

JOURNAL OF COASTAL RESEARCH

An International Forum for the Littoral Sciences

EDITOR-IN-CHIEF Charles W. Finkl. Jnr.

Coastal Education and Research Foundation, Inc. [CERF]
Post Office Box 8068
Charlottesville, VA 22906, USA

CONSULTING EDITOR Rhodes W. Fairbridge New York, NY 10027, USA BOOK REVIEW EDITOR R.W.G. Carter Northern Ireland BT52 1SA, UK

ASSOCIATE EDITORS

BIOLOGICAL SCIENCES Clinton J. Dawes Tampa, Florida OCEANOGRAPHY David Huntley Plymouth, England

J.H. Balsillie

ENGINEERING & TECHNOLOGY
Per Bruun
Hilton Head, South Carolina
COASTAL GEOLOGY
John R. Suter
Baton Rouge, Louisiana

POLICY & MANAGEMENT James R. Broadus Woods Hole, Massachusetts GEOMORPHOLOGY Orson van de Plassche Amsterdam, The Netherlands MARINE GEOLOGY Terry R. Healy Hamilton, New Zealand

EDITORIAL BOARD

Tallahassee, Florida Eric C. F. Bird Parkville, Victoria, Australia Charles Birkeland Mangilao, Guam Charles Bretschneider Honolulu, Hawaii Donald R. Coates Binghamton, New York Fernando V. Costa Lisbon, Portugal Anthony J. Davy Norwich, England Elliot W. Dawson Wellington, New Zealand Richard V. Dingle Cape Town, South Africa Robert Dolan Charlottesville, Virginia Keith R. Dyer Plymouth, England Lionel N. Eleuterius Ocean Springs, Mississippi David W. Fischer Long Beach, California Shoji Fujii Toyama City, Japan D. F. Geritsen

Edgardo D. Gomez Quezon City, Philippines **André Guilcher** Brest, France Ali Günbak Ankara, Turkey David Hopley Townsville, Qlds., Australia O. G. Houmb Trondheim, Normay Paul Kaplin Moscow, USSR Dieter Kelletat Essen, W. Germany Vic Klemas Newark, Delaware N. Kobayashi Newark, Delaware Nicholas C. Kraus Vicksburg, Mississippi Pierre Lasserre Paris, France Miguel A. Losada Santander, Spain E. van der Maarel Uppsala, Sweden M. Anwar Maun London, Ontario, Canada C. Peter McRoy Fairbanks, Alaska

Ashish J. Mehta Gainesville, Florida P. Nielsen Hornsby, NSW, Australia Roland P. Paskoff Le Chesnay, France Edward J. Petuch Boca Raton, Florida Orrin H. Pilkey, Jr. Durham, N. Carolina Paolo A. Pirazzoli Paris, France Norbert P. Psuty New Brunswick, New Jersey Ren Mei-e Nanjing, China Michael R. Rampino New York, New York Reynold J. Ruppé Tempe, Arizona William Sackinger Fairbanks, Alaska Bernard Salvat Paris, France Toru Sawaragi Osaka, Japan Carlos Schubert Caracas, Venezuela

Maurice L. Schwartz Bellingham, Washington Andrew D. Short Sydney, NSW, Australia Aprilani Soegiarto Jakarta, Indonesia H.B. Sørensen Lemvig, Denmark Bernard A. Thomassin Marseille, France Michael J. Tooley Durham, England P. Trvde Lyngby, Denmark J. van de Kreeke Coconut Grove, Florida José F. Arava Santiago, Chile Herman Th. Verstappen Enschede, The Netherlands Ian Watson Boca Raton, Florida Edward Wedler Lawrencetown, NS, Canada Niels West Kingston, Rhode Island Xu Jizu Tianjin, China

Honolulu, Hawaii COPYRIGHT

Authorization to photocopy items for internal or personal use, or the internal or personal use of specific clients, is granted by the Coastal Education and Research Foundation (CERF). This authorization is extended to libraries and other users registered with the Copyright Clearance Center (CCC) Transactional Reporting Service, provided that the base fee of \$US 1.00 per copy of the article plus \$US 0.10 per page is paid directly to the Copyright Clearance Center, 27 Congress Street, Salem, MA 01970. For those organizations that have been granted a License with the Copyright Clearance Center, a separate system of payments has been arranged. Please contact the Copyright Clearance Center to determine whether the License fee arrangement covers your organization. This consent does not extend to other kinds of copying, such as copying for general distributions, for creating new collective works, or for resale. Fees for past articles are the same as those shown for current articles. The Item Fee-Code for users of the Transactional Reporting Service is 0749-0208/1988 \$1.00 + 0.10.

