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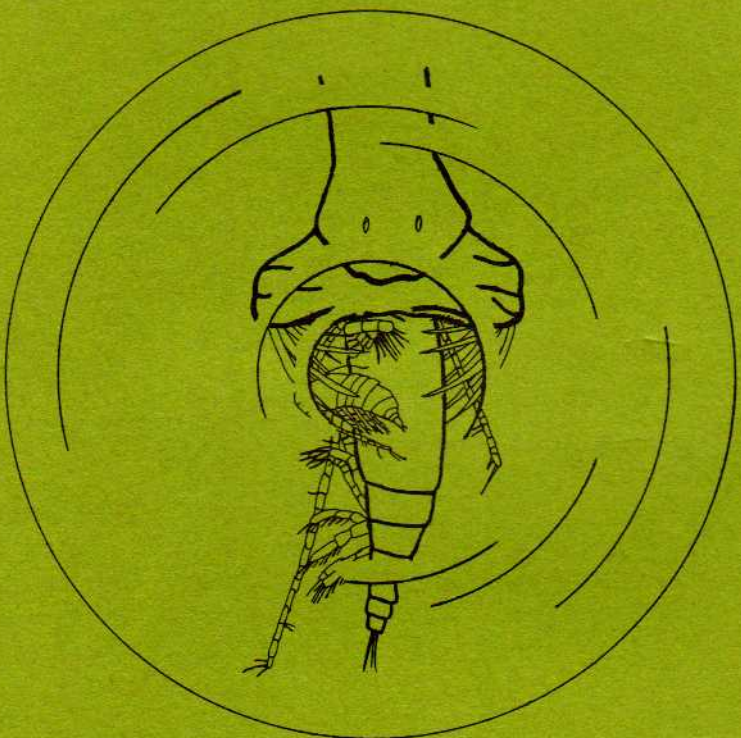
MONOCULUS

Copepod Newsletter



Nr. 16

May 1988

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MONOCULUS

Copepod Newsletter

Number 16 May 1988

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This issue has been typed by: Angelika Sievers, Fachbereich 7 (Biologie), Universität Oldenburg.

The first record of a bopyrid isopod is apparently that of Deslandes (1724), who noted a parasite infesting a shrimp in France ... This same species was finally named Monoculus crangorum by Fabricius (1798). Latreille (1802) subsequently made it the type species of Bopyrus ...

from: Markham - 1985: Mem.Hourglass Cruises 7(3): 7

Birthdays this year

80: C. Mihai Bacescu
Sigeru Motoda

70: Thomas E. Bowman
Albert de Decker
Ingvar Kristensen

Deadline for the next issue of *MONOCULUS*: 15 September 1988

Editorial

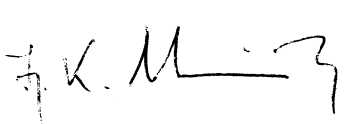
We had to neglect our '*MONOCULUS* factory' for a while. Gerd has left the Museum and has a new address now, Kurt had other priorities for a couple of months. As a consequence, this issue of the newsletter is a little late and the directory 'Copepodologists of the World' spent the winter in diapause, but there are signs that it will soon emerge from this condition.

Articles in *MONOCULUS* start to interest other publishers. Recently, Kabata's note on the disappearing type specimens of Ergasilus funduli and Thatcher's 'Hope for HYP' have been reproduced in the Biology Curators' Group Newsletter in England and Ferrari's obituary of A. Fleminger in this issue will also appear in the Journal of Crustacean Biology.

It has been decided in the meantime where our next International Conference on Copepoda will be held. A fantastic spot has been selected. It is a pity we have to wait until 1990 to go there. Don't just wait, use the time for saving a bit of money to make the stay even more enjoyable.

This newsletter is dominated by the rest of the list of current research projects compiled from the questionnaire in 1986. Some projects may not be 'current' any more but we feel the list may still be useful in showing the different research interests. For the remaining space we have received contributions from H.-U. Dahms, F. Ferrari, G.R.F. Hicks, T. Ito, H. Juhl, M. Mullin, and S.-I. Uye. J. Chojnacki has drawn the portrait of A. Fleminger. M. Pottek, a student in Oldenburg, has contributed a cartoon which was inspired by his sorting of samples from the Antarctic. B. Dussart and K. Purasjoki sent the greetings for New Year reproduced in this issue.

Many thanks to all of them for their help in producing another (interesting) issue of our newsletter.



Noted Marine Biologist Abraham Fleminger Dies

Dr. Abraham Fleminger, a long-time research biologist with UCSD's Scripps Institution of Oceanography, died yesterday, Wednesday, Jan. 13, 1988, in San Diego, California. The cause of death was peritonitis, following a kidney transplant.

Fleminger, 62, was the curator for more than 20 years of the largest and most complete collection of marine zooplankton in the world, housed at Scripps Institution. He had been affiliated with the Scripps Institution's Marine Life Research Group since 1960, specializing in studies of the ecology and distribution of marine copepods.

An outstanding quality of his scientific work was his incisive ability to see the connection between the morphology of copepods, their biogeography, and their evolution, as exemplified in his investigations of the Pontellidae. His publications include descriptions of many new species and analyses of ecological events relating to their evolution. He was known for his use of scanning electron microscopy to reveal new integumentary organs helpful in clarifying phylogeny, and discovery that sex change can take place in certain copepods when the environment changes prompted a rethinking of the population biology in this field.

Fleminger, born in New York City, on Feb. 4, 1925, was a graduate of Brooklyn College and received his master's degree and doctoral degree in biology from Harvard University. He served as a fish research biologist with the U.S. Fish and Wildlife Service from 1955 to 1960.

During his 28 years at Scripps Institution, Fleminger was the chief scientist on several biological expeditions, particularly those conducted for the California Cooperative Oceanic Fisheries Investigations (Cal-COFI), a long-term study of marine life in the California Current. He travelled extensively in the Caribbean, the Eastern Pacific Ocean, and among the archipelagos of the Indo-Pacific region, defining local species of copepods and their distributions. A species of a Japanese copepod is named for him.

Fleminger was an advisor on marine studies to several nations, through UNESCO and other international agencies and universities. He wrote numerous publications and journal articles on biological oceanography and was the editor of the CalCOFI Atlas Series. He was a fellow of the American Association for the Advancement of Science and a member of the American Society of Limnology and Oceanography and Sigma Xi.

Fleminger is survived by his wife, Joy, and his son, David Fleminger of San Diego. A memorial service will be held at Scripps Institution of Oceanography.

Scripps Institution of Oceanography

Abraham Fleminger - Copepod Geographer

Abraham Fleminger died January 13, 1988, of peritonitis. Kidney failure and a failed kidney transplant had complicated his health problems. He was 62.

Abe is very difficult to categorize. He was a bright man, very well-read, who took an eclectic approach to research problems. He enjoyed marine biology, on occasion spoke of himself as a natural historian; copepodologist was fine, but zoogeographer/systematist is the best descriptor, I believe. Abe was interested in a wide range of fundamental problems about copepods and, more generally, marine organisms. He was knowledgeable about distributional ecology, biogeography, feeding and reproductive behavior, and structural and functional morphology. And Abe did more than just discuss these topics separately. He impressed both his readers and listeners with a unique ability to explain how concepts in one topic could be integrated with another to solve a problem in yet a third.

Abe graduated from Brooklyn College, and received a masters and doctorate (under Dr. Elizabeth Deichmann) from Harvard University. While at Harvard, Abe was influenced by the writings of Ernst Mayr. The biological species concept and allopatric model of speciation were fundamental to Abe's approach to copepod zoogeography. After completing his dissertation on calanoid copepods of the Gulf of Mexico, Abe served briefly with the U.S. Fish & Wildlife Service in Galveston. In 1960 he moved to Scripps Institution of Oceanography where Martin Johnson and his students were working on the pelagic zoogeography of the Pacific Ocean.

In his research Abe studied morphological variability among groups of copepods and attempted to correlate that variability with spatial separation of the groups. Whenever possible he tried to associate such correlations with natural history events, particularly as these events may have interrupted gene flow and shaped future populations. In his descriptions of copepods Abe was careful to establish the degrees of poly-

morphism within the species, and then used this information to provide the foundation for all further analyses.

Abe contributed to an understanding of the development and variation in primary sexual characters, but he usually focused his attention on the skeletal morphology of calanoids, because many secondary sexual characters are expressed in the copepod skeleton. Abe believed characters which separated populations were not neutral, but had adaptive significance. Reenforcement of secondary sexual characters resulted from contact between previously isolated populations; its cause was behavioral selection against hybridization, and thus gamete wastage, between populations. Pontellid copepods, like many heterarthandrian calanoids, exhibit elaborate diversity in male grasping antenna, leg 5, spermatophore coupler, and the urosome of both sexes. Abe found these variations were sufficient to allow differentiation of populations and yet structured enough to allow subsequent integration into species groups. Several amphascandrian families offered a more challenging analytical problem for Abe because clausocalanids, eucalanids, and calanids do not exhibit as striking a divergence of secondary sexual characters. With the latter two families, Abe emphasized diversity and patterns of integumental organs as aids in separating and grouping populations. A list of Abe's copepods new to science is appended. He also established two new calanoid genera, Parundinella, and the spinocalanid Isaacsicalanus with which he remembered a close friend, John Isaacs.

