POLISH POLAR RESEARCH (POL. POLAR RES.) POLSKIE BADANIA POLARNE	3	3—4	203—242	1982

Krzysztof JAŻDŻEWSKI,[1]) Wojciech KITTEL[1]) and Krzysztof ŁOTOCKI[2])

[1]) Department of General Zoology, Institute of Environmental Biology, University of Łódź, 12/16 Banacha St., 90-237 Łódź

[2]) Centre for the Environment Studies and Control, Hydrobiological Laboratory, 8 Chrobrego St., 80-423 Gdańsk-Wrzeszcz

Zooplankton studies in the southern Drake Passage and in the Bransfield Strait during the austral summer (BIOMASS-FIBEX, February—March 1981) *)

ABSTRACT: Zooplankton samples taken in February and March 1981 in the southern Drake Passage and the Bransfield Strait revealed distinct differences between animal communities inhabiting water masses of different origin and of different physico-chemical properties. The West Wind Drift waters of the Drake Passage were rich in zooplankton; they were characterized by a high abundance of *Radiolaria* and young *Limacina* sp., the constant occurrence of *Rhincalanus gigas*, a significant share of *Clausocalanus* sp. and *Calanoides acutus*. On the other hand the above mentioned forms were nearly absent or scarce in the much poorer waters adjacent to South Shetland Islands and especially waters of the Bransfield Strait where such copepods like *Metridia gerlachei* and *Oncaea curvata* dominated or at least played a significant role being rare and scarce or absent in the Drake Passage. This picture was especially clear in the upper 100 m water layer, whereas in the deeper layer (300–100 m) these quantitative and qualitative differences were less obvious.

Key words: Antarctica, zooplankton, FIBEX

1. Introduction

The importance of studying zooplankton communities in Antarctica independently of the special attention paid to the study of *Euphausia superba* Dana is briefly but precisely formulated in the introduction to the fundamental paper by Hardy and Gunther (1935).

Qualitative composition of zooplankton of the Southern Ocean can be regarded as comparatively well known due to the wealth of papers that appeared since the pioneer work of Brady (1883) dealing with Copepoda of the H. M. S. "Challenger" collection.

*) This study was supported by the Polish Academy of Sciences within the MR-I-29 Project, embracing the Polish part of the BIOMASS-FIBEX expedition headed by Dr. S. Rakusa-Suszczewski.

It is well known that two main belts of water masses encircling the Antarctic continent, the East Wind Drift and the West Wind Drift differ clearly in their plankton abundance and planktonic communities composition (i. a. Mackintosh 1934, Foxton 1956, Voronina and Naumov 1968, El-Sayed 1971). Hydrological situation in the present study area — the Southern Drake Passage and the Bransfield Strait — is much complicated (Clowes 1934, Gordon and Nowlin 1978, Aržanova and Michajlov 1980, Bogdanov et al. 1980, Patterson and Sievers 1980, Whitworth 1980, Lipski 1982, Wojewódzki unpubl. data). One can roughly divide

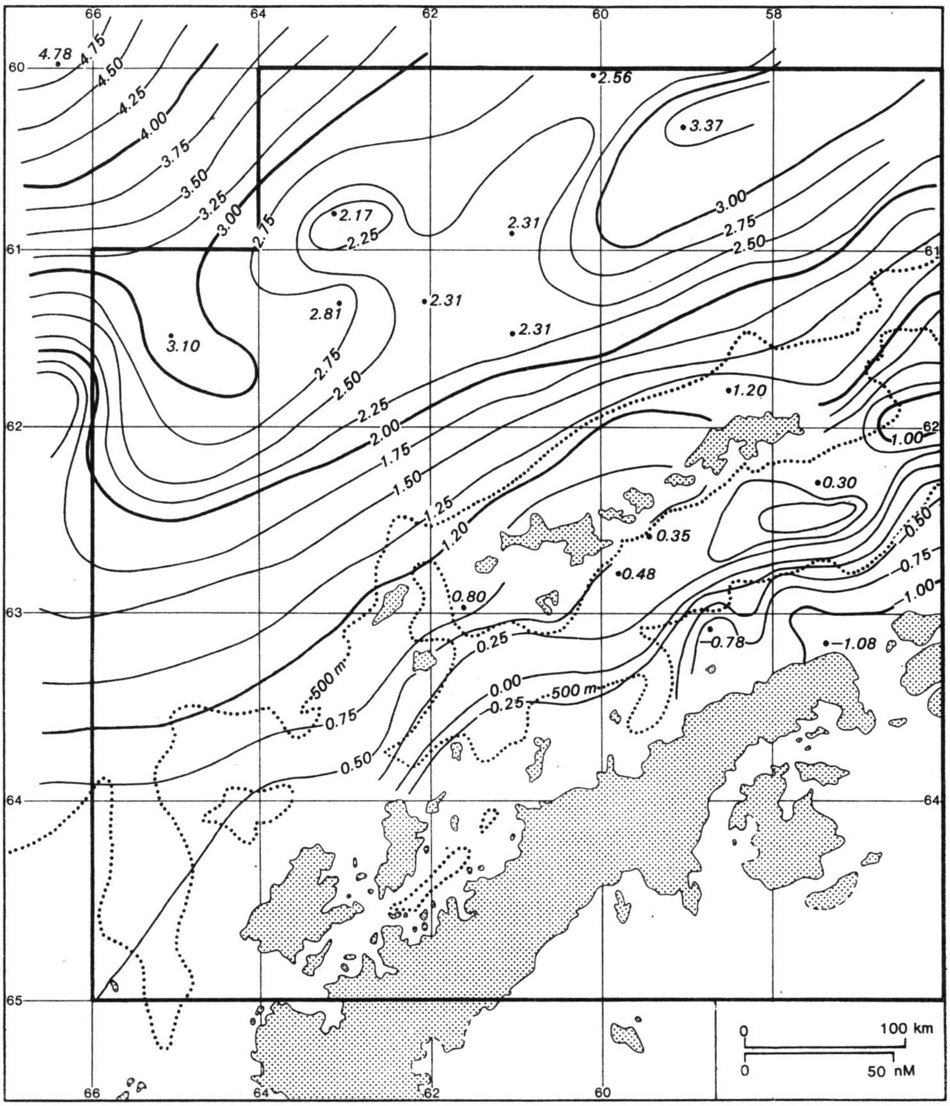

Fig. 1. Surface isotherms in the investigated sector of the Southern Ocean. According to Wojewódzki (unpubl. data).

the investigated sector into two main water masses: Antarctic Zone (AAZ) and Continental Zone (CZ); the boundary between these zones, called Continental Water Boundary (CWB) runs north-west of the South Shetlands along the continental slope (Whitworth 1980). This sivision is well supported by the hydrological data of our cruise (Lipski 1982, Wojewódzki unpubl. data). In Figs. 1 and 2 where surface isotherms and isohalines in the investigated sector are presented, one can see, at least in the South Shetlands area, the AAZ waters that are distinctly warmer and less saline and CZ waters-colder and of higher salt content. The approximate CWB

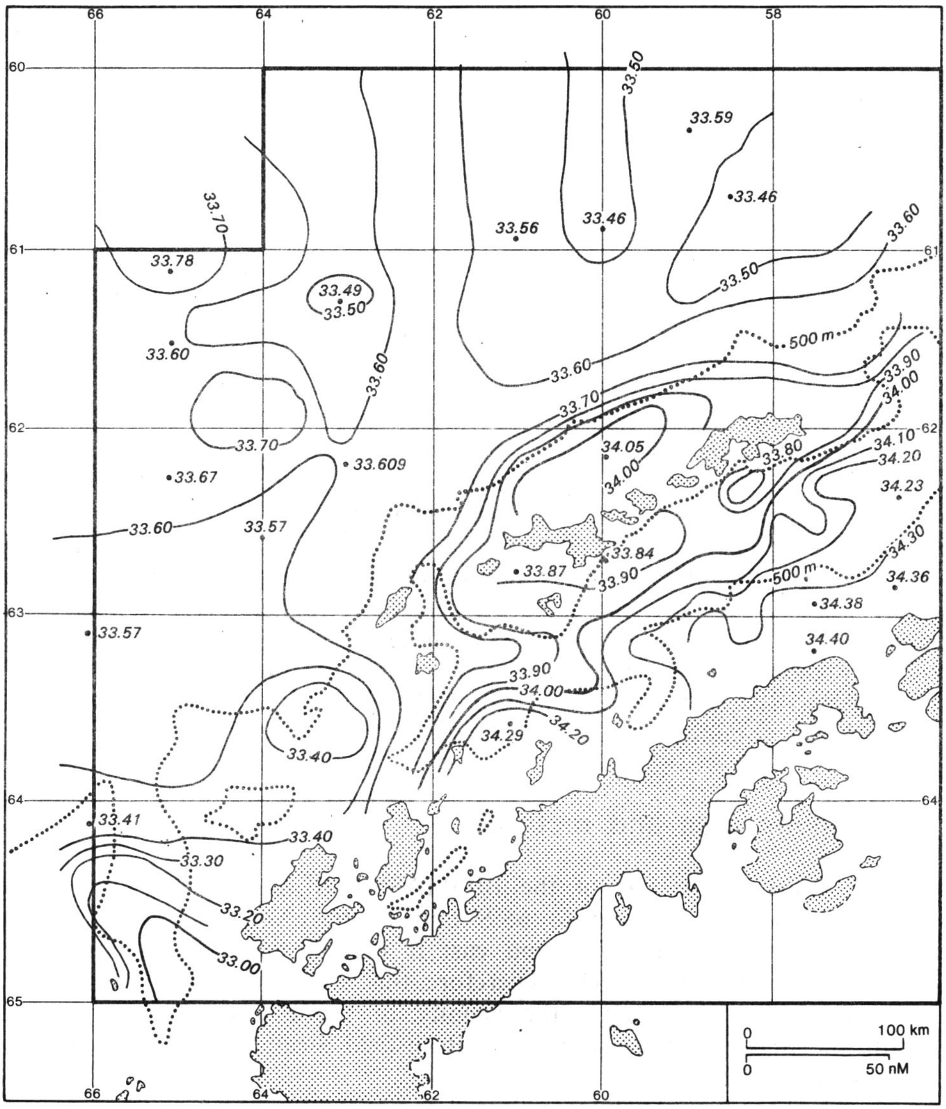

Fig. 2. Surface usohalines in the investigated sector of the Southern Ocean. According to Wojewódzki (unpubl. data).

line indicated by the closer course of the iso-lines can be put here along the 500 m isobath — that is more or less along the shelf margin.

The division into AAZ and CZ is a rather general one. One should bear in mind that closer hydrological investigations, both older (Deacon 1933, 1937, Clowes 1934, Mackintosh 1934) and recent ones (Gordon and Nowlin 1978, Lipski 1982, Wojewódzki unpubl. data.) revealed that in the upper layers of the Bransfield Strait the waters of the Bellingshausen Sea origin occupy in principle the western and northern parts of the strait whereas from the east the Bransfield Strait is entered by the branch of the Weddell Sea waters that are spreading "down" along the Antarctic Peninsula. Moreover there is also an indication (Wojewódzki unpubl. data.) that the tongue of the Bellingshausen Sea waters is to be distinguished along the shelf of the South Shetlands to the north-west of the islands.

Phytoplankton is rather unevenly distributed over the investigated area — its abundance was generally found to be the least in the Bransfield Strait increasing in all directions and especially to the north of the South Shetland Islands (Hart 1934, Mackintosh 1934, El-Sayed 1970, Witek et al. 1981, Kopczyńska and Ligowski 1982).

Zooplankton of the area covered by the present investigations was rather thoroughly studied by the British "Discovery" expeditions (Mackintosh 1934, Hardy and Gunther 1935) and recently also by the Argentine expedition "Oceantar I" (Orensanz et al. 1974, Ramirez and Vreese 1976, Ramirez and Dinofrio 1976, Dinofrio 1977).

On board of the r/v "Profesor Siedlecki" a routine zooplankton samples were collected. In order to have basic results ready as soon as possible the identification and counting were undertaken immediately after sampling on board of the ship taking opportunity of her well accomodated laboratories. Self understanding the accuracy of the determinations is not sufficient and many animals were determined to the generic or higher levels. While further more detailed study of the preserved materials is necessary, it will take much time. Intending to complete the main results of the Polish part of the BIOMASS-FIBEX expedition in one volume we have decided to publish the hitherto obtained results.

2. Sampling area and methods

The Polish sector (A) of the BIOMASS-FIBEX operation covered an area south of 60° S down to 65°S and to the Antarctic Peninsula and d'Urville Island; to the west and east it was bordered by the meridians 66°W and 56°W, respectively. Therefore this sector included the southern part of the Drake Passage, the vicinity of the Palmer Archipelago and South Shetland Islands as well as the Bransfield Strait (Fig. 3) (Rakusa-Suszczewski, 1982 b).

Zooplankton samples were collected at 61 stations using a closed Nansen net of 0,38 m^2 mouth opening (70 cm mouth diameter) and of 260 μm mesh size. Because of the temporary damage of the 260 μm mesh size

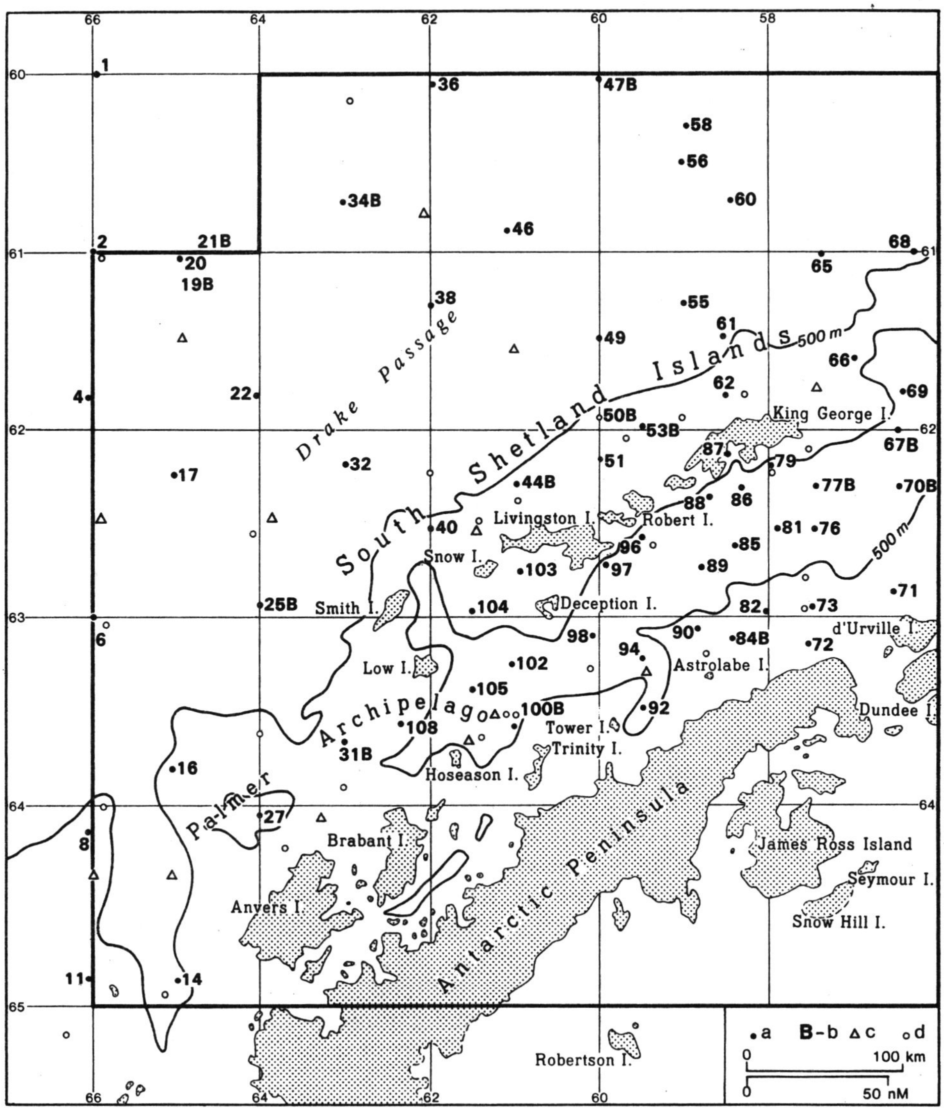

Fig. 3. Sampling stations in the investigated sector (A) during the cruise of r/v "Profesor Siedlecki" in the BIOMASS-FIBEX expedition
a — full stations (plankton, hydrology), b — Bongo-net hauls, c — hydrological stations, d — krill trawl hauls.

net some few hauls were done with a 180 μm mesh size net. These hauls are marked in the table with an asterisk. Samples from one station (69) were not taken into consideration because of our justified suspicions that the net was not properly towed.

