Distribution and abundance of planktonic copepods (Crustacea) in the Weddell Sea in summer 1980/81

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Abstract

Calanoid copepods from hauls to about 250 m depth taken in summer 1980/81 in the inner Weddell Sea (particularly off the Filchner Ice Shelf in the south and Atka Bay in the northeast) were identified and counted. Abundance along the Ice Shelf was very low compared to Atka Bay, although diversity was not significantly different. In the former area, older copepodids and adults of *Metridia gerlachei* were most abundant whereas the water off Atka Bay was dominated by young copepodids of *Calanoides acutus* and *Calanus propinquus*. Low abundance of calanoids in the southern Weddell Sea might be caused by the short summer seasons, as well as unfavourable hydrography.

Introduction

The present material was collected on bord of R.V. "Polarsirkel" during the "Filchner-Schelfeis-Expedition" in 1980/81. The purpose was to examine the little known distribution and abundance of copepods in the southern (Filchner Ice Shelf, mainly polynia stations, Figure 1) and northeastern part (Atka Bay, Figure 2) of the Weddell Sea. A brief summary of the biological sampling is given by KOHNEN (1982) and details about stations, dates, and additional relevant information by HUBOLD & DRESCHER (1982). The present study deals exclusively with calanoid copepods, since cyclopoid copepods were not caught quantitatively.

Previously work about the distribution and abundance of copepods in the inner parts of the Weddell Sea was limited (HEMPEL et al. 1983; KACZMARUK 1983; SCHNACK et al. 1985; BOYSEN-ENNEN 1987) due to difficult access. Our results may be used for more detailed examinations and comparisons with other parts of the Antarctic like the Ross Sea (FARRAN 1929; BRADFORD & JONES 1971). Community analysis (BOYSEN-ENNEN 1987) as well as questions related to reproduction and physiology would be of major importance in this context.

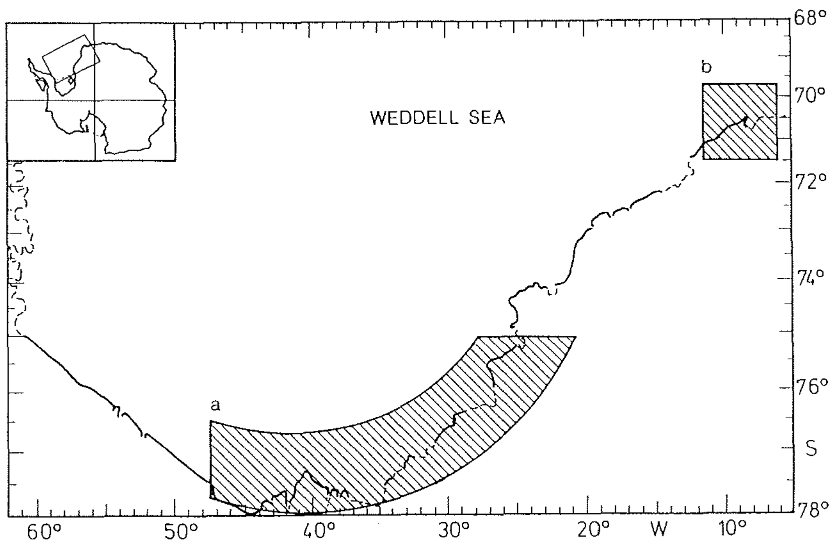

Fig. 1: Areas of investigation within the Weddell Sea a) Filchner Ice Shelf and b) Atka Bay.

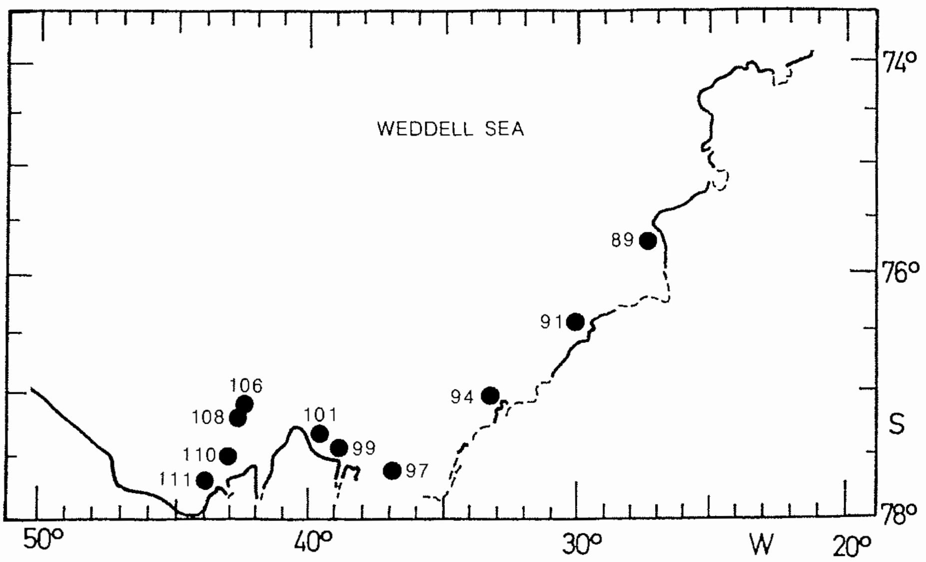

Fig. 2a: Stations along the Filchner Ice Shelf.

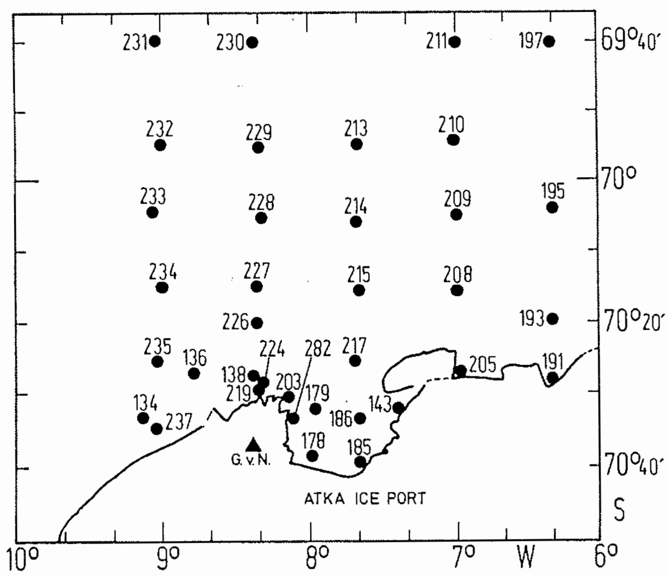

Fig. 2b: Station grid off Atka Bay.

Material and methods

From 29th December 1980 to 26th February 1981 zooplankton was collected with a Bongo net (335 um, 60 cm ø) and preserved in a 4% formaldehyde sea water solution (pH 8.0). The location of stations, depth of hauls and other relevant data are listed in Appendix Table 1.

In most cases one tenth of the samples was enumerated after splitting with a Wiborg plankton splitter (WIBORG 1951). All calanoid copepod specimens of each subsample were counted, separated and identified as at least to their generic and in most cases species level in a Bogorov tray. If necessary the animals were dissected for identification. When possible the copepodite stages were identified to species level too.

To compare the diversity of both regions the SHANNON & WEAVER index (1963) was used:

$$H = -\sum \frac{n_i}{N} \ln \frac{n_i}{N}$$

where n_i is the number of individuals per species per sample and N equals the total number of specimen per sample.

In the ecological context this index measures the diversity per individual in a many-species population. The population is assumed to be infinite. Since diversity on its own is not a sufficient measurement it has to be combined with evenness which gives the relation between diversity H of a specific station or sample and the maximum possible diversity H_{max}, which is defined as:

$$H_{max} = \ln S$$

where S is the number of species (modified, PIELOU 1969). The evenness is therefore a measure of the regularity of the distribution:

$$R = H/H_{max}$$

Results

1. Species collected

At least 17 species of calanoid copepods were found in the samples from both areas. They belong to 13 genera and 11 families (table 1).

Table 1: Families, genera and species of calanoid copepods collected during 1980/81.

Family AETIDEIDAE Giesbrecht, 1892
1. Euchirella
E. rostramagna
Family AUGAPTILIDAE Sars, 1905
2. Haloptilus
H. ocellatus (Wolfenden, 1905)
H. oxycephalus (Giesbrecht, 1889)
Family CALANIDAE Dana, 1849
3. Calanoides
C. acutus (Giesbrecht, 1902)
4. Calanus
C. propinquus (Brady, 1883)
C. simillimus (Giesbrecht, 1902)
Family EUCALANIDAE Giesbrecht, 1892
5. Rhincalanus
R. gigas (Brady, 1883)
Family EUCHAETIDAE Giesbrecht 1892
6. Euchaeta
E. antarctica (Giesbrecht, 1902)
E. exigua (Wolfenden, 1911)
Family HETERORHABDIDAE Sars, 1903
7. Heterorhabdus
H. austrinus (Giesbrecht, 1902)
Family METRIDINIDAE Hülsemann, 1979
8. Metridia
M. gerlachei (Giesbrecht, 1902)
Family PSEUDOCALANIDAE Sars, 1900
9. Ctenocalanus
C. vanus (Giesbrecht, 1888)
Family SCOLECITHRICIDAE Giesbrecht, 1892
10. Scaphocalanus
S. vervoorti (Park, 1902)
Racovitzanus antarcticus (Giesbrecht, 1902)
11. Scolecithricella
S. minor (Brady, 1883)
Family STEPHIDAE
12. Stephos
S. longipes (Giesbrecht, 1902)
Family ACARTIIDAE
13. Paralabidocera
P. antarctica (Thompson, 1898)

2. Abundance along the Filchner Ice Shelf

For the Filchner Ice Shelf region (st. 89 to 111) figure 3 shows very low abundance of males, females and copepodite stages for all species combined for each station.

Males were taken in comparatively high numbers on station 89. On three out of ten stations males were absent (stations 94, 101 and 111), while on the remaining ones they contributed less than ten specimen each. The abundance of females were highest on station 110 and lowest on station 94. Copepodids were most numerous on station 99 and lowest on station 94.

A maximum of six species were found on stations 97 and 106. Minima were recorded with four species on stations 94, 101 and 111. Of the seven species found in this area usually, *Metridia gerlachei*, *Calanoides acutus*, *Calanus propinquus*, and *Euchaeta spp.* occurred in order of abundance on all stations, except *M. gerlachei* on station 101. The remaining three species, *Ctenocalanus vanus*, *Rhincalanus gigas*, and *Paralabidocera antarctica*, were present only occasionally. However, regularly *P.. antarctica* contributed fairly high numbers of individuals and occurred more often than the former two. Females constituted 54%, males round about 1% and copepodids 45%.

Metridia gerlachei was widely distributed and the most abundant copepod species (figure 4). Highest concentrations of this species were recorded on the stations in Gould Bay and on station 99 above the Filchner Depression, where water exceeded 1000m. No specimen were found on station 101 above the Filchner Depression where water depths exceeded 900m. Males were not found at all. Number of females were higher than those of any other species and ranged up to $2000/1000m^3$. Among the copepodids on two and three stations, respectively, merely copepodite stages III and IV were present in low numbers. Only stage V was comparatively abundant. The early developmental stages I and II were entirely absent.

Calanoides acutus was also widely distributed (figure 5) and together with *Calanus propinquus* second in abundance. Males were absent in all samples. Numbers of females were highest on station 99 with $56/1000m^3$. Copepodids showed an increase in abundance from stage III to V. As for *Metridia gerlachei*, copepodite stages I and II were not present. In contrast to the abundance for *M. gerlachei* was fairly uniform.

Calanus propinquus, like *Calanoides acutus*, was widely dispersed and ranked together with it second in abundance (only slightly different in numbers, see appendix, Table 3, 4).

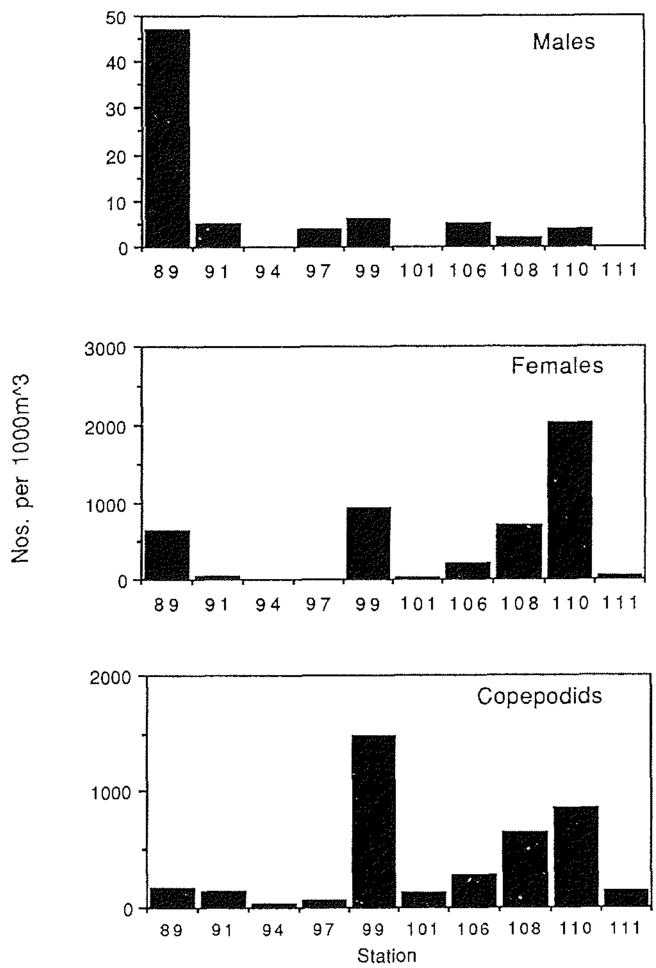

Fig. 3: Pooled numbers of males, females and copepodite stages of calanoid copepods at the stations along the Filchner Ice Shelf.

Females were fairly low in abundance and absent on stations 94 and 111 (figure 6). Males were collected on station 97, 99, 106, 108, and 110 up to 5/1000m^3. In contrast to *C. acutus*, copepodite stages III and IV were by a factor of 2 and 2.5, respectively more abundant than stage V.

The two carnivorous *Euchaeta spp.* were also present on all stations, but did not occur as frequently as the former three species (figure 7). The seven females found on station 110 were exclusively *E. antarctica*. On all other stations neither females nor males were found of *E. spp.*. Copepodids were most numerous on station 99 with $110/1000m^3$.

