

U.S. Department of Commerce

Gina M. Raimondo
Secretary

National Oceanic and Atmospheric Administration

Richard W. Spinrad
Administrator

National Marine Fisheries Service

Janet Coit
Assistant Administrator
for Fisheries



Fishery Bulletin (ISSN 0090-0656) is published quarterly by the Scientific Publications Office, National Marine Fisheries Service, NOAA, 7600 Sand Point Way NE, Seattle, WA 98115-0070.

Although the contents of this publication have not been copyrighted and may be reprinted entirely, reference to source is appreciated.

The Secretary of Commerce has determined that the publication of this periodical is necessary according to law for the transaction of public business of this Department. Use of funds for printing of this periodical has been approved by the Director of the Office of Management and Budget.

For Sale by the Superintendent of Documents, U.S. Government Publishing Office, Washington, DC 20401. Subscription price per year: \$32.00 domestic and \$44.80 foreign. Cost per single issue: \$19.00 domestic and \$26.60 foreign. **See back for order form.**

Fishery Bulletin

Scientific Editor

José I. Castro

National Marine Fisheries Service, NOAA
263 13th Avenue South
Saint Petersburg, Florida 33701

Managing Editor

Kathryn Dennis

Scientific Publications Office
National Marine Fisheries Service, NOAA
1845 Wasp Boulevard, Building 176
Honolulu, Hawaii 96818

Associate Editor

Cara Mayo

Scientific Publications Office
National Marine Fisheries Service, NOAA
7600 Sand Point Way NE
Seattle, Washington 98115-0070

Editorial Board

Henry L. Bart Jr.

Katherine E. Bemis

Matthew D. Campbell

William B. Driggers III

Gretchen L. Grammer

Richard Langton

J. Fernando Márquez-Farías

Richard S. McBride

Richard L. Merrick

Richard D. Methot

Lisa J. Natanson

Mark S. Peterson

André E. Punt

Joseph M. Quattro

John F. Walter III

Tulane University, New Orleans, Louisiana

National Systematics Laboratory, Washington, DC

National Marine Fisheries Service, Pascagoula, Mississippi

National Marine Fisheries Service, Pascagoula, Mississippi

South Australian Research and Development Institute, Adelaide, Australia

National Marine Fisheries Service, Walpole, Maine (retired)

Universidad Autónoma de Sinaloa, Mazatlán, México

National Marine Fisheries Service, Woods Hole, Massachusetts

National Marine Fisheries Service, Falmouth, Massachusetts (retired)

National Marine Fisheries Service, Seattle, Washington

National Marine Fisheries Service, Narragansett, Rhode Island (retired)

University of Southern Mississippi, Ocean Springs, Mississippi

University of Washington, Seattle, Washington

University of South Carolina, Columbia, South Carolina

National Marine Fisheries Service, Miami, Florida

***Fishery Bulletin* website: <https://spo.nmfs.noaa.gov/fb.htm>**

Fishery Bulletin carries original research reports on investigations in fishery science, engineering, and economics. It began as the Bulletin of the United States Fish Commission in 1881; it became the Bulletin of the Bureau of Fisheries in 1904 and the *Fishery Bulletin* of the U.S. Fish and Wildlife Service in 1941. Separates were issued as documents through volume 46; the last document was no. 1103. Beginning with volume 47 in 1931 and continuing through volume 62 in 1963, each separate appeared as a numbered bulletin. A new system began in 1963, with volume 63, in which papers are bound together in a single issue. Beginning with volume 70, number 1, January 1972, *Fishery Bulletin* became a periodical, issued quarterly. In this form, it is available by subscription from the Superintendent of Documents, U.S. Government Publishing Office, Washington, DC 20401. It is also available free in limited numbers to libraries, research institutions, and state and federal agencies and in exchange for other scientific publications.