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THE EUPHAUSIID SPECIES OF THE ANTARCTIC REGION

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ABSTRACT

Morphology of 5 Antarctic euphausiid species is presented with notes on the biology of reproduction, larval development and ecology of the most important species, *Euphausia superba*, and on the distribution of other ones. Methods of the populational investigations of *E. superba* are discussed.

1. INTRODUCTION

Despite the small species diversity (about 85 species only) Euphausiacea are very important components of the marine ecosystems. The biomass of the euphausiids in rich Antarctic region is regarded to be equal to the biomass of the remaining zooplankton species (Knox 1970). Because of their swarming habits some euphausiid species (krill) are or could be of enormous economic importance (El Sayed 1976).

Broad and still increasing information on the morphology, biology and ecology of Antarctic euphausiid species, and mainly of *Euphausia superba* Dana, 1852, is scattered in the vast classical and recent literature (i.e. Rustad 1930, 1934, Fraser 1936, John 1936, Bargmann 1937, 1945, Barkley 1940, Sheard 1953, Baker 1959, Marr 1962, Lomakina 1964, Nemoto 1966, 1967, Mauchline, Fisher 1969, Pavlov 1969, 1971, Shevtsov, Makarov 1969, Makarov et al. 1970, Mackintosh 1972, Makarov 1972, 1976, Voronina 1974, Nemoto et al. 1976, Tomo, Marschoff 1976). Summary of the data available till 1974 is presented in Polish by Wolnomiejski, Porębski (1975).

The aim of this paper is to facilitate the work of future krill investigators, whose number will certainly increase every year, by the presentation of some chosen information mainly on the morphology of Antarctic euphausiids as well as by the indication of simple methods of the biological estimation of their populations. These methods were used during the I-st Polish Antarctic Marine Research Expedition (I P.A.M.R.E.) on boards of the ships: R/V "Profesor Siedlecki" and M/T "Tazar".

In the Antarctic region, understood as an area south of the Antarctic convergence, seven euphausiid species are to be found more or less frequently (Fig. 1). Besides *Euphausia superba*, the species most common, abundant and therefore important from the ecological and commercial points of view, following species should be numered: *Euphausia crystallorophias* Holt et Tattersall, 1906, *E. frigida* Hansen, 1911, *E. triacantha* Holt et Tattersall, 1906, *E. vallentini* Stebbing, 1900, *Thysanoessa macrura* G. O. Sars, 1883 and *T. vicina* Hansen, 1911. Out of these seven species during the cruises of R/V "Profesor Siedlecki" and M/T "Tazar" only 5 species were encountered (excl. *E. crystallorphias* and *E. vallentini)* and these are designed and treated in more detailed way. In Table I the occurrence of four euphausiid species (excl. *E. superba*) in the catches of R/V "Profesor Siedlecki" is presented.

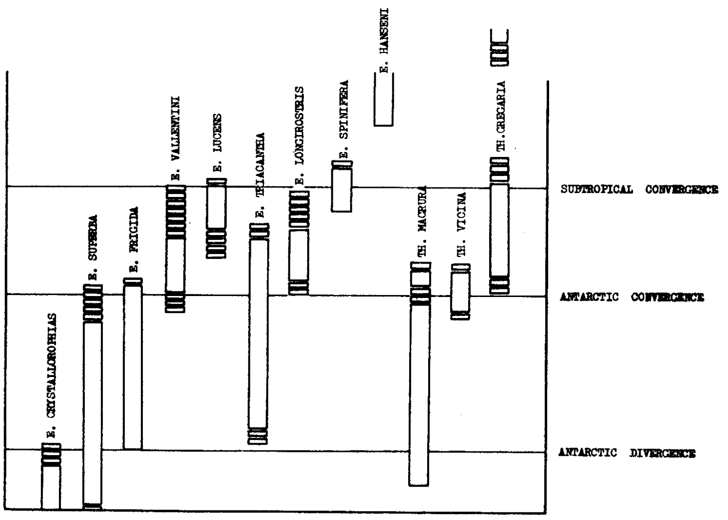

Fig. 1. Ranges of Euphausiacea in the southern Atlantic Ocean (according to John (1936) and Lomakina (1964)

2. SYSTEMATICS AND AFFINITIES OF EUPHAUSIACEA

Main diagnostic characters of the order Euphausiacea Dana, 1852 (proper name should be Euphausiida), separating it from the remaining malacostracan orders, are the lack of the modification of the anterior thoracopoda into maxillipedes as well as the presence of well developed thoracopodial gills (epipodites) which are not covered by the carapace. The first feature, expressing the degree of the cephalization, i.e. integration and specialization of the anterior segments and appendages as

Table I. Euphausiid species (excl. *E. superba*) in the catches of R/V "Profesor Siedlecki"*