The geographical systems Abe studied include the oceanographic provinces of the Pacific Ocean, equatorial regions of the world's oceans, and coastal zone regions of the Americas and Indo-west Pacific. He discussed effects of the final break-up of Tethyan circulation around the Panamian isthmus on the isolation of equatorial oceanic populations, as well as their coastal zone relatives, and clarified the concept of circumglobal distributions. Abe considered Pleistocene sea-level changes as a cause of isolation of American coastal-zone pontellids, and of the historical extension of upwelling in the Flores, Timor and Banda Seas which influenced speciation of the pontellids of that region.

Abe made many basic contributions to marine science, and I believe his most significant study provides evidence for an oceanographic component of Wallacean marine diversity. In a 1986 paper Abe is at his best, integrating morphological affinity, zoogeographical distributions, and the ecology of calanoid copepods. By adding recent advances in historical geology, Abe was able to make a compelling case that the well-known diversity of marine organisms centered around Wallace's Line is as much a product of Pleistocene oceanography as it is of the movement of the earth's tectonic plates.

Abe Fleminger is remembered to copepodologists with an Atlantic Paroithona flemingeri. The boreal Pacific Neocalanus flemingeri is being described. Other species certainly will be added. But Abe's ideas, particularly his magical syntheses, will be his lasting legacy.

Frank D. Ferrari
S.O.S.C./M.S.C.
Museum of Natural History
Smithsonian Institution
Washington, D.C. 20560 - U.S.A.

(A. Fleminger's list of publications will be reproduced in the next issue of the newsletter.)

P.S. This note will also appear in the "Journal of Crustacean Biology". Frank told me how this came about (letter April 7, 1988):

Art Humes wrote to Bill Newman about Abe's death and the availability of an obituary. Bill sent the request to Mike Mullin who heads Abe's unit, M.L.R. I had sent my MONOCULUS manuscript to Mike for review and Mike sent a copy to Art. Art then called me to ask if I would mind if he reprinted it in Journal of Crustacean Biology. I said Ok.

H.K.S.

"What makes a good taxonomic description?" Report on the evening discussion at the Third International Conference on Copepoda held in London on Tuesday, August 11, 1987

The evening started with an introductory contribution from John Wells and Geoff Hicks, continued with a lively discussion summarized further below and ended with the decision to start a series of model descriptions in *MONOCULUS*. Here is a slightly shortened version of the introductory paper entitled:

THE GOOD, THE BAD AND THE UGLY,
OR THE TECHNIQUES OF TAXONOMIC DESCRIPTION

Preparing good descriptions in a form that can be published at the lowest cost has never been more important than now. The reality is that, apart from what we might require as practising taxonomists, the new global economic climate may end up forcing us to accept changes. Spiralling printing costs make it increasingly difficult to get large papers accepted; a situation likely to deteriorate before it improves. On these grounds alone therefore, we should question the need for excessive descriptive verbiage. Our aim in this paper is to give our personal views on what is strictly necessary and on what standard we are trying to achieve.

The essential purpose of a description is obvious and indisputable - it must enable the taxon to be distinguished from any other taxon of the same rank. However, there are further elements to be considered:

1. No data are irrelevant
   The description must be as useful in the future as at present, that is, it must not be confined to describing only the currently important characteristics. Detail irrelevant today may well be vital tomorrow.

2. Variability is data
   The description must provide data on variability in the populations surveyed; statistically presented if possible. We appreciate that it will always be necessary to describe

some species from one or a few specimens, but we stress that this is an undesirable practice. When a large material base is available a statistically valid numbre of specimens must be studied.

3. Pictures speak more directly than words
The description must be easy to use and thus we argue that:

   (a) Illustrations are primary. They are what users first turn to and, importantly, they stand independent of the need for foreign language skills. They must be large, clear and sufficiently detailed both for the immediate purpose and to provide data for potential future use. Authors must resist editorial pressure to excessive reduction and insist on quality reproduction wherever possible; later workers may well need to make accurate measurements from illustrations.

   (b) The text is necessary only to fill out morphological detail not able to be illustrated; provide meristic data; record and discuss variability; give ecological data where available. It should confirm important elements of the figures only if this is judged to be absolutely vital to a proper understanding of the description. For example, how important, or necessary, is it to present a fine illustration of a 6-segmented antennule and to have in the text ..."Antennule 6-segmented (Fig. 1)"? The text, therefore, should be kept to a minimum. It should also be kept grammatically simple and with a limited vocabulary so as to aid translation.

4. Beware the needs of the non-specialists
The fact that descriptions are often used for non-taxonomic purposes must continually be kept in mind. Users should be able to identify their material without the need to understand fully the taxonomic and nomenclatural ramifications surrounding each taxon. In well studied habitats, for instance, good clear whole animal drawings often are sufficient to identify conspicuous species.

In Summary:

A species description should be founded firmly on illustrations that are much better than "adequate", with the text providing only that which cannot be seen or measured from the figures.

A species description must be comprehensive, covering all aspects of anatomical, morphological, meristic, ecological and behavioural data that is available, without reference to the current importance of this detail.

We argue that if the illustrations are good enough nearly all of the relevant information can be interpreted from them, including absolute and relative measurements. In some cases, however, illustrations are not even provided. A classic example where the omission of full, illustrated descriptions has contributed to confusion and frustration is the use of preliminary diagnoses. This technique seeks to legitimise names of taxa well in advance of their full and formal description. We appreciate the reason for doing this but regret that in too many cases the subsequent full descriptions never appear. It is then left to the first reviser to clear up the deficiency. In the meantime the names exist in the literature, with few of us feeling confident of accurately identifying specimens on the basis of such cryptic, inconsequential, unillustrated outlines.

Regrettably this practice exists within the ranks of copepodologists, although more particularly, it must be said, at levels above the species in works which purport to be revisory of higher taxa. The erection in this manner of new genera, new families and new combinations, often through the medium of less rigorously refereed papers in conference proceedings, does nothing for the value of the work, the reputation of the author or, more importantly, for the stability of the science.

Each of us must be as rigorous as possible in our taxonomy. We must endeavour to eliminate contradiction and deception, and give full encouragement to solid practices of accurate description and full illustration before embarking upon revolutionary reassessments of taxa. We should do it ourselves and demand it

of others when we act as referees. Only then may we feel confident that copepod systematics is built on a firm base.

Resumé of Discussion

The ensuing lively, vigorous and wide-ranging discussion endorsed the vital importance of good, clean, clear, comprehensive and detailed line drawings. Photographs and SEM micrographs should be used to support rather than replace line drawings, one of their disadvantages, apart from cost, being the difficulty of obtaining quality xerox copies from them.

However, there was considerable disagreement on the extent of necessary textual description. The opinion ranged from a minimum "shopping list" approach (e.g. descriptions centred largely on abbreviated formulae), through advocates of a "telegraphic style" that highlights essentials, to those that believe that there is no substitute for a highly detailed and voluminous verbal description. There was unanimity that text and figures have to agree and that they must not provide contradictory information. It was felt that a good discussion is most desirable with a detailed comparison of the closest taxa.

There was general agreement that a consensus view on a model description for all Copepoda would not be possible; other things apart, each group tends to have a different set of well established conventions. But it might be possible for such a view to be reached by workers within each copepod order. Kurt Schminke concluded the discussion with the suggestion that an acknowledged expert in each group would present in *MONOCULUS* a model for critical comment. In this way a generally accepted overall standard may be reached, which would be a great service to all of us.

The audience also discussed such items as:

- Editorial policy, and the roles of editors and reviewers in setting and maintaining standards.
- Overcoming, or at least reducing, cost constraints in publishing taxonomic work.

- Techniques in microscopy, drawing and preservation.
- The type-concept; Holotype and Paratypes vs Syntypes.

Each of these topics is worthy of much more attention, and maybe they can be addressed in workshops at the next Conference.

John Wells
Department of Zoology
Victoria University
Private Bag
Wellington, N.Z.

Geoff Hicks
Department of Crustacea
National Museum of N.Z.
Private Bag
Wellington, N.Z.