The net was vertically hauled in two layers: 100—0 m and 300—100 m. When the soundings were less than 300 m the net was hauled in the layer from nearly the bottom up to 100 m. The net was lowered with a 40 kg weight and raised with a speed of 0,5 m per second. Samples from the deeper layer were collected in principle only at noon and midnight stations; therefore their number was smaller than that of the 100–0 m samples.

Usually two parallel samples were taken in the layer 100–0 m and one in the 300—100 m layer. One 100—0 m sample was used in volume estimations and then in qualitative and quantitative analysis. The volume was estimated using a combined method described by Foxton (1956) and Żadin (1966). Generally speaking the plankton sample was filtered off on a piece of silk and added to a measured volume of water. The method was rough enough and its accuracy was at most $\pm$ 100 mm^3. So when the sample was obviously poor it was estimated as "below 100 mm^3". Planktonic samples taken with our nets contained usually considerable or even very large amounts of *Diatomeae* which plugged the net meshes even for smaller cells, especially when the areas rich in phytoplankton were sampled. Therefore planktonic samples from the upper 100 m layer used in the volume and dry weight estimations will be here referred to as "total plankton". We have assumed a filtration efficiency of 70%, following the paper by Grindley and Lane (1979). However one should bear in mind that this efficiency in "rich" area, because of this plugging of net-meshes, is not equal to this efficiency in a "poor" one. This contamination of the samples with diatoms was perhaps proportionally higher in the areas rich in phytoplankton. It is to be stressed here that the results obtained in the above described way should be treated with caution as an approximative picture of the total plankton abundance in the investigated area.

For qualitative and quantitative analysis larger organisms (over $\pm$ 5 mm) were picked out from the sample and were determined separately. In the Bogorov camera (Żadin 1966) from 2 to 4 subsamples of the rest of the sample were analysed under the stereo microscope; animals were determined and counted. Subsamples were taken in a following way. Water was added to the sample in the measuring cylinder up to the definite volume. Subsamples were taken from the carefully mixed suspension with a wide mouthed calibrated pipette. The summarized volume of the analyzed subsamples constituted from 1/5 to 1/50 of the total sample, depending on its richness. The amount of animals was calculated per 1 m^3. The rest of the sample was preserved in 4% formol solution.

The second 100–0 m sample was dried in 60°C to obtain dry weight data. Having for each station only one 300—100 m sample we have measured only their volumes. Because of the usually much smaller quantity of animals and of the rough method of the volume estimation these results are not mapped and are presented only in Appendix I.

In 16 stations there were also taken hauls with a 6 mm mesh size Bongo-net (Fig. 3, "B") towed usually in the layer 25—0 m. These materials are included here as supplementary data.

Geographical coordinates of stations as well as the dates and hours of samplings are to be found in the paper by Rakusa-Suszczewski (1982 b).

Animals were determined using various keys and orginal papers like those by Orensanz et al. (1974) (*Polychaeta*), Giesbrecht (1902), Vervoort (1951, 1957, 1965), Tanaka (1960), Bradford (1971) and Ramirez and Dinofrio (1976) (*Copepoda*), Mauchline and Fisher (1969), Percova (1976), Lomakina (1978) and Dzik and Jażdżewski (1978), (*Euphausiacea*), Hurley (1969), Barnard (1969), Bowman and Gruner (1973), and Dinofrio (1977) (*Amphipoda*), Massy (1920, 1932) (*Pteropoda*), David (1958, 1965) and Alvarino (1967) (*Chaetognatha*).

3. Results and discussion

In total 156 Nansen net samples were collected: 60 double samples (= 120) in the layer 100—0 m, 30 samples in the layer 300–100 m and 6 samples taken from nearly the bottom to 100 m in the case when the actual depth was less than 300 m. Analysis of these samples is presented in zooplankton tables presented in Appendix I. Data obtained from the Bongo-net hauls are also included in this Appendix.

Animals recorded in our Nansen-net samples belonged to the following major groups:

- *Radiolaria*
- * *Foraminifera*
- * *Cnidaria*
- * *Ctenophora*
- *Nemertini* (larvae)
- *Polychaeta*
- *Pteropoda*
- * *Ostracoda*
- *Copepoda*
- *Euphausiacea*
- *Amphipoda*
- * *Echinodermata* (larvae)
- *Chaetognatha*
- *Appendiculariae*
- *Salpae*
- * *Ascidiacea* (larvae)
- * *Pisces* (larvae)

The total number of the identified categories of various levels (stages, species, genera or higher categories) amounted to nearly one hundred. The category "*Euphausia superba* — calyptopis" includes all calyptopis stages and "*E. superba* — furcilia" — furcilia stages I—IV. Krill larvae of our zooplankton samples are treated in detail elsewhere (Kittel and Jażdżewski 1982).

For the sake of clarity the taxa of the groups marked here with an asterisk are included in zooplankton tables in the Appendix I in the category "varia" because of their rare and scarce occurrence in the samples. The presence and abundance of the representatives of these groups in particular samples is presentent in the Appendix II; in this Appendix is shown also the occurrence of the less common taxa of other groups included also in Appendix I as "alia", for instance "*Copepoda alia*".

Fig. 4 presenting the total plankton abundance in the upper 100 m layer, shows a distinct difference between the waters of the southern Drake Passage and those of the immediate vicinity of the South Shetland Islands and especially of the Bransfield Strait. In this latter area the total plankton volume was always significantly lower than that of the adjacent areas. Taking into account the rough method of the volume estimation (open circles) the dry weight data (hatched circles) should be treated as more reliable. The general distribution of the total plankton amount in the investigated sector in the water layer 100—0 m is in a good accordance both with the

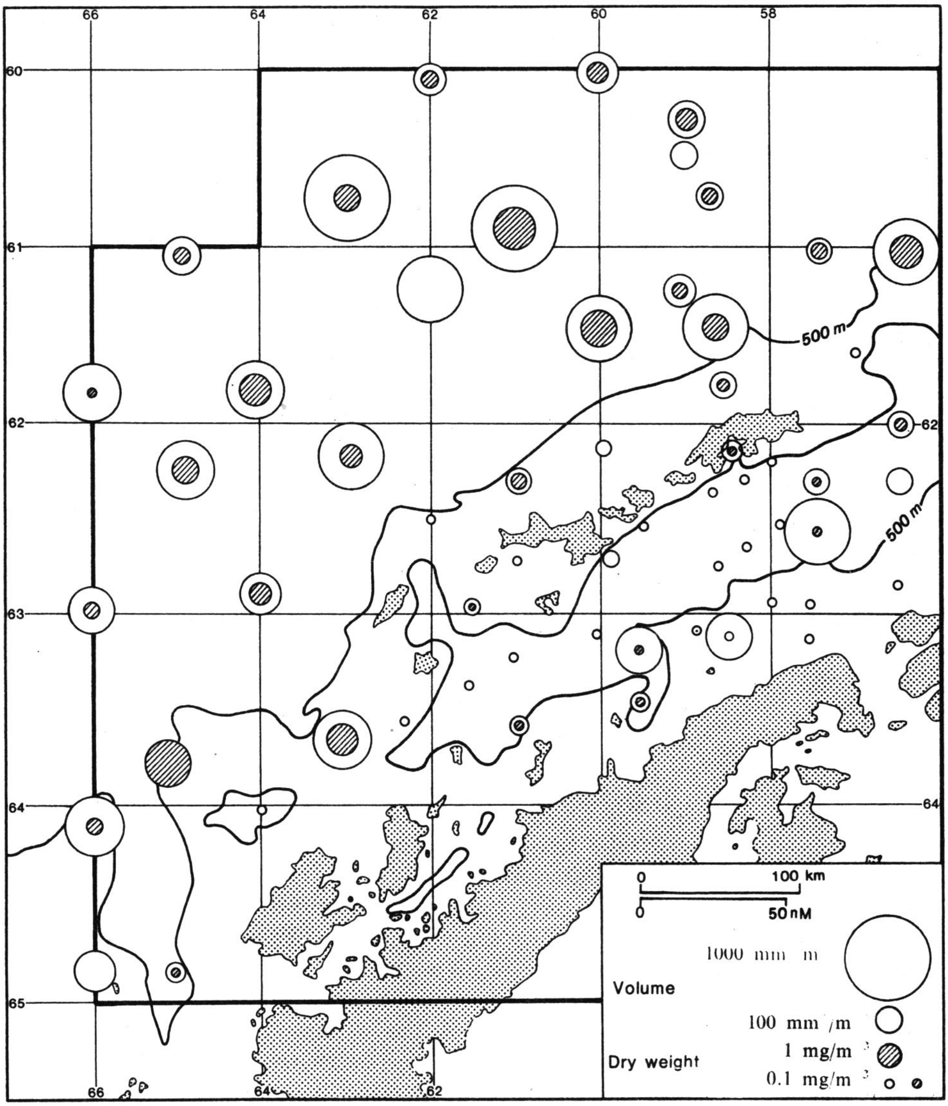

Fig. 4. The distribution of the volume and dry weight of the total plankton in the layer 100—0 m

results of Hart (1934) and of Kopczyńska and Ligowski (1982) for phytoplankton and of Mackintosh (1934) for macro-zooplankton. All these results differentiate from the biological point of view at least two major distinctly different water masses, defined by hydrologists, as previously mentioned, as Antarctic Zone (AAZ) and Continental Zone (CZ) (Whitworth 1980). These two zones correspond more or less to the West Wind Drift and East Wind Drift zones of many earlier authors.

Our stations can be primarily divided in two groups: those over the great oceanic depths (mostly over 3000 m) situated to the north-west of the approximative 500 m isobath bordering Palmer's and South Shetlands

Archipelagos (20 stations) and those situated to the south-east of this line over the South Shetlands and Palmer Islands plateau and in the Bransfield Strait (40 stations).

When we compare now the quantities of the total plankton (volume and dry weight data) as well as the numbers of zooplankton organisms in the samples taken in the 100—0 m layer we can easily see how distinct are the differences between these two groups of stations, belonging in our opinions just to the Antarctic Zone and Continental Zone, respectively. In the AAZ stations the total plankton volume measured in 20 stations was between 94 and 1233 mm^3/m^3, with 80% of the results (extreme values symmetrically omitted) comprised between 116 and 699 mm^3/m^3 (mean — 458 mm^3/m^3). In contrast, in the CZ stations the total plankton volume, measured in 39 stations, was from few (below 3) to 564 mm^3/m^3 (80% of the results between few and 421 mm^3/m^3) with a mean of 96 mm^3/m^3.

The total plankton dry weight in the AAZ stations (measured in 18 ones) amounted from 0,13 to 2,76 mg/m^3 with a mean of 0,94 mg/m^3; over 80% of the results were comprised between 0,34 and 2,26 mg/m^3. The same for the CZ stations (measured in 10 stations) was: range from 0,07 to 1,32 mg/m^3, mean — 0,37 mg/m^3 and 80% of the results between 0,13 and 0,57 mg/m^3.

The comparison presented above shows that the standing crop of the "total plankton" in the upper 100 m layer in the AAZ waters is 3—4 times higher than that of the CZ waters. What is interesting enough the nearly identical results were reported by Foxton (1956) who has observed in the 60°W—0° sector of the Southern Ocean the same proportions between the mean volume of plankton in the upper 100 m in the West Wind Drift and East Wind Drift waters.

Comparing now the numbers of zooplankton organisms alone in the samples taken in these two distinguished station groups we can see the same phenomenon. In the AAZ stations (20) in the upper 100 m layer the mean number of zooplankters was 3067 $ind./m^3$ (range: 470—11588 $ind./m^3$, 80% of results between 521 and 6234 $ind./m^3$). The mean number for CZ waters (40 stations) was 159 $ind./m^3$ (range:3—1325 $ind./m^3$, 80% of results between 22 and 307 $ind./m^3$). These observations are in full accordance with the results of Mackintosh (1934) for the same area and the same water layer (100—0 m); he has found that the numbers of macroplanktonic animals (net mesh size ca. 1,5 mm) in the West Wind Drift of the Drake Passage exceeded more than for one order of magnitude these numbers encountered in the South Shetlands neighbourhood.

It should be taken into consideration that because of the above mentioned overloading with diatoms of our samples the picture obtained in this total plankton volume survey rather accurately follows the results obtained during our cruise by Kopczyńska and Ligowski (1982) for phytoplankton alone. However it is worthy to mention that the detailed number analysis revealed that the highest abundancies of zooplankton in the water layer 100—0 m in particular stations not always coincided with the highest phytoplankton amounts. In accordance with earlier observations (Hardy and Gunter 1935, Hardy 1967) rich zooplankton was often observed in stations where phytoplankton abundance was low or at most moderate — for instance in stations 4, 20, 22, 36 and 58.

Worth mentioning are the suggestions of Mackintosh (1934) concerning the seasonal shift of the abrupt change in the plankton abundance in the top 100 m layer in the cross section from Cape Horn to the Antarctic Peninsula. The position of this change was different in several British surveys: in November 1929 and February 1929 the boundary line of the rich plankton ran rather far from the South Shetlands, more or less at the 60°S; in March 1931 its position was somewhat nearer to the South Shetland Islands and in April 1930 this border-line was the nearest, running approximatively along the South Shetlands shelf. Mackintosh's (1934) cautious conclusion was that" ...it seems possible that there is normally a rich plankton in the central part of the Drake Strait which spreads further south towards the end of the summer". (p. 121). He has mentioned, however, that since the comparsion was made between different months in different years this shift to the south may be the effect of a coincidence. Our border-line between rich and thin plankton observed in the second part of February 1981 fits well to the Mackintosh's line from April 1930. Therefore, not excluding the possibility of the seasonal southerly trend of the rich plankton we are of the opinion that the annual variations of the atmospheric, climatic and hydrological conditions are primarily responsible for the different position of the abrupt change from rich plankton waters to the poor plankton ones in the top 100 m layer in the neighbourhood of the South Shetland Islands.

The differences in the amount of planktonic organisms between the AAZ and CZ waters in the deeper layer (300—100 m) are, in contrast, rather insignificat. The total plankton volume in AAZ measured in 12 stations ranged from few to 124 mm^3/m^3 with a mean of 19 mm^3/m^3 whereas this volume measured in 21 CZ stations ranged from few to 85 mm^3/m^3 with a mean of 31 mm^3/m^3. The numbers of animals in the first group of stations ranged from 8 to 462 ind./m^3 (average 170 ind./m^3), in the second one — from 17 to 197 ind./m^3 (average 121 ind./m^3).

The general difference in the total plankton quantities in the 100—0 m layer between AAZ and CZ waters are supported by the qualitative differences in zooplankton communities of these zones. In this respect figures 5, 6 and 7 are rather instructive. In the southern Drake Passage over large depths, both at night and in the day time, the dominant or subdominant group were *Radiolaria*, whereas young *Limacina* sp. (probably *L. helicina*) were nearly always a significant component. In the Bransfield Strait and over the north-west shelf of the South Shetland Islands these two elements were negligible.

Chaetognatha, that were generally not abundant in the net plankton samples, in the top 100 m layer were far more frequently encountered in AAZ waters than in CZ ones (frequency 75% versus 20%). On the other hand their frequency in the lower water layer (300—100 m) was high and similar in both water masses (80% and 76% respectively).

One should bear in mind that distinct differences in the share of animal organisms per cubic meter between the Drake Passage and the

Bransfield Strait waters shown in figs. 5, 6, and 7 may be not so sharp when considering the weight proportions of particular groups. It is to be remembered that the weight share of tiny radiolarians and young pteropods (*Limacina* sp.) found in such a wealth in the samples taken in the Drake Passage was obviously rather low.

However there is also some indication that there existed a faunistically different water mass, probably the tongue of the Bellingshausen Sea waters, that joined the West Wind Drift over the continental slope. These waters are characterized by the regular and important share of small *Appendiculariae* in the zooplankton community.

The highest abundancies of *Appendiculariae* were noted both in AAZ and CZ waters in stations situated over the shelf and near its slope along the islands chain of Palmer and South Shetlands archipelagos (Figs. 6 and 7).

Zooplankton structure in the water layer 300—100 m as presented in Figs. 8 and 9 seems to be apparently less diversified. This impression comes from the fact that rich in species *Copepoda* in these depths overdominate by numbers all other animal groups. However the faunistic differences between southern Drake Passage and Bransfield Strait waters that are less obvious when treating all *Copepoda* as one unit, are nevertheless to be observed also in that depth (300—100 m). In the samples taken in the southern Drake Passage in AAZ waters the share of *Radiolaria* and *Limacina* sp. was smaller than in top 100 m but distinct. The proportion of these taxa in the CZ waters in the layer 300—100 m was insignificant. This deeper water layer in CZ stations and especially in the Bransfield Strait was characterized by the regular occurrence (frequency of 76%) of the polychaete *Pelagobia longicirrata*, that was observed to a larger extent at night.

