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Marine Rotifera from the Crozet and Kerguelen Islands (Subantarctica), with the Description of a New *Encentrum* (Monogononta: Dicranophoridae)

key words: Rotifera, Subantarctica, Iles Kerguelen, Iles Crozet, zoogeography, taxonomy, *Encentrum frenoti* n. sp.

Abstract

As part of a survey of the rotifer fauna of Terres Australes et Antarctiques Françaises, marine rotifers from the littoral of the subantarctic Grande Terre, Kerguelen archipelago and Ile de la Possession, Crozet archipelago are reported. Nine taxa were found: Bdelloidea indet. and eight Monogononta. One species, *Encentrum frenoti*, is new to science and described.

1. Introduction

Information on the rotifer fauna from marine waters of the Antarctic and Subantarctic is almost inexistent. ZELINKA (1927) described *Trichocerca artmanni* (reported sub *Rattulus artmanni*) and *Synchaeta triophthalma* LAUTERBORN from Baie de l'Observatoire, Iles Kerguelen, and *Synchaeta rousseleti* from the not further localised Gauss Station (Iles Kerguelen or winter anchorage (67°S, 89°E) of the S. S. Gauss of the German South Polar expedition?). The only other report on marine rotifers is by DARTNALL (1997) who recorded *Encentrum salinum* from a fjord and saline lakes at Vestfold Hills, East Antarctica.

In the present contribution, Rotifera of 31 samples collected in the marine littoral of Ile de la Possession, Crozet archipelago and Grande Terre, Kerguelen archipelago, both situated in the Southern Indian Ocean (Fig. 1), is reported upon. It is part of an ongoing study on the rotifer fauna of Terres Australes et Antarctiques Françaises.

The Crozet archipelago (45°48′ – 46°26′S, 50°14′ – 52°15′E) is a group of small islands 2300 km north of the Antarctic Continent and 2400 km southeast of South Africa. The archipelago lies just north of the Antarctic Convergence. The main island is Ile de la Possession. The waters around the island are characterized by a low tidal amplitude (<70 cm) and a little variable salinity (33.71–33.78 ‰, mean 33.75 ‰). Surface water temperature averages 3 °C during winter and varies from 1.8 °C (begin) to 7 °C (end) during summer.

The Kerguelen archipelago (48°58′ – 49°73′S, 68°72′ – 70°58′E) consists of one major island, Grande Terre, and some 300 small islets. It lies about half-way between S. Africa (5000 km) and Australia (4800 km), and 2000 km from the nearest point of the Antarctic Continent. The archipelago is situated at the northern limit of the Antarctic Convergence. The tidal amplitude at the sampling locality (Port-aux-Français) varies from 160–220 cm. Salinity shows little variation (34.32–33.40 ‰). The mean temperature of the surface water of the littoral is 5.51 °C in summer and 2.10 °C in winter (minimum temperature ±1.5 °C in July-August).

According to STONEHOUSE (1982) Iles Crozet and Kerguelen belong to the cold temperate zone of the Subantarctic region.

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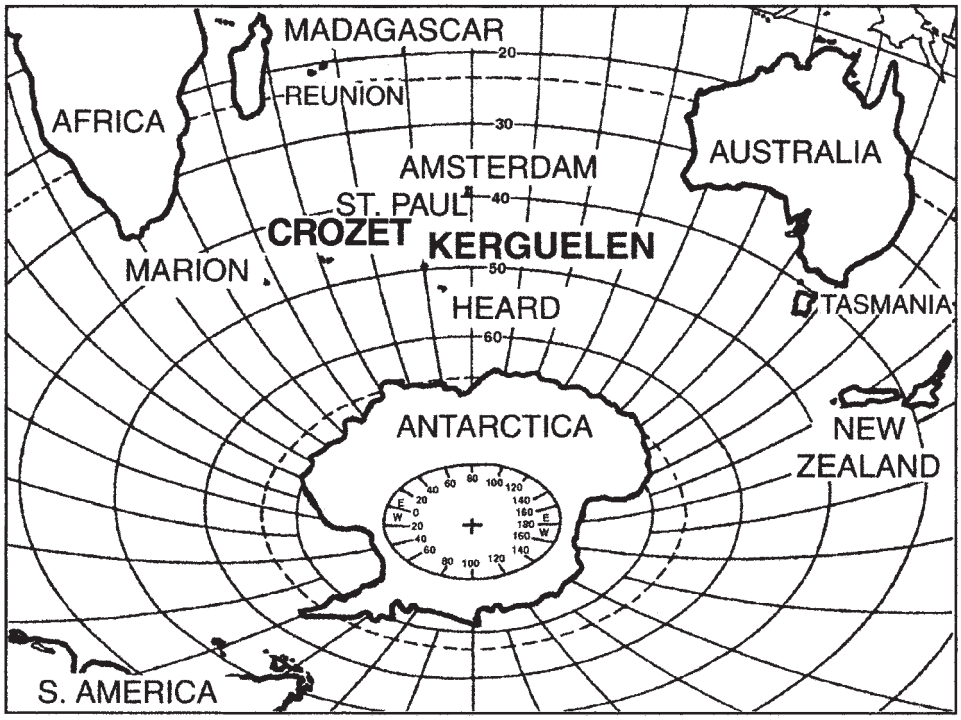


Figure 1. Map showing Iles Crozet and Iles Kerguelen in relation to the continents and some other subantarctic islands.

2. Material and Methods

Sampling was done during the Austral summer 1997–1998. About 100 cm^3 of different species of seaweeds each was collected in the medio-littoral (ML) and infra-littoral fringe (ILF). Aufwuchs was sampled by scraping the substrate with a PVC bottle. All samples were fixed and preserved in 3% formaline. Rotifers were extracted in the laboratory using the swirl-decantation technique with consequent concentration on a 40 μm sieve.