Species	No. of station	Geographical position	Date (1976)	Water layer (m)
E. frigida	22	63°10′S , 67°00′W	3 II	0–100
	30	61°32′S , 56°57′W	5 II	0-150
	34	61°30′S , 56°22′W	6 II	150–300
	52	54°03′S , 36°13′W	17 II	100–250
	140	52°53′S , 37°16′W	13 III	100–250
	141	53°06′S , 37°32′W	14 III	100–250
	206	55°15′S , 37°44′W	30 III	0–100
E. tria-cantha	82	53°56′S , 35°32′W	26 II	100–250
	140	52°53′S , 37°16′W	13 III	250–500
	141	53°06′S , 37°32′W	14 III	100–250
	145	53°30′S , 37°05′W	14 III	0–300
	172	53°51′S , 35°47′W	21 III	0–300
	206	55°15′S , 37°44′W	30 III	0–100
Thysano-essa macrura	5	63°36′S , 65°56′W	28 I	0–70
	6	63°44′S , 65°54′W	28 I	0.50
	9	63°54′S , 66°17′W	29 I	0–35
	10	64°08′S , 67°00′W	29 I	100–300
	12a	63°40′S , 65°01′W	30 I	0–200
	13	63°38′S , 65°10′W	30 I	0–50
	14	63°55′S , 65°19′W	30 I	?
	18	64°44′S , 66°00′W	1 II	0–50
	20	63°40′S , 66°00′W	2 II	100–250
	21	63°40′S , 66°58′W	2 II	0–50
	25	64°11′S , 64°19′W	3 II	0–30
	26	63°14′S , 64°24′W	4 II	0–40
	31	61°31′S , 56°55′W	5 II	0–30
	34	61°30′S , 56°22′W	6 II	0–100
	35	61°45′S , 56°00′W	6 II	300–500
	37	61°51′S , 56°27′W	6 II	0–50
	41	62°13′S , 56°03′W	7 II	0–100
	52	54°03′S , 36°13′W	17 II	100–250
	101	57°00′S , 27°27′W	3 III	100–250
	105	57°34′S , 26°13′W	4 III	0–50
	107	58°04′S , 26°03′W	4 III	0-60
	112	60°03′S , 32°43′W	6 III	100–200
	114	60°03′S , 32°41′W	6 III	0–400
	140	52°53′S , 37°16′W	13 III	250–500
	141	53°06′S , 37°32′W	14 III	100–250
	207	55°01′S , 37°23′W	30 III	0–250
T. vicina	87	53°56′S , 36°43′W	27 II	100–180

* *Thysanoessa* sp.—and most probably always *T. macrura*, was registered also in 28 other stations.

well as the presence of the well developed exopodites on thoracopoda indicate that Euphausiacea are of the most primitive Malacostraca. This is confirmed by the fossil evidence. Ancestors of recent euphausiids, family Eocarididae Brooks, 1962, are known begining from the Middle Devonian (Givetian) and are the oldest hitherto known typical Malacostraca. Fossil euphausiids from a close group (suborder Eocaridina Brooks, 1962, transl. herein) occuring in Devonian and Carboniferous systems, are characterized by the full development of all eight pairs of thoracopoda, functioning as walking legs (see Brooks 1962, Schram 1974). This is a basic difference in comparison to the recent exclusively pelagic euphausiids (Euphausiina Dana, 1852, emend. herein) whose thoracopoda are modified forming often a filtratory basket. In these latter the locomotory function is fulfilled by the pleopoda whereas thoracopoda are specialized and often reduced. The classification on the levels of families and genera is based mainly on the degree of the reduction of these appendages. All eight pairs are retained only in the bathypelagic *Bentheuphausia amblyops* G. O. Sars, 1885, separated into distinct family Bentheuphausiidae Colosi, 1917. In the remaining Euphausiina (family Euphausiidae) the last pair of thoracopoda *(Thysanopoda, Meganyctiphanes, Nyctiphanes* and some species of *Thysanoessa*) or two last pairs of are reduced (Fig. 2).

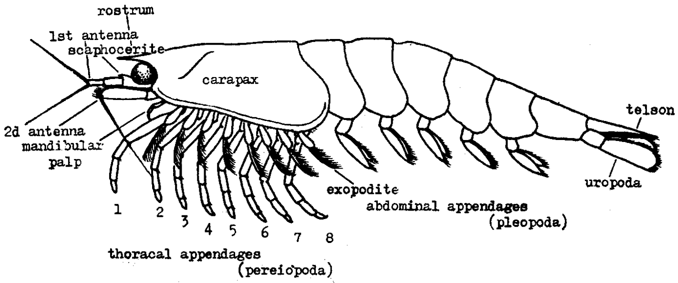

Fig. 2. The generalized euphausiid morphology exemplified by the ancestor of recent Euphausiacea—*Peachella strongi* (Brooks) from the Upper Carboniferous of North America (according to Brooks (1962) and Schram (1974))

3. GENUS *EUPHAUSIA* DANA, 1852

Full reduction of the VII and VIII pairs of thoracopoda and uniformly built remaining pairs forming the filtratory basket distinguish this genus from the other Euphausiidae. Globular eyes allow to separate quickly the *Euphausia* species (Figs. 4, 9, 10) from the Antarctic *Thysanoessa* species of a pear-shaped eyes (Figs. 11, 12). South Atlantic *Euphausia* species are divided into so called *E. superba* group and *E. triacantha* group. These groups differ in the shape of the spines, of the male copulatory organ (petasma) and in the lack or presence of spines on the III—V abdominal segments (John 1936, Lomakina 1964). The species belonging to the *E. superba* group are devoid of abdominal spines and have complex endings of the petasmal spines. One can determine the species of this group basing on the shape of the upper distal projection of the I-st antennular segment called scaphocerite and the shape of rostrum (Fig. 3). In the *E. triacantha* group the species can be distinguished by the morphology of the abdominal tergites III—V and the shape of the scaphocerite (Fig. 3).

