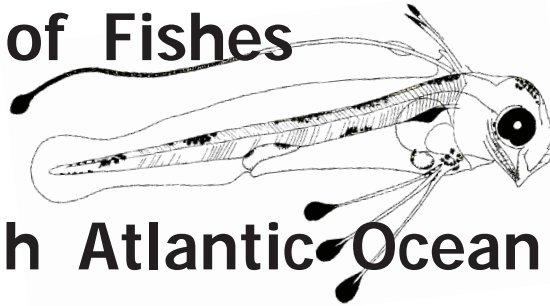


# Early Stages of Fishes in the Western North Atlantic Ocean



by Michael P. Fahay

A hardcover two volume set containing over 1 500 pages  
US \$100

This comprehensive scientific publication is the only up-to-date textbook providing detailed descriptions and accurate drawings of the early life-history stages of the fishes from the Northwest Atlantic Ocean north of 35°N and west of 40°W. The region covers the world's most famous fishing grounds and includes the Davis Strait, southern Greenland, Flemish Cap, Georges Bank, northern Sargasso Sea and Middle Atlantic Bight to Cape Hatteras. This beautifully produced and published work includes:

- A checklist of 1 075 fish species occurring in the study area
- Descriptions of egg, larval and juvenile stages of 760 species from 196 families
- Synopses of habitats from estuarine to abyssal
- Updated ranges and many species' range extensions, often based on early stages
- Identification facilitated by numerous descriptive tables
- Morphological characters of developmental stages summarized and tabulated for 28 orders of teleosts, 15 suborders of Perciformes, 26 families of Percoidei and several other major groups
- Appendices with tabulations of meristic characters, museum reference material sources and collection data for original material
- Some 3 000 drawings of eggs, larvae and juveniles and 2 000 references
- Print version available in early 2007

90° 80° 70° 60° 50° 40°



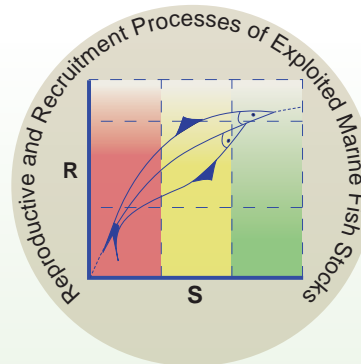
Published and distributed by the  
Northwest Atlantic Fisheries Organization  
P.O. Box 638, Dartmouth, Nova Scotia  
Canada B2Y 3Y9

Order from [www.nafo.int](http://www.nafo.int)  
Phone +1 (902) 468 7139  
Fax +1 (902) 468 5538  
Email [bcrawford@nafo.int](mailto:bcrawford@nafo.int)

## SYMPOSIUM

# Reproductive and Recruitment Processes of Exploited Marine Fish Stocks

1–3 October 2007  
Lisbon, Portugal



The Northwest Atlantic Fisheries Organization (NAFO), the North Pacific Marine Science Organization (PICES), and the International Council for the Exploration of the Sea (ICES), announce a joint symposium on “*Reproductive and Recruitment Processes of Exploited Marine Fish Stocks*”, to be held on 1–3 October 2007, in Lisbon, Portugal.

The symposium will provide a scientific forum to present and discuss study findings on reproduction, early life history and recruitment of exploited marine finfish and invertebrate stocks. Continued low abundance and low recruitment of many stocks necessitates a broad examination of key biological processes underlying potential stock recovery.

### Theme Sessions

- Age and Size at Sexual Maturation
- Fecundity and Spawning Success
- Survival of Eggs and Larvae
- Stock Assessment and Management Implications

Contributed oral and poster presentations are welcome. Abstracts should be submitted by 30 June 2007. Papers should be submitted by 31 October 2007 and will follow a peer-review process for publication in a special symposium issue of the *Journal of the Northwest Atlantic Fishery Science*. Participants who are not giving presentations must register by 1 September 2007.

