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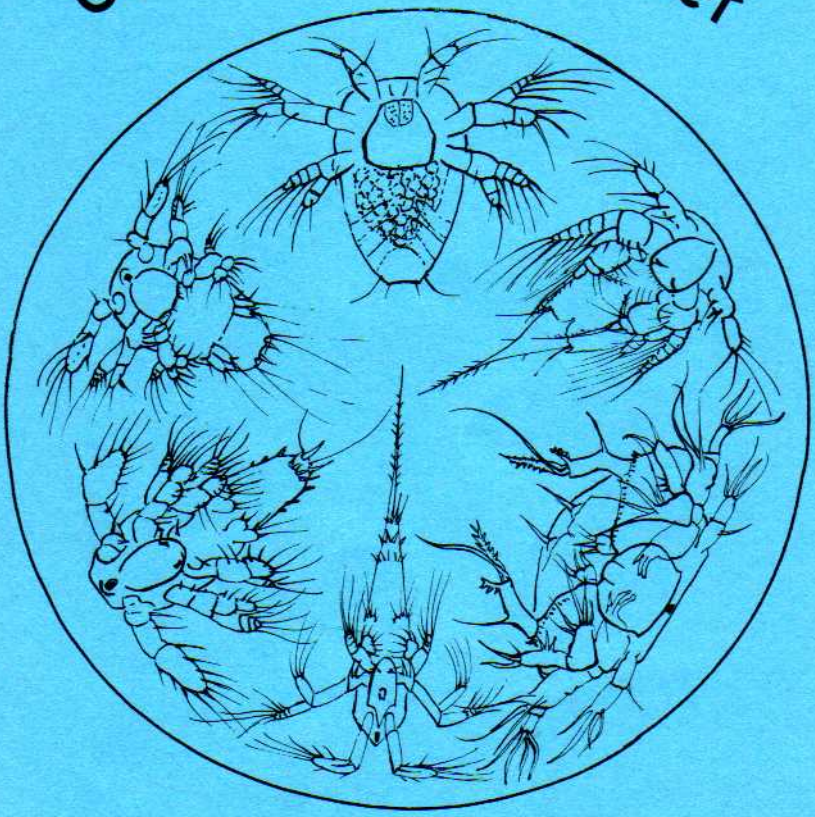
MONOCULUS

Copepod Newsletter



Nr. 10

March 1985

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MONOCULUS

Copepod Newsletter

Number 10

March 1985

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

Do you know the nauplii on the front cover? If you want to win a bottle of German white wine, please, let Gerd or Kurt know to which genus or family the nauplii (in a clockwise sequence starting with 12 o'clock) belong. In case of several correct answers decision will be by lot.

Birthdays this year

70: Siegfried Husmann

75: Helmut Kunz

Death reported:

Dr. Peter Röben

Deadline for the next issue of *MONOCULUS*: 1 September 1985

Editorial

You are in for a lot of reading today. So much time has elapsed since the last number of *MONOCULUS* that the amount of information demanding publication is almost a bit too much for one single issue.

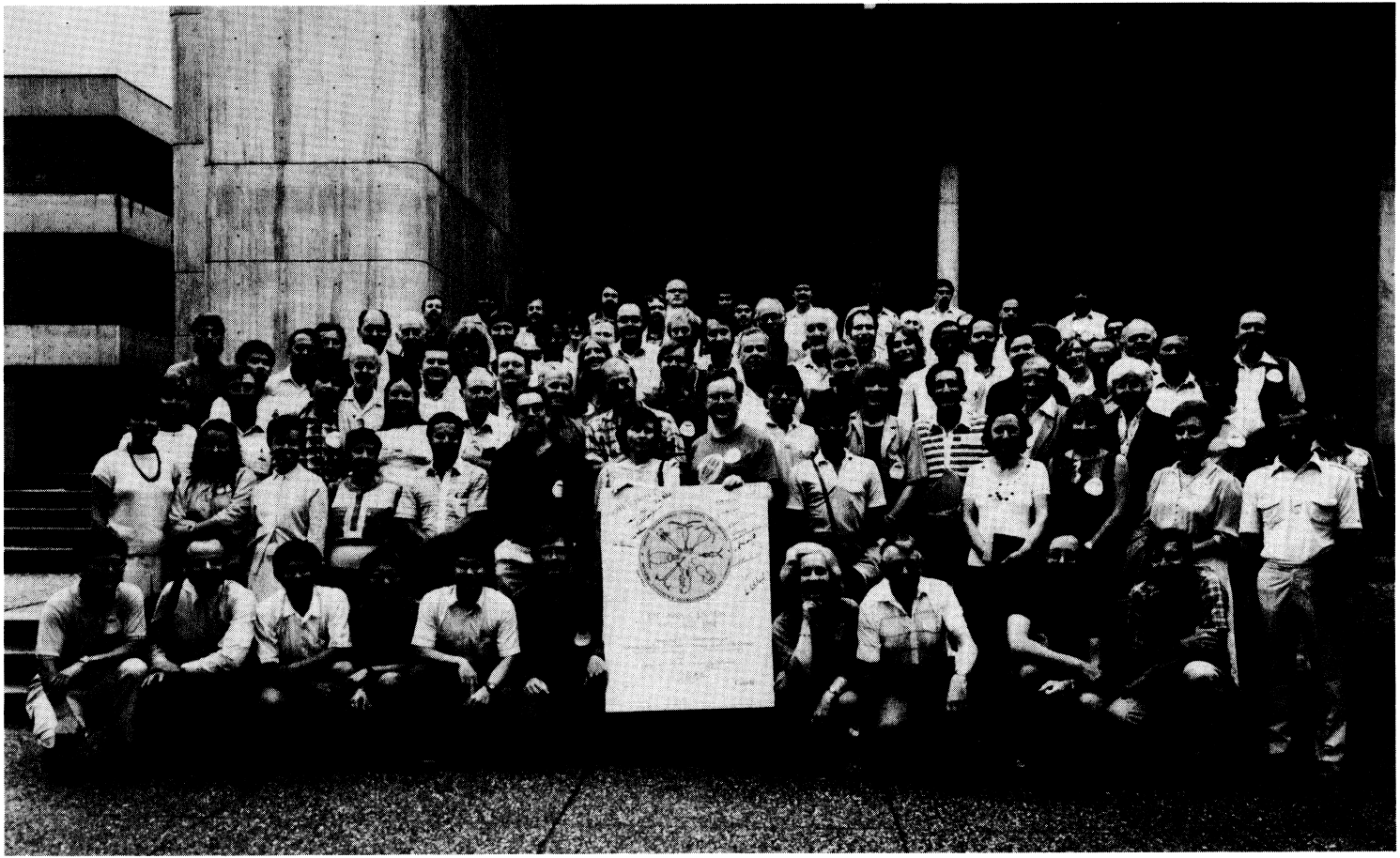
Most of this information is related to the Second International Conference on Copepoda which took place in Ottawa from the 13th to 17th of August last year. The meeting in Amsterdam was historic because it was the first of its kind, but the second meeting in Ottawa was historic as well. You doubt it? Well, read the next pages.