The general faunistic differences between AAZ and CZ water masses are to be seen also in the set of maps presenting the distribution of *Copepoda* alone (Figs. 10—14). Among several most common and abundant copepod forms taken into consideration when arranging the diagrams in these figures the overall dominant form was *Oithona* sp., probably mostly *O. frigida*. The field of the circle denoting the group of *Copepoda* combined as "others" usually occupies larger part of the circle area in the Drake Passage than in the Bransfield Strait reflecting the greater wealth of taxa in warmer Drake Passage. Its AAZ waters in the layer 100—0 m are characterized by the regular presence of *Rhincalanus gigas*, by the important share of *Clausocalanus* sp. and *Calanoides acutus* and by the contrastingly lower abundance of *Metridia gerlachei* and the lack of *Oncaea curvata* (Figs. 10 and 11, tabs. I and II). *M. gerlachei*, as a high Antarctic, cold loving species, is characteristic of the cold, continental waters of the Bransfield Strait and the South Shetlands shelf. It is to be noted, however, that *M. gerlachei* was rather regularly caught in the Drake Passage as well but only in the deeper and colder 300–100 m layer (Figs. 13 and 14). The comparison of figs. 10–14 confirms also the earlier data on the preferences of *M. gerlachei* to the deeper layers and on its diurnal vertical migrations (Mackintosh 1934, Hardy and Gunther 1935, Vervoort 1951, 1965, Bradford 1971). This species was more abundant in our

Table I.
Frequency and abundance of some common planktonic species in different zones in the layer 100—0 m. Further explanations in text

Frequency (F) and abundance (N/m³)	F%			N/m³					
				Maximal			Mean		
Zone	AAZ (20 stat.)	CZ-A (12 stat.)	CZ-B (28 stat.)	AAZ	CZ-A	CZ-B	AAZ	CZ-A	CZ-B
Calanus propinquus	65	50	54	103.0	5.9	5.3	23.8	1.9	0.7
Calanoides acutus	95	100	93	229.0	188.0	9.6	89.1	41.0	3.1
Rhincalanus gigas	70	8	7	45.1	0.2	0.7	10.7	0.02	0.03
Metridia gerlachei	45	42	61	28.0	40.0	34.0	4.6	6.1	3.8
Oncaea curvata	0	0	57	0	0	26.0	0	0	4.0
Pelagobia longicirrata	0	0	21	0	0	2.6	0	0	1.0

Table II.
Freqûency and abundance of some common planktonic species in different zones in the layer 300—100 m. Further explanations in text

Frequency (F) and abundance (N/m³)	F%			N/m³					
				Maximal			Mean		
Zone	AAZ (15 stat.)	CZ-A (5 stat.)	CZ-B (16 stat.)	AAZ	CZ-A	CZ-B	AAZ	CZ-A	CZ-B
Calanus propinquus	47	60	50	13.0	1.0	2.0	1.9	0.4	0.6
Calanoides acutus	100	100	94	62.0	6.0	7.0	10.9	3.6	3.1
Rhincalanus gigas	80	0	6	5.0	0	0.4	1.9	0	0.03
Metridia gerlachei	60	40	81	16.0	7.0	115.0	2.8	1.6	36.6
Oncaea curvata	0	0	75	0	0	44.0	0	0	9.4
Pelagobia longicirrata	13	20	94	1.0	9.0	7.0	1.0	9.0	2.5

samples taken in the 300—100 m layer than in the upper 100 m, and more abundant in the night samples than in the day samples taken in this top water layer.

The representatives of the genus *Clausocalanus* Giesbrecht were more or less equally frequent in both distinguished zones (AAZ and CZ) and in both sampled water layers. However the abundance of *Clausocalanus* sp. treated as one taxon *, especially in the upper 100 m layer, was contrastingly higher in AAZ waters than in CZ ones (average of 183 versus 5.7 ind./m³). In the lower, 300—100 m layer this difference was less distinct (14.2 versus 5.5 ind./m³).

Calanus propinquus and *Calanoides acutus* were rather evenly distributed over the whole investigated area with similar frequency both in AAZ and CZ waters. However one can clearly see that the marked decrease

* Two species, *Clausocalanus arcuicornis* and *C. laticeps* were here involved. However the precise determinations were possible only in few cases.

of the abundance of *Calanus propinquus* in both sampled water layers occurred to the south-east of the CWB line, running in our opinion more or less along the continental slope, whereas such decrease of the abundance of *Calanoides acutus* was observed only in the 300—100 m layer. The sharp fall of the abundance of this last species in the top 100 m layer was noted only in the Bransfield Strait (Tables I and II). Higher proportions of *Calanus propinquus* in the night samples than in the day ones in the upper 100 m layer (Figs. 10 and 11) confirm the data of Mackintosh (1934) on its diurnal, vertical migrations.

In general our above presented observations indicating some preferences of particular copepod species are in agreement with earlier data of Mackintosh (1934), Hardy and Gunther (1935), Vervoort (1951, 1965), Bradford (1971), Naumov (1973 a and b) and Ramirez and Dinofrio (1976).

Our attempts to find out the faunistic differences between groups of stations from the Bransfield Strait that could be assigned to the earlier mentioned water masses of the Bellingshausen Sea or Weddell Sea origin in that strait — failed. It is possible that such differences will be detectable after further definite indentification of *Copepoda* that are left at the moment on a generic level of determination. On the other hand one can easily observe that the top 100 m layer of CZ waters in the investigated sector is faunistically not uniform. Along with the above mentioned distinct share of *Appendiculariae* in CZ stations situated "outside" the South Shetland Islands (CZ-A waters) and the insignificant proportions of these animals in the Bransfield Strait samples (CZ-B waters) (Figs. 5, 6 and 7), a rather distinct difference is to be noted between these two areas in the occurrence of some important planktonic species (Tables I and II). It should be mentioned here that our CZ-A waters correspond to the water mass type II of Lipski (1982, Fig. 2) and our CZ-B waters to his water mass types III and IV combined. In the stations situated over the shelf to the west and north of the Palmer and South Shetlands archipelagos (CZ-A) in the layer 100—0 m *Calanoides acutus* was on an average over 10 times more abundant than in the Bransfield Strait (CZ-B) itself. This difference, however, was not found in the layer 300—100 m, where both maximal and mean abundancies of *C. acutus* were nearly identical in CZ-A and CZ-B waters (Table II). *Oncaea curvata*, on the other hand, was totally absent "outside" the Bransfield Strait, both in AAZ and in CZ-A waters, whereas in the Bransfield Strait (CZ-B) it was a common species in both sampled water layers with a frequency of 57% in the top 100 m layer and of 75% in the 300—100 m one and with comparatively high maximal and mean abundancies (Tabs. I and II). In the water layer 300—100 m there was also observed the similarity of AAZ and CZ-A waters in respect to the frequency and especially to the abundance of *Metridia gerlachei*: in these both water masses this species was less common and clearly less abundant than in the Bransfield Strait (CZ-B), where its maximal and mean abundancles were higher by an order of magnitude (Table II).

CZ-A and CZ-B stations in the layer 300—100 m differed also in the occurrence of the polychaete *Pelagobia longicirrata*. In the first group the frequency of this species was 20% (in AAZ stations — 13%) whereas in the Bransfield Strait (CZ-B) its frequency was as high as 94% (Table II). This latter area was also the only one where *P. longicirrata* occurred also in the top 100 m layer (Table I).

It is rather difficult to compare our results with those of Orensanz et al. (1974) and of Ramirez and Dinofrio (1976) who have studied planktonic polychaetes and copepods, respectively, in the same region during the Argentinean expedition "Oceantar I". Their interesting data are presented in a way that makes impossible to find out the position of their collecting stations enumerated in their tables. Moreover their vertical planktonic hauls were made from various depths, mostly from 500 m but often from 200 m, whereas the results from all these samplings are presented jointly in the maps. The horizontally towed nets of the mentioned authors are supposed to be hauled in the top water layer; in the paper by Ramirez and Dinofrio (1976) there is a rather general information that horizontal tows gave "muestras de plancton superificial" (superficial plankton samples). Nevertheless some common features are to be noted in our results when comparing the maps of Orensanz et al. (1974) with our ones. Firstly — the sharp difference in abundance of planktonic polychaetes between superficial waters of the Drake Passage and the Bransfield Strait (Map 12 of these authors) coincides well with distinct differences in the total plankton and zooplankton abundancies between water masses of AAZ and CZ as observed in our study (Figs. 4, 5 and 6). It is only to be mentioned that the boundary line of this abrupt change in the polychaetes abundance was running in the austral spring 1971/72 (Orensanz et al. 1974) more northerly (abt. 60 S) than in our study. This note is worthy to be confronted with the earlier mentioned observations of Mackintosh (1934).

On the other hand the general abundance of *Copepoda* as found in the same "Oceantar I" expedition and probably in the same samples, was not so obviously lower in the Bransfield Strait than in the Drake Passage (Ramirez and Dinofrio 1976, map 2).

Interesting differences are to be noted between our results and the results of Orensanz et al. (1974) in respect to the commonest planktonic polychaete *Pelagobia longicirrata*. As noted above this species that was very rare in our AAZ stations occurred commonly only in the deeper layer of CZ waters, mainly in the Bransfield Strait (CZ-B). The data of Orensanz et al. (1974) showed that this species was rather common and sometimes abundant in the horizontal shallow hauls taken in the Bransfield Strait being absent in such samples taken in the southern Drake Passage (Map 10); in the vertical planktonic hauls of these authors the highest abundancies of *Pelagobia longicirrata* were observed in the northern Drake Passage (not sampled by our expedition), then, in the southern Drake Passage the lack of this species was noted, when in the Bransfield Strait once more this species was common and abundant (Map 11 of Orensanz et al. 1974).

The distinct decrease in the abundance of *Clausocalanus* sp. when moving south-east from AAZ waters to the CZ ones observed in our survey is in a good accordance with observations of Ramirez and Dinofrio

(1976) concerning *Clausocalanus laticeps*. Their diagrams 1 and 2 (pp. 27 and 29) clearly show that the occurrence of this species was limited to the latitudes north of 60 S.

Similar observations were made both in our and in Argentinean surveys (Ramirez and Dinofrio 1976) in respect to the latitudinal distribution pattern of *Rhincalanus gigas*. Results of both studies showed that the abundance of this species diminished in the southerly direction at least to the latitude of 65°S that is to the southern limit of our survey. It is to be noted, however, that farther to the south Ramirez and Dinofrio (1976) observed again an increase of the abundance of *R. gigas*; that concerned probably the eastern part of the Weddell Sea (Fig. 1 and map 5 of these authors).

At the moment it is rather premature to evaluate exactly the reasons of the evident biological differences between the Antarctic Zone and Continental Zone zooplankton. The nutrient content in the CZ waters of the Bransfield Strait being lower than in the adjacent waters of the Bellngshausen Sea and the Drake Passage is still enough high to be not a limiting factor for biological productivity (El-Sayed 1971, Foster 1981). The present authors are inclining to the opinion of Foster (1981) that the ice conditions and low surface temperatures governing in the Continental Zone are main factors that differentiate quantitatively and qualitatively the planktonic communities of the Southern Ocean that concerns also the investigated sector. At the moment the conclusion that can be formulated as a result of the present study is a rather general and trivial one. As it was to be expected water masses that are hydrologically different are characterized also by diverse planktonic communities; their composition can be a good indication of the origin of these waters that can help in understanding of the circulation of the Antarctic water masses. It is to be remembered however, that the structure of Antarctic zooplankton communities in the upper water layer changes according to the season because of the different course of the life cycles and vertical migrations of the dominant species that is well evidenced by the studies of Vervoort (1965) and Voronina (1972, 1975, 1977). Therefore one should bear in mind that biogeographic conclusions that could be drawn from our study concern the restricted period of the middle of the austral summer.

Finally we have to comment some discrepancies between our detailed analysis and the data published by Rakusa-Suszczewski (1982 a), the data based on our preliminary report. These discrepancies come from the oversimplification of these rough results. We cannot agree with the generalization that in the "Continental" plankton: "*Copepoda* were dominated by predatory *Cyclopoida* — *Oithona* and *Oncaea*." As mentioned above *Oithona* sp. was a form dominating *Copepoda* everywhere in the whole investigated sector. *Oncaea curvata* on the other hand was a good indicator species of the CZ-B waters (Bransfield Strait) but nevertheless we would hesitate to contrast with each other the "Continental" plankton with predatory *Cyclopoida* and the "Antarctic" plankton with phytophagous *Calanoida*. Furthermore we cannot accept the view that "predatory *Polychaeta*" characterized, along with *Appendiculariae*, the area of the Continental Water Boundary (Rakusa-Suszczewski 1982 a). It was *Pelagobia longicirrata* that was a faunistic indicator among pelagic *Polychaeta* but of the Bransfield Strait waters and of the deeper water layer only. Moreover *Parathemisto gaudichaudii* in both „Continental" and „Antarctic" plankton communities occurred in the net plankton not enough frequently and proportionally with too low abundancies to be mentioned as an indicator species of only one — namely of the "Continental" community.

Thanks are due to Dr. T. Wojewódzki, Sea Fisheries Institute, Gdynia, for his kindness in making available his preliminary hydrological data of the FIBEX cruise. We wish also to express our gratitude to Dr. N. Wolnomiejski and H. Czykieta, M. Sc., (Sea Fisheries Institute, Świnoujście) and to Dr. R. Ligowski (University of Łódź) for their immediate help in the sampling as well as to the officers and sailors of the r/v "Profesor Siedlecki" for their collaboration.

4. Резюме

Исследовано зоопланктон южной части пролива Дрейка и пролива Брансфилд в феврале—марте 1981 г. Обнаружено чёткие количественные и качественные различия между планктонными сообществами гидрологически разных вод. Воды Антарктического циркумполярного течения, обозначены здесь как Антарктическая зона (AAZ) характеризовались большим качественным и количественным богатством а также преобладанием таких мелких форм, как *Radiolaria* и молодые *Limacina* sp. (*Pteropoda*). В планктоне этих вод важную роль играли такие веслоногие рачки, как *Calanoides acutus*, *Calanus propinquus* и *Clausocalanus* sp.; *Rhincalanus gigas*, хотя не так многочисленный, встречался регулярно.

Зоопланктон шельфовых вод архипелагов Палмера и Южных Шетландских островов и вод пролива Брансфилд, обозначеных здесь как Континентальная зона (CZ) был количественно на много раз беднее. В этом планктоне чётко меньшую роль играли *Radiolaria* и *Limacina* sp. и такие *Copepoda*, как *Calanus propinquus*, *Rhincalanus gigas* и *Clausocalanus* sp.

В пределах Континентальной зоны выделено две фаунистически разные водные массы: воды располагающиеся над антарктическом шельфом на северо — запад от архипелагов Пальмера и Южных Шетландских островов (CZ-A) и воды пролива Брансфилд (CZ-B). Для первой была характеристичной существенная доля *Appendiculariae*, которые, возможно, были индикатором вод происходящих из моря Беллингсгаузена, а даже и сходство с водами AAZ в частоте встречаемости и численности *Calanoides acutus* и *Metridia gerlachei* — в первом случае в слое воды 100—0 м., в другом — в слое 300—100 м. С другой стороны для вод пролива Брансфилд характерным был вид *Copepoda* — *Oncaea curvata*, совершенно отсутствующий вне этой акватории, далее высокая численность холоднолюбимого *Metridia gerlachei* а даже, преимущественно глубже (300—100 м.) многощетинковый червь — *Pelagobia longicirrata*.

5. Streszczenie

Badania zooplanktonu w południowej Cieśninie Drake'a i w Cieśninie Bransfielda w okresie antarktycznego lata 1981 r. pozwoliły stwierdzić wyraźne różnice ilościowe i jakościowe pomiędzy zespołami planktonowymi wód różniących się swym reżimem hydrobiologicznym. Wody Dryfu Wiatrów Zachodnich, określone jako strefa antarktyczna (AAZ), charaktery-

zowały się dużym bogactwem ilościowym i jakościowym oraz dominacją drobnych form zooplanktonowych takich, jak *Radiolaria* i młodociane *Limacina* sp. (*Pteropoda*). Wśród *Copepoda* w wodach tych znaczący udział miały *Calanoides acutus, Calanus propinquus* i *Clausocalanus* sp. zaś *Rhincalanus gigas*, choć mniej liczny, występował regularnie. Zooplankton zasiedlający wody rozpościerające się nad szelfem i wody Cieśniny Bransfielda, określone jako strefa kontynentalna (CZ), był znacznie uboższy ilościowo, zaś jakościowo charakteryzował się wyraźnie mniejszym udziałem *Radiolaria* i *Limacina sp.* oraz takich widłonogów, jak *Calanus propinquus*, *Rhincalanus gigas* i *Clausocalanus* sp.

