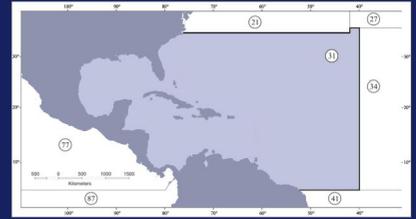




THE LIVING MARINE RESOURCES OF THE
**WESTERN CENTRAL
ATLANTIC**



**Volume 1 Introduction, molluscs, crustaceans, hagfishes,
sharks, batoid fishes and chimaeras**



AMERICAN
SOCIETY OF
ICHTHYOLOGISTS
AND
HERPETOLOGISTS



FOOD AND
AGRICULTURE
ORGANIZATION
OF THE
UNITED NATIONS

EUROPEAN
COMMISSION



FAO SPECIES IDENTIFICATION GUIDE FOR FISHERY PURPOSES
and
AMERICAN SOCIETY OF ICHTHYOLOGISTS AND HERPETOLOGISTS
SPECIAL PUBLICATION No. 5

THE LIVING MARINE RESOURCES OF THE WESTERN CENTRAL ATLANTIC

VOLUME 1

Introduction, molluscs, crustaceans, hagfishes, sharks, batoid fishes and chimaeras

edited by

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with the support of the
American Society of Ichthyologists and Herpetologists
and the
European Commission

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS
Rome, 2002

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ISBN 92-5-104825-8

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Carpenter, K.E. (ed.)

The living marine resources of the Western Central Atlantic. Volume 1: Introduction, molluscs, crustaceans, hagfishes, sharks, batoid fishes, and chimaeras.

FAO Species Identification Guide for Fishery Purposes and American Society of Ichthyologists and Herpetologists Special Publication No. 5.

Rome, FAO. 2002. pp. 1-600.

SUMMARY

This 3 volume field guide covers the species of interest to fisheries of the major marine resource groups exploited in the Western Central Atlantic. The area of coverage includes FAO Fishing Area 31. The marine resource groups included are the bivalves, gastropods, cephalopods, stomatopods, shrimps, lobsters, crabs, hagfishes, sharks, batoid fishes, chimaeras, bony fishes, sea turtles, and marine mammals. The introductory chapter outlines the environmental, ecological, and biogeographical factors influencing the marine biota, and the basic components of the fisheries in the Western Central Atlantic. Within the field guide, the sections on the resource groups are arranged phylogenetically according to higher taxonomic levels such as class, order, and family. Each resource group is introduced by general remarks on the group, an illustrated section on technical terms and measurements, and a key or guide to orders or families. Each family generally has an account summarizing family diagnostic characters, biological and fisheries information, notes on similar families occurring in the area, a key to species, a checklist of species and a short list of relevant literature. Families that are less important to fisheries include an abbreviated family account and no detailed species information. Species in the important families are treated in detail (arranged alphabetically by genus and species) and include the species name, frequent synonyms and names of similar species, an illustration, FAO common name(s), diagnostic characters, biology and fisheries information, notes on geographical distribution, and a distribution map. For less important species, abbreviated accounts are used. Generally, this includes the species name, FAO common name(s), an illustration, a distribution map, and notes on biology, fisheries, and distribution. The final volume concludes with an index of scientific and common names.

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Editorial Notes

Geographical Limits

The area of coverage corresponds exactly with FAO fishing area 31. It includes the tropical and subtropical waters of the western Atlantic and is bordered by 35° north latitude corresponding to Cape Hatteras in North America, 40° west longitude, 5° north latitude corresponding to the coast of French Guiana of South America, and in the west by the corresponding coastline of South, Central, and North America.

Project Institutional Affiliations

This identification guide was prepared under the direction of the Species Identification and Data Programme (SIDP) of the Marine Resources Service, Fishery Resources Division, Fisheries Department, Food and Agriculture Organization of the United Nations (FAO), Rome, Italy. Publication support came from the American Society of Ichthyologists and Herpetologists (ASIH). A workshop to edit and test the taxonomic accuracy of the fish chapters, was held in Belize in 1999. FishBase (www.fishbase.org) staff assisted in the preparation and carrying out of this workshop. Workshop support came from the European Commission (DG VIII) through a Fisheries and Biodiversity project of the International Center for Living Aquatic Resource Management (ICLARM). Maps for this guide were prepared at Conservation International (CI) Washington, DC. Project implementation, editorial management, and desk top publication was carried out at Old Dominion University, Norfolk, Virginia, USA.

