Intergovernmental
Oceanographic
Commission

Manuals and Guides **23**

MARINE INFORMATION CENTRE DEVELOPMENT: AN INTRODUCTORY MANUAL

SC/91/WS/57

1991 UNESCO

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An IOC contribution to the Aquatic Sciences and Fisheries Information System (ASFIS), jointly sponsored by IOC, FAO and UN(OALOS)

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FOREWORD

The purpose of this introductory manual is briefly to explain and put into context the elements involved in marine information centre development and operation.

Aimed at managers, decision-makers and scientists with a general responsibility for funding, maintaining, developing or setting up services, as well as at information workers, it is hoped that the manual will also be of value to library and information staff new to the marine sciences. The intention is not to teach the skills necessary, nor to cover the various aspects in any depth, but to give an overview and create an awareness of the range of inter-connected procedures, activities and products which comprise an information service. It was difficult to maintain a balance, and readers might justifiably claim that some sections are not given sufficient attention.

Most of the sections would benefit from being presented in much greater detail, and with samples of current practice where appropriate. For example, there are frequent requests for an up-to-date list of core books and journals which comprise the basic literature of the marine sciences, and for a guide to marine information sources and resources, while information workers new to the marine sciences, as well as those conducting training courses, would benefit from having access to a co-ordinated set of handbooks on various technical aspects of the work.

It is possible that this introductory volume will stimulate further interest and encourage efforts to produce more detailed guides.

This manual was prepared for the IOC by Mr. Allen Varley, Head of Library and Information Services, Plymouth Marine Laboratory and Marine Biological Association, United Kingdom. The authors' acknowledgements and appreciation are given to the following for the comments and review they kindly provided: Margarita Almada de Ascencio, Luisa Cabral, Joseph Caponio, Jacqueline Carpine-Lancre, Chen Boyong, Alan Duncan, Robert Freeman, Michael Gomez, Patricia Gra, Kay Hale, David Moulder, Ronald Needham, Lidia Nunes, Pan Xueliang, Trevor Sankey, Boris Shechkov, Pauline Simpson, Murari Tapaswi, Rosalinda Temprosa, Cécile Thiéry, Jeffrey Watson, Carolyn Winn. With apologies to anyone inadvertently omitted.

CONTENTS

1. INTRODUCTION

The transfer and utilization of scientific and technical information is vital for economic and social progress.

The processes of learning, experimenting, developing and acquiring skills depend upon the availability of stocks of documents and upon procedures for disseminating and exploiting knowledge. Libraries and information units, making scientific information available and accessible, play a key role in the process.

Following the production of a document by the author and its publication by an issuing agency or publisher, a cycle of linked operations makes the document available to potential users. This set of operations has been described as the "documentary cycle". Publications are traced, selected, acquired, registered, processed, classified, described and placed in the centre in specific locations. The information in each relevant document acquired is indexed and possibly summarized, so that the information may be retrieved and disseminated to specific users, questions may be answered, and the document made available for consultation on demand.

2. INFORMATION CENTRES AND LIBRARIES

Information units are concerned with conservation, documentation and information, and their activities can range from basic library functions, through contents description and the dissemination and exploitation of information, to data and information analysis. Nomenclature and definitions are not precise and vary from country to country, but generally:

(a) A "library" collects, organizes and conserves publications, making them available for consultation. It also frequently undertakes the work of an information or documentation centre, as outlined in (b) below.

(b) An "information" or "documentation" centre indexes the contents of documents, within a clearly defined subject scope, answers enquiries, and actively draws the attention of users to the information held locally and also to information which is available from external sources.

(c) An "information analysis" centre interprets, repackages and exploits information.

A marine information centre will normally undertake the functions of (a) and (b), though it will have the facilities for (c) if there is a demand and if suitably qualified staff and an appropriate budget are available. In some countries the terms "information" or "information officer" can imply public relations, advertising, media relations, and the preparation of press releases, and not the handling of scientific information. These aspects will not be discussed here.

Organizational structures and administrative procedures vary, but the principle tool of an information service is a library, so the marine information centre should:

(a) Include a library; or

(b) Be part of a library, either as a separate unit, or with its functions being undertaken in the overall library activity, sharing the same premises and staff; or

(c) Be co-located with a library.

Many of the processes of selecting, acquiring, recording, cataloguing and classifying publications and providing loan services require the well-accepted practices of librarianship, while the marine information centre is also concerned with the use and exploitation of the information contained in the publications held in the library, and with information from external sources.

3. THE MARINE INFORMATION CENTRE

Methodologies employed in operating a marine information centre will not differ from those used in other scientific information centres and libraries. The subject scope, the users, the expertise of the staff and the documents in the collection form the "marine" element.

PLANNING AND MANAGEMENT

Local circumstances will determine management structures and the position of the centre in relation to other services. At one extreme the marine information centre could be a major department responsible not only for information services in the narrowest sense, but also for the library, the publishing, editing, printing and audiovisual facilities, the data and computing services, public relations, communications, educational and conference facilities, while at the other extreme, the marine information centre could merely form a sub-section of another appropriate department. Various models are suitable, but objectives and management structures must be considered, and whether setting up a completely new centre or strengthening and reorganizing existing facilities, budgetary implications and the requirements for staff, premises, stocks of publications, furniture and equipment must be determined. Staffing and reporting procedures through departmental management, committees or advisory groups will be according to local needs and administrative practice and to the centre's position in the organizational hierarchy. The requirements of aid agencies contributing towards the funding of the centre may also need to be met. Ideal models can be constructed, but usually internal considerations and conflicting claims within the institute must be resolved, often by compromise and a pragmatic approach.

Good management is particularly important in information centres because of their wide range of activities, their need to communicate and interact with users while working harmoniously with other departments, and their need to be aware of scientific advances while providing services at a time of rapid technological change. Management of people, and management of processes and activities must be considered with management of the system as a whole, to produce the most effective services. Policies, planning, functional structure, communications, budget and personnel management are interdependent concerns, and are in turn influenced by the management policies and structure of the parent organization and its funding agencies.

SUBJECT SCOPE

The range of subjects covered by the centre must be clearly defined, and will depend on:

- the mission of the parent institute;
- the centre's role as a local, national or regional facility;
- commitments to serve specific user-groups;
- co-operative agreements with other centres and institutions;
- national, regional or international commitments to provide particular services or to undertake specific tasks.

Thus, one centre may aim to cover the whole of the marine sciences, including oceanography, fisheries, environment, pollution, offshore engineering, etc., while another could limit its scope and services to, say, aquaculture, or fish processing, or marine pollution, or the law of the sea.

THE USERS

The major purpose of the information centre is to serve users, therefore the user population and their research interests are essential factors in planning. The main users will normally be the scientific and technical staff of the parent institute, though services may usefully be extended to management and administrative staff. Visiting workers, undergraduate students and postgraduate researchers attached to the institute will make considerable use of the information centre. Additional commitments may be made through formal or informal arrangements with other institutes and through bi-lateral, regional or international agreements. Facilities may be made available therefore, and services provided, to users from other institutes, universities, government departments and agencies either specifically or from a defined geographic area, and from the following categories:

- marine scientists and technologists;
- administrators and policy makers;
- fishery officers;
- Industry and commerce;
- teachers, lecturers and students;
- journalists and the media;
- fishermen, seamen and artisans;
- the general public.

Circumstances at each centre will be different, and will influence the policy with regard to document selection, cataloguing and indexing, and the services offered.

STAFFING

Staff with professional qualifications in information work, librarianship, or documentation are required, together with clerical, support and technical personnel; a relevant subject background or qualification is helpful. Information units are often small, so staff must be flexible with the ability to switch from one job to another as needs arise, while working as a team. Regardless of their function in the centre, all staff must be able to communicate fluently and helpfully with users and enquirers. In some countries career prospects for information specialists are still limited, though as the value of information and information services is increasingly recognized, the situation should improve. It is important to employ skilled and experienced professionals, and to give them responsibility and authority to manage the centre and to develop services. Staff should be given the opportunity to acquire additional skills and expertise of value to the centre, such as foreign language training, desk-top publishing and bibliographic database management.

THE COLLECTION

Selection of publications for the stock of the centre is not a random process but is closely related to the interests and needs of the defined user group, and is within the framework of the defined subject scope of the centre. No centre or library can acquire all the publications that its users need, and although the main restrictions are budgetary, others are also involved, including:

- availability of storage space;
- material in some foreign languages would not be used;
- political considerations making it impossible to acquire publications from certain countries;
- difficulties in obtaining foreign currencies.

Positive factors reducing the need to acquire certain material include the proximity of other centres which hold relevant periodicals, and the availability of documents through a national science centre or interlending facility. It may be possible to co-ordinate efforts through agreements over subject coverage with other libraries in an administrative, subject or geographic area network. The head of the centre should be responsible for collection development, ensuring consistency and homogeneity.

SELECTION

Selection of publications to maintain the collection up-to-date and to cover new fields of research requires the monitoring of information sources on the availability of newly-published material. These include: catalogues of publishers, government departments, societies and institutions; the national bibliography of the centre's own country; book-trade bibliographies; accessions lists of other information centres and libraries; reviews, announcements and advertisements in scientific journals and newsletters; abstracting and indexing services.

The users of the information service or library are a valuable information resource and they should be encouraged to draw the attention of information staff to relevant newly-published material. They can also be used to advise whether a subscription to a particular journal should be started (or canceled), and whether a copy of

a particular book or monograph (possibly received on loan from another library or on approval from a bookseller) should be purchased. The users are subject specialists and experts; they should be given a feeling of involvement in their information centre by judicious encouragement of their opinions and advice.

Apart from *Ouvrages de référence pour les sciences de la mer* (J. Carpine-Lancre and C. Thiéry, unpublished document, 1984), *Marine science journals and serials: an analytical guide* (J.B. Barnett, 1988) and *Keyguide to information sources in aquaculture* (D. Turnbull, 1989), there is no up-to-date directory of journals, monographs and key works in marine science and technology which could be used as a guide when establishing a marine information centre, or when expanding into a new subject area. *Marine Science Contents Tables* (FAO/ASFIS) gives a broad indication of the scope and coverage of the core marine scientific journals. Publishers' catalogues, specialist booksellers, and other marine science libraries should be consulted when building up a basic collection for a new centre.

