RIJKSINSTITUUT VOOR VOLKSGEZONDHEID EN MILIEUHYGIENE
BILTHOVEN

Report no. 734201001

DOCUMENTATION OF ZOOPLANKTON SPECIES IN THE LOWER RIVER RHINE

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[1] Waterquality, Environment & Limnology, Bilthoven

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INTRODUCTION

In the framework of the Rhine Action Programme, the International Rhine Commission agreed on conducting regular biological inventories of the River Rhine to be held at five-year intervals, starting in 1990. The result is an ecological monitoring programme for plankton, fish fauna and benthic macrofauna prepared by research institutes of the Rhine countries. A harmonization of methods seemed impera tive and for this reason a group of experts on plankton proposed a checklist of plankton species.

This documentation, which gives an overview of zooplankton species commonly found in the River Rhine, will support a proper identification of River Rhine zooplankton. This working document is meant to be used when counting zooplankton samples. It should be stressed, however, that it is not meant to replace the identification documentation. For a selected group of zooplankton species, one or more photographs are shown as well as some relevant information on ecology, feeding behaviour, etc. Where essential details required for proper identification could not be shown clearly on photographs, we refer per species to the relevant literature for more detailed information.

At this stage only lowland species are included. Hence, some relevant species, e.g. those typical of the Upper Rhine might be missing. Furthermore, it has not been possible to describe the distribution of species along the River Rhine to date; only for the lowland reach have some comments been given.

Despite these limitations, this documentation could be a first step towards harmonization within the international biomonitoring programme of zooplankton in the River Rhine.

TAXONOMY OF ZOOPLANKTON SPECIES IN THE RIVER RHINE

Protozoa (after Kudo, 1954)

- _subclass Rhizopoda
  - _order Testacea
  - _order Foraminifera
- _class Ciliata
  - _order Peritricha
- _class Suctoria

Aschelminthes

- _class Rotatoria (after Koste, 1978)
  - _order Ploimida
    - _family Brachionidae
    - _family Euchlanidae
    - _family Trichotridae
    - _family Colurellidae
    - _family Lecanidae
    - _family Synchaetidae
    - _family Asplanchnidae
  - _order Gnesiotrocha
    - -family Testudinellidae

Arthropoda

- _class Crustacea
  - _subclass Phyllopoda (after Flößner, 1972)
    - _suborder Cladocera
      - _family Sididae
      - _family Daphniidae
      - _family Bosminidae
      - _family Macrothricidae
      - _family Chydoridae
      - _family Polyphemidae
    - _order Copepoda (after Kiefer, 1987)
      - _suborder Calanoida
      - _suborder Cyclopoida
      - _suborder Harpacticoida

CHECKLIST OF ZOOPLANKTON SPECIES IN THE RIVER RHINE

RHIZOPODA

Arcella sp.
Centropyxis aculeata
Centropyxis sp.
Cyphoderia ampulla

CILIATA

Ciliata unidentified
Codonella lacustris
Suctoria sp.
Vorticella sp.
Zoothamnium sp.

ROTATORIA

Asplanchna priodonta
Brachionus angularis
Brachionus calyciflorus
Brachionus leydigi
Brachionus leydigi f. tridentatus
Brachionus quadridentatus
Brachionus quadridentatus f. cluniorbicularis
Brachionus urceolaris
Brachionus sp.
Dipleuchlanis propatula
Euchlanis dilatata
Filinia longiseta
Kellicottia longispina
Keratella cochlearis
Keratella cruciformis
Keratella quadrata
Lecane bulla
Lecane closterocerca
Lecane hamata
Lecane luna
Lepadella ovalis
Notholca acuminata
Notholca squamula
Notommata sp.
Polyarthra sp.
Trichotria tetractis

CRUSTACEA

Cladocera

Alona sp.
Bosmina coregoni
Bosmina longirostris
Bosmina sp.
Ceriodaphnia pulchella
Chydorus sphaericus
Daphnia cucullata
Daphnia galeata
Daphnia longispina
Daphnia sp.
Diaphanosoma brachyurum
Disparalona rostrata
Eurycercus lamellatus
Macrothrix laticornis

Copepoda

Cyclops sp.
Eucyclops macruroides
Eurytemora affinis
Eurytemora lacustris
Eurytemora sp.
Mesocyclops leuckarti

Dreissena larvae

RHIZOPODA

RHIZOPODA

GENERAL

Rhizopoda are armoured Protozoans. Most of the species are living attached to silt particles or on substrates.

Arcella sp.

RHIZOPODA

TESTACEA

ARCELLIDAE

morphology
round brown chitinous
carapace
round central opening
dimensions: 30-100 µm

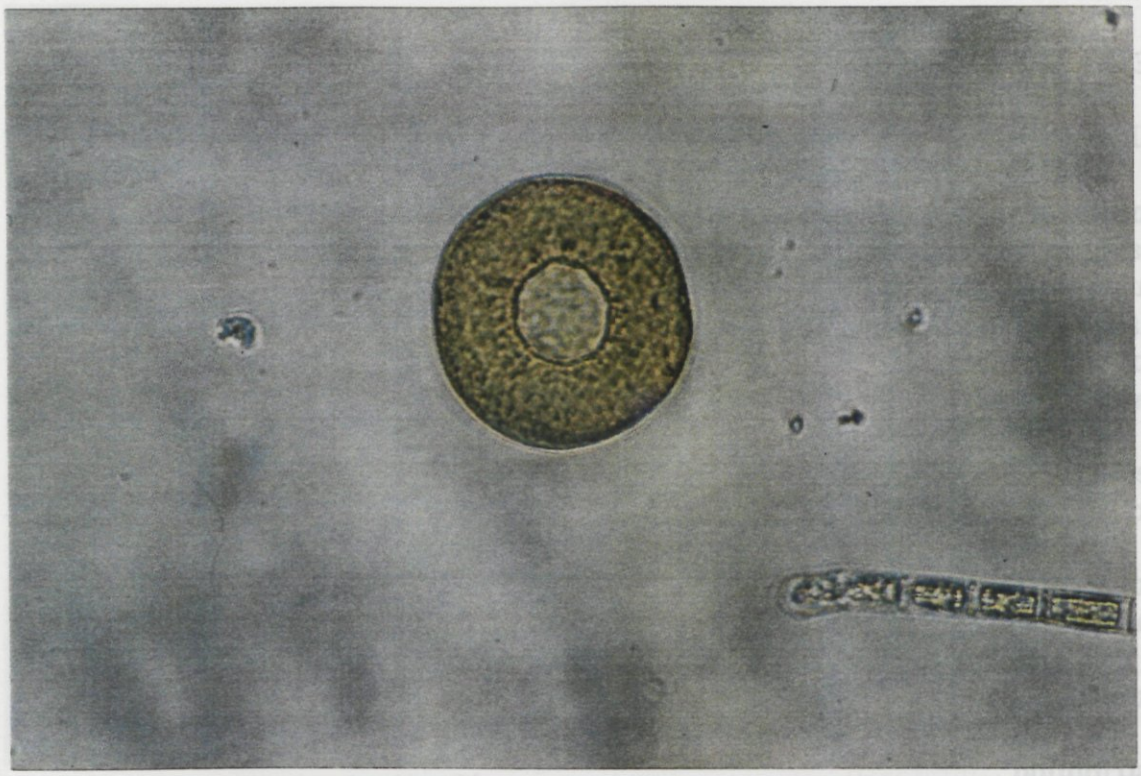
feeding
bacteria, detritus

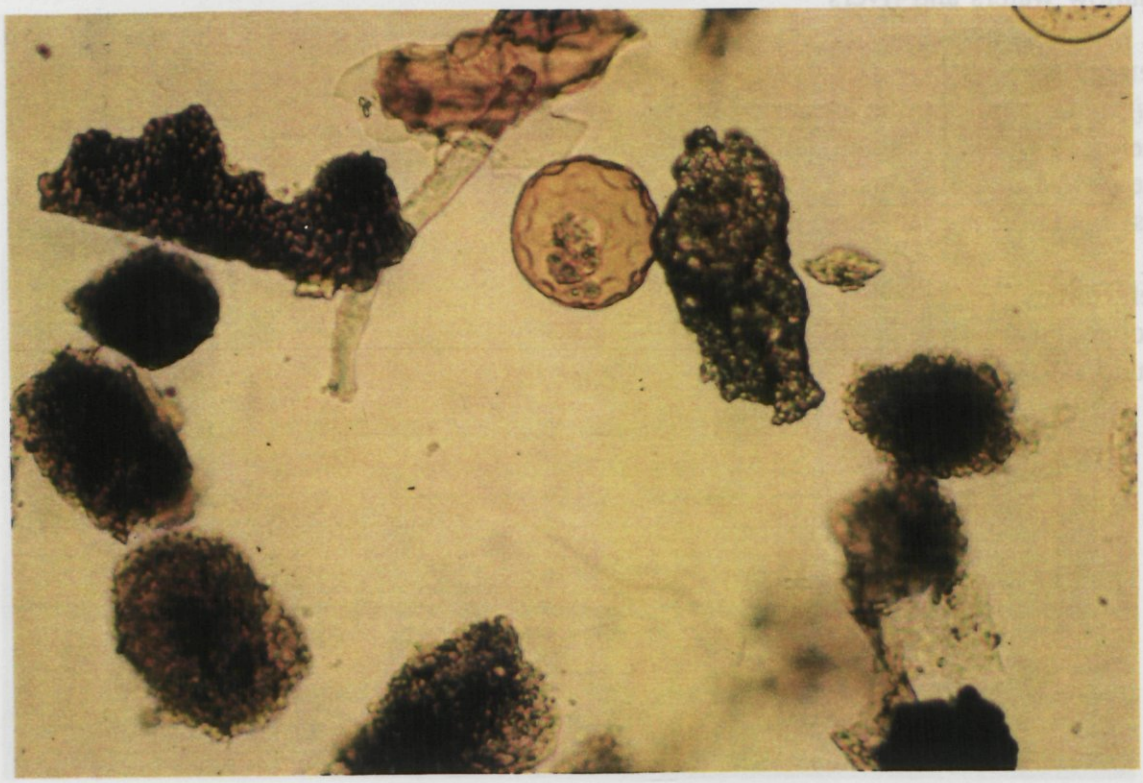
ecology
crawling on substrate,
mud, in plankton
on detritus debris
eutrophic, oligotrophic

distribution
very common in fresh water
also in plankton in the presence
of detritus as in many of the Dutch
shallow waters and rivers

references
Hoogenraad and de Groot (1940)
Kudo (1954)

Arcella sp.





Centropyxis aculeata

PROTOZOA

TESTACEA

DIFFLUGIIDAE

morphology
oval to round carapace
usually with spines and
inlaid with quartz grains
foot opening acentric
dimensions: 80-162 µm

feeding
bacteria, detritus

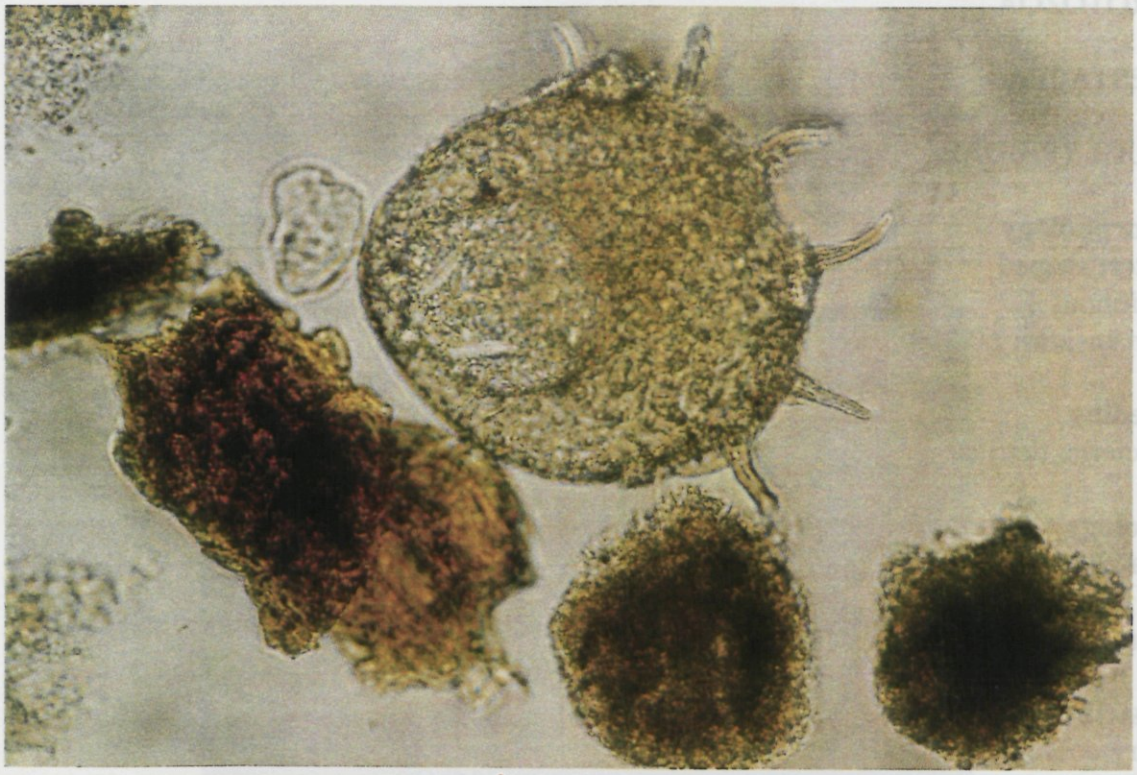
ecology
crawling on substrate, mud,
in plankton on detritus, debris
eutrophic, oligotrophic

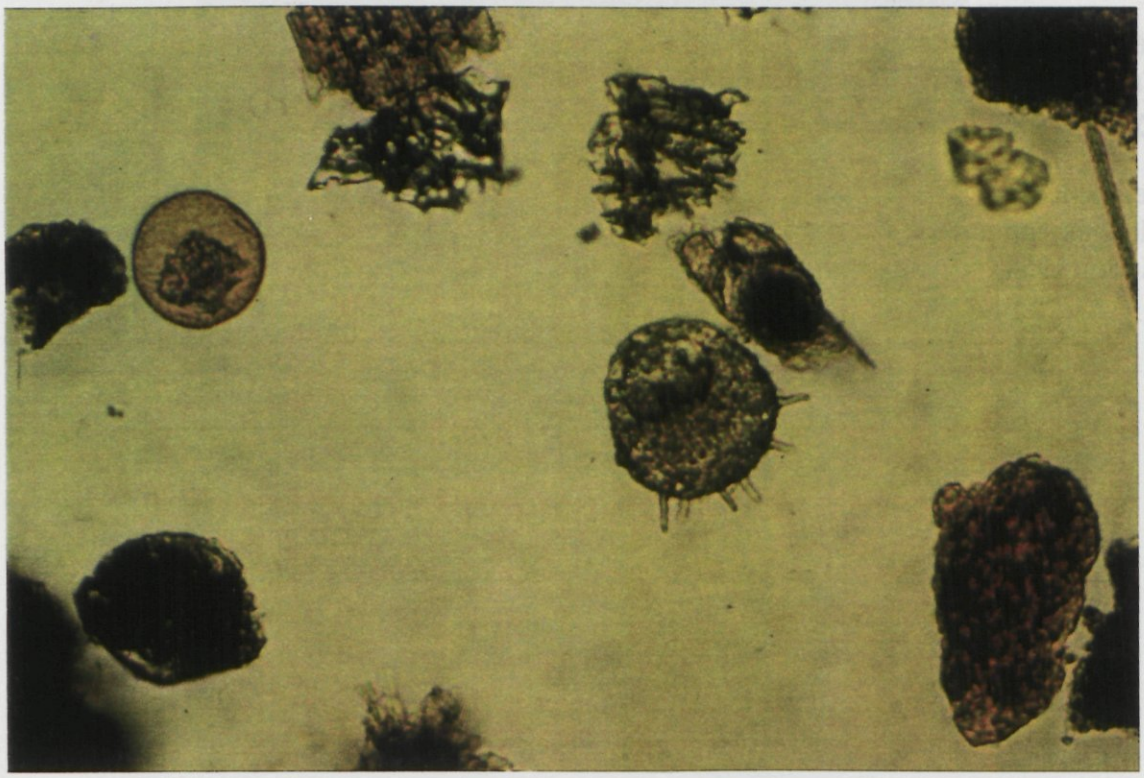
distribution
very common in fresh water
also in plankton in the presence
of detritus as in many of the Dutch
shallow waters and rivers

remarks
Difflugia genus can be identified by
the more elongated acuminated shape and
the coarse inlaid grains,
less common in plankton

references
Hoogenraad and de Groot (1940)
Kudo (1954)

Centropyxis aculeata





Cyphoderia ampulla

PROTOZOA

TESTACEA

EUGLYPHIDAE

morphology
retort shaped
chitinous
dimensions: 60-200 µm

feeding
bacteria, detritus

ecology
crawling on substrate, mud,
in plankton on detritus, debris
eutrophic, oligotrophic

distribution
very common in fresh water, but less
common than *Arcella* sp., also in
plankton in the presence of detritus
as in many of the Dutch shallow
waters and rivers, Rhine

remarks
Euglypha genus is (as type) identified
by the scaled hyaline structure of the carapace

references
Hoogenraad and de Groot (1940)
Kudo (1954)

Cyphoderia ampulla

CILIATA

CILIATA

GENERAL

Ciliata are naked Protozoans and as such often misformed in treated plankton samples. Therefore the group is often missing in plankton lists. Most of the Ciliata are living attached to silt particles and are mainly observed during periods with high turbidity. They also may originate from firm substrates.

Codonella lacustris

PROTOZOA

CILIATA

TINTINNIDAE

morphology
clock-shaped envelope
inlaid with grains
dimensions: 50-100 µm

feeding
bacteria

ecology
in plankton, free-swimming
eutrophic, oligotrophic

distribution
commonly present,
often accompanied by
Tintinnidium fluviatile
Rhine: sporadic

remarks
T. fluviatile has an
elongated envelope

references
Redeke (1975)
Kudo (1954)

Codonella lacustris

Vorticella sp.

PROTOZOA

PERITRICHIA

morphology
colonies on stalks
individuals 70-160 µm
Vorticella sp. has a
contractile stalk

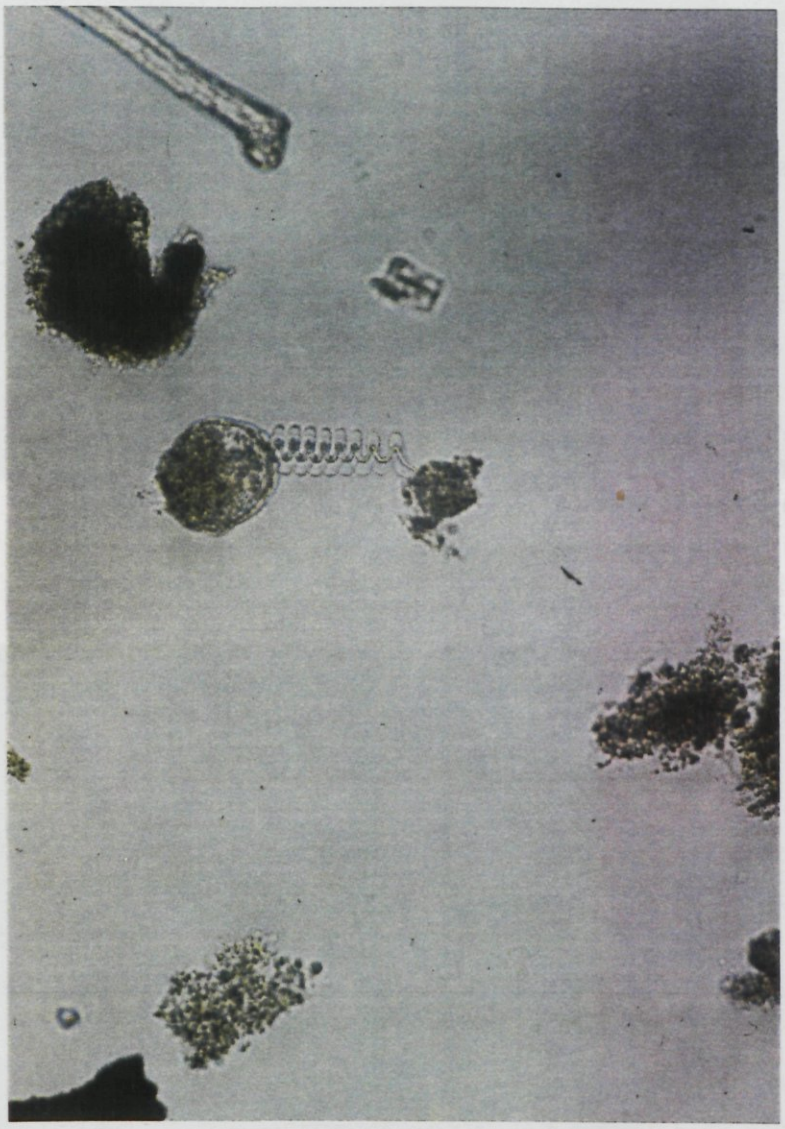
feeding
bacteria

ecology
eutrophic
on various substrate

distribution
common in all kinds of lakes

references
Redeke (1975)
Bick (1972)
Kudo (1954)

Vorticella sp.