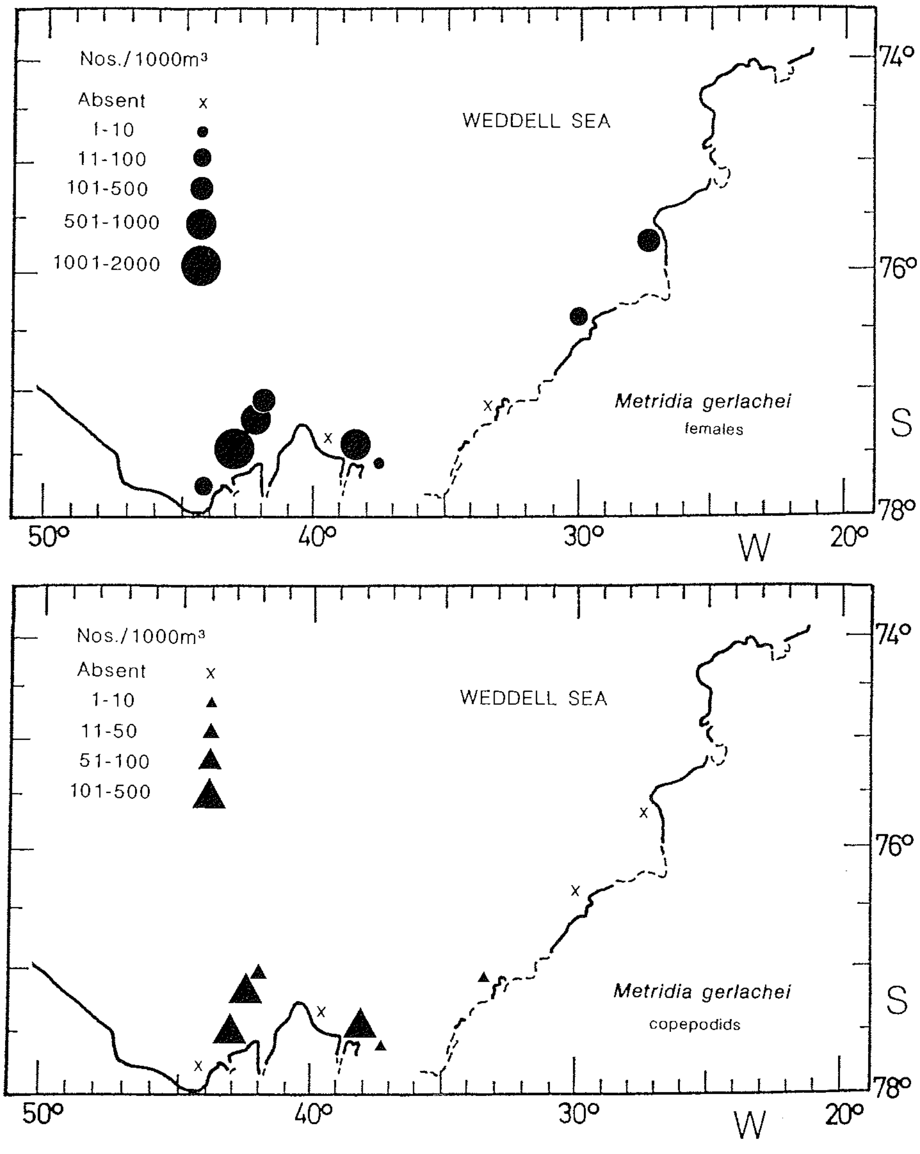

Fig. 4: Distribution and abundance of *Metridia gerlachei* along the Filchner Ice Shelf.

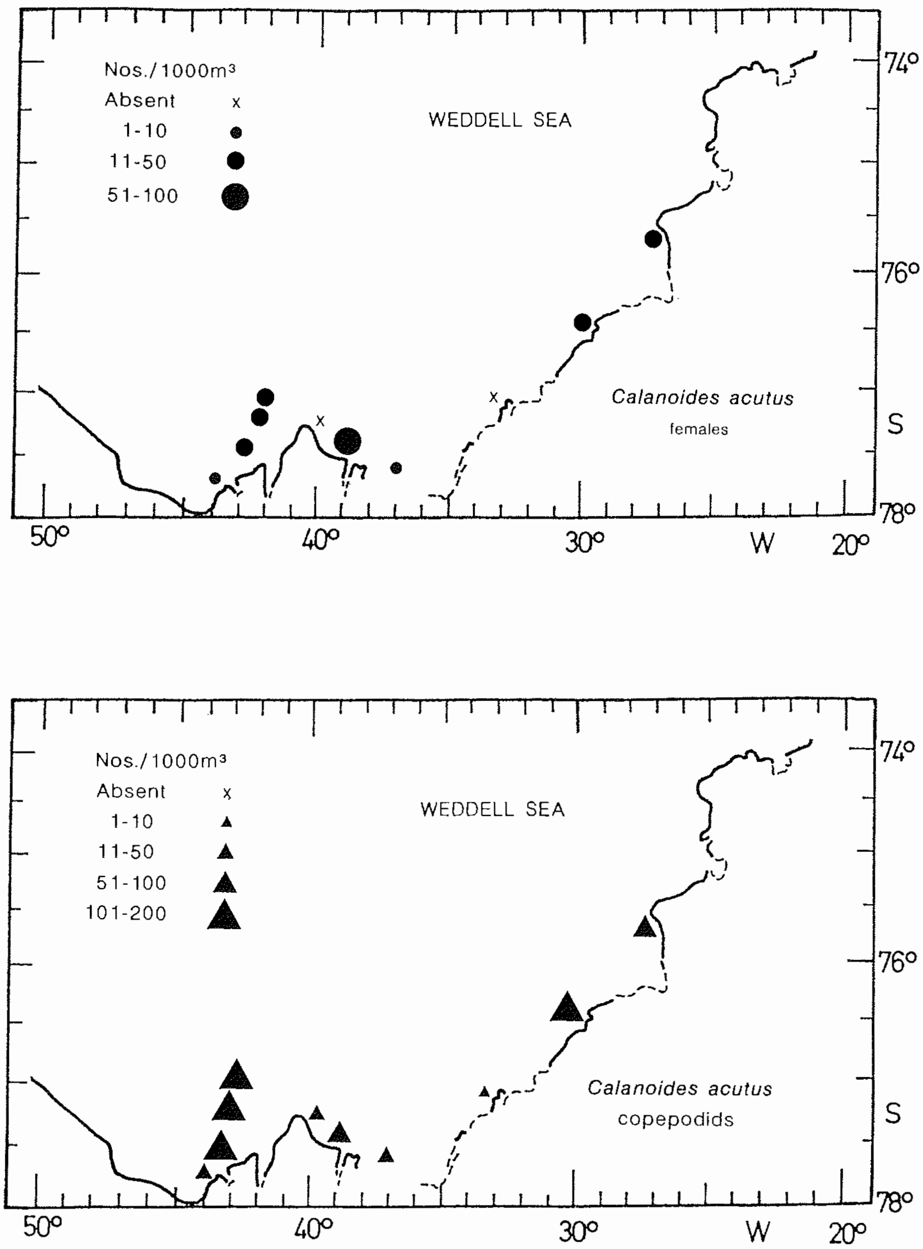

Fig. 5: Distribution and abundance of *Calanoides acutus* along the Filchner Ice Shelf.

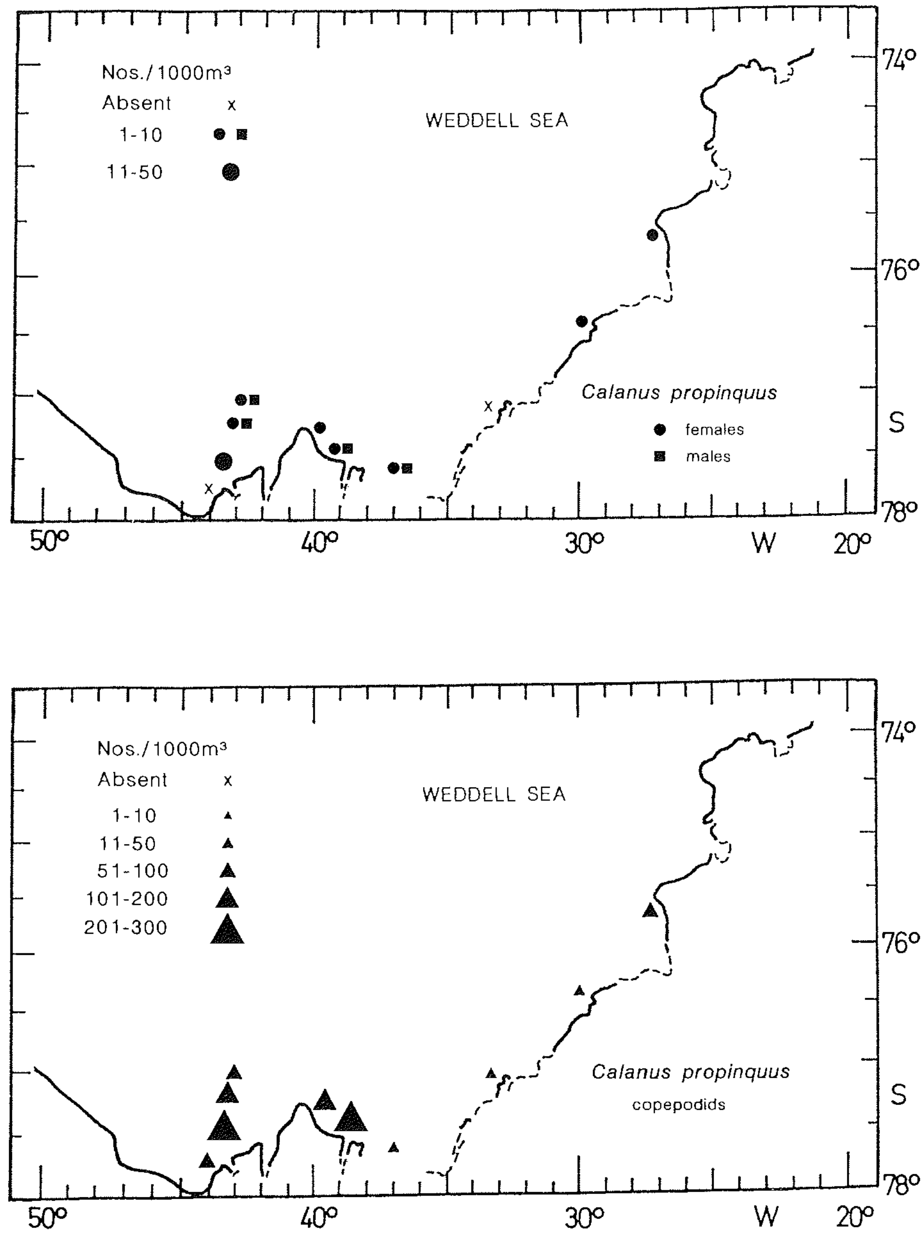

Fig. 6: Distribution and abundance of *Calanus propinquus* along the Filchner Ice Shelf.

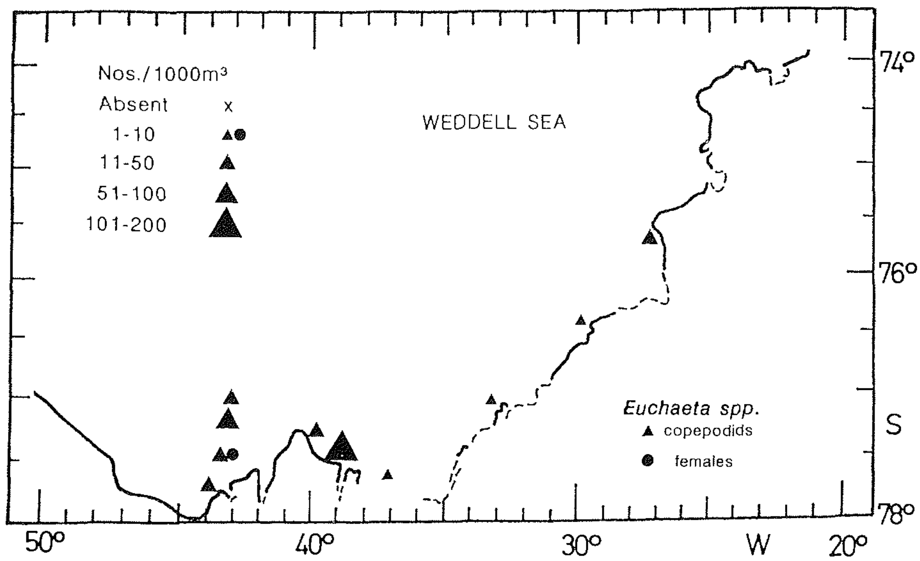

Fig. 7: Distribution and abundance of *Euchaeta spp.* along the Filchner Ice Shelf.

The small *Paralabidocera antarctica* was fairly common in the Filchner Ice Shelf area with a maximum abundance of 203/1000m^3 on station 89 (figure 8). Females and males were most numerous on station 89 with 147 and 47 specimen each. Females were absent on stations 94, 97, 108 and 111, males on station 94, 101, 106, 108 and 111. Since copepodite stages (found only on station 89) were difficult to distinguish they were pooled.

The other small copepod, *Ctenocalanus vanus*, was rarely found. Only on stations 97 and 101, six copepodids and six females were enumerated, respectively (figure 9).

Rhincalanus gigas was present with two copepodite stages IV each on stations 106 and 108, only (figure 10).

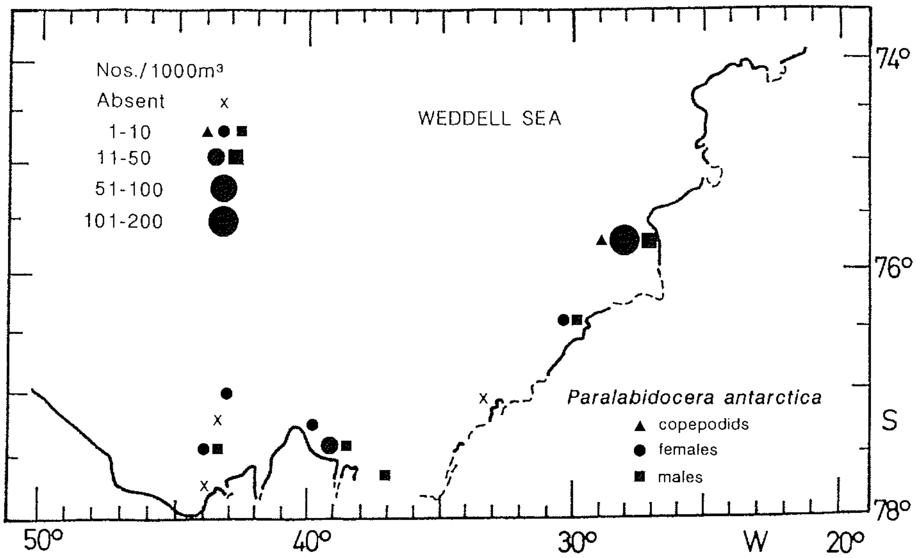

Fig. 8: Distribution and abundance of *Paralabidocera antarctica* along the Filchner Ice Shelf.

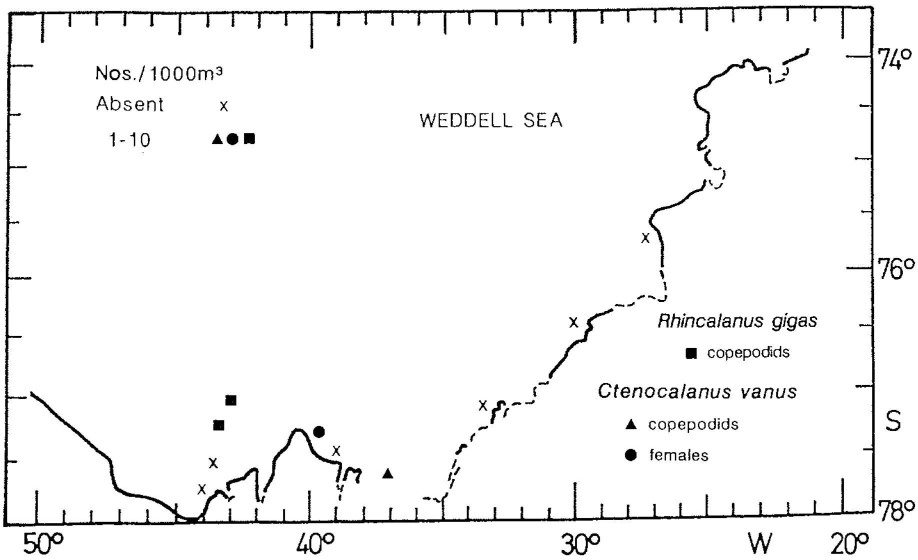

Fig. 9: Distribution and abundance of *Ctenocalanus vanus* and *Rhincalanus gigas* along the Filchner Ice Shelf.

3. Abundance off Atka Bay

In contrast to the Filchner Shelf Ice area, adult copepods were frequent in occurrence within Atka Bay, but relatively low in abundance compared to copepodite stages (all species combined, figure 10). Females constituted 10.2%, males 0.7% and copepodite stages 89.1%.