Although periodicals and books are the main means of disseminating information and will form the major part of the collection, the publications held in the stock of the centre will fall into a number of categories which will influence how they are handled and arranged. The main types are:

- reference material (encyclopedias, atlases, directories, dictionaries, handbooks);
- books, monographs, textbooks and theses;
- conference and symposia proceedings;
- periodicals and serial publications;
- reports, preprints and non-conventional, unpublished or "grey" literature;
- reprints;
- pamphlets, brochures, newsletters;
- abstract journals, indexes, bibliographies, catalogues.

The reports and other material issued by the Intergovernmental Oceanographic Commission, the fishery publications of the Food and Agriculture Organization, and documents issued by other United Nations and international organizations are particularly useful. They are normally held in designated national depository libraries, though copies may also be available direct from the issuing body.

A range of additional material which may be relevant includes: standards and specifications, laws and regulations, trade catalogues, market surveys, statistical and data compilations, maps, charts and engineering drawings, together with non-book materials such as films, slides, sound recordings and video tapes. Maintenance of an archives collection may fall within the scope of the centre, and this will include letters, laboratory notebooks, photographs, drawings and manuscript material.

ACQUISITION

Publications are acquired for the collection in three ways: by purchase, exchange, and as gifts.

Purchase

Most commercially-produced publications - periodicals and books - are available only by purchase (a) direct from the publisher, issuing institution or author, or (b) through a bookshop, specialist book dealer or periodicals subscription agency. Factors such as the problems of obtaining material published overseas and paying invoices in foreign currency make it advisable to use the services of specialist dealers and agents, except in the cases where there is a substantial financial advantage in dealing direct with the producers of the publications.

Exchange

The exchange of publications is a long-established tradition in academic and research communities. When an organization publishes a journal, report series or any serial publication it is possible to enter into reciprocal agreements whereby each organization is placed on the mailing list to receive agreed titles regularly as issued. The system relies on material being available for exchange, but is widely used as a means of acquiring

publications without any direct payment. Often a proportion of the material exchanged is not available through commercial channels, and includes technical reports, collected reprints, restricted circulation publications and "grey literature".

Gifts

Many institutions and government departments distribute bulletins, reports and similar material free of charge, though current "cost recovery" policies are reducing the amount available. Efforts should be made to get on to the mailing lists of relevant institutions. Reprints of papers published in the scientific literature may be obtained direct from the authors, and specific reports may often be obtained by writing to the issuing organizations. Donations of collections of literature built up over many years, for example from retired scientists, or of duplicate material from other libraries, are another source which may be solicited, though only a proportion of the material received might be of use. In these cases it is usual to agree with the donor that duplicate and unwanted material may be passed on to another centre.

Library collections should never be static, and just as new and relevant material must constantly be added, care must also be taken systematically to remove obsolete and out-of-date publications. However, caution is necessary, and this must be carried out by an experienced person with adequate knowledge of the collection, the literature and the subject area.

A problem faced by many information centres and libraries is that publications from other marine institutes may be received or intercepted by senior members of the research staff and retained in their private collections instead of being placed in the information centre for general use, depriving the centre and the research staff of valuable sources of information. This unthinking attitude can only be resolved locally - and by requesting issuing institutions to clearly address publications to the information centre or library.

A special category of material which the information centre must make every effort to obtain and retain is the publications of its own institute and by the staff and visiting workers. These documents, which should include unpublished material such as cruise reports, contract and internal reports, are often kept as a separate collection.

RECORDING

Incoming material must be recorded, given a mark (stamp or label) of ownership, added to stock and prepared for the users. A card record or computerized registration system may be used for journals and other "serial" publications, ensuring that all issues of particular titles are received as published and that any missing parts are claimed promptly from the publisher or supplier. Similarly a card or computer system may be used to record books and other publications ordered. Accessions procedures vary, but it is common practice to allocate a sequential and unique accessions or inventory number to each item received, linking the number to stock and financial records. All publications are stamped with the name of the centre, and according to local practice may have labels affixed, protective coverage and other preparations for loan.

CATALOGUING

The purposes of cataloguing (or bibliographic description) are to create order in the library so that each document has a non-ambiguous reference and the library has an index to its resources, with indications of locations within the system, so that documents may be identified, located and retrieved by the staff and users.

The catalogue is the register of the documents held in the collection. It may be restricted to books, theses and similar publications, or may also include reprints, periodicals and serial publications, films, illustrations and non-print material. The inclusion of "analytical" entries for individual papers published in symposia and conference proceedings and in periodicals extends the function of the catalogue.

The traditional card catalogue is well-known, but with the increasing use of computerized methods the catalogue may be produced from the computer in book form or on microfiche, or it may be accessible only through the computer.

Catalogue entries are produced from the bibliographical and contents descriptions of the documents. In manual card systems a main entry or master record is made and several copies may be produced, with the cards being filed alphabetically by authors and possibly by subject and geographic headings, keywords, and titles, with a separate sequence arranged by classification number to aid retrieval by subject. A further file in accession number order may also be maintained. Additional entries can be produced for any element of the bibliographic record that it is considered the user might search under, and filed accordingly. However, catalogue production and maintenance is extremely time-consuming so local needs and available alternatives must be carefully considered before commencing an elaborate subject cataloguing system.

Computerized cataloguing allows the master records to be reproduced, sorted and arranged in a variety of sequences, and in effect creates a database which can be rapidly interrogated for names, words, indexing terms etc. which make up the master records.

The possibilities of co-operative cataloguing and the use of records prepared by other libraries or agencies should be considered.

CLASSIFICATION

Classification schemes break down subjects into groups and hierarchies. They are used in catalogues and indexes to indicate the subject content of documents and are used for physically arranging and storing books and papers. They bring documents on the same subjects together, co-locating them with documents on related subjects and allowing users to "browse" collections which are open access.

Classification schemes can be general or specialized. General, universal or encyclopedic classifications cover the whole field of human knowledge; special schemes are designed for particular subject areas. Both types are subject to protracted theorizing and philosophizing by educationalists and librarians who may be tempted to regard them as an end in themselves rather than a practical means of arranging books.

General classification schemes are used in national, university and public libraries and in government department libraries with multidisciplinary coverage. The best-known schemes are the Dewey Classification and its derivative the Universal Decimal Classification which divide knowledge into ten classes, each subdivided into ten more classes, each again subdivided. The Library of Congress Classification divides human knowledge into twenty one subject groups and is widely used on the American continent. The Colon Classification is based on the facet principle and though not widely used has influenced thesaurus construction and the design of special classifications.

In the interests of uniformity, general classifications which are used in parent organizations or administrative groups, and which may be recommended by national information policy, are often used without option by smaller specialized information centres and libraries. Using a common classification scheme facilitates co-operation and the exchange of catalogue entries and bibliographic records. In practice, variations and enhancements to general schemes are often introduced at local level, invalidating some of the advantages.

There are disadvantages in using general schemes to classify marine and other special collections in that the arrangement of a classification scheme designed for the whole field of human knowledge does not bring together the interdisciplinary marine elements in any obvious order. Unduly long and cumbersome notations will be allocated to subject areas which might be of major importance in a marine collection, but which in a general library are minor and subsidiary. Subject areas which are closely interrelated in a marine collection are often widely separated in a general scheme. For example in a general classification the books on fish will be relegated to a subsection of zoology; those on ocean waves and currents may be included in the geology sections, while marine pollution could be a subdivision of a section on public health.

Many marine collections are arranged by "home made" systems and are satisfactory in that they link the catalogue entries to the publications held in the collection and arrange books on shelves in reasonably logical groups. Their disadvantages are that they are unique to each library or information centre and may lack the flexibility logically to accept new subject areas.

Some centres use the ASFIS subject categories as a classification scheme and a means of arranging books and documents. This method can be recommended to marine information centre managers seeking a special classification.

UNIVERSAL DECIMAL CLASSIFICATION

Examples from Classes 5 and 6

5 MATHEMATICS AND NATURAL SCIENCES
51 Mathematics
...
55 Geology and collateral sciences. Meteorology
551 General geology. Meteorology. Climatology. Stratigraphy
551.4 Geomorphology
551.46 Oceanography. Submarine topography
(1/9) Regional oceanography
.018 Instruments and methods
.462 Submarine relief. Ocean-floor topography
.463 Seawater: physical properties,colour, transparency, temperature
.464 Chemical properties: composition, salinity
.465 Statics. Dynamics. Ocean currents
.468 Special oceanographic forms. Inland seas
.3 Lagoons. Coastal pools. Waddens
.....
6 APPLIED SCIENCES. MEDICINE. TECHNOLOGY
61 Medical sciences. Health and safety
...
63 Agriculture. Forestry. Stockbreeding. Animal Produce. Hunting. Fishing
639 Game and fish management
639.2 Fisheries
.22 Sea fisheries
.222 Herring, sprat, sardine, anchovy, etc
.223 Haddock, cod, hake
.227 Mackerel
.228 Flat fish. Plaice, sole, turbot, etc. .....

AQUATIC SCIENCES AND FISHERIES INFORMATION SYSTEM

1/581 Aquaculture: general	*ASFA1*
582 Fish culture	*Subject*
583 Shellfish culture	*Categories*
584 Culture of other aquatic animals	
example	
585 Plant culture	
586 Aquaria	

2/181 Chemistry and geochemistry: general	*ASFA2*
182 Methods and instruments	*Subject*
183 Physics and chemistry	*Categories*
184 Composition of water	*- example*
185 Organic compounds	
186 Chemistry of suspended matter	
187 Geochemistry of sediments	
188 Atmospheric chemistry	

ARRANGEMENT

Classification numbers (or combinations of letters and numbers) are entered on the spines of books, acting as "shelf marks" or "location marks" or "call numbers" to arrange publications on the shelves; those items on the same subject and bearing the same classification number being subdivided and arranged either by authors' surnames, or sequentially according to the order of acquisition so that the most recently-published material is together.