PROTOZOA

PERITRICHIA

morphology
colonies on stalks
individuals 70-160 µm
Zoothamnium sp.
stem is dichotomously branched

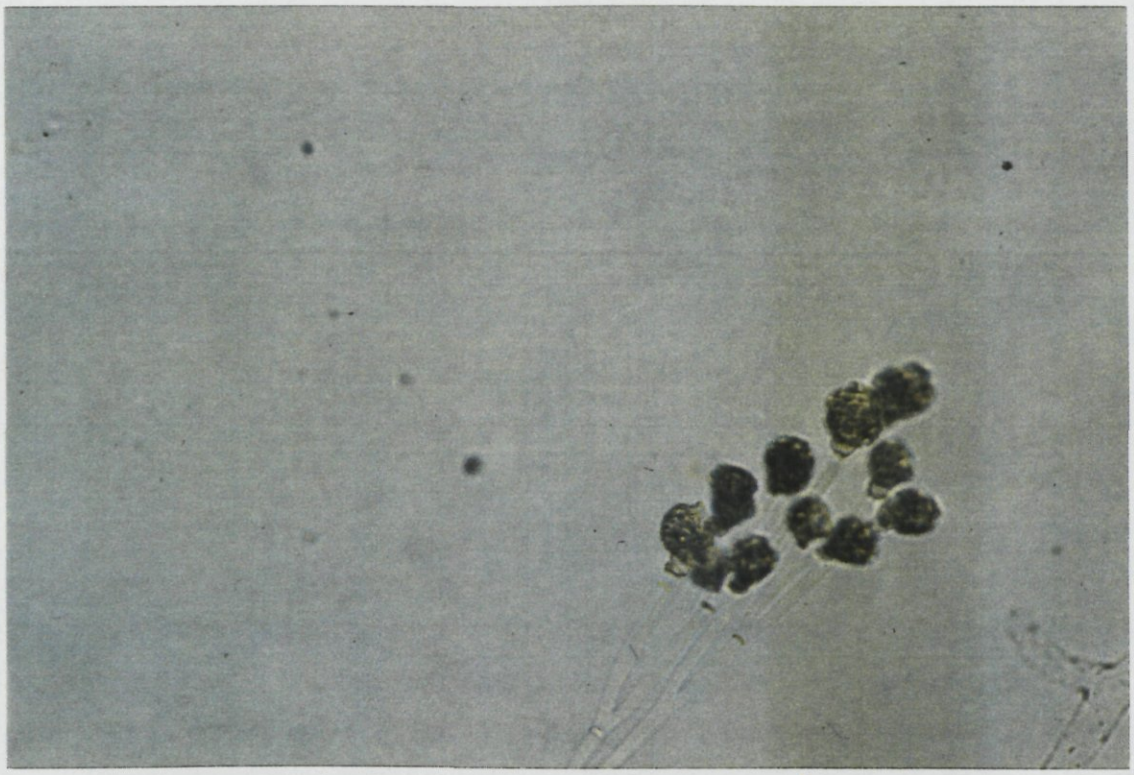
feeding
eutrophic
on various substrate

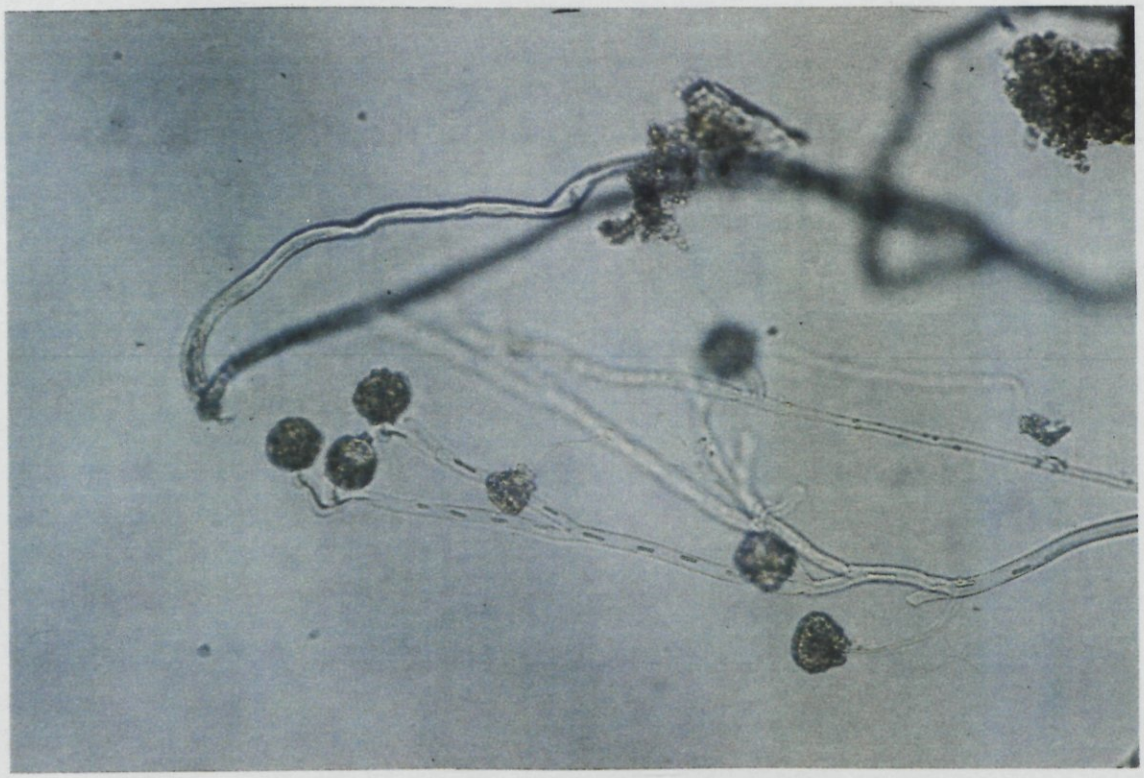
distribution
common in various lakes

remarks
in *Zoothamnium* sp.
the total colony contracts
the fixed specimen in the photo
may also be an *Epistylis* species

references
Redeke (1975)
Bick (1972)
Kudo (1954)

Zoothamnium sp.





ROTATORIA

ROTATORIA

GENERAL

Most Rotatoria species can be identified by the shape and structure of their carapace. Identification of unarmoured Rotatoria is generally difficult as they contract when the samples are fixated. The most common species generally found are: *Keratella cochlearis*, *Keratella quadrata*, and *Polyarthra* spp. Also *Brachionus calyciflorus*, *Brachionus angularis*, *Brachionus urcealaris*, *Filinia longiseta*, *Kellicottia longispina*, and *Asplanchna* spp. are common in stagnant and flowing waters. These species occur in relatively high densities.

Species of the Lecane family are less common and are seldom found in high numbers. Identification of the Lecanes is not easy and as little is know of the specific life conditions, the Lecanes might best be identified as the genus *Lecane* sp. Common but in low numbers are the species *Lecane bulla*, *Lecane luna*, and *Lecane hamata*.

ROTATORIA

ASPLANCHNIDAE

morphology
pouched-shaped transparent
no foot and
no anus
dimensions: 250-1500 µm

feeding
predator with jaws
eats other rotatoria,
diatoms, peridinians, etc.
excrements like
carapaces etc. are spit out
also cannibalistic

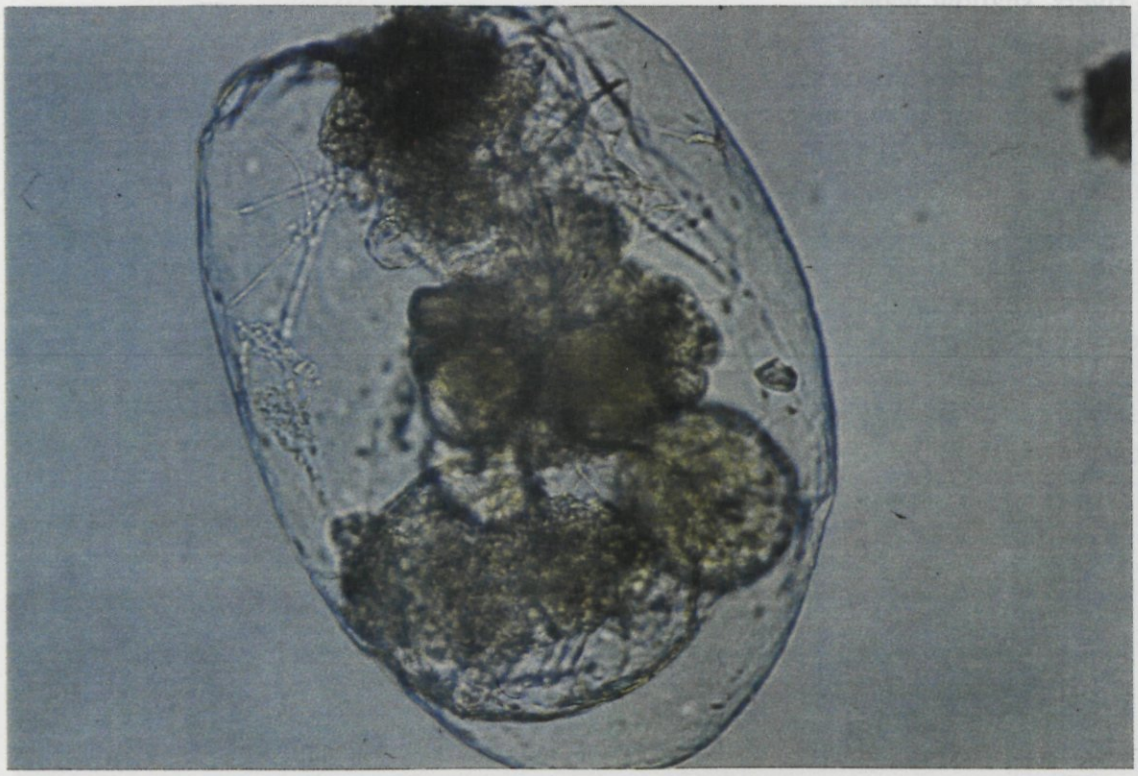
ecology
in plankton from lakes
pH: 4.5-8.0

distribution
cosmopolitan
Netherlands: in almost all waters,
also oligo-haline
Rhine: in small numbers

remarks
is present in combination with
A. brightwelli, which has a
horseshoe-shaped ovary
Asplanchna is transparant
often other Rotatoria swallowed
can be recognized inside the
organism

references
Koste (1978)

Asplanchna priodonta



Brachionus angularis
Brachionus angularis f. bidens

ROTATORIA

BRACHIONIDAE

morphology
dimensions: 90-210 x 60-160 µm
anterior edge of carapace has
2 fairly truncated spines
posterior: no lateral spines,
often with lateral angles

feeding
algae
bacteria

ecology
euplanktonic
in fresh and brackish water
eutrophic
pH: 4.8-9.0

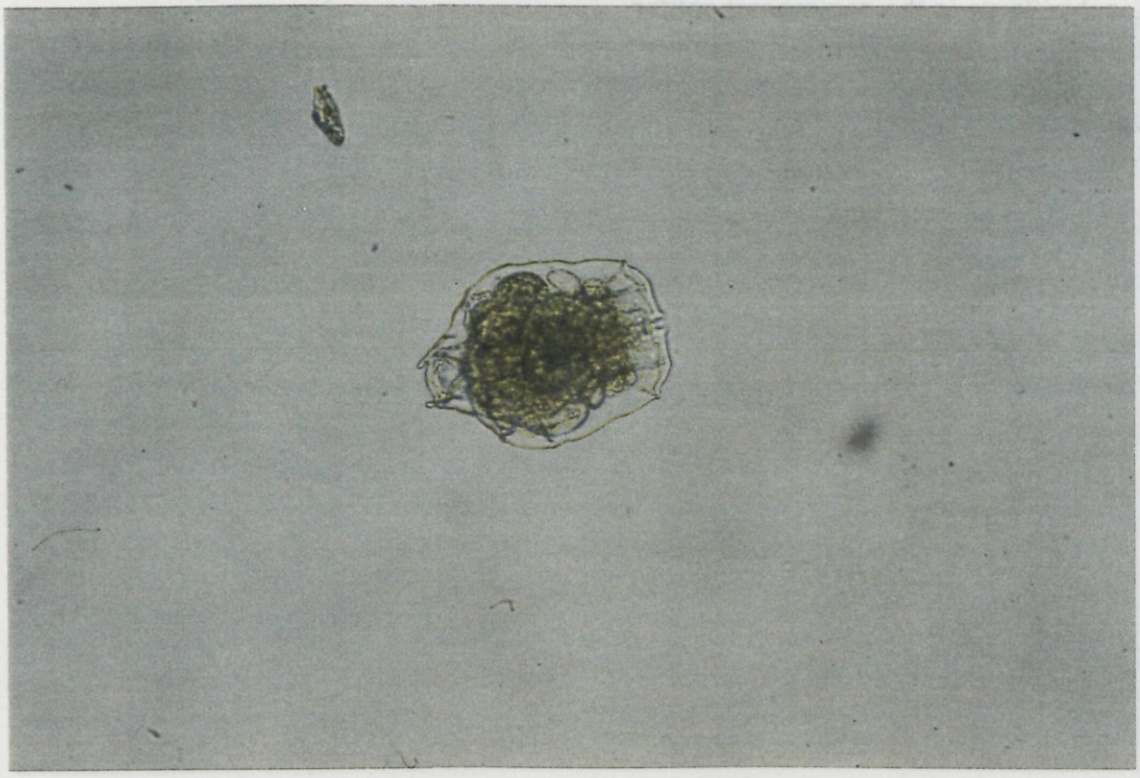
distribution
cosmopolitan
in rivers, shallow waters,
ponds and canals
Rhine: usually accompanied by
B. calyciflorus, but less numerous

remarks
B. angularis f. bidens
is often smaller than
B. angularis without
the sidelong angularity

references
Koste (1978)

Brachionus angularis

Brachionus angularis f. bidens



ROTATORIA

BRACHIONIDAE

morphology
dimensions: 180-600 x 124-300 µm
carapace with 4 identical teeth
posterior: 2 sidelong mobile spines

feeding
algae, bacteria

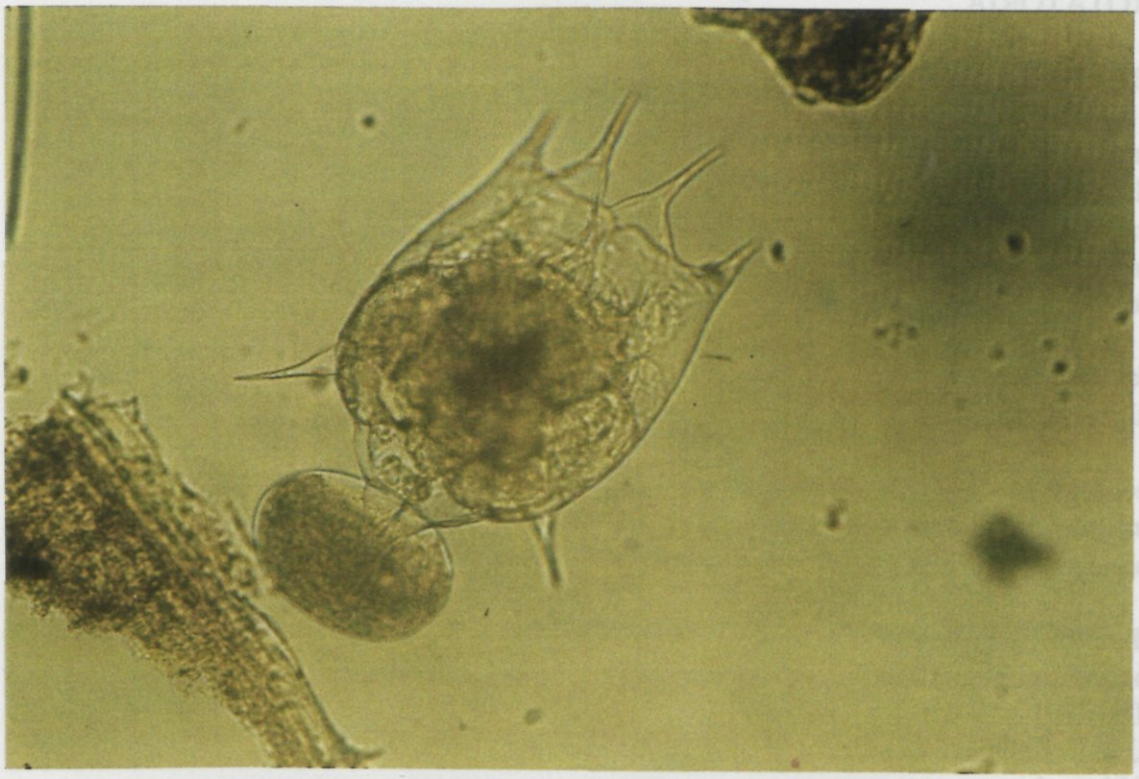
ecology
euplanktonic
in fresh and brackish water
eutrophic
pH: 7-9

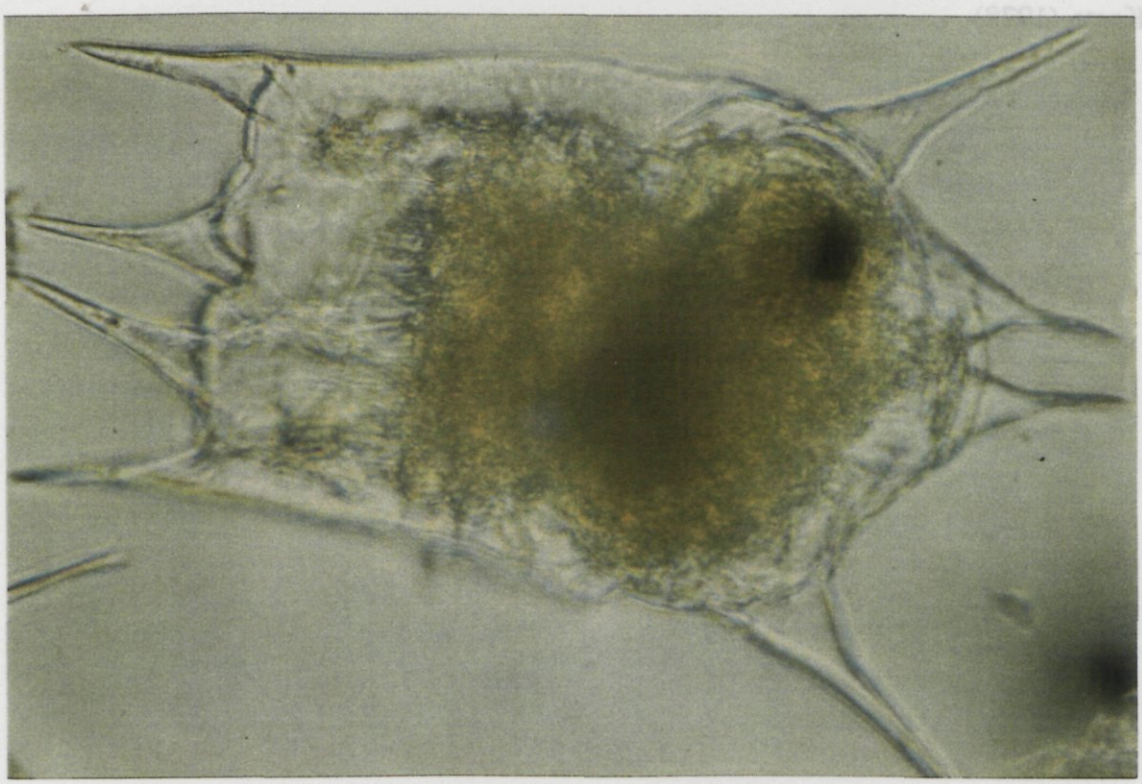
distribution
cosmopolitan
in rivers, shallow waters,
ponds and canals
Rhine: maximum in number downstream

remarks
B. calyciflorus is the commonest rotifer
in the Rhine from March to November

references
Koste (1978)

