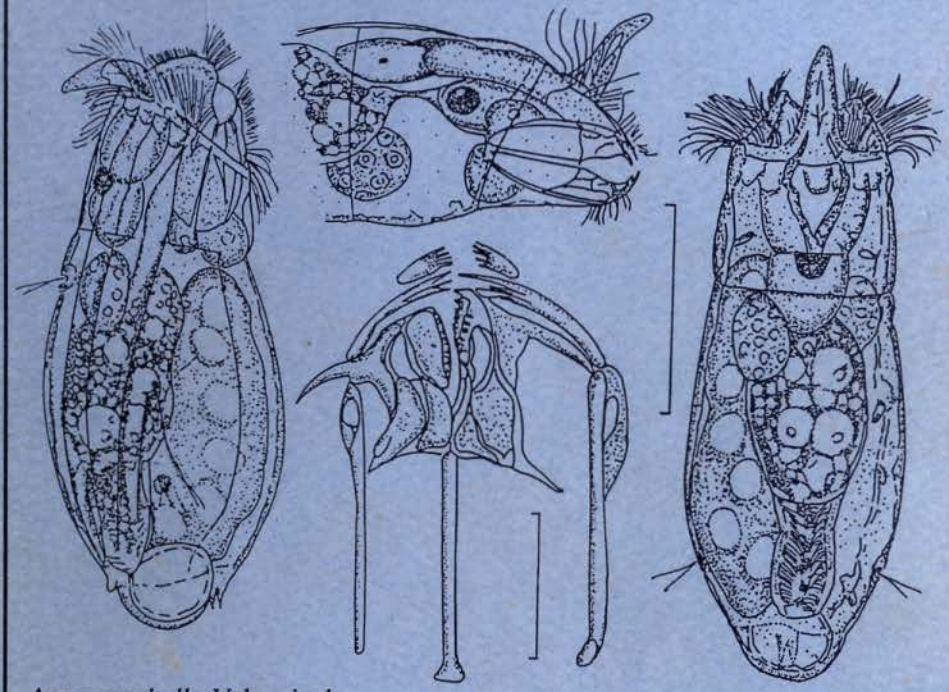
# ROTIFER NEWS

A newsletter for rotiferologists throughout the world



*Ascomorphella Volvocicola*

**ISSUE # 20**

**NOT THE LAST ISSUE!**

**PRODUCED AT** The Murray-Darling Freshwater Research Centre

## ROTIFER NEWS

In keeping with editorial policy of previous issues, this *Rotifer News* is an informal publication available to all workers interested in the Rotifera. It is not a scientific publication and should not be so cited. Items of interest, details of ongoing work, requests for specimens/material, publications lists, abstracts etc. for inclusion in *Rotifer News* should be sent to any of the editors below:


**Production Editor:**

Russ Shiel, Murray-Darling Freshwater Research Centre, P.O. Box 921, Albury, NSW 2640, Australia. Ph. [OTC Code]-61-60-431002, FAX -61-60-431-626.

**Regional Editors**

*Australia & Asia*

Russ Shiel, address above.

*Europe, central*

Jenny Schmid-Araya, Biologische Station Lunz, Seehof 4 A-3293 Lunz Am See, Austria. Ph: 7486-330

*Europe, eastern*

Jolanta Ejsmont-Karabin, Inst. Ecology, Ul. Lesna 13, 11730 Mikolajki, Poland. Ph: 16051

*Europe, western & U.K.*

Linda May, Inst. Freshwater Ecology, Inst. Terr. Ecol., Bush Estate, Penicuik, Midlothian EH26 OQB, Scotland. Ph: 031-4454343, FAX: 031-4453943

*OR*

Ros Pontin, 26 Hermitage Woods Cres., St Johns, Woking GU21 1UE U.K. Ph: 04867-81564

*North America*

Bob Wallace, Dept Biology, Ripon College, 300 Seward St., Ripon WI 54971-0248 USA. Ph: 414-7488122, FAX: 414-7487306

*Scandinavia*

Peter Andersen, Zoologisk Museum, 2. Dep., Universitetsparken 15, DK-2100 Copenhagen, Denmark. Ph: 313-54111-262 FAX: 0045-313 -98155


**Regional editors for the Asian Pacific, South America and South Africa are sought. If you could be a central contact for any of these regions, contact Russ Shiel.**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## Prof. Dr Agnes Ruttner Kolisko 14/07/1911–22/11/1991
## A lifetime devoted to the study of rotifers

[ED: *A summary of the life's work of this dedicated researcher was planned to celebrate her 80th year. Jenny Schmid-Araya provided a brief biography and list of publications in August of 1991. However, Rotifer News was delayed, and I was saddened to receive a fax from Jenny late in November advising that Agnes had died while on holiday in Kenya. She was known and respected by the global family of rotifer workers, many of whom learned their 'trade' from her.*]

Agnes Ruttner-Kolisko was born in Gmunden, Upper Austria on the 14 July 1911; her father was a well-known lawyer and her mother belonged to a distinguished family. At the Vienna University, Agnes Kolisko studied Biology and Zoology, and during this career, she did two summer courses on Limnology (Gewässerkunde) at the Biological Station of Lunz, under the teaching of Prof. Dr. F. Ruttner, V. Brehm and O. Storch. At this time it seems that it became clear for her that she wanted to continue to observe and study freshwater organisms in their own biotopes.

In 1936, she finished her doctoral thesis with the title: "Beiträge zur Erforschung der Lebensgeschichte der Rädertiere auf Grund von Individualzuchten", under the supervision of Prof. Dr. W. Marinelli. At the end of the Biology study in 1937, as a security, she took a teacher examination, because at that time a scientific career for a woman seemed nearly impossible.

During the World War II, she had the chance to work as a scientific assistant at the Biological Station Lunz, led at that time by the famous limnologist Prof. Dr. F. Ruttner. During this period of time, she met Dr. W. A. Ruttner, geologist and son of Prof. Dr. F. Ruttner. They married in 1938 and had five children; at present they have 8 grandchildren. For a certain time, her life was shared between profession and the rearing up of children, but with some extra help she managed to continue her research in various fields of Limnology. After the war, she was employed some years by the Vienna Water Authorities, and became docent at the Vienna University. Meanwhile, she was again at the Biological Station Lunz and between the 50s and 60s, she was awarded the Ohio-Sate Fellowship by the International Association of University Women to study sand biotopes in Erken See (Sweden) and Torneträsk in Swedish Lapland (1952/53). She made interesting and new contributions

to the Psammon Ecology with this research. Between 1963/64 she was awarded the Winifred Cullis Grant by the International Association of University Women, to investigate spring and pools of the East Persian Salt Desert. In 1969, The British Council Fellowship was given to her to study the population dynamics of rotifers in the lakes of the English Lake District.

During the years 1972 to 1976, she was the head of the Biological Station of Lunz, until her retirement, since then she is collaborator of the "Forum österreichischer Wissenschaftlicher für Umwelt-Schutz", and also an adviser to the Green Party of Lower Austria. Agnes Ruttner-Kolisko has made inmense contributions in the study of rotifers, a field in which she also described new species such as *Notholca lapponica* and *Synchaeta calva*. Her special field of rotifer life histories to which she was dedicated for a number of years, were due to her successful cultures maintained for many generations in laboratory conditions. Her extensive reference list reveal her dedication to work, and at the same time many of us will agree that she stands as an example of clearness and serenity in her scientific thoughts.

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*Editorial*

## Continuation of *Rotifer News*

After ten years, the longest serving editor, Bob Wallace, implemented his long-threatened resignation at the VIth Rotifer Symposium, Banyoles. A group at the meeting indicated a willingness to help keep *Rotifer News* afloat as a means of communication. These volunteers are listed inside the front cover of this issue.

24 attendees at the Banyoles meeting contributed 1-3 years 'subscriptions' to assist in production of Issue #20, and after some hiccups, back and forth international faxes or lack of response thereto, here it is! Bob is a hard act to follow, however with interest from the global 'rotiferology' community we hope that the interaction and exchange of information initiated by John Gilbert in the first issue (1973) can be continued.

This issue of *Rotifer News* was assembled by Russ Shiel at the Murray-Darling Freshwater Research Centre. It is based on contributions from the regional editors, with extracts from the book of abstracts and attendance list at the Banyoles meeting, and on a literature search by CSIRO Search Party, Melbourne. The format change has been necessary in view of the increased mailing costs incurred by the change of hemisphere. We hope to keep costs as low as possible by each regional editor handling part of the distribution.

Finally, included with this issue is a brief questionnaire seeking your input for contributions, comments, etc. towards continuing the newsletter. This issue was made possible only by the optimism of the trusting 24 at Banyoles who handed over their scarce pesetas, £ , DM and $. For the rest of you, if your currency is convertible and you can afford the $US5 annual 'subscription', please send one or more years' equivalent to the MDFRC (address inside front cover) [payable *to Rotifer News* a/c 2645-17788 at the Commonwealth Bank, North Albury, NSW 2640 Australia] or to your regional editor in order to save exchange costs. We can organize subscription payments by credit card if there is enough interest - this would be another means of saving expensive bank cheque fees. **Please note on your questionnaire whether you would wish to 'donate' your Rotifer News subscription in future by credit card, and which card you would prefer to use.** RJS will advise by next issue.



*News, Notes and Requests*

1. The outgoing editor suggested in Issue #20 to "hold all new contributions..." so everyone seems to be doing so - only the regional editors are aware of the changes, so news items below have come from them.....*Rotifer News* is alive and well, despite its initial jet lag, so send your contributions in. All correspondence will be answered!

2. Other items received from regional editors before December 1991 have been included. Some publications abstracted by CSIRO Search Party for 1990-91 will be included in Issue #21, *but let the regional editors know of your publications, just in case we have missed some.*

3. A biography of our 'elder statesman' Herr Dr Walter Koste, of Quakenbruck, Germany, was received from Ruth Laxhuber via Ros Pontin after the Banyoles meeting. We have held Dr Koste's biography over until the next issue, in order for his complete bibliography to be included. He will therefore feature in Issue #21, to commemorate his 80th birthday (19th July, 1992).

4. Several comments at Banyoles, also from regional editors, requesting a list of attendees at the VIth meeting or an updated mailing list. Jolanta Ejsmont-Karabin suggested an update on scientific interests, which is covered by the questionnaire in this issue. Until we get responses to the questionnaire, the mailing list inherited from Bob Wallace has been expanded by including the new attendees at Banyoles. There are now >275 people listed. To make our task easier, **please let one of the regional editors know that you do indeed wish to receive *Rotifer News*, that your address is correct, or any alterations that you wish to make.** If there is anyone else who you think would like to hear about us and our activities, pass on our addresses on the front cover, or send their details to one of the editors. We will consider deleting names from the mailing list only after all responses to the questionnaire are in, so we will need help from readers to let us know who may have changed country, research interests, and so on.

6. Another useful suggestion from Jolanta was a 'Report on Rotiferology' from various countries. Perhaps the regional editors can select a 'volunteer'(?) to report on research on rotifers in their countries. RJS probably has the easiest task because there is so little research on rotifers in Australia, so, in brief:

## Rotiferology in Australasia

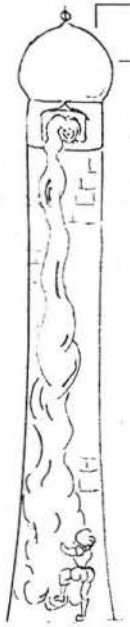
Early studies began in the 1890's, by visiting naturalists, and Hudson & Gosse's publications included some Australian/New Zealand rotifers. Anderson & Shephard described several endemic taxa in 1892, but these were later synonymised with northern hemisphere species in the quest for cosmopolitanism, and only recently have been resurrected. The N.Z. fauna was better known as a result of the efforts of Russell (monogononts) from 1944-61 and Haigh (bdelloids) in the 1960's. Walker in the early 1970's provided the first local study of rotifers in a saline lake ecosystem. He sought the help of Agnes Ruttner-Kolisko, which was freely given. When a PhD student (Shiel) also sought her help in 1976, she directed him to Walter Koste for the taxonomic component. The Koste/Shiel collaboration has continued, with 25 published papers, largely on taxonomy of Australian rotifers. Walter Koste was supported by MDFRC to visit Australia and the Research Centre in Sept.-Oct. 1990 to see first-hand the source of so much work for him!

Other visitors include Jim Green (London), who collected from Australian crater lakes and published on the rotifers in 1981; Jordi De Manuel, who spent 2 months at MDFRC in 1990 studying the rotifers of floating *Azolla/Ricciocarpus*

mats; La-Orsri Sanoamuang, who stopped at MDFRC after the Banyoles meeting to compare notes on SEM morphology of *Filinia* trophi, and Ros and John Pontin, who came for 2 months in Oct.-Nov. 1991. Ros examined rotifer communities in temporary floodplain habitats. The fleeting visits of Minoru Sudzuki have not been documented, but are sure to have been frequent and fast.....this subject will be explored in another issue!

Otherwise, very little rotifer research may be found in this vast country. Fish hatcheries may be interested in rotifers as food items, but the diversity of research seen in the northern hemisphere is lacking. Population centres and research institutions generally are coastal, with marine research much better funded than freshwater. Major rivers and floodplains are inland, there are no large natural lakes, and distances are huge - the Murray-Darling Basin, for example, exceeds 1 million $km^{-2}$. Rotifers, in a country of kangaroos, koalas and wombats, are not warm and cuddly, and are generally unknown. They certainly are there, but who they are and what they do is known only superficially, largely through the efforts of Walter Koste.

7. Received by fax from Ros Pontin - apologies for the loss of quality in photocopying a fax.....



## *Collotheca coronetta* - a rotifer Rapunzel

If your childhood included the fairy tales of the Brothers Grimm, you may remember Rapunzel, who was imprisoned by her father at the top of a high tower to keep her safe from the local men. However, Rapunzel had very long hair. Whenever her lover wanted to visit her, unknown to her Papa, he came to the foot of the high tower and called, "Rapunzel, Rapunzel, let down your hair", and, leaning from her window, she let down the waves of silken tresses to the ground for him to climb up.

This highly unlikely story came to mind when I first met *Collotheca coronetta* (Cubitt), a rotifer Rapunzel if ever there was one. Many years ago, I was given a sample of water containing some of these beautiful creatures and watched them with delight. They came from a pond I know to be shallow, muddy and favoured by cattle and ponies, yet there they lived, in their gelatinous towers, letting down their "tresses", not for their lovers, but for their dinner.

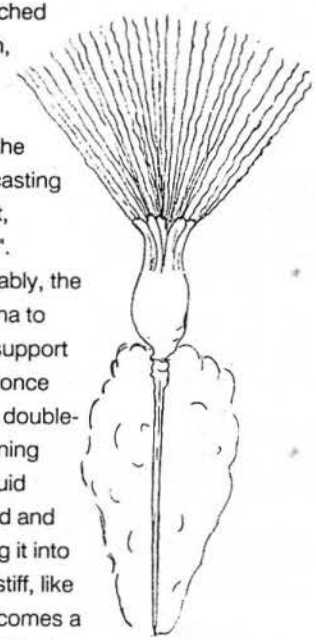
The mystery is, how do these ladies do it? How could Rapunzel have managed to get all that hair through the window of the tower? And back again? And more to our purpose, how does *C. coronetta* get her long coronal cilia extended and held out?

Unlike Rapunzel's hair, these cilia are always described as stiff and rigid - in German, "starr". And when the corona is extended, they are indeed held stiffly out in all directions and are so shown in many figures in the literature (see e.g. Koste[1]). Any tiny organisms which, all unknowing, swim within their range, are



caught in their trap as they incline inwards towards each other. What a fate! There is no way out except into the coronal funnal and down to the mouth and jaws. Clearly the cilia must be stiffly held to act as an efficient trapping device and to prevent the victim's untimely escape.

If the dish non which she sits is tapped, *C. coronetta* folds the cilia like an inside-out umbella and slides them into her body by means of longitudinal muscle fibres attached inside her corona. Yet, when the lady expands again, the cilia appear first like a bunch of hairs on the extending coronal lobes, not stiff and straight, but flexible and rippled, or bent and whip-like. Then, as the corona opens, they are thrown around it as though casting a fine fishing net. As Hudson and Gosse[2] describe it, the cilia "fall round it on all sides in a graceful shower".



How does this extension take place? Presumably, the longitudinal coronal muscles relax, allowing the corona to extend, and it seems that hydrostatic pressure may support the coronal lobes and perhaps act to stiffen the cilia, once they are fully extended. Hudson & Gosse[2] write of a double-layered cuticle with cavities and channels in it, containing fluid. They explain "It is doubtless by means of this fluid that the lobes of the furled corona are pushed forward and expanded, the transverse muscles of the trunk forcing it into definite channels, which are thus rendered tight and stiff, like the ribs of an umbrella." Somehow, rippling "hair" becomes a cage for trapping dinner. Truly, a grim(m) fairy story! (Bad English joke!)

Can you, gentle reader, write the next instalment? Have you watched *C. coronetta* or her cousins, those "animated flowers" as Hudson & Gosse call them? I am indebted to my good friend Eric Hollowday, who has searched some of the literature for me, but neither of us can find much that is of use. Perhaps you know of literature which explains all? Or have you your own ideas? If you have a contribution to make, please send it to *Rotifer News*. And I shall look forward to solving the problem and thus "living happily ever after"!

1. Koste, W. 1978. *Rotatoria. Die Rädertiere Mitteleuropas.*
2. Hudson, C.T. & P.H. Gosse, 1889. The Rotifera or Wheel-animalcules.

