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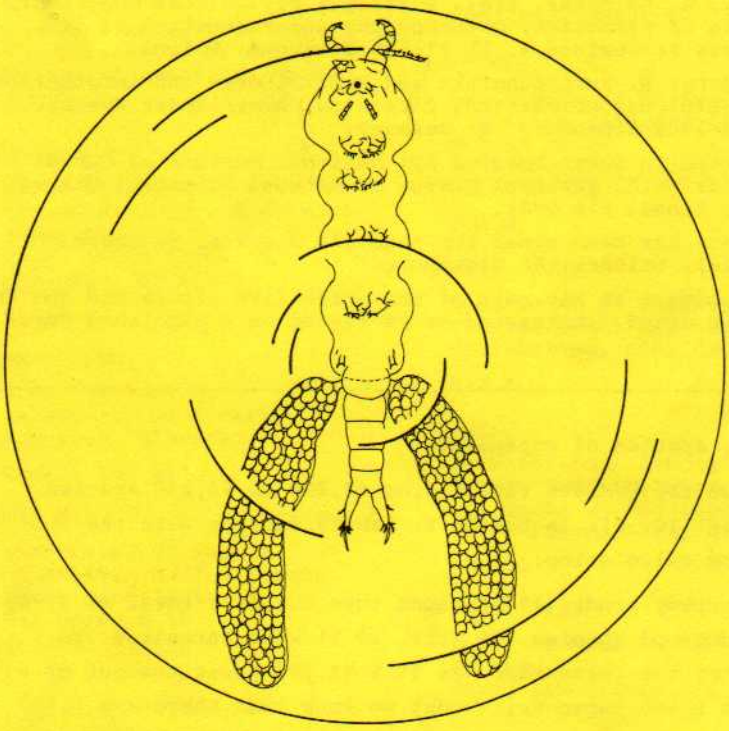
MONOCULUS

Copepod Newsletter



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MONOCULUS

Copepod Newsletter

Number 15 November 1987

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How many species of copepods?

In Ottawa the guesses ranged from 15,000 to 60,000 species. (*MONOCULUS* 10: 5). In London Z. Kabata came up with the following calculation:

In his survey Arndt (1940) found that out of a total of 3,900 marine copepod species 900 (viz. 23 %) were parasites. In freshwater the percentage was 19 % (1,300 parasites out of a total of 6,900 copepods). Today we know that there are 1,937 copepod species parasitic on fishes and 1,828 parasitic on invertebrates. If we accept that the total number of 3,765 known parasites accounts for 20 % of existing copepod species then the total number of species today should at least be 18,825.

Deadline for the next issue of *MONOCULUS*: 1st March 1988

Editorial

London has been a great event. It was a pleasure again to meet so many of you, some for the first time. We enjoyed your company, your lectures and the many lively and profitable conversations. It is good to see, how strong the ties have grown within our community through personal contacts and common aims.

Our appeal for reprints (Schminke/Janetzky) for the *MONOCULUS*-Bibliography has had a marvellous resonance. Reprints still keep arriving every day so that our list (further below) with the names of those who have responded will have to be continued in the next issue of the newsletter. Many reprints were accompanied by a letter. Thank you for praise and encouragement.

Due to this constant stream of reprints our list of current literature is particularly long. As this time we also have many other contributions, not much space is left for continuing the list of current research projects compiled from the questionnaire sent out in 1986. We shall have to continue this list next time even though it may then partly at least be out of date. C. Corkett, H. Juhl, K. Nagasawa, M. Omori, J. Read, and V. Thatcher have contributed to this issue. J. Chojnacki has drawn the portraits and D. Waloßek has given us a sketch from his scribblings during the London conference. Many thanks to all of them for their cooperation.

Many of you have ordered the new directory "Copepodologists of the World-Survey 1987". After the London meeting it had to be brought up to date and will go to print shortly together with the bibliography of the *MONOCULUS*-Library. Both volumes will be available at the end of November, and when finally they are ready for dispatch, Christmas and New Year won't be far any more.

We wish you all the best for both of these events and hope you will enjoy this issue of *MONOCULUS*.

Geoff's stimulating conference

We are gradually building up a tradition as regards the format of our conferences. In Amsterdam we only had contributed paper sessions. In Ottawa in addition to these, symposia, poster displays, and evening discussions have been added. This was continued in London, only with the provision that one of the symposia should be devoted to a species or taxonomic group (in London: Calanus) and a second one to a particular habitat (in London: deep-sea copepods). The major addition in London to this profile, however, has been a specific lecture to honour outstanding achievements in research on copepods. For this "Maxilliped-Lecture" as it has been called the choice will be among those who with their work have set their stamp on a field of copepodology, who have taken the lead and with their work stimulated progress and emulation. The first lecture was given by Dr. Kabata under the title "Copepods and copepodologists, or what's in a name".

The World Association of Copepodologists has officially been founded in London. A report on the founding phase was given by the Founder President, Dr. Kabata. Then the by-laws of the Association (in the form as published in *MONOCULUS* 11: 25-28) were accepted unanimously. They had been formulated by Dr. Heip and Dr. Kabata. Only article 5 has been changed. General Secretary and Treasurer will not be combined in one person but are separate responsibilities. The elections resulted in the following Executive Council:

President of WAC:	Jan H. Stock, Amsterdam, The Netherlands
Vicepresident:	John Wells, Wellington, New Zealand
General Secretary:	Christopher Corkett, Halifax, Canada
Treasurer:	Gerd Schriever, Kiel, W. Germany
Council Members:	Moshe Gophen, Tiberias, Israel
	Ju-shey Ho, Long Beach, U.S.A.
	Kurt Schminke, Oldenburg, W. Germany
	Chang-tai Shih, Ottawa, Canada

It was proposed and accepted that for the time being the newsletter shall continue to be sent to anyone interested in copepod research. It shall serve to spread the message of WAC and its activities and help to recruit new members. This means that with a small fraction of their fees members of WAC will subsidize those copies of the newsletter given to non-members. It is foreseeable that the funds (raised by H.K. Schminke and C.-t. Shih) with which the newsletter has been produced so far will not be available for ever. Lack of these funds will necessitate a revision of the above decision. Members of WAC in addition to a free copy of the newsletter will benefit from other services. For a start they will receive a free copy of the new directory "Copepodologists of the World-Survey 1987".

As for the next meeting in 1990, there is a good chance that it may be held in Japan. Dr. Uye said that it would be an honour for Japanese copepodologists to be host of the next conference but there are a few difficulties which need to be discussed at home. A final decision will be made in November at a national meeting of Japanese copepodologists. It was suggested that in the future efforts should be made to sequentially couple the conferences on Copepoda with those on meiofauna such as to allow to attend two meetings with the travel expenses for one. No objections were raised against trying to achieve such an arrangement in 1993.

The general meeting ended with the "Maxilliped Lecture". It had been preceded by one of the particulars of the London meeting: a session with two excellent and lively review lectures under the theme "Copepods and Light". Dr. P.J. Herring reviewed "Bioluminescence in Copepods" and Dr. M.R. Land summarized knowledge on "Copepod Eyes". Add to this the London specific by-programme with in particular the cruise along the River Thames onboard the launch "Queen Elisabeth" with music and the conference dinner and you know what distinguished the London conference from the ones before. Otherwise it has been as lively, gay and intimate as ever and

on me has had the same effects as the two previous ones. I went home full of new insights, ideas and renewed initiative. I had made new interesting contacts and strengthened older ones. In a word: I felt damned good travelling home.

I know all this could only happen because there had been someone sacrificing a lot of his working and spare time for us before and even more during the conference. Geoff Boxshall has organized a marvellous meeting and we owe a lot of gratitude to him. Trying to save money he did many things himself that others could have done. He awaited us when we arrived late at night the day before the official opening, personally welcoming us and handing out the conference kit. Constantly busy behind the scene he made sure that everything went smoothly and to the satisfaction of all participants. Also his wife helped out and at the expense of their family both worked full-time for the conference. That Kier, their 9 year old son, may forgive us. Coming home late at night as usual during the conference his parents one day found the following note on a bag of dirty clothes:

"To an adult.
Please wash this. I have no underwear or other items of clothing.
Love Kier."