The Symposium will be co-convened by:

**Edward A. Trippel**  
Fisheries and Oceans Canada  
St. Andrews Biological Station  
Canada  
[trippe@mar.dfo-mpo.gc.ca](mailto:trippe@mar.dfo-mpo.gc.ca)



**Richard D. Brodeur**  
Estuarine and Ocean Ecology Program  
Northwest Fisheries Science Center  
USA  
[rick.brodeur@noaa.gov](mailto:rick.brodeur@noaa.gov)



**Mark Dickey-Collas**  
IMARES  
Wageningen University Research  
The Netherlands  
[mark.dickeycollas@wur.nl](mailto:mark.dickeycollas@wur.nl)



Scientific Steering Committee: S. Kim, Korea (PICES), F. Köster, Denmark (ICES), C.T. Marshall, U.K. (ICES), M.J. Morgan, Canada (NAFO), H. Murua, Spain (NAFO), A. Thompson (NAFO Secretariat) and J. Zheng, USA (PICES).

Further information may be obtained at <http://www.nafo.int/symposium.html>

**Contact Information (including registration and abstract submission):** Barb Marshall, NAFO Secretariat  
Tel: (+1-902) 468-8598, email: [bmarshall@nafo.int](mailto:bmarshall@nafo.int)

## Information for Preparing Manuscripts for NAFO Scientific Publications

### Journal of Northwest Atlantic Fishery Science

The Journal is for the primary publication of original practical and theoretical research that is unpublished and is not being submitted for publication elsewhere. While it is intended to be regional in scope, papers of general applicability and methodology may be considered. Space is also provided for notes, letters to the editor and notices. Each paper is assigned to an Associate Editor of the Journal's Editorial Board, and is normally reviewed by two referees regarding suitability as a primary publication.

### NAFO Scientific Council Studies

The Studies publishes papers which are of topical interest and importance to the current and future activities of the Scientific Council, but which do not meet the high standards or general applicability required by the Journal. Such papers have usually been presented as research documents at Scientific Council meetings and nominated for publication by the Standing Committee on Publications. Studies papers are not peer reviewed.

### Content of Paper

The paper should be in English. The sequence should be: Title, Abstract, Text, References, Tables and Figures.

#### Title

The paper should start with the title, followed by the name(s), address(es) and emails of the author(s) including professional affiliation, and any related footnotes.

#### Abstract

An informative concise abstract should be provided along with key words listed alphabetically.

#### Text

In general, the text should be organized into Introduction, Materials and Methods, Results, Discussion, and Acknowledgements. Authors should be guided by the organization of papers that have been published in the NAFO Journal or Studies.

The **Introduction** should be limited to the purpose and rationale of the study.

The **Materials and Methods** should describe in sufficient detail the materials and methods used, so as to enable other scientists to evaluate or replicate the work.

The **Results** should answer the questions evolving from the purpose of the study in a comprehensive manner and in an orderly and coherent sequence, with supporting tables and figures.

The **Discussion** should explain the main contributions from the study, with appropriate interpretation of the results focusing on the problem or hypothesis. Comparisons with other studies should be included here.

The **Acknowledgements** should be limited to the names of individuals who provided significant scientific and technical support, including reviewers, during the preparation of the paper, and the names of agencies which provided financial support.

### References

The references cited in the text should be listed alphabetically. References should be mainly restricted to significant published literature. Unpublished documents and data, papers in preparation, and papers awaiting acceptance to other journals, may be cited with full contact addresses as unpublished or personal communications.

#### Examples:

- KING, M. 1995. Fisheries biology, assessment and management. Fishing News Books, UK, 341 p.
- CROWDER, L. B., and S. A. MURAWSKI. 1998. Fisheries by-catch: implications for management. *Fisheries*, **23**: 8–16.
- ÁVILA DE MELO, A. M., D. POWER, and R. ALPOIM. MS 2005. An assessment of the status of the redfish in NAFO Division 3LN, *NAFO SCR Doc.*, No. 52, 19 p.