Objectives

The purpose of this guide is to provide an accurate means to identify to the appropriate taxonomic level those organisms that are of potential use or likely to be captured by marine fisheries in the region. Correct identification is of utmost importance in marine resource management. The quality of fisheries statistics depends on the ability to correctly assign landing and catch data to taxon-specific categories. The species name is the link to all relevant biological and ecological information in the literature. This information is fundamental in any attempt to manage a fishery. Correct identification is also important for those scientists gathering biological data relevant to marine resource management. The fishery manager cannot confidently use the relevant biological data if the scientist collecting this information did not have an accurate means of identifying the species to begin with. Therefore, this identification tool will benefit fisheries workers gathering catch statistics and resource assessment information, and marine biologists researching information pertinent to resource management. This is particularly important for the WCA area because it encompasses the highest diversity of marine organisms exploited by fisheries in the Atlantic Ocean.

An additional objective of this guide is to document whenever possible the extent of the biodiversity likely to be affected by fisheries. Many of the questions regarding exploitation of resources are linked to issues of biodiversity because of potential adverse environmental effects of fisheries. Therefore, in important groups where it is feasible, as in the finfishes, an attempt has been made to list all species present in all families recorded from the WCA area.

History of the Project

In 1978, Walter Fischer, the founder and senior editor of the SIDP, produced the FAO Species Identification Sheets for Fishery Purposes, Western Central Atlantic (Fishing Area 31). This was the third regional series completed by him. Previous coverage included the Mediterranean area and the eastern Indian Ocean/western Pacific. Both of these first two regional guides have been more recently updated (*Fiches FAO d'Identification des Espèces pour les Besoins de la Pêche, Révision 1. Méditerranée et Mer Noire*, 1987, 2 volumes, edited by W. Fischer, M. Schneider, and M.-L. Bauchot; FAO Species Identification Guide for Fishery Purposes, the Living Marine Resources of the Western Central Pacific, 1998-2001, 6 volumes, edited by K.E. Carpenter and V.H. Niem).

Many taxonomic improvements have occurred since the original western central Atlantic guide and a main purpose for this project was to incorporate these changes into a new edition. However, it should be pointed out that the fauna of the western central Atlantic region was fairly well studied prior the production of the 1978 edition and much of what is in the new edition is essentially unchanged. In addition, many improvements for the current edition are a result of the effort put in to the production of the *FAO Field guide to the commercial marine and brackish-water resources of the northern coast of South America* produced in 1993 and authored by F. Cervigón, R. Cipriani, W. Fischer, L. Garibaldi, M. Hendrickx, A.J. Lemus, R. Márquez, J.M. Poutiers, G. Robaina, and B. Rodriguez. The primary new contribution of this edition is the additional coverage of many more finfish species, expansion of the use of dichotomous keys for identification, and the attempt to catalogue

the entire biodiversity of the ichthyofauna. In addition, the 1978 edition is out of print and the current update is intended to make this body of information more readily available in the region.

A stimulus for this revision originated with the need to improve the information in the FishBase database (managed by Rainer Froese). This led to support for the workshop that was held in Belize City, Belize in July 1999 specifically for the purpose of improving the information in the finfish sections of the guide. The emphasis on finfish later resulted in additional project support that originated in the Special Publication Committee of the American Society of Ichthyology and Herpetology. Conservation International agreed to produce the distribution maps into a publishable figure and into a geographical information system through their Center for Applied Biodiversity Science. This served as the basis for part of the biogeographical information included in the introductory chapter to these volumes.

FAO and AFS/ASIH Common Names

Some official common names for finfishes differ between the FAO and those of the joint committee of the American Fisheries Society (AFS) and American Society of Ichthyologists and Herpetologists (ASIH). In order to allow cross reference between these two widely used systems, whenever the English common name differs substantially, the AFS/ASIH English common name, as in the manuscript for the sixth edition planned for publication in 2003, is listed in parentheses after the FAO common name. To simplify, small differences between the English names, such as a space or hyphen between compound words, or an 'ed' ending are not noted. No attempt was made to note differences between official Spanish FAO and AFS/ASIH names since this part of the AFS/ASIH list is not yet complete.

Finfish scientific names and Eschmeyer's *Catalog of Fishes*

W.N. Eschmeyer has tirelessly researched the scientific names of finfishes and his species and genera database is found in the California Academy of Sciences publication, the *Catalog of Fishes*, which is also available online. The spelling and citation of all scientific names follows this database unless an author specifically disagreed with a listing.

The FAO Codes Currently Included in the Identification Guide Series

The 3 letter code listed to the right of certain species names are alpha identifiers used by agencies to report catches and landings to the FAO. Those species with these 3 alpha codes are those species currently in the FAO database as a statistical taxonomic unit.

Different Levels of Taxonomic Coverage

In addition to the great diversity of species covered in this guide, there is also a wide diversity in the extent and methods of fisheries utilization. We attempt to give more extensive coverage to those species that are more important in fisheries. However, it is also often difficult to judge how fisheries importance will change with time, and whether an organism has potential for exploitation. In addition, exploitation must be carefully weighed against ecological impacts in order to ensure sustainability. Included in this consideration is the issue of biodiversity. Ideally, this document would include a comprehensive list of all species in the groups covered so that it can also be used as a benchmark for biodiversity. However, for many of the invertebrate groups which are very speciose, the work required to compile species lists is beyond the scope of this work. However, for the vertebrate groups, comprehensive species lists were possible and are included here.

