region.

The output from the data centre should focus on the regular (biannual or quarterly) production of summary tables and graphs detailing regional fishing activities. Below is a provisional list of suggested regular output, and this list should serve as a discussion point for the users of the information (e.g., the OECS Fisheries Officers) and be modified in accordance with their needs.

1. Update information on fishery structure (tables).
  - tables of the number of vessels in various categories, number of landing sites and their principle activities, species caught in each country, etc.
2. Catch of the major species by country (graphs).
  - for different sectors of the fishery categorized by landing site type or sale outlet.
  - local consumption, exports and foreign landings for each country.
3. Catch rates (CPUE) by species and country (graphs or maps).
  - average catch per unit effort (vessel day preferably) over time by vessel category.
  - summary graphs giving season abundance changes and migration patterns as indicated by catch rates.
4. Effort data by country (tables).
  - indicative levels of effort by vessel and fishery type.
5. Prices of products (tables).
  - for income/revenue calculations.
  - for comparing sectors and regions.

The uses of these products may be obvious to the reader but I will give a brief account of immediate applications. Detailed data on fishery structure such as vessel sizes and numbers, types of markets and outlets for fishery products and location of landing sites are essential for the construction of a coherent data collection program and database. We must have some means of categorizing catch effort and economic data from the many different parts of the regional fisheries. In addition, knowledge of fishery structure enables comparisons to be made both within and between islands. Development and management projects will need this sort of information to assess any impact of proposed measures.

The overall level of fishing activity is indicated by the catch and effort statistics. These are required by both economic and biological assessment studies in some detail. However, even indicative levels of catch for the OECS as a whole will provide information on seasonal importance and, in conjunction with price information, supply and demand patterns. The catch patterns throughout the region can be used for co-operative development projects and are critical for the introduction of management and regulatory regimes for both local and foreign vessels. The determination of the role foreign fishing may play on a regional basis requires some knowledge of catch by species and country.

Catch rates from many species is an indicator of local abundance and forms the basis for most fisheries assessment work. Graphs of catch rates over the region can be used to describe migration patterns in detail, and to try and determine the composition and size of stocks exploited by the various countries. Catch rate data over time should indicate the status of the stocks, *i.e.*, how they are responding to exploitation and provide basic information for management.

#### **STRUCTURE OF THE DATA BASE**

The database management software employed for the OECS fisheries data base is the RBase System V package. This system provides a very flexible structure, facilities for constructing data entry screens, sophisticated report formats, and a convenient arrangement of menus to access various database functions. The OECS consultant (P. Perry, Antigua) recommended RBase and presented test results indicating that it sorted and accessed data faster than alternative packages.

In RBase, the database is organized in a series of tables of information where each column in the table denotes an attribute such as date or country name and each row in a table contains a case or record of information on those attributes. In most cases tables are linked by containing common attributes. For example, in the fisheries database I have constructed, there is a table of monthly catch data whose attributes (columns) are country code, date the report was submitted, the month to which the data refers, the landing site category reported, the vessel category reported, a species code for the catch, the catch weight in kilograms and the average price per kg for that species in that period. Each record (row) in the table corresponds to the report of one month's catch and price of a species in a particular country, landing site type, and vessel type.

There are seven tables in the database, and each table contains at least a country code column which links the information in the tables. The various

tables are described below:

Table	Content	Data
Country Codes	Database codes for member countries	Ref.
Species Codes	Commercially important species listing	Ref.
Gear Code	Gear listing and database codes	Ref.
Landing Sites	Listing of landing sites by country	Ref.
Boat Types	Listing of boat and fishermen types	Ref.
Effort Data	Main data table of monthly effort figures	Data
Catch Data	Main data table of catch by species	Data

It is clearly recognized that information from the various member states will be incomplete in their reports to the Fisheries Data Centre. For example, it may not be possible for many countries to estimate effort at many or all landing sites. However, in setting up the structure of the system, it is important to balance the need for simplicity (and hence interpretability) with completeness. In the initial period of use of the system, it is expected that there will be many gaps in the information which will hopefully be reduced as sampling programs improve and the utility of the reports generated from the database become appreciated.

Five of the data base tables contain information on the structure of the fishery. The first of these is a table of country codes and contains only columns of country names and the codes used in the data base. This simple table is used to prevent errors resulting from entering an incorrect code. As the operator enters a country code in any table, the system checks if that entry is a valid country codes.

The second table is a list of the species caught in the region. Each record in this table contains a common name, scientific name, the primary gear used to catch that species, and a species code for use in the catch records. There is also a comment field for entering notes concerning that species if required. Other local names or patois names could be entered in this comment field for reference.

