MONOCULUS Copepod Newsletter

The Newsletter of the World Association of Copepodologists

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Message from the President

Dear copepodologists,

When I was a child, Christmas was something I could not wait for. I fervently hoped that my list of wishes would be fully respected, and I was busy myself making little gifts for family members and for my friends. I tried to figure out how they would like what I had produced for them, and I also could not wait to see their real reactions.

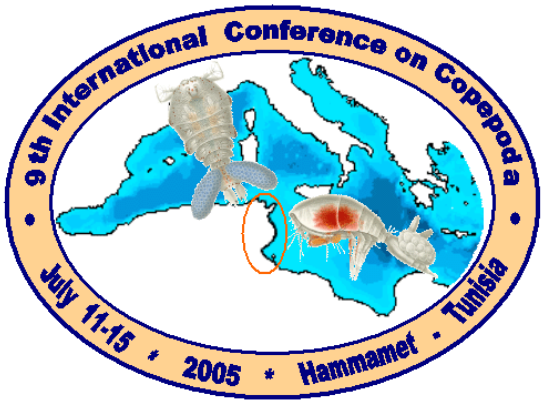
Somehow I am in a similar situation now, shortly before the 9th International Conference on Copepoda in Hammamet. I know the local organizing committee is busy preparing for it to be another highlight in the sequence of our conferences. My wishes are that there will be interesting talks, stimulating discussions, rewarding personal encounters and lots of young participants. It is the first time that we meet on the African continent, and I wish for this also to be visible in the participants. I also wish for the young people to discuss with me how they could become more active and more influential in Society matters, and I also wish for those who are considering hosting the next conference to come up with an informative presentation of their venue and the scientific surroundings. I even wish for them to contact me at least one month in advance.

Myself, I am working at the "Maxilliped Lecture". I have had a lot to read for it and have spent lots of stimulating week-ends doing so. Now I use the time between my normal duties to piece it all together. Thus the conference is in my mind all the time, every finished paragraph brings me nearer to it, and you will not be surprised when I tell you that I count the days.

This is my last message to you as President of WAC. I thank the editor of our newsletter, Janet Reid, who has not only led it into the electronic age but has also given it a new kick and has made it more attractive with the extensive supplement with references.

I look forward to meeting many of you in Tunisia. Have a good trip.

— Kurt Schminke, President
Oldenburg University, Germany



The 9th International Conference on Copepoda (ICOC)

Hammamet, Tunisia
July 11-15, 2005

Members and Friends of WAC:

It is our great pleasure to inform you that the World Association of Copepodologists (WAC), with over 900 active members from 86 countries, will hold its 9th International Conference on Copepoda in Tunisia in 2005. This is the first time that a conference in the ICOC series will be held in Africa, the first time in the Mediterranean region, and also the first time that there are 2 co-organizers Dr. Mohamed Néjib Daly Yahia (Faculty of Sciences of Bizerte - University of 7 November at Carthage, Tunisia) and Dr. Sami Souissi (Marine Station of Wimereux - University of Sciences and Technologies of Lille, France).

The 9th International Conference on Copepoda (ICOC) will be held in the very beautiful city of Hammamet, from 11th to the 15th July 2005. We are also organizing a pre-conference workshop (a training course) from 4th to 8th July 2005 at the Faculty of Sciences of Bizerte.

Up to now, around 225 participants have registered for the conference. We received a total of 250 abstracts. The preliminary scientific programme is composed of 110 talks (including plenary lectures) and 140 posters. These contributions are scheduled in 4 symposia, 13 oral sessions and 16 poster sessions.

The schedule of the scientific program is as follows:

Schedule of Plenary Lectures (Symposia)

Monday, July 11

Symposium I – Behaviour of copepods: role of small-scale processes

Co-chairs: **Jiang-Shiou Hwang** (National Taiwan Ocean University, Taiwan) and **Rudi Strickler** (University of Wisconsin - Milwaukee, USA)

09:00 Introduction
09:10 **J. Rudi Strickler**
"Copepod ecology at small scales: an overview"
10:00 Coffee Break
10:30 **Thomas Kiørboe,** Espen Bagøien and Uffe H. Thygesen (Danish Institute of Fisheries, Denmark)
"Dating, mating, and the dynamics of pelagic copepod populations"
11:20 Discussion

Tuesday, July 12

Symposium II – Use of copepods as bioindicators

Co-chairs: **Jefferson Turner** (University of Massachusetts Dartmouth, North Dartmouth, USA) and **Chris Todd** (University of St Andrews, Scotland, UK)

08:30 Introduction
08:40 **Carol Eunmi Lee** (University of Wisconsin, Madison, USA)
"Evolutionary genetics of invasive species"
09:20 **Adrianna Ianora** (Zoological Station of Naples, Italy)
"Copepods as bio-indicators of secondary metabolites in microalgae"
10:00 Coffee Break
10:30 **Joachim Kurtz** (Max Planck Institute of Limnology, Germany)
"Evolutionary ecology of immune defence in copepods"
11:10 Discussion

Thursday, July 14

Symposium III – Role of copepods in climate change studies

Co-chairs: Thomas Kiørboe (Danish Institute of Fisheries, Denmark) and **Andrew Hirst** (British Antarctic Survey, Cambridge, UK)

08:30 Introduction
08:40 **Mark Ohman** (Scripps Institution of Oceanography; University of California; USA)
"Planktonic copepods as sentinels of a changing climate"
09:20 **Anthony Richardson** (Sir Alister Hardy Foundation for Ocean Science, Plymouth, UK)
"Impacts of climate change on marine foodwebs"
10:00 Coffee Break
10:20 **Andrew Hirst** (British Antarctic Survey, Cambridge, UK)
"An overview of studies linking copepods to climate change"
11:00 **Joachim W. Dippner** (Institut für Ostseeforschung Warnemünde; Rostock, Germany)
"Modelling long-term patterns of zooplankton"
11:40 Discussion

Friday, July 15

Symposium IV – Role of copepods in aquaculture

Co-chairs: Stewart Johnson (Institute for Marine Biosciences, National Research Council, Canada) and **James Bron** (Institute of Aquaculture, University of Stirling, Stirling, UK)

08:30 Introduction
08:40 **Ju-shey Ho** (California State University, Long Beach, USA)
""Myicolid copepods as potential pests in the farming of bivalve molluscs"
09:20 **Chris Todd** (University of St Andrews, Scotland, UK)
"Molecular genetic approaches to applied and ecological problems concerning the sea louse, *Lepeophtheirus salmonis* (Krøyer) infesting salmonid fishes"
10:00 Coffee Break
10:30 **Adelaide Rhodes** (University of Washington, Seattle, USA)
"Mass culture and nutritional value of copepods: examples from the harpacticoid copepod *Nitokra lacustris*"
11:10 Discussion

List of Special Sessions

Monday, July 11

1st conference room
Oral Session I-1: Behaviour
Oral Session I-2: Behaviour
2nd conference room
Oral Session II: Taxonomy and biology of copepods
Oral Session III: Cyclopidae

Tuesday, July 12

1st conference room
Oral Session IV: Copepods in the context of long-term and climate studies
Oral Session V: Molecular, phylogeny, genetics
2nd conference room
Oral Session VI: Diversity, patterns
Oral Session VII: Bioindicators and ecotoxicological studies

Thursday, July 14

1st conference room
Oral Session VIII-1: Diversity and biogeography of copepods in the Mediterranean Sea
Oral Session VIII-2: Diversity and biogeography of copepods in the Mediterranean Sea
2nd conference room
Oral Session IX: Copepods in estuaries and the case of *Eurytemora affinis*
Oral Session X-1: Key ecological processes and copepod production

Friday, July 15

1st conference room
Oral Session X-2: Key ecological processes and copepod production
Oral Session XI: Role of copepods in ecosystems (bottom-up and top-down)
2nd conference room
Oral Session XII: Copepods and aquaculture
Oral Session XIII: Life cycle strategies of copepods

Poster Sessions

PS-I: Behaviour of copepods and small-scale processes
PS-II: Copepods in the context of long-term and climate studies
PS-III: Bioindicators and ecotoxicological studies
PS-IV: Diversity and biogeography of copepods in the Mediterranean Sea
PS-V: Copepods and aquaculture
PS-VI: Copepods in estuaries and the case of *Eurytemora affinis*
PS-VII: Life cycle strategies of copepods
PS-VIII: Key ecological processes and copepod production

PS-IX: Role of copepods in ecosystems (bottom-up and top-down)
PS-X: Taxonomy
PS-XI: Cyclopidae
PS-XII: Parasitic copepods
PS-XIII: Benthic copepods
PS-XIV: Diversity, patterns
PS-XV: Molecular, phylogeny, genetics
PS-XVI: Copepods in small water bodies

The proceedings of the conference will be published in the *Journal of Plankton Research* and *Hydrobiologia* (under discussion).