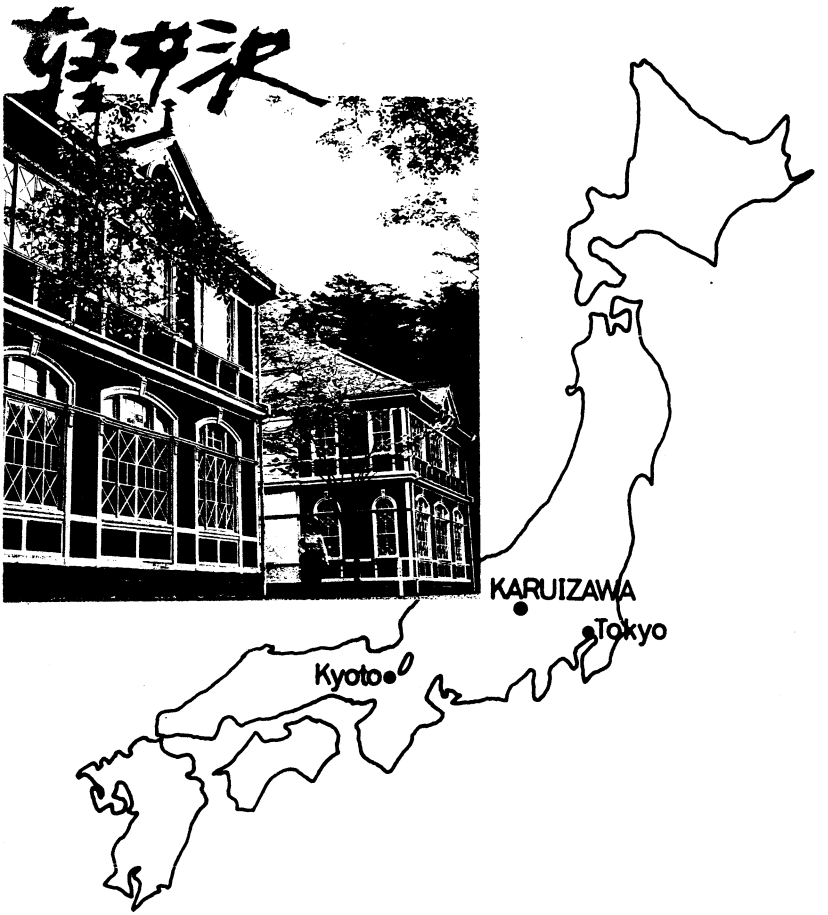
P.S. In the next issue of *MONOCULUS* we shall start with a model harpacticoid description which then is free for critical comment.
Incidentally, Dr. H. Kunz (Saarbrücken) has recently produced an inventory of whole animal drawings of all genera of Harpacticoida he could find in the literature. This collection of xerocopied portraits of whole animals demonstrates that there are many genera of which no portraits are available. Those that exist, mostly are very poor and practically of no use even though many genera have such distinctive features that non-specialists would have no great difficulties in identifying them from whole animal drawings would these be proper enough. Good whole animal drawings are time-consuming, I know - but see above under "Beware the needs of non-specialists"!

H.K.S.

$A^{N}N_{O}U^{N}C_{E}M^{E}N_{T}S$

FOURTH INTERNATIONAL CONFERENCE ON COPEPODA

The Fourth International Conference on Copepoda will be held at Karuizawa Seminor House of Nihon University, Karuizawa, Nagano Prefecture, from September 16 (Monday) to 20 (Friday), 1990. Karuizawa is located 1,000 m above sea level, enjoys



cool and dry summers and is one of Japan's most fashionable inland resorts. It is not very far from Tokyo (as shown on the map), approximately two hours by a limited express train from Tokyo. The Seminor House provides a hall, lecture rooms, a cafeteria and bedrooms. Since nearly 300 people can stay at one time, we can eat, drink, sleep and discuss under the same roof.

We will adopt a similar format for the meeting to the previous one in London. There will be a mixture of half-day symposia on selected topics and contributed paper sessions, in addition to poster presentation sessions and evening discussions. Themes of the symposia and evening discussions are open, and we would welcome your suggestions. These suggestions should be sent to any member of the organizing committee, as listed below.

Further announcements and more detailed information will appear in subsequent issues of *MONOCULUS*. Keep watching.

Members of the Organizing Committee

Sadami Kadota (Chairman)
College of Agriculture and Veterinary Medicine
Nihon University
3-34-1 Shimouma, Setagaya, Tokyo 154
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Shin-ichi Uye (Secretary)
Faculty of Applied Biological Science
Hiroshima University
Saijo-cho, Higashi-Hiroshima 724
Japan

Shuhei Nishida (Local arrangements)
Ocean Research Institute
University of Tokyo
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Geoff Boxshall
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H. Kurt Schminke
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Universität Oldenburg
Postfach 2503, D-2900 Oldenburg
Federal Republic of Germany

Gerd Schriever
Zoologisches Institut
Universität Kiel
Biologiezentrum
Olshausenstr. 40
D-2300 Kiel
Federal Republic of Germany

SEVENTH INTERNATIONAL MEIOFAUNA CONFERENCE (SVIMCO 89)

The SVIMCO will be held in Vienna (Austria) from August 21 to 26, 1989. This is immediately after the International Limnology Meeting at Munich (August 11-19). Since we would like to strengthen the ties between marine and freshwater meiobiologists we considered this a good idea. Unfortunately there is no time schedule for the EMBS 1989 yet.

The following topics to be emphasized are suggested:

1. Adaptations to environmental gradients: e.g. marine - freshwater, oxic - anoxic, microenvironments and microzonation, rapid temporal changes, techniques to measure and simulate gradients.
2. Faunistics: new types, new insights into phylogeny, new and interesting aspects of biogeography.
3. Role of meiobenthos in specific processes: e.g. decomposition, remineralization, microbial interactions.
4. Trophic webs: comparison of trophic relationships in marine, freshwater and groundwater situations, methods for tracing trophic relationships.

A special workshop on the origin of groundwater fauna will be organized within the framework of SVIMCO by Dan Danielopol.

We will be happy to receive further suggestions and comments. Please address correspondence to:

Dr. R. Novak (SVIMCO), Institute for Zoology, University of Vienna, Althanstraße 14, A-1090 Vienna, Austria.

Dan Danielopol Rudi Novak Jörg Ott Fritz Schiemer

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THIRD JAPANESE CONFERENCE ON COPEPODA

"Copepods in Various Ecosystems"

20 November, 1987

(Seto Marine Biological Laboratory, Kyoto University)

The Third Japanese Conference on Copepoda was held at the Seto Marine Biological Laboratory, Kyoto University, Shirahama, on 20 November 1987, and was convened by T. Ito (Kyoto Univ.) and S. Uye (Hiroshima Univ.). Thirty three copepodologists attended to the conference.

Programme

Opening Address — T. Harada (Kyoto Univ.)

Chairman M. Murano (Tokyo Univ. of Fish.)

1. Freshwater Lakes

   In situ development rate of Eodiaptomus japonicus in Lake Biwa

   W. Kawabata (Kyoto Univ.)

2. Brackish-Water Lakes

   Significance of remarkable boundary zones

   E. Harada (Kyoto Univ.)

   Chairman M. Omori (Tokyo Univ. of Fish.)

   Effect of cannibalism of Sinocalanus tenellus on its population dynamics

   A. Hada (Hiroshima Univ.)

3. Estuaries

   Copepods in estuaries: their adaptation

   J. Hiromi (Nihon Univ.)

4. Marine Inshore Waters

   Feeding of copepods in inshore waters, with special reference to its diel variation

   A. Tsuda and T. Nemoto (Univ. Tokyo)

   Chairman E. Harada (Univ. Kyoto)

5. Marine Neuston
   Ecology of neustonic copepods
   Y. Matsuo (Nansei Reg. Fish. Res. Lab.)

6. Marine Mesopelagic Zone
   Bimodal vertical distribution of mesopelagic copepods in relation to their diel migration and feeding
   H. Hattori (Tohoku Univ.)

7. Marine Near-Bottom Layer
   Developmental stages and feeding habits of hyperbenthic calanoids
   S. Ohtsuka (Hiroshima Univ.)

   Chairman K. Izawa (Mie Univ.)

8. Antarctic Waters
   Ecology of a copepod inhabiting in sea ice
   A. Tanimura (Natl Inst. Polar Res.)

9. Marine Sea-Bottom
   Microdistribution of benthic harpacticoids
   N. Iwasaki (Kochi Univ.)

10. On Marine Fish
    Ecology of Pennellidae parasitic on marine fish
    K. Nagasawa (Hokkaido Pref. Fish. Exp. Stn)

    Chairman M. Omori (Tokyo Univ. of Fish.)

Fourth International Conference on Copepoda
Closing Address — M. Omori (Tokyo Univ. of Fish.)

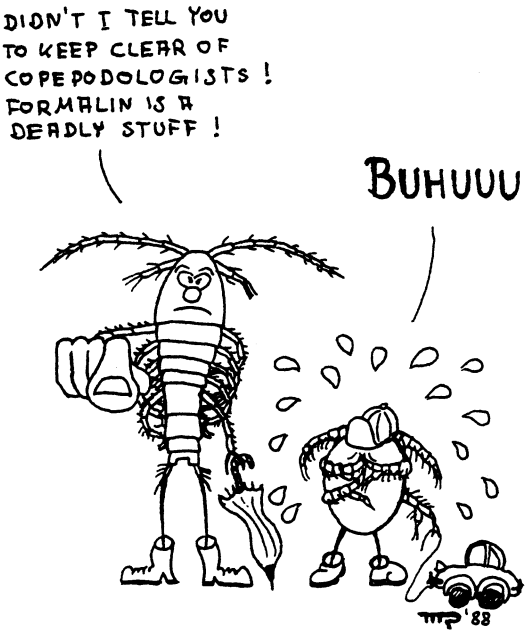
It is our pleasure to give you good news about the Fourth International Conference on Copepoda. As announced above in this issue of *MONOCULUS*, the members of the local organizing committee were elected, and place and time of this conference were decided.

Since Shirahama is popular as hot springs resort, it was a good relaxation for the attendants to soak in hot spring baths after fruitful discussions during this conference.

