MONOCULUS Copepod Newsletter

The Newsletter of the World Association of Copepodologists

Number 54 **December 2007**

CONTENTS

MONOCULUS Editor: Janet W. Reid
Research Associate, Division of Science & Learning
Virginia Museum of Natural History
21 Starling Avenue, Martinsville, Virginia 24112, U.S.A.
Tel. +1 276 656 6719; Fax. +1 276 656 6701
E-mail jwrassociates@sitestar.net
Deadline for submissions to the next number of MONOCULUS: 15 March 2008

—
ISSN 1543-0731 (On-line version)
ISSN 0722-5741 (Printed version)
—
WAC Homepage
http://www.copepoda.uconn.edu
MONOCULUS Homepage
http://www.copepoda.uconn.edu/newsletter

Each number of *MONOCULUS* is announced on:
Copepoda List copepoda@listas.usp.br
Crust-L crust-l@vims.edu
Planktonnet planktonnet@yahoogroups.com
Copepod List copepods@yahoogroups.com

Message from the President

As a local organizer of the PICES/GLOBEC/ICES 4th International Zooplankton Production Symposium, I was most pleased to host 334 zooplanktologists (plus ca. 40 accompanied persons) from 46 countries in Hiroshima this last May. The symposium focus "Human and climate forcing of zooplankton populations" was timely, reflecting growing public attention to the global environmental change, and thus lured such a large number of attendants, especially young scientists. Copepods were certainly a key group, since they were studied in more than 80% of the presentations. Hence, the Hiroshima symposium was like an interim meeting of copepodologists prior to our next regular meeting in the summer of 2008.

Just before this symposium, I was unexpectedly appointed to executive vice-president of Hiroshima University by the newly elected president. Today, senior professors of my age are requested to play so many roles for the university as well as for society. Former professors in my student days had much more time to enjoy their life. I would like to pursue my ideal image of a professor, i.e., a good teacher and researcher. Hence, I was reluctant to accept the president's request, but finally did so after his third visit to my office to convince me. Currently, I wear two hats: my professor hat and my administrator hat. I wear the former hat at my office in the Graduate School of Biosphere Science from 7 to 9 a.m., and then I move to the university head office to wear the latter hat. I am in charge of education affairs for ca. 16,000 beloved students. My work is so dynamic, like a Kabuki actor expressing one hundred faces.

Because of my limited time to spend with my students, they tend to work positively without my pushing and talk to me more aggressively. This change may be the students' self-adaptation to the new circumstance where their mentor is often absent. I will never give up my mentoring responsibilities for them.

An announcement on the next International Conference on Copepoda is available in this issue. Let all WAC members and members-to-be get together in Pattaya, Thailand, to celebrate our 10th Conference, a memorable milestone in WAC history.

— Shin-ichi Uye, President
Hiroshima University, Japan

Call for Papers

The 10th International Conference on Copepoda

13-19 July 2008, Asia Pattaya Beach Hotel, Pattaya, Thailand

Visit our website and register online
http://www.champa.kku.ac.th/10icoc or
http://www.10icoc.com

SYMPOSIA
(PLENARY LECTURES)

1. **Genomics and copepods**
2. **The use of cyclopoid copepods for biological control of larval disease-bearing mosquitoes**
3. **A matter of life and death: causes and consequences of copepod mortality**
4. **The role of small copepods in pelagic marine food webs**

EVENING SYMPOSIA

1. Present and future challenges for *Tigriopus* research

SPECIAL SESSIONS
ORAL AND POSTER CONTRIBUTIONS

PRE-CONFERENCE WORKSHOP

on "Systematics, Morphology, and Techniques for Identification of Copepods and their Larval Stages" will be held at Khon Kaen University during 7-11 July 2008.

Registration opens: November 2007
Deadline for Submission of Abstracts: 15 March 2008
Deadline for Registration: 15 April 2008

— Professor Dr. La-orsri Sanoamuang
Local Secretary of the 10th ICOC
P.O. Box 67, Khon Kaen University Post Office
Khon Kaen 40002, Thailand
E-mail: 10icoc@gmail.com or la_orsri@kku.ac.th

New Address for "World of Copepods" Website

The "World of Copepods" website has moved to a new address – **http://invertebrates.si.edu/copepod/index.htm**

The World of Copepods is a portal with databases and text plus links to other sites with information about copepods. The databases, on copepod researchers, bibliographic references, species names of copepods, and genus names of copepods, are easily searchable.

— Chad Walter
National Museum of Natural History (Smithsonian)
Washington, D.C., U.S.A.

"Advances in Crustacean Phylogenetics"
International Symposium in Rostock, Germany, 10-12 October 2008

Please visit the homepage at
http://www.biologie.uni-rostock.de/zoologie/acp_start.html
for further information.

Organizers: Stefan Richter & Christian Wirkner

Prof. Dr. Stefan Richter
Universitaet Rostock
Allgemeine & Spezielle Zoologie
Institut fuer Biowissenschaften
Universitaetsplatz 2
18055 Rostock, Germany
Ph. ++49(0)381 498 6260
Fax. ++49(0)381 498 6262
Email: stefan.richter3@uni-rostock.de
http://www.biologie.uni-rostock.de/zoologie/zoologie.html

"19th International Symposium of Subterranean Biology"
Fremantle, Australia, 21-26 September 2008

For those copepodologists interested in the fauna below the surface, the next International Symposium of Subterranean Biology will be held in Fremantle, Western Australia next year. This will be the first time this symposium is held outside Europe. To find out more details, see:

http://www.issb2008.org.au

— Danny Tang
The University of Western Australia

Report on the "Fourth International Zooplankton Production Symposium"
(ZPS, 28 May - 1 June 2007, Hiroshima)

About 355 zooplanktologists from 51 countries attended the "Fourth International Zooplankton Production Symposium" (ZPS, from May 28 through June 1 at the Hiroshima International Conference Center, Japan). The first symposium was held in Denmark back in 1961, the second in the U.K. in 1994, and the third in Spain in 2003. These previous symposia were organized in Europe, and there were long gaps (33 and 9 years) between meetings. This fourth symposium was the first to be held outside Europe. The focus of the symposium was "Human and climatic forcing of zooplankton populations," broadly reflecting our current concerns about climate change, decreases in revenues from oceanic resources, coastal ecosystem degradation, and more. The changes and degradation of marine ecosystems are very rapid and serious – as in many regions of Asia. That there is a particular need for plankton research is indicated by changing patterns of biogeochemical fluxes, by the need for ecosystem approaches to sustain and manage fisheries and aquaculture, the maintenance and conservation of habitats and biodiversity against increasing threats from over-harvesting marine resources, and anthropogenic disturbances such as pollution, eutrophication, and acidification. It is claimed by the ICES-PICES-GLOBEC organizers that research on plankton is a growing priority and is becoming increasingly sophisticated and integrated into international programs and multidisciplinary approaches. Plankton communities are central to the patterns and functions in all marine ecosystems. They constitute the bioactive elements in global and local biogeochemical cycles. Understanding them is critical for the energy-flow and food-web dynamics that result in marine productivity.