Please visit regularly the official web site of the conference to have the most updated information about the conference.
http://www.univ-lille1.fr/wimereux/copepoda2005/

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Training Course to be held in Bizerte, Tunisia

The training course on copepod biology and systematics has been very heavily over-subscribed. There was a total of 81 applications for the original 24 places, but we managed to increase this to a maximum of 30 (determined by available laboratory facilities). The applications came from an amazing 34 countries including: Algeria, Kuwait, Turkey, Senegal, Cameroon, Namibia, Indonesia, Latvia, Malaysia, Iran, and Peru. We were delighted to discover how many active young copepodologists are out there, wanting training. The demand is high and the WAC may have to consider providing courses between conferences to satisfy this demand. The line up of tutors has changed a little from the original announcement: the tutors will be Geoff Boxshall, Rudi Strickler, Carol Lee, Thomas Kiørboe, Sami Souissi, Jiang Hwang and Claude Razouls.

The selection for places was difficult. We were fortunate enough to obtain co-sponsorship from MarBEF, a European Union funded network of excellence in marine biodiversity and ecosystem functioning. A condition of this grant was that a proportion of places was reserved for trainees from MarBEF institutes. Our largest sponsor, the Faculty of Sciences at Bizerte of the University of 7 November at Carthage, is hosting the course and a proportion of the places was similarly reserved for Tunisian students. Additional support has been received from the City Council of Bizerte, who are providing a bus to transport course participants from their accommodation to the university campus. So, all is now falling into place ready for the training course thanks particularly to the hard work of Néjib (Dr M. N. Daly Yahia) who has been dealing with all the local arrangements.

– Geoff Boxshall
The Natural History Museum
London, U.K.

Student Report on Plankton Course

Kasia Dmoch received support from the WAC to participate in the course in marine zooplankton ecology offered at CEBIMar, the Centro de Biologia Marinha of the University of São Paulo, in São Sebastião, Brazil, last December. Here is her report.

I must say I had a completely crazy December – I would have never, ever, ever expected such an adventure especially in the month, which in my country unquestionably associates with snowy winter and preparing for Christmas. Just after completing the last tables for our yearly report at the end of November I looked at the Internet and found an announcement about … a training plankton course entitled "**Experimental approaches in marine zooplankton ecology: Concepts and strategies towards global change research**" in Brazil.

This was what I was waiting and looking for eagerly for a long time, but it sounded so fantastic, that taking this into account seemed completely irrational to me. What's more it was already after the deadline, so my first idea was – oh, what an inimitable opportunity, but just as always – too far and too late. But second thought was – why not to try to ask in any case? So I did, and by lucky chance there was still one place available. From Prof. R. Lopes from São Paulo I got an immediate answer and helpful advice on how to apply for support, and a prompt decision by WAC President Prof. K. Schminke, as well as the approval of my department head Prof. J.M. Węsławski, made my dream came true. All of a sudden I was at the São Paulo University Marine Station CEBIMar in São Sebastião, on the coast covered with tropical rain forests, coloured by flowers and plants I knew

only from books or indoor pots before, together with a diverse group of participants from almost all of the South American countries and colleagues who came from Finland, Denmark, Sweden, Portugal and myself from Poland. Surprisingly, we few Europeans felt a bit exotic, strangely and curiously among our companions laughing and chatting in Portuguese or Spanish at the beginning, but after just a couple of hours we mixed and acted together as a multinational "plankton family". I enjoyed very much spending time and talking with students from other countries, and this feeling of union that we experienced there for a while. The program of the course was very comprehensive, and concerned all of the plankton groups of organisms and most of the aspects of trophic relationships among them. It ranged from pelagic ecology, through plankton nutrition, production and stochiometry, to the physical-biological coupling and trophic-cascade performance. We were told how to use culture methods, experimental techniques, and biochemical and molecular tools in research.

I would like to express my gratitude to our Professors Rubens M. Lopes, Hans G. Dam, George McManus and Kam W. Tang for their excellent lectures providing us every day with the best state-of-the-art information on plankton research, and helpful assistance during the course. Even the most informative talks cannot stand in for putting the words into practise.

After the necessary theoretical introduction, we were expected to think out in groups our own experimental designs, from which, after discussion, we decided the one project to be done. We split into teams working with different size fractions (mesozooplankton, microzooplankton, pico/nanoplankton or phytoplankton) and conducted the manipulation experiment with *Temora turbinata* – an invasive species that dominates over the other *Temora* spp. in neighbouring waters. The lab and seminar room were perfectly equipped and prepared for intensive research. Green surroundings shaded by trees and a common room were comfortable places for computer data processing, sharing the information with each other, and discussing the overall results. We could use the library and copy machine and communicate with the outside by a telephone booth and two rather archaic computers. The kitchen supplied us with delicious meals, while the beach picturesquely situated just behind the lab was the perfect place for brief relaxing and unforgettable visual sensations, especially when looking at the rich undersea life, or night swimming among *Noctiluca*'s flashing lights. All these contributed to our good work and good mood. Evenings were dedicated to the Journal Club – analysing and discussing scientific articles previously provided us, which I found a highly effective way of studying, worthy of following. Not only the pure knowledge we took to our home institutes, but also imposing clues for keeping always in mind, particularly before starting experiments, like: "KISS – keep it simple, stupid", and "Remember, don't you ever ever make an observation without having a hypothesis in mind", along with an inducement to not refraining from starting something new, because it is never too late for learning. Organizers had also an extra present for us – a lecture given by a petite, older woman who turned out to be the legend of Brazilian copepodology. Tagea Björnberg showed us her historical cardboards with incredibly precise drawings of tropical copepod developmental stages. Starting with the adoring statement that: "Copepods are beautiful", she reminisced about her work in a way that bore witness to the idea that copepods can be the essence of a worthy and happy life.

After all this, we went home supplied with both the lectures and the experimental data sheets burnt on CDs, together with a huge folder of photos, and a large portion of knowledge ingested for us to assimilate in our future work. Considering the difficulties involved by the nature of experimental work, the time allowed for future courses might profitably be extended. It was a very good course for a modest price – excellent tutors, interesting lectures, friendly people, a beautiful and comfortable place, intensive work, wonderful entertainment and memorable experiences.

