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Louis S. Kornicker, Editor

Antarctic Siphonophores From Plankton Samples of the United States Antarctic Research Program:

Eltanin Cruises for Spring, Summer, Fall, and Winter (Cruises 3-5, 8-23, 25-28, 30, 35, and 38)

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ABSTRACT

The distribution of Siphonophora of the Antarctic, Subantarctic, and adjacent regions of the Pacific and Atlantic Oceans is described. Specimens for this study were obtained during the United States Antarctic Research Program from USNS *Eltanin* cruises 3-5, 8-23, 25-28, 35, and 38 during spring, summer, fall, and winter. Samples were collected from 1962 to 1969, using open-closing and nonclosing plankton nets. Information is compiled on horizontal distributions of siphonophores in the South Atlantic Ocean west of 0^{o}. Illustrations of the species, and maps of distribution at the three bathymetric levels, are also included. In addition, data on *Eltanin* cruise 30 are presented, covering mainly the Pacific tropical region during the summer, with some stations below the equator (austral winter). Vertical distributions of each species are discussed for the three bathymetric zones: epipelagic (200-0 m), mesopelagic (1000-200 m), and bathypelagic (below 1000 m). Life stages and seasonal variations are also considered. Eighty species of Siphonophora were identified in these collections. Among these, and described elsewhere, were five new species: *Lensia eltanin, L. eugenioi, L. landrumae, Heteropyramis alcala,* and *Thalassophyes ferrarii.* The eudoxid stages of *L. lelouveteau* and *L. reticulata* were also discovered. In addition, the following rare Siphonophora species were collected: *Halistemma cupulifera, Desmophyes annectens, Lilyopsis rosea, Eudoxia macra, Lensia achilles, L. baryi, L. exeter, L. grimaldii, L. hostile, Nectocarmen antonioi,* and *Clausophyes galeata.* The most common species of the Antarctic-Subantarctic region during the four seasons was *Dimophyes arctica.* The eudoxid stages of *Chelophyes appendiculata, Diphyes dispar, Diphyopsis mitra, Clausophyes ovata,* and *Heteropyramis maculata* were abundant.

Al brillar un relámpago nacemos
y aún dura su fulgor cuando morimos
¡Tan corto es el vivir!
La gloria y el amor tras que corremos
sombras de un sueño son que perseguimos
¡Despertar es morir!

Gustavo Adolfo Becquer
(Spanish poet, 1836-1870)

INTRODUCTION

Siphonophores are not numerically abundant zooplankters in the plankton collections, but citations are important ecologically owing to their predatory nature. The free-swimming species follow the vertical migrations of their zooplankton prey. The biomass of siphonophores has been studied in the region between New York and Bermuda, where displacement volumes were calculated between 0.9 and 17.7% of the total epizooplankton [Grice and Hart, 1962]. Deevey [1971] and Deevey and Brooks [1971] found dry weight and displacement volume percentages of siphonophores in the Sargasso Sea of 8.1 and 17.7%, respectively.

Most siphonophore swimming behavior and speed permit siphonophores to avoid capture by plankton nets [Biggs, 1977]. The result is patchiness, irregular aggregations, scattered distribution, as well as scanty and disperse presence in the plankton collections [Alvariño, 1981a, 1983; Biggs et al., 1981; Hamner et al., 1975; Sears, 1953].

Few studies have been conducted on the distribution of Antarctic Siphonophora; these include the works by Moser [1925], Mackintosh [1934], Hardy and Gunther [1935], Leloup [1938], and Kramp [1949]. Other studies covering the Subantarctic and adjacent regions pertinent to this report are the ones by Leloup and Hentschel [1935-1938] and Alvariño [1971, 1981a].

The objective of this project was to identify the Siphonophora collected with plankton nets during the USNS *Eltanin* cruises 3-5, 8-23, 25-28, 35, and 38, reporting on species composition and vertical distribution and on abundance. These cruises covered the spring, summer, fall, and winter seasons of the years 1962 to 1969. Areas sampled were the Antarctic and Subantarctic waters in the South Pacific and South Atlantic as well as the Tasman Sea. The geographical distribution of each species is described in relation to the three bathymetric zones. Variations in abundance or distribution of life stages, where applicable, are also noted.

Distributional maps of the South Atlantic west of 0° were completed from *Eltanin* data, plus a map showing the locations of Siphonophora according to previous reports from the region (see Map B1) [Alvariño, 1968a, 1971, 1980c, 1981a; Cervigón, 1961; Chun, 1892, 1897; Haeckel, 1888; Hardy and Gunther, 1935; Keferstein and Ehlers, 1861; Kramp, 1949; Leloup, 1932, 1934, 1937, 1955; Leloup and Hentschel, 1935-1938; Mackintosh, 1934; Margulis, 1972, 1974, 1976; Moser, 1925; Sears, 1952, 1953; Seguin, 1965; Totton, 1941, 1954]. Data for the South Pacific appear in the work by Alvariño [1971]. A distribution list of species for *Eltanin* cruise 30 is also included. This cruise covered mainly the tropical Pacific region during the boreal summer, with some collections obtained for the same period below the equator, corresponding to the austral winter.

MATERIALS AND METHODS

Siphonphore specimens analyzed in this study were obtained from plankton net tows by the USNS *Eltanin* during cruises 3-5, 8-23, 25-28, 35, and 38 during the spring (Appendix Tables A1-A3), summer, fall, and winter seasons (September 23 to December 21, December 22 to March 20, March 21 to June 20, and June 21 to September 22, respectively) of the years 1962 to 1969. The collection of these specimens was sponsored by the United States Antarctic Research Program. Samples from the spring (cruises 10, 15, 20, 25, and most of 21), with the exception of cruise 26, were collected in an area extending from off Chile west to 156°W. Cruise 26 sampled the region of the Tasman Sea. During the summer both the South Atlantic and the South Pacific were sampled. Specimens were collected in the South Atlantic (cruises 12, 22, and part of 11) from 14°32′W west to 66°41′W and south of 50°S. The South Pacific was sampled from the southern coast of Chile west to 147°30′E and as far south as near the Ross Ice Shelf (cruises 16, 27, most of 11, and part of 21). Fall cruises were cruises 3, 8, 17, 18, 28, 38, part of 12, and 13. Winter cruises were cruises 4, 5, 14, 19, 36, and part of 13.

The Lamont Geological Observatory and Texas A & M University collected these plankton samples with open-closing and nonclosing plankton nets. Plankton samples collected at specific depth ranges (100-0, 250-100, 500-250, 1000-500, and 2000-1000 m) using open-closing nets were obtained with the multiple plankton sampler (MPS-S, MPS-M, and MPS-D) and the bathypelagic sampler (BPS-1 and BPS-2) of Lamont Geological Observatory. Plankton samples collected from various depths to the surface were obtained by Texas A & M University with nonclosing nets by making surface (SF), vertical (V), and oblique (OBL) tows. Samples were collected both during the day and at night. The prevailing light conditions were calculated from sunrise and sunset tables [U.S. Navy, 1945], utilizing appropriate corrections for year and southern hemisphere latitudes. All specimens were preserved on board ship in a buffered 5% solution of formalin in seawater. Siphonophores were separated from other plankton at the Smithsonian Oceanographic Sorting Center.

Siphonophores were identified to species level. Pertinent taxonomic literature describing siphonophores from the subtropical, Subantarctic, and Antarctic waters was consulted for identification purposes, including the works by Alvariño [1967a, 1968b, 1981a, 1983, 1985], Bigelow [1911], Sears [1952, 1953], Totton [1941, 1954, 1965], and Totton and Bargmann [1965].

The number of individuals of each species was determined for all samples, except those poorly fixed or preserved. Counting procedures varied with family. For the families Diphyidae, Clausophyidae, and Abylidae both the polygastric and the eudoxid stages were recorded. Numbers of individuals for these life stages for each species were determined from the highest number obtained per sample of either the superior or the inferior nectophore (polygastric stage) and the bract or gonophore (eudoxid stage). For other families of Calycophorae, other methods for determining density were used. For example, for the Hippopodiidae, which nestle in stacks of up to 10-13, as well as for the Cystonectae and Physonectae, the nectophores or bracts indicate only the presence of the species, and for the latter the number of pneumatophores was used to quantify the number. Population density estimates were calculated as the number of individuals per 1000 m^3 of water strained during the haul, for each species or life stage when applicable. These estimates were determined by using the following protocol.

Frequently, two or more bottles were labeled with the same sample number. The procedure for density determination differed for these samples, depending upon the aliquot size of each bottle. An aliquot labeled as "whole" or marked by a dash indicated that the specimens in that bottle had been removed from the complete sample before aliquots were taken. For a bottle marked with a fraction aliquot, such as "1/4 aliquot," the specimens in that bottle were sorted from a quarter aliquot taken from the whole sample. The following calculations were utilized to determine the total number of specimens in a sample divided among two or more bottles.

1. If all bottles were labeled "whole," then the total number of specimens in the sample equaled the sum of all the specimens found in all the bottles.

2. If all bottles were marked as fraction aliquots, then the total number of specimens in the sample (N) was calculated using the following equation:

$$N = \Sigma n_f / \Sigma a$$

where n_f is the number of specimens in each bottle and a is the aliquot size (expressed as a fraction).

3. If a bottle was labeled "whole" and the other bottle or bottles were marked as a fraction aliquot, then the total number of specimens in the sample (N) was calculated using the following equation:

$$N = (\Sigma n_f / \Sigma a) + n_w$$

where n_w is the number of specimens from the bottle marked "whole" and the other symbols are as defined above.

The estimated abundances for each species or life stage were determined incorporating the above data. The following formula was used to calculate the number of individuals per 1000 m^3 of water filtered (N'):

$$N' = 1000N/V$$

where N is the number of individuals in the total sample and V is the volume of water (m^3) filtered during the tow.

For some samples, volume of water filtered was not recorded, and thus density estimates could not be calculated. Species found in these samples were recorded only as being present.

The geographical positions of all stations for the spring, summer, fall, and winter seasons were plotted in distribution maps (Maps A1-A4). Each station included all samples collected at that specific geographical position for that particular season, with no consideration for the depths at which different samples were collected. Then distribution maps illustrating geographical ranges with respect to season and bathymetric position were prepared for most species. The bathymetric range was divided into epipelagic (200-0 m), mesopelagic (1000-200 m), and bathypelagic (>1000 m) strata. A number of vertical and oblique tows were taken from various depths to the surface (300-0, 500-0, 1000-0, 2000-0 m). Since these tows traversed, and thus collected samples from, more than one bathymetric zone, the species data from these samples were not included in the distribution maps but are listed in the distribution table (Table A4). A high percentage of samples was obtained with open-closing nets within the depth range 250-100 m. Since most of the sample was taken in the epipelagic zone (the collection range in the mesopelagic zone extending to only 50 m), data from these samples were included in the epipelagic maps.

Additional station data from published information for the South Atlantic west of 0° are compiled in Map B1. Species distribution related to this information is presented in maps.

Illustrations of Siphonophora, made by the senior author (A.A.), are based on direct observation of the specimens under a stereomicroscope.

Some explanations are included here on the use of main synonyms throughout this work. In the opinion of an anonymous reviewer, *Praya* should be used instead of *Nectodroma*. It should be explained that Blainville [1830] named the genus *Praia* and the species *Praia dubia* Blainville, 1834, which has also been named *Diphyes dubia* Quoy and Gaimard, 1833-1834; *Nectodroma dubia* Bigelow, 1911; and *N. dubia* Moser, 1925. In view of the misspellings, we adopted the generic *Nectodroma* following Bigelow and Moser.

An anonymous reviewer questioned the validity of *Stephanomia*. Our adoption of *Stephanomia* instead of *Nanomia* is based on the fact that the species was first described as *Physophora bijuga* delle Chiaje, 1841; *Anthemodes canariensis* Haeckel, 1869; *A. canariensis* Chun, 1888; *Halistemma picta* Metschnicoff, 1870; *H. picta* Chun, 1888; *Stephanomia canariensis* Metschnicoff, 1874; *Stephanomia picta* Metschnicoff, 1874; etc. The principal published figures are those from Metschnicoff [1870], Claus [1878], and Agassiz and Mayer [1902], for which proper identification is documented. Bigelow [1911] adopted the name *Stephanomia,* which we also follow. Totton [1954] and Totton and Bargmann [1965] changed it to the *Nanomia* synonym. Thus they gave the names *Nanomia bijuga* and *Halistemma rubrum* to two species in which nectophores and other features are closely related. However, *Nanomia cara* nectophores differ widely from those of the so-called *N. bijuga* and *H. rubrum.* Vogt [1852] named *Agalma rubra* the siphonophore that Totton and Bargmann [1965] named *Halistemma rubrum.* In this instance they apparently do not follow the systematic regulations, as Vogt's species was *rubra,* not *rubrum.* In this case following Bigelow [1911], we continue to name the species *Stephanomia bijuga* (delle Chiaje, 1841) and *Stephanomia rubra* (Vogt, 1852).

It was also the opinion of a reviewer that the *Eudoxoides mitra* synonym should be applied to the species here named *Diphyopsis mitra,* but the recommendation was not accepted, for the following reasons. The species was named *Diphyes mitra* by Huxley [1859], *Diphyes gracilis* by Bedot [1896], *Diphyopsis diphoides* by Lens and van Riemsdijk [1908], and *Diphyopsis mitra* by Bigelow [1911]. Totton [1932] named it *Eudoxoides mitra* on the basis, according to his comments, of the fact that Huxley identified the eudoxia of the diphyid. The name should be *Diphyes mitra* or *Diphyopsis mitra,* and we follow the latter, together with Bigelow and others, because it has been the most widely-used synonym.

RESULTS

The following are descriptions of the distribution patterns of the siphonophores from the spring, summer, fall, and winter cruises that were analyzed. Species are listed in taxonomic order. The density terms are as follows: low (1-10 specimens), relatively low (11-100 specimens), moderate (101-1000 specimens), and high (over 1000 specimens per 1000 m^3 of water filtered).

Suborder PHYSONECTAE
Family APOLEMIIDAE

Apolemia uvaria Lesueur, 1811 (Figure 1), has a wide depth distribution and is common in both the Atlantic and the Indian oceans as well as in the Mediterranean Sea [Leloup, 1955]. Specimens have been collected in both warm and cold waters [Fraser, 1961, 1967]. To date, no record of this species exists for the waters south of the Mediterranean Sea [Alvariño, 1971].

In the present study, *A. uvaria* was found in the epipelagic zone off the southwest coast of the Antarctic (Palmer) Peninsula. Relatively low abundances were evident here during the spring (Map A5). This species was also present in the epipelagic zone at 63°04'S, 39°56'W during the summer (Table A4). It was not observed during fall and winter.

Family AGALMIDAE

Agalma elegans (Sars, 1846)

Agalma elegans (Sars, 1846) (Figure 2) is a cosmopolitan species [Alvariño, 1981a] but is most commonly collected in the Atlantic Ocean [Alvariño, 1971]. The southernmost distribution in the Pacific Ocean was found at the Great Barrier Reef [Totton, 1932].

A. elegans was present during the spring and summer. In the spring, moderate numbers were evident in the epipelagic layer at about 36°00'S, 82°42'W. Off Chile, relatively low concentrations were found, probably an extension of northern populations (Map A6). Below 1000 m, low numbers were found at 54°45'S, 123°20'W (Table A4). During summer, a moderate density occurred in the epipelagic zone from 55°00'S to 58°00'S and from 116°40'W to 120°00'W (Map A7). It was not observed during fall and winter. The distribution of *A. elegans* in the South Atlantic west of 0° is presented in Map B2.

Agalma okeni Eschscholtz, 1825

Agalma okeni Eschscholtz, 1825 (Figure 3), is the most abundant species in the family Agalmidae through the world

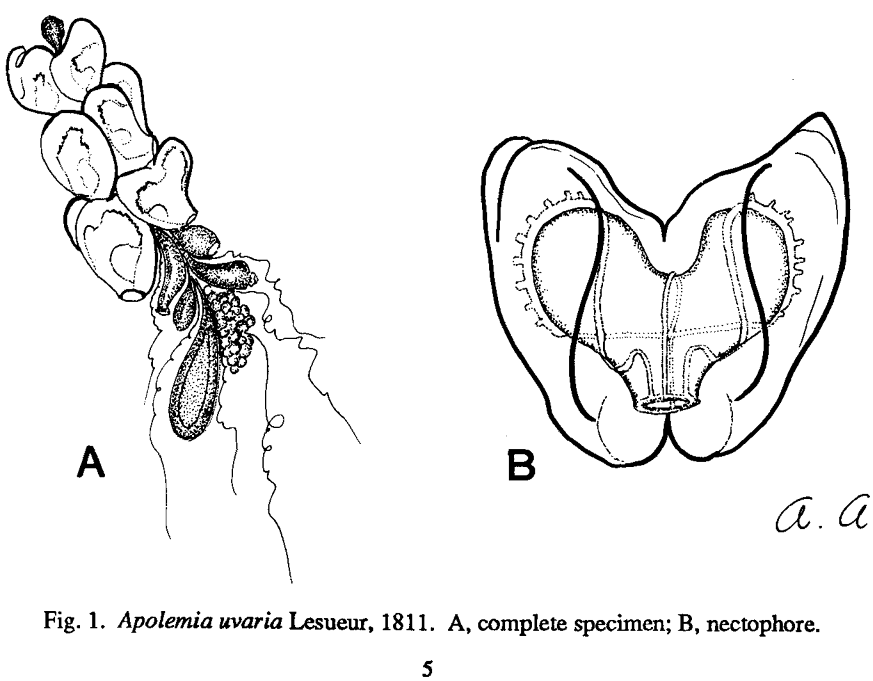


Fig. 1. *Apolemia uvaria* Lesueur, 1811. A, complete specimen; B, nectophore.

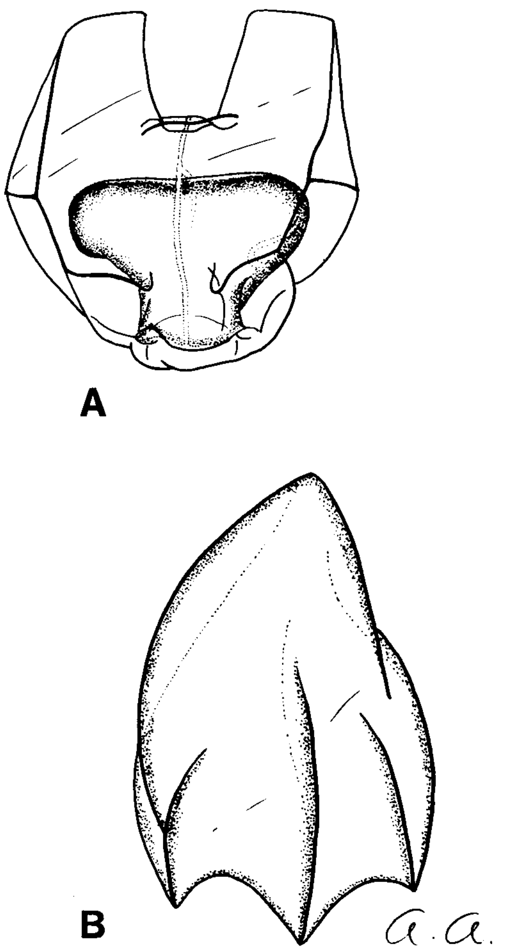


Fig. 2. *Agalma elegans* (Sars, 1846). A, nectophore; B, bract.

oceans, inhabiting warm regions of the Atlantic, Pacific, and Indian oceans [Alvariño, 1971, 1981a]. It is most likely epipelagic [Totton, 1954] but occasionally is found down to 600 m [Bigelow, 1911]. In general, *A. okeni* is found in epipelagic waters from 40°N to 43°S and in the mesopelagic and bathypelagic waters in the central and eastern parts of the tropical-equatorial region [Alvariño, 1971].

A moderate concentration of *A. okeni* occurred off the southwest coast of the Antarctic Peninsula. This distribution was evident only in the epipelagic zone during the spring (Map A8). This is only the second observation of this species south of the Antarctic Convergence. The first was south of the South Sandwich Islands at 61°45′S, 26°50′W [Totton, 1954].

In the South Atlantic *A. okeni* appears widely distributed in the warm and temperate regions (Map B3).

Halistemma cupulifera Lens and van Riemsdijk, 1908

Halistemma cupulifera Lens and van Riemsdijk, 1908 (Figure 4), has been previously observed at 04°25′S, 130°03′E in the New Guinea region at a depth of 2991 m [Lens and van Riemsdijk, 1908]. For this study, *H. cupulifera* was collected only during the spring cruises at epipelagic levels (Map A9) and at mesopelagic depths during summer (Map A10). Moderate densities occurred in the epipelagic zone from 38°00′S to 41°45′S and from 81°45′W to 90°00′W. It was not found in the fall and winter.

Marrus antarcticus Totton, 1954

Marrus antarcticus Totton, 1954 (Figure 5), is typically a southern high-latitude species [Alvariño, 1981a]. Totton

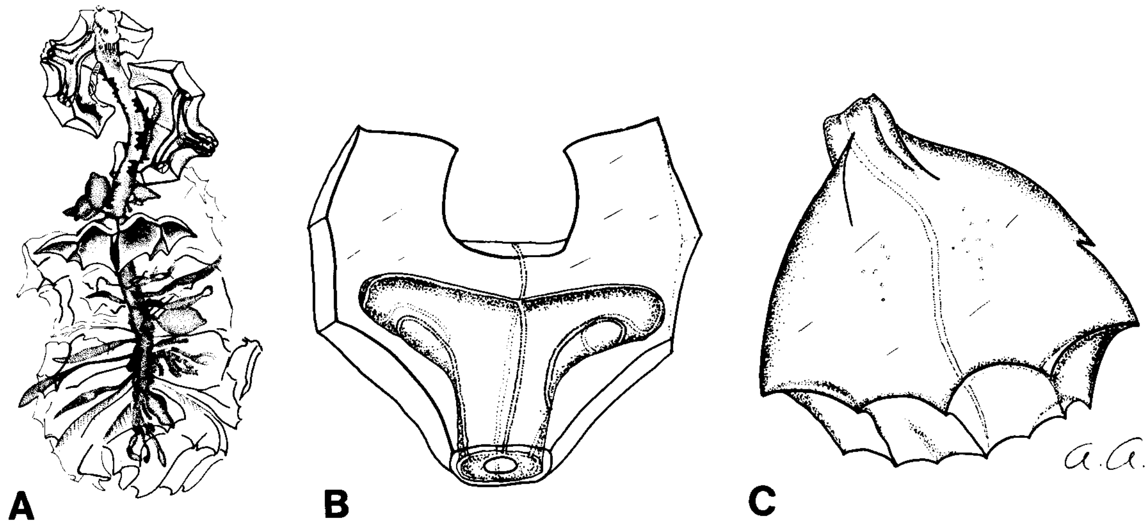


Fig. 3. *Agalma okeni* Eschscholtz, 1825. A, complete animal; B, nectophore; C, bract.

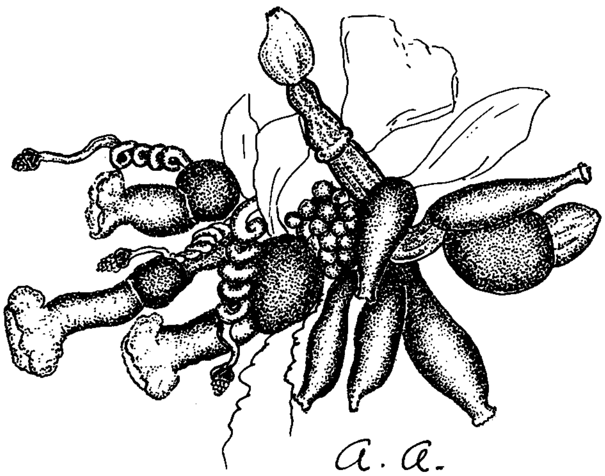


Fig. 4. *Halistemma cupulifera* Lens and van Riemsdijk, 1908.

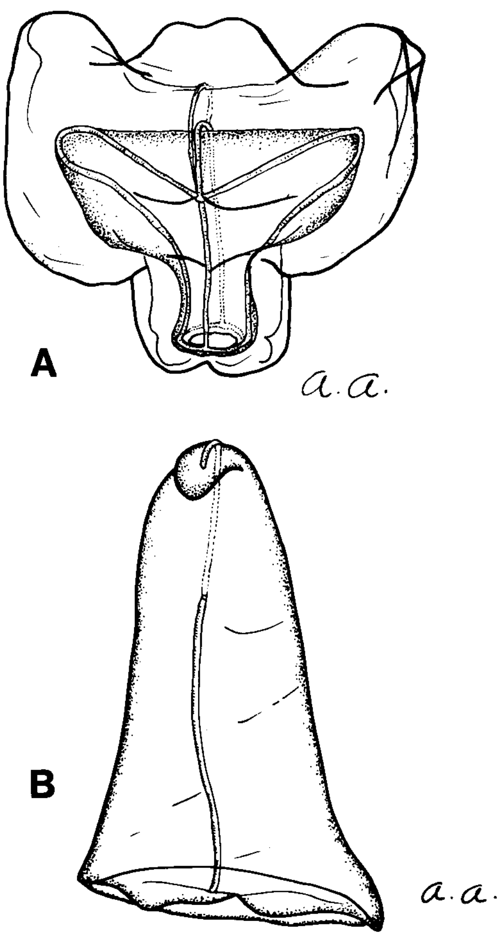


Fig. 5. *Marrus antarcticus* Totton, 1954. A, nectophore; B, bract.

[1954] observed this species southwest and west of the South Sandwich Islands and east of South Island, New Zealand. However, occurrences farther north near Rio Grande do Sul have been recorded [Alvariño, 1981a].

During the spring, *M. antarcticus* occurred in the epipelagic and mesopelagic layers. Relatively low concentrations in the epipelagic zone were distributed off the west coast of the Antarctic Peninsula and off the southwestern coast of Chile. A third, relatively low concentration was located from about 38°00′S to 40°05′S and 119°40′W, and southwest of South Island, New Zealand, in moderate concentrations (Map A11). This species was also present at 64°34′S, 145°46′W (Table A4). In the mesopelagic zone, three relatively low concentrations were discovered in the Bellingshausen Sea. Off the southwestern coast of Chile this species was collected at 40°05′S, 119°40′W (Map A12). The species was also present at 56°01′S, 134°29′W (Table A4).

M. antarcticus was more abundant in the epipelagic strata during the summer. A high to moderate concentration was distributed in the epipelagic zone off Victoria Land into the Ross Sea. A moderate density was also observed off George V Coast and the Balleny Islands, south of Tasmania and at 59°36′S, 155°15′E, and near the South Orkney Islands and off the Weddell Sea (Map A13).

Four isolated occurrences were found for the summer in the mesopelagic zone. Relatively low numbers occurred off the northwest tip of Victoria Land, south of Tasmania at 59°36′S, 155°15′E, in the region of the South Orkney Islands and the Weddell Sea (Map A14), and south of the South Shetland Islands. *M. Antarcticus* was also present at 60°01′S, 36°01′W (Table A4). During the fall a moderate concentration and relatively small patch was observed in the epipelagic zone northwest of the Antarctic Peninsula (Map A15).

This species was not observed in winter. Distribution records presented for the South Atlantic region indicate that *M. antarcticus* occurs in the Subantarctic zone and off Brazil at locations of upwelling of Antarctic waters (Map B4).

From data presented here, *M. antarcticus* inhabits the waters of the West Wind Drift and of the Ross Sea. No records of this species exist in the Antarctic waters off the Indian Ocean [Alvariño, 1971].

Marrus orthocanna (Kramp, 1942)

Marrus orthocanna (Kramp, 1942) (Figure 6) usually inhabits waters around 0°C and depths of 300-2000 m [Stephanyants, 1967]. Previous observations include Baffin Bay [Kramp, 1942], Barents and Norwegian seas [Totton and Fraser, 1955], and the Arctic region [Margulis, 1982]. Although it was once considered a high-latitude Arctic species, Pugh [1974] observed this species as far south as 18°00′N in temperatures up to 9°C, thus extending the known southern geographical distribution.

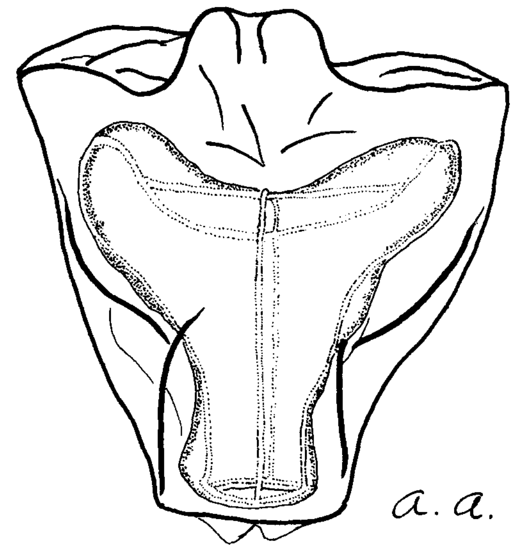


Fig. 6. *Marrus orthocanna* (Kramp, 1942). Nectophore.

In the present study, *M. orthocanna* was found only in the bathypelagic zone in a limited region. This species was determined at 65°59'S, 176°23'E during the summer in a relatively low concentration. It was not observed in the fall collections, but during the winter a relatively low concentration was found in the epipelagic zone northwest of South Georgia island.

Nectalia loligo Haeckel, 1888

Nectalia loligo Haeckel, 1888 (Figure 7), was considered by Totton and Bargmann [1965] to be only a juvenile stage of a large physonect. Pugh [1974] suggested that the specimens described were the juvenile stages of at least two physonects of the genus *Halistemma*. However, specimens of *Nectalia loligo* collected in the Atlantic [Alvariño, 1981a] and in the Sea of Cortés (A. Alvariño, personal observations) presented well-developed gonodendra, indicating that this animal is not a juvenile of another species.

Most specimens collected to date suggest that *N. loligo* is tropical in distribution [Alvariño, 1981a]. However, this species also occurs in colder regions, such as the Irminger Sea [Römer, 1902] and south of Iceland [Vanhöffen, 1906].

In the present study, a limited distribution for this species was determined. In the epipelagic zone during the spring it occurred from 63°00'S to 64°30'S and from 76°00'W to 81°30'W (Map A16). A moderate concentration occurred in the mesopelagic zone from 55°40'S to 57°30'S and from 134°20'W to 141°45'W (Map A17).

N. loliogo was not observed during summer, fall, and winter cruises. Southwest Atlantic records appear in the equatorial region (Map B5).

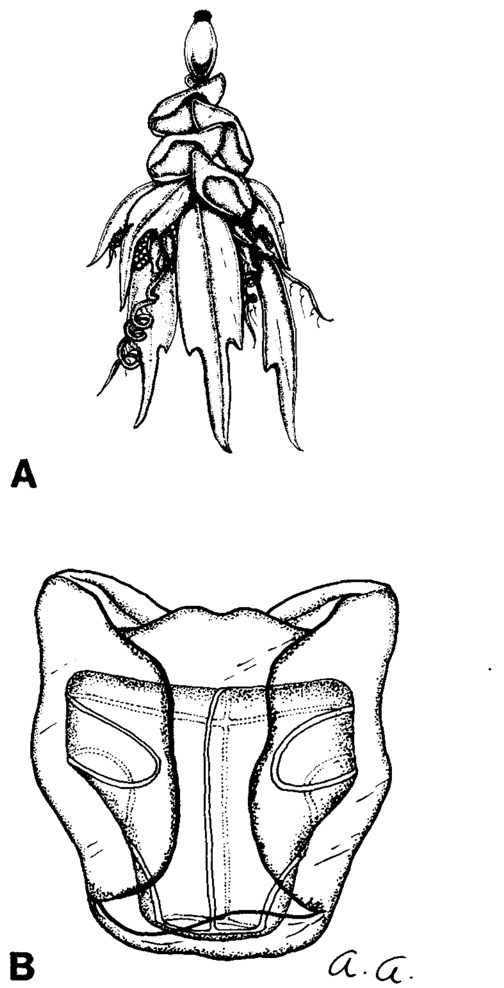


Fig. 7. *Nectalia loligo* Haeckel, 1888. A, complete animal; B, nectophore.

Stephanomia bijuga (delle Chiaje, 1841)

Stephanomia bijuga (delle Chiaje, 1841) (Figure 8) is a common species of the Pacific Ocean, extending along the continental shelf and slope region from Seattle to south of San Diego [Alvariño, 1971]. This species is abundant in the Atlantic, Pacific, and Indian oceans [Alvariño, 1981a]. Margulis [1969] reported *S. bijuga* to 10°S in the South Atlantic.

In this study, *S. bijuga* was found during both spring and summer cruises. This species occurred in the epipelagic layer of the Bellingshausen Sea during the spring in a relatively low concentration (Map A18). During the summer, *S. bijuga* was present at 60°01'S, 36°01'W in the epipelagic zone (Table A4). It was not found during fall and winter.

In the southwest Atlantic it appeared spread through warm and temperate waters (Map B6).

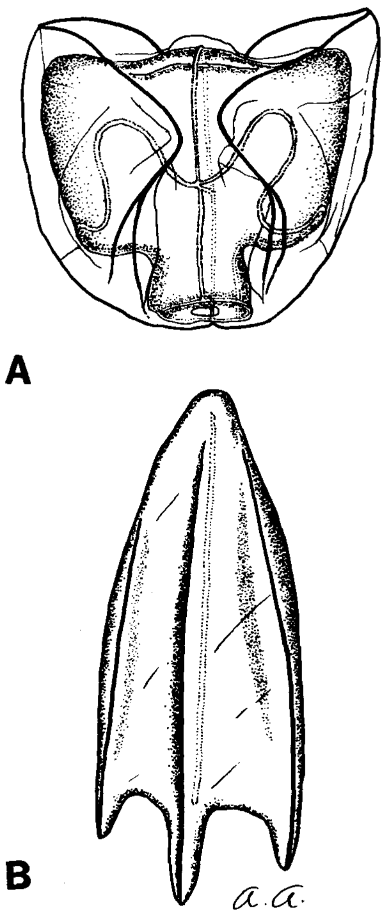


Fig. 8. *Stephanomia bijuga* (delle Chiaje, 1841). A, nectophore; B, bract.

Family PYROSTEPHIDAE

Bargmannia elongata Totton, 1954

Bargmannia elongata Totton, 1954 (Figure 9), probably is a more mesopelagic than bathypelagic species [Stephanyants, 1967; Pugh, 1974], generally present in the tropics [Alvariño, 1981a]. In the eastern Pacific this species inhabits the upper layers or depths below 1000 m [Alvariño, 1971]. Totton [1954] observed *B. elongata* as far south as 45°03´S, 17°03´E. In the South Atlantic this species was recorded at about 44°00´S [Margulis, 1969].

B. elongata was collected in the mesopelagic and bathypelagic strata during the spring. Low numbers were found from 62°20´W to 77°40´W (Map A19). This species was also present in the bathypelagic zone at 39°56´S, 85°54´W (Table A4).

During the summer, *B. elongata* occurred in all three bathymetric strata. In the epipelagic layer, two isolated, relatively low concentrations were found, one south of Tasmania and the other at 68°04´S, 29°55´W (Map A20).

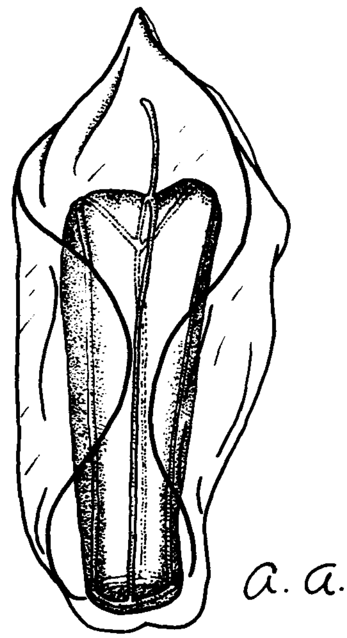


Fig. 9. *Bargmannia elongata* Totton, 1954. Nectophore.

This species was also present at 71°02´S, 166°24´E (Table A4). In the mesopelagic layer, relatively low concentrations occurred off Tierra del Fuego and at 60°04´S, 29°55´W (Map A21). East of the Balleny Islands and north of Victoria Land a relatively low concentration was found in the bathypelagic zone. Low numbers were also present at this depth at 57°57´S, 153°58´E (Map A22). During the fall it appears distributed in a region extending from the Antarctic Peninsula to the west of the tip of the American continent throughout the epipelagic zone (Map A23). In the winter, *B. elongata* was present in the epipelagic and mesopelagic strata. The epipelagic records (Map A24) are in the region of the South Georgia island, and a low-concentration patch was found in the Great Australian Bight. In the mesopelagic zone the species appears in relatively low concentration in the region of the southwest Pacific basin (Map A25).

The south Atlantic records west of 0° appear in the tropical region off Brazil (Map B7).

Pyrostephos vanhoeffeni Moser, 1925

Pyrostephos vanhoeffeni Moser, 1925 (Figure 10), occurs in the southern waters as noted by Moser [1925], Mackintosh [1934], and Hardy and Gunther [1935]. It is abundant in the vicinity of the Falkland and South Georgia islands [Alvariño, 1981a] and in the Croker Passage [Hopkins, 1985].

In this study, *P. vanhoeffeni* was present in both the spring and the summer. During the spring a moderate concentration was found in the epipelagic stratum north of

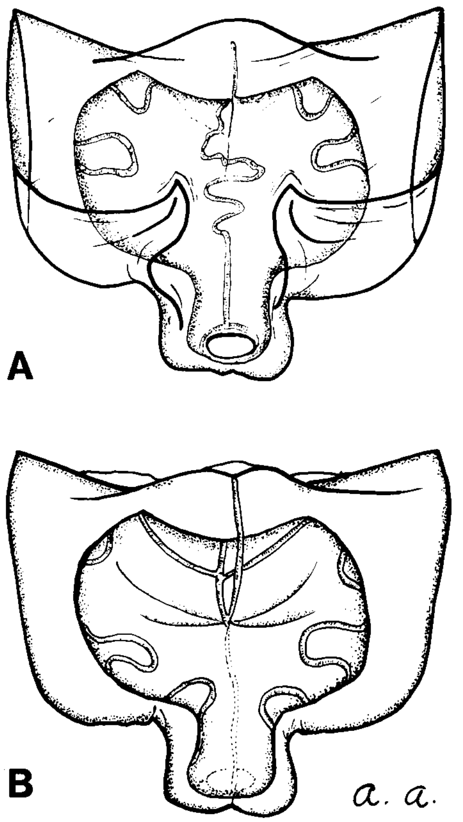


Fig. 10. *Pyrostephos vanhoeffeni* Moser, 1925. A, ventral view of nectophore; B, dorsal view of nectophore.

the Antarctic Convergence at 54°06′S, 119°54′W (Map A26). This species was also present in the epipelagic and mesopelagic layers off the southern Victoria Land coast at 71°02′S, 166°24′E during the summer (Table A4). Considering previous observations and this study, *P. vanhoeffeni* may be endemic to the Antarctic and Subantarctic regions.

P. vanhoeffeni was not obtained during the autumn collections. In winter it was found in relatively low concentration in the mesopelagic zone south of the South Georgia island (Map A27).

In the South Atlantic, records are numerous around the Falkland and South Georgia islands and close to the tip of the Antarctic Peninsula (Map B8)

Family PHYSOPHORIDAE

Physophora hydrostatica Forskål, 1775 (Figure 11), is cosmopolitan in the temperate and warm regions of the Atlantic, Pacific, and Indian oceans [Alvariño, 1978]. Totton [1954] collected specimens as far south as the east coast of New Zealand at 45°24.4′S, 179°06.4′E. According to Stepanyants [1967] this species is generally found from 200 m to the surface and occasionally down to 900-m depth.

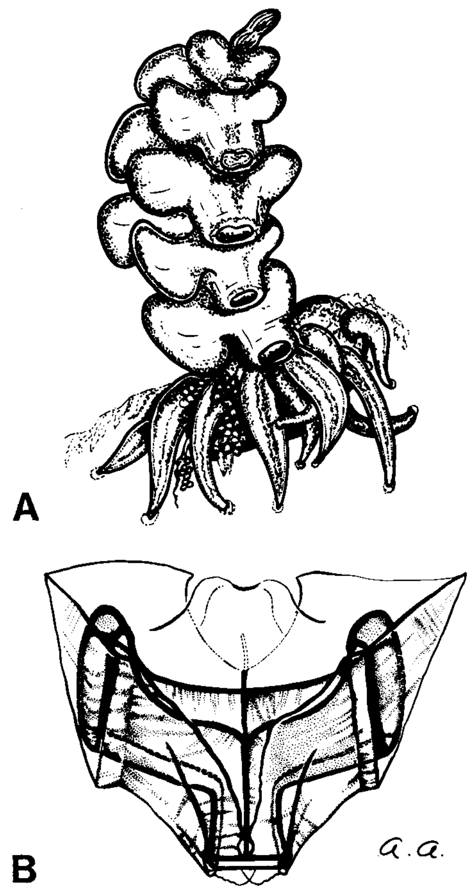


Fig. 11. *Physophora hydrostatica* Forskål, 1775. A, complete animal; B, nectophore [from Alvariño, 1981a].

In the epipelagic and mesopelagic layers, *P. hydrostatica* was collected only during the spring. A patchy distribution was evident in the epipelagic layer off the Ross Sea, near Scott Island, off Marie Byrd Land, west of the South Shetland Islands, and at 39°54′S, 96°55′W (Map A28). This species was also found at 64°34′S, 45°46′W (Table A4). A relatively low concentration occurred at 64°34′S, 145°46′W in the mesopelagic layer. These occurrences of *P. hydrostatica* may be due to the invasion of warm waters from farther north.

The species was absent from autumn and winter collections, which agrees with the impossibility of survival of warm-water species in high latitudes.

It was recorded in the central Atlantic in the region of Gough Island (Map B9).

Family ATHORYBIIDAE

Athorybia rosacea (Forskål, 1775)

Athorybia rosacea (Forskål, 1775) (Figure 12) has been mostly observed in the tropical Atlantic Ocean [Totton, 1954]. Other occurrences have been evident in the

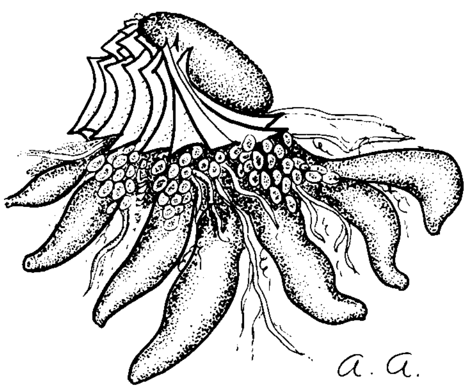


Fig. 12. *Athorybia rosacea* (Forskål, 1775). Complete animal [from Alvariño, 1981a].

Mediterranean Sea [Kölliker, 1853], the Red Sea [Totton, 1954], and the Pacific Ocean [Bigelow, 1911]. This species has been found in the South Atlantic Ocean [Alvariño, 1981a].

A. rosacea was found during the spring and summer cruises. Moderate to low concentrations occurred in the epipelagic zone during the spring in a region extending west from off Chile to 37°17´S-37°14´S and 94°38´W-94°40´W (Map A29). In the mesopelagic zone the population off Chile persisted, but in lower density. This species was also observed at 39°56´S, 85°54´W (Table A4). During the summer an isolated low concentration was found in the mesopelagic zone at about 57°47´S-59°45´S and 114°40´W-115°14´W.

This species was absent from the fall and winter collections.

The information published for the distribution of *A. rosacea* in the Atlantic Ocean shows occurrences off Fernando de Noronha Island (Map B10).

Melophysa melo (Quoy and Gaimard, 1827)

Melophysa melo (Quoy and Gaimard, 1827) (Figure 13) appears distributed throughout the tropical and near-tropical regions of the Atlantic, reaching in the Indian Ocean to 34°30´S off South Africa.

M. melo was not observed during spring and summer cruises. In the fall it appeared in the epipelagic zone, extending in relatively low concentrations in a band at about 43°00´S-43°19´S and 116°05´W to 136°11´W and in low concentrations at 43°16´S, 90°49´W (Map A30). In winter it was obtained in the epipelagic and mesopelagic layers at a southern location in the same general region occupied by the autumn records, but it was scattered. In the epipelagic layers it was found at 47°08´S, 132°40´W-132°42´W, while the specimens were scattered in the mesopelagic domain (Map A31).

The Atlantic records are in the equatorial region, north and west of Ascension Island (Map B11).

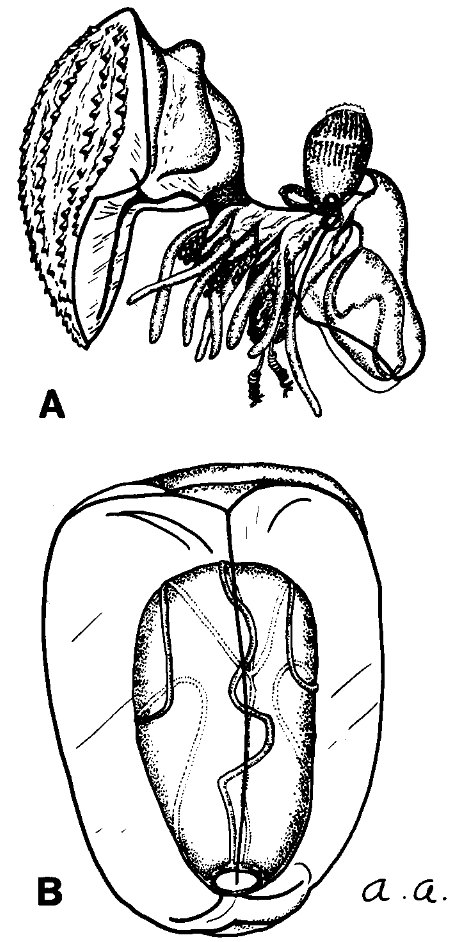


Fig. 13. *Melophysa melo* (Quoy and Gaimard, 1827). A, complete animal; B, nectophore.

Suborder CALYCOPHORAE
Family PRAYIDAE
Subfamily AMPHICARYONINAE

Amphicaryon acaule Chun, 1888

Amphicaryon acaule Chun, 1888 (Figure 14), has a wide geographic distribution, occurring roughly from 40°00´N to 40°00´S in the warm regions of the Atlantic, Pacific, and Indian oceans and in the Mediterranean Sea [Pugh, 1974]. Observations to 50°00´S were recorded in the South Atlantic [Margulis, 1974]. Alvariño [1981a] compilation of information showed *A. acaule* to be present in the region of the Tristan da Cunha group and Trinidade, Ascension, and Fernando de Noronha islands, and off South Africa. In the Pacific Ocean off San Diego, California, this species was observed during the day in the upper 100 m, sinking to the mesopelagic depths at night [Alvariño, 1967b]. A different diurnal migration was noted in the vicinity of the Canary Islands. During the day, 75% of the population occurred between 200 and 250 m, whereas at

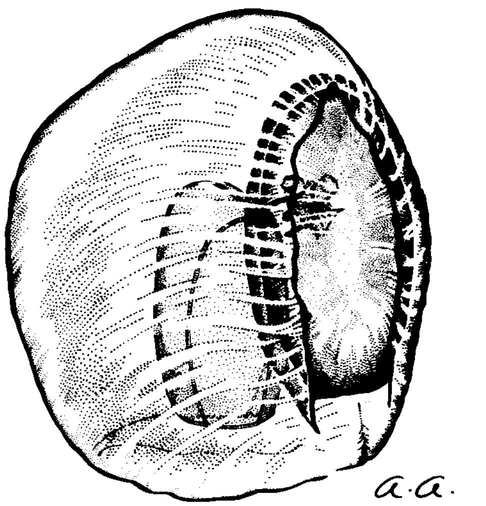


Fig. 14. *Amphicaryon acaule* Chun, 1888. Polygastric phase [from Alvariño, 1981a].

night 55.6% of the population was found at 70 m [Pugh, 1974].

During the spring cruises *A. acaule* was collected in all three bathymetric strata. In the epipelagic zone a relatively low concentration was found in the Tasman Sea and in the region of 56°07'S, 119°54'W and 49°05'S, 120°12'W (Map A32). This siphonophore was also present at 44°32'S, 11°21'W and 41°14'S, 78°44'W (Table A4). *A. acaule* was distributed in the mesopelagic zone off Tierra del Fuego and the Drake Passage, as well as off Chile, extending west to the Pacific Antarctic basin region, being also found in the Tasman Sea (Map A33). A low concentration was found in the bathypelagic zone at 54°06'S, 119°54'W (Table A4).

During the summer, *A. acaule* was more widespread in the mesopelagic than in the epipelagic zone. Only one low-density patch was evident in the epipelagic zone at 56°30'S, 119°29'W (Table A4). However, in the mesopelagic region it appeared scattered in moderate to low concentrations in the region of the South Orkney Islands, the tip of Tierra del Fuego, west of the Bellingshausen Sea, and off Marie Byrd Land (Map A34). Additionally, this species was also present at 50°59'S, 39°51'W (Table A4).

A. acaule was also observed in both epipelagic and mesopelagic layers during fall and winter, extending in winter into the bathypelagic zone. During the fall it extended in relatively low concentrations from off Chile to 86°00'W and 105°00'W, as well as east of New Zealand, and was found scattered in moderate to relatively low concentrations in the Bellingshausen Sea and northwest of this location (Map A35). The mesopelagic records for autumn are in the region north of the Bellingshausen Sea and about 56°00'S, 135°00'W (Map A36).

During the winter, records are scattered in the epipelagic zone at about 59°00'S, 100°00'W and in the region of the South Georgia and South Orkney islands (Map A37). In the mesopelagic zone, patches of relatively low concentrations extended along the South Pacific basin region (Map A38), and in the bathypelagic zone it was found only in low concentration at about 60°05'S, 109°25'W (Table A4).

The South Atlantic records are in the tropical-equatorial region off Brazil, extending to the Tristan da Cunha group area (Map B12).

In the Antarctic and Subantarctic regions, *A. acaule* appears to be more mesopelagic than epipelagic or bathypelagic, at least during the spring and summer. It may be advected into this region by the invasion of warmer waters farther north, surviving successfully in the West Wind Drift waters, mainly during spring and summer.

Amphicaryon ernesti Totton, 1954

Amphicaryon ernesti Totton, 1954 (Figure 15), is mainly distributed throughout the tropical-equatorial region but reaches south to the southeastern tip of South Africa and north to off San Diego, California [Alvariño, 1971].

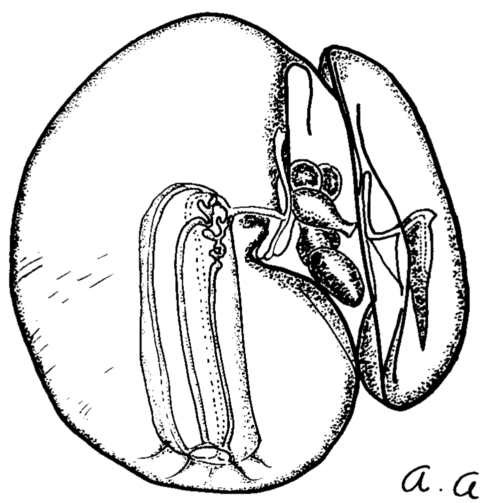


Fig. 15. *Amphicaryon ernesti* Totton, 1954. Polygastric phase [from Alvariño, 1981a].

A. ernesti was not obtained in the spring, summer, and winter collections. During the fall it was observed at the epipelagic and mesopelagic layers. The records for the fall epipelagic zone were in two locations, in low and relatively low concentration at about 43°00'S and 97°00'W-118°00'W, respectively (Map A39).

In the mesopelagic zone it was observed at more southern locations, at about 62°00'S, 101°00'W (Map A40).

The records in the South Atlantic extended to off Brazil (Map B13).

Amphicaryon peltifera (Haeckel, 1888)

Amphicaryon peltifera (Haeckel, 1888) (Figure 16) was observed in the Atlantic and Indian oceans, with the southernmost records at 33°40'S, off South Africa. The species was absent from the spring and summer collections in the Antarctic and Subantarctic regions, but it was recorded from mesopelagic samples in autumn and winter. During the fall it was found off the tip of South America at about 56°00'S, 90°00'W (Map A41). In winter the species appears at the same general region, at about 61°00'S, 100°00'W (Map A42).

The South Atlantic records are distributed northward of the Tristan da Cunha group (Map B14).

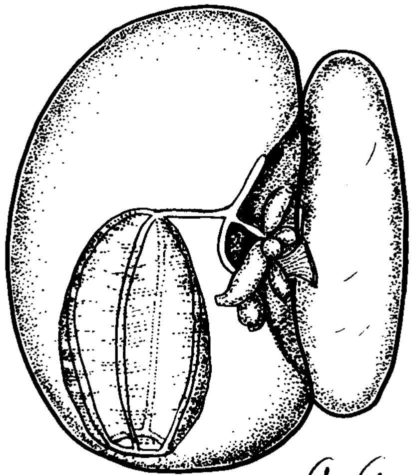


Fig. 16. *Amphicaryon peltifera* (Haeckel, 1888). Polygastric phase [from Alvariño, 1981a].

Subfamily PRAYINAE

Desmophyes annectens Haeckel, 1888

Desmophyes annectens Haeckel, 1888 (Figure 17), is a very rare but widespread eurythermal species [Pugh, 1974]. Pugh [1974] collected specimens at night from 200 m in the Canary Islands region. Hardy and Gunther [1935] observed this species in the South Georgia island region.

The only occurrence of *D. annectens* in these collections was obtained during summer. This species was found in the mesopelagic zone north of the South Shetland Islands and east of Tierra del Fuego in a low concentration (Table A4).

The species was absent from spring, fall, and winter collections.

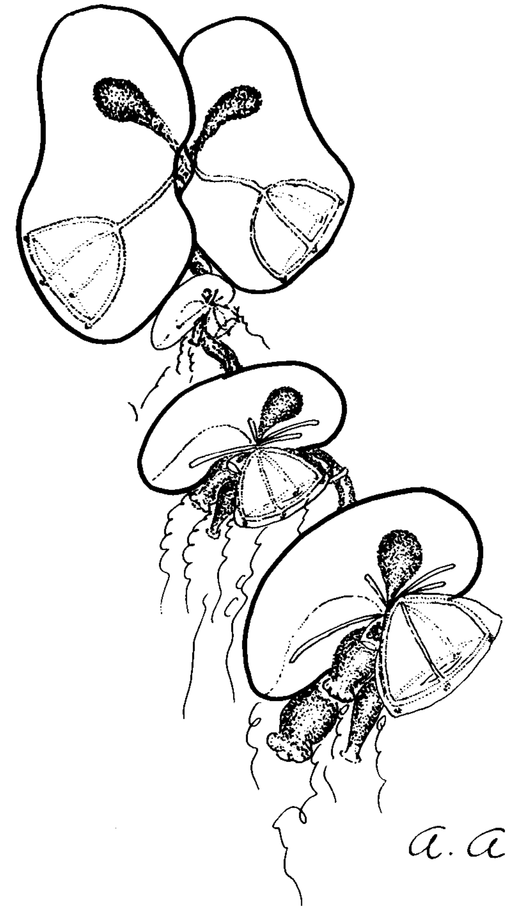


Fig. 17. *Desmophyes annectens* Haeckel, 1888.

Lilyopsis rosea Chun, 1885

Lilyopsis rosea Chun, 1885 (Figure 18) has been collected in the Mediterranean Sea [Chun, 1887; Moser, 1917], Villefranche-sur-Mer [Carré, 1969; Totton and Bargmann, 1965], and off Río de la Plata [Alvariño, 1981a]. In the present study *L. rosea* occurred mostly during the spring. In the epiplagic layer a moderate to relatively low concentration was found off South America in the Pacific Antarctic basin region (Map A43). In addition, specimens were also found during the summer at 45°01'S, 147°14'E from 500-0 m. Because of the depth range of the haul no determination could be made as to whether this species inhabited the epipelagic or the mesopelagic zone.

L. rosea was absent from the autumn and winter collections from the Antarctic and Subantarctic regions. In the South Atlantic it was scattered throughout the central region (Map B15).

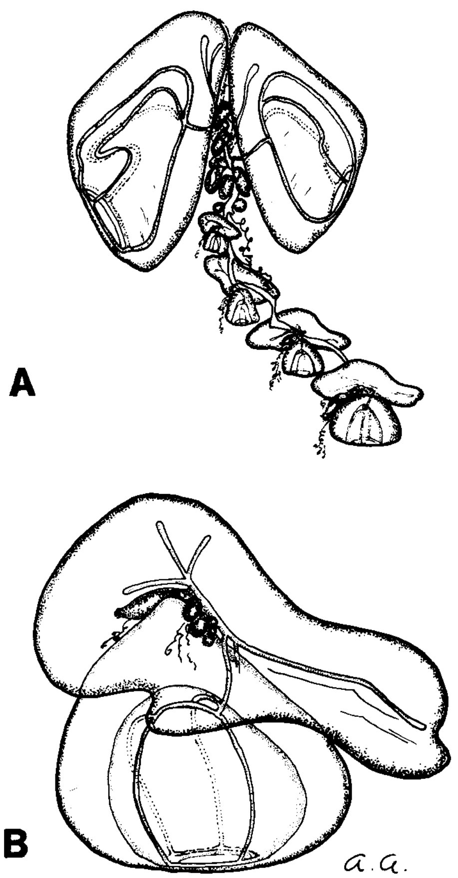


Fig. 18. *Lilyopsis rosea* Chun, 1885. A, polygastric stage; B, eudoxid stage [from Alvariño, 1981a].

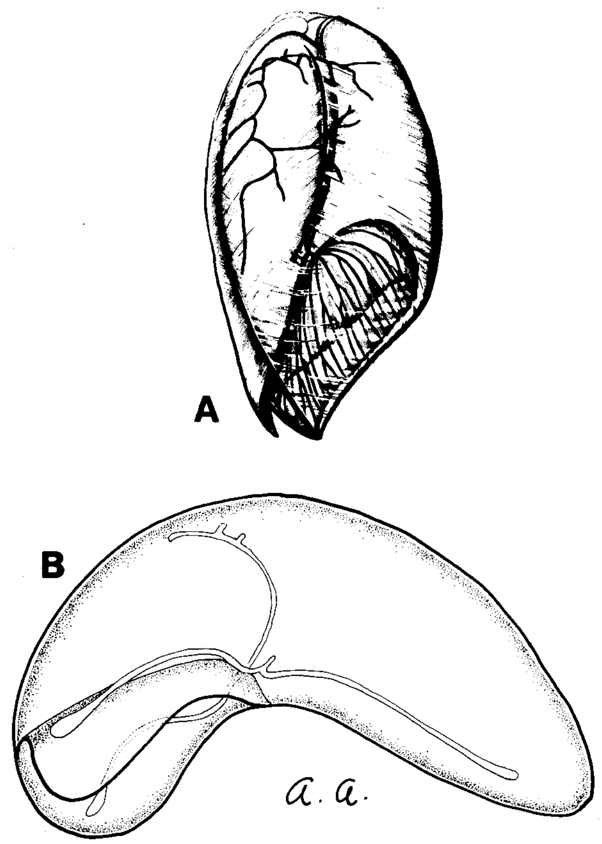


Fig. 19. *Nectodroma dubia* (Quoy and Gaimard, 1833-1834). A, nectophore; B, bract [from Alvariño, 1981a].

Nectodroma dubia (Quoy and Gaimard, 1833-1834)

Nectodroma dubia (Quoy and Gaimard, 1833-1834) (Figure 19) inhabits the bathypelagic zone with a scattered distribution in the world oceans [Alvariño, 1981a]. Southern occurrences have been evident in the Indian Ocean off South Australia [Quoy and Gaimard, 1834], off the southeast coast of Africa [Totton, 1954], off Valparaiso [Moser, 1925], and in the South Atlantic to 40°00'S [Margulis, 1974].

In the present study, *N. dubia* was collected in the spring and summer. During the spring this species was present at 50°00'S, 94°59'W in the epipelagic zone. In the mesopelagic zone a low concentration was determined at 62°45'S-62°55'S and 128°10'W-128°15'W. During the summer a relatively low concentration occurred in the Weddell Sea southeast of the tip of Antarctic Peninsula in the mesopelagic zone (Map A44). *N. dubia* was also present off the southeast tip of Victoria Land at 70°53'S, 171°50'E and 57°57'S, 153°38'E (Table A4). In the bathypelagic zone this species was found in the region of Maquarie Island, southeast of the Tasmanian ridge (Map A45). During the fall and winter, *N. dubia* appeared only in the bathypelagic zone, off the Bellingshausen Sea and at 59°00'S, 100°00'W, respectively (Maps A46 and A47). These data extend the distribution of this species into Antarctic waters.

In the South Atlantic, it appeared in the region of Trindade Island (Map B16).

Rosacea plicata Quoy and Gaimard, 1827

Rosacea plicata Quoy and Gaimard, 1827 (Figure 20), is a cosmopolitan species inhabiting the Atlantic, Pacific, and Indian oceans as well as the Mediterranean Sea and Antarctic waters. Apparently a relatively cold-water animal, the species sinks in the warm oceanic regions. The appearance of *R. plicata* in the upper layers of the warm regions could indicate areas of upwelling [Alvariño, 1971]. This species has been observed as far south as 58°35.0'S, 92°06.2'E [Totton, 1954] and off Graham Land [Margulis, 1974].

Isolated patches of *R. plicata* were present in the epipelagic zone during the spring. Relatively low density

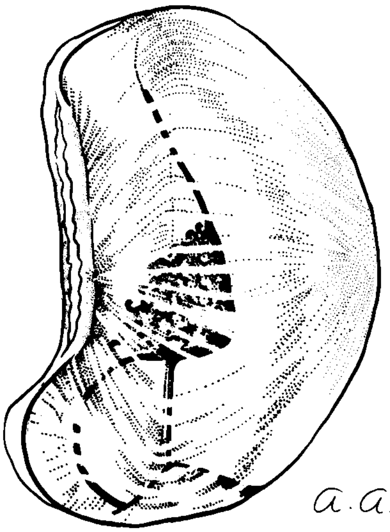


Fig. 20. *Rosacea plicata* Quoy and Gaimard, 1827. Nectophore [from Alvariño, 1981a].

distributions occurred in the Tasman Sea, and low concentrations off the southern coast of Chile, while relatively low concentrations were found in the area of the Pacific Antarctic basin (Map A48).

In the mesopelagic zone, five isolated patches were dispersed throughout the north Amundsen Sea and off Chile in the region of the Subtropical Convergence (Map A49).

During the summer, *R. plicata* occurred in both epipelagic and mesopelagic zones. A relatively low concentration was found at 61°14´S, 120°23´W in the epipelagic stratum, being also present at 62°59´S, 117°40´E (Table A4). In the mesopelagic zone, moderate to low density distributions were scattered east of the Falkland Islands, Bellingshausen and Amundsen seas, Tasmanian Sea, Balleny Islands region, and George V Coast area (Map A50).

In the fall it was observed in the epipelagic zone in two locations in the Antarctic region and off Australia in the Tasman Sea (Map A51). The mesopelagic observations extend west of 90°00´W toward the Bellingshausen Sea, with moderate concentrations occurring at about 63°00´S, 135°00´W (Map A52), and in the bathypelagic zone a small concentration was found at 65°00´S, 95°00´W.

During the winter, *R. plicata* appeared in moderate numbers in the epipelagic zone north of the South Georgia island and off the Ross Sea at 52°00´S-55°00´S and 160°00´S (Map A53). The population in the South Pacific basin appeared more extensively distributed in the mesopelagic zone. A moderate concentration was observed at 57°00´S, 110°00´W spreading south and southeast and west into relatively low and low concentrations, and another wide patch was found from 54°00´S to 62°00´S and 160°00´W extending eastward to 152°00´W (Map A54). *R. plicata* was scattered throughout the tropical-equatorial region of the Atlantic off Brazil (Map B17).

R. plicata appears to inhabit the waters of the West Wind Drift in the Antarctic region. This species also follows the cold currents into the Tasman Sea and is carried northward by the South Pacific gyre.

Nectocarmen antonioi Alvariño, 1983

Nectocarmen antonioi Alvariño, 1983 (Figure 21), was previously observed off California, San Pedro Channel (33°36.7´N, 118°18.4´W). Representations of this species were obtained only in the fall collections and in the epipelagic zone, occurring at two locations near the Subtropical Convergence of the Pacific, at about 43°00´S, 98°00´W and 43°00´S, 118°00´W (Map A55).

Subfamily NECTOPYRAMIDINAE

Nectopyramis diomedeae Bigelow, 1911

Nectopyramis diomedea Bigelow, 1911 (Figure 22), was found only during the fall in the epipelagic zone, occurring in a high concentration that extended from off Chile at 36°00´S and spread in a relatively low concentration to 43°00´S, being also present off Tasmania (Map A56).

In the Atlantic it appeared off Brazil, between Trindade and Fernando de Noronha islands (Map B18).

Nectopyramis natans (Bigelow, 1911)

Nectopyramis natans (Bigelow, 1911) (Figure 23) is a mesopelagic species occurring in the tropical and subtropical regions [Alvariño, 1971, 1981a]. This species has been collected in the Atlantic [Totton, 1954], the South Atlantic to about 25°00´S [Margulis, 1974], the Pacific [Alvariño, 1967b; Bigelow, 1911, 1919, 1931], and the Indian Ocean [Alvariño, 1964; Totton, 1954]. The bracts and gonophores may comprise a free-living eudoxid form for this species, although this is not known with certainty. For the purpose of this study, the presence of a bract or nectophore was regarded as being indicative of the whole animal, as were the eudoxid or polygastric stages.

During the spring, *N. natans* was more abundant and widely distributed in the epipelagic zone than in the mesopelagic domain. In the epipelagic layer, four isolated distributions were evident; a moderate to relatively low concentration extended southward from about 30°00´S off Chile, appearing also scattered along the Pacific Antarctic basin region (Map A57). In contrast, a relatively low concentration appeared in the mesopelagic layer in a small area at the western edge of the Pacific Antarctic basin region (Map A58).

Approximately the same areas were populated by *N. natans* in the epipelagic and mesopelagic layers during the summer. In the epipelagic zone, moderate concentrations

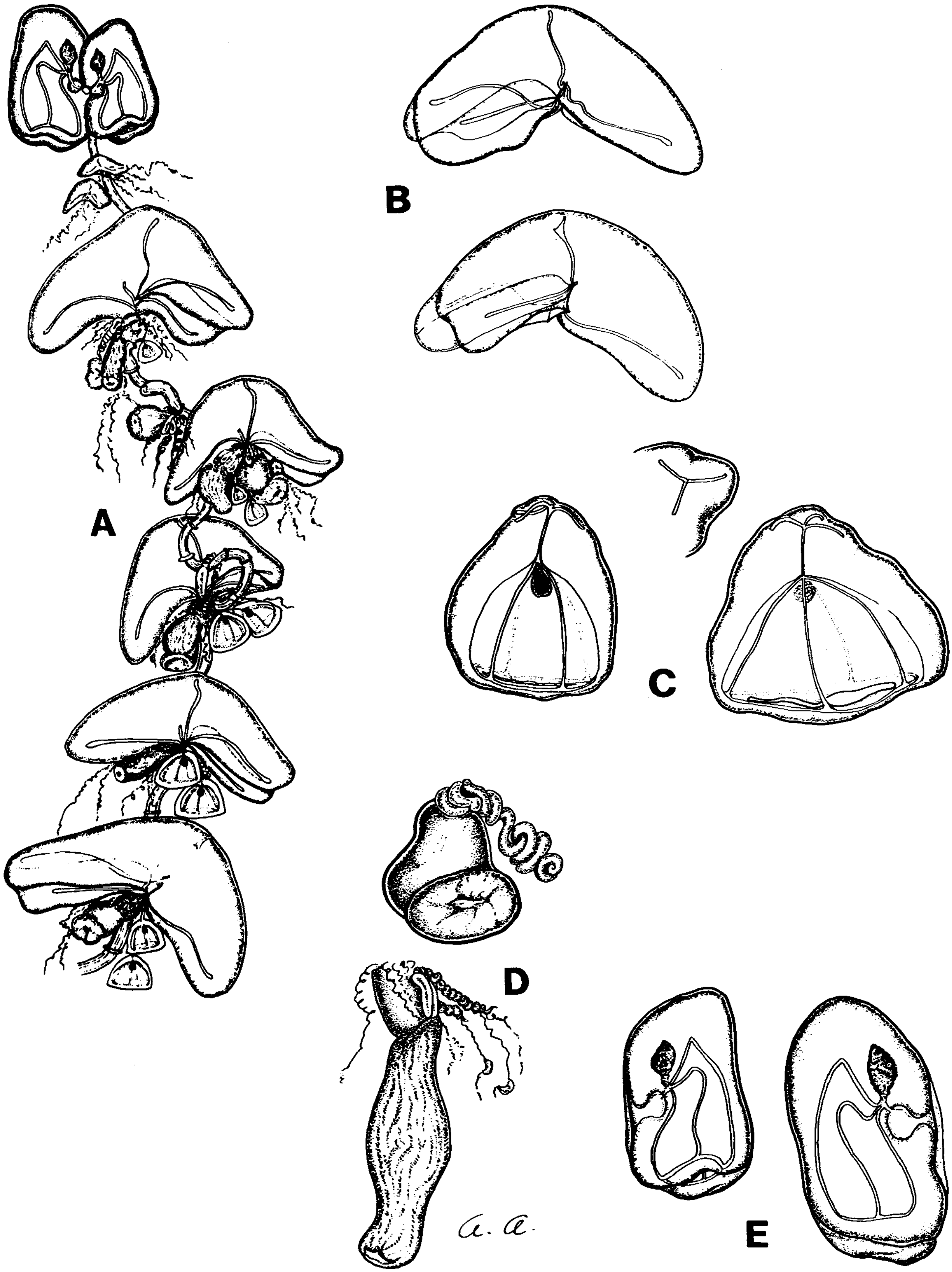


Fig. 21. *Nectocarmen antonioi* Alvariño, 1983. A, complete animal; B, bracts; C, gonophores; D, gastrozoids and tentilla; E, nectophores [from Alvariño, 1983].