Text citations of the above would be (King, 1995; Crowder and Murawski, 1998; Ávila de Melo *et al.*, MS 2005). The surnames of two authors may be used in a citation, but *et al.* should be used for more than two authors. The citation of mimeographed reports and meeting documents should contain the abbreviation "MS". Abbreviations of periodicals should follow the "World List of Aquatic Sciences and Fisheries Serials Titles", published by FAO.

### Tables and Figures

All Tables and Figures must be cited in the text. Tables and Figures must be numbered consecutively and correspond with the order of presentation in the text. Figure captions should be included as a separate page. Each table and figure should have a complete concise descriptive caption. Figures should always be submitted in black and white. Colour plots and photographs are acceptable only if colour is essential to the content. Preferably, all figures should be submitted as separate files in .eps or .ps format. Photographs, maps and contour plots can also be submitted as .jpg format.

### Paper Submission

Papers should be submitted by email to:  
Dr. A. B. Thompson, General Editor, at [journal@nafo.int](mailto:journal@nafo.int).



## Scientific Publications of the Northwest Atlantic Fisheries Organization

### Journal of Northwest Atlantic Fishery Science

The Journal provides an international forum for the primary publication of original research papers on fisheries science in the Northwest Atlantic, with emphasis on environmental, biological, ecological and fishery aspects of the living marine resources and ecosystems. (Scientific publications during ICNAF times during 1949–79 are available at the Secretariat).

- Vol. 1 – Miscellaneous papers, (10), December 1980, 112 pp.
- Vol. 2 – Miscellaneous papers, (10), October 1981, 76 pp.
- Vol. 3, No. 1, 2 – Miscellaneous papers, (17), May and December 1982, 180 pp.
- Vol. 4 – Special issue *Guide to the Early Stages of Marine Fishes Occurring in the Western North Atlantic Ocean, Cape Hatteras to the Southern Scotian Shelf*, July 1983, 424 pp.
- Vol. 5, No. 1, 2 – Miscellaneous papers, (26), January and November 1984, 224 pp.
- Vol. 6, No. 1, 2 – Miscellaneous papers, (17), June and December 1985, 179 pp.
- Vol. 7, No. 1, 2 – Miscellaneous papers, (18), December 1986 and December 1987, 177 pp.
- Vol. 8 – Miscellaneous papers, (7), December 1988, 88 pp.
- Vol. 9 – Miscellaneous papers, (13), September and December 1989, 159 pp.
- Vol. 10 – Special issue, (1), *The Delimitation of Fishing Areas in the Northwest Atlantic*, December 1990, 57 pp.
- Vol. 11 – Miscellaneous papers, (7), February 1991, 80 pp.
- Vol. 12 – Miscellaneous papers, (7), January 1992, 84 pp.
- Vol. 13 – Miscellaneous papers, (7), December 1992, 114 pp.
- Vol. 14 – Symposium papers, (12), on *Changes in Biomass, Production and Species Composition of the Fish Populations in the Northwest Atlantic over the Last 30 Years, and Their Possible Causes*, December 1992, 160 pp.
- Vol. 15 – Special issue, (1), *Decapod Crustacean Larvae from Ungava Bay*, December 1993, 170 pp.
- Vol. 16 – Miscellaneous papers, (7), July 1994, 100 pp.
- Vol. 17 – Miscellaneous papers, (6), October 1994, 78 pp.
- Vol. 18 – Miscellaneous papers, (6) (1 Note), April 1996, 115 pp.
- Vol. 19 – Symposium papers, (11), on *Gear Selectivity/Technical Interactions in Mixed Species Fisheries*, September 1996, 145 pp.
- Vol. 20 – Special issue, (1), *North Atlantic Fishery Management Systems: A Comparison of Management Methods and Resource Trends*, September 1996, 143 pp.
- Vol. 21 – Miscellaneous papers, (5), April 1997, 83 pp.
- Vol. 22 – Symposium papers, (25) (1 Note), on *The Role of Marine Mammals in the Ecosystem*, December 1997, 387 pp.
- Vol. 23 – Symposium papers, (16), *What Future for Capture Fisheries*, October 1998, 277 pp.
- Vol. 24 – Miscellaneous papers, (4), November, 1998, 97 pp.
- Vol. 25 – Symposium papers, (17), (2 Notes), on "*Variations in Maturation, Growth, Condition and Spawning Stock Biomass Production in Groundfish*", October 1999, 233 pp.
- Vol. 26 – Miscellaneous papers, (6), December 2000, 145 pp.
- Vol. 27 – Symposium papers (22) (1 Note), *Pandalid Shrimp Fisheries – Science and Management at the Millennium*, December 2000, 289 pp.
- Vol. 28 – Special issue, (1), *A Review of the Cod Fisheries at Greenland, 1910–1995*, December 2000, 121 pp.
- Vol. 29 – Miscellaneous papers, (5), December, 2001, 99 pp.
- Vol. 30 – Miscellaneous papers, (5), December, 2002, 91 pp.
- Vol. 31 – Symposium papers, (34) (1 Abstract), October, 2003, 496 pp.
- Vol. 32 – Miscellaneous papers, (4), December, 2003, 72 pp.
- Vol. 33 – Symposium papers, (9), *Reproductive Potential of Fish Populations of the North Atlantic*, December 2003, 214 pp.
- Vol. 34 – Mini-symposium papers, (7), *Hydrographic Variability in NAFO Waters for the Decade 1991–2000 in Relation to Past Decades*, March, 2004, 120 pp.
- Vol. 35 – Symposium papers, (43), *Elasmobranch Fisheries: Managing for Sustainable Use and Biodiversity Conservation*, 11–13 September 2001, 544 pp.