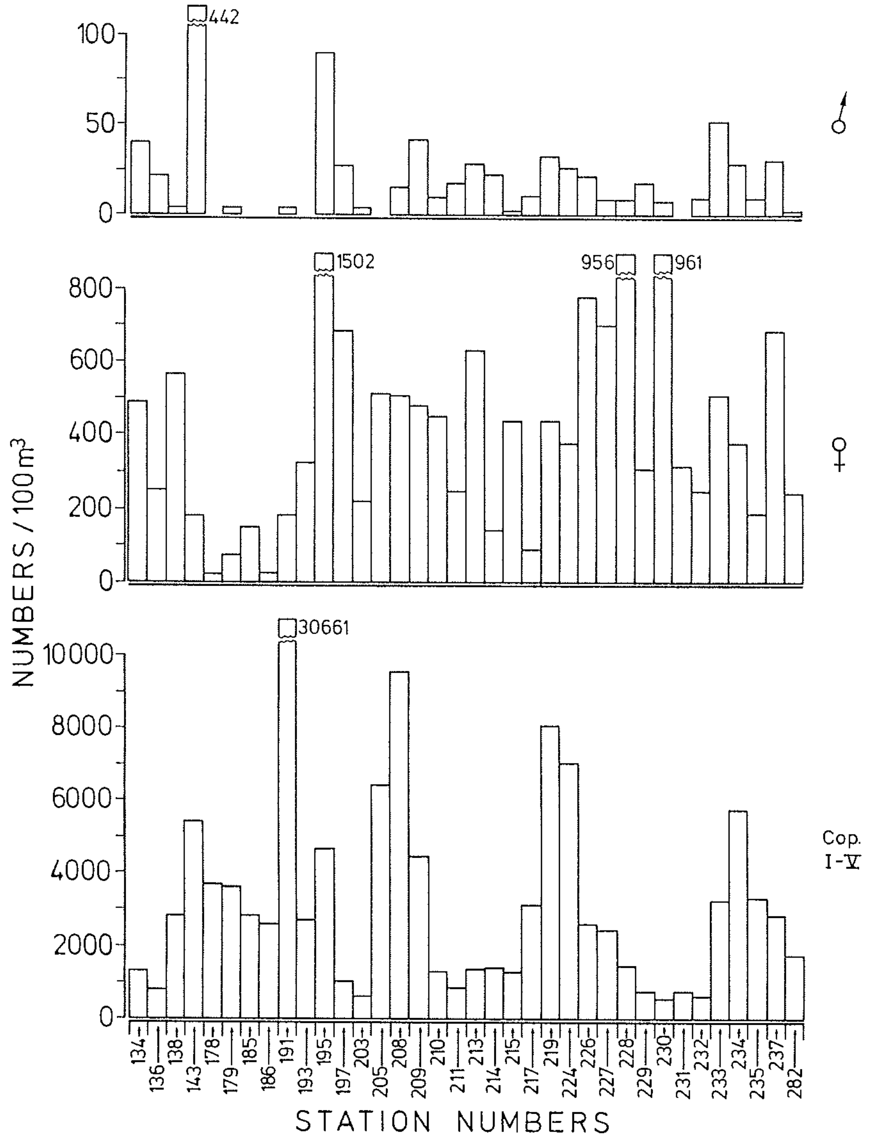

Fig. 10: Pooled numbers of males, females and copepodite stages at the stations off Atka Bay.

Off Atka Bay the highest abundance of females was recorded on station 195 and lowest on 178. Males were taken in relatively high numbers on station 143, but were absent on stations 178, 185, 186, 193, 205 and 231. Copepodids were most abundant on station 191 and lowest offshore on station 230. The number of calanoid copepods (all species and stages combined) calculated per hundred cubic meter varied between 822 (st. 203) and 30851 (st. 191).

A maximum of 12 species were found at station 228 in contrast to a minimum of only four species on stations 178 and 186. A total number of sixteen species were represented in this area, seven of them: *Calanoides acutus*, *Metridia gerlachei*, *Ctenocalanus vanus*, *Calanus propinquus*, *Euchaeta exigua*, *Rhincalanus gigas*, and *Scolecithricella minor* usually occurring on most stations in the investigated area.

Among the remaining nine species, seven: *Euchirella rostramagna*, *Calanus simillimus*, *Euchaeta antarctica*, *Heterorhabdus austrinus*, *Racovitzanus antarcticus*, *Scaphocalanus vervoorti*, and *Stephos longipes* showed relatively low numbers of occurrence in the region examined. Two species of the genus *Haloptilus*, *H. ocellatus* and *H. oxycephalus* were found only on stations 197, 211 and 232 where depths exceeded 2000m.

Calanoides acutus was widely distributed and the most abundant copepod in the investigated area (figure 11). Numbers of females reached 118/100m^3 on station 197. Males were absent in all samples. The numbers of copepodids were much higher than those of any other copepod species. Generally the higher numbers were found near shore, being highest at station 191 near the iceborder (up to 27000/m^3).

Calanus propinquus was widely distributed and second in abundance. No specimen, however, were caught on stations 136, 143, 186, 193 and 203 (figure 12). Males were caught on only six stations. The number of females was highest on station 228. Their abundance was even higher than that of the most common copepod *Calanoides acutus*. Among the copepodite stages, stage II was dominant compared to the other copepodids on 19 stations.

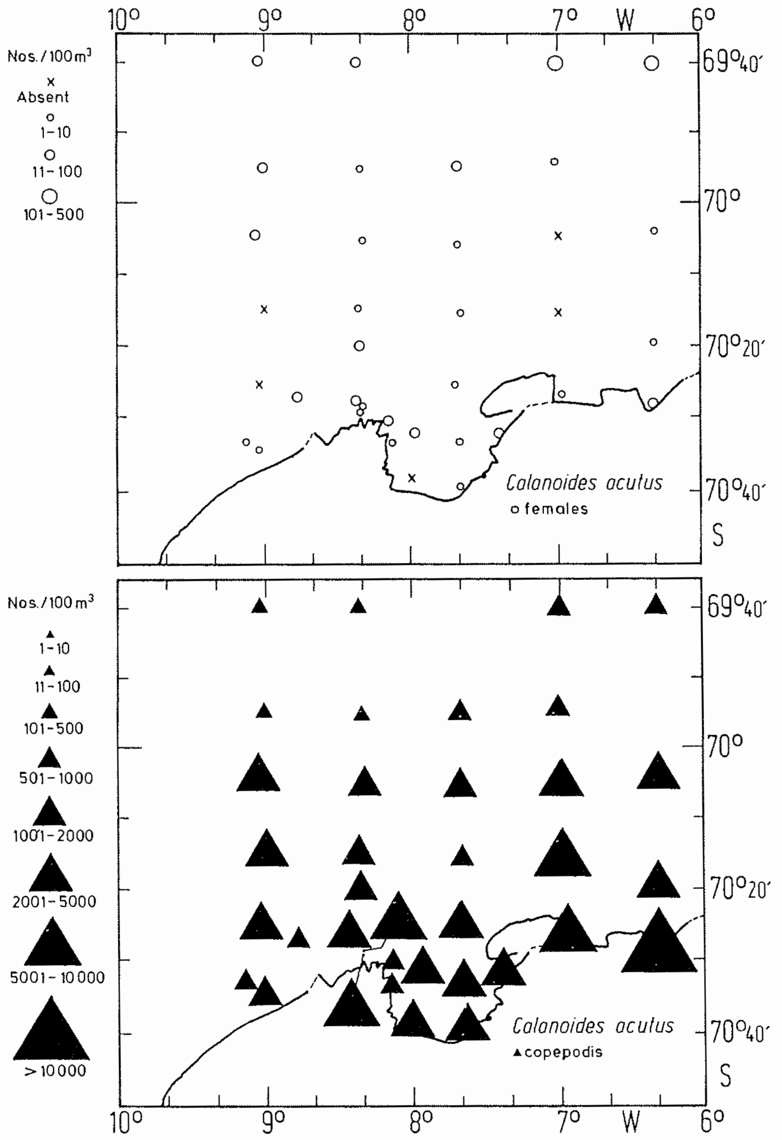

Fig.11: Distribution and abundance of *Calanoides acutus* off Atka Bay.

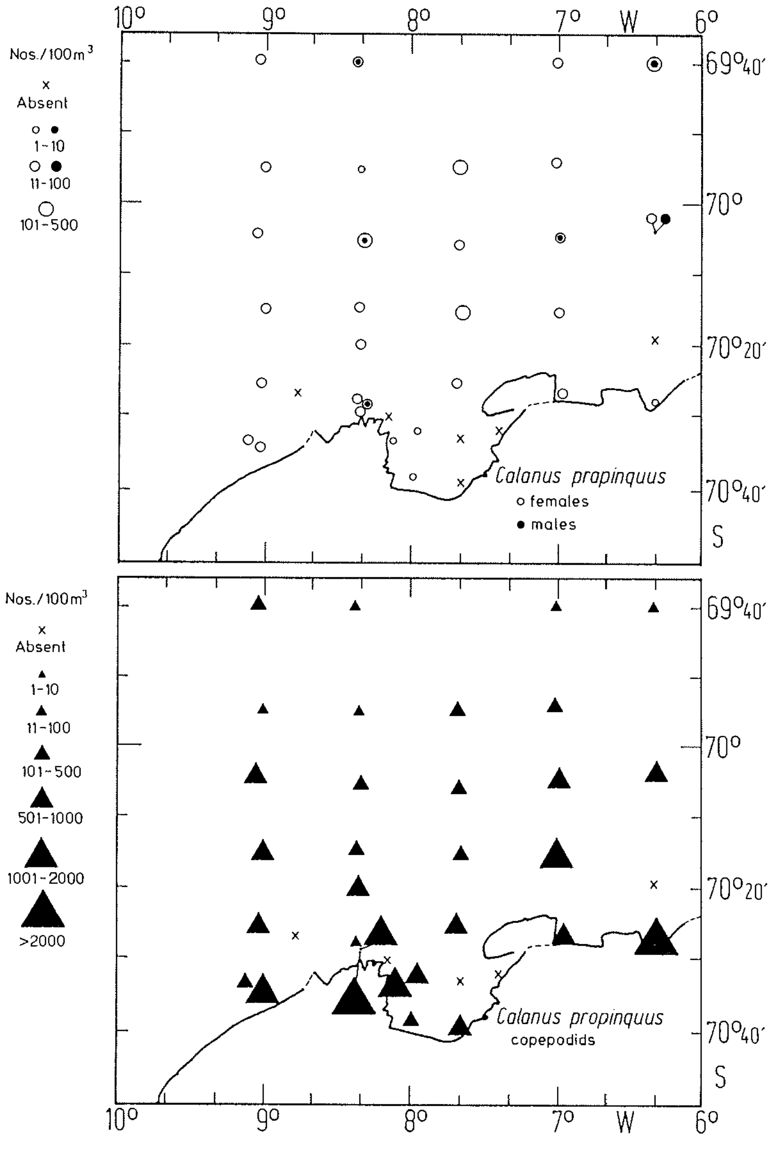

Fig.12: Distribution and abundance of *Calanus propinquus* off Atka Bay.

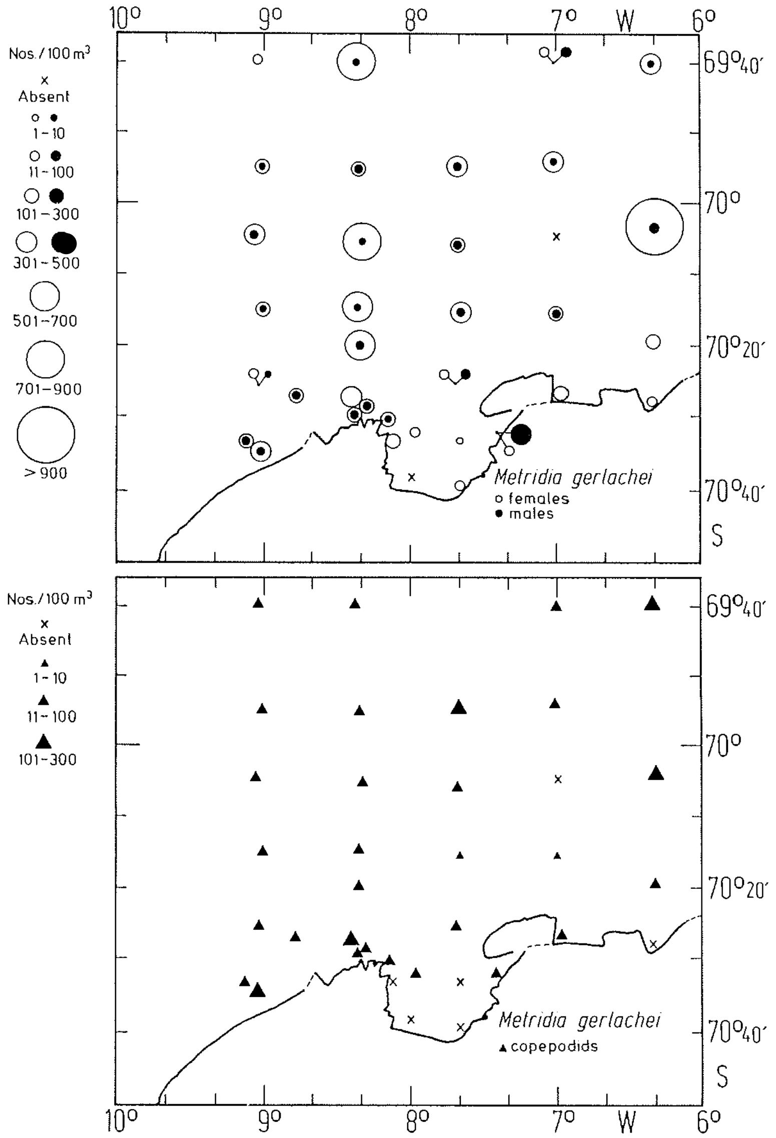

Fig.13: Distribution and abundance of *Metridia gerlachei* off Atka Bay.

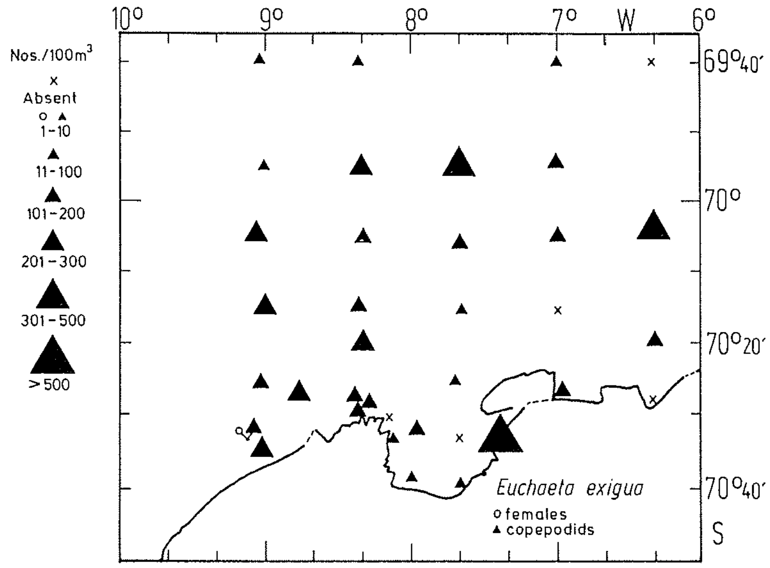

Fig.14: Distribution and abundance of *Euchaeta exigua* off Atka Bay.