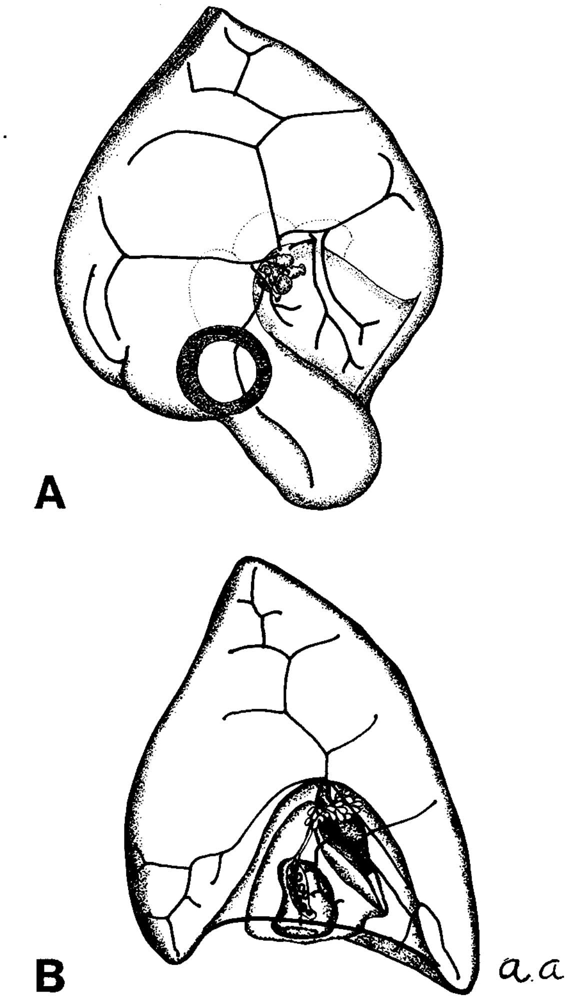


Fig. 22. *Nectopyramis diomedeae* Bigelow, 1911. A, polygastric stage; B, eudoxid stage [from Alvariño, 1981a].

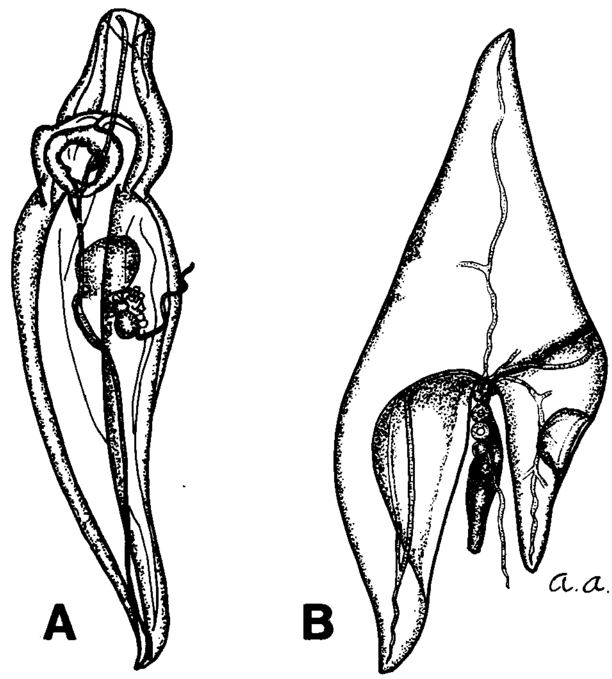


Fig. 23. *Nectopyramis natans* (Bigelow, 1911). A, nectophore; B, eudoxid [from Alvariño, 1981a].

extended north of the Amundsen and Bellingshausen seas (Map A59). In the mesopelagic zone the relatively low density of the populations marked a decreasing abundance relative to the epipelagic zone, the species being found southwest of South Island, New Zealand (Map A60). *N. natans* was also present at this depth at 56°59′S, 39°56′W (Table A4).

In the fall it was observed in the mesopelagic and bathypelagic layers. The mesopelagic populations extended to about 55°00′S and from 89°00′W to 135°00′W (Map A61). The bathypelagic remnant appeared at 68°00′S, 125°00′W.

In the South Atlantic, *N. natans* appeared widely distributed in the equatorial region (Map B19).

Previously, *N. natans* had been observed as far south as 33°40′S-34°13′S and 16°04′E-15°49′E [Totton, 1954]. The *Eltanin* collections provide the first records of this species near the Antarctic Convergence.

Nectopyramis spinosa Sears, 1952

Nectopyramis spinosa Sears, 1952 (Figure 24), has been recorded in all three bathymetric strata. This species occurs in the epipelagic layer off Baja California and the Gulf of Tehuantepec, Mexico [Alvariño, 1971], in the mesopelagic zone in the South Atlantic Ocean [Alvariño, 1981a] and around the Canary Islands [Pugh, 1974], and below 1000 m off California and the central equatorial region of the Pacific [Alvariño, 1971]. Totton [1954] observed this siphonophore as far south as 58°35′S, 92°06.2′E. The bracts and gonophores of this species may also comprise a free-living eudoxid form, although this is not known with certainty. For the purpose of this study, however, the presence of a bract or nectophore was regarded as being indicative of the whole animal, as were the eudoxid or polygastric stages.

During the summer, *N. spinosa* was found in the epipelagic and mesopelagic zones. The distribution was limited in the epipelagic zone to an area south and southwest of New Zealand in a moderate concentration (Map A62). A moderate density was also evident here in the mesopelagic zone. In addition, relatively low concentrations from 61°40′S to 63°15′S and from 104°15′W to 117°30′W were observed (Map A63).

N. spinosa was not obtained in the fall and winter *Eltanin* collections. In the Atlantic it was recorded east of Ascension Island (Map B20).

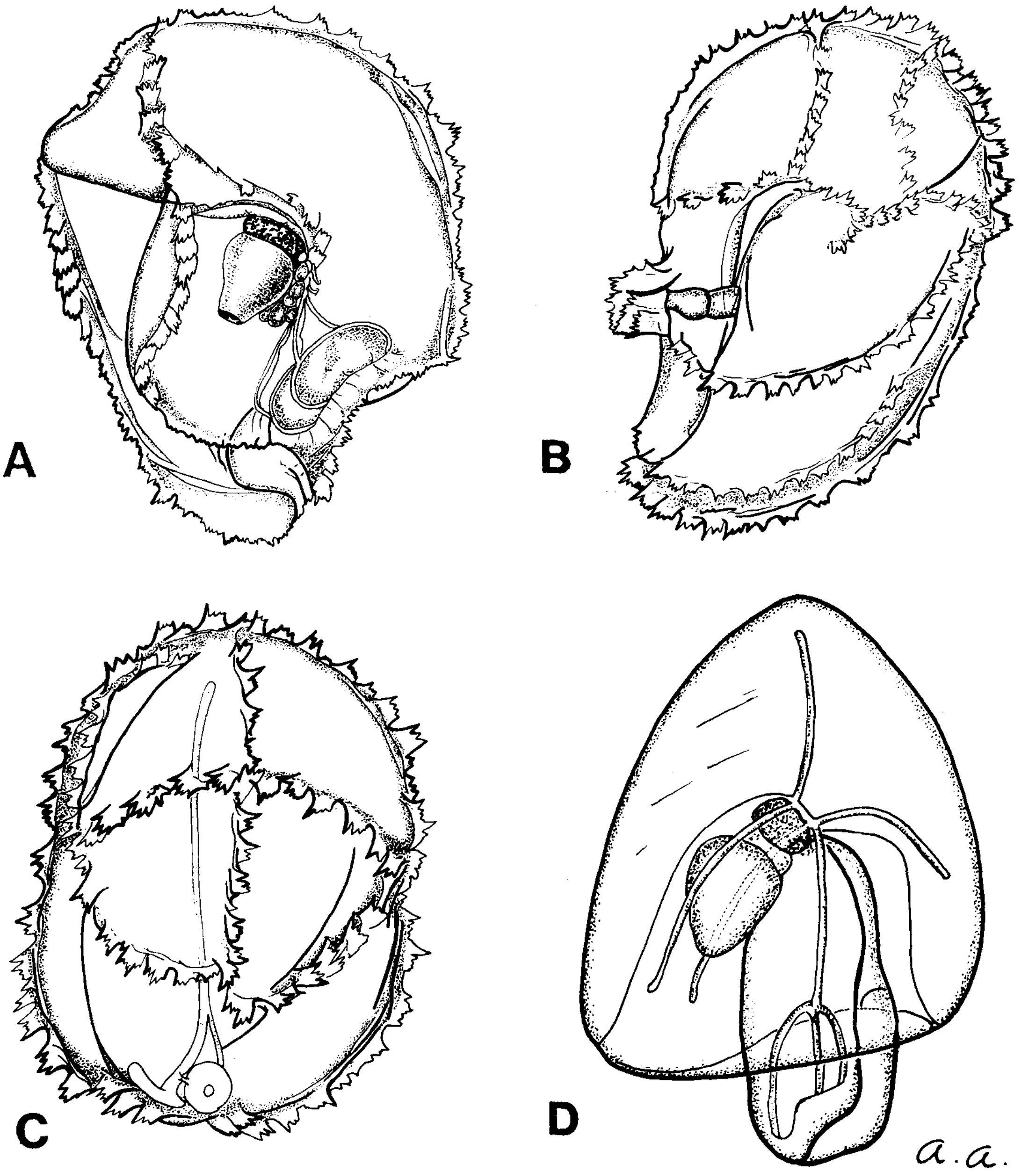


Fig. 24. *Nectopyramis spinosa* Sears, 1952. A, polygastric stage with second nectophore; B, polygastric stage, lateral view; C, polygastric stage, dorsal view; D, eudoxid [from Alvariño, 1981a].

N. spinosa was not as abundant as *N. natans* in the Antarctic and Subantarctic regions, although *N. spinosa* has been observed in both the Subarctic and the Subantarctic regions at 54°15'N, 14°32'W and at 58°35'S, 92°06.2'E, respectively, by Totton [1954]. This may be due to the area sampled, as no collections were obtained for this study from the Indian Ocean.

Family HIPPOPODIIDAE

Hippopodius hippopus (Forskål, 1776)

Hippopodius hippopus (Forskål, 1776) (Figure 25) is a cosmopolitan species occurring in the epipelagic zone of the eastern Pacific from 38°00'N to 45°00'S and in the western

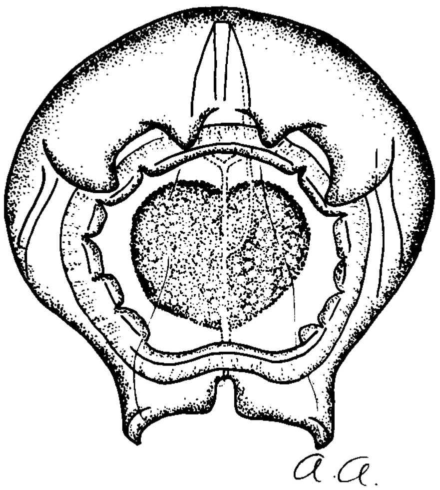


Fig. 25. *Hippopodius hippopus* (Forskål, 1776). Nectophore [from Alvariño, 1981a].

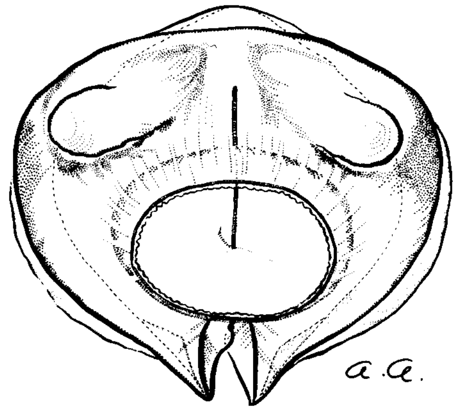


Fig. 26. *Vogtia glabra* Bigelow, 1918. Nectophore [from Alvariño, 1981a].

Pacific from 43°00'N to 41°00'S. In the central tropical-equatorial region of the Pacific a mesopelagic and bathypelagic distribution was found [Alvariño, 1971]. In the South Atlantic the distribution extends to about 50°00'S [Margulis, 1974]. The southernmost record of this species to date is off Wilkes Land [Moser, 1925].

In the present study, *H. hippopus* occurred in the spring, summer, and autumn collections, but it was absent in the winter collections. During the spring this species was present in relatively low and low numbers in the mesopelagic zone of the Tasman Sea (Map A64). However, during the summer, *H. hippopus* appeared in low concentrations in the bathypelagic zone at 57°57'S, 153°58'E.

During the fall, *H. hippopus* was found only in the bathypelagic zone, with a relatively low concentration occurring at 56°00'S, 135°00'W, probably a remnant of the summer population (Map A65).

In the South Atlantic, *H. hippopus* was frequent, with records extending from the equatorial latitudes to the mid-latitudes. It is evident that the population is carried also by the Brazil Current and the South Atlantic gyre (Map B21).

Vogtia glabra Bigelow, 1918

Vogtia glabra Bigelow, 1918 (Figure 26), inhabits tropical and temperate waters [Alvariño, 1971]. Margulis [1974] reported this species to 42°00'S in the Atlantic. Bigelow and Sears [1937] observed *V. glabra* mainly in the 400-m strata. Pugh [1974] also collected specimens from the Canary Islands region, mostly in the mesopelagic zone.

V. glabra was represented during all four seasons. During the spring a low concentration occurred in the Tasman Sea from 200 to 0 m (Map A66). However, during the summer a different situation was noted. A relatively low density distribution was located off the tip of the Antarctic Peninsula in the mesopelagic layer (Map A67) with no occurrence observed in the Tasman Sea.

V. glabra was also obtained in the mesopelagic zone during the fall and winter cruises. In the fall, relatively low numbers appeared in the Bellingshausen Sea at mesopelagic depths (Map A68). A winter record of low concentration was obtained at 47°08'S, 132°42'W in the mesopelagic zone.

In the South Atlantic, *V. glabra* appears distributed throughout the tropical-equatorial region, extending into the central Atlantic gyre (Map B22).

Vogtia kuruae Alvariño, 1967

Vogtia kuruae Alvariño, 1967 (Figure 27), inhabits the epipelagic zone off Japan, Formosa, Philippine Islands, and Peru. Southeast of the Hawaiian Islands and northwest of Easter Island, this species was collected in the mesopelagic zone. Between southern California and Baja California to the Hawaiian Islands a bathypelagic distribution was noted Alvariño, 1967a, 1971].

A rather limited distribution was noted for *V. kuruae* in the present study. This species was absent only during the spring. In summer it appeared between 1000 and 200 m in the Scotia Sea. Only a relatively low concentration was detected (Map A69)

During the fall, *V. kuruae* was obtained in the epipelagic and mesopelagic zones, while in winter the species appeared to be restricted to the mesopelagic domain. The epipelagic records of autumn collections are in the Bellingshausen Sea and far off the George V coast (Map A70). The mesopelagic records during the fall include moderate and relatively low concentration patches distributed in the area of the West Wind Drift, off the Amundsen Sea (Map A71) and in the Antarctic Convergence.

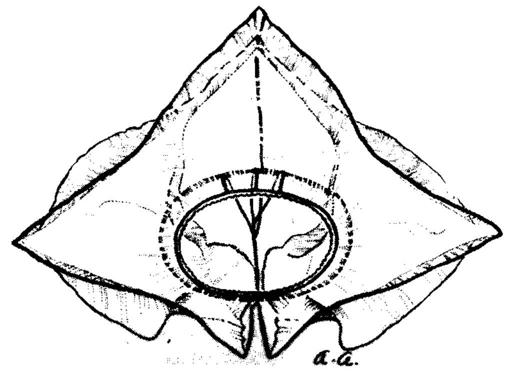


Fig. 27. *Vogtia kuruae* Alvariño, 1967. Nectophore [from Alvariño, 1967a, 1981a].

In winter, *V. kuruae* was observed only in the mesopelagic layers, extending in patches from 57°00'S to 62°00'S and from 160°00'W to 102°00'W (Map A72).

V. kuruae was also observed in the Atlantic Ocean southwest of Saint Helena Island (Map B23).

Vogtia pentacantha Kölliker, 1853

Vogtia pentacantha Kölliker, 1853 (Figure 28), has a wide geographical distribution, occurring in the Atlantic, Pacific, and Indian oceans and in the Mediterranean Sea [Alvariño, 1971]. Bigelow and Sears [1937] collected this species in hauls from 400 to 1000 m, as well as at the surface in the Mediterranean Sea. In the Pacific this siphonphore inhabits the epipelagic layers of the eastern and western areas of the transition region, in the central tropical-equatorial region and off Peru [Alvariño, 1971].

A limited distribution was determined for *V. pentacantha* in the present study. The species occurred in a relatively low concentration during the spring in the mesopelagic zone of the Tasman Sea (Map A73). *V. pentacantha* was not observed during the summer. In the fall it appeared in the mesopelagic zone, far northwest of the Bellingshausen Sea (Map A74). During the winter it was present in the epipelagic layer south of Australia, close to the West Wind Drift region, but in low concentration at 41°58'S, 120°00'E, and in the mesopelagic zone in a relatively low concentration at about 54°00'S, 140°00'W (Map A75).

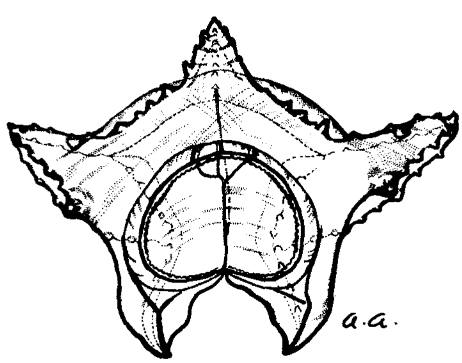


Fig. 28. *Vogtia pentacantha* Kölliker, 1853. Nectophore [from Alvariño, 1981a].

Vogtia serrata Moser, 1925

Vogtia serrata Moser, 1925 (Figure 29), a temperate and tropical species, principally inhabits the 1000- to 200-m-depth zone [Alvariño, 1971]. Southern distributions are found to about 43°00'S in the Atlantic [Margulis, 1974], off the South Georgia and South Sandwich islands at 53°25'S, 25°15'W [Hardy and Gunther, 1936], and off Wilkes Land at 65°00'S, 85°00'E [Moser, 1925].

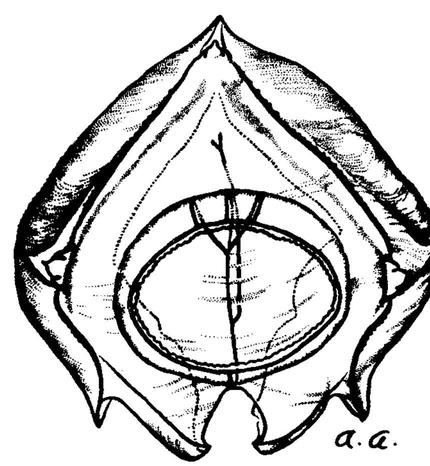


Fig. 29. *Vogtia serrata* (Moser, 1925). Nectophore [from Alvariño, 1981a].

Distributions of *V. serrata* for the spring were recorded in all three depth strata. In the epipelagic zone this siphonophore occurred in a limited area in relatively low numbers at about 58°23'S-58°25'S and 134°38'W-138°36'W. This species was also present at 58°01'S, 145°04'W (Table A4). In the mesopelagic zone there was a more widespread distribution. A relatively low concentration was evident in the Drake Passage off southern Chile, extending south into the Bellingshausen Sea and the Ross Sea regions (Map A76). *V. serrata* was also present at 55°52'S, 139°51'W and 55°19'S, 145°03'W (Table A4) for this depth. In the bathypelagic zone this species was found at 42°11'S, 86°03'W (Table A4).

During the summer, *V. serrata* was restricted to the mesopelagic layer, but with a widespread distribution, off the Amundsen Sea, Ross Sea, and George V Coast region (Map A77). In addition, this species was present at

66°52.6'S, 115°31.2'W and 69°03'S, 179°53'W (Table A4).

V. serrata was found during the fall, a remnant from the summer population, in low concentrations in the mesopelagic zone of the Bellingshausen Sea (Map A78). *V. serrata* was not obtained in the winter.

In the South Atlantic, *V. serrata* was recorded in the tropical-equatorial region off Brazil, extending along the Fernando de Noronha, Ascension, Trindade, and Martin Vaz islands, and also south of the South Georgia island (Map B24).

V. serrata was the most abundant species of the family Hippopodiidae collected during the *Eltanin* cruises. This should be expected, as only this species and *H. hippopus* had been previously observed in Antarctic waters.

Vogtia spinosa Keferstein and Ehlers, 1861

Vogtia spinosa Keferstein and Ehlers, 1861 (Figure 30), has been collected in all three bathymetric zones. Epipelagic occurrences are found in the eastern, central, and western areas of the tropical-equatorial region, off California and Baja California and the Subtropical Convergence. Northeast and southeast of the Hawaiian Islands a mesopelagic distribution was noted. This species inhabited the bathypelagic layers in the central and eastern parts of the tropical-equatorial region as well as off Peru [Alvariño, 1971]. Pugh [1974] found a population maximum for the daytime hauls around the Canary Islands between 415 and 450 m and for the nighttime hauls between 415 and 135 m. Margulis [1974] found this species extending to about 40°00'S in the Atlantic.

V. spinosa was present during both spring and summer, but it was not obtained in the fall and winter collections. The only spring occurrence was at 50°52'S, 104°54'W (Table A4). During the summer, however, a relatively low density distribution was evident in the epipelagic zone near the South Orkney Islands. In the mesopelagic zone a relatively low concentration was found in the Tasman Sea (Map A79).

V. spinosa appeared in the Atlantic off Brazil, spreading along the equatorial region, and from off Rio de Janeiro to the Rio Grande do Sul region (Map B25).

Family DIPHYIDAE
Subfamily SULCULEOLARIINAE

Sulculeolaria biloba (Sars, 1846)

Sulculeolaria biloba (Sars, 1846) (Figure 31) is generally a tropical species [Alvariño, 1971], extending in the South Atlantic to about 35°00'S [Margulis, 1972].

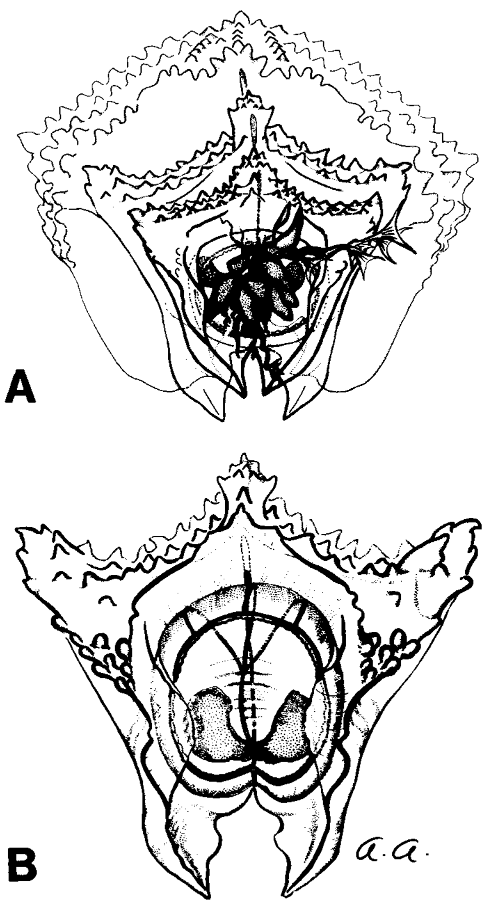


Fig. 30. *Vogtia spinosa* Keferstein and Ehlers, 1861. A, complete animal; B, nectophore [from Alvariño, 1981a].

Fig. 31. *Sulculeolaria biloba* (Sars, 1846). Superior nectophore [from Alvariño, 1968b, 1981a].

Pugh [1974] considers this species to be confined mostly to the upper 200-m strata.

An isolated record was found for *S. biloba* in the present study. It was found in the epipelagic stratum in low numbers off southern Chile at about 50°00′S, 94°59′W. *S. biloba* was not observed in the summer and winter collections. In the fall, polygastric stage specimens were obtained in the epipelagic and bathypelagic layers. In the epipelagic zone a moderate density was found southwest of Tasmania, and in the bathypelagic zone a relatively low concentration was obtained in the Amundsen Sea region.

In the Atlantic Ocean, *S. biloba* is widely distributed throughout the tropical-equatorial region and the area of Rio Grande do Sul, off Brazil (Map B26).

Sulculeolaria monoica (Chun, 1888)

Sulculeolaria monoica (Chun, 1888) (Figure 32) is widely distributed throughout the tropical-equatorial and warm temperate regions of the Atlantic, Pacific, and Indian oceans [Alvariño, 1971]. The southernmost record was obtained along the Chilean coastal region and Juan Fernández Islands, at 30°00′S, 84°30′W [Leloup, 1932].

S. monoica was obtained only during the fall, whereby the polygastric stage was found in the epipelagic zone, extending off Chile southward to about 36°00′S, 77°00′W (Map A80) in the general area of previous records of the species.

In the South Atlantic, *S. monoica* was observed in the tropical-equatorial region off Brazil in the Rio de Janeiro area (Map B27).

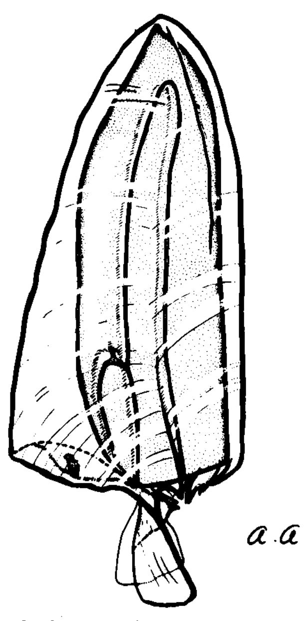


Fig. 32. *Sulculeolaria monoica* (Chun, 1888). Superior nectophore [from Alvariño, 1968b, 1981a].

Sulculeolaria turgida (Gegenbaur, 1853)

Sulculeolaria turgida (Gegenbaur, 1853) (Figure 33) is well distributed throughout the tropical-equatorial regions of the world oceans [Alvariño, 1971]. The southernmost records were at 34°05′S, 16°00′E [Totton, 1954].

S. turgida was obtained only in the fall, whereby polygastric stage populations were found in the epipelagic and mesopelagic zones. During the autumn the epipelagic population appeared in relatively low concentrations, extending southwest of Chile, 55°00′S, 90°00′W, and in the region of the Subtropical Convergence at 43°30′S, 105°00′W (Map A81). In the mesopelagic layers it was found only west of the Bellingshausen Sea (Map A82).

In the Southwest Atlantic, *S. turgida* appeared distributed throughout the tropical and central South Atlantic gyre regions (Map B28).

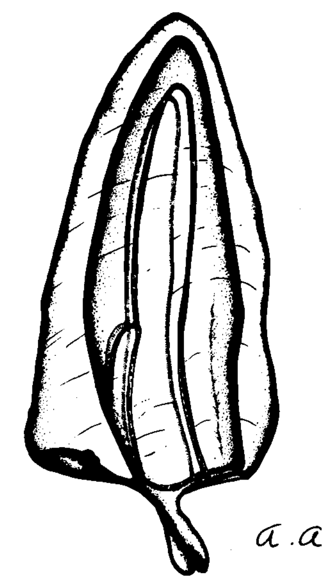


Fig. 33. *Sulculeolaria turgida* (Gegenbaur, 1853). Superior nectophore [from Alvariño, 1968b, 1981a].

Subfamily DIPHYINAE

Chelophyes appendiculata (Eschscholtz, 1829)

Chelophyes appendiculata (Eschscholtz, 1829) (Figure 34) is one of the most abundant species of Siphonophora, inhabiting the warm and temperate regions of the Atlantic, Pacific, and Indian oceans as well as the Mediterranean Sea. In the Pacific this species extends from about 45°00′N to 42°00′S [Alvariño, 1971]. Off San Diego, California, *C. appendiculata* presented a diurnal change in depth, migrating from a lower limit of 450 m during the night to 350 m during the day [Alvariño, 1967b]. Pugh [1974]

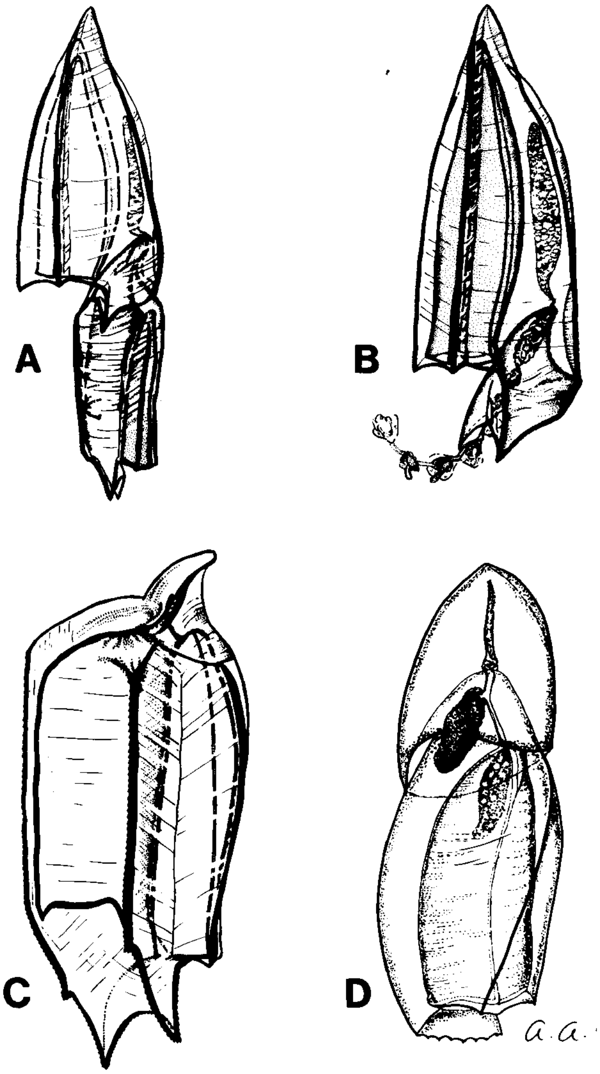


Fig. 34. *Chelophyes appendiculata* (Eschscholtz, 1829). A, polygastric stage; B, superior nectophore; C, inferior nectophore; D, eudoxid.

concluded that the main population of *C. appendiculata* has a diurnal migration of 200+ m, at least at Fuerteventura, with the top of the population entering the surface layers at night.

Off California, both life stage populations were studied using open-closing nets. The polygastric population peaks were at 0-25 m and 25-50 m during daylight and at 50-75 m at night during the spring, and it was found scattered throughout the depth strata during summer [Alvariño, 1980b].

Siphonophores are recognized as active predators. Possible predation by *C. appendiculata* on fish larvae was shown by an inverse relationship between *C. appendiculata* and anchovy larvae [Alvariño, 1980a, 1981b].

The polygastric stage of *C. appendiculata* was collected in the spring in all three bathymetric strata. In the epipelagic zone this form occurred in moderate concentration in a wide area off Chile, extending southward from about 30°00'S, and it was also present in the Tasman Sea (Map A83). The polygastric stage was also present in the epipelagic zone off Chile at 33°03'S, 71°47'W (Table A4). Off the southwest coast of the Chile in the mesopelagic zone, a relatively low concentration was evident extending west to 96°45'W and north to about 30°00'S, mainly at low density; a moderate concentration was found in the region of the Pacific Antarctic basin, and a relatively low density in the Tasman Sea (Map A84). In the bathypelagic zone, however, the distribution of the polygastric form was restricted to the Pacific Antarctic basin region.

The eudoxid stage was more common in the epipelagic zone than in the mesopelagic zone during the spring. In the epipelagic zone a relatively low to high density occurred off Chile west to about 100°00'W and as far south as 41°40'S, being the high density evident from 30°00'S to 35°30'S and from 70°30'W to 87°00'W, extending into the Pacific Antarctic basin region, southwest of South Island, New Zealand, and the Tasman Sea (Map A85). In the mesopelagic zone a relatively low concentration was found at about 38°45'S and 95°00'W, the Pacific Antarctic basin region, and New Zealand, extending into the Tasman Sea (Map A86). The eudoxid stage was not detected in the bathypelagic layer.

The polygastric stage of *C. appendiculata* was less abundant during the summer. This form was found only in the epipelagic and mesopelagic zones in limited areas. A moderate concentration was evident in the epipelagic zone south of New Zealand and in the region of the Pacific Antarctic basin (Map A87). A low concentration was determined in the Ross Sea in the mesopelagic zone, and a relatively low concentration remnant in the region of the Pacific Antarctic basin (Map A88).

In general, the eudoxid stage occurred at all three pelagic depths, decreasing in distribution area from epipelagic to bathypelagic. In the epipelagic layer a moderate concentration of the eudoxid form was found between Tierra del Fuego and the Falkland Islands, in the Amundsen and Ross seas, and south of Tasmania eastward to 52°30'S, 164°30'E (Map A89). In the mesopelagic zone a relatively low concentration was determined in the Amundsen Sea, the region of the Balleny Islands, and south of Tasmania (Map A90). The eudoxid stage was also present in the following locations: 66°52.6'S, 115°31.2'W; 58°57'S, 114°45'W; and 52°26'S, 166°42'E (Table A4). In the bathypelagic zone, distributions were found in the Tasman Sea west to South Island, New Zealand (Map A91).

Although *C. appendiculata* was fairly abundant during the spring, there were only scattered distributions in the summer. However, this was probably due to differences in the sampling area. It is interesting to note that this species was not generally collected east of the Drake Passage. The only occurrence was the eudoxid stage in the epipelagic layer of the Falkland Current (Map A89). Again, this area was not sampled during the spring, so no conclusions can be drawn.

No polygastric or eudoxid stages of *C. appendiculata* were found in the fall and winter collections.

In the Atlantic Ocean, *C. appendiculata* was frequently observed in the tropical-equatorial and temperate regions (Map B29).

Dimophyes arctica (Chun, 1897)

Dimophyes arctica (Chun, 1897) (Figure 35) was once thought to be restricted in distribution to the polar regions. The limiting factor was believed to be temperature, as the species was not usually encountered south of 57°00'N. However, *D. arctica* is now considered a truly cosmopolitan species, inhabiting the Arctic, Atlantic, Indian, and Pacific oceans and the Antarctic waters. At high latitudes this species occupies the upper oceanic strata, sinking to greater depths at lower latitudes [Alvariño, 1971, 1980c, 1981a]. Mackintosh [1934] collected specimens in the Bellingshausen and Weddell seas, while Margulis [1972] reported occurrences as far south as 60°00'S in the South Atlantic and Hopkins [1985] found it in the Croker Passage, Antarctic Peninsula.

An extensive distribution was noted for *D. arctica* in the spring, especially in the epipelagic and mesopelagic strata. In the epipelagic layer, densities were moderate to relatively low in the Drake Passage south into the Bellingshausen Sea, off Chile westward, west of the Bellingshausen Sea, and southwest of South Island, New Zealand, extending north into the Tasman Sea (Map A92). In the mesopelagic zone the population covered the broad region off Chile extending to the Drake Passage south into the Bellingshausen Sea and west to 131°15'W. Relatively low to moderate densities were located in a wide area in the region of Scott Island and the Tasman Sea, extending to southwest of South Island, New Zealand (Map A93).

The distribution in the bathypelagic zone was more restricted. A moderate concentration was determined east of Scott Island (Map A94). This species was also present at the following sites: 36°31'S, 83°15'W; 42°11'S, 86°03'W; 49°58'S, 110°00'W; and 62°09'S, 112°32'W (Table A4).

The distribution of *D. arctica* was not as extensive or as abundant during the summer as in the spring, possibly due to differences in the sampling area. In the epipelagic zone a moderate to relatively low density was noted in the Scotia Sea and northern Weddell Sea. Off the southwestern coast of Chile a moderate concentration was determined extending in decreasing density westward to 122°20'W and southward in increasing numbers into the Amundsen Sea. A moderate abundance occurred off Cape Adare into the Ross Sea, extending north to 67°00'S. In addition, a high density occurred south of South Island, New Zealand (Map A95). In the mesopelagic layer a low to moderate density was noted in the Weddell Sea from 10°30'W through the Scotia Sea to as far west as off the tip of Tierra del Fuego. The northern limit was 50°30'S. An isolated, relatively low

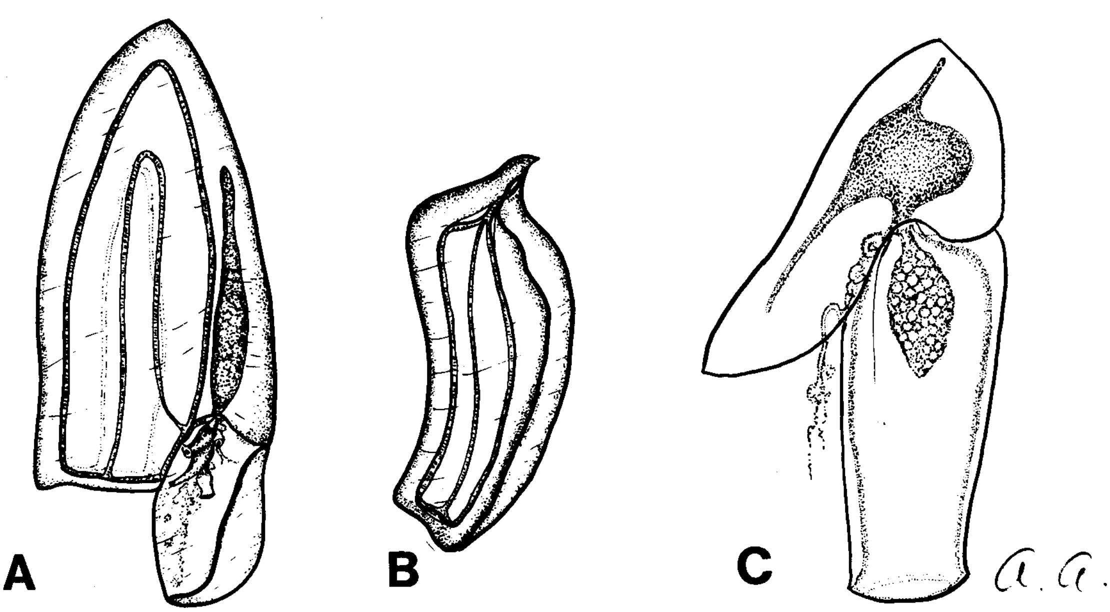


Fig. 35. *Dimophyes arctica* (Chun, 1897). A, superior nectophore; B, inferior nectophore; C, eudoxid [from Alvariño, 1981a].

density occurred from 55°20′S to the Amundsen Sea, with moderate densities evident in the Ross Sea and off Cape Adare and extending northward into the Tasman Sea (Map A96). *D. arctica* was also present at 67°59′S, 90°57′W (Table A4). Two isolated distributions occurred in the bathypelagic zone in the region of the South Sandwich Islands and the Balleny Islands (Map A97).

D. arctica polygastric populations were observed in the autumn and winter collections. During the fall it was found in the epipelagic and mesopelagic layers, whereas in winter this population appeared in all three bathymetric zones. In the fall the epipelagic polygastric population (Map A98) was abundantly distributed in moderate and relatively low concentrations extending from Chile to the Antarctic Peninsula, the Bellingshausen Sea, the Amundsen Sea, and far to the South Pacific basin. Another area of relatively low densities of polygastric *D. arctica* appeared at 47°00′S, 167°00′W, and a third extensive distribution south of Tasmania to Victoria Land. During the fall the polygastric population of *D. arctica* in the mesopelagic zone extended from west of the Drake Passage to the Amundsen Sea, with moderate numbers at the latter location, and was found scattered throughout the Bellingshausen Sea (Map A99). Also during the fall, eudoxids were found in moderate densities in the region between 54°00′S and 99°00′W (Map A100).

It is interesting that the eudoxid population was recorded only in the mesopelagic zone during the fall. This strange situation may be due to the delicate nature of the gonophores, being easily destroyed or damaged by preservation and thus becoming impossible to identify. It probably is not due to the annual reproductive cycle, because in the regions in which the collections were obtained, reproduction does take place mainly during the spring and summer.

The *D. arctica* polygastric population was found at the three bathymetric levels during winter collections. In the epipelagic zone it was observed in moderate numbers in the region of the South Georgia and South Orkney islands and the Scotia Sea, as well as in the West Wind Drift region off the Bellingshausen and Amundsen seas, extending in low concentration off the Great Australian Bight (Map A101). In the mesopelagic zone the polygastric population persisted at the South Georgia island and in the region off the Bellingshausen and Amundsen seas, extending north into the South Pacific basin (Map A102). In the bathypelagic layers only two patches of relatively low densities were found in the Bellingshausen Sea (Map A103).

Records of *D. arctica* appeared over most of the western half of the South Atlantic Ocean, but were most heavily concentrated in the region of the South Georgia, South Sandwich, and Falkland islands (Map B30).

Although the Indian Ocean was not sampled for this study, the data suggest a circumpolar distribution for *D. arctica*. This species was more prevalent in the epipelagic and mesopelagic layers than in the bathypelagic zone.

Diphyes antarctica Moser, 1925

Diphyes antarctica Moser, 1925 (Figure 36) is endemic to the Antarctic and Subantarctic waters [Alvariño, 1971, 1981a]. This species has been observed off Wilkes Land [Moser, 1925] and the Bellingshausen Sea [Mackintosh, 1934]. It extended in the Croker Passage [Hopkins, 1985] down to 1000-m depth during daylight hauls and to about 650-m depth at night, with a population maximum at about 500- to 200-m depth during daylight and at 400- to 200-m depth at night. During the day, *D. antarctica* populations reached up to the 100-m depth, while at night they extended only up to 150-m depth.

Both life stages of *D. antarctica* were present during the spring. The polygastric form was found only in the epipelagic zone. Relatively low concentrations were found at this depth in the Bellingshausen Sea. North of the Antarctic Convergence, low numbers were collected from 42°03′S to 42°11′S and 83°00′W (Map A104). The eudoxid stage, however, occurred only in the mesopelagic zone, with relatively low concentrations found off the southern coast of Chile and at about 61°00′S, 95°00′W (Map A105).

During the summer, both life stages were collected in the epipelagic and mesopelagic layers. In the epipelagic layer the polygastric form was evident in moderate densities off Queen Maud Land, with relatively low numbers extending northwest into the Weddell Sea. In addition, a relatively low density distribution was determined off Cape Adare extending north to 66°30′S (Map A106). The eudoxid stage, however, occurred in high to moderate concentrations in the Amundsen Sea (Map A107). This stage was also present at 63°04′S, 39°56′W (Table A4). In the mesopelagic zone the polygastric stage occurred in low densities southeast of the South Georgia island. *D. antarctica* was also present at 60°01′S, 36°01′W (Table A4). A relatively low concentration of eudoxids occurred in the mesopelagic zone east of the Antarctic Peninsula and south of the South Shetland and South Orkney islands. A relatively low concentration was evident in the Amundsen Sea and other scattered locations north of this area (Map A108). This stage was also present at 57°07′S, 134°38′W (Table A4).

D. antarctica polygastric populations were observed at the three bathymetric levels during the autumn. In the epipelagic zone the species was scattered throughout the Bellingshausen Sea, the Amundsen Sea, the South Pacific basin, east of New Zealand, southeast of Australia, and south of Tasmania (Map A109). In the mesopelagic zone it was recorded in the Bellingshausen Sea (Map A110), and in the bathypelagic layers it was observed at 56°00′S, 36°00′W (Map A111).

In winter, *D. antarctica* was found only in the epipelagic layers, extending in low concentrations off Chile and south of the Great Australian Bight into the region of Wilkes Land in Antarctica (Map A112).

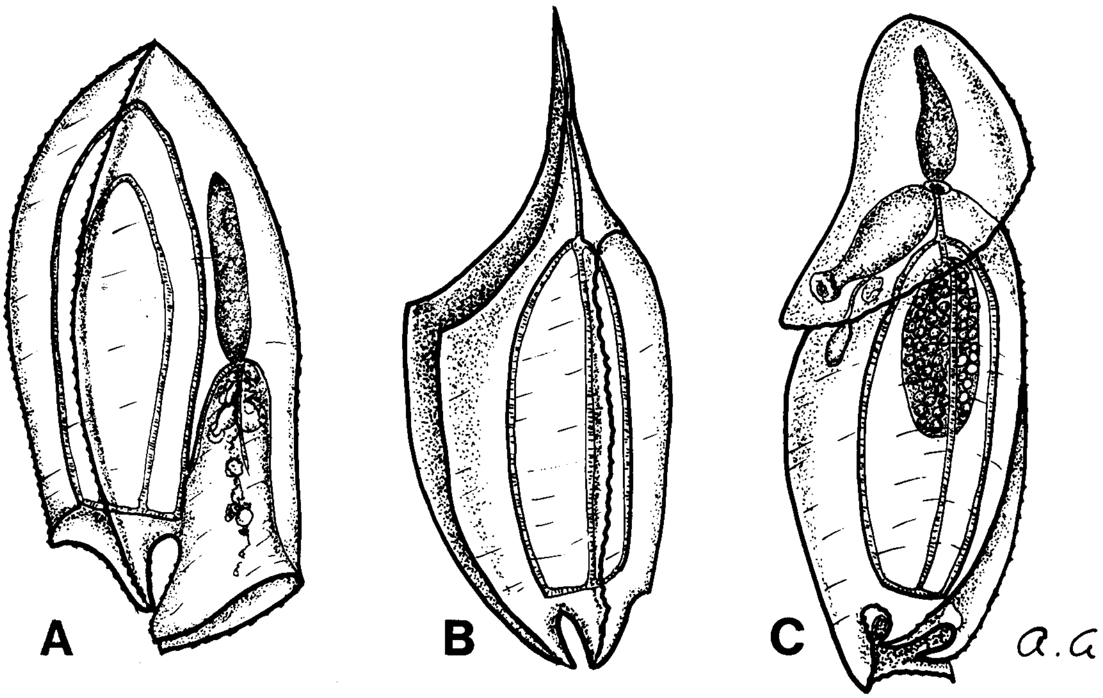


Fig. 36. *Diphyes antarctica* Moser, 1925. A, superior nectophore; B, inferior nectophore; C, eudoxid [from Alvariño, 1981a].

Records in the South Atlantic are from northwest of the Tristan da Cunha group and more abundantly from the region of the South Georgia and Falkland islands (Map B31).

As an endemic to the Antarctic region, *D. antarctica* was collected for the most part south of the Antarctic Convergence. The only occurrence of this species north of this convergence was in the epipelagic zone during the spring (Map A104), probably due to the northward deflection of the West Wind Drift. The Tristan da Cunha records are a relic of the transport by the Falkland Current.

Diphyes bojani (Eschscholtz, 1829)

Diphyes bojani (Eschscholtz, 1829) (Figure 37) is a typical species of the tropics [Alvariño, 1971]. In the South Atlantic this species marks the coastal branch of the Brazil Current, advancing from the Rio Grande do Sul to Río de la Plata. The presence of the species in the subtropical zones adjacent to high southern latitudes indicates a flow of water from the South Atlantic gyre [Alvariño, 1981a].

D. bonjani (eudoxids and polygastrics) was more prevalent in the epipelagic waters during the spring and summer than in the mesopelagic or bathypelagic strata. During the spring the polygastric form was distributed in the epipelagic zone from about 30°00′S to 44°00′S and from 81°15′W to 96°30′W in high to relatively low numbers (Map A113). The eudoxid stage was also found in the same general vicinity, but in the epipelagic zone it appeared in moderate and relatively low concentrations (Map A114). During the summer both the polygastric and the eudoxid forms occurred in the epipelagic zone. Relatively low densities were found for both life stages in the Amundsen Sea (Maps A115 and A116). The polygastric form was also distributed in the epipelagic zone in relatively low densities off the Antarctic Peninsula east to 12°15′W (Map A115). Two relatively low concentrations of the polygastric form occurred in the mesopelagic zone of the Scotia Sea (Map A117). *D. bojani* was more abundant in the central South Pacific gyre than in other areas, as this species is typical of warm waters.

D. bojani was not found in the fall and winter collections.

In the southwest Atlantic, *D. bojani* is frequently distributed from the tropical-equatorial regions and off Brazil down to Río de la Plata, Argentina (Map B32).

Diphyes dispar Chamisso and Eysenhardt, 1821

Dyphyes dispar Chamisso and Eysenhardt, 1821 (Figure 38), has a widespread distribution in the warm waters of the Atlantic, Pacific, and Indian oceans and in the Mediterranean Sea [Alvariño, 1971; Pugh, 1974]. This species has been noted as far south as 58°53′S, 04°54′E [Leloup and

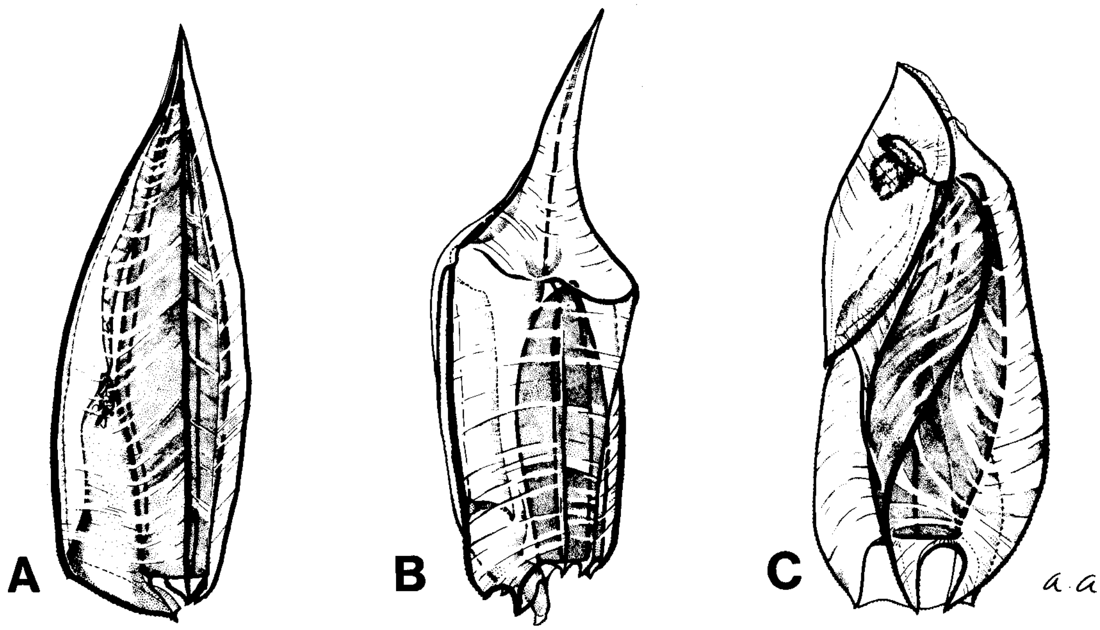


Fig. 37. *Diphyes bojani* (Eschscholtz, 1829). A, superior nectophore; B, inferior nectophore; C, eudoxid.

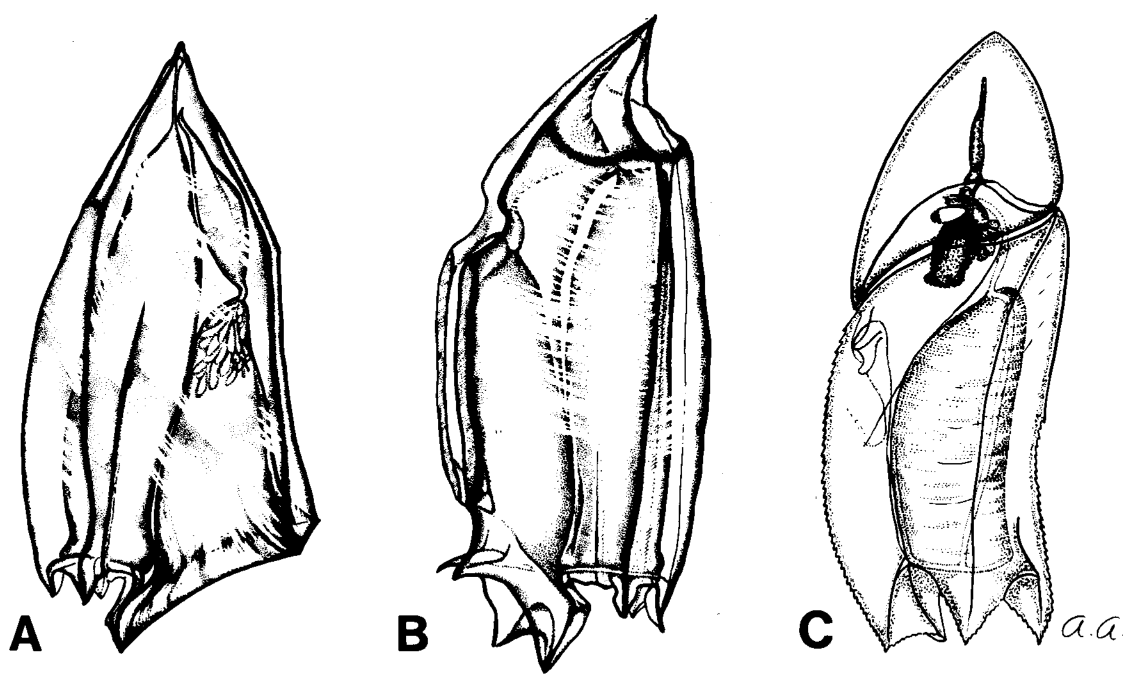


Fig. 38. *Diphyes dispar* Chamisso and Eysenhardt, 1821. A, superior nectophore; B, inferior nectophore; C, eudoxid (bract and gonophore) [from Alvariño, 1981a].

Hentschel, 1935-1938]. Records in the South Atlantic extended to about 60°00′S [Margulis, 1972].

The eudoxid stage of *D. dispar* was more common during the spring than the polygastric stage. The polygastric form was found only in the epipelagic zone, extending south from 30°00′S and spreading toward Chile (Map A118).

In contrast, the eudoxid stage occurred in all three depth strata during the spring. Two high concentrations were found south from about 30°00′S in a wide region off Chile, and moderate numbers were noted south and southwest of South Island, New Zealand, extending north and west into the Tasman Sea (Map A119). The eudoxid stage was also present at 50°00′S, 100°00′W (Table A4). In the mesopelagic zone a moderate to low concentration was found in the region of the Pacific Antarctic basin off the Bellingshausen Sea, and a moderate concentration was distributed southwest of South Island, New Zealand (Map A120). *D. dispar* eudoxids were also collected at 36°33′S, 83°15′W (Table A4). In the bathpelagic zone a low concentration was evident only at 50°01′S, 127°31′W. The eudoxid stage was also collected at 39°56′S, 85°54′W (Table A4).

The eudoxid stage of *D. dispar* was detected only during the summer. A moderate to relatively low concentration occurred in the northern Weddell Sea and east of the South Orkney Islands in the epipelagic zone. It was present in low densities off Cape Adare and west of the Macquarie Island region (Map A121). Relatively low numbers were recorded in the mesopelagic zone, in the northern Weddell Sea northward throughout the Scotia Sea. A moderate to relatively low density distribution was found east of Cape Adare, extending off George V Coast to 61°20′S (Map A122). *D. dispar* was also found in two areas in the bathypelagic zone, in the region of Scott Island and at 57°58′S, 153°58′E, southwest of New Zealand (Map A123).

The eudoxid stage, rather than the polygastric stage, of *D. dispar* was found almost exclusively during the spring and summer. Therefore these two seasons are the reproductive period for this species.

In contrast, during the fall and winter, no eudoxids were observed in the collections. In the fall the *D. dispar* polygastric population in the epipelagic zone appeared in moderate concentration off the west side of the Drake Passage (Map A124). This population persisted in the mesopelagic zone, although at relatively low densities (Map A125). It was not observed in the bathypelagic layers during autumn. In winter, *D. dispar* was found only in the mesopelagic zone, and a low concentration appeared south of the South Georgia island (Map A126).

In the southwest Atlantic, *D. dispar* is widely distributed, extending into the equatorial, tropical, and central Atlantic gyre waters, off the region of Rio Grande do Sul (Brazil) and north of the South Georgia island (Map B33).

Diphyopsis mitra (Huxley, 1859)

Diphyopsis mitra (Huxley, 1859) (Figure 39) is a typical tropical species [Alvariño, 1981a] but also inhabits temperate waters [Alvariño, 1971]. This species inhabits the epipelagic layers from about 38°00′N to 41°00′S in the Pacific Ocean [Alvariño, 1971], and the Canary Islands region in the Atlantic Ocean [Pugh, 1974], extending off South Africa [Alvariño, 1981a].

In this study, the *D. mitra* eudoxid stage was more prevalent than the polygastric stage. In the spring a moderate concentration of eudoxids was evident in the epipelagic zone extending from about 30°00′S off Chile, and moderate numbers occurred in the Pacific Antarctic basin region (Map A127). This stage was also present at 32°59;S, 87°56′W (Table A4). Only two occurrences of the eudoxid stage were evident in the mesopelagic zone. One of low concentration was found off Chile, and another, in moderate numbers, at 40°05′S, 119°40′W (Map A128).

A relatively low density of eudoxids was found during the summer in the epipelagic zone at 63°03′S, 14°32′W. In the mesopelagic zone a relatively low concentration of the polygastric form was distributed west and southwest of South Island, New Zealand (Map A129). Eudoxids in low concentrations occurred in the Scotia Sea between 1000 and 200 m (Map A130). Also in this depth range, eudoxids were collected at 56°59′S, 39°56′W and at 60°01′S, 36°01′W (Table A4).

The eudoxid form of *D. mitra*, like *D. dispar*, was more common during the spring and summer than the polygastric

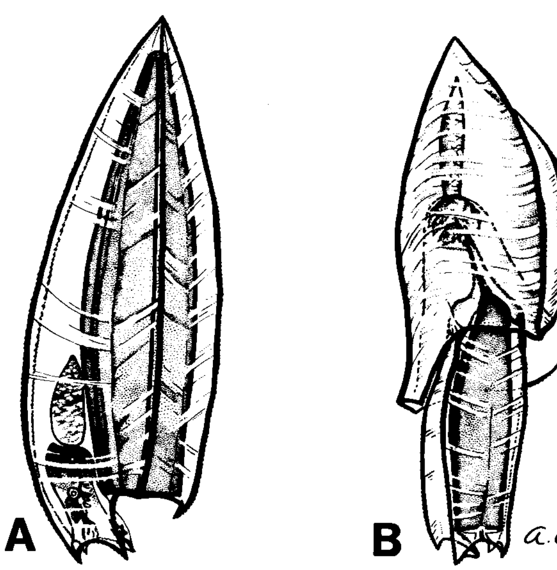


Fig. 39. *Diphyopsis mitra* (Huxley, 1859). A, superior nectophore; B, eudoxid [from Alvariño, 1981a].

form. These two seasons are the reproductive period for *D. mitra* also.

D. mitra was present in the fall but absent from the winter collections. During the fall, polygastric stages of *D. mitra* were obtained in the epipelagic zone (Map A131). The distribution shows evidence that the population inhabits warm waters and is found in the area sampled because of the flow of those waters into the region. A moderate concentration was obtained off Chile. High concentrations were found south of Juan Fernández Islands, and relatively low densities were seen farther west at 43°00´S, 118°00´W (Map A131). In the mesopelagic zone the polygastric population extended off the western part of the Drake Passage (Map A132).

D. mitra is distributed in the southwest Atlantic mainly throughout the tropical-equatorial region, and off Rio Grande do Sul, Brazil, and Río de la Plata, Argentina, as well as in the area of the South Atlantic gyre (Map B34).

Eudoxia macra Totton, 1954

Eudoxia macra Totton, 1954 (Figure 40), has a limited distribution. To date, this species has only been found in the Atlantic Ocean from 07°58´N to 33°20´S, in the Indian Ocean from 07°08´N to 37°50´S [Totton, 1954], and off California (A. Alvariño, unpublished data). This is a eudoxid of unknown parentage [Totton and Bargmann, 1965], waiting for identification of the polygastric stage.

The eudoxid stage of *E. macra* was evident during the spring only. In the epipelagic zone a moderate to relatively low concentration occurred in a region extending south from about 30°00´S to 44°10´S and from about 86°00´W to 94°45´W (Map A133). A moderate concentration was determined at 49°05´S, 120°12´W in the mesopelagic stratum.

Eudoxia macra was not observed in the fall and winter *Eltanin* collections.

Eudoxoides spiralis (Bigelow, 1911)

Eudoxoides spiralis (Bigelow, 1911) (Figure 41) is an abundant species in the epipelagic layers of the tropics but can also be found in the temperate waters [Alvariño, 1981a]. In the Pacific it occurs from 39°00´N to 43°00´S in the epipelagic zone [Alvariño, 1971]. In the South Atlantic this species inhabits the regions off South Africa [Alvariño, 1981a; Margulis, 1972]. Off California the polygastric population is highest during the winter and lowest in spring. The eudoxid populations, in contrast, increase during the winter, with the highest concentration occurring in the spring [Alvariño, 1980b]. This species is an active predator of fish larvae, as populations of this species were found to be inversely related to those of anchovy larvae [Alvariño, 1980a, 1981b].

The polygastric form of *E. spiralis* was present in all three bathymetric strata during the spring. In the epipelagic zone, relatively low numbers occurred off Chile, and a moderate to low concentration in the Tasman Sea, with a relatively low density extending southwest of South Island, New Zealand (Map A134). A low concentration was found

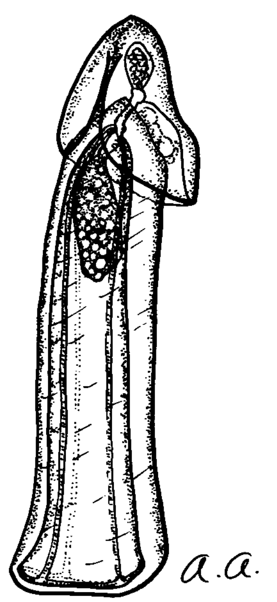


Fig. 40. *Eudoxia macra* Totton, 1954. Eudoxid [from Alvariño, 1981a].

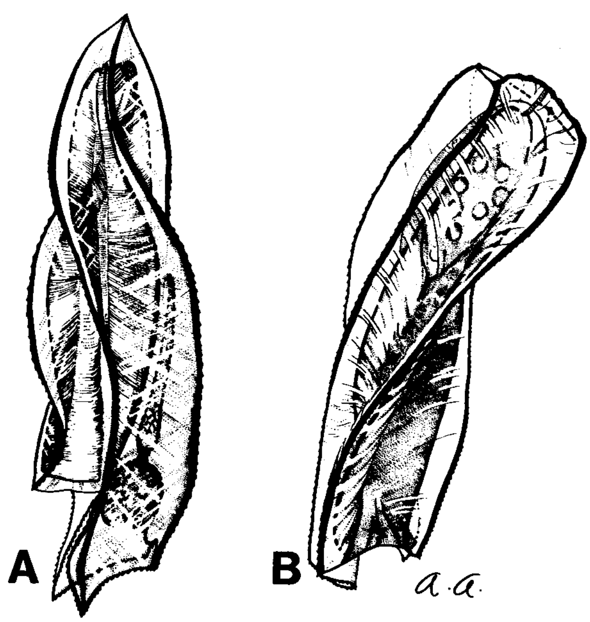


Fig. 41. *Eudoxoides spiralis* (Bigelow, 1911). A, nectophore; B, gonophore [from Alvariño, 1981a].

in the mesopelagic zone of the Tasman Sea (Map A135). Only a small, relatively low concentration appeared in the bathypelagic zone at 32°59´S, 87°56´W. In addition, this stage was also found at 56°21´S, 144°27´W (Table A4).

The eudoxid stage was also more abundant in the epipelagic zone than in the mesopelagic zone. In the epipelagic zone a moderate concentration occurred off Chile west to 110°00´W, north to about 30°00´S, and south to 50°00´S, and moderate densities were found south and southwest of South Island, New Zealand, extending north into the Tasman Sea in decreasing densities (Map A136). A low to moderate concentration was evident in the mesopelagic zone in the region of the Pacific Antarctic basin in the Tasman Sea (Map A137).

During the summer the polygastric stage occurred only in the epipelagic zone, whereas the eudoxid stage was present in both the epipelagic and the mesopelagic layers. The polygastric stage was evident in moderate concentrations in the region of New Zealand and in the Tasman Sea (Map A138). A relatively low concentration of eudoxids was found in the epipelagic zone south of the South Sandwich Islands and in the Tasman Sea, where it reached moderate densities (Map A139). Off the tip of Tierra del Fuego, eudoxids were found in relatively low densities in the mesopelagic zone.

E. spiralis was mainly collected north of the Antarctic Convergence. This should be expected, since this species is more typical of tropical and temperate waters. However, two occurrences were noted south of the Antarctic Convergence (Map A139), one being the southernmost record of this species to date.

E. spiralis was also observed in the fall and winter collections. Polygastric populations in the epipelagic zone during the fall (Map A140) appeared in low concentrations south of Juan Fernández Islands, and in relatively low densities in the Bellingshausen Sea. In the mesopelagic zone the populations persisted in the Bellingshausen Sea, and two records extended west off the Drake Passage (Map A141). The epipelagic polygastric population of *E. spiralis* appeared in moderate concentrations north of the South Georgia island during the winter (Map A142). At this season, low numbers of eudoxids were obtained in the epipelagic layer south of Australia (Map A143). *E. spiralis* was not found in the mesopelagic or bathypelagic zones during the winter.

In the southwest Atlantic, *E. spiralis* was frequently found throughout the tropical-equatorial and central temperate regions (Map B35). Populations found during the Antarctic Program in the southernmost latitudes were probably taken in eddies and rings that had branched off from the main currents in the warm regions.

Lensia achilles Totton, 1941

Lensia achilles Totton, 1941 (Figure 42), is a rare species [Alvariño, 1971], with a geographical distribution from 54°00´N [Fraser, 1961] to 34°00´S [Totton, 1941] in the Atlantic Ocean. Off San Diego, California, this species was found in the mesopelagic zone at night, sinking to lower depths during the day [Alvariño, 1967b, 1985]. Pugh [1974] found the majority of the population around the Canary Islands between 500 and 600 m. In the equatorial Atlantic, Margulis [1971] noted depth ranges of 0-62 m at night and of 548-624 m during the day.

The only occurrence of *L. achilles* in the present study was in the spring and fall in the mesopelagic zone. Polygastric forms were collected at 40°05´S, 119°40´W (Table A4) in the spring. In the fall, polygastric specimens were obtained in the mesopelagic zone, at about 58°00´S, 99°00´W (Map 144).