## ROTIFER NEWS MAILING LIST: BY COUNTRY

**ARGENTINA**
David Kuczynski
Universidad de Moron
Fac. Ciencias Exactas y Naturales
Cabildo 134 MORON (1708)

Clara Constanza Martinez
CECOAL (CONICET)
Casilla de Correo 291
3400 Corrientes

Beatriz E. Modenutti
Departamento de Ecologia
Centro Regional Univ. Bariloche
Casilla de Correo 1336
8400 Bariloche

J.C. & S. B. J. de Paggi
Inst. Nac. de Limnologia
CONICET, Jose Macia 1933/43
3016 Santo Tome (Santa Fe)

**AUSTRALIA**
Tsuyoshi Kobayashi
Scientific Services, Waterboard
PO Box 73, West Ryde, NSW 2114

Lilian K. Matveeva
CSIRO Div. Water Resources
PMB 3 Griffith NSW 2680

I. Joan Powling
8 Rockbeare Gve
Ivanhoe, Vic. 3079

Russell Shiel
Murray-Darling Freshwater Research Centre
P.O. Box 921 Albury N.S.W. 2640

**AUSTRIA**
Hartmut Arndt
Inst. Limnologie
Österreichische Akad. Wissenschaften
Gaisberg 116 A 5310 Mondsee

Alois Herzig
Biologische Station Neusiedlersee
A-7142 Illmitz

Ernst Goethegasse Mikschi
4 A-2380 Perchtoldsdorf

Peter Schaber
Abt. Limnol. Inst. Zool.
Technikerstrasse
13 A-6020 Innsbrück

Jenny M. Schmid-Araya
Biologische St. Lunz
Seehof 4 A-3293 Lunz am See

Wolfgang Zoufal
Schweglerstrasse
4214 A-1150
Wien

**BANGLADESH**
M. Ahsam Bin Habib
Department of Fisheries
Biology and Limnology
Bangladesh Agricultural University
Mymensingh 2201

**BELGIUM**
Geert Kerrebroek Bogaert
83 B-9850
Nevele

Peter Coutteau
Artemia Reference Center
Rozier 44
B-9000 Gent

Henri Dumont
Inst. Ecology, State Univ. Gent
Ledeganckstraat 35
B-9000 Gent

Colin Janssen
Lab. Biol. Res. Aquatic Pollution
State Univ. Gent, J. Plateaustraat 22
B-9000 Gent

Veerle Van Meerhaeghe
Ecology, R.U.G., Ledeganckstr. 35
B-9000 Gent

Veerle Peeters
Ecology, R.U.G., Ledeganckstr. 35
B-9000 Gent

Margaretha De Ridder
V. Van Malderlaan 37/3
B-1710 Dilbeek

Kennedy Roche
Inst. Zoology, R.U.G.
K. L. Ledeganckstraat 35
B-9000 Gent

Hendrik Segers
Lab. Ecol. Dieren R.U.G.
K.L. Ledegankstraat 35
B-9000 Gent



W.H. De Smet
Lab. voor Plant en Dierkundige
Alg. Biol., Universiteit Antwerpen
Groenenborgerlaan 171
2020 Antwerpen

Patrick Sorgeloos
State University of Ghent
Lab. Aquacult. & Artemia Ref. Center
Rozier 44 B-9000 Ghent

**BRAZIL**
Sigrid Naumann-Leitao
Universidade Federal de Pernambuco
Cent. Tecnol., Dept Oceanog.
Campus Univ. - Cidade Universitaria
50739 - Recife - PE

**CANADA**
George Barron
Dept. Environmental Biology
University of Guelph
Guelph., Ontario NIG 2WI

Lois Bateman
Department of Biology
Sir Wilfred Grenell College
Memorial University of Newfoundland
Corner Brook Newfoundland A2H 6P9

Nancy Butler
Department of Zoology
University of British Columbia
Vancouver British Columbia

Rama Chengalath
National Museum of Natural Sciences
Nat. Mus. of Canada
P. O. Box 3443 Station 'D'
Ottawa, Ontario KIP 6P4

Hildegard Enesco
Department of Biology
Concordia University
1455 de Maisonneuve Boulevard West
Montreal Quebec H3G 1M8

C. H. Fernando
Department of Biology
University of Waterloo
Waterloo, Ontario N2L 3G1

Industrial Research Ass. Prog
Malaspina College
900 Fifth Street
Nanaimo. B. C. V9R 5S5

Hugh MacIsaac
Zoology Department
Erindale College
University of Toronto
Mississauga Ont. L5L IC6

Edward Maly
Department of Biology
Concordia University
1455 De Maisonneuve Blvd. West
Montreal Quebec H3G 1M8

Thomas Nogrady
Department of Biology
Queen's University
Kingston Ontario K7L 3N6

Carole Verdone-Smith
Biology Department
Concordia University
1455 de Maisonneuve Blvd.
Montreal Quebec H3G 1M8

**CZECHOSLOVAKIA**
Vladimir Sladecek
Trojanova 13
120 00 Prague 2

**DENMARK**
Peter Funch Andersen
Zoologisk Museum 2 Dep.
Universitetsparken 15
DK 2100 Copenhagen

**EQUADOR**
Maria Moscoso
Instituto Nacional de Pesca
Letamendi 102 y la Ria Casilla
P. O. Box 5918
Guayquil

**ESTONIA**
Juta Haberman
Rannu 202454
Limnological Station
Academy of Sciences of Estonia SSR

Taavi Virro
Department of Hydrobiology
Institute of Zoology & Botany
21 Vanemuise Street
202400 Tartu

**FRANCE**
Christine Charoy
LTCC, bâtiment 401-C
Univ. Lyon 1
69622-Villeurbanne Cx

Pierre Clement
Equipe Neuro-Ethologie Univ.
Lyon 1 43 Boulevard du 11 nov. F-69622
Villeurbanne Cedex

A. J. Francez
INRA Stat. Agronomie
12 Avenue du Brezet
F-63039 Clermont Ferrand

Francois-Joel Gatesoupe
INRA IFREMER
Centre de Brest
B.P. 70 - 29263
Plouzane

B. Menu
GIE-RA Stn, Ifremer de Palavas
Chemin de Maguelone
34250 Palavas les Flots

Patrick Mimouni
LTCC, batiment 401-C
Universite Lyon 1
69622-Villeurbanne Cx

Roger Pourriot
E. N. S. Laboratoire de Zoologie
46 rue d'Ulm
75230 Paris Cedex 05

Jean-Claude Rostan
Universite Lyon 1
Laboratoire de Biologie Animal et Ecologie
43 Boulevard du 11 Novembre
69622 Villeurbanne Cedex

**GERMANY**
Hans Buchner
Zoologisches Institute der Universität
Luisenstrasse 14
D 8000 München 19

Gregor Fussmann
Inst. Allg. Zoologie
Königin Luise-str. 1-3
D-1000 Berlin 33

Angelika Hirschfelder
Sandbachstr. 5
D-4500 Osnabrück

Wolfgang Hofmann
Max-Planck-Institut fur Limnologie
Abteilung Mikrobenökologie
P.O. 165, 2320 Plön

Andreas Hoppe
Hauptstrasse 78
6901 Gaiberg

Walter Kleinow
Zoologisches Institut der Universität
Lehrstuhl Tierphysiologie
Weywertal 119 D-5000 Köln 41

Walter Koste
Ludwig-Brill-Strasse 5
D-4570 Quakenbrück

Jurgen Kuhn
Krugstrasse 21
D-3400 Göttingen

Ruth Laxhuber
Romerstrasse 15
D-8000 München 40

Christine Leutbecher
Steimelager Weg 24
D-4570 Quakenbrück

Birger Neuhaus
Lichtenwalderstrasse 19
D-3400 Göttingen

Hans-Rainer Pauli
Limnologisches Inst.
D-7750 Konstanz

Ulrike Peters
Glückstr. 30
D-4500 Osnabrück

Diethelm Ronneberger
Inst. Mikrobiol. exp. Therapie
Abt. exp. Limnologie
D-1431 Neuglobsow

Karl Otto Rothhaupt
Inst. fur Seenforschung
Unteres Seestrasse 81
D-7994 Langenargen

Andreas Schrimpf
c/o Wasserwirtschschaftsamd Rosenheim
Koenigst. 19
D-8200 Rosenheim

S.C.R. Schubert
Martin-Luther-Univ.-Halle-Wittenberg
Biowissenschaften Geobotanik
Neuwerk 21-Postfach
Halle (Saale) 0-4010

Ludwig Tiefenbacher
Zoologische Staatssammlung
Maria-Ward Strasse 1B
D-8000 München 19



Norbert Walz
Inst. fur Gewässerökol.
und Binnenfisherei
Muggelseedamm 260
O-1162 Berlin

**GREECE**
M.H. Zarfdjian
Aristotelian University of Thessaloniki
Department of Zoology
Box 134
GR-54006 Thessaloniki

**INDIA**
Sukanta Banik
Dep. Life Sciences
Tripura University
Agartala-799004 Tripura (West)

S. C. Bhardwaj
Department of Zoology
Dyal Singh College
Karnal-132001 Haryana

Nandini Iyer
C/ Prof. T.R. Rao
Dept Zoology, Univ. Delhi
Delhi-110007

Francy Kakkassery
Dept of Zoology
Christ College
Irinjalakuda-680 121
Kerala

T. Ramakrishna Rao
Dept. Zoology
Univ. of Delhi
Delhi 110 007

S. S. Sarma
School of Biological Sciences
Madurai Kamaraj University
Madurai - 625 021
Tamil Nadu State

B. K. Sharma
Department of Zoology
North-Eastern Hill University
Shillong-793014 (Meghalaya)

R. N. Singhal
Department of Zoology
Kurukshetra University
Kurukshetra - 132119

Hem Sagar Vasisht
Department of Zoology
Panjab University
Chandigarh-160014

**INDONESIA**
Inneke Rumengan
Fac. Fisheries, Sam Ratulangi Univ.,
Kampus Unsrat, Manado 95115

**ISRAEL**
Bill Kaven
Israel Oceanographic & Limnological
National Center & Mariculture
P.O. Box 1212
Elat 88112

Library
Department of Zoology
The Hebrew University
Jerusalem

Esther Lubzens
Israel Oceanographic& Limnological
Research
Tel-Shikmona
P. O. Box 8030 IL-Haifa 31080

**ITALY**
Guido Badino
Instituto di Zoologia Generale
Della Universita di Torino
Via Academia Albertina 17
10123 Torino

Fabio Barbato
Via Monti di Creta
47 1-00167 Roma

Enrico Bellelli
Dip. Biol. Anim.
Univ. La Sapienza
Roma

Maria Irene Bianchi
Via Appiani
24 1-20121
Milano

Anna Maria Bolzern
Dip. Biologia Sez. Zoologia
SN 1-Via Celoria 26
Milano

Gianna Braioni
Dip. Biol. Animale
Padova

Fausta Carnemolla
Dip. Biol. Anim.
Via Accad. Albertina 17
I-10123 Torino

Bruno Dore
Dip Biol. Anim.
Via Accademia Albertina 17
I-10123 Torino

Alessandra Farabegoli
Instituto di Zoologia
Ferrara Via Borsari
46 Ferrara

Oruella Ferrara
Universita di Roma
Istituto di Zoologia
Federico Raffaele
via dell'Universita 32
Roma

Ireneo Ferrari
Istituto di Zoologia
Via Borsari 1-44100
Ferrara

Mauro Mariani
Acquario Civico e
Stazione Idrobiologica
V. le Gadio 2-20121 Milano

Rita Mauti
Acquario Civico e
Stazione Idrobiologica
V. le Gadio 2 I-20121
Milano

Giulio Melone
Dip. Biol. Un Milano
Via Celoria 26 I-20121
Milano

Manuela Pagani
Dip Biologia
Universita di Milano Via Celoria
26 I-20133
Milano

Cristina Perego
Acquario Civico e
Stazione Idrobiologica
V. le Gadio 2 I-20121
Milano

Claudia Ricci
Dip. Biol. Anim.
Univ.Torino
Via Academia Albertina 17
10123 Torino

Carlo Robotti
Dipartimento di Biologia Animale
University di Turin
Via Academia Albertina 17
10123 Turin

Cristina Sotgia
Dip. Biol., Univ. Milano
Via Celoria 26
20133 Milano

Camillo Vellano
Dip. Biol. Animale
Via Accademia Albertina
17 I-10123
Torino

**JAPAN**
Akinori Hino
Department of Fisheries
Faculty of Agriculture
The University of Tokyo
Yayoi 1-1-1 Bunkyo-Ku
Tokyo 113

Hachiro Hirata
Faculty of Fisheries
Kagoshima University
Kagoshima 890

Kazutsugu Hirayama
Faculty of Fisheries
Nagasaki University
1-14 Bunkyo-machi
Nagasaki-shi 852

Minoru Sudzuki
Biology Laboratory
Nihon Daigaku - University
Higashi-Arai 557
Omiya-shi J-Saitama-ken 330

Masamichi Yamamoto
Ushimado Marine Laboratory
Okayama University
Ushimado
Okayama 701-43

**KUWAIT**
Charles M. James
Kuwait Institute for Scientific Research
Mariculture and Fisheries Department
P. O. Box 1638, 2017 Salmiya

**MEXICO**
Marcelo Silva Briano
Universidad Autonoma de Aguascalientes
Centro Basico
Aguascalientes Ags.



Roberto Rico-Martinez
Universidad de Guadalajara
Instituto de Limnologia
Aparado Postal 310
45900 Chapala Jalisco

**NETHERLANDS**
Ramesh D. Gulati
Limnological Institute
Koninklijke Rijksstraatweg 6
NL 3631 AC Nieuwersluis

Library
Limnologisch Instituut
Vijverhof Laboratorium
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3631 AC Nieuwersluis

B. Z. Salom'e - Librarian
Limnologisch Instituut
Koninklijke Nederlandse Akademie
Van Wetenschappen
Rijksstraatweg 6, 3631 AC Nieuwersluis

J. A. Sinkeldam
Rijksinstituut Voor Natuurbeheer
Kasteel Broekhuizen
Leersum

Anja Wilms
Limnol. Inst. Koninklijke
Rijkestraatweg
6 NL-3631 AC Nieuwersluis

**NEW ZEALAND**
Joy Avalon Edwards
Unit 4
8 Palmeston Street
Hamilton

John D. Green
Dept Biological Sciences
Waikato University
Private Bag 3105 Hamilton

Mark James
DSIR Taupo Research Laboratory
P.O. Box 415 Taupo

Librarian
Taupo Research Laboratory
DSIR P. O. Box 415
Taupo

The Librarian
Auckland Regional Authority
Private Bag
Auckland

Phil Parr
13 Kinross St
Levin

La-orsri Sanoamuang
Department of Zoology
University of Canterbury
Christchurch

Vida M. Stout
Department of Zoology
University of Canterbury
Private Bag
Christchurch 1

Gemma Tolich
Mangere Treatment Plant
Island Road Mangere
Auckland

**NORWAY**
Knut Yngve Børsheim
Dep. Microbiology Plant Physiol.
Allget 70 N 5007
Bergen

Anne Lyche
Department of Limnology
Box 1027
Blindern
0315 Oslo 3

Gunvor Oie
SINTEF Centre Aquacult.
N-7034 Trondheim

Yngvar Olsen
SINTEF, Div. Applied Chemistry
Centre Aquaculture
N-7034 Trondheim

Jorunn Skjermo
SINTEF Centre of Aquaculture
N-7034 Trondheim

Lillian Skjoldal
Dep. Microbiology
Plant Physiol. Allegt 70
N 5007 Bergen

Olav Vadstein
SINTEF, Div. Applied Chemistry
N-7034 Trondheim

**POLAND**
Irena Bielanska-Grajner
Uniwersytet Slaski
Katedra Ekologii Zwierzat
Bankowa 9
40-007 Katowice

Jolanta Ejsmont-Karabin
Polish Academy of Science
Institute of Ecology
ul. Lesna 13 P-11-730
Mikolajki

Anna Hillbricht-Ilkowska
Institute of Ecology
Polish Academie of Sciences
Dziekanow Lesny
05-092 Lomianki

W. Kunicki-Goldfinge
Institute of Microbiology
Warsaw University
Nowy Swiat 67
P-00-046 Warsaw

Stanislaw Radwan
Acad. Agric. Dept. Zool. Hydrobiol.
Akademicka 13
D-20-934 Lublin

Roman Zurek
Polish Academy of Sciences
Institute of Fresh Water Biology
Slawkowska 17
Krakow 31-016

**PORTUGAL**
Maria Daconeicao Nieto Guimaraes
Instituto de Zoologia
Facultade de Ciencias
Universidada do Porto

Librarian
Centro de Ecologia
Faculdade de Ciencias do Porto
Universidade do Porto
4000 Porto

**REPUBLIC OF SOUTH AFRICA**
A.H. Bok
Dept of Nature and Envir. Conservation
Amalinda Natural Conservation Station
P.O. Box 12043
Amalinda 5252

Charles K. Brain
Transvaal Museum
P.O. Box 413
Pretoria 0001

**SAUDI ARABIA**
M.J.K. Shamsi
Department of Zoology
P.O.Box 2455
King Saud University
Rijadh

**SPAIN**
Carles Abella
Inst. Ecol. Aquatica
Pl Hospital 6, Gerona

Maria Teresa Alfonso
Unidad de Ecologia
Biologia, Univ. Valencia
E-46100 Burjassot

Enrique Andreu Moliner
U. Fisiologia Animal
Fac. Cienc. Biologicas
E-46100 Burjassot

Javier Armengol-Diaz
Ecologia, Fac. Biologicas
Dr Moliner 50
E-46100 Burjassot

Eloy Becares
Ecologia, Fac. Biologicas
Universidad de Leon
E-24071 Leon

Maria Jose Carmona
Ecologia, Fac. Biologicas
Dr Moliner 50
E-46100 Burjassot

Gonzalez Guisande Castor
Department of Ecology
Faculty of Biology
E-41080 Sevilla

Angeles Esparcia Collado
Depto. Ecol. Univ. Valencia
E-46100 Burjassot

Jose Maria Conde Porcuna
Ecologia, Dep. Biologia
Univ. Granada
E-18071 Granada

Carmen Maria Hernandez Cruz
Centro Tecnologia Pesquera
Apdo 56 E-35200 Telde (Las Palmas)

Luis Cruz-Pizarro
Catedra de Ecologia
Universidad de Granada
E-18071 Granada

Juana Diez Bugallo
Remigo Cabello Toral 33
E-47014 Valladolid



Francisco A. Domenech
Instituto de Acuicultura de Torre de la Sal
Ribera de Cabanes
Castellon de la Plana

Angeles Esparcia Collado
Ecologia, Fac. Biologicas
Dr Moliner 50
E-46100 Burjassot

Araceli Fernandez Casalderrey
Ecologia, Fac. Biologicas
Dr Moliner 50
E-46100 Burjassot (Valencia)

Maria Dolores Galindo del Pozo
Dep. Ecologia, Univ. de Sevilla
Apdo 1095
E-41080 Sevilla

Maria Guevara Espinosa
Dolors Sagasta 100
527! D. E. 35008
Las Palmas G. C.

