

POLISH POLAR RESEARCH	17	3-4	169-171	1996
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## Parasitic Protozoa on appendages and inside the body of *Euphausia superba* Dana

**ABSTRACT:** The highest infestation by phoronts (resting stages) of *Apostoma* ciliates forms 1, 2, is restricted to the 3-th and 4-th pairs of *E. superba* thoracic limbs. They occur mostly on meropodites of endopodite and plumose setae of exopodite. The trophonts (trophic stage) of those *Apostoma* are present in large numbers in krill's tissue. The life cycle of those histophagous *Apostoma* include also free-living stage — tomit. Swarm formed by krill seems to be a reason for the common and extensive infestation by protozoans.

**Key words:** Antarctic, krill, parasites.

### Results

Antarctic krill *Euphausia superba* Dana was found to be infested by large numbers of two epizoic Protozoa belonging to the Ephelotidae and parasitic *Apostoma* (family Foettingeridae) (Rakusa-Suszczewski and Nemoto 1989). In Admiralty Bay nearly 100% of krill samples year round were infested by phoronts of Foettingeridae (Rakusa-Suszczewski and Filcek 1988) while in the region of Elephant Island (Kittel and Rakusa-Suszczewski 1988) 84% of analysed individuals have been infested. For this analysis samples were obtained from Japanese SIBEX expedition 1983/84 when krill was caught at station P-I-3-4, 64°38.4' S and 127°09.8' E (cf. Fig. 5 in Rakusa-Suszczewski and Nemoto 1989). Almost 100% of individuals were infested by *Apostoma* phoronts and this confirms common infestation *E. superba* by protozoans.

Table 1

Number and distribution of two forms (F1, F2) of phoronts on the thoracic limbs of *Euphausia superba* Dana, 1852 (47 specimens were examined).

<i>E. superba</i>	I-pair		II-pair		III-pair		IV-pair		V-pair		VI-pair	
Forms	F1	F2	F1	F2	F1	F2	F1	F2	F1	F2	F1	F2
Σ	76	2601	405	3787	519	4642	562	3991	431	2445	100	1699
$\bar{x}$	1.6	55.3	8.6	80.5	11	98.7	11.9	84.9	8.6	52	2.1	35.5
SD	2.5	36	8.2	36.9	9.4	49	17.5	43.5	7.2	32.5	3.3	34.7
Σ(F1+F2)	2677		4192		5161		4553		2876		1799	

Foettingeridae occurred on appendages which are filtering water very intensively (thoracic limbs and pleopods, on setae and between them). They were also found at joints of segments, antennules and antennae in the area of rostrum and depression of carapace where microcurrents are attaching Protozoa (*cf.* Rakusa-Suszczewski and Nemoto 1989). The present paper reports on re-analysis of occurrence by phoront *Apostoma*, forms 1, 2, probably Foettingeridae (Rakusa-Suszczewski and Filcek 1988, Rakusa-Suszczewski and Nemoto 1989) on the body of krill and moreover contains detailed information about regions of largest infestation. It appears that the highest infestation was almost entirely restricted to the area of 3-th and 4-th thoracic limbs (filtering basket area) (Table 1). Cysts of form 1 occurred mainly on meropodites of endopodites. Almost 54% of their total number was found on this segment. In case of *Apostoma* form 2 2.87% of total population of phoronts is restricted to the plumose setae of exopodite and meropodites of endopodites.

Recent histological analysis on congealed materials of krill tissues from Admiralty Bay revealed the presence of extensive intramuscular *Apostoma* trophonts. This new data allow us to conclude that the life cycle of those *Apostoma* runs through the body of krill. The photographic evidence (Figs 1–4) indicates that those *Apostoma* are parasitic — histophagous forms. The infestation takes place during the swimming process of krill and settlement of tomit (free-living stage) occurs in contact with filtering setae. This way of infestation is very common among the histophagous *Apostoma* ciliates (Chatton and Lwoff 1935). The presence of trophonts in various layers of tissue suggest that the possible infestation co-occurs with moulting process of krill and that the trophonts are mobile.

Occurrence of krill in large swarms favours the infestation by histophagous *Apostoma* and this fact may have a negative (lethal) consequence for the host

**Acknowledgements.** — The authors express gratitude to Prof. S. Radzikowski for help throughout this project, which was partially completed in Institute of Zoology, Warsaw University.

## References

- CHATTON E. and LWOFF A. 1935. Les Cilies apostomes. — Arch. Zool. exp. gen., 77: 1–435.
- KITTEL W. and RAKUSA-SUSZCZEWSKI S. 1988. Biological characteristics of *Euphausia superba* Dana (BIOMASS III, November 1986 — January 1987). — Pol. Polar Res., 9: 315–325.
- RAKUSA-SUSZCZEWSKI S. and FILCEK K. 1988. Protozoa on the body of *E. superba* (Dana) from Admiralty Bay (South Shetland Islands). — Acta Protozool., 27: 23–39.
- RAKUSA-SUSZCZEWSKI S. and NEMOTO T. 1989. Ciliates associations on the body of *E. superba* (Dana). — Acta Protozool., 28: 77–86.

Received May 25, 1996

Accepted September 15, 1996

## Streszczenie

W próbach kryla zebranych przez Japońską Ekspedycję SIBEX (1983/84) stwierdzono wysoki stopień zarażenia tego skorupiaka pasożytniczym pierwotniakiem z rodzaju *Apostoma* (Foettingriidae). Liczne foronty pierwotniaka były przytwierdzone do przydatków parzystych i do powierzchni karapaksu (tab. I). W populacji kryla z Zatoki Admiralicji stwierdzono natomiast obecność trofontów *Apostoma* wewnątrz ciała, w tkance mięśniowej nasad przydatków ciała (fig. 1–4).