Brachionus calyciflorus





Brachionus leydigi f. tridentatus

ROTATORIA

BRACHIONIDAE

morphology
dimensions: 200-290 µm
carapace at rear with
truncated spines
foot opening with 3 spines

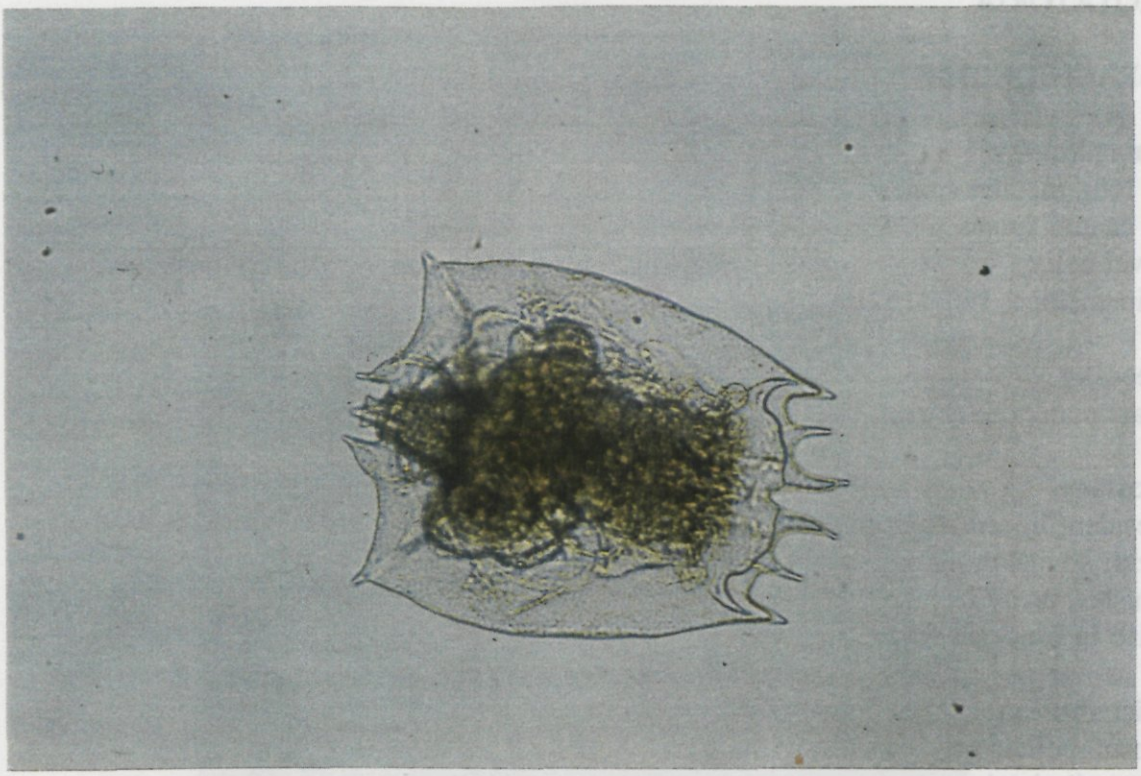
feeding
algae, detritus

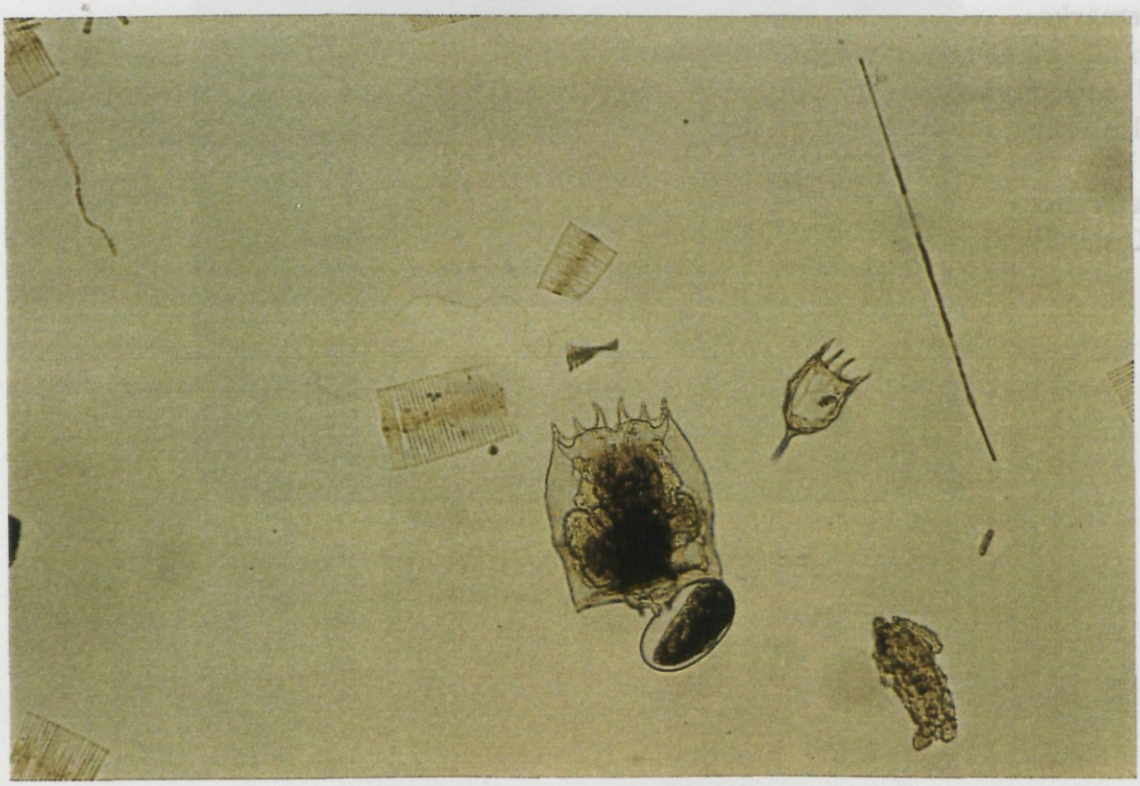
ecology
in littoral of larger bodies of water,
ponds and flushed into flowing water

distribution
no common species
The Netherlands:
IJsselmeer and Loosdrecht
Rhine: downstream

references
Dresscher (1976)
Koste (1978)

Brachionus leydigi f. tridentatus





Brachionus quadridentatus

ROTATORIA

BRACHIONIDAE

morphology
2 long median spines
2 caudal spines
oval belly
dimensions: 160-415 µm

feeding
nanoplankton, detritus

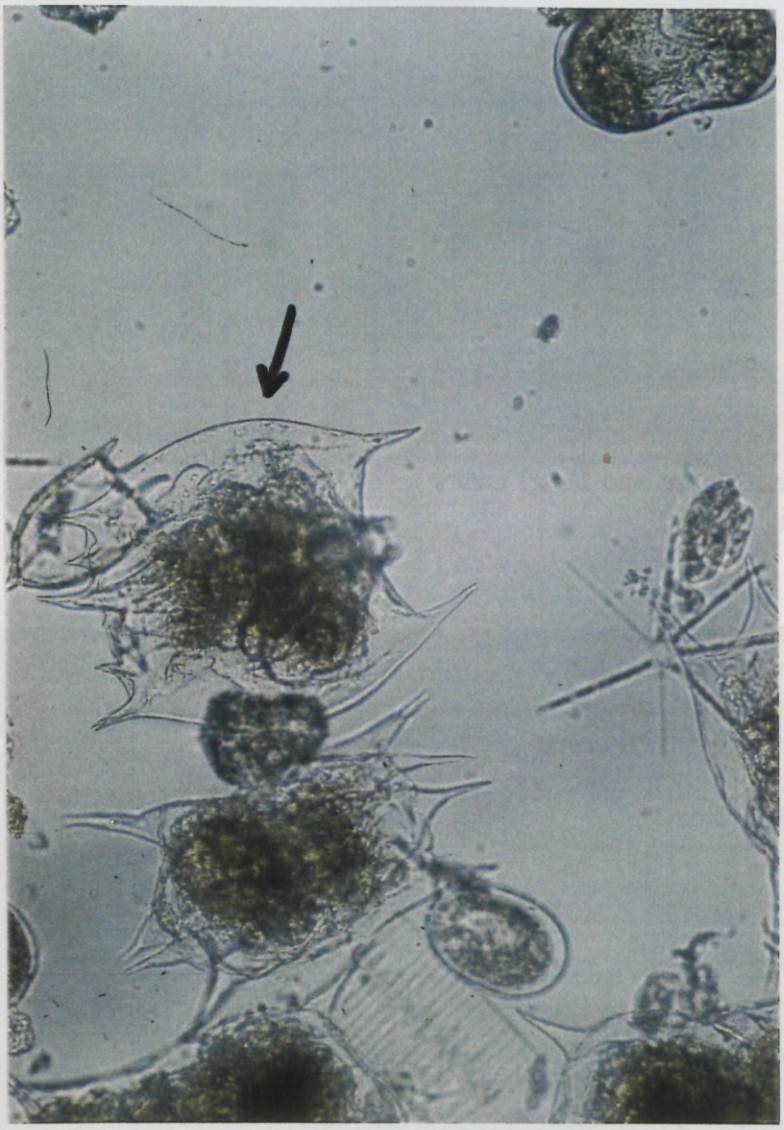
ecology
resident in sediment in water
with abundant plant growth
flushed away in plankton
also in brackish water

distribution
cosmopolitan
sporadic in rivers,
canals, lakes and ponds
Rhine: downstream

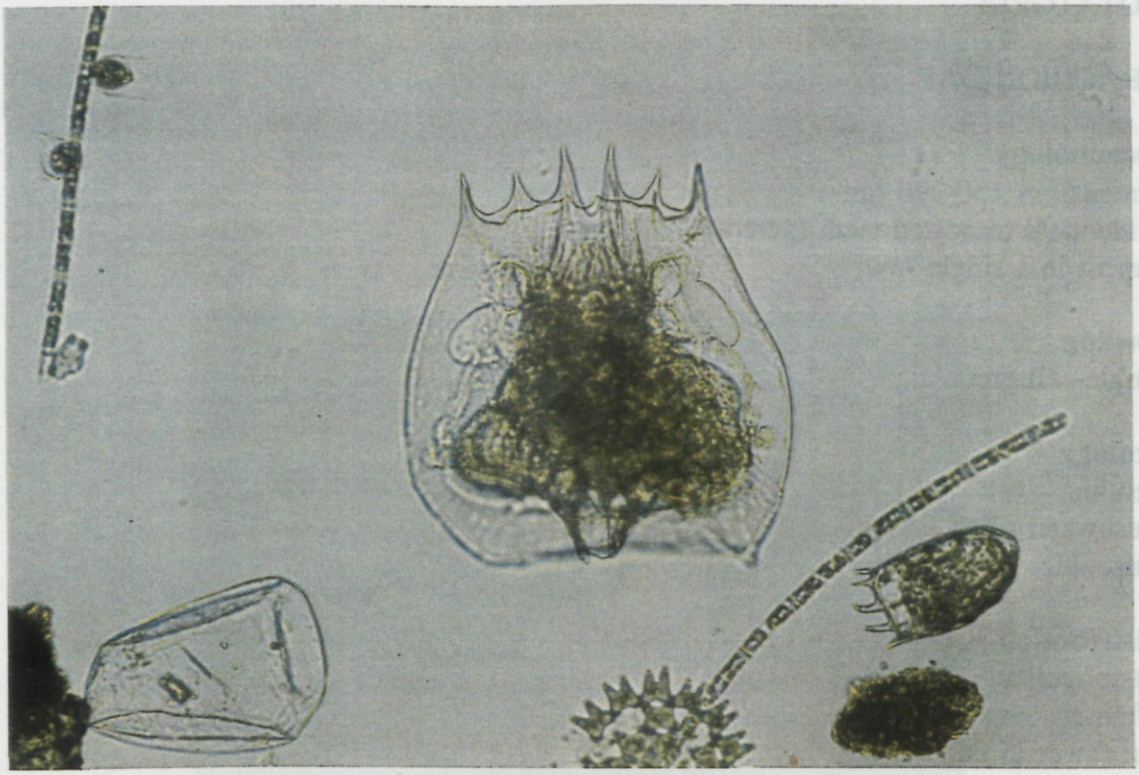
remarks
in the photo one of the median spines is bent
B. calyciflorus and *Keratella cochlearis*
also visible in the photo

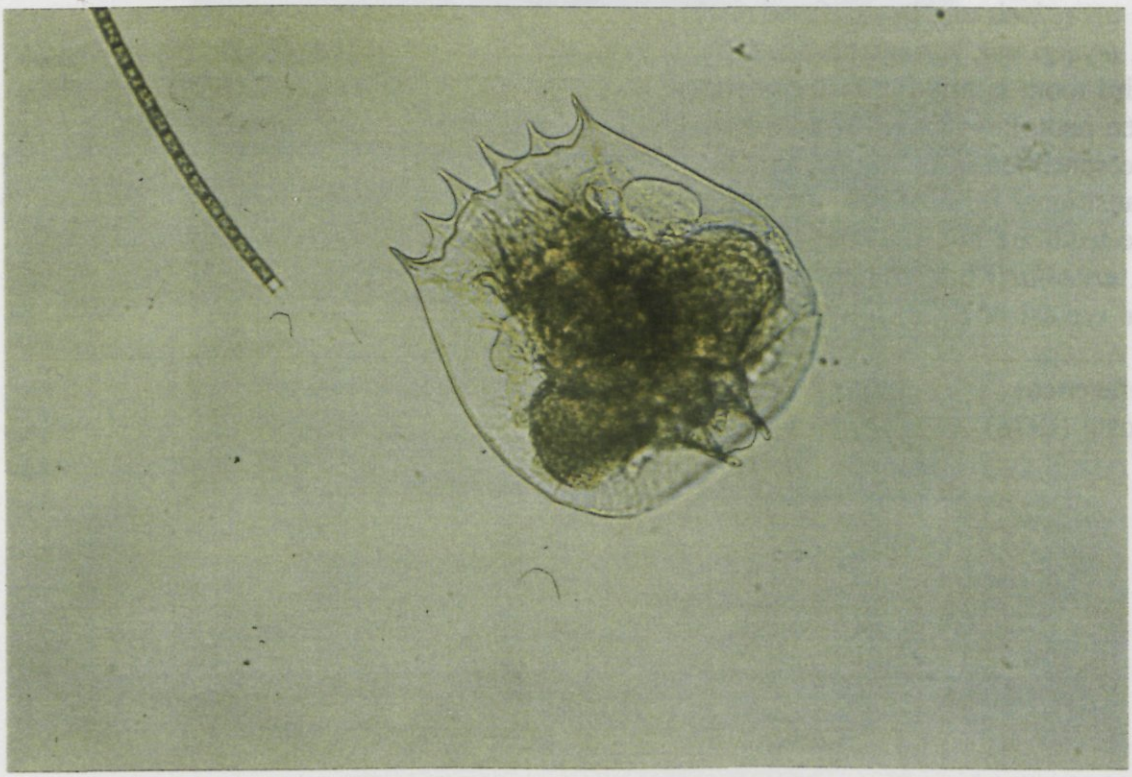
references
Koste (1978)

Brachionus quadridentatus



Brachionus quadridentatus f. cluniorbicularis





ROTATORIA

BRACHIONDAE

morphology
dimensions: 160-290 µm
caudal edge of carapace is
rounded off
rounded belly
anterior spines almost
equal in length

feeding
nanoplankton, detritus

ecology
among plants
also in brackish water in
in ponds and river banks

distribution
Netherlands: the Meuse and IJssel rivers
Rhine: sporadic

remarks
characteristic of the Rhine
distinguishable transitional forms
similar to *B. quadridentatus f. rhenanus*
in which the caudal edge is asymmetric
photos show 2 specimens with one
truncated caudal spine

references
Koste (1978)
De Maeseneer (1980)

ROTATORIA

BRACHIONIDAE

morphology
dimensions 150-290 µm
6 identical truncated teeth (anterior),
almost in a single row

feeding
single-cell green algae

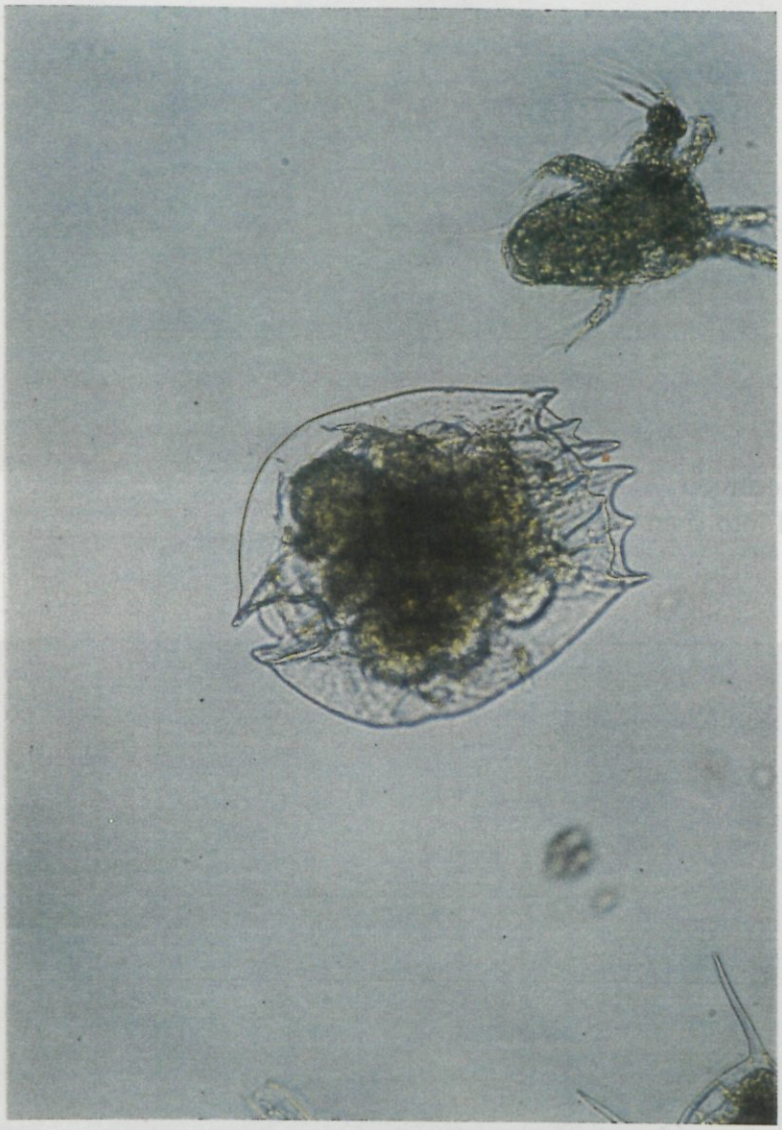
ecology
benthic
freshwater oligo-halines
eutrophic

distribution
cosmopolitan
often accompanied by *B. calyciflorus*
but fewer in number
Netherlands: in practically all waters
Rhine: sporadic downstream

remarks
B. urceolaris can be confused with
B. leydigi var. *rotundatus* as the
third tooth is missing in foot opening
(see photo);
the specimen in the photo may be a
transitional form of both species;
the teeth are not in a row as in
B. urceolaris but 'frames' on carapace
are typical of *B. leydigi* var. *rotundatus*

references
Koste (1978)