With this in mind, did the symposium indeed reflect the diverse objectives, methodologies, and approaches with a remarkable array of new findings that serves the increasing needs of ocean management in this new millennium? Though only a few contributions focused primarily on zooplankton production, there was much information provided that will be important for a deeper understanding of pelagic production (e.g., global comparison of diversity and functional groups at times of climate change; microbial competition with zooplankton; comparative food-web efficiencies; behavioral, life-history, and demographic constraints on production; modeling of various integration levels of zooplankton). Interestingly, there was a session on zooplankton research in Asian countries, which provided a forum for so-called "regional" studies that are dismissed for that reason in other places. It also became clear that zooplankton is related, directly or indirectly, to other disciplines. This holds for fisheries and other forms of human use of biological resources, microorganisms other than phytoplankton, including those heterotrophs (e.g., ciliates, rotifers) that in certain situations may play a larger role than expected.

Appropriately for the qualitative and quantitative significance of the Copepoda in pelagic systems, more than half of the presentations were related to copepods. Hence, this symposium provided a good opportunity for copepodologists to meet, discuss, and plan joint research activities before the 10th ICOC next year in Pattaya, Thailand.

— Hans-U. Dahms
National Taiwan Ocean University, Keelung

Report on the "13th International Meiofauna Conference" (THIRIMCO, 29 July - 3 August 2007, Recife)

Some 135 meiobenthologists from 22 countries participated in THIRIMCO, the thirteenth meeting of the International Association of Meiobenthologists, held at the Recife Palace Hotel in Pernambuco, Brazil. Because, as with the ICOCs, the IAM conferences occur every three years, this represented the 39th anniversary of meetings of this association. The dominant themes reflected the primarily marine-community-ecological interests of the participants, with some studies on freshwater faunas, and a large number of taxonomic reports as well. Talks and posters on nematodes and copepods predominated, but gastrotrichs, gnathostomulids, halacarids, kinorhynchs, loriciferans, opisthobranchs, platyhelminths, polychaetes, rotifers, sipunculans, and tardigrades were also represented among the approximately 165 presentations.

Prominent themes were the meiofauna of shallow-water habitats such as mangrove forests, seagrass beds, mudflats, and sandy beaches; deep-sea habitats, including hydrothermal vents; and effects of pollution. Impressive products from the MANUELA Project (Meiobenthic and Nematode Biodiversity: Unravelling Ecological and Latitudinal Aspects – http://nemys.ugent.be), a collaborative effort within the EU - MarBEF Network, now include an integrated dataset, and NeMys (an online nematode identification and taxonomical tool). Several presentations used information from MANUELA to reveal distributional and community patterns.

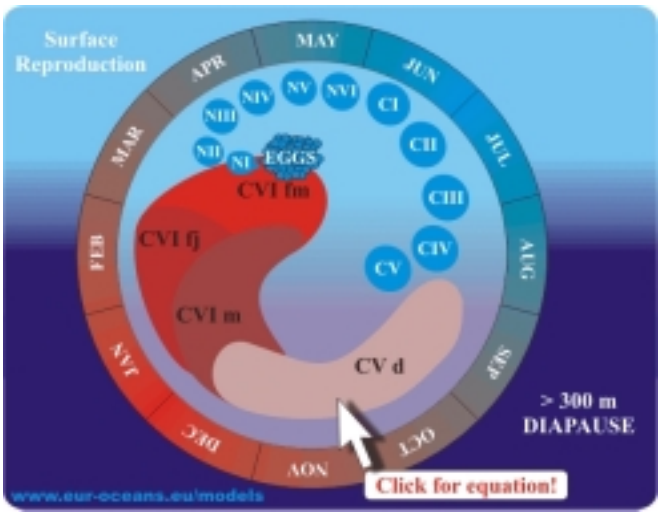
It was obvious that international cooperative projects continue to foster rapid progress in meiofauna studies, in particular in Brazil. In addition to the large and productive group of researchers at the Federal University of Pernambuco (UFPE) and the Rural Federal University of Pernambuco (UFRPE), participants came from 15 other universities and institutions in nine coastal states of the country. Thanks to the organizers for providing a stimulating meeting and inimitable Brazilian hospitality.

— Jan Reid
Virginia Museum of Natural History, Martinsville, U.S.A.

Current Copepod Editors for *Zootaxa*

Tomislav Karanovic and Danny Tang are currently copepod subject editors for Zootaxa. They have volunteered for this role while Genefor Walker-Smith is on maternity leave.

— Danny Tang



What do Copepods look like inside ecosystem models?

Ever looked at a model's insides, I mean really on the insides of it, the hieroglyphic equations, alien parameter names that never follow biological sense, the terminology that sounds like a different language? And if your facial expression was covered with all the incomprehension, confusion and self-doubt as was mine, then you are definitely not a modeler. And if you have never stared at the guts of a model, then the reaction of your colleagues around you may not have inspired you to do so either.

So! Not all process scientists have what it takes to digest the gritty details of the current global 3D models. Frequently it is even a challenge understanding modeled processes that one might be an expert at. One consolation must be that modelers have to be just as phobic about Eppendorf test tubes and latex gloves. Otherwise they wouldn't be performing their experiments virtually, right!

Whether we like it or not, whether we want to get involved or not, global biogeochemistry models are too powerful a tool to ignore, even if there are many gaps to fill and parameters to fix. They are an invaluable predictive, diagnostic and research grant-winning tool, especially in the age of global climate change.

A Key Trophic Link

A recent symposium on parameterization of global ocean ecosystem models (www.eur-oceans.eu/cadiz) reconfirmed that ecosystem models have many problems, and essential processes are oversimplified, misrepresented or just plain wrong – a frequent concern of process scientists. This seems to be even more the case at one key part of the food chain, the mid-trophic levels, or the domain of zooplankton.

The lack of sufficient parameterization data at zooplankton level reflects the long-term practices of the communities of modelers and process scientists, each performing their experiments on the same trophic level but with different research goals in mind. In order to plug the gap, the two communities have to educate each other in each other's languages, strengths, limitations and needs.

Modellers on one hand have the responsibility to describe and publish their models not just with their modeling colleagues in mind, but the non-expert. And, we, the non-expert, have less and less of an excuse to fear mathematical notations even if they are at first intimidating.

Virtual Copepods

In order to shed more light on the black boxes that are 3D global biogechemical models, an online prototype tool attempts to pool the equations and parameters that construct essential physiological and ecological processes within these virtual global ocean ecosystems. The Model Shopping Tool (www.eur-oceans.eu/models) is a database of detailed descriptions of the common building blocks of all models – their equations by process. A non expert can search for a process or a taxonomic group to examine how these are represented in models, down to the values of the parameters and constants.