(T. Ito and S. Uye)

OFFER AND REQUEST CORNER

Upon his retirement Dr. Howard Sanders of the Woods Hole Oceanographic Institution sent his unsorted samples from deep-water hydrothermal vent communities to the Smithsonian Oceanographic Sorting Center. Many specimens (from Galapagos Rift and East Pacific Ridge) previously had been sorted in Dr. Sanders' lab and these were sent to his colleagues for study. Subsequently the Sorting Center has sorted the remaining samples and is distributing the specimens to interested scientists while honoring previous commitments for specimens made by Dr. Sanders. Among the samples are a number of copepods in the orders Siphonostomatoida and Poecilostomatoida (both groups being studied by Dr. Humes), Calanoida (previously sent to Dr. Fleminger) and Harpacticoida. About 6350 specimens of harpacticoids in 28 lots have been sorted. We would like to determine if there is interest among *MONOCULUS* readers in studying the harpacticoids. Specialists should contact Dr. Jon Norenburg or Dr. Frank Ferrari, S.O.S.C./M.S.C., Museum of Natural History, Smithsonian Institution, Washington, D.C. 20560, U.S.A.



Business ssenisuB

1. *MONOCULUS*-Library/Bibliography

Our appeal for reprints (old and new) sent out in a circular letter last year has been a great success. In the last issue of the newsletter we could thank 173 receivers of *MONOCULUS* for their donations; this time we can add another 48 donors to this impressive list:
Andronov, Bamstedt, Benz, Boucher, Burton, Conway, Dagg, M.S. Evans, Fava, Furuhashi, Gee, Hart, Hicks, Holmes, Illg, Jillet, Jones, Kerambrun, Lang, Leblanc, Lindley, Markhaseva, Mastrantuono, Mayzaud, McKinnon, Montagna, Montschenko, Moreira, Mullin, Ohtsuka, Paggi, Park, Pechen-Finenko, Piasecki, Ranga Reddy, Roen, Saraswathy, Schirl, Skjoldal, Stearns, Stella, Stoch, Tackx, P.K.M. Thompson, Tseng, Vyshkvartzeva, Wellershaus, Wiebe.

Thank you very much for supporting our project of a copepod library and computerized bibliography. Recently Frieda Rötterink has joined the team of the *MONOCULUS*-Library and will be working for it full-time at least for one year. Also new in the team are two students working part-time: Martina Mühl and Ove Breiholz. Together with H. Juhl and W. Janetzky the "staff" now consists of 5 persons. No wonder, we are in need of more reprints! The ones received so far have been worked up already.

We therefore repeat our appeal because there are many more than 221 receivers of *MONOCULUS*. Please send us

- reprints of your publications as soon as they appear. Put *MONOCULUS* on your list for regular and prompt mailing;
- copies of your older publications. In case originals are no more available, let us have xerox copies of them (or, alternatively, send us the originals so that we can copy them here and send them back immediately);
- any duplicates in your own collection or that of your Department library. In case you know of any remains of libraries of deceased colleagues, please let us know.

Please send reprints to Kurt Schminke. Support the *MONOCULUS*-Library and our bibliography project!

2. Questionnaire 1986

Heip, C., Gent, Belgium:

1. Harpacticoid copepods from the North Sea.
2. Harpacticoid copepods from macrophytes in the Mediterranean.

Herbst, H.-V., Krefeld, F.R.G.:

1. Cyclopoida Gnathostoma from the West Indies.
2. Copepoda of the lower Rhine River.

Hernroth, L., Fiskebäckskil, Sweden:

1. The zooplankton of Inhaca, Mocambique, S.W. Indian Ocean.

Heron, G.A., Seattle, U.S.A.:

1. Taxonomy of Ocaeidae collected in waters off New Zealand.

Hewitt, G.C., Wellington, New Zealand:

1. Biochemical aspects of evolutionary relationships of Copepoda parasitic on fish.

Hicks, G.R.F., Wellington, New Zealand:

1. Systematics of Harpacticoida from deep-sea biogenic substrata.
2. Ecology of seagrass-dwelling Copepoda.
3. Taxonomy and distribution of N.Z. estuarine Harpacticoida.

Hirche, H.-J., Bremerhaven, F.R.G.:

1. Respiration and swimming activity in Arctic calanoids.
2. Egg production of C. finmarchicus, C. glacialis.
3. Digestive enzymes of C. finmarchicus, C. glacialis.
4. Age pigments in C. hyperboreus, C. glacialis. (all Greenland Sea)
5. Copepod production and oceanic fronts (especially: Arctic, Polar front).

Ho, J.-s., Long Beach, U.S.A.:

1. Copepods associated with hermit crabs.
2. Larval development of Ismaila (Poecilostomatoida)
3. Copepod parasites of deep-sea fish (world wide).
4. Cladistics of Chondracanthidae parasitic on marine fish.

Hoffmeyer, M.S., Bahîa Blanca, Argentina:

1. Studies on feeding of calanoid copepods with experiments in vitro.
2. Scanning electron microscopy studies of mouthparts of copepods.
3. Scanning and transmission electron microscopy studies of chemo- and mechano-receptors.
4. Histochemistry and measurement of enzymatic activity of digestive enzymes in Copepoda Calanoida.

Hogans, W.E., St. Andrews, Canada:

1. Taxonomy of parasitic copepods (Pennellidae, Sphyriidae).

Holmes, J.M.C., Dublin, Ireland:

1. Fauna of Lough Hyne (INE), the marine nature reserve in S.W. Ireland.
2. Cataloguing and building up the reference collection in the National Museum, Dublin.
3. Taxonomy of Clausidiidae.

Holynski, M. and R., Tiszavasvari, Hungary:

1. Faunistics and ecology of the "Bâtorliget" Marsh Reserve Copepoda/Cladocera.
2. Taxonomy of some problematic groups of Cyclopidae.

Hopkins, T.L., St. Petersburg, U.S.A.:

1. Taxonomic structure and food webs of polar (Antarctic) and subtropical (Gulf of Mexico) midwater ecosystems.

Hulsemann, K., Hamburg, F.R.G.:

1. Copepodid stages of Drepanopus forcipatus (Copepoda Calanoida).
2. Copepoda Calanoida from the southwestern Atlantic.
3. Midwater Copepoda Calanoida from the equatorial Atlantic.
4. Variation in Calanus helgolandicus (together with A. Fleminger).

Humes, A.G., Woods Hole, U.S.A.:

1. Poecilostomes and siphonostomes from deep-sea hydrothermal vents.

Huys, R., Gent, Belgium:

1. Morphology and systematics of Cylindropsyllidae (Harpacticoida).
2. Morphology and systematics of Scottopsyllus-group (Paramesochridae, Harpacticoida).
3. Revision of the subfamily Stenocopiinae (Ameiridae, Harpacticoida).

Ianora, A., Napoli, Italy:

1. Vertical zonation patterns of Mediterranean copepods.
2. Biomass and species composition of Mediterranean coastal regions.
3. The effects of parasitization on coastal copepods.

Itô, T., Wakayama, Japan:

1. Origin of Copepoda.
2. Taxonomy of deep-sea harpacticoids.

Izawa, K., Edobashi, Japan:

1. Ontogeny and phylogeny of parasitic Copepoda.

Jackson, D., Galway, Ireland:

1. The genera Lepeophtheirus and Caligus in salmonid culture.

James, C.M., Salmiya, Kuwait:

1. Production of the planktonic copepod Apocyclops borneoensis for aquaculture.

Jeffries, H.P., Narragansett, U.S.A.:

1. Fatty acid profiles in coastal zooplankton.
2. Counting, measuring and identifying copepods by electronic image analysis.

Johnson, T.D., Stony Brook, U.S.A.:

1. Egg production and mortality of Parvocalanus crassirostris.
2. Development of stages of P. crassirostris.
3. Ecology of copepods in Chilean coastal upwelling.

Jonasdottir, S.H., Seattle, U.S.A.:

1. Egg production of Pseudocalanus spp.
2. Food of nauplii of Cyclops abyssorum.

Jones, J.B., Wellington, New Zealand:

1. New Zealand Sphyriidae.
2. New Zealand copepod parasites of scombrids.

Kabata, Z., Nanaimo, Canada:

1. Use of a lernaeopodid copepod as a biological tag for identification of fish stocks.
2. Compilation of copepod part to Guide of Parasites of Fishes of Canada.
3. Description of substantial collections of copepods parasitic on fishes.

Kahan, D., Jerusalem, Israel:

1. High density effects on reproduction and hatching of egg-sacs in Tigriopus.
2. Effect of nitrogenous waste products on growth of Schizopera elatensis.
3. Biology of Leptocaris brevicornis.
4. Growth of Nitocra minor on vegetable material and survey of digestive enzymes.
5. Osmoregulation in harpacticoids.
6. Feeding behaviour of several harpacticoid copepods.
7. Comparison of neurosecretory organs in various harpacticoid copepods.

Kawamura, A., Hakodate, Japan:

1. Spatial scale of the surface swarms of Calanus plumchrus and of C. cristatus.
2. Gut contents of myctophid fishes in the NW Pacific Ocean.