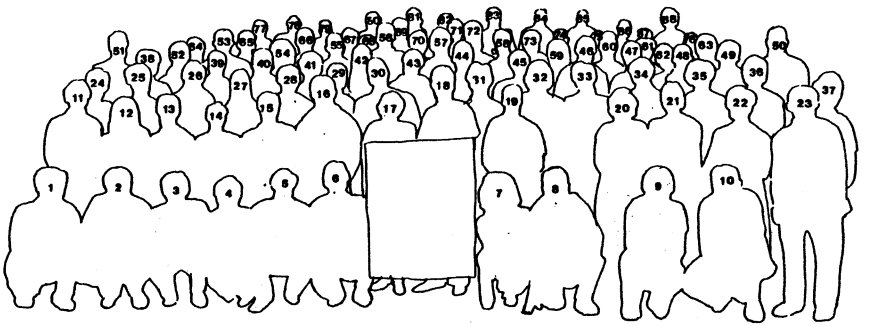
As anticipated in the last issue, the literature received in the meantime adds up to a list double the size of that last time. Stacks of reprints waited on his desk, when Kurt returned from his sabbatical. On his five months' tour through countries in the South Pacific he was so kindly and generously supported by fellow copepodologists all along the way that he is determined more than ever to do as much as he can to enhance contacts and cooperation among copepodologists.

We are glad that 25 more questionnaires have arrived with short reports on current research activities. Together with the 48 last time 73 colleagues have now responded. Are all the others (480) not doing research? Other contributions to this issue have been prepared by M.S. Almeida Prado Por, G. Boxshall, F. Campaner, J. Corkett, K. Hülsemann, Z. Kabata, and C.-t. Shih. Their help is gratefully acknowledged.

Again we have received some money to support production of our newsletter. H. Kunz sent DM 100.00 (about US $ 35.00) and A.G. Lewis sponsored our activities with a donation of US $ 20.00. We are very grateful. Also we have to thank for many colourful postcards received for Christmas and New Year. In return here is *MONOCULUS* No. 10.

F. K. H. J. S.





Please refer the following names to the above numbered chart of the group picture. There are still a few names missing (Nos. 27, 29, 68, 71, 75, and 87) and probably some names are incorrect. We would very much appreciate it if you would let us know any addition or correction of the names.

1. C.-t. Shih
2. H.K. Schminke
3. T.T. Do
4. S. Nagasawa
5. S. Nishida
6. J.R. Cordell
7. M.S. de Almeida Prado-Por
8. F.D. Por
9. R.A. Myers
10. B.P. Bradley
11. P.A. Tester
12. M.L.M. Tackx
13. T.K.S. Björnberg
14. G.S. Moreira
15. J.F. Arcos
16. J. Bresciani
17. R. Tiemann
18. H. Tiemann
19. C.W. Ramcharan
20. O. Mayzaud
21. S. Razouls
22. M. Moraitou-Apostolopoulou
23. J.-S. Ho
24. G. Schminke
25. T. Park
26. A.F. Campaner
27.
28. N.H.F. Watson
29.
30. I. Vuorinen
31. C.K. Wong
32. G.A. Boxshall
33. R.V. Gotto
34. R.J. Conover
35. K. Hülsemann
36. Mrs. C.H.R. Heip
37. S. Ooishi
38. C.W. Yang
39. T.E. Bowman
40. P. Mayzaud
41. S.A. Poulet
42. E.C. O'Doherty
43. T.C. Walter
44. M. Gophen
45. S.C. Johnson
46. C.M. James
47. C.J. Corkett
48. B. Scotto di Carlo
49. C.H.R. Heip
50. I. Drzycimski
51. F. Gröndahl
52. Chen Qing-Chao
53. J.C. von Vaupel Klein
54. P.I. Blades-Eckelbarger
55. Y. Ranga Reddy
56. G.A. Gardner
57. S. Threlkeld
58. J.H. Stock
59. N. Butler
60. C.E. Williamson
61. C.H. Fernando
62. J.W. Reid
63. K. Patalas
64. H.-U. Dahms
65. A.G. Humes
66. K. Schulz
67. C.W. Burns
68.
69. G. Gyllenberg
70. P. Ward
71.
72. W. Vader
73. P.F. Sykes
74. Z. Kabata
75.
76. L.F. Villate
77. G.-A. Paffenhöfer
78. A.A. Mohammed
79. E.H. Grainger
80. J.-M. Sevigny
81. A. Fosshagen
82. D.J. Barr
83. C.S. Davis
84. R. Chengalath
85. F. Ferrari
86. D. Kahan
87.
88. I.G. Sutherland

Open letter

Dear Fellow Copepodologists:

I am sure that by now all of you are aware of all that transpired during our second International Conference in Ottawa, in August 1984. News travels fast and copepodologists even faster. You will know, then, that the collective wisdom of that gathering decided we must establish a "regular" organization. Incomprehensibly (and without recourse to wisdom) I was chosen as the Founder-President of that organization. This fact compels me to usurp some of the precious space in *MONOCULUS* for an open letter to you all.

Our first two international conferences convinced all participants of their value, not only to those who could attend. I would be preaching to the converted if I tried to list all the benefits generated by them. Not all of you are, however, aware of the amount of work necessary to "put the show on the road". Work is a commodity copepodologists can provide. Another ingredient required to smooth the road is money. Copepodologists are not noted for opulence. We must have sponsors. Who, I ask you, is going to sponsor a bunch of individuals getting together to talk about their pets? A properly constituted international scientific organization is a different kettle of fish. It can speak with a voice commanding attention, it can open doors that would otherwise remain closed.

However, the aims of this organization, to be known as the World Association of Copepodologists, will not be limited to conferences. Much broader objectives are envisioned. The Association will provide solid backing for a pioneering group of dedicated copepodologists who on their own initiative and virtually unaided initiated a central repository of copepod literature and specimens (not to say anything about putting together this newsletter). How often were you stymied by lack of literature data? How often did you wish for some place you could write to for comprehensive information? The Association can help our intrepid colleagues to make this come true. A copepod stock

exchange? Yes, and much more. The Association should become a potent instrument for development and progress of our discipline.

I can almost hear some of you: What, another organization? It is just as well that I cannot see you, because I would hate to tell you to your face: Some copepodologist you are!

Armies march on their stomachs and organizations on money. A membership fee will be asked for, but it will not be at a prohibitive level and should not put anybody off. We will open this subject for discussion very soon and seek your views.

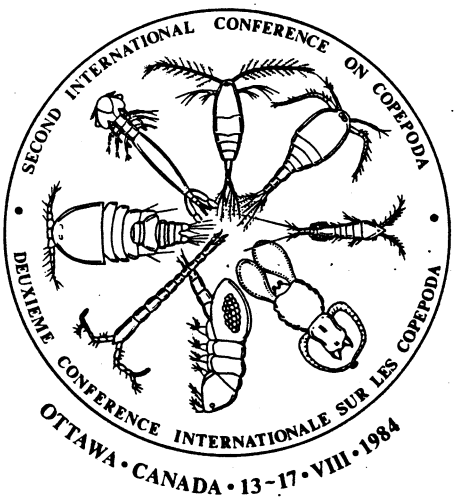
The Third International Conference has been slated for 1987, to be held in London, England. Dr. Geoff Boxshall is already at work on preparatory planning. In the meantime, the Association is beginning to take shape. Its constitution is now in draft stage and will be presented for your scrutiny and comments in one of the coming issues of *MONOCULUS*.

I am writing to you in the certainty that all of you will support the idea of our own World Association. Why don't you express that support by scribbling a note to the Editors of *MONOCULUS*, or to me? I am addressing in particular those colleagues who missed the Second Conference. And remember, by the maxilliped! If we stick together, there is nothing we cannot accomplish.

Z. Kabata
Founder-President
World Association of Copepodologists

A model conference and a surprising decision

Most copepodologists, I guess, are convinced that in number of individuals copepods are unrivalled by any other group of animals. But what about the number of species? I raised this issue in Ottawa when a few of us were waiting to be picked up at the end of the conference. How many species do you think there are in existence today? Here are the answers: Boxshall - 20,000, Corkett - 15,000, Kabata - 20,000, Schminke - 25,000, Schriever - 60,000, Shih - 20,000, Stock - 19,000, von Vaupel Klein -



20,000. As to the number of described species agreement was reached that it must lie somewhere between 10,000 and 12,000. This leaves us with a lot of work to do, not only as regards description of new species but also as to the study of their biology and ecological importance.