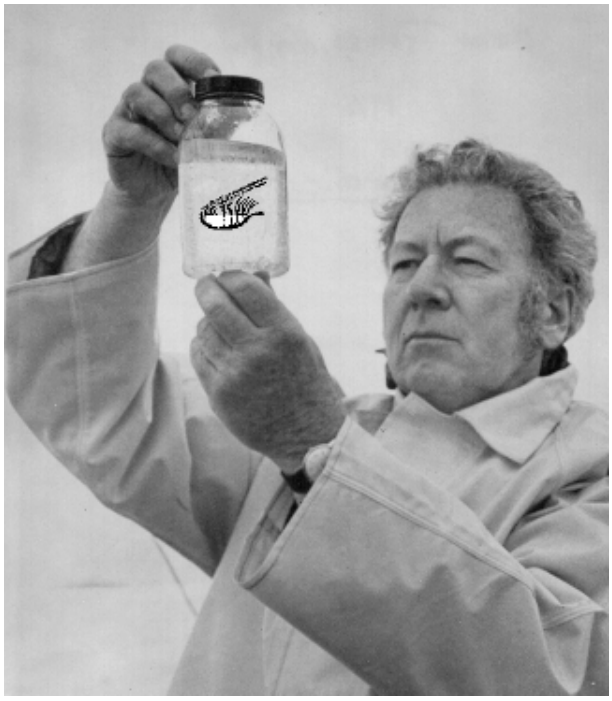
– Katarzyna Dmoch
Marine Ecology Department
Institute of Oceanology
Polish Academy of Sciences
E-mail kasiadm@iopan.gda.pl

Search for Specimens of Laophontidae

In the frame of my PhD research, I am interested in obtaining material of species of the harpacticoid family Laophontidae, preferably from tropical regions.

If you have any laophontids that can be donated, you can contact me at:
Hendrik Gheerardyn, Marine Biology Section, Ghent University, Krijgslaan 281, Building S8, B-9000 Gent, Belgium. e-mail: hendrik.gheerardyn@ugent.be

— Hendrik Gheerardyn
Ghent University, Belgium



Charles Carroll Davis
1911-2004

With my Northeast Pacific orientation, Charles C. Davis has always been a copepodological hero. Unfortunately, I never met Davis, although we corresponded over more than 30 years. Before I was born, he was a student at the University of Washington (UW), having life-forming experiences that I would share a generation later. His professors were already legends in my youth, and I envied his studies in those glory days when everything was new and everything was exciting.

Davis was born in Azusa, California on 24 November 1911. His father worked in Los Angeles as a clerk for the railroad. Apparently, the elder Davis saw in this an opportunity for some embezzled money; he was caught and called to account. Understandably this caused some domestic friction as well as troubles with the law. Mrs. Davis and young Charles left immediately for Los Angeles where he was raised in a fatherless but reputable home. He attended grammar school there, later moving with his mother to the mountains and attending high school in Pasadena.

Davis's high school biology teacher was Max Walker de Laubenfels (1894-1960), later a professor of zoology at Oregon State College and a world-renown sponge taxonomist. De Laubenfels saw "a spark" that promised some biological good in Davis. He convinced Davis to attend Oberlin College in Oberlin, Ohio. In the bargain, it was arranged for Davis to stay without cost with ornithologist and ecologist Lynds Jones (1865-1951), a de Laubenfels relative who taught biology at Oberlin. This was a great, welcome, and fortunate turning point in Davis's life. He graduated from Oberlin in 1933, in the hundredth year of the college.

Davis told me that his choice of graduate studies in Seattle came mainly through his desire to see this part of the country. Davis's first research at UW was on cell-structure in some insects, for which he earned the MS in 1935. The Professor of Zoology in Davis's day was Trevor Kincaid (1872-1970), a present-day icon at the university. Kincaid was a cofounder of the university's Puget Sound Biological Station at Friday Harbor in 1904. He also dabbled in copepods and so this field was a natural choice for Davis. [Kincaid was also the professor for Martin Johnson (1893-1984), a short time before Davis arrived.]

> *When I first came to the University [of Washington] in 1933 as a new graduate student I came ill-advised, for my burning desire was to work on a problem in invertebrate physiology. At that time no-one in the Zoology Department had any interest in physiology. So Kincaid took me on out of the goodness of his heart, because no-one else wanted me. He was, of course, no real help in my master's project on the function of oenocytes in insects, so when I went on for PhD work I changed to the taxonomy of marine copepods. Here he could and did give valuable advice and help....*
>
> *Kincaid loved field collecting and instilled in us as students a similar love. This was done by organizing frequent field excursions for his classes, and by the obvious enthusiasm he showed when he waded into the water with the rest of us, dipping up all sorts of creatures and helping us to identify ours. This was a trait which I, for one, have tried to the best of my ability to apply in my own classes wherever field collecting is appropriate. One thing, though: Kincaid wasn't a slob like the rest of us—He always wore a necktie on field trips!* (Davis ms "Reminiscences," 31 July 1975).

The years that Davis was at UW were economically difficult times for most everyone. However, as he remembered, there was government public-works money for student projects. Although the pay was low, it was better than unemployment in the outside world, and students stayed for that reason and also for the always interesting work and contacts. [The same thing happened in the 1960s, as I can attest.] Davis worked each summer from 1934 through 1938 at the university's marine station. In other months, at the main-campus Oceanographic Laboratories, he studied plankton samples that he collected on the university's research vessel *Catalyst*. He turned this into his own research and received the PhD in 1940. The published work,

"The pelagic Copepoda of the northeastern Pacific Ocean" (Davis 1949), remained for many years the standard reference for plankton copepods from our corner of the world.

> *I've stuck with plankton ever since. Now you know* (Davis to Damkaer, 17 July 1998).

Davis had a few short-term experiences after leaving UW. The early pre-war and wartime was an unsettling period for everyone, and being a committed pacifist, Davis undoubtedly had some qualms working between the war efforts; he did not reveal these to me. He was a research assistant at Scripps from 1938 to 1940. He appeared next working as a biologist for the state of Maryland's Solomon's Island Laboratory until 1943. He was an assistant professor at the University of Miami from 1946 to 1948. His numerous copepod publications began at the Chesapeake Bay laboratory and also reflected his time in Florida.

Case Western University (Cleveland, Ohio) called Davis in 1948, as an assistant professor. He left Case Western twenty years later, as Professor of Biology. During that time, he also worked at the state laboratory on Lake Erie, publishing many papers on ecology and pollution of the Great Lakes. His book on marine and freshwater plankton (Davis 1955) grew out of his continuing interest in this aspect of biology. His "peacenik" [his word] commitments also led to the dedication of that book to Takamochi Mori (1902-1945), killed at Hiroshima.

In 1968, Davis accepted his last position, Professor of Biology at the Memorial University of Newfoundland (St. John's, Newfoundland), in the department of biology and the Ocean Sciences Centre. His biological orientation then turned toward the far north, as well as toward other aquatic invertebrates besides copepods. He lived outside of St. John's, with his pond, canoe, and microscope. Davis retired in 1977 but worked half time until 1984. He continued to come into his office to his last day.

During his tenure in Newfoundland, Davis was sometimes guest-professor in Russia, Norway, and Ethiopia. He was a long-time member of many scholarly groups, including the Ohio Academy of Sciences, the Ecological Society of America, the American Society of Limnology and Oceanography, the Internationale Vereinigung für Limnologie, the Crustacean Society, and the World Association of Copepodologists.

Davis married Sally May Jacobsen, another Kincaid zoology student, on 11 June 1936. They spent their honeymoon at the Puget Sound Biological Station, living as the other students in floored tents. She died in 2000 and he founded a Memorial University award in her name.

His remembered childhood hardships during the Depression no doubt gave Davis first-hand sympathy with the working man and underdog. Environmental issues, social justice, women's rights, and world peace were always impassioned causes. His first demonstration was against the Spanish Civil War. Even if Davis and his wife were the only participants, they turned out year after year to show what they believed in, and remained optimistic for the future. As a graduate student at UW, Davis had a reputation as somewhat of a socialist. Especially in that then hotbed of struggling unions and social strife, this was not looked upon favorably by the establishment. Davis never knew this for certain, but his feelings toward the large social issues of the day did not enhance his recommendations. However, looking back on it from my point of view, this did not seem to slow him down professionally.