Kazachenko, V.N., Vladivostok, U.S.S.R.:

1. Key of genera of parasitic copepods of fishes.
2. Some parasitic copepods of freshwater fishes of Primorje.
3. Some parasitic copepods of fishes of Peter the Great Bay (Japan Sea).

Keim, A., Abon, Indonesia:

1. Taxonomy and biology of copepods in mass cultures.

Kikuchi, Y., Ohu, Japan:

1. Morphological comparison of two terrestrial harpacticoids.
2. Studies on water mites and harpacticoid copepods as the indicators of pollution.

Kimoto, K., Nagasaki, Japan:

1. Under-water observation of copepod swarms.
2. Plankton production and food requirements of fish larvae.

Klein Breteler, W.C.M., Texel, The Netherlands:

1. Cultivation and breeding, growth and development, food consumption and food selection of pelagic copepods.
2. Influence of temperature and food quantity and quality on bioenergetics of pelagic copepods.

Koehl, M.A.R., Berkeley, U.S.A.:

1. Fluid mechanics of particle capture by calanoid copepods.

Kohlhage, K., Münster, F.R.G.:

1. Locomotion and hydrodynamic aspects of locomotion of copepod larvae.

Kukert, H., Seattle, U.S.A.:

1. Copepods of the Pilyusic Islands (Spain).

Kunz, H., Bischmisheim, F.R.G.:

1. Taxonomic studies of Tetragonicipitidae, Paramesochridae and Cylindropsyllidae.

Kurbjeweit, F., Kiel, F.R.G.:

1. Grazing experiments of Arctic copepods on Phaeocystis pouchetii.

Lakkis, S., Jounieh, Lebanon:

1. Corycaeidae, Oncaeidae, and Acartiidae of Libanese waters.
2. Deep water copepods of the eastern Mediterranean.

Le Borgne, R.P.J., Noumea, New Caledonia:

1. Zooplankton of the atoll of Tikchau (Tuamotu Islands).
2. The pelagic food web of the southern lagoon of New-Caledonia.

Lee, W.Y., Port Aransas, U.S.A.:

1. Reproduction and feeding of the harpacticoid Tisbe carolinensis.
2. Population dynamics of Acartia tonsa in Texas coastal waters.
3. Feeding and excretion of the calanoid copepod A. tonsa in the San Antonio Bay systems, Texas.

Lescher-Moutoué, F., Paris, France:

1. Ecology of freshwater Cyclopoida and Calanoida.
2. Systematics and biogeography of subterranean Cyclopidae.

Lewis, M.H., Auckland, New Zealand:

1. Monograph of the New Zealand freshwater Harpacticoida.
2. Developmental stages of some New Zealand freshwater Harpacticoida.

Li, S., Xiamen, People's Republic of China:

1. The developmental stages of Schmackeria poplesia Shen.

Lim, R.P., Kuala Lumpur, Malaysia:

1. Systematics of Malaysian freshwater copepods.

Lindley, J.A., Plymouth, U.K.:

1. Overwintering of calanoid copepods.

Longley, G., San Marcos, U.S.A.:

1. Fauna of Edwards Aquifer in Texas (includes copepods).

Lonsdale, D.J., Stony Brook, U.S.A.:

1. Latitudinal differentiation in growth rate, reproduction, and physiology in Scottolana canadensis, a widespread estuarine harpacticoid copepod.

Madhupratap, M., Goa, India:

1. Possibility of occurrence of copepod resting eggs in tropical coastal lagoons.
2. Rearing copepods from eggs to adults and taxonomy.

Maly, E.J. Montreal, Canada:

1. Mating behaviour in calanoid copepods.
2. Factors affecting incidence of calanoid copepods.
3. Diets and patterns of co-occurrence of calanoids.

Mamaril, A., Quezon City, Philippines:

1. Studies on freshwater copepods of the Philippines.

Marcogliese, D.J., Winston-Salem, U.S.A.:

1. Cyclopoid community dynamics in presence and absence of fish predation.
2. Importance of cyclopoid copepods as intermediate hosts in fish cestode seasonal dynamics.
3. Behavioural interactions between coracidia, procercoids and cyclopoid copepods.
4. Vertical migration of cyclopoid copepods and calanoid copepods.

Marcotte, B.M., Montreal, Canada:

1. Harpacticoid copepods of NW. Atlantic deep sea and slope.
2. Diel vertical migrations of harpacticoid copepods.
3. Feeding ecology of harpacticoids.
4. Harpacticoids of Bermudian caves.

Marcus, N.H., Woods Hole, U.S.A.:

1. Genetics of life history variation.
2. Copepod dormancy - specifically diapause eggs.
3. Photoperiodism in marine copepods.
   (Primary subject of study is Labidocera aestiva).

Markhaseva E.L., Leningrad, U.S.S.R.:

1. Taxonomy of family Aetideidae (Calanoida).

Matsumura-Tundisi, T., S. Paulo, Brazil:

1. Carbon uptake of copepods feeding on the phytoplankton from D. Helvecio Lake (Brazil).
2. Respiration rate of copepods from Lake D. Helvecio.
3. Latitudinal distribution of Calanoida copepods in freshwater aquatic system of Brazil.

Matthews, J.B.L., Oban, U.K.:

1. Biological exchange between Norwegian fjords and coastal waters.
2. Comparison of biological productivity in two Scottish firth systems.

Mauchline, J., Oban, U.K.:

1. Bathymetric distribution and migration in Rockall Trough.
2. Biology of deep sea genera of calanoids.
3. Survey of integumental sensilla of calanoids.

Mayzaud, P., Rimouski, Canada:

1. Influence of food quality changes on copepod nutrition.
2. Adaptability of copepod digestive system.
3. Digestive enzyme characteristics.

McAlice, B.J., Walpole, U.S.A.:

1. Seasonal and spatial distribution of estuarine planktonic copepods.
2. Ecological role of Microsetella norvegica.
3. Morphometric comparison of Acartia tonsa populations.

McKinnon, A.D., Townsville, Australia:

1. Taxonomy of siphonostome families Artotrogidae and Entomolepidae.
2. Speciation in Australian Acartia (Calanoida).
3. Factors regulating distribution and abundance of planktonic copepods in Victorian embayments.
4. Taxonomy of miscellaneous calanoid genera.

McLaren, I.A., Halifax, Canada:

1. Life cycles and production of offshore copepods, Nova Scotia.
2. Analysis of regularities in development rates, size, etc.
3. DNA, especially ribosomal DNA, as rate indicators.

Michel, H.B., Miami, U.S.A.:

1. Taxonomy of Megacalanidae from the Antarctic.

Mielke, W., Göttingen, F.R.G.:

1. Marine harpacticoid copepods from Chile.

Miller, C.B., Corvallis, U.S.A.:

1. Life history of Neocalanus flemingeri with revised life histories for related species.
2. Respiration in large grazing copepods of the Subarctic Pacific.

Moisan, J.R., Walpole, U.S.A.:

1. Larval development and life cycle of Parathalestris jacksoni.
2. Changes in production rates of harpacticoid copepods.

Monniot, C., Paris, France:

1. Variability in parasitic copepods.
2. Description of parasitic copepods from tunicates.

Montagna, P.A., Port Aransas, U.S.A.:

1. Adaptation of marine organisms to chronic hydrocarbon exposure.
2. Feeding of meiofauna on bacteria and diatoms.

Moore, C.G., Edinburgh, U.K.:

1. Revision of Haloschizopera (Harpacticoida).
2. Taxonomy of harpacticoids from UK subtidal shelf sediments.
3. Production ecology of mudflat copepods.
4. Macrofaunal control of benthic harpacticoid community structure.

Moraitou-Apostolopoulou, M., Athens, Greece:

1. Studies on the secondary production of copepods.
2. Impact of pollutants on marine organisms.

Moreira, G.S., Sao Paulo, Brazil:

1. Influence of temperature on embryonic development.
2. Influence of environmental factors on respiration.

Moreno, I., Palma de Mallorca, Spain:

1. Copepod cultivation as food for young fishes.

Morioka, Y., Nagasaki, Japan:

1. Swarming behaviour and its ecological significance.

Nagasawa, K., Hakodate, Japan:

1. Population biology and distribution of Pennella sp. on Pacific saury.
2. Ecology of Lepeophtheirus salmonis on salmonids.
3. Effects of Haemobaphes diceraus on walleye pollack and brown sole.
4. Taxonomy of Copepoda parasitic on marine invertebrates.

Nagasawa, S., Tokyo, Japan:

1. Copepod bacteria associations in coastal waters and in the deep-sea.
2. Copepods associated with peritrichous ciliates.
3. Fecal pellets of copepods.

Naidenow, W., Sofia, Bulgaria:

1. Ecology of freshwater copepods in glacial high mountains.
2. Freshwater Calanoida of Bulgaria.
3. Effect of pollution on planktonic copepods.

Nair, B.U., Trivandrum, India:

1. Taxonomic study of copepods associated with invertebrates.
2. Studies on copepod parasites of fishes.
3. Studies on animal associations of algae with special reference to Copepoda.

Nair Vijayalakshmi, R., Bombay, India:

1. Distribution of copepods in polluted and relatively unpolluted environments.
2. Toxicity studies using selected copepods.