H.K.S.

Zbigniew Kabata

Zbigniew Kabata

Interviewing copepodologists

When I first met him in Ottawa I was surprised to discover that he is not a Japanese. This situation is familiar to him. On the Philippines (or was it in Japan?) he ran into trouble. They wouldn't let him back into the hotel - his appearance being in contradiction to his name. Zbigniew (Bob) Kabata is Polish by birth and Canadian by option.

He is the leading expert on parasitic copepods and his name comes to mind whenever help is needed in this field. "I once received a vial with a copepod from a colleague who sent it in water hoping that it would produce egg-sacs in the meantime. What I got was a copepod soup. I wrote back to him to send it in alcohol next time. He did. He sent it in rum." Even more surprising was a sample received from Lake Baikal. When he opened the vial and studied the label he found it to read "Happy New Year".

In London he was the first to give the "Maxilliped Lecture", a new addition to the programme of our conferences in order to honour outstanding achievements in copepodology. While everybody expected a talk on parasitic copepods he surprised the audience with a "look at the history of copepod research by considering copepod names". At the end of this lecture he touched upon the enigmatic etymology of Calanus. "According to Marshall and Orr", he reported, "Calanus was a Jain ascetic, one of a strict and ancient sect which abhorred possessions so much that its members gave up even clothing. He followed in the train of Alexander the Great from India to Baghdad and there walked into the pyre because his life became worthless to him through illness. He is said to have murmured each morning an Indian greeting which the Greeks understood as 'Kalan' (perhaps 'Kalyan', i.e. God bless you) and so called him Kalanos. The outstretched antennules of the copepod may have suggested to Leach (who coined the name Calanus in 1819) some Yogi attitude practised by the ascetic". He finished his talk with a very personal word: "As I come to the end of my talk, I am acutely aware that this is my last conference before I retire, the last talk of my life with copepods. It was a good, often exciting life and I am glad I lived it. You all have been, to some degree, parts of that life. Let me, therefore, in this finale of my copepod career, stretch out my antennules and bid you farewell in the manner of the enigmatic Jain ascetic: Kalan, my friends and colleagues. And may copepods be as good to all of you as they have been to me."

"I have been lucky all my life. I have always had time for copepods even though I had other things to do." He also writes on Protozoa, but this he has to do, copepods he likes to do. No wonder that at times he even sacrifices his whole spare time for them. "The blue book (his Ray Society monograph on the 'Parasitic Copepoda of British fishes') was written in evenings, mornings, in all the spare time." His director at that time did not mind these activities because Kabata was successful. "How did your ties with copepods develop?" This is a question that Roger Cressey also asked back in 1970 at a dinner party in Washington. There had been twelve of us who had come together on the occasion of a parasitology congress. Except Heegaard, all of us had become copepodologists by accident." "What has been the accident in your case then?" "I graduated at Aberdeen in 1955. My first job in the marine laboratory of the Department of Agriculture and Fisheries consisted in studying migration of the haddock (Melanogrammus) using Lernaeocera as a tag. The result of this study was that it could not be used as a tag, but by the time I had finished I was in the middle of copepods. Lernaeocera has a flatfish as first host and on this flatfish more copepods turned up. I had to learn all by myself because the book by Scott & Scott, the only one of some help in those days, was completely out of date. Since I don't like untidy ends I became a copepodologist."

"What was your first paper on copepods about?" "It was published in 1957. I have only a vague idea of it now. It was on Lernaeocera in the North Sea, on its taxonomy, life cycle and distribution. Incidentally, my first description of a copepod was not valid. It turned out to be a variety of L. obtusa branchialis. Fortunately, I myself found out that this is so."

I had brought my own copy of his Ray Society monograph with me to this interview to have it signed by him. I turned the pages and remarked: "You have developed a distinctive style in your drawings and looking through papers by other authors on

parasitic copepods I have the impression they have followed your lead. How did you achieve this?" "I have never tried to influence other people. I didn't think of me as a person of influence. If I have had some influence it was not through a conscious effort. I have worked in government departments all my life. I have never been a teacher. I have not had students except occasionally for a postgraduate one. One of them, a girl, wanted to study the life-cycle of a copepod on man eating shark! I told her I would give her a Purpled Heart if she did this. The only avenue for me to create followers was through my work. Good work is the best vehicle to instruction for others. I have been active in publishing, so others started to adopt similar styles. Give 105 % of what you can do and you will succeed. Proper description is based on drawings and these have to be as camera-like as possible." He seized the book and opened it at figure 159. "It took me two weeks to draw the egg-sac. I drew every egg." Pointing at figure 782 and the following ones he said "In order to show the whole appendage I drew it in three or four views. I always think of that story about Louis Agassiz giving a student a fish and asking him to draw it. When the student had finished the drawing he sent him back again to draw the fish again and then again to make it an even more painstaking effort. To be a good copepodologist, try to think as a copepod. Put yourself in a copepod's shoes. A copepod is a working unit. It has goals and certain strategies at these goals and a lot of this is reflected in its morphology. 'No data is irrelevant' as we have heard at this conference." The inscription over the entrance of the Victoria and Albert Museum, a bit further along Cromwell Road from the British Museum (Natural History) came to my mind 'The excellence of every art must consist in the complete accomplishment of its purpose'.

"What kind of work do you think has to be done in future?" "Descriptive work has to be continued and more consideration has to be given to studies on the biology of parasitic copepods. Structures have a function, they are not there for fun.

More has also to be found out on life histories. There are great difficulties, however, because laboratory work may impose an artifact. It has been found that in the laboratory a copepod may develop directly in the egg and have no nauplius, whereas in nature it has. These difficulties shouldn't stop us. We need to know more about host-parasite relationships. What influence do copepods exert on the fish? Fishery people want to know. Most people who work on parasitic copepods are also parasitologists unless they are what I call mere speciographers (people content with describing species after species). Taxonomy should be a tool, not an aim in itself."

Kabata has named many species and many species have been named after him. He did not mention this in his "Maxilliped Lecture" which also owes its name to him. In a letter to me long before the conference in London he wrote: "As to the name of the lecture, it should be a name with a clarion ring to it, recognizable by all copepodologists. Should we decide to give it a special name, not name it by someone, then something like a "Monoculus Lecture", or, why not, "Maxilliped Lecture". Whatever we name it, the very fact that we consider it an honour to be invited to give, will impose on it its own splendour." A letter later he added: "A new group like ours should make its own traditions. What might seem rather crazy at first, with time will become a hallowed custom and people will give their eye teeth to be "Maxilliped Lecturers".

Several presentations in London have shown that the name was a very good choice. A memorable lecture by a young colleague defying prescribed time limits has demonstrated (by reviving some of Sars' ideas) that the maxilliped may be of utmost importance in reconstructing the phylogenetic relationships of at least the harpacticoids, if not the Copepoda as a whole. The maxilliped also played an important role in the presentation by Roger Cressey of a fossil parasitic copepod from a Lower Cretaceous fish. Ending his lecture Cressey said that

there had been a slight problem in finding an appropriate name for this exciting species. "For an unusual copepod we needed an unusual name and we decided to call it Kabatarina pattersonia."

Kabata was borne under the sign of Fishes.

H.K.S.

Copepod bibliography: A report on the evening discussion at the Third International Conference on Copepoda held in London on Wednesday, August 12, 1987

The information given that evening can be summarized as follows:

The Crustacea Database, sectio Copepoda, has reached a size where it can begin to offer its services. These will be moderate at the start but become more and more sophisticated as the data-base grows.