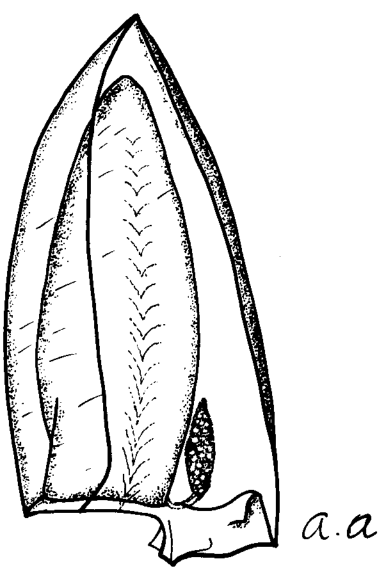


Fig. 42. *Lensia achilles* Totton, 1941. Superior nectophore [from Alvariño, 1981a].

Lensia baryi Totton, 1965

Lensia baryi Totton, 1965 (Figure 43), was previously collected in only two locations. Totton [1965] observed this species off British Columbia, and the second record [Alvariño, 1985] was off California.

In the present study, the distribution of *L. baryi* was very limited. The polygastric form was evident in a relatively low concentration in the summer mesopelagic zone of the Tasman Sea (Map A145). The northern and southern hemisphere populations should connect via deep waters.

L. baryi was not observed during the spring, fall, and winter collections.

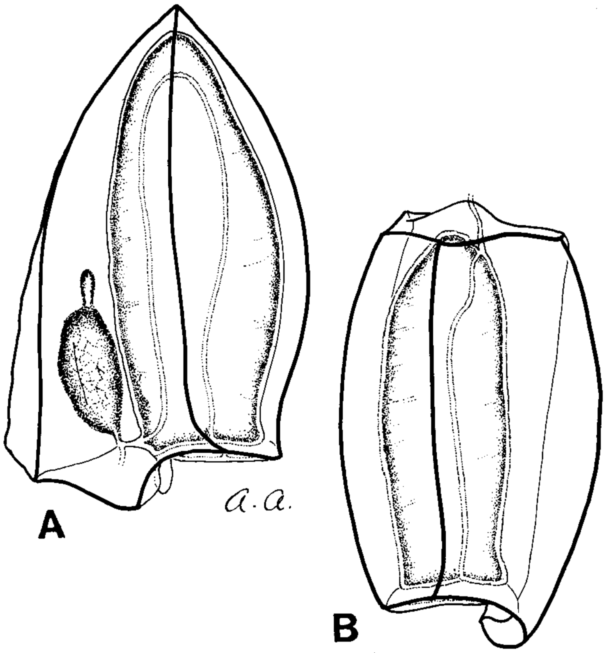


Fig. 43. *Lensia baryi* Totton, 1965. A, superior nectophore; B, inferior nectophore.

Lensia campanella Moser, 1925

Lensia campanella Moser, 1925 (Figure 44), is typical of tropical regions, being an indicator of warm surface currents [Alvariño, 1981a, 1985; Margulis, 1971; Pugh, 1974].

L. campanella was present only during the spring and fall. In the epipelagic zone the polygastric stage was determined from 37°14'S to 37°17'S and from 94°39'W to 94°40'W in a relatively low concentration in the spring. This record is due to the warm water intrusion of the Pacific gyre. One specimen was found at 70°07'S, 102°55'W in the epipelagic zone, probably due to contamination of the sample.

The abundance of the polygastric stage of *L. campanella* in the epipelagic zone during the fall was low at 56°00'S, 90°00'W (Map A146).

In the South Atlantic, *L. campanella* inhabits mainly the tropical-equatorial region, extending with these waters into the central Atlantic gyre (Map B36).

Lensia conoidea (Keferstein and Ehlers, 1860)

Lensia conoidea (Keferstein and Ehlers, 1860) (Figure 45) has a fairly widespread oceanic distribution, preferring temperatures above 12°C [Alvariño, 1981a]. This species inhabits various depths in the Pacific Ocean, mostly occurring in the bathypelagic and mesopelagic layers in the equatorial region [Alvariño, 1971]. Off San Diego, California, this species appeared in the mesopelagic zone [Alvariño, 1967b, 1985]. In the South Atlantic this species is known from as far south as the Falkland and South Georgia islands [Alvariño, 1981a] and from 60°00'S [Moser, 1925].

In the present study, *L. conoidea* was found in the epipelagic and mesopelagic layers during the spring, summer, and fall. A relatively low concentration occurred in both epipelagic and mesopelagic layers in the Tasman Sea and Pacific Antarctic basin region during the spring (Maps A147 and A148), and moderate densities occurred off Chile in the epipelagic zone (Map 147). In the

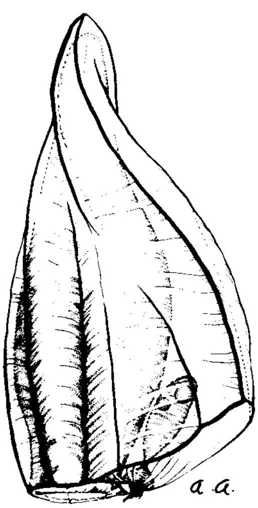


Fig. 44. *Lensia campanella* (Moser, 1925). Superior nectophore [from Alvariño, 1981a].

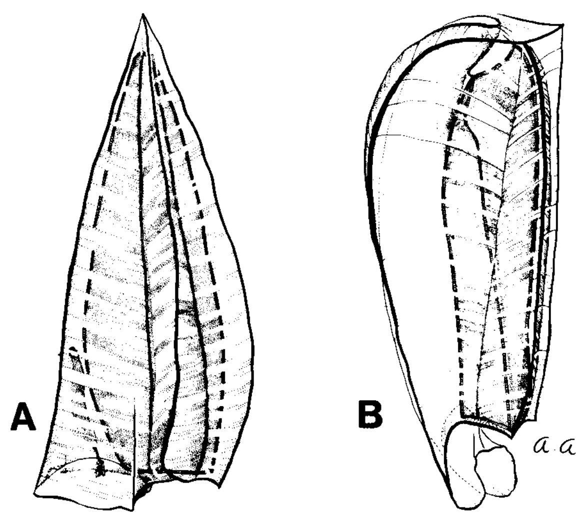


Fig. 45. *Lensia conoidea* (Keferstein and Ehlers, 1860). A, superior nectophore; B, inferior nectophore [from Alvariño, 1981a].

mesopelagic zone a relatively low concentration occurred off the southwest coast of Chile, while low concentrations were found in the Drake Passage and the Tasman Sea (Map 148). During the summer, moderate numbers were obtained in the epipelagic zone south of New Zealand, at 52°27′S, 52°26′S and 166°42′E. In the mesopelagic zone a moderate concentration was also found south and west of New Zealand that extended into the Tasman Sea, and in addition, a relatively low concentration occurred from 62°40′S to 62°45′S and from 105°20′W to 118°20′W (Map A149).

L. conoidea inhabited waters both north and south of the Antarctic Convergence. However, this species was not collected in the vicinity of the Falkland and South Georgia islands, as noted in a previous study [Alvariño, 1981a].

In the fall, *L. conoidea* was observed only in the epipelagic zone in the subtropical region off Chile, at 35°16′S, 73°25′W.

In the South Atlantic, *L. conoidea* was found frequently in the equatorial, tropical, and central temperate regions, extending to off Río de la Plata and north of the South Georgia island, and near the Falkland Islands (Map B37).

Lensia cossack Totton, 1941

Lensia cossack Totton, 1941 (Figure 46), prefers tropical and warm waters [Alvariño, 1981a]. For the Canary Islands region, Pugh [1974] suggested that this species occurs close to the surface. Margulis [1971] determined the Atlantic distribution to 10°00′S, generally being associated with surface layers. Fraser [1961] reported occasional records down to 450 m in the northeastern

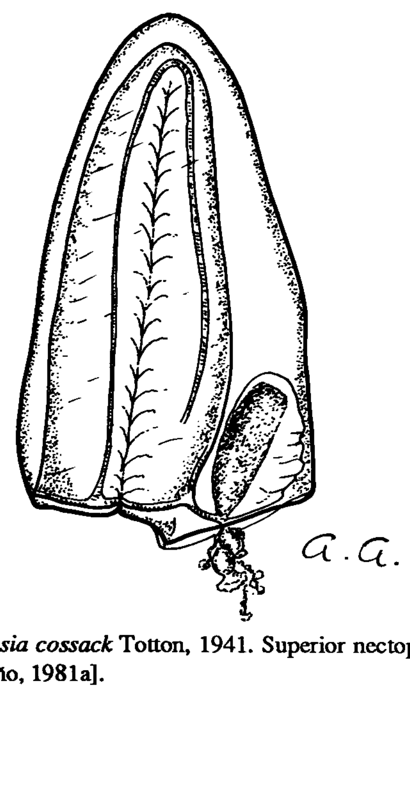


Fig. 46. *Lensia cossack* Totton, 1941. Superior nectophore [from Alvariño, 1981a].

Atlantic, while Totton [1941] observed specimens to 700 m in tropical regions, and off California [Alvariño, 1985] it was found at 25- to 50-m depth.

Two distributions were noted for *L. cossack* during the spring in the epipelagic stratum. Off the west coast of New Zealand in the Tasman Sea, relatively low to moderate concentrations were found off Chile (Map A150). These observations correspond to this species' preference for warm waters. *L. cossack* was found only in the spring.

In the southwest Atlantic, *L. cossack* was mainly distributed in the Brazil Current and the Brazil Current extension joining the South Atlantic gyre (Map B38).

Lensia eltanin Alvariño and Wojtan, 1984

Lensia eltanin Alvariño and Wojtan, 1984 (Figure 47), a mesopelagic species, was discovered during the *Eltanin* cruises. The polygastric stage was found in a patchy distribution during the summer in relatively low concentrations in the Amundsen Sea, the Pacific Antarctic basin region, and southwest of New Zealand (Map A151).

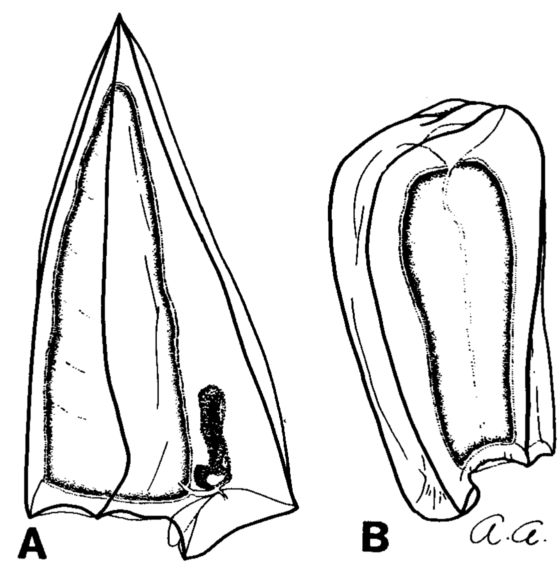


Fig. 47. *Lensia eltanin* Alvariño and Wojtan, 1984. A, superior nectophore; B, inferior nectophore [from Alvariño and Wojtan, 1984].

L. eltanin polygastric stages were observed in the fall and winter collections. During the fall it was found only in the epipelagic zone, in moderate densities west of the Drake Passage, and in a relatively low concentration at 43°30′S, 125°30′W in the South Pacific basin region (Map A152). During the winter, records of moderate concentration were obtained north of the South Georgia island (Map A153) in the epipelagic zone. In the mesopelagic domain this species was observed off the Amundsen Sea at 59°00′S, 138°00′W (Map A154).

Additional records for the Antarctic and other neighboring regions appear in the work by Alvariño and Wojtan [1984].

Lensia eugenioi Alvariño and Wojtan, 1984

Lensia eugenioi Alvariño and Wojtan, 1984 (Figure 48), also discovered during the *Eltanin* cruises, occurs in the epipelagic and mesopelagic layers, only during the spring and winter. A moderate to relatively low density of the polygastric stage occurred in the Tasman Sea in the epipelagic zone (Map A155). In the mesopelagic zone a relatively low concentration was determined southwest of South Island, New Zealand (Map 156). Other Antarctic records appear in the work by Alvariño and Wojtan [1984].

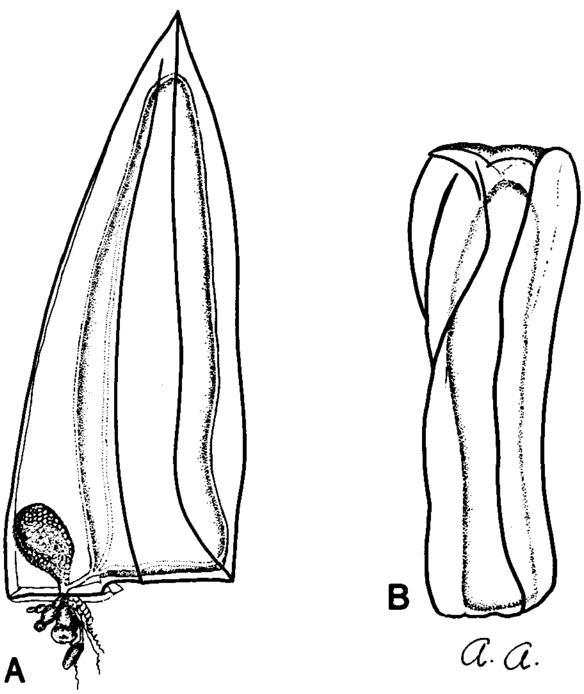


Fig. 48. *Lensia eugenioi* Alvariño and Wojtan, 1984. A, superior nectophore; B, inferior nectophore [from Alvariño and Wojtan, 1984a].

In winter, *L. eugenioi* polygastric stages appeared in relatively low concentration in the epipelagic zone north of the South Georgia island (Map A157) and in the mesopelagic layers in the same area south of the South Georgia island (Map A158).

Lensia exeter Totton, 1941

Lensia exeter Totton, 1941 (Figure 49), a rare species, has previously been observed only in the Atlantic off South Africa [Totton, 1981], off Portugal at about 41°00´N

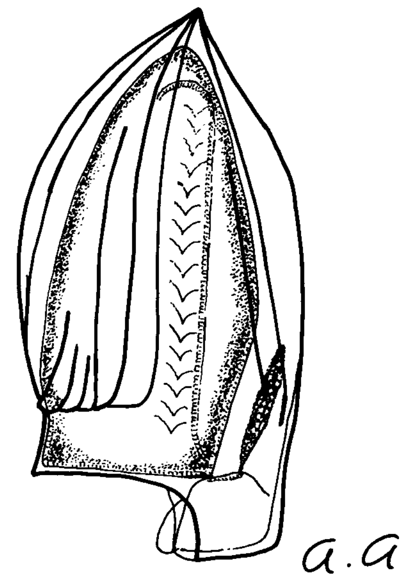


Fig. 49. *Lensia exeter* Totton, 1941. Superior nectophore [from Alvariño, 1981a].

[Margulis, 1971], and at 18°00´N, 25°00´W [Pugh, 1974]. This species was collected from 500 to 750 m and from 1423 to 1645 m [Margulis, 1971], and between 350 and 450 m [Pugh, 1974]. Off California it was observed at 100- to 75-m depth [Alvariño, 1985].

In the present study, *L. exeter* was found in the spring in the mesopelagic zone. A relatively low concentration of the polygastric stage occurred at 54°06´S, 119°54´W. *L. exeter* was also observed in the fall in the epipelagic and mesopelagic zones, but it was absent in the summer and winter collections. In the fall epipelagic zone a polygastric population of moderate concentration was found in the Amundsen Sea, with another low concentration farther north at 59°00´S, 101°00´W (Map A159). Polygastric populations in the mesopelagic layers appeared in relatively low concentrations in the western part of the Bellingshausen Sea area (Map A160).

The southwest Atlantic records are far off Rio Grande do Sul, Brazil (Map B39).

Lensia fowleri (Bigelow, 1911)

Lensia fowleri (Bigelow, 1911) (Figure 50) has been collected in the Atlantic, Pacific, and Indian oceans as well as in the Mediterranean and the Red Sea. However, this species is probably more abundant in the Atlantic Ocean [Alvariño, 1971]. Margulis [1971] stated that it occurred from 61°00´N, 34°00´S in the Atlantic Ocean, at depths of 550-0 m. In the equatorial region a population concentration maximum occurred at 200-m depth.

One specimen of *L. fowleri* was found at 33°02´S, 85°52´W from 490 to 0 m during the spring (Table A4).

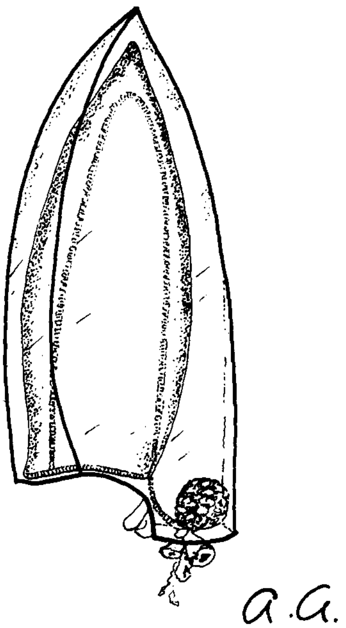


Fig. 50. *Lensia fowleri* (Bigelow, 1911). Superior nectophore [from Alvariño, 1981a].

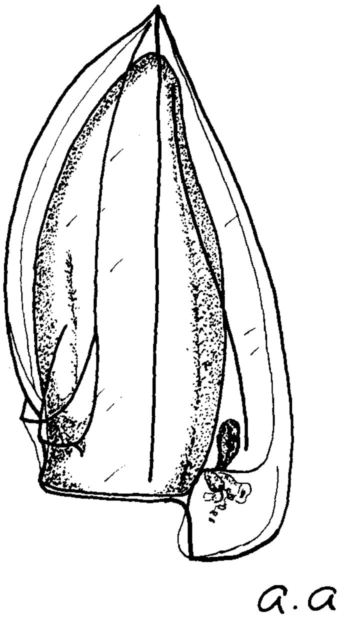


Fig. 51. *Lensia grimaldii* (Leloup, 1933). Superior nectophore [from Alvariño, 1981a].

Owing to the depth range of the haul, no determination could be made as to whether this siphonophore inhabited the epipelagic or the mesopelagic zone.

This species was present only in the spring.

Records in the southwest Atlantic Ocean extend along the tropical-equatorial region off Brazil, with other records northwest of the Tristan da Cunha group (Map B40).

Lensia grimaldii Leloup, 1933

Lensia grimaldii Leloup, 1933 (Figure 51), a rare species, was collected in the mesopelagic zone during daytime off San Diego, California [Alvariño, 1967b, 1985]. Margulis [1971] cites depth ranges of 600-0 m to 2000-1500 m in the Atlantic Ocean from about 41°00′N to 34°00′S. This species has been determined as far south as west of the Drake Passage at 62°56′S, 79°57′W and northwest of Adelaide Island at 65°55.8′S, 73°51.5′W [Totton, 1941].

In the present study, the polygastric stage of *L. grimaldii* was observed only during the spring and fall. In spring a relatively low concentration was evident southwest of South Island, New Zealand, in the mesopelagic zone (Map A161), and not in the region of Totton's [1941] records. In the fall it was observed in the epipelagic layers in a relatively low concentration at 43°15′S, 97°37′W.

In the southwest Atlantic, records extend along the tropical-equatorial region off Brazil, and mainly around the archipelagos and off the Rio Grande do Sul region (Map B41).

Lensia hardy Totton, 1941

Lensia hardy Totton, 1941 (Figure 52), has been found in the central Atlantic gyre [Alvariño, 1981a]. Observations have been noted as far south as Bouvetøya at 55°07′S, 04°03′E and northeast of the Falkland Islands at 45°06′S, 49°00′W [Totton, 1941; Margulis, 1971, 1976]. In this study, *L. hardy* was observed only in epipelagic layers in the summer and in the mesopelagic zone in the fall. During the summer a relatively low density distribution was found in the Tasman Sea west of South Island, New Zealand. *L. hardy* occurred in the mesopelagic layers during the fall, when a moderate density of polygastric population was found north of the Bellingshausen Sea, at about 55°01′S, 94°49′W. This species was absent from other strata during the fall and from all three strata in spring and winter.

Records in the southwest Atlantic appear distributed throughout the oceanic region, extending from south Brazil and Argentina to the Tristan da Cunha group area, and off Recife, Brazil, in the equatorial region (Map B42).

Lensia havock Totton, 1941

Lensia havock Totton, 1941 (Figure 53) was widely recorded in the South Atlantic, extending southward from the Tristan da Cunha group region to the Scotia Sea [Totton, 1941]; in the Indian Ocean it appeared in the South Africa and Mozambique Channel regions, and in the Pacific it was observed off California and Baja California [Alvariño, 1985].

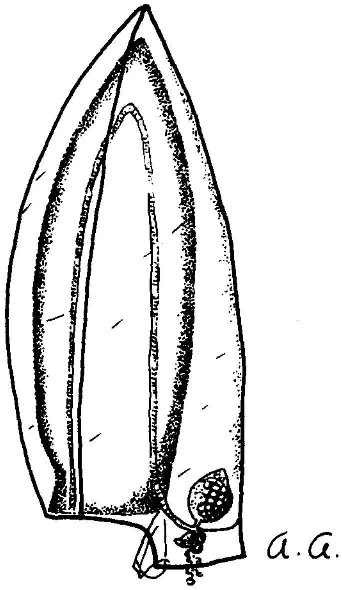


Fig. 52. *Lensia hardy* Totton, 1941. Superior nectophore [from Alvariño, 1981a].

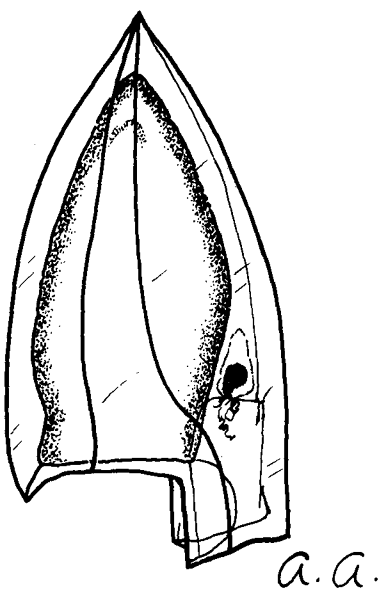


Fig. 53. *Lensia havock* Totton, 1941. Superior nectophore [from Alvariño, 1981a].

L. havock polygastric populations were present only in the winter, where low density concentrations appeared in the mesopelagic layer at 57°10´S, 125°22´W.

In the southwest Atlantic Ocean, records extend from the temperate region, off Mar del Plata, Argentina, to the South Georgia and South Orkney islands (Map B43).

Lensia hostile Totton, 1941

Lensia hostile Totton, 1941 (Figure 54), a rare tropical and temperate species, has been previously noted as far south as 34°05´S, 16°00´E in the Atlantic Ocean [Totton, 1941]. Off San Diego, California, this species occurred in the mesopelagic and bathypelagic layers [Alvariño, 1967b, 1985].

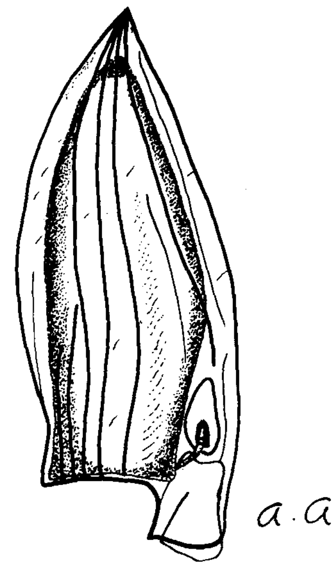


Fig. 54. *Lensia hostile* Totton, 1941. Superior nectophore [from Alvariño, 1981a].

L. hostile was present only in the mesopelagic zone during spring. Two isolated populations were found, a relatively low density in the Tasman Sea and one of moderate density at 49°05´S, 120°12´W (Map A162). *L. hostile* was not observed during summer and winter collections. In the fall a relatively low density polygastric population appeared in the epipelagic zone, extending off Chile and the Juan Fernández Islands region. In the mesopelagic zone it was found in relatively low concentration in the western part of the Bellingshausen Sea. These records constitute the southernmost occurrences of this species, probably introduced into these areas by the Pacific gyre.

Records of *L. hostile* in the southwest Atlantic Ocean are rare and appear in the region between Ascension and Fernando de Noronha islands (Map B44).

Lensia hotspur Totton, 1941

Lensia hotspur Totton, 1941 (Figure 55), mainly an epipelagic species of the tropical and temperate waters, has a Pacific Ocean distribution from 42°00´N to 45°00´S

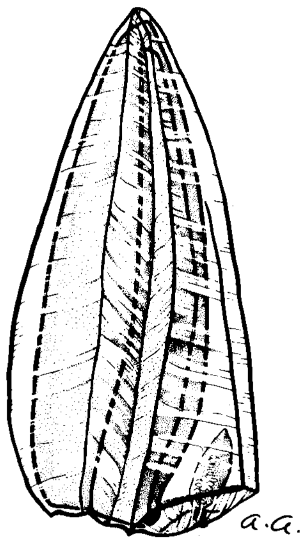


Fig. 55. *Lensia hotspur* Totton, 1941. Superior nectophore [from Alvariño, 1981a].

[Alvariño, 1971]. In the Atlantic this species has been found from 59°00′N [Fraser, 1967] to 43°00′S [Totton, 1941]. Pugh [1974] suggested that the population migrated to the surface at night; however, off California it apparently does not migrate but remains in the epipelagic and mesopelagic layers [Alvariño, 1985].

A limited distribution was noted for *L. hotspur* for the spring cruises. Relatively low concentrations were found in the epipelagic zone off Chile (Map A163). This species was also present in the mesopelagic zone at 39°56′S, 85°54′W (Table A4).

This species was absent from the summer and winter collections. In the fall, relatively low densities of polygastrics appeared in the mesopelagic zone in the Amundsen Sea area (Map A164) and in the bathypelagic layers at locations farther north of that area and north of the Bellingshausen Sea (Map A165).

Records of *L. hotspur* in the southwest Atlantic extend throughout the tropical-equatorial area to the region between Mar del Plata and the Tristan da Cunha group (Map B45).

Lensia hunter Totton, 1941

Lensia hunter Totton, 1941 (Figure 56), inhabits the south temperate zone of the Altantic, Indian, and Pacific oceans. This species has been collected in the Atlantic as far south as 35°18′S, 19°01′W [Totton, 1941].

Two isolated distributions were determined for *L. hunter* in the spring mesopelagic zone, both of relatively low concentrations. One was located near the Drake passage off the southern coast of Chile; the other occurred in the Tasman Sea (Map A166).

L. hunter polygastric populations were absent during summer. In the fall, *L. hunter* appeared in the epipelagic, mesopelagic and bathypelagic layers, but it was absent from the bathypelagic layers in winter. During the fall, polygastric populations of *L. hunter* appeared in the epipelagic zone in moderate concentrations, in a wide region extending off the tip of Chile and the Bellingshausen Sea and Peter I Island, with another relatively low concentration occurring south of Tasmania and southwest of New Zealand's South Island (Map 167). In the mesopelagic zone the population close to the Bellingshausen Sea persisted, although remaining at relatively low densities and extending close to Ellsworth Land, Antarctica (Map A168). In the bathypelagic layers the relatively low densities persisted west of Chile, with another concentration of the same magnitude occurring at 56°00′S, 135°00′W (Map A169).

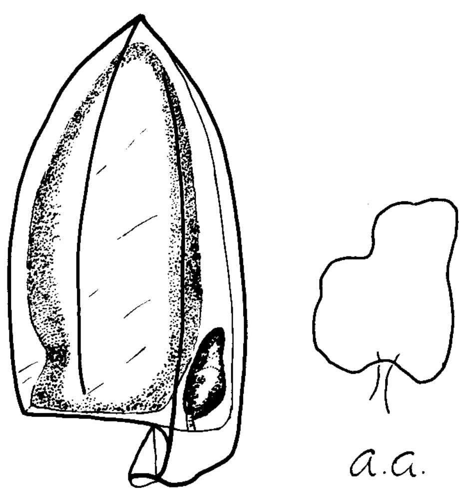


Fig. 56. *Lensia hunter* Totton, 1941. Superior nectophore and ventral view of somatocyst [from Alvariño, 1981a].

In winter the epipelagic polygastric population appeared in relatively low numbers at about 62°00′S, 141°00′W (Map A170). In mesopelagic layers, polygastric *L. hunter* appeared scattered from 54°00′S to 63°00′S and from 148°00′W to 160°00′W (Map A171).

In the southwest Atlantic, records of *L. hunter* appear distributed in the oceanic waters between Brazil and the Tristan da Cunha group (Map B46).

Lensia landrumae Alvariño and Wojtan, 1984

Lensia landrumae Alvariño and Wojtan, 1984 (Figure 57), discovered during the *Eltanin* cruises, inhabits the epipelagic and deepwater layers. In the spring mesopelagic zone a low concentration was found in the Tasman Sea, and relatively low numbers occurred in the region of the Antarctic Pacific basin (Map A172). During the summer a moderate concentration was present in the epipelagic zone south of New Zealand at 52°27'S-52°26'S and 166°42'E.

L. landrumae polygastric stages were obtained in the epipelagic zone in the fall cruises, appearing scattered off Chile and off the Bellingshausen Sea, and at a third location in moderate concentrations south of Tasmania (Map A173). During this season this species was found in relatively low concentration in the mesopelagic zone of the Bellingshausen and Amundsen seas (Map A174).

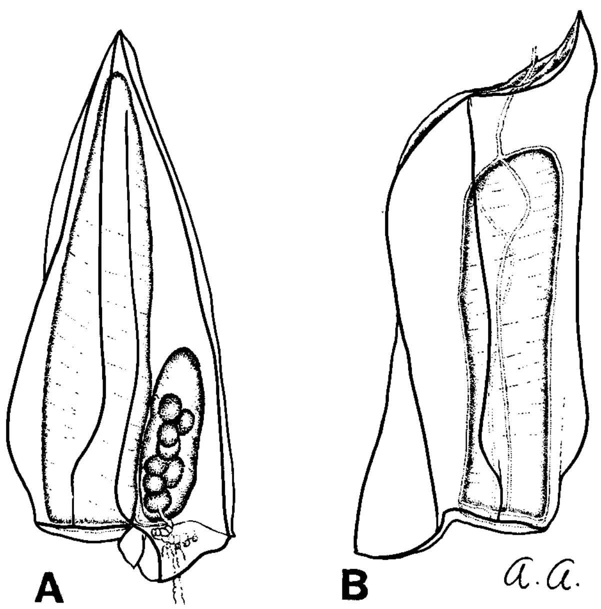


Fig. 57. *Lensia landrumae* Alvariño and Wojtan, 1984. A, superior nectophore; B, inferior nectophore [from Alvariño and Wojtan, 1984].

In winter, *L. landrumae* was found throughout the water column. In the epipelagic zone it appeared east of New Zealand, off the Amundsen Sea, and south of the Great Australian Bight (Map A175). In the mesopelagic region, polygastric populations extended from about 43°30'S to 63°00'S and 160°00'W to 100°00'W close to the Subtropical Convergence (Map A176); in the bathypelagic zone, the species appeared in relatively low numbers in the Bellingshausen and Amundsen seas (Map A177).

Lensia leloupi Totton, 1954

Lensia leloupi Totton, 1954 (Figure 58), is an inhabitant of the tropical-equatorial regions [Alvariño, 1971]. This species has been observed off the Ogowe River [Totton, 1954], off the Amazon estuary [Alvariño, 1968a], and in the Gulf of Guinea [Alvariño, 1981a].

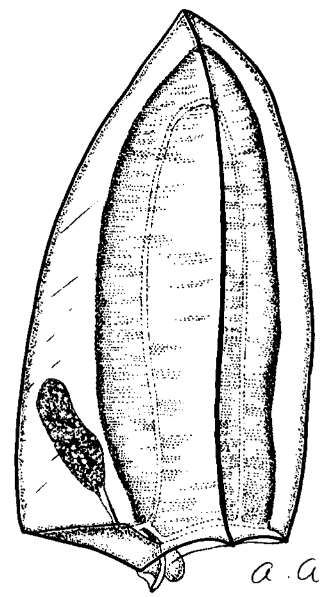


Fig. 58. *Lensia leloupi* Totton, 1954. Superior nectophore [from Alvariño, 1981a].

Limited occurrences of *L. leloupi* were seen only during the spring. Low and relatively low concentrations of the polygastric stage were also found in the Tasman Sea, west and southwest of South Island, New Zealand, in the epipelagic zone (Map 178). This stage was also present in the bathypelagic zone at 42°11'S, 86°03'W (Table A4).

Lensia lelouveteau Totton, 1941

Lensia lelouveteau Totton, 1941 (Figure 59), has been collected most often in the Atlantic Ocean, occurring from 54°00'N [Fraser, 1961] to 33°00'S [Totton, 1941], although specimens have also been found in the Pacific Ocean off California, in the mesopelagic and bathypelagic zones [Alvariño, 1967b, 1985].

During the spring the polygastric stage of *L. lelouveteau* occurred in all three bathymetric strata. In the epipelagic and mesopelagic layers, relatively low and low concentrations, respectively, were distributed in the Tasman Sea. A low concentration was found at 50°05'S, 105°00'W in the bathypelagic zone.

The eudoxid stage was discovered in the *Eltanin* collections. It was present in the spring mesopelagic zone in the following locations (whole sample analyzed): 54°03'S, 119°54'W; 41°58'S, 160°06'E; and 47°37'S, 161°49'E. One specimen was found in a 2045- to 0-m haul at 65°21'S, 75°02'W.

For the summer cruises the polygastric stage was determined in only two locations. One specimen was collected at a depth of 2000-0 m at 45°01'S, 147°14'E, and three specimens were found at the same location in a 1000- to 0-m haul (Table A4).

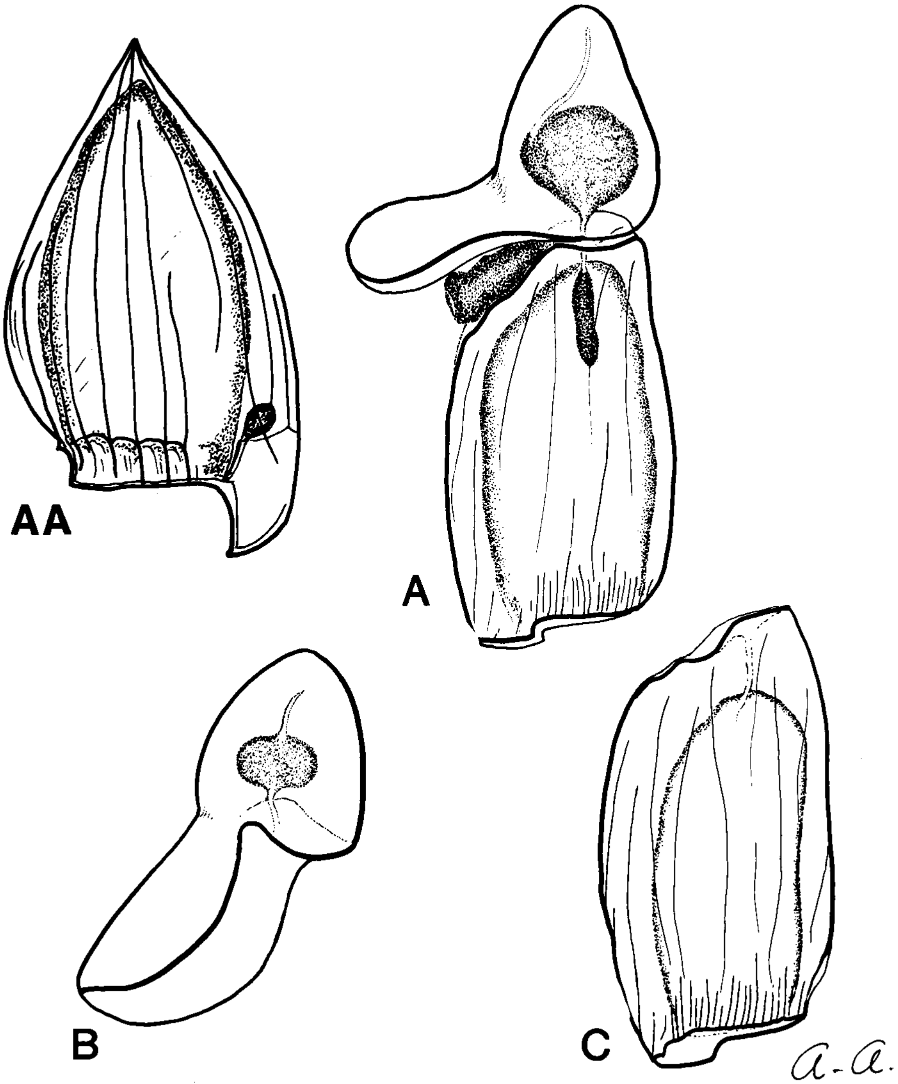


Fig. 59. *Lensia lelouveteau* Totton, 1941. AA, superior nectophore; A, eudoxid; B, bract; C, gonophore.

The eudoxid stage occurred only in the mesopelagic zone during the summer. This stage appeared in relatively low concentrations at 59°03′S, 161°48′E. Upon examination of the whole sample, the eudoxid form was found at the following locations: 59°57′S, 114°57′W; 60°56′S, 114°43′W; 62°58′S, 115°17′W; 60°07′S, 102°55′S; 65°55′S, 89°08′W; 51°09′S, 162°01′E; and 52°26′S, 166°42′E.

Eudoxid stage populations of *L. lelouveteau* were obtained at the three bathymetric levels during the fall. At this season it extended in the epipelagic layer mainly in moderate numbers over a wide area off Chile, the Bellingshausen and Amundsen seas, south of Tasmania, and at several locations along the Subtropical Convergence region (Map A179). In the mesopelagic zone the eudoxid population extended from a location west of the Drake Passage, off the Bellingshausen and Amundsen seas (Map A180). In the bathypelagic zone a relatively low density population appeared to be restricted to off the Bellingshausen Sea and Amundsen Sea areas, in the West Wind Drift (Map A181).

L. lelouveteau appears in winter in the epipelagic, mesopelagic, and bathypelagic zones. Polygastric stage populations were observed south of Australia (Map A182) in the epipelagic zone, and eudoxid populations were obtained in moderate and relatively low numbers north and south of the South Georgia island, respectively; at relatively low concentrations off the Bellingshausen Sea and Amundsen Sea areas; and at a low concentration south of Australia (Map A183). In the mesopelagic zone, eudoxid populations appeared in moderate numbers in the South Georgia island region, and were scattered in moderate and relatively low concentrations in a wide area extending from about 47°00'S to 64°00'S and 161°00'W to 99°00'W (Map A184). In the bathypelagic zone, eudoxids of *L. lelouveteau* were obtained in the Bellingshausen and Amundsen seas (Map A185).

Records of *L. lelouveteau* in the southwest Atlantic Ocean were distributed throughout the equatorial waters in the region of Fernando de Noronha and Ascension islands (Map B47).

Lensia multicristata (Moser, 1925)

Lensia multicristata (Moser, 1925) (Figure 60), a mesopelagic species [Alvariño, 1974], is cosmopolitan in the temperate and warm oceanic regions [Alvariño, 1981a]. In the Atlantic Ocean, Margulis [1971] recorded a distribution range from about 54°00'N to 42°00'S. In the eastern Pacific Ocean an epipelagic distribution between 38°00'N and 48°00'S has been noted; however, between Baja California and Hawaii and in the equatorial region it is mostly mesopelagic and bathypelagic in distribution [Alvariño, 1971, 1985].

L. multicristata was found in both the epipelagic and the mesopelagic layers during the spring. A moderate and relatively low concentration of the polygastric stage was determined in the epipelagic zone southwest of South Island, New Zealand, and north into the Tasman Sea. Two isolated, relatively low concentrations occurred at 37°15'S-37°14'S and 94°39'W, 94°40'~~S~~, and at 56°09'S, 156°11'W (Map 186). *L. multicristata* was also present at 59°04'S, 104°57'W (Table A4). In the mesopelagic zone, relatively low densities were evident in the Antarctic Pacific basin region, southwest of South Island, New Zealand, extending north into the Tasman Sea (Map A187).

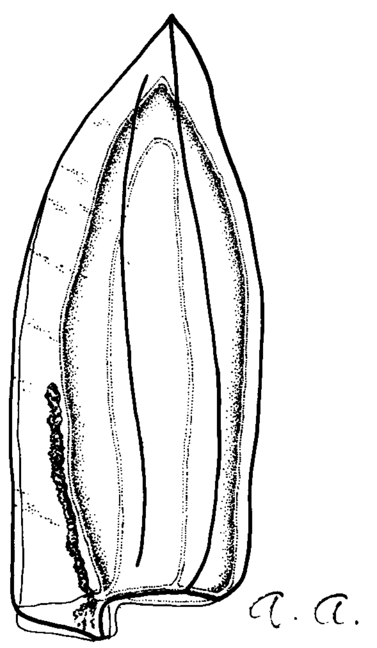


Fig. 60. *Lensia multicristata* (Moser, 1925). Superior nectophore [from Alvariño, 1981a].

During the summer, *L. multicristata* was again evident in the epipelagic and mesopelagic layers. A relatively low concentration was found south of Tasmania in the epipelagic and mesopelagic zones (Map A188). This species was also present at 52°26.0'S, 166°42.0'E (Table A4).

L. multicristata polygastric population was obtained during the fall in the epipelagic and bathypelagic zones. In the epipelagic layer a high concentration extended into the surveyed region at 44°00'S, 86°00'W, while a relatively low concentration was obtained southeast of Tasmania (Map A189). In the bathypelagic zone a remnant was found in a region close to the Antarctic Convergence, west of the Bellingshausen Sea.

In the southwest Atlantic Ocean, records of *L. multicristata* appear widely distributed throughout the equatorial, tropical, and temperate regions, extending as far south as Punta Delgada, Argentina (Map B48).

From data obtained during this study, the distribution of *L. multicristata* approached the Antarctic Convergence from the north. As this species inhabits warmer waters, observations south of the Antarctic Convergence would not be anticipated.

Lensia reticulata Totton, 1954

Lensia reticulata Totton, 1954 (Figure 61), inhabits the mesopelagic and bathypelagic waters off San Diego, California [Alvariño, 1967b, 1985]. This species has been observed in tropical waters of the Atlantic [Alvariño, 1972b], Indian [Totton, 1954], and Pacific oceans [Alvariño, 1967b, 1985].

Both life stages of *L. reticulata* were present during the spring. The eudoxid form was discovered in *Eltanin* collections [Alvariño and Wojtan, 1984].

The polygastric form was distributed in the epipelagic zone in relatively low numbers, from south of 35°00'S to 42°20'S and from 90°00'W to about 120°45'W. In addition, a moderate density was evident at 54°06'S, 119°54'W (Map A190). In the mesopelagic zone this stage was restricted to the Tasman Sea in relatively low numbers. The eudoxid stage occurred only in the mesopelagic zone, at 57°00'S, 158°09'W.

During the summer, *L. reticulata* was restricted to the mesopelagic zone. The polygastric stage was evident in only two isolated areas in low densities, one being located in the Tasman Sea and a second occurring at 56°30'S, 119°29'W (Map A191). The eudoxid stage was found in relatively low concentrations off Marie Byrd Land in the Bellingshausen and Amundsen seas, extending northward to

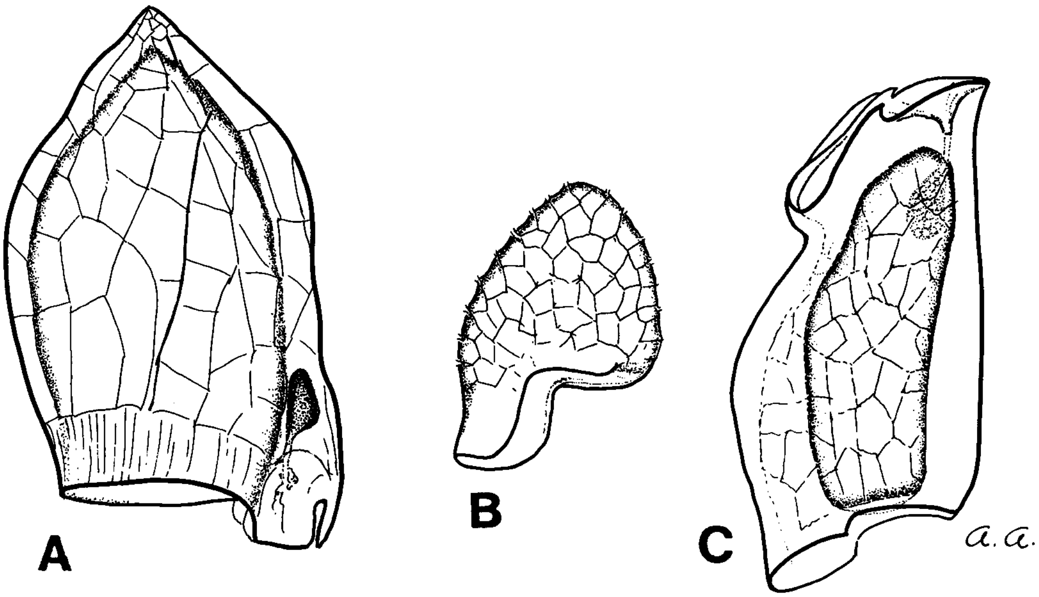


Fig. 61. *Lensia reticulata* Totton, 1954. A, superior nectophore; B, bract; C, gonophore [from Alvariño and Wojtan, 1984].

60°00′S between 110°00′W and 120°00′W, in the Scotia Sea, and southwest of South Island, New Zealand (Map A192). Although the polygastric stage of *L. reticulata* was not found at latitudes higher than 60°00′S, the eudoxid form occurred as far south as the Amundsen and Bellingshausen seas (Map A192).

L. reticulata polygastric and eudoxid stages were obtained during fall and winter collections.

Epipelagic polygastric populations of *L. reticulata* appeared during the fall in relatively low concentrations near Peter I Island. At mesopelagic depths, eudoxid populations were obtained in moderate concentrations in the Amundsen and Bellingshausen seas (Map A193). A small bathypelagic eudoxid population was found at 60°12′S, 114°36′W.

In winter, no *L. reticulata* specimens were observed in the epipelagic layers. Polygastric stages were obtained in the mesopelagic layers off the Bellingshausen Sea (Map A194), and at bathypelagic levels a remnant of eudoxid population was obtained at about 58°30′S, 140°00′W.

Lensia subtilis (Chun 1886)

Lensia subtilis (Chun 1886) (Figure 62) inhabits warm waters [Alvariño, 1981a, 1985] and is widespread in the tropical Atlantic Ocean, occurring at 36°40′S, 16°22.5′E [Leloup and Hentschel, 1935-1938], and from the equator to about 40°00′S [Margulis, 1971]. Pugh [1974] determined a daytime peak for *L. subtilis* in the Canary Islands region at 150 m (59.0% of the population) and a nighttime peak at 100 m (49.5% of the population).

L. subtilis was observed off California and Baja California [Alvariño, 1985] at 15- to 0-m and 25- to 0-m depth in daylight hauls during the winter and spring, and at 250- to 100-m depth in daylight hauls during the summer. No *L. subtilis* were obtained in night collections.

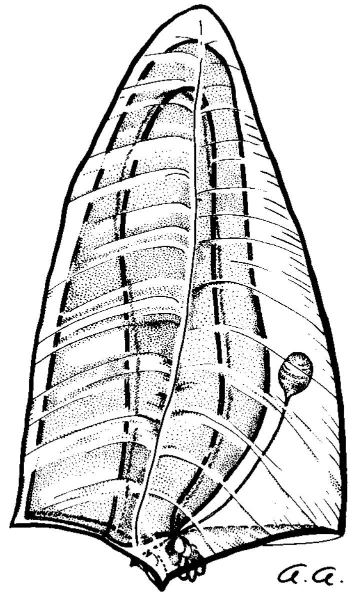


Fig. 62. *Lensia subtilis* (Chun, 1886). Superior nectophore [from Alvariño, 1981a].

L. subtilis was not obtained during the summer, fall, and winter cruises.

A relatively low concentration of *L. subtilis* occurred at 33°02'S, 85°50'W from 490 to 0 m during the spring (Table A4). However, owing to the depth range of the open net haul, its depth range could not be assessed.

Records of *L. subtilis* are frequently found in the southwest Atlantic, extending from the equatorial to the tropical regions and progressing southward to the Río de la Plata, Argentina, and Tristan da Cunha group regions (Map B49).

Lensia subtiloides (Lens and van Riemsdijk, 1908)

Lensia subtiloides (Lens and van Riemsdijk, 1908) (Figure 63) is a typical tropical species [Alvariño, 1981a]. Off San Diego, California, this species was collected in the upper 100 m during the day [Alvariño, 1967b]. Southern occurrences include the areas west of Perth, Australia, at 31°58.1'S, 114°52.2'E and northeast of East London at 32°00'S, 29°43.3'E [Totton, 1954].

L. subtiloides was found only in the spring and summer. In the spring the polygastric stage was present in the epipelagic zone off Chile at 41°14'S, 78°44'W (Table A4) and in relatively low density in the mesopelagic zone in the Tasman Sea. During the summer, *L. subtiloides* was limited to moderate densities south of the South Georgia island in the mesopelagic layers.

Muggiaea atlantica Cunningham, 1892

Muggiaea atlantica Cunningham, 1892 (Figure 64), is an inhabitant of neritic zones in temperate regions [Alvariño, 1974] and is abundant in "anchovy waters, rich in small calanoid copepods" [Alvariño, 1980a, 1981b]. This species is replaced by *M. kochi* in tropical-equatorial waters of the east and west Atlantic and eastern Pacific oceans and by *M. delsmani* in the Indian Ocean and Southeast Asia regions [Alvariño, 1971]. In the South Atlantic this species

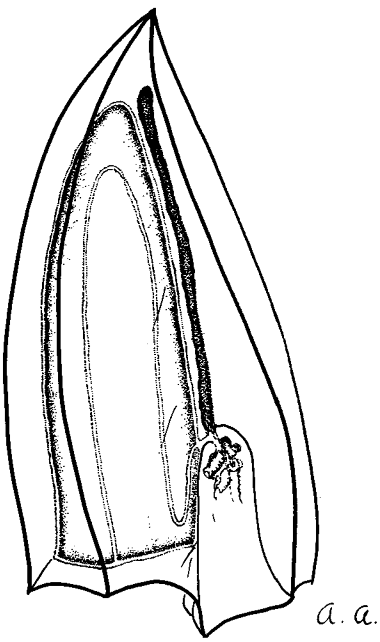


Fig. 64. *Muggiaea atlantica* Cunningham, 1892. Nectophore.

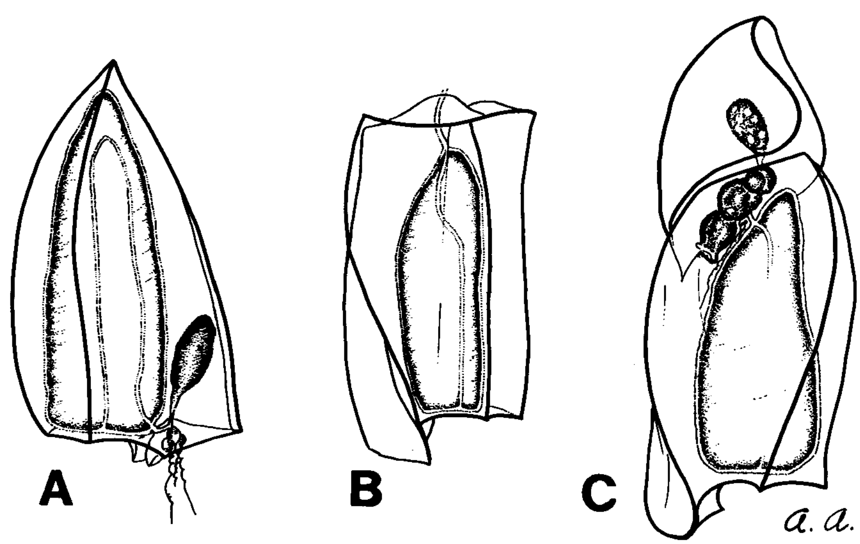


Fig. 63. *Lensia subtiloides* (Lens and van Riemsdijk, 1908). A, superior nectophore; B, inferior nectophore; C, eudoxid.

was previously observed off South Africa [Alvariño, 1981a; Margulis, 1972]. Bigelow and Sears [1937] found *M. atlantica* to be common in the upper 200-100 m of the Mediterranean Sea.

In the present study, the distribution of *M. atlantica* was restricted to the mesopelagic zone during the summer, and it was found south of the South Orkney Islands. Only the polygastric form was observed.

M. atlantica was obtained during the fall cruises, but it was absent from spring and winter collections.

During the fall cruises, polygastric stages of *M. atlantica* appeared in the epipelagic zone southwest of Chile, and in the mesopelagic layers at this same location and two other places in the Bellingshausen Sea, in moderate to relatively low concentration (Map A195).

Muggiaea bargmannae Totton, 1954

Muggiaea bargmannae Totton, 1954 (Figure 65), is a neritic species endemic to the Antarctic and South Georgia island region and therefore can be used as an indicator of Antarctic waters [Alvariño, 1981a].

Two occurrences of *M. bargmannae* were evident during the spring and summer south of the Antarctic Convergence. The polygastric stage occurred in low numbers in the mesopelagic region at the entrance of the Drake Passage in the spring. During the summer this species was found in moderate concentrations in the epipelagic zone along the east coast of the Antarctic Peninsula. Polygastric stages of *M. bargmannae* were obtained during the fall in the epipelagic zone in relatively low density in the Amundsen Sea.

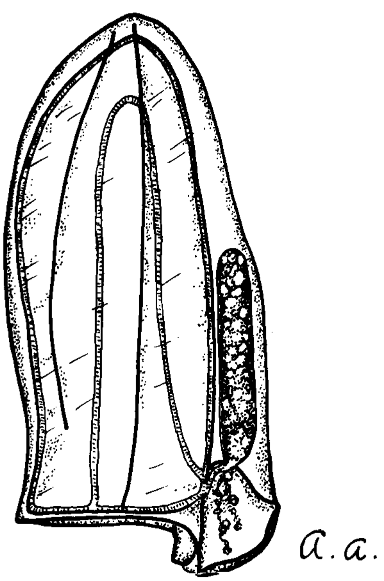


Fig. 65. *Muggiaea bargmannae* Totton, 1954. Nectophore [from Alvariño, 1981a].

In the southwest Atlantic Ocean, *M. bargmannae* records appear distributed around the South Georgia island area and north of that region, southwest of the Tristan da Cunha group (Map B50).

Muggiaea delsmani Totton, 1954

Muggiaea delsmani Totton, 1954 (Figure 66), occurs in the tropical neritic region of the Indian Ocean and Southeast Asia [Alvariño, 1963, 1971, 1972a; Daniel and Daniel, 1963; Rees and White, 1966].

The polygastric stage of *M. delsmani* was present only at 52°52′S, 104°54′W in the spring mesopelagic zone (Table A4).

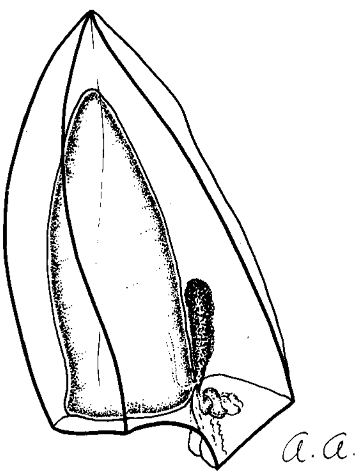


Fig. 66. *Muggiaea delsmani* Totton, 1954. Nectophore.

Subfamily CHUNIPHYINAE

Chuniphyes moserae Totton, 1954

Chuniphyes moserae Totton, 1954 (Figure 67), is a cosmopolitan specie [Alvariño, 1981a]. Collections off Bermuda were from the bathypelagic zone [Totton, 1954], while those off San Diego, California, were from the mesopelagic and bathypelagic zones [Alvariño, 1967b]. Totton [1954] also observed this species in Antarctic waters at 66°16.7′S, 13°23.3′W.

The polygastric stage of *C. moserae* occurred in the mesopelagic zone during both spring and summer cruises. During the spring, low concentrations were found in the Subtropical Convergence region of the South Pacific (Map A196). *C. moserae* was limited during the summer to low densities in the Ross Sea. However, the difference in distribution for the spring and summer cruises may be due to the sampling area.

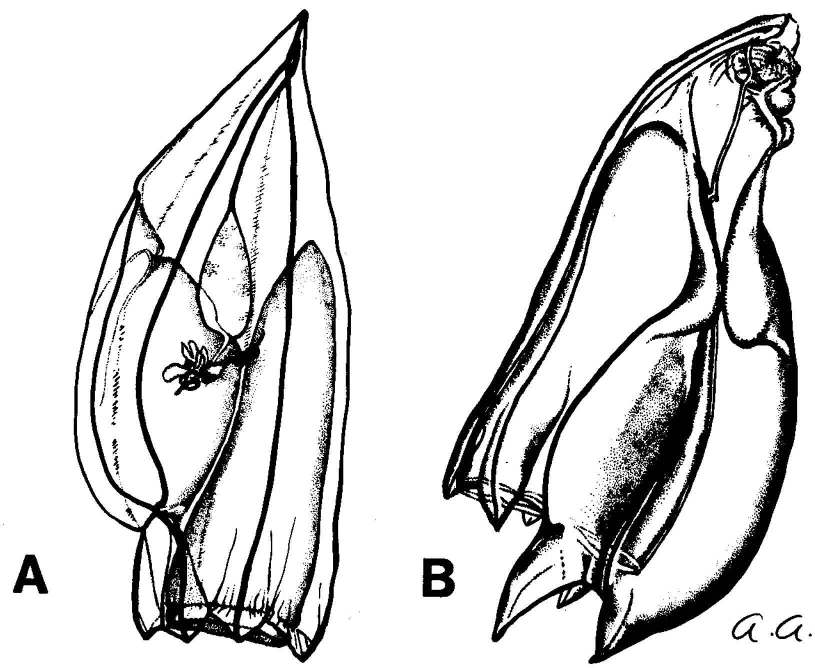


Fig. 67. *Chuniphyes moserae* Totton, 1954. A, superior nectophore; B, inferior nectophore [from Alvariño, 1981a].

Polygastric stage populations of *C. moserae* were not found in the fall. In the winter collections, *C. moserae* appeared in the epipelagic zone in low concentrations north of the South Georgia island.

In the southwest Atlantic Ocean, *C. moserae* appears in a scattered distribution throughout the region of the islands in the tropical-equatorial area, off Brazil, and east of the South Georgia island (Map B51).

Chuniphyes multidentata Lens and van Riemsdijk, 1908

Chuniphyes multidentata Lens and van Riemsdijk, 1908 (Figure 68), a cosmopolitan species, inhabits waters generally deeper than 200 m. In the South Atlantic this species has been found in the vicinity of South Georgia island [Alvariño, 1981a; Margulis, 1972]. In the Pacific the known distribution ranges from 45°00'N to 59°00'S [Alvariño, 1971].

During the spring, *C. multidentata* occurred in the mesopelagic and bathypelagic layers. The polygastric form occurred in low numbers in the mesopelagic zone, off the Bellingshausen Sea and southwest of South Island, New Zealand (Map A197), and at 39°56'S, 85°54'W; 40°05'S, 119°40'W; and 58°06'S, 120°09'W (Table A4). In the bathypelagic zone, two isolated low-density distributions were found, at 40°05'S, 119°40'W and at 56°09'S, 156°11'W (Map A198).

The polygastric stage was collected only in low numbers in the mesopelagic zone during the summer in three isolated locations: off the tip of the Antarctic Peninsula; off the Bellingshausen Sea; and southwest of South Island, New Zealand, and north of the Tasman Sea (Map A199).

C. multidentata was observed in the fall in the mesopelagic layers. Relatively low concentrations of polygastric stages appeared in the Bellingshausen Sea (Map A200).

Although both species of *Chuniphyes* are considered cosmopolitan, *C. multidentata* was more abundant in the Antarctic and Subantarctic regions than *C. moserae*. This higher occurrence of *C. multidentata* was also noted in the South Atlantic [Alvariño, 1981a]. *C. multidentata* was not observed in the epipelagic zone during the spring, summer, or fall, and it was absent from the three bathymetric levels during winter. The depth range of this species below 200 m is in agreement with previous studies [Alvariño, 1981a].

C. multidentata in the southwest Atlantic was frequent throughout the tropical-equatorial and temperate regions, with records around South Georgia island (Map B52).

Family CLAUSOPHYIDAE

Clausophyes galeata Lens and van Riemsdijk, 1908

Clausophyes galeata Lens and van Riemsdijk, 1908 (Figure 69), a rare species first observed at 01°38'N, 124°28'E, also occurs in the Antarctic regions [Alvariño, 1981a]. This species has also been found at 58°35'S,

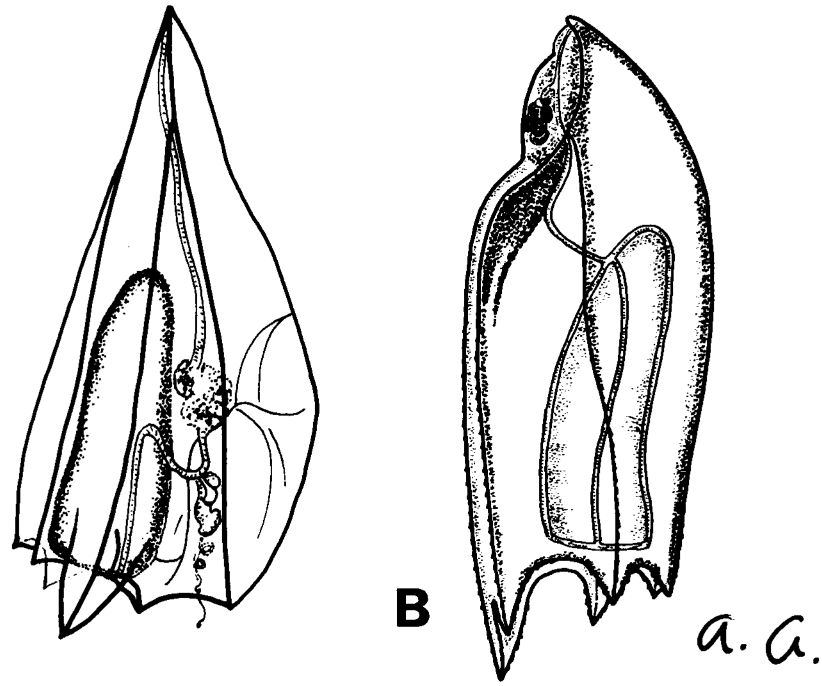


Fig. 68. *Chuniphyes multidentata* Lens and van Riemsdijk, 1908. A, superior nectophore; B, inferior nectophore [from Alvariño, 1981a].

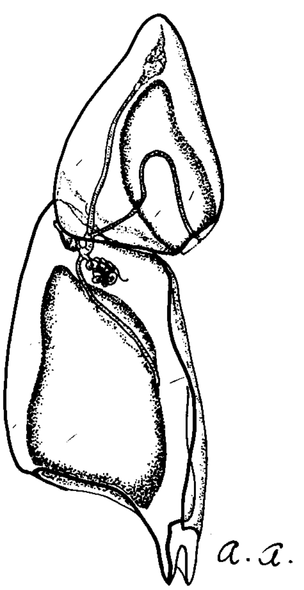


Fig. 69. *Clausophyes galeata* Lens and van Riemsdijk, 1908. Polygastric stage [from Alvariño, 1981a].

92°06.2′E [Totton, 1954] and off California in the mesopelagic and bathypelagic layers [Alvariño, 1967b].

The polygastric form of *C. galeata* was found during the spring and summer. A relatively low concentration was found in the spring in the bathypelagic zone at 40°05′S, 119°40′W, and a low concentration appeared at 60°12′S, 85°02′W (Map A201). During the summer the polygastric stage occurred in the mesopelagic zone. This stage was also present in the bathypelagic zone south of Tasmania, in relatively low concentrations.

C. galeata was not found in the fall collections, and in winter the polygastric populations were obtained in relatively low concentrations in the South Georgia island region.

Totton [1954] collected *C. galeata* at 58°36′S, 92°06.2′E. Although this area was not sampled during the *Eltanin* cruises, polygastric populations occurred in the Tasman Sea.

These siphonophores were probably transported to this site via the West Wind Drift. The species was also found in the Antarctic waters, as it was in a previous study [Alvariño, 1981a].

Clausophyes ovata (Keferstein and Ehlers, 1860)

Clausophyes ovata (Keferstein and Ehlers, 1860) (Figure 70) is characteristic of cold waters [Alvariño, 1981a) and has been recorded off Wilkes Land at 58°35′S, 92°06.2′E [Totton, 1954; Margulis, 1972]. Pugh [1974] concluded that both forms of this species are bathypelagic, although he stated that the entire population was found in the lower mesopelagic zone (700-960 m) in the Canary

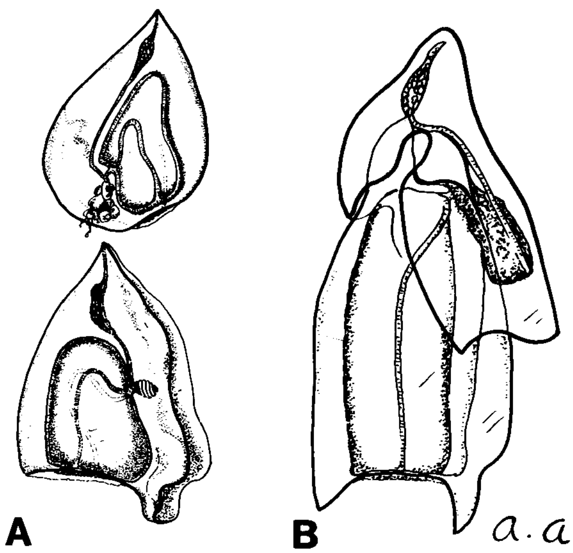


Fig. 70. *Clausophyes ovata* (Keferstein and Ehlers, 1860). A, polygastric stage; B, eudoxid [from Alvariño, 1981a].

Islands region. Off California, this species was collected in the bathypelagic zone from 1875- to 2525-m depth [Alvariño, 1967b].

In the present study, the eudoxid stage of *C. ovata* was common during the spring in the epipelagic zone. Relatively low to high concentrations occurred off Chile westward to 125°15'W as far north as about 30°00'S, spreading to south of the Subantarctic Convergence region. Highest concentrations spread off Chile, the Ross Sea, and the Tasman Sea (Map A202).

The eudoxid stage was also common in the mesopelagic stratum. Low to high densities were evident off Chile as far north as 34°00'S and south into the Drake Passage and west to 160°00'W. Southwest of South Island, New Zealand, and north into the Tasman Sea, relatively low concentrations of *C. ovata* eudoxids were found (Map A203). At 40°05'S, 119°40'W this stage was also present (Table A4).

Below 1000 m the eudoxid form had a more limited distribution. A low to moderate concentration was found in the Pacific Antarctic basin region and off the Ross Sea (Map A204). This stage was also present at 42°11'S, 86°03'W; 49°58'S, 110°00'W; and 39°56'S, 107°24'W (Table A4).

Two isolated concentrations of the polygastric form were evident in the bathypelagic zone in low densities during the spring, one at 60°12'S, 95°04'W and the other at 56°09'S, 156°11'W. At 42°11'S, 86°03'W the polygastric form was also present (Table A4).

During the summer the eudoxid stage of *C. ovata* was widespread in the epipelagic zone. Eudoxids appeared in moderate to low densities east of the Falkland Islands through the Scotia Sea as far east as 14°00'W and as far south as 66°40'S, extending to the north of the Bellingshausen Sea. A moderate to relatively low concentration was found off Victoria Land, extending north to South Island, New Zealand, and south to Tasmania (Map A205). The eudoxid stage was present at 65°50.9'S, 115°03.4'W (Table A4).

The eudoxid stage was also widespread in the mesopelagic zone. A low to moderate density distribution was found in the Weddell Sea, in the Scotia Sea, south and east of the Falkland Islands, and west into the Drake Passage, into the Bellingshausen Sea, from the Ross Sea to the Tasman Sea, and south of New Zealand (Map A206).

In the bathypelagic zone the eudoxid stage was distributed in isolated areas. A relatively low concentration occurred west of South Island, New Zealand, in the Tasman Sea, while another was located off Cape Adare, and off the South Orkney Islands (Map A207).