W obrębie strefy kontynentalnej dały się wyróżnić dwie faunistycznie odmienne masy wodne: wody ponad szelfem antarktycznym na północny zachód od Archipelagu Palmera i Południowych Szetlandów (CZ-A) oraz wody Cieśniny Bransfielda CZ-B). Pierwszą z nich charakteryzował istotny udział *Appendiculariae*, które, być może, były indykatorem wód pochodzących z Morza Bellingshauzena, a także podobieństwo do mas wodnych AAZ w częstości i liczebności *Calanoides acutus* i *Metridia gerlachei*, w pierwszym przypadku w warstwie 100—0 m, a w drugim — w warstwie 300—100 m. Natomiast wody Cieśniny Bransfielda charakteryzował widłonóg *Oncaea curvata*, nieobecny zupełnie poza tym akwenem, następnie szczególna obfitość zimnolubnego *Metridia gerlachei* oraz, przede wszystkim w głębszej warstwie wody (300—100 m), wieloszczet *Pelagobia longicirrata*.

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Paper received 15 July 1982

Appendix I
Zooplankton table I

Station	4		6		8		11	
Sounding m	3500		3300		443		2300	
Haul depth m	100—0		100—0		100–0		100—0	
Volume mm^3/m^3	466,2		364,7		492,5		218,04	
Dry weight mg/m^3	0,128		0,384		0,439			
Total number (ind./m^3)	2163		915		395		1352	
ind./m^3 = A; % = B	A	B	A	B	A	B	A	B
1. *Radiolaria*							233	17,4
2. *Nemertini*-pilidium								
3. *Pelagobia longicirrata*								
4. *Polychaeta* alia	x	z	1	0,2				
5. *Limacina* sp. juv.	1344	62,1	3	0,3			30	2,3
6. *Pteropoda* alia								
7. *Calanus propinquus*								
8. *Calanoides acutus*	241	11,1	79	4,3	41	10,5	188	14,4
9. *Rhincalanus gigas*	45	2,0						
10. *Clausocalanus arcuicornis*								
11. *Clausocalanus laticeps*	18	0,9					8	0,6
12. *Clausocalanus* sp.	28	1,3						
13. *Pareuchaeta antarctica*								
14. *Pareuchaeta* sp.								
15. *Scaphocalanus* sp.								
16. *Scolecithricella* sp.								
17. *Metridia gerlachei*								
18. *Metridia* sp.	17	0,8						
19. *Heterorhabdus* sp.								
20. *Oithona atlantica*								
21. *Oithona* sp.	75	3,3	151	17,5	165	41,8	341	24,7
22. *Oncaea conifera*								
23. *Oncaea curvata*								
24. *Oncaea* sp.								
25. *Lubbockia aculeata*								
26. *Copepoda* alia	331	15,0	623	71,1	38	9,5	105	7,7
27. nauplii	30	1,4	45	5,2	34	8,6	75	5,6
28. *E. superba*-calyptopis			1	0,2				
29. *E. superba*-furcilia								
30. *E. superba* ad.+juv.								
31. *Euphausiacea* alia			x	z				
32. *Thysanoessa macrura*-furc.	5	0,2	x	z	4	1	8	0,6
33. *Th. macrura*-ad.+juv.					0,4	z		
34. *Parathemisto gaudichaudii*	0,2	z			0,1	z	0,3	z
35. *Hyperiella dilatata*								
36. *Amphipoda* alia								
37. *Eukrohnia hamata*								
38. *Sagitta marri*								
39. *Chaetognatha* alia	32	1,5						
40. *Appendiculariae*			10	1,2	113	28,5	361	26,9
41. *Salpae*							4	0,3
42. varia								

x — abundance less than 0,1 ind./m^3
z — frequency less than 0,1%

	14		16		17		20		22		25	
	528		381		3500		2600		3500		3600	
	100—0		100—0		100—0		100—0		100—0		100—0	
	131,6		338,3		642,8		214,3		477,4		350	
	0,193				1,156		0,568		1,356		0,695	
	145		156		6234		3398		2428		521	
	A	B	A	B	A	B	A	B	A	B	A	B
1.	64	44,0	6	3,6	4210	67,5	1966	57,8	1666	57,8	39	7,5
2.												
3.												
4.	4	2.6	6	3.6	15	0,2	15	0,4	7	0.3	3	0.6
5.	6	3.9			526	8.4	355	10.4	186	7.5	3	0.6
6.					x	z	2	z	2	z		
7.			6	3.6			71	2.1	10	0.4		
8.	13	9.1	6	3.6	135	2.1	111	3.3	79	3.2	7	1.4
9.							23	0.7	5	0.2		
10.												
11.							140	3.9				
12.					500	8.0			115	4.7	55	10.7
13.												
14.												
15.												
16.												
17.												
18.							39	1.2	10	0.4	3	0.3
19.												
20.												
21.	26	18.2	36	22.8	616	9.9	493	14.6	262	10.6	237	45.5
22.					30	0.2						
23.												
24.	2	1.3					21	1.0	30	2.8	13	2.6
25.							17	0.5				
26.	8	5.2	19	12.0	107	1.8	34	1.0	23	0.9	7	1.5
27.	6	3.9	17	10.8	86	1.4	30	0.9	12	0.5	15	2.8
28.											29	5.5
29.												
30.												
31.							x	z				
32.					0.2	z						
33.			0.1	z								
34.			0.2	0.1								
35.												
36.												
37.												
38.												
39.					8	0.1	11	0.3	12	0.5		
40.	13	9.0	62	39.7			58	1.7	7	0.3	108	20.7
41.												
42.	4	2.6							2	z		

Appendix I
Zooplankton table I — continued

	27		31		32		34		36		38	
	521		314		3600		3500		3500		3600	
	100—0		100—0		100—0		100—0		100—0		100—0	
	6.7		421		632		1233		154		695	
			1.317		1.104		0.961		0.465			
	77		100		11588		4894		9090		1831	
	A	B	A	B	A	B	A	B	A	B	A	B
1.					10012	86.4	2887	59.0	6015	66.2	440	24.2
2.												
3.												
4.			1	1.0	6	z	48	1.0	11	0.1	11	0.6
5.	0.2	0.3	1	1.0	364	3.1	571	11.8	616	6.8	355	19.2
6.							x	z			4	0.2
7.			0.4	2.0	12	0.1	99	2.0	30	0.3	30	1.6
8.	0.2	0.3	9	9.4	24	0.2	12	0.2	196	2.1	229	12.4
9.					6	z	42	1.0	30	0.3	11	0.6
10.												
11.									19	0.2	6	0.3
12.					298	2.5	276	6.0	695	7.6	175	9.5
13.												
14.												
15.												
16.									37	0.4	19	1.0
17.			14	14.0							17	0.9
18.			0.2	0.2	21	0.2	12	z	4	z	28	1.5
19.									4	z		
20.												
21.	72	93.5	49	49.0	668	5.8	764	15.6	1075	11.8		
22.											35	1.8
23.												
24.							90	1.8	55	0.6	402	22.1
25.							48	1.0				
26.	0.2	0.3	0.4	0.4	60	0.5	30	0.6	52	0.6	26	1.4
27.	0.2	0.3	4	4.0	63	0.5	66	1.3	37	0.4	6	0.3
28.					9	z			60	0.6	2	0.1
29.			x	z							0.5	z
30.											x	z
31.			1	1.0							x	z
32.			1	1.0	0.3	z					4	0.2
33.	x	z	2	2.0							x	z
34.	x	z	0.1	0.1								
35.												
36.			x	z								
37.												
38.												
39.					9	z	6	0.1	34	0.4	4	0.2
40.	3.9	5.0	14	14.0	36	0.3	24	0.5	45	0.5	9	0.5
41.												
42.			x	z			12	0.2			15	0.8

Appendix I
Zooplankton table I — continued

	40		44		46		47		49		51	
	161		161		3600		3600		3350		3500	
	100—0		100—0		100—0		100—0		100—0		100—0	
	11.3		75		1131		282		571		22	
			0.266		2.726		0.939		2.256			
	81		186		5032		2047		1405		126	
	A	B	A	B	A	B	A	B	A	B	A	B
1.			2	1.0	3395	67.0	886	33.5	333	23.6	22	17.0
2.												
3.												
4.					15	0.3	17	0.8	24	1.7		
5.	16	20.4	1	0.5	444	8.8	111	5.4	53	3.7		
6.					11	0.2						
7.					38	0.7	103	5.0	2	0.1	5	4.2
8.	1	1.2	13	7.1			42	2.0	68	4.8	10	8.3
9.	0.2	0.3					2	0.1	4	0.2		
10.												
11.			24	13.0			2	0.1				
12.	4	4.9			301	6.0	156	7.8	169	12.0	8	6.5
13.												
14.												
15.												
16.			1	0.5	4	z						
17.							28	1.4	20	1.4	40	32.2
18.	1	1.2	2	1.0	4	z						
19.												
20.												
21.	40	49.2	89	48.0	534	10.6	512	25.0	253	17.8	6	5.4
22.					8	0.1			17	1.2	1	1.2
23.												
24.	0.4	0.5	1	0.5	45	0.9	36	1.7	43	3.0	14	11.2
25.									86	5.9		
26.	1	1.2			83	1.6	27	1.3	63	4.4	1	1.2
27.	2	2.4	47	25.2	79	1.5	197	9.6	21	1.5	16	13.0
28.							85	4.1	218	15.5		
29.							36	1.7	4	0.3		
30.												
31.												
32.	x	z					4	0.2			0.7	0.6
33.			0.2	0.1	x	z						
34.	x	z	x	z	x	z						
35.												
36.												
37.					0.2	z	4	0.2	6	0.4		
38.												
39.					8	0.1						
40.	15	18.3	6	3.0	41	0.8			15	1.2	0.7	0.6
41.												
42.					22	0.4			6	0.4	0.7	0.6

Appendix I
Zooplankton table I — continued

	53		55		56		58		60		61	
	188		3600		3500		3700		3600		1500	
	100—0		100—0		100—0		100—0		100—0		100—0	
			139		116		221		101		699	
	0.570		0.621				0.495		0.277		1.096	
	293		516		1090		2114		1852		1945	
	A	B	A	B	A	B	A	B	A	B	A	B
1.			34	6.5	106	49.7	937	44.7	607	32.8	68	3.5
2.												
3.												
4.	2	0.6	18	3.5	3	0.2	4	0.2	21	1.1	15	0.8
5.	1	0.3	10	2.0	151	8.4	68	3.2	63	3.4	38	1.9
6.					3	0.2	3	0.1	3	0.1		
7.	6	1.8	1	0.2	25	2.3	60	2.9	9	0.4		
8.	67	22.0	44	8.5	86	8.0	210	10.1	70	37	37	1.9
9.			3	0.6	11	1.0	13	0.6	12	0.7		
10.					3	0.2						
11.			1	0.2			4	0.2				
12.	22	7.2	112	21.9	70	6.4	142	6.8	207	11.1	67	3.4
13.												
14.												
15.												
16.					22	2.0						
17.	2	0.6	3	0.5	1	0.1	12	0.6	3	0.2	7	0.4
18.	3	0.9	4	0.7	15	1.4	4	0.2	4	0.2		
19.												
20.												
21.	102	34.2	194	37.7	523	48.0	628	30.0	466	25.1	241	12.3
22.					24	2.2	1	0.1				
23.												
24.	18	6.0	32	6.4			4	0.2	43	2.3	112	5.8
25.									93	5.1	7	0.4
26.			17	3.1	4	0.4	7	0.3	128	6.9	15	0.8
27.	35	12.0	5	0.9	13	0.7	3	0.1	105	5.7	443	23.0
28.			32	6.4							38	1.9
29.	1	0.3			1	0.1	0.1	z				
30.	x	z										
31.							x	z				
32.	23	8.0	1	0.2	1	0.1	0.1	z	2	z	7	0.4
33.	x	z							0.1	z		
34.	0.2	z					x	z				
35.							x	z				
36.												
37.					3	0.2	1.5	z				
38.												
39.					3	0.2	x	z	6	0.3		
40.	12	4.0	4	0.7	19	1.8	9	0.4	8	0.4	850	43.6
41.							0.2	z				
42.			1	0.2								

Appendix I
Zooplankton table I — continued

	62		65		66		67		68		69	
	191		4000		462		1400		2150		512	
	100—0		100—0		100—0		100—0		100—0		100—0	
	68		94		17		98		568			
	0.270		0.342				0.257		1.348			
	204		2179		39		239		471		0.42	
	A	B	A	B	A	B	A	B	A	B	A	B
1.	1	0.4	1235	56.7	2	6.0	28	11.9	203	43.0		
2.											0.2	42.0
3.												
4.	1	0.7	53	2.4	0.2	0.5	15	6.4	4	0.8		
5.	6	3.0	26	1.2	0.1	0.3			1	0.1		
6.	4	1.8	2	0.1			6	2.4				
7.	6	2.9	15	0.6	0.3	0.8						
8.	24	12.2	98	4.5	1	1.6	8	3.2	13	2.9		
9.			6	0.3								
10.												
11.												
12.	18	9.2	81	3.7	1	3.5	15	6.4	16	3.3		
13.							2	0.8				
14.												
15.												
16.			19	0.9								
17.	16	8.0			0.4	0.9	34	14.3	1	0.1		
18.			51	2.3								
19.												
20.												
21.	88	43.4	348	16.0	27	70.6	18	7.2	117	24.9		
22.									19	3.9		
23.												
24.	1	0.4	26	1.2	0.3	0.7						
25.			49	2.3	2	4.5			7	1.4		
26.	1	0.4	30	1.4	0.3	0.8	2	0.8	7	1.5	x	14.0
27.	9	4.4	41	1.9	0.2	0.5	90	38.3	15	3.2		
28.	1	0.4					2	0.8	58	12.4	0.1	28.0
29.	1	0.4							2	0.5		
30.							x	z				
31.												
32.	1	0.5	2	0.1	0.3	0.8	12	4.8			x	7.0
33.					0.1	0.3	1	z				
34.												
35.												
36.												
37.												
38.			2	0.1								
39.			2	0.1			x	z				
40.	25	12.1	79	3.6	1	2.4			8	1.8		
41.												
42.	x	z	14	0.6	2	4.8	6	2.5	1	0.3	x	7.0

Appendix I
Zooplankton table I — continued

	70		71		72		73		76		77	
	970		112		102		535		1500		1980	
	100—0		100—0		90—0		100—0		100—0		100—0	
	52		3		4		3		564		117	
									0.0278		0.189	
	87		* 46		62		57		23		70	
	A	B	A	B	A	B	A	B	A	B	A	B
1.					1	1.6						
2.			0.4	z								
3.			3	0.6	2	3.2						
4.			0.4	z								
5.	0.5	0.5										
6.												
7.	0.5	0.5	1	0.2	0.2	0.3			1	4.8	2	3.2
8.	3	3.8	3	0.6	2	2.6			0.2	0.8	2	2.6
9.												
10.												
11.												
12.	3	3.8	7	1.6	3	5.5	1	1.9	1	4.9	0.7	1.0
13.												
14.												
15.												
16.												
17.	11	12.9			0.2	0.3	3	4.6	4	17.4	27	37.7
18.			9	0.5								
19.					0.4	0.6						
20.												
21.	31	36.4	93	20.0	21	33.8	27	46.7	4	17.4	18	25.5
22.							1	1.9				
23.					26	42.0	17	29.6				
24.			42	9.3			2	3.3				
25.												
26.	0.5	0.5	1	0.2	1	1.6	1	1.9			1	1.5
27.	26	30.1	6	1.2	4	5.8	6	10.0	7	32.6	12	17.5
28.	8	9.9							0.2	0.8	2	2.6
29.	0.5	0.5							1	4.9	6	7.9
30.	x	z							x	0.2		
31.	0.1	0.1							0.1	0.5		
32.	0.7	0.7	0.4	z								
33.											x	z
34.	x	z										
35.												
36.												
37.												
38.												
39.												
40.									0.2	0.8		
41.									2.2	9.6		
42.	x	z	0.8	0.2	0.4	0.6			0.2	0.8		

* — including faecal pellets

Appendix I
Zooplankton table I — continued

	79		81		82		84		85		86	
	550 100—0 3 74		1800 100—0 3 22		800 100—0 3 2		900 100—0 470 4		1570 100—0 3 514		1450 100—0 3.7 157	
	A	B	A	B	A	B	A	B	A	B	A	B
1.	0.4	0.5			x	3.4						
2.												
3.			x	0.4								
4.	0.4	0.5										
5.	0.4	0.5										
6.					x	0.8						
7.	3	4.0	0.2	0.8	x	3.3						
8.	7	10.5	x	0.4	x	4.2	0.6	16.7	3	0.5	3	2.1
9.												
10.												
11.												
12.	5	6.6	0.6	3.0	0.1	5.1	0.1	4.2	15	2.9	12	7.6
13.												
14.												
15.												
16.												
17.	3	4.0	1	4.7	0.1	5.1					2	1.2
18.												
19.												
20.												
21.	50	67.8	19	85.8	2	69.4	2	50.3	260	50.6	118	75.0
22.												
23.	0.4	0.5	x	0.4							4	2.6
24.												
25.												
26.	0.8	1.0	0.6	2.5	0.1	5.1	0.1	4.2	1	0.1	0.4	0.2
27.	0.4	0.5	0.2	0.8	x	0.8	x	2.1	235	46.0	16	103
28.												
29.												
30.							0.4	11.5				
31.							x	0.5	x	z		
32.												
33.	0.4	0.5	0.2	0.8								
34.												
35.												
36.												
37.	x	z	x	z								
38.												
39.			x	z								
40.	2	2.5			x	2.5					1	0.7
41.							0.4	11.5				
42.			x	z								