This was a reassuring perspective at the end of a conference that offered so much of interest in all disciplines of copepodology. When you have listened to most lectures held at the conference and when in the breaks you have had a look at the posters displayed and talked to different colleagues you are so overwhelmed by all you have heard and seen that you start to wonder what is left to be done. But when a few months later you have a look at your notes and pass in review what memories there are of the conference you realize how stimulating it has been and that new perspectives have clearly been opened up which apart from the nauplius (see below) had only been masked by the first overwhelming impression of all the details.

Looking back you feel a lot of gratitude to those who have sacrificed so much of their time to make this conference possible. Chang-tai Shih and Ian Sutherland have constantly been busy behind the scene and they have succeeded in organizing a

conference which, I am convinced, will serve as a model for all conferences to come. The mixture of symposia with invited speakers and sessions with contributed papers will remain a constant feature. So will the poster displays and the informal discussion groups in the evening.

What will differ is the by-programme. This time we had a relaxing evening cruise on the Rideau Canal in Ottawa and a marvellous reception with good wine and food offered by the National Museum of Natural Sciences. The highlight of this reception was the award given by the Museum to two distinguished zoologists: Dov Por and Jan Stock. The event, however, for which Ottawa will always be remembered was the general assembly on which it was decided to establish a formal organization of copepodologists and on which Z. Kabata was elected as the Founder President. It will be his task together with the provisional Executive Committee of his choice to prepare a constitution and establish the organizational framework so that on the next conference in London in 1987 the first regular President and Executive Committee can be elected.

It was Chang-tai Shih who already while preparing the conference in Ottawa raised the issue of a formal organization. Why? In a letter to the members of the Organizing Committee he wrote: *I always enjoy the informal atmosphere of a conference and that is one of the reasons I liked the First Conference in Amsterdam very much. By organizing the Second Conference in Ottawa, sometimes I feel my hands are tied up because I do not have a permanent structure (a society or something) to back me up. I cannot apply some grants which may be available for society conferences. The lack of any financial resources is a hardship for organizing a conference. I am fortunate to have the full support by the National Museum of Natural Sciences. But will future organizers have the same support from other organizations?*

It turned out in the discussion that they won't necessarily. To organize a conference you need money much earlier than the moment when participation fees start coming in a few months

before the beginning. So, unless there is an organization with own funds, conferences could only take place where there are powerful institutions which means that many parts of the world could be excluded for ever. Also, to obtain travel funds and other support from International Organizations for invited speakers and colleagues in need of help would be less difficult if a world-wide association was the applicant and not a single person who happens to be in charge of the organization of a conference. These arguments and the prospect that a society could also support other activities (publications like monographs, bibliographies, exchange of educational material etc.) finally led to the decision mentioned above. It is now up to us to make the best of this decision which if properly put into practice opens up breathtaking perspectives indeed.

There are not only many copepod species, there are also many copepodologists. Our guess is: over 1,000. If half of them joined the *WORLD ASSOCIATION OF COPEPODOLOGISTS* we would be in for a splendid future. As you know, we like utopian ideas, what we like even more is seeing them become reality. The next issue of *MONOCULUS* will open up the discussion to establish the conditions under which most of you will be able to declare yourself partisan of this dynamic initiative which could make us strong and even independent.

Whatever the outcome, Ottawa has been a historic meeting by either demonstrating our power or our inability. H.K.S.

Tagea Björnberg

Tagea Björnberg

Interviewing copepodologists

There is something particular about this issue of *MONOCULUS*. Didn't it strike you straight away? Look at the front cover. You must be shocked! Instead of viewing an adult copepod through a monocle as would be normal you observe a merry round dance of

nauplii this time. We have broken with a tradition and whoever attended the last conference will know who caused this revolution. The "medaillon" as she calls it herself we owe to Tagea Björnberg from São Paulo. So persistently and charmingly did she lobby for the nauplii on the conference in Ottawa that whoever did not touch upon the subject in his lecture left the podium with a bad conscience.

Nauplii have been underestimated was the message. Not only is the nauplius larva a living fossil as Geoffrey Fryer reminded us in his lecture pointing to the recent discovery of phosphatised nauplii from the late Cambrian, but also he believes that the nauplius "represents the most abundant type of multicellular animal in existence" since merely all copepods "of which there are probably more individuals in the world than of any other group of animals" hatch as nauplii not to mention all the other groups of crustaceans which do the same. Copepod nauplii also are as Dr. Björnberg pointed out herself in her lecture on "The rejected nauplius" ecologically far more important than adults since most of them are eaten before they even reach the copepodid stage. You are amazed, aren't you, and now you want to know who Tagea Björnberg is.

Her name does not fit her country, neither does her English fit her name. There is a distinct German background and, indeed, German was her first language as she told me on the way to a bank in Ottawa where we went to change some money. To reach the bank in time before it closed for the weekend we had to sacrifice the last lecture and the closing remarks of the conference. Her great grandmother was German and she herself was brought up in a part of Brazil which has kept a genuine German character. Watching her while we walked along the busy streets in the centre of Ottawa she reminded me of my geography teacher at school long ago who used to carry her handbag with the same determined charm. I did not have to ask many questions. She evidently knew what I was after.

Her mother was a nature loving woman and knew to confer some of

her enthusiasm upon her children. Dr. Björnberg became a biologist, her brother a geologist. She studied natural history under professors Marcus and Rawitscher and was particularly attracted by the field trips in marine biology. She soon became interested in marine animals and started to work on enteropneusts for her doctorate. These animals, however, have two disadvantages which made work with them a little difficult for her. It can be a terribly exacting job to dig them up and also they do not have hard parts. So later at the Oceanographic Institute she was not disinclined to start work on planktonic copepods as Prof. Carvalho suggested whose eyesight started to deteriorate. She was also interested in Larvacea.

The nauplii entered the scene on Curaçao where she went to study enteropneusts again. These she tried to rear in tanks quite successfully initially, but one morning all cultures had turned foul. Only a few copepods remained unimpressed while the rest of the fauna had faded away leaving Dr. Björnberg utterly frustrated. So she turned to the copepods instead and started to rear calanoids and with great success. The result was her famous work on "Developmental stages of some tropical and subtropical marine copepods" and nauplii have fascinated her ever since.

As professor at university she inspired a lot of work on copepods. A little school was the result with young people studying copepods from practically all habitats. As you may recall this group came like something as a revelation to Dov Por when he made its acquaintance on one of his travels and it influenced his decision to try to establish a copepod organization. Will her example have the same stimulating effect on work with nauplii which has unduely been neglected as she indefatigably reiterated on the conference?

Recently she has turned from studying calanoid nauplii to work with harpacticoid ones because, as she asserted, they show much greater diversity in form and life style than those of any other group of copepods. Look at the "medaillon" on the front

cover again. If you do it long enough it will start to turn like a merry-go-round and behind it the charming smile will appear of the "Queen of the Nauplii" as she was called eventually on the conference.

H.K.S.