Alicia Estvez
Centro de Experimentacin en Acuicultura
Consellera de Pesca
15960 Riveira
La Coru$a

Christian C. Emig
Universidad Complutense
Depto. Biologia Animal
28040 Madrid

Maria Dolores Ferrando
Dep. Fisiol. Animal
Fac. Biologicas
Dr Moliner 50
E-46100 Burjassot

Castor Guisande Gonzales
Dep. Ecologia, Fec. Biologicas
Aptdo 1095 E-41080 Sevilla

Luis Lubian
Inst. Cienc. del Mar De Andalucia
Apartado Oficial
11510 Puerto Real (Cadiz)

Jordi De Manuel
Dep. Ecologia, Fac. Biologia
Av. Diagonal 645
E-08028 Barcelona

Ramon Massana
Inst. Cienc. del Mar, CSIC
Passeig Nacional, sn
08003-Barcelona

Narciso Mazuelos
Ecologia, Univ. Sevilla
Aptdo 1095, 41080 Sevilla

Gidon Minkoff
Tin amenor S. A.
Pesues E-Cantabria

Maria Rosa Miracle
Departamento de Ecologia
Facultad de Ciencias Biologicas
Universidad de Valencia
E-46100 Burjasot, Valencia

Rafael Morales-Baquero
Dep. Biol. Anim., Ecologia
Fac. Ciencias, Univ. Granada
18071 Granada

Rafael Oltra
Ecologia, Fac. Ciencias Biologicas
Univ. de Valencia
46100-Burjassot (Valencia)

Modesto Pozuelo
Dep. Fisiol., Lab Psicobiol.
Av S. Francisco Javier sn
41005-Sevilla

Xavier Quintana
Inst. Ecol. Aquatic
Pl. Hospital 6, Girona

Maria Luisa Sanchez del Arco
Pl. San Nicholas 18 5$^{O}$ D
47000 Valladolid

Manuel Serra
Dept Ecologia, Fac. Cienc. Biologicas
Univ. de Valencia
E-46100 Burjassot (Valencia)

Laura Martin Serrano
Department of Ecology
Faculty of Biology
E-41080 Sevilla

Juan Miguel Soria
Dept Microbiol., Fac. Biol.
Dr Moliner 50
46100-Burjassot (Valencia)

Julia Toja Santillana
Dept Ecologia, Univ. Sevilla
Apdo 1095, 41080 Sevilla

Eduardo Vicente
Dept Microbiol., Fac. Biol.
Dr Moliner 50
46100-Burjassot (Valencia)

Manuel Yufera
Inst. Cien. Mar. Andalucia
CSIC Poligono S. Pedro
s/n Apdo Oficial
E-Puerto Real, Cadiz

**SWEDEN**
Michael Brett
Uppsala University
Limnology Institute
Box 557 5-75233 S-Uppsala

Reidar Grundstrom
Institute of Limnology
Box 557
S-751 22 Uppsala

Sif Johansson
ASO Laboratory
Institute of Marine Ecology
University of Stockholm
S-10691 Stockholm

Kare Lindstrom
Institute of Limnology
Box 557
S-751 21 Uppsala

Birger Pejler
Institute of Limnology
Box 557
S-751 22 Uppsala

**SWITZERLAND**
H. Berner-Fankhauser
Wilgasse 17
CH-5600 Lenzburg

**TAIWAN**
SHINREVO Co. Ltd.
att- Ricky Hwang
PO Box 2097
Kaohsiung

**UK**
Acquisitions Section DLS
British Museum Library
(Natural History)
Cromwell Road, LONDON SW7 5BD

Herbert Dartnall
Royal Observer Corps Headquarters
Fiskerton Lincoln LN3 4HA

A. Duncan
Department of Zoology
Royal Holloway College
Englefield Green
Surrey TW20 9TY

Freshwater Biological Association
Windemere Laboratory Library
The Ferry House
Ambleside, Cumbria LA22 OLP

Alison Fulcher
Dept Biol. Sci.
Univ. Lancaster. Lancaster LA1 47Q

James Green
School of Biological Sciences
Queen Mary College
Mile End Road
London E1 4NS

Eric D. Hollowday
45 Manor Road
GB-Aylesbury
Bucks HP20 IJB

Charles G. Hussey
Department of Zoology
British Museum of Natural History
Cromwell Road
London SW7 5BD

John Langley
Middlesex Polytechnic
Bramley Rd, London N14 4XS

Library
British Museum of Natural History
Library Services
Cromwell Road, London SW7 5BD

Linda May
Institute of Freshwater Ecology
Bush Estate, Penicuik
GB-Midlothian EH26 0QB SCOTLAND

Rosalind M. Pontin
26 Hermitage Woods Crescent
St. Johns Woking
Surrey GU21 1UE

Anthony Saunders-Davies
33 Park Road
GB-Esher
Surrey KT10 8NP

J. Martin Scott
Dunstaffnage Marine Research Laboratory
P. O. Box 3 Oban
Argy11 PA34 4AD SCOTLAND

Lesley J. Stewart
Freshwater Biological Association
Ferry House - Ambleside
Cumbria LA22 OLP



William Whiteley
Midway
Chapel Mill
Truro, Cornwall TR1 3BP

**UKRAINE**
Elonora N. Ovander
Institute of Zoology
Academy of Science
Kiev

**USA**
Walter J. Barnett
195 East Faith Terrace
Maitland FL 32751

L. M. Bennetch
827 West Market Street
Bethlehem PA 18015

Robert Black
Department of Biology
Cornell College
Mount Vernon IA 52314

Martin E. Boraas
Center for Great Lakes Studies
University of Wisconsin-Milwaukee
Milwaukee WI 53201

Raymond D. Dillon
Department of Biology
Room 180 Churchill-Haines Labs
The University of South Dakota
Vermillion SD 57069

Stanley I. Dodson
Department of Zoology, Birge Hall
University of Wisconsin
Madison WI 53706

Mark W. Durand
Department of Biological Sciences
Dartmouth College
Hanover NH 03755

W. T. Edmondson
Department of Zoology NJ-15
University of Washington
Seattle WA 98195

D. A. Egloff
Department of Biology
Oberlin College
Oberlin OH 44074

Wayne A. Evans
Department of Zoology
Ohio University
Athens OH 45701

B. Everitt
Department of Zoology and Physiology
Louisana State University
Baton Rouge
LA 70803-1725

Tom Frost
Center for Limnology
680 North Park Street
University of Wisconsin
Madison WI 53706

Anna Helen Gallagher
5255 La Hermosa Avenue
La Jolla
CA 92037

John J. Gallagher Collection
Curator in Charge
Section of Invertebrate Zool.
The Carnegie Museum of Natural History
4400 Forbes Avenue Pittsburgh
PA 15213

John J. Gilbert
Department of Biological Sciences
Dartmouth College Hanover
NH 03755

Nevin E. Grossnickle
Grand Canyon College
3300 W. Camelback Road
Phoenix AZ 85017-1097

Nevin E. Grossnickle
UW-Marathon Center
Wausau WI 54401

Karl Havens
Kent State University
Dept. of Biological Sciences
Kent Ohio 44242-0001

David G. Jenkins
Salisbury State University
Department of Biological Sciences
Salisbury MD 21801-6837

Elena Karnaugh
Dept. of Resource Recreation Managment
Oregon State University
Corvallis OR 97331-5704

Robert Keen
Department of Biological Sciences
Michigan Technological University
Houghton MI 49931

Charles E. King
Department of Zoology
Oregon State University
Corvallis OR 97331-2914

Kevin L. Kirk
Department of Biological Sciences
Dartmouth College
Hanover NH 03755

Andrew E. Jahn
2125 Oak Grove Road
Suite 300
Walnut Creek
CA 94598

John Korstad
Dept. of Biology
Oral Roberts University
Tulsa
OK 74171

Robert Magnien
Office of Environmental Programs
Maryland Department of Health & Mental Hygiene
201 Preston Street Baltimore
MD 21201

J. C. Makarewicz
Biology Department
Lannon Hall SUNY Brockport
Brockport NY 14420

Roy E. McLaughlin
1600 SW 23rd Drive
P. O. Box 14565
Gainesville
FL 32604

Matthew Meselson
Dept. of Biochemistry and Molecular Biology
Harvard University
7 Divinity Avenue
Cambridge MA 02138

New York Botanical Garden
Cary Arboretum Library
Box AB Millbrook
NY 12545

Ken Nichols
Colorado State Univerity
Department of Biology
Fort Collins
CO 80523

Robert Otis
Psychology Department
Ripon College
300 Seward Street
Ripon WI 54971-0248

Roberto Rico-Martinez
Department of Zoology
Birge Hall
University of Wisconsin-Madison
Madison WI 53706

Parke A. Rublee
Biology Department
University of North Carolina
Greensboro NC 27412

George W. Salt
Department of Zoology
University of California
Davis CA 95616

Serban Sarbu
Department of Biological Sciences
821A Rieveschl Hall (ML 006)
Cincinnati OH 45221-0006

James F. Saunders III
Department E.P.O. Biology
University of Colorado
Boulder CO 80309-0334

Michael Sierszen
U.S. EPA, Environmental Research Lab.
6201 Congdon Boulevard
Duluth MN 55804

Terry W. Snell
School of Biology
Georgia Institute of Technology
Atlanta GA 30332-0230

Min Ok Song
5315 Fredericksburg Rd #632
San Antonio, TX 78229

Doris Soto
Department of Biology
San Diego State University
San Diego CA 92182-0057

Peter L. Starkweather
Department of Biological Sciences
University of Nevada
Las Vegas NV 89154 CA

Richard Stemberger
Department of Biological Sciences
Dartmouth College
Hanover NH 03755



Barbara Taylor
Savannah River Ecology Laboratory
Drawer E, Aiken
SC 29802

Howard L. Taylor
1812 Wood Hollow Court
The Woods, Sarasota
FL 34235

Stephen Threlkeld
Louis Calder Centre
Box K Armonk
N.Y. 10504

Paul N. Turner
12900 Barnwell Pl.
Upper Marlboro, MD 20772

James E. Vancil
Dept. of Natural Sciences and Math.
Texas College
Tyler TX 75702

Malcolm F. Vidrine
Division of Sciences
Louisiana State University at Eunice
P. O. Box 1129 Eunice
LA 70535

R. L. Wallace
Biology Department
Ripon College
300 Seward Street
Ripon WI 54971-0248

Liz Walsh
Department of Biological Sciences
University of Nevada
Las Vegas NV 89154-4004

David Welch
Department of Biochemistry
Harvard University
7 Divinity Avenue Cambridge
MA 02138

Robert G. Wetzel
Department of Biology
The University of Alabama
Tuscaloosa
AL 35487-0344

Ronald Wilhelm
MD Department of theEnvironment
2500 Broening Highway
Baltimore MD 21224

Jan Williams
Applied Science Center
13339 Hager Jerry Road
Hunterville NC 28078

Craig E. Williamson
Department of Biology
Williams Hall 31
Lehigh University
Bethlehem PA 18015

Elizabeth Wurdak
Department of Biology
Saint John's University
Collegeville
MN 56321

Yuqi Zhao
Department of Zoology
Oregon State University
Corvallis
OR 97331-2914

**USSR**
Galina Galkovskaya
Institute of Zoology
Academie of Sciences of BSSR
Academytekeskaya 27
Minsk 220072

Ludmilla A. Kutikova
Zoological Institute
Academy of Sciences
Leningrad B-034 199034

G.I. Markevich
Institute of the Biology of Inland Waters
Academy of Sciences Borok 152742

Irena V. Telesch
Zoological Institute
Academy Sciences USSR
199034 Leningrad

**VENEZUELA**
Claudia Cressa
Department of Ecologia
University Central Venezuela
Apartado 47058 Caracas 1041-A

Enrique Vasquez
Fundacion La Salle de Ciencias Naturales
Estacion Hidrobiologica de Guayana
Apartado de Correos No 51
Sn. Felix, Estado Bolivar

**YUGOSLAVIA**
Radovan Erben
Zoology Department
Faculty of Natural Sciences and Math.
University of Zagreb
Rooseveltov trg 6 P. Box 933
YU-41000 Zagreb

Ivan Habdija
Dept Zoology
Rooseveltov trg 6, P. Box 933
YU-41001 Zagreb

Marjanca Markic
62000 Maribor
Truborjeva 25a

Stjepan Misetic
Centre for Res. Dev. Fisheries
Kneza Mislava 2
41000 Zagreb

Michael Toman
Boris Kidric Institute of Chemistry
Hajdrihova 19
P.O. Box 30, YU-61115 Ljubljana

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## VIth INT. ROTIFER SYMPOSIUM, BANYOLES, SPAIN 03–07 JUNE 1991

Despite very late arrival of the third circular and some last-minute travel organization, most people arrived on Sunday 2nd at the appointed bus stop in Barcelona. We learned very quickly not to leave luggage unattended! The Banyoles bus, complete with familiar rotiferological faces, appeared to transport us the 100 km north to the monastery of Sant Esteve at Banyoles (see Fig. inside back cover). The more hardy chose to stay in campgrounds, but some of us who used to be hardy don't seem to be anymore, and were lodged in the dormitories of the monastery (spartan but comfortable and cheap). Meals were taken there (at very unusual hours for non-Spaniards!) and the main hall in the same building (with extremely robust seating!) used for paper presentations.

More than 100 people were listed as participants. Several old faces listed were not able to attend, however new freedoms in Eastern Europe meant that there were many unscheduled attendees at the meeting. The editors were unable to obtain a final count in time for this issue - around 120 seems likely, from >25 countries - the Banyoles meeting was the largest yet of what were becoming family reunions.

With such a large attendance, and to avoid parallel presentations, it was necessary to have long sessions. The program follows this brief summary. It was not absolutely followed, but in most cases is a reasonable approximation of the meeting. The organisers remarkably managed to fit everyone in, with only minor difficulties when the projectors had a global shutdown (another bad English joke?). How Maria Rosa and Eduardo managed to keep smiling in the face of demands from such a multitude is even more remarkable!

Their efforts were appreciated, particularly during the mid-week excursion to Besalu, a restored town from the Middle Ages, and the ruins of a Benedictine monastery on the Mediterranean coast. A real paella lunch stop (see back cover!) and some fine Spanish wine complemented the outing. Memorable was the extent of construction in preparation for the 1992 Olympics in Barcelona, and notable was the disappearance of our two guides, who got lost! Fortunately they spoke the language and could ask directions.....

Overall impressions? - I felt that the socializing time, and interpersonal communication typical of the earlier meetings suffered considerably. Bob Wallace's comments in *Rotifer News* #16/17, written after the Vth meeting in Gargnano, are instructive. He noted an overwhelming sense of family from previous meetings which was somewhat swamped at Banyoles by sheer numbers. With so many new faces there was less chance of meeting everyone in the limited remaining hours each day, particularly when keeping Spanish hours for dinner and still rèquiring some sleep for the next gruelling round. Who said conferences were a holiday? Perhaps it's age? Compounded by >24 hours travel time from Australia and some degree of jet lag? Nevertheless, the stayers are still there - possibly a dozen or more participants had attended all six meetings, with many more attending at least 5.

**The VI International Rotifer Symposium is organized by:**
Cátedra de Ecología. Facultad de Ciencias Biológicas.
Universitat de València.

**Scientific Commitee:**
John J. Gilbert (Hanover, U.S.A.)
Esther Lubzens (Haifa, Israel)
María Rosa Miracle (Valencia, Spain)

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**Financial support from:**
Ministerio de Educación y Ciencia. D.G.I.C.Y.T. Madrid.
Vicerrectorado de Investigación. Univ. Valencia.
Vicerrectorado de Extensión Universitaria. Univ. Valencia.
Ajuntament de Banyoles.
Diputació de Girona.
Vicente Belenguer S.A., Fotografía y Electrónica.
Banco Bilbao-Vizcaya.
Caixa de València.
Caixa de Catalunya.



# SYMPOSIUM PROGRAMME

## Sunday, 2nd

17:00 - 22:00 Registration.

## Monday 3rd

Opening address

9:00 - 9:20 Chairperson: M.R. Miracle.
Banyoles City Hall official welcome.

**Session 1: Biochemistry and ecotoxicology**
Chairperson: T.W. Snell.

9:30 **Kleinow, W.** Biochemical studies on *Brachionus plicatilis*: Hydrolytic enzymes, integument proteins and composition of trophi. 1

10:10 **Olsen, Y., K.I. Reitan & O. Vadstein.** Impact of temperature on survival and fatty acids in starved rotifer *Brachionus plicatilis* (SINTEF-strain). 2

10:35 Coffee - break.

11:05 **Nogrady, T. & T.L.A. Rowe.** Comparative studies on rotifer narcosis. 3

11:55 **Janssen, C.R., M.D. Ferrando & G. Persoone.** Ecotoxicological studies with the freshwater rotifer *Brachionus calyciflorus*. I. Conceptual framework and applications.

12:20 **Skjermo, J. & O. Vadstein.** Characterization of the bacterial flora of mass cultivated *Brachionus plicatilis* (SINTEF-strain). 7

13:30 Lunch

**Session 2: Taxonomy, Evolution, Parasitism and Biogeography (pages 8 - 15).**
Chairperson: J. Green

15:30 **Ricci, C., G. Melone & C. Sotgia.** Old and new data on Seisonidea. 8

16:05 **Ruttner-Kolisko, A.** Is *Keratella hiemalis* a valid species and where does it live? 9

6:30 **Conde, J.M., R. Morales & L. Cruz.** Effectiveness of the spine as defense mechanism in *Keratella cochlearis*. 10

6:55 Coffee - break.

7:30 **Dumont, H. & H. Segers.** Rotifers from the sultanate of Oman and the Yemen Arab Republic, with notes on East Saudi Arabia and Kuwait. 11

7:55 **R. Rico & M. Silva.** The rotifera of Mexico. 12

8:20 **Segers, H. & H.J. Dumont.** Zoogeography of Pacific ocean islands: a comparative study of the Rotifer fauna of Easter Island with that of the Galapagos archipelago. 13

18:45 **Sanoamuang, L.-O. & R.J. Shiel.** Trans-Tasman variation in notogaean and New Zealand rotifers. 14

19:10 **Hollowday, E.D.** *Cephalodella edax* sp. nov. A rotifer parasitic in the motile colonial alga *Uroglena volvox* Ehr. 15

20:00 Dinner

**Evening session** (21:30 - 22:30). Informal talk: Natural History of Banyoles lake. M. R. Miracle.

## Tuesday, June 4th

### Session 3: Biology of Reproduction

Chairperson: J. Gilbert.

9:00 **Snell, T. & P.D. Morris.** Biochemical characterization of the mate recognition pheromone from *Brachionus plicatilis* (Rotifera). 16

9:40 **Pagani, M. & C. Ricci.** Oogenesis in *Macrotrachela quadricornifera* (Rotifera, Bdelloidea). I. Karyotype and germarium nuclei. 17

10:05 **Lubzens, E., Y. Wax, G. Minkoff & F. Adler.** A model evaluating the contribution of environmental factors to the production of resting eggs in the rotifer *Brachionus plicatilis*. 18

10:30 Coffee - break.

11:00 **Pozuelo, M., L.M. Lubián & M. Yúfera.** Sexuality and reproduction in the rotifer *Brachionus plicatilis* cultures at different salinities. 19

11:25 **Hirayama, K. & I. Rumengan.** Fecundity pattern of S and L type rotifers *Brachionus plicatilis*. 20



11:50 **Yúfera, M., E. Pascual & J. Guinea.** Study of some factors influencing the biomass of the rotifer *Brachionus plicatilis* in culture. 21

12:15 **Galindo, M.D., C. Guisande & J. Toja.** Reproductive investment of several rotifer species. 22

13:30 Lunch.

### Session 4: Genetics and Population Dynamics

Chairperson: P. Starkweather.

15:30 **Walsh, E.J.** Rotifer genetics: integration of classical and modern techniques. 23

16:05 **King, C.E.** Genetic drift in cyclic parthenogens. 24

16:30 **Rumengan, I., Yong Fu, H. Kayano & K. Hirayama.** Chromosomes and isozymes of hypotriploid strains of rotifer *Brachionus plicatilis*. 25

16:55 Coffee - break.

17:30 **Walsh, E.J. & P.L. Starkweather.** Analysis of rotifer ribosomal gene structure using the polymerase chain reaction (PCR). 26

17:55 **Hofmann, W. & M.G. Hofle.** Rotifer population dynamics in response to increased bacterial biomass and DOM: a mesocosm experiment. 27

18:20 **Walz, N.** Computer simulations of rotifer continuous cultures. 28

18:45 **Rothhaupt, K.O.** Influence of the growth rate ingestion and clearance rates of *Brachionus rubens*. 29

19:10 **Rao, T.R.** Effects of prey concentration and temperature on the reproductive performance of the predatory rotifer *Asplanchnopus multiceps*. 30

19:35 **Habib, A.R. & S. Rahman.** Culture of Rotifera in nursery ponds. 31

20:00 Dinner.