The tool that this article is shamelessly trying to promote, is by no means the full solution that will plug the dialogue gap between modellers and process scientists. It will not generate the necessary parameterization data to better model mid-trophic levels, either. It does, however, aim to bring transparency to global biogeochemical models, and to allow process scientists to rapidly stroll through the main models in use. The database also allows the non-expert to compare their process of expertise and/or taxonomic group across models, and to examine other related processes or taxonomic groups.

In the case of mid-trophic levels, zooplankton in ecosystem models is represented in various ways, from a simple carbon-processing variable in nutrient-phytoplankton-zooplankton-detritus (NPZD) models (see NEMURO, PISCES, ECOSMO models in the Model Shopping Tool), to a more sophisticated Quota-like representation (ERSEM-PELAGOS) or even a mechanistic approach (ECO3M). In contrast, zooplankton can also be represented as a predator group feeding on size classes determined by its own size and transfering energy as part of the nutrients-to-top-predators virtual ecosystem (APECOSM model). In the latter examples, however, the compartment "zooplankton," whether in size groups or size-scaled, does not address zooplankton-specific processes. Individual-based models (IBM) are also added to the database, which focus on modeling copepod life stages and history, and how the environment impacts the energetics of the individuals.

The Model Shopping Tool is far from fully representative of all the modelling efforts and is still a prototype, but even so, it can already be used to work towards two objectives: homogenize the language that modellers themselves use among themselves (not a given!), and open up the insides of the models so that process scientists can be aware of detailed model capabilities and over-parameterization, and eventually even incorporate that knowledge into the design of their future experimental work.

— Ivo Grigorov

Author Information:

Ivo Grigorov is a Project Officer for Model Interfacing within EUROCEANS Network of Excellence, and responsible for developing and maintaining the Model Shopping Tool database (www.eur-oceans.eu/models). MoST aims to allow process scientists and non-ecosystem modelers to step into marine ecosystem models and compare the multiple modeling approaches used, from the philosophy down to the individual parameter values. For any queries and comments on the MoST or to include your modeling effort into the database, please contact **ivo.grigorov@eur-oceans.eu**

WebLinks

Model Shopping Tool (MoST) – pelagic ecosystem model descriptions and equations: www.eur-oceans.eu/models

EUROCEANS Network of Excellence: www.eur-oceans.eu

EUROCEANS Symposium on Parameterization of Trophic Models: www.eur-oceans.eu/cadiz

Bob Kabata Receives the Order of Canada

Zbigniew Kabata, C.M., D.Sc.

In May, the WAC's first President Bob Kabata was appointed a Member of the Order of Canada (C.M.). The text of the award is as follows:

"Bob Kabata is an internationally renowned authority on the biology of marine parasites and was the long-standing head of Parasitology research at the Pacific Biological Station in Nanaimo. His groundbreaking research, spanning over five decades, has greatly improved our understanding of marine ecology and has had a significant worldwide impact on the management of commercial fisheries. Undeterred by retirement, he actively pursues his research and remains an eminent authority in this important field of biological study."

An all-too-brief biography is available on Wikipedia at http://en.wikipedia.org/wiki/Zbigniew_Kabata

New Books and Websites: Reviews

Crustacea, Copepodos marinos I. Calanoida

By Francisco Vives & Alexandra A. Shmeleva

2006. Museo Nacional de Ciencias Naturales, Consejo Superior de Investigaciones Cientificas, Madrid. Fauna Iberica Vol. 29. 1152 pp. ISBN-13: 9788400085155.

From the Fauna Iberica website: "This is the first volume that FAUNA IBÉRICA dedicates exclusively to the revision of the class Copepoda in the Iberian-Balearic region. The monograph opens with an introduction on the changes suffered by the systematics of these crustaceans over the past, and then discusses the orders, superfamilies and families that are currently accepted. It continues by considering the general features of the external morphology and anatomy of the adult, the natural history of marine copepods, and collection, conservation and analysis procedures before addressing the work's main focus, the systematics of the order Calanoida. Included are the order's 33 families, with diagnoses and descriptions of its 111 genera and most significant morphological characteristics of the 520 species it comprises with the corresponding figures. After establishing its world distribution and that corresponding to the Iberian-Balearic region, the issue closes with comments on the order's biology. Provided are identification keys for its families, genera and species, along with a meticulous review of the scientific nomenclature (list of synonyms and current combinations) and the updated bibliography used in this monograph."

An annotated checklist and keys to the species of Copepoda Harpacticoida (Crustacea)

By John B. J. Wells

2007. Zootaxa 1568: 1-872.

Hard copy US$ 145.80, PDF version $87.20.

From the author's abstract: "A checklist of the approximately 4300 species of Copepoda Harpacticoida is presented. It is prepared according to the opinions of the latest revisers and adopts the phylogenetic system of Seifried (2003). The opportunity is taken to formally propose replacement names for preoccupied taxa (p. 14). Comments are provided on other taxonomic issues. A dichotomous key to families is followed by tabular keys to species within each family."

Treatise on Zoology – Anatomy, Taxonomy, Biology THE CRUSTACEA

Revised and Updated from the **TRAITÉ DE ZOOLOGIE** [*Founded by* P.-P. GRASSÉ (†)]

Edited by J. Forest and J. C. von Vaupel Klein. Advisory Editor F. R. Schram.

Volume 2.

With contributions by H. J. Ceccaldi, G. Charmantier, M. Charmantier-Daures, G. Dandrifosse, P. Juchault, J.-J. Legrand (†), S. Loret, A. Mayrat, B. R. McMahon, A. Péqueux, E. Schoffeniels (†), C. Spanings-Pierrot, K. Tanaka, and D. I. Williamson. English translation by J. C. von Vaupel Klein and L. C. von Vaupel Klein. Brill, Leiden. 521 pp., 2006. ISBN 13: 978 90 04113791 2

In 1954 I learned in the class of Invertebrate Zoology that TRAITÉ DE ZOOLOGIE is one of the best available standard references to the biology and systematics of animals. At the time I was an undergraduate student studying zoology in Mandarin at the National Taiwan University. Since I had limited knowledge of English and could hardly understand Libbie H. Hyman's *The Invertebrates*, let alone to read the famous *Traité de Zoologie*, which is written entirely in French. Thus, then, I could at most thumb through the pages of the Traité, stare at fancy illustrations, and guess what the author(s) was (were) trying to get across. Inasmuch as many carcinologists nowadays are just like me half-a-century ago without skill in understanding French, I acknowledge with many thanks the efforts put forth by Brill to arrange for translation with updates of the parts of the Traité dealing with the Crustacea. I am certain not only carcinologists but many biologists in the world will benefit from this thoughtful product of Brill.