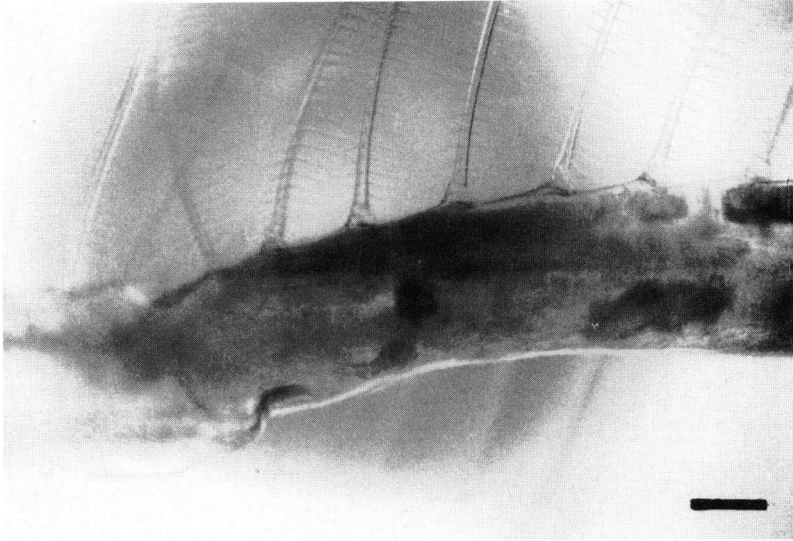


Fig. 1. Light micrograph showing trophonts on the base of the limb of *E. superba*.  
Bar = 200  $\mu$ m.



Fig. 2. Light micrograph showing the ishium of endopodite of 3-th toracic limbs of *E. superba*.  
Those tissue have been entirely infested by *Apostoma* trophonts. Bar = 200  $\mu$ m.

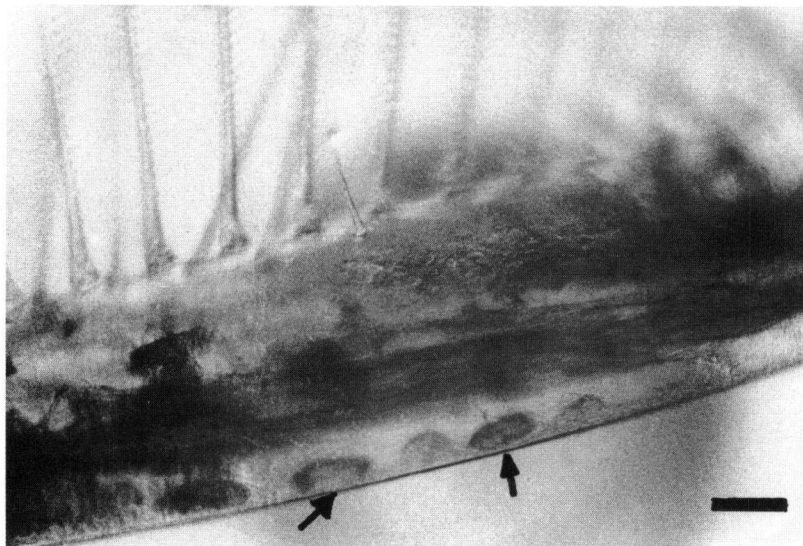


Fig. 3. Light micrograph showing the meropodite of endopodite of 3-th pair of thoracic limbs. The arrows shows the locations of trophonts. Bar = 100  $\mu$ m.

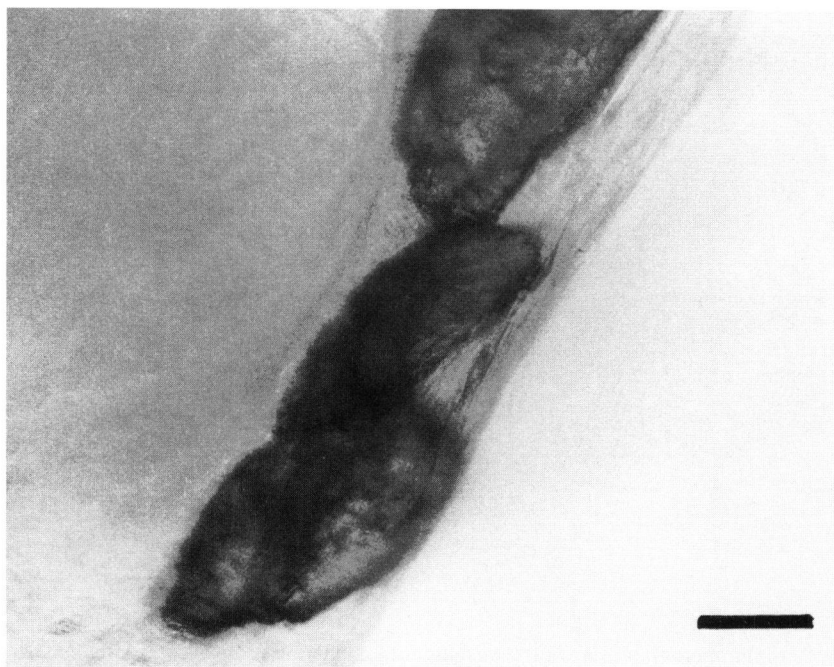


Fig. 4. Light micrograph of trophonts inside the meropodite of endopodite (thoracic limb of *E. superba*). Bar = 120  $\mu$ m.