Natarajan, P., Trivandrum, India:

1. Populations biology of copepod parasites of estuarine fishes.
2. Effects of copepod infestations on fishes.
3. Environmental influence on the distribution of copepod parasites of fishes.
4. Taxonomy of copepod parasites of fishes.

Nishida, S., Tokyo, Japan:

1. Zoogeography of neritic copepods in the Indo-West Pacific.
2. Phylogeny of the family Oithonidae.
3. Ultrastructure of a sense organ in Paracalanidae.

Nival, S., Villefranche/Mer, France:

1. Fertility rate and reproduction of Temora stylifera and Centropages typicus.

Ohtsuka, S., Fukuyama, Japan:

1. Horizontal distribution of pontellids in the Inland Sea of Japan.
2. Feeding habits of pontellids.
3. Description of new species of Pseudocyclops and Stephos.

Okemwa, N.E., Mombasa, Kenya:

1. Production of copepods in estuarine waters of Kenya.
2. Ecology of marine copepods in Kenya.
3. Respiration of marine copepods in Kenya.
4. Systematics of copepods in Western Indian Ocean.

Omori, M., Tokyo, Japan:

1. Feeding behaviour and swarming behaviour of marine copepods.

Onbé, T., Fukuyama, Japan:

1. Larval development of neritic copepods.
2. Vertical microdistribution of zooplankton including copepods.
3. Taxonomy and ecology of crustacean zooplankton in the Inland Sea of Japan.

Ooishi, S., Edobashi, Japan:

1. Ascidicoles from the northern Gulf of California, from Montrey Bay, from Madagascar, and from the Pacific coast of Japan.

Øresland, V., Stockholm, Sweden:

1. Diurnal feeding of chaetognaths on copepods.

Orsi, J.J., Stockton, U.S.A.:

1. Food habits of Sinocalanus doerrii and Eurytemora affinis.
2. Vertical migration and factors affecting abundance of above species.

Paffenhöfer, G.-A., Savannah, U.S.A.:

1. Effects of physical, chemical and biological variables on zooplankton behaviour.
2. Ontogenetic changes in the feeding behaviour of calanoid copepods.
3. In situ observations, in upwelled waters, on zooplankton behaviour.

Paiva, I., Lisboa, Portugal:

1. The Copepoda of the coast of Algarve, Portugal, frequency of occurrence and ecology.

Papinska, K., Warszawa, Poland:

1. Dynamics of Cyclops abyssorum tatricus in oligotrophic lakes.

Park, T., Galveston, Texas, U.S.A.:

1. Systematic review of the calanoid genus Haloptilus.

Paul, G., Madurai, India:

1. Biology of Mesocyclops leuckarti.
2. Mass culturing of Cyclops sp.
3. Effect of pesticides on the development of Cyclops sp.

Pesce, G.L., L'Aquila, Italy:

1. Copepods (mainly cyclopoids and harpacticoids) from groundwater (phreatic waters) of Italy and Mediterranean: systematics and biogeography.
2. Revision of the genus Diacyclops (Cyclopidae) with particular regard to the "languidoides-group" of species.
3. Revision of the genus Elaphoidella (Harpacticoida).

Petkovski, T.K., Skopje, Yugoslavia:

1. Cyclopoida and Harpacticoida of fresh waters of Macedonia.
2. Harpacticoida of Adriatic Sea.

Piasecki, W., Szczecin, Poland:

1. Pathological changes in Abramis brama tissues caused by its parasite Tracheliastes maculatus.
2. Ultrastructure of some morphological elements of larvae and adult forms of Tracheliastes maculatus.
3. Embryology of Tracheliastes maculatus.
4. Epizoic organisms occurring on parasitic copepod Tracheliastes maculatus in the vicinity of Szczecin.
5. Parasitic copepods in the collection of Institute of Ichthyology (University of Agriculture in Szczecin).

Pinel-Alloul, B., Montreal, Canada:

1. Post-embryonic development of Diaptomus leptopus.
2. Grazing rates of diaptomids.

Pleşa, C., Cluj-Napoca, Rumania:

1. Taxonomic reviews in Cyclopoida Gnathosoma.
2. Biology of stygobiont forms (only Cyclopidae).

Por, F.D., Jerusalem, Israel:

1. Revision of Canthocamptidae.
2. Subterranean Cyclopoida of Israel.

Purasjoki, K.J., Helsinki, Finland:

1. Paraergasilus longidigitus Yin and P. nordmanni n.sp. (nomen nudum): common in Finland).
2. Morphological notes of the male and larval stages of Ergasilus sieboldi and of the male of E. briani.
3. Is Caligus lacustris Steenstrup & Lütken a glacial relict?
4. The development (stages) of Caligus lacustris Steenstrup & Lütken.

Radhakrishnan, S., Trivandrum, India:

1. Ecology of copepod parasites of fishes with emphasis on the family Ergasilidae (Copepoda: Poecilostomatoida).
2. Ecology of estuarine fish parasites.
3. Parasites and diseases of freshwater fishes of the south-west coast of India.

Rama Devi, C., Nagarjunanagar, India:

1. Postembryonic development of diaptomid copepods.
2. Mass cultures of copepods.

Ramcharan, C.W., Mississauga, Canada:

1. Interference competition between calanoids and cladocerans; feeding and fat levels in freshwater calanoids.

Ranga Reddy, Y., Nagarjunanagar, India:

1. Copepod fauna of Kashmir lakes, India.
2. Zooplankton of fish ponds, with special reference to copepods.
3. Genus Megadiaptomus.
4. Postembryonic development of certain diaptomids.

Rayner, N.A., Pietermaritzburg, South Africa:

1. Taxonomy and zoogeography of southern African freshwater Copepoda.
2. Ellobiopsid parasite of freshwater calanoid.

Razouls, C., Banyuls-sur-Mer, France:

1. Correlation between length, biovolume, weight, dimensional spectrum of the copepod community in different areas.
2. Special study of the biology in Kerguelen Islands.

Reid, J.W., Washington, U.S.A.:

1. Distribution of species of the genus Thermocyclops in the New World.
2. Distribution and taxonomy of free-living freshwater copepods of Brazil.
3. Ecology of planktonic copepods in some Brazilian lake systems.
4. Taxonomy of benthic copepods from the Arabian Gulf.

Revis, N., Brussels, Belgium:

1. Systematics and ecology of copepods of Tudoc Creek, Kenya, Indian Ocean.
2. Study of synecology and changes of the tropical plankton in Tudoc Creek.

Rieper, M., Helgoland, F.R.G.:

1. Food of harpacticoid copepods.
2. Role of harpacticoid copepods in macrophyte degradation processes.

Rippingale, R.J., Bentley, Australia:

1. Culture of freshwater and estuarine calanoids, Sulcanus, Gladioferens and Calamoecia.

Robertson, B.A., Manaus, Brazil:

1. Atlas of calanoid copepods occurring in the Curvá-Una Reservoir, Pará, Brazil.
2. Standing stock of copepods in Calado Lake, Amazonas, Brazil.

Rocha, C.E.F. da, Sao Paulo, Brazil:

1. Cyclopid copepods from the Juréia ecological reserve, Brazil.

Roe, H.S.J., Wormley, England:

1. Ecology and systematics of benthopelagic calanoid copepods.
2. Variability in bathypelagic copepod populations.
3. Trace metal content of oceanic copepods.

Røen, U.I., København, Denmark:

1. Distribution of freshwater copepods (and Cladocera) in Scandinavia and Greenland.

Roff, J.C., Guelph, Canada:

1. Estimation of secondary production of tropical and temperate zooplankton.

Ronneberger, D., Neuglobsow, G.D.R.:

1. Role of diaptomids (Eudiaptomus) in the ecological system of acid lakes.

Roubal, F.R., Oban, Scotland, U.K.:

1. Ectoparasites of fish-taxonomy, host response, and seasonal cycles.

Rouch, R., Moulis, France:

1. Systematics and zoogeography of freshwater subterranean harpacticoids.
2. Ecology of freshwater subterranean harpacticoids.

Roy, T., Calcutta, India:

1. Systematic & ecological studies on copepods of the State of West Bengal, India.
2. Determination of unnamed calanoid & cyclopoid copepods present in the national collections of the Zoological Survey of India, Calcutta, India.

Runge, J., Mont-Joli, Canada:

1. Productivity of Calanus.
2. Evolutionary ecology of copepod populations.
3. Ecology of arctic Copepoda.

Sach, G., Kiel, F.R.G.:

1. Benthic copepods as a tool for assessment of oil pollution.
2. Dispersion of harpacticoids.
3. Reproductive biology of harpacticoids.

Santhakumari, V., Cochin, India:

1. Studies on the associates and parasites of Copepoda.

Santos Silva, E.N., Manaus, Brazil:

1. Calanoid copepod taxonomy.
2. Influence of water quality, in newly formed reservoirs, on zooplankton communities.

Sarnita, A.S., Bogor, Indonesia:

1. Systematics, zoogeography and autecology of Indonesian freshwater cyclopoids.

Sarvala, J., Turku, Finland:

1. Life histories of freshwater benthic Harpacticoida and Cyclopoida.
2. Distribution of benthic and littoral Copepoda in Finland.
3. Interactions of littoral and planktonic microcrustacea (Cladocera & Copepoda) and fish.