The families most important in fisheries are covered with a family section summarizing family diagnostic characters, biological and fisheries information, notes on similar families occurring in the area, a key to species, a list of species, and a short list of relevant literature. However, for certain groups, family accounts are omitted and extensive information is included only under the species accounts. Species in the important families have a single side of a page to include the species name, frequently encountered synonyms (or combinations) and misidentifications, the FAO common name or names, an illustration, diagnostic characters, biology and fisheries information, notes on geographical distribution, and a map showing a generalized area of coverage. For less important species, abbreviated accounts are used. This includes the species name, FAO common name or names, notes on biology and distribution, an illustration, and a generalized distribution map. Families which are monotypic or contain a single species in the area are covered similar to important species except that frequently 2 sides of a page are used and notes on similar species occurring in the area are included. Families that are less important have a family section similar to those for important families except a key to species may or may not be included, and no detailed species pages follow. For finfish, the maximum size and a brief distribution description are included for those species in a list of species not additionally covered in a species account.

Sizes Reported

All sizes listed are the total lengths unless otherwise specified.

The Distribution Maps

The maps included for species of importance to fisheries are generalized maps with a total expected range. This masks the complexity of distribution of many species since the actual records of occurrence are not shown. Points in between geographical limits are included in many maps and this gives the impression that species may also be found in inappropriate habitats. Obviously, however, a fish normally found on a coral reef is not expected to occur in the intervening open ocean indicated on the generalized map. These maps should be used to give a quick indication of the known or expected limits of geographical limits of occurrence, rather than as an absolute indication of occurrence.

Distribution maps were digitized and collated into a geographical information system at the Center for Applied Biodiversity Science, Conservation International, Washington, DC, USA with support from the Gordon and Betty Moore Foundation and Bay Foundation. Project manager for this was M.L. Smith. The geographical information systems work was supervised by R.W. Waller and V. Katariya. Digitizing was done by C. Standlee, S. Aggarwal, and S. Musinsky.

Peer Review and Citations

Each separate finfish family was reviewed by a minimum of 2 peer reviewers and therefore can be considered a peer review publication. When citing a specific taxonomic work, the author or authors should be listed first. For example:

Smith-Vaniz, W.F. 2002. Carangidae. In K.E. Carpenter (ed.). The living marine resources of the Western Central Atlantic. Vol. 3: Bony fishes part 2 (Opistognathidae to Molidae), sea turtles and marine mammals. *FAO Species Identification Guide for Fishery Purposes and American Society of Ichthyologists and Herpetologists Special Publication* No. 5. Rome, FAO. pp. 1426-1468.

When citing this work in its entirety the editor should be listed first:

Carpenter, K.E. (ed.). 2002. The living marine resources of the Western Central Atlantic. *FAO Species Identification Guide for Fishery Purposes and American Society of Ichthyologists and Herpetologists Special Publication* No. 5. Vols 1-3. Rome, FAO. 2150p.

The 1999 Belize City, Belize Workshop to Review Finfish Sections

The Belize workshop participants included project staff, identification key testers, authors, and experts who reviewed manuscripts and worked with testers during identification exercises. The objective of testing the identification keys using both fresh and preserved specimens was to improve the usefulness of the keys for those fishery workers that are likely to use these keys. The authors interacted with testers during these exercises in order to gain feedback on ways to make the identification guide more efficient and easier to use for fishery workers.

Special thanks are due N. Nagassar who worked tirelessly as project coordinator before and during the workshop. An important element for making the workshop effective was the collection of specimens that were used during tests of identification keys. M. DeGravelle, T. Orrell, and T. Wasaff did an excellent job collecting these specimens prior to and during the workshop. T. Orrell deserves special thanks for helping to curate and manage the specimens in a database. The editor thanks all those who participated and helped:

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National Systematics Laboratory; L.J.V. Compagno, South African Museum; J.K. Dooley, Adelphi University; W.N. Eschmeyer, California Academy of Sciences; I. Harrison, American Museum of Natural History; K. Hartel, Harvard University; P.C. Heemstra, J.L.B. Smith Institute of Ichthyology; G.D. Johnson, National Museum of Natural History; P. Lobel, Boston University; K. Matsuura, National Science Museum; J. McCosker, California Academy of Sciences; J. D. McEachran, Texas A&M University; J.A. Moore, National Marine Fisheries Service; I. Nakamura, Kyoto University; T. Orrell, Virginia Institute of Marine Science; N. Parin, P.P. Shirshov, Institute of Oceanology; J. R. Paxton, The Australian Museum; S.G. Poss, Gulf Coast Research Laboratory; J.E. Randall, B.P. Bishop Museum; B.C. Russell, Museums and Art Galleries of the Northern Territory; G. Sedberry, South Carolina Marine Resources Research Institute; W.F. Smith-Vaniz, U.S. Geological Survey; B.A. Thompson, Louisiana State University; M.W. Westneat, Field Museum of Natural History; E. Wiley, University of Kansas; J.T. Williams, National Museum of Natural History.