### NAFO Scientific Council Studies

This publication includes papers of topical interest and importance to the current and future activities of the Scientific Council.

- No. 1 – Miscellaneous papers, (11), March 1981, 101 pp.
- No. 2 – Manual on *Groundfish Surveys*, December 1981, 56 pp.
- No. 3 – Miscellaneous papers, (8), April 1982, 82 pp.
- No. 4 – Special Session papers, (12), on *Remote-Sensing Applications to Fishery Science*, September 1982, 98 pp.
- No. 5 – Symposium papers, (12), on *Environmental Conditions in 1970–79*, December 1982, 114 pp.
- No. 6 – Miscellaneous papers, (8), December 1983, 104 pp.
- No. 7 – Miscellaneous papers, (9), August 1984, 98 pp.
- No. 8 – Miscellaneous papers, (12), April 1985, 96 pp.
- No. 9 – Special Session papers, (17), on *Squids*, November 1985, 180 pp.
- No. 10 – Miscellaneous papers, (9), August 1986, 112 pp.
- No. 11 – Miscellaneous papers, (11), March 1987, 127 pp.
- No. 12 – Miscellaneous papers, (8), March 1988, 90 pp.
- No. 13 – Miscellaneous papers, (5), November 1989, 82 pp.
- No. 14 – Miscellaneous papers, (6), May 1990, 74 pp.
- No. 15 – Miscellaneous papers, (7), May 1991, 68 pp.
- No. 16 – Special Session papers, (22), on *Management Under Uncertainties*, November 1991, 190 pp.
- No. 17 – Workbook on *Introduction to Sequential Population Analysis*, February 1993, 98 pp.
- No. 18 – Symposium papers, (18), on *Changes in Abundance and Biology of Cod Stocks and Their Possible Causes*, July 1993, 110 pp.
- No. 19 – Miscellaneous papers, (8), October 1993, 98 pp.
- No. 20 – Miscellaneous papers, (7), February 1994, 114 pp.
- No. 21 – Collections of Papers, (10), Related to *Northern Cod and Seals in NAFO Divisions 2J and 3KL*, December 1994, 165 pp.
- No. 22 – Miscellaneous papers, (6), May 1995, 95 pp.
- No. 23 – Miscellaneous papers, (5), September 1995, 95 pp.
- No. 24 – Symposium papers, (12), on *Impact of Anomalous Oceanographic Conditions at the Beginning of the 1990s in the Northwest Atlantic on the Distribution and Behaviour of Marine Life*, September 1994, 155 pp.
- No. 25 – Collection of Papers, (5), *Flemish Cap Selected Environmental and Other Papers*, July 1996, 91 pp.
- No. 26 – Selected Papers, (11), (2 Notes), on *Harp and Hooded Seals*, December 1996, 129 pp.
- No. 27 – Miscellaneous papers, (5), (1 Note), December 1996, 81 pp.
- No. 28 – Special Session papers, (6), on *Assessment of Groundfish Stocks Based on Bottom Trawl Survey Results*, December 1996, 105 pp.
- No. 29 – Selected Papers, (11), *Selected Studies Related to Assessment of Cod in NAFO Divisions 2J+3KL*, May 1997, 125 pp.
- No. 30 – Miscellaneous papers, (9), December 1997, 117 pp.
- No. 31 – Miscellaneous papers, (8), December 1998, 165 pp.
- No. 32 – Miscellaneous papers, (8), April 1999, 133 pp.