Preparation of trophi for light and scanning electron microscopy (SEM) was done following De Smet (1998) using NaOCl solution. For SEM a Philips SEM 515 microscope, operated at 20 kV, was used.

The following sites and seaweeds were sampled:

1. Iles Kerguelen, Grande Terre (KER): Golfe du Morbihan, Baie de l'Aurore near Port-aux- Français. 7 February 1998. lower ML: N°22. *Enteromorpha* sp., 23. *Adenocystis utricularia* (Bory) Skott., 24. *Urospora penicilliformis* (Roth.) Aresch., 25. *Ulva* sp.
2. Iles Crozet, Ile de la Possession (CRO).

– Crique de Noël. 12 December 1997: lower ML and ILF: N°29. *Polysiphonia* sp., 30. *Ceramium* sp., 31. *Ceramium* sp., 32. *Polysiphonia* sp., 33. *Rhodymenia* sp., 34. *Ceramium* sp., *Polysiphonia* sp.; upper ML: 35. *Enteromorpha* sp., 36. *Chaetomorpha* sp.
– Baie Américaine. 16 December 1997: N°37. ILF, *Codium* sp.; 17 January 1998: N°124. lower ML, *Monostroma* sp., 125. lower ML, unident. chlorophyte.
– Baie de Lapérouse. 28 December 1997: N°89. lower ML, *Porphyra* sp., 90. ML, lithotelm, Aufwuchs.
– Baie du Marin. 26 December 1997: N°91. ML, rock pool, Aufwuchs, 92. ML, *Enteromorpha* sp., 93. ILF, *Polysiphonia* sp., 94. ILF, *Ballia callitricha* (C. Agardh) Kuetz., *Polysiphonia* sp., 95. ILF,

Acrosiphonia pacifica (MONT.) J. AGARDH, 96. ML, rock pool, unident. rhodophyte, 97. ML, rock pool, Aufwuchs.

– Crique du Sphinx. 23 December 1997: N°139. ML, rock pool, *Acrosiphonia pacifica*, 140. ILF, *Ballia callitricha*, unident. rhodophyte, 141. ILF, *Ceramium* sp., 142. ILF, *Polysiphonia* sp., 143. lower ML, *Ulva* sp., 144. ILF, *Polysiphonia* sp., 145. ML, rock pool, *Polysiphonia* sp.

3. Results and Discussion

Rotifers were present in 29 of the 31 samples collected. Species richness of the rotifer positive samples is low and varies from 1 to 6. Total abundancy likewise was low. A list of the different taxa found in the samples is presented in Table 1. Bdelloidea are treated as a gross taxonomic group, since they were contracted and deformed beyond identification. The Monogononta are represented by 8 species belonging to the families Colurellidae, Dicranophoridae, Lindiidae and Proalidae. One species, an *Encentrum*, is new to science.

The description of the new species and comments on the other taxa is as follows.

Table 1. List of rotifer taxa found in the marine littoral of Ile de la Possession, Iles Crozet (CRO) and Grande Terre, Iles Kerguelen (KER). Numbers refer to sample numbers (see Materials and Methods).

Bdelloidea *indet.*: CRO 29, 35, 36, 91, 92, 93, 94, 97, 143; KER 23, 24, 25
Colurella salina ALTHAUS: CRO 139, 142; KER 24
C. cf. *colurus* (EHRENBERG): CRO 33, 36, 91; KER 22
Encentrum algente HARRING: CRO 139, 142, 143, 145
E. frenoti n. sp.: CRO 139; KER 24
E. marinum (DUJARDIN): CRO 139,142; KER 24
Proales halophila (REMANE): CRO 35, 139; KER 24
P. reinhardti (EHRENBERG): CRO 29, 30, 32, 33, 34, 35, 36, 37, 89, 93, 94, 95, 96, 97, 124, 139, 140, 141, 142, 143, 144, 145; KER 23, 24
Lindia torulosa DUJARDIN: CRO 36

Encentrum frenoti n. sp. (Figs. 2–13)

Diagnosis

A medium-sized (±200 μm) *Encentrum*. Toes more or less conical, offset near mid-length, slightly decurved ventrally, tips straight cut, bases set close together. Bladder long, extending till middle of trunk. Brain with paired appendages. Trophi of *Isoencentrum*-type, obpyriform, rami with small alulae. Inner margin of subbasal rami chambers with tooth. One pair of preuncinal teeth.

Material examined

Holotype: a parthenogenetic female in a permanent, glycerine glass slide mount deposited in the Koninklijk Belgisch Instituut voor Natuurwetenschappen (K.B.I.N.), Brussels. Reg.n° IG 29.289.

Paratypes: one slide with paratype and trophi preparation in K.B.I.N. and the Laboratory for Animal Ecology, R.U.G., Gent, Belgium; slides with parthenogenetic females and trophi, 4 stubs each with one trophi preparation for SEM, and several specimens in glycerine in the Department of Biology, R.U.C.A.

Type locality

Grande Terre, Iles Kerguelen: Golfe du Morbihan, Baie de l'Aurore Australe near Port-aux-Français. 7 February 1998. Amongst seaweed in lower medio-littoral.

Additional material from Ile de la Possession, Crozet archipelago, Crique du Sphinx. 23 December 1997. Amongst seaweed in rock-pool from medio-littoral.

Etymology

The species is named after Dr. Yves Frenot, in recognition of his work on terrestrial ecology in the Subantarctic, and the support with my participation in the antarctic campaign 1997–1998.

