

menting gear restrictions, for example stipulating minimum mesh sizes, setting bag limits, closing certain areas and declaring closed seasons, outlawing the use of fish poisons, the use of artificial light and certain types of destructive modern gear. In the evaluation of gear types preference will be given to non-destructive passive gear in contrast to non-selective destructive modern gear. The policy aims to protect the resource from activities other than fishing that may have a negative impact on the sustainability and biological integrity of the resource. Whenever actions are planned that may have an impact on inland fish, the Minister will have to be consulted. Environmental impact studies are to be undertaken to the satisfaction of the Minister before any commercial exploitation will be allowed.

Mechanisms will be set up to liaise with neighbouring countries on uniform management policies to ensure the proper management of shared river systems with catchments in neighbouring countries.

Principles for Sustainable Management

The Namibian government's policy on the responsible management of the inland fish resources is based on the following principles:

- (a) An approach to allow sustainable use of resources and to protect the biodiversity of the Namibian inland fish fauna;
- (b) In consideration of the diverse nature of the various systems, different management approaches are devised to deal with the circumstances particular to each river system;
- (c) The protection of the interests of subsistence households in terms of the availability of fish from the rivers as a supplement to diets and the need to control the commercialisation of the resources;
- (d) Restriction of fishing gear to control fishing and to protect the resources. Passive gear will have preference over active gear and traditional gear over modern nets;
- (e) The Namibian Police will be responsible for control and law enforcement together with personnel already employed by other ministries or to be employed by the Ministry of Fisheries and Marine Resources with the assistance of traditional communities and traditional authorities.
- (f) People living in communal areas should share in the income generated by the commercialisation or use of communal resources;
- (g) Recognition of the need to devise policies for future research on inland fish and the founding of a multidisciplinary research station to eventually serve the regions;
- (h) An emphasis on the need for regional cooperation on inland waters and related matters between states in the Southern African Development Community that share rivers.

Information Management in the Fisheries Sector

By David Evans

Beginning with an analysis of the need and potential for an integrated fisheries information management system in late 1993, the Ministry of Fisheries and Marine Resources embarked on an extensive programme to develop an information management system that would satisfy its needs well into the 20th century.

The development and implementation of the Fisheries Information Management System (FIMS) was funded mainly by the government of Namibia, with management assistance from the Department of International Development (formerly the Overseas Development Administration) of the United Kingdom and GTZ (Germany's technical cooperation agency).

This system will process information on the allocation of fisheries quotas, issuing of licences, payment of fees and monitoring of landings. An extensive process of analysis and definition of information requirements, redefinition of business practices and training ensures that user needs are realised.

A core concept was introduced around which other functions and modules would be constructed. This core system processes all the information needed to administer commercial fisheries as required under the Sea Fisheries Act. Subsequently, further modules will be developed for the complex requirements of research and enforcement. Above all, the system needed to be accurate and adaptable, efficient and simple, as well as transparent and secure.

System implementation

The system has been developed with advanced software, hardware and network management. The software is mainly from Microsoft and the hardware is the latest personal computer servers and workstations. The communications equipment is of international standards to connect the local area networks at four sites, namely Windhoek, Walvis Bay, Swakopmund and Lüderitz, via a wide area network, with adequate hardware and data security provisions on the network and controlled rights of access. User groups are defined with access permissions managed by the systems manager after this has been granted by the Information Systems Committee. The Ministry managed the design of the specialised software, which was developed by Q-Data.

The system was implemented as an application through Windows for Workgroups and Windows 95. Data entry screens mirror data collection forms and double punching, with 'blind' (red) error highlights, are standard. Data entry is monitored through audit trails for each user, enabling user performance assessment and error recovery. Online help offers a comprehensive and detailed system search and review facility. Detailed user training has been conducted,

Core System Components

The Fisheries Information Management System is operated by the Information Systems Division but with specified access to all Ministry users.

Information is available on a management information sub-system to other users, particularly senior management, for export in a variety of formats for further editing or presentation. This is essential for the review of standard reports and queries and extraction of data.

The core system offers a set of basic data in a series of subsystems, as follows:

Species: information on all species, including on total allowable catches;

Fisheries: fishery types, seasons, geographic distribution, gear limits and related matters;

Vessels: including vessel characteristics, ownership, licensing;

Factories: characteristics, ownership, licensing and other aspects;

Rights: details on fishing right, quota and licence holders and allocations;

Landings: including information gathered by the inspector.

Logsheets: logsheet information generated by the captains of fishing vessels.

Payments: including quota fees, licence fees, levies and the generation of accounts.

supported by the publication of user training manuals and user guides.

Output can be produced via individual submodules or through the Management Information System. Common report buttons are supplemented by cascading menus. Both generate a standard report which can be filtered (by any field and Boolean operator), printed, exported, or refiltered. Report formats are common, including the date, operator name and ministry header, except where they require specific formats as in the case of licences and company accounts.

Alternatively, certain users have permission to access the database by other methods. This allows a wide range of flexibility, particularly for researchers.

Module development

During the final implementation phases of the core system, concurrent activities have been undertaken to develop other modules, including the biological, oceanographic and supporting research module (BOSRM) and the surveillance and enforcement module (SEM).

BOSRM has the following capabilities:

Historical data warehousing: Fisheries, ecological and oceanic research has a long history in the southeast Atlantic.

Data sets from such research were generated in a variety of forms by countries that operated fleets in the area before independence and from international oceanographic and atmospheric research. A programme is now underway to collate, collect and make available these data sets for researchers in ways that are compatible with the system and yet without translation into FIMS format. Modern data warehousing techniques are being investigated for this purpose.