- No. 33 – Miscellaneous papers, (7), May 2000, 135 pp.
- No. 34 – Miscellaneous papers, (3), October, 2001, 91 pp.
- No. 35 – Workshop: *The Canada-United States Yellowtail Flounder Age Reading*, December 2002, 68 pp.
- No. 36 – Workshop on Assessment Methods, May 2003, 320 pp.
- No. 37 – Working Group on Reproductive Potential, August 2003, 378 pp.

### NAFO Scientific Council Reports

This publication contains reports of Scientific Council Meetings held through each year since NAFO replaced ICNAF. (The comparable publication during ICNAF was called the *Redbook*).

- 1980 – Reports of seven meetings in 1979 and 1980, Published December 1980, 190 pp.
- 1981 – Reports of four meetings in 1981, Published December 1981, 148 pp.
- 1982 – Reports of two meetings in 1982, Published December 1982, 110 pp.
- 1983 – Reports of three meetings in 1983, Published December 1983, 152 pp.
- 1984 – Reports of three meetings in 1984, Published December 1984, 126 pp.
- 1985 – Reports of three meetings in 1985, Published December 1985, 146 pp.

**NAFO Scientific Council Reports (Continued)**

- 1986 – Reports of three meetings in 1986, Published December 1986, 156 pp.
- 1987 – Reports of three meetings in 1987, Published December 1987, 138 pp.
- 1988 – Reports of two meetings in 1988, Published December 1988, 150 pp.
- 1989 – Reports of two meetings in 1989, Published December 1989, 180 pp.
- 1990 – Reports of two meetings in 1990, Published December 1990, 188 pp.
- 1991 – Reports of two meetings in 1991, Published December 1991, 164 pp.
- 1992 – Reports of four meetings in 1992, Published December 1992, 212 pp.
- 1993 – Reports of three meetings in 1993, Published January 1994, 234 pp.
- 1994 – Reports of four meetings in 1994, Published January 1995, 234 pp.
- 1994 – Reports of four meetings in 1994, Published January 1995, 234 pp.
- 1995 – Reports of three meetings in 1995, Published January 1996, 244 pp.
- 1996 – Reports of three meetings in 1996, Published January 1997, 226 pp.
- 1997 – Reports of three meetings in 1997, Published January 1998, 274 pp.
- 1998 – Reports of three meetings in 1998, Published January 1999, 257 pp.
- 1999 – Report of four meetings in 1999, Published January 2000, 327 pp.
- 2000 – Report of four meetings in 2000, Published January 2001, 303 pp.
- 2001 – Report of three meetings in 2001, Published January 2002, 339 pp.
- 2002 – Report of three meetings in 2002, Published January 2003, 323 pp.
- 2002/2003 – Report of four meetings in 2002-03, Published August 2003, 383 pp.
- 2003 – Report of two meetings in 2003, Published January 2004, 104 pp.
- (Supplement)
- 2004 – Report of three meetings in 2004, Published January 2005, 298 pp.
- 2005 – Report of three meetings in 2005, Published May 2006, 359 pp.