The series is planned to comprise at least 8 volumes, based on the French parts hitherto published. In this **Volume 2** of **The Crustacea**, the following six chapters are included: Chapter 9 - The Circulatory System (original text by André Mayrat and updated by Brian R. McMahon and Kosuke Tanaka in May 2001); Chapter 10 - The Digestive Tract: Anatomy, Physiology, and Biochemistry (revised and updated by the original author Hubert Jean Ceccaldi in July 2002, latest additions August 2005); Chapter 11 - Osmoregulation: Morphological, Physiological, Biochemical, Hormonal, and Developmental Aspects (original version by E. Schoffeniels and G. Dandrifosse; updated and extended by A. Péqueux, G. Dandrifosse, S. Loret, G. Charmantier, M. Chjarmantier-Daures, and C. Spanings-Pierrot in October-April 2001; final additions November 2004-February 2005); Chapter 12 - The Endocrine Organs (revised and updated by the authors in 2001); Chapter 13 - The Ontogeny of Sex and Sexual Physiology (written by Jean-Jacques Legrand and Pierre Juchault in 1983 and updated by the latter in November 1999); and Chapter 14 - The Origin of Crustacean Larvae (completed in September 2001 by Donald I. Williamson).

Chapters 10 (digestive tract), 11 (osmoregulation) , and 13 (ontogeny) are the three major ones of this volume with each containing over one hundred pages. On the other hand, Chapter 14 (origins of crustacean larvae) is the shortest, comprising only 22 pages. This is mainly because only a handful of studies have so far been published on this subject. While most chapters include discussion of the topics found in Copepoda, Chapter 12 (endocrine organs) is exceptional, due to the lack of endocrine organ in the copepods. On the other hand, although species of euryhaline and stenohaline copepods are known, due to the limited studies conducted on their osmoregulation, the coverage of Copepoda in Chapter 11 is accordingly also limited. By the same token, the coverage of Copepoda in Chapter 9 is scarce, because a heart is completely absent in most copepods. The heart described for the two species of calanoids, *Calanus finmarchicus* and *Epilabidocera amphitrites*, is exceptional rather than the rule in Copepoda. As far as Copepoda is concerned, Chapter 10 on the digestive tract is the leading one carrying copepod information on 18 pages. Next is Chapter 13, where information on the ontogeny of Copepoda is found on 13 pages. There is a section in this last chapter called: *Influence of the host on the sex of a parasite*. Regrettably, Do and Kajihara's (1986) work on the sex determination in *Pseudomyicola spinosus*, a symbiont of mussels, was overlooked by the junior author of this chapter when the updating was made in 1999.

This volume concludes with extensive taxonomic (13 pages) and subject (21 pages) indices, which are very helpful and useful for readers to locate the wanted information scattered in various chapters.

— Ju-shey Ho
California State University
Long Beach, California, U.S.A.

Reference:

Do, T.T. & T. Kajihara. 1986. Sex determination and atypical male development in a poecilostomatoid copepod, *Pseudomyicola spinosus* (Raffaele and Monticelli, 1885). Syllogeus 58:283-287.

Post-Embryonic Development of the Copepoda

By Frank D. Ferrari & Hans-Uwe Dahms

2007. Crustaceana Monographs 8:1-256. ISBN 978 9004157 13 2.

From the publisher's website: "Crustaceans that are now called copepods have been known, not necessarily by that name, since Aristotle. Published reports of their post-embryonic development, however, date only from the last 250 years. This monograph is a first attempt to gather all published information about copepod post-embryonic development. Careful diagnoses of nauplius and copepodid allow comparisons of specific developmental stages among species. Changes from the last naupliar stage to the first copepodid stage are used to interpret the naupliar body. Body and limb patterning are discussed, and models of limb patterning are used to generate segment homologies for the protopod and both rami. Contributions of post-embryonic development to phylogenetic hypotheses are considered and suggestions for future studies are provided."

Grundwasserfauna Deutschlands: Ein Bestimmungswerk

Edited by Horst Kurt Schminke & Gunnar Gad, with assistance from Herta Sauerbrey & Iris Zaehle

2007. Deutsche Vereinigung für Wasserwirtschaft, Abwasser und Abfall e.V., Hennef. Series DWA-Themen. 628 pp. ISBN-13: 9783939057444. € 119.

This soft-cover volume in ample A4 format was designed to aid non-specialists in identifying some 370 species belonging to the main groups of groundwater fauna that are known from Germany. The chapters on Cladocera, Copepoda, Ostracoda, Bathynellacea, Amphipoda, and Mollusca were written by Horst Kurt Schminke; on Tardigrada, Annelida, Nemertini, Gastrotricha, and Nematoda by Gunnar Gad; on Plathelminthes and Rotifera by Wilko Ahlrichs; on Acari by Peter Martin, Reinhard Gerecke, Peter Rumm, and Ilse Bartsch; on Nematoda by Heino Christl; and on Isopoda by Johann Wolfgang Wägele. Each species is amply illustrated, and the accompanying text includes a morphological diagnosis, a summary of its ecology and reproductive biology, and its geographical

distribution (for Germany in detail, and other countries listed). Each chapter includes a brief general introduction to the group, with sections on morphology, ecology, study methods; and there are keys to family- and eventually to species-level. The literature references for each chapter include carefully selected, essential taxonomic sources, current up to 2003 or so. Peter Rumm provided a general introduction on the groundwater realm and its inhabitants, research methods, and the range of threats that these fascinating little animals are now facing. Appended to this introduction is a cleverly composed pictorial and verbal key to aid the beginner in identifying the major groups – accomplished in two facing pages!

Carefully edited, this volume, sponsored by the German Association for Water Management, Sewage and Waste, with financial support from the Länderfinanzierungsprogramm "Wasser, Boden und Abfall," was obviously a labor of love. It will be an essential reference for European researchers and their students who are interested in any aspect of the small metazoans of subterranean waters. Printed on recycled paper, the book should last for a generation, and fall apart from use about the time that a new edition will be necessary.

— Jan Reid

"Plankton Identifier: a software for automatic recognition of planktonic organisms"

By Stéphane Gasparini

2007. http://www.obs-vlfr.fr/~gaspari/Plankton_Identifier/index.php

Plankton Identifier is a free software that allows the automatic identification of objects (plankton and/or particles) from a set of images with their associated data.

A Guide to the Meso-Scale Production of the Copepod *Acartia tonsa*

By Nancy A. Marcus & Jeffrey A. Wilcox

Florida Sea Grant, University of Florida, PO Box 110409, Gainesville, FL, 32611-0409, (352) 392.2801, www.flseagrant.org

http://www.flseagrant.org/program_areas/aquaculture/copepod/index.htm

"This website is a guide for the daily production of a few million *A. tonsa* nauplii for feeding to marine vertebrates and invertebrates."