Journals may be arranged in subject order, according to the classification scheme in use, but small or medium-sized collections are frequently arranged alphabetically by journal title. Another possibility is by country of origin, but the few advantages of this arrangement are outweighed by the disadvantages. It must be remembered that a simple index can indicate which journals the collection contains on a particular subject, or from a particular country, without the journals being physically arranged in these categories. A further method is to allocate a number to each non-commercial publishing body (laboratory, university, etc.); journals and reports received are given the number of the publishing body followed by a letter of the alphabet (A, B, C... depending on the number of different titles received from the organization). Thus all publications from the same organization are found at the same location in the collection. Commercially-published journals are arranged in a separate sequence. The latest issues of journals are normally displayed in a reading area to encourage users to browse and keep up-to-date. If funds are available it is customary to bind volumes of journals in uniform style. This both preserves the documents and makes them easier to handle. Only material which is of lasting value and which is to be retained indefinitely should be bound, and the binding process should be at a time of least inconvenience to the users. This is usually after the first two years of the life of the document, which is the expected period of heaviest demand.

Pamphlets and reprints may be arranged in classified order; in pamphlet boxes in broad subject groups; alphabetically by authors' surnames, or sequentially in accession number order as received. Indexing systems of varying complexity will be required, depending upon the method of arrangement and importance attached to retrievability by subject.

Annual reports (and technical reports if desired) may be arranged by country of origin, subdivided by issuing institution, or kept with journals published by the institution, as outlined above.

LOANS

Some material in the collection will be for consultation in the centre only (the latest issues of journals; rare and valuable books; directories and other "reference" works). The majority of the stock however should be available for loan. Loan systems vary; in some the reader completes a loan card or carbon-duplicate form, filling in the details of the publication; others employ computerized systems. The purpose is the same, to know who has what, and the file must be searchable both by document and by borrower. Local rules must be devised regarding period of loan, number of items which may be borrowed, and whether documents must remain in the institute, so as to be readily accessible if required by other readers, or whether they can be removed for home reading. If publications are loaned for a set period, a procedure for recalling overdue material must be operated.

INTERLIBRARY LOANS AND DOCUMENT DELIVERY

Publications not in stock may be borrowed from other libraries, or photocopies may be obtained from libraries or agencies. Agreements are necessary between libraries, usually on a reciprocating basis, and standard procedures are often instigated at national level. Interlibrary loan systems rely on the ability to locate publications held in particular libraries and are assisted by the availability of union catalogues of the holdings of groups of libraries, and by periodical and serials holdings lists issued by libraries, or by "clearing house" procedures usually set up on a national basis. Electronic mail and facsimile transmission systems are being used increasingly to satisfy urgent requests for copies of documents, though the majority, for budgetary reasons, must depend on postal services.

In countries which lack national interlibrary loan structures, groups of libraries and information centres linked by common subject interests join together formally or informally to facilitate interlibrary loans. When making loan requests it is essential to quote the precise bibliographical details of, for example, the book required, or the exact journal title. Useful checklists for the verification of journal titles are the ASFIS *World List of Aquatic Sciences and Fisheries Serial Titles* and the British Library's *Current Serials Received.*

Document delivery remains a major problem in many countries. Access to documents requires that the documents have been acquired and are available for loan. Proposals are frequently made to alleviate the problem, but often the proposals are concerned only with document supply, rather than with document provision. Relatively modest investments in core collections of books and journals, together with reliable photocopying equipment and the easing and streamlining of existing bureaucratic cost-recovery procedures would bring substantial benefits.

CURRENT AWARENESS

Current awareness or selective dissemination of information services aim to alert users on a regular basis to newly-published literature in their subject fields. Services are based on:

(a) The current accessions of the centre, and/or

(b) Secondary sources, such as abstract and indexing journals or databases, which cover the relevant world literature.

Possibilities include:

- preparation and circulation of weekly or monthly "accessions" lists of new books, reports etc. added to stock;
- circulation of photocopies of contents pages of recently-received journals;
- notification to individuals or to project groups of all new publications received on their range of interests;
- utilization of external abstracting and indexing services to provide sets of references extracted by scanning printed products, or by undertaking regular computer searches of bibliographic databases;
- announcements of seminars, conferences and local scientific meetings;
- provision of "management" information to senior staff.

Some centres and libraries circulate periodicals around groups of readers who have expressed interest in seeing all new issues of particular titles. Although widely used in the past, in practice this procedure is cumbersome and difficult to operate, since periodicals go astray or are retained by individuals for far too long. It is preferable to persuade readers to get into the habit of visiting the centre regularly to consult the latest issues of periodicals. In this way they will also be exposed to other new publications of possible relevance, which otherwise they might have missed.

INDEXING

Indexes provide answers to subject enquiries, and are also used in the compilation of bibliographies, information bulletins and similar products.

The level of in-house indexing activity depends on the mission and resources of the information centre and on the needs of the users. The catalogue and classification scheme provide broad indexes to the collection, but access to the contents of documents through detailed indexes is a central requirement. Some centres attempt to index in depth all publications received within a widely-defined subject scope; others rely on external services - abstract journals, on-line bibliographic databases and products of other information units; the majority use a combination of internally-produced indexes and external services.

Great care and restraint are required when considering and determining and scope and amount of indexing to be undertaken locally. The perfection and comprehensiveness of the index itself can become the chief aim of the information centre, consuming undue amounts of staff effort and resources, to the detriment of services to users. Locally-produced indexes should cater for real local needs, supplementing, but not duplicating what is available from other sources such as international databases. However it must be stated that there is usually a delay of months and in some cases over a year between the publication of a paper and its appearance in an international database. Therefore a system of alerting scientists to newly-published material of relevance to their interests is desirable.

Examples of indexes maintained in marine information centres include:

- papers and reports produced by institute staff and visiting workers;
- papers about the marine environment of the institute's country or of a specific geographic area;
- papers on a subject of current research in the institute;
- a particular collection of photographs, slides or illustrations.

Subject knowledge on the part of the indexer is required, and usually a controlled vocabulary, thesaurus, authority list or defined list of keywords is employed to ensure consistency. Manual card systems may be employed in index compilation and maintenance, but use of a computer and bibliographic software is recommended.

INFORMATION RETRIEVAL

A primary role of an information centre is to answer questions and to undertake literature searches to provide documents or information on specific subjects. Although some centres will evaluate information and data, giving opinions and advice in response to particular requests, most limit their role to the actual retrieval and provision of the most pertinent documents, leaving the user to extract and evaluate the facts. Enquiries are received from institute staff, and from external users by post, telephone or personal visit. The enquirer may be provided with the actual documents, photocopies of the most relevant papers, or a list of references (exhaustive or selective according to need), possibly with abstracts, detailing publications which are available in the world literature with an indication of those which are held locally.

The information specialist must be familiar with the subject, with the local stock and indexes, and with external sources of information, and will utilize the following:

- the centre's own collection of documents, reference books, directories and indexes;
- abstract journals and bibliographies;
- the CD-ROM (compact disc database) system, if available;
- guidance and advice, as appropriate, from members of the institute's own research staff, who may be experts on the subject of the enquiry;
- online access to bibliographic, numeric and full-text databases, and to catalogues or online public access catalogues (OPACs) of other libraries;
- personal contacts with staff in other information units and libraries, oceanographic data centres and meteorological agencies;
- referral of the enquirer to an external library source, expert or institution.

Information services, either on a regular current awareness basis or on demand (also known as "question and answer" services) may be provided to external users on a repayment basis or as part of a national or international commitment or reciprocal agreement.

TRANSLATION

A proportion of the potentially useful scientific literature is in languages unfamiliar to the users.

"Cover-to-cover" translations into English of certain key journals, particularly from China, Japan and the USSR, are produced by commercial publishers, government departments or other agencies. Examples are *Oceanology (Okeanologiya)*; *Soviet Journal of Marine Biology (Biologiya Morya, Vladivostok)*; *Chinese Journal of Oceanology and Limnology*. Translations of books and monographs are similarly produced.

Some countries have programmes to translate scientific publications into the national language, and there is certainly a need for extension and instructional material, including student textbooks, to be available in local languages.

Information centres may employ translators, or have staff with language skills, to produce abstracts in the local language. However to arrange the systematic translation of complete books, journals or scientific papers, or to offer an on-demand translation service is a highly expensive undertaking. Nevertheless, all centres, on occasion, need to produce or commission a translation, even if merely a partial translation of the complete document, and perhaps limited to an abstract plus the captions and headings on graphs and tables.

Access to language expertise is essential and the centre needs to be able to translate titles of books and papers as necessary. Co-operation in any regional or international network normally requires working in an agreed "carrier" language. International systems almost invariably work in English, and participation in ASFIS demands the translation of titles and abstracts into English, and the use of English indexing terms.

INFORMATION PRODUCTS AND PUBLICATIONS

Products and publications prepared by the marine information centre for local use or for wider distribution may include:

- current awareness publications (accessions lists, bulletins of recent papers on specific topics);
- bibliographies (papers about the marine environment of the country or region, or by the country's marine scientists, or on specific subjects);
- directories (of institutions and marine researchers in the country or region; projects and research in progress; experts; equipment and research vessels; data inventories and sources);
- species catalogues;
- compilations of laws, regulations and treaties.

Some of the services and publications may be extended to certain groups of users (external, industry, overseas, for example) on a payment basis. This will involve the centre in sales and accounting activities which are both time-consuming and require special skills and procedures. Income will partially offset costs, but managers should not expect to make profits, nor should they distort services or staff resources in an attempt to generate additional income.

The centre may also be actively involved in editing and publishing primary documents such as periodicals, proceedings and reports, and also with their distribution and sale. This activity can usefully be co-ordinated with the operation of the centre's publication exchange programme.