**NAFO Statistical Bulletin**

This publication replaced *ICNAF Statistical Bulletin* which terminated with Vol. 28 (revised). The volume numbering continues the series as the *NAFO Statistical Bulletin*.

- Vol. 29 – Fishery statistics for 1979, Originally published July 1981; revised edition published November 1984, 290 pp.
- Vol. 30 – Fishery statistics for 1980, Originally published August 1982; revised edition published October 1984, 280 pp.
- Vol. 31 – Fishery statistics for 1981, Originally published September 1983; revised edition published March 1985, 276 pp.
- Vol. 32 – Fishery statistics for 1982, Published December 1984, 284 pp.
- Vol. 33 – Fishery statistics for 1983, Published December 1985, 280 pp.
- Vol. 34 – Fishery statistics for 1984, Published December 1986, 304 pp.
- Vol. 35 – Fishery statistics for 1985, Published December 1987, 322 pp.
- Vol. 36 – Fishery statistics for 1986, Published October 1989, 304 pp.
- Vol. 37 – Fishery statistics for 1987, Published April 1990, 295 pp.
- Vol. 38 – Fishery statistics for 1988, Published February 1991, 307 pp.
- Vol. 39 – Fishery statistics for 1989, Published February 1993, 300 pp.
- Vol. 40 – Fishery statistics for 1990, Published February 1994, 309 pp.
- Vol. 41 – Fishery statistics for 1991, Published February 1995, 318 pp.
- Statistical Bulletin Supplementary Issue, 1960–90, (statistics) Published April 1995, 156 pp.
- Vol. 42 – Fishery statistics for 1992, Published October 1995, 310 pp.
- Vol. 43 – Fishery statistics for 1993, Published December 1997, 329 pp.
- Vol. 44 – Fishery statistics for 1994, Published December 2000, 201 pp.
- Vol. 45 – Fishery statistics for 1995, Published October 2001, 207 pp.
- Vol. 46 – Fishery statistics for 1996, Published November 2001, 214 pp.
- Vol. 47 – Fishery statistics for 1997, Published November 2001, 216 pp.
- Vol. 48 – Fishery statistics for 1998, Published November 2001, 210 pp.
- Vol. 49 – Fishery statistics for 1999, Published January 2002, 210 pp.

### **Inventory of Sampling Data**

This publication replaced *ICNAF Inventory of Sampling Data 1967–1978* which was completed in 1986.

Inventory of Sampling Data 1979–1984, Published April 1989, 250 pp.

Inventory of Sampling Data 1985–1989, Published March 1993, 265 pp.

Inventory of Sampling Data 1990–1994, Published October 1999, 287 pp.

Inventory of Sampling Data 1995–1999, Published November 2002, 142 pp.

### **NAFO Index of Meeting Documents**

This publication contains lists of all documents along with a subject and author index of the NAFO Scientific Council documents issued during 5-year periods.

1979–84 – Index of Meeting Documents, Published March 1985, 146 pp.

1985–89 – Index of Meeting Documents, Published December 1990, 116 pp.

1990–94 – Index of Meeting Documents, Published November 1995, 139 pp.

1995–99 – Index of Meeting Documents, Published December 2000, 141 pp.

---