The next table is a list of gear types used in each country. The attributes in each record are the country code, local gear name, a trip type code, and a comment field. All possible gear types should be included in this table including diving, raking of seamoss, etc., not just the major types. The trip type codes assigned to particular gears will be used in organizing the information and for subsequent reporting. A list of trip types was agreed upon at the OECS/ICOD Workshop on Data Collection.

Fourthly, there is a table of landing sites in each country. The attributes in this table are the country code, a site name, a site code, the site category which will be determined by grouping landing sites into comparable types, the vessel categories to be described later, the number of vessels in each category at that

site, and a comment field which should be used to include additional information about those boats at that site. Note that for the purposes of the data base, direct sales outlets such as hotels which buy directly from the fisherman are considered landing sites as are foreign vessels known to be operating in the waters of a country. It is not necessary to include all hotels and restaurants in the landing site table; however, a code for these direct sales sites must be assigned by having one record for each country in the landing site table which is coded for direct sales sites and contains an estimate of the number of boats of each type which land directly at hotels.

The vessel type list contains the country code, boat type (*i.e.*, local name) an assigned category, and the number known to operate in that country. Again for the purposes of the data base, divers or beach fishermen for example will be considered as a vessel type. The information from this table and several of the other reference tables will come from the frame survey conducted by Mahon (see these conference proceedings).

In these tables there are built in checks in the system so that a boat category entered in the landing site list must be present, with a local name, in the vessel type list and so on. These tables contain the available information on the structure of the fishery and so will need to be constantly updated. For example, if data from a new landing site is collected, the characteristics of that site (at least it's name and code) must be entered before catch data will be accepted by the data base. While this may seem awkward, particularly to an operator who must do the entry, it is to ensure that we know where each piece of information originates.

There are two main data tables in the system, the monthly catch data and the monthly effort data. It is expected that each member country will estimate catch and effort information on a monthly basis where possible. The monthly totals will be computed from the sampling scheme in each country and these totals will be transmitted to the Fisheries Unit. The monthly effort table contains the country code, date when the report was submitted, the month the data refers to, site category, boat category, trip type such as oceanic pelagic or demersal fishing, an indication of whether the data is from a census (logbook records, purchase slips, or a complete count of some sort) or a sample which has been used to estimate total effort in the period, the effort for that boat and site category in the period, and a comment. From these seven tables it should be possible to prepare the regular summaries suggested in the previous sections. Initially the reports may be only rough estimates of catch and effort, but with improved sampling programs, it is hoped the situation should improve rapidly.

The monthly catch table contains the basic data on the catches of each of the species. There are several records in the catch table associated with each record in the effort table because each record contains the country and species code, the

month, year of landing, boat and trip type, and catch and price data. The comment field in the effort table will serve for these catch records as well.

In addition to the basic fisheries statistics in the data base, there is an associated system of bibliographic references which user's can draw on. In this reference list it will be important to include as much of the literature, both published and unpublished, on regional fisheries as possible. When a data report is submitted by a member country, a bibliographic reference for it, including the name of the reporter and the preparation data and country issuing the report should be input to the bibliographic file as a list of the available data sources.

#### DATA INPUT

Access to the fisheries data base is through a set of menus which give the user the option to either enter information, request output from the data base, or edit (correct) previously entered data. Data input will constitute the bulk of the work in the early stages of using the data base system. Input and editing use data forms on the screen so that the operator has a picture which corresponds closely to the structure of proposed data reporting forms.

When a menu selection for data input is made to, for example, the monthly catch and effort tables, a new menu appears which asks whether the operator wished to input new information, edit the existing data file, or exit the system. There is a help sheet which explains the data entry procedure which is accessed by pressing the F10 key. For the catch and effort data, the form (Figure 1) enters information into both tables simultaneously to avoid the need to enter the same field separately in two different steps. For each record in the effort table, there will usually be several records in the catch table corresponding to the reports for several species. The data entry form extends over two screens (pages) to leave room for as many species entries as possible. If data is unavailable for a particular entry, *e.g.*, effort or price, the operator can simply skip that entry by pressing return. A missing data code will then be assigned to that attribute in that record. If an error is made, then the data can always be edited later using the edit choice in the menu.

As the data are entered, the input values are compared with various validation criteria. For example, the country, species, vessel, and landing site codes and categories must already be included in the corresponding other tables in the data base. The reporting month cannot be in the future. The kilograms caught must be greater than or equal to zero and less than or equal to 10,000 (100 tons) for any one vessel category at a single landing site. The price per kilogram must be greater than zero and less than \$20. These checks are to try and reduce the number of input errors in the data base. The validation rules can be modified easily as the information improves. It is extremely important that the data entered into the system be thoroughly checked both by the entry rules in