**Evening session**: Small discussion groups to be organized *ad hoc*. A discussion group in *Brachionus plicatilis* will meet in one of the small meeting rooms of the first floor at 21:30 - 22:30 (Coordinator: E. Lubzens).

## Wednesday, June 5th

### Session 5: Phylogeny workshop (pages 32 - 37).

Coordinator: R. L. Wallace.

9:00 **Wallace, R.L.** Phylogeny of the phylum Rotifera: a workshop. 32
**Markevich, G.I.** Evolution of rotifers and their position in the worm system. 33
**Clément, P.** Round-table on the phylogeny of Rotifers. 34

10:30 Coffee - break

11:00 **Kutikova, L.A. & G.I. Markevich.** The principal directions of the evolution of monimotrochida. 35
**Ricci, C.** The position of Seisonidea. 36
**Stakweather, P.L.** Hierarchal gene trees and molecular phylogeny: use of the polymerase chain reaction (PCR) to dissect evolutionary patterns in the Rotifera. 37

12:10 General discussion.

13:30 Lunch.

15:00 **Mid-Symposium excursion.** Boat-trip and walk at Banyoles lake. Bus trip to small local lakes and a short visit to the Middle Age town of Besalú. Approx. return time 21:00.

21:00 Dinner.

## Thursday, June 6th

### Session 6: Ageing, Development and Behaviour (pages 38 - 40).

Chairperson: C. King.

9:00 **Enesco, H.** Rotifers in aging research: Use of rotifers to test theories of aging. 38

9:40 **Ejsmont-Karabin, J., K. Stewertsen & R.D. Gulati.** Changes in size, biomass and production of *Euchlanis dilatata lucksiana* Hauer during its lifespan. 39

10:05 **Oie, G. & Y. Olsen.** Influence of rapid changes in salinity and temperature on mobility of the rotifer *Brachionus plicatilis* (SINTEF-strain). 40



10:30 Coffee - break.

11:00 - 13:00 **Poster session (pages 67 - 96).**

Coordinator: L. May.
All poster presenters will be standing near their respective posters for questions and discussions. Posters will be displayed throughout the Symposium and participants are welcome to look at them any time.

13:30 Lunch.

### Session 7: Feeding and trophic webs (pages 41 - 49).

Chairperson: H. Dumont.

15:30 **Arndt, H.** Rotifers as predators on components of the microbial web (Bacteria, heterotrophic flagellates, Ciliates). 41

16:05 **Gilbert, J.J. & J.D. Jack.** Rotifer predation on ciliates. 42

16:30 **Wilms, A.L., G. Postema & R.D. Gulati.** Clearance rates of Bacteria by the rotifer *Filinia longiseta* (Ehrb.) measured using three tracer techniques. 43

16:55 Coffee - break.

17:55 **Gulati, R.D., J. Ejsmont-Karabin & G. Postema.** Feeding *Euchlanis dilatata lucksiana* (Hauer) on filamentous cyanobacteria and a prochlorophyte. 45

18:20 **Habdija, I., B. Primc, R. Erben, & I. Belinic.** Trophic role of Rotifers in the plankton community of the lake Kozjak (Plitvice lakes). 46

18:45 **Telesh, I.V.** Fish impact on planktonic rotifers. 47

19:10 **Ronneberger, D.** Changes in the rotifer fauna after biomanipulation in lake Haussee (Germany, Mecklenburg-Vorpommern). 48

19:45 **Sarma, S.S.S.** Feeding responses of *Asplanchna brightwelli* (Rotifera): Laboratory and field studies. 49

20:00 Dinner.

21:30 **Cultural evening** with Catalan folkloric dances and music.

# Friday, June 7th

## Session 8: Ecology.

Chairperson: R. Shiel.

9:00 **Cruz, L.** Diurnal vertical migration of rotifers: A review.

10:05 **May, L.** The ecology of *Synchaeta kitina* Rousselet in Lock Leven, Scotland. 52

10:30 Coffee - break.

11:00 **Pejler, B. & B. Berzins.** On choice of substrate and habitat in bdelloid rotifers. 53

11:25 **Fussmann, G.** Succession of pelagic rotifers during autumnal circulation in a hypertrophic lake (Heilingensee, Berlin). 54

11:50 **Green, J.** Diversity and dominance in planktonic rotifers 55

12:15 **Virro, T. & J. Haberman.** The rotifers of lake Peipus. 56

12:40 **Misetic, S. & R. Erben.** Rotifer fauna in the Visovac Lake, Croatia, Yugoslavia. 57

13:30 Lunch.

## Session 9: Ecology and History of Rotifer Research.

Chairperson: B. Pejler.

15:30 **Koste, W. & E. Hollowday.** A short History of European Rotifer research 1687 - 1950. 58

16:05 **Mazuelos, N. C. Guisande & J. Toja.** Rotifers in ephemeral ponds of Doñana National Park. 59

16:30 **Shiel, R.J. & Lor-Wai Tan.** Responses of Billabong rotifer communities to inundation. 60

16:55 Coffee - break.

17:30 **Pontin, R. & J. Langley.** The use of rotifer communities to provide a preliminary national classification of small water bodies in England. 61

17:55 **Erben, R. & S. Misetic.** Rotifer fauna in the karst Plitvice Lakes, Croatia, Yugoslavia. 62

18:20 **Schmid-Araya, J.M.** Rotifer communities from some Araucanian lakes of southern Chile. 63

18:45 **De Manuel, J. & J. Armengol.** Composition of the rotifer communities: A contribution to the typology of the Spanish Reservoirs. 64

19:10 **Turner, P.** Ecology and distribution of rotifers in a Floridian saltwater beach, with a note on rotifer dispersal. 65

19:35 **Banik, S. & N.C. Datta.** Sessile rotifers of a freshwater lake in relation to some abiotic factors. 66

20:00 Dinner.

21:30 **Farewell Reception,** hospitality of the Banyoles City Council.

# POSTERS:

Posters will be displayed throughout the conference for looking at them any time. The official poster session will be on Thursday, 11:00 - 13:00, when all presenters of posters will be available for questions and discussions.

## Biochemistry and microscopy

P1 **Carnemolla, F. & B. Dore.** Enzyme histochemistry of *Macrotrachela quadricornifera.* 69

P2 **Dore, B. & F. Carnemolla.** Polar embedding for *Macrotrachella quadricornifera.* 70

P3 **Diez, J., J. García & M.L. Sánchez.** Notes on chemical composition and differential stain of the lorica in *Philodina.* Initial stages in embryonic development: zigote cleavage. 71

P4 **Wallace, R.L.** Presence of anisotropic (birefringent) crystalline structures in embryonic and juvenile monogonont rotifers. 72

## Ecotoxicology

P5 **Ferrando, M.D., C.R. Janssen, E. Andreu & G. Persoone.** Ecotoxicological studies with the freshwater rotifer *Brachionus calyciflorus.* 73

P6 **Fernández, A., M.D. Ferrando & E. Andreu.** Chronic toxicity of methylparathion to the rotifer *Brachionus calyciflorus* FED ON *Nannochloris oculata* and *Chlorella pyrenoidosa* 74

## Biogeography, parasitism and other relations



## Biology of reproduction and Population dynamics



## Behaviour and Feeding



## History of rotifer research



## Ecology

## VI *th* International Rotifer Symposium Trivia Quiz

*A fun quiz based on the happenings at the VI th I.R.S. held in Banyoles early June 1991. by Bob Wallace*

1. The number of churches visited during the Wednesday and Saturday excursions was _____.

   A. Just over the number of times salad was served at the dinning hall.

   B. Two less than the number of times the bus from Barcelona had to back up in Banyoles

   C. One fewer than the number of overhead projector bulbs that burned out during the symposium.

2. The number of slides Pierre Clément showed was _____.

   A. Greater than the number of *Brachionus plicatilis* in one of Ester Lubzen's batch cultures.

   B. > 75 but <∞

   C. Two

   D. One more than the number of switch-backs on the road to the monastery on the post-conference excursion.

3. What did Bob Wallace say when courteously offer a microphone during one of the question and answer periods?

   A. Why thank you.

   B. *&^%$#@ -- NO!

4. True or False: Prior to the Banyoles meetings, the diamond was the hardest known substance; we now know it to be the chairs in the meeting hall.

5. Complete the following sentence. Spanish time is like _____ _____ _____ _____.



6. The number of dance steps Charles King knows is _____.

   A. An imaginary number.

   B. A real number but not very large.

   C. Considerably less than the number of important papers he has published.

   D. Equal to 0.01% of the number of times Agnes Ruttner-Kolisko has corrected Bob Wallace's pronunciation of *Sinantherina*.

7. True or False: Claudia Ricci has discovered that an extraterrestrial being has been posing as a marine rotifer for many years.

8. Complete the following sentence: The real definition of a billabong is _____ _____ _____.

9. The number of rotifer species that Eric Hollowday has actually seen is _____.

   A. Inversely proportional to the number of hairs on top of his head.

   B. Some other large number.

10. The number of people (X) who have attended all of the rotifer symposia (Y) is equal to _____.

    A. About equal to the number of people who could fit either downstairs loo in the meeting hall.

    B. Equal to the number of domestic animals seen at one of the observation stations at the costal wildlife areas visited on the Saturday excursion.

    C. $X-\sqrt{X} = Y$

11. Which important (essential) member of our community became lost not once but twice during the excursions?

## BIBLIOGRAPHY

The bibliography lists published rotifer-related papers appearing since the previous issue of Rotifer News, or earlier works provided by authors and not previously cited in the Newsletter. In press, in prep., or unpublished works provided to the regional editors will be held over to the issue following publication. Readers wishing to obtain full publication lists from particular authors should contact them directly. In the list below, titles in parentheses indicate the paper is in a language other than English. Where possible, a very brief summary is included: apologies to the authors for transcription/ translation errors or omissions which may have occurred - they are entirely the fault of the southern hemisphere editor, and no doubt due in part to working upside-down.

**[NB: Citations received too late for inclusion in this issue will appear in** *Rotifer News* **#21]**

**AHMED, M., & S. ALIREZA, 1991.** Diurnal fluctuations in population density of zooplankton in relation to some physico-chemical parameters from Godavari River, Paithan Maharashtra, India. *J. Environ. Biol.* **12**, 123-130. <Dept Zool., Marathwada Univ., Aurangabad-431 004, INDIA.>

**ALI, A.B. 1990.** Seasonal dynamics of microcrustacean and rotifer communities in Malaysian rice fields used for rice-fish farming. *Hydrobiologia* **206**, 139-148. Cladocerans and rotifers were subdominant to copepods in these shallow littoral habitats. Abundance and seasonal dynamics were affected by pesticide and herbicide use, predator-prey interactions, presence of hydrophytes and interactions among microcrustaceans and rotifers.

**ALI, H.O., N. LAIR & H. AYADI, 1990.** The seasonal succession of rotifers in the eutrophic Aydat Lake - spatio-temporal organization. *Ann. Sci. Nat. Zool. Biol. Anim.* **11**, 113-121. <Univ. Clermont Ferrand, Zool. Protistol. Hydrobiol. Eaux Douces Grp, CNRS UA 138, F-63177 Clermont Ferrand, France.> Rotifers represented 70% of zooplankton. Temporal succession of detritivorous, herbivoro-detritivorous and carnivorous taxa is described.

**ALVAREZ-OSSORIO, M.T., L. VALDES, E. GONZALEZ-GURRIARAN, 1990.** (Effects of several diets on larval development of *Necora puber* L. 1767.) *Bol. Inst. Esp. Oceanogr.* **6**, 73-80. <Inst. Espanol de Oceanografia, Centro Oceanografica de la Coruna, Apdo. 130. 15080 La Coruna, Spain.> Four diets were tested: rotifer *Brachionis plicatilis*, *Artemia* nauplii, frozen *N. puber* larvae and fresh mussel tissues. Percent survival was greater and development times shorter on *Artemia*, which allowed complete development. Larvae fed with rotifers did not metamorphose to the megalopa. All the larvae died in the first 12 days.

**ANADU, D.I., A. OBIOHA & C. EJIKE, 1990.** Water quality and plankton periodicity in two contrasting mine lakes in Jos, Nigeria. *Hydrobiologia* **208**, 17-26. <Dept Anim. Prod. Aquacult., Anambra State Univ. Technol., Abakaliki Campus, Nigeria.> Rotifera were included in an 8 month study of two Nigerian lakes. Both lakes were considered unproductive in terms of phosphate and nitrate levels.

**ARAYA, J.M. & L.R. ZUNIGA, 1985.** (Taxonomic manual of the lacustrine zooplankton of Chile.) *Bol. Inform. Limnol.* **8**, 1-110. Univ. Austral de Chile. <Dr J. Schmid-Araya, Biol. Station Lunz, A-3293 Lunz am See, Austria.> Descriptions and habitat distribution of zooplankton (Rotifera, Cladocera, Copepoda) collected 1980-1985 in Chile.

**ARFI, R., D. GUIRAL & J.-P. TORRETON, 1991.** Natural recolonization of a productive tropical pond: day to day variations in the photosynthetic parameters. *Aquat. Sci.* **53**, 39-54. <Centre Oceanol. Marseille, Fac. Sci. Luminy, 13288 Marseille, Cedex 9, France.> Discusses microalgal, nanoplankton periodicity, photosynthetic activity and algal biomass. Blooms appeared to be controlled by selective grazing on small algae. A more complex equilibrium followed the appearance of rotifers.



**AUSTRALIAN SOCIETY FOR LIMNOLOGY** Conference, 12-15 July 1991, Lorne Vic. Abstracts only published. <ASL Secretary, Dr R. Marchant, Museum of Victoria, 71 Victoria Cres., Abbotsford Vic 3067, Australia.> Papers were presented to the conference on river and stream ecology, pollution and disturbance to streams and benthos, dynamics of stream benthos, organic matter in streams, stream chemistry, fish and crayfish and their management and conservation, taxonomy of freshwater invertebrates and rotifers, phytoplankton ecology, aquatic chemistry and bioassay, macrophyte ecology and hydrology, wetlands management, plant physiology, billabong dynamics, invertebrate ecology and lake limnology.

**BAMSTEDT, U. 1990.** Trophodynamics of the Scyphomedusae *Aurelia aurita* predation rate in relation to abundance size and type of prey organism. *J. Plankt. Res.* **12**, 215-230. <Dept Mar. Biol., Univ. Bergen, N-5065 Blomsterdalen, Norway.> Phytoplankton, ciliates, rotiers (Synchaeta) and mixed zooplankton were used in predation experiments with the jellyfish. *Synchaeta* comprised 1-13% of the daily ration of ephyra larvae (2-5 mm diameter). Mixed zooplankton allowed the highest daily rations.

**BARRON, G.L. 1990.** A new and unusual species of *Haptoglossa*. *Can J. Bot.* **68**, 435-438. <Univ. Guelph, Dept Environ. Biol., Guelph N1G 2WI, Ont., Canada.>

**BARRON, G.L. 1991.** A new genus, *Rotiferophthora*, to accommodate the Diheterospora-like endoparasites of rotifers. *Can. J. Bot.* **69**, 494-502. <Address above.> 17 species of fungi parasitic on rotifers are placed in a new genus. These endoparasites may devastate *in vitro* populations of bdelloids in a few days.

**BARRON, G.L. 1991.** A new genus of the Hyphomycetes endoparasitic in bdelloid rotifers with conidia that lodge in the mastax. *Can. J. Bot.* **69**, 503-506. <Address above.> Three endoparasitic fungal species are placed in a new genus, *Haptospora*. Their conidia have morphological adaptations for lodging in the mastax of their bdelloid hosts.

**BARRON, G.L. 1991.** New species of *Dwayaangam* parasitic on eggs of rotifers and nematodes. *Can. J. Bot.* **69**, 1402-1406. <Address above.> *Dwayaangam heterospora* is described as a new Hyphomycete attacking the eggs of rotifers and nematodes. The fungus attaches to the eggshell by an appressorium-like swelling. After penetration a postinfection bulb is produced from which haustorium-like assimilative hyphae develop and consume the contents of the egg. The fungus produces several morphologically different types of conidia from inconspicuous conidiogenous cells. The conidia are solitary, hyaline and septate and are either scolecospores or staurospores.

**BARRON, G.L. & E. SZIJARTO, 1991.** A new *Harposporium* with triangular conidia attacking bdelloid rotifers. *Can. J. Bot.* **69**, 1284-1287. <Address above.> Conidia of this fungus lodge in the gut of rotifers ingesting it; hyphae may penetrate the body wall, proliferate in the body, and result in the death of the rotifer.

**BIELANSKA-GRAJNER, I. 1990.** (Rotifers (Rotatoria) in the inlets of the Rybnik Dam Reservoir, Poland.) *Pr. Nauk. Uniw. Slask. Katowicach O.* **1167**, 203-218. <Univ. Slaski, Ul. Bankowa 9, 40-007 Katowice, Poland.>

**BOON, P.I. & R.J. SHIEL, 1990.** Grazing on bacteria by zooplankton in Australian billabongs. *Aust. J. Mar. Freshw. Res.* **41**, 247-257. <MDFRC, P.O. Box 921, Albury, NSW 2640, Australia.> Five species of rotifer ingested bacteria at a prey density of 5-7 x $10^9$ cells/L, and a sixth (*Keratella procurva*) did so at 4x$10^{10}$ cells/L. Four species were not bacteriovores. Bacteriovory was detected with safranin red or methylene blue stained bacteria. Clearance rates for the zooplankton community larger than 51 $\mu$m, varied from less than 0.1 to 71 mL/L/h, but were usually less than 5 mL/L/h. Significant grazing was detected in greater than 200 lm, 90-200 $\mu$m and 51-90 $\mu$m fractions.

**BOWMAN, B.P., T.W. SNELL & B.J. COCHRANE, 1990.** Isolation and purification of glutathione S-transferases from *Brachionus plicatilis* and *Brachionus calyciflorus* (Rotifera). *Comp. Biochem. Physiol. B* **95**, 619-624. <Divn Sci., Univ. Tampa, Tampa, Fla. 33606, U.S.A.> In *B. plicatilis*, glutathione S-transferase (GST) (important in

xenobiotic metabolism) comprised 4.2% of cytosolic protein, and was present as three isozymes. In *B. calyciflorus* 2 isozymes representing 1% of cytosolic protein were isolated. Rotifer GST's are monomers; all other animals investigated have dimeric GST's.

**BRANSTRATOR, D.K. & J.T. LEHMAN, 1991.** Invertebrate predation in Lake Michigan, USA: regulation of *Bosmina longirostris* by *Leptodora kindtii*. *Limnol. Oceanogr.* **36**, 483-495. <Dept Biol., Nat. Sci. Bldg, Univ. Mich., Ann Arbor, Mich. 48109, USA.> *Conochilus* was included in the diet of juvenile *Leptodora,* which may be a primary predator of this rotifer in Lake Michigan.

**CAMPBELL, C.E. 1991.** Prey selectivities of threespine sticklebacks (*Gasterosteus aculeatus*) and phantom midge larvae (*Chaoborus* spp.) in Newfoundland lakes. *Freshw. Biol.* **25**, 155-168. <Dep. Biol., Memorial Univ. Newfoundland, St John's, Newfoundland.> Rotifers featured in the chaoborid diets, but not in those of the fish. Selective predation by planktivores in oligotrophic Avalon Peninsula lakes may influence species composition and size structure of pelagic zooplankton communities.