New Forum on Aquatic Alien Species

https://listserv.heanet.ie/cgi-bin/wa?A0=AQUATIC-ALIENS

AQUATIC-ALIENS, a new public forum, is open to all interested in non-native aquatic species and their impacts on freshwater and marine biodiversity. This forum is for posting news items and so forth, that are of interest to people working in the area of aquatic (marine & freshwater) invasive species.

The United States Fish Commission Steamer *Albatross*
(from the IZ/NMNH/SI Oceanographic Data Sets website)

Historical Data Sets Online

The Department of Invertebrate Zoology (NMNH) of the Smithsonian Institution recently posted information on access to historical Oceanographic Data Sets. The site hosts station data and original cruise logs from the research vessels *Albatross* and *Blake*. They can be accessed through the Invertebrate Zoology home page
http://invertebrates.si.edu/
or directly at
http://invertebrates.si.edu/albatross/index.cfm

José Bresciani

22 May 1926 - 20 December 2006

Professor José Bresciani, known to his colleagues and friends as "Pepe", died on 20 December 2006 at the age of 80. He was a prominent Professor in Denmark, and authored multiple textbooks. As a parasitologist who worked on parasitic copepods among other groups, he authored 177 publications; those on the Copepoda are listed below.

José Bresciani was born on 22 May 1926 in Lima, Peru, the son of Spaniards and Peruvians from his mother's side and Italian immigrants from his father's side. In Lima he attended an Italian school, where he enjoyed a classical education, learning among other languages Greek and Latin. He then studied fine arts at an Austrian art school in Lima. He left Peru in 1947 for France, and hence his highschool diploma was equivalent to the French. Particularly attracted by French culture, he enrolled in 1950 at the Sorbonne in Paris for a propedeutic course in biology. When he became acquainted with his wife-to-be Agnette, he moved in 1952 to her hometown of Copenhagen, which then became his permanent place of residence. As a master's student in biology he worked for the Danish Fishery and Research Institution. It was then that he participated in the annual cruises of the Dana III to the Faroe Islands and Greenland. In 1963 he graduated in "Comparative Anatomy of Invertebrates", as a Magister of Science cumulatively with five papers on copepod taxonomy and anatomy. Most of his studies were done during a stay at the Helsingør Marine Biological Laboratory, in those days headed by Gunnar Thorson. During the years of studying primarily copepods collected from the Gulmarfjord area of Kristineberg Station, he was introduced to Karl Lang and Gösta Jägersten from Stockholm. In Kristineberg he met for the first time Peter Ax (then at Kiel) and Adolf Remane, who were both studying the interstitial fauna of sands. From 1963 to 1968 he worked at the Institute for Comparative Anatomy in Copenhagen under the director K.G. Wingstrand. From 1968 until his death, he worked at the Royal Veterinary Institute for Ecology and Molecular Biology/ Section Zoology, where he held a chair in zoology until his retirement. This chair was previously held, for example, by Boas, Schøtte, and Torben Wolff.

This post was coupled with heavy teaching obligations. Still, he published more than 130 papers in his professional life and remained very busy, even after becoming Emeritus on his birthday, 22 May 1996. He worked on various aspects of copepod anatomy and morphology, being especially attracted by those parasitic copepods which are hardly recognizable as crustaceans at all. On copepod anatomy he worked together with H-U. Dahms, A. Fosshagen, L. Laubier, P. López-González, P. I. Lützen, K. Nagasawa, and K.W. Ockelmann, and on parasites of trout with K. Buchmann. As a parasitologist he worked among approximately 15 colleagues in the Copenhagen area (most of them belonging to a Center of Experimental Parasitology). He also became involved in ultrastructural studies of the Mesozoa, together with Tom Fenchel, on various Platyhelminthes as well as Nemathelminthes. The use of fungi in the biological control of nematodes or insects became another focus of his research. Later, besides comparative studies on the copepod gut and the naupliar development of symbiotic copepods, he became involved in joint studies on the composition of the cuticle of Nemathelminthes.

A personal remembrance

My nineteen years knowing, corresponding, and collaborating with José Bresciani began in 1987 when we first met during the 3rd ICOC in London, organized by Geoff Boxshall. In those days we pursued joint studies on the ontogeny of *Stenhelia peniculata*, which he had studied before, and the ultrastructural investigation of the copepod cuticle in his Copenhagen laboratory. We met again in 1993 during the 5th ICOC in Baltimore, during the 6th ICOC in 1996 in Germany that I was co-organizing, and during the 7th ICOC in Brazil in 1999.

José Bresciani certainly was an artistic person, since he was always interested in forms, structures, and colors. He thought in images, as he said himself. As a child he was particularly fond of insects because of their diverse morphology and coloration. His favorite artists were Mondrian, Kandinski, Klee (and his "magical wall"), and especially Italian artists. During his time in Paris he also initially studied fine arts, especially Cubism and modern art. Later, he became fascinated by Precolumbian cultures during a journey through Mexico and Guatemala. He enjoyed meals from all countries, particularly the Spanish, Italian, French, and Japanese cuisines.

He was happy in Denmark, as he assured me when I was visiting his cozy home in Holte, Copenhagen. "Being a Mediterranean type of person, the calmness of northern mentality becomes boring at times," he told me. The more he enjoyed holiday journeys to the south – "but always being happy when back at home." More unusual for a biologist, he actively demonstrated against the Vietnam War and signed the Russell Tribunal II. As a liberal democrat he was generally for personal freedom and against any doctrinaire system. José Bresciani is survived by two sons, one daughter, and six grandchildren. For the past 36 years he was accompanied by Vibeke Dantzer, a professor of veterinary anatomy at the same university. Both shared their interests, before all in science and zoology, and among others in arts, traveling, and kitchen skills. Here – as I could experience – the couple as a team produced creatively delicious meals of various kinds.

José did not seek approval from others for his worth as a scientist. His life was dedicated to science, and he was always motivated by a general interest in the field and the subject he was studying, even during periods of tiresome

work, which is naturally involved – especially in histological and taxonomic studies – or when experiencing administrative difficulties. José told me that "Systematic and morphological research is needed as the base of all biology - the illustrious functions, let's say, about the dynamics of parasite infection rates explain little when neither hosts nor parasites have appropriate names, based on their phylogenetic relationships, or the organ and tissue affected and structural as well as functional alterations are unknown. And, adding the least, morphology will always be needed for documentation and illustration." These aspects convinced Danish authorities to continue sponsoring anatomical research, especially on the Crustacea, which has a long tradition in Danmark, before Bresciani, Lützen, and Høeg, with, for example, Krøyer, Steenstrup, Lütken, Heegard, Levinsen, Stephensen, Hansen, and Wolf.