1. The Crustacea database contains about 7000 entries on Copepoda at present. Nearly 4000 of these are titles from the *MONOCULUS*-Library, the rest are titles from the Wilson-Library at the Smithsonian Institution (Washington) and from other sources.
2. Until the end of 1988 the number of entries on Copepoda will have reached 20,000. About 8000 of these will by then have gone through a detailed keywording procedure, while for the rest keywording will as yet be less detailed. Accordingly, the taxonomic thesaurus will only be partially complete.
3. On-line searches in the copepod section of the Crustacea database will be possible through 'Deutsches Institut für Medizinische Dokumentation und Information (DIMDI)', Cologne, from the beginning of 1988.

4. Printed catalogues on particular topics are available from now on and can be ordered also under the provision of automatic continuous completion as the data-base grows. Catalogues can be provided in the form of either lists or index cards. Bibliographies (in the form of booklets) of all copepod families are planned for the future.

5. Prices are (on a US dollar basis) 5 cents per index card or per page in the case of lists. Prices for family bibliographies will be announced separately when available.

The printed services are at your disposal right now. Address your orders to:

Crustacea Database
c/o Dr. J. Sieg
Fachbereich 13
Universität Osnabrück
Abt. Vechta
Postfach 1349
D-2848 Vechta
W. Germany

or

MONOCULUS Bibliography
c/o Dr. H.K. Schminke
Fachbereich 7 (Biologie)
Universität Oldenburg
Postfach 2503
D-2900 Oldenburg
W. Germany

(A report on the other evening discussion on 'What makes a good taxonomic description?' will be given in the next issue of the newsletter.)

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Otohiko Tanaka Otohiko Tanaka

The name of Dr. Otohiko Tanaka brings to mind an outstanding taxonomist of marine Copepoda and a connoisseur of conversation and drink. Dr. Tanaka loves Scotch whisky and shochu (Japanese spirits) as much as copepods. It is always a pleasure to talk and drink with him. Although he has never travelled to foreign countries, except for his military

service in China and New Guinea, during these friendly conversations his speech turns from Japanese to English, then to German, and finally to French. We would like to show him different countries and seas where the copepods live. Especially this year, when many copepodologists will celebrate Dr. Tanaka's 85th birthday.

Dr. Tanaka was born in Tokyo on March 21, 1902. He graduated from the Department of Fisheries, Faculty of Agriculture, Tokyo Imperial University in 1929. He looks back upon the day when he saw a swarm of Euchaeta marina for the first time. This happened when he was senior student and led him to the world of copepods. After graduation, he was given a position at the Kobe Marine Meteorological Observatory, but because of military service he soon had to resign from there. He returned to the University after his service and, as a research assistant, began his life work on the "taxonomy of marine copepods of the Izu Region". In 1934, he became a scientist of the Mitsui Marine Laboratory, a private research institute sponsored by the Baron T. Mitsui at Suzaki near Shimoda.

The Mitsui Laboratory was situated at an isolated place, but was ideal for sampling copepods from both Sagami Bay and Suruga Bay. Dr. Tanaka enjoyed the life and his energetic study continued until 1939 when he was called to the Imperial Army troops in Manchuria, the northeastern part of China. He had to stop his studies during the war, and, as an officer in an engineer battalion, he moved to various places, including central and northern China, New Britain Island, and New Guinea. In 1944, his ship was sunk in the Bashi Channel by a U.S. submarine, but he was rescued after floating in the sea for many hours.

Dr. Tanaka married Yasuko in 1932, and had one daughter and one son. The family stayed in China when the war was over. To our great regret, his only son Ryo was killed early in his boyhood on the way to Japan. In 1956, Dr. Tanaka described the new genus Ryocalanus in memory of his only son.

After the war, Dr. Tanaka resumed the academic life at Kyushu University (1947), where he joined the Department of Fisheries, Faculty of Agriculture, and remained until his retirement in 1965. He received the degree of Dr. Agr. in 1949 with a thesis on the pelagic copepods of the Izu Region. The world-renowned paper "The pelagic copepods of

the Izu Region, middle Japan, Systematic Account I-XIII" (1956-1965) was based on this thesis. The soft and smooth touches of his illustrations of copepods are characteristic: he always uses a finest Japanese brush called "Menso".

Dr. Tanaka moved to Tokyo after his retirement, and commenced active study on pelagic copepods in association with the Ocean Research Institute, University of Tokyo. He published several papers including "Additional report on calanoid copepods from the Izu Region" with M. Omori. This series has not yet been completed. Although Dr. Tanaka has written three more manuscripts in this series, each of which contains a number of new species, owing to unfavourable circumstances and my slow work, these have not been published.

Dr. Tanaka's nearly 50 publications span 55 years of devotion to his work on copepods. Admiring his great contribution to the field of planktology, he was named an Honorary Member of the Plankton Society of Japan in 1965. On behalf of all who are following his footsteps, I thank Dr. Tanaka for his cheerful guidance both in the laboratory and in the bar, and sincerely hope for the continuation of his excellent health.

M. Omori
Tokyo University of Fisheries

Note added in last minute concerning DUES 1987

On page 25 you are urged to pay your dues for WAC immediately. The exchange rate US $/DM is so unfavourable for the moment that we would lose a lot of money if you did. The Treasurer of WAC now proposes to postpone payment until next year when either the exchange rate is acceptable again or he has built up his system of Regional Treasurers. Please save your money so that next year you can pay your dues for 1987 and 1988 together. We shall remind you in *MONOCULUS* 16.

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Toshikazu Hoshina Toshikazu Hoshina

Toshikazu Hoshina was born on December 14, 1907 in Ibaraki Prefecture, Japan. He graduated from the Department of Aquaculture, Imperial Fisheries Institute (presently the

Tokyo University of Fisheries) in 1931 and taught there from 1932 to 1971. During his long university career he held the posts of Assistant (1932-40), Associate Professor (1940-58), and Professor and Chairman of the Laboratory of Fish Physiology and Pathology (1958-71). He received a degree of Doctor of Agriculture from the University of Tokyo in 1962. For many years he also taught as a Visiting Professor at the University of Tokyo (1954-68), Mie University (1953-62), Nihon University (1964-65), and Tohoku University (1970-71). He is now (1973-) an Emeritus Professor of the Tokyo University of Fisheries.

Dr. Hoshina is interested in copepods parasitic on fishes and marine molluscs. He has published seven papers on the subject so far. However, he is a fish pathologist and parasitologist rather than a copepodologist. He has devoted much time of his scientific activity to the investigation of fish diseases and pathogens in Japan. He studied several bacterial diseases causing high mortality in fish culture and also described several protozoan parasites of fishes. Because of his outstanding contributions to fish pathology, he was awarded by the Japanese Society of Scientific Fisheries in 1964 and by the Japanese Society of Fish Pathology in 1987. In addition, among his other academic activities was membership of the Editorial Board of the Bulletin of the Japanese Society of Scientific Fisheries (recently renamed Nippon Suisan Gakkaishi) from 1953 to 1962.

It remains for me to offer Dr. Toshikazu Hoshina the heartiest congratulations on his eightieth birthday, and to wish him good health and happiness for many years to come.

K. Nagasawa

The l e t t e r box

C. Cheng, Xiamen, People's Republic of China, reports:

I would like to give a list of my recent work on marine Crustacea:

1. *The biology of marine Cladocera (a small book will be published by the Xiamen Univ. Press in the very near future (before the end of this year).*
2. *The biology of marine Copepoda (another small book in the course of preparation). It will also be published by the Xiamen Univ. Press in the next year.*

The above two books are the partial contents of a new series of monographs on the "Biology of marine Zooplanktonic Animals".

F. Evans, Cullercoats, U.K., writes:

You may be interested to know that as a result of the note you published about my long-term plankton collections (MONOCULUS 9, p5) I was contacted by John Roff of Guelph, Canada and now he, Ken Middlebrook and I are producing a paper on long-term copepod production and predation in the North Sea. Many thanks for your catalytic intervention. MONOCULUS serves more than one useful purpose... Marine copepod studies are suffering badly in this country. Universities are exceptionally short of money (for instance, my laboratory may have to sell its research vessel) and I hear that the prestigious Marine Biological Laboratory in Plymouth will have to merge with another laboratory, which will mean a big reduction in staff. For plankton work around the English coast we may have to look much more to workers on the mainland of Europe. Very sad. I am pleased that MONOCULUS has become more than just a newsletter and wish you success with the library.