Description

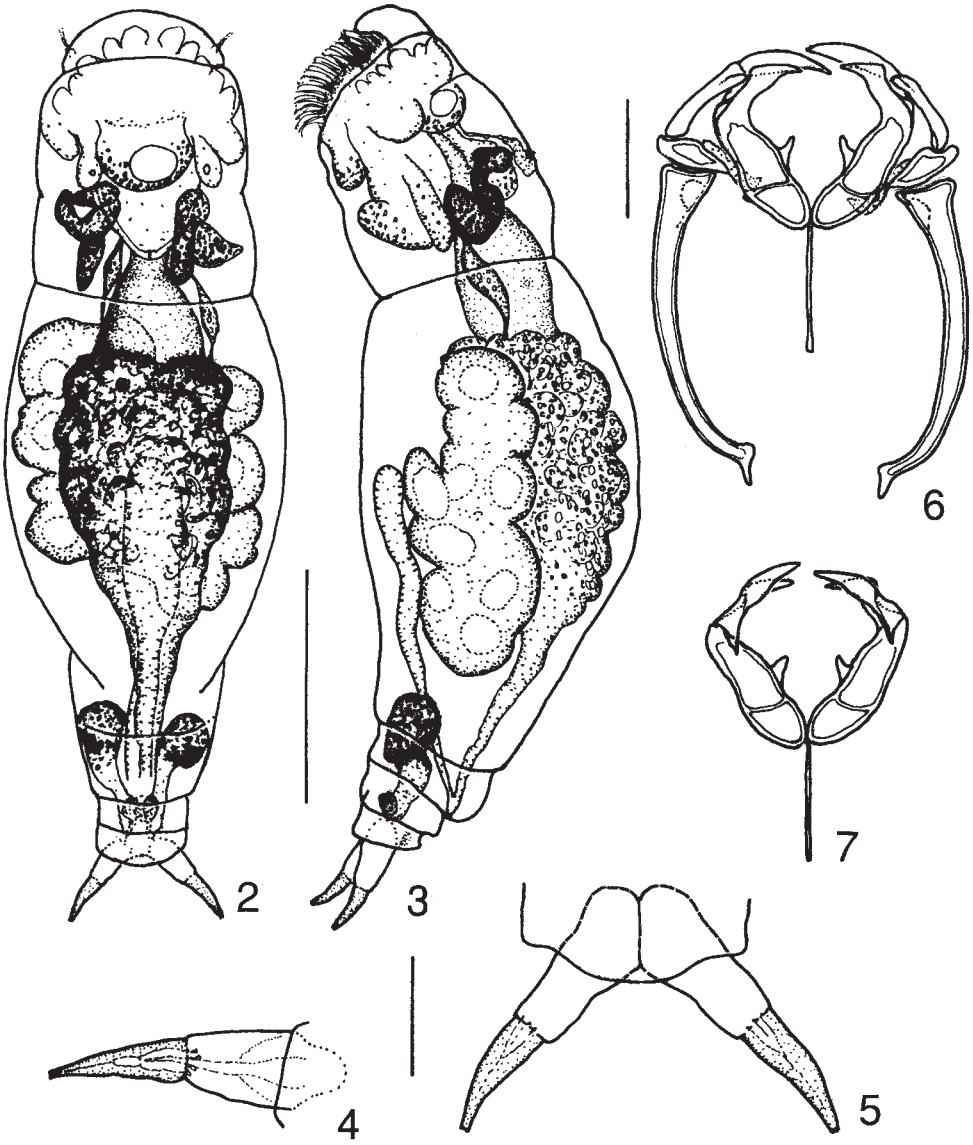
Parthenogenetic female. Body (Figs. 2, 3) stout, fusiform in dorsal view, broadest near mid-length. Head c. 1/3 total length, offset by neckfold, slightly tilted ventrally. Dorsal antenna at 1/3 head length from neckfold. Rostrum well developed, broadly rounded, decurved ventrally. Corona oblique. Trunk with distinct pseudosegment posteriorly, in lateral view dorsally arched and ventrally flattened; tail very short, broadly rounded; lateral antennae not seen. Foot short, two pseudosegments. Toes (Figs. 4, 5) c. 1/10 total length, more or less conical, abruptly offset near mid-length, terminating in straight cut point, slightly decurved ventrally; in dorsal view slightly incurved, anterior half weakly indented medially; bases of toes set close together. Eyespots absent. Brain saccate, subcerebral glands present. Two large, apparently S-like tube-shaped appendages of unequal thickness postero-laterally from brain. Proventriculus present. Gastric glands fusiform, with secondary connection between brain and mastax. Bladder long, extending till middle of trunk or farther. Pedal glands large, extending into trunk, club-shaped; ventrally two small accessory gland-like stuctures. Vitellarium with eight nuclei.

Trophi (Figs. 6–13) of *Isoencentrum*-type (De Smet, 1997). Rami outline obpyriform; very small alulae dorso-laterally, almost imperceptible by light microscopy. Median rami opening broadly wedge-shaped. Rami stout, each with stout, slightly offset and incurved apical tooth, and stout preuncinal tooth placed at the same angle to the axis as the apical teeth; inner margin of subbasal chambers with strong tooth anteriorly. Fulcrum slightly shorter than rami, narrow and parallel-sided in dorsal view, in lateral view with broad base, gradually tapering posteriorly, slightly decurved ventrally. Unci single-toothed, tooth about shaft length, dorsal and ventral apophyses well developed, base of shafts distinctly expanded ventrally. Intramallei flattened, inner half obliquely tapering; outwards with two short, blunt spiniform processes. Supramanubria more or less parallel-sided with apically recurved tip, inserted on oblique section of anterior margin of intramallei. Manubria with torsion in posterior half: depending slight variations in orientation this results (dorsal view) in evenly curved manubria (Fig. 8, left manubrium), or weakly curved manubria with incurved cauda (Figs. 6, and 8 right manubrium); manubria crutched posteriorly; head with triangular expansion and large opening.

Measurements (N = 15): Length 185–207 ($\bar{x}$ = 199) μm, toe 19–25 ($\bar{x}$ = 23) μm; trophi 34.2–36.8 μm: ramus 13.3–16 μm, fulcrum 10–11.1 μm, uncus 13.8–15.2 μm, intramalleus (l × h) 6.0–6.9 × 1.8–2.1 μm, supramanubrium 6–6.9 μm, manubrium 25.5–28 μm.