On being asked about his personal fate after retirement, he explained to me that he was offered a large, brand-new laboratory, including a technician at his side, where he could move even four months after his retirement. This was certainly a reward for more than three decades of research and teaching, maintaining good contacts with the university, and being the author of the only Danish textbook on Invertebrate Zoology.

Professor José Bresciani really enjoyed his second life after retirement by continuing to study parasites, and he has greatly contributed to the progress of parasitology and copepodology.

— Hans-U. Dahms
National Taiwan Ocean University, Keelung

Publications on Copepods by José Bresciani:

Bresciani, J. 1961. Some features of the larval development of *Stenhelia* (*Delavalia*) *palustris* Brady, 1868 (Copepoda Harpacticoida). Videnskabelige Meddelelser fra Dansk Naturhistoriske Forening 123:237-247.

Bresciani, J. & J. Lützen. 1960. *Gonophysema gullmarensis* (Copepoda parasitica). An anatomical and biological study of an endoparasite living in the ascidian *Ascidiella aspersa*. I. Anatomy. Cahiers de Biologie Marine 1(2):157-184 + pls. 1-7.

Bresciani, J. & J. Lützen. 1961. *Gonophysema gullmarensis* (Copepoda parasitica). An anatomical and biological study of an endoparasite living in the ascidian *Ascidiella aspersa*. II. Biology and development. Cahiers de Biologie Marine 2(4):347-371.

Bresciani, J. & J. Lützen. 1961. The anatomy of a parasitic copepod, *Saccopsis steenstrupi* n.sp. Crustaceana 3(1):9-23 + pl. 1.

Bresciani, J. & J. Lützen. 1962. Parasitic copepods from the West Coast of Sweden including some new or little known species. Videnskabelige Meddelelser fra Dansk Naturhistoriske Forening 124:367-408.

Bresciani, J. 1964. Redescription of *Rhodinicola elongata* Levinsen and description of *Rhodinicola gibbosa* sp. nov., parasitic copepods of Maldanid Polychaetes. Ophelia 1(2):223-234.

Bresciani, J. 1964. *Sigecheres brittae* gen. et sp. nov., a parasitic copepod from the polychaete *Sige fusigera* Malmgren. Ophelia 1(2):295-301.

Bresciani, J. & J. Lützen. 1966. The anatomy of *Aphanodomus terebellae* (Levinsen) with remarks on the sexuality of the family Xenocoelomidae nov. fam. (parasitic Copepoda). Bulletin du Muséum national d'Histoire naturelle, Paris (2)37(5):787-806 + Pl. 1.

Bresciani, J. & K.W. Ockelmann. 1966. *Axinophilus thyasirae* gen. et sp. nov., a parasitic copepod from the bivalves *Thyasira flexuosa* and *T. sarsi*. Ophelia 3:179-182.

Bresciani, J. 1967. Redescription du mâle de *Selioides bolbroei* Levinsen, avec une note sur la répartition géographique du genre *Selioides* (Copepoda Cyclopoidea). Crustaceana 13(2):220-226.

Bresciani, J. 1968. Den cuticulære struktur hos parasitiske Crustaceer. Finska Vetenskabs-Societeten Parasitol. Institut, Tiedoksianto 8 Information: 32-33.

Bresciani, J. 1970. A new *Cholidya* from the mantle cavity of a cephalopod (Crustaea, Harpacticoidea, Tisbidae). Steenstrupia 1(2):11-16.

Bresciani, J., L. Laubier & J. Lützen. 1970. Sur la découverte de *Gonophysema* Bresciani & Lützen (Copépode parasite) dans un hôte nouveau, *Distomus* (Ascidie), en Méditerranée. Bulletin de la Société Zoologique de France 95(1):173-178.

Bresciani, J. & J. Lützen. 1972. The sexuality of *Aphanodomus* (Parasitic Copepod) and the phenomenon of cryptogonochorism. Videnskabelige Meddelelser fra Dansk Naturhistoriske Forening 135:7-20 + pls. 1,2.

Bresciani, J. & J. Lützen. 1974. On the biology and development of *Aphanodomus* Wilson (Xenocoelomidae), a parasitic copepod of the polychaete *Thelepus cincinnatus*. Videnskabelige Meddelelser fra Dansk Naturhistoriske Forening 137:25-63.

Bresciani, J. & J. Lützen. 1975. *Melinnacheres ergasiloides* M. Sars, a parasitic copepod of the polychaete *Melinna cristata*, with notes on multiple infections caused by annellidicolous copepods. Ophelia 13(1-2):31-42.

Bresciani, J. & N. Haarløv. 1985. Zoologien og den kgl. Veterinaer- og Landbohøjskole. Ugeskrift for Jordbrug 46:1287-1295.

Bresciani, J. 1986. The fine structure of the integument of free-living and parasitic copepods. A review. Acta Zoologica 67(3):125-145.

Bresciani, J. 1986. Aspects of morphology and anatomy of the tegument in freeliving and parasitic copepods. In: Schriever, G., H.K. Schminke & C.-t. Shih (eds.). Proceedings of the Second International Conference on Copepoda, Ottawa, Canada, 13-17 August, 1984. Syllogeus 58:627. [Abstract.]

Nagasawa, K., J. Bresciani & J. Lützen. 1988. Morphology of *Pectenophilus ornatus*, new genus, new species, a

copepod parasite of the Japanese scallop *Patinopecten yessoensis*. Journal of Crustacean Biology 8(1):31-42.

Bresciani, J. 1988. The integumental ultrastructure of *Lamippe rubra* Bruzelius and *Enalcyonium rubicundum* Olsson (Copepoda, Poecilostomatoida). In: Boxshall, G.A. & H.K. Schminke (eds.). Biology of Copepods. Proceedings of the Third International Conference on Copepoda. Developments in Hydrobiology 47. Hydrobiologia 167/168:539-543.

Bresciani, J. 1991. SEM and TEM study of the male of the parasitic copepod *Pectenophilus ornatus*. In: Uye, S.-i., S. Nishida & J.-s. Ho (eds.). Proceedings of the Fourth International Conference on Copepoda. Bulletin of the Plankton Society of Japan, Special Volume: 11-18.

Nagasawa, K., J. Bresciani & J. Lützen. 1991. *Ischnochitonika japonica*, new species (Copepoda), a parasite on *Ischnochiton (Ischnoradsia) hakodadensis* (Pilsbry) (Polyplacophora: Ischnochitonidae) from the Sea of Japan. Journal of Crustacean Biology 11(2):315-321.

Dahms, H.-U. & J. Bresciani. 1993. Naupliar development of *Stenhelia* (*D.*) *palustris* (Copepoda, Harpacticoida). Ophelia 37(2):101-116.