INFORMATION AND DATA ANALYSIS

Information analysis involves reviewing, consolidating and evaluating current knowledge on specific topics. Products are prepared on-demand for a single customer or enquirer, or for wider distribution. Often referred to as "tertiary documents" or "added value services" the analyses and reviews may be produced by information centres or specialized information analysis units and issued as progress reports, reviews and state-of-the-art evaluations. Those published by the International Center for Living Aquatic Resources Management (ICLARM) and the Brackishwater Aquaculture Information System of the Southeast Asian Fisheries Development Center (BRAIS/SEAFDEC) are good examples. Some are sponsored by commercial publishers and issued as serial publications, for example:

Advances in Marine Biology
Oceanography and Marine Biology Annual Review

The centre may also initiate or be requested to undertake or advise on citation analysis, scientometric or bibliometric studies. These are aimed at assessing the work or impact of a particular institute, group of scientists, individual researcher, area of research, or scientific periodical. The studies are based on analyzing the number of publications, and the number of times publications are cited in the reference lists in other scientific publications, and are used increasingly in the evaluation of scientific research and the determination of policy and funding. Basic studies can be carried out manually, but the main tool is SCISEARCH, the ISI *Science Citation Index* computer database. However its treatment of the literature from the third world, and in non-English language periodicals is not as comprehensive as could be desired, and results need to be interpreted with this in mind.

Data sets contain potentially valuable information which may remain under-exploited unless condensed, reviewed and presented in a standardized manner. Oceanographic, biological, environmental, fisheries or aquaculture data can be analyzed as a service for research, management, conservation, or for commercial exploitation. Information and data analysis requires a thorough knowledge of the subject as well as experience in collecting, condensing and presenting the information.

One of the most important functions of the Intergovernmental Oceanographic Commission is to facilitate the exchange of oceanographic data, and to standardize methods and formats. A worldwide network of oceanographic data centres collaborate to respond to user requests, and many of the centres are seeking ways to make data sets and data products more accessible. It is in this area that the marine information centre and the data centre can most usefully co-operate, for example, by issuing integrated information products combining analyzed data and reviewed information on a particular topic or geographic area.

REFERRAL

Referral services do not provide documents or information in response to requests, but refer users to sources of information. These sources can include:

- secondary publications such as abstract journals;
- directories;
- bibliographic databases or numeric databanks;
- data inventories such as the IOC's *Marine Environmental Data Information Referral System Catalogue* (MEDI);
- institutions, professional bodies, or individuals.

Referral is a valid function of the marine information centre when an enquiry cannot be answered adequately from local resources. Referral centres and services often use the analogy of telephone directory "yellow pages" when describing their functions. Their expertise is in creating and maintaining up-to-date files and directories of sources.

DISASTER CONTINGENCY PLANNING

All institutions should have contingency disaster response plans to be implemented in case of damage by fire, flood, hurricane, earthquake or other disaster. Library and information staff should have clear instructions regarding preventive action and salvage operations, particularly in connection with the recovery and treatment of library materials, especially water damaged books and documents.

4. AUTOMATION

Information centres use computers in-house and on-line for information retrieval, and automated systems are employed in many centres both for cataloguing and indexing and for a range of functions related to the management and administration of the collection and the services.

Microcomputers, minicomputers and mainframe systems are used according to local circumstances and availability. Applications include:

- acquisitions (records of publications ordered and received);
- loans (records of the borrowers and the publications they have on loan);
- serials (check-in of periodicals; serials holdings lists; subscriptions records; exchange records);
- cataloguing (preparation of catalogue records; production of cards, book or microfiche catalogue, or on-line catalogue; maintenance of authority lists and thesauri);
- indexing and database creation (in-depth indexes to specific subject areas, and preparation of machine-readable input for co-operative systems such as ASFIS);
- storage and retrieval of full-text material;
- publishing (preparation of camera-ready or laser printer copy for current awareness bulletins, bibliographies and promotional material);
- directory databases (e.g. listing marine scientists and institutions; and for address lists and mailing label production);
- word processing;
- accounts and spreadsheets;
- electronic mail;
- access to bibliographic databases on remote hosts via telecommunication systems (allowing formulation of search strategies before going on-line, rapid downloading of sets of references, and off-line browsing and editing of the references selected as useful);
- access to compact disc (CD-ROM) system;
- numerical data (oceanographic, environmental, fisheries, etc..related to the mission of the institute or scope of the centre);
- management information related to scientific projects; staff and their publications; cruises; equipment inventories, etc.

DATABASES

Bibliographic databases are computer-searchable catalogues and indexes to the published literature. They usually cover specific subject areas and are created and distributed by external producers, or built in-house for local use. Databases also give access to numeric, chemical and observational data, and to statistics; some are factual, combining data with information, while others hold full-text, for example of legislation or of specifications. Storage and retrieval of full text of scientific documents, manuals, encyclopedias and reference material is an area of accelerated growth in the near future.

On-line systems

Hundreds of bibliographic databases which are the equivalent of printed abstract journals are produced and made available by commercial or non-profit organizations, and by international co-operative effort. The databases vary in size from several thousand to millions of indexed bibliographic references, with abstracts, and are searchable on-line to host computers far more flexibly, intensively and rapidly than by manually searching their printed counterparts.

The most important on-line bibliographic database relevant to the work of the marine information centre is:

Aquatic Sciences and Fisheries Abstracts (ASFA)

Others include:

AGRIS International
BIOSIS Previews (Biological Abstracts)
CA Search (Chemical Abstracts)
Food Science and Technology Abstracts
Life Sciences
Medline
Meteorological and Geo-astrophysical Abstracts
Oceanic Abstracts
SCISEARCH (Science Citation Index)
Zoological Record

The coverage of most databases does not extend back more than fifteen to twenty years, so traditional methods of searching are still required for the wealth of literature published before 1970. It must be remembered that there is a time-lag between the publication of a scientific paper and its appearance in a database. Producers of databases constantly endeavour to streamline abstract processing and production, but the delay is usually six months, and can be much more.

In searching, access points include authors' names, words, phrases and dates appearing in the references and abstracts, which also contain authors' addresses and indexing terms allocated from taxonomic, geographic and subject thesauri and authority lists. Although the database tapes may be run on-site, the normal way is to access them on-line to remote host computers using telecommunication channels. Searches are interactive and are best conducted via a microcomputer so that search results may be rapidly downloaded to disc for off-line perusing, editing and printing.

SEARCH PROCEDURES

Bibliographic databases create huge indexes or "inverted files" of all the words in the references and abstracts, allowing the searcher to use "Boolean operators" - technical language meaning that "AND", "OR", and "NOT" are used to combine or indicate relationships between the selected keywords, concepts, dates, or sets of references. Word truncation or root searching is also normally allowed, so that for example:

"Estua?" would retrieve all the records containing:

estuaire
estuaires
estuarial
estuaries
estuarine
estuario
estuarios
estuary

Modern systems also permit proximity searching, where two terms must appear in the same field or no more than a specified number of words apart.

Contracts and passwords must be arranged with database hosts and telecommunications systems, who will provide instructions for access and search procedures.

COMPACT DISC SYSTEMS

An attractive alternative which has been developed recently is the CD-ROM (Compact Disc Read-Only Memory) system. CD-ROM information systems use optical laser technology which was originally developed for high quality audio reproduction of music. A single five-inch disc can contain 500 to 600 megabytes of data - the

equivalent of 200,000 pages of printed text, or 250,000 bibliographic references complete with abstracts, indexes and search software. This is a revolutionary step in information technology, making available large amounts of information and data through a keyboard, locally on the desktop, and giving instant access with no telecommunications problems or costs. Many bibliographic databases which were previously accessible only from expensive online hosts, together with directories, encyclopedias and similar publications, are now available in this medium. Compact disc technology has spread rapidly, and the medium has been welcomed and utilized enthusiastically by libraries and information centres.

The falling costs of producing "master" discs from which copies may be reproduced cheaply is encouraging libraries (or more usually co-operating groups of libraries) to make their catalogues, local databases and union serials lists available on compact disc.

Aquatic Sciences and Fisheries Abstracts (ASFA) is available with some 220,000 references which have been added to the system since 1982. The equipment required is a microcomputer, a compact disc reader and a printer. The discs are updated quarterly at the rate of some 35,000 references with abstracts per annum, and the database can be searched in a similar way and with a response time almost as rapid as an on-line system.

IN-HOUSE SYSTEMS

The availability of computers, and in particular the increasing power of microcomputers with suitable software, makes it possible for libraries and information centres to create their own databases for local use. In place of references being typed on to catalogue and index cards they can now be keyed into a computer system for storage, manipulation and retrieval. Interrelated information about books, scientific papers and specific documents, arranged in structured form, is contained in "records" in the database. Each record contains several items of information - author, title, publisher, date of publication, etc. These items of information are stored in "fields", groups of which comprise the record. A set of records constitute a "file" and one or more files constitute the database.

A wide choice of software is available, varying from general database management, through specialized bibliographic, to integrated library software. The CDS/ISIS software described below has most of the features expected in a modern bibliographic storage and retrieval system, and is under continual improvement and development.

CDS/ISIS BIBLIOGRAPHIC SOFTWARE

CDS/ISIS (Computerized Documentation Service/Integrated Set of Information Systems) is a menu-driven general database management system designed specifically, but not exclusively, for handling textual databases. It is a descendant of ISIS which was developed in the 1960s by the International Labour Organization for a mainframe computer, and MINISIS which was developed in the 1970s by the International Development Research Centre in Ottawa for minicomputer use in projects in developing countries. In the 1980s Unesco developed a microcomputer version called Mini-micro CDS/ISIS. The latest release (1989) is version 2.3. The system is supported and updated by the Unesco Division of Library, Archives and Documentation Services and is recommended by United Nations and international agencies, including Unesco, IOC, FAO, IAEA, ILO and WHO. It is widely used in libraries and information centres, with thousands of registered users.

It formats records in the international exchange format ISO 2709, which is a base for the MARC family of formats used by libraries, and is compatible with the international Common Communications Format, which is the latest in a series of attempts to design a format that can be used to standardize machine-readable bibliographic records of all types.