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```
##### DECS Fisheries Unit #####Date: S E :
: Monthly Data Form STime: S E :
: #####
: Country Code: S E Date of Report (dd/mm/yy): S E :
: Data Month (mm): SE Data Year (yy): SE :
: Landing Site Category: S E Vessel Category: S E :
: Effort (trawling days): S E Sampled or Censused (S or C): E :
: Type of Trip: E :
:
: Comment (if no comment press return): :
: S W :
: :
: :
: :
: :
: Please enter the catches by species on the next page of this form. :
: The screen will pane down when you enter the comment or hit return. :
: Use as many rows as required and leave extras blank. :
: If you have more species to be entered than there is available space, :
: use a second form. :
#####
[ESC] Return [F1] Insert [F2] Delete [F3] Review [Shift-F10] More
Form: monthlys Edit Table: monthlys Page 1 < 1, >
```

```
#####
: #####
: SSpecies Code: S E Catch in Kg: S E Average Price: S E3 :
: SSpecies Code: S E Catch in Kg: S E Average Price: S E3 :
: SSpecies Code: S E Catch in Kg: S E Average Price: S E3 :
: SSpecies Code: S E Catch in Kg: S E Average Price: S E3 :
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: SSpecies Code: S E Catch in Kg: S E Average Price: S E3 :
: #####
#####
[ESC] Return [F1] Insert [F2] Delete [F3] Review [Shift-F10] More
Form: monthlys Edit Table: monthlys Page 2 < 2, >
```

Figure 1.





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```
Press [ESC] when done
##### DECS Fisheries Unit #####
:
:      Vessel Type Data      3#####
:      DDDDDDDDDDDDDDDDDDD 3
:      :
:      Country Code:        3 Date: 11/06/87 :
:      :                    3 Time: 21:00:15 :
:      :                    9#####
:      :
:      Boat Type (local name): :
:      :
:      Category (classification of boat or type in standard categories): :
:      :
:      Number of Vessel in the Country: :
:      :
:      :
#####<
```

```
Press [ESC] when done
##### DECS Fisheries Unit #####
:
:      Gear List Data Form 3 Date: 11/06/87 :
:      DDDDDDDDDDDDDDDDDDD 3 Time: 21:00:15 :
:      :                    9#####
:      :
:      Country Code:          Gear Code: :
:      :                    :
:      Local Name for the Gear: :
:      :
:      Comment: :
:      :
:      :
:      :
:      :
:      :
:      :
:      :
:      :
:      :
#####<
```

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**Figure 1 (continued).**

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Rbase and also by scanning printed copies of the data. These and similar methods are the only way to maintain the integrity of the data set.

Data input for the reference tables is also through entry forms which can be accessed from the main menu. The same forms are used for data editing and can be used to list the information on the screen.

When it is necessary to edit the data, it is not necessary to search through all the records to find those that need correction. The editing menu option asks the operator to input the country code and first reporting date for those entries to be edited. Then, all entries for that country on or after that data will be selected for data editing. For the fishery structure tables, the records for editing are selected by country code alone.

### RETRIEVING INFORMATION

One of the powers of data base management systems is that the data for a particular study or report can be selected or sorted in a wide variety of different ways. For example, it may be of interest to select all the data for a particular country over a particular time interval, or it may be useful to tabulate the catch of one species by country and month for one particular gear type. The data base management system allows the user to select, sort, and summarize information based on a set of given criteria. RBase is very flexible in the way in which it allows the user to select data.

It is clearly not feasible to set up menu operations for all possible ways of looking at the information but an experienced operator can devise many ways of examining the data. A menu for summarizing data has been constructed with a limited number of choices thought to be the most commonly needed selections. These include simple listings of all the information in each of the tables selected by country, date (month and year), trip type, or species. These listings can be sent to the screen or the printer. There are also quarterly summary reports of catch and effort selected by trip type or for selected species. More detailed reports need to be designed for the regular reports from the Fisheries Unit as data becomes available. These reports should be along the lines suggested above and will require substantial planning. However, extracting the relevant data from the data base is basically a straightforward task.

### IMMEDIATE GOALS

The immediate goals for the OECS Fisheries Unit data center should be the construction of a coherent picture of the fisheries of the region based on summary statistics and trends for catches and catch per unit effort from all the member states. In order to accomplish these goals, data collection programs must be instituted or upgraded in all the member states, and a system of regular reporting to the Fishery Unit must be devised. The production of a quarterly bulletin is an achievable goal within the next 18 months. From these summary

statistics, it should then be possible to coordinate development and management planning with a common data base for the eastern Caribbean. Detailed stock assessments for most of the fisheries of the region are some way in the future. However, analysis of catch trends and catch per unit effort trends is a first major step in this direction. It may be feasible to meet this need by incorporating historical data from the region into the data system. Even though such data is incomplete and somewhat scattered in coverage, it may, coupled with more complete statistics on the current status of the fisheries, provide some pictures of the state of the stocks.