The polygastric stage of *C. ovata* occurred in both the mesopelagic and the bathypelagic layers during the summer. A relatively low concentration appears in the mesopelagic layers at 65°50'S, 65°51'S and 115°03'W, and off Cape Adare.

Totton [1954] observed *C. ovata* northeast of the South Georgia island (49°58'S, 29°52'W to 49°58'S, 30°13'W) and east of this island (54°17'S, 34°47'W). In the present study, the eudoxid form was widespread in this general region in the epipelagic and mesopelagic layers. In the bathypelagic zone the distribution was smaller, though of moderate density.

C. ovata was also observed in the *Eltanin* fall and winter cruises in the Antarctic and adjacent regions. During the fall it was present at all depths. Eudoxids appeared in the epipelagic stratum, extending from off Chile southward to the Bellingshausen and Amundsen seas (Map A208). In the mesopelagic layers, moderate to relatively low concentrations of polygastric populations inhabited a wide area in the Bellingshausen and Amundsen seas, extending far off to the Subantarctic regions (Map A209), and the eudoxid populations were scattered in moderate and relatively low densities through those areas and off Chile (Map A210). In the bathypelagic zone, only eudoxid stages were obtained in the fall, extending far off Chile (Map A211).

In winter, only eudoxid stages of *C. ovata* were observed. In the epipelagic zone, eudoxids appeared in moderate concentrations north of South Georgia island, in relatively low concentrations in the region off the Amundsen Sea, and in low concentrations in a wide area in the Antarctic Ocean (Map A212). In the mesopelagic layers, eudoxid populations in moderate, relatively low, and low concentrations extended along the West Wind Drift off the Bellingshausen, Amundsen, and Ross Sea areas (Map A213).

In the southwest Atlantic, *C. ovata* records extend from off Rio Grande do Sul, Brazil, to the South Georgia island (Map B53).

From the present data and a previous study of the Indian Antarctic [Totton, 1954], *C. ovata* has a circumpolar distribution, inhabiting the waters of the West Wind Drift.

Crystallophyes amygdalina Moser, 1925

Crystallophyes amygdalina Moser, 1925 (Figure 71), is characteristic of the Antarctic and Subantarctic regions [Alvariño, 1971]. This species has been collected in the region of the South Georgia island [Hardy and Gunther, 1935; Leloup, 1934; Leloup and Hentschel, 1935-1938; Totton, 1954], the South Sandwich Islands [Totton, 1954], the south Atlantic to about 60°00′S [Margulis, 1974], southeast of Heard Island [Totton, 1954], from 59°00′E to 98°00′E, the Antarctic ice edge [Totton, 1954], and southwest of Australia (60°06.7′S, 102°48.6′E) [Totton, 1954].

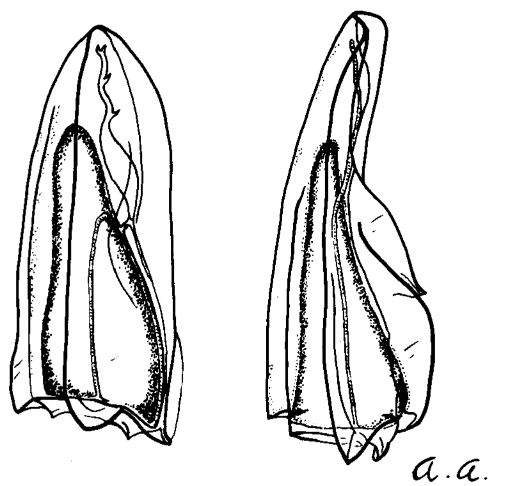


Fig. 71. *Crystallophyes amygdalina* Moser, 1925. Superior and inferior nectophores.

However, *C. anygdalina* has also been collected in warmer waters such as in the mesopelagic and bathypelagic zones off San Diego, California [Alvariño, 1967b], and the equatorial Indian Ocean [Totton, 1954].

In the present study, *C. amygdalina* occurred in all three bathymetric strata during the spring. Only the polygastric stage was present.

This species appeared in a scattered distribution throughout the epipelagic zone. A moderate to relatively low density distribution was determined off the southern coast of Chile southward through the Drake Passage into the Bellingshausen Sea, as well as in other locations farther north close to 30°00′S and from 86°40′W to 90°30′W, the Pacific Antarctic basin region (Map A214).

C. amygdalina was present mostly in relatively low densities in the mesopelagic stratum. The polygastric stage was distributed off southern Chile south through the Drake Passage into the Bellingshausen Sea. Three isolated distributions also were evident in the Subantarctic region near the Pacific Antarctic basin, off the Bellingshausen and Amundsen seas (Map A215). *C. amygdalina* was also present at 40°05′S, 119°40′W and 55°19′S, 145°03′W (Table A4).

Only one relatively low distribution occurred in the bathypelagic layer. The polygastric stage was located at 32°59′S, 87°56′W.

During the summer, *C. amygdalina* was present in the epipelagic and mesopelagic layers. A relatively low concentration of this species occurred northeast of the South Shetland Islands in the epipelagic zone. Another relatively low concentration was evident in the Pacific Antarctic basin region and south of South Island, New Zealand (Map A216). In the mesopelagic zone, relatively low densities were found in the Amundsen and Bellingshausen seas and also south and southwest of South Island, New Zealand (Map A217).

In the fall, *C. amygdalina* polygastric populations were observed at three bathymetric levels. In the epipelagic zone, *C. amygdalina* polygastric stages appeared scattered in relatively low concentrations along the subtropical region, from off Chile to about 127°00′W, and also in moderate density south of Tasmania (Map A218). In the mesopelagic layers, polygastrics appeared in moderate and relatively low concentrations in the Bellingshausen and Amundsen seas (Map A219), and in the bathypelagic zone, relics of those populations persisted in those areas (Map A220).

In winter, also only the polygastric stages of *C. amygdalina* were obtained, and at the three bathymetric zones. In the epipelagic layers a moderate concentration was observed north of the South Georgia island, and relatively low concentrations in the Bellingshausen and Amundsen seas (Map A221). In the mesopelagic zone, moderate to low densities were obtained in the West Wind Drift areas (Map A222). In the bathypelagic zone a relic from the mesopelagic population was observed at 59°00′S, 110°00′W (Map A223).

In the southwest Atlantic Ocean, *C. amygdalina* appeared densely concentrated in the region of the South Georgia island, extending also north of this area (Map B54).

Considering this study and previous studies [Hardy and Gunther, 1935; Leloup, 1934; Leloup and Hentschel, 1935-1938; Totton, 1954], *C. amygdalina* has a circumpolar distribution, following the northward flow at South America. This species was not detected in the Tasman Sea.

Heteropyramis alcala Alvariño and Frankwick, 1983

Heteropyramis alcala Alvariño and Frankwick, 1983 (Figure 72), a mesopelagic species, was discovered during the *Eltanin* cruises. Both polygastric and eudoxid stages were found during the spring. A relatively low concentration of both stages occurred in the Amundsen Sea and Bellingshausen Sea areas (Maps A224 and A225). This species was also found at 41°58′S, 160°06′E and 47°37′S, 161°49′E when the whole samples were examined. During the summer, *H. alcala* was detected at 49°17′S, 162°00′E upon analysis of the whole sample [Alvariño and

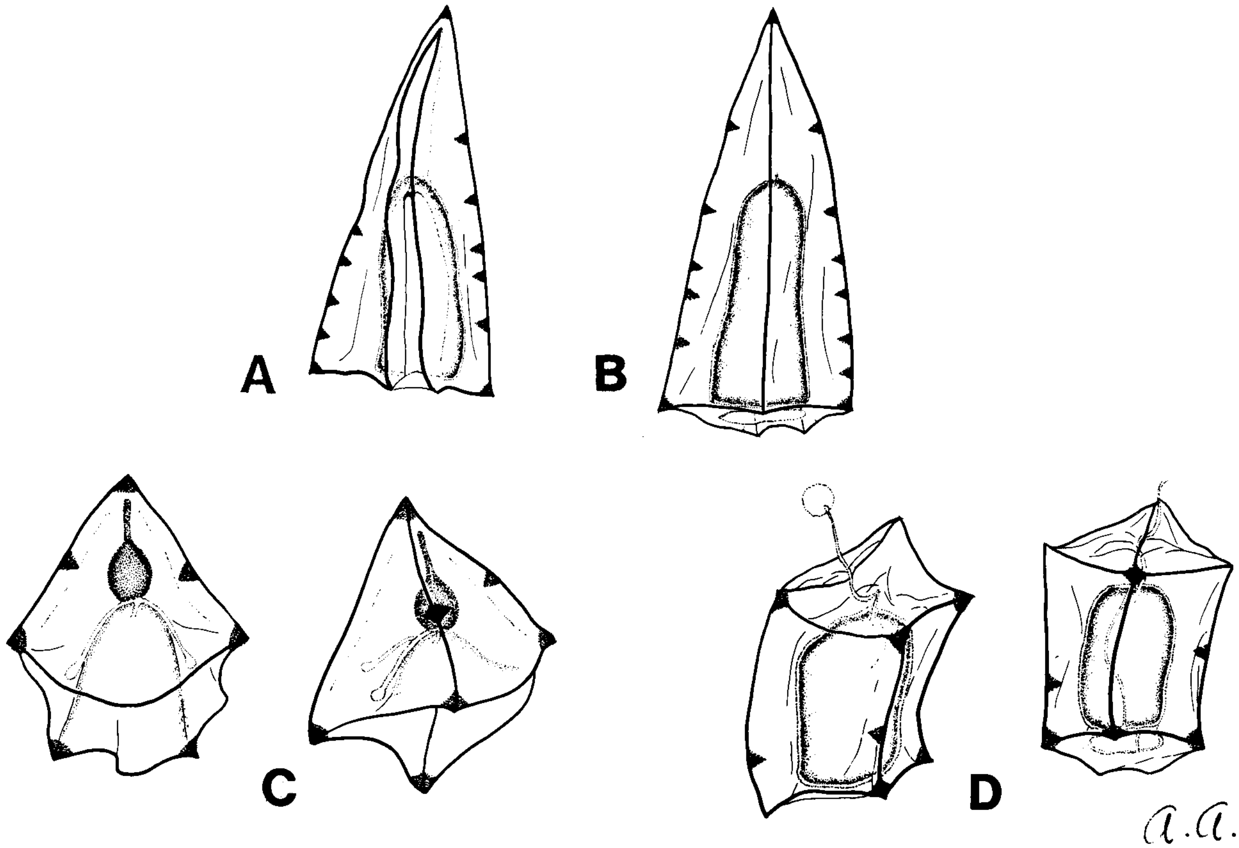


Fig. 72. *Heteropyramis alcala* Alvariño and Frankwick, 1983. A and B, nectophore; C, bract; D, gonophore [from Alvariño and Frankwick, 1983].

Frankwick, 1983], spreading this species along the mesopelagic layers.

H. alcala was also observed in the fall in mesopelagic and bathypelagic zones. In the mesopelagic layers both polygastric and eudoxid populations were obtained. Polygastric populations extended in relatively low concentrations southward from southern Chile (Map A226), and eudoxid stages in low concentrations were found in the Peter I Island region (Map A227), whereas in the bathypelagic layers, eudoxid populations were restricted to this area, but in relatively low concentrations (Map A228).

H. alcala was found only in the eudoxid stage in winter, in mesopelagic layers at about 58°00′S, 109°45′W (Map A229).

Heteropyramis maculata Moser, 1925

Heteropyramis maculata Moser, 1925 (Figure 73), has been collected mostly in the Atlantic Ocean. Leloup and Hentschel [1935-1938] found this species in the southern Atlantic west of the South Georgia island at 54°45′S, 43°23′W from 200- to 800-m depth. In the Canary Islands region, Pugh [1974] found most specimens between the 500- and 600-m range. Off San Diego, California, this

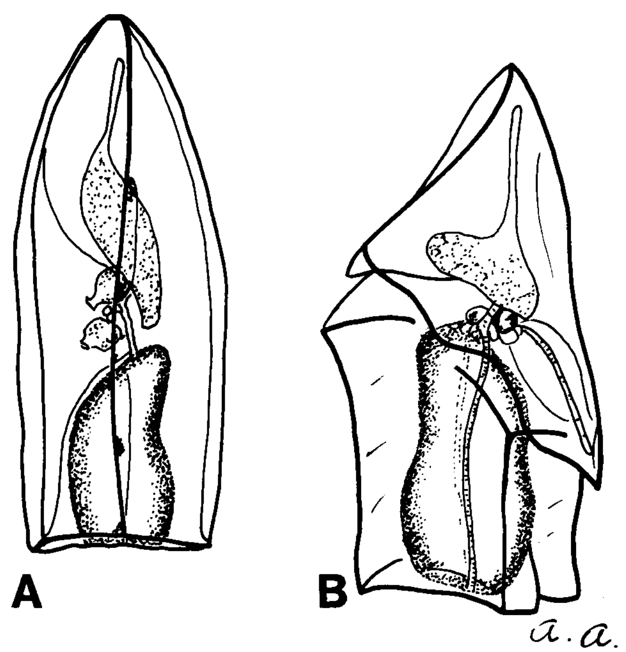


Fig. 73. *Heteropyramis maculata* Moser, 1925. A, superior nectophore; B, eudoxid [from Alvariño, 1981a].

species was collected in the mesopelagic and bathypelagic zones [Alvariño, 1967b].

During the spring the polygastric stage of *H. maculata* was more common in the mesopelagic zone than in the epipelagic zone. In the epipelagic zone this stage was found off southwest Chile (Map A230). This stage was also present at 65°57.3´S, 82°56.0´W (Table A4). Scattered relatively low densities occurred in the mesopelagic zone. One was located off the southwestern coast of Chile, while another extended from the Drake Passage to the Bellingshausen Sea (Map A231).

The eudoxid stage of *H. maculata* occurred in all three bathymetric zones during the spring. In the epipelagic zone a relatively low to moderate density was located off southern Chile that extended into the Drake Passage; southwest of South Island, New Zealand; and northward into the Tasman Sea (Map 232).

The eudoxid stage was more common in the mesopelagic zone. Moderate to low concentrations occurred off Chile, extending northward to about 30°00´S, south into the Drake Passage and Bellingshausen Sea, and westward to 150°00´W, and were evident at locations west of New Zealand and the Tasman Sea (Map A233).

Only a low concentration of eudoxids was found in the bathypelagic zone at 59°01´S, 99°43´W during the spring. This stage was also present at 57°01´S, 127°30´W (Table A4).

The polygastric stage of *H. maculata* occurred in all bathymetric strata during the summer. In the epipelagic zone, relatively low densities were found at 57°47´S-58°58´S and 115°14´W-114°47´W. However, three isolated, relatively low concentrations appeared in the mesopelagic zone in the region of the South Orkney Islands, off the Bellingshausen Sea, and south of the Tasman Sea (Map 234). At 57°57´S, 153°58´E the polygastric form was also present (Table A4).

In the bathypelagic zone the polygastric stage was found off Cape Adare and south of the Tasman Sea in relatively low concentration (Map A235).

During the summer, *H. maculata* eudoxids were collected in all three bathymetric zones. In the epipelagic zone a relatively low to moderate concentration was found in the Scotia Sea and southeast of the South Orkney Islands, off the Bellingshausen and Amundsen seas, and south of New Zealand (Map A236). At 70°53´S, 171°50´W the eudoxid stage was also present (Table A4).

The eudoxid stage was widespread in the mesopelagic zone. This stage occurred in the Scotia Sea in relatively low to low concentration and in moderate densities in the South Orkney Islands region; the Amundsen, Bellingshausen, and Ross seas; west of Cape Adare; and around the Balleny Islands. The moderate concentration was located off George V Coast in the Balleny Islands region and west of South Island, New Zealand (Map A237). This stage was also found at 56°59´S, 39°56´W; 70°53´S, 171°50´W; and 57°57´S, 153°58´E (Table A4).

Moderate and relatively low densities appeared in the bathypelagic zone from Cape Adare and off George V Coast north to 50°00´S and from about 180°00 to 150°00´E, and around the Balleny Islands (Map A238).

The eudoxid stage of *H. maculata* was more prevalent during the spring and summer than the polygastric stage. Thus these two seasons are probably the reproductive period.

H. maculata was observed in the fall and winter. During the fall cruises, both polygastric and eudoxid populations were obtained, but the former at all three bathymetric levels, and the latter only in the mesopelagic and bathypelagic zones. The polygastric populations appeared distributed in moderate and relatively low concentrations in the Bellingshausen and Amundsen seas, east of New Zealand, and east and south of Tasmania (Map A239). The mesopelagic populations persisted in the Bellingshausen Sea and Amundsen Sea areas only (Map A240), and the eudoxid stages in mesopelagic layers appeared to be restricted to the Peter I Island region (Map A241). In the bathymetric layers, polygastric populations were observed in relatively low densities off southern Chile (Map A242), and eudoxid populations in this zone were located in the Peter I Island region (Map A243).

In winter, *H. maculata* polygastric stages were observed at all depths, whereas the eudoxid stages occurred only in the mesopelagic zone. Epipelagic polygastric populations appeared scattered in moderate, relatively low, and low concentrations in the region of the South Georgia island, in the Bellingshausen and Amundsen seas, south of the Great Australian Bight, and off Wilkes Land (Map A244). In the mesopelagic layers, populations were observed only off the Bellingshausen and Amundsen seas (Map A245). Eudoxid populations were observed in the mesopelagic zone far off the Bellingshausen Sea and Amundsen Sea areas and east of New Zealand (Map A246). Polygastric populations appeared in the bathypelagic layers in relatively low density at about 58°00´S, 100°00´W and 59°00´S, 148°00´W (Map A247).

H. malculata records in the southwest Atlantic are scattered throughout the South Georgia, Fernando de Noronha, and Ascension islands areas (Map B55).

Thalassophyes crystallina Moser, 1925

Thalassophyes crystallina Moser, 1925 (Figure 74), has most records in the southern hemisphere, occurring in the mesopelagic and bathypelagic layers [Alvariño, 1971]. Observations in Antarctic waters were made off Wilkes Land at 63°00´S, 80°00´E, southwest of Australia at 60°06´S, 102°48.6´E, and near the South Georgia and the South Shetland islands [Totton, 1954].

The polygastric stage of *T. crystallina* was present in all three bathymetric strata during the spring cruises. In the epipelagic zone, moderate to low concentrations occurred off Chile westward to about 120°00´W and as far south as

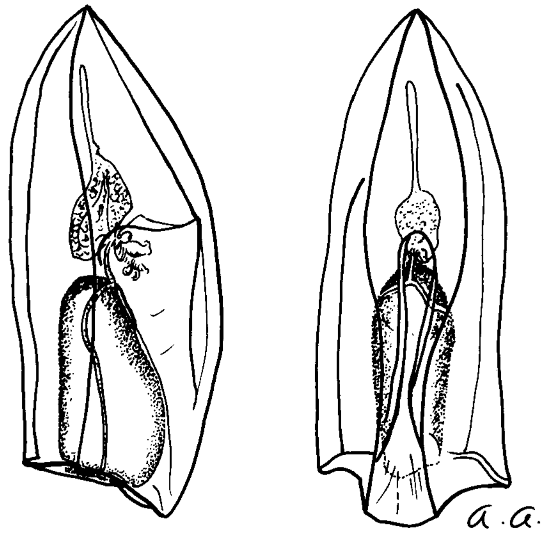


Fig. 74. *Thalassophyes crystallina* Moser, 1925. Lateral and ventral view of the superior nectophore [from Alvariño, 1981a].

59°45′S. An isolated, relatively low density was determined from 59°45′S to 63°45′S and from 71°20′W to 80°30′W. In the Tasman Sea and southwest of South Island, New Zealand, a relatively low concentration was found (Map A248). The polygastric form was also present at 56°09′S, 156°11′W (Table A4).

The polygastric stage was most abundant in the mesopelagic zone. Off southern Chile, extending westward to 106°20′W and as far north as 30°00′S, a low to moderate density distribution appeared. Farther west, two relatively low density patches and one moderate one occurred, extending from the northern Bellingshausen Sea into the Drake Passage, and southwest of South Island, New Zealand (Map A249). The polygastric stage was also present at 40°05′S, 119°40′W (Table A4).

In the bathypelagic zone, three isolated distributions of *T. crystallina* were determined off Chile in the Pacific Antarctic basin and west of this region (Map A250). At the following locations the polygastric form was also present: 36°30′S, 83°15′W; 39°56′S, 85°54′W; 42°11′S, 86°03′W; and 39°56′S, 107°24′W (Table A4).

In contrast, the eudoxid stage of *T. crystallina* was detected only in the mesopelagic zone during the spring. A relatively low concentration was distributed southwest of South Island, New Zealand (Map A251). In addition, the eudoxids were found at 41°58′S, 160°06′E and 47°37′S, 161°49′E when the whole samples were examined.

The polygastric stage of *T. crystallina* was present in all three bathymetric zones during the summer also. In the epipelagic layers a relatively low concentration occurred in the Weddell Sea off the east Antarctic Peninsula. East of the Falkland Islands and in the Amundsen Sea and in the Ross Sea off Cape Adare a moderate density distribution occurred, decreasing in density to the northwest, and moderate densities were found from 49°30′S to 53°15′S and from 154°15′E to 145°00′E (Map A252).

In the mesopelagic zone the *T. crystallina* polygastric stage was more widespread. This stage occurred in relatively low densities from the tip of Tierra del Fuego into the Drake Passage, through the Scotia Sea north to 49°45′S, south to 64°30′S, and as far east as 24°00′W, with low to moderate densities evident in the Amundsen Sea and southeast of South Island, New Zealand. In addition, a relatively low concentration was determined from 58°45′S to 62°00′S and from 159°15′E and 148°40′E (Map A253). This stage was also present at 71°02′S, 166°24′E (Table A4).

Three isolated distributions were determined in the bathypelagic zone, with moderate concentrations occurring in the Scotia Sea, the Falkland Islands region, and off George V Coast (Map A254). In addition, the polygastric stage was found at 53°05′S, 42°02′W (Table A4).

During the summer the eudoxid stage of *T. crystallina* occurred in all three bathymetric strata. In the epipelagic zone a relatively low density was evident at 60°01′S, 36°01′W. In the mesopelagic zone, relatively low concentrations occurred off Tierra del Fuego and in the Amundsen Sea, also extending from the tip of the Antarctic Peninsula through the northern Weddell Sea, the Bellingshausen Sea, south of New Zealand, and into the Tasman Sea (Map A255). At 52°26′S, 166°42′E this stage was also present (Table A4). The eudoxid form was found in the bathypelagic zone in two areas in moderate and relatively low density, east of the Falkland Islands and the South Orkney Islands (Map A256). This form was also present at 53°05′S, 42°02′W (Table A4).

T. crystallina was also observed in fall and winter collections, when only polygastric stages were obtained. During the fall the population appeared in the epipelagic layers of the Bellingshausen Sea and far off this region west of the tip of South America (Map A257). In the mesopelagic and bathypelagic zones the species persisted in these areas (Maps A258 and A259).

During the winter the population of *T. crystallina* was found in moderate concentrations north of the South Georgia island, in a relatively low concentration near Peter I Island, and in low numbers extending from the Great Australian Bight to Wilkes Land (Map A260). In the mesopelagic layers the population extended from near the South Georgia island through the South Pacific basin to east of New Zealand (Map A261), whereas in the bathypelagic zone it was restricted to the Peter I Island region (Map A262).

In the southwest Atlantic Ocean *T. crystallina* records are abundant in the South Georgia island region and far north and southwest of that area (Map B56).

The present data, together with previous studies [Leloup and Hentschel, 1935-1938; Totton, 1954], indicate a circumpolar distribution of *T. crystallina*. This species inhabits the waters of the West Wind Drift, following the current northward at South America and into the Tasman Sea. *T. crystallina* was collected in all bathymetric strata.

Thalassophyes ferrarii Alvariño and Frankwick, 1983

Thalassophyes ferrarii Alvariño and Frankwick, 1983 (Figure 75), discovered during the *Eltanin* cruises, inhabits the mesopelagic and bathypelagic waters. West of Chile this species was present during the spring at 42°11′S, 86°03′W in the bathypelagic zone. *T. ferrarii* was also found in the mesopelagic zone of the Tasman Sea at 41°58′S, 160°06′E and 47°37′S, 161°49′E upon examination of the whole samples [Alvariño and Frankwick, 1983].

Scattered polygastric populations of *T. ferrarii* were observed in the epipelagic zone during the fall, extending off Chile and in the South Pacific basin in relatively low concentration, and in moderate densities in a region close to Tasmania (Map A263). In the mesopelagic layers it was found only in the Peter I Island region (Map A264).

During the winter a low concentration of *T. ferrarii* was observed at only about 59°00′S and 125°00′W in the mesopelagic stratum (Map A265).

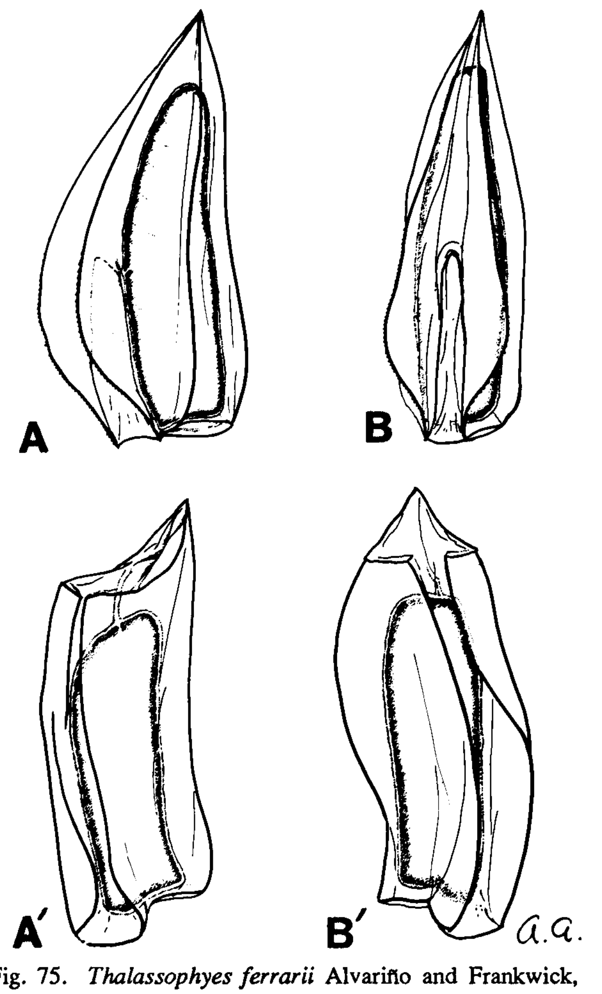


Fig. 75. *Thalassophyes ferrarii* Alvariño and Frankwick, 1983. A, superior nectophore, lateral view; B, ventral view of superior nectophore; A′, lateral view of inferior nectophore; B′, ventral view of inferior nectophore.

Family ABYLIDAE
Subfamily CERATOCYMBINAE

Ceratocymba leuckarti (Huxley, 1859)

Ceratocymba leuckarti (Huxley, 1859) (Figure 76), the most abundant species belonging to this genus in the Pacific, has mainly a tropical distribution. This species inhabits mostly the epipelagic zone but occasionally is also found in the mesopelagic and bathypelagic layers [Alvariño, 1981a]. To date, this species has been observed as far south as 35°49′S, 23°09′E [Sears, 1953]. In the present study, *C. leuckarti* occurred only in the epipelagic zone during the summer and fall.

Relatively low densities of the polygastric stage were distributed in the Weddell Sea off the east coast of the Antarctic Peninsula during the summer (Map A266).

In the fall, polygastric stages of *C. leuckarti* were observed only in the Peter I Island region and in low concentration (Map A267). The species was not found during the spring and winter collections.

Records of *C. leuckarti* in the southwest Atlantic Ocean are spread throughout the tropical-equatorial and temperate regions (Map B57).

Ceratocymba sagittata (Quoy and Gaimard, 1827)

Ceratocymba sagittata (Quoy and Gaimard, 1827) (Figure 77), the most abundant species in this genus in the southwest Atlantic, also has a tropical distribution [Alvariño, 1981a]. Moser [1925] observed *C. sagittata* as far south as 36°00′S, 75°00′E.

In this study, only the eudoxid stage of *C. sagittata* was found during the spring. In the Tasman Sea off New Zealand, a low density appeared in the epipelagic zone (Map A268). Pugh [1974] found this species in the Canary Islands region, mainly at 100- to 200-m depth. Thus the depth distribution of the present study is in agreement with Pugh's findings.

In the southwest Atlantic Ocean, records of *C. sagittata* extend also along the tropical-equatorial and warmer parts of the temperate region (Map B58).

Subfamily ABYLINAE

Abyla haeckeli Lens and van Riemsdijk, 1980

Abyla haeckeli Lens and van Riemsdijk, 1908 (Figure 78), is a tropical species known to inhabit the upper

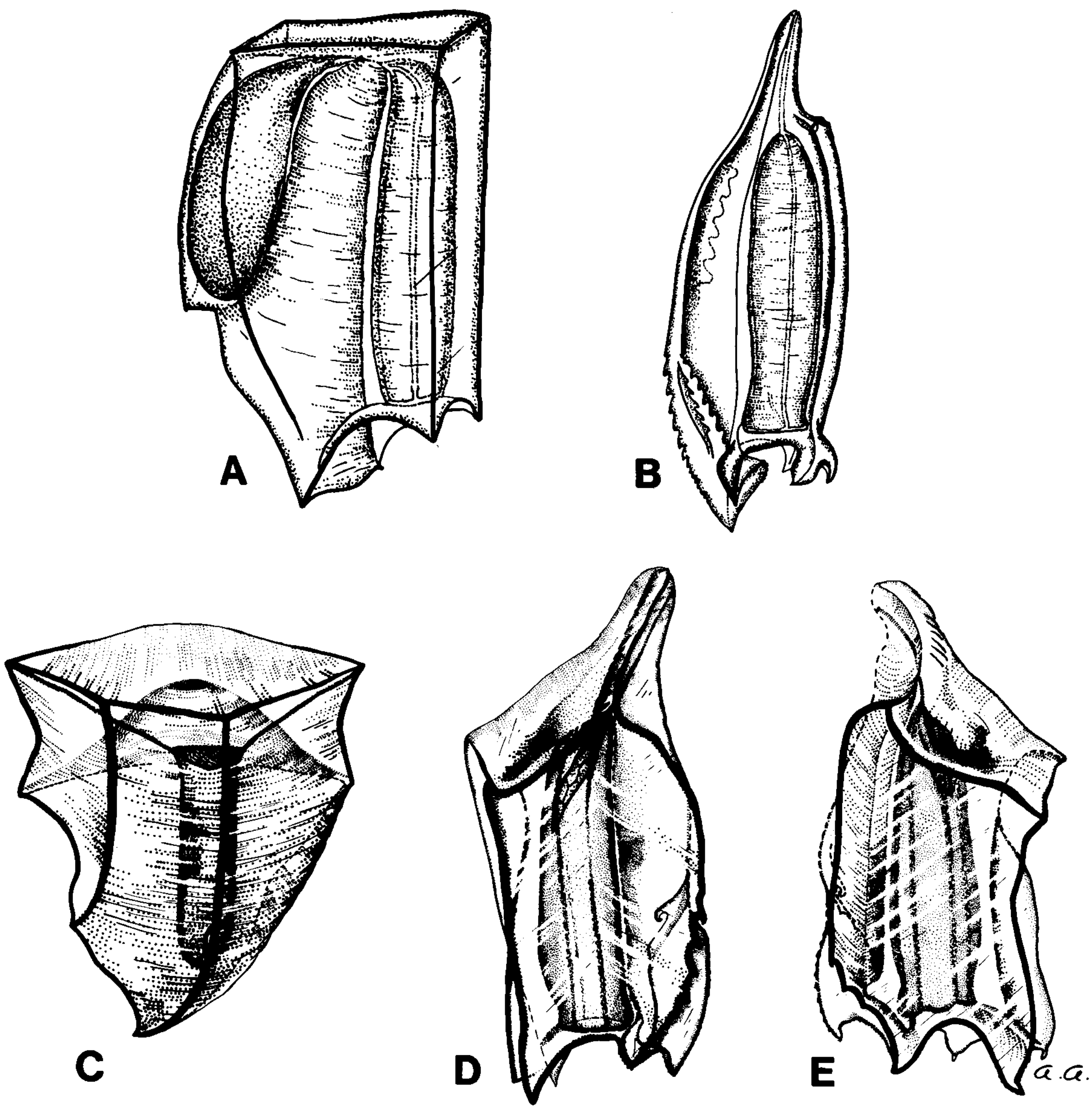


Fig. 76. *Ceratocymba leuckarti* (Huxley, 1859). A, superior nectophore; B, inferior nectophore; C, bract; D, female gonophore; E, male gonophore [from Alvariño, 1981a].

warm-water layers to about 28°00′S in the Pacific Ocean [Alvariño, 1971]. In the present study, the eudoxid stage of *A. haeckeli* occurred in the epipelagic zone in spring at 33°43′S, 80°43′W.

Abyla trigona Quoy and Gaimard, 1827

Abyla trigona Quoy and Gaimard, 1827 (Figure 79), inhabits tropical and temperate waters of the Atlantic and Pacific oceans and tropical waters of the Indian Ocean [Alvariño, 1971]. In the Gulf of Aden, Totton [1954] found specimens at the surface. To date, this species has been collected as far south in the Atlantic as 35°00′S, carried by the South Atlantic gyre [Alvariño, 1981a].

In this study the polygastric stage of *A. trigona* was present only during the summer in the epipelagic stratum, where a low concentration was determined at 60°01′S, 36°01′W.

Distribution records of *A. trigona* in the southwest Atlantic appear mainly in the tropical-equatorial region, extending into the South Atlantic gyre with the oceanic branch of the Brazil Current (Map B59).

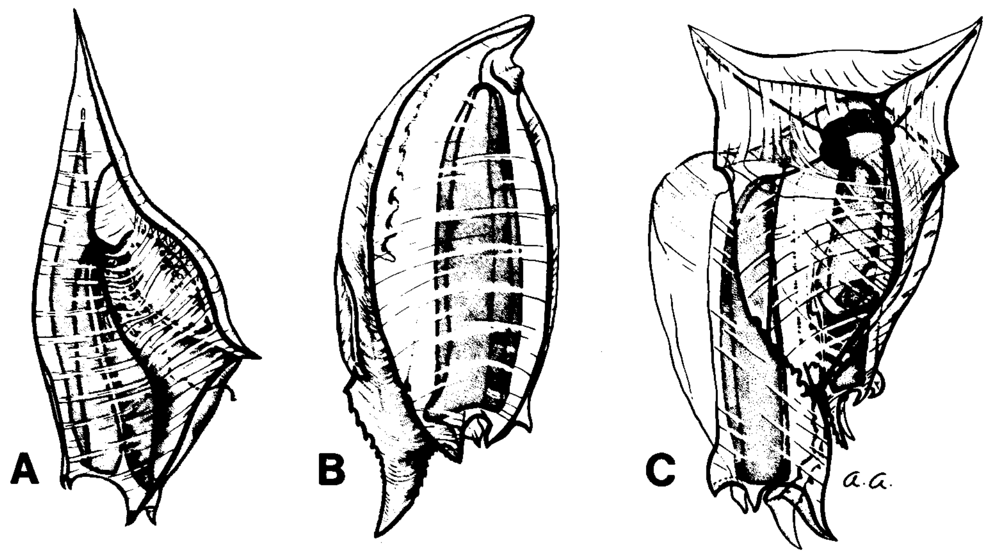


Fig. 77. *Ceratocymba sagittata* (Quoy and Gaimard, 1827). A, superior nectophore; B, inferior nectophore; C, eudoxid [from Alvariño, 1981a].

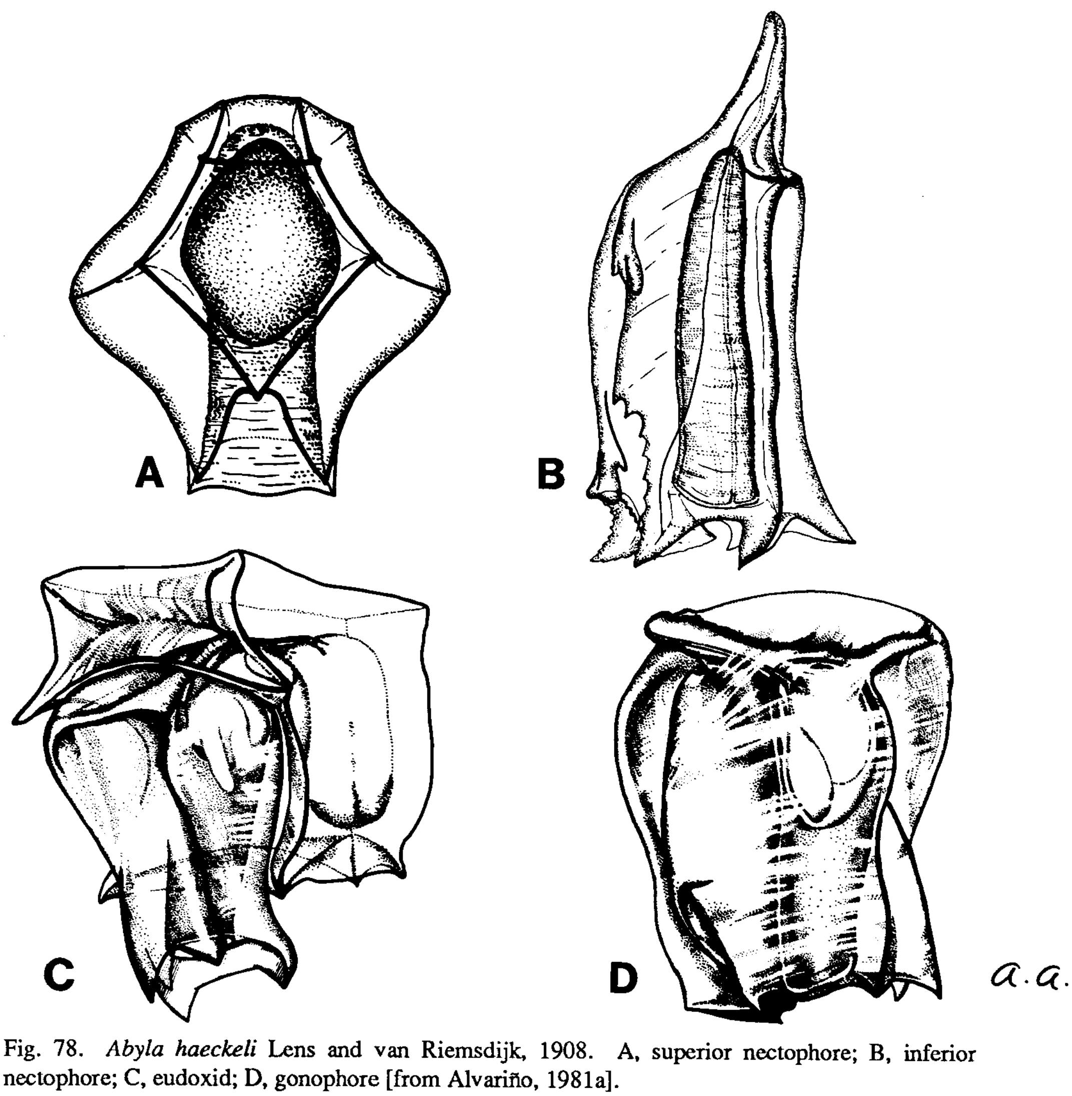


Fig. 78. *Abyla haeckeli* Lens and van Riemsdijk, 1908. A, superior nectophore; B, inferior nectophore; C, eudoxid; D, gonophore [from Alvariño, 1981a].

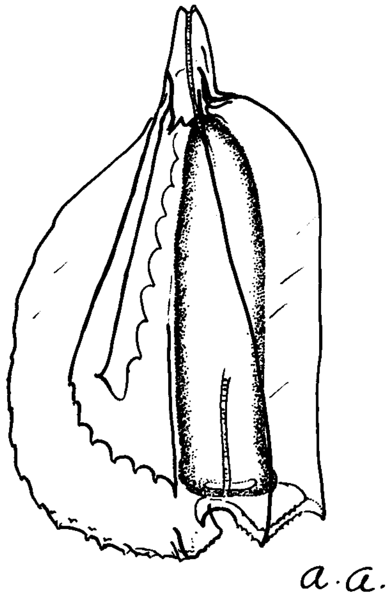


Fig. 79. *Abyla trigona* Quoy and Gaimard, 1827. Inferior nectophore.

Subfamily ABYLOPSINAE

Abylopsis eschscholtzi (Huxley, 1859)

Abylopsis eschscholtzi (Huxley, 1859) (Figure 80) inhabits the warm waters of the Atlantic, Pacific, and Indian oceans [Alvariño, 1971]. Leloup and Hentschel [1935-1938] considered this species to be most common in the upper 100 m of the South Atlantic, with a southern observation at 39°46′S, 22°12′E. This species is also known from the surface waters of the Gulf of Aden [Totton, 1954].

Both life stages of *A. eschscholtzi* were observed during the spring. A moderate concentration of the polygastric form was found off Chile at about 35°15′S, 75°21′W between 0 and 10 m, with a surface temperature of 15.1°C. This stage was also present in the mesopelagic zone at 40°05′S, 119°40′W (Table A4). The eudoxid stage occurred in a relatively low concentration in the mesopelagic zone southwest of South Island, New Zealand.

In the southwest Atlantic, records of *A. eschscholtzi* were found in the tropical-equatorial region from off Brazil to the central Atlantic (Map B60).

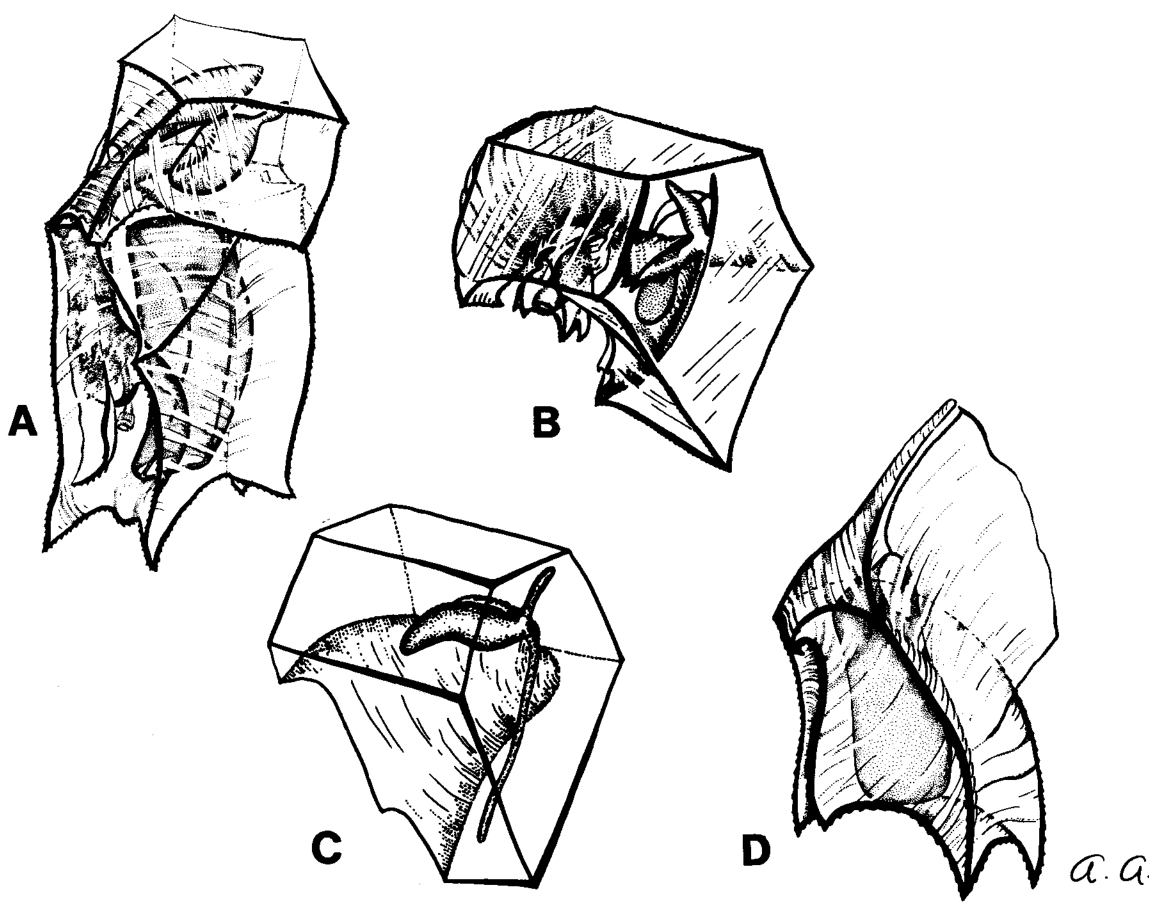


Fig. 80. *Abylopsis eschscholtzi* (Huxley, 1859). A, polygastric stage; B, eudoxid; C, bract; D, gonophore [from Alvariño, 1981a].

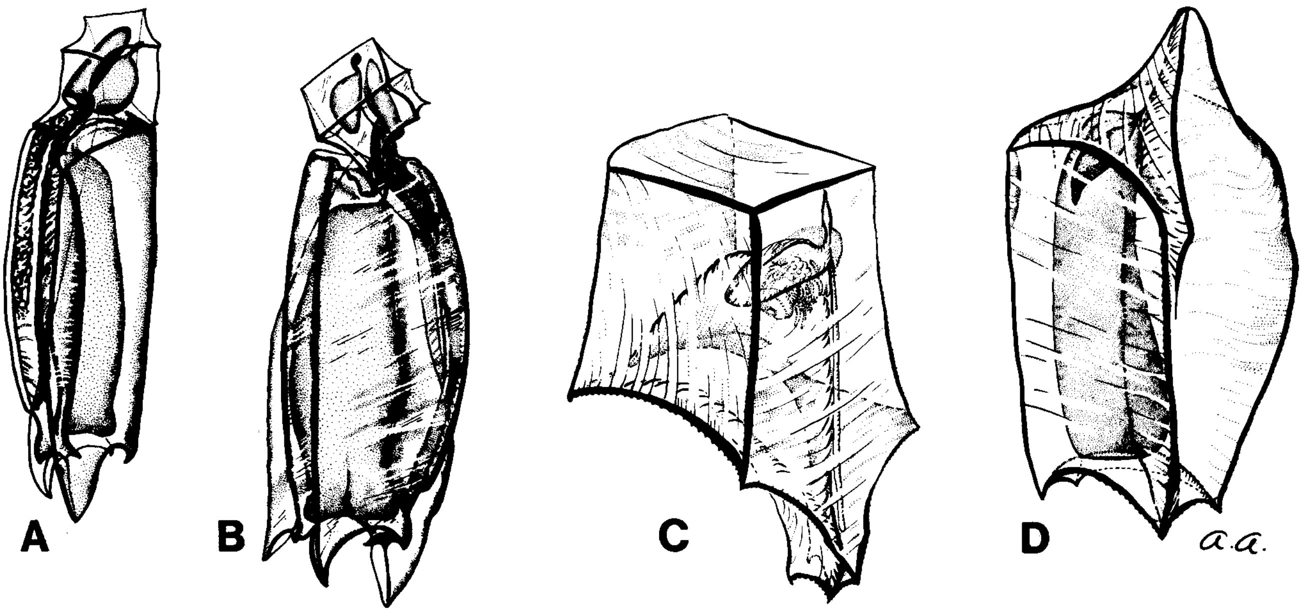


Fig. 81. *Abylopsis tetragona* (Otto, 1823). A and B, polygastric stage; C, bract; D, gonophore [from Alvariño, 1981a].

Abylopsis tetragona (Otto, 1823)

Abylopsis tetragona (Otto, 1823) (Figure 81) is an abundant epipelagic species found throughout the Pacific Ocean from 37°00'N to 35°00'S [Alvariño, 1971] and in the South Atlantic [Leloup and Hentschel, 1935-1938]. Moore [1949, 1953] determined mean day depth levels at 55 m and 104-85 m in the Bermuda area and in the Florida Current. In the Atlantic Ocean, *A. tetragona* has been observed as far south as 37°21'S, 51°53'W [Leloup and Hentschel, 1935-1938].

The polygastric and eudoxid stages of *A. tetragona* were collected in this study during the spring. The eudoxid stage was found in moderate and relatively low concentrations in the epipelagic stratum off Chile, extending west to about 98°00'W and as far south as 38°00'S (Map A269). The polygastric stage was found in three isolated patches in the mesopelagic zone in moderate to relatively low concentrations, in the regions of the Pacific Antarctic basin, at 55°06'S, 149°47'W, and in the Tasman Sea (Map A270). The eudoxid stage was present in moderate to relatively low densities at this depth off Chile in the region of the Subantarctic Convergence of the Pacific and in the region of the Pacific Antarctic basin (Map A271).

During the summer, both life stages of *A. tetragona* were collected in the epipelagic stratum, whereas only the eudoxid stage was detected in the mesopelagic zone. A moderate concentration of the polygastric form occurred off the southern coast of Chile. The eudoxid stage was evident in a relatively low concentration in the Tasman Sea in the epipelagic layer. Three relatively low concentrations of the eudoxid stage were distributed in the mesopelagic zone: the Amundsen Sea, from 59°15'S to 60°30'S and from 108°00'W to 120°00'W, and the Tasman Sea off South Island, New Zealand (Map A272).

Eudoxid populations of *A. tetragona* were obtained in the subtropical region close to Chile in the epipelagic layers during the fall, and in the same area, but in the bathypelagic zone, during the winter.

Generally, *A. tetragona* was collected north of the Antarctic Convergence; however, in the mesopelagic zone in summer, the eudoxid stage was determined south of the Antarctic Convergence in the Amundsen Sea as well as in the southeastern Pacific basin (Map A272). These constitute the southernmost records of this species to date.

In the southwest Atlantic, *A. tetragona* appears widely distributed throughout the equatorial, tropical, and temperate regions, extending to Mar del Plata and the Tristan da Cunha group (Map B61).

Bassia bassensis (Quoy and Gaimard, 1834)

Bassia bassensis (Quoy and Gaimard, 1834) (Figure 82) inhabits the tropical and subtropical waters of the Atlantic, Pacific, and Indian oceans. In the Pacific the distribution ranges from 35°00'N to 41°00'S, occurring at depths almost exclusively above 150 m [Alvariño, 1971].

Both life stages of *B. bassensis* occurred during the spring. In the epipelagic zone both stages were located off Chile as far south as about 40°00'S and west to about

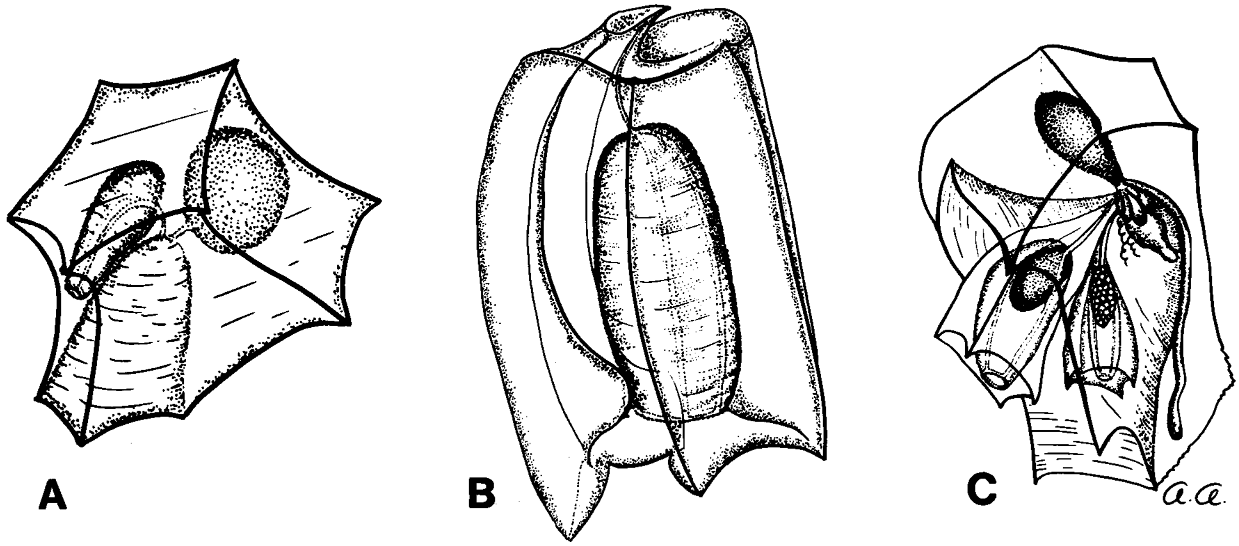


Fig. 82. *Bassia bassensis* (Quoy and Gaimard, 1834). A, superior nectophore; B, inferior nectophore; C, eudoxid [from Alvariño, 1981a].

98°00'W. The eudoxid stage has a moderate concentration near the coast, while the polygastric stage was present in relatively low concentrations there (Maps A273 and A274). The polygastric form was also present at 32°59'S, 87°56'W (Table A4). In the mesopelagic zone the polygastric stage appeared at 57°02'S-57°03'S and 119°50'W-119°53'W in relatively low density.

During the summer the eudoxid form was restricted to the epipelagic zone, and the polygastric stage was limited to the mesopelagic zone. A relatively low concentration of eudoxids occurred at 56°30'S, 119°29'W. Two occurrences of the polygastric stage were detected, both in relatively low densities. One appeared at about 61°40'S and from 77°30'W to 90°00'W, while the other was present from 62°15'S to 63°20'S and from 106°00'W to 122°15'W (Map A275).

Huxley [1859] observed *B. bassensis* off the southern shores of Tasmania, but although this region was sampled during this study, the species was not collected there.

Distributions south of the Antarctic Convergence were also noted, the first records for *B. bassensis* in the region. These occurrences were the polygastric form in the spring mesopelagic zone, the eudoxid form in the summer epipelagic zone, and the polygastric form in the summer mesopelagic zone (Map A275).

B. bassensis records were not obtained during fall and winter collections, which agrees with the general concept of survival of warm-water species spreading into high latitudes.

B. bassensis records in the southwest Atlantic appear frequently distributed throughout the equatorial, tropical, and warmer parts of the temperate regions, extending to Mar del Plata, Argentina, and the Tristan da Cunha group (Map B62).

OTHER SPECIES OF SIPHONOPHORA DISTRIBUTED THROUGHOUT THE SOUTH ATLANTIC

Other species of siphonophores that occur in the South Atlantic but were not observed in the *Eltanin* collections are listed below.

Epibulia ritteriana Haeckel, 1888 (Figure 83). The species was recorded off California [Alvariño, 1972c]

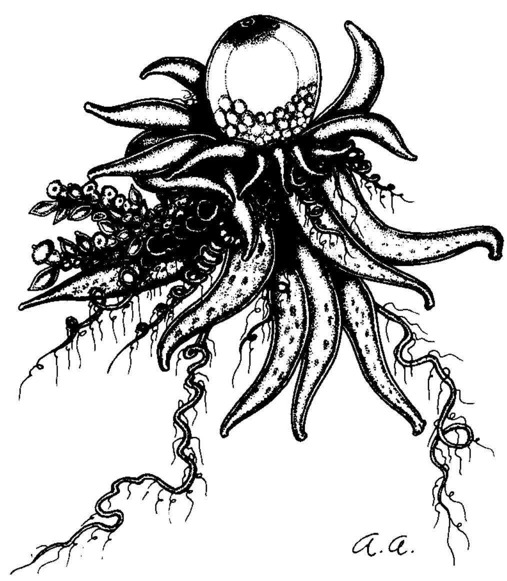


Fig. 83. *Epibulia ritteriana* Haeckel, 1888. Complete animal [from Alvariño, 1972c, 1981a].

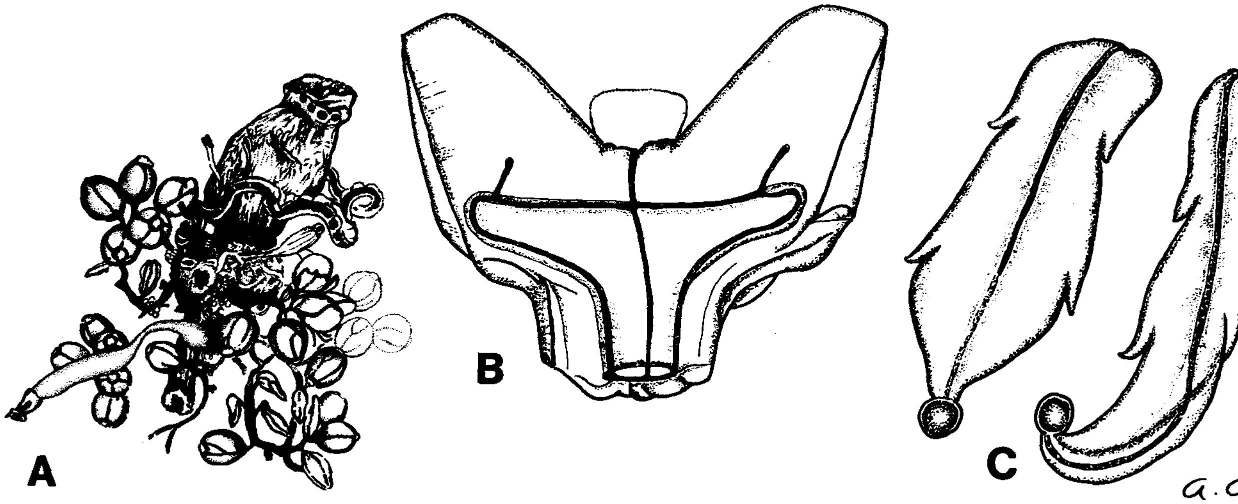


Fig. 84. *Erenna richardi* Bedot 1904. A, part of animal with gonodendra; B, nectophore; C, bracts [from Alvariño, 1981a].

almost one century after it was first described. It is distributed in the southwest Atlantic (Map B63).

Erenna richardi Bedot, 1904 (Figure 84). Distribution in the southwest Atlantic (Map B64).

Forskalia edwardsi Kölliker, 1853 (Figure 85). Distribution in the southwest Atlantic (Map B65).

Nectopyramis thetis Bigelow, 1911 (Figure 86). Distribution in the southwest Altantic (Map B66).

Maresearsia praeclara Totton, 1954 (Figure 87). Distribution in the southwest Atlantic (Map B67).

Sulculeolaria chuni (Lens and van Riemsdijk, 1908) (Figure 88). Distribution in the southwest Atlantic (Map B68).

Sulculeolaria quadrivalvis Blainville, 1834 (Figure 89). Distribution in the southwest Atlantic (Map B69).

Chelophyes contorta (Lens and van Riemsdijk, 1908) (Figure 90). Distribution in the southwest Atlantic (Map B70).

Lensia meteori (Leloup, 1934) (Figure 91). Distribution in the southwest Atlantic (Map B71).

Muggiaea kochi (Wild, 1844) (Figure 92). Distribution in the southwest Atlantic (Map B72).

Ceratocymba dentata (Bigelow, 1918) (Figure 93). Distribution in the southwest Altantic (Map B73).

Abyla bicarinata Moser, 1925 (Figure 94). Distribution in the southwest Atlantic (Map B74).

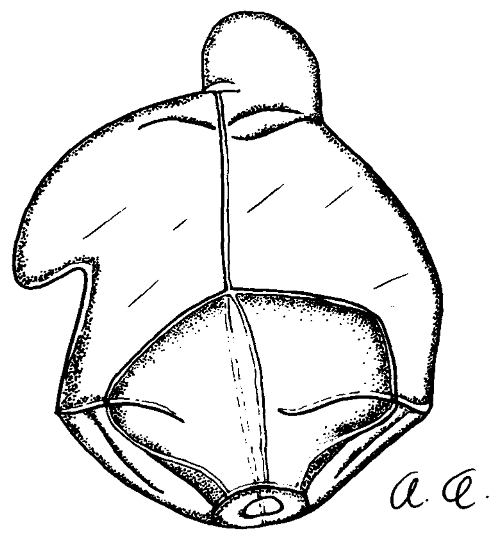


Fig. 85. *Forskalia edwardsi* Kölliker, 1853. Nectophore [from Alvariño, 1981a].

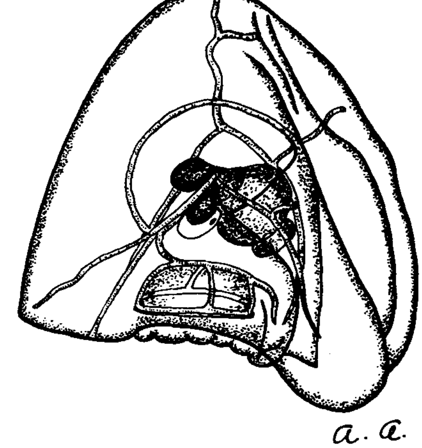


Fig. 86. *Nectopyramis thetis* Bigelow, 1911. Complete animal [from Alvariño, 1981a].

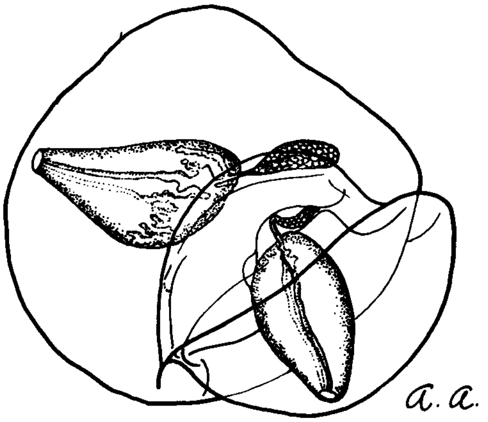


Fig. 87. *Maresearsia praeclara* Totton, 1954. Polygastric stage [from Alvariño, 1981a].

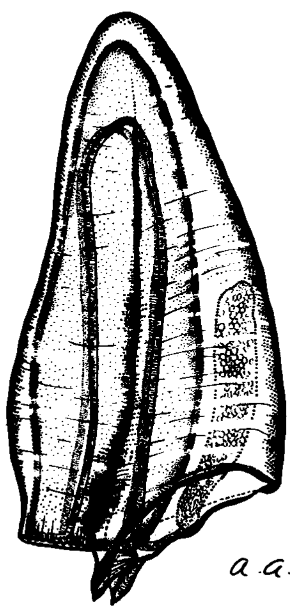


Fig. 88. *Sulculeolaria chuni* (Lens and van Riemsdijk, 1908). Superior nectophore [from Alvariño, 1968b, 1981a].

Abyla carina Haeckel, 1888 (Figure 95). Distribution in the southwest Atlantic (Map B75).

Abyla ingeborgae Sears, 1953 (Figure 96). Distribution in the southwest Atlantic (Map B76).

Abyla tottoni Sears, 1953 (Figure 97). Distribution in the southwest Atlantic (Map B77).

Enneagonum hyalinum (Quoy and Gaimard, 1827) (Figure 98). Distribution in the southwest Atlantic (Map B78).

Muggiaea kochi, *Chelophyes appendiculata*, *Sulculeolaria chuni*, *Maresearsia praeclara*, and the species of the Abylidae family (*C. dentata*, *A. bicarinata*, *A. carina*,

Fig. 89. *Sulculeolaria quadrivalvis* Blainville, 1834. Superior nectophore [from Alvariño, 1968b, 1981a].

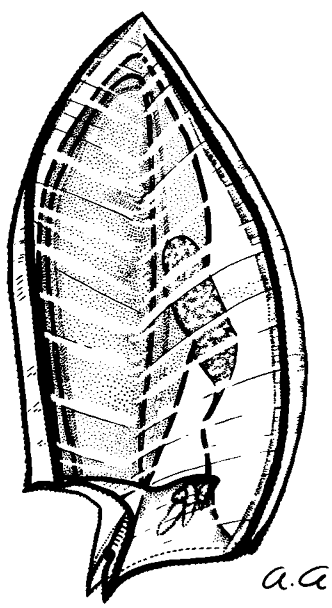


Fig. 90. *Chelophyes contorta* (Lens and van Riemsdijk, 1908). Superior nectophore [from Alvariño, 1981a].

A. ingeborgae, *A. tottoni*, *E. hyalinum*) have tropical distributions. *Lensia meteori*, *Sulculeolaria quadrivalvis*, *Nectopyramis thetis*, *Erenna richardi*, and *Epibulia ritteriana* extend their distributions into the temperate regions, while *Forskalia edwardsi*, although typical of the Subantarctic waters, was not found during the present study.

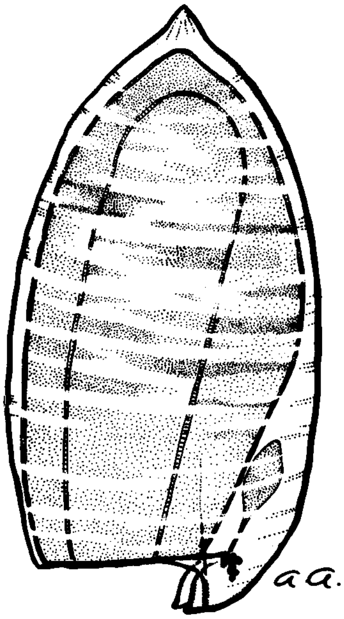


Fig. 91. *Lensia meteori* (Leloup, 1934). Superior nectophore [from Alvariño, 1981a].

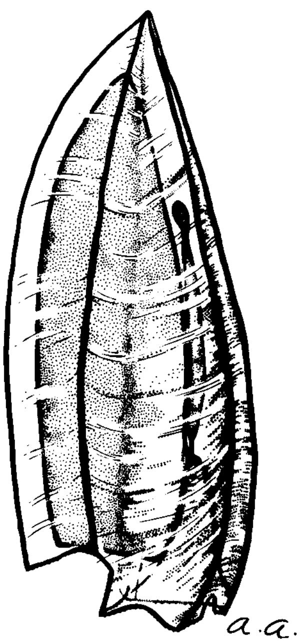


Fig. 92. *Muggiaea kochi* (Wild, 1844). Nectophore [from Alvariño, 1981a].

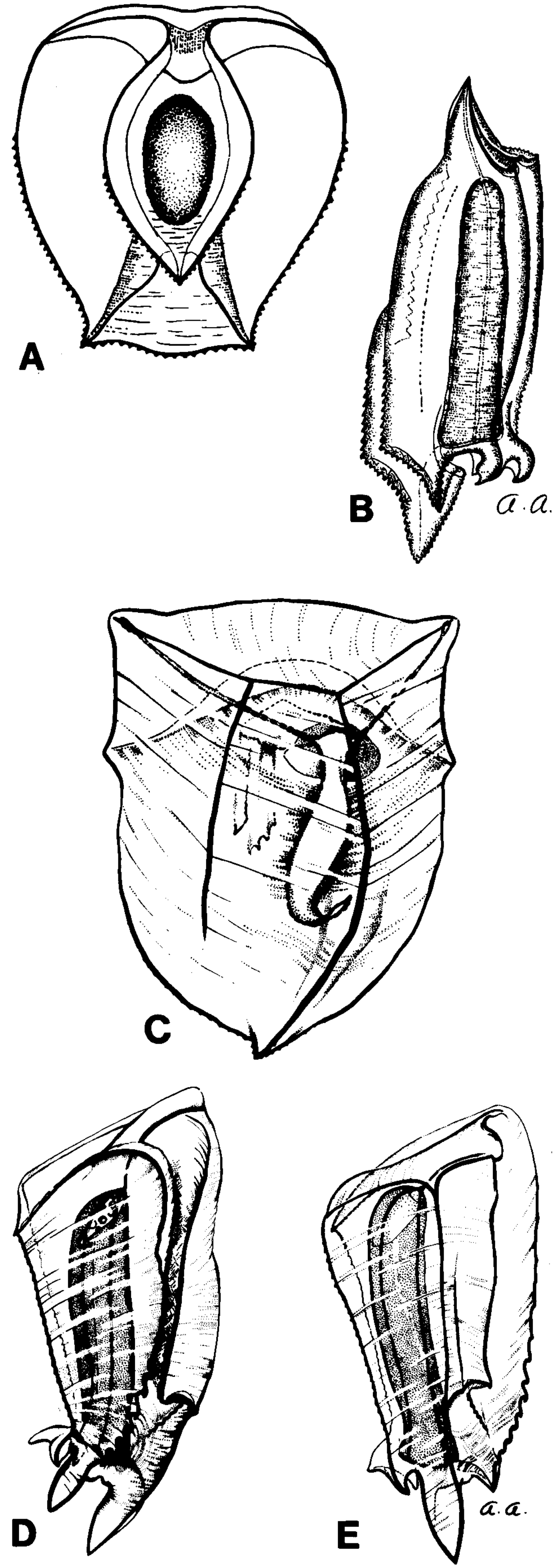


Fig. 93. *Ceratocymba dentata* (Bigelow, 1918). A, superior nectophore, ventral view; B, inferior nectophore; C, bract; D, female gonophore; E, male gonophore.