Appendix I
Zooplankton table I — continued

	87		88		89		90		92		94	
	340		775		1550		226		750		850	
	100–0		100–0		100—0		100—0		100–0		100—0	
	15		3		3		5.63		33.83		432	
	0.068						0.0209		0.024		0.018	
	122		331		44		84		69		5	
	A	B	A	B	A	B	A	B	A	B	A	B
1.	0.4	0.3										
2.					0.4	1.0			2	2.8	0.3	6.0
3.	0.4	0.3	1	0.2								
4.	0.4	0.3										
5.			1	0.2					1	1.4		
6.					0.1	0.2						
7.	0.7	0.6							5	7.6	0.3	6.0
8.	7	5.5	3	0.9	0.8	2.0	0.8	1.0	8	11.9		
9.												
10.												
11.												
12.	9	7.4	24	7.2	2	5.6	4	5.0	3	4.3	x	1.8
13.												
14.												
15.												
16.	1	0.9										
17.	14	11.4	1	0.2							0.4	8.0
18.			35	10.6	7	15.0			1	1.4	x	1.8
19.												
20.												
21.	54	44.3	205	61.9	30	70.0	57	67.7	34	49.7	2	40.0
22.	0.4	0.3										
23.	6	4.6	19	5.6			11	13.4	3	4.3		
24.			7	2.3			4	5.0				
25.							6	7.4				
26.	0.4	0.3			1	2.2	0.6	0.7	1.	1.4		
27.	20	16.3	27	8.2	2	4.4	0.3	0.3	8	11.9	1	20.0
28.	4	3.2										
29.	2	1.5							0.2	0.3	0.4	8.0
30.												
31.												
32.	1	0.9									0.3	6.0
33.			1	0.2					x	z	x	0.7
34.											x	0.7
35.												
36.												
37.							x	z			x	0.4
38.												
39.	1	0.9	1	0.2								
40.	1	0.9	6	1.8					2	2.8		
41.							x	z	0.6	0.9	0.3	6.0
42.					0.1	0.2					x	1.8

Appendix I
Zooplankton table I — continued

	96		97		98		100		102		103	
	705		800		823		615		910		156	
	100—0		100—0		100—0		100—0		100—0		100—0	
	3		11		3		90.2		3		3	
			0.233		0.0564							
	173		98		3		43		45		91	
	A	B	A	B	A	B	A	B	A	B	A	B
1.	0.5	0.3	3	3.0					0.2	0.5	1	0.7
2.					x	0.5			0.1	0.2		
3.											0.2	0.2
4.	1	0.6			x	1.1					0.1	0.1
5.									0.2	0.5	0.5	0.5
6.												
7.							1	2.3	0.2	0.5	0.6	0.8
8.	8	4.5	3	3.0	x	0.5	2	4.6	1	2.2	8	8.8
9.			1	1.0							0.1	0.1
10.												
11.												
12.	18	10.9	4	4.5	x	2.7	1	2.3	3	6.0	8	8.8
13.												
14.									0.1	0.2		
15.												
16.												
17.					x	1.1	4	5.2	1	2.2	1	1.0
18.	7	4.2	5	5.3			1	2.3	1	2.2	6.4	7.0
19.												
20.												
21.	116	66.6	71	71.3	3	84.5	25	55.4	30	65.8	42	45.7
22.												
23.	9	5.2	4	4.5	x	0.5			2	4.4	6	6.2
24.											3	3.4
25.												
26.	2	0.9	0.7	0.7	x	0.5	x	0.8	0.2	0.5	1	1.0
27.	10	5.8	4	4.5	0.2	5.0	9	21.0	6	12.4	11	11.0
28.												
29.							x	0.1	0.3	0.7	x	z
30.							x	0.1				
31.	0.5	0.3										
32.			0.5	0.5								
33.	x	z	0.3	0.3	x	1.6	x	0.2	x	0.2		
34.			x	z								
35.												
36.							x	z				
37.											x	z
38.												
39.												
40.	0.5	0.3	2	2.0	x	1.1			0.7	1.5	0.8	0.9
41.							0.4	1.0				
42.												

Appendix I
Zooplankton table I — continued

	104		105		108	
	281		1050		284	
	100—0		100—0		100—0	
	13.15		3		3	
	0.0487					
	*220		*38		24	
	A	B	A	B	A	B
1.	9	4.1	0.4	1.2	1	4.1
2.			0.2	0.6		
3.						
4.					0.4	1.6
5.	1	0.5				
6.						
7.	2	1.0				
8.	10	5.0	1	3.5	1	4.1
9.						
10.						
11.						
12.	0.5	0.2	0.4	1.2	0.2	0.8
13.	13.					
14.	14.					
15.	15.					
16.	16.					
17.	17.					
18.	10	5.0	1	3.5		
19.						
20.						
21.	29	13.0	25	68.0	21	86.7
22.						
23.	5	2.5	0.2	0.6		
24.						
25.						
26.	4	1.8	0.4	1.2		
27.	6	2.7	1	3.5	1	4.1
28.						
29.	2	1.0				
30.						
31.						
32.					0.2	0.8
33.	2	1.0				
34.						
35.						
36.						
37.						
38.						
39.						
40.	3	1.5			0.4	1.6
41.						
42.	2	1.0	0.2	0.5	0.2	0.8

Appendix I
Zooplankton table II

Station	17		20		22		25	
Sounding m	3500		2600		3500		3600	
Haul depth m	300—100		300—100		300—100		300—100	
Volume mm^3/m^3	–		–		–		2	
Total number (ind./m^3)	201		231		156		8	
Taxon ind./m^3 = A; % = B	A	B	A	B	A	B	A	B
1. *Radiolaria*	22	11.1	5	2.0	11	7.2		
2. *Nemertini*-pilidium								
3. *Pelagobia longicirrata*								
4. *Polychaeta* alia	0.4	0.2			0.5	0.3	0.2	2.3
5. *Limacina* sp. juv.	3	1.4			4	2.6		
6. *Pteropoda* alia					4	2.6		
7. *Calanus propinquus*	7	3.5						
8. *Calanoides acutus*	3	1.4	36	15.4	4	2.6	0.2	2.3
9. *Rhincalanus gigas*	2	1.0	5	2.0	2	1.3		
10. *Clausocalanus arcuicornis*	0.4	0.2			1	0.6		
11. *Clausocalanus laticeps*								
12. *Clausocalanus* sp.	7	3.5	7	2.8	6	3.8	1	12.6
13. *Pareuchaeta antarctica*								
14. *Pareuchaeta* sp.								
15. *Scaphocalanus* sp.	3	1.4			6	3.8		
16. *Scolecithricella* sp.			8	3.7	2	1.3		
17. *Metridia gerlachei*	7	3.5						
18. *Metridia* sp.			32	13.8	17	10.8	0.6	6.9
19. *Heterorhabdus* sp.					1	0.6		
20. *Oithona atlantica*								
21. *Oithona* sp.	69	34.3	83	35.7	50	32.1	4	47.4
22. *Oncaea conifera*								
23. *Oncaea curvata*								
24. *Oncaea* sp.	23	11.3	25	10.5	15	9.6		
25. *Lubbockia aculeata*	5	2.5			5	3.2		
26. *Copepoda* alia	41	20.5	22	9.3	23	14.7	1	12.6
27. nauplii	1	0.6	2	0.8	2	1.3	0.2	2.3
28. *E. superba*-calyptopis	3	1.4			1	0.6	0.2	2.3
29. *E. superba*-furcilia								
30. *E. superba* ad.+juv.								
31. *Euphausiacea* alia					x	z		
32. *Thysanoessa macrura*-furc.								
33. *Th. macrura*-ad.+juv.			0.1	z				
34. *Parathemisto gaudichaudii*								
35. *Hyperiella dilatata*								
36. *Amphipoda* alia								
37. *Eukrohnia hamata*								
38. *Sagitta marri*								
39. *Chaetognatha* alia	2	1.0	5	2.0	0.5	0.3	0.7	8.0
40. *Appendiculariae*	1	0.6					0.3	3.4
41. *Salpae*								
42. varia	1	0.6			0.5	0.3		

Appendix I
Zooplankton table II — continued

	27		31		32		34		36		38		40	
	521		310		3500		3500		3500		3600		161	
	300—100		300—100		300—100		300—100		300—100		300—100		150—100	
	3		66		21		36		2		124		8	
	48		196		126		198		57		367		127	
	A	B	A	B	A	B	A	B	A	B	A	B	A	B
1.			4	1.9	3	2.3	22	11.2	27	47.5	127	34.6		
2.														
3.			9	4.8										
4.	0.5	1.0			3	2.3	1	0.5	0.2	0.1	1	0.3	1	0.8
5.			3	1.7			7	3.5	0.1	1.8	13	3.5		
6.			0.5	0.2			1	0.5			1	0.3		
7.	0.2	0.5	1	0.5	2	1.9					1	0.3		
8.	2	4.6	6	2.6	6	4.8	1	0.5	3	5.3	62	16.8	5	4.0
9.					0.5	0.4	0.5	0.3	0.3	0.5	4	1.1		
10.														
11.														
12.	4	8.2	6	2.9	13	10.3	21	10.6	7	12.3	43	11.7	9	7.1
13.														
14.							0.5	0.3						
15.														
16.									0.1	0.2	8	2.2	1	0.8
17.			7	3.5	1	1.1	2	1.0			6	1.6		
18.	1	3.0	14	7.2	3	2.3	21	10.6	0.3	0.5	23	6.3	34	26.9
19.														
20.														
21.	27	55.2	74	37.5	46	36.5	47	23.7	14	24.6	41	11.2	28	22.2
22.							9	4.5			8	2.2		
23.														
24.	3	5.6	2	0.9					1	1.8	11	3.0	9	7.1
25.	0.5	1.0					25	12.6	1	1.8				
26.	5	10.1	27	13.6	13	10.3	34	17.1	1	1.8	9	2.5	16	12.7
27.	5	10.1	35	17.8	8	6.3	3	1.5	0.6	1.1	1	0.3	18	14.2
28.					26	20.6			0.1	0.2				
29.														
30.														
31.	x	z												
32.							1	0.5						
33.			0.3	0.2										
34.			0.1	z										
35.											x	z		
36.														
37.	0.1	0.2					0.2	0.1					2	1.6
38.							0.1	z						
39.	0.2	0.5	0.5	0.2			1	0.5			2	0.5		
40.	0.2	0.5	7	3.5					0.3	0.5	2	0.5	3	2.4
41.											1	0.3		
42.			1	0.5			0.5	0.3			2	0.5	0.4	0.3

Appendix I

Zooplankton table II — continued

	44		46		49		55		58		60		62		65	
	161		3600		3600		3600		3700		3600		191		4000	
	150—100		300—100		300—100		300—100		300—100		300—100		180—100		300—100	
	8		2		11		2		13		2		3		2	
	135		462		171		57		282		28		17		29	
	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B
1.			68	14.1	17	10.0	4	7.0	6	2.1	15	53.6			9	31.0
2.																
3.															1	3.4
4.	0.5	0.4			2	1.2	1	1.8	3	1.1	0.4	1.4				
5.			17	3.7	2	1.2	0.4	0.7	3	1.1	1	3.6	0.1	0.6	1	3.4
6.			1	0.2	2	1.2			6	2.1	0.1	0.4			0.2	0.7
7.			5	1.1	1	0.6			13	4.6			1	6.0	0.1	0.3
8.	1	0.7	4	0.9	3	1.8	7	12.3	30	10.6	1	3.6	4	24.1	1	3.4
9.			1	0.2	2	1.8			11	3.9	0.4	1.4			0.2	0.7
10.					1	0.6										
11.			1	0.2												
12.	18	13.4	38	8.2	9	5.3	10	17.5	34	12.1	3	10.7	3	18.1	3	10.3
13.																
14.																
15.									2	0.7						
16.	0.5	0.4									0.5	1.8				
17.					6	3.5	1	1.8	2	0.7			1	6.0	1	3.4
18.	4	3.0	19	4.1	12	7.0	1	1.8	17	6.0	0.3	11.1				
19.			13	2.8	2	1.2			3	1.1	0.1	0.4	0.1	0.6		
20.																
21.	68	50.4	91	19.7	57	33.3	25	43.9	66	23.4	5	17.9	5	30.1	7	24.1
22.			5	1.1	8	4.7	2	3.5							0.1	0.3
23.																
24.	5	3.7	40	8.6	21	12.3	2	3.5	37	13.1	0.7	2.5	0.1	0.6	0.7	2.4
25.			51	11.0	2	1.2			22	7.8						
26.	7	5.2	91	19.7	15	8.8	1	1.8	13	4.6	0.4	1.4	1	6.0	2	6.9
27.	24	17.8	3	0.6	4	2.3	1	1.8	1	0.4			0.5	3.0	1	3.4
28.			1	0.2	2	1.8	1	1.8							0.6	2.1
29.															0.6	2.1
30.																
31.									2	0.7						
32.			2	0.4			0.4	0.7	1	0.4						
33.	0.3	0.2					x	z								
34.																
35.																
36.																
37.			0.2	z			0.2	0.4	4	1.4					x	0.1
38.			x	z			x	z							x	0.1
39.	0.5	0.4	3	0.6	1	0.6			1	0.4	0.2	0.7			0.1	0.3
40.	6	4.5	5	1.1	0.4	0.2			5	1.8	0.2	0.7	0.5	3.0	0.2	0.7
41.													0.3	1.8		
42.			3	0.6	1	0.6										

Appendix I
Zooplankton table II — continued

	67		68		70		73		77		79		81	
	1400		2150		980		540		1970		550		1760	
	300—100		300—100		300—100		300—100		300—100		300—100		300—100	
	19		13		8		2		2		85		70	
	124		178		95		125		58		185		94	
	A	B	A	B	A	B	A	B	A	B	A	B	A	B
1.	3	2.4	20	11.2	1	1.1	3	2.4	0.3	0.5	1	0.5		
2.							0.6	0.5						
3.	7	5.6	1	0.6	3	3.2	2	1.6			1	0.5	1	1.1
4.	1	0.8	1	0.6					0.3	0.5	3	1.6	0.4	0.4
5.	0.2	0.2	1	0.6			0.3	0.3						
6.														
7.							1	0.8	0.3	0.5	1	0.5	2	2.1
8.	1	0.8	1	0.6	2	2.1	2	1.6	3	5.2	6	3.2	4	4.3
9														
10.														
11.														
12.	4	3.2	7	4.0	6	6.3	5	4.0	3	5.2	2	1.1	2	2.1
13.	0.4	0.3												
14.	0.4	0.3	1	0.6										
15.			1	0.6										
16.							1	0.8			1	0.5	0.4	0.4
17.	46	37.1	16	9.0	40	42.1			3	5.2	115	62.2	55	58.5
18.							6	4.8						
19.			0.4	0.2										
20.														
21.	36	29.0	41	23.0	27	28.4	52	41.6	29	50.0	18	3.7	14	14.9
22.			8	4.6			3	2.4						
23.							31	24.8	5	8.6	9	4.9	1	1.1
24.	9.73	7.3	18	10.2	2	2.1								
25.			29	16.4										
26.	4	3.2	17	9.5	5	5.3	5	4.0	7	12.1	12	6.5	2	2.1
27.	10	8.1	9	5.0	6	6.3	12	9.6	5	8.6	2	1.1	3	3.2
28.	0.2	0.2	1	0.6	2	2.1	1	0.8			9	4.9	0.4	0.4
29.	0.4	0.3			0.4	0.4			0.6	1.0	4	2.2	8	8.5
30.														
31.	x	z	x	z	x	z								
32.														
33.	0.1	0.1							0.5	0.9	0.1	z	x	z
34.	x	z												
35.	x	z							x	z				
36.	0.1	0.1					x	z						
37.	x	z	1	0.6	1	1.1					1	0.5	x	z
38.			0.1	z										
39.														
40.			1	0.6										
41.														
42.	1	0.8	3	1.7			0.3	0.3	0.6	1.0	x	z	0.4	0.4