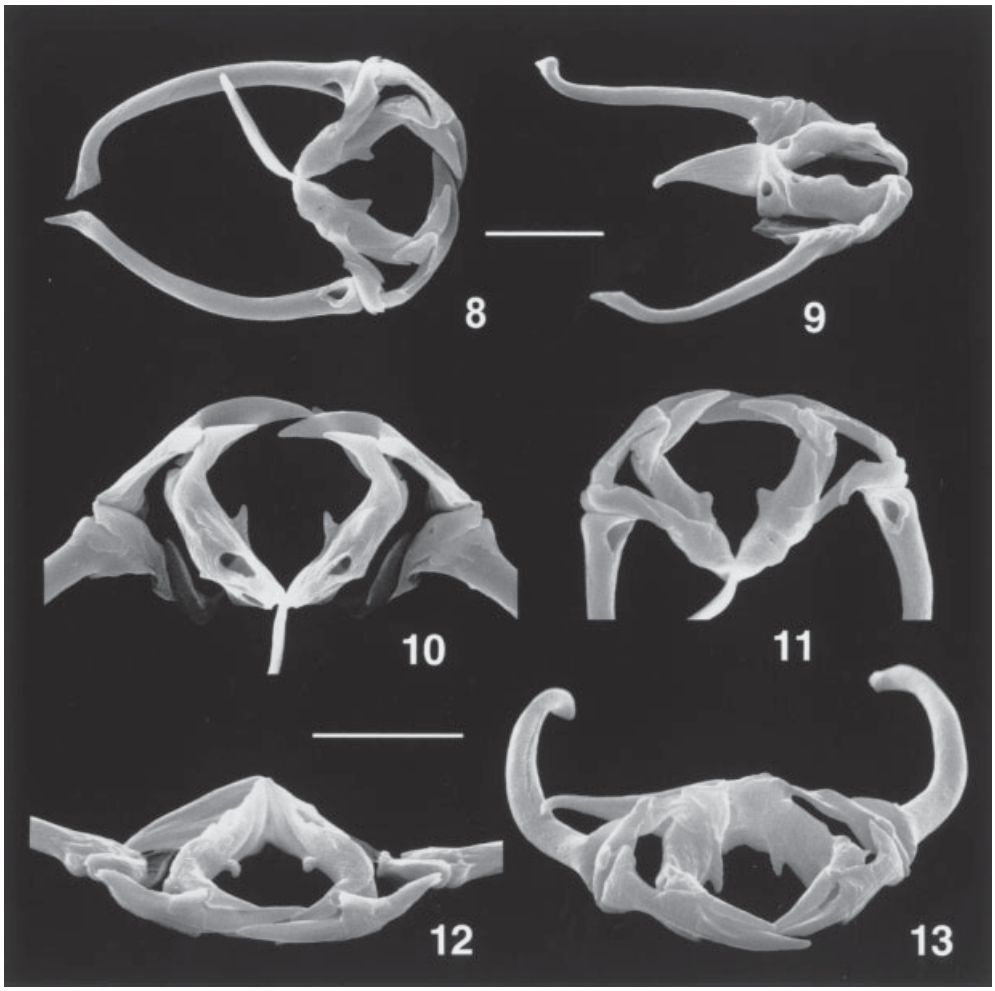
Comments

Following the key by De Smet (1997), the new species comes out to *E. graingeri* Chengalath, 1985, from which it is unequivocally distinguished by the near mid-length abruptly offset toes with straigth cut tip (toes with weak and broad shallow indentation near mid-length, and tapering to acute tip in *E. graingeri*), the long bladder (small and roundish in *E. graingeri*), the fusiform gastric glands with secondary connection to mastax (rounded and long-stalked without secondary connection in *E. graingeri*), as well as the presence of glan-



Figures 2–7. *Encentrum frenoti* n. sp., female – 2: dorsal view, 3: lateral view, 4: toe, lateral view, 5: toes, dorsal view, 6: trophi, dorsal view, 7: incus, ventral view. Scale bars: 2, 3: 50 μm, 4–7: 10 μm.

dular appendages connected to the brain (absent in *E. graingeri*). The trophi of both species are resembling superficially. The major differences in trophi morphology distinguishing *E. frenoti* n. sp. from *E. graingeri* are its obpyriform rami outline with small alulae (roundish without alulae in *E. graingeri*), the in lateral view broader fulcrum, and the presence of a single preuncinal tooth on each ramus instead of two. *E. frenoti* n. sp. cannot be confused with any other congener.