**CAMPOS, H., W. STEFFEN, G. AGUERO, O. PARRO & L. ZUNIGA, 1990.** Limnological study of Lake Todos Los Santos, Chile: Morphometry, physics, chemistry, plankton and primary productivity. *Arch. Hydrobiol.* **117**, 453-484. <Inst. Zool., Univ. Australe de Chile, Casilla 567, Valdivia, Chile.> Nine species of Rotifera were identified in the zooplankton of this volcanic lake, including *Synchaeta stylata* and *Conochilus unicornis*. Zooplankton maxima coincided with those of the phytoplankton.

**CHAKRABARTI, R. & B.B. JANA, 1990.** Food preferences and selection by common carp (*Cyprinis carpio*) fry under different feeding regimes. *J. Appl. Ichthyol.* **6**, 223-230. <Fish. Limnol. Res. Unit., Dep Zool., Univ. Kalyani, Kalyani 741235, West Bengal, India.> Cladocerans constituted an important source of food in 5 experimental culture systems. Rotifers were positively selected in a live food system.

**CHRISTOFFERSEN, K., B. RIEMANN, L.R. HANSEN, A. KLYSNER & H.B. SORENSEN, 1990.** Qualitative importance of the microbial loop and plankton community structure in a eutrophic lake during a bloom of cyanobacteria. *Microb. Ecol.* **20**, 253-272. <Water Quality Inst., 11 Agern Alle, DK 2970 Horsholm, Denmark.> Describes plankton community structure and major pools and fluxes of carbon before and after a bloom of *Aphanizomenon*. Microzooplankton (nauplii, rotifers and ciliates) ingested low amounts of bacteria and removed 10-16% of bacterial carbon. Ciliates smaller than 50 $\mu$m grazed 19-39% of bacterial production.

**COCHRANE, B.J., R.B. IRBY & T.W. SNELL, 1991.** Effects of copper and tributyl tin on stress protein abundance in the rotifer *Brachionus plicatilis*. *Comp. Biochem. Physiol. C Comp. Pharmacol Toxicol.* **98**, 385-390. <Dept Biol., Univ. South Florida, Tampa, FL 33620 USA.> Describes production of proteins in response to heat shock, sublethal does of $CuSO_4$ and tributyl tin. Results indicate that changes in stress protein abundance may be useful biomarker of exposure to particular toxicants.

**COMPS, M., B. MENU, G. BREUIL & J.-R. BONAMI, 1991.** Viral infection associated with rotifer mortalities in mass culture. *Aquaculture* **93**, 1-8. <G.I.E., R.A. Stn Exp. D'Aquacult. de L'Ifremer, Chemin de Maguelone, 34250 Palavas-Les-Flots, France.> Viruses with characteristics of the Birnaviridae were observed in cultures of *Brachionus plicatilis*. The possibility of transmission to fish is discussed.

**COMPS, M., J. MARI, F. POISSON & J.-R. BONAMI, 1991.** Biophysical and biochemical properties of an unusual birnavirus pathogenic for rotifers. *J. Gen. Virol.* **72**, 1229-1236. <Address above.> Rotifer birnavirus (RBV) isolated from *B. plicatilis* is associated with high mortality. Biochemical and biophysical characters indicate that RBV is a member of the Birnaviridae family with, for the moment, a unique position in this group.



**COOPER, J., W.R. SIEGFRIED, P.G. RYAN, J.E. CRAFFORD & W.D. STOCK, 1991.** Effects of ornithogenic products on ecosystem structure and functioning - a new South African biological Antarctic research subprogramme. *S. Afr. J. Sci.* **87**, 223-226 <Univ Cape Town, Percy Fitzpatrick Inst. Afr. Ornithol., Rondebosch 7700, S. Africa.> Nunataks in Antarctica support simple ecosystems: bacteria, yeasts, fungi, algae, lichens, mosses, protozoa, rotifers, tardigrades, nematodes, collembolans and mites. Seabirds may be the largest members of the biota, but effects of ornithogenic products on ecosystem structure and functioning of Antarctic nunataks are little known. The South African Biological Antarctic Research Subprogramme (SABARSP) intends to study these effects commencing in April 1991, and to run initially for five years. An appeal is made for the involvement of interested scientists.

**CORSINI, M. & M. KARYDIS, 1990.** An algal medium based on fertilizers and its evaluation in mariculture. *J. Appl. Phycol.* **2**, 333-340. <Dept Env. Studies, Univ. Aegaen, 811 00 Mytilini, Greece.> An algal medium based on a commercial fertilizer is an inexpensive food source for the rotifer *Brachionus plicatilis*.

**DHONT J , 1990.** An adapted technique for the bioenrichment of ongrown *Artemia* as food source in marine larviculture. *Belg. J. Zool.* **120** (Suppl. 1), 28-29. <R.U.G., Lab. Aquacult., Rozier 44, B-9000 Gent, Belgium.> *In* Abstracts, 1st Belgian Congress of Zoology, Antwerp, Belgium, Nov. 16-17, 1990.

**DOLAN, J.R. & C.L. GALLEGOS, 1991.** Trophic coupling of nanoflagellates and rotifers in the Rhode River estuary, Maryland. (1991 ASLO Abstract). <Smithsonian Environmental Research Centre, P.O. Box 28, Edgewater, MD 21037, USA.> Rotifers (100-5000 $l^{-1}$) varied inversely with total auto- and heterotrophic microflagellates. A model of a rotifer-microflagellate-bacteria food web was presented.

**DRENNER, R.W., J.D. SMITH, J.R. MUMMERT & H.F. LANCASTER, 1990.** Responses of an eutrophic pond community to separate and combined effects of nitrogen to phosphorus ratio supply and planktivorous fish: a mesocosm experiment. *Hydrobiologia* **208**, 161-168. <Dept Biol. Tex. Christian Univ., Fort Worth, TX 76129, U.S.A.> Nutrient supply and fish effects were not independent of each other as shown by significant nutrient x fish interactions for total phosphorus, Secchi depth, filamentous blue-green algae, periphyton chlorophyll, *Asplanchna* and non-predatory rotifers.

**EJSMONT-KARABIN, J. & T. WEGLENSKA, 1989.** Densities, structure, and the role of zooplankton in phosphorus cycling in limnetic and lotic parts of Zegrzynski Reservoir, Poland. *Ekol. Pol.* **37**, 251-280. <Hydrobiol. Stn, Inst. Ecol., Pol. Acad. Sci., Lesna 13, 11-730 Mikolajki, Poland.> Reports 1982 and 1984 studies of zooplankton dynamics in the reservoir.

**EMIR, N. 1991.** Some rotifer species from Turkey. *Doga - Turk. J. Zool.* **15**, 39-45. <Hacettepe Univ, Fac. Sci., Dept Biol., Ankara, Turkey.) 30 rotifer species and one genus identified from 20 different localities in Turkey. Most cosmopolitan, freshwater.

**ENESCO, H.E., A. McTAVISH & R. GARBERI, 1990.** Spontaneous activity level and life span in rotifers - lack of support for the rate of living theory. *Gerontology* **36**, 256-261. <Concordia Univ., Dept Biol. Sci., Montreal H3G 1M8, Quebec, Canada.> Activity measurements for *Asplanchna brightwelli* tended toward greater activity in longer-lived rotifers - inconsistent with the rate of living theory of aging.

**FAHNENSTEIL, G.L., H.J. CARRICK & R. ITURRIAGA, 1991.** Physiological characteristics and food-web dynamics of *Synechococcus* in Lakes Huron and Michigan, North America. *Limnol. Oceanogr.* **36**, 219-234. <Great Lakes Environ. Res. Lab., NOAA, 2205 Commonwealth Blvd., Ann Arbor, MI. 48105, USA> Three techniques for estimating grazing loss rates (ampicillin, dilution, and $^{14}$C-labeling of *Synechococcus*) provided similar estimates ranging from 0.1 to 0.7 $d^{-1}$. On specific dates, grazing loss rates were 33-120% of growth rates, suggesting that grazing was the major loss for *Synechococcus* populations. Most of the grazing loss (68%) was attributable to small (4-10 $\mu$m), heterotrophic flagellates and ciliates. Crustaceans and

rotifers accounted for only a small percentage of total grazing loss (5-21%) even when *Daphnia* accounted for 40% of crustacean biomass.

**FERRANDO M.D. & E. A. MOLINER, 1991**. Acute lethal toxicity of some pesticides to *Brachionus calyciflorus* and *Brachionus plicatilis*. *Bull. Environ. Contam. Toxicol.* **47**, 479-484. <Univ. Valencia, Fac. Biol. Sci., Dept. Anim. Biol., 50/E-46100 Burjassot, Spain.>

**FU, Y., K. HIRAYAMA & Y. NATSUKARI, 1991.** Morphological differences between 2 types of the rotifer *Brachionus plicatilis* Muller,O.F. *J. Exp. Mar. Biol. Ecol.* **151**, 29-42. <Nagasaki Univ., Grad. Sch. Mar. Sci. & Engn., 1-14 Bunkyo-Machi, Nagasaki 852, JAPAN.> Morphological differences between S & L strains of *B. plicatilis* were studied biometrically. For each of 67 strains, seven characters of the lorica were measured on each of 20 individuals derived parthenogenetically. Cluster analysis using the seven measurements classified into two groups containing the predesignated 37 S and 30 L strains. Two linear discriminant functions associated with S-L types were also derived to classify new strains that may be observed in the future into S or L type.

**FU, Y., K. HIRAYAMA & Y. NATSUKARI, 1991.** Genetic divergence between S-type and L-type strains of the rotifer *Brachionus plicatilis* Muller. *J. Exp. Mar. Biol. Ecol.* **151**, 43-56. <Address abovve> Allozyme variation, using horizontal starch gel electrophoresis, was determined for 37 strains of S type and 30 strains of L type *B. plicatilis* collected from all over the world. 33 of 46 alleles detected for six loci were specific for either S or L type strains. On the basis of genetic distances, a dendrogram of the similarity among 67 strains was drawn. The strains were divided into two groups at a large genetic distance. One group consisted of 37 strains which coincided with S type in morphometric analysis. The other 30 strains coincided with L type in morphometric analysis. The result indicates that the two groups of the rotifer, S and L, are genetically divergent.

**GASOL, J.M., J. GARCIA-CANTIZANO, R. MASSANA, F. PETERS, R. GUERRERO & C. PEDROS-ALIO, 1991.** Diel changes in the microstratification of the metalimnetic community in Lake Ciso, Spain. *Hydrobiologia* **211**, 227-240. <Dept Genetics & Microbiol., Autonomous Univ. Barcelona, 08193 Bellaterra, Spain.> *Anuraeopsis fissa* occurred in the uppermost metalimnion, with ciliates in lower strata. Purple sulphur bacteria occurred in the bottom part of the metalimnion. Details of stratified populations are given.

**GATESOUPE, F.-J. 1991.** The effect of three strains of lactic bacteria on the production rate of rotifers (*Brachionus plicatilis*) and thier dietary value for larval turbot (*Scophthalmus maximus*). *Aquaculture* **96**, 335-342. <INRA/IFREMER, Cent. Brest, B.P. 29280 Plouzane, France.>

**GIOVANNI, M.V. DE & E. GORETTI, 1988 (1990).** Notes to the knowledge of Lake Piediluco, Italy: the biological drift. *Riv. Idrobiol.* **27**, 715-728. <Ist. Zool., Univ. Perugia, Perugia, Italy.> Biological drift in an impoundment with constant diagonal current. Brief mention is given to Rotifera, which were more abundant in the summer.

**GOPHEN, M., S. SERRUYA & P. SPATARU, 1990.** Zooplankton community changes in Lake Kinneret, Israel, during 1969-1985. *Hydrobiologia* **191**, 39-46. <Yigal Allon Kinneret Limnol. Lab., P.O. Box 345, Tiberias, Israel 14102.> In Proceedings of an International Symposium on Trophic Relationships in Inland Waters, Tihany, Hu[illegible], Sept. 1-4, 1987.

**GIANI A, 1991.** Implications of phytoplankton chemical composition for zooplankton production - experimental evidence. *Oecologia* **87**, 409-416. <Univ. Constance, Inst. Limnol., POB 5560/W-7750 Constance, Germany.> Growth and reproduction of two *Daphnia* species were studied using the cryptomonad *Rhodomonas* sp. and the diatom *Stephanodiscus hantzschii* as food. Both *Daphnia* species grew well at concentrations of 0.2-2.0 mgC/l of *Rhodomonas* sp., and 0.4-2.0 mgC/l of *S. hantzschii*. Nitrogen-limited *Rhodomonas* was offered to the cladocerans: the reduction in algal nitrogen



content hindered animals' growth and reproduction. Results suggested that zooplankton production may also be affected by the chemical composition of the food algae, and that nitrogen potentially limits production, even in freshwater environments that are generally not N-limited.

**GILBERT J.J. 1989.** Rotifera. In K.G. Adiyodi & R. G. Adiyodi (Eds). *Repruductive Biology of Invertebrates*, Vol. 4. *Fertilization, Development and Parental Care, Part A.* <Dep. Biol. Sci., Dartmouth Coll., Hanover, N.H. 03755, USA.> Wiley, N.Y.: 179-200.

**GILBERT, J.J. & M.W. DURAND, 1990.** Effect of *Anabaena flos-aquae* on the abilities of *Daphnia* and *Keratella* to feed and reproduce on unicellular algae. *Freshw. Biol.* **24**, 577-596. <Address above.> *Anabaena* inhibited the ability of *Keratella cochlearis* to feed on *Cryptomonas*, possibly by mechanical interference with feeding. Interpretation of cyanobacterial/zooplankton interactions requires analysis of the effects of the cyanobacteria on feeding and reproduction of the species under a variety of conditions.

**GLADYSHEV M I, 1990.** (Daily dynamics of the vertical distribution of wide-spread zooplankton species in the Sydinskiy Bay of Krasnoyarsk Water Reservoir, Russian SFSR.) *Izv. Sib. Otd. Akad. Nauk SSSR* Ser Biol. Nauk **0**, 78-85. <Inst. Biophys., Sib. Dep., Acad. Sci. USSR, Krasnoyarsk, USSR.> Dispersion complexes for 12 species of Crustacea and Rotatoria were calculated. Three patterns of vertical distributions are reported, and compared with the same organisms in other reservoirs. Migration dynamics in Sydinskiy Bay was statistically stable but big differences from migration dynamics of the same species in other reservoirs are found.

**GRAHAM, D.M., W.G. SPRULES & S.J. NEPSZY, 1991.** Effects of Zebra mussels (*Dreissena polymorpha*) on diets and growth of juvenile perch in Lake Erie. (1991 ASLO Abstract). <Dept. of Zool., Erindale College, University of Toronto, Mississauga, Ont., Canada L5L 1C6.> Competition between zebra mussels and Lake Erie zooplankton influences zooplankton composition. Microzooplankton are directly suppressed by adult mussels. Rotifers , e.g. *Polyarthra* spp. are a dietary component of young fish.

**GRAINGER, E.H. & S.I.C. HSIAO, 1990.** Trophic relationships of the sea ice meiofauna in Frobisher Bay, Arctic Canada. *Polar Biol.* **10**, 283-292. <Arctic Biol. Stn., Fisheries & Oceans, 555 St Pierre Blvd, St Anne de Bellevue, Quebec H9X 3R4, Canada.> Rotifers are a component of the sea ice community in Frobisher Bay, which includes nematodes, cyclopoid and harpacticoid copepods, turbellarians and polychaete larvae. The ice meiofaunal species are major consumers of ice algae, and important links in food chains.

**GREEN, J. & S. MENGESTOU, 1991.** Specific diversity and community structure of Rotifera in a salinity series of Ethiopian inland waters. *Hydrobiologia* **209**, 95-106. <Univ. London, Queen Mary College, Ctr Res. Aquat. Biol., Mile End Rd, London E1 4NS, England.> The planktonic rotifers of 30 localities above 1100 m were studied, with significantly higher mean momentary species numbers than reported elsewhere. Brachionids were most frequently dominant.

**GUISANDE, C. & N. MAZUELOS, 1991.** Reproductive pattern of *Brachionus calyciflorus* Pallas at different food concentrations. *J. Plankt. Res.* **13**, 279-286. <Univ. Sevilla, Fac. Biol., Dept Ecol. 41080 Seville, Spain.> With abundant food, egg volume and carbohydrate content were low - *B. calyciflorus* utilized its energy to increase the number of offspring. At low food concentrations egg volume and carbohydrate concentration increased - the rotifer appeared to use its energy to increase neonate size.

**GUISANDE, C., A. DUNCAN & W. LAMPERT W, 1991.** Trade-offs in *Daphnia* vertical migration strategies. *Oecologia* **87**, 357-359. <Address above.> We used length-body protein regressions as a measure of the nutritional state of *Daphnia* to distinguish possible sub-populations differing in their migration strategy. An overwhelming part of the population migrated downwards during the day. However, the few daphnids in the epilimnion during the day had significantly higher protein content than the animals in

deep water, indicating that these daphnids did not migrate randomly but remained in the surface food-rich water all day. This shows that migrating animals gain no metabolic advantage over non-migrating ones.

**GULATI, R.D. 1990**. Zooplankton structure in the Loosdrecht Netherlands lakes in relation to trophic status and recent restoration measures. *Hydrobiologia* **191**, 173-188. <Limnol. Inst., Rijksstr. 6, 3631 AC Nieuwersluis, Neth.> In Proceedings of an International Symposium on Trophic Relationships in Inland Waters, Tihany, Hungary, Sept. 1-4, 1987.

**GULBRANDSEN, J. 1991.** Functional response of Atlantic Halibut larvae related to prey density and distribution. *Aquaculture* **94**, 89-98. <Agricul. Res. Council Norway, Inst. Aquacult. Res., N-6600 Sunndalsora, NORWAY.> Rotifers (*Brachionus plicatilis*) can be prevented from horizontal patching simply by providing diffused light; hunger motivation is seemingly without effect. Brine shrimp (*Artemia* sp.), on the other hand, appear to be less well controlled. Halibut seem to have an optimal feeding response at approximately 12 rotifers $ml^{-1}$; the majority feed above a level of 2.5 $ml^{-1}$.

**HALKOWSKAYA, H.A., Z.I. HARELYSHAVA & V.A. FIL"CHANKA, 1991.** (Morphological features of *Keratella cochlearis* Gosse during adaptation to environmental conditions.) *Vyes. Akad. Nauk BSSR Syer. Biyal. Nauk* 0 (2). 112-115. <Inst. Zool., Acad. Sci. BSSR, Minsk, USSR.>

**HAMILTON, S.K., S.J. KIPPEL, W.M. LEWIS Jr & J.F. SAUNDERS III,** 199
Zooplankton abundance and evidence for its reduction by macrophyte mats in two Orinoco, Venezuela, floodplain lakes. *J. Plankt. Res.* **12**, 345-364. <Dept Biol. Sci., Univ. Calif., Santa Barbara, CA 93106, U.S.A.> Export of plankton from floodplain waterbodies to the Orinoco River was reduced by passage of zooplankton through a large bed of aquatic grass (*Paspalum repens*). Planktonic production was thereby concentrated in epiphytic and benthic habitats, where it potentially could support food webs.