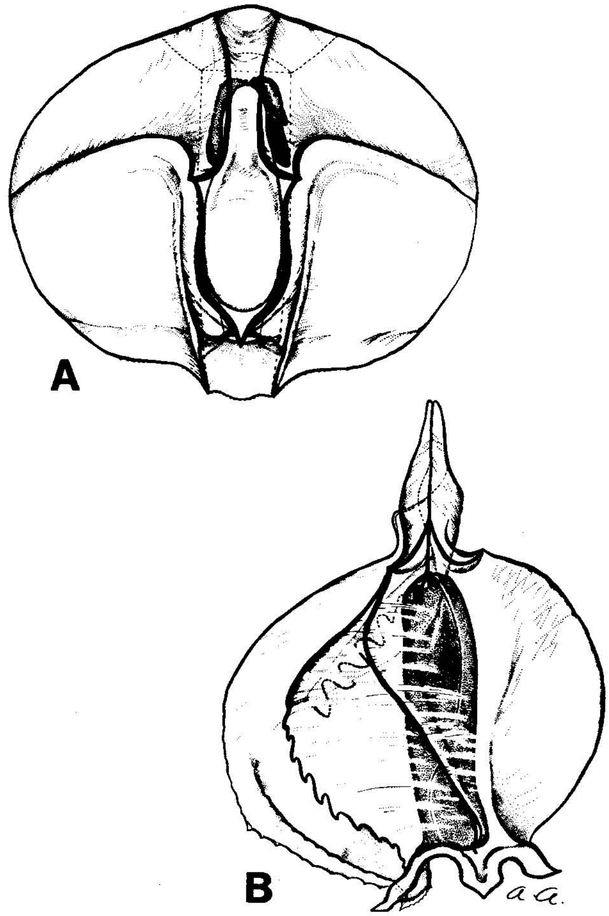


Fig. 94. *Abyla bicarinata* Moser, 1925. A, superior nectophore; B, inferior nectophore.

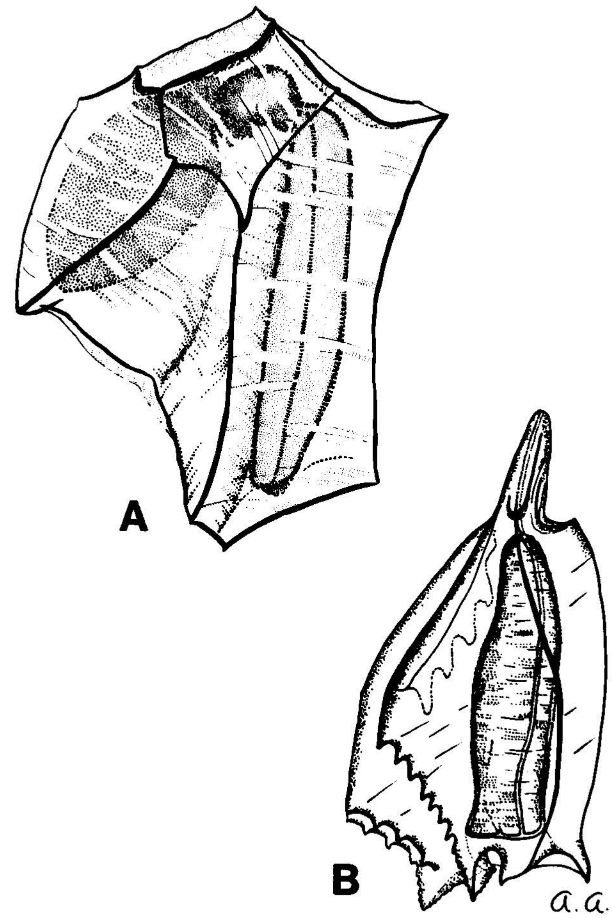


Fig. 96. *Abyla ingeborgae* Sears, 1953. A, superior nectophore; B, inferior nectophore.

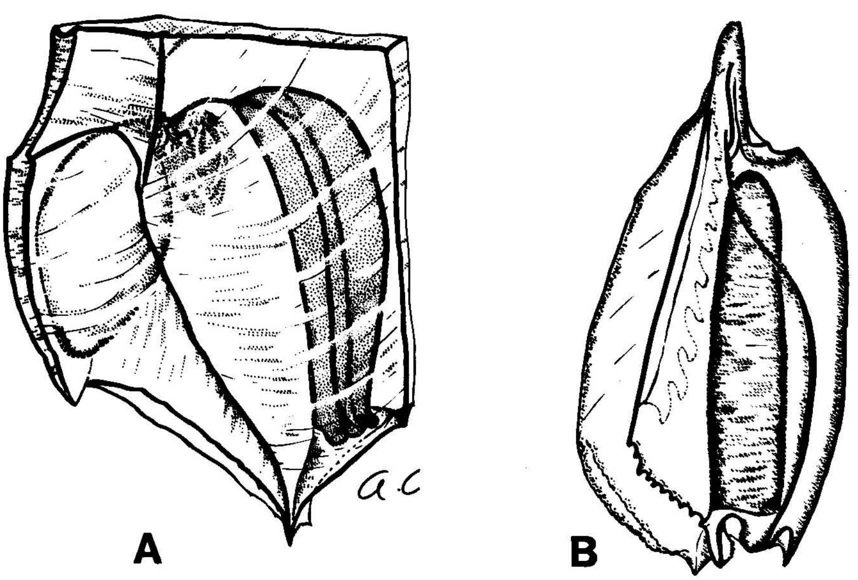
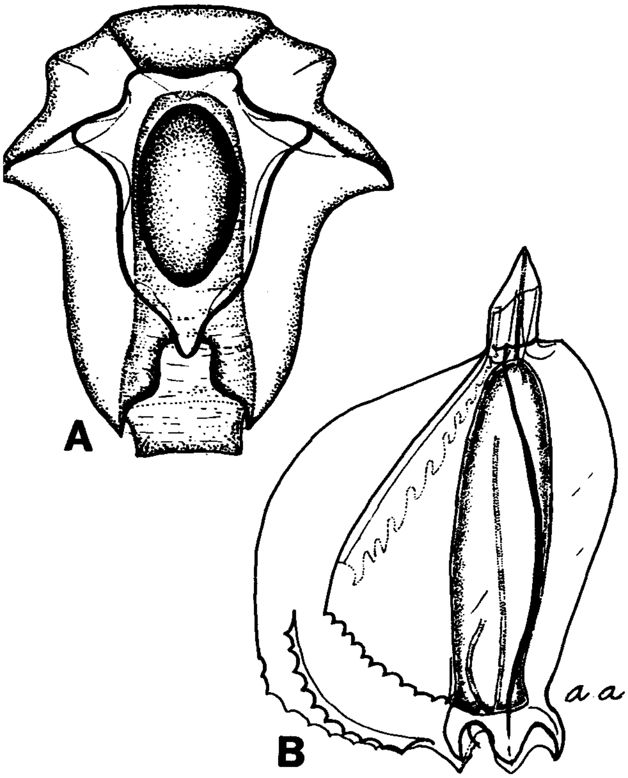


Fig. 95. *Abyla carina* Haeckel, 1888. A, superior nectophore; B, inferior nectophore.



ADDITIONAL REMARKS

Eltanin cruise 30 covered the region extending from 123°44'W to 155°28'E and from 24°43'S to 37°25'N. The region surveyed extended mainly through the tropical-equatorial Pacific Ocean, reaching the temperate regions of the northern and southern hemispheres. The cruise period included the boreal summer and austral winter, respectively, during the collections in the northern and southern hemispheres.

Data for cruise 30 appear in Table A5. The species observed in the collections analyzed for that cruise are listed in Table A6. The very small number of species found in the collections from cruise 30 was surprising, since more species, mainly those typical of the tropical regime, had been expected to be present in the samples.

Fig. 97. *Abyla tottoni* Sears, 1953. A, superior nectophore; B, inferior nectophore.

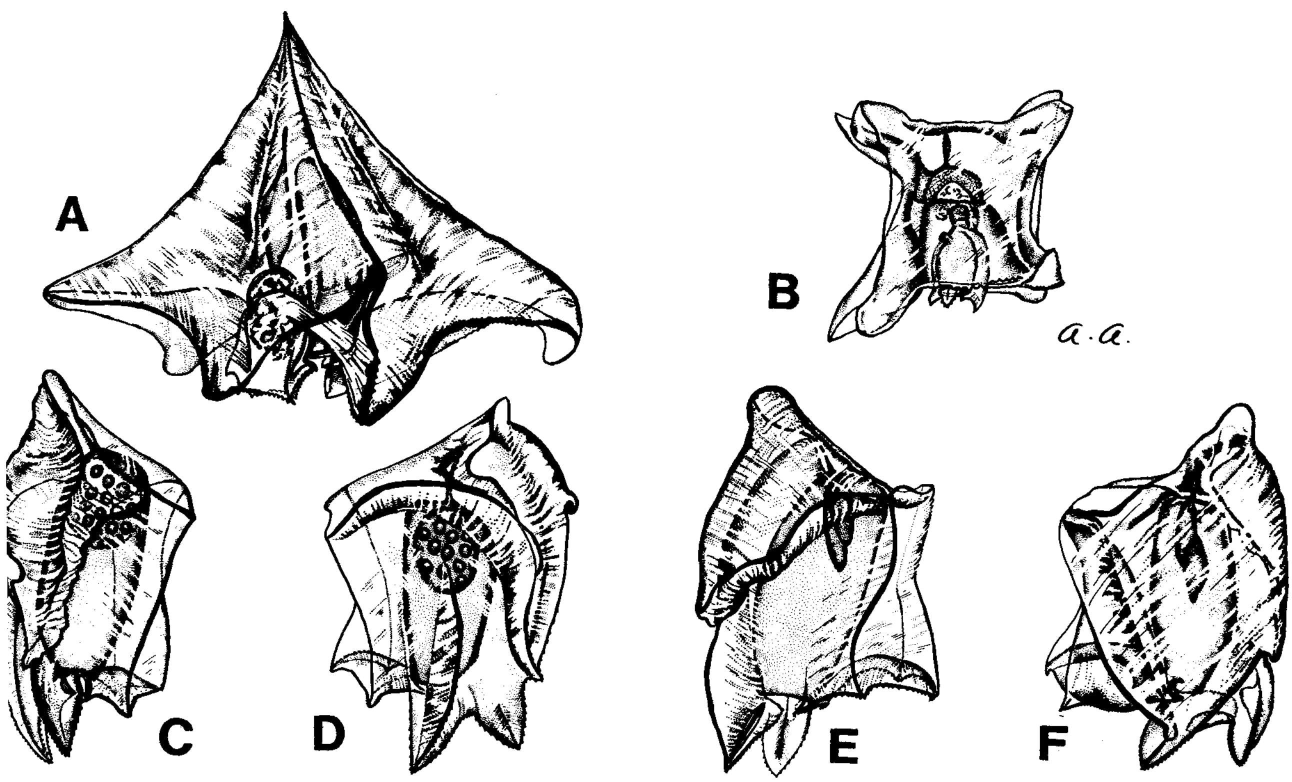


Fig. 98. *Enneagonum hyalinum* (Quoy and Gaimard, 1827). A, polygastric stage; B, eudoxid; C and D, female gonophores; E and F, male gonophores.

DISCUSSION

Seventy-four species of Siphonophora were identified in the collections from the *Eltanin* spring and summer cruises, 64 species having been found during spring and 46 species during the summer cruises. During the fall and winter the combined number of species found was 55; of these, 49 were collected in the fall and 31 in the winter. Five new species were discovered [Alvariño and Frankwick, 1983; Alvariño and Wojtan, 1984]. These were *Lensia eltanin, L. eugenioi, L. landrumae, Heteropyramis alcala,* and *Thalassophyes ferrarii*. In addition, the eudoxid stages of *L. lelouveteau* and *L. reticulata* were determined for the first time.

A total of eighty species of siphonophores were obtained during the spring, summer, fall, and winter cruises of the U.S. Antarctic Research Program. The collections analyzed correspond to surveys covering the Antarctic, Subantarctic, and Subtropical Convergence regions. Alvariño [1971, 1981a] included data and compiled information on seventy-three species from the South Pacific and eighty-eight from the South Atlantic, respectively. The species previously recorded in the South Pacific but not observed in the present collections are *Stephanomia rubra, Erenna richardi, Nectodroma reticulata, Rosacea cymbiformis, Sulculeolaria angusta, S. chuni, S. quadrivalvis, Lensia challengeri, L. meteori, Chelophyes contorta, Diphyes chamissonis, Muggiaea kochi, Sphaeronectes spp., Abyla bicarinata, A. carina, A. ingeborgae, A. peruana, A. schmidti, A. tottoni, Ceratocymba dentata, C. intermedia,* and *Enneagonum hyalinum*. Most of these species are typically tropical in distribution and/or restricted to the southeastern Asiatic waters and the Indian Ocean. Species found in the South Atlantic but missing in the present collections are *Epibulia ritteriana, Erenna richardi, Forskalia edwardsi, Maresearsia praeclara, Nectopyramis thetis, Sulculeolaria chuni, S. quadrivalvis, Lensia ajax, L. meteori, Chelophyes contorta, Muggiaea kochi, Abyla bicarinata, A. brownia, A. ingeborgae, A. schmidti, A. tottoni,* and *Enneagonum hyalinum*. Species appearing in the U.S. Antarctic Research Program collections for spring, summer, fall, and winter not previously found in either the South Atlantic or the South Pacific are *Apolemia uvaria, Halistemma cupulifera, Marrus orthocanna, Desmophyes annectens, Nectocarmen antonioi, Lensia baryi,* and the newly discovered species *Lensia eltanin,* L. *eugenioi, L. landrumae, Heteropyramis alcala,* and *Thalassophyes ferrarii*. Species previously found in the Antarctic are *Pyrostephos vanhoeffeni, Marrus antarcticus, Dimophyes arctica, Diphyes antarctica, Muggiaea bargmannae, Eudoxia galathea, Clausophyes galeata,* and *Crystallophyes amygdalina*.

Typical Antarctic-Subantarctic region species are *Marrus antarcticus, Amphicaryon acaule, Rosacea plicata, Dimophyes arctica, Diphyes antarctica, Clausophyes ovata, Crystallophyes amygdalina, Heteropyramis maculata,* and *Thalassophyes crystallina*. Three species were typical of the Subantarctic region for the spring, advancing south into the Antarctic region during the summer. These were *Chelophyes appendiculata, Diphyes dispar,* and *Eudoxoides spiralis*.

Diphyes antarctica was the most common species collected in the Antarctic and Subantarctic regions during the spring, summer, fall, and winter cruises. This species was present in all three bathymetric zones during all seasons but was most abundant in the epipelagic zone. The polygastric stage was detected during all seasons, but eudoxids were not obtained in the winter.

The eudoxid stage of *Clausophyes ovata* was present in all three bathymetric layers during the spring, summer, fall, and winter, but it was more prevalent in the epipelagic and mesopelagic zones. In contrast, the polygastric form was collected only in the bathypelagic zone during the spring, in the mesopelagic and bathypelagic zones during the summer, and in the mesopelagic zone in the fall.

The eudoxid stage of *Heteropyramis maculata* was more common during the spring and summer than the polygastric stage. However, both were present in all three bathymetric layers with the exception of the polygastric stage from the bathypelagic zone. During fall and winter the eudoxid stage was observed in the mesopelagic and bathypelagic zones during the fall and in the mesopelagic zone in winter, while the polygastric stage appeared at the three bathymetric levels during both seasons.

Thalassophyes crystallina was present at all bathymetric levels during the spring, summer, fall, and winter. Polygastric and eudoxid stages were observed in the mesopelagic zone in the spring and at the three bathymetric levels in the summer. The polygastric stage was present in the epipelagic, mesopelagic, and bathpelagic zones during the four seasons. No eudoxid stage was observed during fall and winter.

Chelophyes appendiculata was collected during both the spring and the summer cruises in all three bathymetric layers. Both life stages were present. The eudoxid stage was common in the epipelagic zone and more abundant than the polygastric stage overall. It was not observed in the fall and winter collections.

Both the polygastric and the eudoxid stages of *Eudoxoides spiralis* were more common in the epipelagic zone than in the other bathymetric layers. However, the eudoxid form was more abundant during the spring, possibly due to differences in sampling area. It was scattered in fall and winter.

Some rare Siphonophora species were also collected. These were *Apolemia uvaria*, *Agalma okeni*, *Desmophyes annectens*, *Nectocarmen antonioi*, *Nectopyramis diomedeae*, *Sulculeolaria monoica*, *Lensia baryi*, *L. havock*, *L. subtilis*, *Muggiaea delsmani*, *Ceratocymba sagittata*, *Abyla haeckeli*, and *A. trigona*. The scattered distribution of these siphonophores is in part due to the particular distributional and behavioral characteristics of Siphonophora [Alvariño, 1983] and to the latitudinal fluctuation of the populations related to seasons and the flow of currents. Cold-water species can survive into lower latitudes during winter, and warm and temperate species may survive into high latitudes during spring and summer.

PHYSICAL OCEANOGRAPHY RELATED TO PLANKTON

Southern Ocean Water Masses and Currents

The Antarctic ocean, or southern ocean, is a continuous circumpolar belt of waters moving or drifting eastward under the influence of the prevailing westerly winds [Baker, 1954]. The zone between Antarctica and the southern coasts of Australia, South America, and Africa permits the free interoceanic circulation and exchange of plankton populations with the other three oceans. In contrast, free exchange of the Arctic Ocean with the Atlantic and Pacific is blocked by islands and continents.

The Antarctic Coastal Current flows sluggishly westward and is confined by the continental slope. The width of this current may reach up to 300 km southwest of the Weddell Sea. This current divides into north drifting gyres contributing to the dispersal of planktonic populations.

The Circumpolar Current flows from west to east around Antarctica and varies in width from about 200 km to more than 1000 km. This important Antarctic current is also called West Wind Drift. It is a major current in the Antarctic-Subantarctic region. Northward deflections occur at New Zealand and the Falkland Islands, forming the New Zealand and Falkland currents, respectively. In addition, a considerable northward deflection occurs along the west coast of South America. Eddies and rings may branch off from this current, as it has been observed in other regions [Alvariño et al., 1983].

Oceanic Fronts

The Antarctic Convergence, normally considered the northern limit of the Antarctic region, is discussed in this study in relation to the Siphonophora. It is the boundary between the Antarctic and Subantarctic waters, a north-south fluctuating front which winds forming loops, extending north and south, and eventually developing rings, similar to those in the Gulf Stream and other currents. These eddies usually extend to the depth of the ocean [Alvariño et al., 1983].

The Antarctic Convergence has been considered an oceanic front zone, separating the Antarctic and Subantarctic water masses [Gordon, 1971]. Some species appeared to be restricted to regions either north or south of the convergence. To others, the convergence did not seem to pose any habitat boundary. In fact, the most abundant species of Siphonophora in the Antarctic ocean, *Diphyes antarctica* and *Dimophyes arctica*, in some instances had high densities precisely at the Antarctic Convergence zone. The Antarctic Convergence south of New Zealand [Garner, 1958; Knox, 1960] appears to limit the southern extension of *Rosacea plicata* in mesopelagic layers in summer. However, species of Chaetognatha were not found to be restricted to the Antarctic waters; all species found south of the Antarctic Convergence were also in Subantarctic waters [Alvariño et al., 1983].

However, it was observed [Alvariño et al., 1983] that the Subtropical Convergence represented a barrier for the distribution of warm- and cold-water Chaetognatha species. A similar situation has been found for the Siphonophora.

The high concentration of birds feeding on krill off King George Island and the Falkland Current [Veit and Braun, 1984] in regions of upwelling (warm waters of 3° to 4°C) agrees also with the concentration of siphonophores.

The Subtropical Convergence encircles the southern hemisphere, interrupted by the New Zealand Plateau and South America. It is a relatively stable feature east of New Zealand. A surface current of subtropical waters flows southward east of South Island, New Zealand [Robertson et al., 1978], showing a southward transport across the convergence near the Chatham Rise east of South Island.

The Subtropical Convergence in New Zealand surface waters [Garner, 1959; Knox, 1960] constitutes a barrier for several warm and temperate species carried south by the East Australia and East New Zealand currents. At times, upwelling will be induced, indicated by the presence of deepwater species in the upper oceanic layers.

Gordon [1971] suggested that the meridional exchange at the Antarctic and Subtropical convergences of nutrients, oxygen, and heat is responsible for the high biological productivity in those waters.

Variations in the location of the convergences occur with seasons. The Subtropical Convergence reaches higher latitudes during the summer than during the winter, and subsequently the species distributions will fluctuate latitudinally.

RELATION OF SIPHONOPHORA DISTRIBUTION TO PHYSICAL OCEANOGRAPHY

Patchy Distribution

Analyses of large numbers of plankton samples show that the Antarctic-Subantarctic Siphonophora species have a circumpolar distribution. However, owing to net avoidance by siphononphores [Alvariño, 1977, 1983; Biggs, 1977; Biggs et al., 1981; Hamner et al., 1975; Sears, 1953], and analyses of only aliquots of the samples for the most part of the collections instead of analyses of the total sample obtained during the haul, the distributional patterns shown by the species of siphonophores are patchy in both time and space. Since the same areas were not consistently sampled during the spring, summer, autumn, and winter cruises, this may also contribute to the patchy patterns.

In quasi-synoptic oceanographic surveys, occurrences are scattered owing to their particular patchy seasonal and spatial aggregation of populations and the ability of these animals to avoid capture by the plankton nets. In general, the distributional ranges of Siphonophora are related to the ocean isotherms, but most probably, the patchy distributions shown by most species may also be related to aggregations of prey. Siphonophores are active predators, feeding on other plankton organisms, such as larvae of fish and of other animals of commercial importance. Aggregations of prey could be responsible for the concentration of birds as mentioned above.

Most authors indicate that salps are abundant and widely distributed, mainly during summer. Abundance of salps precludes the abundance or even the presence of other zooplankters, a factor also to be considered affecting distributional patterns.

Reproduction also marks variations in concentration and the extent and abundance of the populations. Thus there is need to consider reproduction seasons and reproduction peaks, influencing the maintenance of Siphonophora populations in the Antarctic-Subantarctic regions during the winter and fall periods. The biotic impact of accumulation of populations related to their predatory activities is evidently an important subject.

Plankton Organisms as Indicators of Oceanic Environments

General Comments. The Siphonophora, unlike the Chaetognatha, are not distinctly restricted to water masses. However, some species are indicators of regional water movements. For example, monthly samples taken in 1954 and 1958 during the California Cooperative Oceanic Fisheries Investigations cruises off California (United States) and Baja California (Mexico) indicated that populations of *Chelophyes appendiculata*, a temperate water species, were alternately displaced by *C. contorta* (tropical species) with the inflow of warm waters into the California region (A. Alvariño, personal data).

Determination of water masses and the Antarctic and Subtropical Convergence zones based solely on salinity and temperature of the waters often has lead to contradictory results [Boltovskoy, 1962]. These contradictions are due to the very complicated hydrological structure of the convergences and the diversity of criteria used to define the water masses and hydrological features, based on salinity and temperature. Biological studies, based on biological indicators, may, however, reflect changes in the water masses by recognizing differences in the oceanic populations. Therefore plankton organisms can be selected as indicators of water masses and zones of convergence.

The circumpolar distribution of plankton in the Antarctic-Subantarctic region is generally accepted [Baker, 1954]. However, while the Antarctic-Subantarctic regions of the Atlantic and Pacific have been well surveyed, the comparable region of the Indian Ocean has received only slight coverage. As a result, scanty information is available on the planktonic organisms of the Antarctic-Subantarctic waters of the Indian Ocean. The data collected on the Chaetognatha of the Antarctic-Subantarctic regions seem to indicate a circumpolar distribution of the species of this group inhabiting those regions. However, sufficient data are not available for the Antarctic-Subantarctic Siphonophora.

Some species of Siphonophora are restricted in their distribution to the neritic habitat. Others occur in the tropical-equatorial oceanic belt or extend along the temperate waters, while a few inhabit exclusively the Southeast Asia, Indonesia, and Indian Ocean regions or only the Atlantic or Pacific oceans [Alvariño, 1970, 1971, 1972a, 1981a].

Siphonophores do not have distributional ranges restricted to water masses in the manner observed for most Chaetognatha species [Alvariño, 1965, 1969, 1970, 1971; Alvariño et al., 1983; Russell, 1934, 1935, 1936]. Most species of Siphonophora are widely distributed throughout the oceans, but some species have distributions limited to high boreal or austral latitudes, or both. In the latter case, the populations in the Arctic and Antarctic regions are connected via the depths of the Atlantic and Pacific oceans.

However, siphonophores also can be used as indicators of oceanic conditions in the South Atlantic [Alvariño, 1980c]. Progressions of Antarctic-Subantarctic species were used to identify the Falkland, Patagonia, and Fuegina currents, the eastern edge of the Benguela Current, and outlines of the Peru-Chile Current. Similarly, the distribution of tropical species shows the progression of those waters along the South America continental shelf, bending to the east to join the great central South Atlantic gyre, and the Eastern Australian and New Zealand current systems. Also, siphonophores are of value as indicators of transport of waters across ocean canals [Alvariño, 1974].

Together with the analysis of distribution related to ocean dynamics, it must be noted that the following general rule stands: warm-water species are observed in samples from high latitudes during the spring and summer; cold-water species survive at low latitudes during the winter.

Specific information. Twenty-four tropical-equatorial siphonophores were discussed by Alvariño [1970]. A high number of those species are tropical-equatorial in distribution, and their extension into the Subantarctic region suggests that the water those species inhabit is advected below the Subtropical Convergence.

Neritic species, such as *Muggiaea atlantica*, *M. bargmannae*, and *M. delsmani*, may indicate the flow of neritic waters. The present study shows the southern extension of the neritic species *M. atlantica* (typical of the temperate neritic regions of the eastern Pacific and Atlantic), the northern progression of the neritic cold-water species *M. bargmannae*, and the southern progression of the neritic species *M. delsmani* (typical of the Southeast Asia, Indonesia, and Indian Ocean neritic regions). Therefore the presence of *M. atlantica* (previously found in South Africa neritic waters) in the region of the South Georgia island, and the presence of *M. bargmannae* south of Tierra del Fuego in the spring and off Graham Land in the summer, are unusual. More information is needed on the distribution of these species in the southern hemisphere.

Dimophyes arctica has a bipolar distribution in the epipelagic layers, inhabiting the deep strata of the Atlantic, Pacific, and Indian oceans. The presence of this species in the epipelagic layers of medium and low latitudes indicates upwelling in those regions.

Halistemma cuplifera, previously observed at 04°25'S, 130°03'E [Lens and van Riemsdijk, 1908], appeared in this study off Chile in the epipelagic layers and in the mesopelagic strata west of the South Georgia island.

Populations of *Marrus antarcticus* extend along the West Wind Drift, showing the advance in the spring toward New Zealand, Chile, and the central South Pacific, marking the zone of the Subtropical Convergence. During the summer those advances also indicate the outline of the Subtropical Convergence zone, which extends at that time toward Tasmania but does not reach the latitudes of the spring locations of the central South Pacific.

A similar distribution was also found for *Pyrostephos vanhoeffeni*, appearing only during spring in the epipelagic layers and during winter in mesopelagic strata.

The distribution of *Marrus orthocanna* is south of the Antarctic Convergence during the spring, and in the winter it extends to the South Georgia island region.

Desmophyes annectens was observed only at the zone of the Antarctic Convergence east of Tierra del Fuego.

Rosacea plicata and *Nectopyramis natans* distributions indicate advection of the populations into the Antarctic-Subantarctic region from areas in the north, via the South Pacific central gyre and the eastern Australia-Tasmania gyre.

Chelophyes appendiculata distribution also showed a similar characteristic, but it advanced within the mesopelagic strata into the high latitudes.

Dimophyes arctica, *Clausophyes ovata*, and *Thalassophyes crystallina* extended mainly in the Subantarctic region in the spring, toward east Australia, New Zealand, and the southern part of Chile, outlining the portion of the South Pacific central gyre in the areas off South America. In the summer the populations occurred mainly within the Antarctic-Subantarctic regions.

Diphyes antarctica mainly inhabits the Antarctic region. Specimens off Chile and Tierra del Fuego observed during the spring suggest advection from southern waters.

Meanders of Antarctic waters, the northern boundary of the Antarctic Convergence, form rings [Emery, 1977] in which isolated populations are advected far from their normal distributional habitat. The East Australian Current and the Tasman Front [Nilson and Cresswell, 1981] form eddies or rings in spring that coalesce during the summer and form the Subtropical Convergence east of New Zealand near the Chatham Rise [Gilmore and Cole, 1979]. Evidence of these eddy formations is shown.

Distributions of *Rosacea plicata* in summer and of *Amphicaryon acaule*, and the southern transport of *Chelophyes appendiculata*, *Diphyes dispar*, *Eudoxoides spiralis*, *Lensia conoidea*, *L. leloupi*, *L. lelouveteau*, *L. hunter*, *L. multicristata*, *L. reticulata*, *L. subtiloides*, *Chuniphyes multidentata*, *Clausophyes ovata*, and *Ceratocymba sagittata*, may provide evidence of these eddy and ring formations.

Records of *Lensia baryi* off New Zealand, and of *Nectocarmen antonioi* in the vicinity of the Subtropical Convergence of the Pacific, far off Chile, are noteworthy because these species have been previously found off British Columbia (Canada) and California, respectively, and in the area of San Pedro Channel, California.

The three species *L. eltanin*, *L. eugenioi*, and *L. landrumae* show a typical Antarctic-Subantarctic distribution, together with *Heteropyramis alcala*, *Thalassophyes ferrarii*, *Heteropyramis maculata*, and *Clausophyes ovata*.

The Antarctic-Subantarctic ecosystem should show stability in species diversity. Variations in abundance of populations are expected as well as differences in the depth strata inhabited in relation to season. It is possible that some populations are in the epipelagic layers during the summer but retreat to deeper waters in winter. Also, variations in depth strata inhabited by the polygastric and eudoxid stages of siphonophores may be encountered.

Seasonal variations. Nectalia loligo was found only in spring. *Agalma elegans* was observed only in spring and summer, together with *Lensia subtiloides*, *Diphyes bojani*, and *Athorybia rosacea*. Species observed only during spring collections were *Physophora hydrostatica*, *Stephanomia bijuga*, *Lilyopsis rosea*, *Lensia subtilis*, *L. fowleri*, *Ceratocymba sagittata*, *Abyla haeckeli*, *A. trigona*, *Abylopsis eschscholtzi*.

Evidence of reproduction in the regions surveyed is more numerous during spring and summer, although in some species the reproduction period appears to extend into the fall or even to cover the whole year. Free-swimming reproductive stages were found during the four seasons for *Lensia reticulata*, *Clausophyes ovata*, *Heteropyramis maculata*, and *Heteropyramis alcala*. Eudoxid stages of *L. reticulata* appear in mesopelagic layers during spring, summer, and fall and at bathypelagic levels during fall and winter. *Clausophyes ovata* eudoxids were obtained at the three bathymetric levels during spring, summer, and fall, while they were found in the epipelagic and mesopelagic zones in winter. Eudoxids of *Heteropyramis alcala* were present in mesopelagic layers during the four seasons and also in the bathypelagic zone in the fall. *H. maculata* eudoxids were obtained at the three batymetric levels during spring, summer, and fall and in the epipelagic and mesopelagic zones in winter.

Eudoxids of *Lensia lelouveteau*, *Eudoxoides spiralis*, and *Abylopsis tetragona* were obtained in three seasons. *L. lelouveteau* eudoxids appeared in summer, fall, and winter at the three bathymetric levels during the cold seasons and in the mesopelagic zone in summer. Eudoxids of *E. spiralis* were present in the epipelagic and mesopelagic layers in spring and summer and in the epipelagic zone in winter. *A. tetragona* eudoxids were found in the epipelagic and mesopelagic zones in spring and summer but only in the uppermost layers in the fall.

Eudoxids of *Diphyes antarctica*, *D. dispar*, *D. bojani*, *Diphyopsis mitra*, *Chelophyes appendiculata*, *Thalassophyes crystallina*, and *Bassia bassensis* appeared during spring and summer. Eudoxids of *D. dispar* were observed at three bathymetric levels during both seasons; those of *D. antarctica* and *D. mitra* were obtained in epipelagic and mesopelagic layers. *D. bojani* and *B. bassensis* eudoxids were found in the epipelagic layers in spring and summer. Eudoxids of *C. appendiculata* and *T. crystallina* were observed in epipelagic and mesopelagic layers in spring and in the three bathymetric strata during summer.

Dimophyes arctica eudoxids were recorded only during the fall in mesopelagic layers. Eudoxid populations of *Ceratocymba sagittata* and *Abyla haeckeli* were present during spring in the epipelagic zone, and *Abylopsis eschscholtzi* eudoxids appear also in spring in mesopelagic layers.

Warm-water species appear to reproduce in spring and summer in the Antarctic-Subantarctic regions and adjacent areas. Typical Antarctic species have eudoxid populations during various seasons. However, the typical polar species *D. arctica* showed eudoxids in the fall only, and *D. antarctica* in spring and summer, while in both cases, polygastric stages were observed during the entire year.

The analysis of the Siphonophora from the U.S. Antarctic Research Program collections for the four seasons completes the present work in regard to the seasonal cyle of this group. Together with this information, a more detailed picture of the spatial and seasonal distributional patterns has been provided, with complete taxonomic composition in those regions, the fluctuations in the populations, the biogeographic zoning, indicator species of ocean dynamics, and the high density of populations in relation to reproduction and aggregations of prey.

APPENDIX

TABLE A1. Data for the Analyzed Plankton Collections From the United States Antarctic Research Program *Eltanin* Cruises 3-5, 35, 38

Sample Number	Position Lat., S	Position Long.	Depth, m Upper	Depth, m Lower	Local Date	Local Time	Length of Tow, min	Volume of Water Filtered, m^3	Type of Gear	Uncorrected Bottom Depth, m	Surface Temperature, °C
					Eltanin Cruise 3						
60	23°21′	72°49′W	0	4	June 20, 1962				Pl(0.5)		
69	25 43	71 07 W		11	June 21, 1962	2000-2120			Pl(0.5)	3440	
					Eltanin Cruise 4						
85	32 02	72 40 W	0	18	July 6, 1962	1745-1845			Pl(0.5)	5929	
89	32 01	72 40 W		2	July 6, 1962				Pl(0.5)		
94	39 02	75 39 W	0	9	July 8, 1962				Pl(0.5)		
					Eltanin Cruise 5						
209	37 27	73 52 W	46	183	Sept. 11, 1962				Pl(0.5)		
212	41 01	74 58 W	6	183	Sept. 12, 1962				Pl(0.5)		
					Eltanin Cruise 35						
2150	49 59	131 38 E	0	150	Aug. 18, 1968	1240-1249			V, Pl	3475	8.0
2152	56 20	129 25 E	0	200	Aug. 22, 1968				V, Pl		
2153	58 54	127 55 E	0	150	Aug. 25, 1968				V, Pl		
2154	56 03	128 10 E	0	150	Aug. 26, 1968	1244-1254			V, Pl	4521	1.1
2155	54 40	128 00 E	0	150	Aug. 27, 1968				V, Pl		
2156	46 15	128 02 E	0	150	Sept. 1, 1968	1309-1319			V, Pl	4609	8.5
2157	41 58	128 00 E	0	150	Sept. 3, 1968	1233-1243			V, Pl	4883	10.0
2158	38 43	128 02 E	0	150	Sept. 5, 1968	1305-1314			V, Pl	5541	10.8
2159	34 31	127 06 E	0	150	Sept. 7, 1968	1237-1246			V, Pl	4103	14.0
2160	35 15	121 20 E	0	150	Sept. 10, 1968	1344-1353			V, Pl	4215	13.8
2161	39 08	117 02 E	0	150	Sept. 13, 1968	1307-1316			V, Pl	4700	12.4
2162	41 55	117 04 E	0	150	Sept. 14, 1968				V, Pl	4413	10.0
2164	46 03	117 00 E	0	150	Sept. 16, 1968	1320-1329			V, Pl	4058	8.4
2165	48 44	117 01 E	0	150	Sept. 18, 1968	1353-1403			V, Pl	3698	6.8
					Eltanin Cruise 38						
2206	44 08	148 38 E	0	300	March 22, 1969	1300-1312		28	V, Pl(0.5)		
2209	61 42	149 51 E	0	300	April 5, 1969				V, Pl(0.5)		
2211	61 56	150 00 E	0	300	April 7, 1969				V, Pl(0.5)		
2212	61 56	150 03 E	0	200	April 7, 1969	1740-1755		800	H, Pl(0.5)		

TABLE A1. (continued)

Sample Number	Position Lat., S	Position Long.	Depth, m Upper	Depth, m Lower	Local Date	Local Time	Length of Tow, min	Volume of Water Filtered, m^3	Type of Gear	Uncorrected Bottom Depth, m	Surface Temperature, °C
					Eltanin Cruise 38 (continued)						
2213	61 56	149 59 E	0	200	April 8, 1969				H, Pl(0.5)		
2214	57 33	149 38 E	0	500	April 18, 1969				V, Pl(0.5)		
2215	57 33	149 38 E	0	200	April 18, 1969	1125-1139		250	H, Pl(0.5)		
2216	57 30	150 08 E	0	500	April 19, 1969				V, Pl(1.0)		
2218	57 39	149 13 E	0	500	April 21, 1969	1311-1336		1800	V, Pl(1.0)		
2220	57 58	149 24 E	0	500	April 21, 1969	2235-2306		2000	V, Pl(1.0)		
2222	53 51	151 26 E	0	500	April 23, 1969	1150-1223		300	V, Pl(1.0)		
2223	53 53	151 26 E	0	200	April 23, 1969	1156-1217		12	V, Pl(0.5)		
2225	49 43	152 36 E	0	200	April 25, 1969	1230-1241		10	V, Pl(0.5)		
2226	49 49	152 31 E	0	500	April 26, 1969	1122-1151		55	V, Pl(1.0)		
2227	49 49	152 31 E	0	200	April 26, 1969				V, Pl(0.5)		
2228	49 47	152 35 E	0	500	April 27, 1969				V, Pl(1.0)		
2229	49 47	152 35 E	0	200	April 27, 1969	0952-1004		7	V, Pl(0.5)		
2230	49 42	152 30 E	0	200	April 28, 1969				V, Pl(0.5)		
2231	49 43	152 33 E	0	500	April 29, 1969	1145-1209		100	V, Pl(0.5)		
2232	49 43	152 33 E	0	200	April 29, 1969	1154-1209		100	V, Pl(0.5)		
2233	49 43	152 33 E	0	500	April 30, 1969	1222-1250		130	V, Pl(1.0)		
2237	39 59	151 59 E	0	500	May 8, 1969	1228-1252		100	V, Pl(1.0)		
2238	39 59	151 59 E	0	200	May 8, 1969				V, Pl(0.5)		
2239	40 05	152 10 E	0	500	May 9, 1969	1134-1158		47	V, Pl(1.0)		
2240	40 05	152 10 E	0	200	May 9, 1969				V, Pl(0.5)		

Data for cruises 8-28 appear in the work by Alvarino et al. [1983, pp. 150-185].
Pl, plankton net; V, vertical tow; H, horizontal tow. Numbers in parentheses are meters.

TABLE A2. Code Numbers Used on Station Location Maps and the Station Numbers They Represent

Code Number on Map	Station Number(s)
Spring	
1	130, 131
2	132, 133
3	134-136
4	137-139
5	140, 141
6	142
7	144, 145
8	146-148
9	149, 150
10	152, 155-157
11	158-161
12	164, 165
13	166, 167
14	168-172
15	173-177
16	178-181
17	182
18	183-185
19	186-188
20	189-182
21	193-196
22	198-201
23	202-205
24	206-209
25	210-212
26	213-215
27	216, 217
28	219
29	221
30	223
31	224-227
32	228-230
33	728, 729
34	730-736
35	739-742
36	744-749
37	751-755
38	757-761
39	762-766
40	769,770
41	772-776, 1340
42	779-781
43	784-786
44	788, 789
45	792-795
46	797-801
47	804, 805
48	806
49	808, 810-813
50	815-819
51	820-824
52	827-829, 831
53	834-836, 838
54	839-843
55	846-849
56	854-857

TABLE A2. (continued)

Code Number on Map	Station Number(s)
Spring (continued)	
57	861-865
58	867-869, 871
59	873-875, 877
60	879-882a
61	1307
62	1308
63	1309, 1311
64	1313, 1315
65	1317, 1319
66	1320
67	1322
68	1325
69	1329
70	1330
71	1332, 1333
72	1334
73	1335
74	1338, 1339
75	same as code 41
76	1341
77	1342, 1343
78	1344
79	1348, 1349
80	1350, 1351
81	1352, 1353
82	1354, 1357
83	1358, 1363
84	1365, 1369
85	1371, 1375
86	1376-1382
87	1384-1389
88	1390-1397
89	1398-1405
90	1685-1691
91	1692-1698
92	1700-1710
93	1711-1715
94	1717-1719
95	1720-1725
96	1727-1731
97	1733-1738
98	1739-1744
99	1745-1749
100	1750-1753
101	1754
102	1755, 1756, 1760, 1761
103	1757, 1759
104	1762, 1763
105	1764-1768
106	1770-1775
107	1776-1780
108	1782-1787
109	1789-1794
110	1797
111	1798-1803

TABLE A2. (continued)

Code Number on Map	Station Number(s)
Summer	
1	231, 232
2	233-235
3	236-239
4	240-243
5	246-249
6	250
7	251-254
8	255-258
9	259
10	260-263
11	264-268
12	269,271
13	272-276
14	277, 280-282
15	285-287
16	288, 289, 292
17	293, 294
18	298-300
19	301-303
20	305-309
21	310, 311
22	312, 1314
23	317-320
24	322-326
25	327-330
26	331-334
27	335-339
28	340
29	341
30	342
31	343
32	344-346
33	347
34	348, 349
35	351, 352
36	355, 356
37	358-363
38	365-370
39	883-888
40	889
41	890-895
42	898-900
43	901, 902
44	903, 904
45	905, 906
46	908-911
47	913-915
48	917-922
49	923-926
50	1406-1413
51	1414
52	1415-1421
53	1436-1440
54	1442-1447
55	1448-1452
56	1453-1456

TABLE A2. (continued)

Code Number on Map	Station Number(s)
Summer (continued)	
57	1458-1464
58	1466-1471
59	1473-1475
60	1478-1481
61	1484-1487
62	1489-1493
63	1494-1499
64	1502-1505
65	1507-1509
66	1510-1512
67	1513, 1514
68	1516-1519
69	1520
70	1806-1811
71	1814-1817
72	1820-1824
73	1827-1832
74	1838
75	1847
76	1851-1852
77	1855
78	1858
79	1861
80	1864-1868
81	1871, 1872
82	1874-1878
83	1881-1886
84	1889-1894
85	1897-1902
86	1905-1910
87	1912-1915
88	1917-1920
89	1923-1928
90	1930-1934
91	1936-1940
92	1941, 1942
93	1944
94	1945, 1946
95	1948
96	1949, 1950
97	1951, 1952
98	1954
99	1956
100	1957
Fall	
1	1
2	4
3	6
4	8, 9
5	11
6	13
7	15
8	16
9	17, 18
10	20

TABLE A2. (continued)

Code Number on Map	Station Number(s)
Fall (continued)	
11	22
12	24
13	25
14	27
15	28, 29
16	30
17	32
18	33
19	35, 36
20	38-41
21	43
22	45, 46
23	49
24	51-53
25	58
26	60
27	61
28	62
29	63
30	64
31	65
32	371-376
33	377
34	378-381
35	383-385
36	387
37	389-391
38	392-397
39	398-403
40	405-410
41	411-414
42	418, 419
43	420
44	421
45	422-424
46	425-428
47	429-434
48	435
49	438, 440, 442
50	443-448
51	449-453
52	455-457
53	458-464
54	465-469
55	471-475
56	479
57	480-484
58	486-489, 491
59	492-496
60	497-501
61	502, 503
62	504-509
63	510-513,515
64	516-521
65	522-527
66	528-533

TABLE A2. (continued)

Code Number on Map	Station Number(s)
Fall (continued)	
67	534, 535
68	536-540
69	541, 542
70	929-933
71	934-939
72	941-945
73	948-952
74	956-961
75	963-968
76	970-975
77	977-979
78	981-986
79	988-993
80	994-996
81	998, 999
82	1001-1004
83	1008-1012
84	1014-1018
85	1020-1025
86	1027-1032
87	1034-1039
88	1041-1045
89	1046, 1048
90	1050-1054
91	1056-1060
92	1062-1066
93	1068-1072
94	1074-1078
95	1080-1082
96	1083-1088
97	1091-1096
98	1097-1100
99	1104-1107
100	1108-1110
101	1112-1117
102	1119-1124
103	1126-1131
104	1132-1137
105	1138-1143
106	1144-1150
107	1151-1157
108	1521-1524
109	1525-1531
110	1532-1538
111	1539-1544
112	1546-1552
113	1553-1557
114	1559-1565
115	1566-1572
116	1573-1578
117	1579, 1580
118	1581, 1582
119	1583, 1584
120	1585-1588
121	1960
122	1961, 1962

TABLE A2. (continued)

Code Number on Map	Station Number(s)
Fall (continued)	
123	1963, 1964
124	1965, 1966
125	1967, 1968
126	1969, 1970
127	1971, 1972
128	1973, 1974
129	1975, 1976
130	1977, 1978
131	1979, 1980
132	1981, 1982
133	1983, 1984
134	1985, 1986
135	1987, 1988
136	1989, 1990
137	1991, 1992
138	1993, 1994
139	1995, 1996
140	1997, 1998
141	1999, 2000
142	2001, 2002
143	2003, 2004
144	2005, 2006
145	2007, 2008
146	2009
147	2010, 2011
148	2012, 2013
149	2014, 2015
150	2016, 2017
151	2018, 2019
152	2020, 2021
153	2022, 2023
154	2024, 2025
155	2026, 2027
156	2028, 2029
157	2030, 2031
158	2032, 2033
159	2034, 2035
160	2036
161	2037, 2038
162	2039, 2040
163	2041, 2042
164	2043, 2044
165	2046, 2047
166	2048, 2049
167	2050, 2051
168	2052, 2053
169	2054, 2055
170	2056, 2057
171	2058, 2059
172	2060, 2061
173	2062, 2063
174	2064, 2065
175	2066, 2067
176	2068, 2069
177	60 (cruise 3)
178	2206

TABLE A2. (continued)

Code Number on Map	Station Number(s)
Fall (continued)	
179	2209
180	2211-2213
181	2214-2215
182	2216-2218, 2220
183	2222, 2223
184	2225
185	2226, 2227
186	2228, 2229
187	2230
188	2231-2233
189	2237, 2238
190	2239, 2240
Winter	
1	68, 69
2	70-73
3	74, 75
4	76-79
5	80-82
6	83-85
7	86-88
8	89-91
9	92-94
10	96, 97
11	98-100
12	102, 103
13	105, 106
14	107, 108
15	109-111
16	112
17	114, 115
18	117-119
19	121, 122
20	124-126
21	127-129
22	543-548
23	549-551
24	553-555
25	556-557
26	558-562
27	564-569
28	570-574
29	576-581
30	582-587
31	588-594
32	595-601
33	602-607
34	608-614
35	615-621
36	622-628
37	630-632
38	636-638
39	644-648
40	651-654
41	655-657

TABLE A2. (continued)

Code Number on Map	Station Number(s)
Winter (continued)	
42	659-664
43	666-671
44	673-677
45	679-681
46	684-688
47	691-695
48	696-698
49	699
50	700-706
51	707-712
52	713-718
53	719-721
54	722-727
55	1158-1164
56	1165-1171
57	1172-1176
58	1177-1184
59	1185-1191
60	1192-1195, 1197
61	1199-1205
62	1206-1211
63	1212-1218
64	1219-1224
65	1225-1231
66	1232-1234
67	1235-1237
68	1238-1242
69	1243-1249
70	1250-1252
71	1253-1257

TABLE A2. (continued)

Code Number on Map	Station Number(s)
Winter (continued)	
72	1259-1261
73	1263, 1265-1267
74	1268-1270, 1272, 1273
75	1274-1280
76	1281-1283
77	1284-1288
78	1289, 1292-1295
79	1296-1300
80	1301-1306
81	69 (cruise 3)
82	85 (cruise 4)
83	89 (cruise 4)
84	94 (cruise 4)
85	209 (cruise 5)
86	212 (cruise 5)
87	2150
88	2152
89	2153
90	2154
91	2155
92	2156
93	2157
94	2158
95	2159
96	2160
97	2161
98	2162
99	2164
100	2165

TABLE A3. Species List

Species	Cruise Number										
	10	11	12	15	16	20	21*	22	25	26	27
				Spring and Summer Collections							
Apolemia uvaria	X							X			
Agalma elegans							X,x				
Agalma okeni	X										
Halistemma cupulifera									X		
Marrus antarcticus	X		X	X			X,x	X	X	X	X
Marrus orthocanna											X
Nectalia loligo	X			X							
Stephanomia bijuga	X			X							
Bargmannia elongata	X		X					X	X		X
Pyrostephos vanhoeffeni	X			X			X,x		X		
Physophora hydrostatica	X			X			X,x		X		
Athorybia rosacea	X	X					X		X		
Amphicaryon acaule	X	X		X		X	X,x	X	X	X	X
Desmophyes annectens								X			
Lilyopsis rosea									X		X
Nectodroma dubia									X		X
Rosacea plicata	X	X		X	X		X,x	X	X	X	X
Nectopyramis natans		X		X	X		X	X			
Nectopyramis spinosa		X			X						
Hippopodius hippopus										X	X
Vogtia glabra			X				X			X	
Vogtia kuruae			X								
Vogtia pentacantha										X	
Vogtia serrata	X	X	X	X		X		X	X		X
Vogtia spinosa			X		X	X					X
Sulculeolaria biloba									X		
Chelophyes appendiculata	X	X		X	X		X,x		X	X	X
Dimophyes arctica	X	X	X	X	X	X	X,x	X	X	X	X
Diphyes antarctica	X	X	X	X			X,x	X	X		X
Diphyes bojani		X	X				X	X	X		X
Diphyes dispar			X	X			X	X	X	X	X
Diphyopsis mitra					X	X	X	X	X		
Eudoxia macra							X		X		
Eudoxoides spiralis					X	X	X	X	X	X	X
Lensia achilles							X				
Lensia baryi					X						
Lensia campanella							X				
Lensia conoidea	X	X			X		X		X	X	X
Lensia cossack							X			X	
Lensia eltanin		X		X	X						
Lensia eugenioi										X	
Lensia exeter							X				
Lensia fowleri							X				
Lensia grimaldii											X
Lensia hardy					X						
Lensia hostile							X			X	
Lensia hotspur									X		
Lensia hunter	X						X			X	
Lensia landrumae	X				X		X			X	
Lensia leloupi	X								X	X	X
Lensia lelouveteau	X	X			X		X		X	X	X
Lensia multicristata					X	X	X		X	X	X
Lensia reticulata	X	X		X	X		X,x			X	
Lensia subtilis							X				
Lensia subtiloides			X						X	X	

TABLE A3. (continued)

Species	Cruise Number 10	11	12	15	16	20	21*	22	25	26	27
					Spring and Summer Collections (continued)						
Muggiaea atlantica			X	X							
Muggiaea bargmannae	X		X								
Muggiaea delsmani						X					
Chuniphyes moserae							X				X
Chuniphyes multidentata	X		X	X	X		X,x		X	X	
Clausophyes galeata				X			X	X			X
Clausophyes ovata	X	X	X	X	X	X	X,x	X	X	X	X
Crystallophyes amygdalina	X	X	X	X	X		X,x		X		
Heteropyramis alcala					X				X	X	
Heteropyramis maculata	X	X	X	X	X		X	X	X	X	X
Thalassophyes crystallina	X	X	X	X	X		X,x	X	X	X	X
Thalassophyes ferrarii									X	X	
Ceratocymba leuckarti			X								
Ceratocymba sagittata										X	
Abyla haeckeli							X				
Abyla trigona			X					X			
Abylopsis eschscholtzi		X					X			X	
Abylopsis tetragona		X			X		X		X	X	
Bassia bassensis		X		X			X	X	X		

Species	Cruise Number 3	4	8	9	13	14	17	18
				Fall and Winter Collections				
Marrus antarcticus				X		X	X	X
Marrus orthocanna				X				
Bargmannia elongata				X	X	X	X	
Pyrostephos vanhoeffeni				X				
Melophysa melo								
Amphicaryon acaule				X	X	X	X	X
Amphicaryon ernesti					X			
Amphicaryon peltifera								
Nectodroma dubia							X	
Nectocarmen antonioi					X			
Rosacea plicata				X	X	X	X	
Nectopyramis diomedeae							X	
Nectopyramis natans					X		X	X
Hippopodius hippopus							X	
Vogtia glabraa								
Vogtia kuruae						X	X	
Vogtia pentacantha								X
Vogtia serrata			X		X			
Subculeolaria biloba								
Subculeolaria monoica								
Subculeolaria turgida								
Chelophyes appendiculata				X				
Dimophyes arctica			X	X	X	X	X	X
Diphyes antarctica	X	X	X		X		X	
Diphyes dispar				X	X			
Diphyopsis mitra			X		X		X	
Eudoxides spiralis				X	X			
Lensia achilles					X			X
Lensia campanella					X		X	
Lensia conoidea					X			

Table A3. (continued)

Species	3	4	8	9	13	14	17	18
				Cruise Number				
Fall and Winter Collections (continued)								
Lensia eltanin				X	X	X	X	
Lensia eugenioi			X	X	X			
Lensia exeter							X	
Lensia grimaldii								
Lensia hardy						X		X
Lensia havock						X		

Species	10	11	12	15	16	20	21*	22	25	26	27
						Cruise Number					
Fall and Winter Collections (continued)											
Lensia hostile					X	X					
Lensia hotspur					X		X	X			
Lensia hunter						X	X	X			
Lensia landrumae					X	X	X				
Lensia lelouveteau			X	X	X	X	X	X			
Lensia multicristata											
Lensia reticulata				X			X				
Muggiaea atlantica					X						
Muggiaea bargmannae							X				
Chuniphyes moserae				X							
Chuniphyes multidentata					X						
Clausophyes galeata				X							
Clausophyes ovata			X	X	X	X	X	X			
Crystallophyes amygdalina				X	X	X	X	X			
Heteropyramis alcala					X	X	X				
Heteropyramis maculata				X	X	X	X	X			
Thalassophyes crystallina			X	X	X	X	X	X			
Thalassophyes ferrari				X		X					
Ceratocymba dentata											
Ceratocymba leuckarti					X						
Abylopsis tetragona		X		X							

Species	19	23	28	30	35	38
				Cruise Number		
Fall and Winter Collections (continued)						
Marrus antarcticus		X	X			
Marrus orthocanna						
Bargmannia elongata	X			X	X	
Pyrostephos vanhoeffeni						
Melophysa melo	X	X	X			
Amphicaryon acaule	X		X			X
Amphicaryon ernesti	X	X	X			X
Amphicaryon peltifera						
Nectodroma dubia	X	X				
Nectocarmen antonioi			X			
Rosacea plicata	X	X				X
Nectopyramis diomedeae			X			X
Nectopyramis natans						
Hippopodius hippopus						
Vogtia glabra	X					

Table A3. (continued)

Species	Cruise Number					
	19	23	28	30	35	38
	Fall and Winter Collections (continued)					
Vogtia kuruae	X	X		X		X
Vogtia pentacantha		X		X	X	
Vogtia serrata						
Subculeolaria biloba		X				X
Subculeolaria monoica			X			
Subculeolaria turgida		X	X	X		
Chelophyes appendiculata						
Dimophyes arctica	X	X	X	X	X	X
Diphyes antarctica		X	X	X	X	X
Diphyes dispar						
Diphyopsis mitra						
Eudoxides spiralis			X		X	
Lensia achilles						
Lensia campanella						
Lensia conoidea						
Lensia eltanin			X			
Lensia eugenioi						
Lensia exeter		X				
Lensia grimaldii			X			
Lensia hardy						
Lensia havock						
Lensia hostile						
Lensia hotspur				X		
Lensia hunter	X	X		X		
Lensia landrumae	X	X	X	X	X	X
Lensia lelouveteau	X	X	X		X	X
Lensia multicristata		X	X	X		X
Lensia reticulata	X	X				
Muggiaea atlantica						
Muggiaea bargmannae						
Chuniphyes moserae						
Chuniphyes multidentata		X				
Clausophyes galeata						
Clausophyes ovata	X	X	X	X	X	X
Crystallophyes amygdalina	X	X	X			X
Heteropyramis alcala	X	X				
Heteropyramis maculata	X	X	X		X	X
Thalassophyes crystallina	X	X			X	
Thalassophyes ferrari		X	X			X
Ceratocymba dentata				X		
Ceratocymba leuckarti						
Abylopsis tetragona			X			

*Cruise 21 was mostly a spring cruise, but some samples were collected during the summer. X, species collected during spring portion of cruise 21; x, species collected during summer portion of cruise 21.

TABLE A4. Estimated Abundance (per 1000 m^3 of Water Filtered) and Presence of Siphonophorae Obtained During Eltanin Cruises

	Cruise 3 Stations				
Species	60		69		
Diphyes antarctica			P/O		
	Cruise 4 Stations				
Species	85	89	94		
Diphyes antarctica	P/O*		P/O		
Abylopsis tetragona	O/P		O/P		
	Cruise 8 Samples				
Species	20	24	25	27	28
Dimophes arctica		88/0		241/0	221/0
Lensia eugenioi					221
L. lelouveteau					0/221
Clausophyes ovata	0/58	0/88	0/451	0/80	0/221
Thalassophyes crystallina				80	
	Cruise 8 Samples (continued)				
Species	29	30	32	33	35
Vogtia serrata		129			
Dimophyes arctica	438/0			40/0	67/0
Diphyes antarctica	110/0			40/0	
Diphopsis mitra			0/57		
Clausophyes ovata	0/548				0/101
	Cruise 8 Samples (continued)				
Species	36	40	45	49	51
Dimophyes arctica		269/0	77/0	495/0	
Clausophyes ovata	0/44	0/134	0/231	0/19	0/165
	Cruise 8 Sample (continued)				
Species	52				
Clausophyes ovata	0/255				
	Cruise 9 Samples				
Species	67	68	72	73	74
Marrus antarcticus					41
Marrus orthocanna				73	
Bargmannia elongata	45				
Dimophyes arctica		48/0		73/0	41/0
Diphyes dispar		0/48			
Lensia eltanin			40		41
L. lelouveteau		0/104	0/242	0/73	0/490
Clausophyes ovata			0/81	0/163	0/204
Hetropyramis maculata		0/48		0/73	
Thalassophyes crystallina			73		
Thalassophyes ferrarii	273				
	Cruise 9 Samples (continued)				
Species	75	76	77	79	80
Dimophyes arctica	77/0		44/0	257/0	
Eudoxoides spiralis					109/0
Lensia eltanin	153	824			
L. eugenioi				73	

TABLE A4. (continued)

Species	Cruise 9 Samples (continued)				
	75	76	77	79	80
L. lelouveteau	0/842	0/235	0/200		0/163
L. reticulata				37/0	
Clausophyes ovata	0/1531	0/941	0/111		0/163
Crystallophyes amygdalina	77				163
Heterophyramis maculata					163
Thalassophyes crystallina		235	22		163
Abylopsis tetragona	77/0				

Species	Cruise 9 Samples (continued)				
	82	83	85	90	94
Amphicaryon acaule	61				29
Rosacea plicata	303		141		
Chelophyes appendiculata			57/0		
Dimophyes arctica	424/0		171/0		
Lensia eugenioi	61				
L. lelouveteau	0/61	O/P	0/114	0/150	
L. reticulata			57/0		
Chuniphyes moserae				19	
Clausophyes galeata				19	
Clausophyes ovata	0/121	O/P	0/114		
Thalassophyes crystallina				37	

Species	Cruise 9 Samples (continued)			
	96	97	98	99
Pyrostephos vanhoeffeni		40		
Dimophyes arctica	122/0	82/0	381/0	32/0
Lensia lelouveteau	0/10	0/816		0/32
Clausophyes ovata	0/41			0/32
Thalassophyes crystallina		82		

Species	Cruise 10 Samples						
	131	132	134	135	137	138	144
Athorybia rosacea							14
Amphicaryon acaule							14
Rosacea plicata		23	22	13			
Dimophyes arctica		23/0		39/0	112/0	22/0	28/0
Lensia hunter	26/0						
L. leloupi		45/0					
Crystallophyes amygdalina		23/0	45/0				14/0
Heteropyramis maculata	0/26		22/0		0/56		
Thalassophyes crystallina			22/0				14/0

Species	Cruise 10 Samples (continued)						
	145	157	149	150	152	153	154
Bargmannia elongata	10						
Vogtia serrata						8	
Chelophyes appendiculata						8/0	
Dimophyes arctica			18/0	41/0		50/0	P/O
Diphyes antarctica						8/0	
Lensia conoidea	10/0						
Clausophyes ovata				0/14		0/8	
Crystallophyes amygdalina	49/0	14/0		14/0		41/0	P/O
Heteropyramis maculata	10/10			0/14	P/O		
Thalassophyes crystallina	20/0			0/14		8/0	

TABLE A4. (continued)

Species	Cruise 10 Samples (continued)						
	155	156	157	159	160	161	162
Apolemia uvaria							73
Agalma okeni							150
Marrus antarcticus					14		150
Stephanomia bijuga				32			
Rosacea plicata		14			14		
Vogtia serrata			22				
Dimophyes antarctica	139/0		34/0	97/0	28/0		224/0
Diphyes arctica	13/0						
Chuniphyes multidentata			11/0				
Crystallophyes amygdalina	38/0		34/0	48/0	28/0	138/0	75/0
Heteropyramis maculata	0/50	0/42	0/34	0/32	14/14	50/12	0/15
Thalassophyes crystallina		99/0	22/0		14/0	150/0	

Species	Cruise 10 Samples (continued)						
	165	166	167	169	170	171	175
Vogtia serrata						13	
Chelophyes appendiculata		105/0					
Dimophyes arctica		105/0	148/0	115/0	21/0	13/0	45/0
Lensia conoidea						7/0	
L. reticulata	0/22						
Clausophyes ovata	0/22					0/26	
Crystallophyes amygdalina	22/0		296/0	58/0	7/0	33/0	30/0
Heteropyramis maculata	0/65				0/35	20/26	0/30
Thalassophyes crystallina	44/0				14/0	26/0	15/0

Species	Cruise 10 Samples (continued)						
	176	178	180	182	184	185	187
Bargmannia elongata	43						
Amphicaryon acaule						3	
Rosacea plicata						6	
Dimophyes arctica	43/0		36/0		114/0	35/0	
Diphyes antarctica						0/12	
Muggiaea bargmannae						12/0	
Clausophyes ovata						0/47	
Crystallophyes amygdalina		36/0	10/0				110/0
Heteropyramis maculata					0/114	0/47	
Thalassophyes crystallina	22/0	17/0	12/0			12/0	

Species	Cruise 10 Samples (continued)						
	188	190	191	192	193	194	195
Nectalia loligo					26		
Amphicaryon acaule	22		42				
Rosacea plicata	41			31			
Vogtia serrata	15					13	
Dimophyes arctica	53/0	413/0		62/0		152/0	39/0
Diphyes antarctica							0/10
Lensia conoidea							26/0
L. hunter	13/0						
L. landrumae				31/0			
Clausophyes ovata	0/26		0/64	0/62			0/7
Crystallophyes amygdalina	26/0	206/0					52/0
Heteropyramis maculata	0/13	0/413	0/149	0/93		0/76	26/14

TABLE A4. (continued)

Species	Cruise 10 Samples (continued)						
	196	199	200	201	203	204	205
Physophora hydrostatica					25		
Amphicryon acaule				24			P
Rosacea plicata			31				
Vogtia serrata			25				
Dimophyes arctica	16/0	109/0	25/0			17/0	
Lensia conoidea	16/0						
L. lelouveteau	0/16						
Clausophyes ovata	0/96	0/73					
Crystallophyes amygdalina	32/0					17/0	
Heteropyramis maculata			0/25				O/P
Thalassophyes crystallina				47/0		17/0	

Species	Cruise 10 Samples (continued)						
	208	209	212	214	216	219	221
Athorybia rosacea		6					
Amphicaryon acaule		2	20				
Rosacea plicata			32				
Dimophyes arctica	21/0	6/0	48/0	25/0		48/0	
Clausophyes ovata		0/13					
Crystallophyes amygdalina		6/0					79/0
Heteropyramis maculata		0/19	0/16				
Thalassophyes crystallina		6/0			13/0		

Species	Cruise 10 Samples (continued)						
	223	225	226	227	228	229	230
Marrus antarcticus					17		25
Amphicaryon acaule			P				
Rosacea plicata						3	
Chelophyes appendiculata						86/0	25/0
Dimophyes arctica	19/0	148/0				513/0	76/0
Lensia conoidea				103/0			
Clausophyes ovata		0/49				0/86	
Heteropyramis maculata	0/57	49/98				0/86	0/127

Species	Cruise 11 Samples						
	231	232	233	234	235	237	238
Amphicaryon acaule			7				18
Nectopyramis natans			7		923		
Chelophyes appendiculata						50/0	
Dimophyes arctica		68/0				50/0	18/0
Clausophyes ovata		0/68		0/30		0/298	0/92
Crystallophyes amygdalina			7/0				18/0
Heteropyramis maculata	0/48	0/68	0/7	0/30		50/348	
Thalassophyes crystallina			7/0				

Species	Cruise 11 Samples (continued)						
	239	241	242	243	248	249	250
Athorybia rosacea			7				
Amphicaryon acaule			7				
Rosacea plicata					38		
Nectopyramis natans				27			552

TABLE A4. (continued)

	Cruise 11 Samples (continued)						
Species	239	241	242	243	248	249	250
Vogtia serrata				9			
Chelophyes appendiculata						O/P	
Dimophyes arctica		48/0	3/0				
Diphyes antarctica				0/9			
Lensia reticulata						O/P	
Clausophyes ovata	0/10	0/144	0/54	0/9			
Crystallophyes amygdalina	10/0			9/0		P/O	
Heteropramis maculata	19/19		0/3	9/9	0/19	O/P	
Thalassophyes crystallina			10/0	18/0	19/0	P/O	

	Cruise 11 Samples (continued)						
Species	251	253	254	256	257	262	263
Amphicaryon acaule		50			22		
Nectopyramis natans	314						
N. spinsoa						25	
Chelophyes appendiculata					0/65		
Dimophyes arctica				P/O			
Diphyes antarctica						0/25	0/15
Lensia conoidea						25/0	
L. eltanin							15/0
L. reticulata		0/75	0/16		0/22	0/49	
Clausophyes ovata		0/50			0/86		0/44
Crystallophyes amygdalina			32/0		43/0		15/0
Heteropyramis maculata		0/126	0/16		0/129	0/25	0/44
Thalassophyes crystallina		176/0	81/0		65/0	25/0	59/0
Abylopsis tetragona		0/25					

	Cruise 11 Samples (continued)						
Species	264	267	268	271	274	275	276
Amphicaryon acaule			11				
Rosacea plicata			6				
Nectopyramis natans		76	17				
Vogtia serrata			17				
Dimophyes arctica			6/0		54/0		
Lensia reticulata			0/11				
Clausophyes ovata			0/23				
Crystallophyes amygdalina			28/0		18/0		29/0
Heteropyramis maculata	0/42	0/76	0/17		0/54	0/15	14/0
Thalassophyes crystallina			40/6	25/0		10/0	36/0
Bassia bassensis			11/0				

	Cruise 11 Samples (continued)						
Species	277	281	286	287	288	289	292
Vogtia serrata			P				
Chelophyes appendiculata			O/P			0/56	
Dimophyes arctica		P/O	P/O	6/0	416/0	168/0	
Diphyes antarctica					0/416		
Lensia reticulata							15/15
Clausophyes ovata	0/30	O/P					0/46
Crystallophyes amygdalina							77/0
Heteropyramis maculata		O/P	O/P				0/15
Thalassophyes crystallina			P/O			56/0	77/0