C.K. Wong, Hong Kong, announces:

I have recently left N. America and moved to the Dept. of Biology at The Chinese University of Hong Kong. My continued research interest in copepods will, from now on, concentrate on the ecology and behaviour of marine species in the Hong Kong waters.

OFFER AND REQUEST CORNER

J.R. Moisan, Dept. of Oceanography, RM 508, Texas A&M University, College Station, TX 77843-3146, U.S.A., asked us:

Could you print in the next MONOCULUS that I am looking for copies of C.B. Wilson's Copepods of The Woods Hole Region Massachusetts 1937 and Harding B. Michel's Carribean Zooplankton. Both are US Government Document Publications which are no longer in print.

S.C. Goswami, National Institute of Oceanography, Dona-Paula, Goa - 403004, India, is interested in material:

I am keen on receiving zooplankton material from the temperate waters. The procedure for fixation and preservation of zooplankton for cytogenetics studies is enclosed. I would be thankful if the material could be sent at the Institute's address at Goa.

Procedure for Fixation and Preservation of Zooplankton for Cytogenetics (Chromosomal) Studies

1. Collect the fresh zooplankton and keep them in a glass beaker for 5-10 minutes.
2. Prepare the fixative (acetic alcohol) in a ratio of 3:1 (3 parts absolute (pure) alcohol and 1 part acetic acid). If 100 ml of fixative solution is prepared, it will contain 75 ml of alcohol and 25 ml of acetic acid.
3. Filter the zooplankton with a net material to remove the excess water.
4. Put the fixative solution in a glass beaker or in a petri-dish. Add the filtered zooplankton. The zooplankton should be immersed in the fixative solution. Keep for 20-30 minutes (fixation time).

5. Filter the zooplankton again to remove the fixative solution. Wash the zooplankton with 70 % alcohol.
6. Preserve the zooplankton in 70 % alcohol in a plastic bottle.
7. Label the sample indicating the place of collection (latitude and longitude) and date of collection.

Copepodid or *Copepodite*?

C. Corkett, Department of Biology, Dalhousie University, Halifax, Nova Scotia, Canada B3H 4J1, seeks advice:

When I was a student I remember having a conversation with J.P. Harding in which he told me that in his opinion the larval stage of the Copepoda should be "copepodid" not "copepodite". Since that conversation I have only used the term "copepodid". It seems as if most other copepodologists do not follow the trend.
In recent correspondence with J.P. Harding he wrote that he remembers our earlier conversation but doubts that he had a good reason for his advice - the main objection to the use of "copepodite" being that the "ite" ending suggests part of a limb.
What do readers of MONOCULUS think - should it be "copepodite" or "copepodid"?

THE C.B. WILSON COPEPOD LIBRARY

Charles Branch Wilson (1861-1941), author of many works on Copepoda and Professor of Biology at the Massachusetts State Teachers College at Westfield, held for many years the honorary appointment of Collaborator at the U.S. National Museum (now National Museum of Natural History), Smithsonian Institution. Most of the Museum's collection of

copepods were entrusted to him for study, and the results of much of his research were published in the Proceedings and Bulletin of the Museum (now replaced by Smithsonian Contributions to Zoology). Upon his death in August 1941 he bequeathed to the Museum his extensive library of copepod and argulid literature, together with his card files. The latter included a card for each author, and a card for each species and genus listing all known published references to that taxon, i.e. a synonymy. The donation also included Wilson's original illustrations, dismounted from their plates.

With the addition of more publications since 1941, including other collections such as those of C. Dwight Marsh and Mildred S. Wilson, the Library has steadily grown. Housed in the Division of Crustacea, Department of Invertebrate Zoology, it now occupies some 35 meters of linear shelf space; the number of publications is estimated to be about 5000. As we catalog incoming publications we also add to the synonymies of the species cards. We do not, of course, have anything approaching a complete library of the immense literature on copepods, but the collection includes many original and now rare taxonomic works as well as articles dealing with other aspects of copepod biology, including physiology, functional morphology, behavior, evolution, biogeography and ecology. It has been very useful to copepodologists over the years.

We obtain publications for the Wilson Library in several ways. When available, older or out-of-print works are purchased from bookdealers. However, most works are received as reprints from the authors. Because there are so many scientists working on copepods and publishing in a wide variety of outlets in several languages, it is difficult to keep track of all articles. Many of you have generously sent us copies of your copepod publications; we encourage you to continue. If you do not regularly send us reprints, we would like to urge that you do, so that your works will be available to users of the Wilson Library. We also welcome copies of theses and dissertations. This year the limited depart-

mental funds for the Library were augmented by a generous grant from the Smithsonian Women's Association, and this has enabled us to make significant inroads into our backlog of uncatalogued reprints, increase active searching for new articles, and initiate a program to make working copies of fragile articles on acid-free paper. We can supply a reasonable number of photocopies of references from the Library at the rate of 10 cents per page (US$ 1.00 per 10 pages).

Finally we invite each of you to use the Wilson Library when you are in Washington. The Library is in Room 106 of the Division of Crustacea, West Wing, Natural History Building at 10th and Constitution Avenue. Please call one of us from the Guard's station or Visitors' Desk in the lobby (Bowman 357-4667, Reid 357-4674), and we will come and lead you to the Library.

Janet Reid
Smithsonian Institution
Washington, U.S.A.

H O P E F O R H Y P

The sad but amusing story by Dr. Kabata about the disappearing copepods in *MONOCULUS*, 14, suggests to me that it is time someone offered a few words about methods. Making permanent whole-mounts is more a craft or an art than a scientific procedure, and permanence is relative. For example, a ringed glycerine jelly mount stored in an unheated room in Hamburg might last for years, whereas the same slide kept in my sometimes airconditioned lab in Manaus might deteriorate in a few months. Mythology and alchemy are still to be found in microtechnique and some people assume that the same "classic methods" are used by all and date from van Leeuwenhoek (1674). Both of these assumptions are false. In truth, procedures vary from lab to lab and most have evolved during the last 30 to 50 years.

Although the "classic methods" have evolved over the years and new reagents have been introduced from time to time, the basic problems remain the same. We must kill and fix an animal in a solution that will preserve its cells and produce minimal distortion. After that we need to remove all water from the animal (dehydration) and replace it with liquid that will harden without undue alteration in form. At some point, stains should be introduced to enhance visibility and the animal should be cleared enough to permit the passage of light, but not so much as to render it totally transparent.

If we define "permanent slide" as one that will last for one hundred years, we have expressed our goal. That is, we seek hundred year permanence (or HYP). The mounting medium that has HYP is Canada balsam. Most others are too recent for us to know if they have HYP or not. Similarly, many stains do not have HYP but Eosin may, since it has been in use for a long time.

In a long and arduous search for HYP, I have tried and abandoned many reagents and procedures either because they were inadequate or unnecessary. Among these are: Bouin's, Schaudinn's and Zenker's fixatives; carmine, cochineal and fuchsin stains; graded alcohols, dioxane and absolute alcohol; lactic acid, lacto-phenol, xylene, cedarwood oil and creosote; Berlese's, Gray & Wess' and any mounting medium containing either PVA or glycerine.