**HANAZATO, T. & M. YASUNO, 1990.** Influence of time of application of an insecticide on recovery patterns of a zooplankton community in experimental ponds. *Arch. Environ. Contam. Toxicol.* **19**, 77-83. <Divn Envtal Biol., Natl Inst. for Envt Studies, Onogawa, Tsukuba, Ibaraki 305, Japan.> Carbaryl insecticide (0.5 mg $l^{-1}$) reduced microcrustacean populations in outdoor ponds, but not those of *Keratella valga* during the growth phase. Exposure to carbaryl during the decreasing phase led to the loss of the *K. valga* population even in the absence of competitors.

**HANAZATO, T. & M. YASUNO, 1990.** Influence of persistence period of an insecticide on recovery patterns of a zooplankton community in experimental ponds. *Environ. Pollution* **67**, 109-122. <Address above.> A single application of carbaryl reduced cladocerans briefly, but they recovered and suppressed rotifers through competition. Repeated applications induced occurrence of abundant rotifers by suppressing cladocerans for longer.

**HATAKEYAMA, S. 1991.** Effects of chlornitrofen A herbicide on reproduction of *Brachionus urceolaris* Rotatoria through water and food *Chlorella*. *Environ. Pollut.* **70**, 143-156. <Environ. Biol. Div., Nat. Inst. Environ. Stud. , Onagawa 16-2, Tsukuba, Ibaraki 305, Japan.> Chronic effects of the herbicide were studied at increasing concentrations. Increasing tolerance with growth of neonates was reported.

**HAVENS. K.E. 1991.** Summer zooplankton dynamics in the limnetic and littoral zones of a humic acid lake. *Hydrobiologia* **215**, 21-29. <Kent State Univ., Dept Biol. Sci. Kent, OH 44242, USA.> Limnetic and littoral zooplankton were studied during summer 1989 in Triangle Lake, a humic acid (pH 4.9) bog lake in Ohio, USA. The limnetic zooplankton showed low species richness and biomass, and dominance by the rotifers *Kellicottia bostoniensis* and *Polyarthra vulgaris*. Littoral species richness and biomass were markedly higher, with crustaceans and the rotifer *Ascomorpha ecaudis* dominants. The extreme rotifer dominance and lack of cladocerans in the limnetic zone were likely the



result of *Chaoborus* predation. A pronounced mid-summer decline in cladoceran biomass in the littoral was likely due to predation by *T. prasinus* and *Utricularia* (bladderwort).

**HAVENS K.E. 1991.** The importance of rotiferan and crustacean zooplankton as grazers of algal productivity in a freshwater estuary. *Arch. Hydrobiol.* **122**, 1-22. <Address above.>

**HERZIG, A. & B. AUER, 1990.** The feeding behaviour of *Leptodora kindti* and its impact on the zooplankton community of Neusiedler See (Austria). *Hydrobiologia* **198**, 107-117. <Biological Station, Neusiedler See, A-7142 Illmitz, Austria.> *L. kindti* in Neusiedlersee prefers *Diaphanosoma brachyurum*, with a substantial effect on the zooplankton population (including rotifers) at high predator densities.

**HERZIG, A. & W. KOSTE, 1989.** The development of *Hexarthra* spp. in a shallow alkaline lake. *Hydrobiologia* **186/187**, 129-136. <Address above>. Four species of *Hexarthra* occur in Neusiedlersee, usually only one species at any time. Temporal succession appears to be controlled by abiotic factors, with predation by *Leptodora* and young fish also important.

**HILLMAN, T.J. & R.J. SHIEL, 1991.** Macro- and microinvertebrates in Australian billabongs. *Verh. Internat. Verein. Limnol.* **24**, 1581-1587. <MDFRC, PO Box 921, Albury, 2640, NSW, Australia.> Paper identifies subsets of macro- and microfauna specialized for floodplain habitats. Spring and autumn pulses of rotifers reached 20,000+ $l^{-1}$, with community dominants cycling in 4 days or less at 26.8 $^{o}$C. Rotifer communities of adjacent billabongs were markedly dissimilar, reflecting habitat heterogeneity.

**INAMORI, Y., Y. KUNIYASU, N. HAYASHI, H. OHTAKE & R. SUDO, 1990.** Monoxenic and mixed cultures of the small metazoa *Philodina erythrophthalma* and *Aeolosoma hemprichi* isolated from a waste-water treatment process. *Appl. Microbiol. Biotechnol.* **34**, 404-407. <Nat. Inst. Environ. Studies, Onogawa, Tsukuba 305, Japan.> Growth of a euryphagous rotifer and a stenophagous oligochate in culture were compared, and the role of metozoa in waste-water purification discussed.

**JACK, J.D., & J.J. GILBERT, 1991.** Effects of *Daphnia* on microzooplankton communities. (Abstract from 1991 ASLO meeting). <Dept Biology, Dartmouth College, Hanover, NH 03755, USA>

**JAMES, C.M. & T. ABU-REZEQ, 1990.** Efficiency of rotifer chemostats in relation to salinity regimes for producing rotifers for aquaculture. *J. Aquacult. Trop.* **5**, 103-116. <Kuwait Inst. Scientific Res., Mariculture Fish. Dept, P.O. Box 1638, 22017 Salmiya, Kuwait.> *Brachionus plicatilis rotundiformis* (S-type) and *B. plicatilis typicus* (L-type) rotifers growth and productivity were inversely related to increasing salinity in culture. Size was also inversely proportional to increasing salinities. Salinity of 20.permill. is recommended for producing S-type rotifers and 30.permill. for producing L-type rotifers in culture.

**JAMES M.R. 1991.** Sampling and preservation methods for the quantitative enumeration of microzooplankton. *N.Z. J. Mar. Freshw. Res.* **25**, 305-310. <DSIR Mar. & Freshw.,Taupo Res. Lab. POB 415, Taupo, N.Z.> 4 sampling and 4 preservation techniques were compared. Counts of most microzooplankton groups (ciliates, rotifers, and nauplii) were significantly higher in samples preserved with Lugol's iodine and mercuric chloride than with formalin and glutaraldehyde. The collection of samples with nets or pumps, and the concentration of samples with nylon screens gave significantly lower counts than discrete settled samples. All ciliates < 50 $\mu$m in length passed through a 20 $\mu$m mesh screen - size fractionation by screen or net is not an effective way of partitioning planktonic organisms.

**JANSSENS DE BISTHOVEN, L., J. SNOEKS, F. OLLEVIER, & D. THYS VAN AUDENAERDE, 1990.** The food of *Haplochromis burtoni* (Pisces, Cichlidae) of Lake Mugesera, Rwanda. *Belg. J. Zool.* **120,** 37-50. <Katholieke Univ. Leuven, Zool. Inst., Naamsestr. 59, B-3000 Leuven, Belgium.> Rotifera were numerically abundant in the gut contents of 38 adult cichlids, but volumetriacally insignificant. *H. burtoni* is a benthic insectivore/ detritivore.

**JINDAL, R. & R.K. GHEZTA, 1991.** Diel variations in a eutrophic pond. *Geobios* (Jodhpur) **18**, 25-28. <Dept Zool., Panjab Univ., Chandigarh 160 014, India.> Discusses responses of zooplankton (including rotifers) to diurnal variation in physico-chemical parameters.

**KANKAALA, P., A. VASAMA, K. ESKONEN & L. HYYTINEN, 1990.** Zooplankton of Lake Ala-Kitka, northeast Finland, in relation to phytoplankton and predation by Vendace (*Coregonus albula*). *Aqua Fenn.* **20**, 81-94. Zooplankton was dominated by small species, including rotifers: secondary production was estimated as 3-4 g C $m^{-2}$ $yr^{-1}$. Pelagic system was consistent with other lakes having intensre top-down predation by planktivorous fish.

**KARYMSHAKAW, A.A. 1990.** (Rotifera of the Dnieper River and its tributaries in the Belorussian Polesye USSR.) *Vyestsu Akad. Navuk BSSR Syer. Biyal. Navuk* **1**, 103-107. <Gomel State Univ., Gomel, USSR.>

**KIRK, K.L. 1991.** Inorganic particles alter competition in grazing plankton - the role of selective feeding. *Ecology* **72**, 915-923. <Michigan Technol. Univ., Dept. Biol. Sci., Houghton, MI 49931, USA> Suspended sediments differentially inhibit cladoceran populations, but not rotifer populations. Rotifers feed more selectively, avoid ingesting clay particles. This mechanism may influence relative abundance of rotifers and cladocerans in turbid lakes and reservoirs.

**KITAJIMA, C., M. TAKAYA, Y. TSUKASHIMA & T. ARAKAWA, 1991.** Development of eggs, larvae and juveniles of the grouper, *Epinephelus septemfasciatus*, reared in the laboratory. *Jap. J. Ichthyol.* **38**, 47-55. <Kyushu Univ. Fish. Res. Lab., Tsuyazaki, Fukuoka 81133, Japan.> Describes all developmental stages. Larvae were fed successively with oyster trochophores, rotifers, *Artemia* nauplii, cultivated *Tigriopus japonicus*, copepods collected from the sea and minced meat of krill and sand lance.

**KOROVCHINSKII, N.M. 1991.** (How well do we know the species composition of zooplankton in the well investigated lake?) *Byull. Mosk. O-Va Ispyt. Prir. Otd. Biol.* **96**, 17-29. <Mosc. Univ., Moscow, USSR.>

**KOSTE, W. 1991.** *Anuraeopsis miraclei* new species, a new planktonic rotifer species in karstic lakes of Spain. *Hydrobiologia* **209**, 169-173. <Ludwig-Brill-Strasse 5, D 4570 Quakenbrueck, Germany.>

**KOSTE, W. & B. ROBERTSON, 1990**. Taxonomic studies of the Rotifera from shallow waters on the island of Maraca, Roraima, Brazil. *Amazoniana* **11**, 185-200. <Ludwig-Brill-Str. 5, Quakenbruck D-4570, Germany.> 159 species of rotifers characteristic of decomposing vegetation in shallow waters are recorded. Most species are cosmopolitan, with three new species (*Lepadella christinei, Lepadella tricostata* and *Testudinella robertsoni*) described.

**KOSTE, W. & R.J. SHIEL, 1990.** Rotifera from Australian inland waters: V: Lecanidae (Rotifera: Monogononta). *Trans. R. Soc. S. Aust.* **114**, 1-36. <reprints from Shiel, MDFRC, P.O. Box 921, Albury, NSW 2640, Australia.> Includes diagnostic keys and figures for genera and species of Lecanidae (*Hemimonostyla*, *Monostyla*, *Lecane*) recorded from Australian inland waters. Available distribution data and ecological information are given.



**KOSTE, W. & R.J. SHIEL, 1990.** Rotifera from Australian inland waters, VI: Proalidae, Lindiidae (Rotifera: Monogononta). *Trans. R. Soc. S. Aust.* **114**, 129-143. (Reprints from Shiel, address above.) Keys and figures for the genera and species of the Proalidae (4 genera) and Lindiidae (1 genus). Two species of *Proalinopsis* and 10 species of *Proales* are known from Australian inland waters. Five species of L*india* are confirmed, with a sixth, known from New Zealand, doubtful. Brief comments are included on current rotifer taxonomy and biogeography.

**KOSTE, W. & R.J. SHIEL, 1991.** Rotifera from Australian inland waters, VII: Notommatidae (Rotifera: Monogononta). *Trans. R. Soc. S. Aust.* **115**, 111-159. (Reprints from Shiel, address above.) Provides keys and figures for 14 genera and 70 species of the notommatid rotifers of Australia. The genera *Pseudoharringia, Pleurotrochopsis, Sphyrias* and *Tylotrocha* are not recorded from the continent. *Russelletia,* erected by Sudzuki (1959) to accommodate *Lindia parrotti* Russell from N.Z., is a junior synonym of *Proalides, viz. P. tentaculatus* Beauchamp.

**KOSTE, W. & W. TOBIAS, 1990.** Zur kenntnis der Radertierfauna des Kinda-Stausees in Zentral Burma (Aschelminthes: Rotatoria). *Osnabrucker Naturwiss. Mitt.* **16**, 83-110. <Address above.> 99 rotifer species were found in samples collected 1987-89 from Kinda Reservoir on the Myanmar River. One new species, *Wulfertia kindensis*, is described.

**KUCKLENTZ, V. 1990.** (The effect of Nitrilotriacetate (NTA) on zooplankton in a field pond experiment.) Bayer. Landes. Wasserforsch. Muenchener Beitr. Abwass. Fisch. Flussbiol. **44**, 544-566. <Bayerische Landesanstalt Wasserforsch., Kaulbachstr. 37, 8000 Munich, Germany.) Environmental tolerance of cleansing agents and detergents.

**KUCZYNSKI, D. 1991.** Rotifers from Reconquista River, Argentina - the genus *Brachionus*, with descriptions of new species. *Hydrobiologia* **215**, 135-152. <Univ. Moron, Fac. Cienc. Exact. & Nat. Inst. Ecol. & Contam. Ambient., Cabildo 134, RA-1708 Moron, Argentina.> Twelve taxa of the genus *Brachionus* from Reconquista River, Argentina, are recorded with descriptions and figures. Several are new to Argentina, and three (*B. moronensis* nov. sp., *B. postcurvatus* nov. sp. and *B. urceolaris reductispinis* nov. subsp.) new to science. Morphological variability in the species of Brachionus identified is discussed. Biogeographical information and a key to the recorded species are also given.

**KUEHLE, K. & W. KLEINOW, 1990**. Glycosidases in *Brachionus plicatilis* (Rotifera). *Comp. Biochem. Physiol. B. Comp. Biochem.* **95**, 393-402. <Zool. Inst., Univ. Kln, Weyertal 119, D-5000 Kln 41, Germany.> Glycosidase activity was detected in homogenates of *B. plicatilis*. pH dependence of the glycosidase activities were determined. SDS-gel electrophoresis was used to localise glycosidase activity on separated proteins

**KUKHTA, A.E., S.M. SEMENOV & G.A. TONOYAN, 1990.** (Analysis of the seasonal population dynamics of moss-inhabiting rotifers and their sensitivity to medium acidification changes using a statistical model.) *Biol. Zh. Arm.* **43**, 387-393. <Lab. Monitoring Nat. Means Climate, Acad. Sci. USSR, Moscow, USSR.> Moss-inhabiting rotifers are regarded as suitable subjects for ecological monitoring.

**KULSHRESTHA, S.K., U.N. ADHOLIA, A. BHATNAGAR, A.A. KHAN & M. BAGHAIL, 1991.** Community structure of zooplankton at River Chambal near Nagda with reference tp industrial pollution. *Acta Hydrochim. Hydrobiol.* **19**, 181-191. <Motilal Vigyan Mahavidyalaya Bhopal, Dept Zool. Bhopal 462008, Madhya Pradesh, India.> 32 species of zooplankton were observed at pre-pollution sampling stations. The abundance, distribution, total population, group percentage and species diversity were correlated with pollution-indicating parameters. Species diversity decreased from the sampling station near a pre-effluent point to an effluent discharge channel and increased at a post-effluent discharge point revealing a slight recovery zone. *Keratella tropica* and *Kellicottia* sp. were identified as pollution tolerant taxa.

**LAMPERT, W. & K.O. ROTTHAUPT, 1991.** Alternating dynamics of rotifers and *Daphnia magna* in a shallow lake. *Arch. Hydrobiol.* **120**, 447-456. <Max-Planck-Inst. f. Limnol., Postfach 165, 2320 Ploen, Germany.> Highest rotifer densities occurred before daphniids appeared; rotifer populations later crashed when *Daphnia* became abundant. Exploitative competition is suggested as a mechanism explaining the inverse relationship, however mechanical interference may have increased in importance as the season progressed.

**LANDAU, R. 1991.** *Mirogrex terraesanctae* (Cyprinidae) of Lake Kinneret - biomass changes in relation to inflow - growth rate in relation to fish zooplankton interaction. *Hydrobiologia* **218**, 1-14. <52-22 Keren Hayesod St, IL-34970 Haifa, Israel.>

**LAXHUBER, R. & U. HARTMANN, 1988.** The influence of temperature on developmental stages of the cold stenothermal rotifer *Notholca caudata* Carlin. *Verh. Internat. Verein. Limnol.* **23**, 2016-2018. <Zool. Inst. Univ. Munchen, Seidlstr. 25, D-8000, Munchen 2, Germany.> Life spans and developmental stages decreased with increasing temperature, e.g. mean life span of *N. caudata* decreased from ca. 25 days @ 5 $^{o}$C to 7 days @ 20 $^{o}$C. *N. caudata* has an apparent temp. optimum around 10 $^{o}$C.

**LOPEZ, T., J. TOJA & N.A. GABELLONE, 1991.** Limnological comparison of two peridunar ponds in the Donana National Park, Spain. *Arch. Hydrobiol.* **120**, 357-378. <Dept Ecol., Fac. Biol., Univ. Sevilla, Aptdo 1095., 41080 Sevilla, Spain.> The zooplankton of two sodium chloride enriched ponds is included in this limnological study - *Brachionus plicatilis* and *Keratella quadrata* dominate with *Daphnia magna* and *Acanthocyclops robustus* in Santa Olalla, while copepods dominate in Dulce.

**LUBZENS, E., G. KOLODNY, B. PERRY, N. GALAI, R. SHESHINSKI & Y. WAX, 1990.** Factors affecting survivial of rotifers *Brachionus plicatilis* O.F. Mueller at 4 $^{o}$C. *Aquaculture* **91**, 23-48. <Israel Oceanogr. & Limnol. Res., Tel-Shikmona, P.O. Box 8030, Haifa 31080, Israel.> This paper proposes a new method for preservation of rotifers for periods extending to days or weeks. This would allow more flexibility in managing the supply and demand in a marine hatchery. For users lacking facilities for culturing rotifers, stored rotifers could be distributed from one main location.

**MACISAAC, H.J. & J.J. GILBERT, 1991.** Discrimination between exploitative and interference competition between Cladocera and *Keratella cochlearis*. *Ecology* **72**, 924-937. <Dept. Zool., Erindale College, Univ. Toronto, Mississauga L5L 1C4, Canada.> The small-bodied cladoceran *Ceriodaphnia dubia* suppressed *Keratella* through exploitative competition (EC), while larger *Daphnia* suppressed *Keratella* through interference competition (IC). EC, but not IC, is dependent on low food concentration. IC should favour large-bodied rotifer species; EC should favour rotifers with low food requirements, i.e. small-bodied.

**MACISAAC, H.J. & W.G. SPRULES, 1991.** Size-selective predation by Zebra mussels (*Dreissena polymorpha*) on Great Lakes zooplankton. (1991 ASLO Abstract). <Dept. of Zool., Erindale College, University of Toronto, Mississauga, Ont., Canada L5L 1C6.> Lab. and field experiments demonstrated that mussel predation rates on susceptible rotifers (e.g. *Keratella, Polyarthra, Trichocerca*) exceeded those of other Great Lakes invertebrate predators by more than an order of magnitude. Predation is likely to be the primary mechanism by which zebrra mussels suppress microzooplankton (<300 $\mu$m) in Lakes Erie and St Clair.