CDS/ISIS is recommended for use in preparing machine-readable records for the ASFIS, AGRIS, and other international bibliographic databases, and its use for the creation and maintenance of in-house databases in marine libraries in many parts of the world is being actively promoted by ASFIS and Unesco/IOC marine information management groups.

CDS/ISIS allows the user to:

- define data bases containing the required data elements;
- enter new records into a given database;
- modify, correct or delete existing records;
- automatically build and maintain fast access inverted files;
- retrieve records by their contents, through a sophisticated search language;
- sort the records in any sequence desired;
- display or print the records, or portions thereof according to requirements;
- print partial or full catalogues and/or indexes from any given database, and create camera-ready copy for library publications;
- transfer records or portions thereof, to or from other databases.

Features include:

(a) A menu-driven system by which the user is always presented with the choice of available commands at any given step.

(b) User-definable data entry screens with full screen-editing capabilities and help facilities, making it very easy to perform on-line data entry and editing. Provides data exchange in ISO (International Organization for Standardization) 2709 format.

(c) Allows updating of existing records through the same screens as the ones that were used for data entry. The full screen capability makes it very easy to insert or delete any part of any field of the record. Will make incremental changes to the existing inverted files.

(d) Has several options for indexing and the user is free to select which fields should be indexed as well as which options should be used. A tagged indexing option is also provided whereby only the terms indicated are indexed. A list of stop words may be built in.

(e) Very fast retrieval. Supports the use of Boolean expressions ("and", "or", "not") hierarchical searching, truncated term and proximity searches. The user can specify the field from which each query word or phrase should be searched; if no field specification is given, all inverted fields will be searched.

(f) Has print formatting and report generators. Report parameters are kept in a text file which can easily be modified using the text editor. Provides the option of sorting the output records by any field alphabetically or numerically before printing or displaying the search results. Has the provision for storing complicated formats and commands that are used often, so that the user does not have to repeatedly key long commands. Will sort and generate indexes, and format for printing in two columns.

(g) Includes a Pascal integrated programming facility which allows the development of specialized applications, including the execution of a whole sequence of commands and procedures at one keystroke.

The maximum database size is 16 million records; maximum record size is 8000 characters; maximum number of fields per record is 200, all of which are indexable. The system is multilingual (in English, French and Spanish), and is also available in Arabic and Chinese, and can be customized by the user to other languages. It is suitable not only for bibliographic databases but for addresses, personnel, directory and inventory-type information. A useful feature which is not yet available would be the facility easily to convert records from non-ISIS databases or text files for batch loading. A mainframe version (latest release 4.6) is also available from Unesco.

Many other bibliographic and library software packages are available, and local circumstances may make their use appropriate, if they fulfill the requirements of the centre.

DATABASE STRUCTURES AND STANDARDS

In an information centre, the records which constitute the database or databases will be in a number of separate but compatible formats. These will include formats for input, storage, retrieval, display and printing.

Simple record structures could be devised, for example the bibliographic record could be divided into three fields only: author, title and source. However the limitations and drawbacks of oversimplified in-house structures will soon be realized, and the design of record structures compatible with international standards is strongly recommended.

If two or more organizations wish to exchange records with each other, it will be necessary for them to agree upon a common standard format for exchange purposes. Countries may adopt a single national exchange format, facilitating information interchange both technically and economically. Until recent years a variety of national standard exchange formats existed.

The bibliographic descriptions carried in the formats also may differ according to their source, with abstracting and indexing agencies operating differently from libraries. As a result various rules for bibliographic description have come into general use, leading to the creation of often incompatible bibliographic records held in equally incompatible formats.

In order to resolve the lack of uniformity, international standard exchange formats have been developed. The aim is:

(a) To permit the exchange of bibliographic records between groups of libraries, information centres, and abstracting and indexing services.

(b) To permit an information centre to use a single set of computer programs to manipulate bibliographic records received from external sources.

(c) To serve as the basis for the centre's own bibliographic database, by providing a list of mandatory elements augmented by additional optional data elements.

Local, national, regional and international systems are advised to be compatible with the Common Communication Format issued by Unesco's General Information Programme and UNISIST.

INTEGRATED SYSTEMS

Current trends in library and information management are towards integrated systems. These eliminate duplication of keyboarding effort and add flexibility yet consistency to routine operations. Systems are normally designed as a set of linked modules, and may include:

- cataloguing and bibliographic database creation. Data entry, searching and retrieval, production of current awareness services, bulletins and bibliographies;
- indexing. Primarily to hold a thesaurus of indexing terms;
- serials management. Periodicals subscription records; exchange lists; regular check-in of journals and claims for missing issues;
- readers and loan records. Including circulation, reservations, inter-library loans, and loan statistics.

Interfaces to compact disc systems; dial-up procedures for on-line access to remote databases; electronic mail; local area networks; financial spreadsheets and statistical packages may be linked to the overall system.

5. INTERNATIONAL INFORMATION SYSTEMS

International information systems organize the processing and provision of information, and the past thirty years have witnessed the growth and development of systems covering many scientific subjects and disciplines.

The systems are chiefly concerned with processing bibliographic references, often with abstracts. Some are financed and administered by a national agency; others are based on centralized or decentralized networks, using common methodologies. The truly international systems are administered by international agencies, with the participation of national and regional partners. Additional services offered may include referral, data, document delivery, and information analysis.

The objectives of international co-operation in information are:

- to provide improved responses to the needs of users;
- to make the best use of available knowledge, providing comprehensive, rapid, practical and economical access to world information in a particular field;
- to improve existing systems;
- to share work, avoid duplication of effort, and make the most efficient use of resources.

International systems are usually based on decentralization of input and provision of services, with the centralization of the work of database creation, system maintenance, and the delivery of output products.

There are various patterns, but the following is typical: each member country is responsible for acquiring current primary documents (books, journals, reports etc.) within a defined subject scope, and produced within a defined geographic area, or appearing in an agreed list of publications. Bibliographic entries are prepared for the literature in agreed formats. In many systems each country deals with the literature produced in its own country or region. An international centre collects and verifies the bibliographic records submitted by the participating centres, merging them into a single database and creating and distributing the products required (abstract journals, bulletins, directories, magnetic tapes, compact discs). The international centre, in collaboration with the participants, co-ordinates the activities, maintains and develops the system tools (input manuals, thesauri, authority lists) and is responsible for management, financial control, development, training and promotion.

Financial arrangements vary. Costs can be shared between participants, sometimes on a *pro rata* basis according to national resources, and often with major contributions from UN or international agencies, with support from aid agencies. Income from the sales of services, publications and system products offsets costs, though participating countries normally finance their own centres, staff, and local output services.

RATIONALE AND BENEFITS

Participation involves commitment and effort, but brings benefits.

(a) It is impossible for a country to be self-sufficient in information, and access is needed to documents and information resources of other countries.

(b) By sharing effort, duplication is avoided, and each participant benefits from work undertaken by others, having easier, cheaper and improved access to all the information in the system as a whole, in exchange for their own contributions.

(c) International systems enable managers to satisfy as completely as possible the information requirements of users by ensuring access to the fullest range of sources of information and to documents produced abroad.

(d) Co-operation assists national and local systems to be compatible with international standards, and enables countries to participate in the management of international systems and to influence their development to ensure that they remain responsive to the needs of local users.

(e) By collecting, recording and disseminating the marine scientific literature of its own country and region, the centre ensures that national and regional literature is more effectively utilized and brought to the attention of the world scientific community.

International systems include AGRIS, INIS and ASFIS. The latter is fundamental to the work of the marine information centre.

6. THE AQUATIC SCIENCES AND FISHERIES INFORMATION SYSTEM (ASFIS)

ASFIS is the international co-operative information system offering a set of products and services covering the science, technology and management of marine and freshwater environments. It is aimed at a whole range of users, including scientists, technologists, lecturers, students, administrators, legislators, and policy-makers, and anyone concerned with research and the exploitation of aquatic resources. It is an integrated system concerned with the collection and dissemination of information, and it includes a bibliographic database and abstract journal, directories, registers, and current-awareness publications.

ASFIS is operated by the Food and Agriculture Organization (FAO), the Intergovernmental Oceanographic Commission of Unesco (IOC), the Office for Ocean Affairs and the Law of the Sea of the United Nations Secretariat (UN/OALOS), and the United Nations Environment Programme (UNEP), with the participation of national and regional centres in most parts of the world. The system and its network are still developing and expanding. The main products are *Aquatic Sciences and Fisheries Abstracts* (ASFA), the *International Directory of Marine Scientists, Marine Science Contents Tables* and *Freshwater and Aquaculture Contents Tables*.

From 1950 the FAO Fisheries Division in Rome published *World Fisheries Abstracts*, and from 1958 published the *Current Bibliography for Aquatic Sciences and Fisheries*. The latter was widely distributed and was a praiseworthy attempt to cover and index the world literature. In the 1960s increasing concern was being expressed about the proliferation of information in our areas of interest, and an international advisory group of the Scientific Committee on Oceanic Research (SCOR) resolved that it would be desirable, and probably feasible for international agencies to co-operate with major marine scientific institutes to share resources, avoid duplication of effort and join together in a "marine sciences communication network, which involves data exchange and retrieval, literature retrieval and the exchange of information concerning activities of individuals and institutions". The concept was that the users and the producers of the marine scientific literature would co-operate to produce their own abstracting system, designed to meet their special requirements.

By the early 1970s FAO had been able to phase out the *Current Bibliography for Aquatic Sciences and Fisheries*, and with the co-operation of a few marine and fisheries institutes in different countries, and with a commercial publisher, was producing *Aquatic Sciences and Fisheries Abstracts* (ASFA). By 1973 the monthly abstract journal was covering some 13,000 papers a year, and computerization, expansion and the integration of other information products were being planned. During the next ten years coverage more than doubled, the computerized bibliographic database was made accessible via international telecommunications systems to host computers in several countries, and there was a well-established and expanding network of national participating centres based in major marine and freshwater research institutes.