Brachionus urceolaris



Dipleuchlanis propatula

ROTATORIA

EUCHLANIDAE

morphology
slender turtle-like
2 long spines ('toes')
dimensions: 338-508 µm

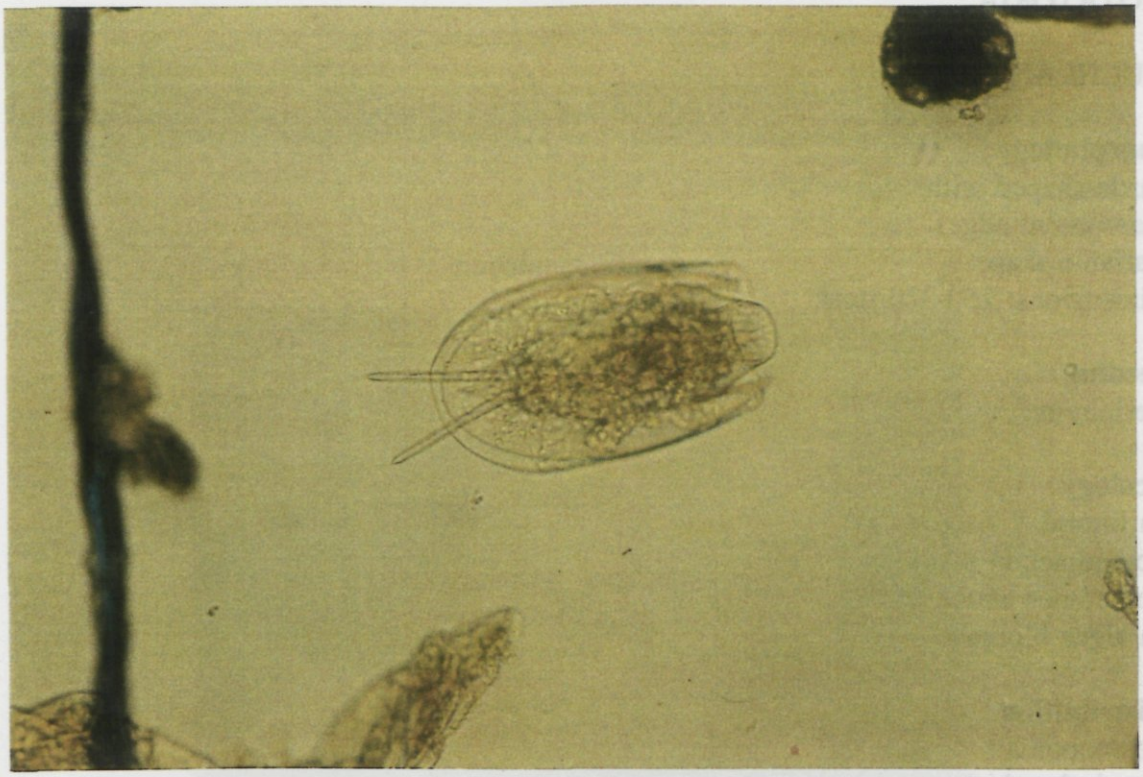
feeding
probably periphyton

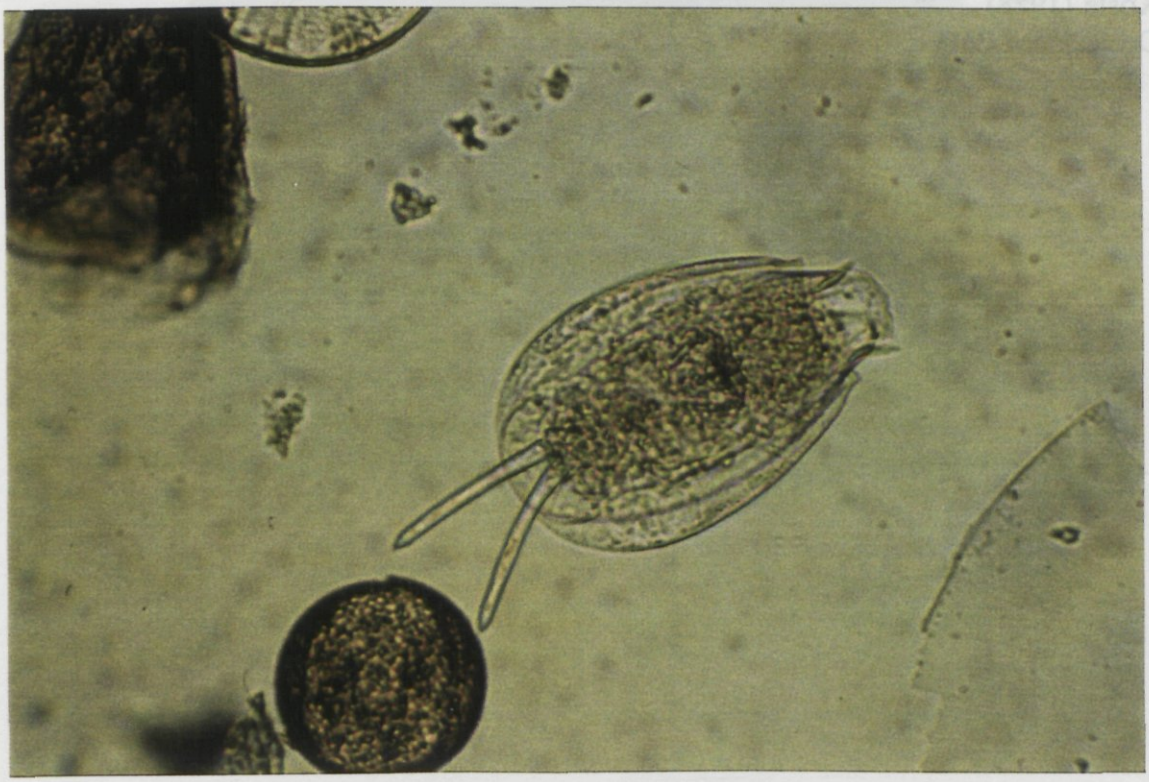
ecology
preferably in relatively
warm water in pools and swamps
pH: 4.5-6.4
also in mud
benthic

distribution
cosmopolitan
Netherlands: common
Rhine: flushed into river

references
Koste (1978)

Dipleuchlanis propatula





Euchlanis dilatata

ROTATORIA

EUCHLANIDAE

morphology
turtle-shaped with
transparent edges
variable shape
dimensions: 150-320 µm

feeding
periphyton

ecology
in littoral
sometimes in plankton
sometimes abundant
in algae blooms

distribution
cosmopolitan
few in brackish water and rivers
Rhine: sporadic

references
Koste (1978)
De Ridder (1962)

Euchlanis dilatata

ROTATORIA

TESTUDINELLIDAE

morphology
egg or spindle-shaped
2 long lateral springy bristles
1 caudal long bristle
dimensions: 130-250 µm

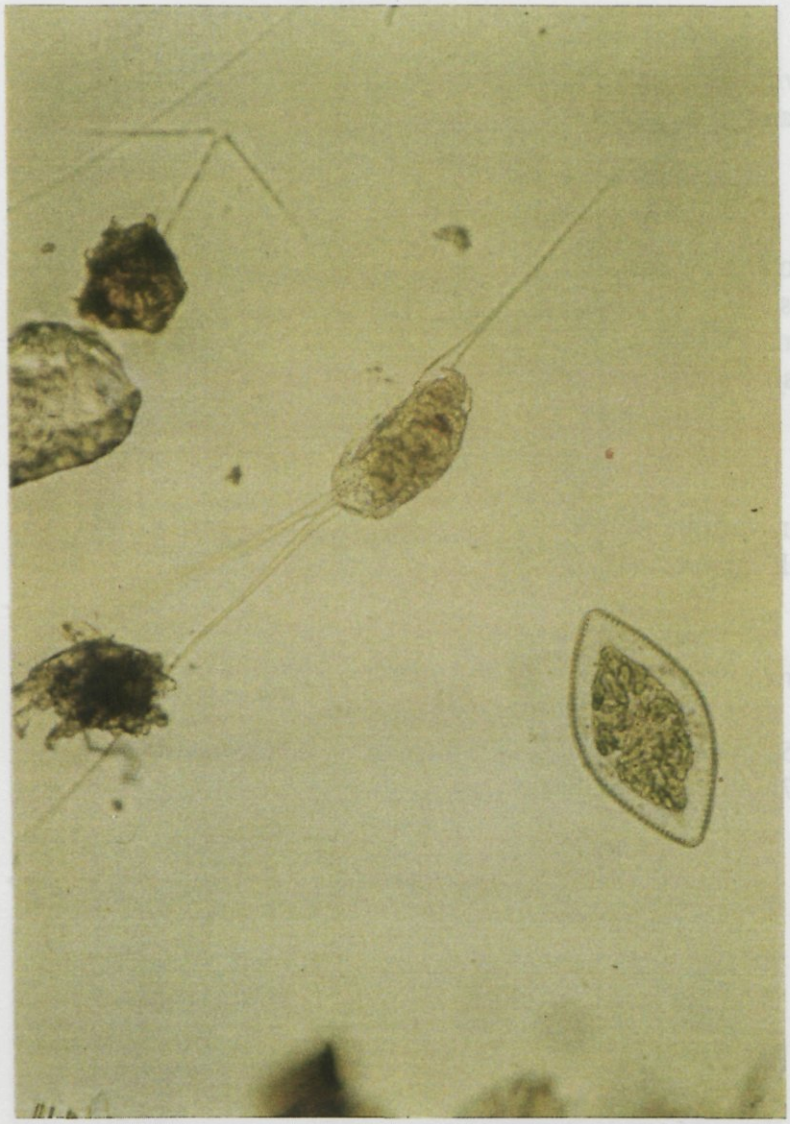
feeding
detritus, bacteria
algae

ecology
in plankton from ponds and lakes
eutrophic

distribution
cosmopolitan
Netherlands: in various waters
sometimes in abundance
Rhine: sporadic

references
Koste (1978)
Pontin (1978)
Pourriot (1977)

Filinia longiseta



Kellicottia longispina

ROTATORIA

BRACHIONIDAE

morphology
6 anterior spines of uneven length
1 long posterior spine
dimensions: 380-1000 µm

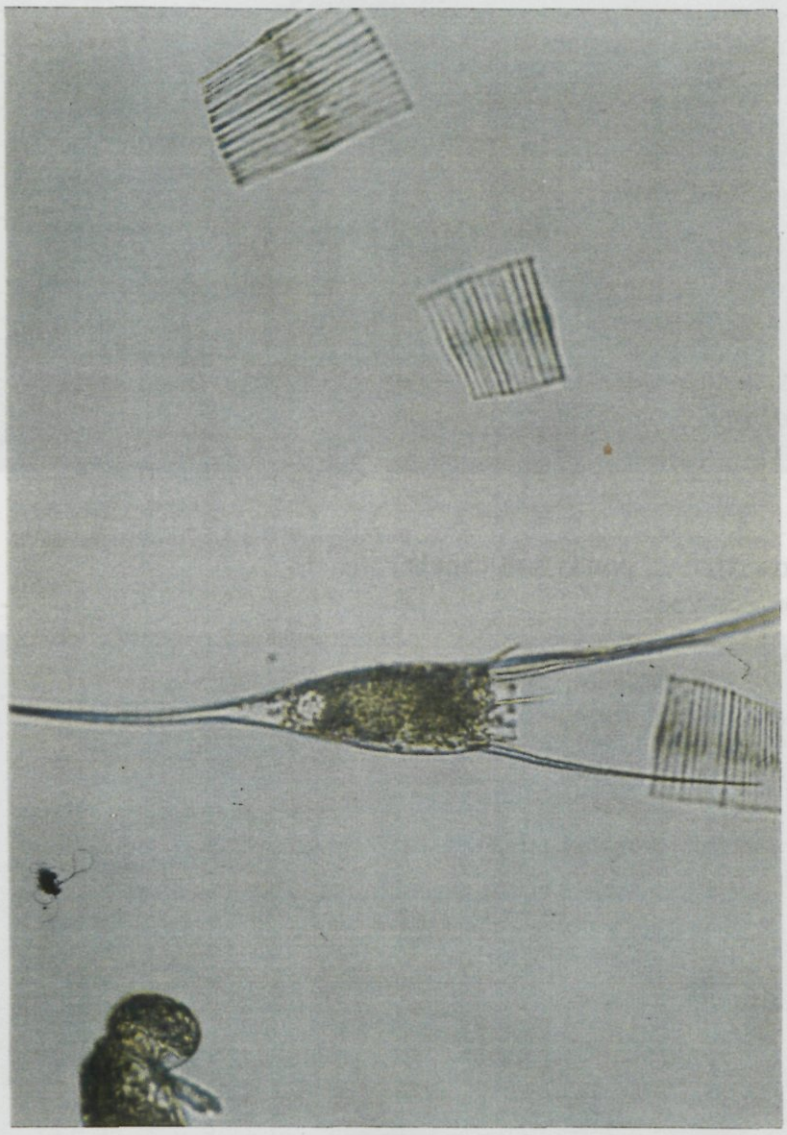
feeding
eats detritus with bacteria
attached to it and to a lesser
extent algae

ecology
in plankton from deep and
shallow waters
oligotrophic and eutrophic,
also in brackish water

distribution
cosmopolitan
Netherlands: in various waters
Rhine: in small numbers

references
Bosch and Ringelberg (1985)
Koste (1978)
Pourriot (1965)
Pourriot (1977)

Kellicottia longispina



Keratella cochlearis

ROTATORIA

BRACHIONIDAE

morphology
6 anterior spines,
with or without 1 median caudal spine
dimensions: 80-320 µm
variable
honeycomb structure on carapace

feeding
eats detritus with bacteria
attached to it and to a lesser
extent algae

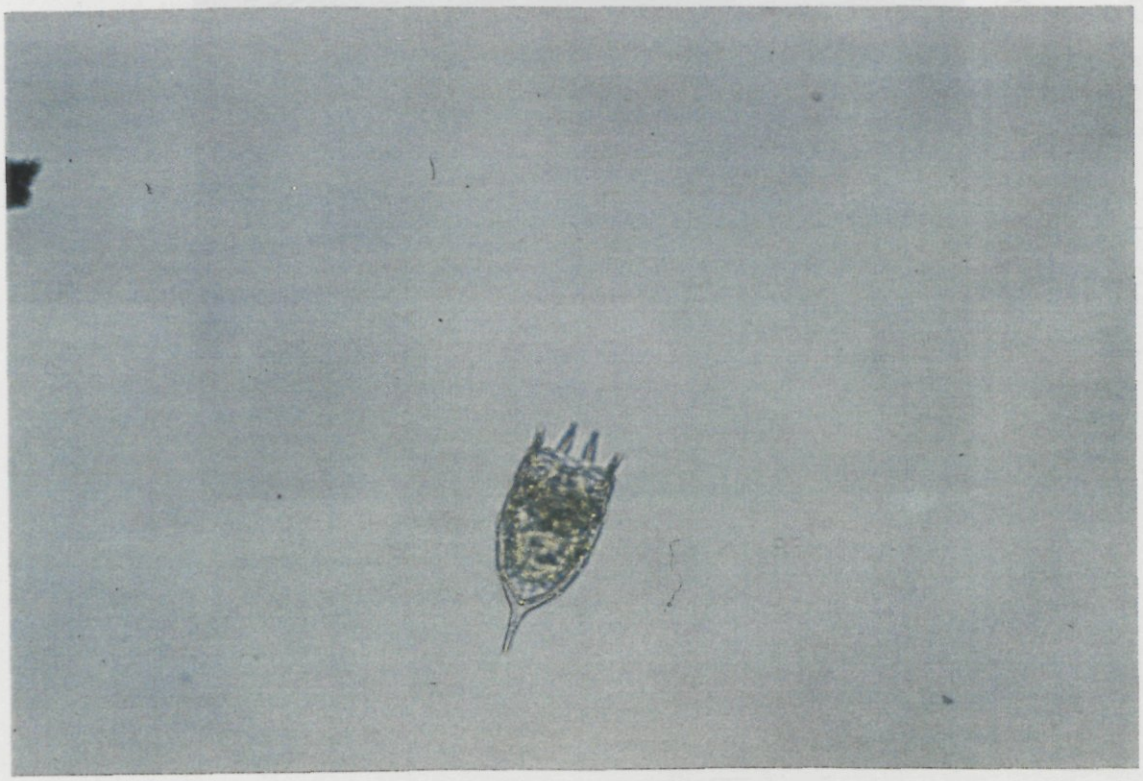
ecology
euplanktonic
in fresh and brackish water
eutrophic, oligotrophic

distribution
cosmopolitan
in rivers, shallow waters, ponds and canals
Rhine: common ecotypes

remarks
the shape without caudal spine is often
called *K. tecta*

references
Koste (1978)

Keratella cochlearis



ROTATORIA

BRACHIONIDAE

morphology
dimensions: 175-203 µm
shaped like *K. tecta* but dorsal
honeycomb structure vague

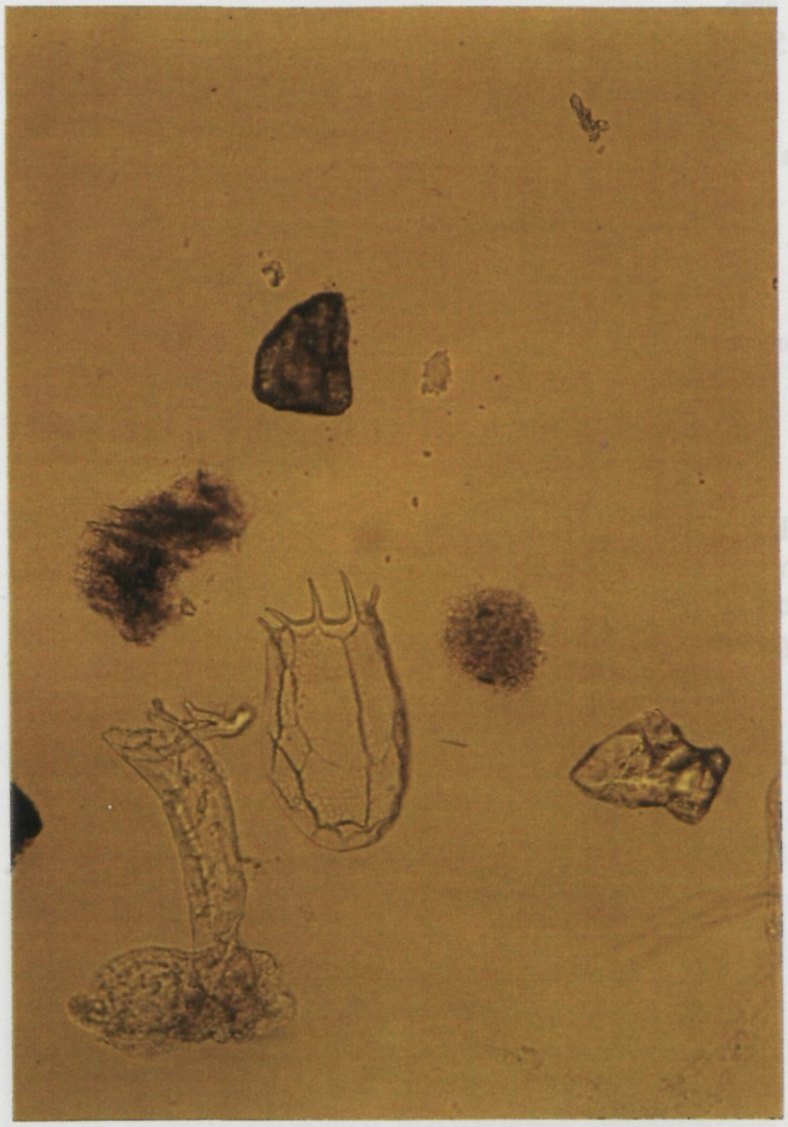
feeding
eats detritus with attached
bacteria and to a lesser
extent algae

ecology
in salt and brackish coastal waters

distribution
in coastal seas and estuaries
Netherlands: Wadden Sea, Dollart,
Veersemeer
Rhine: downstream, sporadic

references
Koste (1978)

Keratella cruciformis



ROTATORIA

BRACHIONIDAE

morphology
anterior edge with 4 spines
caudal edge with 2 spines
hexagonal honeycomb structure
in the median area
dimensions: 150-250 µm

feeding
algae, bacteria
flagellates

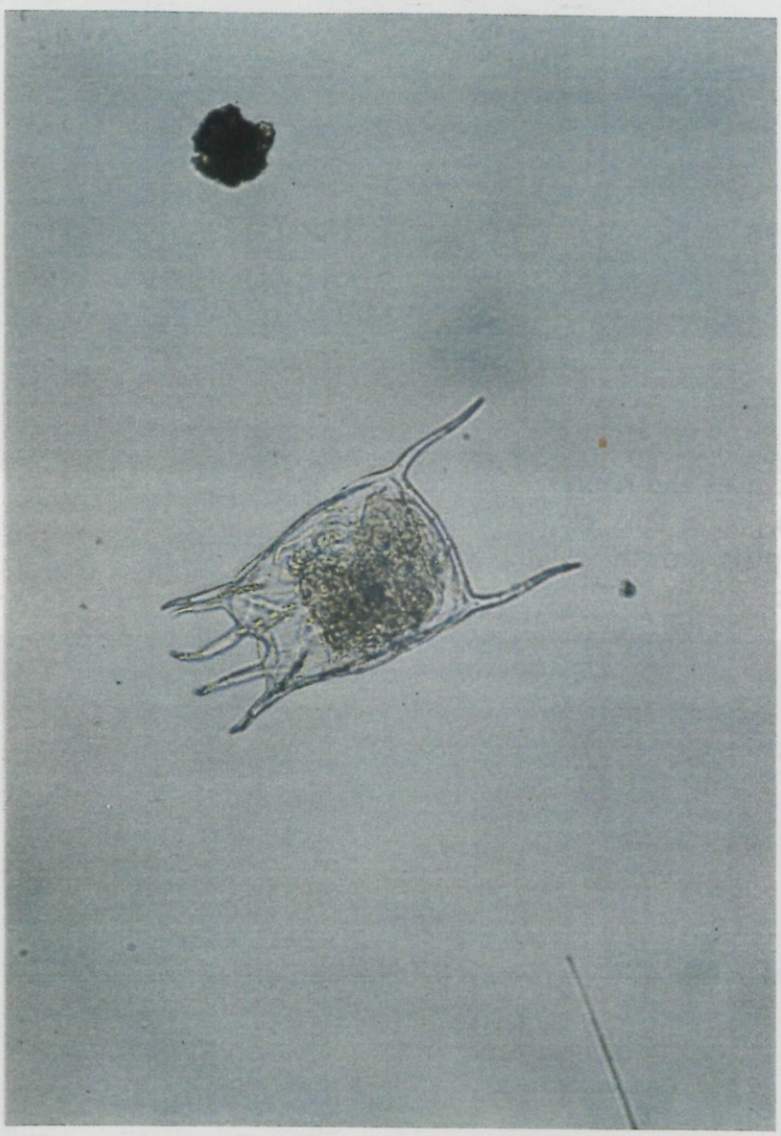
ecology
euplanktonic
in fresh and brackish water
eutrophic

distribution
cosmopolitan
in rivers, shallow waters,
ponds and canals
Rhine: common
in many ecotypes

remarks
K. valga and *K. tropica* species
are rare

references
Koste (1978)