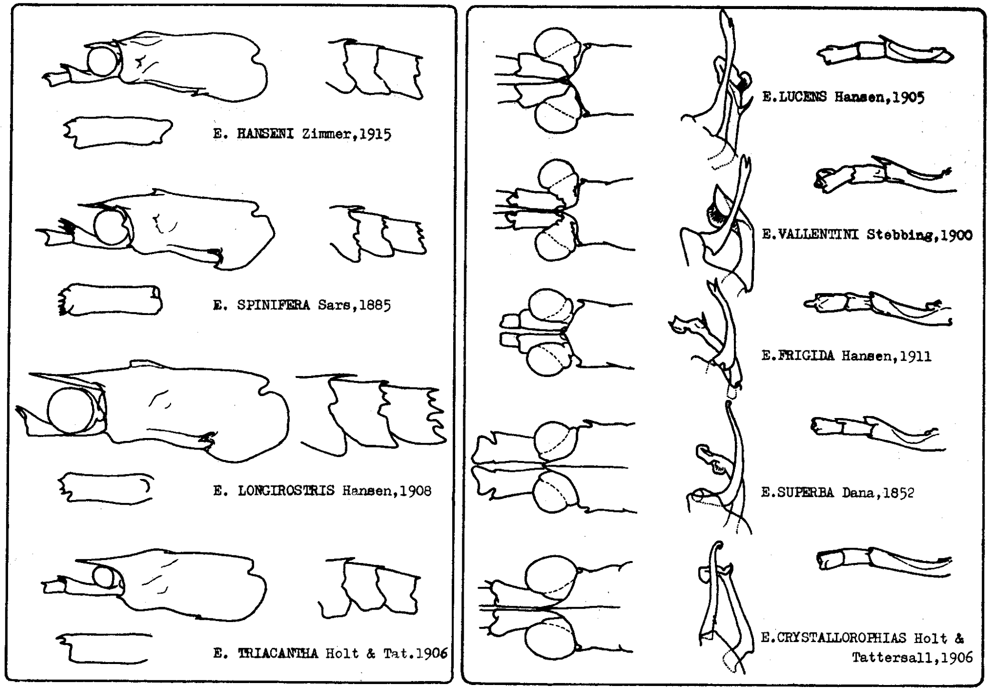

Fig. 3. Diagnostic table of the South Atlantic *Euphausia* species. In the *E. superba* groups (right side) rostrum drawn from above, the antennular peduncle from the side and the morphology of petasmal spines are presented. In the *E. triacantha* group (left side) there is designed the shape of cephalothorax, I-st antennule segment and abdominal segments III—V (from the side) as well as the I-st antennule segment from above (mostly according to John 1936)

Euphausia superba Dana, 1852

Characteristic and easy to observed diagnostic features of this species are: large and convex scaphocerite (larger in males than in females), the shape of the anterior lobes of the I-st abdominal segment embracing the cephalothorax, slender distal segment of the mandibular palp (length/width proportion amounting from 7 to 9) as well as the shape of spines of the petasma (Figs. 3 and 4).

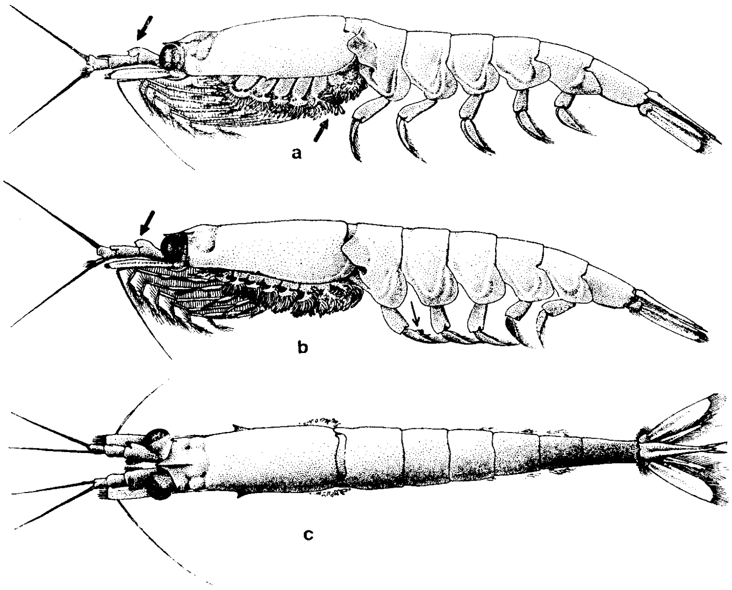

Fig. 4. *Euphausia superba* Dana. a—adult female; b, c—adult male from the side and from above. Arrows indicate the position of the thelycum (with 2 spermatophores), the petasma and scaphocerite