Davis was a gourmet cook, in later years trading fancy meals and cookies for help with his computer. On 25 February 2004, he went home as usual for lunch. He prepared his meal, poured a glass of wine, sat down, and died. He was 92, and a friend to all mankind.

> *I have chosen for Monoculus a photo taken [in 1976] in northern Norway examining a sample containing among other things numerous Calanus finmarchicus, obviously not far from its type locality, which must have been in Finmark. It looks like it was posed, but it was not* (Davis to Damkaer 5 May 1998).

I was then tempted to alter the photograph somewhat:

> *My eyesight must have been defective when someone took my picture in Tromsø. I failed to notice that Gunnerus had mixed one of his creatures in with my catch. I enjoyed the photo* (Davis to Damkaer 7 July 1998).

In fact, Davis enjoyed it so much he placed it on his office wall. Otherwise you would not see it now.

— David M. Damkaer
Monroe, Washington, U.S.A.

PUBLICATIONS ON COPEPODS

Davis, Charles C. 1943. The larval stages of the calanoid copepod *Eurytemora hirundoides* (Nordquist). Publications of the Chesapeake Biological Laboratory 58:1-52, 9 pls.

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————. 1966b. A study of the hatching process in aquatic invertebrates. XVI. Events of eclosion in *Calopsectra neoflavellus* Malloch (Diptera, Tendipedidae). XVII. Hatching in *Argulus megalops* Smith (Crustacea, Branchiura). Hydrobiologia 27(1-2):196-207, 8 figs.
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————. 1969a. *Ergasilus luciopercarum* males in an unusual collection from Newfoundland. Canadian Journal of Zoology 47(6):1249-1252, 11 figs.
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Coauthored papers

Daggett, Rollin F. and Charles C. Davis. 1974a. A new species of freshwater cyclopoid copepod from Newfoundland. Canadian Journal of Zoology 52(2):301-304, 10 figs.
————. 1974b. A seasonal quantitative study of the littoral Cladocera and Copepoda in a bog pond and an acid marsh in Newfoundland. Internationale Revue der Gesamten Hydrobiologie 59(5):667-683, 12 figs.
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Davis, Charles C. and Robert H. Williams. 1950. Brackish water plankton of mangrove areas in southern Florida. Ecology, Brooklyn 31(4):519-531, 1 fig.
Smith, F. G. Walton, Robert H. Williams and Charles C. Davis. 1950. An ecological survey of the subtropical inshore water adjacent to Miami. Ecology, Brooklyn 31(1):119-146, 7 figs.
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Online Databases on Invasive Species

With the surge of interest and increasing information on invasive species, several global or regional databases on this subject are now available. If you know of other such databases, please let me know.

Looking at the databases listed here, it is obvious that the great majority of invasive copepod species have not been included. Most of these databases specifically welcome contributions by interested researchers.

– Jan Reid

Global Invasive Species Database
Sponsor: IUCN/SSC Invasive Species Specialist Group (ISSG)
Area of Coverage: worldwide
URL: http://www.issg.org/database/welcome/
Copepods listed: none

Database on Introductions of Aquatic Species
Sponsor: FAO (Fisheries Global Information System)
Area of Coverage: World
URL:
http://www.fao.org/waicent/faoinfo/fishery/statist/fisoft/dias/index.htm
Copepod listed: *Acartia tonsa*

Baltic Sea Alien Species Database
Sponsor: Baltic Marine Biologists Working Group on Non-indigenous Estuarine and Marine Organisms
Area of coverage: Baltic Sea
URL: http://www.ku.lt/nemo/mainnemo.htm
Copepod listed: *Acartia tonsa*

Non-native Marine Species in British Waters
Sponsor: Joint Nature Conservation Committee (JNCC), U.K.
Area of coverage: United Kingdom
URL: http://www.jncc.gov.uk/marine/non_native/
Copepod listed: *Acartia tonsa*

NISbase – Nonindigenous Aquatic Species
Sponsor: U.S. Geological Survey
Area of coverage: United States; distributed links to several other databases
URL: http://nas.er.usgs.gov/

NEMESIS – National Exotic Marine and Estuarine Species Information System
Sponsor: SERC – Smithsonian Environmental Research Center
Area of coverage: Chesapeake Bay (eventually to all coastal regions). Provides search access to multiple invasive-species databases.
URL: http://invasions.si.edu/nemesis/index.html
Copepods and branchiuran listed:
Lernaea cyprinacea
Mytilicola sp.
Argulus japonicus

Non-Native Aquatic Species in the Gulf of Mexico Region
Sponsor: Gulf States Marine Fisheries Commission
Area of Coverage: Gulf of Mexico
URL: http://nis.gsmfc.org/
Copepod listed:
Lernaea cyprinacea

NIMPIS – National Introduced Marine Pest Information System

Sponsor: CSIRO
Area of Coverage: Australia
URL: http://www.marine.csiro.au/crimp/nimpis/
Copepods listed: none

Guidebook of Introduced Marine Species in Hawaii
Sponsors: Bishop Museum and University of Hawaii
Area of Coverage: Hawaiian Islands
URL:
http://www2.bishopmuseum.org/HBS/invertguide/index.htm
Copepods listed: none

CIESM Atlas of Introduced Species in the Mediterranean Sea
Sponsor: CIESM
Area of Coverage: Mediterranean Sea
URL: http://www.ciesm.org/atlas/
Copepods listed: none

News from the "World of Copepods" Website

Just wanted to let you know that the web site has finally been updated with new database structures and information. The bibliographic, species and genera databases are current as of October 2004, and we anticipate the next update by the end of June.

We would appreciate feedback from users of the site and hope they will send us their updated addresses, emails, corrections and additions to the databases for bibliography, genera, species and researchers.

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New Books and Websites: Reviews

Copepods Parasitic on Fishes (2nd, revised edition)

By Zbigniew Kabata

2003. In: J. H. Crothers and P. J. Hayward (Eds.): Synopses of the British Fauna (New Series), No. 47, 2nd, revised edition. *Published for* The Linnean Society of London *and* The Estuarine and Coastal Sciences Association *by* Field Studies Council, Shrewsbury. Backhuys. Vii+274 pp., 288 figs., paperbound. ISBN 1-85153-265-X. €50.00

Commensal and Parasitic Copepods Associated with Marine Invertebrates (2nd, revised edition)

By Vivian Gotto

2004. In: J. H. Crothers and P. J. Hayward (Eds.): Synopses of the British Fauna No. 46, 2nd, revised edition). *Published for* The Linnean Society of London *and* The Estuarine and Coastal Sciences Association *by* Field Studies Council, Shrewsbury. Backhuys. viii + 352 pp., 379 figs., paperbound. ISBN 1-85153-266-8. €76.00

The first edition of these two *Synopses of the British Fauna*, published in 1992 and 1993, respectively, was sold out within a decade of their publication. Thus, it prompted the editors of the *Synopses* to plan for the reprint of the books. Both authors opted to revise their book.

Since the main objective of the book is to furnish a set of easy-to-follow keys to enable any interested reader to identify copepods found in association with any member of the British aquatic vertebrates and invertebrates, in these two revised editions a pictorial key accompanied with appropriate illustrations is provided to the families, genera and species recorded from British Isles. Synopsis of each species is provided with information on six categories: *synonyms* (if present), *hosts*, *distribution*, *female*, *male* (if known), and *notes*. It is in this last category that additional information is often found to help confirmation of identification of the species. Both Kabata and Gotto have tried to list all hosts so far recorded from British Isles for each copepod species, irrespective of the area of origin. A glossary of 123 technical terms is provided at the end of the book before the Index. In general, the second edition is much more user-friendly, with illustrations for whole or parts of animals as well as appendages being placed close to where they are mentioned in the text or key.