SECOND INTERNATIONAL CONFERENCE ON COPEPODA
Financial Statement as of 31 December 1984

INCOME	
Registration fees, prepayment of accommodation, and overpayment due to currency exchange	$13,381.50
Bank interest	117.84
Total Income	$13,499.34
EXPENSES	
Prepayment of accommodation forwarded to University of Ottawa	$2,383.88
Reimbursement of overpayment due to currency exchange to participants	450.00
University of Ottawa convention service charges	5,553.27
Bank service charges	16.80
Loss due to currency exchange for an advance of UNESCO Travel Grant	10.18
Prepayment for typing the proceedings and bank charge	2,005.00
Total Expenses	$10,419.13
NET	$3,080.21

C. T. Shih
1955-03-11

As for the "surplus" Chang-tai Shih proposes to use this money as follows during the calendar year 1985:

a. Art work required for the Proceedings
b. Donation of up to $ 500.oo to *MONOCULUS*
c. Seed money for the Third Conference

Antarctic Copepoda: A report on the group discussion at the Second International Conference on Copepoda held in Ottawa on Tuesday, August 14, 1984

A group of about 30 participants at the Conference met to discuss problems related to Antarctic Copepoda. Most of the participants are actively engaged in various aspects of Antarctic copepod research. The discussion group was organized by Dr. Almeida Prado Por and chaired by Dr. Hülsemann.

The first point on the discussion agenda concerned expeditions to Antarctica and the availability of the material collected by them. Dr. Schnack reported on collections kept in the Federal Republic of Germany. The material collected up to 1977/78 by "Polarbjörn", "Polarsirkel", "John Biscoe", "Walter Herwig" and "Meteor" are on deposit at the Institut für Meereskunde in Kiel. The more recent collections of "Polarstern" are at the Institute for Polar Research in Bremerhaven, but soon all the Antarctic samples will be transferred to Bremerhaven too.

The material from the Brazilian Expeditions ("Wladimir Besnard") is being kept at the Oceanographic Institute - University of São Paulo. It is studied by the staff of this Institute (Almeida Prado Por) and of the Center of Marine Biology - Federal University of Paraná (M. Montú).

Dr. Park and Dr. Ferrari spoke about the Smithsonian Oceanographic Sorting Center collections, mostly from "Eltanin", in Washington, D.C., USA. There are about 1000 presorted mid-water trawl samples from the Atlantic as well as the Pacific. Unsorted aliquots of these samples are available for study. There are also about 1000 samples collected by small mesh Bé net.

The British Antarctic Survey is presently engaged in a three-year project on South Georgia. Collections taken with a rectangular mid-water trawl from "John Biscoe" are deposited at Cambridge (Ward).

France maintains an active laboratory on Kerguelen Island where physiological work on copepods can be performed (Razouls).

Despite the fact that systematics of copepods is relatively well known in the area, there are still some lesser known groups that are presently studied, such as Oncaeidae (Heron), Lucicutiidae (Park), Euchaetidae (Park). Dr. Hamond, Australia, is working on a revision of the pelagic Harpacticoida. Ecological work on Euchaetidae is presently done by Dr. Ward.

Information given by colleagues who are presently working in the Antarctic confirmed the presence of unusually large swarms of salps in the last two years and the correlated extremely low densities of copepods (Wormuth, Schnack, Almeida Prado Por).

Some future directions from Antarctic copepod research were discussed: Dr. von Vaupel Klein pointed out that the "Eltanin" collections can still answer some questions about the vertical migration of copepods in the area. It was also suggested and agreed upon that there is a need for intensive work at fixed stations in order to study distribution and 'round the clock' migration - rather than continuing classical transect sampling.

Most of the sampling programs take place during the Antarctic summer; therefore there is very little knowledge on seasonality. This subject should be tackled by the staff of the Antarctic bases rather than by expeditions.

Much attention has been given in the past to large calanoids of Antarctic waters, but it was recently shown (Kaczmaruk, Almeida Prado Por) that the small epiplanktonic calanoids can form a biomass equal to that of the large species.

Dr. Björnberg raised the problem of the life cycles of Antarctic Copepoda and pointed out the importance of including the study of the nauplii. She suggested that the early stages are to be found in net phytoplankton samples. It seems that only the nauplii of Rhincalanus gigas and Calanoides acutus have been described till now.

It is evident that most research efforts have been made around the Antarctic Peninsula and the Weddell Sea, while relatively little is known from the Pacific area. It has been, however, mentioned that the USSR expeditions have been preferentially sent to this area.

In general, the Antarctic species have a circumpolar distribution. In the Weddell Sea there is a North-South gradient in

the composition of the species: Rhincalanus gigas, for instance, disappears toward the South (Schnack).

Bipolarity of copepod species was discussed, and it was generally felt that sibling species are present in the Arctic and the Antarctic. However, Dr. Björnberg mentioned the presence of Rhincalanus gigas at the latitude of Peru and Dr. Park noted the presence of spent females of Antarctic copepods at low latitudes.

A preliminary checklist of Antarctic Copepoda was distributed. The Antarctic specialists are requested to complement or correct the list of eventual publication.

Effort will be made to establish a list of Antarctic copepodologists and their special interests in order to further cooperation.

It was decided to hold a second meeting on Antarctic Copepoda during the 3rd International Conference on Copepoda to be held in London in 1987.

Summarized by M.S. de Almeida Prado Por and K. Hülsemann

Copepod morphological terminology: A report on the group discussion at the 2nd International Conference on Copepoda held in Ottawa on Wednesday, August 15, 1984

A letter in *MONOCULUS* No. 5 (Nov. 1982) under the heading "Can Copepodologists agree on terminology of body form" first suggested this subject as a suitable one for discussion at Ottawa.

At the meeting a handout was passed out that contained two items:

1. "A proposal for a practical nomenclature of the major body divisions and appendages in copepods" by Christopher Corkett and Chang-tai Shih copied from *MONOCULUS* No. 8 (May, 1984);

2. An "Introduction" by Fred Campaner that is reproduced below.

During the discussion, Geoff Boxshall proposed the praecoxa-coxa-basis system of Lang for the protopodite of the feeding appendages. This suggestion was based on his study of the intrinsic musculature of the mouthparts of calanoid, mormonilloid misophrioid and siphonostomatoid copepods. This information is reproduced in the enclosed Fig. 3.

After the continuation of the lively group discussion, it was clear that any agreement would not be forthcoming at Ottawa. The meeting concluded with the suggestion that all copepodologists should make exact definitions of the morphological terms they are using and send these definitions to Kurt Schminke to be registered in the *MONOCULUS*-Glossary as outlined in *MONOCULUS* No. 5, p. 19.

Christopher J. Corkett

Historical introduction for morphological terminology

The terminologies of the copepod body form basically gather round two systems (Fig. 1). The former, called here as 'Giesbrechtian' is shared by the majority of the last century carcinologists, who usually studied the copepods according to the organization plan found in the malacostracans; the latter, which could be referred to as 'Sarsian', proposes a new nomenclature, free from homologies with malacostracan tagmosis.

The 'Giesbrechtian' terminology is found, among others, in Dana (1852), Claus (1863), Brady (1883), Canu (1892), and became more widely elaborated after several works by Giesbrecht. It appears in many of the fundamental taxonomic papers of this century, like those of Farran (1905, 1908), Wolfenden (1911), A. Scott (1909), Kiefer (1928, 1978), Pesta (1928), Sewell (1929, 1947), Rylov (1948), Brodskii (1950), Vervoort (1951, 1957, 1963, 1965), and Tanaka (1956-1965).