AQUATIC SCIENCES AND FISHERIES ABSTRACTS (ASFA)

ASFA is a computer-searchable bibliographic database with an equivalent printed monthly abstract journal. It covers the world literature on the science, technology and management of marine and freshwater environments. The database contains records of the literature processed since 1978, amounting to over 300,000 references and abstracts of scientific and technical papers in journals, books, conference proceedings, reports and

non-conventional literature. Upwards of 35,000 references are added annually, and the database or the printed journal can be searched for references and abstracts by specific authors, on particular subjects, species or geographical areas; computer searching giving more options, power, speed and flexibility than using the printed indexes.

ASFA aims for comprehensive coverage of the world literature on marine and freshwater environments, including ecology, conservation, pollution, biology, geology, chemistry, oceanography and limnology; marine and freshwater resources, including fisheries, aquaculture, minerals and energy; ocean engineering; ocean law, policy, economics and social sciences; ocean commerce and trade. It excludes shipbuilding (apart from oceanographic and fisheries research vessels), hydraulic engineering, water supply and related topics.

The records contain details of the author or authors; title, in the original language and in English translation; source, i.e. journal reference, or details of the book or conference proceedings etc.; publisher; author's address; indexing terms, and an abstract summarizing the content of the paper in about 150 words.

Approximately 65% of the records deal with biological aspects, fisheries, and the conservation and exploitation of living resources, and 35% deal with oceanographic aspects, geology and non-living resources. 65% to 70% of the database consists of references to journal articles; 20% from monographs, including chapters in books and conference proceedings; and the remainder is from the report literature. ASFA makes considerable efforts to cover the technical report and non-conventional literature, which is quite difficult to obtain, and consequently which is not well covered by commercially-produced databases and abstract journals. However ASFA still needs to improve its coverage, particularly of this type of material.

The database may be searched on-line using international telecommunication links to host computers in Canada, France, Germany, Italy and the United States; the tapes are available for running in other centres, and a recent development is the provision of the database on Compact Disc (CD-ROM), for local or desktop searching by microcomputer.

The printed journal appears monthly in three parts:

ASFA1 - Biological sciences and living resources
ASFA2 - Ocean technology, policy and non-living resources
ASFA3 - Marine and freshwater pollution and environmental quality

The monthly issues have author, subject, taxonomic and geographic indexes, and there are annual cumulative indexes.

The records are grouped in 44 main subject areas subdivided into 260 subject categories, allowing the user to browse through main sections or pinpoint papers of direct relevance. Subject indexing terms are allocated from a controlled vocabulary, the ASFIS Thesaurus; taxonomic indexing goes down to family, genus or species level, and geographic indexing is from an authority list which allows entries under major sea or land areas down to specific locations such as rivers or estuaries. Because there has to be a limit on the number of indexing terms which can appear in printed indexes, there are many more terms in the computer files than in the printed indexes.

Two "spin-off" publications are also produced from the main database:

ASFA Aquaculture Abstracts
ASFA Marine Biotechnology Abstracts

The database covers literature processed since 1978, but a project is nearing completion which will add a further 45,000 records which were published in 1975-1977.

ASFA is produced by FAO, IOC, UN/OALOS and UNEP with national input centres in Canada, China, France, Germany, India, Japan, Mexico, Norway, Portugal, Southeast Asia, UK, USA, and the USSR. Cambridge Scientific Abstracts, of Washington DC, publish ASFA and produce the database on behalf of FAO and the ASFA partners.

SAMPLE ASFA RECORD

(Searchable by any word or combination of words in the record)

TITLE: **Characteristic features of air-sea interaction in the Tropical Southeast Pacific during the El Nino event.**
ORIGINAL TITLE: **Kharakternye cherty vzaimodejstviya okeana i atmosfery tropicheskoj zony yugo-vostochnoj chasti Tikhogo okeana v gody El'-Nin'o**
AUTHOR: **Tsyganov-VF; Bendik-AB**
SOURCE: (FISHERY OCEANOGRAPHIC INVESTIGATIONS IN THE ATLANTIC AND SOUTHEAST PACIFIC OCEANS).
SB. NAUCH. TR. ATLANTNIRO. 1986. pp. 38-45
EDITOR: Yakovlev-VN
LANGUAGE: Russian *ABSTRACT LANGUAGE*: English; Russian
ABSTRACT: **Advection, which contributes to formation of positive sea surface temperature anomalies, is shown to provoke favorable conditions for the El Nino development. Intensification of the Peru-Chile Countercurrent results in the reduction of the upwelling area and its eastward spreading, which favors tropical water advection and formation of positive sea surface temperature anomalies. A co-development of the El Nino phenomenon and tropical water advection leads to the catastrophic El Nino event.**
PUBLICATION YEAR: 1986.
DESCRIPTORS: air-sea interaction; El Nino phenomena; ISE
CLASSIFICATION CODE: 2244 Marine Meteorology and Climatology: Air-sea coupling; 1567 Practical Aspects of Fisheries: Fishery oceanography and limnology
ENVIRONMENTAL REGIME: Marine

CURRENT AWARENESS PUBLICATIONS

In 1966 FAO, with the support of Unesco, commenced publication of *Marine Science Contents Tables* (MSCT). This is a monthly bulletin which reproduces the contents pages of core journals in the marine sciences, drawing the attention of users to new papers in their areas of interest. It is a simple but effective means of disseminating information, and about 4,000 copies are distributed worldwide. Since 1978 a similar publication *Freshwater and Aquaculture Contents Tables* (FACT) has also been produced and distributed. The latter covers about 50 journals, some of which are also included in MSCT, and it is distributed to about 2,000 addresses.

REGISTERS AND DIRECTORIES

Each year over 100 marine and freshwater related meetings, symposia and conferences are held of potential interest to the international and research community, and the ASFIS Meetings Register records and disseminates details. Information is gathered from many sources and details on forthcoming meetings are listed regularly in MSCT and FACT.

An ASFIS Register of Experts and Institutions is maintained, and a major product, in 1983, was the third edition of the *International Directory of Marine Scientists*. This lists organizations, country by country, together with their scientists, with brief details of their subject interests. Over 2500 institutions and 18000 scientists are listed in the directory, the first edition of which appeared in 1970, and the second in 1977.

Information is gathered by circulating questionnaires to institutions and organizations worldwide, and by ASFIS centres in particular countries ensuring that all potential sources are approached. It is a time-consuming process and inevitably there are omissions from the published directory, and because of the long process of collection, editing, preparation and publishing, some of the entries are out of date. Ideally, all countries or regions would maintain up-to-date registers of their own institutions and scientists, so that this information would be on hand locally, and so that when there was a need for a new international directory, the information could be quickly gathered and merged together. In fact an increasing number of countries are keeping such information.

There is also an ASFIS Register of International Marine Affairs Activities, which is a small database of international projects. Information on ongoing research (which has not yet been published) is always difficult to obtain, and in many areas of science attempts have been made to maintain details of current research projects. There was a proposal that details of ongoing research and projects of particular relevance to developing countries should be maintained as an ASFIS register, but the problems and cost of building up such a database, of verifying

the information in it, and of ensuring worldwide and accurate coverage have prevented such a project from going ahead. Consequently the database is restricted to international, multinational and bi-national projects. It was set up partially as an experiment or a pilot project, and its use is being monitored by FAO.

ASFIS REFERENCE SERIES

A set of publications known as the ASFIS Reference Series provide guidance for input centres and for users. Some are of wider relevance and are appropriate for general marine information centre use. They include:

ASFIS Subject Categories and Scope Descriptions
ASFIS Guidelines for Bibliographic Description
ASFIS Abstracting Guidelines
ASFIS Guidelines for Subject Categorization and Indexing
ASFIS Thesaurus
ASFIS Geographic Authority List
ASFIS Taxonomic Authority List

Of these, the *Subject Categories and Scope Descriptions* may be used as a basis for a special classification scheme, and the *Thesaurus, Geographic Authority List* and the *Taxonomic Authority List* may be used as controlled vocabularies for indexing and cataloguing.

WORLD LIST OF AQUATIC SCIENCES AND FISHERIES SERIAL TITLES

This is a register of some 4000 periodicals and other serial titles relevant to the aquatic sciences. Periodically it is published and distributed by FAO, and a new enlarged edition is due for preparation. It lists the full titles and their abbreviations as used in the ASFA database, the name and address of the publisher or issuing body, the language and frequency of publication, the previous title, and any other changes of potential interest to the librarian or user. It is extremely useful in that it brings together information of value to anyone concerned with the literature of the aquatic sciences, and it includes details of the report and other "semi-published" literature which is very difficult to track down in general sources.

PARTICIPATION IN ASFIS

ASFIS is an evolving system, and since the mid-1980s has begun the process of expansion to more developing countries and towards more decentralization. Many countries are now able to use and contribute to information services once they are established and operational, and there is a trend towards the provision of local and regional services, using ASFIS methodologies and having a symbiotic relationship with ASFIS. Fisheries and aquaculture information services in parts of Southeast Asia and the Pacific are examples. The ASFIS decentralized global network aims to promote the build-up of national and regional capabilities, and to encourage all member countries of the sponsor agencies to participate in ASFIS, while recognizing that local needs and local time-scales will vary.

The ASFIS structure is flexible enough to permit various types of participating centres, depending on national and regional structures, needs and preferences. Thus, one country will have one participating centre, another may have several participating centres with one of them being designated the focal point, while some regional groups of countries may wish to concentrate their ASFIS participation in a single centre.

RESPONSIBILITIES AND BENEFITS

In line with the principle of decentralization to meet national user interests, it is not possible to lay down an extensive and uniform set of requirements for every ASFIS centre. Conditions are expected to vary among participating countries and, in many cases, donor agencies that are not among the ASFIS sponsors may be influential in determining the course of development of a particular centre. It is also recognized that some centres may require a period of training and development of services of entirely local or national benefit before reaching the stage of contributing to any global co-operative efforts.

Nevertheless at some point ASFIS centres are expected to reach a level of participation such that they can assume responsibility for identifying and collecting copies of reports relevant to the scope of ASFIS, documenting them according to ASFIS procedures; for identifying and reporting information about marine and fisheries institutions, programmes, and experts; and for promoting the development of marine and fisheries information, and related services in the country or region.