**MACKAY, W.P., S.J. LORING, T.M. FROST & W.G. WHITFORD, 1990.** Population dynamics of a playa community in the Chihuahuan Desert, New Mexico. *Southwest. Nat.* **35**, 393-402. <Dept Env. Sci., Lab. Env. Biol., Univ. Texas, El Paso, TX 79968, USA.> Describes population events following spring and late-summer flooding. Three genera of rotifers are mentioned (*Brachionus, Polyarthra* & *Pedalia* (=*Hexarthra*!)), with community dominants macroinvertebrates and cladocerans.



**MARINONE, M.C. & H.E. ZAGARESE, 1991.** A field and laboratory study on factors affecting polymorphism in the rotifer *Keratella tropica*. *Oecologia* **86**, 372-377. <Inst. Nacl. Investigacion Desarrollo Pesquero, Luis Maria Compos Igldo-8'O B, 1426 Buenos Aires, Argentina.> The biomass of planktonic crustaceans was depressed by larval fish predation. Associated with this depression, *K. tropica* underwent a striking reduction of caudal spines, the first record of rotifer morphological change as an indirect effect of fish predation. Morphological induction was directly related to concentration of crustaceans. Long spines were strong deterrents against small predators (*Acanthocylops robustus* copepodites), but were useless against large ones (females of the same species). The morphotypes of *K. tropica* obtained by experimental induction from a single clone encompass much of the worldwide variation of the species.

**MATVEEVA, L.K. 1991.** (Planktonic rotifers as indicators of trophic state). *Biol. Mosk. Ist. Prirod. Otd. Biol.* **96**, 54-62. <Severtsov Inst., Leninskii Pr. 33, Moscow 117071, USSR.> Indicative properties of 50 spp. are reviewed. Total rotifer density was found to be the most reliable estimator for mesotrophic L. Glubokoe.

**MAZZOLA, A. & M. ARCULEO, 1989.** Experience of larval rearing of *Sparus aurata* L. subjected to various diet (Pisces: Sparidae). *Nat. Sicil.* **13**, 111-122. <Ist. Zool., Via Archirafi 18, 90123 Palermo, Italy.> Larval and post-larval stage seabream (*Sparus aurata*) were subjected to various feeding regimes. The best results, in terms of growth and low mortality, were obtained when the ciliate *Euplotes* was introduced at the same time as the supply of concentrated *Chlamydomonas* culture, which substituted for thd rotifer *Brachionus plicatilis* in the first few days.

**MCTAVISH, A. M. SAWADA & H.E. ENESCO, 1990.** Nifedipine influences rotifer lifespan: studies on the calcium theory of aging. *Age* (Omaha) **13**, 65-71. As *Asplanchna brightwelli* ages, its cells increase calcium uptake. 1 $\mu$M nifedipine prevents this age-related increase

**MEEREN, T. VAN DER 1991.** Selective feeding and prediction of food consumption in turbot larvae (*Scophthalmus maximus* L.) reared on the rotifer *Brachionus plicatilis* and natural zooplankton. *Aquaculture* **93**, 35-56. <Inst. Mar. Res., Austevoll Aquacult. Res. Stn, N-5392 Storebo, Norway.>

**MENGESTOU, S., J. GREEN & C.H. FERNANDO, 1991.** Species composition, distribution and seasonal dynamics of Rotifera in a Rift Valley lake in Ethiopia (Lake Awasa). *Hydrobiologia* **209**, 203-214. <Addis Ababa Univ., Dept Biol., POB 1176 Addis Ababa, Ethiopia.> 40 rotifer species were recorded 1983-1987, with *Brachionus* and *Keratella* species numerically >50%. Densities were low (<50 ind. $l^{-1}$). Bacteriovory was indicated as a means of sustaining biomass, but competitive exclusion for food by nauplii and ciliates probably keeps rotifer abundance low.

**MILLAMENA, O.M., V.D. PENAFLORIDA & P.F. SUBOSA, 1990.** The macronutrient composition of natural food organisms mass cultured as larval feed for fish and prawns. *Isr. J. Aquacult. Bamidgeh* **42**, 77-83. <Southeast Asian Fisheries Devt Centre, Tigbauan, Lloilo 5021, Philippines.> 5 species of phytoplankton, *Artemia* nauplii and *Brachionus plicatilis* were analysed. The zooplankton generally had higher protein and fat content.

**MIRACLE, M.R., E. VICENTE, R.L. CROOME & P.A. TYLER, 1991.** Microbial microcosms of the chemocline of a meromictic lake in relation to changing levels of PAR. *Verh. Int. Verein. Limnol.* **24**, 1139-1144. <Universidad de Valencia, Depart. Ecol. y Depart. Microbiol.> The flow of the Gordon River, Tasmania, was slackened in 1986-87, permitting penetration of an estuarine salt wedge upstream to the vicinity of Lake Fidler, adjacent to the river. This has resulted in restoration of meromixis in the lake and the chemocline now lies higher in the water column than it had during previous river regulation. Microbial responses to the waxing and waning of meromixis are examined. The principle outcome is the return of *Scourfieldia caeca* and the microbial "*Chlorochromatium aggregatum*". Microzooplankton also exhibit zonation in the water

column. Nutritional factors are presumed to affect distribution. Further studies on the composition of the complex microcosm are being made.

**MITCHELL S A, 1991.** The growth rate and growth efficiency of *Streptocephalus macrourus* (Crustacea: Anostraca) cultured on microalgae. *Hydrobiologia* **212**, 1-10. <Water Res. Commisison, PO Box 824, Pretoria 0001, S. Afr.> The maximum daily growth rates (0.15-0.21) approximate the growth rates of cladoceran or rotifer cultures managed for maximal biomass production. *S. macrourus*' ability to withstand crowding enabled production from cultures (up to 91.8 mg dry mass 1-1 d-1, or 1241 mg wet mass l-1 d-1) to exceed production recorded from cladoceran or rotifer cultures. The anostracan is able to convert algae grown on livestock waste efficiently into anostracan biomass, and is able to give a very high daily production.

**ORTIZ-GALINDO J.L., E. MATUS-NIVON, R. RAMIREZ-SEVILLA & B. GONZALEZ-ACOSTA, 1990.** (Embryo larva and pre-juvenile of the Mexican soleid *Achirus mazatlanus* (Pisces: Soleidae).) *Rev. Biol. Trop.* **38**, 195-204. <Centro Interdiscipl. Cienc. Marinas, A.P. 592, La Paz, B.C.S., Mexico.> The early life history of the Mexican sole (*Achirus mazatlanus*) is described from eggs collected by plankton tows in two sites of Baja California Sur, Mexico. During the first 14 days, the larvae were feeding on the rotifer *Brachionus plicatilis* and later on *Artemia francisana* nauplii. Larval development is described.

**PACE, M.L., S.E.G. FINDLAY & D. LINTS, 1991.** Variance in zooplankton samples: evaluation of a predictive model. *Can. J. Fish. Aquat. Sci.* **48**, 146-151. <Inst. Ecosyst. Studies, Box AB, Millbrook, N.Y. 12545, U.S.A.> Mean-variance relationships for zooplankton samples (incl. copepods; cladocera and rotifers) were used to test a published model by comparing observed with predicted variance. The authors conclude that zooplankton mean-variance relationships are highly consistent and predictable for a variety of aquatic systems and levels of taxonomic organization.

**PAGANI, M., C. RICCI & A.M. BOLZERN, 1991.** Comparison of five strains of a parthenogenetic species, *Macrotrachela quadricornifera* (Rotifera, Bdelloidea). 2. Isoenzymatic patterns. *Hydrobiolologia* **211**, 157-163. <Univ. Milan, Depto Biol., Via Celoria 26, I-20122 Milan, Italy.> Electrophoresis (six enzymes) gave a relatively high degree of enzymatic polymorphism, with only 27% of alleles shared. Cluster analysis demonstrated 'moss' and 'water' populations. Differences between the five strains may result from phenotypic plasticity and real genetic divergence.

**PAGGI, S.J. DE 1990.** Ecological and biogeographical remarks on the rotifer fauna of Argentina. *Rev. Hydrobiol. Trop.* **23**, 297-312. <Inst. Nac. Limnol., Macia 1933, 3016 S. Tome, Argentina.> 279 taxa including 45 genera of the Superorder Monogononta are recorded from Argentina. *Lecane*, *Trichocerca* and *Brachionus* contributed the largest number of species. The northern part of Argentina belongs to the Guiana-Brazilian subregion and includes amazonian elements and a large number of species of *Brachionus*, some of them endemics from Neotropic. The Andean-Patagonian subregion is characterized by some endemic taxa, principally from the *Keratella* genus (*K. ona, K. yamana, K. kostei*) and by the common occurrence of *Notholca* mainly along the Andean ranges.

**PANKHURST, P.M., J.C. MONTGOMERY & N.W. PANKHURST, 1991.** Growth, development and behaviour of artificially reared larval *Pagrus auratus* (Bloch and Schneider, 1801) (Sparidae). *Aust. J. Mar. Freshw. Res.* **42**, 391-398. <Univ. Auckland, Leigh Mar. Lab., Auckland, N.Z.> Larvae were cultured for periods of up to 1 month on a diet of marine rotifers, *Brachionus plicatilis*. By Days 4-5, the larvae were able to maintain a horizontal swimming mode and actively search for and attack prey. Growth was retarded during the transition from endogenous to exogenous nutrition and then increased, probably as feeding proficiency improved with experience.



**PENCZAK, T. & C. LASSO, 1991.** Problems of estimating population parameters and produciton of fish in a tropical rain forest stream, north Venezuela. *Hydrobiologia* **215**, 121-133. <Univ. Lodz, Dept Ecol. & Vert. Zool, Banacha 12-16, PL-90237 Lodz, Poland.>

**RAFIUDDIN, A.S. & K. NEELAKANTAN, 1990.** Production of rotifer *Brachionus plicatilis* Muller fed with different cell densities of microalgae, *Chlorogibba trochisciaeformis* Geiter. *Proc. Ind. Acad. Sci. Anim. Sci.* **99**, 519-524. <Dept Mar. Biol., PG Centre, Karnatak Univ., Kodibag, Karwar 581303, India.>

**RAO, T.R. & S.S.S. SARMA, 1990.** Interaction of *Chlorella* density and DDT concentration on the population synamics of the rotifer *Brachionus patulus* (Rotifera). *Indian J. Environ. Health* **32**, 157-162. <Dept Zool., Univ. Delhi, Delhi-110 007, India.> Food level and DDT concentration had a significant effect on the intrinsic rate of increase and the carrying capacity. At low food concentation under the tested DDT levels, rotifer populations completely declined in <10 days.

**RATAJAC, R. & S.T. PETKOVSKI, 1990.** (On the presence of *Moina salina* Daday, 1888 emend. Negrea 1984 in the inland saline waters of northeastern Yugoslavia.) *Mitt. Hamb. Zool. Mus. Inst.* **87**, 247-260. <Inst. Biol., Ilije Djuricica 6, 21000 Novi Sad, Jugoslavia.> *Brachionus plicatilis* is included in the plankton fauna of these alkaline/saline waters.

**REINERTSEN, H., A. JENSEN, J.I. KOKSVIK, A. LANGELAND & Y. OLSEN, 1990.** Effects of fish removal on the limnetic ecosystem of a eutrophic lake. *Can. J. Fish. Aquat. Sci.* **47**, 166-173. <SINTEF, Applied Chem Divn, Aquac. Group, N.7034 Trondheim, Norway.> Removal of fish by rotenone treatment of Lake Haugatjern in 1980 resulted in a 30% drop in total phosphorus concentration, a fourfold decrease in algal biomass, a change in algal species composition, almost total disappearance of rotifer populations and increase in daphnids.

**RICCI, C. 1991.** Comparison of five strains of a parthenogenetic species, *Macrotrachela quadricornifera* (Rotifera, Bdelloidea). 1. Life history traits. *Hydrobiologia* **211**, 147-155. <Univ. Turin, Depto Biol. Anim., Via Accad. Albertina 17, I-10124 Turin, Italy.> The strains differed in response to food types, temperatures and life history traits, reflecting adaptation to different environmental conditions faced by the strains in nature.

**RICHARDSON, W.B. 1991.** Seasonal dynamics, benthic habitat use and drift of zooplankton in a small stream in southern Oklahoma, USA. *Can. J. Zool* **69**, 748-756. <Savannah River Ecol. Lab., Drawer E, Aiken, S.C. 29801, USA> Variation in densities of cyclopoid copepods and rotifers were best predicted by the product of pool retention time and water temperature. Microcrustacea and rotifers were imported into the pool during flooding and exported during low flow periods in the summer. All microcrustacean and rotifers commonly occurring in the pool were associated with benthic and (or) littoral habitats. This habitat association is probably the primary mechanism for resisting downstream movement.

**ROMO, S. 1990.** Seasonal zooplankton patterns in a shallow oligotrophic lake, Loch Rusky, Scotland, U.K. *Ann. Limnol.* **26**, 11-18. <Dept. Ecol., Fac. Biol., Univ. Valencia, 46100 Burjasot, Valencia, Spain.> Rotifers dominated the zooplankton for most of the year (11 of 15 zooplankton taxa). Patterns are attributed to the faster rate of rotifer reproduction, their higher grazing efficiency under oligotrophic conditions, and size-selective rpedation by fish.

**ROSS, P.E., L.C. BURNETT, C. KERMODE & M. TIMME, 1990.** Miniaturizing a toxicity test battery for screening contaminated sediments. 17th Ann. Aquatic Toxicity Workshop, Vancouver, BC, Canada, Nov. 5-7, 1990. *Can. Tech. Rep. Fish. Aquat. Sci.* **1774**, 331-335. <Ill. Natl Hist. Surv., 607 E. Peabody Dr., Champaihn, Ill. 61820-6970, USA.>

**ROTHHAUPT, K.O. 1991.** The influence of toxic and filamentous blue-green algae on feeding and population growth of the rotifer *Brachionus rubens*. *Int. Rev. ges. hydrobiol.* **76**, 67-72. <Max Planck Inst. Limnol., Postfach 165-2320, Plon, Germany.> A toxic strain of *Microcystis aeruginosa* was ingested, but increased mortality rate. *Cylindrospermopsis raciborskii* was not ingested, but interfered with feeding and depressed population growth rate. *Anabaena flos-aquae* was ingested at a moderate rate and was utilized.

**ROTTMANN, R.W., J.V. SHIREMAN & E.P. LINCOLN, 1991.** Comparison of three live foods and two dry diets for intensive culture of grass carp and bighead carp larvae. *Aquaculture* **96**, 269-280. <Dept Fish. Aquacult., Inst. Food & Agric. Sci., Univ. Fla., Gainesville, FLA. 32606, U.S.A.>

**RUYTER VAN STEVENINCK, E.D. DE , W. ADMIRAAL & B. VAN ZANTEN, 1990.** Changes in plankton communities in reGulated reaches of the lower River Rhine. *Regul. Rivers Res. & Management* **5**, 67-76. <Natl Inst. Publ. Health Environ. Protection, P.O. box 1, NL-3720 Ba Bilthoven, Netherlands.> Fortnightly water samples were taken from the lower Rhine at the German-Dutch border during 1987. Suspensoids, bacteria and phytoplankton decreased, rotifers, crustaceans and mollscan larvae increased. Conditions favour development of a true plankton community.

**SARMA, S.S.S. & T.R. RAO, 1990.** Population dynamics of *Brachionus patulus* Muller (Rotifera) in relation to food and temperature. *Proc. Indian Acad. Sci. Anim Sci.* **99**, 335-343. <Madurai Kamaraj Univ., Sch. Biol. Sci., Dept Anim. Physiol., Madurai 625021, Tamil Nadu, India.> Seasonal variations in abundance of *B. patulus* are explained in terms of the observed food-temperature effects on the survival and reproduction of the laboratory population.

**SARMA, S.S.S. & T.R. RAO, 1991.** The combined effects of food and temperature on the life history parameters of *Brachionus patulus* Muller (Rotifera). *Int. Rev. ges. Hydrobiol.* **76**, 225-239. <Address above.>

**SCHMID-ARAYA, J.M. 1991.** Distributional aspects of Rotifera in Central and South Chile. *Arch. Hydrobiol.* **120**, 481-493. <See **ARAYA** for address.> 115 taxa of rotifers are recorded from 29 Chilean lakes. Low taxonomic associations between lakes imply a relatively specific rotifer fauna for each lake.

**SCHMID-ARAYA, J.M. 1991.** The effect of food concentration on the life histories of *Brachionus plicatilis* (O.F.M.) and *Encentrum linnhei* Scott. *Arch. Hydrobiol.* **121**, 87-102. <Address above> *E. linnhei* survived and produced eggs at a lowest food concentration of $5x10^3$ cells $ml^{-1}$, *B. plicatilis* at $2x10^3$ cells $ml^{-1}$. In both species, maximal egg production was the result of a minimum interval between egg laying.

**SCHRAM, M.D., A.V. BROWN & D.C. JACKSON, 1990.** Diel and seasonal drift of zooplankton in a headwater stream. *Am. Midl. Nat.* **123**, 135-143. <Dept Biol Sci., Murray State Univ., Murray, Kentucky 42071, U.S.A.> Significantly mroe zooplankton were collected at night during June and January sampling periods from a third order reach of the Illinois River, Arkansas. Rotifers included bdelloids, *Euchlanis dilatata* and *Keratella cochlearis*, with peaks between 2300 and 0100 hrs..

**SEAMAN, M.T., P.J. ASHTON & W.D. WILLIAMS, 1991.** Inland salt waters of southern Africa. *Hydrobiologia* **210**, 75-92. <Dept Zool. Entomol., Univ. Orange Free State, Bloemdontein, South Africa.> Review of inland salt lakes, includes brief description of macrophytes, fauna. *Brachionus plicatilis* is encountered frequently.

**SELLNER, K.G., R.V. LACOUTURE, S.J. CIBIK, A. BRINKLEY & S.G. BROWMLEE, 1991.** Importance of a winter dinoflagellate microflagellate bloom in the Patuxent River (Maryland, USA) estuary. *Est. Coastal Shelf Sci.* **32**, 27-42. A dense bloom of the dinoflagellate *Katodinium* (Dec. 1988 - Feb. 1989) was heavily grazed by zooplankton, e.g. *Synchaeta baltica*, *Eurytemora affinis*, which consumed 67% of the bloom biomass in Feb. Such blooms could be the primary source of carbon to the system in winter.



**SETALA, H. & V. HUHTA, 1990.** Evaluation of the soil fauna impact on decomposition in a simulated coniferous forest soil. *Biol. Fertil. Soils* **10**, 163-169. <Dept Biol., Univ. Jyvaskyla, SF-40100 Jyvaskyla, Finland.> 2-yr lab. experiments simuilated the complexity of of a coniferous forest floor. Dense populations of microbial feeders (nematodes, rotifers and protozoans) are reported.