Keratella quadrata



Lecane bulla

ROTATORIA

LECANIDAE

morphology
oval, curved inwards (anterior)
long toe
dimensions: 100-133 x 74-105 µm

feeding
nanoplankton

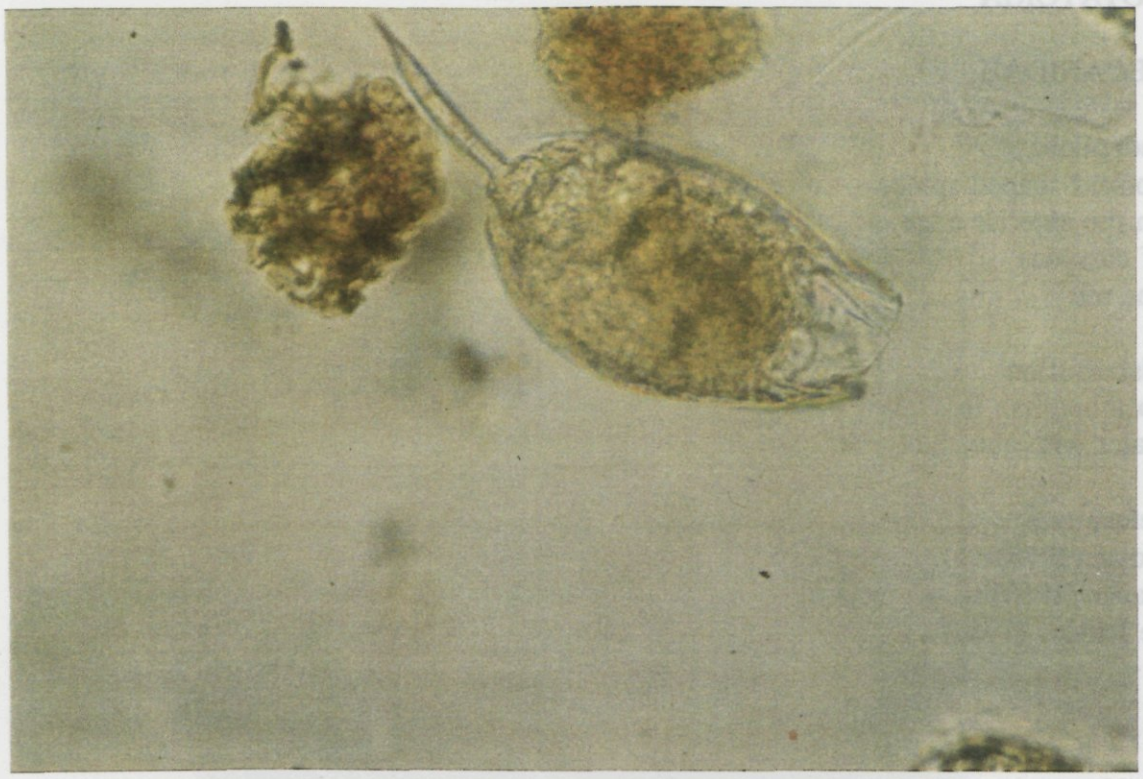
ecology
pH tolerant
in fresh, brackish,
salt and sulphur-containing waters
temp. 10-32°C
pH: 5.6-8.5

distribution
most common in small numbers for plankton
in lakes, fens, canals and rivers
most species in ponds, fens, etc.
with abundant plant growth
Rhine: sporadic

remarks
there are many *Lecane* species with
various carapace shapes,
wholly or partially deformed talons

references
Koste (1978)
Hauer (1963)
de Ridder (1962)

Lecane bulla



Lecane hamata

ROTATORIA

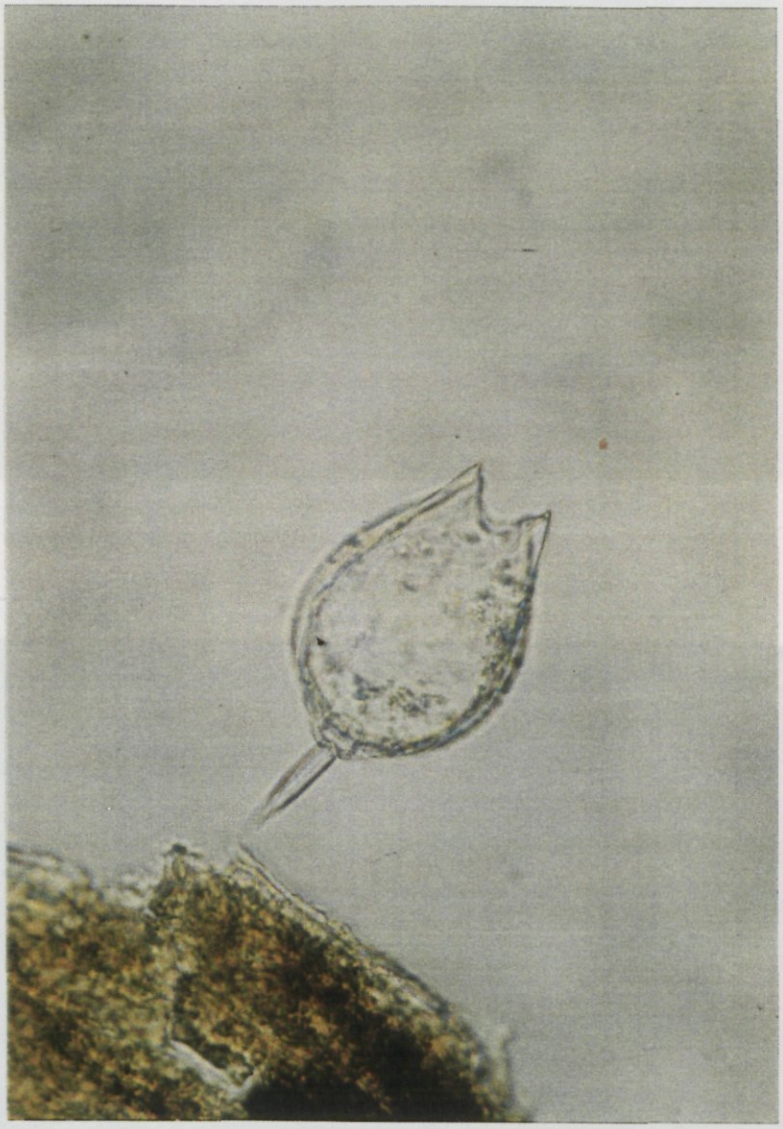
LECANIDAE

morphology
hooked-shaped spines
on the anterior edge
of carapace
one toe

distribution
cosmopolitan in shallow
water with abundant plant growth

references
Koste (1978)
Hauer (1963)
de Ridder (1962)

Lecane hamata



ROTATORIA

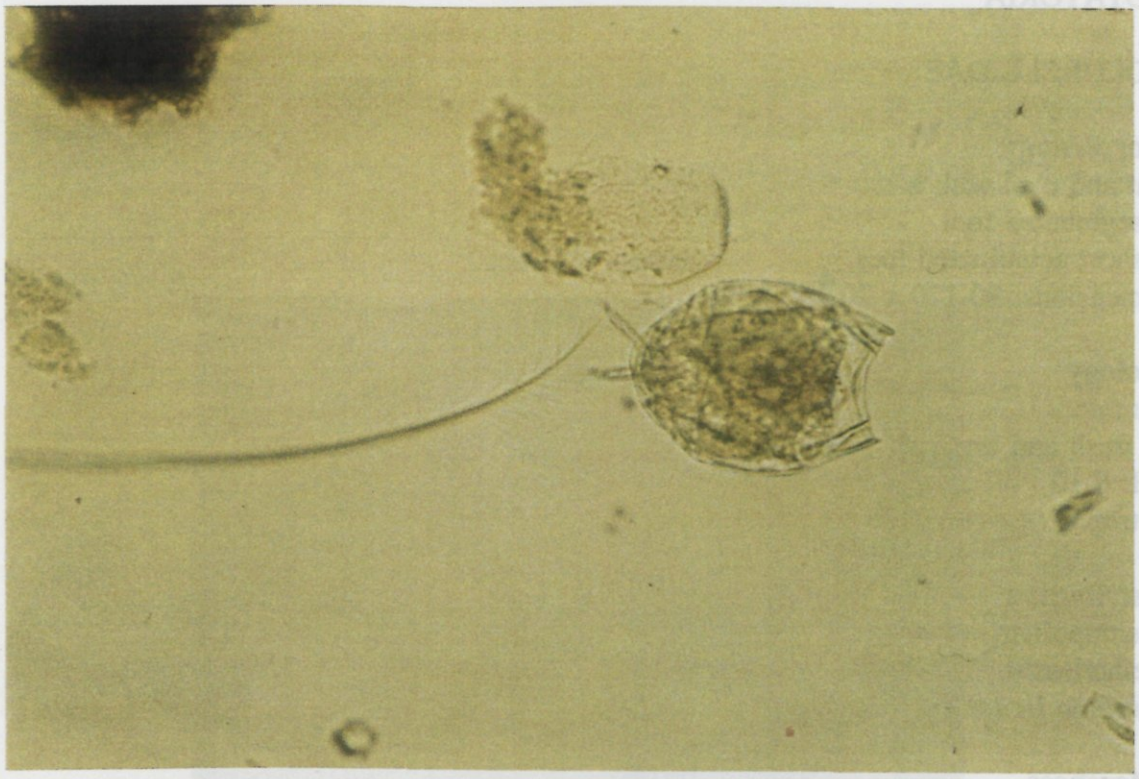
LECANIDAE

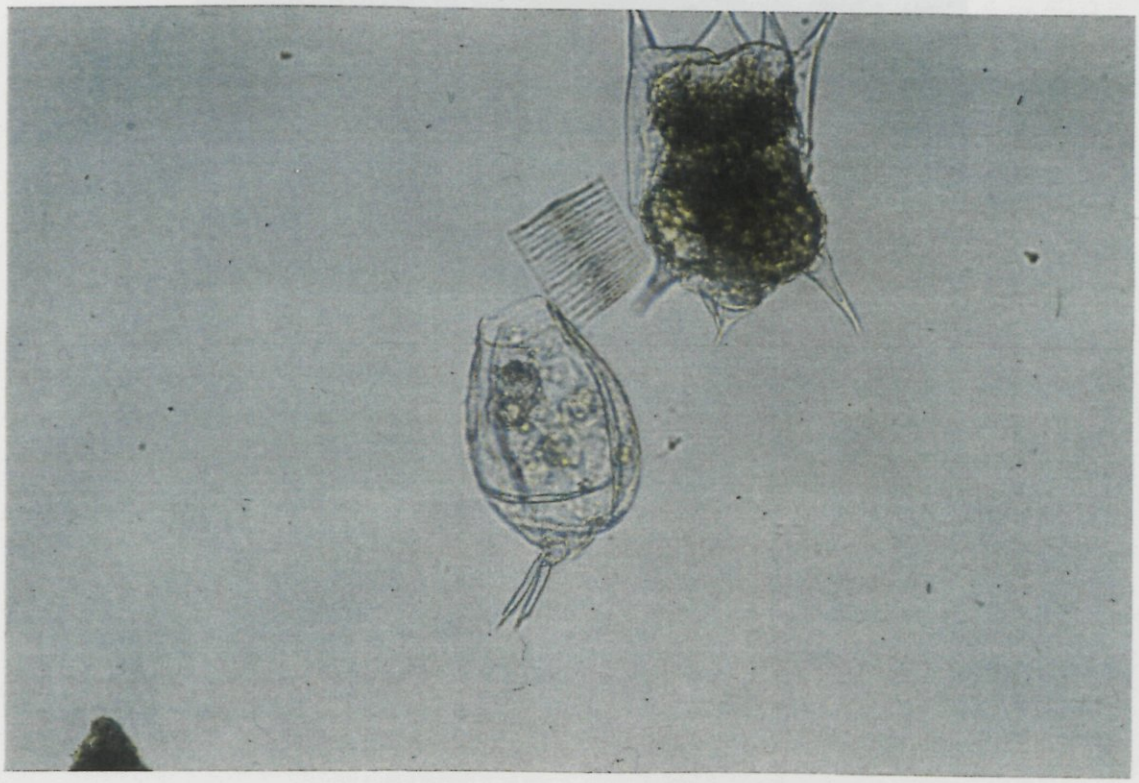
morphology
oval with more -or-less acuminated
angles on anterior edge
two toes
cross pits

distribution
very common in littoral

references
Koste (1978)
Hauer (1963)
de Ridder (1962)

Lecane luna





Lepadella ovalis

ROTATORIA

COLURELLIDAE

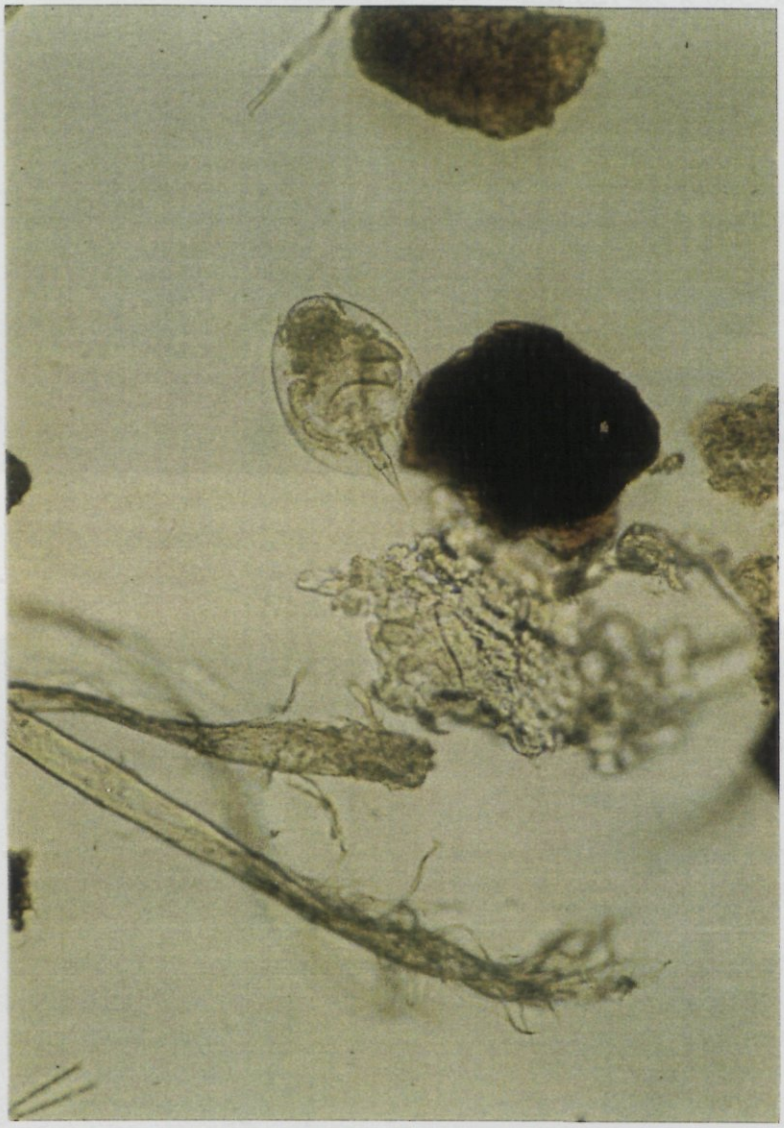
morphology
flat and oval with a
4-segmented foot
2 short acuminated toes
dimensions: 90-170 x 70-140 µm

ecology
benthic
in fresh and brackish water
pH: 6-10
eutrophic

distribution
cosmopolitan
Netherlands:
common in various waters

references
Koste (1978)

Lepadella ovalis



ROTATORIA

BRACHIONIDAE

morphology
boot- to bottle-shaped carapace
6 acuminated spines
1 truncated caudal spine
dimensions: 200-360 x 90-120 µm

feeding
nanoplankton

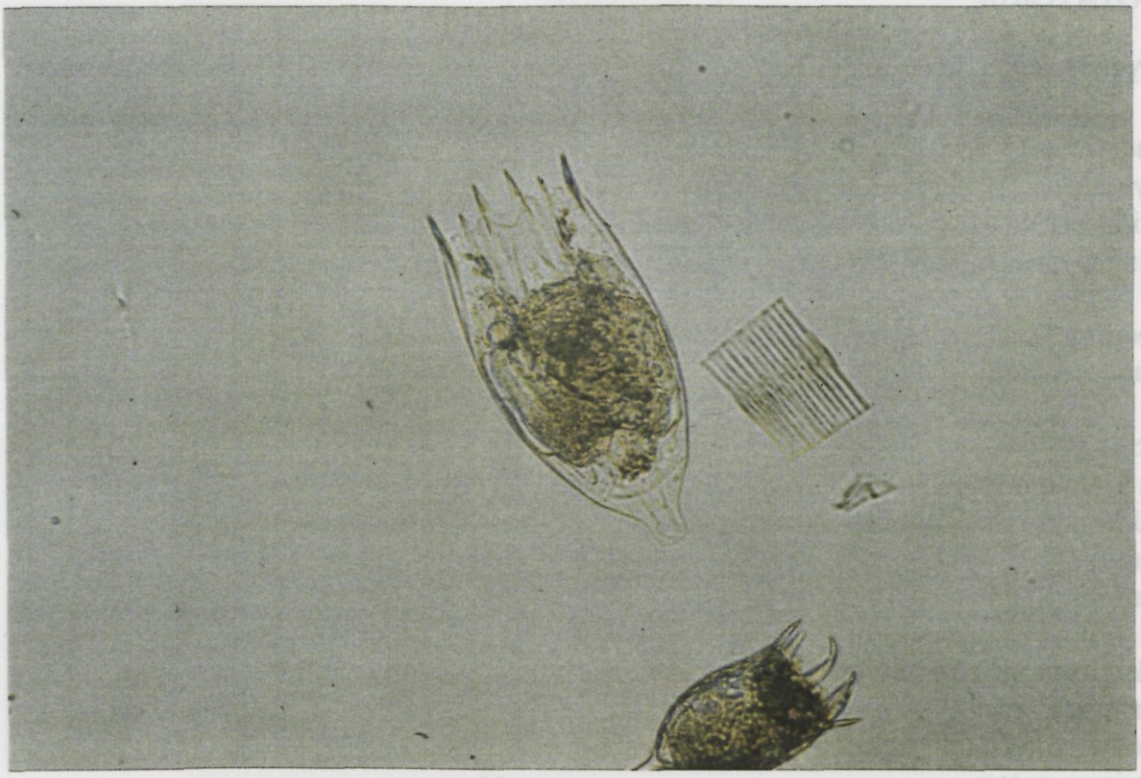
ecology
euplanktonic in fresh water and
oligo-halines
optimal in cold seasons

distribution
common to lakes, fens,
canals and rivers
in small numbers
Rhine: sporadic

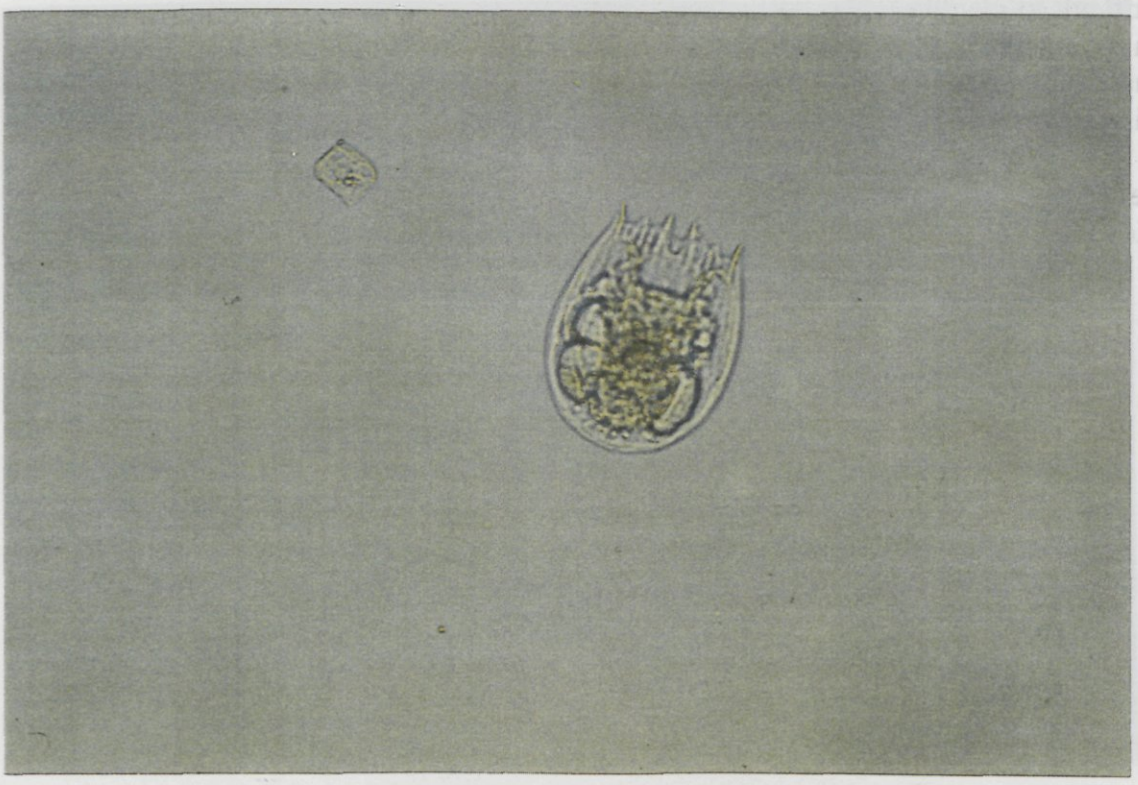
remarks
the shape of the caudal spine can vary
from truncate to acuminate so that
determination of species is difficult
N. squamula has a round posterior
and occurs in littoral;
both species are found regularly
in small numbers in the plankton
of rivers and lakes

references
Koste (1978)
Dresscher (1976)

Notholca acuminata



Notholca squamula



Polyarthra sp.