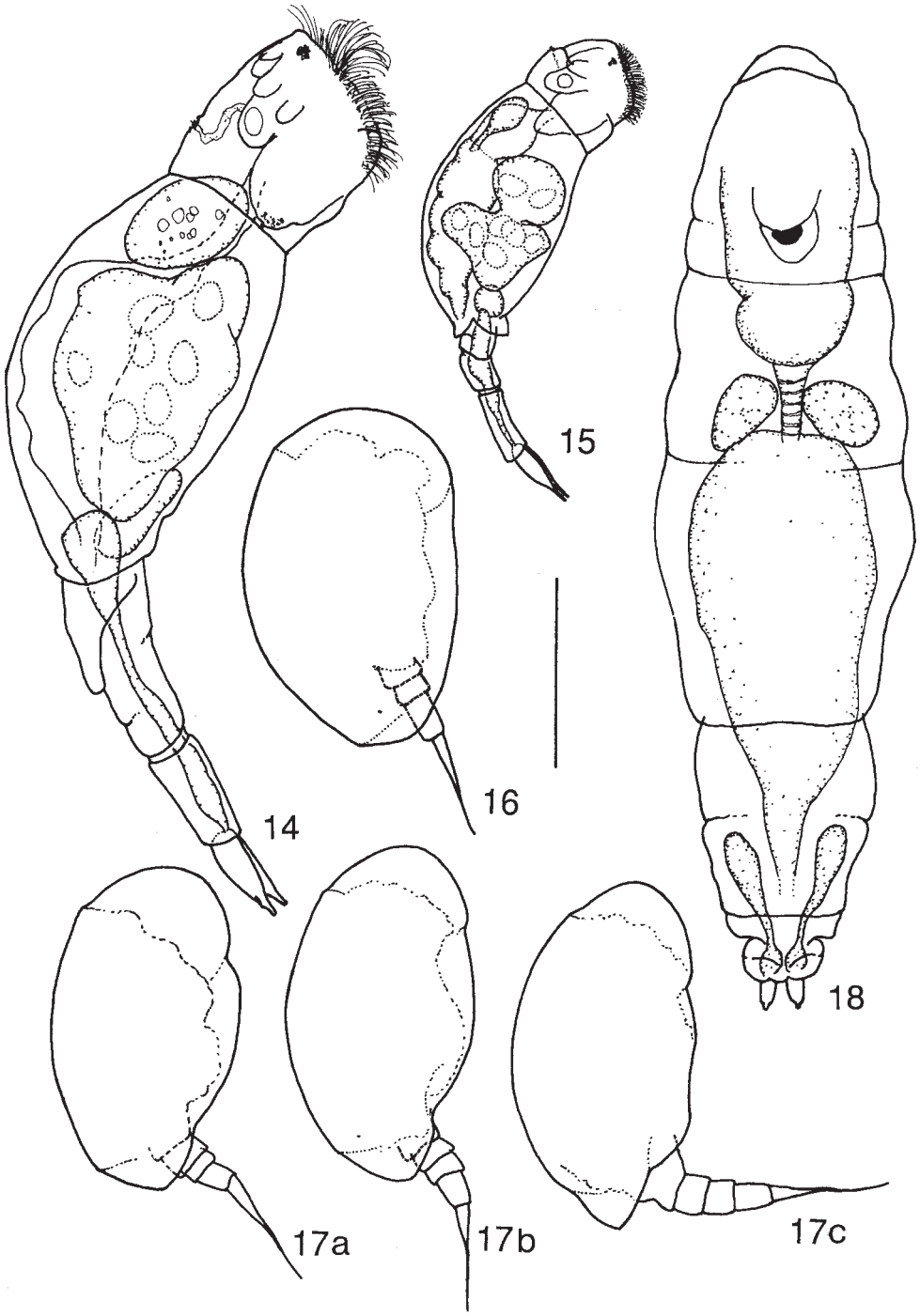


Figures 8–13. *Encentrum frenoti* n. sp. SEM of trophi – 8: ventral view, 9: lateral view, 10: detail, dorsal view, 11: detail, ventral view, 12: detail, dorso-apical view, 13: detail, ventro-apical view. Scale bars: 10 μm.

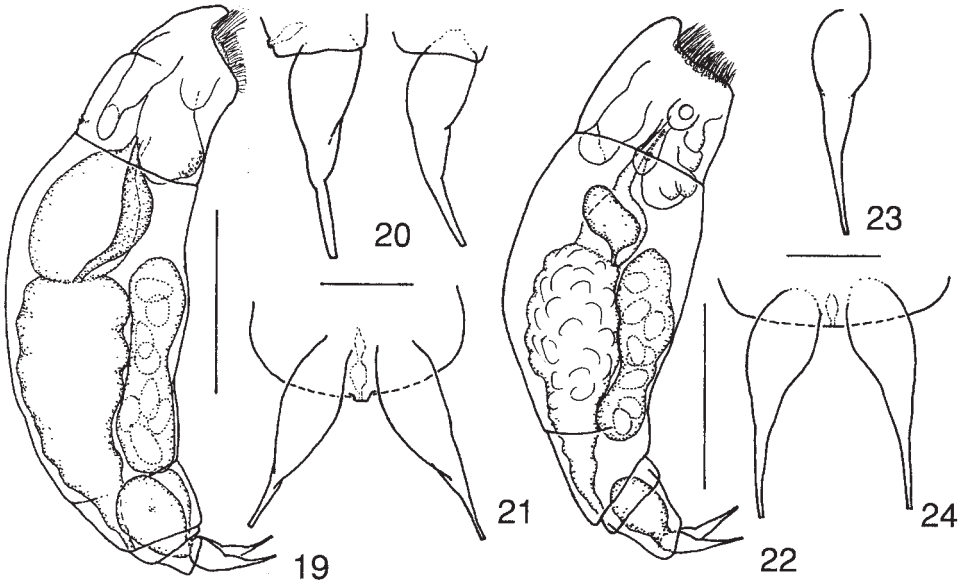
Paired appendices of the brain (and/or retrocerebral sac) have been reported in several *Encentrum* species (see e.g. Jersabek, 1999). They have a glandular appearance and may be connected to the gastric glands or stomach. Their function remains unknown. Going through the species list shows that they are mainly present in members of the subgenus *Isoencentrum*.

Distribution and ecology

Only known from Crique du Sphinx, Ile de la Possession, Iles Crozet and Baie de l'Aurore, Grande Terre, Iles Kerguelen. It was periphytic among dense growths of *Urospora penicilliformis* (Roth.) Aresch. from the lower medio-littoral and *Acrosiphonia pacifica*



Figures 14–18. 14: *Proales reinhardti*, 15: *P. halophila*, 16: *Colurella* cf. *colurus*, 17a–c: *C. salina*, 18: *Lindia torulosa*. Scale bar: 50 μm.



Figures 19–24. 19: *Encentrum algente*, 20: ibidem, toes lateral view, 21: toes, ventral view, 22: *E. marinum*, 23: ibidem, toe lateral view, 24: ibidem, toes ventral view. Scale bars: 19, 22: 50 μm, 20, 21, 23, 24: 10 μm.