Appendix I
Zooplankton table II — continued

	84		86		87		88		90		94	
	815		1450		342		775		225		850	
	300—100		300—100		300—100		300—100		210—100		300—100	
	11		47		71		41		3		6	
	72		187		195		155		197		52	
	A	B	A	B	A	B	A	B	A	B	A	B
1.												
2.												
3.	2	2.8	0.4	0.2	2	1.0	7	4.5	1	0.5	1	1.9
4.	2	2.8			x	z	3	1.9	0.3	0.2		
5.							0.4	0.3				
6.												
7.	2	2.8	0.4	0.2			1	0.6				
8.	2	2.8	3	1.6	7	3.6	3	1.9	5	2.5	1	1.9
9.			0.4	0.2								
10.												
11.							1	0.6				
12.	3	4.2	12	6.4	4	2.1	2	1.3	8	4.1	2	3.8
13.											x	z
14.					0.5	0.3						
15.												
16.												
17.	15	20.8	96	51.3	73	37.4	93	60.0			19	36.5
18.									8	4.1		
19.												
20.												
21.	40	55.6	40	21.4	43	22.1	17	11.0	70	35.5	19	36.5
22.	1	1.4					2	1.3				
23.	2	2.8					6	3.9	44	22.3	2	3.8
24.			4	2.1	22	11.3			9	4.6		
25.									23	11.7		
26.	1	1.4	2	1.1	5	2.6	8	5.2	11	5.6	4	7.7
27.	2	2.8	21	11.2	17	8.7	6	3.9	17	8.6	2	3.8
28.	0.4	0.6	6	3.2	17	8.7	2	1.3			0.4	0.8
29.			1	0.5	4	2.1	1	0.6			1	1.9
30.	x	z			x	z						
31.												
32.												
33.	0.2	0.3			x	z					0.4	0.8
34.												
35.												
36.	x	z			x	z						
37.					x	z	1	0.6			0.2	0.4
38.												
39.					0.5	0.3	x	z	0.3	0.2		
40.												
41.												
42.							0.4	0.3			0.2	0.4

Appendix I
Zooplankton table II — continued

	97		100		104		108	
	800		615		309		284	
	300—100		300—100		240—100		280—100	
	47		34		9		2	
	111		86		145		138	
	A	B	A	B	A	B	A	B
1.	0.2	0.2			1	0.7	2	1.4
2.			0.2	0.2			0.5	0.4
3.	1	0.9	4	4.7	2	1.4	3	2.2
4.	2	1.8					2	1.4
5.	0.2	0.2					0.5	0.4
6.								
7.	2	1.8						
8.	4	3.6	3	3.5	3	2.1		
9.								
10.	0.2	0.2						
11.								
12.	5	4.5	3	3.5	4	2.8	8	5.8
13.								
14.			0.4	0.5	0.3	0.2		
15.								
16.	0.6	0.5						
17.	17	15.3	5	5.8	8	5.5		
18.	40	36.0	14	16.3	72	49.7	22	15.9
19.	0.2	0.2						
20.								
21.	18	16.2	19	22.1	11	7.6	36	26.1
22.	1	0.9	1	1.2	2	1.4	2	1.4
23.	4	3.6	28	32.6	13	9.0	6	4.3
24.	0.4	0.4						
25.								
26.	7	6.3	4	4.7	15	10.3	6	4.3
27.	5	4.5	4	4.7	9	6.2	46	33.3
28.	2	1.8			2	1.4	0.5	0.4
29.	1	0.9	0.6	0.7	2	1.4		
30.			x	z				
31.								
32.								
33.			0.4	0.5	x	z		
34.	0.1	0.1			0.1	z		
35.								
36.					x	z		
37.	0.2	0.2	0.3	0.3	1	0.7	0.5	0.4
38.								
39.					x	z		
40.			0.6	0.7			2	1.4
41.								
42.	0.2	0.2					0.5	0.4

Appendix I
Zooplankton table III — Bongo-net hauls

Station		19		21		25		31		34		38		44		47	
Sounding		3000		2600		3600		314		3500		3600		161		3600	
Taxa	A=number; B=wet weight in g	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B
1.	*Cnidaria* — medusae											x					
2.	*Ctenophora* indet.									xx	200						
3.	*Tomopteris cf. carpenteri*									2	0.6					9	
4.	*Vanadis antarctica*					1	0.8										
5.	*Clione* sp.													1			
6.	*Spongiobranchaea australis*	9	2.5	35	6.0	1	0.1					2		1		1	
7.	*Cephalopoda* indet.	3	0.5	2	0.4												
8.	*Euphausia crystallorophias*							x	x					1			
9.	*Euphausia frigida*													1		6	
10.	*Euphausia superba*							873	564							2	
11.	*Thysanoessa macrura*							x	x	2	0.2			6			
12.	*Parathemisto gaudichaudii*	30	2.6	18	1.6	64	2.7	82	6.0	3	0.3	8		350		6	
13.	*Hyperiidae* indet.																
14.	*Sagitta gazellae*															11	
15.	*Sagitta* sp.									1	0.1						
16.	*Salpae* indet.	11	4.5	5	12.2	3	14.1			45	90	13				180	
17.	*Chaenichthyidae* juv. indet.																
18.	*Myctophiidae* juv. indet.																
19.	*Nototheniidae* juv. indet.													1			
20.	*Pisces* juv. indet.																

x single specimens
xx numerous

Appendix I

Zooplankton table III — Bongo-net hauls (continued)

Station	50		53		58		67		70		77		84		100	
Sounding	316		188		3700		1400		970		1980		900		615	
A = number; B = wet weight in g Taxa	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B
1. *Cnidaria* — medusae																
2. *Ctenophora* indet.															1	
3. *Tomopteris cf. carpenteri*																
4. *Vanadis antarctica*																
5. *Clione* sp.																
6. *Spongiobranchaea australis*					1		1									
7. *Cephalopoda* indet.																
8. *Euphausia crystallorophias*									1		9					
9. *Euphausia frigida*	7	x			7		3		35		77					
10. *Euphausia superba*			247				115		949		98		32		xx	4600
11. *Thysanoessa macrura*	47	x	3				9				1					
12. *Parathemisto gaudichaudii*	14	1.5	47		16		4		119	10	98					
13. *Hyperiidae* indet.					2		1		2							
14. *Sagitta gazellae*					1											
15. *Sagitta* sp.																
16. *Salpae* indet.	2	0.5			180				27		49					
17. *Chaenichthyidae* juv. indet.															4	
18. *Myctophiidae* juv. indet.					1		1									
19. *Nototheniidae* juv. indet.																
20. *Pisces* juv. indet.													2			

Appendix II

The occurrence and abundance of particular taxa is denoted by one letter and two numbers, where "A" means sample from the 100—0 m layer and "B" — from 300 (or less) 100 m layer, the first number — station number, the second one — abundance per 1 m^3, "x" means that the abundance was less than 0,1 ind./m^3.

Foraminifera:
A: 34/12; 46/15; 49/6; 51/0,7; 55/1; 65/6; 68/1,5; 71/0,4; 72/0,2
B: 31/1; 49/0,4; 65/0,1; 68/3; 73/0,3

Cnidaria (medusae):
A: 70/x B: 88/x

Cnidaria — *Siphonophora*:
B: 46/1

Ctenophora:
A: 31/x; 67/2,2; 69/x; 76/0,2; 94/0,1 B: 31/x; 67/x; 77/0,3

Polychaeta alia:

Tomopteris sp.:
A: 4/0,3; 56/x; 87/0,4 B: 58/1; 81/x; 87/x; 88/1; 97/0,2

Krohnia bongraini:
B: 67/0,2; 84/0,4

Vanadis antarctica:
B: 68/x

Pteropoda alia:

Clione sp.:
A: 17/19 B: 22/x; 49/2; 58/6; 65/0,2

Spongiobranchaea australis:
A: 17/x B: 38/x

Pteropoda juv. indet.
A: 38/3,7; 56/3; 82/x; 89/0,1

Pteropoda — veliger:
A: 62/4; 65/53; 67/6

Ostracoda:

Conchoecia sp.:
A: 22/2 B: 14/3,8; 17/2,9; 22/0,5; 34/0,5; 38/1; 40/0,4; 77/0,3; 88/0,4; 94/0,2; 97/0,2; 108/0,5

Ostracoda indet.
A: 46/3,8; 105/0,2

Copepoda alia:

Eucalanus sp.:
A: 4/9,4

Paracalanus sp.:
A: 14/1,9

Microcalanus sp.:
B: 65/0,6; 67/1

Gaidius tenuispinus:
B: 25/0,1

Scolecithricella glacialis:
A: 34/6

Centropages sp.:
A: 4/11,3 B: 17/2

Haloptilus sp.:
A: 38/1,9; 65/2 B: 20/1; 25/0,1; 27/0,2; 34/0,5; 46/1; 49/0,4

Acartia sp.:
A: 11/7,5; 66/1,9 B: 22/2
Clytemnestra sp.:
A: 11/15
Corycaeus sp.:
A: 25/1,5; 32/6 B: 20/3; 22/2; 31/0,5; 34/0,5; 34/0,5; 46/2; 49/0,4
Macrosetella sp.:
A: 4/7,5; 17/22,5; 20/3,7; 36/11,3; 38/24; 40/0,6; 47/21; 49/36; 51/1,4; 55/7; 56/4,5; 58/x; 60/9; 65/15; 66/0,1; 68/15; 73/0,4; 81/0,3; 108/0,2;
B: 17/0,4; 38/6; 46/1; 49/1; 55/1; 60/0,1; 65/0,4

Euphausiacea alia:
Euphausia crystallorophias:
A: 84/x B: 22/x; 27/x; 67/x
Euphausia frigida:
A: 6/x; 38/x; 70/0,1; 71/x; 76/0,1; 85/x B: 70/x
Euphausia triacantha:
A: 20/x B: 68/x

Amphipoda alia:
Orchomene sp.:
B: 87/x; 104/x
Lysianassidae indet.
A: 31/x B: 84/x
Polycheria sp.:
A: 62/x
Primno sp.:
B: 73/x
Vibilia antarctica:
A: 38/x
Hyperiidae indet.
B: 67/x
Echinodermata — larvae:
auricularia:
A: 67/4 B: 67/0,6; 81/0,4

Chaetognatha alia:
Sagitta gazellae:
A: 58/x; 60/0,4 B: 88/x; 104/x
Sagitta marri:
B: 34/0,1; 55/x; 56/x; 65/x; 68/0,1
Sagitta sp. indet.
A: 34/6; 46/x; 65/2

Ascidiacea — larvae:
A: 53/4

Pisces — larvae:
B: 34/x; 79/x

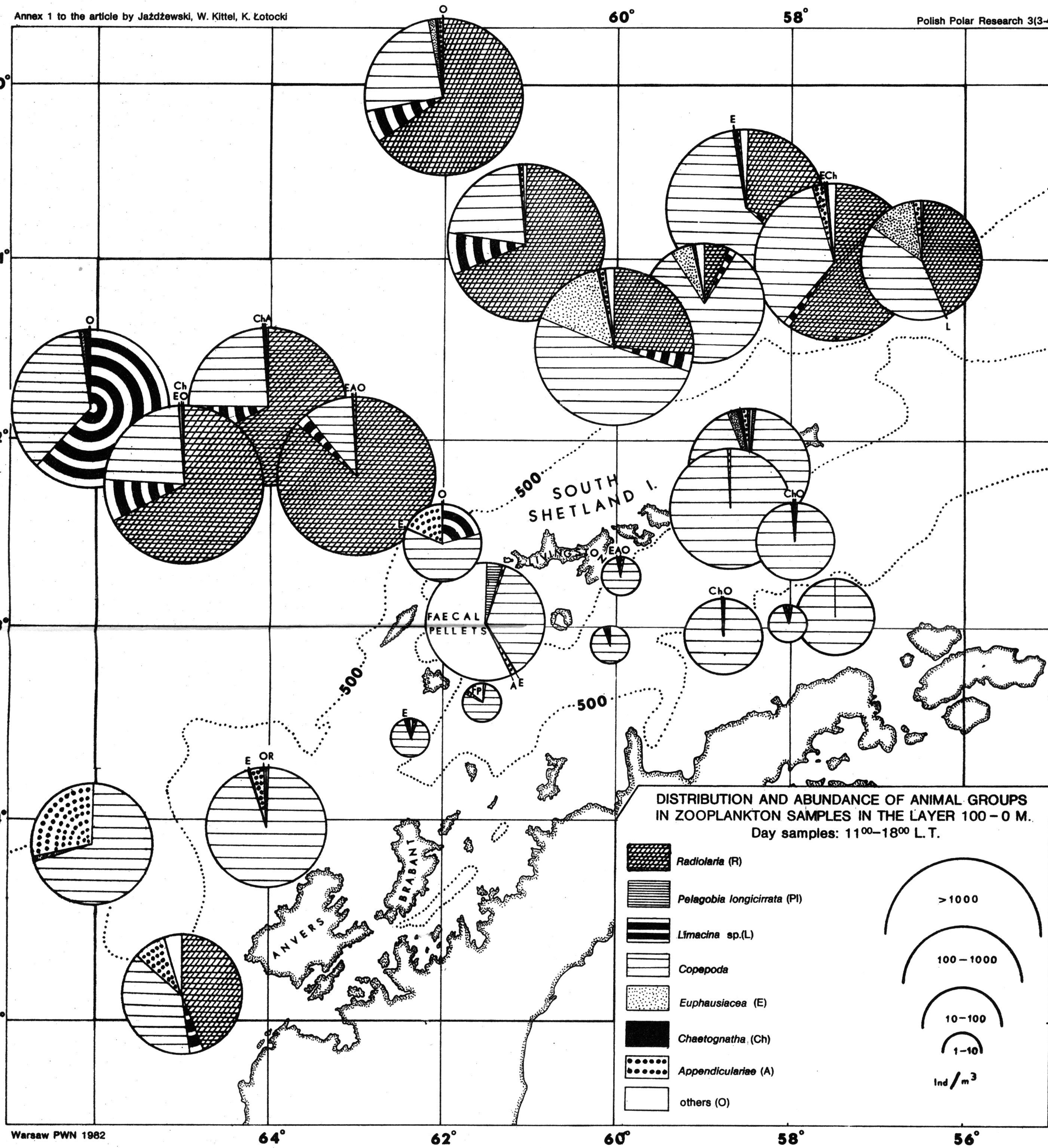

Fig. 5. Distribution and abundance of animal groups in zooplankton samples in the layer 100—0 m. Day samples: 11 —18 L. T.

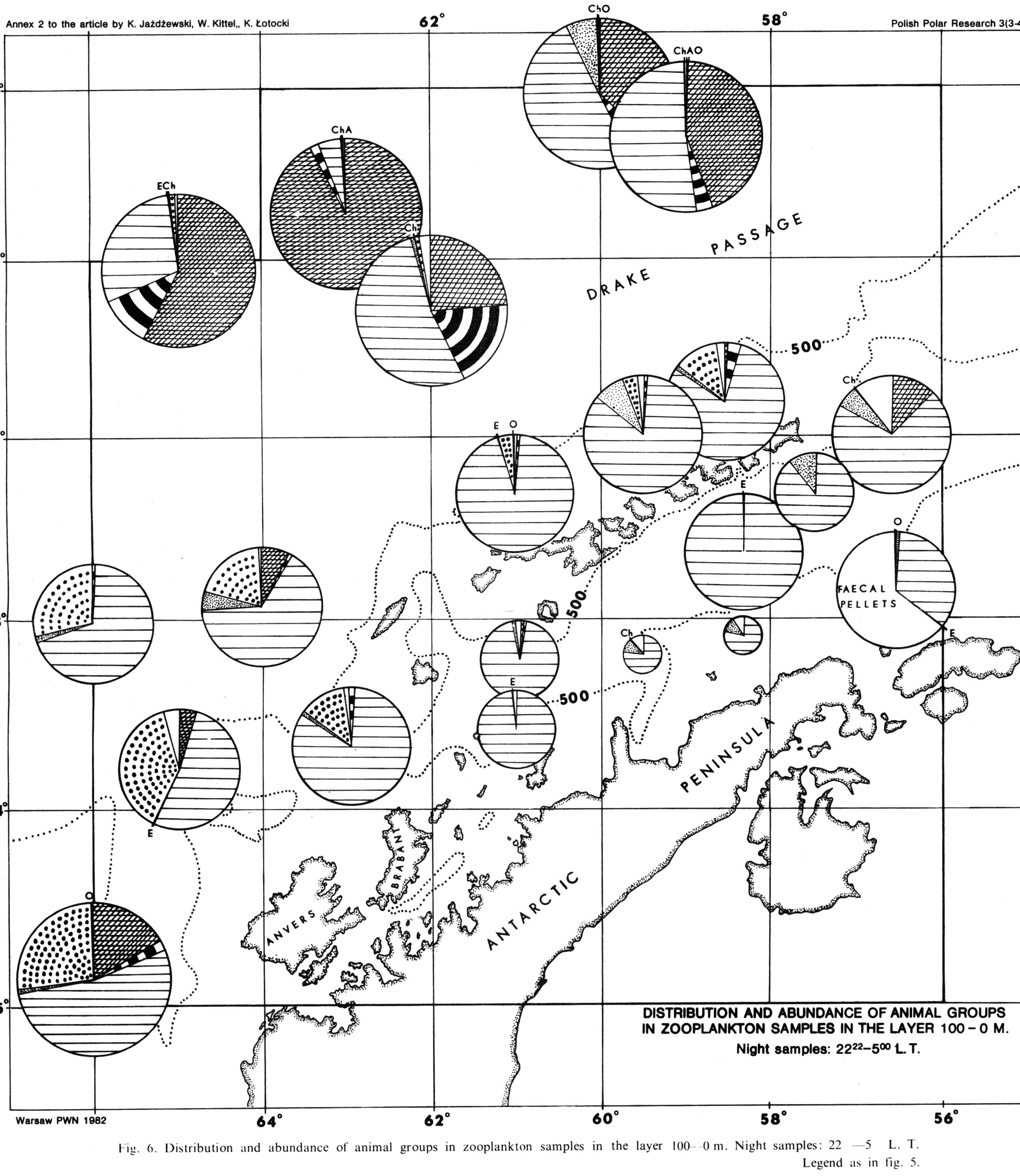

Fig. 6. Distribution and abundance of animal groups in zooplankton samples in the layer 100—0 m. Night samples: 22 —5 L. T. Legend as in fig. 5.