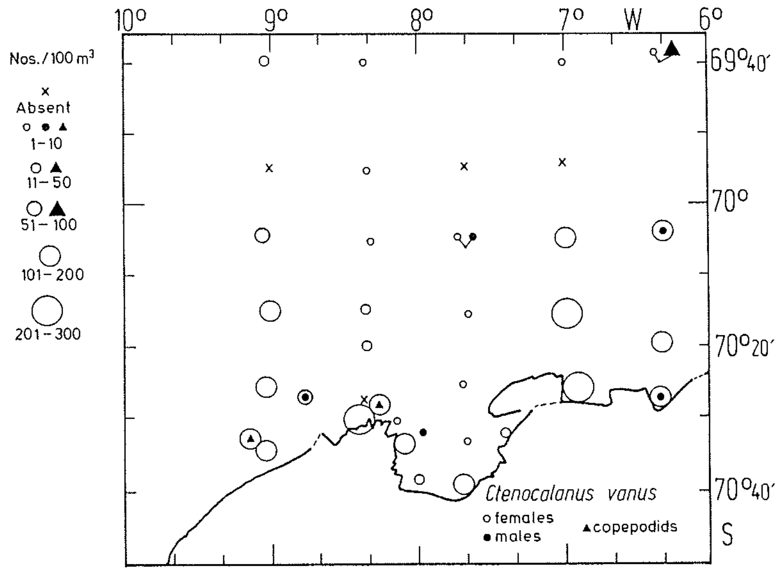

Fig.15: Distribution and abundance of *Ctenocalanus vanus* off Atka Bay.

Metridia gerlachei (figure 13) ranked third in abundance. The highest number of males was taken on station 143 with $442/100m^3$. Neither adults nor juvenile stages were found on stations 178 and 209. Although on almost all stations copepodite stages III-V were found, within the inner parts of Atka Bay they were absent.

Euchaeta exigua was caught on most stations except stations 186, 191, 197, 203, and 208 (figure 14). Only two females per $100m^3$ were found on station 134. No female was taken on any other station. The copepodids were well represented. Maximum numbers reached $596/100m^3$, and the predominant copepodite stage was stage III.

The small *Ctenocalanus vanus* was absent on stations 138, 210, 213 and 232 (figure 15). Males were caught in low numbers (up to 4) on stations 136, 179, 191, 195 and 214. Only on stations 134, 197 and 224 copepodids were found in small numbers.

The abundance and distribution of *Rhincalanus gigas* off Atka Bay is shown in figure 16. Males were absent on all stations whereas females were sampled on several stations, but only in low abundances. The copepodite stages were represented only by stages III, IV and V and, like females, mainly offshore.

Scolecithricella minor was present on 24 out of 36 stations (figure 17). Their total number ranged from 2 to $83/100m^3$, being highest on station 197. Males were most abundant on station 213, whereas females showed a maximum on station 231 with $67/100m^3$. The copepodite stages were only represented by stage V on stations 195, 197, 229, 231, 234 and 235.

In figure 18 distribution and abundances of *Euchaeta antarctica* and *Euchirella rostramagna* are combined. *E. antarctica* was represented only by females on stations 195, 203, 213, 224, 227, 230 and 237, most of them offshore. Males of both species were completely absent. Females were most abundant on station 203, but with only seven individuals. Copepodite stage V of *E. rostramagna* could be found merely on stations 197 and 203.

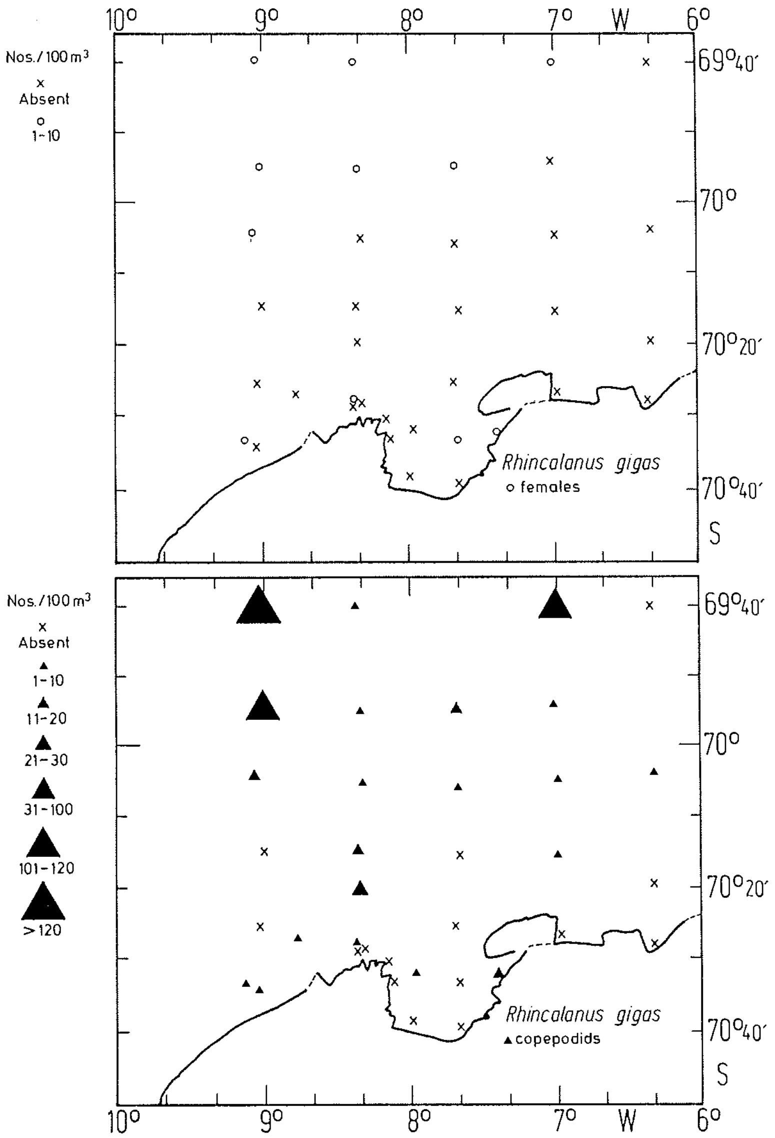

Fig.16: Distribution and abundance of *Rhincalanus gigas* off Atka Bay.

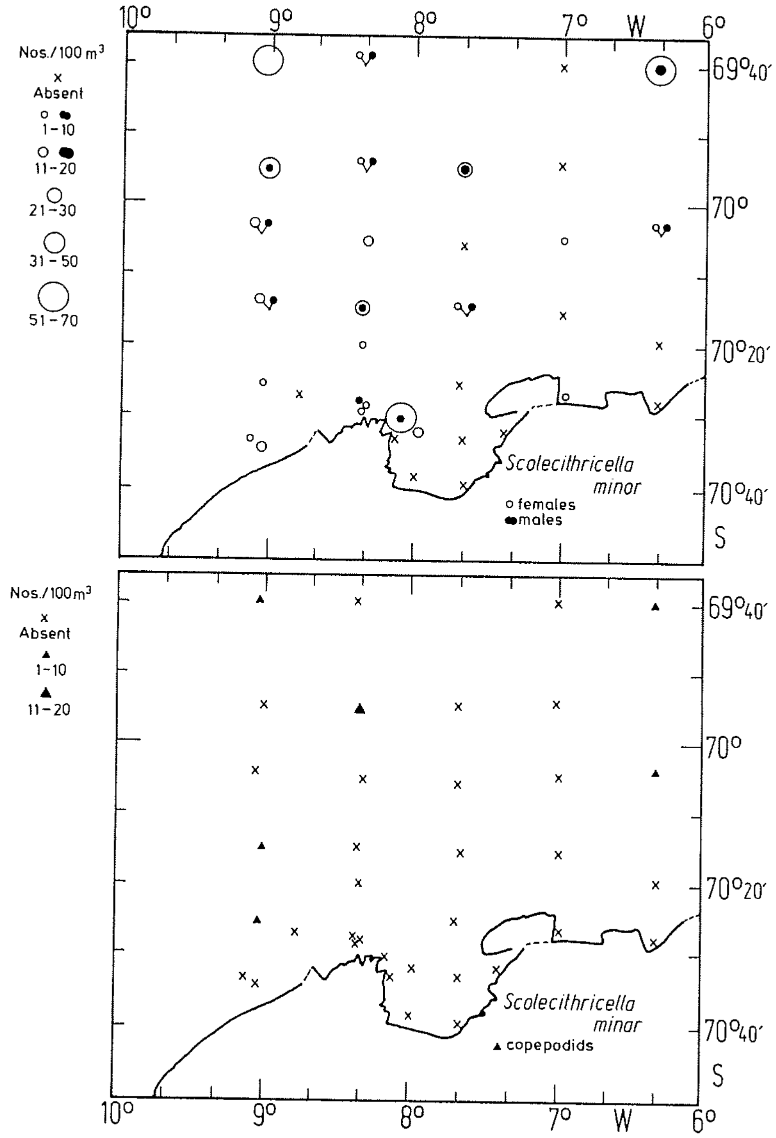

Fig.17: Distribution and abundance of *Scolecithricella minor* off Atka Bay.

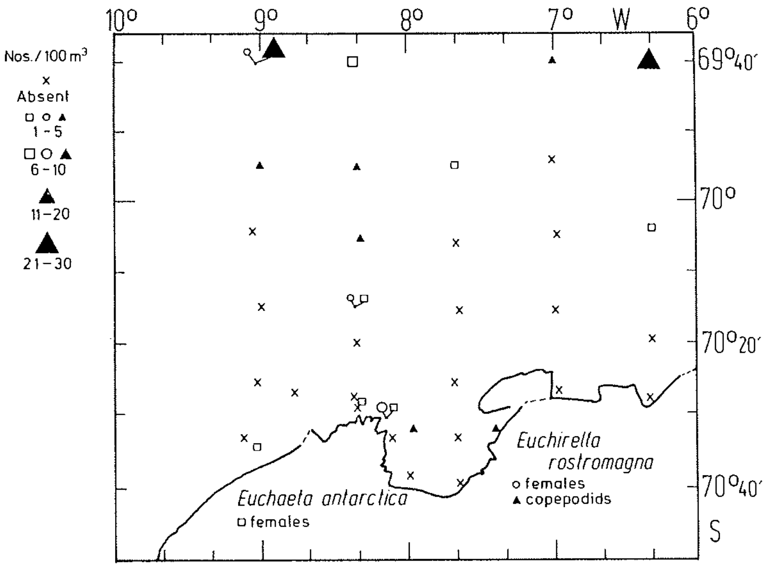

Fig.18: Distribution and abundance of *Euchaeta antarctica* and *Euchirella rostramagna* off Atka Bay.

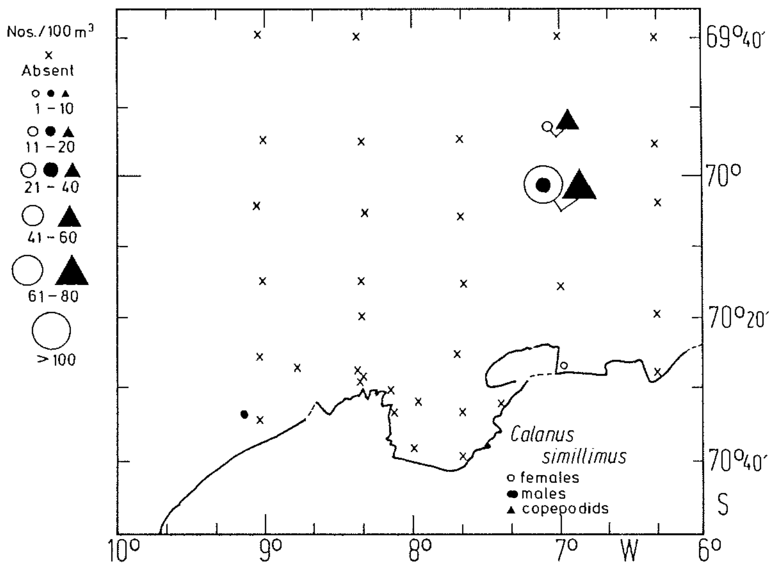

Fig.19: Distribution and abundance of *Calanus simillimus* off Atka Bay.

Calanus simillimus was collected only on stations 209 and 210 in fairly high numbers up to 411/100m^3 for all stages inclusively, males and females (figure 19). On stations 134 and 205 they contributed 6 and 7 females each.

Heterorhabdus austrinus was taken only on seven stations (figure 20). Males were found on stations 211 and 226, females on all seven stations and copepodite stages on stages 179 and 211.

Figures 21 and 22 show the distribution and abundance of *Racovitzanus antarcticus* and *Scaphocalanus vervoorti*. The former species was taken in maximum numbers on station 231, whereas the number of the latter one was highest on station 197. Males of both species were absent and only copepodite stages IV and V were identified.

Stephos longipes was present in small numbers on six stations close to the ice edge (figure 23). Only females were found except on station 282, where also males were abundant in similar numbers.

The distribution and abundance of *Haloptilus ocellatus* and *H. oxycephalus* seem to reflect co-occurrence for the area investigated. Only females were collected except one copepodite stage V of *H. oxycephalus* on station 232 (figure 24).

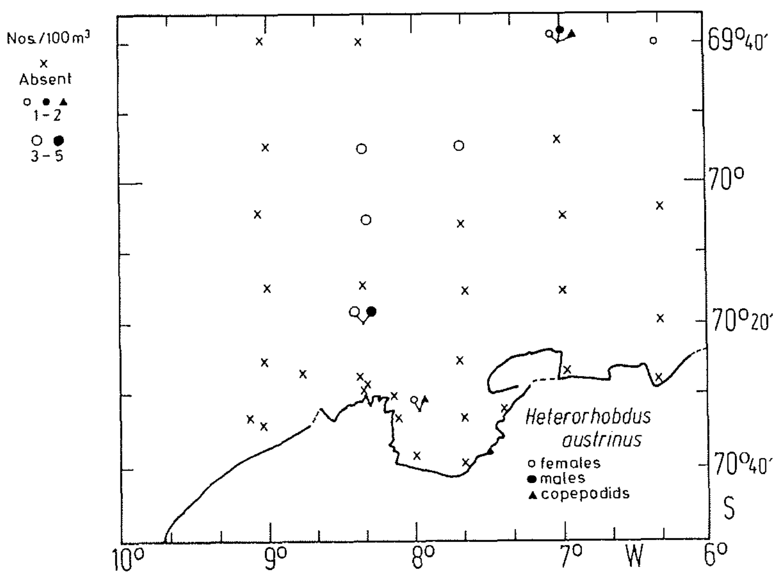

Fig.20: Distribution and abundance of *Heterorhabdus austrinus* off Atka Bay.

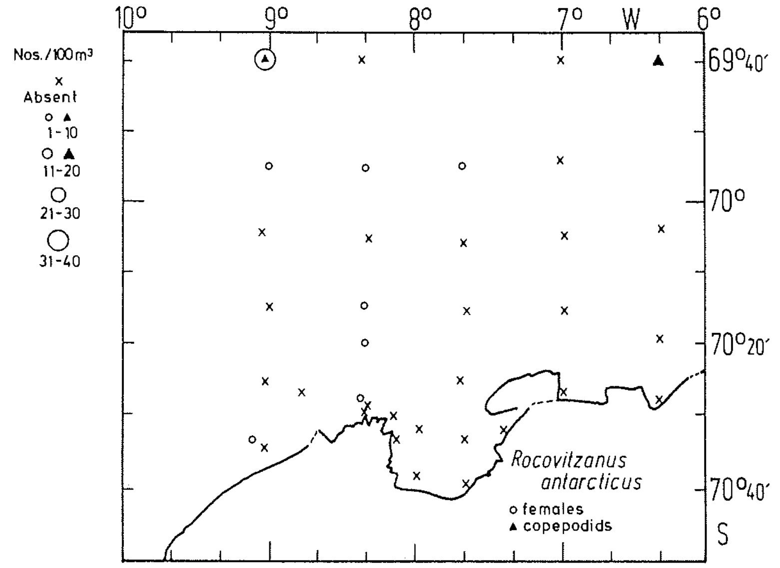

Fig.21: Distribution and abundance of *Racovitzanus antarcticus* off Atka Bay.