E. superba is the largest Antarctic euphausiid species; when measured from the tip of telson to the anterior eye margin (that means nearly the same as to the tip of rostrum) it can attain nearly 70 mm in length. *E. superba*, occurs as a rule in swarms whose basic vertical distribution range, at least in the Antarctic summer, lies between 0 and 100 m, sometimes deeper. This euphaussid species was encountered in waters of the temperature not higher than 4°C. Various authors consider the swarming habits of *E. superba* as being connected with different factors, most often, however, with light intensity and feeding activity. Pavlov (1969) suggested that with this last factor a diurnal cycle of vertical migration of *E. superba* is correlated. Krill swarms are formed, according to his theory, when feeding stops and animals descend deeper, whereas actively feeding euphausiids are more or less dispersed near the surface. Single specimens swim in the oblique position with the cephalothorax directed upwards, incessantly beating with their locomotory pleopoda. When frightened they can use their tail fin (telson + uropoda) for quick backward jump. The water is filtered in the filtratory basket formed by the endopodites of thoracopoda densely fringed with long feathered setae. The density of these setae and o ftheir hairs diminshes distally. The distance between setae on ischium is about 40—60 μm and on propus — about 100—135 μm. The distance between the hairs on the former is about 4—5 μm and on the latter about 20—25 μm. Respective numbers given by Barkley (1940) are 7 and 35 μm.

Food of *E. superba* consists mainly of diatoms but there exist some not yet proved hypotheses that in winter season animal plankton and detritus can play a significant role in its diet.

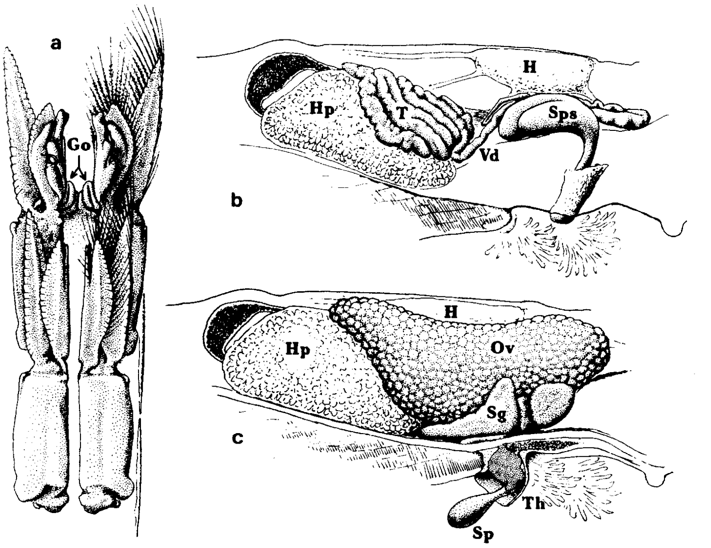

Fig. 5. ***Euphausia superba*** **Dana.** a—ventral view of male pleopoda I and II directed forwards and their position towards the male genital openings; b—schematic view of the male reproductive system; c—schematic view of the female reproductive system. H—heart, Hp—hepatopancreas, T—testis, Vd—vas deferens, Sps—spermatophore sac, Ov—ovarium, Th—thelycum, Sp—spermatophore, Sg—shell gland, Go—genital opening

While swimming the flagella of the *E. superba* antennule are set apart and directed anteriorly whereas antennal flagellum is directed obliquely backwards (Fig. 4). On the eye stalks and on the base of II-nd thoracopoda and at the base of gills on the VII-th thoracic segment there are 3 pairs of red luminous organs (photophores); four single photophores are located on the sternites of the abdominal segments I—IV, therefore the total number is 10. In darkness the photophores emanite greenish light.

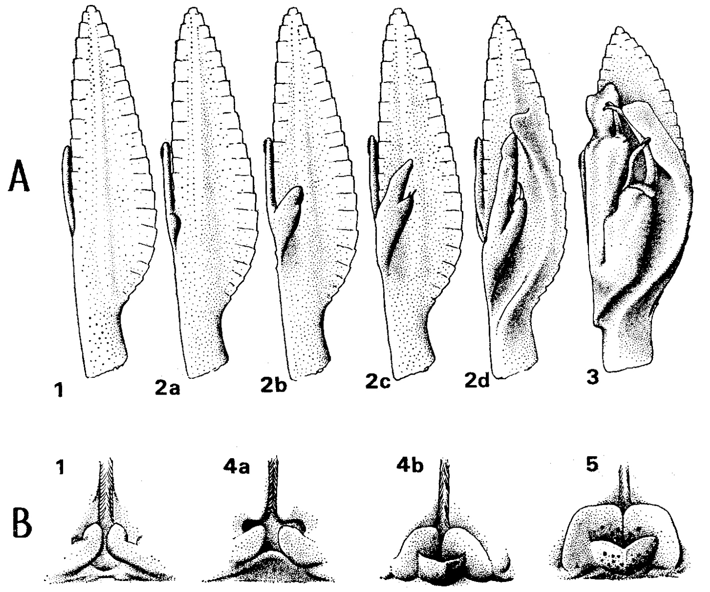

Fig. 6. *Euphausia superba* Dana—the development of copulatory organs. A—of the petasma on the endopodite of the male pleopoda I, seen from behind; B—of the thelycum on the female VI-th thoracic sternite, ventral view