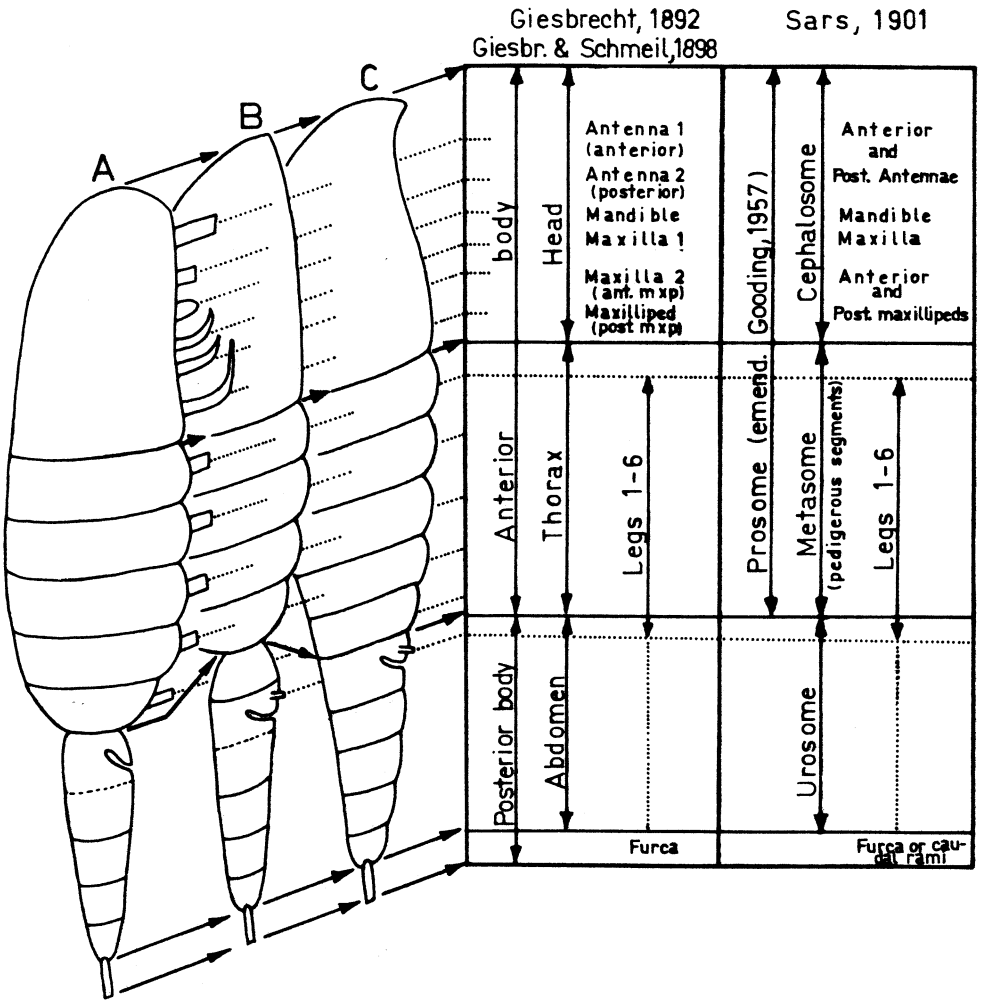
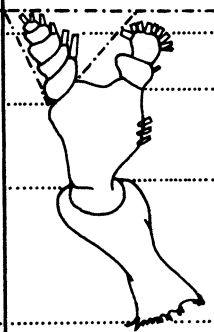
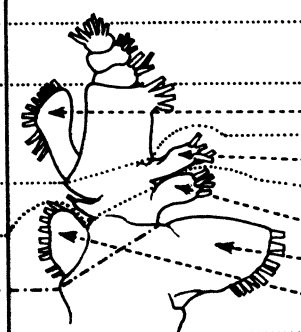
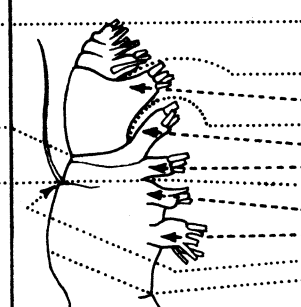


Fig. 1. 'Giesbrechtian' and 'Sarsian' terminology of copepod tagmata and appendages (A, B and C - generalized calanoid, cyclopoid and harpacticoid body types, respectively).

Fig. 2. 'Giesbrechtian' and 'Hansenian' terminology for the first five pairs of copepod appendages, with Gurney's (1931) interpretation included.

Gurney 1931		Giesbrecht 1892 Giesbr. & Schm. 1898	Hansen 1893, 1925
ANTENNULE		ANTENNA 1	ANTENNULA
ANTENNA		ANTENNA 2	ANTENNA
MANDIBLE		MANDIBULA	MANDIBULA
exopod		exopodite	exopodite
endopod		endopodite	endopodite
basis		basipodite 2	coxa and basis
coxa		basipodite 1 ('Mandibellade' or 'Kaulade')	precoxa ('corpus mandibulae')
MAXILLULE		MAXILLA 1	MAXILLULA
endopod		endopodite	endopodite
sympodal seg. 4		basipodite 2: exopodite	coxa: basis: exopodite
		basipodite 2: inner lobe 3	coxa: inner lacinnia
basis		basipodite 1: inner lobe 2	precoxa: inner lacinniae
coxa		basipodite 1: inner lobe 1	precoxa: inner lacinniae
precoxa		basipodite 1: outer lobe 1	precoxa: pre-epipodite
MAXILLA		MAXILLA 2	MAXILLA
endopod		endopodite	endopodite
		basipodite 2: inner lobe 5	endopodite: inner lacinnia
basis		basipodite 1: inner lobe 4	basis: inner lacinniae
		basipodite 1: inner lobe 3	basis: inner lacinniae
coxa		basipodite 1: inner lobe 2	coxa: inner lacinniae
		basipodite 1: inner lobe 1	coxa: exopodite
			precoxa

With (1915) and Wilson (1932) partially used this terminology, and replaced some terms by others created by Sars (1901). Sarsian terminology is followed, generally in its original form, by Rose (1933), Dudley (1966) and Owre and Foyo (1967), and, partially, by Wilson (1932), Illg (1958) and Matthews (1964). Gooding (1957) introduced the term 'prosome', which has been widely employed recently (e.g. Ferrari and Bowman, 1980; Von Vaupel Klein, 1982).

The terms 'cephalothorax' and 'genital segment' have been subject to controversies in their concept and adequacy. The first term is employed, either in an extensive sense as the 'anterior body' (e.g., Dana, 1852; Brady, 1883; Canu, 1892; Farran, 1905, 1908; A. Scott, 1909; Wolfenden, 1911; Sewell, 1929, 1947; Brodskii, 1950; Vervoort, 1963, 1965), or in a restricted sense, e.g. by Kiefer (1928, 1978), Rylov (1948), Gooding (1957), Dussart (1967), Owre and Foyo (1967), and Kabata (1979). The female genital segment has been considered by many authors as composed of abdominal segments only (Kiefer, 1978, suggests inclusively that the sixth pair of legs are vestigial pleopods), whereas others believe that it is formed by the fusion of a thoracic and an abdominal segment (e.g., Dudley, 1966; Kabata, 1979; Von Vaupel Klein, 1982). The term 'genital complex' has been used to avoid ambiguities.

The appendage terminology may also be grouped in two fundamental lines. The first is based on Hansen (1893) and is adopted, among others, by With (1915), Gurney (1931), Lang (1946, 1948), Rylov (1948), Illg (1958), Dudley (1966), Dussart (1967), Kiefer (1978), Von Vaupel Klein (1982). The last can be attributed to Giesbrecht (1892, 1893) and Giesbrecht and Schmeil (1898), and is adopted by Pesta (1928), Sewell (1929, 1947), Vervoort (1951, 1957), Tanaka (1956 - 1965), Anraku and Omori (1963), Owre and Foyo (1967), Arashkevich (1969), and Kabata (1979).