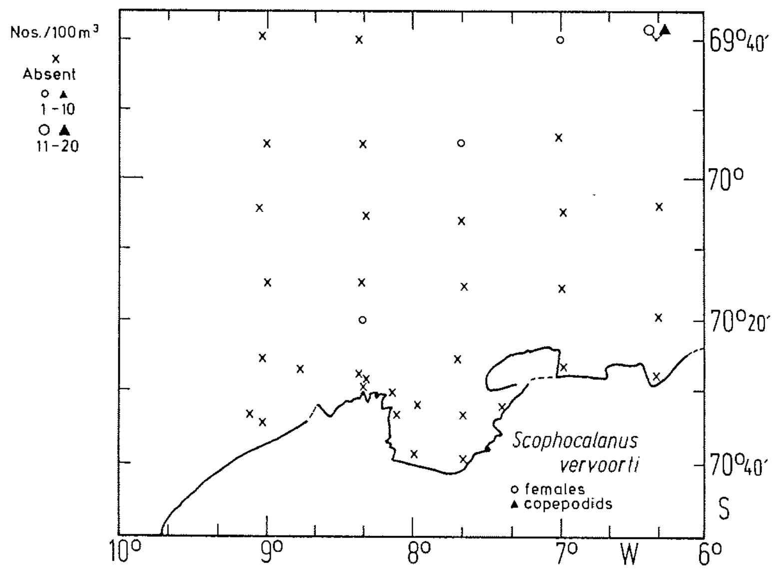

Fig.22: Distribution and abundance of *Scaphocalanus vervoorti* off Atka Bay.

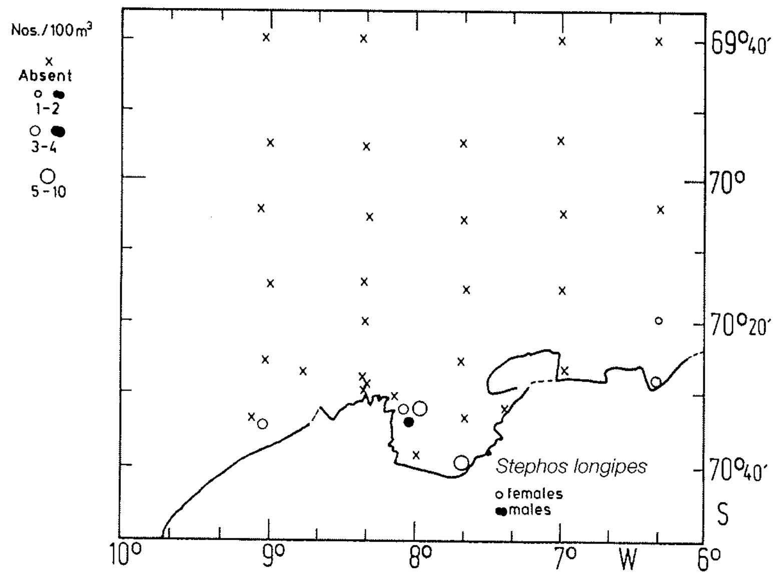

Fig.23: Distribution and abundance of *Stephos longipes* off Atka Bay.

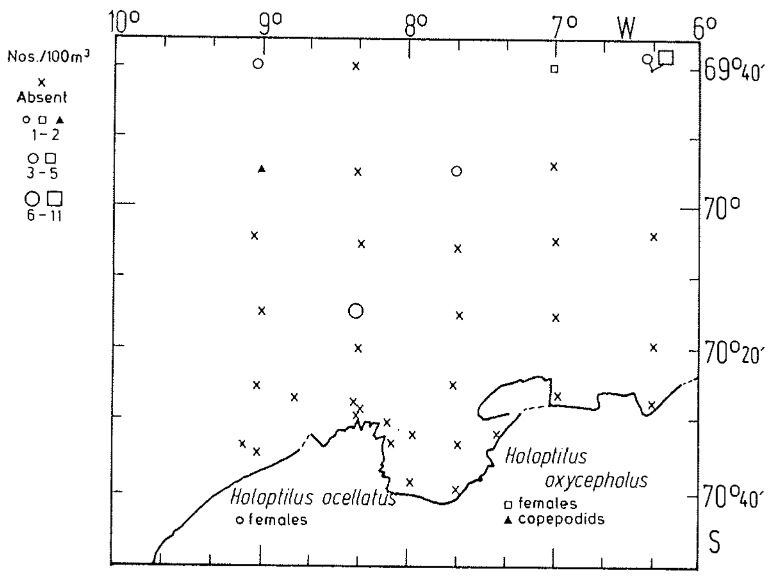

Fig.24: Distribution and abundance of *Haloptilus ocellatus* and *H. oxycephalus* off Atka Bay.

4. Diversity

Species diversity and evenness were calculated for each station of the two areas. Both areas were treated separately to see if diversity and/or evenness show significant differences (table 2).

With an average of 5.1 species the Filchner Ice Shelf exhibits only about 70% of the mean number of species off Atka Bay (table 2). Highest diversity is found off Atka Bay over deep water, especially on station 231 and 232 (1.896 and 1.583) whereas along the Ice Shelf and especially within Atka Bay lowest diversities can be found (station 186, 0.133, table 2).

The mean diversity of the Filchner Ice Shelf (1.071) does not differ significantly from that of Atka Bay (1.014; P > 0.5; table 2). The evenness along the Ice Shelf (0,662, table 2) is also not significantly higher from that off Atka Bay (0.505, P > 0.5). Figure 25 shows that H and R are better correlated (r^2 = 0.753) than H and S (r^2 = 0.353).

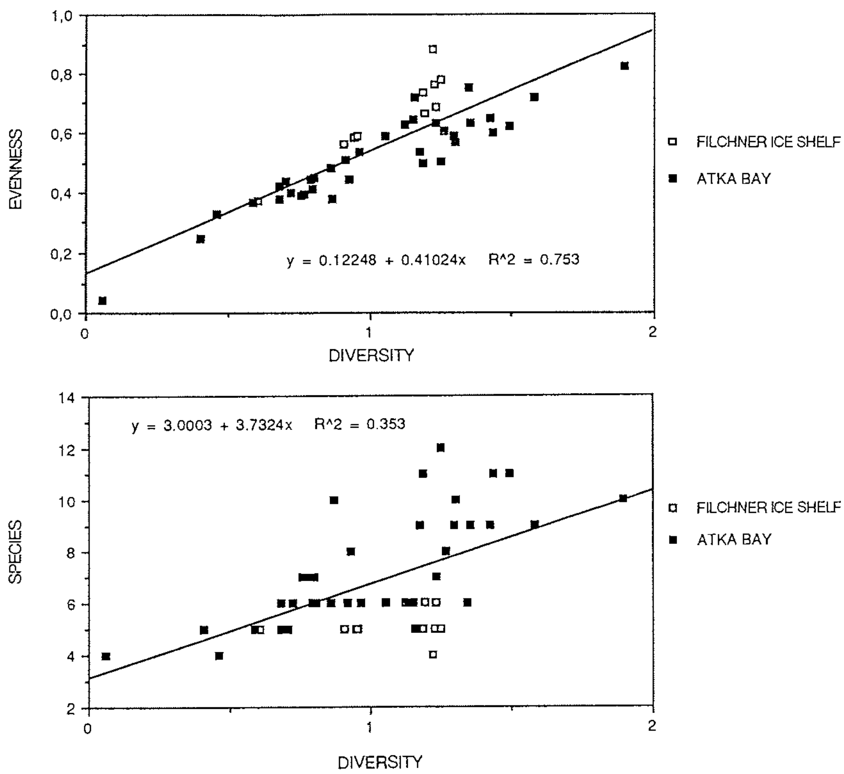

Fig. 25: a) Diversity plotted against evenness combined for both areas; b) diversity plotted against number of species for both areas.

Table 2: Number of diversity (H), evenness (R) and species (S) calculated for each station of the Filchner Ice Shelf area and Atka Bay.

STAT.-FILCHNER	H	R	S
89	1,227	0,762	5,0
91	1,186	0,737	5,0
94	1,221	0,881	4,0
97	1,190	0,664	6,0
99	0,951	0,591	5,0
101	0,942	0,585	5,0
106	1,230	0,686	6,0
108	0,905	0,562	5,0
110	0,604	0,375	5,0
111	1,249	0,776	5,0
mean	**1,071**	**0,662**	**5,1**
sd	**0,213**	**0,142**	
STAT.-ATKA	H	R	S
134	1,427	0,649	9,0
136	1,156	0,718	5,0
138	0,758	0,390	7,0
143	0,678	0,378	6,0
178	0,460	0,332	4,0
179	0,868	0,377	10,0
185	0,803	0,448	6,0
186	0,133	0,146	4,0
191	0,402	0,250	5,0
193	0,588	0,365	5,0
195	1,264	0,608	8,0
197	1,435	0,598	11,0
203	0,792	0,442	6,0
205	0,768	0,395	7,0
208	0,678	0,421	5,0
209	0,719	0,401	6,0
210	1,346	0,751	6,0
211	1,186	0,495	11,0
213	1,493	0,623	11,0
214	1,052	0,587	6,0
215	1,152	0,643	6,0
217	0,703	0,437	5,0
219	0,914	0,510	6,0
224	0,798	0,410	7,0
226	1,298	0,591	9,0
227	1,250	0,503	12,0
228	0,926	0,445	8,0
229	1,300	0,565	10,0
230	1,175	0,535	9,0
231	1,896	0,823	10,0
232	1,583	0,720	9,0
233	1,230	0,632	7,0
234	0,858	0,479	6,0
235	0,959	0,535	6,0
237	1,352	0,634	9,0
282	1,120	0,625	6,0
mean	**1,014**	**0,505**	**7,3**
sd	**0,374**	**0,155**	

Discussion

In a comparison of the two areas investigated in austral summer 1980/81, two major points shall be discussed, abundance and diversity and their determining factors. First, the average abundance in Atka Bay is approximately 40 times higher than that along the Filchner Ice Shelf. In contrast to previous investigations of both areas (KACZMARUK 1983; BOYSEN-ENNEN 1987), the abundances along the Filchner Ice Shelf are significantly lower in this study, presumably due to the early time (season) of sampling (Filchner Ice Shelf, Jan. 04 to 12). Most stations were located in the Ice Shelf polynia in the southern part of the Weddell Sea (HUBOLD & DRESCHER 1982). In 1980/81 this polynia opened shortly before the present investigation.

Copepod populations found in the region survived the winter months in deeper, comparatively warmer waters as mentioned for these species for other, more northern regions (OMMANEY 1936; OTTESTAD 1936; ANDREWS 1966; VORONINA 1966; EVERSON 1984) or they were recently advected by the coastal current. Investigations of the standing stock of phytoplankton, primary productivity, and the possible interactions with the standing crop of zooplankton were not the goal of this expedition (KOHNEN 1982). However, VORONINA (1966; 1968; 1972) pointed out for northern parts of the Weddell Sea and the Antarctic Peninsula that overwintering copepodite stages IV and V of *Calanoides acutus* ascend to the upper water coloumn in early spring, mature to adults and start spawning with the onset of the phytoplankton spring bloom. This part of the life cycle is similar also for *Calanus propinquus* (VORONINA 1966; 1972) and the oceanic *Rhincalanus gigas* (EVERSON 1984), the latter spawning only in waters with temperatures above $0^{o}C$ (OTTESTAD 1932). Therefore, the specimen of *R. gigas* found along the Filchner Ice Shelf presumably are expatriates (EKMAN 1953), transported by the coastal current from the northern into the southern Weddell Sea (BOYSEN-ENNEN 1987). For the other two Calanidae, *C. acutus* and *C. propinquus*, it is known that their reproduction depend on the phytoplankton spring bloom (HEINRICH 1962). Since no copepodite stages I and II of any of the species could be found in the southern Weddell Sea during the investigation, it is assumed that the phytoplankton spring bloom had not started, and therefore reproduction had not taken place there, in contrast to Atka Bay, where the season was progressed and young copepodite stages I-III of the above mentioned species dominated. The phytoplankton spring bloom is prerequisite for reproduction for these species and therefore the reason for the 40-fold higher abundance off Atka Bay. The assumption presented here, that none of the Calanidae reproduce in the southern Weddell Sea (BOYSEN-ENNEN 1987), but that young stages are instead advected, needs still prove.

The hydrographical data (HEMPEL et al. 1983; unpublished data) suggest that the Filchner Ice Shelf is an unfavourable place for plankton, since water temperatures are on average very low all year round (-1.67oC; GORDON & GOLDBERG 1970) an did not differ significantly during the cruise from the mean (unpubl. data). This has unequivocally major influence on the enzymatic reactions, which determine the digestion and reproduction times as well as many other physiological processes. However, CLARKE (1988) showed that for polar regions the major factor influencing the biology and productivity of the organisms may be the short period of available food rather than temperature.

Along the Ice Shelf in the southern Weddell Sea advection may have negative implications for mainly herbivorous zooplankton at the ice edge, since they are transported by strong tidal currents into aphotic zones under the ice shelf (GAMMELSROED & SLOTSVIK 1981). This might not be of importance for species like the omnivorous, opportunistic *Metridia gerlachei*, which is very abundant along the ice shelf and whose reproduction cycle does not appear to be dependent on the phytoplankton spring bloom, since it is even in summer vertically and horizontally widely distributed. This may also be true for many of the small copepods like *Oithona sp.*, *Ctenocalanus sp.*, *Oncaea sp.* (KACZMARUK 1983; BOYSEN-ENNEN1987) and *Paralabidocera antarctica* (this study), which are either omnivorous or carnivorous. But for mainly herbivorous zooplankton like *Calanoides acutus* and *Calanus propinquus* it might be a way of no return, since no countercurrent is known for the southern Weddell Sea, so that they would be trapped under the ice shelf.

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Appendix

Table 1: Zooplankton samples collected during the Filchner-Schelfeis-Expedition 1980/81. Position of stations, depth of haul, volume of water filtered and other relevant information for each Bongo-net.

St. No.	Position Latitude	Position Longitude	Depth [m]	Date/ Time [GMT]	Haul Depth [m]	Fil. Vol. [m^3]
				04.01.81		
089	75°40.0'S	27°10.0'W	250	00.35	165	696
091	76°19.0'S	29°47.0'W	295	06.24	180	839
094	77°05.0'S	33°41.0'W	340	13.53	220	615
097	77°42.1'S	36°59.8'W	1100	23.34	195	662
				05.01.81		
099-1	77°31.2'S	39°12.1'W	1000	06.32	250	301
				06.01.81		
101	77°32.4'S	39°39.7'W	980	11.29	260	327
				10.01.81		
106-3	77°20.0'S	42°57.0'W	430	20.26	225	413
				11.01.81		
108-2	77°25.1'S	43°04.9'W	420	14.36	200	631
110	77°36.7'S	43°07.0'W	465	07.08	190	410
111	77°45.5'S	43°31.5'W	460	08.58	225	416
				21.01.81		
134	70°33.2'S	9°07.5'W	450	02.31	190	681
136	70°27.0'S	8°45.5'W	400	04.48	135	526
138	70°27.5'S	8°22.3'W	285	06.49	205	573
				27.01.81		
143	70°32.1'S	7°23.6'W	268	19.45	160	475
				04.02.81		
178	70°38.5'S	7°59.7'W	110	08.43	90	283
179	70°33.2'S	7°58.1'W	184	09.37	165	497
185	70°39.3'S	7°39.4'W	110	13.53	77	332
186	70°33.2'S	7°40.7'W	175	14.45	140	479
				05.02.81		
191	70°28.2'S	6°20.6'W	100	08.30	70	285
193-1	70°19.7'S	6°20.6'W	375	10.25	280	607
195	70°03.9'S	6°20.7'W	2100	15.06	148	572
197-1	69°40.3'S	6°21.5'W	2800	20.14	212	567
				07.02.81		
203-1	70°29.8'S	8°08.8'W	250	12.58	195	599
				08.02.81		
205-1	70°26.9'S	6°58.1'W	640	09.09	200	396
208	70°15.7'S	6°58.9'W	1250	14.30	220	694
209	70°05.0'S	6°58.8'W	1540	16.58	190	747
210	69°54.8'S	7°01.1'W	1915	19.21	165	505
211-1	69°40.2'S	7°01.8'W	2500	22.12	185	513

St. No.	Position Latitude	Longitude	Depth [m]	Date/ Time [GMT]	Haul Depth [m]	Fil. Vol. [m^3]
				09.02.81		
213	69°55.1´S	7°41.6´W	1900	10.28	210	347
214	70°06.3´S	7°40.5´W	1230	12.38	200	768
215	70°15.8´S	7°39.1´W	1300	14.50	185	953
217	70°25.4´S	7°41.9´W	800	17.57	250	638
				11.02.81		
219	70°29.1´S	8°20.7´W	260	10.11	211	491
				12.02.81		
224	70°28.7´S	8°20.7´W	260	08.35	185	664
226	70°20.0´S	8°21.4´W	760	11.17	190	645
227	70°14.9´S	8°20.5´W	1500	13.15	215	705
228	70°05.6´S	8°18.9´W	2350	15.47	215	647
229	69°55.5´S	8°20.1´W	1850	18.16	175	576
230-1	69°40.0´S	8°21.9´W	2340	20.57	190	491
				13.02.81		
231-1	69°40.0´S	9°00.8´W	906	08.13	906	238
232	69°54.6´S	9°00.1´W	2350	11.55	195	683
233	70°04.5´S	9°03.7´W	1570	14.11	223	702
234	70°15.1´S	9°00.7´W	1240	16.31	180	617
235	70°25.4´S	9°02.5´W	350	18.23	176	480
237	70°34.1´S	9°02.8´W	470	20.23	200	586
				26.02.81		
282-1	70°34.7´S	8°09.2´W	120	20.20	105	367

Table 2: Adults and copepodids of *Metridia gerlachei*. Nos. per 1000 m^3, - for absent.