Sexes can be distinguished using copulatory organs — thelycum in females and petasma in males (Figs. 4, 5 and 6). In fresh material the gonads can be seen through the thin cuticule. Testis, a bilobed gonad of a somewhat horseshoe shape, is situated between the heart and the hepatopancreas and during the development it embraces the hind dorsal surface of the latter (Bargmann 1937). Flask shaped spermatophores are formed in two spermatophore sacs, terminating the paired vasa deferentia. Spermatophore sacs open with two external genital apertures on the VIII-th thoracal sternite (Fig. 5b). Ovary, also of a narrow horseshoe shape, develops similarly between the heart and the hepatopancreas, filling all this space during the development, extending when ripe even into the first abdominal segment (Fig. 5c). Strong extension of the cephalothorax and of the I-st abdominal segment allows to recognize the ovigerous (gravid) female. The weight and volume of the ripe ovary can attain nearly 50% of the female's weight and volume (Jażdżewski et al. 1978). The number of eggs in the ovary on an average amounts to several thousands reaching 13,500 (Jażdżewski et al. 1978) or even above 14,000 (Nemoto et al. 1976). Two oviducts, running through the shell glands, open on the VI-th thoracal sternite. In this place the female's copulatory organ, thelycum, is formed. The development of the thelycum begins in the females of the length of about 30—32 mm as the earliest (similarly the buds of petasma) (Fig. 6). The place of the future thelycum in the earliest stage when sex determination is possible differs from the respective place on male VI-th thoracic sternite in the presence of a small ledge joining coxae. Thelycum of the adult female is red.

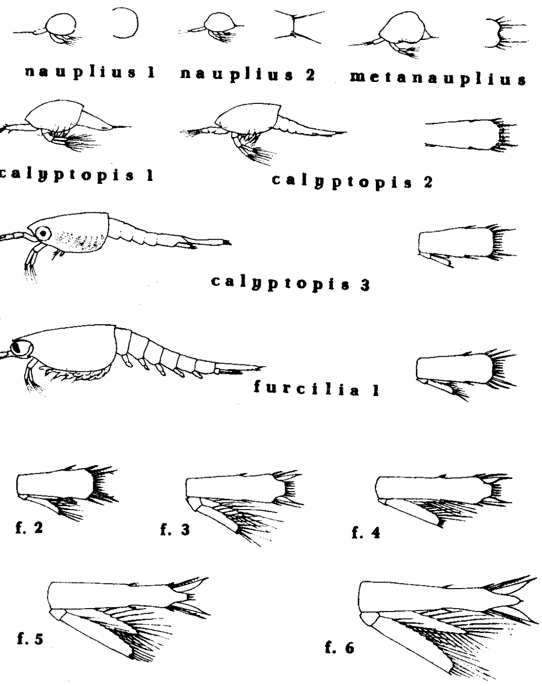

Fig. 7. Larval stages of *Euphausia superba* Dana according to Fraser (1936)

Judging from the length of the I-st and II-nd male pleopoda bearing copulatory organs and from the position of male genital openings the spermatophores are probably taken from the openings by the second pleopoda, whose endopodites are modified into the copulatory organ directed dorsally and thereafter the spermatophores are taken over by the first pleopoda, with their copulatory organ — petasma which is oriented ventrally. During the copulation petasma fix the spermatophores into the thelycum of the female. The spermatophores adhere to the thelycum by the cement substance. The sperm penetrates then into the cavity of the thelycum. Generally, two spermatophores affixed to the thelycum are observed but very often 4 were encountered and Bargmann (1937) noted even the presence of 7 ones. The female lays eggs some time after the copulation and only then the fertilization takes place. Empty spermatophores are retained on the thelycum of the spent female.

Spawning period lasts from November till April. Eggs are laid directly to the water. The diameter of the free egg is about 660 μm. Larval development of *E. superba* is broadly treated in the paper by Fraser (1936) (Fig. 7). From the egg the nauplius 1 hatches. Its length amounts to about 620 μm. Next stages are nauplius 2 and metanauplius (length about 670 μm and 1 mm, respectively). Three successive calyptopis stages differ in the degree of the segmentation of the abdomen and the development of uropoda. Average lengths of the three calyptopis stages are following: 1.75, 2.7 and 4.0 mm, respectively. Beginning from the formation of the pleopoda 6 successive furcilia stages are recognized, differing in the number of telsonic spines. Average lengths of these six furcilia stages are according to Fraser (1936) 5.3, 6.2, 7.3, 8.0, 9.5 and 11.3 mm, respectively.