Through participation in the determination of ASFIS policies, ASFIS centres will have the opportunity to determine the benefits distributed to them.

In general these will include one or more copies of the printed ASFA abstract journals, the computer readable database, copies of publications and products of the co-operative effort, including directories and bibliographies, and assistance with training. Intangible benefits will include direct access to other ASFIS centres' collections, indexes, staff expertise and advice, enabling the centre to obtain copies of publications from many countries, rapidly and at minimum cost. Recognition of the centre as a national or regional resource may bring additional funding and opportunities to co-operate in other regional and international programmes.

ASFIS THESAURUS
(Sample entries)

FISHING NETS

BT1	FISHING GEAR	
NT1	CAST NETS	
NT1	ENTANGLING NETS	
NT1	GILL NETS	*(BT = Broader term;*
NT1	LIFT-NETS	*NT = Narrower term;*
NT1	SEINE NETS	*RT = Related term)*
NT2	BEACH SEINES	
NT2	BOAT SEINES	
NT1	SURROUNDING NETS	
NT2	LAMPARA NETS	
NT1	TRAP NETS	
NT1	TRAWL NETS	
NT2	BOTTOM TRAWLS	
NT2	MIDWATER TRAWLS	
RT	AVOIDANCE REACTIONS	
RT	FISHING OPERATIONS	
RT	FISHING TECHNOLOGY	
RT	NEKTON COLLECTING DEVICES	
RT	NET FISHING	
RT	NETS	
RT	NETTING MATERIALS	
RT	PLANKTON COLLECTING DEVICES	
RT	YARNS	

.....

ASFIS GEOGRAPHIC AUTHORITY LIST
(Sample entries)

BAHAMA I.
use of a subentry is recommended, e.g.:
Andros
Eleuthera
Grand Bahama
Great Abaco
New Providence
Paradise I.
San Salvador
for coast use: ASW, Bahama I.

BAHAMAS
see: Bahama I.

BAHIA DE CAMPECHE
use: ASW, Campeche Bahia

BAHRAIN
for coast use: ISW, Bahrain

7. THE ASFIS CENTRE

The ASFIS centre will normally operate as part of a marine information centre, though special circumstances in particular countries could make it appropriate, for example, for the ASFIS centre to be based in a national science information centre, or attached to an oceanographic data centre.

DESIGNATION

Designation of an ASFIS centre must be with the formal approval and agreement of the relevant government departments and agencies (concerned with fisheries, oceanography and the marine environment), and with the ASFIS secretariats. If there are more than one ASFIS centre in a country they must agree which centre is to be designated the ASFIS focal point.

DUTIES

(a) Collecting documents for input to the abstract journal and database *Aquatic Sciences and Fisheries Abstracts* (ASFA) by monitoring all issues of a specified list of periodicals, by monitoring technical literature and reports issued by specified institutions in the country or region, and some books, symposia and conference proceedings, by arrangement with the ASFIS secretariats. When monitoring publications, all papers within the scope of ASFA (i.e. including freshwater) must be covered.

(b) Completion of input records, in standardized formats, either on sheets or in machine-readable form, to include:

- author(s) of the paper;
- principal author's address;
- title in original language and in English;
- source, (journal title/place of publication, publisher, date) and bibliographical details;
- indexing terms (subject, taxonomic, geographic) taken from ASFIS thesauri and authority lists;
- abstract in English, based on the author's abstract.

(c) To co-operate in the preparation of additional ASFIS products, e.g. directories of experts and institutions, and assist in the development of system tools, training aids and promotional material.

(d) To act as the national focal point, promoting and publicizing the system, providing services or arranging for the provision of services to users and assisting in training. Developing, if appropriate, a network of additional input centres so as to cover the national and regional literature more comprehensively. Maintaining close contact with oceanographic data centres and other aquatic sciences institutions and meteorological agencies in the country and region, and with any national science information agency so that ASFIS is included in national information programmes.

It is desirable that the centre should:

- have reasonable communications;
- be closely located (or co-located) with a good library;
- have close links with marine science research institutions and with the user community;
- have trained staff, able to index documents and produce abstracts;
- have computer facilities;
- have reproduction facilities - photocopy, microform;
- have an appropriate budget, and the likelihood of continuity and stability.

The work requires staff with skills in abstracting, indexing and documentation, with appropriate support, and the involvement of staff at a senior level, for negotiation, publicizing, co-ordinating, developing activities locally, and with expertise for training.

8. NETWORK DEVELOPMENT, CO-OPERATION AND COLLABORATION

No information centre or library can be self-sufficient, and information workers share a long tradition of co-operation and interaction.

Formal and informal networks collaborate over resource-sharing, inter-library lending, subject specialization, co-operative cataloguing, referral and information exchange, and database creation. They include members with shared interests, activities and objectives, and are generally based on:

- bureaucratic or administrative groups, for example encompassing all the information units and libraries within a government ministry or division;
- geographic areas;
- subject areas.

Most libraries belong to local networks, within the same town or conurbation, allowing each others' users limited access to their collections and services. However the most productive networks are discipline- or mission-oriented, linking information centres and libraries sharing the same subject interests. Over the past 15 years initiatives have taken place in several regions, aimed at improving bibliographic support for marine and aquatic scientists through the strengthening of local capabilities and the establishment of systems for information and documentation exchange.

The IOC has long recognized that information is a valuable resource and that co-operation is vital. Through its Working Committee on International Oceanographic Data and Information Exchange (IODE) and the Group of Experts on Marine Information Management, the IOC devotes efforts to promote and improve information management and exchange.

The IOC Assembly and regional bodies such as IOCARIBE have regularly stressed that for marine science programmes to be effective, scientists must have access to adequate information facilities through national and regional marine information networks.

With encouragement and support from ASFIS, the IOC, FAO, UNEP and international aid agencies, considerable progress has been made in co-operation, network building and the provision of services. Examples are SEAFIS (Southeast Asian Fisheries Information System); RECOSCIX-WIO (Regional Co-operation for Scientific Information Exchange - Western Indian Ocean); INFIS (Indonesian Fisheries Information System).

At the same time marine information professionals have organized themselves into associations and groups, of which IAMSLIC (International Association of Aquatic and Marine Science Libraries and Information Centers), the Nordic Marine Librarians, and EURASLIC (European Aquatic Sciences Libraries and Information Centres) are examples.

The IOC and the ASFIS secretariats are actively seeking ways to promote national and regional groups and to link them into a worldwide network. The advantages are self-evident and have been discussed earlier, but initiatives must emerge locally and nationally and must be firmly based on the real needs of local users. The model is not a new one, but conforms generally to the pattern of other co-operative information systems covering other disciplines. AGRIS (FAO International Information System for the Agricultural Sciences and Technology) is an example.

The steps necessary to develop networks include:

- identifying the potential users and their needs;
- defining the geographic area and subjects to be covered;
- identifying institutions and agencies in the country or region with groups of potential users, and those with information and library facilities;
- defining the objectives, functions, products and services of network members;
- securing the approval of relevant national and regional bodies, at least for a pilot study.

Local consensus is vital, and a recommended procedure is to convene a meeting or seminar for information managers, marine librarians and representative users from the country or region, together with a few experts from other regions and from international agencies. A well-conducted meeting will act as a catalyst for further action, and once enthusiasm has been generated and human links created it is important to maintain momentum. This can be achieved by encouraging each centre to undertake some work of mutual benefit, for example:

- contributing towards the compilation of a union list of periodical holdings of group members;
- preparing material for a national or regional directory of information and library resources;
- contributing references for a regional bibliography;
- preparing input for a national or regional directory of marine institutions and scientists;
- developing practical inter-library loan procedures.

Network structures vary, from being completely centralized and working through a single co-ordinating centre and focal point, to the completely decentralized, with individual centres interacting with each other directly. In practice a compromise between the two extremes may be found most effective and acceptable to the participating centres.

The range of services offered will vary according to the resources, capabilities and needs of network members. In addition to basics such as document delivery and interlibrary loans, information exchange through the distribution of accessions lists and bulletins, and the referral of enquiries, moves towards more formal co-operation involving the collaborative provision of services and information products will be expected.

Systematic arrangements must be made to build up local collections, and to ensure that all publications about the marine environment of the country and region, and all those produced by local scientists, are acquired, recorded and made available. Special efforts are needed to obtain the unpublished and "grey" literature. The availability of microcomputers and suitable bibliographic software such as CDS/ISIS makes it possible to capture and record the information in a database which can be compiled by co-operative effort and made available in participating centres. By ensuring that the bibliographic records conform in structure to international standards, appropriate records or sections of the database can be transferred regularly to ASFIS for inclusion in the international database ASFA. Similarly, services can be provided from the world literature abstracted in ASFA, with selected records being downloaded if required, and transferred to local databases.

Other areas of co-operation will involve the compilation and maintenance of directories and subject bibliographies, and the range of products and services outlined earlier in the sections devoted to the marine information centre and the ASFIS centre.

Network interaction with regional and international marine programmes and with ASFIS, and a group approach to the promotion of services and to training, will bring benefits which individual centres would find difficult to achieve.

9. PROMOTION

All information centres must continually assess their services to ensure that they continue to be relevant to the needs of their users and potential users. They also need to remind their users of the services and products available, and to instruct them in the use of the centre. Methods include:

- leaflets describing services, products, publications;
- guides on how to use the collection, on its procedures, and how to search the centre's database or ASFA Compact Disc;
- displays of recently-acquired books;
- advertisements, and direct mail to external potential users;
- an information section in parent institute publications such as newsletters, brochures and annual reports;
- articles in the professional literature;
- information services stands, displays or posters at exhibitions and scientific conferences;
- seminars for users, and group visits.

Information centre publications and products are themselves promotional material, and must be of good quality both in content and appearance. Similar comments apply to the information centre staff, who must always remember that satisfied users are the most effective advertisements.

Although existing demand is only a partial guide to potential demand, feedback from users should be collected both systematically and informally, and acted upon to ensure the continuing relevance and responsiveness of the work of the centre.