I have recently evolved, and will now explain, a method that is rapid, simple, has HYP, has CLASS, gives excellent short-term results and is almost foolproof. First, fix everything in AFA (85 pts 85% alcohol: 10 pts formalin: 5 pts glacial acetic acid) for at least 10 minutes. Next, pass the specimens directly from AFA to the stain solution (95% alcohol colored to the intensity of weak tea with equal parts of Eosin and Orange-G stains). Stain in this solution for 3-10 minutes and then move the specimens to pure phenol (liquify phenol crystals with a bit of 95% alcohol to make this solution). The phenol simultaneously dehydrates, clears

and destains the material. When the specimen is clear in phenol a few seconds later it is already dehydrated, but if more destaining is desired it may be left in this solution for a few minutes. After the proper degree of destaining is achieved, pass the copepod to methyl salicylate which stops the destaining process. After 3 minutes in the latter, the specimen can be mounted in balsam. The entire process requires 8-10 minutes. Material fixed by other means and stored in 70% alcohol can be processed in the same way, but specimens in aqueous solutions (10% formalin) must be placed in 70% alcohol for a few minutes before staining.

If a specimen collapses in methyl salicylate (copepods seldom do), it may mean that it was not properly fixed or was dead too long before fixation. Not all is lost, however, for when such a specimen is returned to phenol, it returns to normal shape in a few minutes. To resolve the problem of collapse, it may be necessary to perforate the animal with a fine needle to permit a more rapid exchange of liquids. It is sometimes helpful to pass such specimens through a solution of half and half (phenol and methyl salicylate) before exposure to pure methyl salicylate.

It often happens that a copepod is fixed in an undesirable position with the antennae wrapped around the body or the abdomen curled under. Regardless of the fixative used, these conditions can be corrected because a specimen in phenol becomes soft and pliable. It can be taken from that liquid, placed on a dry slide and manipulated into a good position with dissecting needles. Arranging the legs at this time may obviate the necessity for dissection. When the animal is in the desired position, place a coverglass on top to hold it and add some methyl salicylate. The latter hardens the specimen in a few seconds and it will retain the same form when mounted in balsam.

The described method will produce good whole-mounts of any zoological material that it is possible to place between a coverglass and a slide, as long as it clears in phenol. It

is especially useful for Copepoda, but we have also had good results with Ciliophora, Rotifera, Temnocephala, Monogenea, Digenea, Cestoda, Nematoda, Acanthocephala, Oligochaeta, Hirudinea, Cladocera, Branchiura, small isopods, decapod larvae, mites, insects and larval fish. Small pieces of vertebrate intestine and snail hepato-pancreas have been flattened and mounted in this way as well. With nematodes, it is relatively easy to make permanent "en face" mounts by removing a worm from methyl salicylate, placing it on a dry slide near a drop of balsam, cutting off the head and pushing it into the balsam.

In case some skeptic should ask how I know this method achieves HYP, I would have to ask him to come back in one hundred years and we will then take a look at these slides. If they are not as good as we would like them to be, we will simply remount them using the same technique. Any slide made with balsam can be demounted by soaking in methyl salicylate or xylene for a few hours. Slides made with PVA or glycerine jelly, on the other hand, cannot be successfully demounted. Personally, I plan to check my collections every 50 years or so to see if any specimens require remounting.

Vernon E. Thatcher
INPA, Manaus, AM, Brazil

THE WORLD ASSOCIATION OF COPEPODOLOGISTS

WAC WAC ..... WAC WAC

1. Membership

What we had hoped to reach at the end of last year has now been achieved. We have doubled the membership of WAC. There now are 249 paying members and 10 whose dues have been waived.

If you want to enter the Association, continue to receive free copies of the newsletter, obtain a free copy of the new directory "Copepodologists of the World - Survey 1987", and benefit from other services of the Association actually being prepared, please write to the General Secretary Dr. C. Corkett, Department of Biology, Dalhousie University, Halifax, Nova Scotia, Canada B3H 4J1. You will be in excellent company as you can see from the following list:

MEMBERS OF THE WORLD ASSOCIATION OF COPEPODOLOGISTS

ARGENTINA: Hoffmeyer* ---- **AUSTRALIA:** Arnott, Bayly, Greenwood, McKinnon, Muffinon, Rippingale, Tafe*, West* ----- **AUSTRIA:** Schaber ----- **BANGLADESH:** Das ----- **BARBADOS:** Gooding* ----- **BELGIUM:** Bergmans*, Daro*, Fiers*, Huys*, Maas*, Revis*, Tackx* ----- **BENIN:** Citarella* ----- **BRAZIL:** Alvarez*, Björnberg* M.H., Björnberg T.K.S.*, Campaner*, Carvalho*, Hadel, Malta*, Robertson, Rocha*, Santos Silva*, Thatcher, Varella* ----- **BULGARIA:** Naidenow* ---- **CANADA:** Benz, Chapman, Chow-Fraser*, Conover, Corkett*, Crawford-Kellock*, Davis, Deets, Fernando*, Fontaine*, Fulton, Gardner, Grainger, Harding*, Hogans, Kabata*, LeBrasseur, Mayzaud, McLaren*, Rainville*, Roff, Sevigny, Shih* ---- **CHILE:** Castro Romero ----- **CHINA, PEOPLES REP.:** Chen, Li Song ----- **DENMARK:** Kiørboe* ----- **ECUADOR:** Arcos* ----- **FINLAND:** Purasjoki*, Sarvala*, Vuorinen ----- **FRANCE:** Boucher, Hipeau-Jacquotte, Le-Borgne*, Lescher-Moutoué*, Miquel*, Monniot*, Poulet*, Razouls, Rouch ----- **GERMAN DEM. REP.:** Brenning* ----- **GERMANY, FED. REP.:** Barthel*, Beckmann*, Böttger-Schnack*, Dahms*, Diel, Grau*, Hahn-Mieth*, Hulsemann*, Kohlhage*, Kunz*, Kurbjeweit, Lenz*, Mielke*, Noodt, Rieper, Schminke*, - Schnack-Schiel, Schriever*, Schulz*, Schwenzer*, Sieg*, Stich, Tiemann, Wellershaus* ----- **GREAT BRITAIN:** Barnett, Boxshall, Conway*, Fryer*, Gamble*, Gee*, Geddes*, Gotto, Hamond*, Harding, Harris*, Hay*, Lindley, O'Reilly*, Thompson, Ward* ----- **HUNGARY:** Forró*, Holynska* ----- **INDIA:** Arunachalam*, Bhattacharya, Chandran*, Madhupratap, Meenakshikunjamma, Nair*, Ranga Reddy, Roy*, Shirgur, Stephen ----- **INDONESIA:** Keim* ----- **IRELAND:** Holmes* ----- **ISRAEL:** Almeida Por*, Gophen*, Kahan, Por* ----- **ITALY:** Fava*, Lazzaretto*, Stella ----- **JAPAN:** Ito*, Izawa*, Kikuchi*, Kimoto, Koga, Morioka, Motoda*, S. Nagasawa*, Nishida, Ohtsuka*, Onbé, Ooishi*, Takegami, Tanaka, Taniguchi, Ueda, Urawa, Uye ----- **KUWAIT:** James ----- **LEBANON:** Lakkis*, Zeidane* ----- **NETHERLANDS:** Baars, Klein-Breteler*, Heip, Stock, von Vaupel Klein, Vervoort, Vijverberg*, ----- **NEW ZEALAND:** Bradford, Burns, Hicks*, Jones*, Lewis, Wells* ----- **NORWAY:** Båmstedt*, Fosshagen ----- **PAKISTAN:** Ali-Khan* ----- **PAPUA NEW GUINEA:** Tseng ----- **PHILIPPINES:** Mamaril* ----- **POLAND:** Chojnacki, Drzycimski, Piasecki ----- **PORTUGAL:** Vilela* ----- **ROMANIA:** Plesa* ----- **SOUTH AFRICA:** Grindley, Hart*, Heeg, Rayner* ----- **SOUTH - KOREA:** Kim ----- **SPAIN:** Soler-Torres* ----- **SWEDEN:** Elmgren, Öresland ----- **THAILAND:** Suvapepun, Yoosukh ----- **USA:** Barr, Bell, Benz, Blades-Eckelbarger*, Bowman, Bradley*, Chisholm*, R. Cohen*, Cordell, Coull*, Dagg, Damkaer, Dawson, Decker*, Dojiri, Ferrari, Fleeger, Fleminger, Frost, Gannon, Gifford*, Greene*, Haury*, Heron, Ho*, Humes*, Illg*, Jonasdottir, Kukert, Landry*, Lonsdale*, Marcogliese, Marcus*, McAlice, Michel*, Miller*, Moisan, Morris, Moskowitz*, Orsi, Paffenhöfer*, Park, Peterson, Reid*, Roman*, Simenstad, Stearns, Tester*, Toal, Trinast*, Turner, Vanderploeg*, Walker, Walter, Wiebe, Wilkes*, Wishner, Wyngaard* ----- **USSR:** Gusev*.