(Mont.) J. Agardh from a rock pool in the intertidal zone. The accompanying rotifer fauna consisted of bdelloids, *Colurella salina*, *Encentrum algente*, *E. marinum*, *Proales halophila* and *P. reinhardti*. Examination of the gut content reveals that *E. frenoti* n. sp. is feading on nematods and rotifers, among which *Proales reinhardti* (Fig. 14).

Bdelloidea indet.

Bdelloids were present at varying numbers in 12 samples from different habitats (macroalgae and Aufwuchs from medio-littoral and infra-littoral fringe, and rockpools).

***Colurella* cf. *colurus* (Ehrenberg, 1830)** (Fig. 16)

Altogether 8 specimens resembling *C. colurus* were found at three locations from Ile de la Possession, and one from Iles Kerguelen. It is a fairly broad and medium-sized species, truncated posteriorly, with shallow ventral furrow; ventral margin weakly convex.

Measurements (N = 8): Lorica length 85–102 μm, height 52–61 μm, width 35–47 μm, toe 28–30 μm.

***Colurella salina* Althaus, 1957** (Figs. 17a–c)

Specimens attributed to *C. salina* were rare amongst algae in two samples from Ile de la Possession and one from Iles Kerguelen. The species is medium-sized and fairly broad. A deep ventral furrow is lacking. The ventral margin shows a shallow concavity posterior to the head-opening and at the beginning of the foot-opening. The margin between the two concavities is slightly convex or almost straight with or without shallow concavity medially. The latter form reminds *C. colurus* figured by Althaus (1957b: Fig. 2a, b; microphotograph), which might be synonymous with *C. salina* according to Segers (1998). Compared to the specimens from Belgium figured by Segers (1998: Fig; 11, 12), the postoral concavity of the specimens seen by us is less pronounced and more in concordance with Althaus (1957a).

Measurements (N = 7): Lorica length 83–92 μm, height 47–51 μm, width 37–42 μm, toe 25–32 μm.

C. salina has been reported from Europe, Florida, U. S. A. and New Zealand.

***Encentrum algente* HARRING, 1921** (Figs. 19–21, 32)

This species was only found in Crique du Sphinx, Ile de la Possession amongst seaweeds from rock pools and infra-littoral fringe. Specimens typical with basally bulged toes set apart, a caudal antenna on a shallow and broad papilla, and characteristic trophi with tooth on inner margin of rami.

Measurements (N = 7): Length 160–195 μm, toe 21–24 μm.

E. algente is fairly common in thalassic waters of the Holarctic region, where its highest latitudinal occurrence is from the littoral of the arctic island Spitsbergen, Svalbard (DE SMET, 1995). The present record is the first for the southern hemisphere.

***Encentrum marinum* (DUJARDIN, 1841)** (Figs. 22–24, 33)

This species was common in two samples from Ile de la Possession, and one from Iles Kerguelen. Specimens typical. Toes set apart, caudal antenna sometimes on shallow papilla.

Measurements (N = 6): Length 140–165 μm, toe 18–22 μm.

E. marinum has been reported from the Holarctic region, N. Africa and the Gulf of Bengal, India. The most northern records are from the littoral of Spitsbergen, Svalbard (DE SMET, 1995). Apparently the present record is the first for the southern hemisphere.

***Lindia torulosa* DUJARDIN, 1841** (Figs. 18, 29–31)

Just four specimens of this species were found in a sample of *Enteromorpha* sp. from the medio-littoral at Ile de la Possession. Morphology of animals and trophi typical.

Measurements (N = 3): Length 250 μm, toe 10 μm.