Commercial and research cruise sampling: Current and future biological and environmental data needs and user requirements have been assessed and a conceptual model prepared. A computerised fish sampling data system for use by researchers and observers at sea and at landings sites has been developed.

Biological and physical oceanography: In contrast to basic fish data, the diversity of data types and their collection methods for biological and physical oceanography (and associated climatology) requires a flexible approach and a need to define clearly the objectives and information needs for research.

Geographic information systems (GIS) and remote sensing is another feature of BOSRM. There are likely to be two approaches; the first a relatively simple mapping facility (two- and three-dimensional, over time); the second, a use of modern GIS software for hypothesis testing and analysis. An expanded use of remote sensing applications to determine ocean temperature and colour data, wind speed and vector, and other climate data is expected to provide further information for time-series analysis and predictive modelling of ocean conditions.

The surveillance and enforcement module will support the work of the inspectors of the Ministry.

The Inspectorate, which has the largest group of personnel (and hence the biggest budgets), is involved in monitoring, control and surveillance. Efficiency in information management is critical for effective control. The core Fisheries Information Management System captures much of the basic fishery-generated data, such as the monitoring data obtained from landings and logsheets. However, there are data generated by the Inspectorates themselves during the course of their activities (in the harbours and along the coast, at sea and in the air) which require integration in the FIMS.

Personnel and platform management: Inspectors and observers need to be deployed in response to the activities of the industry to monitor landings, factory operations and fishing operations at sea and from the shore. Ensuring quota control and compliance with other management measures is their primary role.

The surveillance and enforcement module will provide a link between the activities of the Inspectorate and the known operations of the fisheries. Records of deployment of personnel and patrol vessels, aircraft and vehicles will be maintained. The SEM will improve the efficient and effective deployment of these assets.

Operations control: Communications between headquarters and inspectors at sea, on land and in the air are controlled through the Operations Centre in Walvis Bay in order to

track and record their activities (patrol vessel cruise and interception track, aircraft flight plan and sightings track, shore inspections). A basic INMARSAT/GPS ground station link similar equipment on the patrol vessel and aircraft. A programme to introduce a vessel monitoring system (VMS – a series of automatic position-fixing and transmission transponders) onto fishing vessels was started in January 1997. The data will be coupled to the GIS system proposed for 2-dimensional mapping throughout the Fisheries Information Management System. This will enable immediate recognition of infringements and any required patrol platform redeployment. The module would also offer significant contributions to safety at sea through the transponder network which would facilitate emergency assistance operations by patrol vessels and aircraft with the rest of the fishing fleet.

Enforcement: Records of sightings, boardings, infringements (including evidence), charges or actions made, prosecutions and their outcomes and penalties of companies, vessels and individuals will be maintained to enable improved management of enforcement. Through its linkage to the core system, this module will assist in the preparation of operational, patrol track and boarding plans. Such information will also enable the analysis of compliance control, raise the likelihood of successful prosecution and offer possibilities for setting standards for enforcement actions.

Future components

The Ministry of Fisheries and Marine Resources anticipates that the fishing industry will want secure and wide access to the Fisheries Information Management System. This will be encouraged for all forms of information communication in both directions. A company will be able to confidentially view all data (and summaries) held on their activities, and on the industry in general.

For the better management of the fisheries sector, information will be made available to external organisations and individuals. The Ministry cooperates in a number of international research projects, provides statistical summaries to regional and global institutions and might make available appropriately confidential data sets for institutions, companies or individual researchers.

The advent of the Internet, Worldwide Web and advanced methods for data security allows such access with relative ease, thus offering participants outside the Ministry the facility to receive and contribute to fisheries management and development. Technology will be adopted (the *information fire wall*) to secure company confidentiality and confidence.

Economic and financial module

The implementation of a secure Fisheries Information Management System in support of the primary roles of the Ministry of Fisheries and Marine Resources namely *conservation and fisheries management*, will offer much for planners and managers. As the fisheries industries develop, and research into their financial and operating environments

becomes a more sophisticated task, there will be a need for economic and financial information for a wide variety of policy and development analyses.

Company financial information: Annual fisheries statistical surveys (begun in 1995) collect confidential financial and economic data. While these are maintained separately at this stage it will be possible to securely link such data to the core Fisheries Information Management System. This will allow greater flexibility of analysis by fishery, company or vessel than hitherto.

Exports and consumption: This module will provide export data to compare it with other sources, such as customs and excise. Internal consumption data will also be maintained.

Employment: Similarly the annual surveys require employment information which would be available for reviews of and planning for the progress of training.

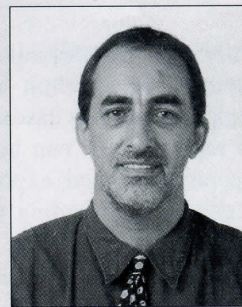
Processing and marketing module

As the fishing industry becomes confident in the accuracy, transparency and confidentiality of the system, a variety of public interest data sets could be added. The system might evolve into an *open information system* serving the public and private sectors, and the costs and benefits of it might be efficiently shared. Some areas that might be valuable are briefly outlined below.

Quality control: Maintenance of quality control information against standards. Value: performance measurement.

Prices, products and production: Maintenance of the quality and quantity characteristics of products.

Marketing and promotion: Maintenance of information on opportunities for marketing; for example on Worldwide Web sites as a service for marketing and promotion and for external buyers.



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