Schaber, P., Innsbruck, Austria:

1. Zooplankton in high mountain lakes of Tyrol.
2. Distribution of Acanthodiaptomus denticornis in Tyrolean lakes.
3. Invasion of Cyclops vicinus in Lake Piburg (Tyrol).

Schminke, H.K., Oldenburg, F.R.G.:

1. Revision of the family Parastenocarididae (Harpacticoida).
2. Systematics of Tisbidae (Harpacticoida).
3. Antarctic harpacticoids.

Schnack-Schiel, S.B., Bremerhaven, F.R.G.:

1. Distribution and feeding of Antarctic copepods.

Schram, T.A., Oslo, Norway:

1. Lernaeenicus sprattae and L. encrasicoli, behaviour of larval stages.

Schriever, G., Kiel, F.R.G.:

1. Long-term investigation of Harpacticoida in the deep western North Atlantic Ocean.

Schulz, K., Hamburg, F.R.G.:

1. Calanoid copepods of the upwelling region (NW.-Africa), particularly family Scolecithricidae.
2. Calanoid copepods as prey organisms of midwater fishes.

Scotto di Carlo, B., Napoli, Italy:

1. Vertical zonation patterns of Mediterranean copepods.
2. Biomass and species composition of Mediterranean coastal regions.
3. The effects of parasitization on coastal copepods.

Seguin, G., Nice, France:

1. Systematics and ecology of the planktonic copepods of Aqaba (Red Sea).
2. Project of a study of the copepods of Algiers (Algeria).
3. Systematics and ecology of the planktonic copepods of the north Mediterranean Sea.

Sekiguchi, H., Edobashi, Japan:

1. Vertical distribution of neritic copepods with ontogeny.
2. Mechanisms of dispersion of neritic copepods into the offshores.

Sendacz, S., Sao Paulo, Brazil:

1. Zooplankton (including copepods) of lakes, reservoirs and rivers of Sao Paulo State, Brazil.

Shih, C.-t., Ottawa, Canada:

1. Calanoid copepods of the Atlantic coast of Canada.
2. Marine harpacticoids of Canada.
3. Copepods collected by the Amsterdam Mid North Atlantic Plankton Expedition.

Shirgur, G.A., Bombay, India:

1. Mass culturing of Apocyclops dengizicus Lepeshkin, in large capacity plastic pools by phased fertilisation techniques and assessment of productivity.
2. Survey of copepod fauna in the reservoir and nursery pond of Aarey Fish Farm, Goregaon, Bombay, India, and mass monoculturing of responsive species isolated.
3. Evaluation of various sewage materials and bio-gas slurry materials as inexpensive phased fertilisers for culturing and productivity in respect of different copepod species.
4. Temperature effects on fecundity levels of Apocyclops dengizicus cultured under optimum saline media treated with the most productive phased fertiliser.

Simenstad, C.A., Seattle, U.S.A.:

1. Microhabitat distribution and tidal dispersal of harpacticoids.
2. Fish predation on seagrass harpacticoids.

Skjoldal, H.R., Bergen, Norway:

1. Reproduction of copepods and krill in the Barents Sea.

Soler Torres, E., Valencia, Spain:

1. Dynamics and distribution of copepods and cladocerans in Cullera Bay.
2. Idem in Valencia Harbour with notes on their ecology.
3. Systematics and morphology of Centropages kröyeri ponticus.
4. Trophic relationships in eutrophied neritic ecosystems between zoo- and phytoplankton.

Soto, D., Santiago, Chile:

1. Calanoid - cyclopoid interactions.
2. Calanoid/cyclopoid ratio in relation to food supply (algae).
3. Population dynamics of calanoids in experimental microcosmos.

Sprules, W.G., Mississauga, Canada:

1. Patterns of body size in aquatic ecosystems.
2. Changes in copepod swimming behaviour caused by variation in food density and density of conspecifics.
3. Effects of pH on Epischura swimming and feeding.

Stancyk, S.E., Columbia, U.S.A.:

1. Factors affecting abundance of estuarine copepods - North Inlet, South Carolina, U.S.A.
2. Heritability of male dimorphism in Euterpina acutifrons.

Stearns, D.E., Dauphin Island, U.S.A.:

1. Copepod grazing behaviour in simulated natural light and its relation to nocturnal feeding.
2. Impacts of zooplankton grazing and excretion on short-interval fluctuations in chlorophyll a and nitrogen concentrations in a well-mixed estuary.
3. Field studies of short-term changes in copepod egg production and related factors.

Steib, K., Heidelberg, F.R.G.:

1. Cyclopoids as intermediate hosts of dracunculiasis.
2. Ecology of African cyclopoids.

Stella, E., Roma, Italy:

1. Systematics and biology of Calanoida and Cyclopoida of lakes and temporary waters of central Italy (particularly Latium).

Stich, H.B., Langenargen, F.R.G.:

1. Synecology of zooplankton in lakes (phytoplankton - herbivorous stages of copepods, rotifers, cladocerans; carnivorous stages - rotifers and other prey).

Stock, J.H., Amsterdam, Netherlands:

1. Copepoda associated with invertebrates.

Suvapepun, S., Bangkok, Thailand:

1. Copepods in mangrove area.
2. Copepod culture for feeding marine larvae.

Tackx, M.L.M., Brussels, Belgium:

1. Grazing by zooplankton in the Oosterschelde (S.W. Netherlands).

Tafe, D.J., Dee Why, Australia:

1. Zooplankton and salinity in the Rufiji River Delta, Tanzania.
2. Copepods of Zanzibar Channel.
3. Copepods of East Australian coastal waters.

Takegami, T., Shirahama, Japan:

1. Life history of Pseudocaligus fugu (Caligidae).

Tande, K., Tromsø, Norway:

1. Growth strategy and ecological importance of Calanus finmarchicus and C. glacialis in the Barents Sea.

Taniguchi, A., Sendai, Japan:

1. Abundance and role of microzooplanktonic copepods in the marine ecosystems.
2. Feeding of copepods on protozoan plankters.
3. Ecology of herbivorous copepods stabilizing the marine food chain.

Tester, P.A., Beaufort, U.S.A.:

1. Feeding ecology of marine copepods.
2. Feeding ecology of marine larval fish (on copepods and other zooplankters).
3. Egg production by marine copepods.
4. Effects of trace metals on survival of adults, fecundity and larval survival of copepods.

Thatcher, V.E., Manaus, Brazil:

1. Parasitic copepods of Amazonian fishes.

Thistle, D., Tallahassee, U.S.A.:

1. Ecology of the harpacticoid copepods of San Diego Trough.
2. The response of a harpacticoid copepod to a small-scale disturbance.

Thompson, P.K.M., Narakkal, India:

1. Dynamics of copepod populations in prawn culture ponds.

Threlkeld, S.T., Kingston, U.S.A.:

1. Trophic and nutrient related effects of fish on plankton communities.
2. Turbidity and water renewal effects on plankton communities.

Toal, J.P., Santa Cruz, U.S.A.:

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Torke, B.G., Muncie, U.S.A.:

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4. Distribution and new records of copepods in Indiana.

Trinast, E.M., Irvine, U.S.A.:

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Turner, J.T., North Dartmouth, U.S.A.:

1. Non-selective grazing of copepods in the plume of the Mississippi River.
2. Relationships between food, feeding rate and egg production rate in calanoids.

Ueda, H., Nishihara, Japan:

1. Taxonomic reexaminations of Japanese Acartia species.
2. Temporal and spatial (horizontal & vertical) distribution of planktonic copepods in Japanese inlet waters.

Uhlig, G., Helgoland, F.R.G.:

1. Mass production of copepods as live food for maricultural purposes.
2. Population density and growth in copepod mass cultures.

Urawa, S., Sapporo, Japan:

1. Systematics of Ergasilidae in Japan.
2. Population dynamics of the parasitic copepods (Ergasilus spp.) on fish.

Uye, S.-i., Fukuyama, Japan:

1. Primary and copepod secondary production in inshore waters.
2. Phosphorus regeneration by neritic copepod community.
3. Impact of copepod feeding on a red tide flagellate.
4. Population dynamics of a brackish-water copepod Sinocalanus tenellus.

Vanderploeg, H.A., Ann Arbor, U.S.A.:

1. Direct observations of Diaptomus feeding using high-speed microcinematography.
2. Diaptomus overwintering in Great Lakes: feeding, lipid content, reproduction.

Van de Velde, I., Brussels, Belgium:

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Varella, A.M.B., Manaus, Brazil:

1. Systematics and larval development of parasitic copepods.

Vaupel Klein, J.C. von, Leiden, Netherlands:

1. Taxonomic revision of Euchirella, including phylogeny.
2. Taxonomy and phylogeny of other Aetideidae.
3. Morphology of Pseudocalanus spp.
4. Integumental pore patterns and - morphology.

Vervoort, W., Leiden, Netherlands:

1. Bibliography of copepods.

Vijverberg, J., Oosterzee, Netherlands:

1. Population dynamics and production of copepod species.
2. Growth and instar durations of copepod species.
3. Egg production of copepod species.
4. The role of copepods in the food chains of lakes and reservoirs.