TABLE A4. (continued)

Species	293	298	299	300	301	303	306
	Cruise 11 Samples (continued)						
Chelophyes appendiculata	16/0				O/P		0/720
Dimophyes arctica	49/0		273/0		P/O		
Diphyes antarctica	0/16	0/3820		0/61			
L. reticulata						0/21	
Heteropyramis maculata						0/41	
Thalassophyes crystallina	33/16			61/0		20/21	
Abylopsis eschscholtzi	33/0						
A. tetragona						0/21	

Species	307	308	309	310	311	312	314
	Cruise 11 Samples (continued)						
Dimophyes arctica	38/0	46/0		32/0			270/0
Diphyes bojani	38/38						
Lensia eltanin		46/0	28/0	32/0			
L. reticulata		0/46					
Clausophyes ovata						0/11	
Heteropyramis maculata				0/32		0/11	
Thalassophyes crystallina					41/0	0/11	

Species	318	319	320	326	329	330	331
	Cruise 11 Samples (continued)						
Rosacea plicata						22	
Dimophyes arctica		P/O					
Lensia reticulata			0/15	0/10			
Clausophyes ovata				0/5	0/49	0/156	
Crystallophyes amygdalina						67/0	
Heteropyramis maculata	0/37		0/41	0/40		0/44	0/49
Thalassophyes crystallina			26/10	5/0		22/0	

Species	334	338	339	341	343	345
	Cruise 11 Samples (continued)					
Rosacea plicata					17	
Chelophyes appendiculata						0/178
Dimophyes arctica		82/0		3765/0		
Clausophyes ovata	0/81	0/165		0/1882		
Crystallophyes amygdalina			35/0			
Heteropyramis maculata		0/82		0/1882		0/89
Thalassophyes crystallina	162/0	247/0			8/0	
Bassia bassensis		82/0				

Species	351	352	354	356	359	360	366
	Cruise 11 Samples (continued)						
Vogtia glabra	14						
Dimophyes arctica		106/0			80/0	73/0	135/0
Diphyes antarctica		0/71					
Diphyes bojani			32/0				
Diphyes dispar		0/35			0/40	0/15	0/45
Muggiaea bargmannae					279/0		
Chuniphyes multidentata		12/0					
Clausophyes ovata		0/129		0/33	0/279		0/90
Heteropyramis maculata				0/7		0/15	

TABLE A4. (continued)

Species	Cruise 11 Samples (continued)						
	351	352	354	356	359	360	366
Thalassophyes crystallina				0/7	40/0		
Ceratocymba leuckarti					40/0		

Species	Cruise 12 Samples						
	367	371	372	373	374	377	379
Dimophyes arctica	56/0		1480/0	118/0	36/0	10/0	380/0
Diphyes bojani							45/0
Diphyes dispar	0/11	0/137				0/5	0/112
Clausophyes ovata		0/137	0/231	0/237		0/15	0/156
Heteropyramis maculata						0/5	
Thalassophyes crystallina	0/38		93/0				

Species	Cruise 12 Samples (continued)						
	381	384	387	389	393	394	395
Bargmannia elongata						13	
Vogtia serrata							6
Dimophyes arctica	191/0	51/0	195/0		66/0	364/0	
Diphyes antarctica		26/0					
Diphyes dispar						0/65	
Muggiaea bargmannae				7/0			
Clausophyes ovata		0/26				0/364	0/6
Heteropyramis maculata					0/17		

Species	Cruise 12 Samples (continued)						
	399	400	401	406	407	408	410
Bargmannia elongata		16					
Vogtia kuruae					23		
Dimophyes arctica	522/0	32/0	35/0		56/0	18/0	
Diphyes bojani				65/0	28/0		
Diphyes dispar		0/16				0/53	
Lensia reticulata						0/21	
L. subtiloides					113/0		
Clausophyes ovata	0/58		0/26		0/366	0/88	
Heteropyramis maculata		0/16	0/44				0/15
Thalassophyes crystallina			0/44				

Species	Cruise 12 Samples (continued)						
	412	413	414	418	419	420	421
Vogtia serrata		20					
Vogtia spinosa						27	
Dimophyes arctica	678/0	59/0	74/0	40/0		27/0	40/0
Diphyes dispar		0/59	0/25				
Muggiaea atlantica		20/0					
Clausophyes ovata	0/68	0/78	0/8	0/146	0/114		0/40
Heteropyramis maculata			0/8				

Species	Cruise 12 Samples (continued)						
	422	426	427	428	430	431	432
Marrus antarcticus						90	
Amphicaryon acaule							10
Vogtia serrata	27						

TABLE A4. (continued)

Species	Cruise 12 Samples (continued)						
	422	426	427	428	430	431	432
Dimophyes arctica	134/0	378/0	88/0	38/0	115/0	77/0	77/0
Diphyes bojani		32/0					19/0
Diphyes dispar	0/54						0/29
Lensia reticulata			0/70				
Clausophyes ovata	0/134	0/158	0/33		0/138	0/39	0/220
Heteropyramis maculata	0/27	0/32		0/10			
Thalassophyes crystallina	54/0						

Species	Cruise 12 Samples (continued)			
	435	436	438	440
Marrus antarcticus				524
Vogtia spinosa		37		
Dimophyes arctica	17/0			
Diphyes bojani		37/0		
Clausophyes ovata	0/17			0/16
Crystallophyes amygdalina			46/0	
Abyla trigona	17/0			

Species	Cruise 13 Samples				
	444	445	446	448	449
Rosacea plicata		13			
Dimophyes arctica	195/0	13/0			
Diphyes dispar					0/75
Diphyopsis mitra			11/0		
Lensia lelouveteau			11/0		
Muggiaea atlantica	20/0	13/0			
Clausophyes ovata	0/20		0/22	0/11	
Thalassophyes crystallina	39/0				

Species	Cruise 13 Samples (continued)				
	450	451	452	455	456
Amphicaryon acaule		13			
Amphicaryon peltifera		13			
Dimophyes arctica	29/0	25/0	17/0	32/0	
Diphyes dispar		0/13			
Diphyopsis mitra			0/6		
Lensia campanella			6/0		
L. conoidea			6/0		
L. hotspur	58/0				
L. lelouveteau					45/0
Muggiaea atlantica		13/0			
Clausophyes ovata	0/29		0/58	0/32	
Thalassophyes crystallina			6/0		

Species	Cruise 13 Samples (continued)				
	457	459	460	461	463
Amphicaryon acaule			27	55	
Rosacea plicata			27		
Dimophyes arctica		98/0	27/0		
Diphyes dispar	325/0				
Eudoxoides spiralis			27/0	82/0	
Lensia eltanin					125/0

TABLE A4. (continued)

Species	Cruise 13 Samples (continued)				
	457	459	460	461	463
L. lelouveteau			82/0		
Clausophyes ovata			0/27	0/109	

Species	Cruise 13 Samples (continued)				
	466	467	468	469	471
Amphicaryon acaule			30		
Rosacea plicata			30	41	
Dimophyes arctica	79/0	87/0			
Clausophyes ovata		0/29			0/53
Heteropyramis alcala			0/30		

Species	Cruise 13 Samples (continued)				
	472	473	475	481	482
Bargmannia elongata			29		
Dimophyes arctica	28/0		25/0		32/0
Eudoxoides spiralis					32/0
Clausophyes ovata	0/28	0/80	0/15		

Species	Cruise 13 Samples (continued)				
	488	485	497	499	502
Bargmannia elongata			30		
Rosacea plicata	20			22	
Vogtia serrata		6			
Dimophyes arctica	30/0			44/0	
Diphyes antarctica					16/0
Diphyopsis mitra	10/0				
Chuniphyes multidentata				22/0	

Species	Cruise 13 Samples (continued)				
	504	506	507	512	513
Amphicaryon peltifera		45			
Dimophyes arctica		68/0		111/0	
Lensia hostile					18/0
L. lelouveteau	0/16				
Muggiaea atlantica		23/0	198/0		
Chuniphyes multidentata				22/0	
Clausophyes ovata				0/22	0/18

Species	Cruise 13 Samples (continued)				
	515	518	521	524	529
Rosacea plicata				P	160
Dimophyes arctica		125/0		45/0	
Muggiaea atlantica				45/0	
Clausophyes ovata		0/62		0/45	

Species	Cruise 13 Samples (continued)				
	530	531	534	535	537
Amphicaryon acaule	16		11		
Rosacea plicata	98				
Dimophyes arctica	49/0		32/0		53/0

TABLE A4. (continued)

Species	Cruise 13 Samples (continued)				
	530	531	534	535	537
Eudoxoides spiralis		20/0			
Clausophyes ovata	0/49				0/18
Thalassophyes crystallina				31/0	

Species	Cruise 13 Samples (continued)				
	538	542	545	546	553
Eudoxoides spiralis		0/59			
Lensia landrumae				7/0	
L. lelouveteau			0/19		
Clausophyes ovata		O/P		0/7	
Heteropyramis maculata				7/0	14/0
Thalassophyes ferrarii	P				

Species	Cruise 13 Samples (continued)				
	556	60	561	566	567
Amphicaryon acaule		44		12	6
Nectocarmen antonioi			9		
Rosacea plicata	20		9		
Nectopyramis natans				11	11
Sulculeolaria turgida				36/0	
Dimophyes arctica		15/0		0/36	
Lensia achilles			9/0	24/0	
L. lelouveteau		0/59	0/136	0/71	0/17
Clausophyes ovata			1/18		
Crystallophyes amygdalina				47/0	
Heteropyramis maculata				36/0	

Species	Cruise 14 Samples				
	572	573	574	578	579
Amphicaryon acaule				P	8
Rosacea plicata				P	
Nectopyramis diomedeae				P	
Dimophyes arctica	P/O	7/0		P/O	
Lensia landrumae	P/O	37/0	33/0	P/O	
L. lelouveteau	P/O	0/37		P/O	0/34
Heteropyramis maculata		22/0			8/0
Crystallophyes amygdalina	P/O				
Thalassophyes crystallina		15/0			

Species	Cruise 14 Samples (continued)				
	583	584	585	589	590
Amphicaryon acaule		387			P
Rosacea plicata	123	129	23	34	P
Dimophyes arctica				68/0	P/O
Lensia hunter			11/0		P/O
L. lelouveteau			0/23		P/O
Heteropyramis maculata					P/O

Species	Cruise 14 Samples (continued)				
	591	597	604	605	610
Amphicaryon acaule	9	16	21		39
Rosacea plicata					19

TABLE A4. (continued)

Species	Cruise 14 Samples (continued) 591	597	604	605	610
Dimophyes arctica		31/0			
Lensia landrumae		16/0			
L. lelouveteau	0/17	0/93		0/15	0/10
Clausophyes ovata	0/9		0/21		
Crystallophyes amygdalina				15/0	
Thalassophyes crystallina			21/0		

Species	Cruise 14 Samples (continued) 611	617	618	624	625
Amphicaryon acaule	8	14		11	
Rosacea plicata				22	
Vogtia kuruae	8				
Dimophyes arctica	27/0			33/0	7/0
Lensia landrumae			18/0		7/0

Species	Cruise 14 Samples (continued) 630	631	632	638	644
Rosacea plicata		49			
Dimophyes arctica					29/0
Lensia landrumae		12/0			10/0
L. lelouveteau	0/25		0/7		0/39
Heteropyramis maculata					0/29

Species	Cruise 14 Samples (continued) 645	648	651	652	657
Amphicaryon acaule			25		
Rosacea plicata					10
Vogtia kuruae			25		10
Dimophyes arctica		22/0			
Diphyes antarctica					P/O
Lensia lelouveteau	0/15			0/17	0/20
Clausophyes ovata		0/22			

Species	Cruise 14 Samples (continued) 661	662	668	670	673
Bargmannia elongata	14				
Dimophyes *arctica*	14/0		P/O	47/0	28/0
Lensia lelouveteau	0/14	0/60			

Species	Cruise 14 Samples (continued) 674	675	680	681	685
Amphicaryon acaule	23				
Vogtia kuruae			24		
Dimophyes arctica		P/O	24/0		42/0
Lensia eltanin	12/0		24/0	34/0	
L. hardy	12/0				
L. hostile	12/0				
L. landrumae	12/0				

TABLE A4. (continued)

Species	Cruise 14 Samples (continued)				
	674	675	680	681	685
L. lelouveteau			0/24		
Clausophyes ovata				0/11	
Crystallophyes amygdalina					42/0
Heteropyramis alcala	0/12				
H. maculata				11/0	0/127
Thalassophyes crystallina					42/0

Species	Cruise 14 Samples (continued)				
	686	692	693	695	702
Amphicaryon acaule			29		43
Vogtia kuruae			43		
Dimophyes arctica		28/0			65/0
Lensia lelouveteau		0/14			
Clausophyes ovata				0/48	0/22
Crystallophyes amygdalina				48/0	
Heteropyramis maculata	12/0				43/0
Thalassophyes crystallina	12/0				22/0

Species	Cruise 14 Samples (continued)				
	703	707	708	709	715
Rosacea plicata			10		
Dimophyes arctica		19/0			9/0
Lensia havock				8/0	
L. lelouveteau					0/26
Clausophyes ovata			0/10		0/26
Heteropyramis maculata	7/0		10/0		
Thalassophyes crystallina	7/0		10/0		
Thalassophyes ferrarii	7/0				

Species	Cruise 14 Samples (continued)				
	716	719	723	724	725
Marrus antarcticus	P				
Rosacea plicata	P				
Dimophyes arctica	P				
Lensia hostile				8/0	
L. hunter			16/0		
Clausophyes ovata				0/15	0/8
Heteropyramis maculata	P/O	P/O			
Thalassophyes crystallina	P/O				39/0

Species	Cruise 15 Samples						
	734	735	736	742	745	746	749
Amphicaryon acaule	21						40
Dimophyes arctica				36/0	P/O		80/0
Diphyes antarctica		0/5					
Clausophyes galeata			5/0				
Clausophyes ovata		0/27	5/0		O/P		0/40
Heteropyramis maculata		0/5	0/5	0/36		0/10	0/80

TABLE A4. (continued)

Species	Cruise 15 Samples (continued)						
	752	753	754	755	760	764	766
Physophora hydrostatica							37
Amphicaryon acaule					P		
Rosacea plicata						69	
Chelophyes appendiculata				0/6			
Dimophyes arctica	12/0	72/0			P/O	69/0	
Clausophyes ovata			0/33				
Heteropyramis maculata		72/72			O/P		

Species	Cruise 15 Samples (continued)						
	770	772	773	774	775	776	779
Amphicaryon acaule							121
Rosacea plicata	21				18		
Vogtia serrata			26				
Dimophyes arctica	21/0					42/0	
Diphyes dispar						0/42	
Clausophyes ovata			0/39			0/42	
Crystallophyes amygdalina			13/0				
Heteropyramis maculata		0/41	0/26	0/27		0/84	
Thalassophyes crystallina				27/0			

Species	Cruise 15 Samples (continued)						
	780	784	786	788	789	795	797
Amphicaryon acaule				8		P	9
Vogtia serrata	22						28
Chelophyes appendiculata							0/9
Dimophyes arctica		15/0	29/0	40/0	36/0	P/O	
Muggiaea atlantica				16/0			
Chuniphyes multidentata						P/O	
Clausophyes ovata			0/10	0/8	0/31		0/9
Heteropyramis maculata			9/19		0/16	O/P	9/37
Bassia bassensis							19/0

Species	Cruise 15 Samples (continued)						
	800	804	806	808	811	812	813
Marrus antarcticus							P
Amphicaryon acaule						182	
Rosacea plicata						182	
Nectopyramis natans				145	35		
Dimophyes arctica	18/0		38/0	48/0			
Heteropyramis maculata	0/35		0/38				
Thalassophyes crystallina		20/0					

Species	Cruise 15 Samples (continued)						
	817	819	820	824	829	831	836
Nectalia loligo							333
Rosacea plicata					57		
Nectopyramis natans				40			
Vogtia serrata			42			104	
Dimophyes arctica		8/0					
Clausophyes ovata	0/36	38/8			0/57		0/222
Heteropyramis maculata	0/36						
Thalassophyes crystallina							222/0

TABLE A4. (continued)

Species	Cruise 15 Samples (continued)						
	839	843	848	857	862	863	864
Amphicaryon acaule		36		P		74	9
Nectopyramis natans			73				
Vogtia serrata	P			P			
Chelophyes appendiculata					0/106		
Dimophyes arctica			73/0		317/0		
Clausophyes ovata	O/P		0/37				0/9
Crystallophyes amygdalina				P/O			
Heteropyramis maculata						0/74	0/9

Species	Cruise 15 Samples (continued)						
	869	870	871	874	875	877	881
Amphicaryon acaule	26				33		
Rosacea plicata	37		11		66		32
Nectopyramis natans		308					
Dimophyes arctica					66/0		
Lensia reticulata							0/32
Clausophyes ovata						0/11	
Crystallophyes amygdalina						11/0	
Heteropyramis maculata			11/11	0/35			0/32

Species	Cruise 15 Samples (continued)	
	882	882a
Crystallophyes amygdalina	46/0	12/0

Species	Cruise 16 Samples						
	883	884	887	888	889	893	894
Rosacea plicata		29					
Nectopyramis spinosa						188	41
Vogtia spinosa				39			
Chelophyes appendiculata	15/0						
Dimophyes arctica				197/0			41/0
Diphyopsis mitra		57/0					
Eudoxoides spiralis			0/59		51/17	376/94	330/8
Lensia baryi		29/0					
L. conoidea				79/0			
L. hardy			59/0				
L. reticulata		29/0					
Chuniphyes multidentata		29/0					
Clausophyes ovata	0/15	0/29		0/39			0/41
Crystallophyes amygdalina					17/0		
Heteropyramis maculata		0/28		0/118			
Thalassophyes crystallina				78/0	17/0		
Abylopsis tetragona		0/57	0/59	0/39			

Species	Cruise 16 Samples (continued)						
	895	899	900	902	903	906	910
Rosacea plicata	37						
Nectopyramis natans			41				113
N. spinosa	148						
Chelophyes appendiculata		41/0	41/0				
Dimophyes arctica	74/0	410/0	41/0		50/0	435/0	113/0
Diphyopsis mitra	74/0						

TABLE A4. (continued)

	Cruise 16 Samples (continued)						
Species	895	899	900	902	903	906	910
Eudoxoides spiralis	0/37						
Lensia conoidea		41/0					
L. eltanin			41/0				
L. multicristata	74/0						
L. reticulata	0/37						
Chuniphyes multidentata	37/0						
Clausophyes ovata	0/259	0/82	0/697		0/100	0/218	
Crystallophyes amygdalina	37/0	41/0		12/0	25/0		
Heteropyramis maculata	0/222		0/82		0/25		
Thalassophyes crystallina					50/0		

	Cruise 16 Samples (continued)				
Species	911	915	919	925	926
Rosacea plicata	287	93			
Chelophyes appendiculata				923/0	O/P
Dimophyes arctica				2154/0	P/O
Eudoxoides spiralis				308/0	
Lensia conoidea				615/0	P/O
L. landrumae				615/0	
L. lelouveteau			0/70		O/P
L. multicristata					P/O
Clausophyes ovata	0/144	0/127		0/615	O/P
Crystallophyes amygdalina					P/O
Heteropyramis maculata		0/63		0/615	
Thalassophyes crystallina				308/0	O/P

	Cruise 17 Samples				
Species	932	933	935	936	938
Amphicaryon acaule				63	
Nectopyramis diomedeae		16			
N. natans				63	
Hippopodius hippopus		16			
Vogtia kuruae				126	
Dimophyes arctica					265/0
Diphyes antarctica		33/0	P		0/159
Diphyopsis mitra			P		
Lensia hotspur		16/0			
L. lelouveteau				0/63	
Clausophyes ovata	0/45	0/16	P		
Crystallophyes amygdalina					53/0

	Cruise 17 Samples (continued)				
Species	939	942	944	945	950
Dimophyes arctica			38/0	147/0	143/0
Lensia lelouveteau	0/53				0/41
Clausophyes ovata	0/53			0/49	
Thalassophyes crystallina		29/0			

	Cruise 17 Samples (continued)				
Species	952	958	960	963	965
Rosacea plicata			27		
Lensia lelouveteau	0/30	0/70			

TABLE A4. (continued)

	Cruise 17 Samples (continued)				
Species	**952**	**958**	**960**	**963**	**965**
Clausophyes ovata				0/46	
Crystallophyes amygdalina		141/0			
Heteropyramis maculata		70/0			P/O

	Cruise 17 Samples (continued)				
Species	968	972	974	975	977
Rosacea plicata	353				
Dimophyes arctica			99/0	103/0	
Lensia landrumae				103/0	
L. lelouveteau					0/432
Heteropyramis maculata		24/0	99/0		
Thalassophyes crystallina		118/0			

	Cruise 17 Samples (continued)				
Species	983	985	989	990	991
Rosacea plicata		49			
Vogtia kuruae		49		48	
Dimophyes arctica	86/0		466/0		
Lensia landrumae					51/0
L. lelouveteau		0/98	0/115		
L. reticulata		0/49			
Clausophyes ovata	0/172		0/155		

	Cruise 17 Samples (continued)				
Species	993	995	996	999	1002
Dimophyes arctica		370/0			43/0
Lensia eltanin		370/0			
L. lelouveteau		0/370	0/225		43/0
Muggiaea bargmannae					43/0
Crystallophyes amygdalina	14/0				
Heteropyramis maculata		740/0		132/0	

	Cruise 17 Samples (continued)				
Species	1003	1010	1011	1012	1015
Dimophyes arctica	86/0				168/0
Lensia eugenioi			153/0		
L. hotspur		75/0			
L. landrumae	43/0	75/0			
L. lelouveteau					0/168
Crystallophyes amygdalina		75/0			

	Cruise 17 Samples (continued)				
Species	1016	1018	1022	1024	1028
Vogtia kuruae				16	
Dimophyes arctica	72/0	102/0			66/0
Diphyes antarctica	0/72				
Lensia lelouveteau	0/143	0/34			
Clausophyes ovata	0/72	0/34			
Crystallophyes amygdalina	72/0		57/0		
Heteropyramis alcala				0/8	
H. maculata		34/0			

TABLE A4. (continued)

Species	Cruise 17 Samples (continued)				
	1029	1031	1035	1038	1039
Amphicaryon acaule	38				
Nectodroma dubia		15			
Dimophyes arctica	76/0				
Lensia eltanin					9/0
L. landrumae	76/0				
L. lelouveteau			0/43	0/45	
L. reticulata				0/45	
Crystallophyes amygdalina		30/0			
Thalassophyes crystallina				45/0	

Species	Cruise 17 Samples (continued)				
	1043	1045	1052	1057	1058
Rosacea plicata	73				
Dimophyes arctica			124/0	142/0	
Lensia exeter	37/0				
L. hunter			60/0		
L. landrumae	37/0				
L. lelouveteau	0/73		60/0		
L. reticulata	0/37	0/41			
Clausophyes ovata			0/60		
Heteropyramis maculata		41/0			

Species	Cruise 17 Samples (continued)				
	1059	1060	1064	1070	1071
Marrus antarcticus					136
Bargmannia elongata	35				
Amphicaryon acaule	105				
Dimophyes arctica			59/0	74/0	
Lensia hunter		51/0			
L. lelouveteau				0/37	
Crystallophyes amygdalina				37/0	
Heteropyramis maculata		102/0		74/0	
Thalassophyes crystallina				37/0	

Species	Cruise 17 Samples (continued)				
	1072	1075	1076	1077	1080
Amphicaryon acaule			48		P
Rosacea plicata	6				P
Dimophyes arctica		87/0			P/O
Lensia lelouveteau	0/6		0/144		P/O
Clausophyes ovata					P/O
Crystallophyes amygdalina			96/0	P/O	
Thalassophyes crystallina	18/0				P/O

Species	Cruise 17 Samples (continued)				
	1081	1083	1085	1087	1092
Amphicaryon acaule		94			
Nectopyramis diomedeae	15		64		
Dimophyes arctica		63/0		66/0	
Lensia lelouveteau	0/15				
Clausophyes ovata		0/63			

TABLE A4. (continued)

Species	1081	1083	1085	1087	1092
	Cruise 17 Samples (continued)				
Heteropyramis maculata		94/0			41/0
Thalassophyes crystallina	15/0				

Species	1093	1094	1098	1099	1104
	Cruise 17 Samples (continued)				
Rosacea plicata				50	
Dimophyes arctica		32/0			262/0
Lensia hunter					66/0
L. lelouveteau	0/29	0/32			0/33
Clausophyes ovata					0/33
Heteropyramis maculata		32/0	78/0		33/0

Species	1105	1106	1108	1113	1114
	Cruise 17 Samples (continued)				
Amphicaryon acaule	40	16			
Rosacea plicata	40				
Dimophyes arctica	160/0			224/0	55/0
Lensia lelouveteau	0/40		0/119		0/27
Clausophyes ovata				0/56	
Heteropyramis maculata	80/0		60/0	168/0	55/0

Species	1115	1120	1121	1122	1124
	Cruise 17 Samples (continued)				
Dimophyes arctica		37/0	20/0		
Lensia landrumae			40/0		
L. lelouveteau			0/40		
Clausophyes ovata		0/37			0/15
Crystallophyes amygdalina				34/0	
Heteropyramis maculata	101/0			34/0	15/0

Species	1133	1134	1135	1137	1139
	Cruise 18 Samples				
Marrus antarcticus	60				
Nectopyramis natans			0/47		
Dimophyes arctica	60/0	166/0			
Lensia hardy		166/0			
L. landrumae				139/0	71/0
L. lelouveteau			0/47		
Heteropyramis maculata		166/0	24/0		
Thalassophyes crystallina					71/0

Species	1140	1142	1143	1145	1146
	Cruise 18 Samples (continued)				
Amphicaryon acaule		24			
Vogtia pentacantha	32				
Lensia achilles					36/0
L. hunter	32/0		70/0	89/0	36/0
L. lelouveteau			0/139		0/72
Clausophyes ovata		0/72			

TABLE A4. (continued)

	Cruise 18 Samples (continued)				
Species	1140	1142	1143	1145	1146
Heteropyramis maculata		120/0			
Thalassophyes crystallina					36/0

	Cruise 18 Samples (continued)				
Species	1147	1149	1150	1154	1156
Amphicaryon acaule				71	
Dimophyes arctica				178/0	
Lensia hotspur		22/0			
L. hunter			54/0	71/0	
L. lelouveteau	0/16				
Clausophyes ovata					0/23
Crystallophyes amygdalina					23/0
Heteropyramis maculata					23/0

	Cruise 19 Samples				
Species	1158	1159	1162	1163	1165
Amphicaryon acaule		37	63		
Nectodroma dubia	26				
Dimophyes arctica					16/0
Lensia landrumae	26/0				16/0
L. lelouveteau			0/32		0/49
L. reticulata				0/39	0/16
Clausophyes ovata				0/193	0/16
Heteropyramis maculata	26/0			271/0	16/0

	Cruise 19 Samples (continued)					
Species	1168	1170	1172	1179	1182	
Melophysa melo	10					
Amphicaryon acaule	82					
Amphicaryon peltifera	41					
Nectocarmen antonioi	41					
Rosacea plicata				30		
Dimophyes arctica	41/0					
Lensia landrumae			22/0			
L. lelouveteau					0/30	
Crystallophyes amygdalina						19/0
Heteropyramis maculata						19/0
Thalassophyes crystallina		17/0				

	Cruise 19 Samples (continued)				
Species	1183	1188	1190	1192	1194
Vogtia kuruae	35				
Dimophyes arctica	18/0				
Lensia lelouveteau		0/70	0/38		0/68
Clausophyes ovata			0/38		
Heteropyramis maculata				138/0	

	Cruise 19 Samples (continued)				
Species	1195	1197	1203	1205	1208
Amphicaryon acaule				9	
Rosacea plicata					26

TABLE A4. (continued)

Species	Cruise 19 Samples (continued)				
	1195	1197	1203	1205	1208
Dimophyes arctica		48/0		9/0	26/0
Lensia lelouveteau		0/24	0/92	0/9	0/26
L. reticulata	0/38	0/24			
Clausophyes ovata	0/76				
Crystallophyes amygdalina	114/0				
Thalassophyes crystallina		24/0			

Species	Cruise 19 Samples (continued)				
	1211	1212	1215	1216	1218
Dimophyes arctica	34/0	93/0	125/0		
Lensia landrumae				40/0	
Crystallophyes amygdalina				40/0	22/0
Heteropyramis maculata				40/0	

Species	Cruise 19 Samples (continued)				
	1221	1222	1225	1227	1228
Bargmannia elongata		56			
Melophysa melo					7
Rosacea plicata	36				
Dimophyes arctica	145/0		10/0	104/0	
Lensia lelouveteau		0/446	0/10		
L. reticulata		0/28			
Crystallophyes amygdalina		28/0	10/0		
Heteropyramis alcala		56/0			
Heteropyramis maculata	36/0	56/0			52/0

Species	Cruise 19 Samples (continued)				
	1229	1233	1234	1235	1236
Bargmannia elongata		12			
Melophysa melo			6		9
Amphicaryon acaule			2		39
Rosacea plicata	134				77
Dimophyes arctica	67/0	37/0	74/0	42/0	19/0
Lensia hunter	25/0				19/0
L. landrumae					19/0
L. lelouveteau				0/17	
Clausophyes ovata			0/25	0/8	
Crystallophyes amygdalina	134/0	37/0	62/0		
Heteropyramis alcala				0/25	
Heteropyramis maculata				25/0	
Thalassophyes crystallina			25/0	42/0	

Species	Cruise 19 Samples (continued)				
	1238	1239	1241	1242	1245
Melophysa melo	3			3	
Amphicaryon acaule	4				
Vogtia glabra	8				
V. pentacantha				11	15
Dimophyes arctica		34/0			
Lensia landrumae	31/0		P/O		
L. lelouveteau		0/67			
Thalassophyes crystallina					24/0

TABLE A4. (continued)

Species	Cruise 19 Samples (continued)				
	1246	1248	1249	1252	1253
Bargmannia elongata		24			
Melophysa melo				4	
Amphicaryon acaule		49		2	
Rosacea plicata			42		
Vogtia pentacantha				5	
Dimophyes arctica				57/0	40/0
Lensia landrumae				14/0	
L. lelouveteau		0/49			
Crystallophyes amygdalina				14/0	
Heteropyramis maculata	0/5				

Species	Cruise 19 Samples (continued)				
	1254	1259	1260	1263	1265
Bargmannia elongata			35		
Rosacea plicata			35		
Dimophyes arctica	37/0				
Lensia landrumae					P/O
L. lelouveteau					P/O
L. reticulata		0/20			
Heteropyramis maculata				78/0	

Species	Cruise 19 Samples (continued)				
	1269	1270	1272	1277	1278
Dimophyes arctica	54/0		14/0	78/0	85/0
Lensia landrumae			29/0		
L. lelouveteau		0/112	0/29		0/43
Clausophyes ovata					0/43
Heteropyramis maculata		0/74			85/0

Species	Cruise 19 Samples (continued)				
	1280	1282	1282	1287	1288
Dimophyes arctica		39/0	46/0	78/0	84/0
Lensia hunter	79/0				
L. landrumae			9/0	16/0	
L. lelouveteau			0/18		0/10
Crystallophyes amygdalina			9/0	16/0	31/0
Heteropyramis maculata			28/0		

Species	Cruise 19 Samples (continued)			
	1293	1295	1300	1306
Vogtia kuruae		18		
Lensia hunter	18/0		13/0	
L. landrumae			13/0	
Crystallophyes amygdalina				P/O
Heteropyramis maculata			13/0	

Species	Cruise 20 Samples						
	1311	1319	1320	1322	1325	1330	1331
Amphicaryon acaule			P				
Vogtia serrata						P	
Vogtia spinsoa		P					

TABLE A4. (continued)

Species	Cruise 20 Samples (continued)						
	1311	1319	1320	1322	1325	1330	1331
Dimophyes arctica		P/O		P/O	P/O		P/O
Diphyopsis mitra							O/P
Lensia multicristata	P/O						
Clausophyes ovata							O/P

Species	Cruise 20 Samples (continued)					
	1338	1340	1341	1342	1343	1344
Amphicaryon acaule						P
Vogtia spinosa					P	
Dimophyes arctica	P/O		P/O			
Eudoxoides spiralis				O/P		
Lensia multicristata		P/O		P/O		
Muggiaea delsmani					P/O	

Species	Cruise 21 Samples						
	1347	1348	1349	1350	1351	1352	1353
Agalma elegans			127	40			
Marrus antarcticus			13				
Athorybia rosacea					101		33
Nectopyramis natans			13	40			
Vogtia glabra							7
Chelophyes appendiculata	P/O	0/151	0/25	40/2680	0/50	587/4991	123/349
Dimophyes arctica			13/0				17/0
Diphyes bojani			13/0			2651/294	316/0
Diphyes dispar			0/25	0/1920	0/453	0/7339	0/23
Diphyopsis mitra					0/101		0/16
Eudoxoides spiralis			0/40			0/587	66/50
Lensia conoidea			13/0				
L. cossack							17/0
L. fowleri							3/0
L. hunter			25/0				
L. lelouveteau							17/0
L. reticulata			13/0				
L. subtilis							17/0
Clausophyes ovata		0/75	0/25				0/50
Crystallophyes amygdalina			25/0				
Heteropyramis maculata							0/1
Thalassophyes crystallina		151/0	25/0				33/0
Abyla haeckeli					0/50		
Abylopsis eschscholtzi		679/0	38/0				
A. tetragona		0/75	0/63	0/120	0/101		33/0
Bassia bassensis		75/151	38/0	0/40			17/0

Species	Cruise 21 Samples (continued)						
	1354	1355	1356	1357	1358	1359	1360
Athorybia rosacea						65	
Rosacea plicata		57					
Nectopyramis natans					244		
Chelophyes appendiculata		0/114	P/P		49/1319	145/1097	0/2
Dimophyes arctica							53/0
Diphyes bojani			P/O		391/0	597/0	0/27
Diphyes dispar		0/57	O/P		0/4641	163/3871	
Diphyopsis mitra			O/P		0/293	0/323	0/10

TABLE A4. (continued)

Species	1354	1355	1356	1357	1358	1359	1360
	Cruise 21 Samples (continued)						
Eudoxia macra		0/171			0/49		
Eudoxoides spiralis		57/57	P/O	13/0	0/98	194/0	27/5
Lensia campanella							27/0
L. conoidea						129/0	27/0
L. cossack		229/0					27/0
L. multricristata							53/0
L. reticulata					98/0		
Clausophyes ovata		0/229	O/P				
Crystallophyes amygdalina		57/0		13/0			
Heteropyramis maculata	0/119						
Thalassophyes crystallina	60/0				98/0		27/0
Abylopsis tetragona	0/179	0/114	O/P		0/49	0/1419	0/29
Bassia bassensis			P/O		147/293	919/839	

Species	1361	1365	1366	1367	1368	1369	1371
	Cruise 21 Samples (continued)						
Physophora hydrostatica		381					
Rosacea plicata	62						
Chelophyes appendiculata	4/31						31/0
Dimophyes arctica			246/0	44/0			
Diphyopsis mitra							0/140
Chuniphyes moserae	62/0						
Ch. multidentata	8/0				20/0		
Crystallophyes amygdalina	124/0						
Thalassophyes crystallina				219/0	59/0		17/0

Species	1372	1375	1377	1378	1379	1380	1381
	Cruise 21 Samples (continued)						
Agalma elegans			353				
Marrus antarcticus				72			
Amphicaryon acaule							P
Chelophyes appendiculata	12/0						
Dimophyes arctica	651/0			360/0			
Diphyes dispar	0/93						
Diphyopsis mitra					0/114		
Eudoxides spiralis	0/93	P/O					
Lensia achilles							P/O
L. reticulata				72/0			
Chuniphyes moserae							3/0
Ch. multidentata						P/O	3/0
Clausophyes galeata							21/0
Clausophyes ovata	0/93	O/P					P/O
Crystallophyes amygdalina				72/0			P/O
Heteropyramis maculata					0/38		
Thalassophyes crystallina		P/O		72/0			P/O
Abylopsis eschscholtzi							P/O

Species	1382	1385	1387	1391	1392	1393	1394
	Cruise 21 Samples (continued)						
Amphicaryon acaule					P		61
Chelophyes appendiculata			32/0	O/P			490/0
Dimophyes arctica	71/0	135/0	66/0			372/0	653/0
Eudoxia macra							0/327

TABLE A4. (continued)

Species	Cruise 21 Samples (continued)						
	1382	1385	1387	1391	1392	1393	1394
Eudoxiodes spiralis							0/327
Lensia conoidea		34/0					
L. hostile							490/0
Clausophyes ovata							0/1143
Heteropyramis maculata		68/34					
Thalassophyes crystallina							327/0
Abylopsis tetragona							0/327

Species	Cruise 21 Samples (continued)						
	1396	1397	1398	1399	1400	1401	1402
Agalma elegans				77			
Pyrostephos vanhoeffeni			183				
Amphicaryon acaule	14			4			11
Rosacea plicata	14						11
Chelophyes appendiculata	0/219			77/0			
Dimophyes arctica	2849/0			308/0		163/0	2394/0
Chuniphyes multidentata						4/0	
Clausophyes ovata				0/308		0/163	0/191
Crystallophyes amygdalina	219/0						340/0
Thalassophyes crystallina				154/0			

Species	Cruise 21 Samples (continued)						
	1403	1404	1405	1407	1408	1409	1411
Agalma elegans							188
Marrus antarcticus							1318
Amphicaryon acaule	47				51		
Rosacea plicata		26			39		
Chelophyes appendiculata					39/0		
Dimophyes arctica	94/0	2462/0	352/0		39/0		
Diphyes antarctica				O/P			
Diphyopsis mitra		0/410					
Lensia exeter	47/0						
L. landrumae	47/0						
L. reticulata		410/	176/0				39/0
Clausophyes ovata	0/282	0/1241	0/1055	O/P	0/153	0/193	0/188
Crystallophyes amygdalina	94/0						188/0
Heteropyramis maculata	0/141						
Thalassophyes crystallina	154/0				153/0	77/0	
Abylopsis tetragona	0/94						

Species	Cruise 21 Samples (continued)						
	1413	1417	1419	1422		1423	1424
Physophora hydrostatica							91
Amphicaryon acaule	5		13				
Rosacea plicata	11		21				
Chelophyes appendiculata				0/50			
Dimophyes arctica	42/0	14/0		200/0		137/0	
Lensia reticulata				50/0			
Chuniphyes multidentata		3/0					
Clausophyes ovata				0/200			
Abylopsis tetragona						137/0	
Bassia bassensis	0/42						

TABLE A4. (continued)

Species	Cruise 22 Samples 1438	1439	1445	1450	1451	1455	1456
Bargmannia elongata		20					
Amphicaryon acaule	33						
Desmphyes annectens			6				
Vogtia serrata			45				
Dimophyes arctica	49/0		6/0		47/0	91/0	11/0
Diphyes dispar							0/11
Eudoxoides spiralis		0/20					
Clausophyes ovata	0/130	0/39	0/17				0/11
Heteropyramis maculata		0/20					
Thalassophyes crystallina		20/20	17/0	71/0			

Species	Cruise 22 Samples (continued) 1460	1461	1462	1463	1464	1468	1469
Amphicaryon acaule						P	
Rosacea plicata		13					
Dimophyes arctica	39/0	13/0			182/0		
Diphyes dispar			0/29				
Clausophyes ovata	0/423	0/13	0/29		0/545		0/62
Heteropyramis maculata				0/200			
Thalassophyes crystallina	19/0		15/0	200/200	61/0		12/0

Species	Cruise 22 Samples (continued) 1473	1474	1479	1480	1484	1485	1486
Nectopyramis natans			P				
Vogtia serrata	7						
Dimophyes arctica	7/10		P/O		P/O		17/0
Diphyes dispar			O/P				
Diphyopsis mitra			O/P				0/5
Clausophyes ovata	0/60	O/P	O/P	0/54	O/P	0/5	0/162
Heteropyramis maculata		O/P	O/P				17/0
Thalassophyes crystallina	82/0	P/P	P/O	54/0		3/0	17/0

Species	Cruise 22 Samples (continued) 1490	1491	1492	1493	1494	1495	1496
Apolemia uvaria	P						
Stephanomia bijuga	P						
Amphicaryon acaule		2					
Vogtia serrata		21					
Dimophyes arctica	P/O	124/0		130/0	56/0		277/0
Diphyes antarctica	O/P	0/2		44/0			P/O
Diphyes dispar		0/5					
Clausophyes ovata	O/P	0/70	0/22	0/190		0/198	0/26
Heteropyramis maculata			0/15				
Thalassophyes crystallina			15/0				

Species	Cruise 22 Samples (continued) 1497	1499	1501	1502	1503	1504	1505
Marrus antarcticus	P						
Dimophyes arctica	P/O	239/0	48/0	87/0	88/0	69/0	733/0
Diphyes antarctica				22/0		6/0	33/0
Diphyes dispar	O/P				0/22		0/33
Diphyopsis mitra	O/P						

TABLE A4. (continued)

Species	1497	1499	1501	1502	1503	1504	1505
	Cruise 22 Samples (continued)						
Eudoxides spiralis							0/33
Clausophyes ovata	O/P	0/60			0/66	0/213	0/600
Heteropyramis maculata	O/P	0/60				0/56	
Thalassophyes crystallina	O/P	0/60			11/0	44/0	67/0

Species	1507	1508	1510	1511	1513	1516	1517
	Cruise 22 Samples (continued)						
Vogtia serrata		7	25				
Dimophyes arctica	163/0	14/0	139/0	80/0	160/0	30/0	21/0
Diphyes antarctica	109/0		10/0	32/0			
Diphyes bojani				10/0			
Diphyes dispar			0/33				
Diphyopsis mitra	0/54						
Clausophyes ovata	0/163	0/7	0/8	0/10	0/383	0/30	0/118
Heteropyramis maculata	0/54						
Thalassophyes crystallina			8/0	10/0	96/0		
Abyla trigona				10/0			
Bassia bassensis					0/64		

Species	1518	1519
	Cruise 22 Samples (continued)	
Dimophyes arctica	13/0	27/0
Clausophyes galeata	6/0	
Clausophyes ovata	0/6	0/274
Heteropyramis maculata	0/6	0/18
Thalassophyes crystallina	25/6	89/18

Species	1521	1522	1530	1531	1532
	Cruise 23 Samples				
Rosacea plicata				P	
Vogtia kuruae	22				
Dimophyes arctica	11/0	44/0		P/O	22/0
Lensia hunter	11/0	44/0			
L. lelouveteau			P/O	P/O	
Clausophyes ovata		0/44			
Heteropyramis maculata				P/O	

Species	1534	1536	1539	1542	1543
	Cruise 23 Samples (continued)				
Amphicaryon acaule		19			
A. ernesti		19			
Lensia exeter					37/0
L. lelouveteau				0/51	
Chuniphyes multidentata	P				
Crystallophyes amygdalina	P				
Thalassophyes ferrarii	P				

Species	1546	1548	1549	1550	1551
	Cruise 23 Samples (continued)				
Amphicaryon acaule			47		
Rosacea plicata			16		

TABLE A4. (continued)

Species	Cruise 23 Samples (continued)				
	1546	1548	1549	1550	1551
Vogtia pentacantha			16		
Dimophyes arctica	45/0			390/0	135/0
Lensia exeter					9/0
L. lelouveteau		O/P			0/9
L. reticulata		O/P			
Clausophyes ovata				0/260	0/9
Heteropyramis maculata		P/O			
Thalassophyes crystallina		P/O		130/0	

Species	Cruise 23 Samples (continued)				
	1553	1554	1555	1556	1557
Dimophyes arctica	120/0			90/0	P/O
Lensia hunter				10/0	P/O
L. landrumae					P/O
L. lelouveteau	0/30	0/15		0/40	O/P
Chuniphyes multidentata			P/O		P/O
Clausophyes ovata			O/P		
Crystallophyes amygdalina			P/O		

Species	Cruise 23 Samples (continued)				
	1559	1561	1562	1563	1564
Amphicaryon acaule				20	
Rosacea plicata				20	
Diphyes antarctica	23/0			40/0	15/0
Lensia eltanin		P/O			
L. lelouveteau			0/82	0/20	
Heteropyramis maculata			0/20		
Thalassophyes crystallina		P/O			
T. ferrarii			41/0		

Species	Cruise 23 Samples (continued)				
	1566	1568	1569	1570	1571
Amphicaryon acaule				71	
Voqtia glabra			38		
Sulculeolaria biloba		11/0		35/0	
Diphyes antarctica	45/0				250/0
Lensia lelouveteau					0/10
L. multicristata		32/0			
Heteropyramis alcala		0/21			
H. maculata		0/11			
Thalassophyes crystallina		21/0			

Species	Cruise 23 Samples (continued)				
	1573	1575	1576	1577	1579
Amphicaryon acaule					6
Rosacea plicata					6
Vogtia kuruae					6
Dimophyes arctica	121/0		45/0	P/O	6/0
Lensia lelouveteau	0/10	0/17	0/45		
L. reticulata		0/35			
Clausophyes ovata			0/43		
Crystallophyes amygdalina		17/0			
Heteropyramis alcala		0/52			

TABLE A4. (continued)

Species	Cruise 23 Samples (continued)				
	1573	1575	1576	1577	1579
H. maculata					6/0
Thalassophyes crystallina		52/0	30/0		6/0

Species	Cruise 23 Samples (continued)				
	1580	1581	1582	1584	1585
Marrus antarcticus	3				
Melophysa melo	3	75			
Amphicaryon acaule		75		14	14
Nectodroma dubia	3				
Dimophyes arctica	59/0			43/0	
Diphyes antarctica					14/0
Lensia lelouveteau			0/26		
Clausophyes ovata					0/14
Heteropyramis maculata	3/0			14/0	
Thalassophyes crystallina		75/0			

Species	Cruise 23 Samples (continued)	
	1586	1587
Lensia lelouveteau	0/8	O/P
Heteropyramis maculata	33/0	P/O
Thalassouphyes ferrarii		P/O

Species	Cruise 25 Samples						
	1685	1686	1687	1688	1689	1690	1691
Athorybia rosacea		95					6
Chelophyes appendiculata		63/63		7/0			
Dimophyes arctica		95/0				6/0	P/O
Diphyes bojani		95/0					
Diphyes dispar	0/1584	63/1575	17/305	0/4	O/P		P/O
Eudoxoides spiralis	26/390	0/221	0/119				
Lensia hotspur		32/0					
Clausophyes ovata	0/315		0/34	0/5		0/19	
Heteropyramis maculata						0/19	
Thalassophyes crystallina				4/0		6/0	P/O
Abylopsis tetragona	0/52						
Bassia bassensis	0/52	32/32					

Species	Cruise 25 Samples (continued)						
	1692	1693	1694	1696	1697	1698	1699
Halistemma cupulifera			105				
Bargmannia elongata							P
Athorybia rosacea	87		790	P			
Amphicaryon acaule				P			
Sulculeolaria biloba	32/0		105/0				
Chelophyes appendiculata	286/95	32/8	53/0	P/O			
Dimophyes arctica		16/0	105/0	P/O	20/0		
Diphyes bojani			53/0				
Diphyes dispar	32/286	0/16	53/158	O/P		O/P	P/O
Eudoxiodes spiralis	0/127	8/103	158/421	P/P	0/10		
Lensia conoidea			158/0				
L. hotsupr				P/O			
Chuniphyes multidentata				P/O			

TABLE A4. (continued)

Species	Cruise 25 Samples (continued)						
	1692	1693	1694	1696	1697	1698	1699
Clausophyes ovata		0/151	0/158	O/P	0/65		
Heteropyramis alcala					20/20		
H. maculata		8/0			0/10		
Thalassophyes crystallina				P/O	40/0	P/O	
Bassia bassensis	254/32	87/0	158/0				

Species	Cruise 25 Samples (continued)						
	1700	1701	1702	1703	1705	1706	1707
Athorybia rosacea					8		
Chelophyes appendiculata					49/0	20/0	13/0
Dimophyes arctica	328/0	19/0	111/0			39/0	6/0
Diphyes antarctica					8/0		
Diphyes bojani					16/0		
Diphyes dispar					24/0	20/0	
Eudoxia macra	0/17						
Eudoxoides spiralis	0/69	0/74			41/276	0/78	0/51
Lensia hotspur	17/0		19/0				
Clausophyes ovata	0/17		0/19	O/P			0/39
Thalassophyes crystallina	17/0						

Species	Cruise 25 Samples (continued)						
	1708	1710	1711	1712	1713	1714	1715
Amphicaryon acaule	1					P	12
Vogtia serrata		P					
Chelophyes appendiculata	1/0						P/O
Dimophyes arctica		P/O		211/0		P/O	46/0
Diphyopsis mitra	0/1						
Eudoxoides spiralis			0/133	0/35	20/0	O/P	
Lensia leloupi		P/O					
L. subtiloides							P/O
Chuniphyes multidentata	1/0						
Clausophyes ovata	0/3	P/P				O/P	0/103
Heteropyramis maculata							0/17
Thalassophyes crystallina	3/0	P/O				P/O	6/0
T. ferrarii		P/O					

Species	Cruise 25 Samples (continued)						
	1717	1718	1719	1720	1721	1722	1723
Nectodroma dubia				P			
Chelophyes appendiculata							P/O
Dimophyes arctica		332/0	6/0		51/0		P/O
Diphyes dispar		0/30					
Eudoxoides spiralis	O/P	0/15	0/6	P/P	38/51	34/27	
Clausophyes ovata		0/76	0/29		0/51	0/21	O/P
Heteropyramis maculata			0/6				
Thalassophyes crystallina			6/0		51/0		P/O

Species	Cruise 25 Samples (continued)						
	1724	1725	1726	1727	1728	1729	1730
Amphicaryon acaule							4
Lilyopsis rosea				40			331
Vogtia serrata		11					

TABLE A4. (continued)

Species	Cruise 25 Samples (continued)						
	1724	1725	1726	1727	1728	1729	1730
Chelophyes appendiculata	65/0						
Dimophyes arctica	11/0			60/0		60/0	11/0
Diphyes dispar	0/140		O/P				0/1
Eudoxoides spiralis	0/11			0/80			
Lensia multicristata							7/0
Clausophyes ovata		0/75	O/P	0/80	O/P	0/60	0/21
Heteropyramis maculata		0/22					0/17
Thalassophyes crystallina	22/0	54/0	40/0				14/0

Species	Cruise 25 Samples (continued)						
	1731	1732	1733	1734	1735	1736	1737
Amphicaryon acaule	P						
Lilyopsis rosea			892				
Dimophyes arctica	P/O		48/0		105/0	19/0	22/0
Diphyes dispar	O/P					0/157	0/36
Eudoxoides spiralis		0/23	48/121	O/P	0/132		0/7
Lensia multicristata						19/0	7/0
Clausophyes ovata	O/P		0/24	O/P	0/316	0/65	0/14
Heteropyramis maculata	O/P						0/14
Thalassophyes crystallina	P/O				132/0	9/0	

Species	Cruise 25 Samples (continued)						
	1738	1739	1740	1741	1742	1744	1745
Lilyopsis rosea		8	74				
Rosacea plicata			519				
Dimophyes arctica					22/0	P/O	9/0
Eudoxoides spiralis		0/52		4/4			
Lensia lelouveteau	4/0						
L. multicristata					22/0		
Clausophyes ovata	0/16				0/43	O/P	
Thalassophyes crystallina			74/0				

Species	Cruise 25 Samples (continued)						
	1747	1748	1749	1751	1752	1753	1754
Amphicaryon acaule	47	29		11	44	8	
Dimophyes arctica	70/0		7/0	59/0	9/0		20/0
Diphyes dispar			0/4	0/5			
Lensia multicristata		10/0					
Clausophyes ovata	0/70		0/11	0/27	0/18	0/18	
Heteropyramis maculata						0/3	
Thalassophyes crystallina			18/0	5/0	18/0		

Species	Cruise 25 Samples (continued)						
	1759	1760	1761	1763	1764	1766	1767
Marrus antarcticus							P
Physophora hydrostatica						P	28
Amphicaryon acaule	29			4			10
Nectopyramis natans				4			
Dimophyes arctica	14/0	12/0			244/0	P/O	10/0
Diphyes dispar	14/0	0/25					
Clausophyes ovata	14/0						0/10
Crystallophyes amygdalina		25/0					

TABLE A4. (continued)

	Cruise 25 Samples (continued)						
Species	1759	1760	1761	1763	1764	1766	1767
Heteropyramis maculata			O/P				
Thalassophyes crystallina	14/0	12/0					

	Cruise 25 Samples (continued)				
Species	1768	1770	1772	1773	1775
Physophora hydrostatica		240			
Amphicaryon acaule				67	
Dimophyes arctica	34/0	240/0	P/O	17/0	
Diphyes dispar				0/34	
Lensia multicristata		80/0			
Chuniphyes multidentata					4/0
Clausophyes ovata	0/52	0/320	O/P	0/67	11/11
Heteropyramis maculata	0/17				
Thalassophyes crystallina			P/O	17/0	4/0
Thalassophyes ferrarii		P/O			

	Cruise 26 Samples						
Species	1776	1777	1783	1784	1785	1786	1787
Rosacea plicata		4	10		12		
Hippopodius hippopus						7	4
Vogtia pentacantha							14
Chelophyes appendiculata	0/62	0/16	0/175	36/0	0/296	27/27	
Dimophyes arctica		33/0	41/0		148/0	54/0	
Diphyes dispar			0/165		0/296		
Eudoxoides spiralis	31/31	8/0	52/0	72/0	49/0	7/54	
Lensia conoidea			31/0		12/0	54/0	
L. cossack		16/0					
L. eugenioi					12/0		
L. hunter						27/0	
L. lelouveteau		33/0					
L. multicristata					185/0	61/0	
L. reticulata						27/0	
L. subtiloides						27/0	
Clausophyes ovata			0/289		0/296	0/27	
Heteropyramis maculata				0/71	0/49	0/27	
Thalassophyes crystallina			41/0				
Ceratocymba sagittata		0/4					

	Cruise 26 Samples (continued)						
Species	1790	1791	1792	1793	1794	1797	1798
Amphicaryon acaule			11				
Hippopodius hippopus					27		
Vogtia glabra						6	
Chelophyes appendiculata	0/61				0/3		
Eudoxoides spiralis	121/240	653/0	118/0	6/240	3/13	642/148	28/140
Lensia eugenioi	121/0						
L. hostile				48/0			
L. hunter					3/0		
L. landrumae					3/0		
L. leloupi					3/0		
L. lelouveteau					3/0		
L. multicristata				55/0	3/0		
Clausophyes ovata					0/7		

TABLE A4. (continued)

Species	Cruise 26 Samples (continued)						
	1790	1791	1792	1793	1794	1797	1798
Heteropyramis maculata					0/3		
Abylopsis tetragona					3/0		

Species	Cruise 26 Samples (continued)				
	1799	1800	1801	1802	1803
Marrus antarcticus	397				
Pyrostephos vanhoeffeni	450				
Amphicaryon acaule					5
Chelophyes appendiculata	0/133			0/282	0/79
Dimophyes arctica	212/0		320/0	74/0	
Diphyes dispar	0/121			0/184	
Eudoxoides spiralis	53/503	29/382	0/320		
Lensia eugenioi					20/0
L. grimaldii				12/0	
L. leloupi					20/0
L. multicristat	27/0			37/0	
Chuniphyes multidentat				12/0	
Clausophyes ovata				0/98	0/60
Heteropyramis maculata			0/160		
Thalassophyes crystallina	53/0			49/0	20/20
Abylopsis eschscholtzi					0/99

Species	Cruise 27 Samples						
	1806	1808	1809	1810	1811	1812	1816
Marrus antarcticus				7	46		
Amphicaryon acaule			124				
Rosacea plicata			206				P
Chelophyes appendiculata			0/41	0/7			
Dimophyes arctica			41/0				
Clausophyes ovata	0/542	0/168			7/0		0/26
Heteropyramis maculata				7/7	0/13		0/40
Thalassophyes crystallina			83/0				

Species	Cruise 27 Samples (continued)						
	1817	1820	1822	1823	1824	1827	1828
Marrus artarcticus		205	184				
Marrus orthocanna	17						
Bargmannia elongata					31		
Chelophyes appendiculata	0/14						
Dimophyes arctica		68/0	46/0	150/0		281/0	
Diphyes antarctica		68/0				35/0	
Diphyes dispar	0/10	0/68					
Clausophyes ovata	3/0		0/46				
Heteropyramis maculata	7/17				0/8		O/P
Thalassophyes crystallina			46/0				70/0

Species	Cruise 27 Samples (continued)						
	1829	1830	1831	1832	1835	1836	1838
Marrus antarcticus					696	831	246
Nectodroma dubia			P				
Chelophyes appendiculata				0/14			
Dimophyes arctica	P/O	71/0			348/0		123/0

TABLE A4. (continued)

Species	Cruise 27 Samples (continued)						
	1829	1830	1831	1832	1835	1836	1838
Clausophyes ovata	O/P	0/47		0/14			0/123
Heteropyramis maculata			O/P	28/14			
Thalassophyes crystallina	P/O						

Species	Cruise 27 Samples (continued)						
	1841	1844	1847	1849	1850	1851	1852
Dimophyes arctica							P/O
Clausophyes ovata	0/200						O/P
Thalassophyes crystallina							P/O

Species	Cruise 27 Samples (continued)						
	1855	1858	1864	1866	1867	1868	1871
Marris antarcticus		108					
Pyrostephos vanhoeffeni	459						
Vogtia serrata					111		
Chelophyes appendiculata						4/0	
Dimophyes arctica			364/0	674/0	37/0	4/0	258/0
Diphyes antarctica							258/0
Diphyes bojani		108/0					
Chuniphyes moserae						4/0	
Clausophyes ovata					0/74		

Species	Cruise 27 Samples (continued)						
	1874	1876	1877	1878	1881	1883	1884
Marrus antarcticus			16				P
Vogtia serrata						P	
Chelophyes appendiculata	0/172						
Dimophyes arctica		233/0	47/0		598/0	P/O	P/O
Diphyes antarctica		47/0					
Diphyes dispar			0/16				
Clausophyes ovata		0/47	0/63	0/11		O/P	O/P
Heteropyramis maculata				0/33			
Thalassophyes crystallina	172/0	93/0				P/O	

Species	Cruise 27 Samples (continued)						
	1885	1886	1891	1892	1893	1894	1897
Marrus antarcticus			174				
Dimophyes arctica							417/0
Diphyes dispar	0/8	0/42		0/200		0/129	
Clausophyes ovata	0/53				0/151		0/139
Heteropyramis maculata	0/53				0/101	0/129	

Species	Cruise 27 Samples (continued)						
	1900	1901	1902	1905	1907	1908	1909
Nectodroma dubia							P
Rosacea plicata	35					P	P
Vogtia serrata		12					
Dimophyes arctica	35/0			889/0	38/0		
Diphyes dispar	17/0						
Clausophyes ovata	0/17			0/593			
Heteropyramis maculata			0/12				P/P
Thalassophyes crystallina	17/0		6/0				

TABLE A4. (continued)

Species	Cruise 27 Samples (continued)						
	1910	1918	1919	1920	1923	1924	1925
Marrus antarcticus				89			
Bargmannia elongata	3						
Amphicaryon acaule		70	193	805			
Nectodroma dubia	11			89			
Hippopodius hippopus	3						
Chelophyes appendiculata		0/47					
Dimophyes arctica		35/0	278/0	626/0	160/0	P/O	692/0
Diphyes dispar	0/6						0/77
Eudoxoides spiralis					107/0	P/O	
Clausophyes galeata	6/0						
Clausophyes ovata	0/3	23/23	0/21	0/536			0/231
Heteropyramis maculata	6/6	0/12					
Thalassophyes crystallina							154/0

Species	Cruise 27 Samples (continued)						
	1926	1927	1928	1930	1931	1933	1934
Marrus antarcticus					91		290
Rosacea plicata							79
Chelophyes appendiculata			0/14				0/158
Dimophyes arctica	95/0		7/0	444/0			684/0
Eudoxoides spiralis				111/667	182/0	154/0	
Lensia multicristata							79/0
Clausophyes galeata			14/0				
Clausophyes ovata		0/308	0/7				0/179
Heteropyramis maculata		31/31	0/21				
Thalassophyes crystallina							947/0

Species	Cruise 27 Samples (continued)				
	1936	1937	1938	1939	1940
Bargmannia elongata	44				
Lilyopsis rosea				13	
Rosacea plicata		12			
Vogtia spinosa				100	
Chelophyes appendiculata		0/49	0/177	0/113	0/22
Dimophyes arctica		25/0	68/0	38/0	
Diphyes dispar				0/50	
Lensia lelouveteau		12/0	41/0		
L. multicristata		61/0	68/0	38/0	22/0
Clausophyes ovata		0/12	0/95	0/138	
Heteropyramis maculata			0/27		
Thalassophyes crystallina		12/0	54/0		

Species	Cruise 28 Samples				
	2017	2019	2021	2023	2025
Melophysa melo	4			49	15
Diphyes dispar					10/0
Diphyes antarctica				37/0	
Lensia eltanin				37/0	
L. lelouveteau			0/63		
Crystallophyes amygdalina			31/0		
Heteropyramis maculata		107/0			
Thalassophyes ferrarii		27/0			

TABLE A4. (continued)

Species	Cruise 28 Samples (continued)					
	2026	2027	2028	2029	2033	2036
Nectocarmen antonioi	49	68				
Dimophyes arctica					17/0	26/0
Diphyopsis mitra		23/0				
Lensia lelouveteau					0/17	
L. multicristata						26/0
Clausophyes ovata						0/26
Crystallophyes amygdalina		45/0				

Species	Cruise 28 Samples (continued)				
	2037	2038	2040	2044	2048
Amphicaryon acaule		68		5	
Nectocarmen antonioi				119	
Sulculeolaria turgida		23/0			
Dimophyes arctica			75/0		30/0
Lensia grimaldii				20/0	
L. lelouveteau				0/59	
Crystallophyes amygdalina	54/0				

Species	Cruise 28 Samples (continued)					
	2040	2050	2051	2054	2054	2055
Melophysa melo			5			
Amphicaryon ernesti						5
Dimophyes arctica	18/0					75/0
Diphyopsis mitra	4/0			1182/0		
Lensia hostile				18/0		
L. multicristat				1164/0		
Crystallophyes amygdalina		25/0				
Thalassophyes ferrarii				18/0		

Species	Cruise 28 Samples (continued)		
	2057	2059	2061
Dimophyes arctica			74/0
Diphyopsis mitra		80/0	5/0
Eudoxoides spiralis	5/0		
Lensia landrumae		77/0	
L. lelouveteau		0/464	

Species	Cruise 35 Samples				
	2150	2154	2156	2157	2158
Bargmannia elongata					P
Vogtia pentacantha	P				
Dimophyes arctica					P/O
Diphyes antarctica			P/O	P/O	P/O
Lensia landrumae			P/O		
L. lelouveteau			O/P		O/P
Clausophyes ovata					O/P
Heteropyramis maculata		P/O		P/O	P/O
Thalassophyes crystallina	P/O				P/O

TABLE A4. (continued)

Species	2159	2160	2161	2162	2164	2165
	Cruise 35 Samples (continued)					
Dimophyes arctica	P/O					
Diphyes antarctica	P/O	P/O		P/O	P/O	
Eudoxoides spiralis		O/P				
Lensia lelouveteau	O/P	O/P		O/P	O/P	
Clausophyes ovata	O/P	O/P	O/P		O/P	O/P
Heteropyramis maculata	P/O					
Thalassophyes crystallina	P/O	P/O	P/O			P/O

Species	2206	2212	2215	2218	2220
	Cruise 38 Samples				
Nectopyramis diomedeae	71				
Vogtia kuruae				71	
Dimophyes arctica	71/0	80/0			
Lensia landrumae			128/0		
L. lelouveteau			0/128		
Crystallophyes amygdalina					64/0
Thalassophyes ferrarii	143/0				

Species	2222	2223	2225	2226	2229
	Cruise 38 Samples (continued)				
Sulculeolaria biloba					143/0
Dimophyes arctica		167/0	100/0		
Diphyes antarctica	320/0			509/0	
Lensia landrumae		83/0		73/0	
L. lelouveteau			0/100		
Clausophyes ovata	0/107		0/100		
Crystallophyes amygdalina		167/0			
Heteropyramis maculata			0/100		

Species	2231	2232	2233	2237	2239
	Cruise 38 Samples (continued)				
Amphicaryon acaule				480	
Rosacea plicata					85
Dimophyes arctica		160/0			
Diphyes antarctica			123/0	80/0	
Lensia hunter	80/0				
L. landrumae		320/0	123/0		85/0
L. lelouveteau	0/240	0/560	0/123		
L. multicristata	400/0				
Clausophyes ovata	0/80				
Heteropyramis maculata					85/0

Cruise 5 samples were analyzed but contained pieces that could not be identified to siphonophore species.

*P stands for present. Letters or numerals preceding the slash refer to the polygastric stage; letters or numerals following the slash refer to the eudoxic stage.