Although Copepoda is widely known as a Subclass of the Class Maxillopoda, it is regrettable to see that in these two revised edition of the *Synopses* the authors still keep calling it "Order COPEPODA" as it was in the previous edition. Thus, contrary to our common knowledge, three suborders (Siphonostomatoida, Poecilostomatoida, and Cyclopoida) are found in No. 47 and four suborders (with addition of Harpacticoida) are listed in No. 46. Nevertheless, the term of

the last pair of appendages on the copepod body is changed, *i.e.*, "uropods" found in the previous edition has been replaced with "caudal rami" in the revised edition.

One hundred and twenty-eight species of fish-parasitizing copepods are dealt with in No. 47 of the *Synopses*. They are placed in 64 genera belonging to 20 families. Suborder Siphonostomatoida has the largest number of representatives occurring in the British Isles, boasting 78% (100/128) of the reported species, 80% (51/64) of the recorded genera, and 70% (14/20) of the reported families. Although Caligidae is known as the largest family of Copepoda, it does not have the highest number of species represented in the British Isles. The largest family of fish-parasitizing copepods from the British Isles is the Lernaeopodidae. While the Caligidae of the United Kingdom comprises 21 species in 4 genera, that of the Lernaeopodidae is richer, with 34 species in 19 genera. Suborder Poecilostomatoida is represented by 27 species in 11 genera belonging to 5 families. Chondracanthidae has the largest representation of this suborder, with 12 species in 4 genera. As to the Suborder Cyclopoida, only one cosmopolitan species, *Lernaea cyprinacea* Linnaeus, is recorded from the British Isles.

The species of fish-parasitizing copepods treated in the second edition of No. 47 is not different from those found in the previous edition. The tremendous increase in the number of figures in the second edition, from 45 to 288, is chiefly due to the regrouping of drawings collected in a previous plate and dividing them into several figures with one figure for one species or two species of the congeners. For instance, like Fig. 24 in the first edition is broken into Fig. 138 (with two drawings of two congeners), Fig. 139 (with two drawings of the same speciess), Fig. 143 (with two drawings of the same species), and Fig. 144 (with a single drawing). As in the previous edition, frequent reference to Kabata's (1979) monumental work on the parasitic copepods of British fishes is made for confirmation of species identification.

Contrary to *Synopsis* No. 47, where one does not see much difference in the content between the two editions, the new edition of *Synopsis* No. 46 listed 252 species of symbiotic copepods with an addition of 21 species over the previous edition. This increment in species has also added four more families (Chitonophilidae, Micrallectidae, Myicolidae, Spiophanicolidae) and 11 more genera (*Glannapontius, Jeanella, Lomanoticola, Megaclausia, Micrallecto, Myicola, Myzopontius, Nucellicola, Phyllodicola, Spiophanicola, Stenothocheres*) to the new edition. Therefore, currently, there are recorded in British Isles 60 species in 26 genera belonging to 3 families of CYCLOPOIDA, 97 species in 51 genera belonging to 18 families of POECILOSTOMATOIDA, 72 species in 38 genera belonging to 11 families of SIPHONOSTOMATOIDA, and 11 species in 9 genera belonging to 4 families of HARPACTICOIDA. In addition, there are 2 families without attribution to the order, and 8 genera without attribution to the family.

Scambicornus, a member of the Sabelliphilidae that appeared in the first edition, is removed from the British fauna in the new edition of *Synopsis* No. 46. Although two species of this genus, *S. armoricanus* and *S. finmarchicus*, were listed in the previous edition, the former is now regarded as a synonym of the latter, and the latter was renamed *Eupolymniphilus finmachicus* by Humes and Boxshall (1996).

Fourteen species of the symbiotic copepods listed in *Synopsis* No. 46 are not accompanied by any figures in the key or the text. Perplexingly, they were all new additions to the British fauna and need illustrations to furnish an easy-to-follow guide like this book. Aside from this minor shortcoming, the book still serves the need of any copepodologists who are interested in knowing the symbiotic copepods of British Isles.

— Ju-shey Ho
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References:

Kabata, Z. 1979. Parasitic Copepoda of British Fishes. The Ray Society, London. 468 pp., 2031 figs.

Humes, A.G. & G.A. Boxshall. 1996. A revision of the lichomolgoid complex (Copepoda: Poecilostomatoida), with the recognition of six new families. Journal of Natural History 30:175-227.

Key to the Species of Freshwater Calanoid Copepods of British Columbia

By G. A. Sandercock† and G. G. E. Scudder. 1996.

http://srmwww.gov.bc.ca/risc/pubs/aquatic/calanoid/

This webkey is a product of British Columbia's Resource Information Standards Committee, which has produced a series of online documents for use in natural and cultural resources inventory work in that province. The key itself, first presented in HTML format in 1998, is part of a larger, unpublished manuscript. By focusing on the 30 species of calanoid copepods found in British Columbia, the authors' goal was to simplify the identification process for researchers working in this region. By presenting their key in HTML format, they have made it accessible to a broader audience.

The opening page of the website presents links to an introduction, a checklist of the freshwater calanoid copepods of British Columbia, a key to the species (based on male specimens), a list of references used in the document, 2 tables, and 33 figures. Below these are listed the acknowledgments. The species included in the checklist and key incorporate previously published data and the authors' unpublished records.

The brief introduction familiarizes the user with the basic morphological features of calanoids that are illustrated in Figures 1 and 2. The checklist lists the taxa by family, with author and date of description included. The checklist is somewhat out of date in regards to family designation. Table 1 places the species into groups based on preferred habitat. Table 2 separates the taxa in the family Diaptomidae into several large groupings based on the numbers of setae on specific segments of the left 1st antenna. The key employs a typical dichotomous approach with 28 couplets. Many of the characters (mainly P5 and antennal characters) used in the key are not ones used by Wilson (1959) or Pennak (1989); or, if they are the same, they are used in a different order within the key. One-third of the drawings are original, while the remaining two-thirds are reproductions of historical illustrations. The document-like presentation of the material in this website lends itself to quick conversion to a printed, more portable hard copy.

One of us tested this key against those of Wilson (1959) and Pennak (1989) by keying out specimens of *Hesperodiaptomus kenai*. Similar results were achieved with this key and Wilson's key. The determination made using Pennak was obviously incorrect in that it fit neither the detailed description, nor the distribution of the tentatively identified species. Progress through the website key was slow due to the time it took to repeatedly move between the key and the figures. The figures in Wilson's key are embedded within the text and are usually within a page or two of the couplet discussing a particular character. With this site being static HTML, it would have been nice to have the illustrations placed below the branch of the couplet in which they are discussed. This would help to expedite the identification process. With the current power of the World Wide Web, there is great potential for a website such as this in regard to databases, windows, changing content on user demand, etc.

After reviewing this website and comparing it to Wilson's key, we still prefer the latter, although this may be more due to our familiarity with it than to the superiority of one key over the other. If there is any hesitancy with an identification made using either one of the above keys, it certainly would be a good idea to run the specimen through the other key. The different routes and characters used in each key could be of benefit under different scenarios. The text in this website had only one obvious error in that an ovigerous female calanoid was described as carrying two egg sacs. There is good, useful information in this site, and to see it presented in a more interactive and sophisticated format would be a nice improvement.

The first author, Gail Sandercock, passed away in the year 2000. This was a sad loss for copepod studies in North America. It is to be hoped that others who share her deep interest in calanoid copepods will eventually resume and refine this worthy project.

— Patrick L. Hudson
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References:

Pennak, R. W. 1989. Fresh-water Invertebrates of the United States. Protozoa to Mollusca. 3rd Edition. John Wiley, New York. 628 pp.