Dana (1852: 1024, 1033-6) considered the last two pairs of mouthparts as '2nd pair of maxillary feet or maxillipeds' and 'anterior pair of legs or 1st feet', respectively. Subsequently, Claus (1863) considered them as being rami of the same limb,

and called them 1st and 2nd maxillipeds. This nomenclature was adopted by Canu (1892), Sars (1901-1903), A. Scott (1909), Wolfenden (1911), Rose (1933), and Brodskii (1950), among others. Different views about these appendages are in Lang (1946:4). The Clausian concept has been entirely rejected (vide Von Vaupel Klein, 1982:87), and the appendage terminology of Sars has consequently not been used in recent taxonomic papers.

Some controversy exists on the number, position and names of the segments forming the 'protopodite' of the appendages, especially of the mandible and of the maxillae. The most widely accepted interpretations, given by Giesbrecht (1892) and Hansen (1893, 1925), were analysed by Gurney (1931), Lang (1946, 1948) and Von Vaupel Klein (1982).

Despite existing two general terminologies for the body tagmata (Fig. 1) and appendages (Fig. 2), most of the copepodologists have adopted the terms which they judge to be the most convenient, customary or practical, usually without any care for uniformity and homology.

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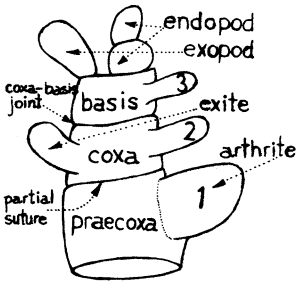

OBS. - The coxa-basis joint is identifiable because of its musculature, which is essentially similar to that of the maxilla and maxilliped (i.e. muscles proximal to the joint insert on the proximal rim of the basis). The pattern is less clear for the maxillules than for the maxillae & maxillipeds. The suture marking the praecoxa-coxa joint is only present posteriorly and has led to much of the confusion in the literature.

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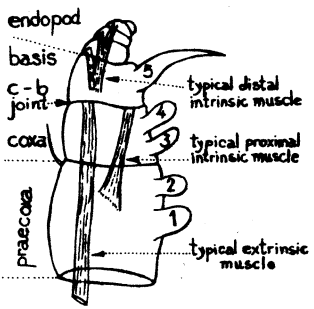

OBS. - Coxa-basis joint identifiable as a reference point within the limb because almost all extrinsic muscles serving the basis, and the proximal intrinsic muscles insert at this joint (i.e. on the proximal rim of the basis). Muscles to the endopod originate distal to this joint as in copepod swimming legs.

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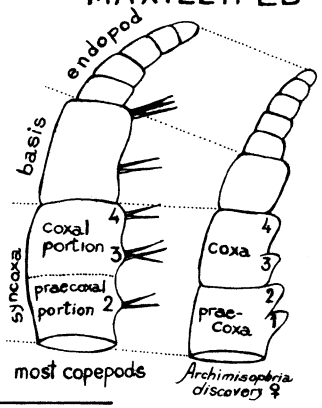

OBS. - The coxa-basis joint can again be identified by its musculature. All extrinsic muscles insert at this joint or proximal to it, as do all proximal intrinsic muscles. Muscles serving the endopod originate in the basis, as in copepod maxillae and swimming legs.

Note: nos 1-5 = endites 1-5

Fig. 3. Boxshall's interpretation of postmandibula limb structure based on evidence from the musculature.

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F. Campaner

CRUSTACEA-database and the plan for an EDP based bibliography of copepod literature. Report on the group discussion at the Second International Conference on Copepoda held in Ottawa on Thursday, August 16, 1984

This evening event attracted about 25 participants. After a short discussion there was general agreement to establish a database for the copepod literature published between 1864 and 1970. This limitation is due to two facts: in 1864 the first volume of the most important reference journal, the Zoological Record, was published; since 1970 the EDP based database BIOSIS is available and there is at the moment no chance of obtaining funds for also storing information published since then. All participants also agreed that preference should be given to the publication of bibliographies on taxonomic groups or general biological themes (e.g. ecology, anatomy, biogeography, nauplius etc.) over direct on-line search. Since this would not be accessible from all parts of the world more colleagues would profit from the availability of bibliographies.

The remaining 2/3 of the evening were spent on how to organize the database project and what contribution is needed from other copepodologists. During the first phase unselective data collection is planned using the Zoological Record, literature lists in monographs, personal literature lists as well as reprints sent to the *MONOCULUS*-Library. In selecting keywords emphasis will be given to taxonomic categories, i.e. all species and genus names mentioned in publications will be stored

as keywords. As to the general biological themes only a rough indexing will be done.

The second phase starts with the storage of taxonomic categories. This will allow us to compile for all higher taxonomic categories the literature stored in the CRUSTACEA-database so far. For this a more or less acceptable classification of the Copepoda is needed. It was decided to publish a provisional classification in *MONOCULUS* which then can be discussed in later issues of the newsletter. In cases where no consensus can be reached alternative classifications will be stored. Based on this classification bibliographies primarily on the family level will be printed. Specialists will then be invited to check these compilations against their own files and complete them where necessary. At the same time the keywords should be verified and there is a chance that funds will be available by then for those who agree to do the job. As this is the most important and difficult part of the project success depends on the willingness of most, if not all specialists in the different fields to cooperate and spend a little more time on literature than usual. There will be a double reward, however: everyone will be the principal author of the bibliography published in the series "Bibliographies from the CRUSTACEA-database" on the group or theme he has revised and he will be offered a certain number of free searches in the database every year.

J. Sieg / H.K. Schminke

The Third International Conference on Copepoda

The third conference will be held in London in 1987, from Monday 10th to Friday 14th of August, inclusive. We hope to be able to hold all the lectures in the British Museum (Natural History) at South Kensington, but if concurrent sessions are required we may have to use the lecture theatres of Imperial

College, University of London which are situated nearby. Accomodation for participants will be available in the student residence of Imperial College. The price for a single room including bed and breakfast, will be approximately £ 14.00 per night assuming price increases of about 6 % per annum. Participants will, of course, be able to make their own bookings at local hotels and a list of these, with current prices, will be circulated next year.

We will adopt a similar format for the meeting to the one used in Ottawa. There will be a mixture of symposia on selected themes and contributed sessions but we may also include a small number of invited review-style lectures on particular topics. We have some suggestions for titles of the symposia and review lectures but we would welcome additional suggestions. These should be sent to any member of the organizing committee, as listed below. The poster session at Ottawa was highly successful and we plan a poster session for London in 1987 as well.

Further announcements and programme details will appear in subsequent issues of *MONOCULUS*, so keep watching.

Members of the Organizing Committee:

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Request

R. Castro R. and H. Baeza K., Instituto de Investigaciones Oceanologicas, Universidad de Antofagasta, Casilla 1240, Antofagasta, Chile, are trying to work out the systematic relationships between pennellid genera using adults and premetamorphosis stages. They write: *As we are unable to obtain specimens of all the different pennellid genera ourselves we would like to ask fellow copepodologists who have samples of Pennellidae (adults and/or premetamorphosis stages) to kindly send us some material. We shall be very grateful for your cooperation.*

Business ssenisuB

1. Bibliography

In Ottawa we distributed a first draft of our *MONOCULUS*-Bibliography, a little booklet of 122 pages containing about 2,200 documents representing mainly the literature (reprints) received for the *MONOCULUS*-Library since 1981. We are at the moment hoping to succeed in raising funds in order to advance more rapidly with our plans to compile a computerized bibliography of all literature published on copepods. The next step will consist in storing the titles from the lists of publications delivered to us over the years. This time we have only two asterisks to bestow: Drzycimski, A.G. Lewis.