Bresciani, J. & H.-U. Dahms. 1994. The integumental ultrastructure of *Parathalestris harpactoides* (Claus 1863) (Copepoda, Harpacticoida). In: Ferrari, F.D. & B.P. Bradley (eds.). Ecology and Morphology of Copepods. Proceedings of the Fifth International Conference on Copepoda. Developments in Hydrobiology 102. Hydrobiologia 292/293:137-142.

Bresciani, J. & J. Lützen. 1994. Morphology and anatomy of *Avdeevia antarctica*, new genus, new species (Copepoda: Harpacticoida; Tisbidae) parasitic on an antarctic cephalopod. Journal of Crustacean Biology 14(4):744-751.

Buchmann, K. & J. Bresciani. 1997. Parasitic infections in pond-reared rainbow trout *Oncorhynchus mykiss* in Denmark. Diseases of Aquatic Organisms 28(2):125-138.

López-Gonzalez, P.J., J. Bresciani & M. Conradi. 1998. *Tarificola bulbosus*, new genus, new species, a highly transformed parasitic copepod, with information on its parasitism and larval development. Journal of Crustacean Biology 18(3):581-589.

Buchmann, K. & J. Bresciani. 1999. Parasites of the Danish rainbow trout. Dansk Veterinärtidsskrift 82(7):286-293. [In Danish.]

Østergaard, P. & J. Bresciani. 2000. SEM and TEM study of the integument of *Ophioika* sp. (Crustacea, Copepoda). Journal of Crustacean Biology 20(4):674-679.

López-González, P.J., J. Bresciani, R. Huys, A. González, A. Guerra & S. Pascual. 2000. Description of *Genesis vulcanoctopusi* gen. et sp. nov. (Copepoda: Tisbidae) parasitic on a hydrothermal vent octopod and a reinterpretation of the life cycle of cholidyinid harpacticoids. Cahiers de Biologie Marine 41(3):241-253.

López-González, P., J. Bresciani & M. Conradi. 2000. Two new species of *Herpyllobius* Steenstrup & Lütken, 1861 and a new record of *H. antarticus* Vanhöffen, 1913 (parasitic Copepoda) from the Weddell Sea, Antarctica. Polar Biology 23(4):265-271.

Bresciani, J. & P. López-González. 2001. *Arthurhumesia canadiensis*, new genus and species of a a highly transformed parasitic copepod (Crustacea) associated with an ascidian from British Columbia. Journal of Crustacean Biology 21(1):90-95.

López-González, P. & J. Bresciani. 2001. New Antarctic records of *Herpyllobius* Steeenstrup & Lütken, 1861 (Parasitic Copepoda) from the EASIZ-III cruise, with description of a new subgenus and two new species. Scientia Marina 65(4):357-366.

Buchmann, K. & J. Bresciani. 2001. An Introduction to Parasitic Diseases of Freshwater Trout. Drawings by B. Beyerholm. DSR Publishers, Frederiksberg, Denmark. 76 pp.

López-González, P., J. Bresciani & M. Conradi. 2006. New genus, three new species and new records of Herpyllobiidae Hansen, 1892 (Crustacea, Copepoda), parasites of polychaetes from Antarctica. Scientia Marina 70(2):243-259.

Francesc Pagès

1962-2007

The Spanish oceanographer and specialist in marine gelatinous zooplankton Francesc Pagès passed away suddenly on 5 May 2007. Please consult the obituary by Josep Maria Gili (2007). Dr. Pagès' scientific legacy includes several publications touching on some aspect of copepods, which are listed below.

Gili, J.M. 2007. Francesc Pagès (1962-2007). Scientia Marina 71(2):413-414.

Publications on Copepoda by Francesc Pagès:

Sabates, A., J.M. Gili & F. Pagès. 1989. Relationship between zooplankton distribution, geographic characteristics and hydrographical patterns off the Catalan coast (Western Mediterranean). Marine Biology, Berlin 103(2):153-159.

Schnack-Schiel, S.B., W. Hagen, U. Klauke, E. Miszdalski, F. Pagès, T. Probyn, M. Stürcken-Rodewald & D. Thomas. 1993. Zooplankton. In: Spindler, M., G. Dieckmann & D. Thomas (eds.). Die Expedition

ANTARKTIS X/3 mit FS "Polarstern" 1992. Berichte zur Polarforschung 121:75-84.

Pagès, F., H.E. González & S.R. González. 1996. Diet of the gelatinous zooplankton in Hardangerfjord (Norway) and potential predatory impact by *Aglantha digitale* (Trachymedusae). Marine Ecology Progress Series 139(1-3):69-77.

Pagès, F. & S.B. Schnack-Schiel. 1996. Distribution patterns of the mesozooplankton, principally siphonophores and medusae, in the vicinity of the Antarctic Slope Front (eastern Weddell Sea). Journal of Marine Systems 9:231-248.

Pagès, F., H.E. González, M. Ramon, M. Sobarzo & J.M. Gili. 2001. Gelatinous zooplankton assemblages associated with water masses in the Humboldt Current System, and potential predatory impact by *Bassia bassensis* (Siphonophora: Calycophorae). Marine Ecology Progress Series 210:13-24.

González, H.E., R. Giesecke, C.A. Vargas, M. Pavez, J. Iriarte, P. Santibáñez, R. Escribano & F. Pagès. 2004. Carbon cycling through the pelagic foodweb in the northern Humboldt Current off Chile (23° S). ICES Journal of Marine Science 61(4):572-584.

— with contributions from Sigrid Schnack-Schiel
Alfred-Wegener-Institut für Polar- und Meeresforschung
Bremerhaven, Germany

News from or about Members

From Dagmar Frisch:

In April I started my postdoc with Larry Weider at the Biological Station of the University of Oklahoma. I received a Marie Curie fellowship (EU funding) to work on *Daphnia lumholtzi* genetics, and will be here in Oklahoma for 2 years, and after that continue the project for another year at the Doñana Biological Station in Sevilla, Spain. Please note my new mail address (below), while my email address remains the same.