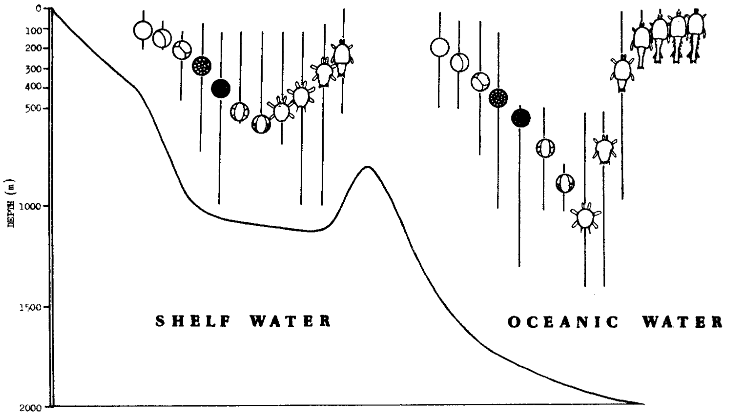

Fig. 8. Vertical distribution of the larval stages of *E. superba*. Perpendicular lines show the total range registered; schematical picture of the stage is placed in the depth of its most common occurrence (according to Marr 1962)

The eggs and larvae of *E. superba* were encountered each in the rather wide depth span. According to Marr (1962) however, one can observe some regularities suggesting that the eggs are released in the upper water layers. Embryos develop when sinking and naupliar stages began to return actively to the surface (Fig. 8). Voronina (1974) supposes that the successful returning of larvae to the trophogenic surface layers is possible only there where the layer of the dense bottom water, preventing further sinking of embryos, is located not deeper than 1800 m.

There are different opinions concerning the life span of *E. superba*. It is usually estimated as lasting 2.5 to 3 years. Highly possible hypothesis that at least part of the stock can breed twice, in the second and third years of life is supported by the last work of Makarov (1975).

Euphausia frigida Hansen, 1911

E. frigida differs from the other Antarctic species of the *E. superba* group in its small scaphocerite with a nearly straight anterior margin and in the short rostrum (Figs. 3, 9). Distal segment of the mandibular palp is short and wide (length/width proprtion 2.5—3.0). Body pigmentation is weak. Adults attain 20 mm in length. *E. frigida* does not form swarms; it occurs deeper than *E. superba*, usually below 100 m and often is caught in common with *E. triacantha*. Calyptopis larvae of *E. frigida* differ from those of *E. superba* in their more convex carapace and smaller size. Egg diameter about 470 µm.

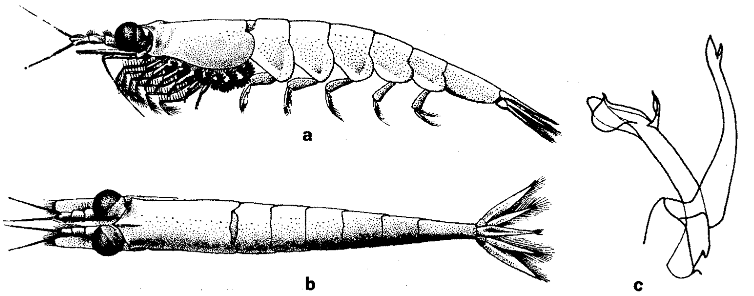

Fig. 9. ***Euphausia frigida*** Hansen, male: a—from the side; b—from above; c—spines of the petasma

Euphausia triacantha Holt et Tattersall, 1906

E. triacantha is characterized by the presence of medial spines on the abdominal tergites III—V (feature of the *E. triacantha* group) and by the small scaphocerite produced in two spines (Figs. 3 and 10). Distal segment of the mandibular palp is short and wide (length/width proportion about 2.5). In fresh material this species is easy to recognize due to the carmine colour of the mouthparts and proximal setae on the first thoracopoda. Adults attain the length of about 35 mm. *E. triacantha* also does not form swarms. It occurs in the depths down to 750 m. Baker (1959) has noted vertical migrations of this species which was found in the day time in the layer 250—500 m and at night — 50—100 m. Main distributional range of *E. triacantha* is connected with the Antarctic convergence, comprising the belt from some 150 miles North to some 200 miles South of this zone. Living in these water masses

E. triacantha experiences the temperatures from 2 to 12°C. Spawning was noted in October and November, life cycle lasts 2 years. Carapace hind margin of the calyptopis stage is armed with a medial spine.

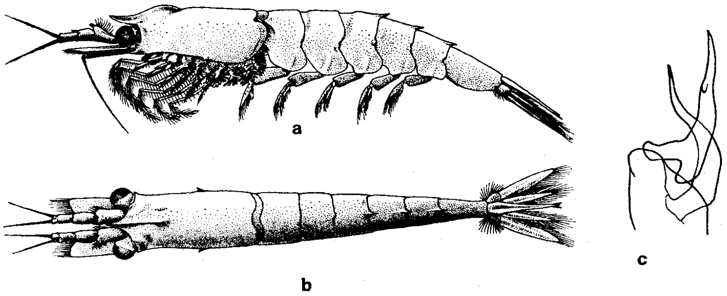

Fig. 10. *Euphausia triacantha* Holt et Tattersall, male. a—from the side; b—from above; c—spines of the petasma

4. GENUS *THYSANOESSA* BRANDT, 1851

Antarctic species of this genus differ from the *Euphausia* species in the pear shaped eyes and in long and rather strong raptorial II pair of thoracopoda (predatory species). In the Antarctic region occur two closely related *Thysanoessa* species, differing in the morphology of the petasmal spines.