Contributing Illustrators

The scientific illustrator for these volumes was E. D'Antoni who rendered most of the illustrations appearing here for the first time. A number of other illustrators and authors also provided original illustrations. These include: P. Caruso (Lophiidae); N.L. Chao (Sciaenidae); K. Harrison (Cynoglossidae); K.E. Marsh (Virginia Beach; Atheriniformes); K.H. Moore (National Systematics Laboratory, National Marine Fisheries Service); M. Tavares (Crustaceans); C.S. Toxey (Old Dominion University; various families).

I thank B. Kensley and Publications Scientifiques du Muséum national d'Histoire naturelle, Paris for permission to reproduce a number of shrimp illustrations.

Acknowledgements

Special thanks are due W.N. Eschmeyer (California Academy of Sciences) for checking all the scientific names of finfishes against his database and to J.S. Nelson (University of Alberta) for checking all the finfish common names against the updated AFS/ASIH list. A very special thanks to the production staff who are listed in the title pages. In addition, a number of people have helped at some stage in the production of these volumes. The editor extends his sincere thanks to all: D. Blessich, F. Carocci, K. Cochrane, L. Garibaldi, J. Minow, M.T. Ruspantini-Campi, G. Sciarrappa-Demuro (FAO, Rome); C.M. Carpenter (Virginia Beach); M. DeGravelle, C. Kimbro (Old Dominion University); E. Luchetti (Studio Cyan, Rome); M. Neighbors (ASIH).

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- Orrell, T.M., National Marine Fisheries Service, Systematics Laboratory, MRC-153, National Museum of Natural History, Washington, D.C. 20560-0153, USA. - **Centropomidae, Inermiidae.**
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- Pietsch, T.W., School of Aquatic and Fisheries Sciences, University of Washington, P. O. Box 355100, Seattle, WA 98195-5100, USA. - **Antennariidae, Bathyclupeidae, Caulophryniae, Centrophryniae, Ceratiidae, Diceratiidae, Gigantactinidae, Himantolophidae, Linophryniae, Melanocetidae, Neoceratiidae, Oneirodidae, Thaumatchthyidae.**
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- Russell, B.C., Div. Nat. Sci-N.T. Mus., P.O. Box 4646, Darwin, NTE 0801, Australia. - **Bathysauridae, Sphyaenidae, Synodontidae.**
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- Sedberry, G.R., Mar. Resources Res. Institute, P.O. Box 12559, Charleston, SC 29422-2559, USA. - **Polypriionidae.**
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- Smith, D.G., Division of Fishes, National Museum of Natural History, MRC-159, Washington, D.C. 20013-7012, USA. - **Albulidae, Anguillidae, Chlopsidae, Colococongridae, Congridae, Cyematidae, Derichthyidae, Elopidae, Eurypharyngidae, Halosauridae, Heterenchelyidae, Lipogenyidae, Megalopidae, Monognathidae, Moringuidae, Muraenesocidae, Nemichthyidae, Nettastomatidae, Notacanthidae, Saccopharyngidae, Serrivomeridae, Synaphobranchidae.**
- Smith, M.L. Center for Applied Biodiversity Science, Conservation International, 1919 M Street NW, Washington, D.C., 20036, USA. - **Introduction.**
- Smith, J.F., Department of Biological Sciences, Old Dominion University, Norfolk, VA 23529, USA. - **Marine Mammals.**
- Smith-Vaniz, W.F., U.S. Geological Survey, Biological Resources Division, 412 NE 16th Ave., Room 250, Gainesville, FL 32610-3701, USA. - **Carangidae, Dactylopteridae, Opistognathidae.**
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- Thompson, B.A., Wetland Resources Building, Louisiana State University, Baton Rouge, LA 70803-7503, USA. - **Alepisauridae, Anopteridae, Aulopidae, Bramidae, Chlorophthalmidae, Evermannellidae, Giganturidae, Ipnopidae, Notosudidae, Omosudidae, Paralepididae?, Percophidae, Scopelarchidae**.
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- Wiley, E.O., Museum of Natural History, University of Kansas, Lawrence, KS 66045, USA. - **Anablepidae, Cyprinodontidae, Fundulidae, Lepisosteidae, Poeciliidae, Rivulidae**.
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