With my best wishes,
Dagmar

Dr Dagmar Frisch
University of Oklahoma Biological Station HC-71, Box 205
Kingston, OK 73439 U.S.A.
Office +1 405 325 7432
Home +1 580 564 0318
Fax +1 580 564 2479
E-mail dfrisch@sistern.net

New Addresses or E-mails:

D. Sc. Dr. Hans-Uwe Dahms
Zooplankton and Coral Reef Laboratory
Institute of Marine Biology
National Taiwan Ocean University (NTOU)
2, Pei-Ning Road, Keelung 202, Taiwan 20224, R. O. C.
Tel: 886-2-2469-8084; Fax: 886-2-24629464
e-mail: hansd@ntou.edu.tw

Dr. Claudia Halsband-Lenk
Zooplankton Ecologist
Plymouth Marine Laboratory
Prospect Place
Plymouth
PL1 3DH U.K.
Phone: +44 1752 63-3415
Fax: +44 1752 63-3101
Mailto: clau1@pml.ac.uk
Website: www.pml.ac.uk

Prof. Dr. Rubens M. Lopes
Instituto Oceanográfico
Universidade de São Paulo
Praça do Oceanográfico 191
São Paulo - SP 05508-900, Brazil
Phone + 55 11 30918963 / 30916556
Fax + 55 11 30916607
Email: rubens@usp.br
Skype: rubens-iousp
(new e-mail)

Peter Thor, PhD
Docent, Assistant Professor
Göteborg University, Dept. of Marine Ecology
Kristineberg Marine Research Station
S-450 34 Fiskebäckskil, Sweden
Phone: +45 46 36 15 55
Cellphone: +45 21 22 27 87
Email: peter.thor@marecol.gu.se
http://hjem.get2net.dk/copepodenergetics

Ko Tomikawa, D. Sc.
Department of Science Education
Graduate School of Education
Hiroshima University
1-1-1 Kagamiyama, Higashihiroshima,
Hiroshima 739-8524, Japan
Tel and Fax: +81-824-24-7093
E-mail: tomikawa@hiroshima-u.ac.jp
(new address)

New Candidate Member

Melanie Andrews
Tasmanian Aquaculture and Fisheries Institute, University of Tasmania.
Nubeena Crescent, Taroona, 7053 Tasmania, Australia
(61)3 62277263
andrewsm@utas.edu.au
Area of specialization: Aquatic parasitology.

Copepods for Food (continued)

At the Keelung Conference, La-orsri Sanoamuang described the use of freshwater riverine copepods to make a condiment. It seems that the inventive people of Thailand and other Southeast Asian countries also use marine copepods and several other kinds of zooplankters to make a shrimp paste known as "kapi." According to the article by Ling and Suriyong, the copepods are called "khi thau khai" (eggs of mysids).

For those who may wish to make their own kapi, this article includes instructions!

Ling, S.W. & M.K. Suriyong. 1954. Notes on the utilization of zoo-plankton for food in Thailand. In: Symposium on Marine and Freshwater Plankton in the Indo-Pacific, 1954. Indo-Pacific Fisheries Council, Bangkok, UNESCO-FAO. Pp. 55-57.
http://www.apfic.org/Archive/symposia/1954/07.pdf

— Jan Reid

Editor's Notes

For their contributions and assistance for this number, I am grateful to Hans Dahms, Dagmar Frisch, Ivo Grigorov, Claudia Halsband-Lenk, Kai Ho, La-orsri Sanoamuang, Sigi Schiel, Kurt Schminke, Eduardo Suárez-Morales, Danny Tang, Ko Tomikawa, Shin-ichi Uye, Chad Walter, and John Wells; and as always to Rubens Lopes for his essential help and invaluable advice.

— Jan Reid, Editor
Martinsville, U.S.A.

WAC Executive Committee
2005-2008 Term

***President*:**

Shin-ichi Uye 上 真一
Graduate School of Biosphere Sciences
Hiroshima University
1-4-4 Kagamiyama, Higashi-Hiroshima 739-8528, Japan
suye@hiroshima-u.ac.jp

***Past-President*:**
H. Kurt Schminke
Universität Oldenburg
Fachbereich 7, Biologie
Postfach 25 03
D-26111 Oldenburg, Germany
schminke@uni-oldenburg.de

***Vice-President*:**
Jefferson T. Turner
Department of Biology
University of Massachusetts Dartmouth
North Dartmouth, Massachusetts 02747, U.S.A.
jturner@UMassD.edu

***General Secretary*:**
Eduardo Suárez-Morales
ECOSUR, El Colegio de la Frontera Sur - Unidad Chetumal
Apartado Postal 424
Chetumal, Q. Roo 77000, Mexico
esuarez@ecosur-qroo.mx

***Treasurer*:**
John A. Fornshell
6911 Quander Road
Alexandria, Virginia 22307, U.S.A.
johnfornshell@hotmail.com

***Executive Council Members*:**

Janet Bradford-Grieve
National Institute of Water & Atmospheric Research
Box 14901
Kilbirnie, Wellington, New Zealand
j.grieve@niwa.cri.nz

Gaël Dur
Institute of Marine Biology
National Taiwan Ocean University
Keelung, 202, Taiwan, Republic of China
D94340006@mail.ntou.edu.tw

Jiang-Shiou Hwang 黃將修
Institute of Marine Biology
National Taiwan Ocean University
Keelung, 202, Taiwan, Republic of China
Jshwang@mail.ntou.edu.tw

Mark D. Ohman
Integrative Oceanography Division
Scripps Institution of Oceanography
University of California San Diego
La Jolla, California 92093-0218, U.S.A.
mohman@ucsd.edu

Sami Souissi
Marine Station of Wimereux-CNRS
University of Sciences and Technologies of Lille
BP 80, Wimereux 62930, France
Sami.Souissi@univ-lille1.fr

***Local Secretary, 10th ICOC*:**
La-orsri Sanoamuang ละออศรี เสนาะเมือง
Applied Taxonomic Research Center (ATRC)
Faculty of Science
Khon Kaen University
Khon Kaen 40002, Thailand
la_orsri@kku.ac.th

Appointed Positions:

***MONOCULUS Editor*:**
Janet W. Reid
Research Associate, Virginia Museum of Natural History
Martinsville, Virginia 24112, U.S.A.
jwrassociates@sitestar.net

***Webmaster*:**
Rubens M. Lopes
University of São Paulo
Oceanographic Institute
Dept. of Biological Oceanography
Praça do Oceanográfico 191
São Paulo, SP 05508-900, Brazil
rubens@usp.br

Membership in the WAC: Any person interested in any aspect of the study of Copepoda is eligible for membership in the WAC. Contact the General Secretary for an application form and other information.
Dues: Dues of US $20.00 per annum are payable by Founder, Active, and Candidate members. Members who have difficulty paying dues may apply to the President and the Executive Council for a waiver or reduction. Dues may be paid in advance. WAC accepts personal checks issued in local currencies, made payable to WAC. Checks should be sent by mail to the Treasurer of the WAC. Dues may also be paid in person at WAC conferences. Members who are more than two years in arrears will automatically have their membership terminated.
Newsletter: All members receive the newsletter *MONOCULUS*, which appears at least once a year, in electronic or printed versions.
Copepod Libraries: Monoculus-Library: C/o Prof. Dr. Pedro Martínez Arbizu, Forschungsinstitut Senckenberg, DZMB-Forschungsinstitut Senckenberg, Monoculus-Library, Suedstrand 44, D-26382 Wilhelmshaven, Germany.
C. B. Wilson Library: C/o Mr. T. Chad Walter, Smithsonian Institution, PO Box 37012, NMNH, MRC-163, Washington DC 20013-7012, U.S.A.