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# Distribution of siphonophores in the Northwest Pacific Ocean and links to environmental conditions

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Despite their abundance in marine ecosystems, studies on siphonophores are limited. In this study, 26 species of siphonophores in the Northwest Pacific Ocean were identified during multiple cruises of the R/V ISABU from 2018–2020, and various factors that may affect the occurrence of siphonophores, including water temperature, salinity, zooplankton biomass, and trophic niche were investigated. Statistical analysis revealed that the distribution of siphonophores and their biomass could be divided into two water mass groups, affected by the Kuroshio and Oyashio Currents. The species with high contributions to distinguishing the water mass groups (including *Chelophyes contorta*, *Dimophyes arctica*, *Bassia bassensis*, and *Eudoxoides spiralis*—mainly belonging to the Diphyidae) showed species-specific correlations with water temperature and salinity. This suggests that diphyids can be used as indicator species for currents and hydrological factors that influence water mass. The biomass of siphonophores exhibited a trend opposite to that of non-gelatinous zooplankton and showed no association with other gelatinous zooplankton. These results can be interpreted from an ecological niche perspective. Through nitrogen and carbon stable isotope analyses, the dietary sources of siphonophores could potentially overlap with those of chaetognaths or non-gelatinous zooplankton. Because the trophic position of siphonophores (2.4–3.2) also falls in the range of those of chaetognaths (2.8–3.4) and non-gelatinous zooplankton including copepods, euphausiids, and amphipods (2.4–3.5), diet competition with carnivorous mesozooplankton could be predicted. Considering that the diversity and biomass of most siphonophores are strongly positively correlated with water temperature and salinity, expansion of the Kuroshio Current is expected to lead to an increase in siphonophores in the Northwest Pacific in the future. The findings of this study are anticipated to provide novel insights into climate change prediction and response and enhance our understanding of siphonophore communities.

## KEYWORDS

biodiversity, gelatinous zooplankton, indicator species, Kuroshio Extension, siphonophore, stable isotope, trophic position

# Siphonophores Of The Pacific With A Review Of The World Distribution

**Roger Harris, Peter Wiebe, Jurgen  
Lenz, Hein-Rune Skjoldal, Mark Huntley**



## **Siphonophores Of The Pacific With A Review Of The World Distribution:**

**The Light and Smith Manual** James T. Carlton, 2023-09-01 The Fourth Edition of The Light and Smith Manual continues a sixty five year tradition of providing to both students and professionals an indispensable comprehensive and authoritative guide to Pacific coast marine invertebrates of coastal waters rocky shores sandy beaches tidal mud flats salt marshes and floats and docks This classic and unparalleled reference has been newly expanded to include all common and many rare species from Point Conception California to the Columbia River one of the most studied areas in the world for marine invertebrates In addition although focused on the central and northern California and Oregon coasts this encyclopedic source is useful for anyone working in North American coastal ecosystems from Alaska to Mexico More than one hundred scholars have provided new keys illustrations and annotated species lists for over 3 500 species of intertidal and many shallow water marine organisms ranging from protozoans to sea squirts This expanded volume covers sponges sea anemones hydroids jellyfish flatworms polychaetes amphipods crabs insects snails clams chitons and scores of other important groups The Fourth Edition also features introductory chapters on marine habitats and biogeography interstitial marine life and intertidal parasites as well as expanded treatments of common planktonic organisms likely to be encountered in near to shore shallow waters The Fourth Edition of The Light and Smith Manual continues a sixty five year tradition of providing to both students and professionals an indispensable comprehensive and authoritative guide to Pacific coast marine invertebrates of coastal waters *Siphonophores of the Pacific with a Review of the World Distribution* Angeles Alvarino, 1971 **Siphonophora (Cnidaria:Hydrozoa) of Canadian Pacific Waters** Gillian M. Mapstone, Mary N. Arai, 2009 Section 4 Ecology by Mary N Arai and Department of Biological Sciences University of Calgary Fishery Bulletin, 1977 Marine Plankton Claudia Castellani, Martin Edwards, 2017-09-01 A thorough understanding of planktonic organisms is the first step towards a real appreciation of the diversity biology and ecological importance of marine life A detailed knowledge of their distribution and community composition is particularly important since these organisms are often very delicate and sensitive to change and can be used as early indicators of environmental change Natural and man induced modification of the environment can affect both the distribution and composition of plankton with important ecological and economic impacts Marine Plankton provides a practical guide to plankton biology with a large geographic coverage spanning the North Sea to the north eastern Atlantic coast of the USA and Canada The book is divided into three sections an overview of plankton ecology an assessment of methodology in plankton research covering sampling preservation and counting of samples and a taxonomic guide richly illustrated with detailed line drawings to aid identification This is an essential reference text suitable for senior undergraduate and graduate students taking courses in marine ecology particularly useful for fieldwork as well as for professional marine biologists It will also be of relevance and use to environmental scientists conservation biologists marine resource managers environmental consultants and other specialised practitioners

**Advances in Marine Biology** ,1987-12-01 *Advances in Marine Biology Ecological Geography of the Sea* Alan R. Longhurst,2010-08-03 This book presents an in depth discussion of the biological and ecological geography of the oceans It synthesizes locally restricted studies of the ocean to generate a global geography of the vast marine world Based on patterns of algal ecology the book divides the ocean into four primary compartments which are then subdivided into secondary compartments Includes color insert of the latest in satellite imagery showing the world s oceans their similarities and differences Revised and updated to reflect the latest in oceanographic research Ideal for anyone interested in understanding ocean ecology accessible and informative