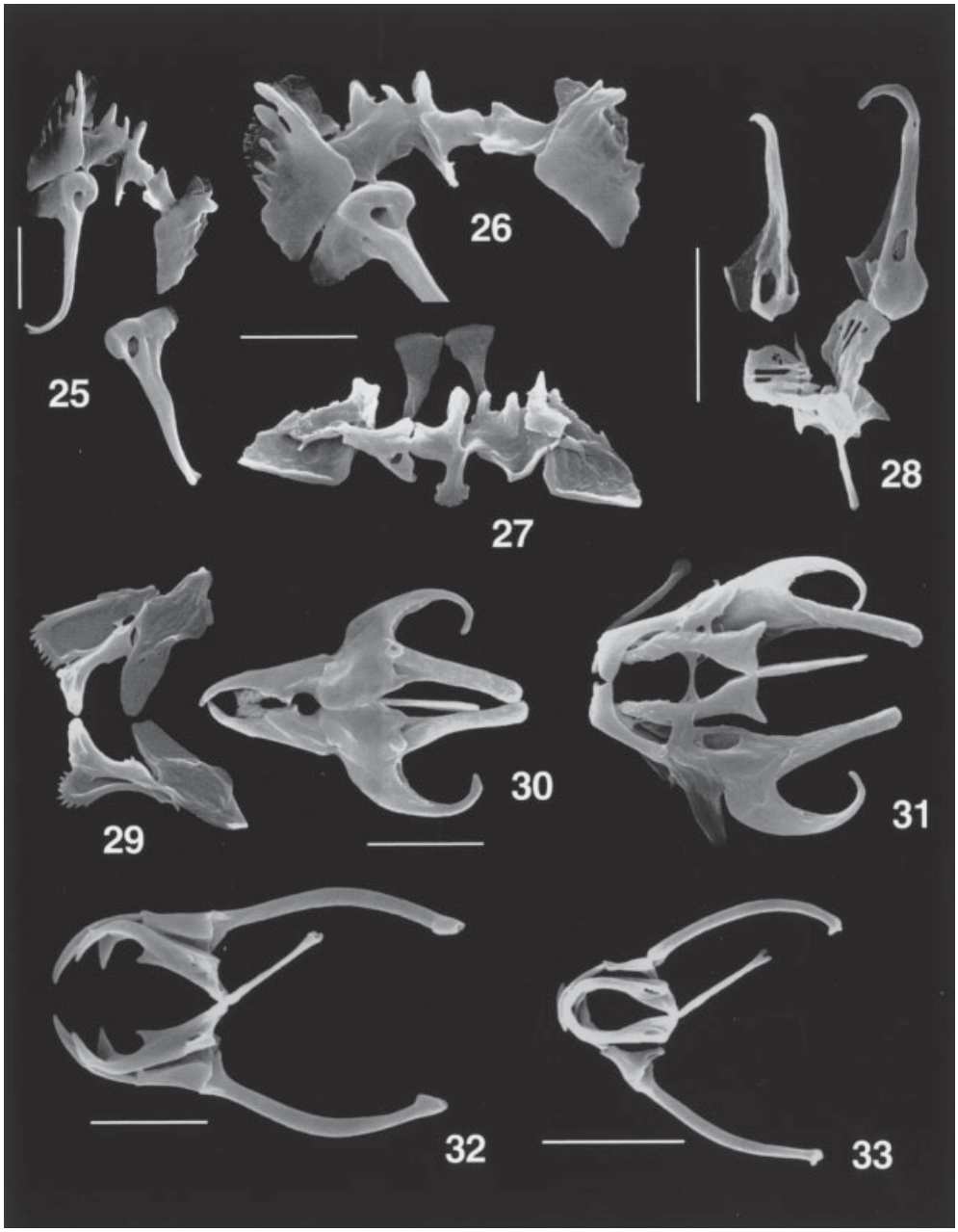
L. torulosa is a common and wide-spread inhabitant of fresh waters and limno-terrestrial habitats (e.g. wet aerophytic mosses), encountered as far north as the high-arctic island Edgeøya, Svalbard (DE SMET, unpubl.). The present record is from a truly marine location, not influenced by inflow of nearby freshwater habitats. The only other thalassic reports, which may be questionable identifications, are from brackish waters of the Baltic Sea (REMANE, 1929) and a marine lagoon in England (SAUNDERS-DAVIES, 1998). The species is one of the most common and eurytopic rotifers of fresh waters from Grande Terre and Ile de la Possession (DE SMET, unpubl.). Other subantarctic reports are from Macquarie Island (DARTNALL, 1993) and Heard Island (DARTNALL, 1995). The species has also been recorded from the Antarctic at Jenny Island (DE BEAUCHAMP, 1913), Alexander Island (HEYWOOD, 1977) and the Vestfold Hills, East Antarctica (DARTNALL, 1997). HEYWOOD (1977) mentions without any further comments, that the *L. torulosa* he found at the Ablation Point area, Alexander Island could be a new variety. Without any description DARTNALL & HOLLOWDAY (1985) give subspecies rank (*L. torulosa antarctica*) to the presumed new variety mentioned by HEYWOOD (l.c.), and treat it as such afterwards (e.g. DARTNALL, 1993, 1995). It is clear that this subspecies is a *nomen nudum* and should be rejected.

***Proales halophila* (REMANE, 1929)** (Figs. 15, 28)

This species was found amongst algae in two samples of Ile de la Possession and one of Grande Terre. Specimens typical.

Measurements (N = 7): Length 125 μm, toe 18–20 μm.

P. halophila was hitherto only known from the northern hemisphere, where its highest latitudinal occurrence is from the littoral of the arctic waters around Spitsbergen, Svalbard (DE SMET, 1995).



Figures 25–33. SEM of trophi – 25: *Proales reinhardti*, ventral view, 26: ibidem, detail ventral view, 27: ibidem, detail dorsal view, 28: *P. halophila*, ventral view (right manubrium inner view), 29: *Lindia torulosa*, epipharynx, 30: ibidem, trophi ventral view, 31: ibidem, dorsal view, 31: *Encentrum algente*, dorsal view, 33: *E. marinum*, dorsal view. Scale bars: 10 μm.

***Proales reinhardti* (EHRENBERG, 1834)** (Figs. 14, 25–27)

This was the most common rotifer, found in 24 samples (Ile de la Possession, Grande Terre), both from the medio-littoral, infra-littoral fringe and rock pools. Specimens typical. Length of distal foot pseudosegment and trophi fairly variable.

Measurements (N = 12): Length 200–235 μm, distal foot pseudosegment 29–47 μm, toe 23–24 μm.

P. reinhardti is a very common and wide-spread species in the Holarctic region. The most northern report is from arctic sea ice of the Barents Sea (FRIEDRICH & DE SMET, 2000). As far as I know, the only records from the southern hemisphere are from fresh waters in the Vestfold Hills (KOROTKEVICH, 1964; KUTIKOVA, 1958, 1991) and Bunger Hills (KUTIKOVA, 1958, 1991), East Antarctica. However, the figures by KUTIKOVA (1991: Fig. 2.II) attributed to *P. reinhardti* do not allow for a decisive identification. Moreover, considering that *P. reinhardti* is probably restricted to saline habitats (DE SMET, 1996a), the specimens seen by KOROTKEVICH (l.c.) and KUTIKOVA (l.c.) may belong to another species.