2. Dues

When studying the membership list above you will recognize several names marked by an asterisk. This sign has a good tradition in the newsletter and has always served to indicate people whose example should be followed. If your name in the list is naked it means that you have not yet paid the dues for 1987. An asterisk is a sign for good standing. If you want to adorn your name, hurry to the bank and make your personal cheque, money order or bank draft payable to "WAC, c/o Dr. Gerd Schriever, Zoologisches Museum Kiel". Dues for one year amount to 7.00 US $ or to 13.00 DM and should be paid (in these two currencies only) into the following account:

No. 7233 190, Commerzbank Kiel, W. Germany

Those who want to pay by postal money order may use the following account by adding "WAC, c/o Dr. H.K. Schminke":

No. 3465 08 - 303, Postgiroamt Hannover, W. Germany

If you wish, you can also pay your dues for one or two years in advance, and there also is, of course, the possibility to send a little more than actually required in order to donate to the Association or to sponsor colleagues who have difficulties with foreign currencies.

3. Treasurer's Report

The Association is not too wealthy as yet but we are proud of the sum all the same and hope it will grow continuously to help us realize all our ambitious plans. About 3000.00 US$ is more than to to what the dues add up received up to the present. Many dues for 1987 are still lacking (see above). That our balance is better than it should be has 3 reasons:

- Some have paid their dues for 2 years in advance.
- When the first cheques arrived on May 14th, 1986 from France and Bénin the exchange rate US$/DM was still very much better than it is today.
- There have been many donations to the WAC as a sign of encouragement for our activities.

WAC - TREASURER's REPORT 1986/87

The financial situation

	1986	1987
Balance forward	--	3129,50 DM
Deposits	3164,72 DM	3021,55 DM
Interests	2,18 DM	11,09 DM
Total	**3169,90 DM**	**3032,64 DM**
Expenses		
Support of MONOCULUS		694,80 DM
Account dues	37,40 DM	39,70 DM
Total	3129,50 DM	2298,14 DM
Balance	**3129,50 DM**	**5427,64 DM**

4. Regional Treasurers

Variable exchange rates and bank charges urge us to try to establish a system of regional treasurers. We need volunteers from the following areas: North America, South America (Brazil), East Asia (Japan), Australia. Regional treasurers are to open an account into which dues and donations may be paid so that they may be transferred collectively once a year to a central account which should be where the exchange rates yield the best results. Volunteers should contact the Treasurer of WAC, Dr. Gerd Schriever, Zoologisches Museum, Hegewischstr. 3, D-2300 Kiel, W. Germany.

... from a student's test paper ...

> "... a trophic niche is a small hole from which an organism derives nourishment."

(courtesy of Janet Reid, Washington)

Business ssenisuB

1. *MONOCULUS* Library/Bibliography

There has been an overwhelming response to our circular letter by Schminke/Janetzky. Because of mailing costs its dispatch had to be spread over several months. So reprints kept coming in continuously. Your cooperation has really been marvellous! Thank you very much. It is such a good feeling to find support for one's activities. Here are the names of those (173 in all) who have reacted to our letter:

Arcos, Arts, Avdeev, Bacescu, Barthel, Bathmann, Bayly, Binet, Bowman, Boxshall, Bradford, Brenning, Bresciani, Briggs, Brylinski, Burns, Campaner, Castel, Castro Romero, Ceccherelli, Chandler, Chandran, Chapman, Conover, Corkett, Corral, Coull, Crawford, Cressey, Daborn, Dadswell, Dahms, Damkaer, Davis, Dessier, Diel, Dinet, Dojiri, Dowidar, Drzycimski, Dumont, Durfort, Eiselt, Elmgren, Evans, Feller, Ferrari, Fleeger, Fleminger, Forro, Fosshagen, Fransz, Fulton, Gannon, Geller, Goswami S.C., Goswami U., Gotto, Greenwood, Grice, Hadel, Hairston, Hamond, Hattori, Haury, Hebert, Herbst, Heron, Hewitt, Hipeau-Jacquotte, Hirakawa, Hirota, Ho, Hopkins, Hoshina, Hulsemann, Huys, Jarvis, Johansson, Johnson, Kajihara, Kawamura, Kikuchi, Koga, Kukert, Kunz, Lacroix, Lai, Lescher-Moutoué, Lim, Madhupratap, Malt, Maly, Martens, Matthews, McQueen, Mercade, Michel, Mielke,*Miquel, Miura, Monniot, Moore, Moraitou-Apostolopoulou, Motoda, Nagasawa K., Nagasawa S., Nair, Neill, Nishida, Nival, Onbe, Ooishi,*Paiva, Papinska, Patalas, Pavlova, Pinel-Alloul, Por, Purasjoki, Radhakrishnan, Rainville, Ramirez, Reid, Rieper, Roberts, Robertson A., Robertson B., Rohde, Ronneberger, Roubal, Rouch, Roy, Runge, Sach, Sarvala, Schulz, Seguin, Sekiguchi, Sevigny, Shih, Simenstad, Soler Torres, Southward, Soyer, Sprules, Sykes, Tester, Thatcher, Thompson, Trinast, Turner, Ueda, Uhlig, Uye, Vader, Valente, Vaupel-Klein, Vervoort, Vijverberg, Vilela, Vranovsky, Vriser, Walter, Watson, West, Williams, Wooldridge, Wormuth, Wyngaard, Yeatman, *Minello, *Paffenhöfer.

Some of you have had the impression that they had already sent more reprints previously than did show up in the list added to our letter. In many cases this was true because the older literature has priority in our bibliography project, i.e. earlier publications are computerized first. If you want to know whether your reprints have reached us, please check in the list of current literature published in every newsletter. This list also serves as acknowledgment of receipt. It would be impossible for us to acknowledge every receipt separately. We hope you understand and accept that. Literature older than 2 years does not show up in the literature lists of *MONOCULUS* because not much else could be published in the newsletter if we kept a complete record of all titles received. In the future we will acknowledge receipt of older literature by regularly publishing at least the names of those who have provided us with literature between two issues of the newsletter as is done for the first time above.

There still are many receivers of *MONOCULUS* who have ignored our appeal. This appeal is therefore repeated here. 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.

There is a particular need for reprints of older publications. Please send reprints to Kurt Schminke. If you send them to Gerd Schriever, add "For *MONOCULUS*-Library" so that he can distinguish them from those meant for him personally.

As announced in *MONOCULUS* 14: 24, we can now offer a moderate service if you need literature from the *MONOCULUS*-Library.