St.No.	I	II	III	IV	V	♀	♂	Total Cop.	Total
89	-	-	-	-	-	467	-	-	467
91	-	-	-	-	-	18	-	-	18
94	-	-	-	-	2	-	-	2	2
97	-	-	-	-	2	3	-	2	5
99	-	-	-	7	163	860	-	170	1030
101	-	-	-	-	-	-	-	-	-
106	-	-	-	-	36	186	-	36	222
108	-	-	3	32	246	681	-	281	962
110	-	-	5	41	390	1976	-	436	2412
111	-	-	-	-	-	48	-	-	48
Total	-	-	8	80	839	4239	-	927	5166

Table 3: Adults and copepodids of *Calanoides acutus*. Nos. per 1000m^3, - for absent.

St.No.	I	II	III	IV	V	♀	♂	Total Cop.	Total
89	-	-	-	11	42	22	-	53	75
91	-	-	-	35	82	17	-	117	134
94	-	-	-	5	3	-	-	8	8
97	-	-	3	5	3	3	-	11	14
99	-	-	17	13	47	56	-	77	133
101	-	-	3	9	-	-	-	12	12
106	-	-	2	46	92	19	-	140	159
108	-	-	-	43	89	14	-	132	146
110	-	-	2	56	102	24	-	160	184
111	-	-	2	2	41	7	-	45	52
Total	-	-	29	185	501	162	-	755	917

Table 4: Adults and copepodids of *Calanus propinquus*. Nos. per 1000m^3, - for absent.

St.No.	I	II	III	IV	V	♀	♂	Total Cop.	Total
89	-	-	43	26	-	9	-	69	78
91	-	-	4	6	6	5	-	16	21
94	-	-	-	7	7	-	-	14	14
97	-	-	26	6	8	5	2	40	47
99	-	-	123	93	50	10	3	266	279
101	-	-	49	43	9	6	-	101	107
106	-	-	10	39	24	2	5	73	80
108	-	-	5	67	52	6	2	124	132
110	-	-	63	132	27	15	2	222	239
111	-	-	14	58	2	-	-	74	74
Total	-	-	334	477	185	58	14	999	1071

Table 5: Adults and copepodids of *Euchaeta ssp.*. Nos. per 1000 m^3, - for absent.

St.No.	Copepodids	♀	♂	Total
89	32	-	-	32
91	10	-	-	10
94	7	-	-	7
97	3	-	-	3
99	110	-	-	110
101	12	-	-	12
106	19	-	-	19
108	95	-	-	95
110	37	7	-	44
111	12	-	-	12
Total	337	7	-	344

Table 6: Adults and copepodids of *Paralabidocera sp.* Nos. per 1000 m^3, - for absent.

St.No.	Copepodids	♀	♂	Total
89	7	149	47	203
91	-	7	5	12
94	-	-	-	-
97	-	-	2	2
99	-	17	3	20
101	-	9	-	9
106	-	7	-	7
108	-	-	-	-
110	-	2	2	4
111	-	-	-	-
Total	7	191	59	259

Table 7: Adults and copepodids of *Ctenocalanus vanus*. Nos. per 1000 m^3,
- for absent.

St.No.	Copepodids	♀	♂	Total
89	-	-	-	-
91	-	-	-	-
94	-	-	-	-
97	-	-	-	-
99	6	-	-	6
101	-	-	-	-
106	-	6	-	6
108	-	-	-	-
110	-	-	-	-
111	-	-	-	-
Total	6	6	-	12

Table 8: Adults and copepodids of *Rhincalanus gigas*. Nos. per 1000 m^3,
- for absent.

St.No.	Copepodids	♀	♂	Total
89	-	-	-	-
91	-	-	-	-
94	-	-	-	-
97	-	-	-	-
99	-	-	-	-
101	-	-	-	-
106	2	-	-	2
108	2	-	-	2
110	-	-	-	-
111	-	-	-	-
Total	4	-	-	4

Table 9: Adults and copepodids of *Calanoides acutus*. Nos. per 100 m^3, - for absent.

	I	II	III	IV ♀	IV ♂	V ♀	V ♂	♀	Total Cop.	Total
134	35	35	26	549	-	247	-	5	892	897
136	-	-	11	61	-	437	-	27	509	536
138	689	799	91	155	-	806	2	38	2542	2580
143	51	253	177	158	-	4118	-	82	4740	4822
178	537	1435	968	170	-	88	-	-	3198	3198
179	223	1058	1028	62	-	185	-	12	2556	2568
185	172	708	874	133	-	283	-	9	2170	2179
186	132	670	1096	98	-	512	-	4	2508	2512
191	1902	10625	13853	295	-	295	-	14	26970	26984
193	92	959	1259	109	-	130	-	8	2549	2557
195	12	897	1839	119	-	233	-	2	3100	3102
197	-	-	-	19	-	642	-	118	661	779
203	5	60	177	35	-	240	-	22	517	539
205	-	1252	3982	38	-	154	-	3	5426	5429
208	3	1548	5369	732	-	196	-	-	7848	7848
209	16	809	2490	295	-	115	-	-	3622	3622
210	12	208	414	115	-	26	-	6	775	781
211	-	8	2	18	-	576	-	113	604	717
213	-	29	144	69	-	499	-	14	741	755
214	-	133	553	146	-	174	-	7	1006	1013
215	3	13	646	59	-	123	-	4	844	848
217	-	256	1792	263	-	124	-	3	2435	2438
219	12	1232	3556	550	-	326	-	4	5676	5680
224	-	374	4039	846	-	352	-	3	5611	5614
226	12	205	985	50	-	375	-	12	1627	1639
227	14	213	899	182	-	454	-	3	1762	1765
228	6	45	227	182	-	550	-	6	1010	1016
229	-	-	7	14	-	377	-	10	398	408
230	-	6	18	6	-	306	-	12	336	348
231	-	-	4	4	-	160	-	21	168	189
232	-	-	-	7	-	347	-	20	354	374
233	86	234	1120	331	-	285	-	11	2056	2067
234	16	577	3111	564	-	344	-	-	4612	4612
235	12	210	1550	508	-	73	-	-	2353	2353
237	68	433	580	113	-	247	-	3	1443	1446
282	8	120	124	296	-	33	-	5	581	586
Total	4118	25404	53011	7351	-	14432	2	601	104400	104801

Table 10: Adults and copepodids of *Calanus propinquus*. Nos. per 100 m^3 - for absent.

	I	II	III	IV		V		Ad.		Total	Total	Total
				♀	♂	♀	♂	♀	♂	♀ + ♂	Cop.	
34	20	60	4	29	-	45	-	26	-	26	158	184
36	-	-	-	-	-	-	-	-	-	-	-	-
38	-	-	7	18	-	8	-	89	-	89	33	122
43	-	-	-	-	-	-	-	-	-	-	-	-
78	42	251	134	11	-	4	-	4	-	4	442	446
79	109	457	177	40	-	18	-	8	-	8	801	809
85	69	319	108	30	-	-	-	-	-	-	526	526
86	-	-	-	-	-	-	-	-	-	-	-	-
91	561	2751	344	28	-	7	-	7	-	7	3691	3698
93	-	-	-	-	-	-	-	-	-	-	-	-
95	11	411	301	152	4	79	21	80	11	91	979	1070
97	-	4	16	9	-	60	-	111	8	119	89	208
03	-	-	-	-	-	-	-	-	-	-	-	-
05	-	535	152	81	-	38	-	30	-	30	806	836
08	9	1196	303	164	6	9	-	40	-	40	1687	1727
09	-	386	142	70	-	35	-	24	5	29	633	662
10	4	119	79	71	-	30	-	71	-	71	303	374
11	-	10	12	-	-	2	-	64	-	64	24	88
13	3	17	29	55	-	110	-	147	-	147	214	361
14	-	73	78	33	-	17	-	21	-	21	201	222
15	7	153	90	50	-	72	-	115	-	115	372	487
17	6	270	135	113	2	34	-	61	-	61	560	621
19	24	1316	546	212	-	33	-	20	-	20	2131	2151
24	-	593	301	175	-	60	9	84	6	90	1138	1228
26	-	329	155	105	-	62	-	68	-	68	651	719
27	10	133	101	92	-	85	3	62	-	62	424	486
28	-	96	79	54	-	77	6	155	3	158	310	468
29	2	3	12	21	-	61	-	6	-	6	99	105
30	4	6	24	4	-	49	-	84	2	86	87	173
31	29	25	34	13	-	80	-	97	-	97	181	278
32	-	6	3	-	-	61	-	66	-	66	70	136
33	11	276	308	190	-	80	-	68	-	68	865	933
34	6	399	211	159	-	117	-	39	-	39	892	931
35	6	287	202	208	-	35	-	25	-	25	738	763
37	27	105	696	151	-	44	-	31	-	31	1029	1060
82	19	272	583	234	-	11	-	8	-	8	1119	1127
otal	979	10858	5364	2578	12	1423	39	1711	35	1746	21253	22999

Table 11: Adults and copepodids of *Metridia gerlachei*. Nos. per 100 m^3, - for absent.

	I	II	III	IV ♀	IV ♂	V ♀	V ♂	Ad. ♀	Ad. ♂	Total ♀ + ♂	Total Cop.	T(
134	-	-	-	-	-	56	-	261	40	301	56	[illegible]
136	-	-	-	-	-	27	-	129	17	146	27	[illegible]
138	-	-	5	14	-	63	28	436	-	436	110	[illegible]
143	-	-	-	25	-	51	-	76	442	518	76	[illegible]
178	-	-	-	-	-	-	-	-	-	-	-	
179	-	-	18	2	-	40	22	30	-	30	82	[illegible]
185	-	-	-	-	-	-	-	18	-	18	-	
186	-	-	-	10	4	15	10	2	-	2	39	
191	-	-	-	-	-	-	-	28	-	28	-	
193	-	-	-	2	7	10	12	178	-	178	31	[illegible]
195	-	-	-	-	-	187	35	1266	73	1339	222	1[illegible]
197	-	-	-	21	21	67	39	356	9	365	148	[illegible]
203	-	-	5	10	3	43	20	174	2	176	81	[illegible]
205	-	-	-	-	-	20	15	207	-	207	35	[illegible]
208	-	-	-	-	-	3	-	228	17	245	3	[illegible]
209	-	-	-	-	-	-	-	-	-	-	-	
210	-	-	-	-	-	40	10	364	10	374	50	[illegible]
211	-	-	-	49	-	25	-	54	16	70	74	[illegible]
213	-	-	-	18	-	75	9	421	17	438	102	[illegible]
214	-	-	-	5	-	26	-	109	22	131	31	[illegible]
215	-	-	-	1	1	7	1	316	2	318	10	[illegible]
217	-	-	-	3	-	13	-	22	11	33	16	
219	-	-	-	16	-	33	-	122	33	155	49	[illegible]
224	-	-	-	24	-	51	6	157	21	178	81	[illegible]
226	-	-	-	31	-	34	3	651	19	670	68	[illegible]
227	-	-	-	3	-	45	4	567	6	573	52	[illegible]
228	-	-	-	6	-	6	-	773	6	779	12	[illegible]
229	-	-	-	14	-	3	-	273	16	289	17	[illegible]
230	-	-	-	20	-	20	-	843	4	847	40	[illegible]
231	-	-	-	46	-	17	-	71	-	71	63	[illegible]
232	-	-	-	25	-	3	-	104	6	110	28	[illegible]
233	-	-	6	66	-	6	-	325	49	374	78	[illegible]
234	-	-	-	10	-	49	-	220	23	243	59	[illegible]
235	-	-	-	10	-	29	-	73	10	83	39	[illegible]
237	-	-	-	34	-	78	-	495	31	526	112	[illegible]
282	-	-	-	-	-	-	-	106	-	106	-	[illegible]
Total	-	-	34	465	36	1142	214	9455	902	10357	1891	12[illegible]

Table 12: Adults and copepodids of *Euchaeta exigua*. Nos. per 100 m^3, - for absent.

	I	II	III	IV		V		Ad.		Total	Total	Total
				♀	♂	♀	♂	♀	♂	♀ + ♂	Cop.	
134	4	45	103	25	9	2	-	2	-	2	190	192
136	2	99	154	21	21	-	-	-	-	-	297	297
138	7	23	44	21	9	-	-	-	-	-	104	104
143	19	145	246	70	110	-	6	-	-	-	596	596
178	-	-	35	4	4	-	-	-	-	-	43	43
179	4	50	44	20	14	-	-	-	-	-	132	132
185	-	30	42	6	-	-	-	-	-	-	78	78
186	-	-	-	-	-	-	-	-	-	-	-	-
191	-	-	-	-	-	-	-	-	-	-	-	-
193	2	23	48	17	18	-	-	-	-	-	108	108
195	-	26	220	65	58	2	2	-	-	-	373	373
197	-	-	-	-	-	-	-	-	-	-	-	-
203	-	-	-	-	-	-	-	-	-	-	-	-
205	-	33	81	5	3	2	-	-	-	-	124	124
208	-	-	-	-	-	-	-	-	-	-	-	-
209	3	35	72	24	11	5	3	-	-	-	153	153
210	-	16	32	30	46	4	2	-	-	-	130	130
211	2	2	8	2	10	10	2	-	-	-	36	36
213	3	58	89	72	81	3	-	-	-	-	306	306
214	-	31	50	33	27	3	3	-	-	-	147	147
215	-	5	-	28	17	2	-	-	-	-	52	52
217	-	6	39	30	14	3	2	-	-	-	94	94
219	-	53	90	37	16	-	-	-	-	-	196	196
224	-	21	81	27	27	15	15	-	-	-	186	186
226	-	15	99	56	50	6	3	-	-	-	229	229
227	-	38	61	31	31	3	11	-	-	-	175	175
228	-	11	62	24	24	3	3	-	-	-	127	127
229	-	55	73	45	43	9	3	-	-	-	228	228
230	4	12	16	24	24	6	4	-	-	-	90	90
231	-	29	17	8	-	4	-	-	-	-	58	58
232	4	18	12	1	4	1	-	-	-	-	40	40
233	6	37	91	43	43	3	3	-	-	-	226	226
234	3	36	91	42	36	-	-	-	-	-	208	208
235	-	25	73	31	31	-	-	-	-	-	160	160
237	-	61	89	55	41	-	-	-	-	-	246	246
282	-	8	14	14	8	3	3	-	-	-	50	50
Total	63	1046	2176	911	830	89	65	2	-	2	5180	5182

Table 13: Adults and copepodids of *Ctenocalanus vanus*. Nos. per 100 m^3, - for absent.