**SHIEL, R.J. 1990.** Zooplankton. *In* N. Mackay & D. Eastburn (Eds), *The Murray*. Murray-Darling Basin Commission, Canberra, 275-284. <MDFRC, P.O. Box 921, Albury NSW 2640, Australia.> The high proportion of endemic, highly tolerant species in the Murray-Darling Basin zooplankton suggests a long evolutionary history in an unpredictable, flood-drought ecosystem. >500 species of rotifers are known from Murray-Darling waters, with distinct communities in reservoirs, billabongs and rivers. Each of these communities is reviewed briefly. Finally, a warning is given of the inapplicability of northern hemisphere tolerance data to the zooplankton of the Murray-Darling system.

**SHIEL, R.J. 1990.** Microzooplankton grazing and planktonic community structure. AWRAC Res. Proj. final report 85/96. 24 pp. <Address above.> Zooplankton community data collected from Lake Hume and Lake Mulwala were compared with data from Mt Bold Reservoir, SA. Communities were found to be highly diverse with a much greater microzooplanktonic species richness than recorded for comparable waters in South Australia. Location, distribution and abundance information is recorded for each of the major systematic groups of Protozoa, Rotifera, Cladocera, Copepoda and other invertebrates.

**SHIEL, R.J. 1990.** Habitat partitioning by billabong microfauna. 29th Aust. Soc. Limnol. Congr., 20-22 Apr. 1990, Jabiru NT. Programme and abstracts. Alligator Rivers Region Research Institute, Jabiru NT, 1990: 32. <Address above.> Abstract only. In 1988-89, more than 200 species of Rotifera and Microcrustacea were recorded from weekly plankton samples from a billabong near Albury NSW. Marked contrasts were apparent between the communities of adjacent billabongs, with different species dominants in common genera. Daily sampling demonstrated rapid changes in community structure. Pattern analysis was used to identify these communities and interpret intra- and inter-site heterogeneity at the species level.

**SHIEL, R.J. & W.D. WILLIAMS, 1990.** Species richness in tropical fresh waters of Australia. *Hydrobiologia* **202**, 175-183. <Address above.> Review of biological diversity in tropical Australian waters. Studies of zooplankton in general and rotifers in particular in Australia do not conform to the general ecological expectation that species richness is greater at low latitudes (the tropics) than at higher latitudes. The converse appears to be the case for these groups.

**SIERSZEN, M.E. 1990.** Variable selectivity and the role of nutritional quality in food selection by a planktonic rotifer. *Oikos* **59**, 241-247. <Env. Res. Lab., US EPA, Duluth, MINN. 55804, USA.> Study indicated that selection by *Keratella taurocephala* does not simply maximize the intake of food items that yield high reproduction. Selectivity is a complex, dynamic process, one function of which may be the exploitation of locally or seasonally abundant foods.

**SKET, B., J. BOLE, A. BENOVIC, A. BRACELJ, J. BRGLEZ, M. CUCEK, B. CURCIC, A. JAKLIN, G. KARAMAN *et al.* 1991.** Richness and state of knowledge of the fauna of Yugoslavia: lower invertebrates (Metazoa Invertebrata ex. Insecta).. *Biol. Vestn.* **39**, 37-52. <Biol. Dept., Univ., YU-61000 Ljubljana, Askerceva 12, Yugoslavia.>

**SMET, W.H. DE 1990.** Planktonic and periphytic Monogonont Rotifera from the Arctic. *Belg. J. Zool.* **120** (Suppl. 1), 25-26. <U.A., Lab. Plant Dierk. algemene Biol., Groenenborgerlaan 171, B-2020 Antwerpen, Belgium.> *In* Abstracts, 1st Belgian Congress of Zoology, Antwerp, Belgium, Nov. 16-17, 1990.

**SMET, W.H. DE 1990.** Notes on the monogonont rotifers from submerged mosses collected on Hopen (Svalbard), Arctic Ocean. *Fauna Norv.* Ser A **11**, 1-8. <Address above.> Fourteen rotifer taxa, six new to Svalbard, were identified.

**SMET, W.H. DE & J.M. BAFORT, 1990 (1991).** Notes on Rotifera and Tardigrada from running waters on Mount Kenya. *Natuurwet. Tijdschr.* **72**, 103-108. <Address above.>

**SMITH, B.B. & C.B. REIF, 1990.** The plankton of Harveys Lake, Pennsylvania, USA, 1984 through 1988. *J. PA Acad. Sci.* **64**, 66-72. <3520 Windsor Dr., Nacogdoches, TX 75961, USA.> Reports physicochemical changes and plankton composition over 5 years. 5 taxa of rotifers, one calanoid, one cyclopoid and nine cladocerans were identified.

**SMITH, A.D. 1991.** Effects of *Microcystis aeruginosa* on competitive interactions between *Daphnia* and *Keratella*. (Abstract from 1991 ASLO meeting). <Dartmouth College, Hanover, NH 03755, USA> In lab. experiments, suppression of *Daphnia pulex* by *Microcystis* allowed competitively inferior *Keratella cochlearis* to dominate. This suggests that the presence of *Microcystis* may alter natural zooplankton community structure. The competitive outcome will be dependent on initial population sizes as well as on Microcystis concentration.

**SNELL T.W. & T.J. VIGERSTAD, 1990.** Using dose-response data from the rotifer: acute toxicity test for brackish and marine environments. 17th Ann. Aquat. Tox. Workshop, Vancouver, B.C., Canada, Nov. 5-7, 1990. *Can. Tech. Rept. Fish. Aquat. Sci.* **1774**, 341-346. <Div. Sci., Univ. Tampa, Tampa, FL. 33606, USA.>

**SNELL, T.W., B.D. MOFFAT, C. JANSSEN & G. PERSOONE, 1991.** Acute toxicity tests using rotifers. III. Effects of temperature, strain and exposure time on the sensitivity of *Brachionus plicatilis*. *Environ. Toxicol. Water Qual.* **6**, 63-76. <Address above.> The toxicity of 21 chemicals to the estuarine rotifer *Brachionus plicatilis* was investigated. Toxicity was chemical specific, with LC50s ranging from 0.061 mg. $L^{-1}$ for mercury to 598 mg.$L^{-1}$ for 2,4-dichlorophenoxyacetic acid. The age of rotifer cysts stored up to 27 months had no effect on the sensitivity of test animals, but significant differences in sensitivity were detected among rotifer strains. Test temperatures of 25, 30, and 35 oC generally yielded lower LC50s than at 20 oC. LC50s decreased by 80-90% for cadmium and pentachlorophenol when toxicant exposure time was incrased from 24 to 72 h. 72 h is the longest acute test possible without feeding. A comparison of the sensitivity of the rotifer test to that of sea urchin (Arabacia punctulata) early embryo, sea urchin sperm cell, Microtox, and Mysidopsis bahia tests revealed comparability for several compounds. However, no species is consistently the most sensitive to all compounds.

**SNELL T.W., B.D. MOFFAT, C. JANSSEN & G.C. PERSOONE, 1991.** Acute toxicity tests using rotifers. IV. Effects of cyst age, temperature and salinity on the sensitivity of *Brachionus calyciflorus*. *Ecotoxicol. Environ.* SAF **21**, 308-317. <Address above.> Acute toxicity of 28 compounds is described with 24-hr LC50's. Cyst age from 0 to 18 months had no effect on the sensitivity of neonates to reference toxicants. High and low temperatures increased rotifer sensitivity to reference toxicants. *B. calyciflorus* is preferred over *B. plicatilis* for toxicity tests in salinities up to 5 ppt because it is consistently more sensitive.

**SOLER, A., J. SAEZ, M. LLORENS, I. MARTINEZ, F. TORRELLA & L.M. BERNA, 1991.** Changes in physico-chemical parameters and photosynthetic microorganisms in a deep wastewater self-depuration lagoon. *Wat. Res.* **25**, 689-695. <Univ. Murcia, Dept Chem. Engn., E-30071 Murcia, Spain.> A first bloom of Chlamydomonas sp. dominated the system during the period of heavy organic contamination. This algal species disappeared without noticeable proliferation of the zooplankton grazer community. A second phase of water depuration was characterized by proliferation of small chlorophytes, mainly of the genera Golenkinia, Chlorella and Scenedesmus. Rotifers and ciliates grazed on this second bloom giving rise to a third one, dominated by a small cyanophyte (0.5-1.5 m) of the genus Synechococcus. The cyanophyte population was controlled by rotifers, copepods and cladocerans up to the end of the study. The



detection of all these easily identifiable organisms has proved to be very useful as bioindicators of the water depuration stage in deep lagoons of the area.

**SOROKIN, Y.I. 1990.** (Estimation of plankton mortality in turbines of high-pressure hydroelectric plants.) *Zh. Obshch. Biol.* **51**, 682-687. <South Dep., P.P. Shirshov Inst., Acad. Sci. USSR, Gelendzhik, USSR.> Mortality of 83-99% was observed in meso-, micro- and phytoplankton, with greatest mortalities in Cladocera and small rotifers.

**SOTO, D. & S.H. HURLBERT, 1991.** Short term experiments on calanoid-cyclopoid-phytoplankton interactions. *Hydrobiologia* **215**, 83-110. <Univ. Austral Chile, Fac. Pesq. & Oceanogr., Campus Pelluco, Casilla 1327, Puerto Montt, Chile.>

**STEMBERGER, R.S. 1990.** *Keratella armadura* new species (Rotifera: Brachionidae), a new rotifer from a Michigan, U.S.A., bog lake. *Can. J. Zool.* **68**, 2306-2309. <Dept Biol. Sci., Dartmouth College, Hanover, NH 03755, USA.> *K armadura* has a long recurved caudal spine, and is distinctive from known congeners. It occurred in spring and summer. The author suggests that if restricted distribution is common among rotifers, many undescribed species still exist in Michigan and North America.

**STOUT, V.M. 1991.** Year to year fluctuations in zooplankton in a small mountain lake. *Verh. Internat. Verein. Limnol.* **24**, 1145-1148. <Dept Zoology, Univ. Canterbury, Christchurch, N.Z.> Describes seasonal variations in rotifer and microcrustacean species and abundance in Lake Grasmere, N.Z. Rotifers peaked in Oct./Nov., cladocerans in December (summer), followed by a short clearwater phase. A variable mixture of rotifers and crustacean species persisted through summer.

**SUDZUKI M. 1990.** Summer Rotifera from southwest islands of Japan. *Zool. Sci.* (Tokyo) **7**, 1185. <Biol. Lab., Nihon Daigaku Univ., Omiya, Saitama, Japan.> Abstract, 61st Ann. Meeting of the Zool. Soc., Niigata, Japan, Oct. 3-5 1990. New species and new records of rotifers from Japan (*Brachionus, Anuraeopsis, Lecane, Monostyla, Testudinella, Cephalodella*.)

**TANAKA, Y. 1991.** Nitrogen budget for the rotifer *Brachionus plicatilis*. *J. World. Aquacult. Soc.* **22**, 57-64. <Fac. Agric., Kagawa Univ., Mikicho, Kagawa 761-07, Japan.>

**TATICCHI, M.I. 1988.** Notes to the knowledge of Lake Piediluco, Italy: the zooplankton. *Riv. Idrobiol.* **27**, 685-696. <Ist. Idrobiol. Pesc., Univ. Perugia, Perugia, Italy. Low densities of zooplankton are reported, with rotifers ca. 25% of the community Oct. 1979-Sept. 1980. Species present are regarded as indicators of good water quality - oligo-Pmesosaprobic.

**TAYLOR, B.E. & D.L. MAHONEY, 1990.** Zooplankton in Rainbow Bay, a South Carolina, U.S.A. Bay pond: population dynamics in a temporary pond. *Freshw. Biol.* **24**, 597-612. <Savannah R. Ecol. Lab., Drawer E, Aiken, S.C. 29801, USA.> Zooplankton species succession was attributed to resting egg emergence from dry sediments, with food limitation operating after emergence. 12+ taxa of rotifers were recorded from the temporary pond.

**TAYLOR H L, 1991.** Using the Taylor Microcompressor.. *Microscope* **39**, 35-41. <1812 Wood Hollow Crt, Sarasota, FL 34235, USA> Use and maintenance of the microcompressor are outlined. The instrument is useful in the examination and photomicrography of living forms, such as rotifers and their trophi.

**TAYLOR, W.D. & D.R.S. LEAN, 1991.** Phosphorus pool sizes and fluxes in the epilimnion of a mesotrophic lake. *Can. J. Fish. Aquat. Sci.* **48**, 1293-1301. <Univ. Waterloo, Dept Biol. Waterloo N2L 3G1, Ont. Canada.> Some microplankton were shown to liberate dissolved phosphate and organic phosphorus when lake water is filtered. The phosphorus content and turnover of major ciliate, rotifer, and crustacean zooplankton were determined and the importance of these compartments as phosphorus sources and sinks was included in an epilimnetic model.

**TEREK, J. 1990.** Net zooplankton of hydromelioration canals and its relation to selected ecological factors. *Biologia* (Bratislava) **45**, 801-814. <Slovak Acad. Sci., Biol.-Ecol. Sci., Kukorelliho 10, 040 00 Kosice, Czechoslovakia.> 58 taxa of rotifers were observed in the zooplankton over a two year study 1985-87.

**TOLEDO, J.D. & H. KUROKURA, 1990.** Cryopreservation of the euryhaline rotifer *Brachionus plicatilis* embryos. *Aquaculture* **91**, 385-394. <Dept Aquaculture, Southeast Asian Fish. Devt Centre, P.O. Box 256, Iloilo City, Philippines.> Reports post-thaw survival rates of 53-63% for embryos stored 3-30 days in liquid nitrogen. Survivors fed actively on marine *Chlorella* and started to lay eggs 2-3 days after thawing.

**TURNER, J.T. & P.A. TESTER, 1991.** Bacterivory by metazoan microzooplankton - marine rotifers and copepod nauplii. (1991 ASLO Abstract). <Southeastern Massachusetts Univ., Dartmouth, MA 02747, USA and National Marine Fisheries Service, Beaufort, NC 28516, USA respectively>.

**TURNER, P.N. 1990.** Some rotifers from coastal lakes of Brazil, with description of a new rotifer, *Lepadella* (*Xenolepadella*) *curvicaudata* n.sp. *Hydrobiologia* **208**, 141-152. <12900 Barnwell Pl., Upper Marlboro, MD 20772, U.S.A.>. Describes new records of rare rotifers and one new species from coastal lakes near Rio de Janeiro.

**TURNER, P.N. 1990.** Some interstitial Rotifera from a Florida, USA beach. *Trans. Am. Microsc. Soc.* **109,** 417-421. <Address above.> Reports eleven taxa from sand and mud of Florida beaches. Three are considered psammobionts.

**UNGER, P.A. & W.M. LEWIS Jr, 1991.** Population ecology of a pelagic fish *Xenomelanirus venezuelae* (Atherinidae) in Lake Valencia, Venezuela. *Ecology* **72**, 440-456. <Intermedics Orthopedics Inc., 1300-C E. Anderson Lane, Austin, TX, USA.> This zooplanktivorous fish has a strong ontogenetic shift in diet from rotifers in early development to copepods and *Chaoborus* in later development. It consumed only 3.6% of zooplankton production because it was never sufficiently abundant to exploit its food resources fully. There was a trophic bottleneck, apparently resulting from larval mortality.

**VASQUEZ, E., W. KOSTE & M.-L. MEDINA, 1991.** Variaciones morfologicas del rotifero *Keratella americana* (Carlin, 1943) de una laguna de inundacion del Rio Orinoco, Venezuela. *Rev. Hydrobiol. trop.* **24**, 83-90. <Fundacion La Salle de Cienc. Nat., Apdo. 551, San Felix, Est. Bolivar, Venezuela>. A range of forms of *K. americana* from Venezuelan flooplain waters is described. The authors propose a correlation between posterior spine development and water level: at high water level (low food availability), long spines are advantageous, while at low water level (high food availability) the converse applies.

**VRIES, D.R. DE & R.A. STEIN, 1991.** Comparison of three zooplankton samplers: a taxon-specific assessment. *J. Plankt. Res.* **13**, 53-60. <Dept Fisheries Allies Aquacultures, Auburn University, Auburn. Ala., 36849 U.S.A.> Comparison of vertical net, Schindler-Patalas trap and tube sampler indicated that the latter generally was more efficient (with exceptions for rotifers and *Diaphanosoma*); tube samplers are a time-saving alternative for zooplankton sampling in shallow lakes and weedy littoral zones.

**VYAS, N. & H.S. NAMA, 1991.** Pollution ecology of reshwater reservoir at Jodhpur, India, with special reference to microorganisms. *Geobios* **18**, 33-37. <Dept Zool., Univ. Jodhpur, Jodhpur-342 001, INDIA.> Rotifers were present in the biotic community.

**WALFORD, J., T.M. LIM & T.J. LAM, 1991.** Replacing live foods with microencapsulated diets in the rearing of Sea Bass (*Lates calcifer*) larvae: do the larvae ingest and digest protein-membrane microcapsules? *Aquaculture* **92**, 225-236. <Dept Zool., Nat. Univ. Singapore, Kent Ridge, Singapore.> Sea Bass were fed microcapsules alone or in combination with rotifers. Those fed capsules alone died by day 10 post-hatching. Diets including rotifers produced a 2.4% survival rate. In the presence of rotifers the protein wall of the microcapsules was degraded in the larval intestine.



**WEISSE, T. 1991.** The annual cycle of heterotrophic freshwater nanoflagellates: role of bottom-up versus top-down control. *J. Plankt. Res.* **13**, 167-186. <Limnol. Inst., Univ. Konstanz, PO Box 5560, D-7750 Konstanz, Germany.> Grazing by ciliates, rotifers and daphnids was more important in controlling cycles of nanoflagellates than was bottom-up control by bacterial food supply.

**ZAGARESE, H.E., 1990.** Effect of selective planktivory by fry of *Rhamdia sapo* (Pimelodidae, Pisces) on zooplankton community structure. *Freshw. Biol.* **24,** 557-562. <Inst. Nac. Invest. y Desarrollo Pesquero, Sante Fe 1548, Piso 7, 1060 Buenos Aires, Argentina.> *R. sapo* selectively preyed on *Acanthocyclops robustus*, indirectly enhancing populations of rotifers, the biomass of which increased in tanks with fish.

**ZAGARESE, H.E., 1991.** Planktivory by larval *Odontesthes bonariensis* (Atherinidae: Pisces) and its effects on zooplankton community structure. *J. Plankt. Res.* **13**, 549-560. <Dept Biol. Lehigh Univ., Williams Hall 31, Bethlehem, PA 18015-3189 USA.> 3-month study of antherinid predation showed consumption of small prey. Constraints were gape size and gastric inefficiency. Prey community showed symptoms similar to size-selective predation upon largest individuals, with extinction of largest zooplankton species, increase in rotifer biomass, etc. Ecological implications of this result are discussed.

**Top left:** Site of the VIth Rotifer Symposium, monastery of Sant Esteve, Banyoles. **Left centre:** Terry Snell and Charles King toasting (yet again) good fellowship. **Lower left:** Paella at the mid conference lunch, with Bob Wallace (right) attempting to identify the invertebrates. **Top right:** T. Snell trying extremely hard not to enjoy himself at the cultural evening. **Lower right**: Four-score years and still working - the late Dr Agnes Ruttner-Kolisko and Dr Walter Koste on the shore of Lake Banyoles.