We need help from our Russian speaking and publishing colleagues. Lately we have received quite a few reprints of articles written completely in Russian without a summary in any other language. This brings us into trouble. Could you in the future in such cases please provide us at least with an English or French or German translation of the title? This would save us a lot of work. Thank you.

2. *MONOCULUS*-Library

This time we have received a lot of reprints and also a few copies of Ph.D. and Master's theses. We thank in particular A. Raibaut and his group and hope that others will follow their example. As a result our list of current literature further below is the second longest ever published in *MONOCULUS*. More and more copepodologists seem to have put the *MONOCULUS*-Library on their list for direct mailing. This is great! Our collection of the most recent literature thus tends to become more and more complete.

However, this is not so with the older literature. Many of you certainly still have reprints of older publications which you haven't sent to the *MONOCULUS*-Library yet. Please plunder your old stocks immediately and make yourself immortal by depositing these publications in the reference library of all copepodologists. We know that many Departments have reprint stocks of the works published by their staff. Usually there are still copies of older and very old publications which nobody seems to be interested in. Many are from deceased members of the staff in older times. Please help us to secure these treasures by having a chat very soon with your librarian who will be happy to free the shelves and get precious space available.

Recently some colleagues (e.g. Ito, Schriever) have started to send to the *MONOCULUS*-Library reprints of which they had extra copies. Many thanks for these valuable and surprising gifts! Normally one only needs one copy, in case you have a second one, please, send it to the *MONOCULUS*-Library before you throw it away.

3. *MONOCULUS*-Museum

No comment.

4. *MONOCULUS*-Glossary

See report on the group discussion on "Copepoda Terminology".

5. Current research activities

V.N. ANDRONOV from Kaliningrad, USSR:
Taxonomy of the near-bottom Calanoida, peculiarities of morphology. Phylogenetic relations between families of Calanoida.

D.L. BARKER from Georgetown, USA:
1) Long term monitoring of copepod populations in a tidal estuary, North Inlet, South Carolina, USA; long term population ecology vs. short term events (predation by fishes, storm events, etc.)
2) Recent interest in high altitude, Andean lake copepod fauna; Family Centropagidae, genus Boeckella.

K.-G. BARTHEL from Kiel, Fed. Rep. Germany:
Since spring 1983 I am involved in an investigation of the marginal ice zone ecosystem in the Fram Strait the goal of which is to elucidate the influence of the ice edge and the local currents on primary and secondary production. My part in this is the determination of the food uptake of several dominant Calanus species under changing conditions - mainly food availability - of the ecosystem. Furthermore the faecal pellet production was measured.

W. BECKMANN from Hamburg, Fed. Rep. Germany:
Environmental studies on the risk of a possible deep-sea mining project. Base-line studies on Red Sea zooplankton (Ph.D. Thesis). Method: multiple opening and closing net, mesh-size 300 µm. Evaluation: regional and seasonal variations of biomass (wet weight), vertical zooplankton distribution down to 1800 m, structure of the zooplankton community (main taxa; Calanoida in more detail), trophic structures.

S.S. BHATTACHARYA from Bombay, India:
Presently research work on the effects of salinity and temperature on the survival and breeding of Oithona similis Claus is in progress. Studies on the population dynamics and distribution of calanoid copepods in Bombay coastal waters are also being carried out.

G.W. BRAND from Queenscliff, Australia:
(i) Larval viability in Tisbe holothuriae. Anionic detergent strongly enhances viability in the laboratory. Studies by Fava et al. in Venice suggest that it does so by suppressing interactions, mediated by some metabolite, between crowded individuals. Work just completed provides direct evidence for such interaction (in preparation).
(ii) Genetic variation in natural populations of T. holothuriae (in collaboration with Dr. G. Arnott). Using a number of isofemale strains (established from single field-inseminated females), laboratory founder populations have been compared for adult productivity and sex ratio. Strain effects are observed for both characters (in preparation). Further work is needed to establish the basis for between-strain differences.
(iii) Effect of heavy metals on laboratory T. holothuriae populations. Tests to determine the impact of low Cd, Zn and Cu levels on adult productivity are about to commence.

J. CASTEL from Arcachon, France:
We are involved in two major projects supported by the CNRS and the CNEXO: (1) Characterization of lagoon ecosystems by means of the study of meiobenthic copepod assemblages: In spite of the fact that brackish waters are unstable environments, meiobenthic copepods have adapted remarkably well, notably in their tolerance to salinity variations. Thus biological gradients may depend more on morphological and hydrological factors than on salinity in itself. (2) Biology of the copepod Eurytemora hirundoides in the Gironde estuary: The aim of this project is to study the biological cycle and the demographic strategies of the species as a function of temperature, salinity and dissolved oxygen. We want to explain the spatial distribution of E. hirundoides in the estuary and to estimate its production.

R. CASTRO R. and H. BAEZA K. from Antofagasta, Chile:
We are actually doing a taxonomic study of the parasitic copepods on fishes of Antofagasta, having several papers in press: Metapeniculus antofagastensis. Gen. et sp. nov. (Copepoda:Pennellidae). Clavellotis n. gen. (Copepoda:

Lernaeopodidae) and redescription of Clavellotis dilatata (Krøyer, 1863). Lernanthropus antofagastensis sp. nov. (Copepoda:Lernanthropidae). Clavella simplex sp. nov. (Copepda:Lernaeopodidae). Premetamorphosis stages of two pennellids. Two new species and one new record of Clavella. In revision: Neobrachiella anisotremi new species. Some Neobrachiella species (including N. paralichthyos n. sp. a new record of other 3 species). At present we are describing: some Neobrachiella species parasitic on Sciaenids fishes. Parasitic copepods on Elasmobranch fishes. Parallelly we are interested in establishing the relationships between the pennellid genera, based on adults and premetamorphosis stages. To realize this work we need to detect or verify some morphological details that can permit us to establish these relationships.

A. CHANDRAN from Trivandrum, India:
Recently completed one project (Ph.D. work) - "Functional morphology of the digestive system in certain marine lernaeopodids (Copepoda:Siphonostomatoida) with notes on the nature of infestation of copepod parasites of fishes of the south-west coast of India". At present I am engaged in the preparation of papers for publication relating to my thesis.

B.C. COULL from Columbia, USA:
Experimental manipulation of fish feeding on meiofauna (particularly harpacticoid copepods) in various habitats to study effect of habitat, heterogeneity on prey survival. Analysis of 11-year continuous data set on meiofauna in general and copepod species in particular.

C.J. DECKER from Stony Brook, USA:
My Ph.D. research involves the feeding selectivity and mechanisms of selection of several species of harpacticoid copepods found in salt marsh sediments. I am also interested in the effects of pollutants on the distribution and abundance of harpacticoids.

B.L. DEXTER from Purchase, USA:

1. Baseline survey of plankton populations (phytoplankton, microzooplankton, copepods and other planktonic grazers) in lower Hudson River, N.Y. Samples for chlorophyll (size-fractionated) and nutrients are also taken along with profiles of temperature, salinity, light, and oxygen.
2. Baseline survey of plankton populations (phytoplankton, microzooplankton < 20 µm, zooplankton ≥ 20 µm) from Western Basin of Long Island sound, N.Y. Seasonal distribution and abundance patterns of dominant plankton species will be compared to plankton community of eastern Long Island sound.

A. DINET from Nieul sur Mer, France:
Life cycles and ecophysiology of meiofauna (with special reference to harpacticoid copepods) from salt marshes of the French Atlantic coast.

K. ELKMORK from Oslo, Norway:
Life cycle strategies of Cyclops scutifer Sars in various types of lakes in Norway and North America, including studies of seasonal cycle, diapause, and correlations to environmental factors. A taxonomic study is in progress on the taxonomic variation of Cyclops scutifer over the northern parts of the Eurasian and American continents. The analysis is based on comparisons of morphometric indices.