TABLE A5. Data for Analyzed Plankton Collected During Cruise 30

Sample Number	Position		Depth, m		Local Date 1967	Local Time	Volume of Water Filtered, m^3	Type of Gear
	Latitude	Longitude	Upper	Lower				
2070	24°43′ S	155°28′ E	0	10	August 13	1020-1037		S, Pl
2071	24 43 S	155 28 E	0	200	August 14	1220-1227	637	V, Pl
2072	21 25 S	156 46 E	0	300	August 14	1207-1225		V, Pl
2073	21 25 S	156 46 E	0	10	August 14	1320-1350	632	S, Pl
2074	18 02 S	158 19 E	0	300	August 15	1204-1225	187	V, Pl
2075	18 02 S	158 19 E	0	10	August 15	1300-1315		S, Pl
2076	16 39 S	161 06 E	0	300	August 16	1235-1257		V, Pl
2077	16 39 S	161 06 E	0	10	August 16			S, Pl
2078	13 31 S	162 58 E	0	300	August 17	1236-1251		V, Pl
2079	13 31 S	162 58 E	0	10	August 17	1337-1352	185	S, Pl
2080	11 18 S	164 10 E	0	300	August 18	1238-1252		V, Pl
2081	11 18 S	164 10 E	0	10	August 18	1330-1345		S,Pl
2082	08 33 S	164 38 E	0	10	August 19			S,Pl
2083	08 33 S	164 38 E	0	300	August 19	1222-1233		V,Pl
2084	05 46 S	165 06 E	0	300	August 20	1234-1247	131	V,Pl
2086	05 51 S	167 31 E	0	300	August 21	1229-1248	171	V,Pl
2088	05 44 S	169 42 E	0	300	August 22	1223-1239	149	V,Pl
2089	05 44 S	169 42 E	0	10	August 22	1306-1321	179	S,Pl
2090	05 36 S	172 00 E	0	300	August 23			V,Pl
2091	05 36 S	172 00 E	0	10	August 23	1313-1328	324	S,Pl
2092	05 40 S	174 20 E	0	300	August 24	1243-1257	136	V,Pl
2093	05 40 S	174 20 E	0	10	August 24			S,Pl
2094	04 19 S	176 31 E	0	300	August 25	1230-1244	155	V,Pl
2095	04 19 S	176 31 E	0	10	August 25	1317-1342		S, Pl
2096	02 23 S	177 46 E	0	300	August 26	1201-1245	183	V, Pl
2097	02 23 S	177 46 E	0	10	August 26			S, Pl
2098	00 21 S	179 14 E	0	300	August 27	1207-1222	208	V, Pl
2099	01 44 N	179 25 W	0	300	August 27	1215-1229	200	V, Pl
2100	00 21 S	179 14 E	0	10	August 27			S, Pl
2101	01 44 N	179 25 W	0	10	August 27	1306-1321	190	S, Pl
2102	03 41 N	177 37 E	0	300	August 28	1201-1214	164	V, Pl
2103	03 41 N	177 36 W	0	10	August 28	1247-1257	309	S,Pl
2104	06 05 N	175 32 W	0	300	August 29			V,Pl
2105	06 05 N	175 32 W	0	10	August 29			S,Pl
2106	08 43 N	173 27 W	0	300	August 30	1246-1301	261	V,Pl
2107	08 43 N	173 27 W	0	10	August 30	1203-1217	149	S,Pl
2108	11 04 N	171 27 W	0	300	August 31			V,Pl
2109	11 04 N	171 27 W	0	10	August 31			S,Pl
2110	13 11 N	169 27 W	0	300	September 1	1235-1258	142	V,Pl
2111	13 11 N	169 27 W	0	10	September 1	1330-1345	206	S,Pl
2112	15 19 N	167 34 W	0	300	September 2	1221-1235	159	V,Pl
2113	15 19 N	167 31 W	0	10	September 2			S,Pl
2114	17 09 N	165 43 W	0	300	September 3			V,Pl
2115	17 09 N	165 43 W	0	10	September 3			S,Pl
2116	19 28 N	164 01 W	0	300	September 4	1215-1229	137	V,Pl
2117	19 28 N	164 01 W	0	10	September 4			S,Pl
2118	21 46 N	162 04 W	0	300	September 5			V,Pl
2119	21 46 N	162 04 W	0	10	September 5	1228-1239	505	S,Pl
2120	23 44 N	160 53 W	0	500	September 6	1208-1244	287	V,Pl
2121	23 44 N	160 53 W	0	10	September 6	1316-1346	481	S,Pl
2122	25 17 N	158 20 W	0	500	September 7	1153-1225	305	V,Pl
2123	25 17 N	158 20 W	0	10	September 7			S,Pl
2124	26 40 N	155 37 W	0	500	September 8	1229-1303	295	V,Pl
2125	26 40 N	155 37 W	0	10	September 8	1339-1424	961	S,Pl
2126	27 50 N	152 38 W	0	500	September 9	1223-1249	228	V,Pl
2127	27 50 N	152 39 W	0	10	September 9			S,Pl

TABLE A5. (continued)

Sample Number	Position		Depth, m		Local Date 1967	Local Time	Volume of Water Filtered, m^3	Type of Gear
	Latitude	Longitude	Upper	Lower				
2128	29 08 N	149 39 W	0	500	September 10			V,Pl
2129	29 08 N	149 39 W	0	10	September 10	1316-1401	573	S,Pl
2130	30 06 N	146 52 W	0	300	September 11			V,Pl
2131	30 06 N	146 52 W	0	10	September 11			S,Pl
2134	32 19 N	140 37 W	0	500	September 13			V,Pl
2136	33 24 N	137 46 W	0	500	September 14			V,Pl
2137	33 24 N	137 46 W	0	10	September 14			S,Pl
2138	34 06 N	134 46 W	0	500	September 15			V,Pl
2139	34 06 N	134 06 W	0	10	September 15			S,Pl
2140	34 49 N	132 12 W	0	500	September 16			V,Pl
2141	34 49 N	132 12 W	0	10	September 16			S,Pl
2142	35 27 N	130 13 W	0	300	September 17			V,Pl
2143	35 27 N	130 13 W	0	10	September 17			S,Pl
2144	35 01 N	128 10 W	0	300	September 18			V,Pl
2145	36 01 N	128 10 W	0	10	September 18			S,Pl
2146	36 30 N	126 44 W	0	300	September 19			V,Pl
2147	36 30 N	126 44 W	0	10	September 19			S,Pl
2148	37 25 N	123 44 W	0	300	September 20			V,Pl
2149	37 25 N	123 44 W	0	10	September 20			S,Pl

S, surface tow; V, vertical tow; Pl, 0.50 m plankton net.

TABLE A6. Distribution of Species During *Eltanin* Cruise 30

Species	Stations				
	2070	2071	2072	2074	2075
Diphyes bojani	P		P/0*	171/0	
Lensia eltanin		13			
Lensia hotspur		13	P		
Clausophyes ovata			0/25		
Heteropyramis alcala		0/25	P/0	0/48	0/8

Species	Stations				
	2076	2078	2079	2080	2081
Diphyes bojani	P	P	22/0		
Lensia multicristata					P
Heteropyramis alcala	0/P	0/P	0/43		0/P
Heteropyramis maculata					P

Species	Stations				
	2082	2083	2084	2086	2088
Sulculeolaria biloba	P				
Dimophyes arctica		P/0			
Diphyes bojani	P/0	P/0	122/0	94/0	27/0
Lensia hotspur				47/0	
Lensia multicristata				94/0	54/0
Clausophyes ovata	0/P				
Crystallophyes amygdalina	P				
Certaocymba dentata		0/P			

Species	Stations				
	2089	2091	2092	2094	2095
Vogtia glabra			59		
Sulculeolaria monoica				77/0	
Dimophyes arctica			59/0		
Diphyes bojani	37/0		176/0	52/0	P/0
Lensia hotspur				26	
Clausophyes ovata				0/26	
Heteropyramis alcala				0/26	
Ceratocymba dentata	0/22				0/P

Species	Stations				
	2096	2098	2099	2101	2102
Bargmannia elongata	44				
Sulculeolaria turgida			320	84	
Diphyes bojani	437/0		480/0	253/0	390/0
Lensia landrumae	87				
Ceratocymba dentata		0/1230			

Species	Stations				
	2103	2106	2107	2110	2111
Diphyes bojani	52/0	17/0	23/0	56/0	
Clausophyes ovata				0/56	
Heteropyramis maculata		0/8		0/56	
Ceratocymba dentata					0/19

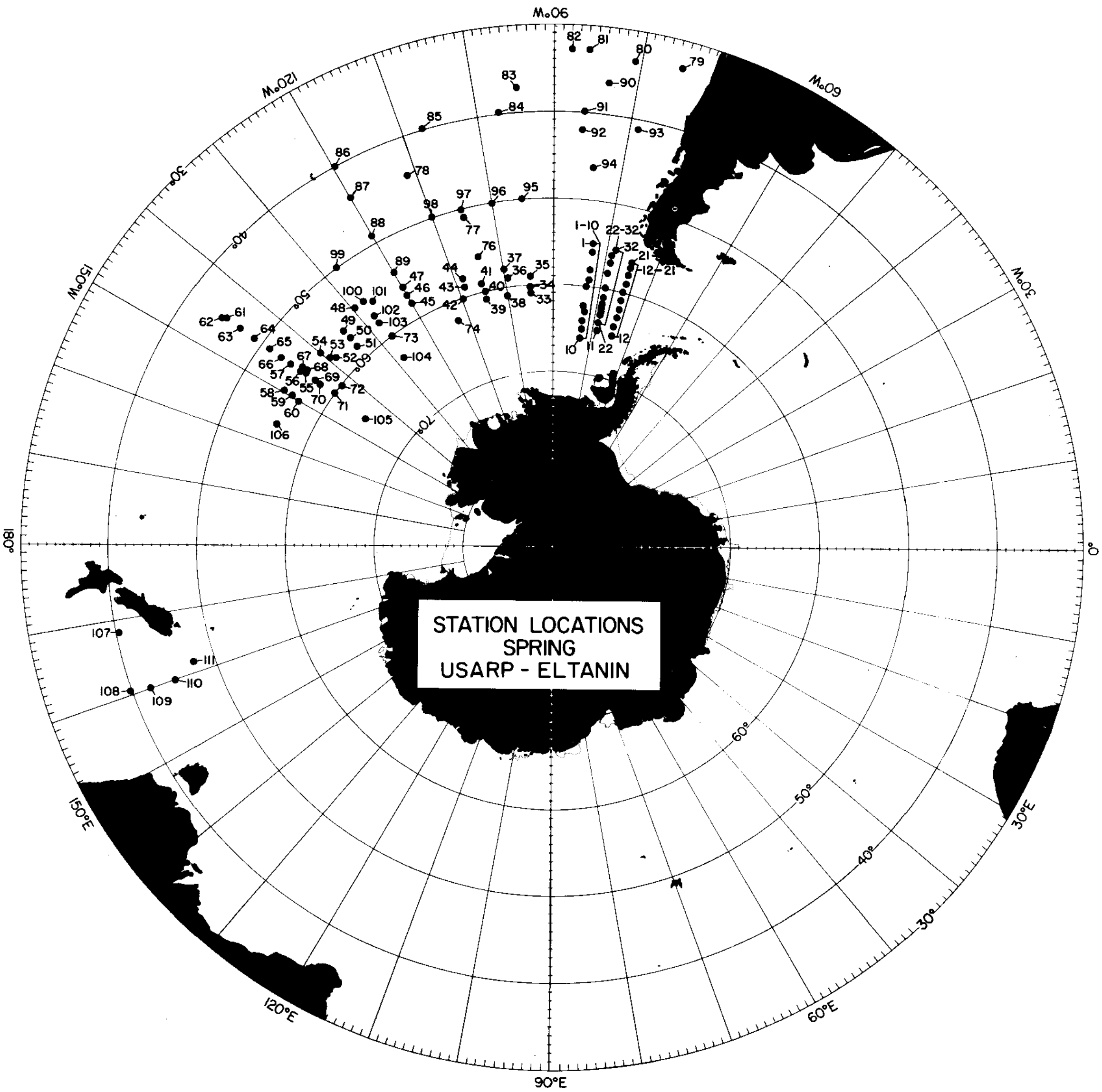
TABLE A6. (continued)

Species	Stations 2112	2116	2119	2120	2121
Vogtia pentacantha		7			
Sulculeolaria turgida	50				
Dimophyes artica	101/0				
Diphyes bojani	101/0		4/0	114/0	200/0
Clausophyes ovata		0/58			0/33
Thalassaphyses crystallina				56/0	
Ceratocymba dentata	50/0			0/56	
Abylopsis tetragona					0/67

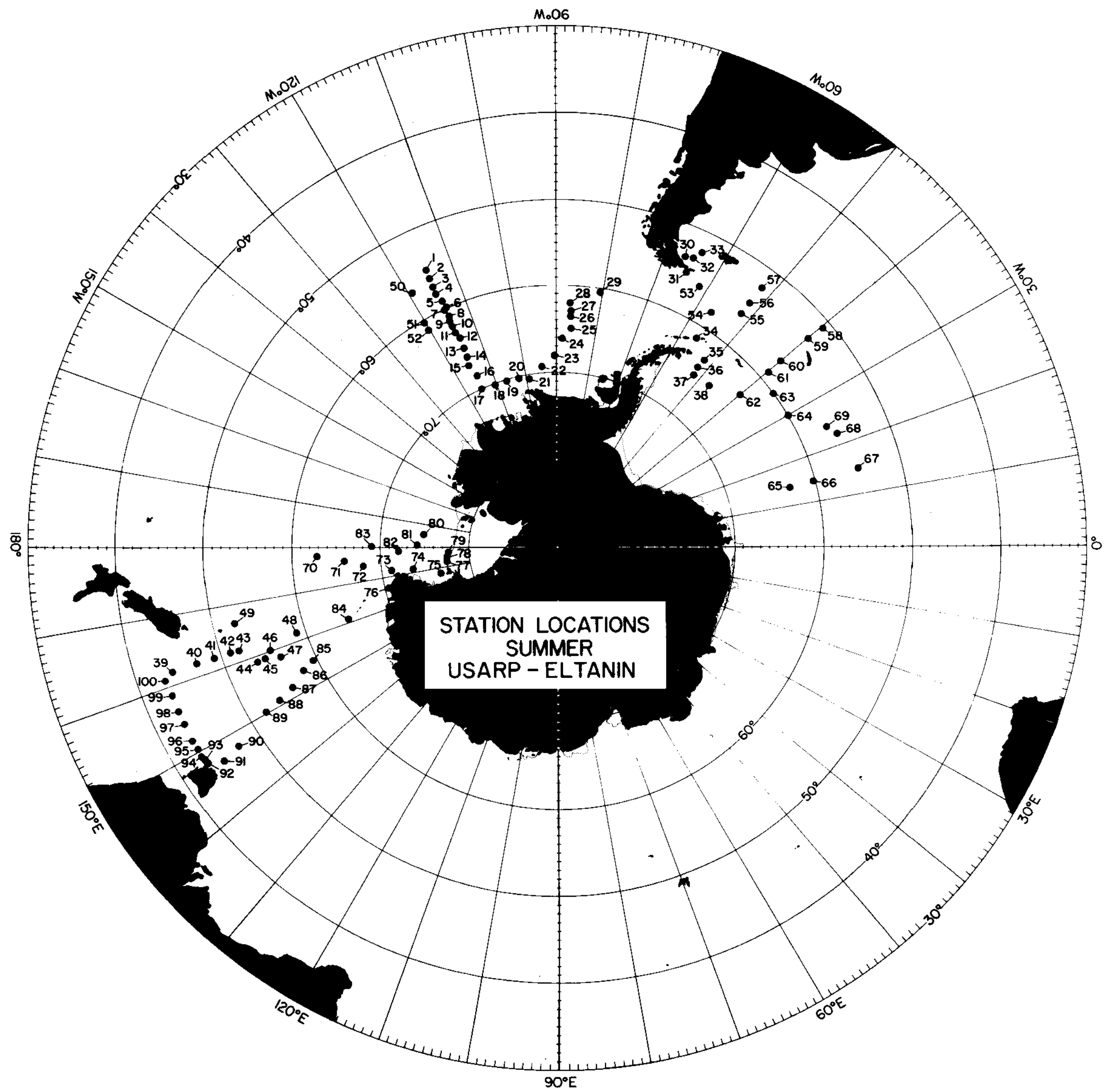
Species	Stations 2122	2124	2125	2126	2129
Dimophyes arctica	157/0				
Diphyes bojani			50/0	140/0	
Clausophyes ovata	0/26				
Thalassophyes crystallina		54/0			
Abylopsis tetragona	0/52	0/54			0/2

Number of specimens per species per sample corresponds to estimations based on the counting from the aliquot of the sample and the numerical abundance standardized when information on the volume of water filtered during the haul was available.

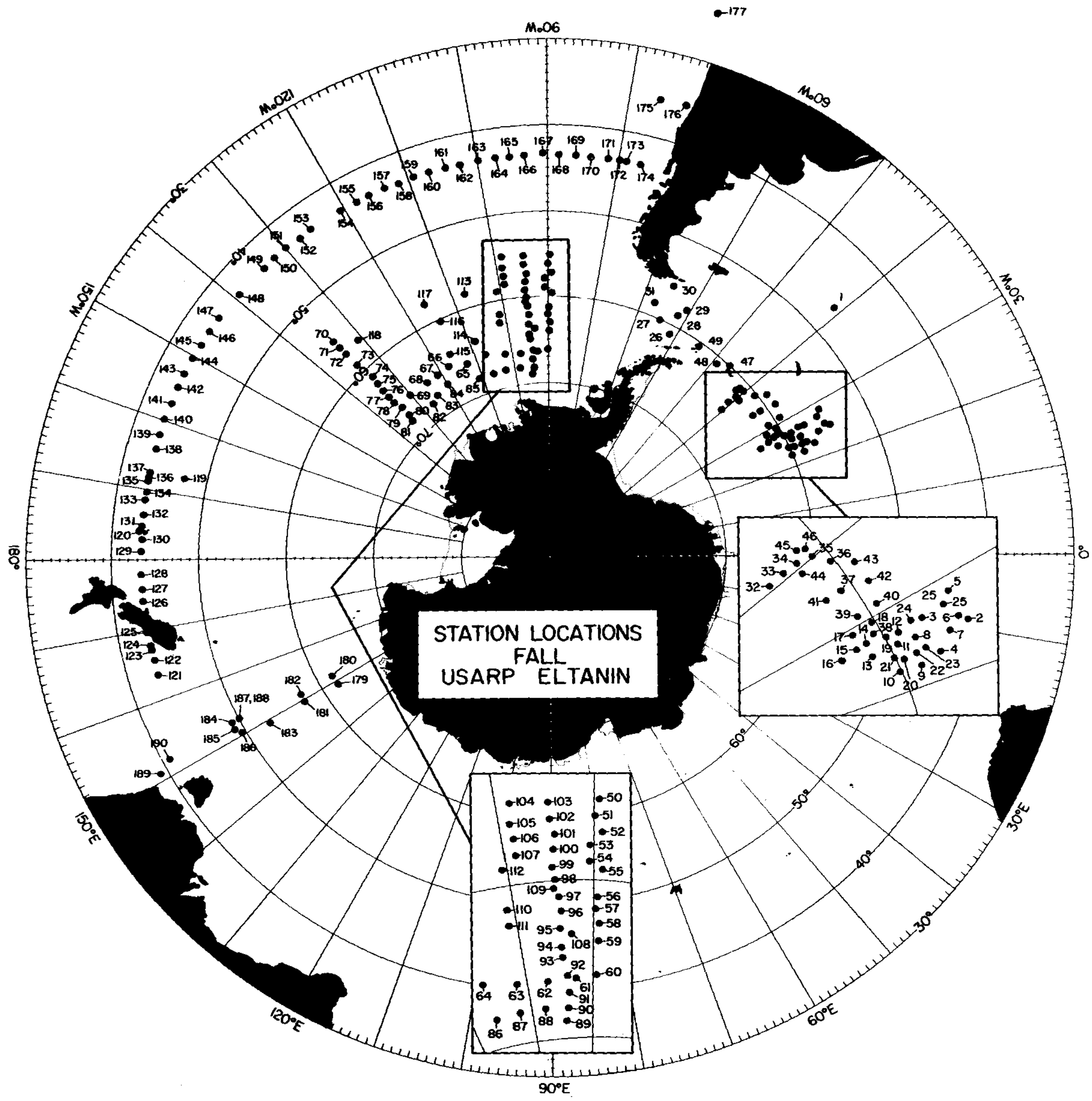
* P indicates present (when information on the volume of water filtered during the haul was not available). Letters or numerals preceding slash refer to the polygastric stage; letters or numerals following the slash refer to the eudoxid stage.



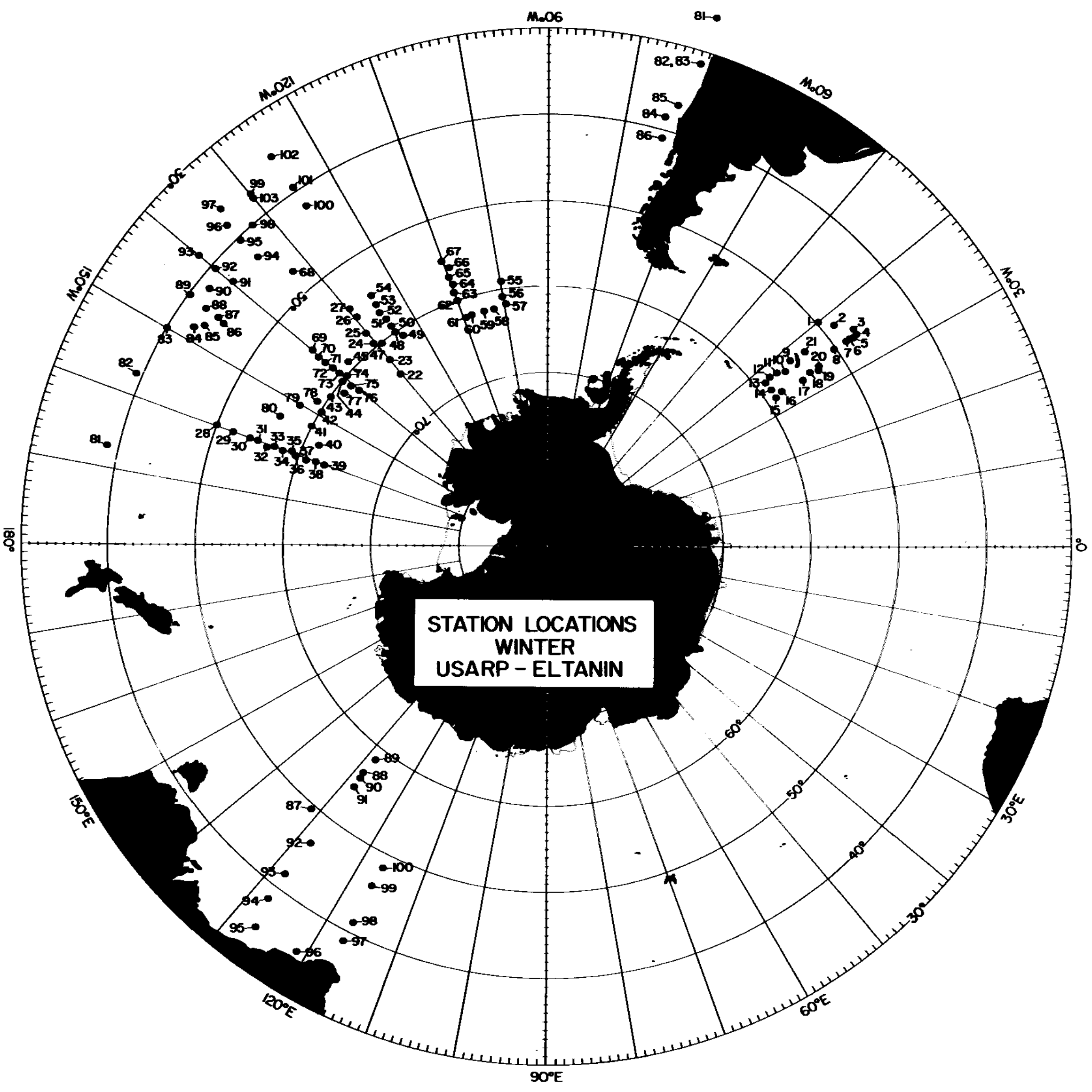
Map A1. The location of spring stations for *Eltanin* cruises.



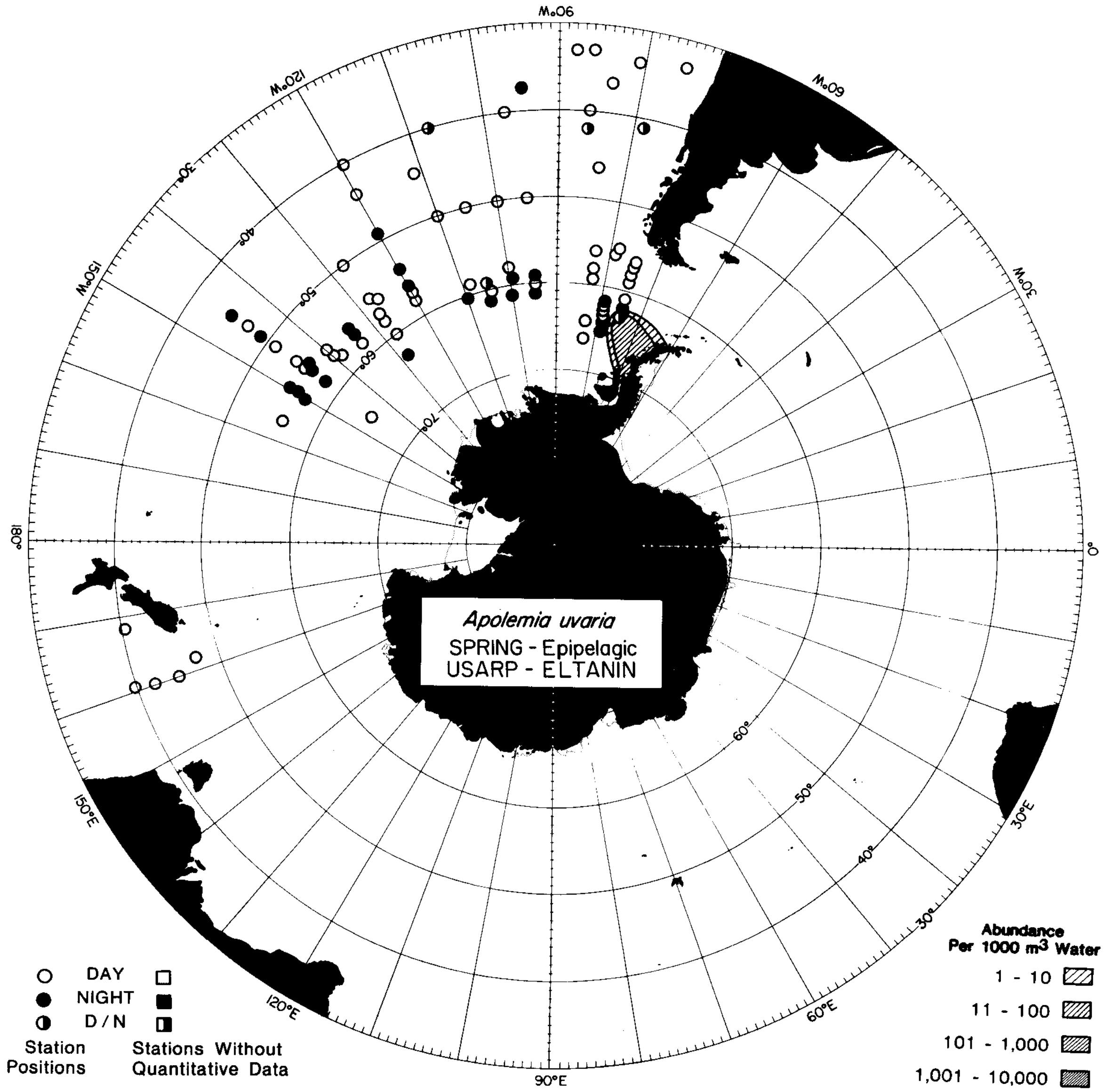
Map A2. The location of summer stations for *Eltanin* cruises.



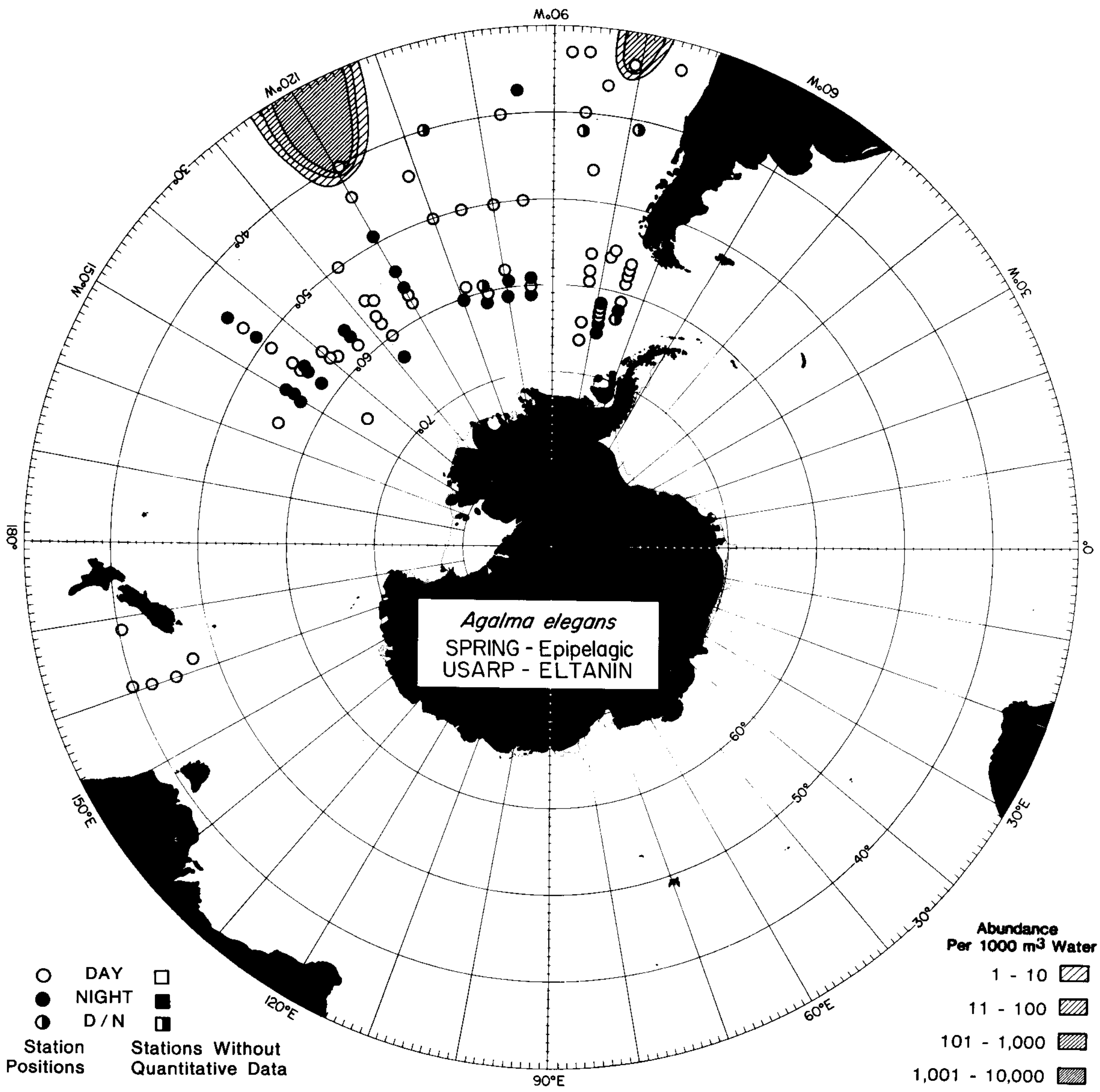
Map A3. The location of autumn stations for *Eltanin* cruises.



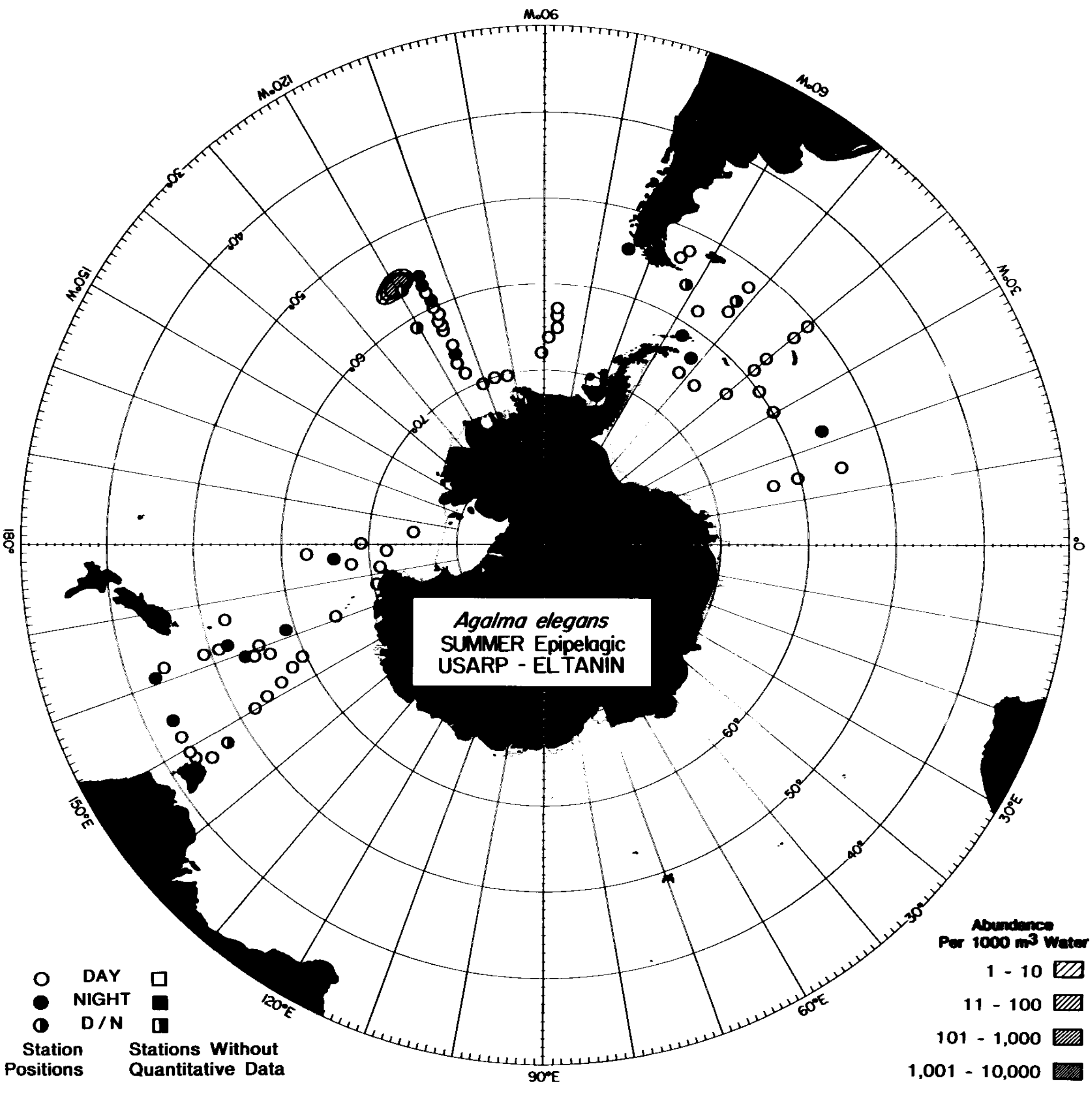
Map A4. The location of winter stations for *Eltanin* cruises.



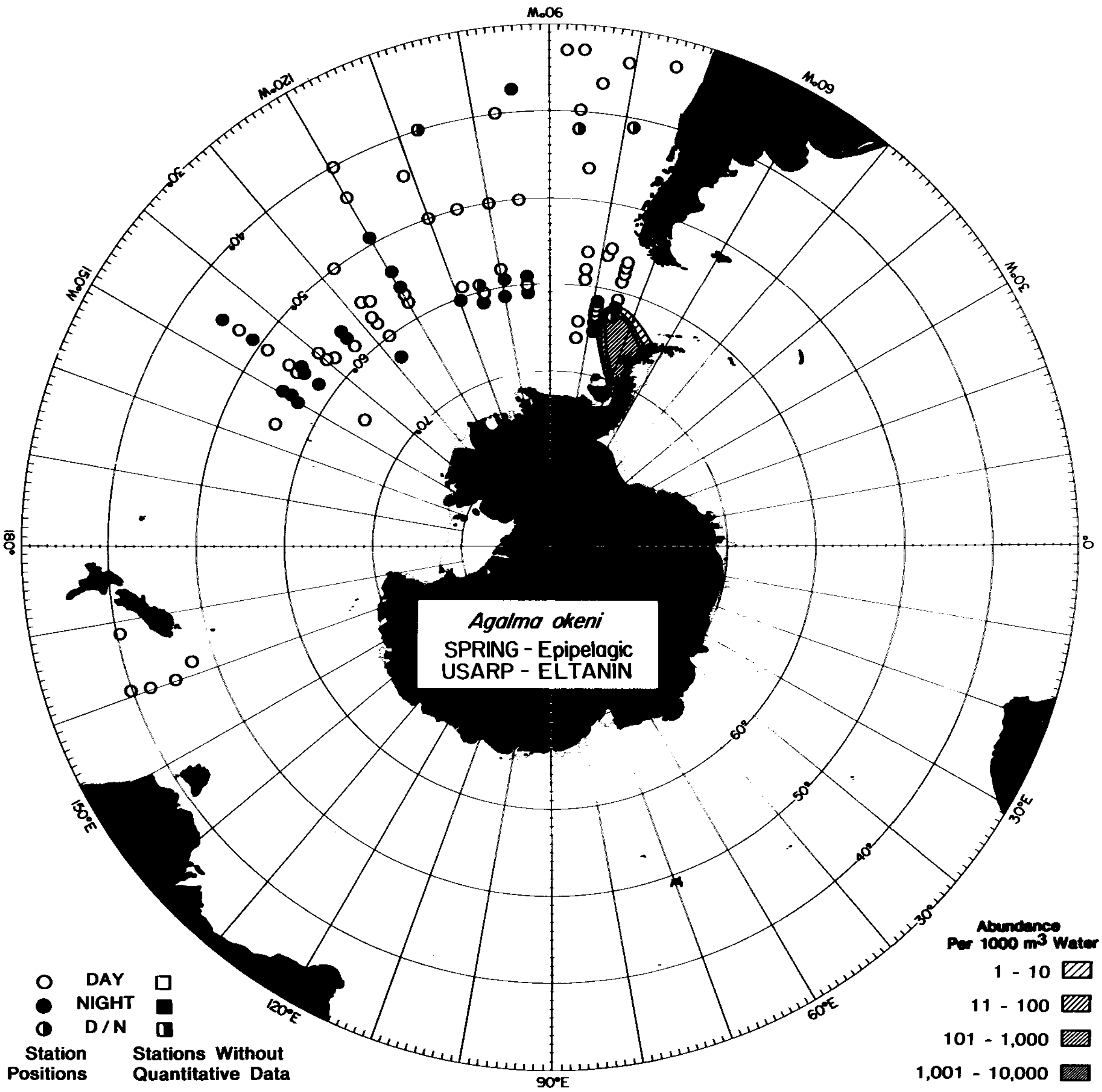
Map A5. The distribution of *Apolemia uvaria* during the spring in the epipelagic zone.



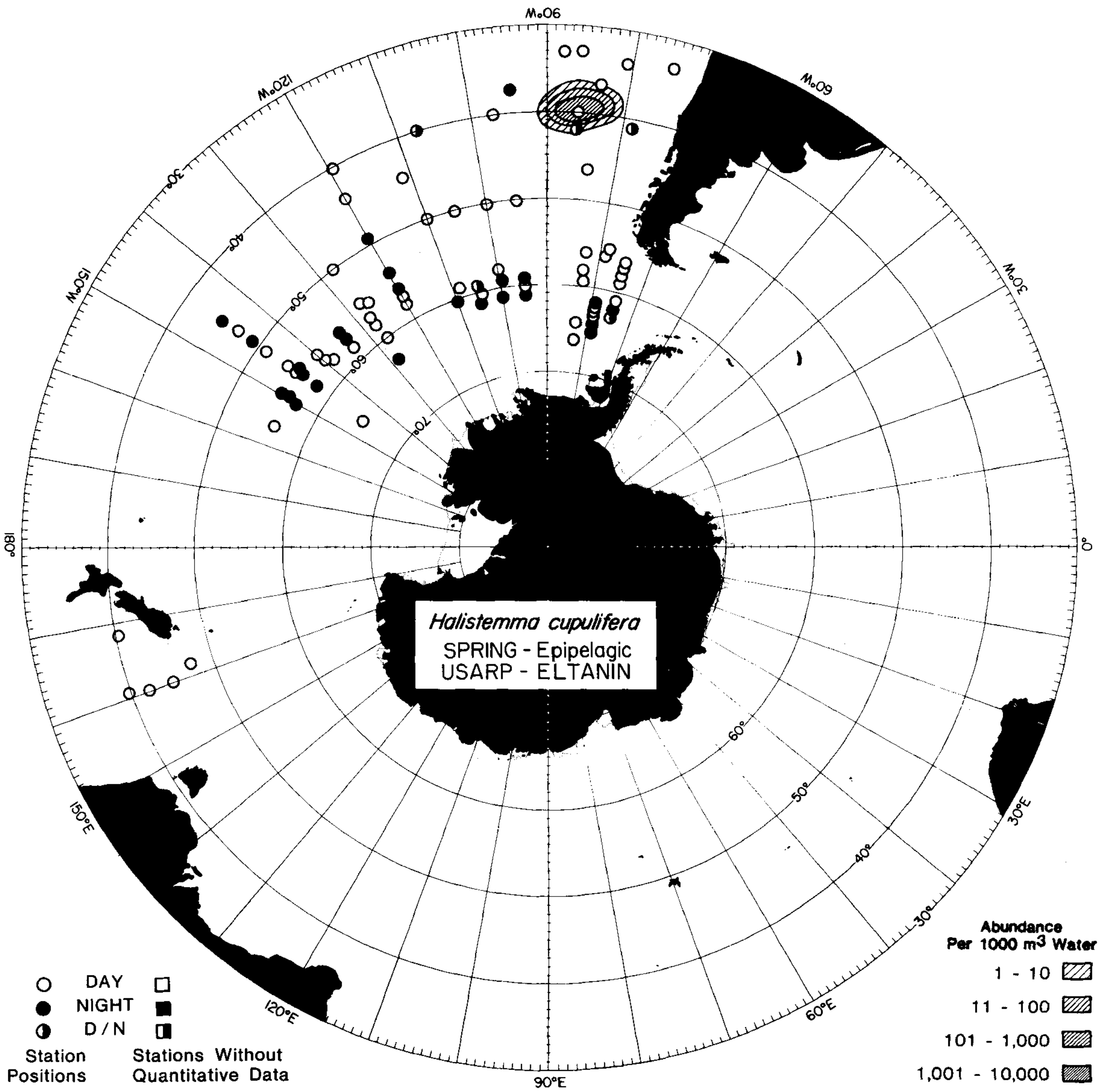
Map A6. The distribution of *Agalma elegans* during the spring in the epipelagic zone.



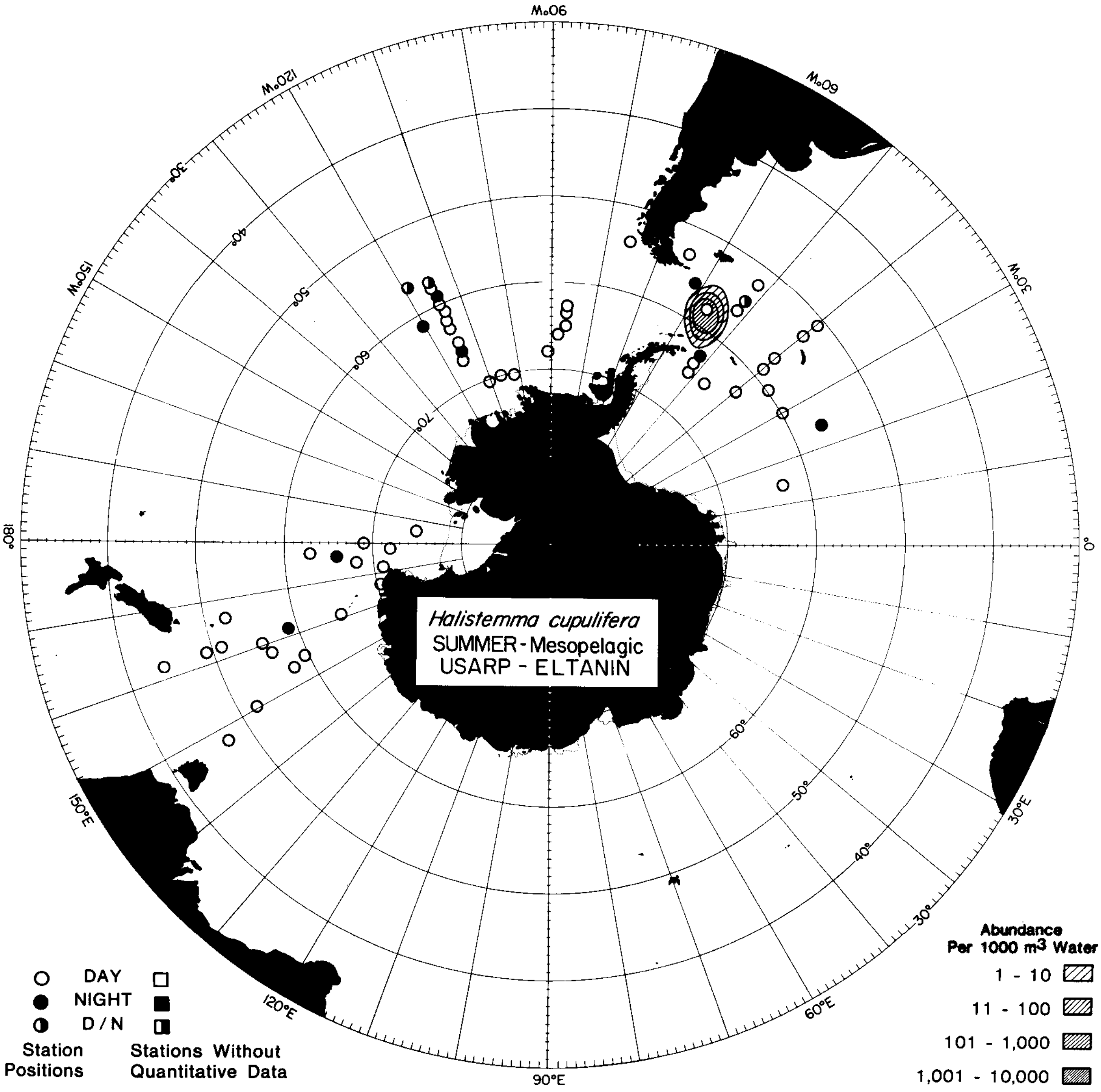
Map A7. The distribution of *Agalma elegans* during the summer in the epipelagic zone.



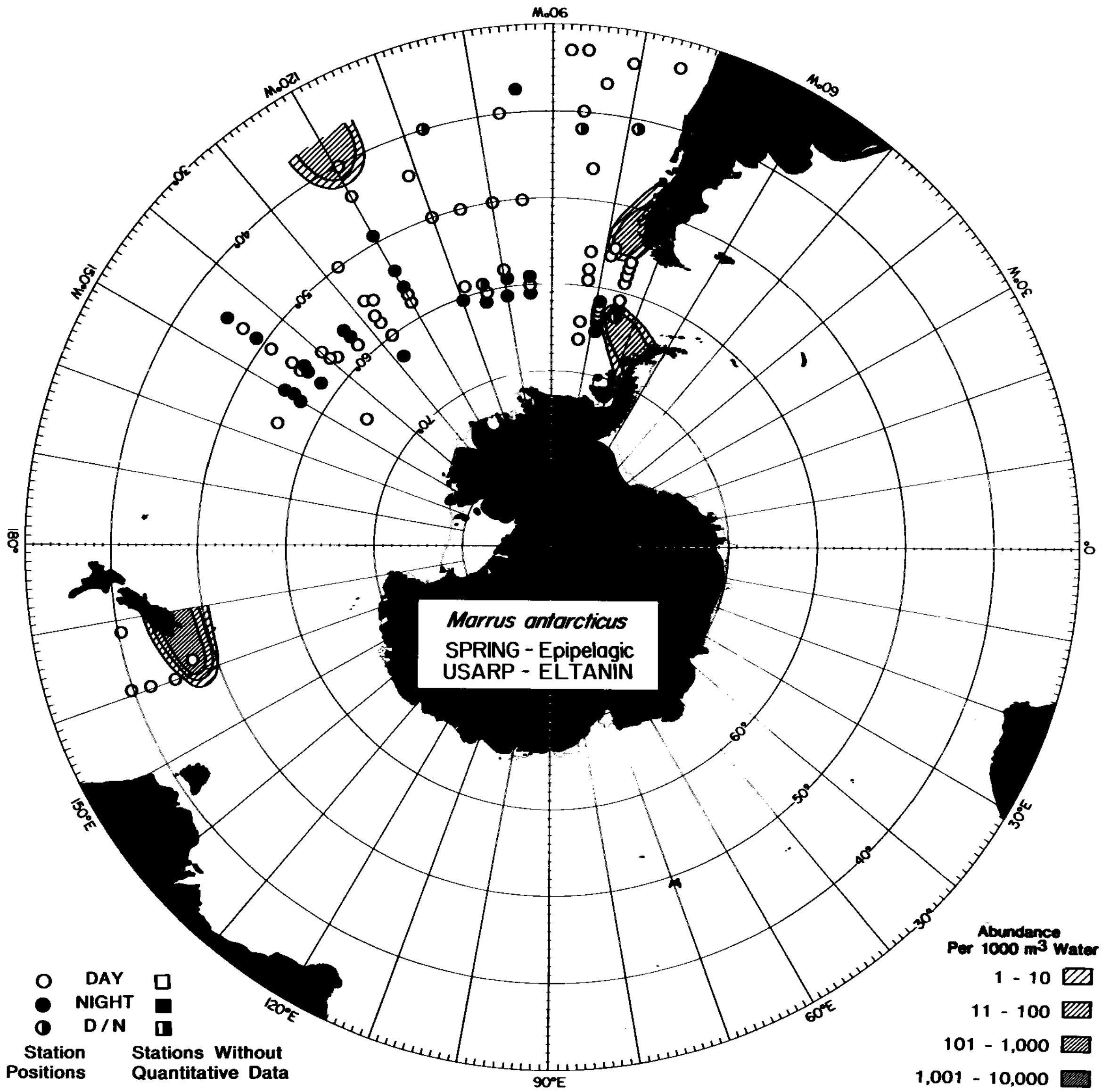
Map A8. The distribution of *Agalma okeni* during the spring in the epipelagic zone.



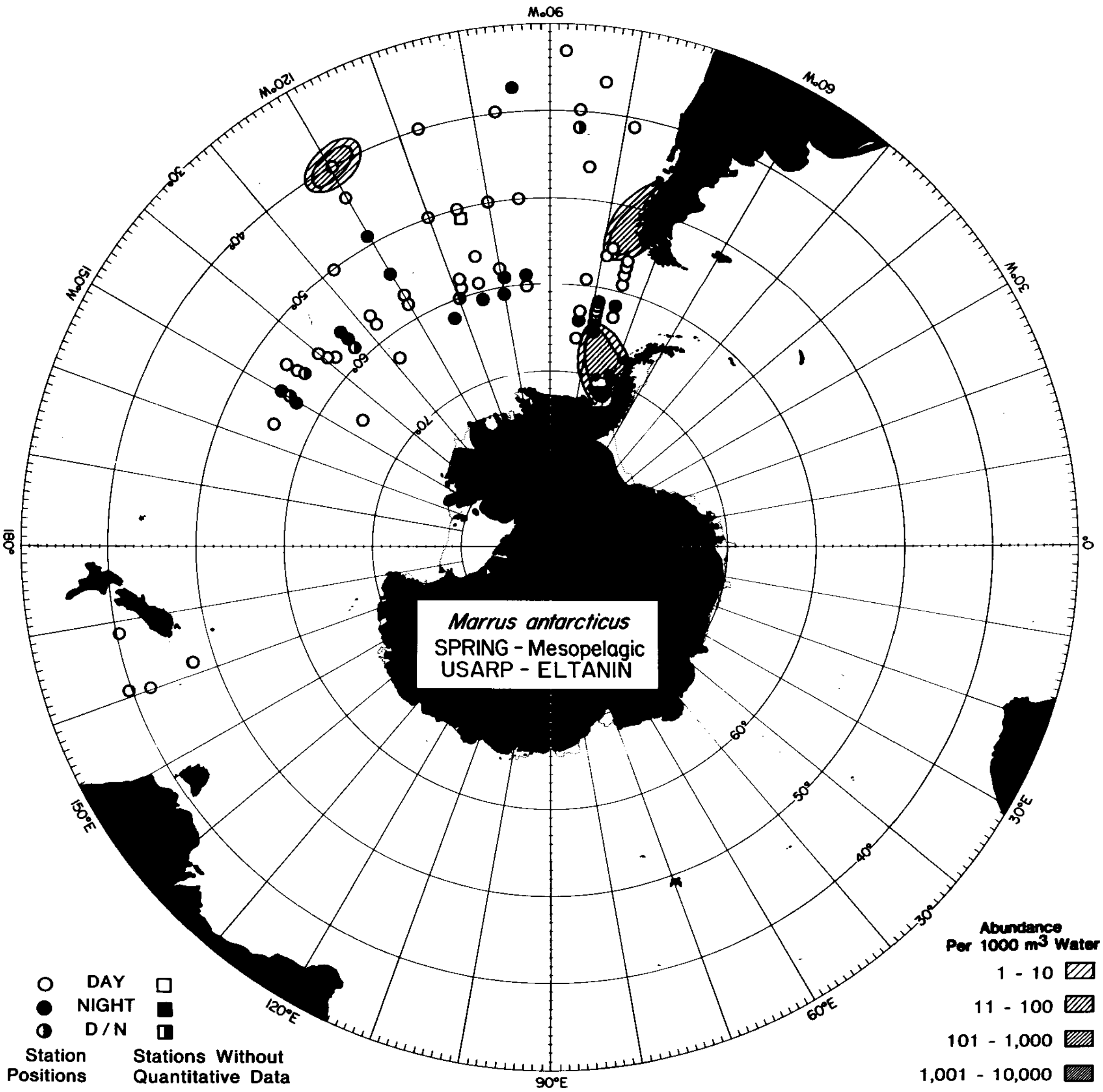
Map A9. The distribution of *Halistemma cupulifera* during the spring in the epipelagic zone.



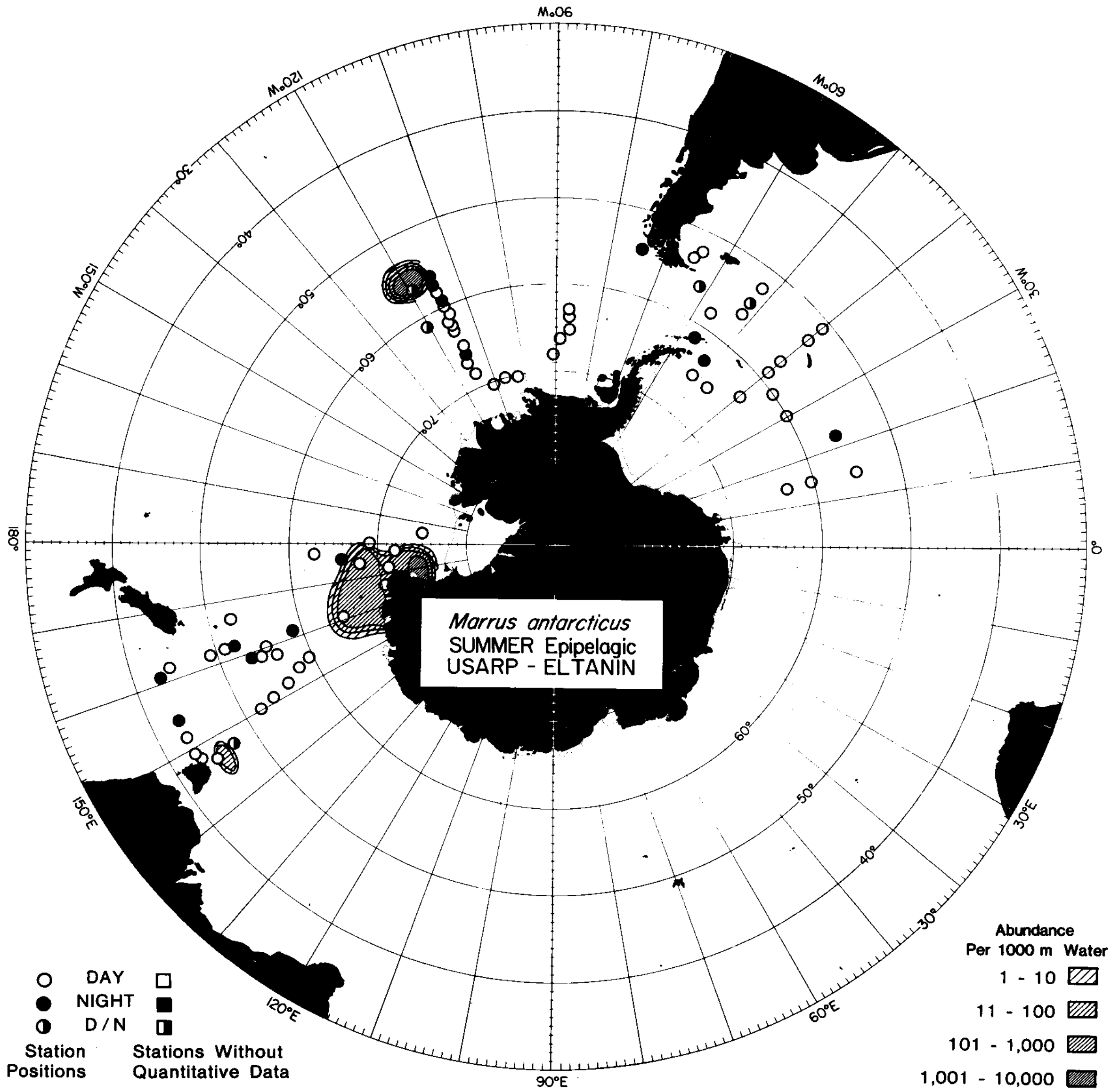
Map A10. The distribution of *Halistemma cupulifera* during the summer in the mesopelagic zone.



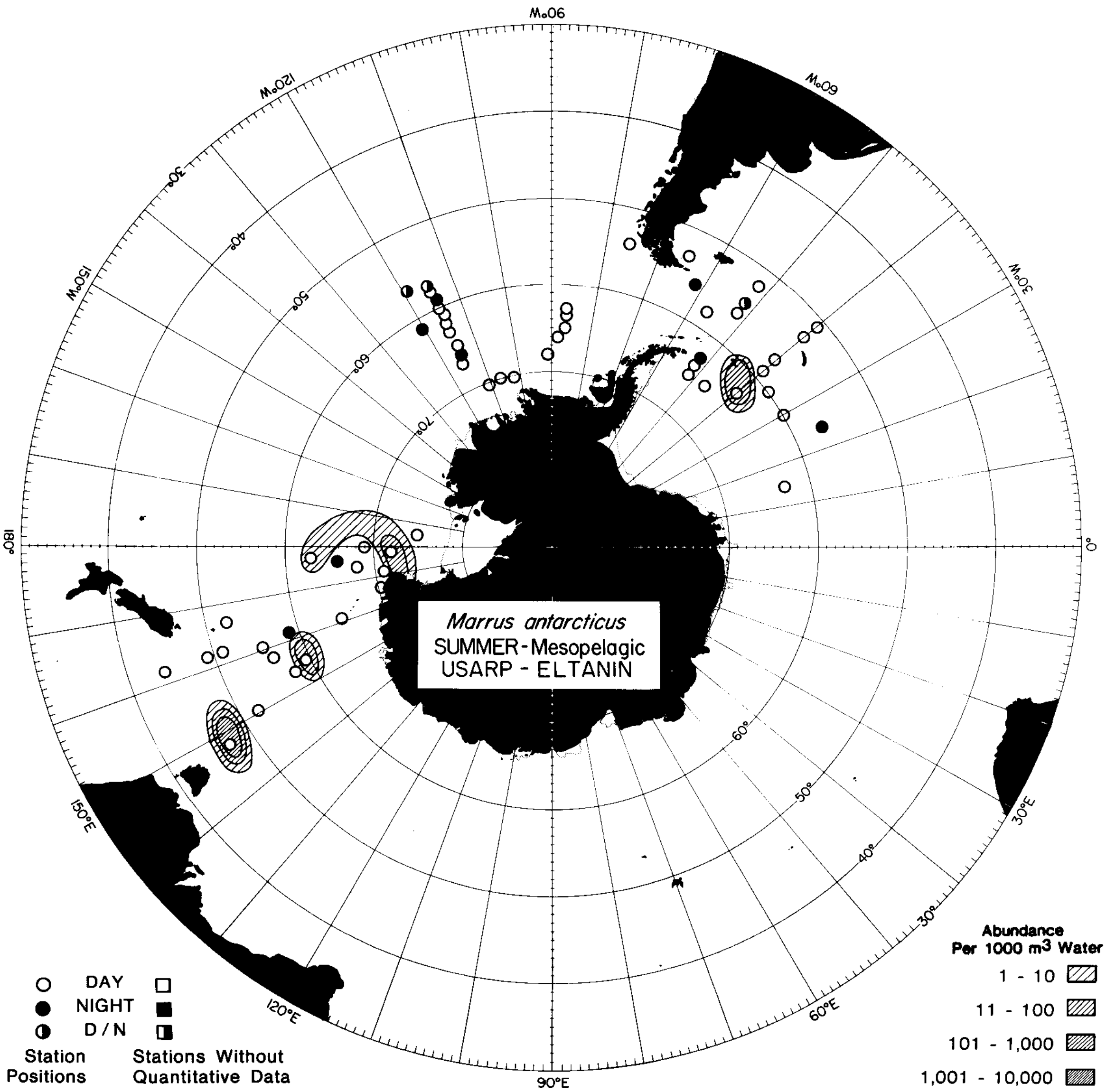
Map A11. The distribution of *Marrus antarcticus* during the spring in the epipelagic zone.



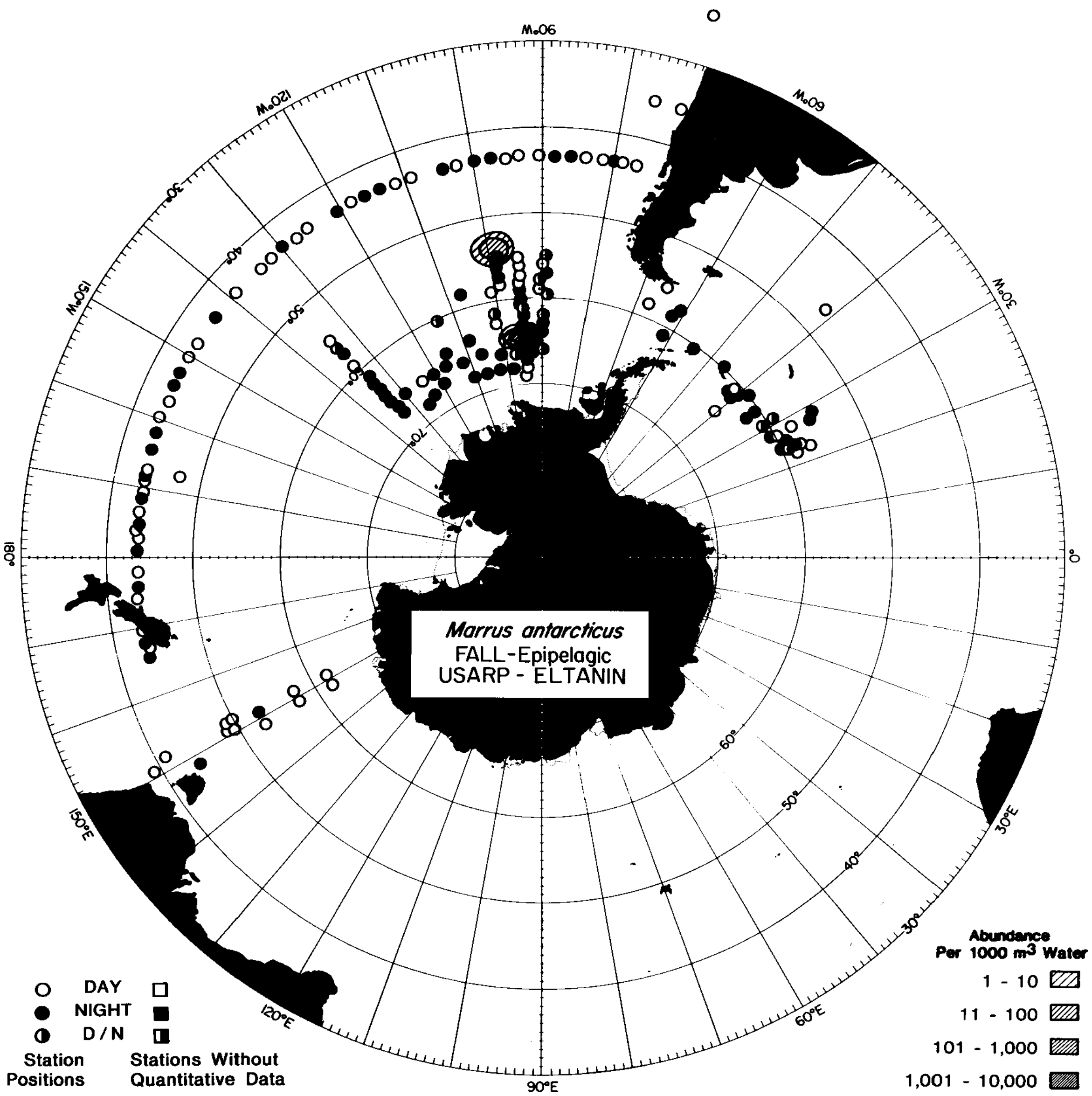
Map A12. The distribution of *Marrus antarcticus* during the spring in the mesopelagic zone.



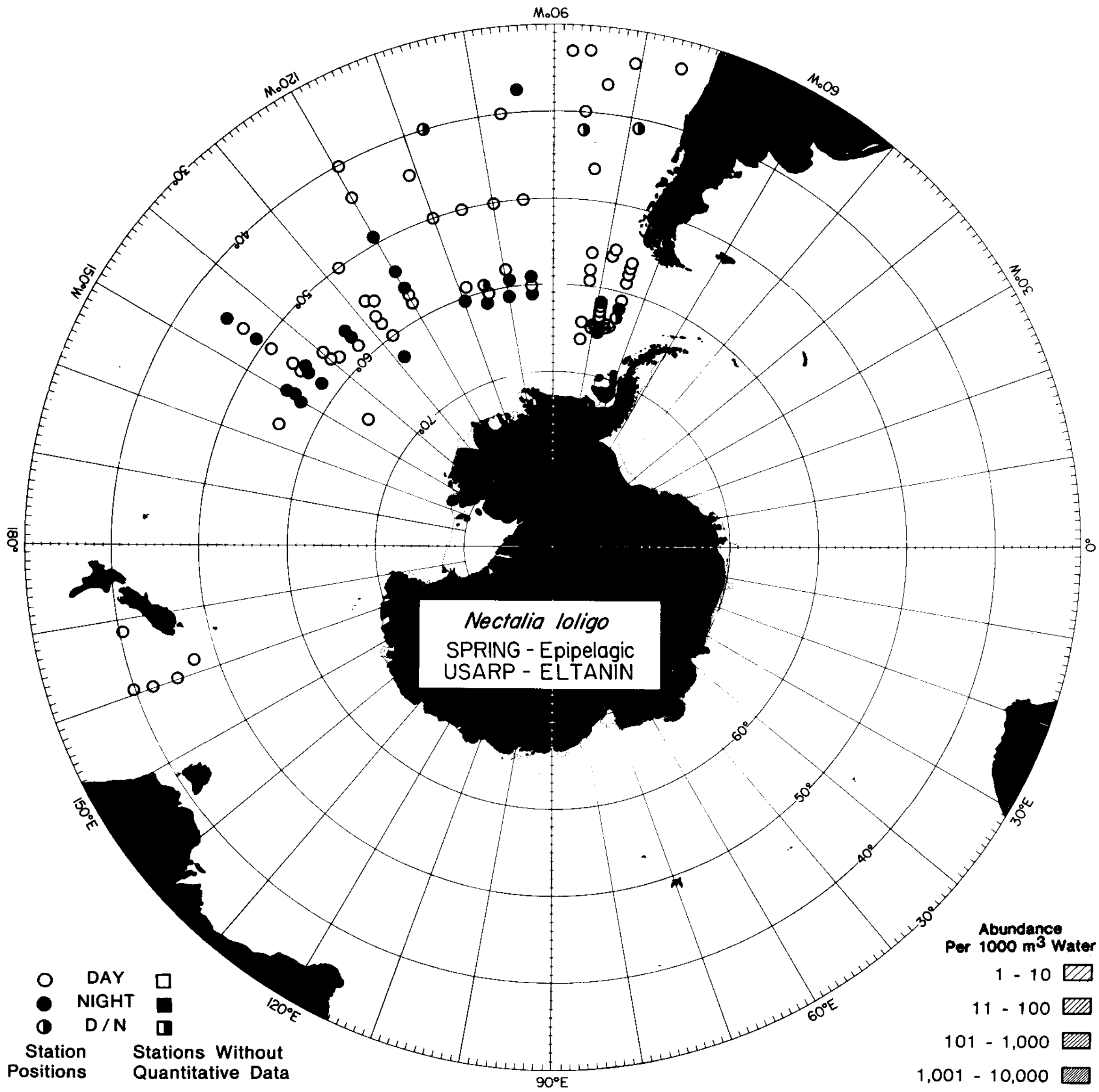
Map A13. The distribution of *Marrus antarcticus* during the summer in the epipelagic zone.