ROTATORIA

SYNCHAETIDAE

morphology
cylindrical, pocket- or square-shaped,
with leaf or sword-shaped appendages
dimensions: 60-200 µm

feeding
nanoplankton

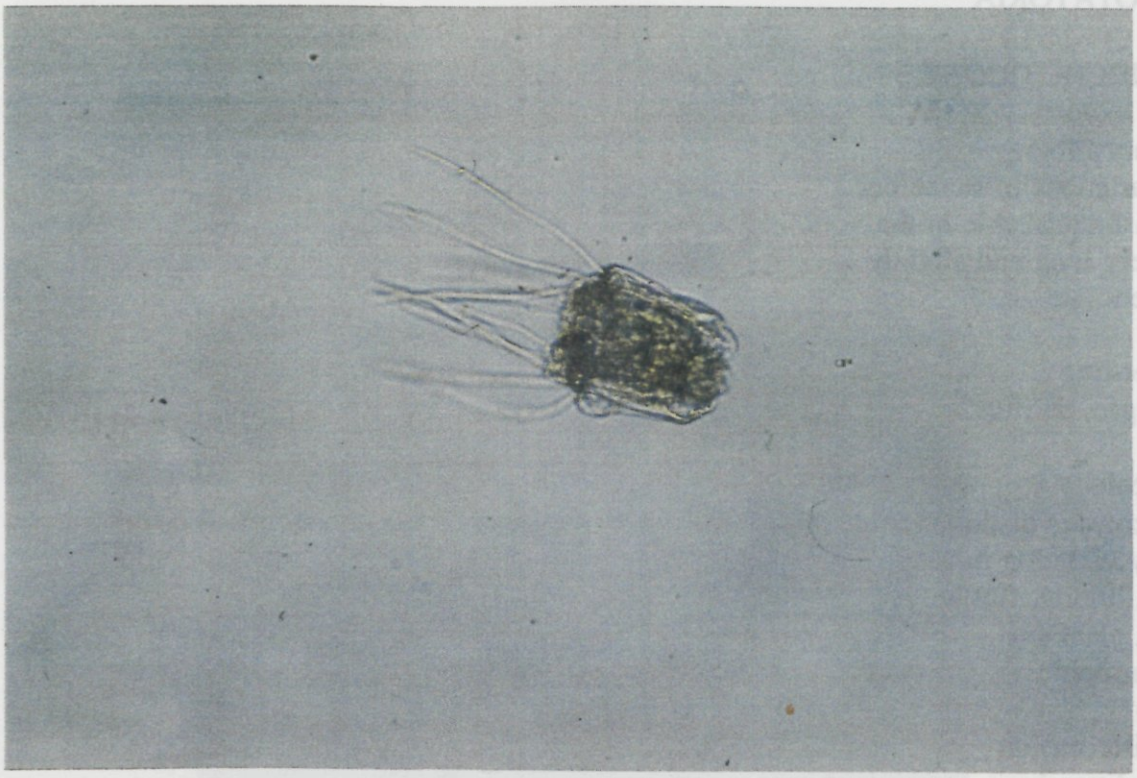
ecology
in plankton from ponds,
lakes and river banks
eurythermal
eutrophic

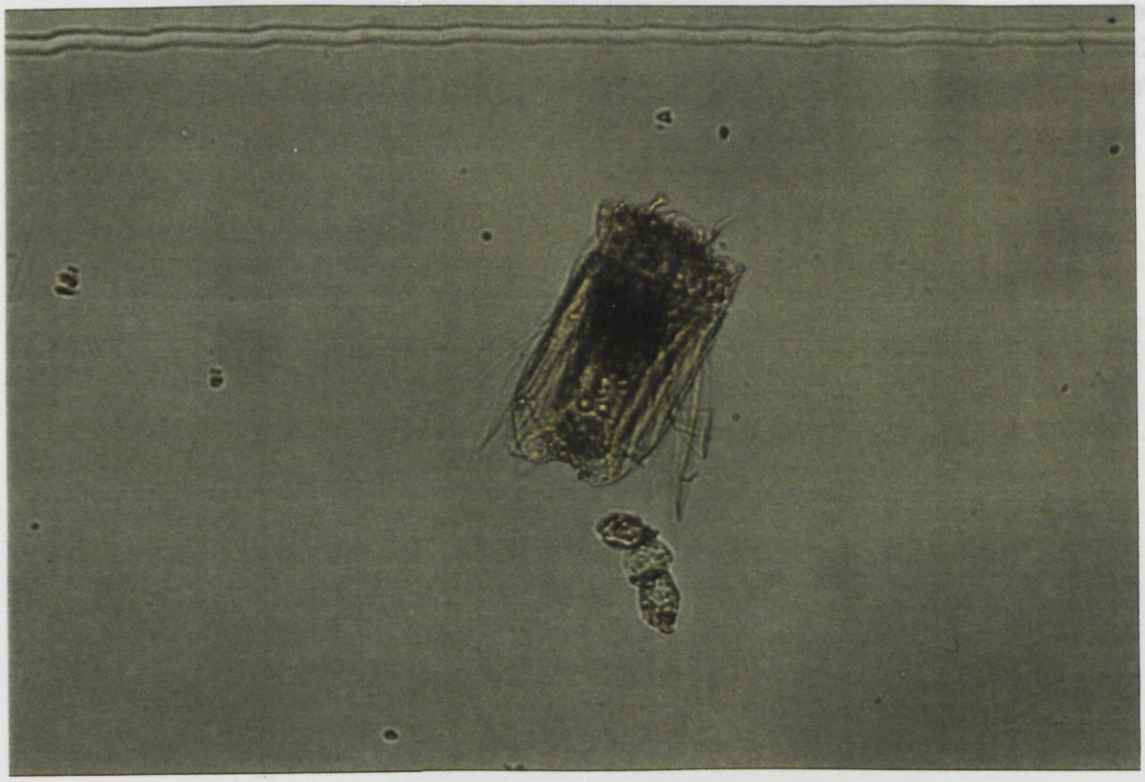
distribution
cosmopolitan
Netherlands: is common in
various waters
Rhine: in small numbers

remarks
difficult to identify
in fixed situation;
many shapes can be
distinguished into subspecies

references
Koste (1978)

Polyarthra sp.





ROTATORIA

TRICHOTRIDAE

morphology
variations in shape but
distinguishable in the
very long and slightly
bent toe

feeding
algae, detritus

ecology
ecotypes distinguishable
by variation in shape
in littoral, flushed
in plankton
eutrophic

distribution
in littoral
Netherlands: in the Meuse and Rhine
in small numbers in plankton

references
Koste (1978)
Pejler (1977)

Trichotria tetractis

CRUSTACEA

CRUSTACEA

GENERAL

Cladocera

Species of the family Bosminidae are smaller than the species of the family Daphniidea and are easily recognized by their long 'elephant-like snout'. The genus *Daphnia*, family Daphniidae is subdivided in the subgenera *Ctenodaphnia* and *Daphnia*. The species *Ctenodaphnia magna* is most commonly found in stagnant shallow waters, often forming red coloured swarms. The other two *Ctenodaphnia* species are rare. *C. magna* is relatively robust, the endclaw has two combs and a characteristic incission. If found in Rhine zooplankton samples it has been transported from stagnant backwaters. *Daphnia* species are more transparant and not so robust as *C. magna.*
Ceriodaphnia species are distinctly different from *Daphnia* sp. by absence of a rostrum.
Species of the family Chydoridae are small rounded forms of Cladocera which prefer living at the bottom.

Copepoda

In the group of Copepoda three types are distinguished:
- Calanoidae: long antennae, one eggcapsule and a slender torpedo-like body. They are floating in plankton and scarce or absent in flowing waters.
- Cyclopoidae: short antennae, two eggcapsules and a more spindle-like body. They are often found in river plankton.
- Harpacticidae: very short antennae, tiny creeping bottom species. Seldom found in plankton.

Bosmina longirostris
Bosmina coregoni

CRUSTACEA

CLADOCERA

BOSMINIDAE

morphology
rounded with long proboscis
dimensions: 0.4-1.2 mm, brown
transparent carapace variable shape

feeding
filters fine material, algae,
bacteria and detritus

ecology
common in plankton

distribution
common in large and small bodies of water
in rivers downstream in large numbers
Rhine: in small numbers from May - December

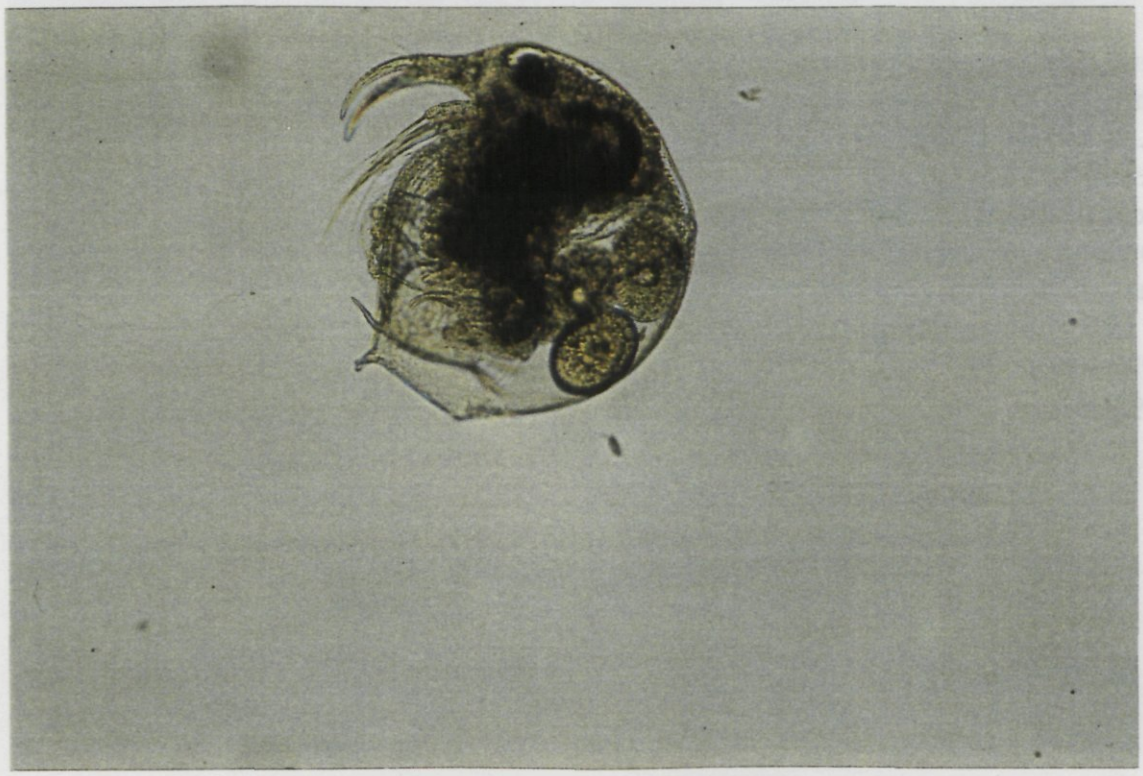
remarks
both species are often difficult
to distinguish from one another
(endclaw is often not visible)
B. longirostris: fine-bristled tail-fork,
feelers near ocellus
B. coregoni: short-spined tail-fork,
feelers nearer end of rostrum (often absent),
B. coregoni is usually smaller
than *B. longirostris*
when counting samples mention only genus *Bosmina*

N.B. The *Bosmina longispina* species occurs in the Netherlands in oligotrophic fens. It is further found in lime-deficient freshwater large lakes and rivers. This species can be carried down the Rhine from Lake Constance but is probably not viable downstream.

references
Flößner (1972)

Bosmina longirostris

Bosmina coregoni



Ceriodaphnia sp.

CRUSTACEA

CLADOCERA

DAPHNIIDAE

morphology
head without rostrum and a
downward incision
between head and body
dimensions: 0.4-0.8 mm

feeding
filters especially
bacteria and algae

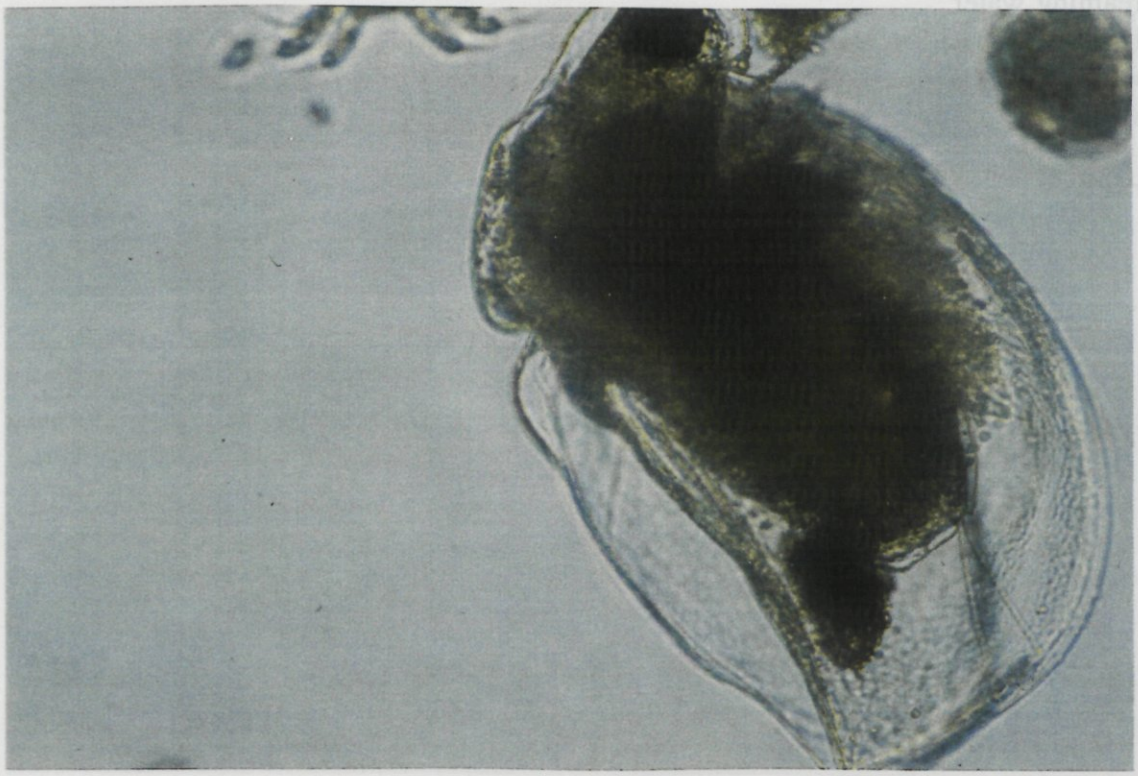
ecology
tolerant to salt
sometimes in plankton

distribution
common in various waters.
In rivers few in numbers
with larger numbers found downstream
Rhine: sporadic, especially along
river banks

remarks
Three species are most common:
C. pulchella, *C. quadrangularis* and
C. reticulata
identification is often difficult, when
counting samples, mention only genus
Ceriodaphnia sp.

references
Flößner (1972)

Ceriodaphnia sp.