	I	II	III	IV		V		Ad.		Total	Total	To
				♀	♂	♀	♂	♀	♂	♀ + ♂	Cop.	
134	-	-	-	-	-	-	3	182	-	182	3	1
136	-	-	-	-	-	-	-	97	4	101	-	1
138	-	-	-	-	-	-	-	-	-	-	-	
143	-	-	-	-	-	-	-	19	-	19	-	
178	-	-	-	-	-	-	-	18	-	18	-	
179	-	-	-	-	-	-	-	-	4	4	-	
185	-	-	-	-	-	-	-	117	-	117	-	1
186	-	-	-	-	-	-	-	10	-	10	-	
191	-	-	-	-	-	-	-	133	4	137	-	1
193	-	-	-	-	-	-	-	137	-	137	-	1
195	-	-	-	-	-	-	-	145	4	149	-	1
197	-	-	-	-	-	51	4	5	-	5	55	
203	-	-	-	-	-	-	-	10	-	10	-	
205	-	-	-	-	-	-	-	265	-	265	-	2
208	-	-	-	-	-	-	-	239	-	239	-	2
209	-	-	-	-	-	-	-	142	-	142	-	1
210	-	-	-	-	-	-	-	-	-	-	-	
211	-	-	-	-	-	-	-	2	-	2	-	
213	-	-	-	-	-	-	-	-	-	-	-	
214	-	-	-	-	-	-	-	9	1	10	-	
215	-	-	-	-	-	-	-	1	-	1	-	
217	-	-	-	-	-	-	-	5	-	5	-	
219	-	-	-	-	-	-	-	285	-	285	-	2
224	-	-	-	-	-	-	6	133	-	133	6	1
226	-	-	-	-	-	-	-	28	-	28	-	
227	-	-	-	-	-	-	-	28	-	28	-	
228	-	-	-	-	-	-	-	3	-	3	-	
229	-	-	-	-	-	-	-	3	-	3	-	
230	-	-	-	-	-	-	-	8	-	8	-	
231	-	-	-	-	-	-	-	17	-	17	-	
232	-	-	-	-	-	-	-	-	-	-	-	
233	-	-	-	-	-	-	-	88	-	88	-	
234	-	-	-	-	-	-	-	104	-	104	-	1
235	-	-	-	-	-	-	-	87	-	87	-	
237	-	-	-	-	-	-	-	137	-	137	-	1
282	-	-	-	-	-	-	-	123	-	123	-	1
Total	-	-	-	-	-	51	13	2580	17	2597	64	26

Table 14: Adults and copepodids of *Rhincalanus gigas*. Nos. per 100 m^3, - for absent.

	I	II	III	IV ♀	IV ♂	V ♀	V ♂	Ad. ♀	Ad. ♂	Total ♀ + ♂	Total Cop.	Tota
.34	-	-	-	2	-	4	-	2	-	2	6	8
.36	-	-	-	2	-	-	-	-	-	-	2	2
.38	-	-	-	-	-	7	-	2	-	2	7	9
.43	-	-	-	-	-	15	-	2	-	2	15	17
.78	-	-	-	-	-	-	-	-	-	-	-	-
.79	-	-	2	-	-	-	-	-	-	-	2	2
.85	-	-	-	-	-	-	-	-	-	-	-	-
.86	-	-	-	-	-	-	-	10	-	10	-	10
.91	-	-	-	-	-	-	-	-	-	-	-	-
.93	-	-	-	-	-	-	-	-	-	-	-	-
.95	-	-	-	-	-	4	-	-	-	-	4	4
.97	-	-	-	-	-	-	-	-	-	-	-	-
'03	-	-	-	-	-	-	-	-	-	-	-	-
'05	-	-	-	-	-	-	-	-	-	-	-	-
'08	-	-	-	3	-	-	-	-	-	-	3	3
'09	-	-	-	3	-	-	-	-	-	-	3	3
'10	-	-	-	2	-	-	-	-	-	-	2	2
'11	-	-	16	66	-	33	-	10	-	10	115	125
'13	-	-	-	3	-	12	-	6	-	6	15	21
'14	-	-	-	1	-	-	-	-	-	-	1	1
'15	-	-	-	-	-	-	-	-	-	-	-	-
'17	-	-	-	-	-	-	-	-	-	-	-	-
19	-	-	-	-	-	-	-	-	-	-	-	-
.24	-	-	-	-	-	-	-	-	-	-	-	-
'26	-	-	-	9	-	12	-	-	-	-	21	21
'27	-	-	3	7	-	3	-	-	-	-	13	13
28	-	-	-	6	-	-	-	-	-	-	6	6
29	-	-	-	-	-	3	-	2	-	2	3	5
30	-	-	-	2	-	-	-	2	-	2	2	4
31	-	-	29	84	-	139	-	4	-	4	252	256
32	-	-	4	57	-	56	-	7	-	7	117	124
33	-	-	-	6	-	6	-	6	-	6	12	18
34	-	-	-	-	-	-	-	-	-	-	-	-
35	-	-	-	-	-	-	-	-	-	-	-	-
37	-	-	-	7	-	-	-	-	-	-	7	7
82	-	-	-	-	-	-	-	-	-	-	-	-
otal	-	-	54	260	-	294	-	53	-	53	608	661

Table 15: Adults and copepodids of *Scolecithricella minor*. Nos. per 100 m^3, - for absent.

	I	II	III	IV		V		Ad.		Total	Total	To
				♀	♂	♀	♂	♀	♂	♀ + ♂	Cop.	
134	-	-	-	-	-	-	-	2	-	2	-	
36	-	-	-	-	-	-	-	-	-	-	-	
138	-	-	-	-	-	-	-	-	4	4	-	
143	-	-	-	-	-	-	-	-	-	-	-	
178	-	-	-	-	-	-	-	-	-	-	-	
179	-	-	-	-	-	-	-	18	-	18	-	1
185	-	-	-	-	-	-	-	-	-	-	-	
186	-	-	-	-	-	-	-	-	-	-	-	
191	-	-	-	-	-	-	-	-	-	-	-	
193	-	-	-	-	-	-	-	-	-	-	-	
195	-	-	-	-	-	-	2	7	2	9	2	1
197	-	-	-	-	-	5	5	62	11	73	10	8
203	-	-	-	-	-	-	-	5	2	7	-	
205	-	-	-	-	-	-	-	3	-	3	-	
208	-	-	-	-	-	-	-	-	-	-	-	
209	-	-	-	-	-	-	-	4	-	4	-	
210	-	-	-	-	-	-	-	-	-	-	-	
211	-	-	-	-	-	-	-	2	-	2	-	
213	-	-	-	-	-	-	-	23	12	35	-	3
214	-	-	-	-	-	-	-	-	-	-	-	
215	-	-	-	-	-	-	-	5	1	6	-	
217	-	-	-	-	-	-	-	-	-	-	-	
219	-	-	-	-	-	-	-	8	-	8	-	
224	-	-	-	-	-	-	-	3	-	3	-	
226	-	-	-	-	-	-	-	6	-	6	-	
227	-	-	-	-	-	-	-	26	3	29	-	2
228	-	-	-	-	-	-	-	16	-	16	-	1
229	-	-	-	-	-	16	2	8	2	10	18	2
230	-	-	-	-	-	-	-	6	2	8	-	
231	-	-	-	-	-	8	-	67	-	67	8	7
232	-	-	-	-	-	-	-	47	4	51	-	5
233	-	-	-	-	-	-	-	11	3	14	-	1
234	-	-	-	-	-	-	3	19	6	25	3	2
235	-	-	-	-	-	-	2	4	-	4	2	
237	-	-	-	-	-	-	-	14	-	14	-	1
282	-	-	-	-	-	-	-	-	-	-	-	
Total	-	-	-	-	-	29	14	366	52	418	43	46

Table 16: Adults and copepodids of *Euchaeta antarctica*. Nos. per 100 m^3, - for absent.

	I	II	III	IV		V		Ad.		Total	Total	Total
				♀	♂	♀	♂	♀	♂	♀ + ♂	Cop.	
.34	-	-	-	-	-	-	-	-	-	-	-	-
.36	-	-	-	-	-	-	-	-	-	-	-	-
.38	-	-	-	-	-	-	-	-	-	-	-	-
43	-	-	-	-	-	-	-	-	-	-	-	-
78	-	-	-	-	-	-	-	-	-	-	-	-
79	-	-	-	-	-	-	-	-	-	-	-	-
85	-	-	-	-	-	-	-	-	-	-	-	-
86	-	-	-	-	-	-	-	-	-	-	-	-
91	-	-	-	-	-	-	-	-	-	-	-	-
93	-	-	-	-	-	-	-	-	-	-	-	-
95	-	-	-	-	-	-	-	2	-	2	-	2
97	-	-	-	-	-	-	-	-	-	-	-	-
03	-	-	-	-	-	-	-	2	-	2	-	2
05	-	-	-	-	-	-	-	-	-	-	-	-
08	-	-	-	-	-	-	-	-	-	-	-	-
09	-	-	-	-	-	-	-	-	-	-	-	-
10	-	-	-	-	-	-	-	-	-	-	-	-
11	-	-	-	-	-	-	-	-	-	-	-	-
13	-	-	-	-	-	-	-	3	-	3	-	3
14	-	-	-	-	-	-	-	-	-	-	-	-
15	-	-	-	-	-	-	-	-	-	-	-	-
17	-	-	-	-	-	-	-	-	-	-	-	-
19	-	-	-	-	-	-	-	-	-	-	-	-
24	-	-	-	-	-	-	-	3	-	3	-	3
26	-	-	-	-	-	-	-	-	-	-	-	-
27	-	-	-	-	-	-	-	4	-	4	-	4
28	-	-	-	-	-	-	-	-	-	-	-	-
29	-	-	-	-	-	-	-	-	-	-	-	-
30	-	-	-	-	-	-	-	6	-	6	-	6
31	-	-	-	-	-	-	-	-	-	-	-	-
32	-	-	-	-	-	-	-	-	-	-	-	-
33	-	-	-	-	-	-	-	-	-	-	-	-
34	-	-	-	-	-	-	-	-	-	-	-	-
35	-	-	-	-	-	-	-	-	-	-	-	-
37	-	-	-	-	-	-	-	3	-	3	-	3
82	-	-	-	-	-	-	-	-	-	-	-	-
otal	-	-	-	-	-	-	-	23	-	23	-	23

<u>Table 17:</u> Adults and copepodids of *Euchirella rostramagna*. Nos. per 100 m^3, - for absent.

	I	II	III	IV ♀	IV ♂	V ♀	V ♂	Ad. ♀	Ad. ♂	Total ♀ + ♂	Total Cop.	Tot
134	-	-	-	-	-	-	-	-	-	-	-	-
136	-	-	-	-	-	-	-	-	-	-	-	-
138	-	-	-	-	-	-	-	-	-	-	-	-
143	-	-	2	-	3	-	-	-	-	-	5	5
178	-	-	-	-	-	-	-	-	-	-	-	-
179	-	-	4	-	-	-	-	-	-	-	4	4
185	-	-	-	-	-	-	-	-	-	-	-	-
186	-	-	-	-	-	-	-	-	-	-	-	-
191	-	-	-	-	-	-	-	-	-	-	-	-
193	-	-	-	-	-	-	-	-	-	-	-	-
195	-	-	-	-	-	-	-	-	-	-	-	-
197	-	-	8	-	2	2	14	-	-	-	26	26
203	-	-	-	-	-	-	-	7	-	7	-	7
205	-	-	-	-	-	-	-	-	-	-	-	-
208	-	-	-	-	-	-	-	-	-	-	-	-
209	-	-	-	-	-	-	-	-	-	-	-	-
210	-	-	-	-	-	-	-	-	-	-	-	-
211	-	-	-	2	-	-	-	-	-	-	2	2
213	-	-	-	-	-	-	-	-	-	-	-	-
214	-	-	-	-	-	-	-	-	-	-	-	-
215	-	-	-	-	-	-	-	-	-	-	-	-
217	-	-	-	-	-	-	-	-	-	-	-	-
219	-	-	-	-	-	-	-	-	-	-	-	-
224	-	-	-	-	-	-	-	-	-	-	-	-
226	-	-	-	-	-	-	-	-	-	-	-	-
227	-	-	-	-	-	-	-	4	-	4	-	4
228	-	-	-	-	-	3	-	-	-	-	3	3
229	-	-	-	-	-	2	-	-	-	-	2	2
230	-	-	-	-	-	-	-	-	-	-	-	-
231	-	-	-	-	-	-	21	4	-	4	21	25
232	-	-	-	-	-	3	-	-	-	-	3	3
233	-	-	-	-	-	-	-	-	-	-	-	-
234	-	-	-	-	-	-	-	-	-	-	-	-
235	-	-	-	-	-	-	-	-	-	-	-	-
237	-	-	-	-	-	-	-	-	-	-	-	-
282	-	-	-	-	-	-	-	-	-	-	-	-
Total	-	-	14	2	5	10	35	15	-	15	66	81

Table 18: Adults and copepodids of *Calanus simillimus*. Nos. per 100 m^3, - for absent.

	I	II	III	IV		V		Ad.		Total	Total	Total
				♀	♂	♀	♂	♀	♂	♀ + ♂	Cop.	
34	-	-	-	-	-	-	-	7	-	7	-	7
36	-	-	-	-	-	-	-	-	-	-	-	-
38	-	-	-	-	-	-	-	-	-	-	-	-
43	-	-	-	-	-	-	-	-	-	-	-	-
78	-	-	-	-	-	-	-	-	-	-	-	-
79	-	-	-	-	-	-	-	-	-	-	-	-
85	-	-	-	-	-	-	-	-	-	-	-	-
86	-	-	-	-	-	-	-	-	-	-	-	-
91	-	-	-	-	-	-	-	-	-	-	-	-
93	-	-	-	-	-	-	-	-	-	-	-	-
95	-	-	-	-	-	-	-	-	-	-	-	-
97	-	-	-	-	-	-	-	-	-	-	-	-
03	-	-	-	-	-	-	-	-	-	-	-	-
05	-	-	-	-	-	-	-	6	-	6	-	6
08	-	-	-	-	-	-	-	-	-	-	-	-
09	-	-	-	-	-	59	3	311	38	349	62	411
10	-	22	10	6	-	8	-	14	-	14	46	60
11	-	-	-	-	-	-	-	-	-	-	-	-
13	-	-	-	-	-	-	-	-	-	-	-	-
14	-	-	-	-	-	-	-	-	-	-	-	-
15	-	-	-	-	-	-	-	-	-	-	-	-
17	-	-	-	-	-	-	-	-	-	-	-	-
19	-	-	-	-	-	-	-	-	-	-	-	-
24	-	-	-	-	-	-	-	-	-	-	-	-
26	-	-	-	-	-	-	-	-	-	-	-	-
27	-	-	-	-	-	-	-	-	-	-	-	-
28	-	-	-	-	-	-	-	-	-	-	-	-
29	-	-	-	-	-	-	-	-	-	-	-	-
30	-	-	-	-	-	-	-	-	-	-	-	-
31	-	-	-	-	-	-	-	-	-	-	-	-
32	-	-	-	-	-	-	-	-	-	-	-	-
33	-	-	-	-	-	-	-	-	-	-	-	-
34	-	-	-	-	-	-	-	-	-	-	-	-
35	-	-	-	-	-	-	-	-	-	-	-	-
37	-	-	-	-	-	-	-	-	-	-	-	-
82	-	-	-	-	-	-	-	-	-	-	-	-
otal	-	22	10	6	-	67	3	338	38	376	108	484

Table 19: Adults and copepodids of *Heterorhabdus austrinus*. Nos. per 100 m^3, - for absent.