A. FLEMINGER from La Jolla, USA:

1. Studying sex-linked dimorphism common to calanoid copepods and the implications regarding sex determination in the family.
2. Reviewing the genus Calanoides; reexamining calanid genera and their phylogenetic relationships.
3. Analysing character divergence, biogeography and speciation patterns in near-shore pontellid copepods of the Americas and the Indo-West Pacific.

S. GAVIRA from Vienna, Austria:
I am developing a research project on copepods of the Columbian Cordillera "Los Andes", as a "Dissertation-Arbeit" to obtain

the degree Ph.D. in Zoology at the University of Vienna. The project is being directed by Professor Dr. Heinz Löffler of the above-mentioned university.

I.M. GEE from Plymouth, England:

1) I am the copepodologist in a team working on various aspects of benthic community structure and functioning. Most of the work so far has been done in estuaries but we are now extending this to the continental shelf, shelf edge and deep ocean.
2) Taxonomic studies on Antarctic harpacticoids.

M.I. GRYGIER from Copenhagen, Denmark:

I compile morphological, anatomical, and developmental information on Copepoda from literature sources in order to compare these with the Ascothoracida. I hope to determine the bounds of the Maxillopoda in this way, and the interrelations of the included taxa. I do not anticipate working in any major way myself with copepods for the next year (more work on ascothoracids and cirriped larvae to do). I have also been interested in the taxonomy of the family Lamippidae, parasites of octocorals.

L. GUIDI from Banyuls-sur-Mer, France:

As can be seen from the title of the article published in 1983, I was not working on copepods before. This article is from my "Thèse de 3e cycle" in which I studied the nutrition of the amphipod Siphonoecetes dellavallei. However, this type of work can easily be carried out on benthic copepods. In 1982 I started working on harpacticoid nutrition (there will be a paper coming out at the end of this year). Now, I'm studying harpacticoid populations and their potential foods, on a transect from coast (river outlet) to the bottom of the continental slope, through a marine canyon. This work is part of a Mediterranean pluridisciplinary program (ECOMARGE) that aims to evaluate the importance of advective and vertical transfers in the regulation of benthic populations.

K. IZAWA from Edobashi, Japan:
I am completing my study on the ontogeny and phylogenetic features found during the developmental stages of the poecilostome Cyclopoida.

A. KAWAMURA from Hakodate, Japan:
Spatial distribution of zooplankton, especially the surface swarms/aggregations of copepods and euphausiids, their marine ecological aspects. The food habits of micronektonic fishes is also studied from the view point of copepod consumer. Spatial distribution of phytoplankton is also studied in relation to an environmental factor of local aggregations of zooplankton. (Zooplankton patchiness as found in the analysis of baleen whale stomachs and consecutive plankton net tows) was postered at the Intern. Marine Plankton Symp. Shimizu, 1984.

M.H. LEWIS from Auckland, New Zealand:
I am currently preparing a monograph on the freshwater Harpacticoida of New Zealand for the Fauna of New Zealand series. I hope to soon start work on a collection of small cyclopoids from damp stream and terrestrial moss in New Zealand.

A. MAMARIL from Quezon City, Philippines:
Population dynamics of Diaptomus mississippiensis in warmwater channel catfish ponds in the Mississippi delta; interactions with other zooplankters.

G.L. PESCE from L'Aquila, Italy:
1. Numerical taxonomy in harpacticoid species of the genus Nitocrella (Ameiridae)
2. Cyclopid copepods from groundwater of Italy
3. Taxonomical review of the species of the cyclopid genus Diacyclops (Cyclopinae).

W. PIASECKI from Szczecin, Poland:
I am a newly hatched copepodologist. My investigation concerns copepods parasitic on fishes. I work towards the doctor degree

in Institute of Ichtiology of University/Academy of Agriculture in Szczecin, Poland.

S.A. PIONTKOVSKII from Sevastopol, USSR:

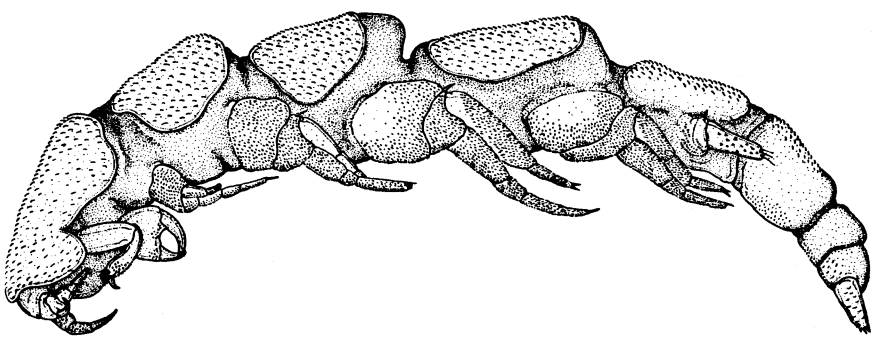
1. The mechanisms of distribution of copepods on microscales (10-100 m). Connections between locomotor activity of species and spatial heterogeneity (including estimations of turbulent diffusivity, advection of waters, internal waves).
2. The mechanisms of distribution of copepods on mezoscales (10 - 100 km). Connections between productivity of species and their spatial heterogeneity (including estimations of turbulent diffusivity, advection of waters, internal waves).
3. The estimations of spatial heterogeneity of copepods on various space levels (0.01-0.1-1-10-100 km).
4. (Hobby). Time structure of locomotor activity during feeding, reproductive, escaping behaviour of carnivorous and herbivorous copepods.

C. RAZOULS and S. RAZOULS from Banyuls-sur-Mer, France:
C. RAZOULS: Mise à jour (compléments et corrections) des fiches de références concernant la morphologie des Copépodes planctoniques marins. Analyse qualitative des populations de Copépodes de l'Antarctique.
S. RAZOULS: Structure dimensionnelle des populations de Copépodes de l'écosystème antarctique. Analyse particulière des populations de Drepanopus pectinatus des iles australes françaises (cycle de vie, dimensions corporels). Ce travail devrait être prolongé dans les années à venir par une étude de la biologie de la croissance et de la réproduction.

J.W. REID from Washington, USA:
I am continuing work on several problems regarding the taxonomy of free-living neotropical Copepoda. I am also collaborating with colleagues at the Universidade Federal de São Carlos, São Paulo, Brazil, on planktonic and benthic copepod populations of several Brazilian coastal lake systems.

W.G. SPRULES from Mississauga, Canada:
Projects in my laboratory:

1. Predatory behaviour of Epischura lacustris, Limnocalanus macrurus, and Senecella calanoides. (C. Kim Wong)
2. Field measurement of algal grazing rates as a function of body size for species of Diaptomus typical of Ontario lakes. (Pat Chow-Fraser)
3. Behavioural interactions among cyclopoid and calanoid copepods typical of Ontario lakes. (Charles Ramcharan)
4. Effects of acid precipitation on ecological interactions amongst zooplankton species of central Ontario lakes. (Joy Bowerman)
5. Effects of Mysis relicta predation on structure of zooplankton communities in lakes of glaciated Canada. (Woody Nero)
6. Size distributions of zooplankton communities in inland lakes and the Great Lakes of Canada. (Gary Sprules)



From a Christmas card received from G. Deets, Long Beach, U.S.A.: Eudactylina sp.nov. from gills of a ray (Mobula, species name illegible) in the Sea of Cortez.

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In order to complete and to correct his repertory C. Razouls is always interested in receiving morphological data of planktonic copepods (marine or brackish) from any area.

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