Chydorus sphaericus

CRUSTACEA

CLADOCERA

CHYDORINAE

morphology
dimensions: 0.3-0.5 mm
round to oval
rounded caudal edge on carapace

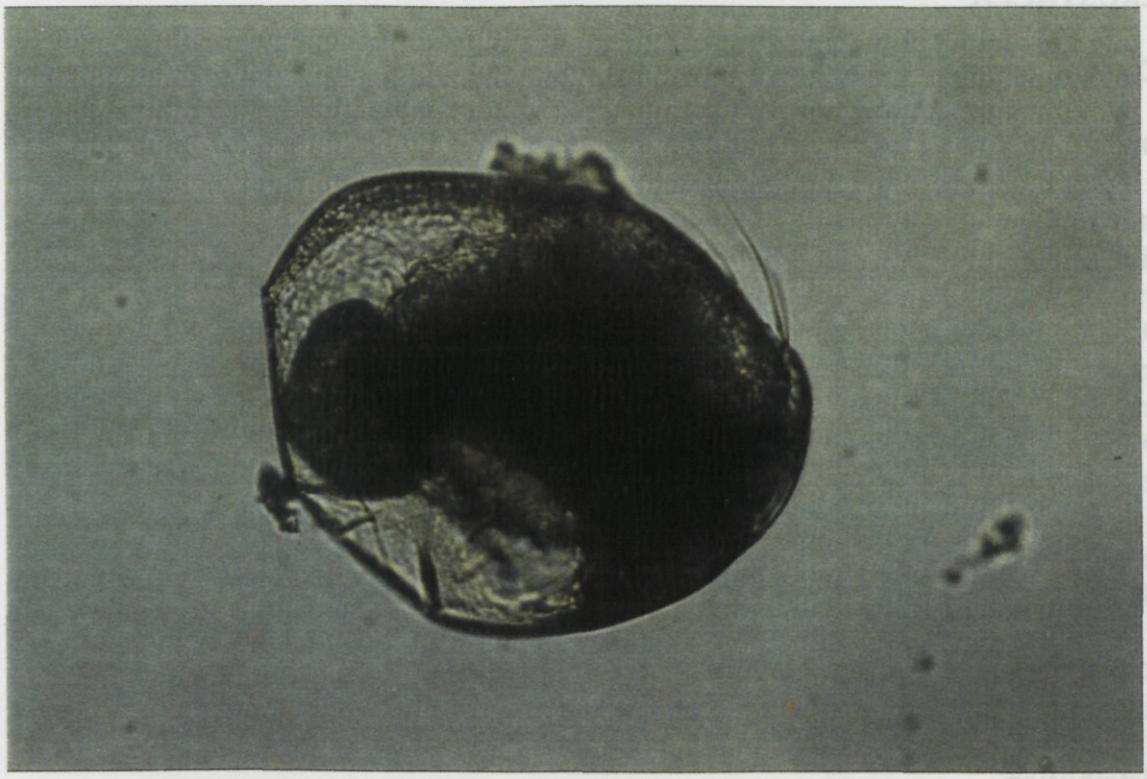
feeding
algae, bacteria
detritus
substrate filtration

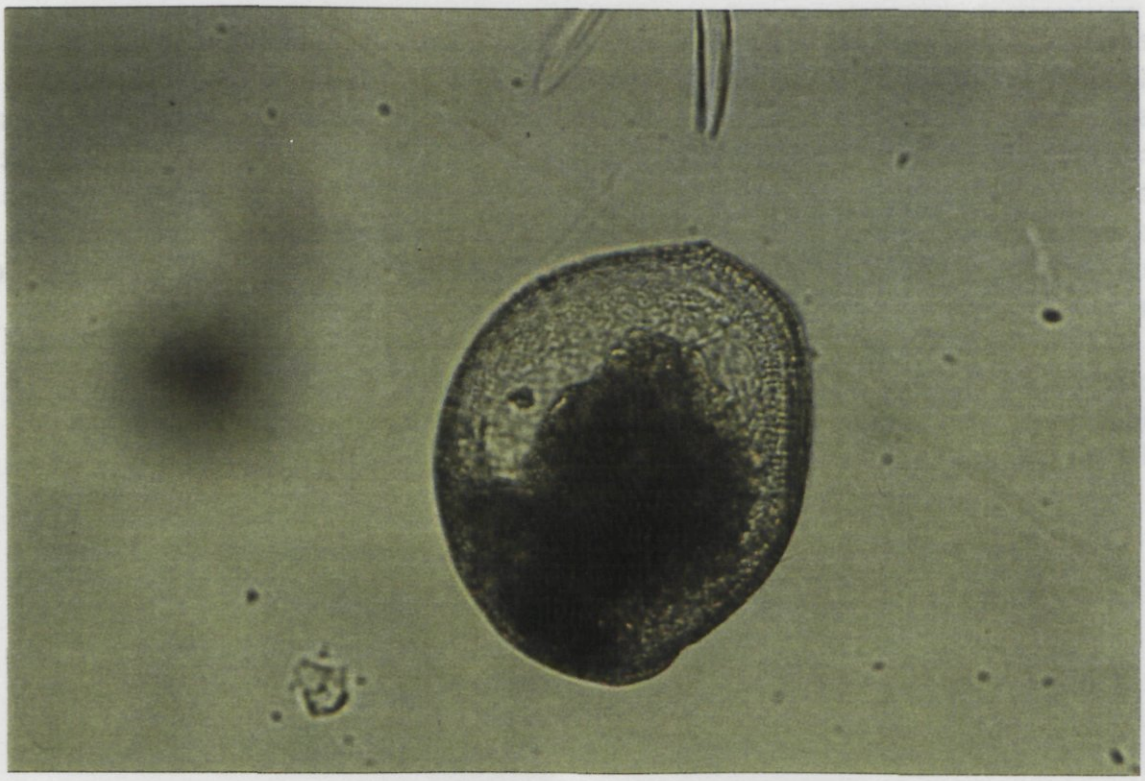
ecology
in littoral between plants
sometimes in plankton
also in acid and brackish waters

distribution
occurs in nearly all waters as
bottom dweller
sometimes as plankton in
streaming water
Rhine: along shallow river banks with stagnant water
sporadic in the mainstream
more frequent downstream

references
Flößner (1972)

Chydorus sphaericus





Daphnia sp.

CRUSTACEA

CLADOCERA

DAPHNIIDAE

morphology
dimensions: 1.0-3.0 mm
transparent
D. longispina group: no combs at endclaw, slender and more transparent
D. pulex group: two combs at endclaw

feeding
plankton algae, detritus

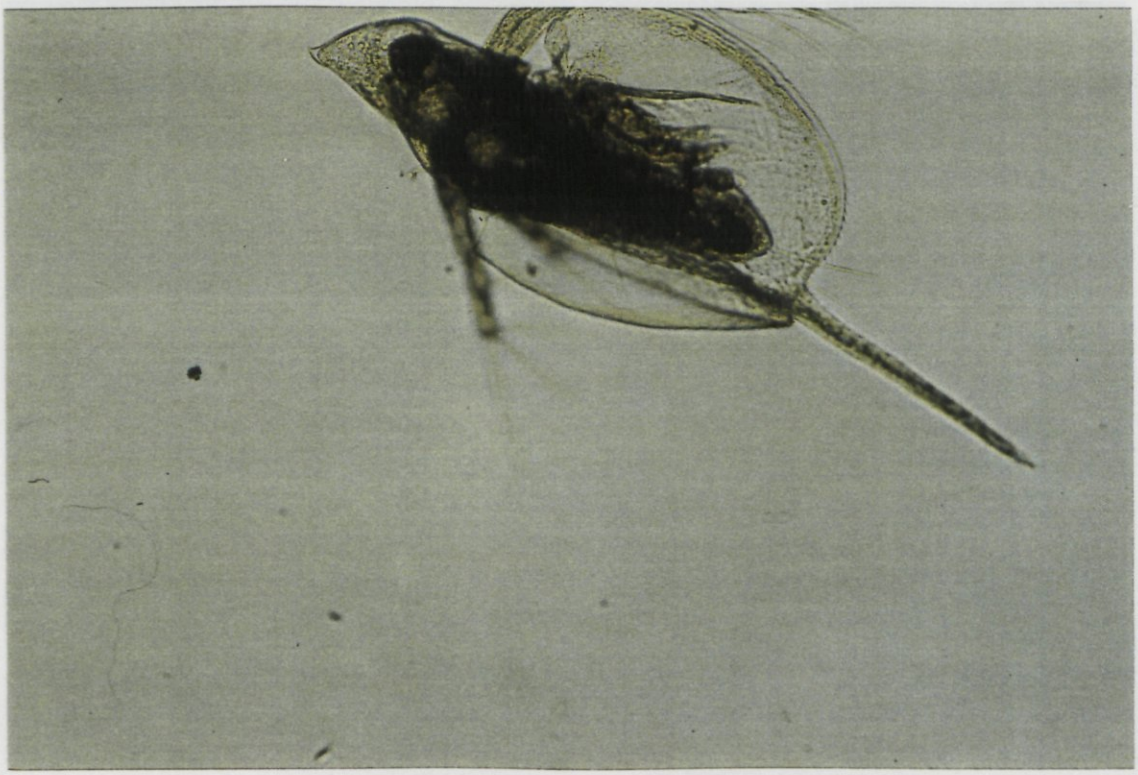
ecology
eutrophic

distribution
Most specimens found in the River Rhine originate from stagnant backwaters, floodplain waters etc.

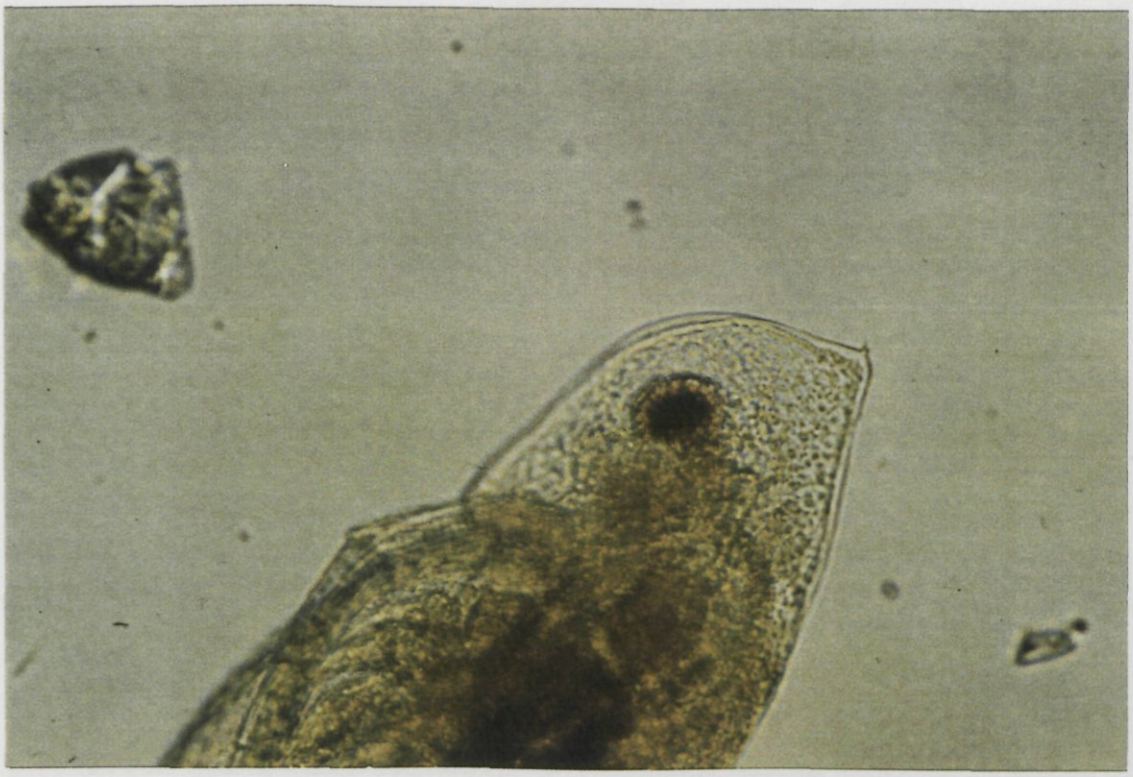
remarks
Identification of the *D. longispina* group is difficult as a result of a wide hybridization and parthenogenetic reproduction. Therefore identification is performed using and assessing characteristics of one species together with those from another species. This results in names like *D. cucullata x hyalina* which is a hybride of *D. cucullata* etc. A lake often has its own *Daphnia* strain. In the lower course of a river several strains enter the area and may proceed to multiply locally as a population. When counting samples, mention only genus *Daphnia*.

references
Flößner (1972)
Flößner and Kraus (1986)

Daphnia sp.

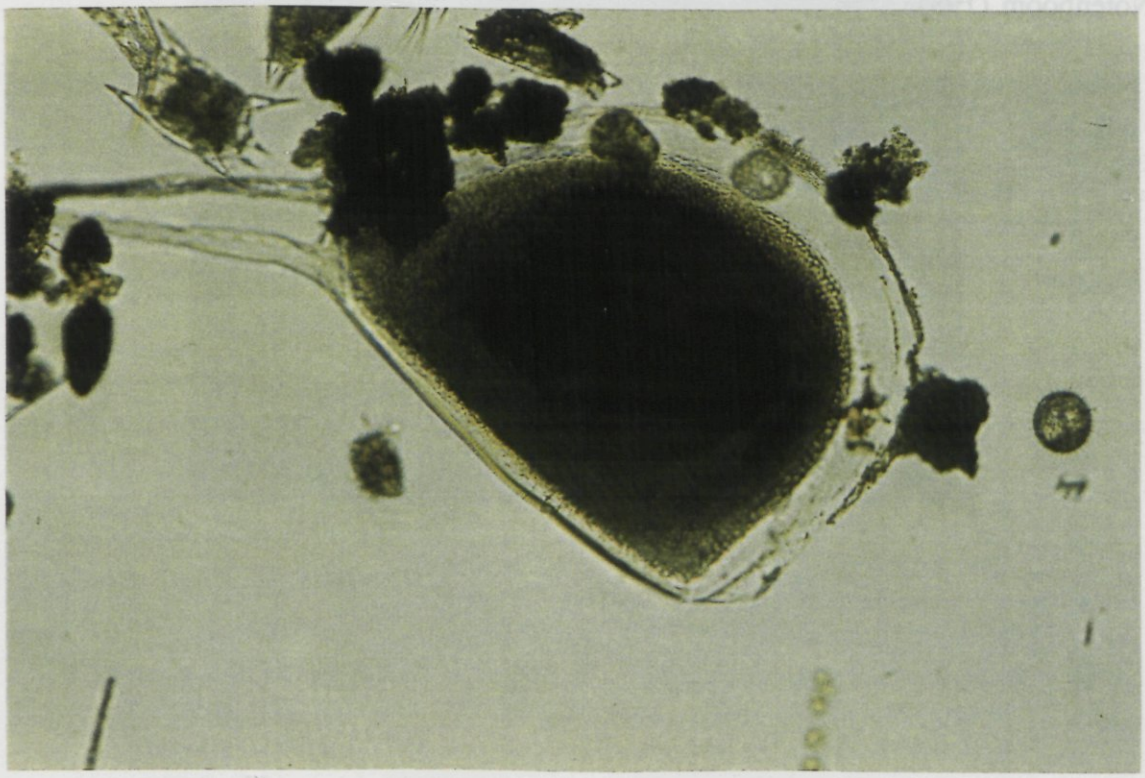


Daphnia sp.



Daphnia sp.

Ephippium of *Daphnia*



Diaphanosoma brachyurum

CRUSTACEA

CLADOCERA

SIDIDAE

morphology
dimensions: 3-4 mm
colourless, transparent

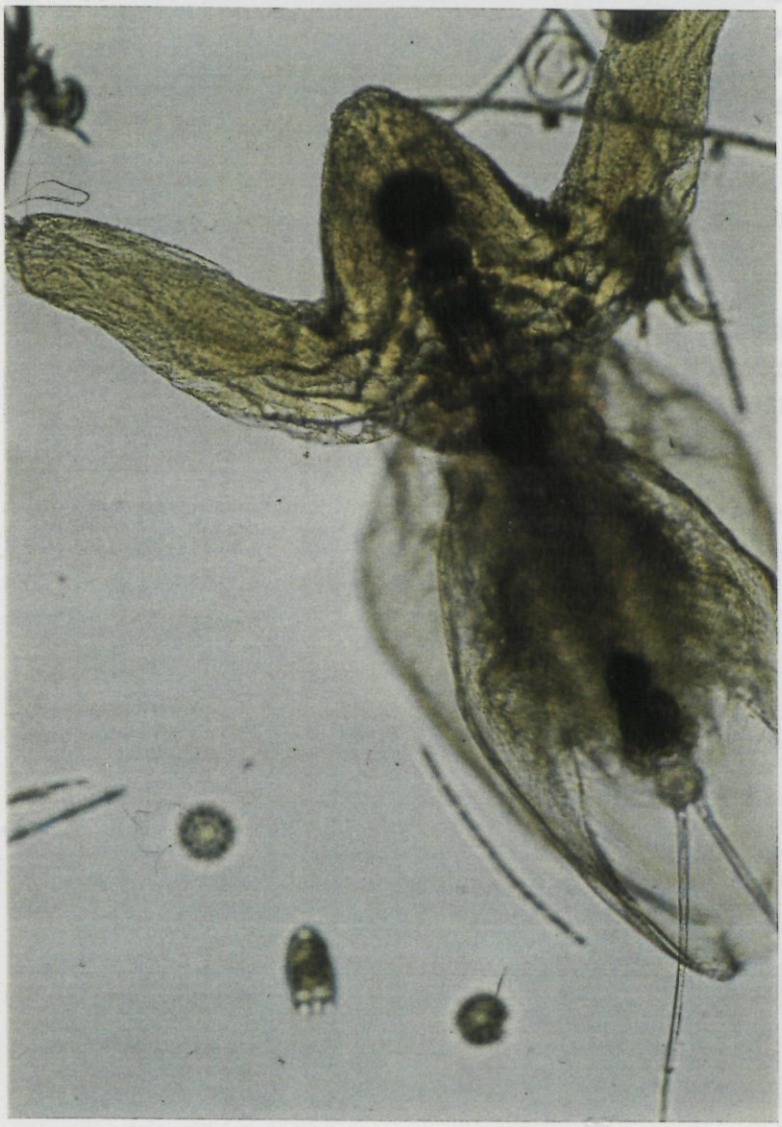
feeding
filters fine debris

ecology
in plankton
originating from lakes

distribution
Netherlands: widespread
Rhine: scarce, originating
from stagnant floodplain
waters

references
Flößner (1972)
Notenboom (1981)

Diaphanosoma brachyurum



CRUSTACEA

CLADOCERA

CHYDORINAE

morphology
more-or-less elongated
striped carapace
long acuminated rostrum
dimensions: 0.4-0.65 mm
ocellus nearly as large as compound eye

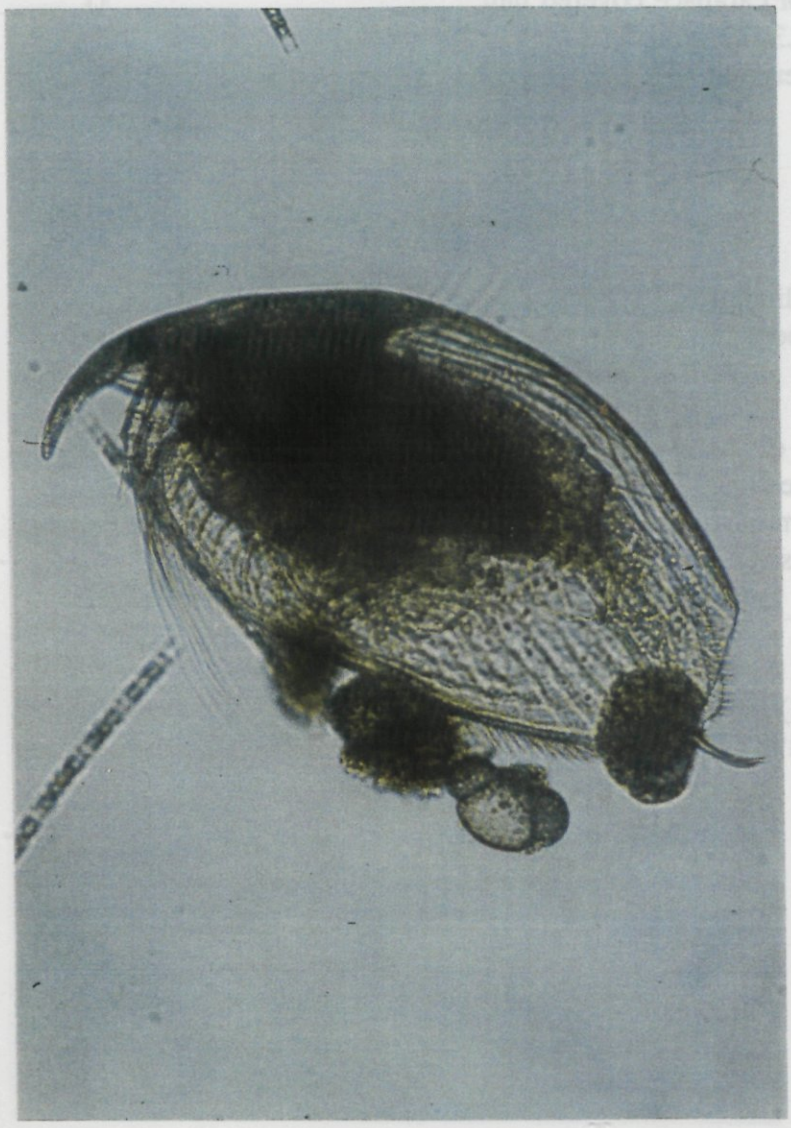
feeding
filters fine debris

ecology
resident in sediment
usually in larger eutrophic waters
on mud along the bank

distribution
in littoral of larger bodies of water
not in flowing water
Rhine: flushed in plankton from muddy banks

references
Flößner (1972)
Notenboom (1981)

Disparalona rostrata



CRUSTACEA

CLADOCERA

MACROTHRICIDAE

morphology
long and mobile antennulae
ventral edge of carapace covered hair
dimensions: 0.3-0.7 mm
back lightly serrated

feeding
fine detritus

ecology
resident in sediment
in small numbers

distribution
in the mud of ditches and shallow fens
along the large rivers
Rhine: where mud forms sediment
sometimes flushed in
river plankton from banks

references
Flößner (1972)
Notenboom (1981)