Thysanoessa macrura G. O. Sars, 1883

This species differs from the second one, *T. vicina*, in having acute tip of one of two petasmal spines. The second difference, a bit less certain, lies in the length of the antennular flagella. In *T. macrura* the

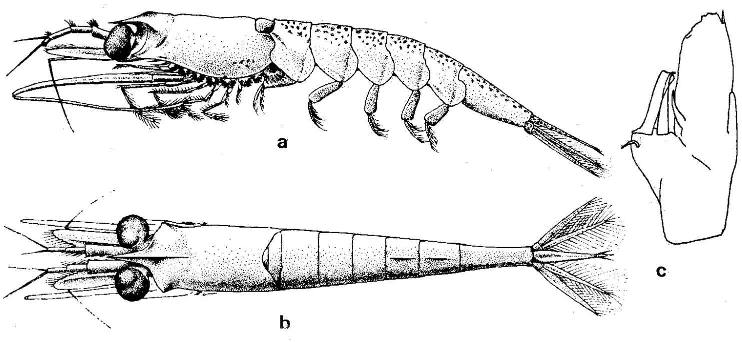

Fig. 11. *Thysanoëssa macrura* G.O. Sars, male: a—from the side; b—from above; c—petasma

upper flagellum is shorter than the lower one whereas in *T. vicina* both flagella are approximatively equal (Fig. 11). The II-nd thoracopoda are longer in *T. macrura* than in *T. vicina*. Adult males of *T. macrura* attain 30 mm in length.

T. macrura has swarming habits and along with *E. superba* and a hyperiid amphipod, *Parathemisto gaudichaudi* (Guérin) it belongs to the most common Antarctic macroplanktonic crustaceans. In catches *T. macrura* accompanies very often *E. superba*, it seems however that the swarms of both species are not mixed. Monospecific swarms of *T. macrura* were observed by Japanese expeditions (Nemoto et al. 1976). Furciliae of *Thysanoessa* spp., often found in planktonic samples, are alsod easy to distinguish from the *Euphausia* furciliae by the shape of their eyes.

Thysanoessa vicina Hansen, 1911

Both spines of the petasma in *T. vicina* are bluntly cut. Antennular flagella are long and more or less of the same length (Fig. 12). Average length of the adult male is about 12 mm. The species occurs rather rarely.

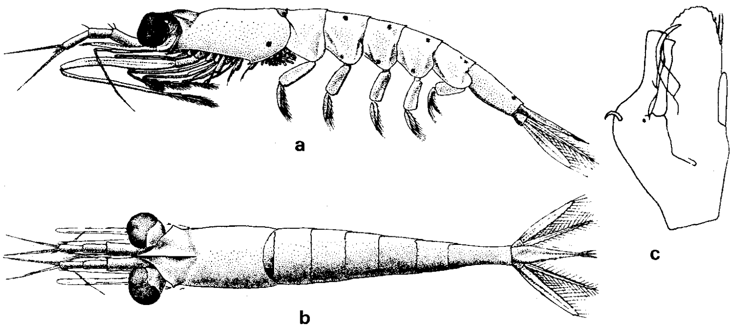

Fig. 12. *Thysanoessa vicina* Hansen, male: a—from the side; b—from above; c - petasma

5. METHODS OF THE DESCRIPTION OF *E. SUPERBA* POPULATIONS USED DURING THE I-ST P.A.M.R.E.

The basis for the investigations of the euphausiid populations were random samples of about 100 specimens taken from the commercial krill trawl hauls. Populations were characterized by the following indices:

1. Size distribution
2. Proportions of sexes in various developmental stages in particular length classes
3. The degree of the intestine filling.

The euphausiids were measured from the tip of telson to the anterior eye margin (that means nearly the same as to the tip of rostrum) under a low magnification of the stereoscopic microscope in the shallow, rectangular scaled plastic vessel, with an accurracy of ±1 mm. Animals were sexed basing only on the morphology of the copulatory organs. Dead euphausiids become opaque very quickly that hinders the sex determination on the base of gonad morphology through the cuticule. Therefore all specimens without any signs of copulatory organs were considered as juveniles. First signs of the thelycum or petasma formation were observed in the animals of the size between 30 and 38 mm, about 35 mm as an average. All male specimens with fully developed and chitinized petasmal spines (Figs. 6 : 3) were regarded as adult, all remaining males — as subadult ones (Figs. 6 : 2a-2d). Since the full development of petasma is necessary for the attainment of the copulatory possibilities (Bargmann 1937) this division into subadult and adult males seems to be proper.