4. Concluding Remarks

Nine rotifer taxa (Bdelloidea indet. and eight Monogononta) are recorded from periphyton and Aufwuchs of the marine littoral of subantarctic Ile de la Possession, Iles Crozet (27 samples) and Grande Terre, Iles Kerguelen (4 samples). Both species richness and total abundancies were usually low, which agrees with the very few observations from the different climatic belts of the northern hemisphere. The discovery of a new species, *Encentrum frenoti*, was not surprising as marine habitats and especially periphyton and Aufwuchs are amply studied, the studies moreover being mostly confined to occasional samplings (e.g. JANSSON, 1967; THANE-FENCHEL, 1968; DE SMET, 1995, 1996b, 2000; SAUNDERS-DAVIES, 1995, 1998). The lack of study of these habitats is also demonstrated by the fact that some of the more common species of the Holarctic region (*Encentrum algente*, *E. marinum*, *Proales halophila*) are new records for the southern hemisphere. Of the eight monogononts found, at least four (*Encentrum algente*, *E. marinum*, *Proales halophila*, *P. reinhardti*) are also reported from marine periphyton of the Arctic, and one, *Lindia torulosa*, is known to occur in arctic fresh waters. All full identified species were considered typical, i.e. their morphology did not deviate from that of conspecifics from the northern hemisphere, which indicates good possibilities for transport, and extensive gene flow despite the isolated situation and small dimensions of the Iles Crozet and Kerguelen.

5. Acknowledgements

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6. References

ALTHAUS, B., 1957a: Faunistisch-ökologische Studien an Rotatorien salzhaltiger Gewässer Mitteldeutschlands. – Wiss. Z. Univ. Halle, Math.-Nat. **6**: 117–158.

ALTHAUS, B., 1957b: Neue Sandbodenrotatorien aus dem Schwarzen Meer. – Wiss. Z. Univ. Halle, Math.-Nat. **6**: 445–458.

DARTNALL, H. J. G. and E. D. HOLLOWDAY, 1985: Antarctic rotifers. – Brit. Antarc. Surv., Sci. Rep. **100**: 46 pp.

Dartnall, H. J. G., 1993: The rotifers of Macquarie Island. – ANARE Res. Notes **89**: 41 pp.
Dartnall, H. J. G., 1995: The rotifers of Heard Island: preliminary survey, with notes on other freshwater groups. – Pap. Proc. R. Soc. Tasm. **129** : 7–15.
Dartnall, H. J. G., 1997: Three new species of *Encentrum* (Rotifera) from the Antarctic. – Quekett J. Microscop. **38**: 15–20.
De Smet, W. H., 1995: Description of *Encentrum dieteri* sp. nov. (Rotifera, Dicranophoridae) from the High Arctic, with redescription of *E. bidentatum* (Lie-Pettersen, 1906) and *E. murrayi* Bryce, 1922. – Belg. J. Zool. **125**: 349–361.
De Smet, W. H., 1996a: Rotifera. Vol. 4: The Proalidae (Monogononta). Guides to the Identification of the Microinvertebrates of the Continental Waters of the World 9. SPB Academic Publishing bv, The Hague, The Netherlands, 102 pp.
De Smet, W. H., 1996b: Description of *Proales litoralis* sp. nov. (Rotifera, Monogononta: Proalidae) from the marine littoral. – Hydrobiologia **335**: 203–208.
De Smet, W. H., 1997: Rotifera 5: The Dicranophoridae (Monogononta). Guides to the Identification of the Microinvertebrates of the Continental Waters of the World 9. SPB Academic Publishing bv, The Hague, The Netherlands, 325 pp.
De Smet, W. H., 1998: Preparation of rotifer trophi for light and scanning electron microscopy. – Hydrobiologia **387/388** (Developm. Hydrobiol. **134**): 117–121.
De Smet, W. H., 2000: Three new species of the genus *Encentrum* (Rotifera, Monogononta, Dicranophoridae). – Sarsia **85**: 77–86.
De Smet, W. H., 2001: Freshwater Rotifera from plankton of the Kerguelen Islands (Subantarctica). – Hydrobiologia **446/447**: 261–272.
Friedrich, C. and W. H. De Smet, 2000: The rotifer fauna of arctic sea ice from the Barents Sea, Laptev Sea and Greenland Sea. – Hydrobiologia **432**: 73–89.
Heywood, R. B., 1977: A limnological survey of the Ablation Point area, Alexander Island, Antarctica. – Phil. Trans. R. Soc. Lond. B. **279**: 39–54.
Jersabek, C. D., 1999: New dicranophorids (Rotifera, Monogononta) from the Austrian Alps, including a new genus. – J. Nat. Hist. **33**: 177–192.
Jansson, A.-M., 1967: The food-web of the *Cladophora*-belt fauna. – Helgoländ. Meeresunters. **15**: 574–588.
Korotkevich, V. S., 1964: Concerning the population of water bodies in the oases of East Antarctica. – Sov. Antarct. Exped. Inform. Bull. **1**: 154–161.
Kutikova, L. A., 1958: Rotifers from the coast of East Antarctica. – Sov. Antarct. Exped. Inform. Bull. **3**: 162.
Kutikova, L. A., 1991: Rotifers of the inland waters of East Antarctica. – Informats. Byull. sovetsk. Antarkt. Eksped. **16**: 87–99. (In Russian).
Remane, A., 1929: Rotatoria. – Tierwelt Nord- u. Ostsee **16**: 156 pp.
Saunders-Davies, A., 1995: Factors affecting the distribution of benthic and littoral rotifers in a large marine lagoon, together with the description of a new species. – Hydrobiologia **313/314** (Developm. Hydrobiol. **109**): 69–74.
Saunders-Davies, A., 1998: Differences in rotifer populations of the littoral and sub-littoral pools of a large marine lagoon. – Hydrobiologia **387/388** (Developm. Hydrobiol. **134**): 225–230.
Segers, H., 1998: Notes on the taxonomy and distribution of the interstitial Rotifera from a dune pool. – Belg. J. Zool. **128**: 35–47.
Stonehouse, B., 1982: La zonation écologique sous les hautes latitudes australes. – C. N. F. R.A. **51**: 531–537.
Thane-Fenchel, A., 1968: Distribution and ecology of non-planktonic brackish-water rotifers from Scandinavian waters. – Ophelia **5**: 273–297.
Zelinka, K., 1927: Die Rädertiere der deutschen Südpolar-Expedition 1901–1903. – Dtsch. Südpolar-Exped., Bd. 19, Zool. **11**: 422–446.

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