	I	II	III	IV		V		Ad.		Total	Total	Tot
				♀	♂	♀	♂	♀	♂	♀ + ♂	Cop.	
134	-	-	-	-	-	-	-	-	-	-	-	-
136	-	-	-	-	-	-	-	-	-	-	-	-
138	-	-	-	-	-	-	-	-	-	-	-	-
143	-	-	-	-	-	-	-	-	-	-	-	-
178	-	-	-	-	-	-	-	-	-	-	-	-
170	-	-	-	-	2	-	-	2	-	2	2	4
185	-	-	-	-	-	-	-	-	-	-	-	-
186	-	-	-	-	-	-	-	-	-	-	-	-
191	-	-	-	-	-	-	-	-	-	-	-	-
193	-	-	-	-	-	-	-	-	-	-	-	-
195	-	-	-	-	-	-	-	-	-	-	-	-
197	-	-	-	-	-	-	-	2	-	2	-	2
203	-	-	-	-	-	-	-	-	-	-	-	-
205	-	-	-	-	-	-	-	-	-	-	-	-
208	-	-	-	-	-	-	-	-	-	-	-	-
209	-	-	-	-	-	-	-	-	-	-	-	-
210	-	-	-	-	-	-	-	-	-	-	-	-
211	-	-	-	-	-	2	-	2	2	4	2	6
213	-	-	-	-	-	-	-	3	-	3	-	3
214	-	-	-	-	-	-	-	-	-	-	-	-
215	-	-	-	-	-	-	-	-	-	-	-	-
217	-	-	-	-	-	-	-	-	-	-	-	-
219	-	-	-	-	-	-	-	-	-	-	-	-
224	-	-	-	-	-	-	-	-	-	-	-	-
226	-	-	-	-	-	-	-	3	3	6	-	6
227	-	-	-	-	-	-	-	-	-	-	-	-
228	-	-	-	-	-	-	-	3	-	3	-	3
229	-	-	-	-	-	-	-	4	-	4	-	4
230	-	-	-	-	-	-	-	-	-	-	-	-
231	-	-	-	-	-	-	-	-	-	-	-	-
232	-	-	-	-	-	-	-	-	-	-	-	-
233	-	-	-	-	-	-	-	-	-	-	-	-
234	-	-	-	-	-	-	-	-	-	-	-	-
235	-	-	-	-	-	-	-	-	-	-	-	-
237	-	-	-	-	-	-	-	-	-	-	-	-
282	-	-	-	-	-	-	-	-	-	-	-	-
Total	-	-	-	-	2	2	-	19	5	24	4	28

Table 20: Adults and copepodids of *Racovitzanus antarcticus*. Nos. per 100 m^3, - for absent.

	I	II	III	IV		V		Ad.		Total	Total	Total
				♀	♂	♀	♂	♀	♂	♀ + ♂	Cop.	
34	-	-	-	-	-	-	-	2	-	2	-	2
36	-	-	-	-	-	-	-	-	-	-	-	-
38	-	-	-	-	-	-	-	2	-	2	-	2
43	-	-	-	-	-	-	-	-	-	-	-	-
78	-	-	-	-	-	-	-	-	-	-	-	-
79	-	-	-	-	-	-	-	-	-	-	-	-
85	-	-	-	-	-	-	-	-	-	-	-	-
86	-	-	-	-	-	-	-	-	-	-	-	-
91	-	-	-	-	-	-	-	-	-	-	-	-
93	-	-	-	-	-	-	-	-	-	-	-	-
95	-	-	-	-	-	-	-	-	-	-	-	-
97	-	-	-	-	14	-	5	-	-	-	19	19
03	-	-	-	-	-	-	-	-	-	-	-	-
05	-	-	-	-	-	-	-	-	-	-	-	-
08	-	-	-	-	-	-	-	-	-	-	-	-
09	-	-	-	-	-	-	-	-	-	-	-	-
10	-	-	-	-	-	-	-	-	-	-	-	-
11	-	-	-	-	-	-	-	-	-	-	-	-
13	-	-	-	-	-	-	-	9	-	9	-	9
14	-	-	-	-	-	-	-	-	-	-	-	-
15	-	-	-	-	-	-	-	-	-	-	-	-
17	-	-	-	-	-	-	-	-	-	-	-	-
19	-	-	-	-	-	-	-	-	-	-	-	-
24	-	-	-	-	-	-	-	-	-	-	-	-
26	-	-	-	-	-	-	-	6	-	6	-	6
27	-	-	-	-	-	-	-	3	-	3	-	3
28	-	-	-	-	-	-	-	-	-	-	-	-
29	-	-	-	-	-	-	-	5	-	5	-	5
30	-	-	-	-	-	-	-	-	-	-	-	-
31	-	-	-	-	-	-	8	33	-	33	8	41
32	-	-	-	-	-	-	-	4	-	4	-	4
33	-	-	-	-	-	-	-	-	-	-	-	-
34	-	-	-	-	-	-	-	-	-	-	-	-
35	-	-	-	-	-	-	-	-	-	-	-	-
37	-	-	-	-	-	-	-	-	-	-	-	-
32	-	-	-	-	-	-	-	-	-	-	-	-
otal	-	-	-	-	-	14	13	64	-	64	27	91

<u>Table 21:</u> Adults and copepodids of *Scaphocalanus vervoorti*. Nos per 100 m^3, - for absent.

	I	II	III	IV ♀	IV ♂	V ♀	V ♂	Ad. ♀	Ad. ♂	Total ♀ + ♂	Total Cop.	Tot
134	-	-	-	-	-	-	-	-	-	-	-	-
136	-	-	-	-	-	-	-	-	-	-	-	-
138	-	-	-	-	-	-	-	-	-	-	-	-
143	-	-	-	-	-	-	-	-	-	-	-	-
178	-	-	-	-	-	-	-	-	-	-	-	-
179	-	-	-	-	-	-	-	-	-	-	-	-
185	-	-	-	-	-	-	-	-	-	-	-	-
186	-	-	-	-	-	-	-	-	-	-	-	-
191	-	-	-	-	-	-	-	-	-	-	-	-
193	-	-	-	-	-	-	-	-	-	-	-	-
195	-	-	-	-	-	-	-	-	-	-	-	-
197	-	-	-	-	12	-	-	16	-	16	12	28
203	-	-	-	-	-	-	-	-	-	-	-	-
205	-	-	-	-	-	-	-	-	-	-	-	-
208	-	-	-	-	-	-	-	-	-	-	-	-
209	-	-	-	-	-	-	-	-	-	-	-	-
210	-	-	-	-	-	-	-	-	-	-	-	-
211	-	-	-	-	-	-	-	2	-	2	-	2
213	-	-	-	-	-	-	-	3	-	3	-	3
214	-	-	-	-	-	-	-	-	-	-	-	-
215	-	-	-	-	-	-	-	-	-	-	-	-
217	-	-	-	-	-	-	-	-	-	-	-	-
219	-	-	-	-	-	-	-	-	-	-	-	-
224	-	-	-	-	-	-	-	-	-	-	-	-
226	-	-	-	-	-	-	-	6	-	6	-	6
227	-	-	-	-	-	-	-	-	-	-	-	-
228	-	-	-	-	-	-	-	-	-	-	-	-
229	-	-	-	-	-	-	-	-	-	-	-	-
230	-	-	-	-	-	-	-	-	-	-	-	-
231	-	-	-	-	-	-	-	-	-	-	-	-
232	-	-	-	-	-	-	-	-	-	-	-	-
233	-	-	-	-	-	-	-	-	-	-	-	-
234	-	-	-	-	-	-	-	-	-	-	-	-
235	-	-	-	-	-	-	-	-	-	-	-	-
237	-	-	-	-	-	-	-	-	-	-	-	-
282	-	-	-	-	-	-	-	-	-	-	-	-
Total	-	-	-	-	12	-	-	27	-	27	12	39

'able 22: Adults and copepodids of *Stephos longipes*. Nos. per 100 m^3, - for absent.

	I	II	III	IV		V		Ad.		Total	Total	Total
				♀	♂	♀	♂	♀	♂	♀ + ♂	Cop.	
34	-	-	-	-	-	-	-	-	-	-	-	-
36	-	-	-	-	-	-	-	-	-	-	-	-
38	-	-	-	-	-	-	-	-	-	-	-	-
43	-	-	-	-	-	-	-	-	-	-	-	-
78	-	-	-	-	-	-	-	-	-	-	-	-
79	-	-	-	-	-	-	-	6	-	6	-	6
85	-	-	-	-	-	-	-	9	-	9	-	9
86	-	-	-	-	-	-	-	-	-	-	-	-
91	-	-	-	-	-	-	-	4	-	4	-	4
93	-	-	-	-	-	-	-	2	-	2	-	2
95	-	-	-	-	-	-	-	-	-	-	-	-
97	-	-	-	-	-	-	-	-	-	-	-	-
03	-	-	-	-	-	-	-	-	-	-	-	-
05	-	-	-	-	-	-	-	-	-	-	-	-
08	-	-	-	-	-	-	-	-	-	-	-	-
09	-	-	-	-	-	-	-	-	-	-	-	-
10	-	-	-	-	-	-	-	-	-	-	-	-
11	-	-	-	-	-	-	-	-	-	-	-	-
13	-	-	-	-	-	-	-	-	-	-	-	-
14	-	-	-	-	-	-	-	-	-	-	-	-
15	-	-	-	-	-	-	-	-	-	-	-	-
17	-	-	-	-	-	-	-	-	-	-	-	-
19	-	-	-	-	-	-	-	-	-	-	-	-
24	-	-	-	-	-	-	-	-	-	-	-	-
26	-	-	-	-	-	-	-	-	-	-	-	-
27	-	-	-	-	-	-	-	-	-	-	-	-
28	-	-	-	-	-	-	-	-	-	-	-	-
29	-	-	-	-	-	-	-	-	-	-	-	-
30	-	-	-	-	-	-	-	-	-	-	-	-
31	-	-	-	-	-	-	-	-	-	-	-	-
32	-	-	-	-	-	-	-	-	-	-	-	-
33	-	-	-	-	-	-	-	-	-	-	-	-
34	-	-	-	-	-	-	-	-	-	-	-	-
35	-	-	-	-	-	-	-	-	-	-	-	-
37	-	-	-	-	-	-	-	3	-	3	-	3
82	-	-	-	-	-	-	-	3	3	6	-	6
otal	-	-	-	-	-	-	-	27	3	30	-	30

Table 23: Adults and copepodids of *Haloptilus ocellatus*. Nos. per 100 m^3, - for absent.

	I	II	III	IV ♀	IV ♂	V ♀	V ♂	Ad. ♀	Ad. ♂	Total ♀ + ♂	Total Cop.	To
134	-	-	-	-	-	-	-	-	-	-	-	
136	-	-	-	-	-	-	-	-	-	-	-	
138	-	-	-	-	-	-	-	-	-	-	-	
143	-	-	-	-	-	-	-	-	-	-	-	
178	-	-	-	-	-	-	-	-	-	-	-	
179	-	-	-	-	-	-	-	-	-	-	-	
185	-	-	-	-	-	-	-	-	-	-	-	
186	-	-	-	-	-	-	-	-	-	-	-	
191	-	-	-	-	-	-	-	-	-	-	-	
193	-	-	-	-	-	-	-	-	-	-	-	
195	-	-	-	-	-	-	-	-	-	-	-	
197	-	-	-	-	-	-	-	4	-	4	-	
203	-	-	-	-	-	-	-	-	-	-	-	
205	-	-	-	-	-	-	-	-	-	-	-	
208	-	-	-	-	-	-	-	-	-	-	-	
209	-	-	-	-	-	-	-	-	-	-	-	
210	-	-	-	-	-	-	-	-	-	-	-	
211	-	-	-	-	-	-	-	-	-	-	-	
213	-	-	-	-	-	-	-	3	-	3	-	
214	-	-	-	-	-	-	-	-	-	-	-	
215	-	-	-	-	-	-	-	-	-	-	-	
217	-	-	-	-	-	-	-	-	-	-	-	
219	-	-	-	-	-	-	-	-	-	-	-	
224	-	-	-	-	-	-	-	-	-	-	-	
226	-	-	-	-	-	-	-	-	-	-	-	
227	-	-	-	-	-	-	-	6	-	6	-	
228	-	-	-	-	-	-	-	-	-	-	-	
229	-	-	-	-	-	-	-	-	-	-	-	
230	-	-	-	-	-	-	-	-	-	-	-	
231	-	-	-	-	-	-	-	4	-	4	-	
232	-	-	-	-	-	-	-	-	-	-	-	
233	-	-	-	-	-	-	-	-	-	-	-	
234	-	-	-	-	-	-	-	-	-	-	-	
235	-	-	-	-	-	-	-	-	-	-	-	
237	-	-	-	-	-	-	-	-	-	-	-	
282	-	-	-	-	-	-	-	-	-	-	-	
Total	-	-	-	-	-	-	-	17	-	17	-	1

Table 24: Adults and copepodids of *Haloptilus oxycephalus*. Nos. per 100 m^3, - for absent.

	I	II	III	IV ♀	IV ♂	V ♀	V ♂	Ad. ♀	Ad. ♂	Total ♀ + ♂	Total Cop.	Total
34	-	-	-	-	-	-	-	-	-	-	-	-
36	-	-	-	-	-	-	-	-	-	-	-	-
38	-	-	-	-	-	-	-	-	-	-	-	-
43	-	-	-	-	-	-	-	-	-	-	-	-
78	-	-	-	-	-	-	-	-	-	-	-	-
79	-	-	-	-	-	-	-	-	-	-	-	-
35	-	-	-	-	-	-	-	-	-	-	-	-
36	-	-	-	-	-	-	-	-	-	-	-	-
91	-	-	-	-	-	-	-	-	-	-	-	-
93	-	-	-	-	-	-	-	-	-	-	-	-
95	-	-	-	-	-	-	-	-	-	-	-	-
97	-	-	-	-	-	-	-	11	-	11	-	11
03	-	-	-	-	-	-	-	-	-	-	-	-
05	-	-	-	-	-	-	-	-	-	-	-	-
08	-	-	-	-	-	-	-	-	-	-	-	-
09	-	-	-	-	-	-	-	-	-	-	-	-
10	-	-	-	-	-	-	-	-	-	-	-	-
11	-	-	-	-	-	-	-	2	-	2	-	2
13	-	-	-	-	-	-	-	-	-	-	-	-
14	-	-	-	-	-	-	-	-	-	-	-	-
15	-	-	-	-	-	-	-	-	-	-	-	-
17	-	-	-	-	-	-	-	-	-	-	-	-
19	-	-	-	-	-	-	-	-	-	-	-	-
24	-	-	-	-	-	-	-	-	-	-	-	-
26	-	-	-	-	-	-	-	-	-	-	-	-
27	-	-	-	-	-	-	-	-	-	-	-	-
28	-	-	-	-	-	-	-	-	-	-	-	-
29	-	-	-	-	-	-	-	-	-	-	-	-
30	-	-	-	-	-	-	-	-	-	-	-	-
31	-	-	-	-	-	-	-	-	-	-	-	-
32	-	-	-	-	-	1	-	-	-	-	1	1
33	-	-	-	-	-	-	-	-	-	-	-	-
34	-	-	-	-	-	-	-	-	-	-	-	-
35	-	-	-	-	-	-	-	-	-	-	-	-
37	-	-	-	-	-	-	-	-	-	-	-	-
32	-	-	-	-	-	-	-	-	-	-	-	-
otal	-	-	-	-	-	1	-	13	-	13	1	14