Vives, F., Barcelona, Spain:

1. Ecology of the copepod populations of the Catalonian Coast and the Balearic Sea.

Vuorinen, I., Helsinki, Finland:

1. Long-term changes in mesozooplankton of the Baltic Sea.
2. Adaption of zooplankton to predation.

Vyshkvartzeva, N.V., Leningrad, U.S.S.R.:

1. Taxonomy of Phaennidae, Scolecithricidae, Spinocalanidae.
2. Deep-water plankton, distribution, zoogeography.

Walter, T.C., Washington, U.S.A.:

1. Review of the calanoid copepod genus Pseudodiaptomus, systematics and zoogeography.
2. Description of a new species of Chirundinella.

Ward, P., Cambridge, England:

1. Reproduction of Euchaeta antarctica.
2. Distribution and reproductive biology of Antarctic Euchaetidae.

Watras, C.T., Boulder, U.S.A.:

1. Reproductive biology of diaptomids.

Wellershaus, S., Bremerhaven, F.R.G.:

1. Salinity dependence of calanoid copepods in estuaries.
2. Calanoid copepods in tropical estuaries, very low salinity region.
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Wells, J.B.J., Wellington, New Zealand:

1. Survey of N.Z. littoral Harpacticoida.
2. Ecology and behaviour of Harpacticoida.

West, C.A., Brisbane, Australia:

1. The taxonomy and phylogeny of the genus Colobomatus.
2. The taxonomy of the family Shiinoidae.

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1. Systematics and ecology of the taxon Paraleptastacus.

Wiebe, P.H., Woods Hole, U.S.A.:

1. Coarse-scale structure and diel migration in oceanic zooplankton (includes copepods).
2. Meso-scale structure of oceanic zooplankton in Gulf Stream

Wilkes, S.N., Flagstaff, U.S.A.:

1. A new sphyriid copepod from a North Pacific deep-sea fish.
2. A new species of Peniculus from Anisotremus davidsoni.
3. A new chondracanthid from a North Pacific sculpin.

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1. Deep-sea benthic boundary layer copepods: trophic relationships.
2. Whale-copepod interactions.
3. Copepod distributions in the Gulf Stream.

Wooldridge, T., Port Elizabeth, South Africa:

1. Succession of three copepod spp. in South African estuaries.
2. Role of copepods in an estuarine food web.
3. Role of abiotic environment in estuarine plankton productivity studies. - Our geographical locality dictates that our estuaries are periodically subjected to catastrophic events, e.g. torrential floods, droughts, estuary mouths often choked or closed by sediments, etc.

Wormuth, J.H., College Station, U.S.A.:

1. Zooplankton in krill swarms in Antarctic.
2. Zooplankton seasonality of Louisiana.

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1. Genetic relationships among life history traits.
2. Lipid contents.
3. Nuclear DNA content, cell number and generation time.
4. Genetics of diapause.

Yang, C.M., Singapore, Singapore:

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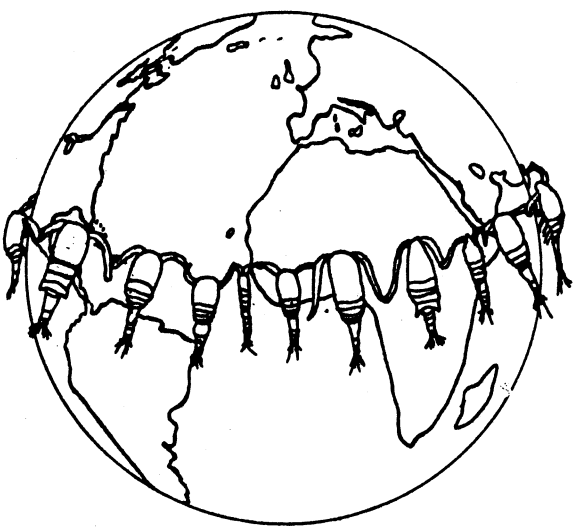

MEILLEURS VOEUX

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Before leaving this subject of surface life I may record here what I noticed at the time in a letter to "Nature" (for July 23rd, 1891, p. 273, "Copepoda as an article of food"), viz., that we tried the experiment of cooking and eating a gathering of "plankton". While tow-netting in the neighbourhood of the North Cape we had had some large hauls of Copepoda, and it occurred to us, on the night of July 12th, while watching the midnight sun off the entrance to the Lyngen Fjord, that one gathering might be spared from the preserving bottle and devoted to the saucepan. Accordingly we put out one of the smaller tow-nets (3 1/2 feet long, mouth 1 foot in diameter) from 11.40 p.m. to midnight, the ship going dead slow, and traversing in all, say, a mile and a half during the 20 minutes. The net when hauled in contained about three heaped up table-spoonfuls of the large red Copepod Calanus finmarchicus. We conveyed our material at once to the galley, washed it in a fine colander, boiled it for a few minutes with butter, salt and pepper, poured it into a flat dish, covered it with a thin layer of melted butter, set it in ice to cool and stiffen, and had it next morning for breakfast, when we found it most excellent. The taste was less pronounced than that of shrimps, and had, we thought, more the flavour of lobster. Our 20 minutes haul of the small net through a mile or two of sea made, when cooked in butter, a dishful which was shared by eight people, and would probably have formed with ship biscuits or bread a nourishing meal for one person. It would apparently, in these northern seas at least, be an easy matter to gather very large quantities of Copepoda which might be preserved in tins or dishes like potted shrimps.

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At present the morphology of parasitic copepods is only poorly known. One of the reasons for this state of affairs is the small size of these animals. Morphological details of small animals are often ignored by observers just because they are small. No effort has been spared in describing minute details of mammalian dentition and a lot of space has been devoted to the discussion of the biological significance of these details. In contrast, hardly any attention has been paid, for example, to the apical armature of the copepod first antenna. The author ventures to suggest that, had the copepod been the size of a cow, the tip of its first antenna would have become a topic for exhaustive studies. One tends to forget that the dimensional scale does not influence the biological importance. The world of the copepod is very different from ours and one cannot apply to it standards and criteria derived from other habitats and other size ranges.

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Excerpt from literature

From: CHAPPUIS, P.A. - 1916: Viguierella coeca Maupas. Ein Beitrag zur Entwicklungsgeschichte der Crustaceen. Rev. Suisse Zool. 24: 539

From notes made by Maupas Chappuis quotes (and translates) the following lines:

"Die zwei Exemplare, die hier isoliert und in ihrer Entwicklung verfolgt wurden, waren ♂♂. Nachdem sie beide ihre Reife erreicht hatten, verschwanden sie von dem Präparat ohne irgendwelche Spur zu hinterlassen. Dieses Verschwinden kann sich nur durch Entweichen des Tieres aus dem Präparat erklären. In der Tat ist dieser kleine Copepode sehr wanderlustig und in einem feuchten Orte kriecht er behende von dem Wassertropfen weg, indem er sich auf dem Glase herumwälzt. Meine zwei ♂♂, die im Wasser des Präparates nicht mehr die ihnen zusagenden Existenzbedingungen fanden, oder vielleicht von dem bei diesen Tieren sehr ausgeprägten Sexualtrieb auf die Suche nach einem ♀ getrieben, sind aus dem Präparat herausgekrochen und auf dem Objektträger fortgeschlichen."

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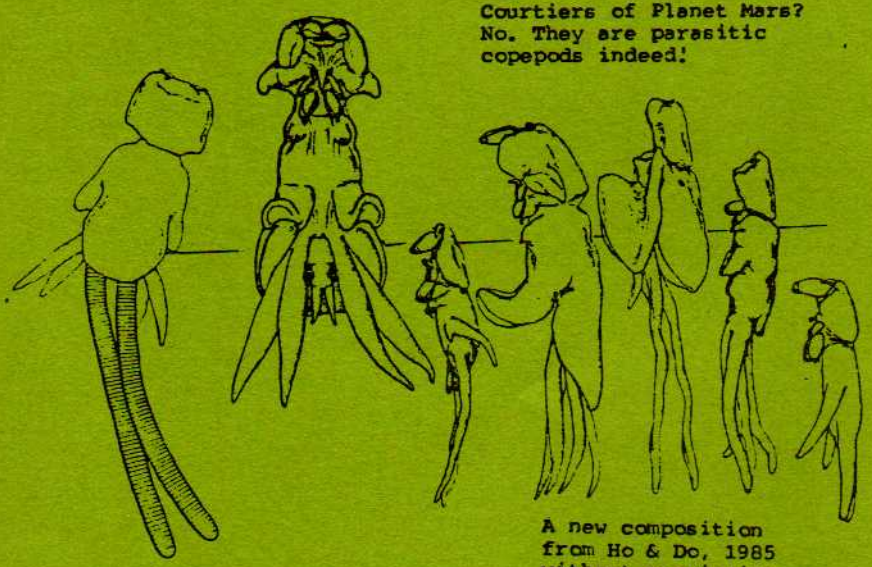

Courtiers of Planet Mars? No. They are parasitic copepods indeed!

A new composition from Ho & Do, 1985 without permission
K.P.

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