Wilson, M. S. 1959. Free-living Copepoda: Calanoida. Pp. 738-794 In: Edmondson, W.T. (ed.). H.B. Ward & G.C. Whipple's Freshwater Biology, 2nd. ed. John Wiley & Sons, Inc., New York. 1,248 pp.

An Image-Based Key to the Zooplankton of the Northeast (USA): Version 2.0

By Maria A. Aliberti, Darren J. Bauer, Shane R. Bradt, Brady Carlson, Sonya C. Carlson, W. Travis Godkin, Sara Greene, Dr. James F. Haney, Amy Kaplan, Shawn Melillo, Juliette L. Smith (Nowak), Brian Ortman, Judith E. Quist, Shayle Reed, Tiffany Rowin, and Dr. Richard S. Stemberger.

2005. Center for Freshwater Biology, Department of Zoology, University of New Hampshire, Durham, New Hampshire. CD-ROM. Also available at: http://cfb.unh.edu/CFBkey/index.html

Currently available as Version 2.0, this webkey started as a PowerPoint presentation in 2000 and consisted of a handful of zooplankton taxa. The impetus behind the key=s conception was the frustration experienced by University of New Hampshire students trying to use traditional keys – often where illustrations were poorly labeled, key characters were not illustrated at all, or scientific lingo lacked definition. Their goal, therefore, became the creation of a key that would be intelligible for those having minimal taxonomic experience, yet also rigorous enough to be used in scientific studies. Guided by their professor, Dr. James Haney, a core group of students tackled the job of creating the key and bringing it to its present incarnation, which today contains 34 Cladocera taxa, 28 Copepoda taxa, 79 Rotifera taxa, and 7 taxa in other Arthropoda groups.

Upon first entering the homepage of the key, the user is presented with a number of tabbed content options. Navigating through the various sections is straight-forward and consistent, although the Purpose, History of Key, References, Video, and Order a CD tabs cannot be accessed from the Use the Key, Groups, Species, and Anatomy pages. If the user is unsure how to proceed through the key itself, the three intended methods are outlined on the Instructions page, along with a cautionary note warning users to not push a specimen into a Aclose enough@ couplet if it does not seem to belong there. The Groups page offers the user a shortcut option, should they already know the general identity of the organism in question (e.g., subphylum, family, genus) and

not wish to start at the very beginning of the key. This page also contains links to pages that present alternate groupings of the organisms, to facilitate different search styles. The Species page, divided into Arthropoda and Rotifera sections, lists alphabetically all species included in the website for quick access to their individual species detail pages.

The key itself is not a typical dichotomous key, and this is clearly apparent on the first page. While in most instances there are two couplets at any juncture in the key, at times there may be three or more routes available for selection by the user. Also, rather than relying on textual descriptors, photographic images are the focal points of the couplets. These images are supported by labels, lines or arrows, or text, as needed. As a case in point, the first page of the key presents four images from which the user is to choose the one that best exemplifies their specimen. As the user directs the cursor over each of four thumbnail images representing the different groupings, a larger collage of various organisms within that particular grouping appears. A convenient feature of the key is the ability with some of the images to remove lines, arrows, and text by rolling the cursor over the image. In this way, the user can get an unobstructed view of the organism, yet still know exactly what they are looking at.

The more one uses the key, the more familiar they will become with its assets and idiosyncracies. Within the Cladocera and Copepoda sections of the key, the whole-body drawings with the area(s) of interest highlighted are a nice touch and will prove helpful to those who are not as familiar with the organisms= morphologies. The *Daphnia* section of the Cladocera key uses alternate characters that may be more reliable and facilitate the keying of problematic species. One suggestion for future versions of the Cladocera key would be to include more of the chydorid species which, although considered to be benthic by nature, can appear in zooplankton samples with some regularity.

Aspects of the Copepoda key are straightforward and intuitive; however, there are a couple of shortcomings. While *Acanthocyclops robustus* is included in the key, *Acanthocyclops brevispinosus* is not. Because these two species are so similar, and *A. brevispinosus* undoubtedly occurs in the northeastern United States, it should certainly be a part of the key. Without it, users of the key would misidentify their specimens and be none the wiser. Additionally, there are characters used in the key that rely on mounting various body parts and judging presence vs absence of characters on these parts or relative lengths between sections of these parts. Mounting technique or the angle of view may result in the user either not seeing the character or misjudging the lengths. There are more reliable characters that could be used.

The Arthropoda key is short and concise. Within this section, the *Chaoborus* key to species is especially nice.

As with all Rotifera keys, specimens that are contracted or contorted will always pose difficulties in keying. To help assuage this problem, this key includes alternate keys for certain rotifer groups. The user can either key their specimen based on whole-body appearance, or prepare and identify their specimen based on trophi structure. Helpful directions for mouthpart examination are included as a link on the first page of the key, wherever keys based on trophi are present, and on the species detail pages.

As the key is available via a dynamic medium such as the internet, misspellings and errors can be corrected as they are discovered, text can be added as it becomes available, and fuzzy or indistinct images can be replaced with clearer images. The addition of more information under the Distinguishing Characteristics, Ecology, and Additional Notes sections of the species detail pages will greatly enhance the value of this website. It is anticipated that as time passes, more species will be added to the key as they are encountered in the field. This will also increase the value of the key by filling in some of the suspected voids that exist. In conclusion, this webkey should prove to be a useful resource for users ranging from novice students to seasoned taxonomists.

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Zooplankton of the Atlantic and Gulf Coasts: A Guide to Their Identification and Ecology

By William S. Johnson and Dennis M. Allen.
Illustrations by Marni Fylling.
2005. Johns Hopkins University Press, Baltimore. 400 pp.
US$44.95 (hardcover, ISBN 0-8018-8019-X),
US$80.00 (paperback, ISBN 0-8018-8168-4).

I often towed astern a net made of bunting, and thus caught many curious animals. — Charles Darwin, December 1833, Notes made during the voyage of the *Beagle.*

This note by Darwin heads the Preface to the new book by Professors Bill Johnson and Dennis Allen on the zooplankton to be found off the Atlantic and Gulf coats of the United States. Unhappily, as the authors noted, the "many curious animals" in marine zooplankton usually receive short shrift in marine-biology courses, largely because it is difficult for beginners to identify them. This book provides the first guide to the commonest groups of zooplankton in estuarine and nearshore marine waters, from Cape Cod southward along the Atlantic coast, and westward along the Gulf coast to Texas. Tropical plankton that are carried northward by the Gulf Stream, and deep-ocean plankton are not included; nor are most of the freshwater groups that sometimes enter the upper reaches of estuaries.

All of the taxa that are usually brought up in plankton tows, including the common large phytoplanktan and fish larvae, are included. The level of treatment varies with the

ease of identification, and only taxa that can be determined fairly easily by use of a dissecting microscope are treated. For copepods, this means the most common calanoids (*Acartia tonsa, A. hudsonica, Calanus finmarchicus, Pseudodiaptomus pelagicus, Pseudocalanus newmani, P. moultoni, P. minutus, Parvocalanus crassirostris, Paracalanus parvus, P. aculeatus, P. denudatus, P. quasimodo, Labidocera aestiva, L. scotti, L. mirabilis, Anomalocera ornata, A. patersoni, Pontella meadii* and other species, *Centropages hamatus, C. velificatus, C. violaceus* (misspelled as *"violaceous"*), *C. typicus, Candacia armata* and other species, *Eurytemora affinis, E. hirundoides, E. herdmani, E. americanus, Temora longicornis, T. turbinata, Eucalanus pileatus, Tortanus discaudatus, T. setacaudatus*), cyclopoids (*Oithona colcarva, O. similis, O. plumifera, O. robustua, O. nana, O. atlantica, Halicyclops fosteri, Mesocyclops edax*), poecilostomatoids [*Hemicyclops* spp. (*Saphirella* stage), *Oncaea venusta, Corycaeus amazonicus*], harpacticoids (*Euterpina acutifrons, Coullana canadensis, Macrosetella gracilis*), and "caligoids" (*Caligus* spp.). There is also a brief section on *Argulus*.