Macrothrix laticornis

CRUSTACEA

COPEPODA

CYCLOPIDAE

morphology
tail clearly contrasted
from body
slender furcal branches with "sawteeth"

feeding
small organisms

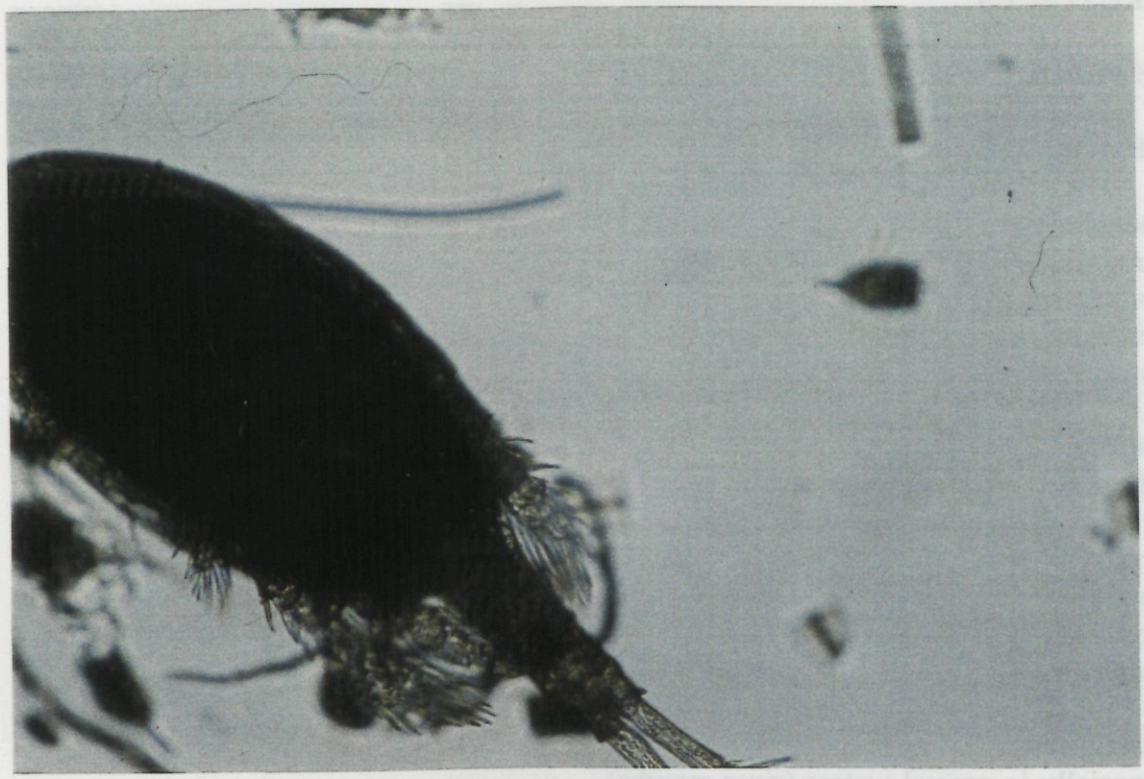
ecology
eutrophic
in littoral but also pelagic

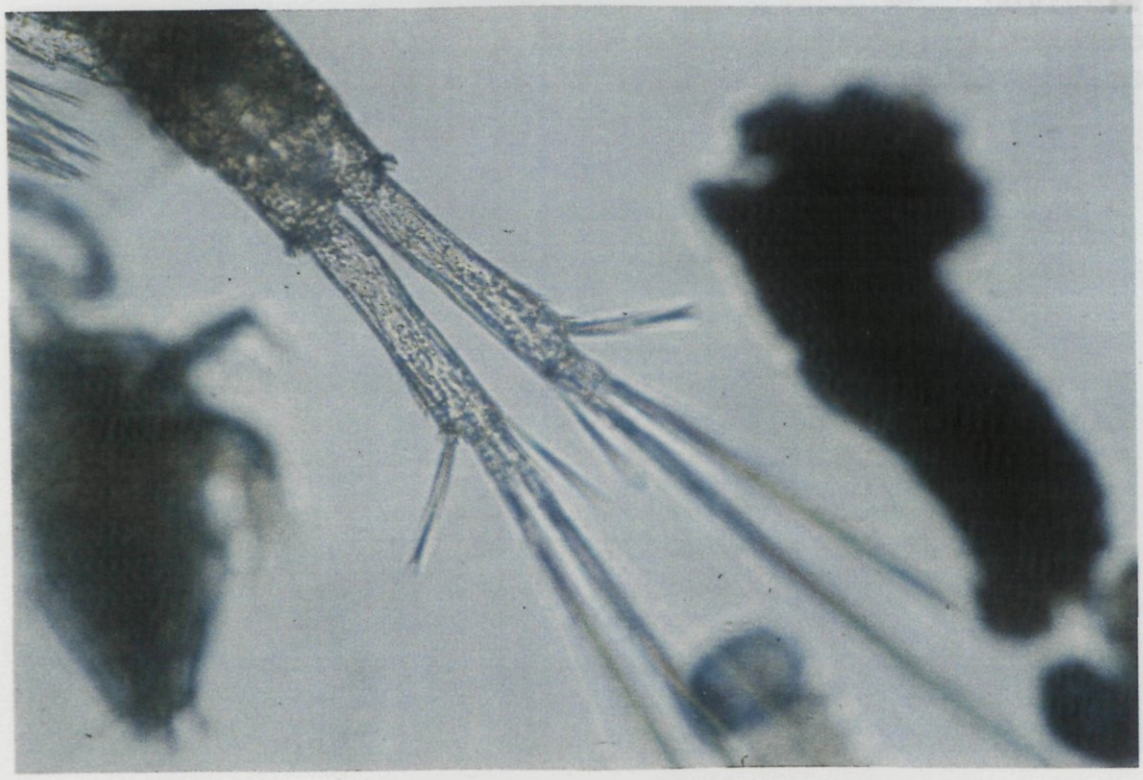
distribution
common in various waters
Rhine: sporadic

remarks
furcal with "sawteeth" on the outer
edge shown on photo
many similarities to *E. serrulatus*,
which can occur accompanied by *E. macruroides*

references
Dresscher (1976)
Kiefer (1978)
Redeke (1975)
Remane and Schlieper (1971)

Eucyclops macruroides





CRUSTACEA

COPEPODA

TEMORIDAE

morphology
dimensions: 1.0-1.7 mm
spindle-shaped body converging in the tail
winged thorax
furcal branches with spines

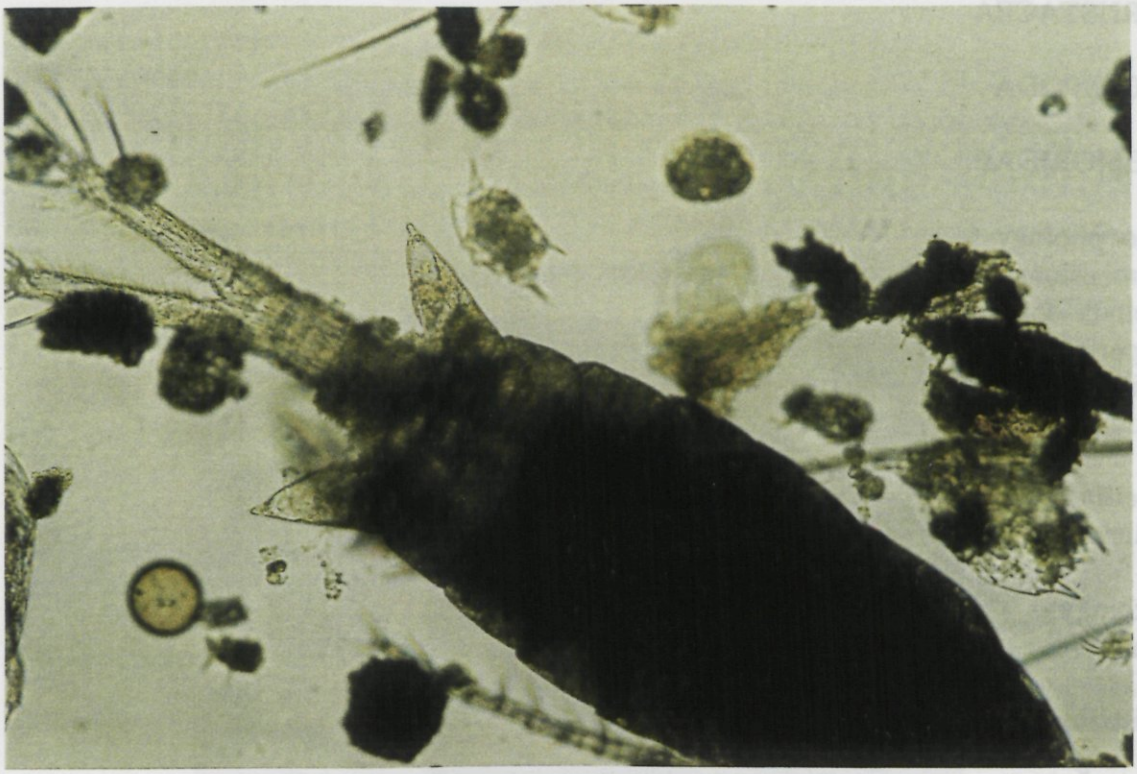
feeding
filters fine material

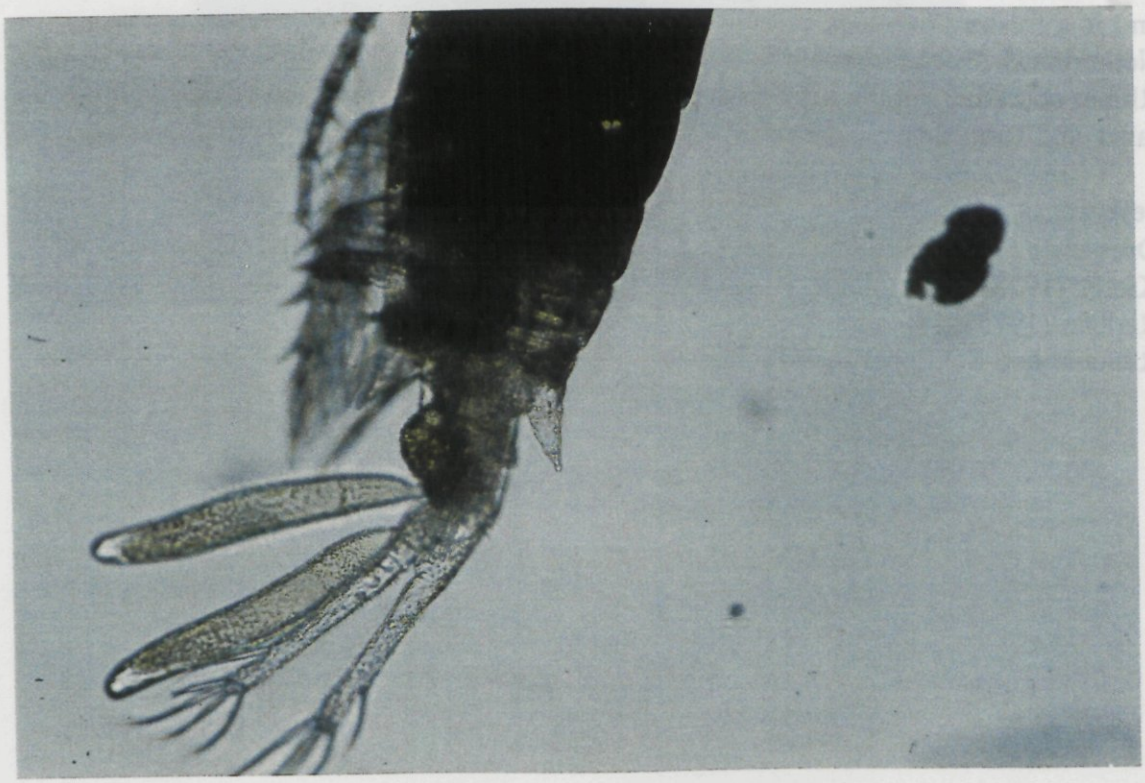
ecology
eutrophic
especially in coastal waters
euryhaline

distribution
especially in coastal waters (river mouths)

references
Drescher (1976)
Kiefer (1978)
Redeke (1975)
Remane and Schlieper (1971)

Eurytemora affinis





CRUSTACEA

COPEPODA

TEMORIDAE

morphology
dimensions: 1.0-1.7 mm
spindle-shaped body
tapering into tail
winged thorax (see **remarks** below)
furcal branches with spines

feeding
filters fine debris

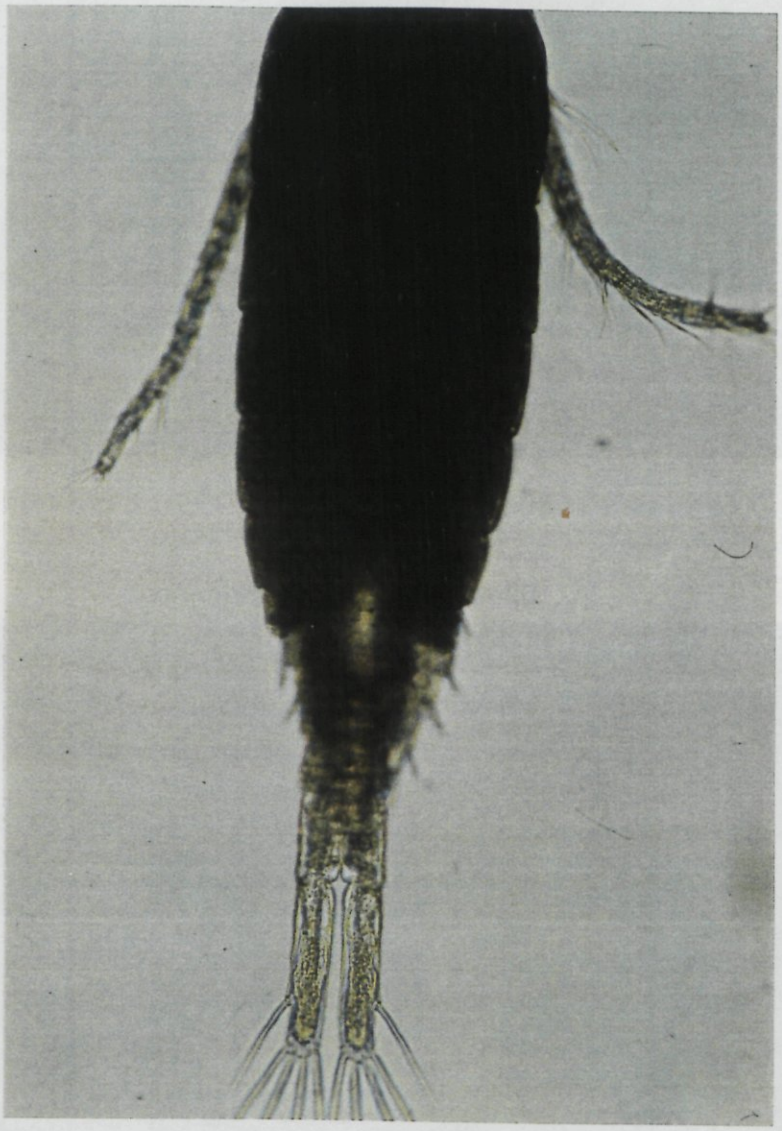
ecology
eutrophic

distribution
in large and small bodies of water
Rhine: sporadic

remarks
E. lacustris does not have winged thorax
and is a freshwater species
Netherlands: Brielsemeer
Rhine: sporadic; supplied from large
lakes and former river courses

references
Dresscher (1976)
Kiefer (1978)
Redeke (1975)
Remane and Schlieper (1971)

Eurytemora lacustris



Nauplius of Calanoida

Nauplius of Cyclopoida

MOLLUSCA

MOLLUSCA

GENERAL

Mollusca belong to the group of macroinvertebrates. However, larvae of the Zebra mussel (*Dreissena polymorpha*) may be found in high densities in the river zooplankton.

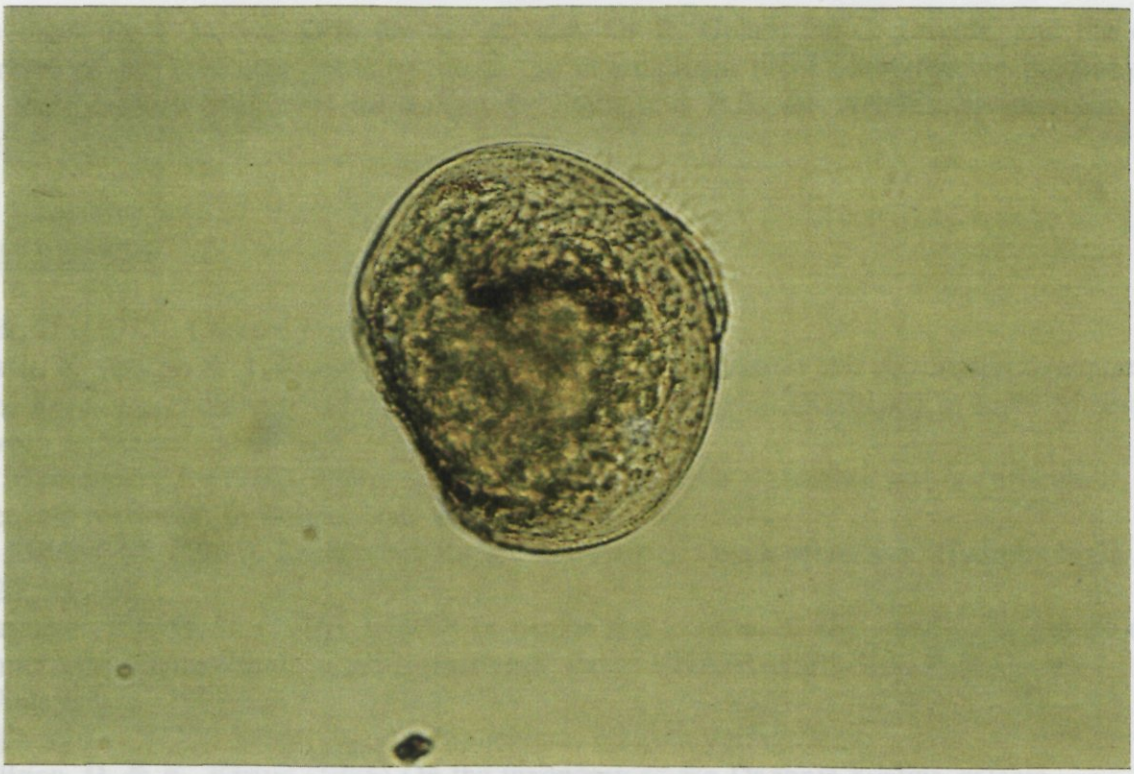
Dreissena polymorpha

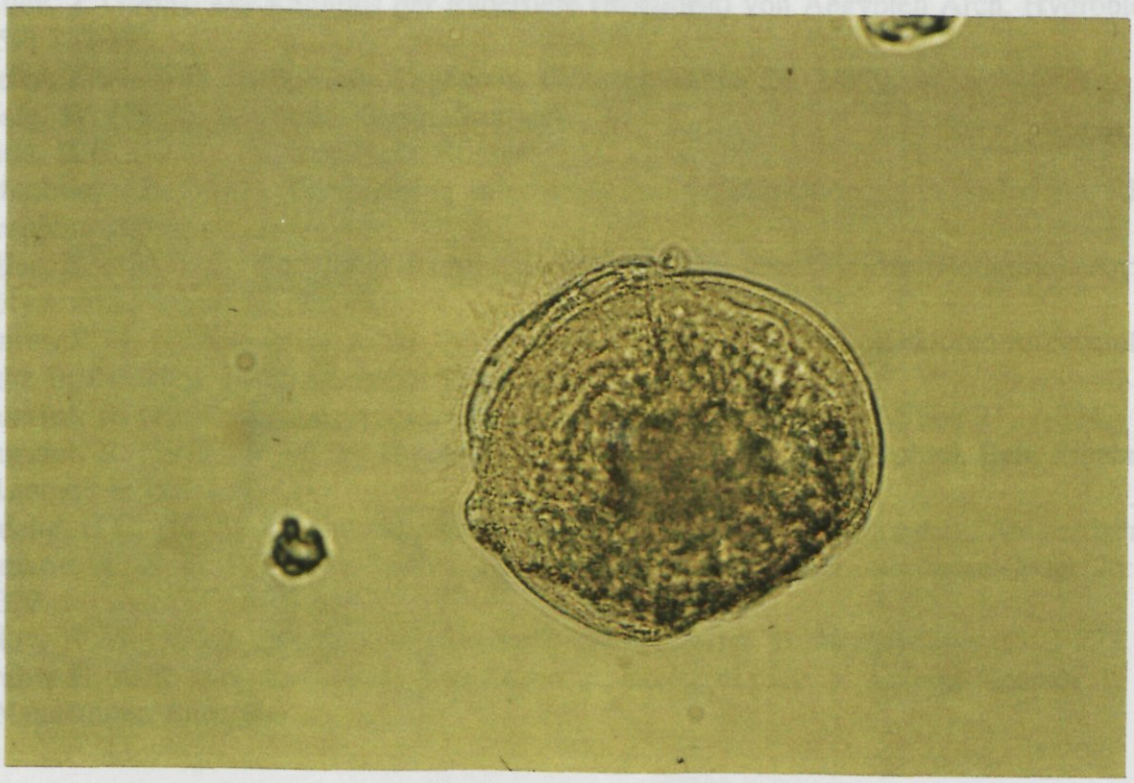
LAMELLIBRANCHIATA

DREISSENIDAE

The larvae of the Zebra mussel reside temporarily in plankton.
The animal swims with a ciliary whorl with which it also guides food to itself. After a number of weeks the (veliger) larva develops a shell (trochophora), and then sinks and attaches itself to the bottom.

Dreissena polymorpha larva





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