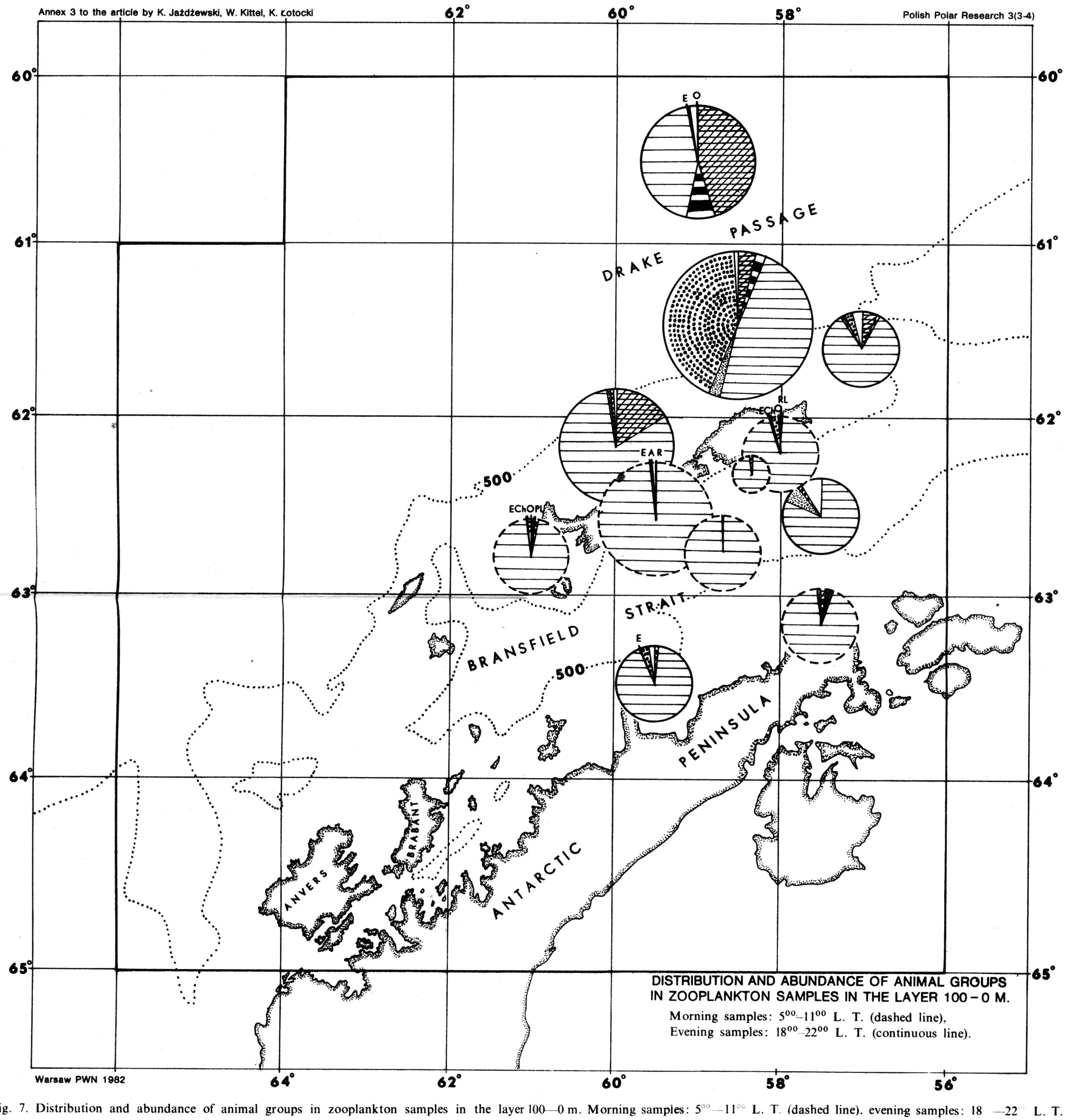

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Fig. 7. Distribution and abundance of animal groups in zooplankton samples in the layer 100—0 m. Morning samples: 5^{00}—11^{00} L. T. (dashed line). evening samples: 18 —22 L. T. (continuous line). Legend as in fig. 5.

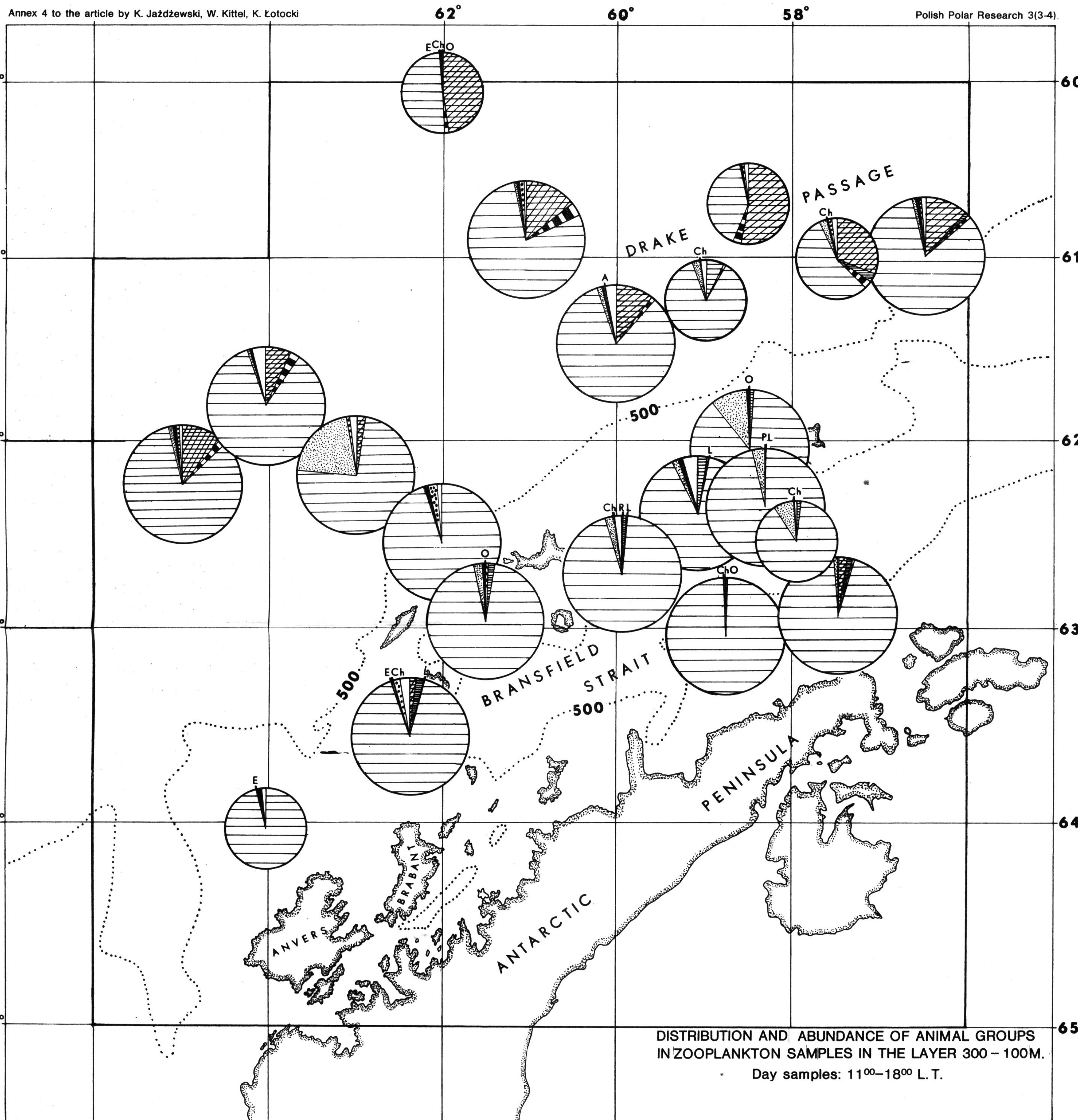

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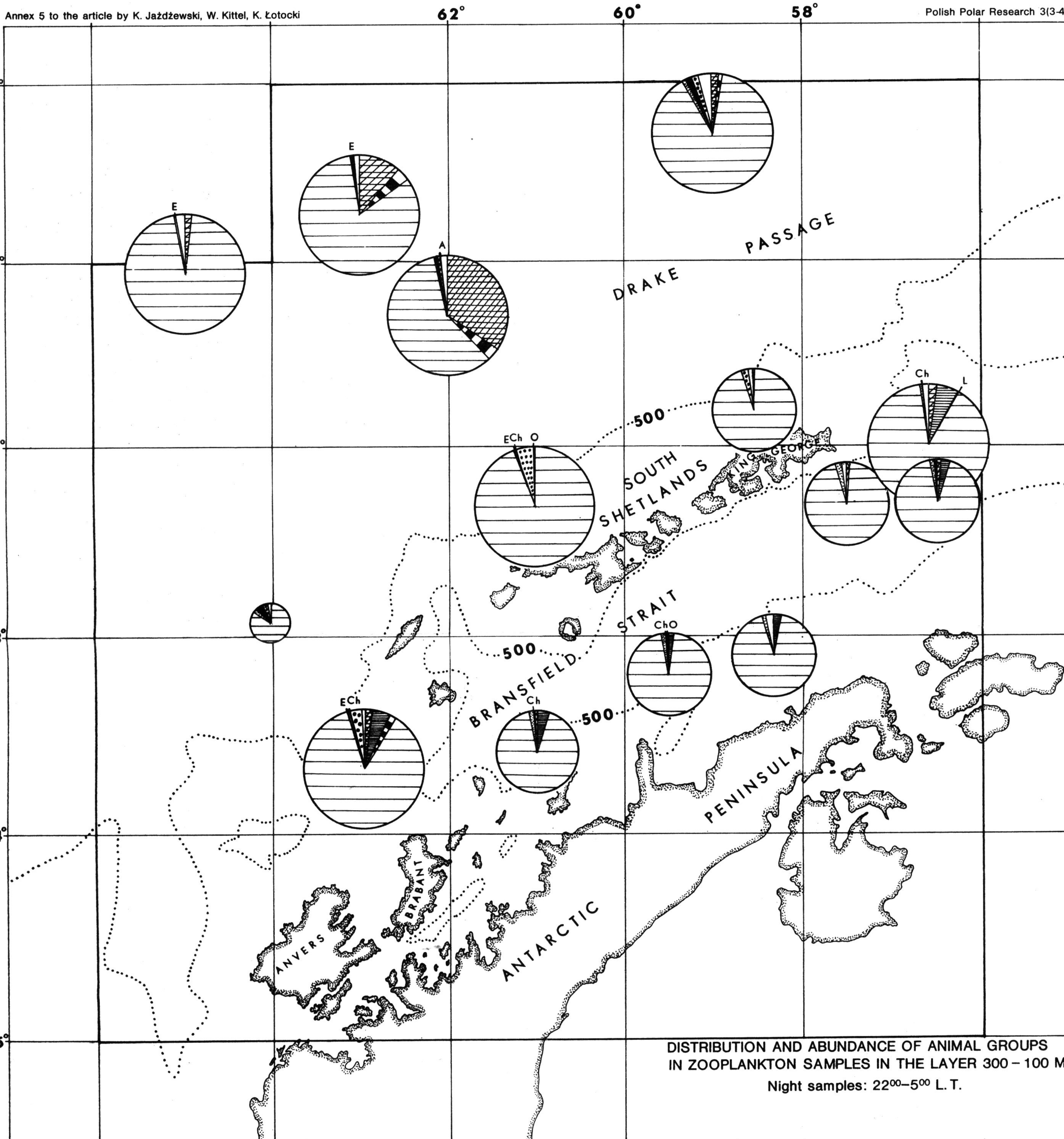
Fig. 8. Distribution and abundance of animal groups in zooplankton samples in the layer 300—100 m. Day samples: 11 —18 L. T.
Legend as in fig. 5.



Warsaw PWN 1982

Fig. 9. Distribution and abundance of animal groups in zooplankton samples in the layer 300—100 m. Night samples: 22 —5 L. T.
Legend as in fig. 5.

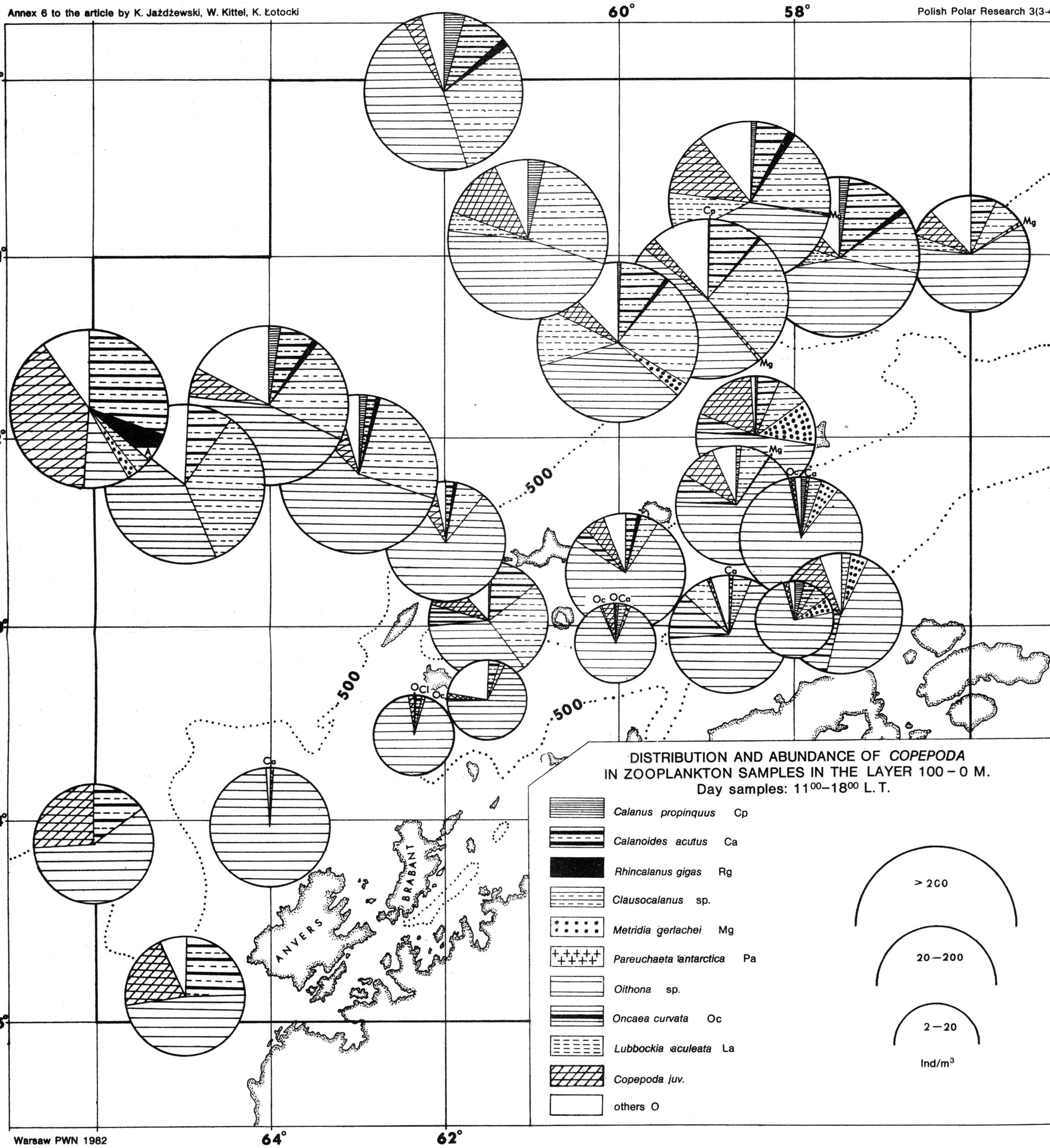


Fig. 10. Distribution and abundance of *Copepoda* in zooplankton samples in the layer 100—0 m Day samples: 11 —18 L. T.