The approach to identification is visual. A beginning "Quick Picks" section provides illustrations of members of main categories such as "small protists," "ciliated protists," "gelatinous, usually transparent," "small crustaceans," and "larger crustaceans." Within each main category, subcategories, such as, for small crustaceans, "copepods," "cladocerans," barnacle cyprid," "copepod nauplius," etc. direct the user to the beginning page for each.

The explanatory text for each species or group of species describes its occurrence (geographical range; estuarine, nearshore or offshore; salinity; season), biology and ecology, notes on taxonomic or sampling problems, and references. The references and suggested reading include predominantly articles on ecology. Each major group is introduced in respect to its general composition, appearance, life cycle, feeding, predators, behavior, associations, and anecdotes about introduced species (if any). The "Identification Hints" are informed by the authors' long experience in teaching undergraduate students.

One or two of the most common members of each genus are illustrated by figures of the whole animal – in the case of copepods, usually a female in dorsal and perhaps also lateral view, with the size range given for adults of both sexes, and the "fieldmarks" described in text left of the figure(s) and indicated on each figure. The illustration for each species is placed on the right-hand page, opposite the explanatory text on the left-hand page. The artist Marni Fylling deserves special congratulations for her line drawings that clearly show the differences in body shapes and antennules. Her fine original illustrations for each taxon are simple but detailed enough to show the "look" of the animal (or alga).

Several useful appendices describe methods of collecting, relaxing, fixing, storing, observing, and sample processing and data analysis. There is an extensive bibliography of regional surveys. A four-page glossary, an extensive reference list, and an index complete the book.

No work of this complexity is ever perfect. Some lapses to do with the copepods include the treatment of the "caligoids" as an "order," misspelling the order Poecilostomatoida in several places, mislocating the genital segment in the cyclopoid and harpacticoid (Fig. 20), and stating (p. 139) that harpacticoids lack a major body articulation. The monstrilloids, although they are rare, could be included; as could *Longipedia americana*, which like *Coullana canadensis* is a large, distinctive epibenthic harpacticoid that often appears in the plankton in shallow estuarine waters. A future edition might also include some of the diaptomids and fresh-water cyclopoids that may enter the oligohaline stretches of estuaries.

The writing style is enjoyably limpid, compact, and precise. Within this style and in spite of space constraints, the authors present a huge amount of information gracefully. Most importantly, they convey their appreciation of these animals as living and functioning beings.

This book will become an indispensable reference for every course on marine biology that is given in this part of the world.

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

Aquatic Ecology of Rice Fields

Edited by C. Herbert Fernando, F. Goeltenboth, and J. Margraf

2005, 1st Edition. Volumes Publishing, Kitchener, Ontario, Canada, N2B2B9, A Third Millennium Book

ISBN 0-0737503-0-8. US$60 incl. postage – see www.volpub.com

Rice, wheat and corn are the three major cereals in human nutrition – rice being the most important. There is probably no other crop with a longer history, a longer list of scientific publications, a wider influence in human culture and arts than rice. Rice cultivation has also influenced social systems, religions, art and culinary habits over large areas of the globe. Rice-growing has created a vast system of irrigation reservoirs, channels, ponds and other aquatic habitats that can provide additional foods. Meanwhile, rice fields are the most common man-made habitats in much of the tropics and subtropics. Rice-growing has not only altered landscapes but has created complex and aesthetically pleasant ones, especially in many countries of Asia. Rice fields can be used as sites for education in general biology and ecology, in ecosystem analysis as well as in conservation and various applied fields of life science.

There is a vast amount of literature on rice cultivation in many languages – however, hardly any comprehensive monograph integrates various agronomical and ecological

aspects of rice plantation. In the present volume, the interaction of rice cultivation with fish, other living aquatic organisms and men in its many facets has been studied by scientists, not only from a wide angle of disciplines but, equally important, from four continents, leaving only the potential of Africa out for a separate study. This collection of contributions on the ecology of rice fields is the first comprehensive coverage of the subject, including most of the literature and research done around the world – including a vast body of scientific contributions from Russia that are now included in this volume. It covers work on the ancient rice terraces in the Philippines, to the little-known work on rice-field fish culture in the former Soviet Union. Much of the recent research in tropical Asia is covered, from bacterial ecology, to fish and fish culture. European studies in Hungary and recent work on mosquito control ecology in California are also included.

The topics chosen are wide-ranging and covered by specialists who have had experience in the field in many countries over many years. What makes this monograph different from many other publications on isolated topics of rice cultivation is the diversity of contributors and their long-term expertise in many disciplines of study. Their different cultural and linguistic backgrounds allow scientific findings from very different areas to be disseminated to an international English-speaking audience.

Copepods, however, are only marginally considered. In a record of benthos from rice fields, copepods typically found within the soil or above the bottom as many taxa of the Harpacticoida or Cyclopoida, are not even mentioned. In a chapter on the Ifugao Rice Terraces (Philippines) only Cyclopoida are reported from this system. Species identified are *Mesocyclops aspericornis* and *M. mirolasius.* Others are members of the genera *Cryptocyclops*, *Microcyclops*, *Eucyclops* and *Macrocyclops*. Cyclopoids are polyphagous predators in this system and feed on rotifers, other crustaceans (including cannibalism), small oligochaetes and the larvae of Diptera. Some descriptions are provided on cyclopoid adult and naupliar life stages.

The ecology of rice fields still holds a great number of unanswered questions and problems to be solved – this also includes copepodological studies. This becomes evident in many of the chapters. Long-term sustainability and intensive modern methods seem to be incompatible. The interactions of benthic fauna with the rice plant, the soil chemistry and their roles in fertility and weed control cannot be understood without considering the role of nitrogen-fixing bacteria and microbiological issues in general. The high biodiversity of rice-field ecosystems probably assists sustainability while at the same time providing humans and animals with a variety of foods besides the primary crop. The domestication of plants and animals sustains larger populations of humans and has also saved much wildlife and harvesting of wild plants and animals. Here the concepts of conservation and sustainable economic production become intermingled. The food supply will have to be increased dramatically for an ever-increasing human population. For economic, ecological and social reasons this has to be extended beyond national boundaries. Finding soft solutions for quantitative and qualitative increases of food, reducing costs and environmental risks, might be even more difficult than just maximizing yields per land-unit. The combined rice- and fish-production is a good example of how biocoenotic systems can lead to increased production on the same land area, at the same time keeping pests and diseases below levels that affect yields and reduce external input costs without the application of biocides. Co-cultivation of fish in rice fields and other aquatic habitats created by the rice-growing enterprise could provide much-needed protein to people all over the world. The technology of fish culture has improved vastly, and if suitable fish species and the necessary investments are all brought together, it could lead to a major economic and social breakthrough for humanity. The more we know about the interaction of plants and animals relevant for agriculture, the more we have a chance to develop interdependent generation-responsible systems to produce food and food choices for a world population reaching 10 billion before the middle of the 21st century. The cultivation of rice has often led to great increases of vectors such as mosquitos, copepods, and snails, that are transmitting diseases to humans, domesticated animals and wildlife. The impacts of biocides on the rice-field ecosystem has been a major factor causing the demise of fish stocks that were harvested in rice fields. Integrated pest management has meant that there is a much-improved situation for fish farming in irrigation systems and for harvesting edible protein, particularly in rural areas.