10. TRAINING

The main groups requiring training are the end-users and the intermediaries or information professionals.

Users

The promotional material listed above, aimed at creating user-awareness, together with group visits, demonstrations and seminars are the most appropriate methods of training. The inclusion of an information module in university oceanographic and fisheries courses would be worthwhile.

Information Professionals

Degree-level training is available for librarians, information scientists and documentalists through university courses and colleges of librarianship and information studies.

Specialized training in handling and organizing marine information is not available through any regular educational programmes, though several organizations such as the International Center for Living Aquatic Resources Management (ICLARM) offer training courses. Seminars, workshops and international or regional training courses, both general and on specialized techniques, are organized occasionally under the auspices of the IOC, ASFIS or regional bodies.

Work experience and practical training on a personal attachment basis is offered by some of the major centres, mainly in Europe and North America. All marine information centres should provide in-service training for their support staff.

The ASFIS secretariats are developing a training strategy, which will include a general overview of training needs, methods and aids, together with guidelines and outline course material.

11. SELECT LIST OF REFERENCES

Barnett, J.B. *Marine science journals and serials: an analytical guide.* 189pp. Greenwood Press, 1988.

Carpine-Lancre, J.; Thiéry, C. *Ouvrages de référence pour les sciences de la mer; version provisoire.* ii, 28pp. Monaco: Musée océanographique, 1984. (Unpublished document)

Di Lauro, A. *IDIN manual for the creation and management of a bibliographic data base using Micro-ISIS.* 189pp. Paris: Organization for Economic Co-operation and Development, 1988. (includes diskette).

Fuseler-McDowell, E. Documenting the literature of marine biology. *Current Contents*, 32, (19), 4-13, 1989. [Citation analysis]

Garfield, E. The literature of marine biology. [In Russian]. *Biologiya Morya*, Vladivostok, 3, 3-20, 1980. (English translation published in *Soviet Journal of Marine Biology*, 7, 137-153, 1982). [Citation analysis]

Guinchat, C.; Menou, M. *General introduction to the techniques of information and documentation work.* xv, 340pp. Paris: Unesco, 1983.

International Association of Aquatic and Marine Science Libraries and Information Centers. *Iamslic Newsletter.* (published four times a year).

International Labour Office. *Bibliographic field descriptions: manual for Micro-ISIS users.* 73pp. Geneva: ILO, Central Library and Documentation Branch, 1988. (ILO-BIBL 4 ENGL (1988 rev.2))

International Organization for Standardization. *Documentation and information.* 3rd ed. xi, 1021pp. Geneva: ISO, 1988. (ISO Standards Handbook 1).

Lendvay, O. *Primer for agricultural libraries.* 2nd ed. 91pp. Wageningen: Centre for Agricultural Publishing and Documentation, 1980.

Simmons, P.; Hopkinson, A. *CCF: the Common Communication Format.* 2nd ed. iv, 196pp. Paris: Unesco General Information Programme and UNISIST, 1988. (PGI-88/WS/2)

Southeast Asian Fisheries Development Center. *Fisheries information science in Southeast Asia. Proceedings of a seminar held in Bangkok, Thailand, 16-20 August 1982.* Co-sponsored by International Development Research Centre and Southeast Asian Fisheries Development Center. 163pp. Bangkok: SEAFDEC, 1983.

Turnbull, D.A. *Keyguide to information sources in aquaculture.* xv, 137pp. Mansell Publishing, 1989.

Unesco. *Mini-micro CDS/ISIS reference manual (Version 2.3).* xiv, 286pp. Paris: Unesco Office of Information Programmes and Services, Division of Software Development and Applications, 1989.

Unesco. *Mini-micro CDS/ISIS: CDS/ISIS PASCAL (version 2.3).* viii, 54pp. Paris: Unesco Office of Information Programmes and Services, Division of Software Development and Applications, 1989.

Unesco. *UNISIST Guidelines on referral centres.* iv, 49pp. Paris: Unesco, 1979. (WS/PGI/79/4)

United Nations. *Scientific and technological information for development: proceedings of the Ad-hoc Panel of Experts on Information Systems for Science and Technology for Development, held in Rome, Italy 21-25 January 1985.* vi, 179pp. New York: United Nations, 1985.

United Nations Office for Ocean Affairs and the Law of the Sea; Food and Agriculture Organization of the United Nations; Intergovernmental Oceanographic Commission of Unesco. *A strategy for the development of the international Aquatic Sciences and Fisheries Information System (ASFIS).* 27pp. Rome: FAO, 1990.

Varley, A.; Freeman, R.R. A bibliography on information services, systems and centres for marine and freshwater resources and environment. *FAO Fisheries Circular,* No. 830, iv, 68pp., 1990.

Notes:

1. Some of the volumes above which are published by international organizations are also available in French, Spanish and in some other languages.

2. Introductory, intermediate and advanced texts on librarianship and information science are available in many countries in a variety of languages. Readers are advised to contact colleagues in other libraries, their national library association, and society of documentalists and information specialists for details of the most up-to-date and appropriate titles.

12. SELECT LIST OF ADDRESSES

The following list includes ASFA/ASFIS centres, institutions and agencies concerned with marine information exchange, and database hosts offering online access to bibliographic databases. The list is not exhaustive and the addresses included must be regarded as representative.

Department of Fisheries and Oceans
Communications Directorate, ASFA Centre
200 Kent Street
Ottawa, Ontario K1A OE6
CANADA

International Centre for Ocean Development
5670 Spring Garden Road
Halifax, Nova Scotia B3J 1H6
CANADA

International Development Research Centre (IDRC)
60 Queen Street
Ottawa, Ontario K1G 3H9
CANADA

Institute of Marine Scientific and Technological Information ASFA Centre
77 Qiwei Road
Hedong District
Tianjin 300171
CHINA

International Council for the Exploration of the Sea
Palaegade 2-4
DK-1261 Copenhagen K
DENMARK

Institut Français de Recherche pour l'Exploitation de la Mer (IFREMER)
Service de la Documentation et des Publications, ASFA Centre
Centre de Brest
29273 Plouzané
FRANCE

Intergovernmental Oceanographic Commission
ASFA Co-ordinating Centre
Unesco
7, place de Fontenoy
75700 Paris
FRANCE

Unesco Marine Information Centre
7, place de Fontenoy
75700 Paris
FRANCE

Unesco Office of Information Programmes and Services
7, place de Fontenoy
75700 Paris
FRANCE

Bundesforschungsanstalt für Fischerei
Informations- und Dokumentationsstelle, ASFA Centre
Palmaille 9
D 2000 Hamburg 50
GERMANY

National Institute of Oceanography
Library, ASFA Centre
Dona Paula
Goa 403 004
INDIA

Food and Agriculture Organization
Fishery Information, Data and Statistics Service
ASFA Co-ordinating Centre
Via delle Terme di Caracalla
00100 Rome
ITALY

Japan Fisheries Resource Conservation Association, ASFA Centre
Tokyo Suisan Building 6F
4-18 Toyomi-cho, Chuo-k
Tokyo 104
JAPAN

United Nations Environment Programme
Ocean and Coastal Areas Programme Activity Centre, ASFA Centre
P.O. Box 30552
Nairobi
KENYA

Universidad Nacional Autonoma de Mexico
Centro de Informacion Cientifica y Humanistica, ASFA Centre
Apartado Postal 70 392
Mexico D.F. 04510
MEXICO

International Federation for Information and Documentation (FID)
P.O. Box 90402
2509 LK The Hague
NETHERLANDS

Norwegian Oceanographic Data Centre, ASFA Centre
Nordnesparken 2
Nordnes, N-5024 Bergen
NORWAY

International Centre for Living Aquatic Resources Management (ICLARM)
MC P.O. Box 1501
Makati, Metro Manila
PHILIPPINES

Instituto Nacional de Investigaçao das Pescas
Divisao de Informaçao e Documentaçao, ASFA Centre
Alges-Praia
1400 Lisboa
PORTUGAL

Southeast Asian Fisheries Development Centre (SEAFDEC)
Olympia Building, 4th Floor
956 Rama IV Road
Bangkok 10500
THAILAND

All-Union Research Institute for Marine Fisheries and Oceanography (VNIRO)
ASFA Centre
17a V. Krasnoselskaya
Moscow B-140
USSR

European Association of Aquatic Sciences Libraries and Information Centres (EURASLIC)
Plymouth Marine Laboratory - Library
Citadel Hill
Plymouth Pl1 2PB
UNITED KINGDOM

Plymouth Marine Laboratory and Marine Biological Association
Library and Information Services, ASFA Centre
Citadel Hill
Plymouth PL1 2PB
UNITED KINGDOM

Cambridge Scientific Abstracts
ASFA Publisher
7200 Wisconsin Avenue
Bethesda, MD 20814
USA

International Association of Aquatic and Marine Science
Libraries and Information Centers (IAMSLIC)
Harbor Branch Oceanographic Institution
5600 Old Dixie Highway
Ft. Pierce, FL 94946
USA

National Oceanic and Atmospheric Administration NESDIS/NODC, ASFA Centre
1825 Connecticut Avenue N.W.
Washington, D.C. 20235
USA

United Nations Office for Ocean Affairs and the Law of the Sea
ASFA Co-ordinating Centre
2 United Nations Plaza
New York, NY 10017
USA

DATABASE HOSTS

Readers are advised to consult their national library or national science information agency with regard to available host computer systems and access procedures, and for advice regarding any national and regional systems.

Dialog Information Services Inc.
3460 Hillview Avenue
Palo Alto, CA 94304
USA

DIMDI
Weisshausstrasse 27
D-5000 Köln 41
GERMANY

ESA-IRS
ESRIN
Via Galileo Galilei
I-00044 Frascati
ITALY

Maxwell Online
ORBIT Search Service and BRS Information Technologies
Achilles House, Western Avenue
London W3 0UA
UNITED KINGDOM

and

8000 Westpark Drive
McLean, VA 22102
USA

System Development Corporation (SDC)
Information Services
2500 Colorado Avenue
Santa Monica, CA 90406
USA