It is a condition of publication that manuscripts submitted to this journal have not been published, nor will they be simultaneously submitted or published elsewhere. By submitting a manuscript, the authors agree that the copyright for their article is transferred to the publisher if the article is accepted for publication. Assignment of copyright is not required, however, from authors who work for organizations which do not permit such assignment. The copyright covers the exclusive rights to reproduce and distribute the article, including reprints, photographic reproductions, microform or any other reproductions of a similar nature, and translations. No part of this publication may be reproduced, stored in a retrieval system or transmitted in any form or by any means, electronic, electrostatic, magnetic tape, mechanical, photocopying, recording or otherwise, without permission in writing from the copyright holder.

The JOURNAL OF COASTAL RESEARCH (ISSN 0749-0208) is published quarterly by the Coastal Education & Research Foundation [CERF], P.O. Box 8068, Charlottesville, Virginia 22906, USA. Subscription rates are \$92.50 for institutions, \$50 for individuals and \$35 for students. Single back issues and parts are available at current subscription rates.

* 1988, the Coastal Education & Research Foundation [CERF]. Printed by Allen Press, Inc., Lawrence, Kansas, USA.

Journal of Coastal Research

An International Forum for the Littoral Sciences

Supporting Organizations

- International Union for Quaternary Research (INQUA): Commission on Quaternary Shorelines, The Holocene Commission, and The Neotectonics Commission.
- International Geological Correlation Program (IGCP) (supported by the International Union of Geological Sciences and UNESCO): Project No. 274 — Theoretical and Applied Aspects of Coastal and Shelf Evolution, Past and Future.
- The International Geographical Union (IGU): Commission on the Coastal Environment
- International Institute for Aerial Survey and Earth Sciences (ITC)[Enschede, The Netherlands]
- International Association for Biological Oceanography (IABO)
- International Association of Meiobenthologists (IAM)
- International Post-Graduate Training Courses on Fundamental and Applied Quaternary Geology (IFAQ) [Brussels, Belgium]

Aims and Scope of the Journal

Journal of Coastal Research, an International Forum for the Littoral Sciences, is dedicated to all aspects of coastal research. These include geology, biology, geomorphology (physical geography), climate, littoral oceanography, hydrography, coastal hydraulics, environmental (resource) management, engineering, and remote sensing. Although each field functions effectively within its own purview, the cross-disciplinary nature of coastal studies requires familiarity with other fields as well. Hence, the scope of topics is necessarily broad in order to address the complexity of coastal biophysical and socio-economic interactions. Because of the wide range of interrelated topics, the journal invites original contributions and manuscripts dealing with theory, methodology, techniques, and field or applied topic studies on interdisciplinary coastal issues.

The journal encourages the dissemination of knowledge and understanding of the coastal zone by promoting cooperation and communication between specialists in different disciplines. Natural scientists, for example, are encouraged to collaborate with professionals in other fields to prepare contributions relating to the coastal zone that foster increased appreciation of coastal environments and processes. By means of this journal, with its scholarly and professional papers, systematic review articles, book and symposia reviews, communications and news, and special topical issues, an international forum for the development of integrated coastal research is provided.

Subscription Information

Editorial, Advertising and Publishing Office: Dr. Charles W. Finkl, Jnr., Editor-in-Chief, Post Office Box 8068, Charlottesville, Virginia 22906-8068, USA. Telephone: (804) 973–1863. FAX (804) 973–4193.

Published Quarterly in January, March, June, and September. Annual Subscription Rate (1987): \$ US35.00 (Student), \$ US50.00 (Personal), \$ US92.50 (Institution). Subscribers outside of the USA please add \$ US6.50 for surface postage or \$ US28 for airmail postage and handling to Europe and South America, \$ US35 to Australia, Africa, and the Far East. Single copy price: \$ US19. Back issues are available at current subscription rates.

THE JOURNAL OF COASTAL RESEARCH is surveyed in Aquatic Sciences and Fisheries Abstracts; Current Awareness in Biological Sciences; Current Contents/Agriculture; Biology & Environmental Sciences; Ecology Abstracts; GeoAbstracts; GeoScience Contents; Institute of Scientific Information (USSR); Marine Science Contents Tables; Oceanic Abstracts; Oceanographic Literature Review; Physics Abstracts; and Pollution Abstracts.

i