**Collected Reprints** ,1986 *Coelenterate Biology: Recent Research on Cnidaria and Ctenophora* R.B. Williams,P.F.S. Cornelius,R.G. Hughes,E.A. Robson,2012-12-06 *Proceedings of the Fifth International Conference on Coelenterate Biology* 1989 *Collected Reprints* Southwest Fisheries Center (U.S.),1984

*Monthly Report* Southwest Fisheries Center (U.S.),1981

**Jellyfish Blooms IV** Jennifer Purcell,Hermes Mianzan,Jessica R. Frost,2015-03-21 Jellyfish generally are considered to be nuisances because they interfere with human activities by stinging swimmers clogging power plant intakes and nets of fishermen killing fish in aquaculture pens and being both predators and competitors of fish There is concern that environmental changes such as global warming eutrophication over fishing and coastal construction may benefit jellyfish populations During this past decade following the first Jellyfish Blooms volume some species have bloomed more frequently expanded their range and caused more problems for humans Mnemiopsis leidyi the ctenophore that invaded the Black Sea in the 1980s and damaged fisheries now also blooms in the North Baltic and Mediterranean seas Nemopilema nomurai a giant Asian jellyfish has bloomed frequently during this decade causing severe damage to the Japanese fishing industry Jellyfish Blooms Interactions with Humans and Fisheries is the fourth volume in this series Syntheses and original research articles address the question if jellyfish have increased globally and what factors may have contributed to the abundance of jellyfish This volume is the most extensive to date containing papers from all continents except Antarctica on scyphozoans hydrozoans cubozoans staurozoans and ctenophores and on the fate of jellyfish blooms This is a key reference for students and professional marine biologists oceanographers and fishery scientists and managers Previously published in Hydrobiologia vol 690 2012

**ICES Zooplankton Methodology Manual** Roger Harris,Peter Wiebe,Jurgen Lenz,Hein-Rune Skjoldal,Mark Huntley,2000-02-14 The term zooplankton describes the community of floating often microscopic animals that inhabit aquatic environments Being near the base of the food chain they serve as food for larger animals such as fish The ICES International Council for the Exploration of the Sea Zooplankton Methodology Manual provides comprehensive coverage of modern techniques in zooplankton ecology written by a group of international experts Chapters include sampling acoustic and optical methods estimation of feeding growth reproduction and metabolism and up to date treatment of population genetics and modeling This book will be a key reference work for marine scientists throughout the world Sampling and experimental design Collecting zooplankton Techniques for assessing biomass

and abundance Protozooplankton enumeration and biomass estimation New optical and acoustic techniques for estimating zooplankton biomass and abundance Methods for measuring zooplankton feeding growth reproduction and metabolism Population genetic analysis of zooplankton Modelling zooplankton dynamics This unique and comprehensive reference work will be essential reading for marine and freshwater research scientists and graduates entering the field     **Antarctic Siphonophores From Plankton Samples of the United States Antarctic Research Program** Angeles Alvarino, Joan M. Wojtan, M. Rachel Martinez, 1990 Published by the American Geophysical Union as part of the Antarctic Research Series Volume 49 The distribution of Siphonophora of the Antarctic Subantarctic and adjacent regions of the Pacific and Atlantic Oceans is described Specimens for this study were obtained during the United States Antarctic Research Program from USNS Eltanin cruises 3 5 8 23 25 28 35 and 38 during spring summer fall and winter Samples were collected from 1962 to 1969 using open closing and nonclosing plankton nets Information is compiled on horizontal distributions of siphonophores in the South Atlantic Ocean west of 0 Illustrations of the species and maps of distribution at the three bathymetric levels are also included In addition data on Eltanin cruise 30 are presented covering mainly the Pacific tropical region during the summer with some stations below the equator austral winter Vertical distributions of each species are discussed for the three bathymetric zones epipelagic 200 0 m mesopelagic 1000 200 m and bathypelagic below 1000 m Life stages and seasonal variations are also considered Eighty species of Siphonophora were identified in these collections Among these and described elsewhere were five new species *Lensia eltanin* *L. eugenioi* *L. landrumae* *Heteropyramis alcala* and *Thalassophyes ferrarii* The eudoxid stages of *L. lelouveteau* and *L. reticulata* were also discovered In addition the following rare Siphonophora species were collected *Halistemma cupulifera* *Desmophyes annectens* *Lilyopsis rosea* *Eudoxia macra* *Lensia achilles* *L. baryi* *L. exeter* *L. grimaldii* *L. hostile* *Nectocarmen antonioi* and *Clausophyes galeata* The most common species of the Antarctic Subantarctic region during the four seasons was *Dimophyes arctica* The eudoxid stages of *Chelophyes appendiculata* *Diphyes dispar* *Diphyopsis mitra* *Clausophyes ovata* and *Heteropyramis maculata* were abundant     *Book Catalog of the Library and Information Services Division: Shelf list catalog* Environmental Science Information Center. Library and Information Services Division, 1977     **Book catalog of the Library and Information Services Division** Environmental Science Information Center. Library and Information Services Division, 1977     Bishop Museum Occasional Papers , 1997     **Book Catalog of the Library and Information Services Division: Author-title-series indexes** Environmental Science Information Center. Library and Information Services Division, 1977     **University Bulletin** University of California (System), 1971     Catalog of Copyright Entries. Third Series Library of Congress. Copyright Office, 1973

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