Annex 7 to the article by K. Jażdżewski, W. Kittel, K. Łotocki
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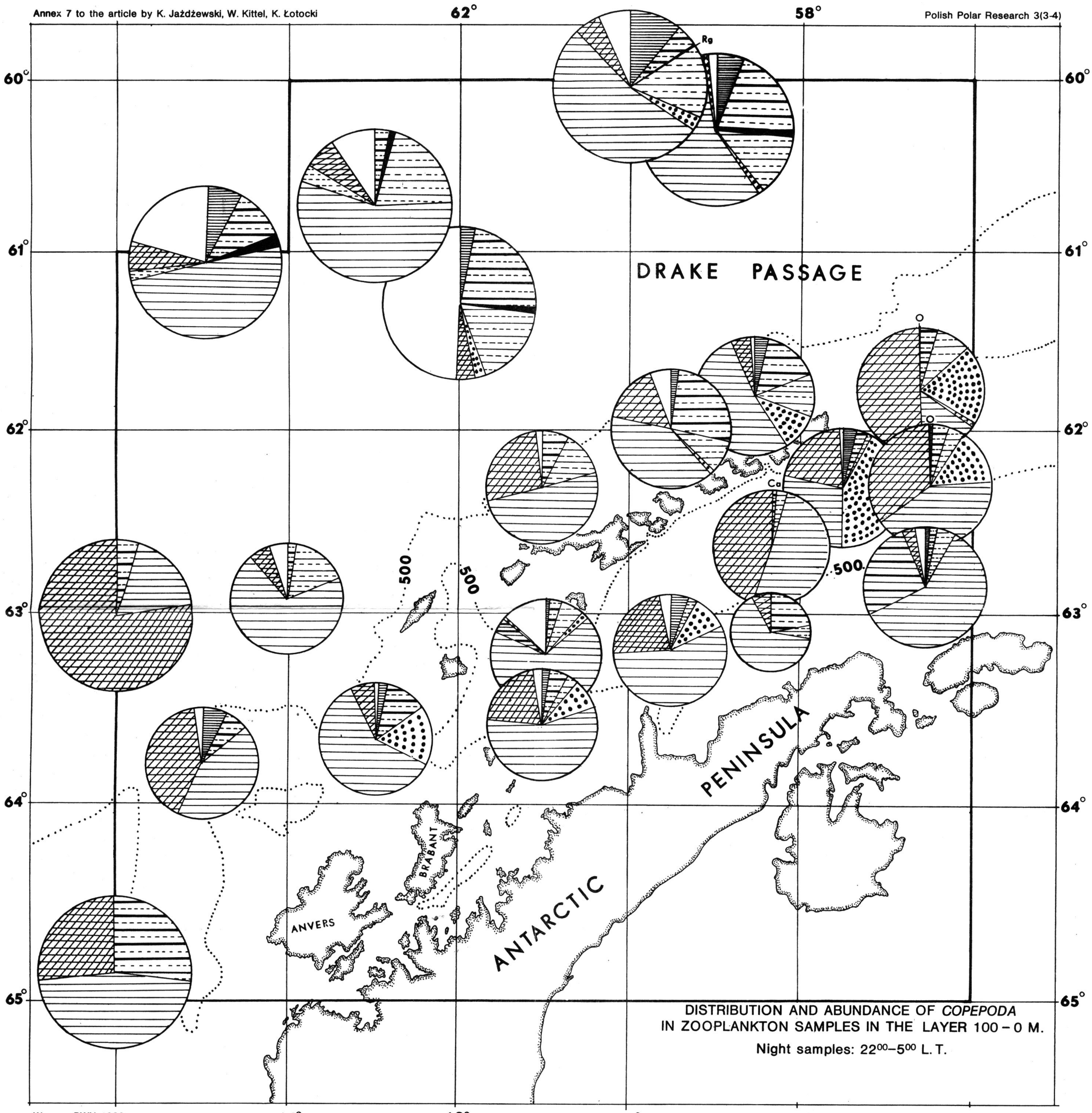
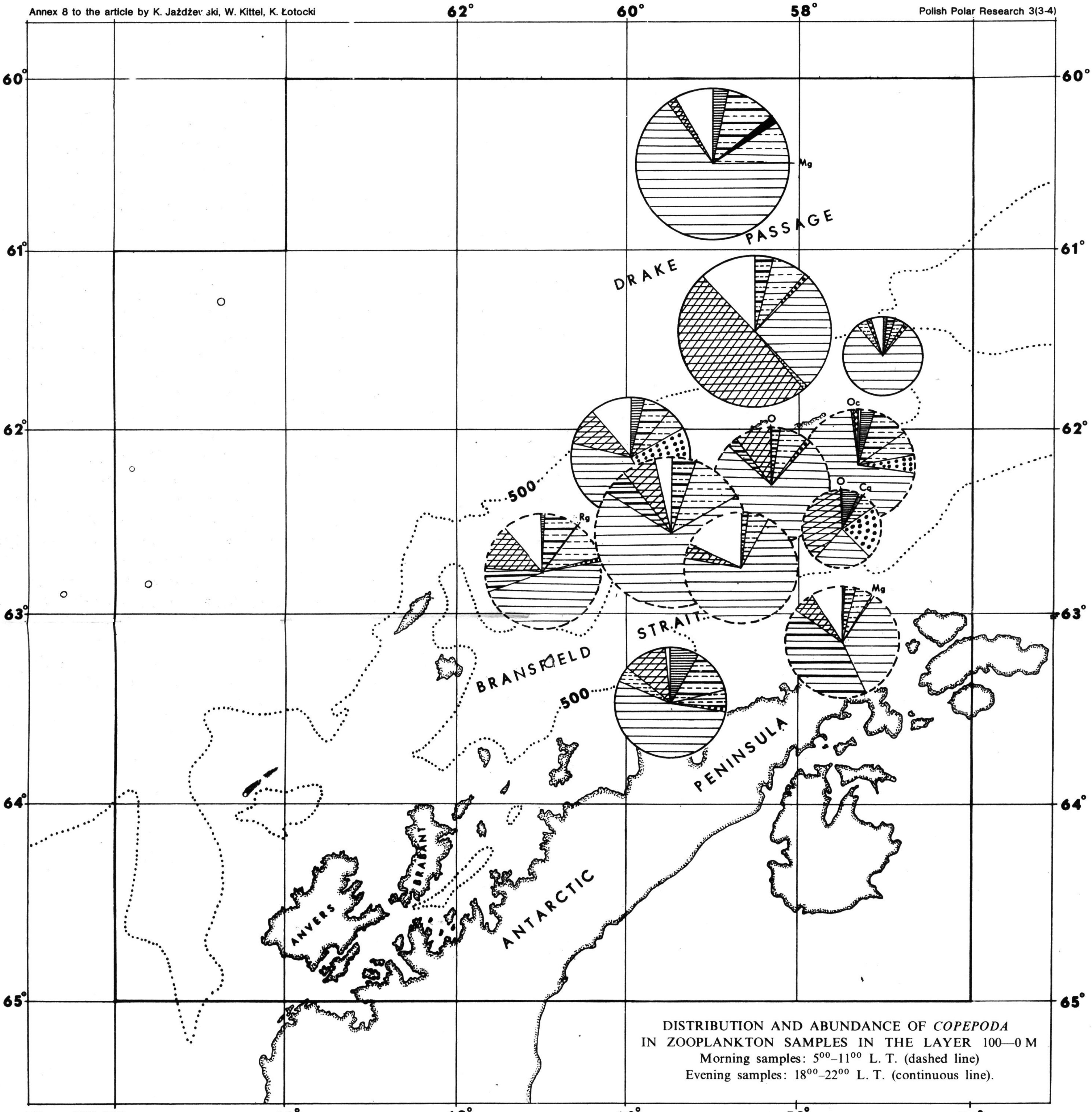


Warsaw PWN 1982

Fig. 11. Distribution and abundance of *Copepoda* in zooplankton samples in the layer 100—0 m. Night samples: 22^{00}—5^{00} L. T.
Legend as in fig. 10.



Warsaw PWN 1982

Fig. 12. Distribution and abundance of *Copepoda* in zooplankton samples in the layer 100—0 m. Morning samples: 5—11 L. T. (dashed line) evening samples: 18—22 L. T. (continuous line). Legend as in Fig. 10.

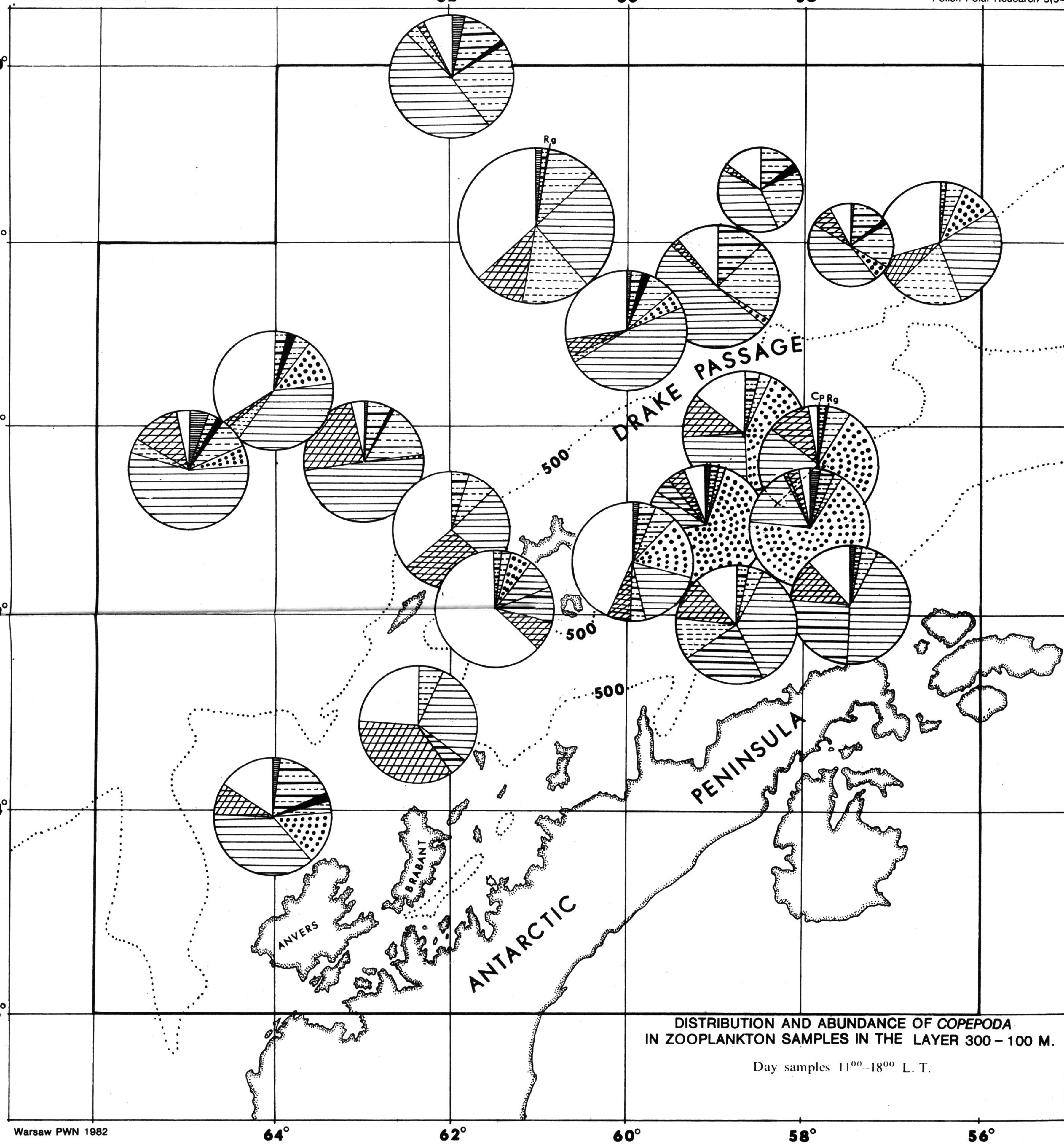


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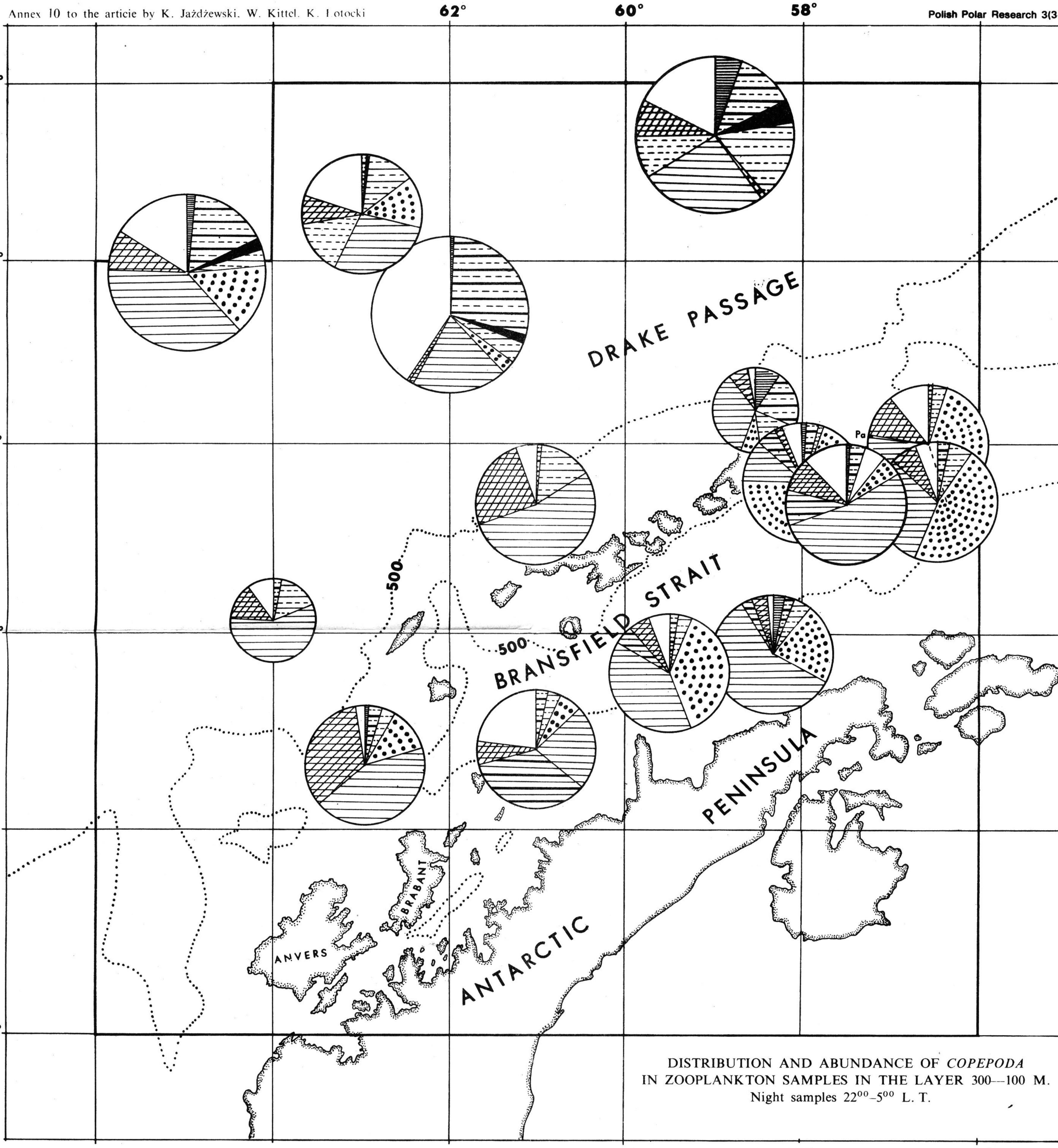
Fig. 13. Distribution and abundance of *Copepoda* in zooplankton samples in the layer 300—100 m, Day samples 11—18 L. T. Legend as in fig. 10.



Warsaw PWN 1982

Fig. 14. Distribution and abundance of *Copepoda* in zooplankton samples in the layer 300—100 m. Night samples: 22—5 L. T. Legend as in fig. 10.