2. *MONOCULUS*-Museum

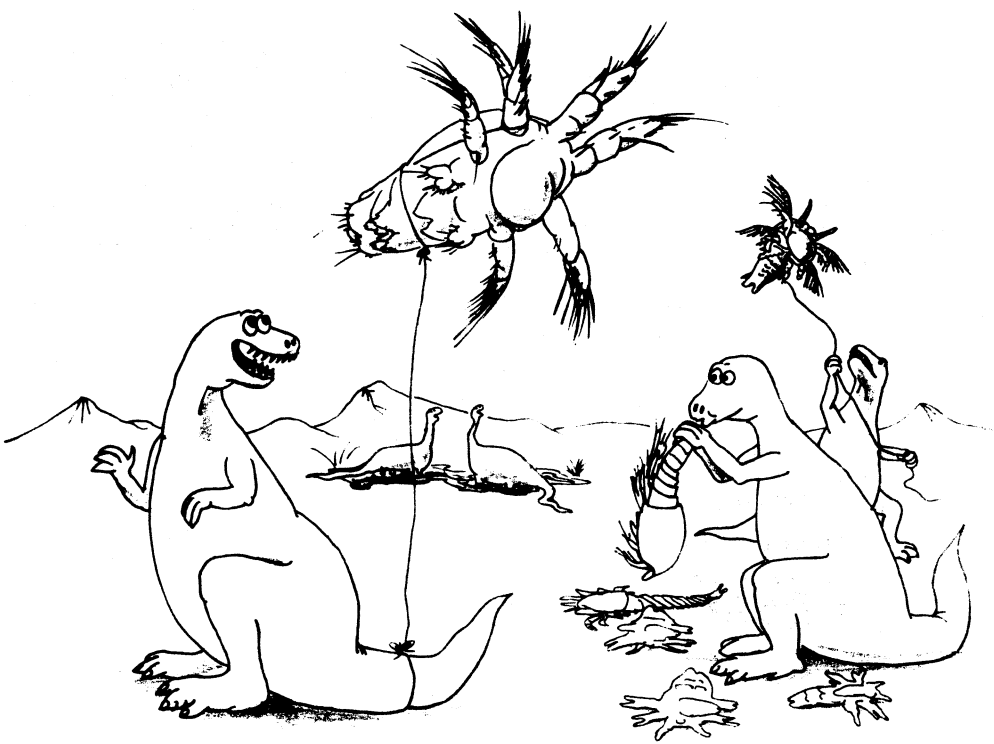
No news.

3. Mailing

Letters addressed to the following persons have been returned to us as being undeliverable:
R.S. Anderson (Montreal, Canada),
J.D. Cooney (Oak Ridge, Tennessee, U.S.A.),
G. Deets (Vancouver, Canada),
J.C. Dugas (Halifax, Canada),
B. Lebreton (Sarlat, France),
N. Stallard (Sidney, Canada),
Z. Zo (Richardson, Texas, U.S.A.).

Who knows the new address?

D. Waloßek (Bonn)



4. Questionnaire 1986

Dojiri, M., Long Beach, U.S.A.:

1. A new species of gallicolous copepod (Lichomolgidae) from Seriatopora.
2. Phylogenetic analysis and coevolutionary relationships of the Taeniacanthidae.

Dowidar, N.-M., Alexandria, Egypt:

1. Vertical distribution and diel migration of copepods.
2. Estimation of biomass and production of common copepods.
3. The role of copepods in the secondary production of the S.E. Mediterranean waters.

Drzycimski, I., Szczecin, Poland:

1. Harpacticoida of eutrophic waters.
2. Taxonomic studies on Baltic Harpacticoida.

Dumont, H.J., Gent, Belgium:

1. Tropodiaptomus in Africa.
2. Cyclopoid biogeography.

Dussart, B., Les Eyzies, France:

1. Taxonomy of tropical freshwater copepods (South America, Indonesia).

Einsle, U., Konstanz, F.R.G.:

1. Determination key for copepods (cyclopids and calanoids) in Middle Europe.
2. Enzyme-electrophoresis in copepods.
3. General ecology of planktonic copepods in Lake Constance.

Elmgren, R., Stockholm, Sweden:

1. Factors structuring benthic communities in the Baltic Sea.

Evans, F., North Shields, England:

1. Long-term monitoring of zooplankton at a single station (North Sea).

Fava, G., Venice, Italy:

1. Quantitative genetics and morphometrics.
2. Adaptation to brackish environments.

Feller, R.J., Columbia, U.S.A.:

1. Response of meiobenthic prey to juvenile fish predation.
2. Feeding of penaeid shrimp on salt marsh benthos.

Fernando, C.H., Waterloo, Canada:

1. Calanoida of Malaysia.
2. Thermocyclops and Mesocyclops of Oriental Region.
3. Copepoda diversity in the tropics.

Ferrari, F.D., Washington, U.S.A.:

1. Segmentation patterns in developing copepod legs.
2. Copepodid ontogeny - Oithona (Dioithona) oculata.
3. Seasonal changes in sex and asymmetry - Pleuromamma xiphias.

Fiers, F., Brussels, Belgium:

1. Systematics and taxonomy of the families Laophontidae and Ancorabolidae.
2. Harpacticoid copepods from Papua New Guinea and the West Indies.
3. Copepodite development, mainly of the species and genera of the Laophontidae and the Ancorabolidae.

Fleeger, J., Baton Rouge, U.S.A.:

1. Predation on harpacticoid copepods.
2. Harpacticoid behaviour in sediments.
3. Tube-building in harpacticoids.
4. Effects of hypoxia on meiofauna densities.

Fleminger, A., La Jolla, U.S.A.:

1. Geographical variation in Calanus helgolandicus s.l. with evidence for speciation of the Black Sea population.
2. Revision of the genera of the family Calanidae.
3. The species of Calanus s.l.
4. Systematics and distribution of Malaysian pontellid copepods.

Flößner, D., Jena, G.D.R.:

1. Plankton of water reservoirs in South India.
2. Harpacticoida of the groundwater of Zagreb (Yugoslavia).

Fontaine, M., Victoria, Canada:

1. Taxonomy of Euchaetidae from Antarctic and Subantarctic waters.
2. Hardening of cuticle of mandibles of calanoids.

Forró, L., Budapest, Hungary:

1. Faunistics of copepods of the Carpathian Basin.
2. Copepoda of sodic water bodies of the Carpathian Basin.
3. Seasonal occurrence of calanoids in sodic waters; co-occurrence of Arctodiaptomus spinosus and A. bacillifer.

Fosshagen, A., Blomsterdalen, Norway:

1. Copepods from marine caves.
2. Benthic calanoids.

Fransz, H.G., Den Burg, The Netherlands:

1. Population dynamics and production in North Sea coastal and frontal systems.
2. Recruitment of copepod populations in the Antarctic Weddell Sea.

Frost, B.W., Seattle, U.S.A.:

1. Diel vertical migration in marine copepods (calanoids).
2. Studies on physiology and population biology of marine calanoid copepods.
3. Systematics of the genus Pseudocalanus.

Fryer, G., Ambleside, England:

1. Inclusion of copepods in a survey of an area of northern England (carried out as time and opportunity offer).

Fulton, J., Nanaimo, Canada:

1. Ontogenetic migration of Neocalanus plumchrus.
2. Effect of anoxic conditions on N. plumchrus.

Gajevskaja A.V., Sevastopol, U.S.S.R.:

1. Parasitic copepods of marine fishes and invertebrates.
2. The significance of parasitic copepods as indicators of ecological peculiarities of their hosts.

Gannon, J.E., Windsor, Canada:

1. Effects of toxic substances on zooplankton.
2. Response of zooplankton community structure to trophic conditions.
3. The role of zooplankton in water quality monitoring and surveillance.

Gardner, G.A., St. John's, Canada:

1. Composition of nearshore zooplankton communities.
2. Physical and biological mechanisms affecting community composition.
3. Factors affecting zooplankton production on the Grand Bank of Newfoundland.

Gaudy, R., Marseille, France:

1. Biological cycle and production of pelagic copepods.
2. Experimental studies of grazing, respiration, excretion, growth and egg production.

Gaviria, S., Wien, Austria:

1. Taxonomy and zoogeography of freshwater copepods of Colombia.

Geddes, D.C., Paisley, Scotland, U.K.:

1. Seasonal fluctuations of phytal harpacticoid associations.

Gee, J.M., Plymouth, U.K.:

1. Predation by epibenthic predators on benthic copepods.
2. Nutrient enrichment effects on benthic community structure.
3. Benthic community structure in shelf or deep sea waters.
4. Systematics of shelf or deep sea harpacticoids.

Gifford, D.J., Chauvin, Louisiana, U.S.A.:

1. Feeding of Neocalanus spp. on ciliate microzooplankton in the Subarctic North Pacific.
2. Feeding of Acartia tonsa on ciliate microzooplankton in the coastal Gulf of Mexico.