Females with fully red thelycum only were considered as adult ones, remaining female specimens with initial thelycum as well as those with white and slightly reddish thelycum — as subadult females. In the group of adult females the specimens with ripe ovaries and therefore with their carapace and I-st abdominal segment expanded were separated into the class of ovigerous (gravid) females as opposed to the group of non-ovigerous females with more or less slender bodies. This division is not very sharp but in practice we hesitated only rarely when numbering females into these classes. Our final groups were therefore following:

1) juveniles, 2) subadult males, 3) adult males, 4) subadult females, 5) non-ovigerous adult females, 6) ovigerous adult females.

Some authors divide also adult females into the class of specimens with spermatophores on the thelycum (copulated females) and the class of specimens without spermatophores (noncopulated females). This latter group perhaps better corresponds in its age to our group of subadult males.

The results of size measurements and sex and group determination can be presented in various types of diagrams (e.g. Fig. 13). In our work groups 4 and 5 were sometimes treated jointly (Jażdżewski et al. 1978).

In our materials collected in the Bellingshausen Sea, in the Bransfield Strait and in the Scotia Sea in January, February and March 1976 the largest subadult males exceptionally attained even 58 mm, but usually were not larger than 54 mm. The smallest adult male measured 40 mm but generally only males longer than 46 mm had fully chitinized petasma. Females with not ripe thelycum only exceptionally reached the length of 54 mm, generally the animals of that group were not longer than 48 mm. The smallest gravid female was 42 mm in length but usually this class began from the length of 46 mm upwards. The largest male registered was 62 mm in length, the largest female — 66 mm.

An attempt to evaluate the degree of the intestine filling with faeces as an indicator of the feeding activity was undertaken, basing on the paper by Pavlov (1969). The intestine sector between the hepatopancreas and the end of the cephalothorax was divided into two parts approximatively equal to the abdominal, segmental sectors of the intestine, obtaining in this way eight conventional sectors. The lack of faeces in the intestine was denoted as 0, one intestine sector filled with faecal mass — 1 and so on; full intestine filling — as 8. The results of that kind of work obtained during the I-st P.A.M.R.E. were not clear, not indicating a regular rhythm of feeding; we have observed only that in general the highest filling of intestine occurred in the morning. We suppose, however, that not the method but the material was not good enough. Therefore the results were certainly deformed. Probably such a method will be proper for the material coming from the another type of gear.

Other methods for biological characteristics of *E. superba* populations, for instance length /weight, length/ volume relationships, eggs counting etc. are discussed in the paper by Jażdżewski et al. (1978).

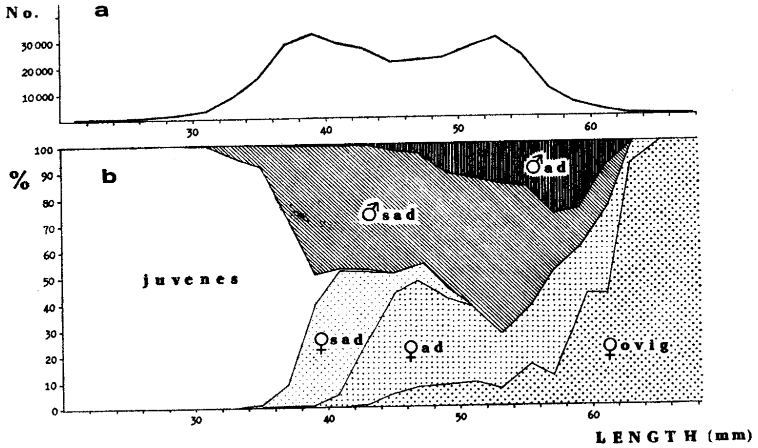

Fig. 13. a. Size-frequency distribution calculated for the total haul of *E. superba* from the Bellingshausen sea. b. Percent proportions of ontogenetic stages and sexes in particular length classes in the total sample of *E. superba* from the Bellingshausen Sea (January—Frebruary 1976). Specimen numbers were calculated from samples of 100 specimens and the weight of particular hauls

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6. SUMMARY

In this paper the basic information on systematics and morphology of the Antarctic euphausiids is presented (Figs. 2—6 and 9—12). The morphology and some elements of the biology and ecology of *Euphausia superba* are treated in more detailed way (Figs. 4—8). New data concerning the occurrence of Antarctic Euphausiacea are presented (Tab. I) as well as the methods of the populational studies on *E. superba* used during the I-st Polish Antarctic Marine Research Expedition.

7. STRESZCZENIE

W pracy przedstawiono podstawowe informacje dotyczące systematyki i morfologii antarktycznych gatunków Euphausiacea (Rys. 2—6 i 9—12). Najobszerniej omówiono morfologię oraz pewne elementy biologii i ekologii gatunku *Euphausia superba* (Rys. 4—8). Przedstawiono nowe dane dotyczące występowania antarktycznych gatunków eufauzji (Tab. I) oraz metody badania populacji *E. superba*, zastosowane podczas I Polskiej Antarktycznej Morskiej Ekspedycji Badawczej.

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