The possibilities of integrated fish culture and harvesting, the use of integrated pest control and the conservationist approach to agriculture can all benefit from a broad-based set of papers covering as wide a range of subjects as possible, as is presented in this volume. The present coverage is unique in that it draws upon the experience of two generations of scientists who have worked on all continents where rice is grown except Africa. This volume will be invaluable to researchers around the world who wish to find comprehensive data on the aquatic ecology of rice fields. Biologists will find an updated survey of fauna and flora, and ecologists descriptions of the intimate relationships between different components of rice ecosystems and aquatic cycles. Data are provided that are useful for a comparison of aquatic systems around the world. Agronomists will find this book useful because the culture of rice, fish and other organisms in rice fields that serve directly or indirectly for human food is considered. Moreover, it will be useful for applied agronomists and fishery biologists, vector ecologists, pest control researchers and technicians, as well as for rice plant and fish farmers. An integrated and multidisciplinary approach has been followed in most chapters. Many chapters base their results on long-term studies and a thorough review of the literature.

The monograph provides a compendium of rice-field ecology studies globally. Some flaws, i.e., insufficiently clear reproduction of graphs, are compensated by the wide coverage of information that is comprehensive and well-integrated at the same time. The monograph will provide students with a good start in their research. This book is a useful tool and authoritative guide for all these purposes.

— Hans-U. Dahms
Hong Kong University of Science and Technology,
Hong Kong

NATIONAL SEA GRANT LIBRARY

For more than three decades, the National Sea Grant Library (NSGL) has served as the archive and lending library for Sea Grant funded publications produced by the 30 National Sea Grant College programs.

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DIALOG

Interdisciplinary training for Recent Ph.D. Graduates across the spectrum of aquatic sciences
freshwater and salt, basic and applied
http://aslo.org/dialog/dialogposter.pdf

After years of disciplinary specialization, graduates from a wide array of backgrounds must increasingly work together to advance our understanding of aquatic organisms and systems. It can take years to broaden perspectives and develop the necessary collegial networks and experience. DIALOG, an initiative funded by NSF, NOAA, ONR and NASA, seeks to jump-start the process.

DIALOG VII Symposium
December 3 - 10, 2005
Dauphin Island Sea Lab

Application Deadline
May 1, 2005

Annual symposia enable graduates to present their research in an interdisciplinary forum, learn about agency programs, discuss early-career development and emerging research, education and societal issues, and forge lasting collegial bonds with their peers. Graduates from all countries who completed their Ph.D. between
April 1, 2003 - March 31, 2005
and whose work in biological, chemical, geological or physical science is relevant to freshwater or marine biological/ecological science are eligible to apply for the DIALOG VII Symposium. A committee will evaluate applications and select 40 to participate. Selection will favor those with interdisciplinary interests. On-site expenses will be covered for all invited participants. Air fare will be covered for most, with preference given to participants residing in the US or in developing countries. Air-travel support for those residing in developed countries outside the US is pending.

Webpage: http://aslo.org/phd.html is the portal to DIALOG. This electronic gateway opens DIALOG resources to a world-wide audience.The site includes resources for early-career development, an on-line registry of Ph.D. dissertation abstracts, program reports and Symposium application instructions. Dissertation abstracts are presented in a fully searchable format to provide a concise overview of the field and highlight individual accomplishments; see http://aslo.org/dialog/dcite.html..

Electronic newsletter A weekly digest distributes news and time-sensitive information to all registered graduates. Please send news, job and other announcements of opportunity to **dialog@whitman.edu**.

Register your dissertation using the interactive form:
http://aslo.org/forms/phdform.html.
To take full advantage of the program, graduates are encouraged to register dissertations immediately after Ph.D. completion. The remaining **symposium application materials must be submitted by May 1.**

— C. Susan Weiler
DIALOG Program Director
dialog@whitman.edu

News from Members

— From Kunihiko Izawa —

Dear colleague:

I retired last spring from Mie University, and then I am continuing my study on parasitic copepods at home laboratory.

Of Shiino collection of parasitic copepods lodged in Mie Univ., the specimens studied and described by Shiino including type specimens were deposited in National Science Museum, Tokyo (Hyakunin-cho 3-23-1,Shinjuku, Tokyo 169-0073, Japan).

Unexamined specimens of Shiino collection are preserved in my lab. for study together with own collections. The specimens of parasitic copepods preserved in my lab. including unexamined ones of Shiino's and own are able to lend out to workers interested in those to study.

Thanking you,
Sincerely yours,

Kunihiko Izawa
Izawa Marine Biological Laboratory
795-16 Kannonji, Tsu
Mie 514-0062, Japan
e-mail: izawafam@ztv.ne.jp

— From B. A. Venmathi Maran —

I am B. A. Venmathi Maran from India, now doing doctoral degree in Hiroshima University, Japan under Prof. Susumu Ohtsuka in the field of "taxonomy and ecology of parasitic copepods in tropical and subtropical countries and also the association of pathogenic bacteria with pseudocaligids from Seto inland sea".

Thanking you
Regards
Maran

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— From M. Gopikrishna —

Dear Dr. Reid,

For your kind information Mr. M. Gopikrishna, from Unit of Reproductive Biology & Live Feed Culture has been bestowed with doctorate in Zoology, from UNIVERSITY OF MADRAS. The title of the thesis is "Studies on the marine Cyclopoid copepods". This study is from the South east of India along the Chennai Coast and the study comprises of taxonomy of marine Cyclopoids, their diversity with ecological indices, culture of two cyclopoids and their biology has been described in view with Scanning Electron Microscopy & Light Microscopy.

With regards
Dr. M. Gopikrishna

New or Updated Addresses

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Financial Statement for the World Association of Copepodologists for 2004

Balance on January 1, 2004	$29,586.41
Membership dues paid	381.73
Interest Earned	219.61
Mailing expenses for *MONOCULUS*	20.44
Seed money for 9th ICOC	2,000.00
Bank fee for wiring seed money to 9th ICOC Local Organizing Committee	40.00
Balance on December 31, 2004	$28,127.31

All members of the WAC are encouraged to pay their dues by mailing them to the address given below. Dues for the WAC are $20.00 US Dollars/year. Dues should be paid in US Dollars (USD) if possible. In the event that this creates a hardship for any member, then dues may be mailed to the treasurer in local currency equivalent to the amount being paid in USD. Because the collection of such foreign currency checks will incur a fee of USD$5.00 against the WAC bank account, it is requested that such payments be made for a minimum of three years' dues.

— John A. Fornshell
Treasurer, WAC

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Editor's Notes

For their contributions and assistance for this number, I am grateful to Geoff Boxshall, Margret A. Chriscinske, Hans Dahms, Néjib Daly Yahia, David Damkaer, Kasia Dmoch, John Fornshell, Hendrik Gheerardyn, M. Gopikrishna, Jushey Ho, Patrick L. Hudson, Kunihiko Izawa, B. A. Venmathi Maran, Kazuya Nagasawa, Kurt Schminke, Sami Souissi, Shin-Ichi Uye, Chad Walter, and Susan Weiler. Thanks to Diane McGannon for permission to reproduce her announcement about the National Sea Grant Library.

Members of the WAC may advise me if they wish to receive the Literature Supplement as an e-mail attachment.

Editing *MONOCULUS* for the past three years has been a most enjoyable experience, especially because of the ready help from many friends and colleagues who have provided advice and contributed articles – in most cases well in advance of requested due dates. I especially thank Kurt Schminke, Rubens Lopes, Chad Walter, and David Damkaer. The experience of walking in the moccasins of the previous Editors Kurt Schminke and Hans Dahms has deepened my appreciation for their years of service, which raised this newsletter to the status it enjoys today. As always, contributions from members and non-members of the WAC will be warmly welcomed.

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

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Membership in the WAC: Any person interested in any aspect of the study of Copepoda is eligible for membership in the WAC. Applicants for membership must be nominated by two active members of the Association. Those interested in becoming a member of the WAC may write to 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 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.
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