Gill, C.W., Roscoff, France:

1. Food detection and selection by copepods.
2. Sensory feeding behaviour of copepods.
3. Receptor structure and function.
4. Effects of toxic dinoflagellates.

Glatzel, T., Oldenburg, F.R.G.:

1. Life history and ecology of groundwater copepods.

Gooding, R.U., St.Michael, Barbados:

1. Animals associated with diadematid sea-urchins, world: systematics and biology.

Goswami, S.C., Goa, India:

1. Larval biology of planktonic copepods.
2. Zooplankton productivity and biochemistry.

Goswami, U., Goa, India:

1. Karyological studies in marine copepods.
2. Cytotaxonomical analysis in different families of copepods.
3. Trends of evolution of chromosomes in marine copepods.

Gotto, R.V., Belfast, U.K.:

1. Preparation of synopsis of British parasitic copepods (with Z. Kabata).
2. Structure of annelidicolous copepods.

Grainger, E.H., Ste. Anne de Bellevue, Canada:

1. Trophic relations within and adjacent to sea ice.
2. General ecology of copepods of the sea ice meiofauna.
3. Vertical distribution of copepods living under the sea ice.
4. Feeding of Arctic planktonic copepods.

Grau, S., Hamburg, F.R.G.:

1. Costal upwelling ecology: community structure and vertical distribution of cyclopoid and calanoid copepods; the variability of short-term and small-scale distribution of copepods.
2. Distribution and variation of developmental stages of copepods, especially nauplii.

Green, J.D., Hamilton, New Zealand:

1. Comparative population biology of Boeckella delicata and Calamoecia lucasi.
2. Morphology of the nauplii of New Zealand freshwater Calanoida.

Greenwood, J.G., Brisbane, Australia:

1. Copepods of the Gulf of Carpentaria (Australia) - with R. Othman.
2. The Labidocera cervi complex (with A. Fleminger).
3. The genus Stephos.
4. Emergence patterns in demersal species.

Grindley, J.R., Rondebosch, South Africa:

1. Plankton of South African estuaries.
2. Zoogeography of the Pseudodiaptomidae.
3. Vertical migration of estuarine Copepoda.

Gröndahl, F., Fiskebäckskil, Sweden:

1. Zooplankton composition and distribution in the Eurasian part of the Nansen Basin, Arctic Ocean.

Grygier, M.J., Washington, U.S.A.:

1. Comparison of "cypris y" to copepods and other maxillopodans.
2. Demonstration that Sphaerothylacus (supposed rhizocephalan from a tunicate) is really an encysted notodelphyid copepod).

Gulati, R.D., Nieuwersluis, The Netherlands:

1. Composition abundance and biomass of copepods and Cladocera in eutrophic Dutch lakes".
2. Grazing and excretion rates of crustacean zooplankton in Loosdrecht lakes".

Hadel, V.F., Sao Sebastiao, Brasil:

1. Ecology of the copepod bromeliad association.
2. Organic pollution monitoring in sandy beaches using the ratio nematodes/copepods.

Hahn-Mieth, A., Hamburg, F.R.G.:

1. Impact of oil on reproduction and development of harpacticoids.

Hammer, W.T., Saskatoon, Canada:

1. The zooplankton of saline lakes in Saskatchewan and Alberta.

Hamond, R., Holt, U.K.:

1. World revision of the family Harpacticidae.
2. The harpacticoids of the Belgian Great Barrier Reef expedition.
3. The freshwater and brackishwater harpacticoids of Australia.
4. Fauna-list of the harpacticoids of Norfolk, U.K.

Harding, G.C.H., Dartmouth, Canada:

1. Documenting the vertical migration of zooplankton.
2. Studying the dynamics of chlorinated hydrocarbons in zooplankton.

Hardy, E.R., Egham, U.K.:

1. Zooplankton of Amazon lakes and rivers.
2. Limnological studies, composition, density, distribution of zooplankton in Varzea lakes, Brazil.
3. Ecological studies on Amazonian freshwater zooplankton - Ph.D. Thesis in preparation.

Harris, R.P., Plymouth, U.K.:

1. Basic studies of biological productivity in West European seas.
2. Influence of thermal stratification on vertical migration of copepods.
3. Inhibition of copepod feeding by dinoflagellates.
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Hattori, H., Sendai, Japan:

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2. Small-scale structure (vert. and horiz.) in relation to physical features.
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Head, E.J.H., Dartmouth, Canada:

1. Diurnal feeding behaviour in marine copepods from different environments.
2. Nutrition and metabolism in marine copepods from different environments.
3. Biology, biochemistry and physiology of Arctic marine copepods.

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2. Genetic variation in calanoid and cyclopoid freshwater copepods.

Heeg, J., Pietermaritzburg, South Africa:

1. Temperature and metabolism - Calanoida.
2. Dormancy - particularly in temporary waters.
3. Temperature and larval development - Calanoida.

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Das Flugvermögen unter den Crustenthieren ist, so viel mir bekannt, bis jetzt noch nicht beobachtet worden. Zum ersten Male sahen wir, Diener der Biologischen Station, mein Sohn und ich, im Juli dieses Jahres, wie die winzigen, grünen Crustenthierchen, nämlich Pontellina mediterranea Claus, in der Luft fliegen. Dies war während eines Überganges in der Schaluppe längs der Küste der Halbinsel von Chersones früh Morgens bei ruhigem Meer und klarem Himmel. Viele von jenen Spaltfüßlern ruhten auf dem Wasserspiegel, machten Sprünge in die Luft, beschrieben hier eine lange Curve, und fielen wiederum auf den Wasserspiegel. Solch ungewöhnliche Ortsbewegung ist allerdings durch die stark befiederten Glieder begünstigt und steht wahrscheinlich in Zusammenhang mit dem Häutungsproceß oder genauer gesagt mit dem Anfange desselben. So wissen wir, daß manche Entomostraken, z.B. solche Polyphemiden wie Evadne, Pleopis, sich auf dem Wasserspiegel mit Hilfe der Luft, welche die abgeworfenen Hüllen anhält, häuten.

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(The rascal of this story is a cladoceran today. Because of his old name his portrait is admitted to these columns. Thanks God he is not a copepod!)

Donovan, in his "Natural History of British Insects", 1802, gives but an indifferent figure of a species taken when in its young state, and which appears to be the D. vetula. He calls it "Monoculus Conchaceus", and makes a few remarks upon its habits and manners, giving a frightful picture of its ferocity and cowardice! By numerous filaments which it darts forth, he says, it causes such motion in the water as to attract unresistingly the insects in the water to its mouth. "Thus it exists", he concludes, "a life of rapine and destruction, enjoyed at the expence of the lives of thousands; and as the objects of its ravenous disposition are defenceless, so are they the sport of their conqueror; the few moments of intermission its craving appetite grants them, is occupied equally in the spoil, first pressing them to death, and then tossing them undevoured into the fluid. But should a more powerful insect oppose him, he immediately contracts his parts, and nothing more than the external covering is open to his antagonist's violence, and he will sooner die ignobly than offer the least opposition."

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Later he (Brady, 1894) described a copepod which he thought was responsible for making the galls as a new genus and species - Fucitrogus rhodymeniae. ...
The specimen is flattened on a slide but appears to be a rather unusual copepod nauplius. Brady considered and rejected the possibility of its being a nauplius stage in the life history of a copepod or some other crustacean because he misinterpreted the appendages and thought they were "more in accordance with the idea of retrogression arising from parasitic habits". It will be shown in this paper that the animal is indeed a nauplius .... Brady's published figure is quite a good one, but by describing the animal from the drawing instead of from the specimen he misinterpreted nearly every detail. The legend to his plate gives "explanations" of the following: -mandible, antennule, antenna, mandible-palp, maxilla-palp, maxilla, maxillipede, papilla with genital aperture, setae, pharynx and stomach and of all these the only identification which is correct is "setae".

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