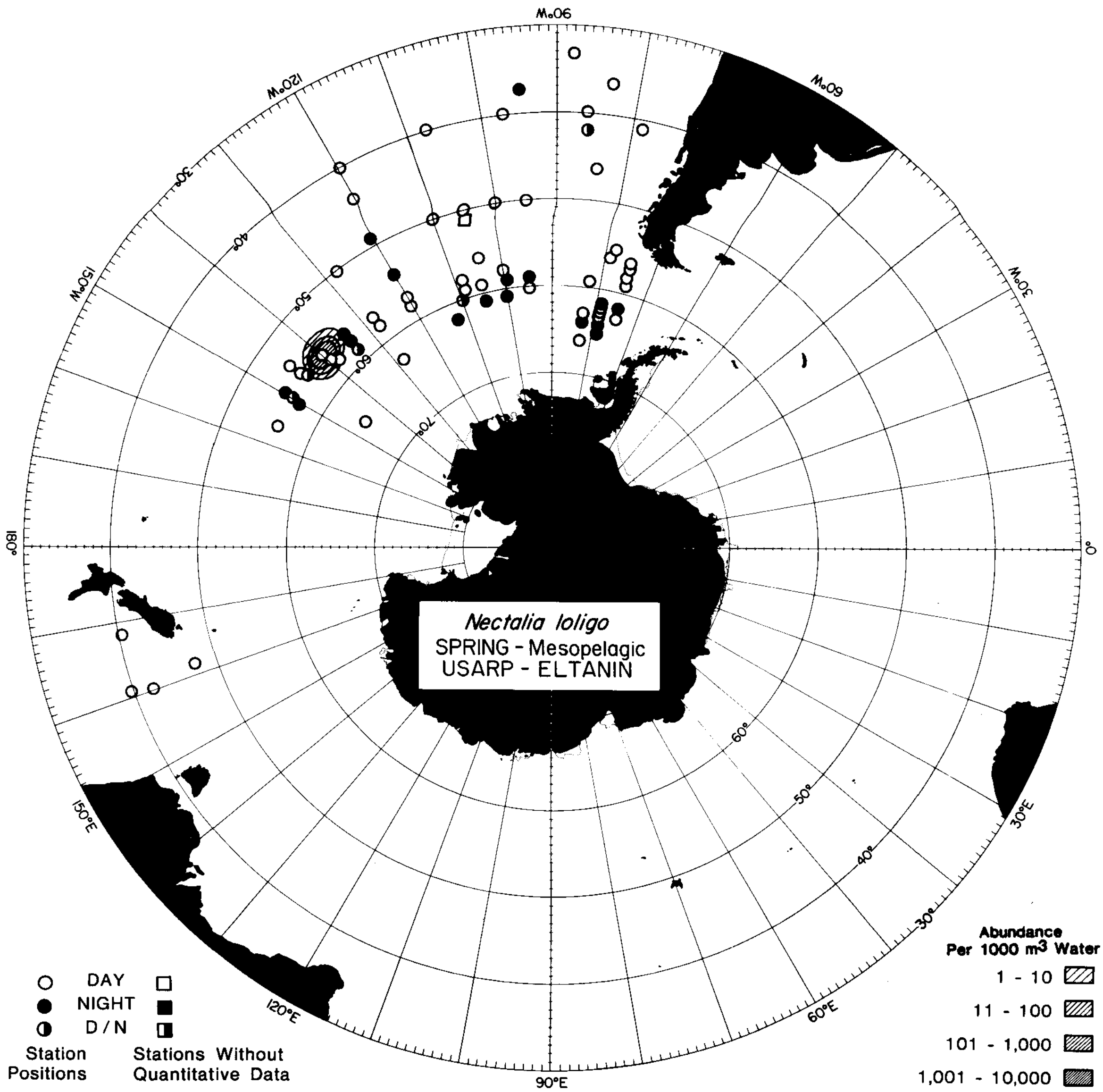
Map A14. The distribution of *Marrus antarcticus* during the summer in the mesopelagic zone.



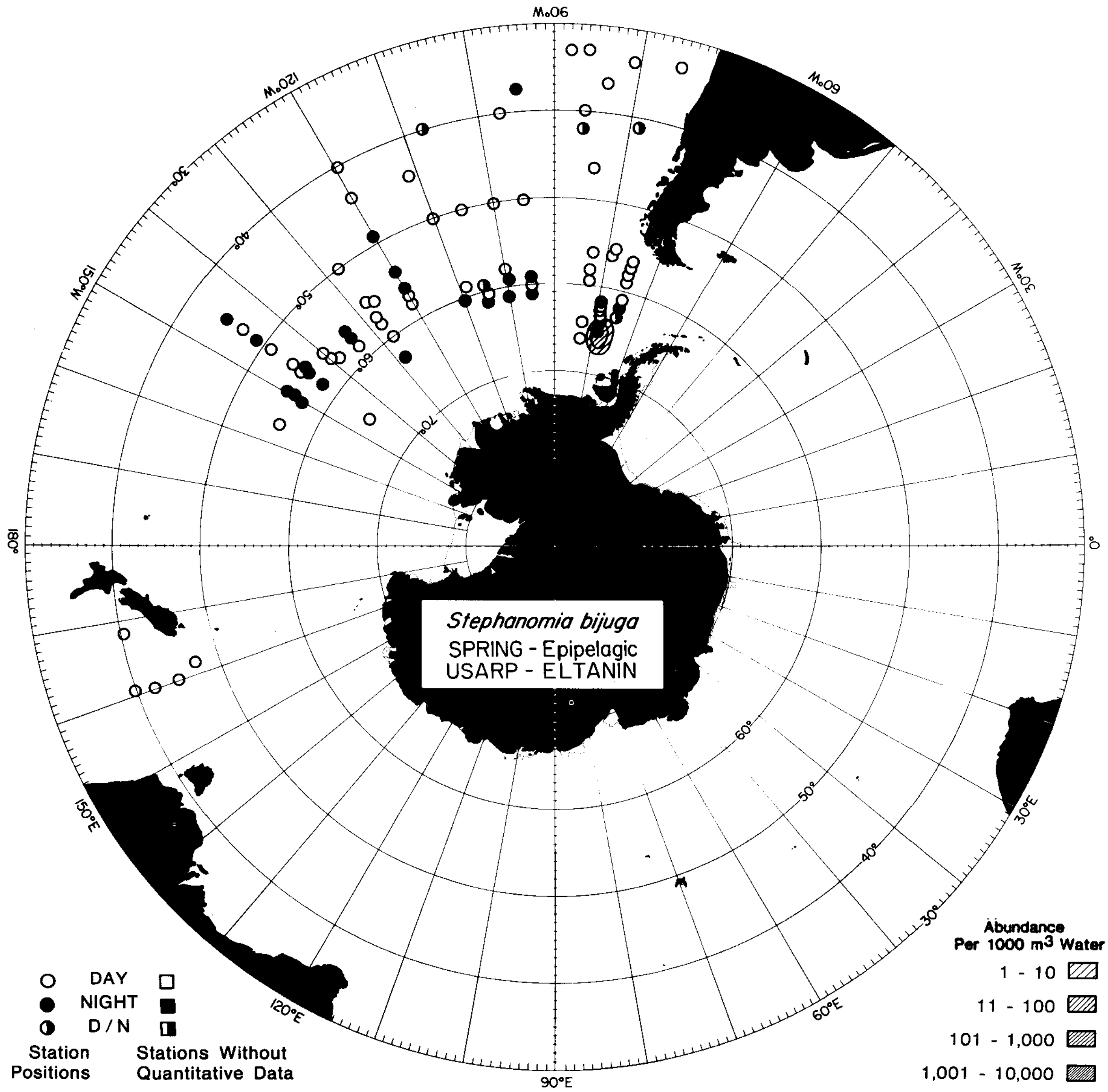
Map A15. The distribution of *Marrus antarcticus* during the fall in the epipelagic zone.



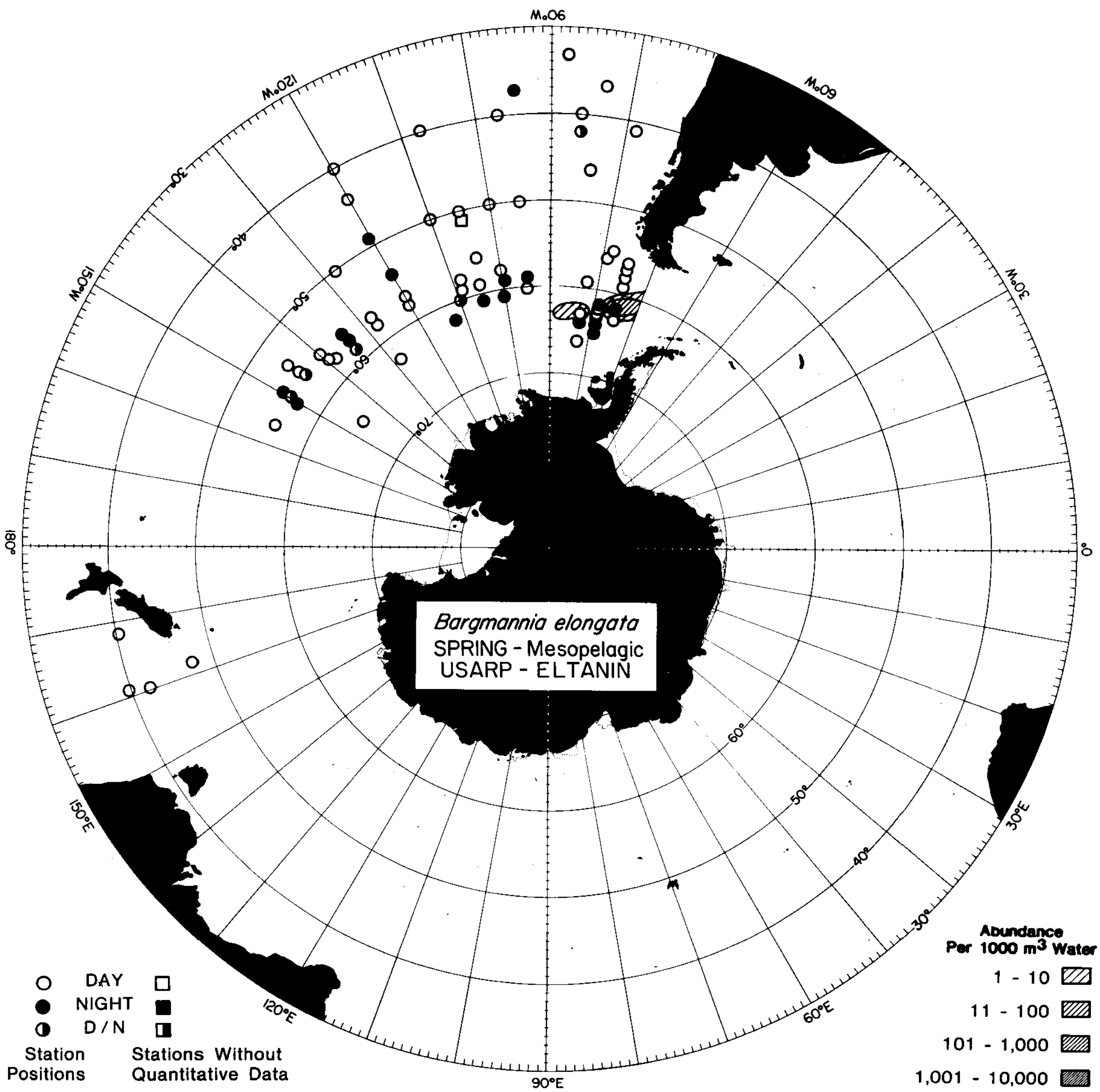
Map A16. The distribution of *Nectalia loligo* during the spring in the epipelagic zone.



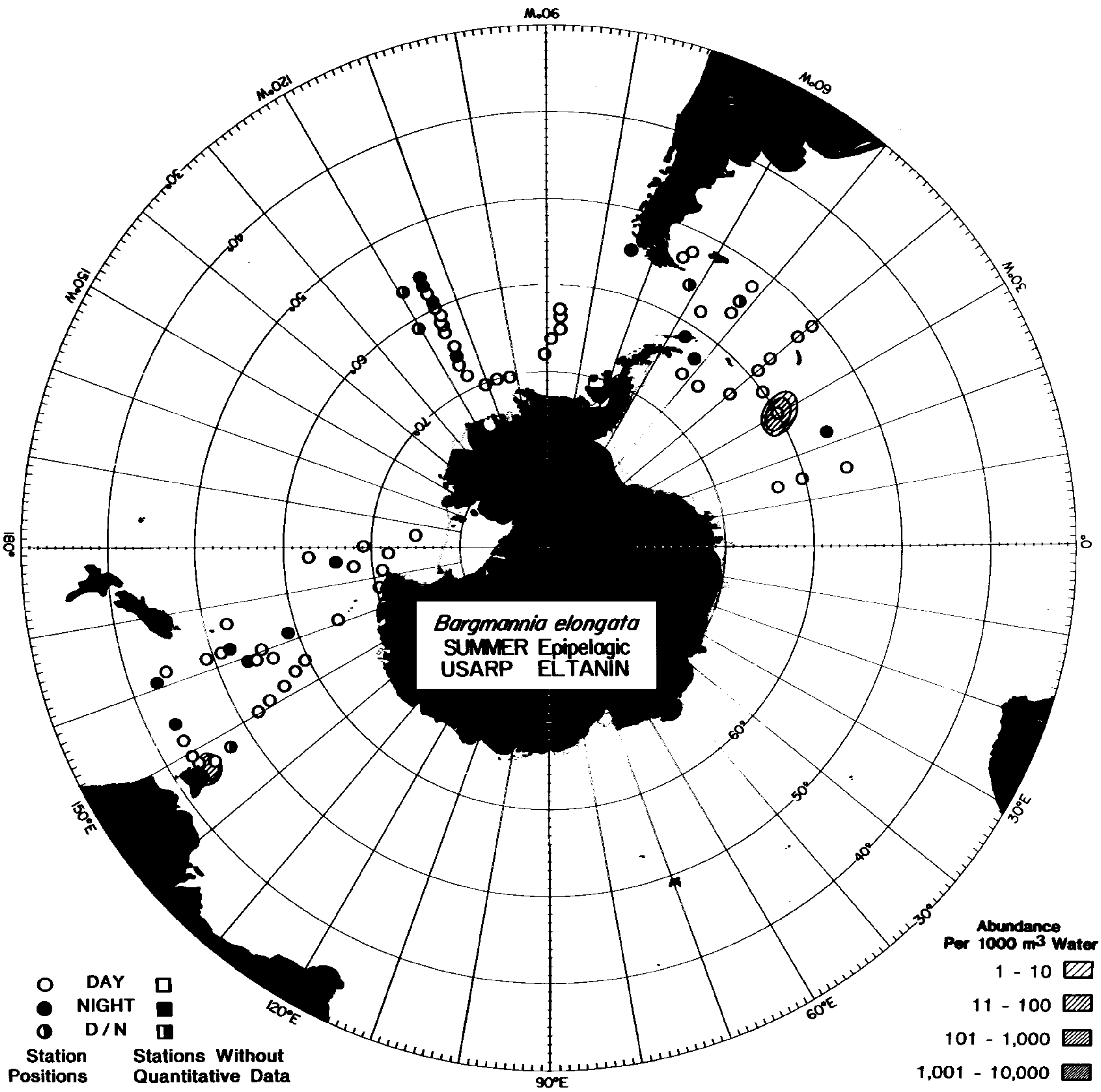
Map A17. The distribution of *Nectalia loligo* during the spring in the mesopelagic zone.



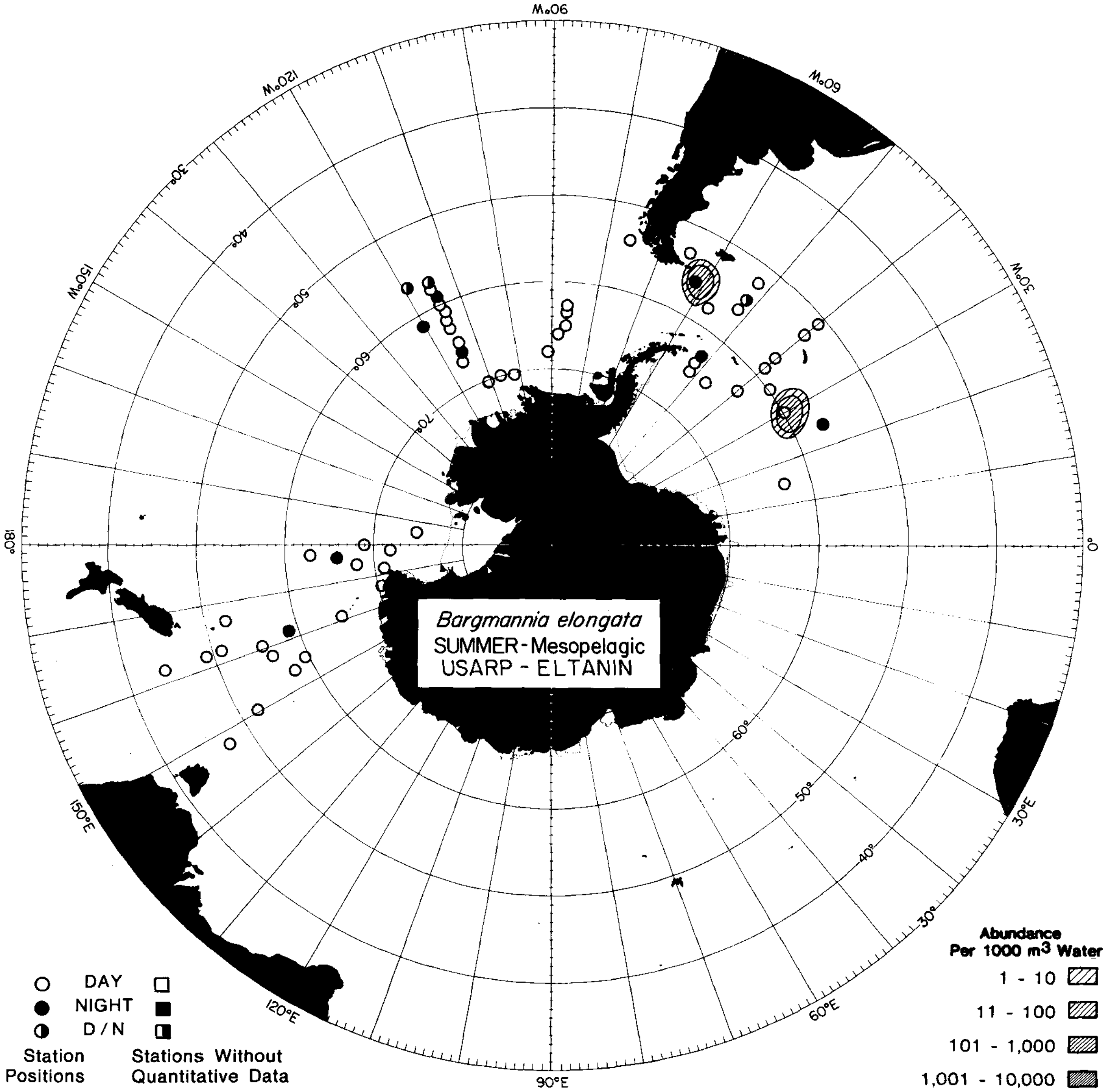
Map A18. The distribution of *Stephanomia bijuga* during the spring in the epipelagic zone.



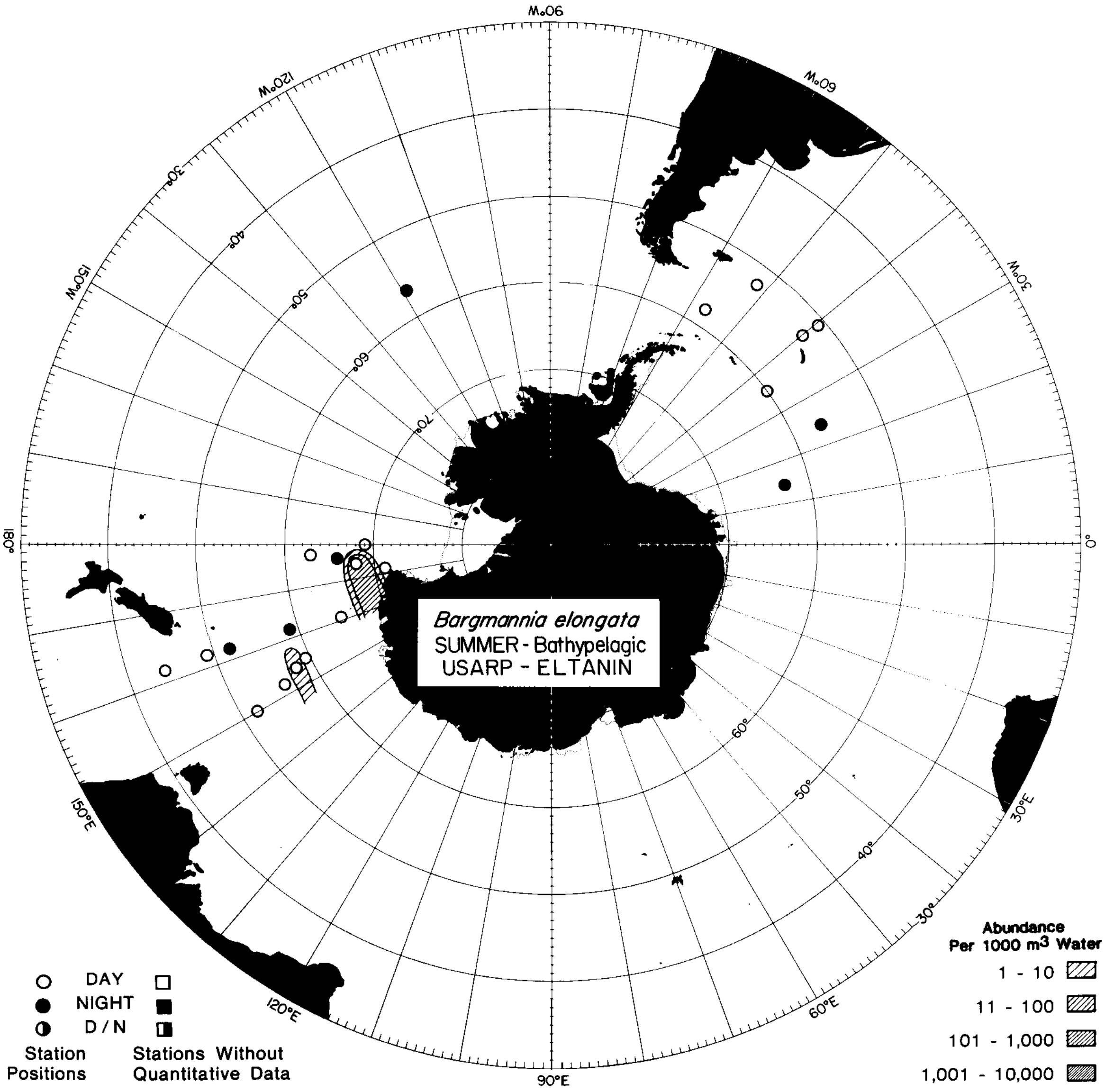
Map A19. The distribution of *Bargmannia elongata* during the spring in the mesopelagic zone.



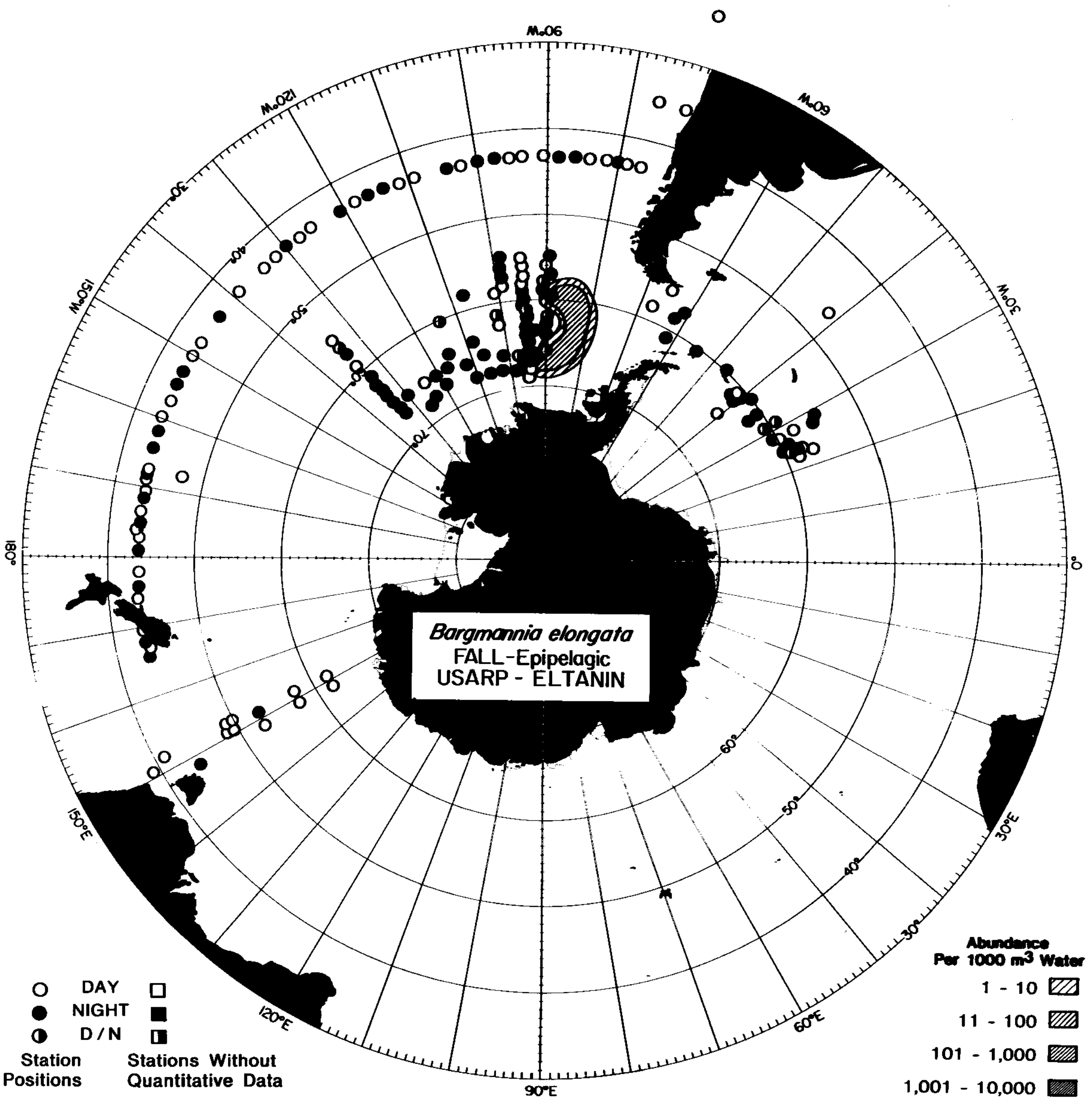
Map A20. The distribution of *Bargmannia elongata* during the summer in the epipelagic zone.



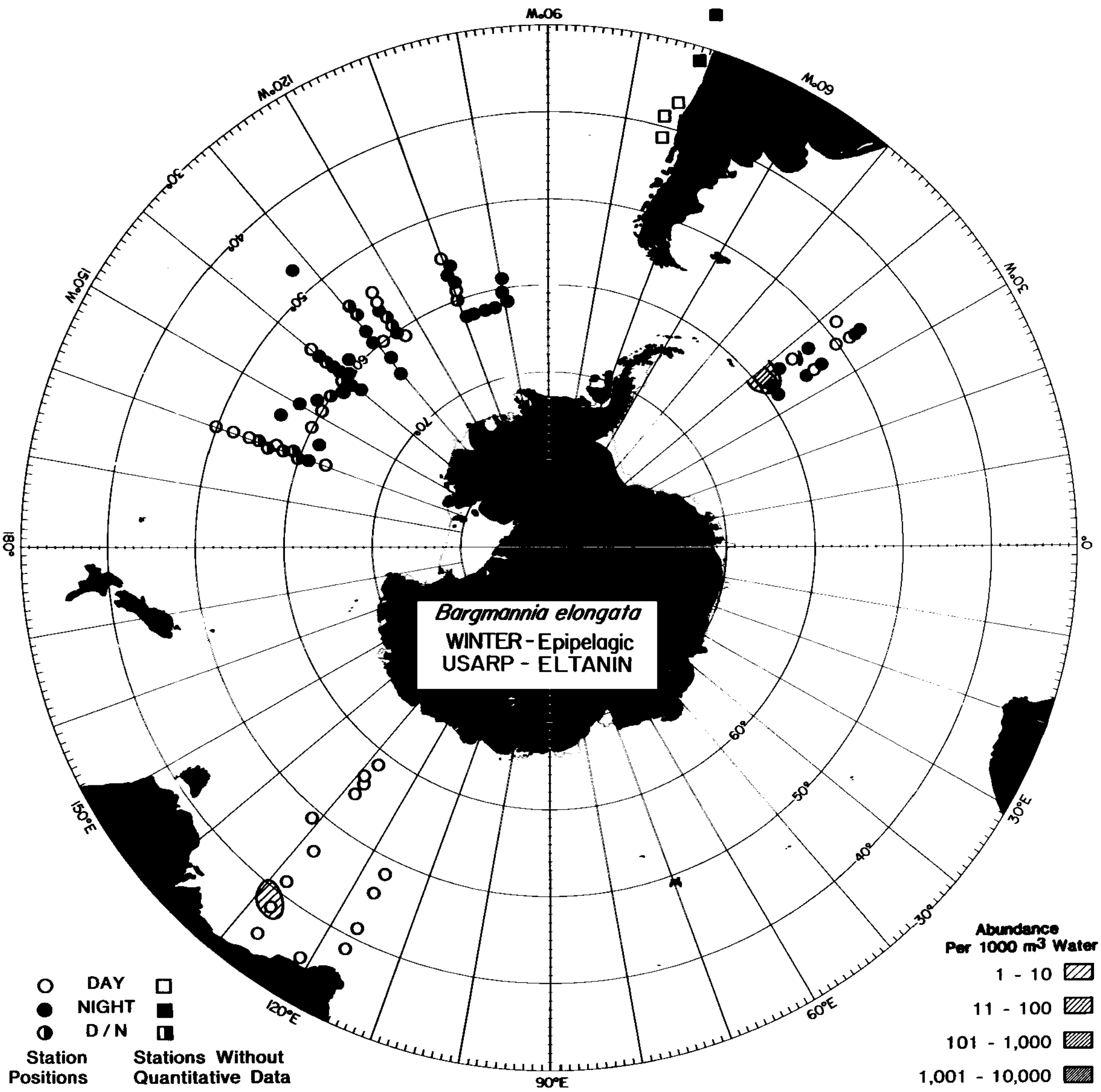
Map A21. The distribution of *Bargmannia elongata* during the summer in the mesopelagic zone.



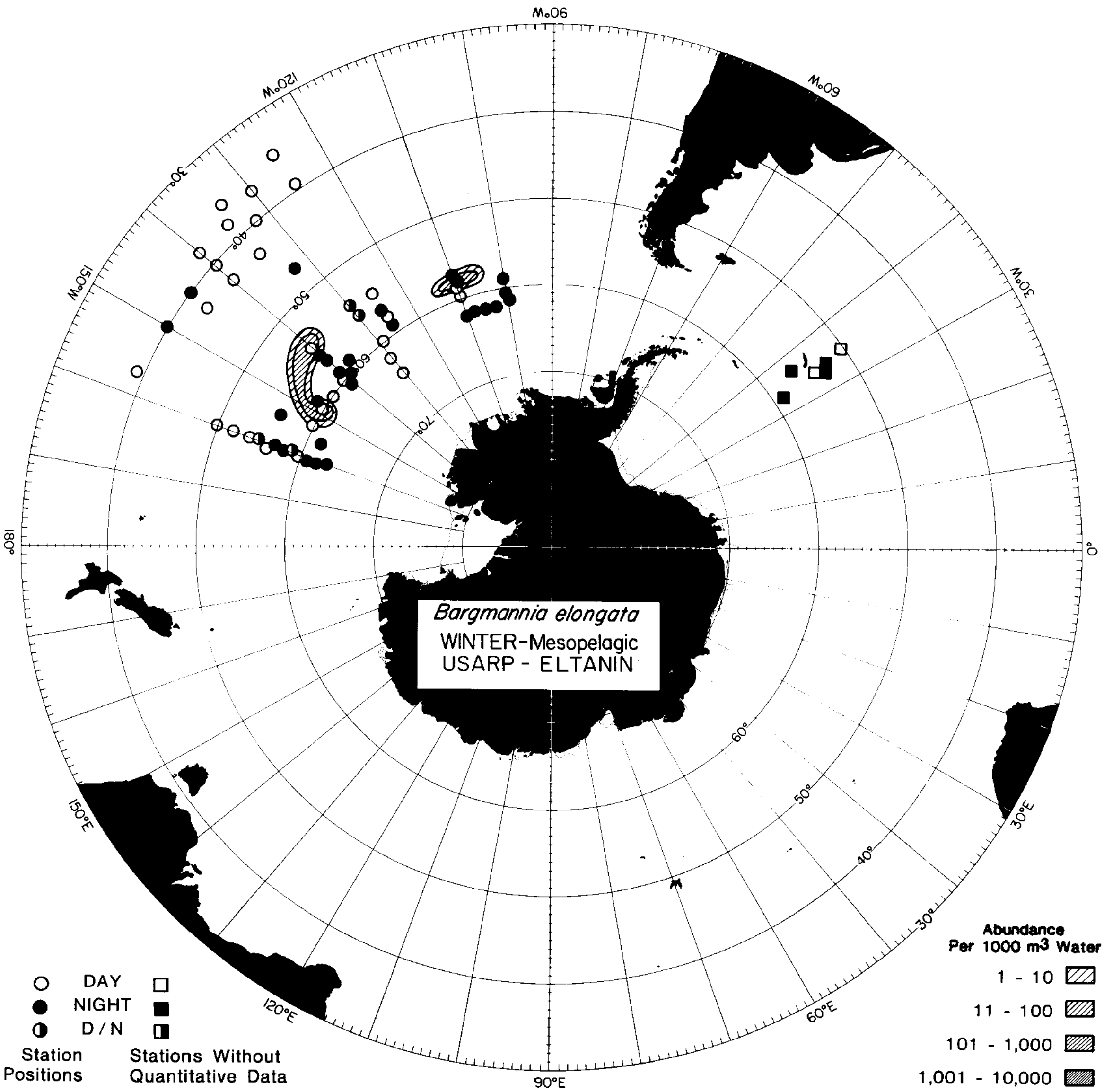
Map A22. The distribution of *Bargmannia elongata* during the summer in the bathypelagic zone.



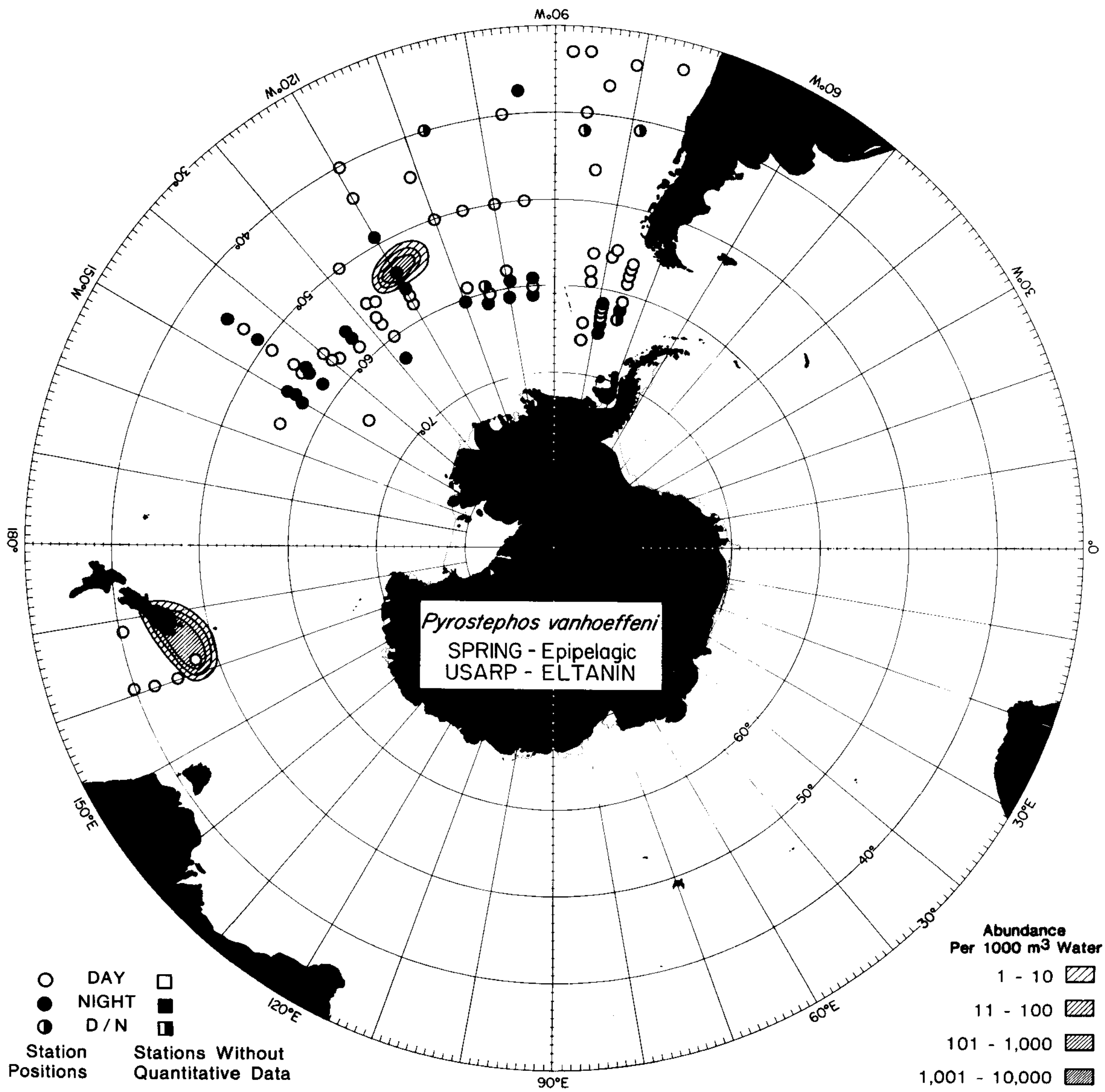
Map A23. The distribution of *Bargmannia elongata* during the fall in the epipelagic zone.



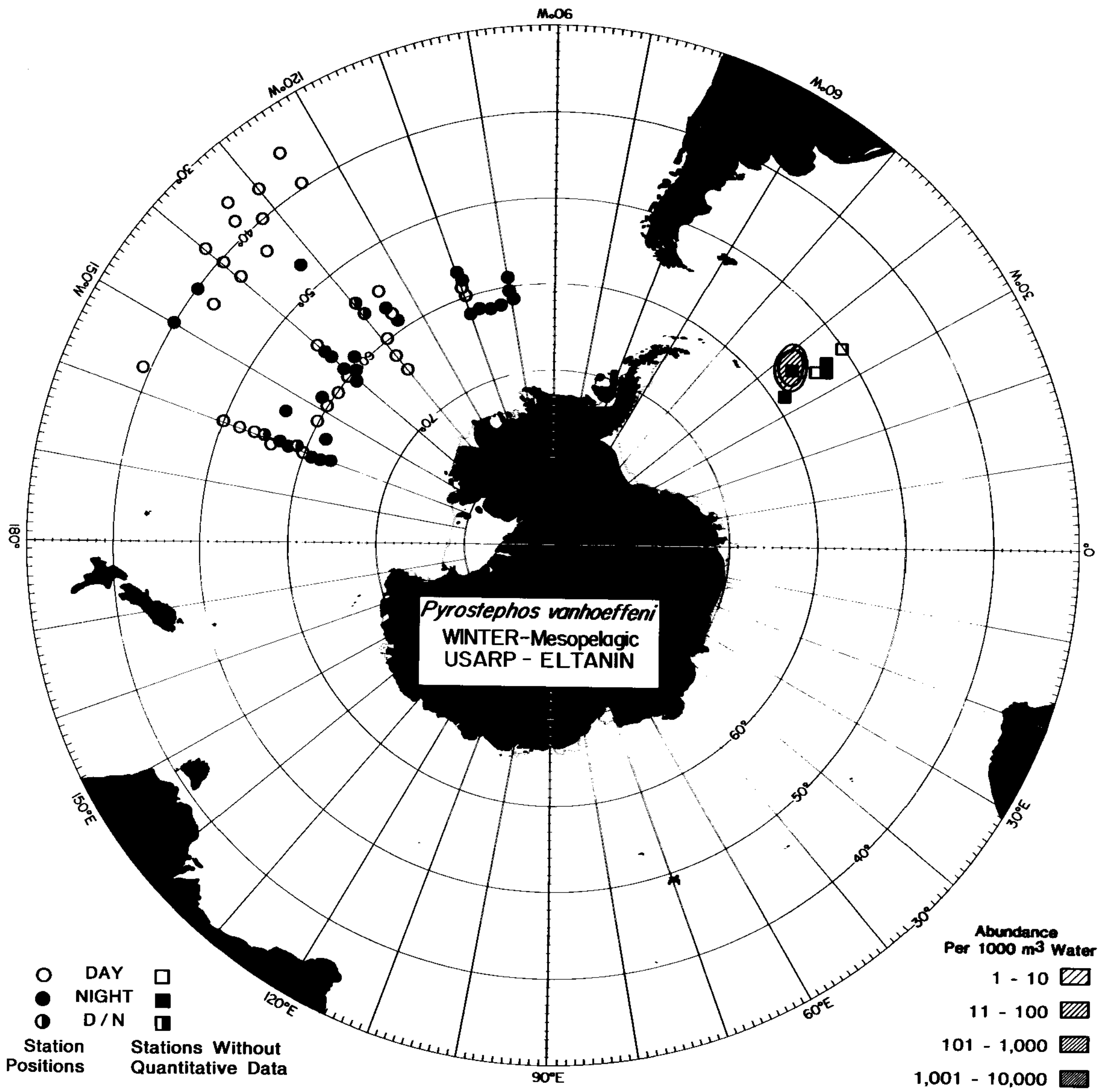
Map A24. The distribution of *Bargmannia elongata* during the winter in the epipelagic zone.



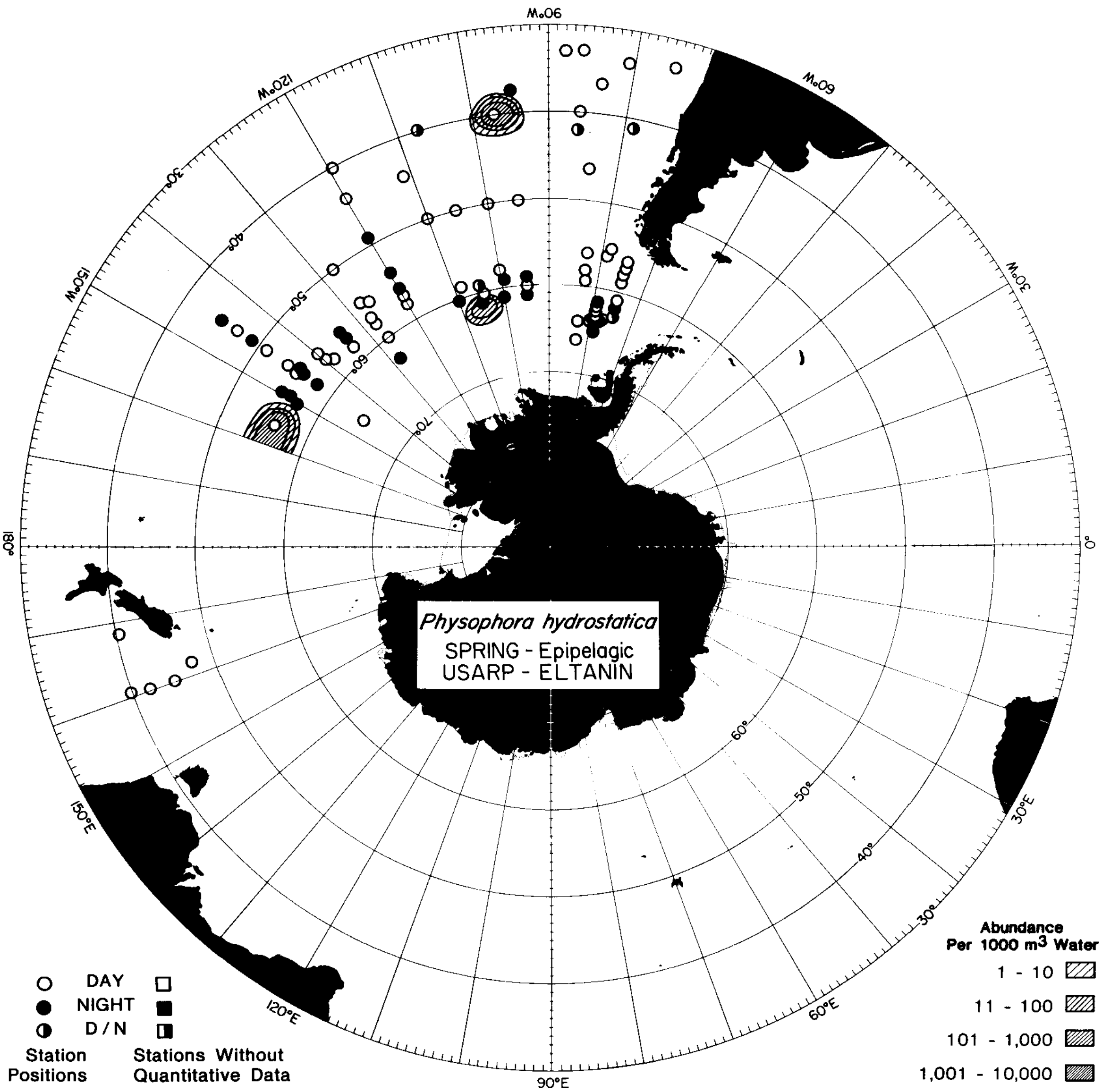
Map A25. The distribution of *Bargmannia elongata* during the winter in the mesopelagic zone.



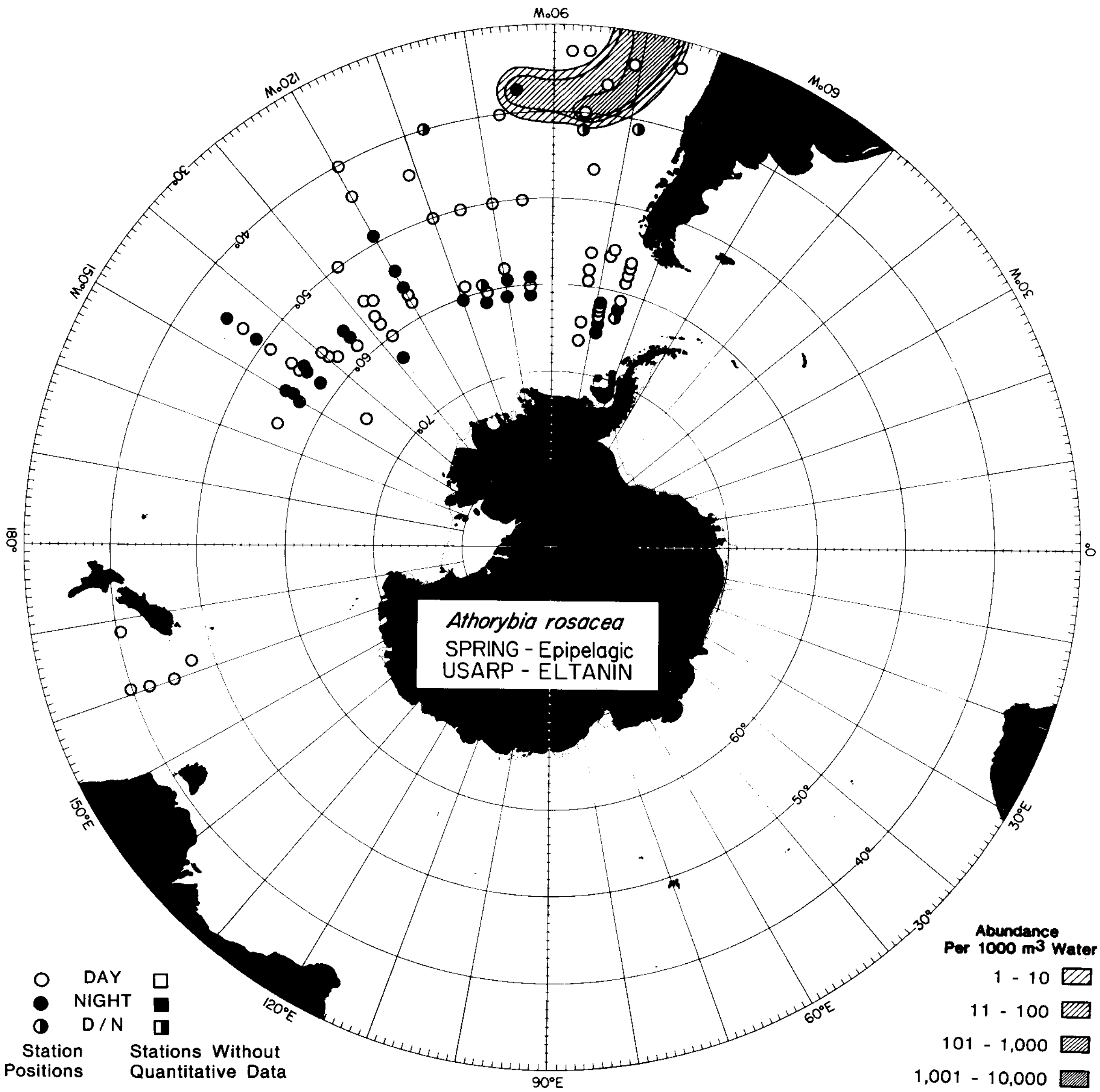
Map A26. The distribution of *Pyrostephos vanhoeffeni* during the spring in the epipelagic zone.



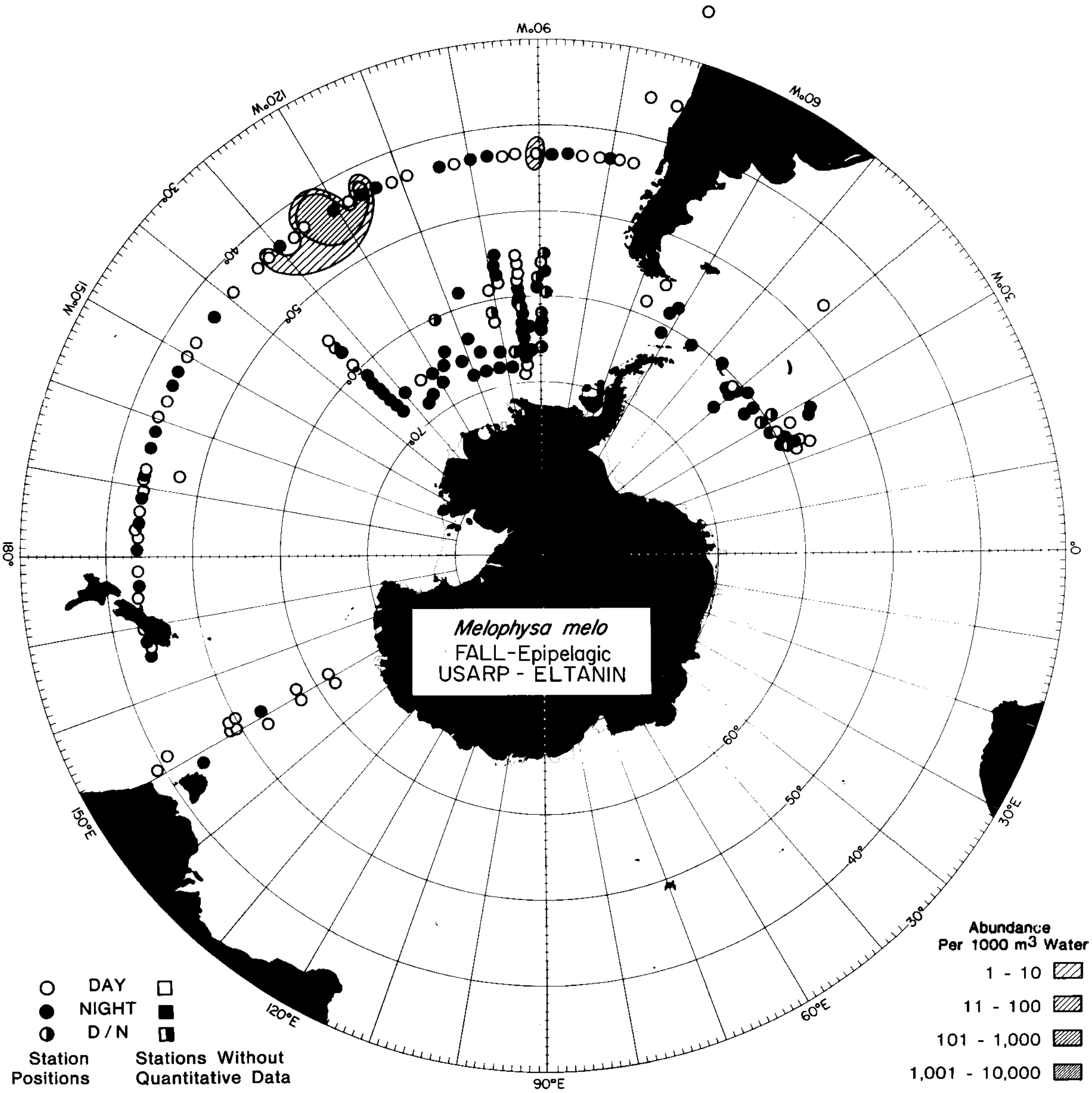
Map A27. The distribution of *Pyrostephos vanhoeffeni* during the winter in the mesopelagic zone.



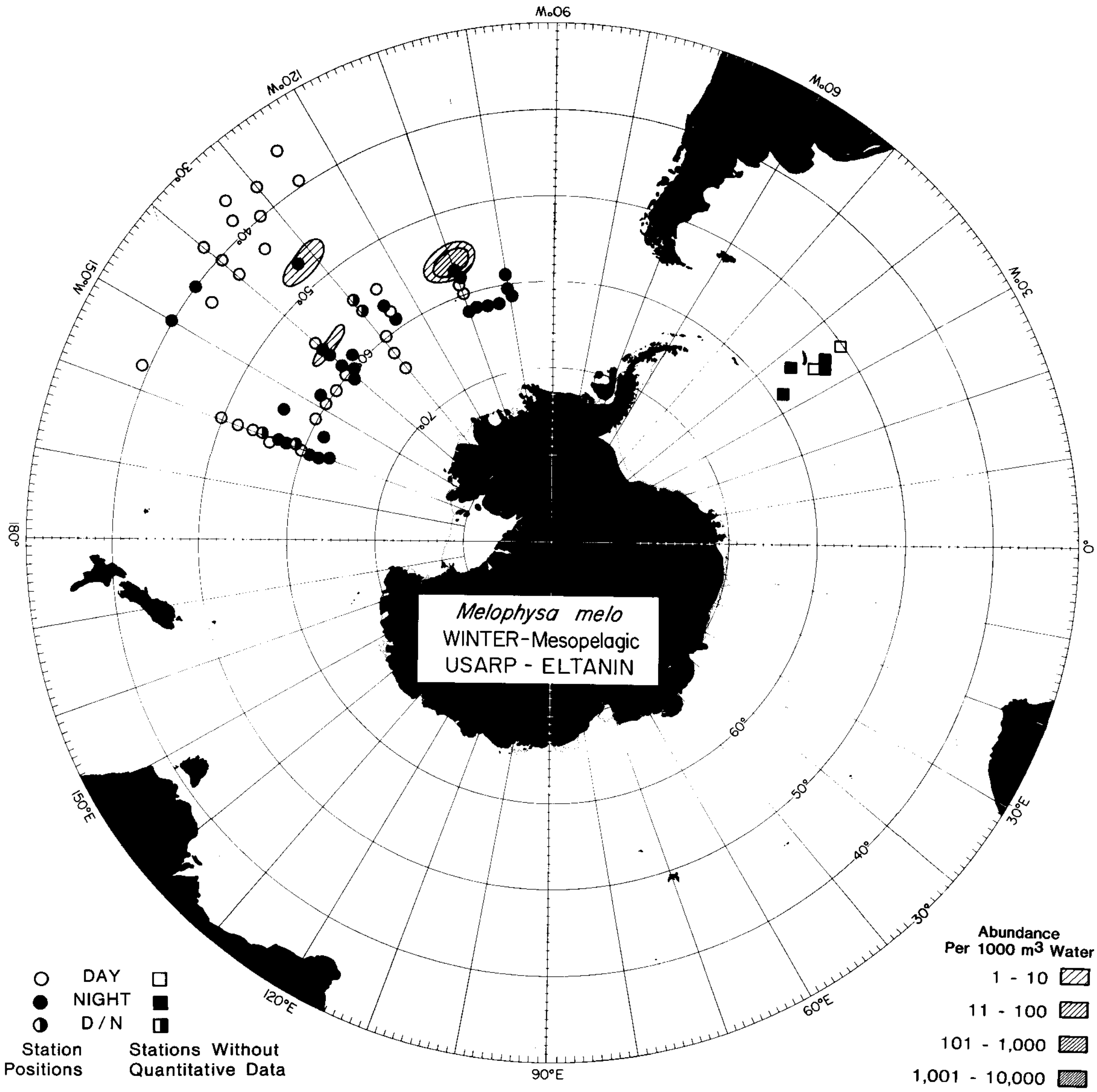
Map A28. The distribution of *Physophora hydrostatica* during the spring in the epipelagic zone.



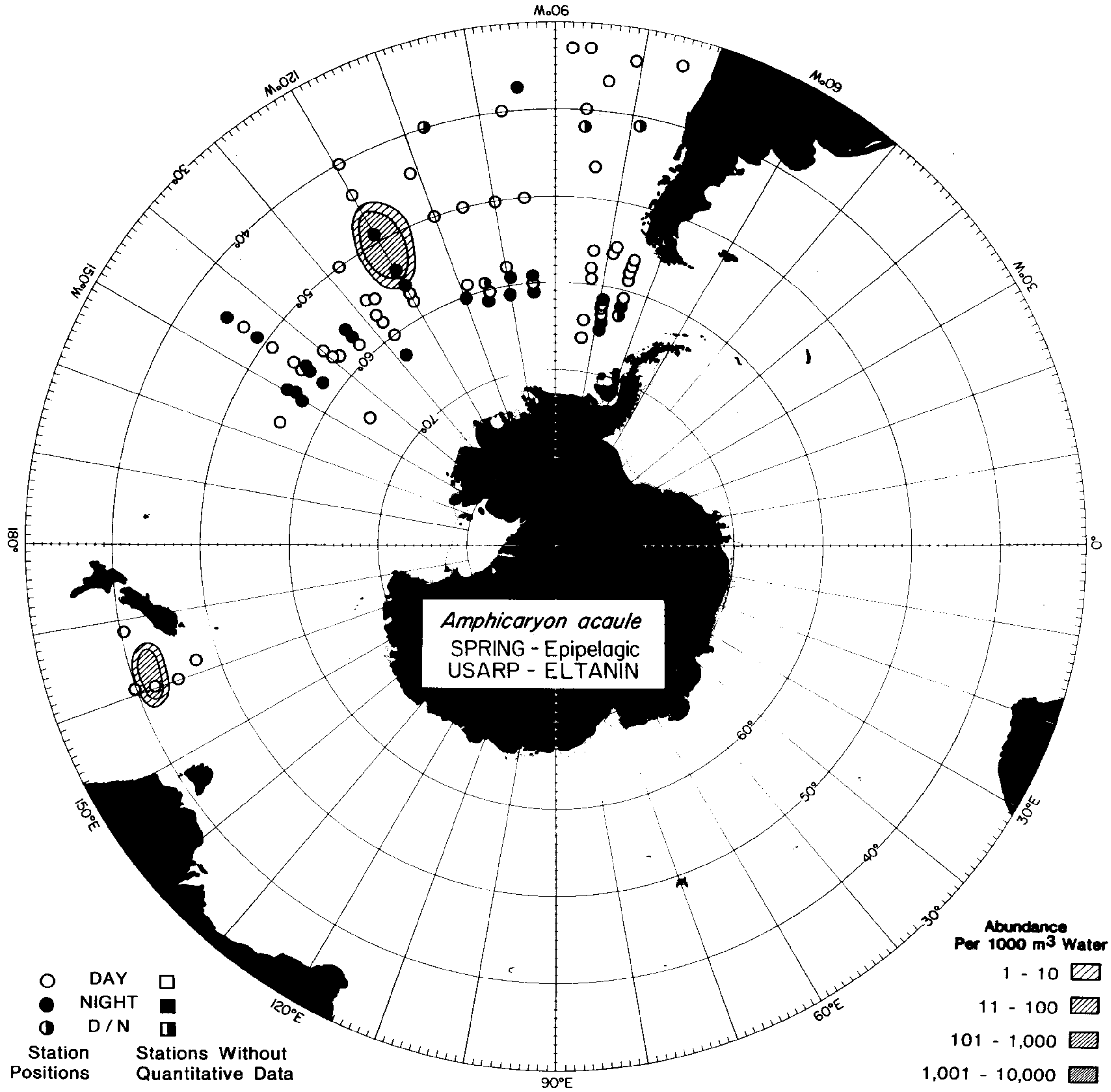
Map A29. The distribution of *Athorybia rosecea* during the spring in the epipelagic zone.



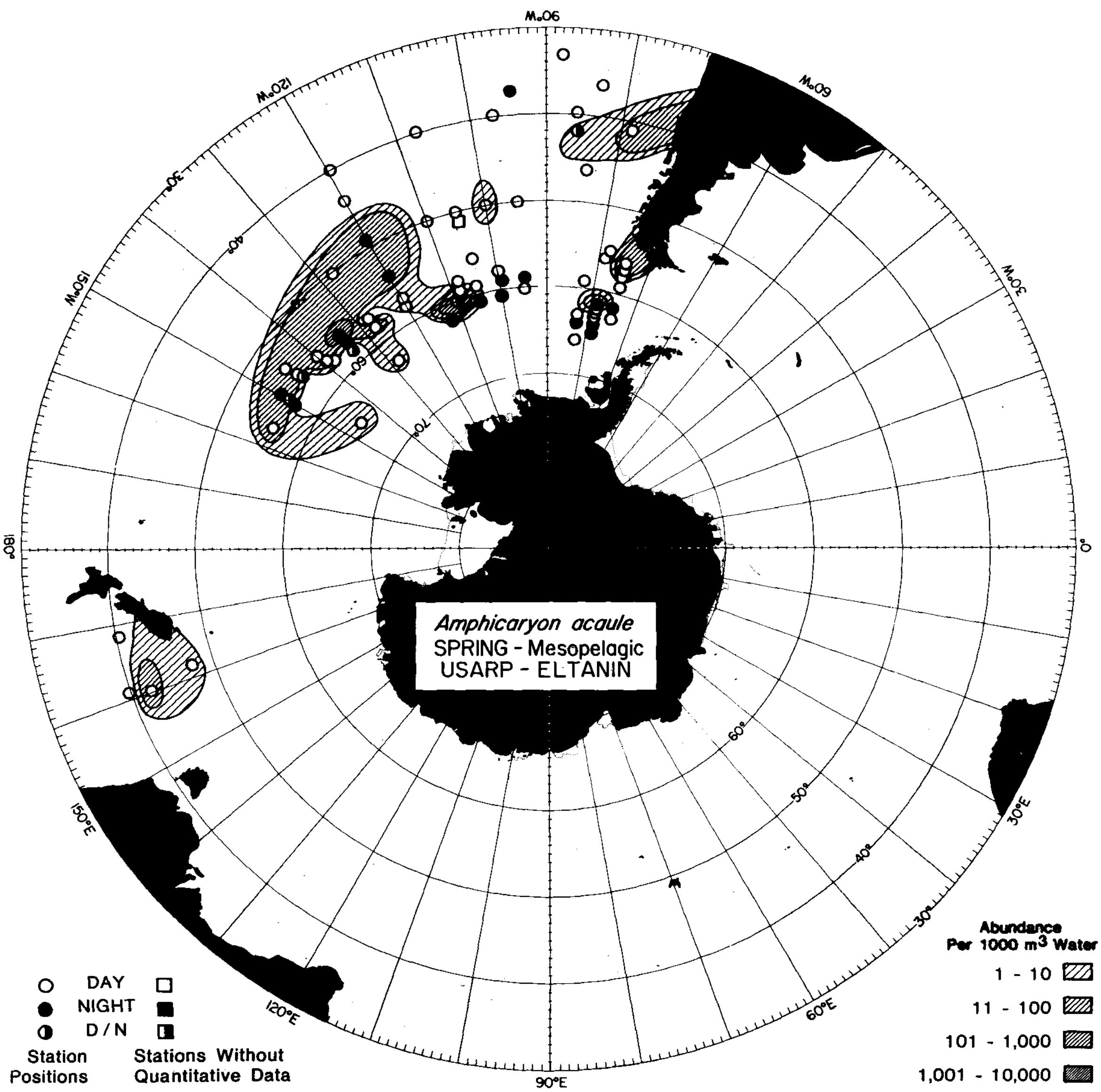
Map A30. The distribution of *Melophysa melo* during the fall in the epipelagic zone.



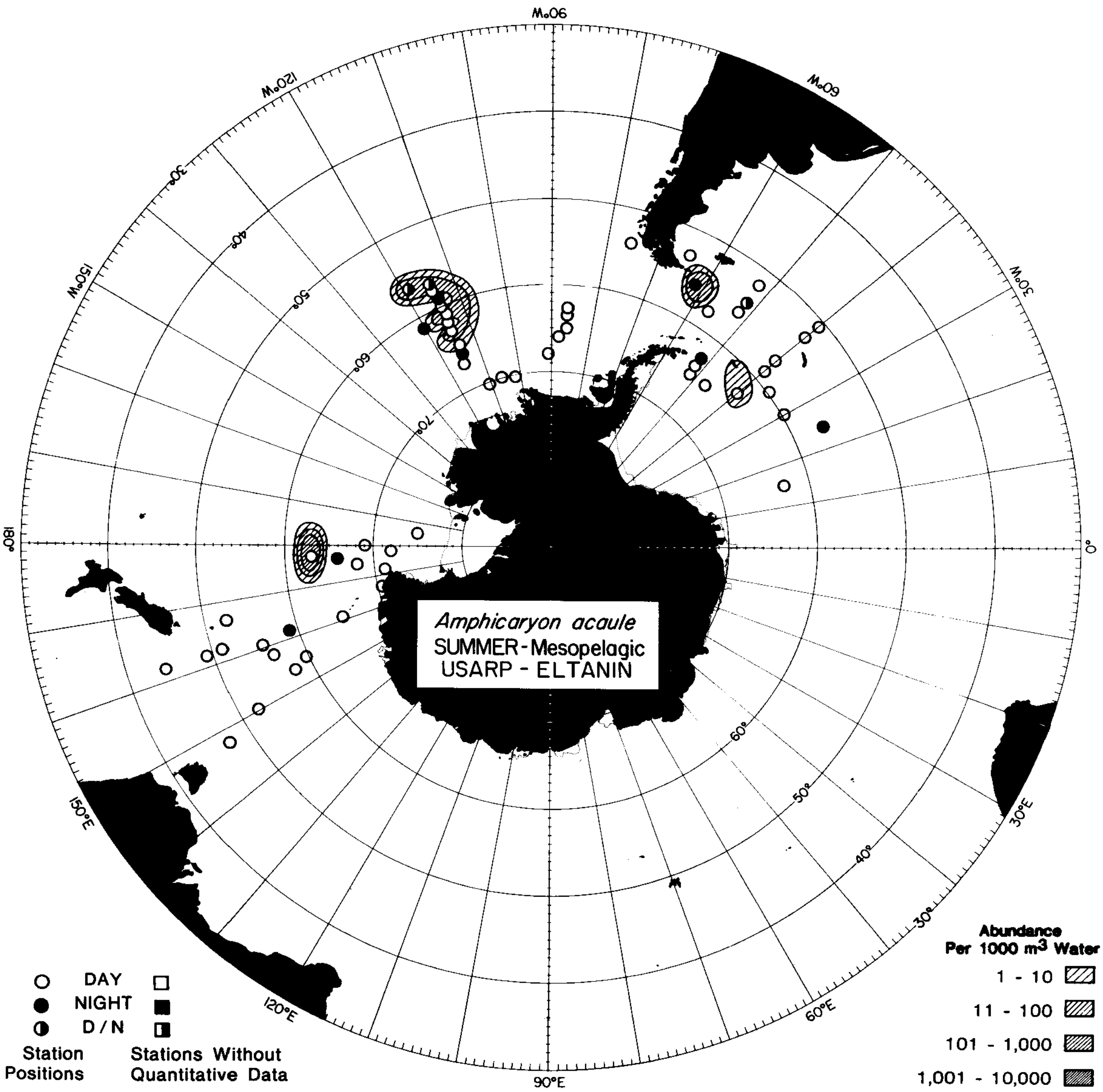
Map A31. The distribution of *Melophysa melo* during the winter in the mesopelagic zone.



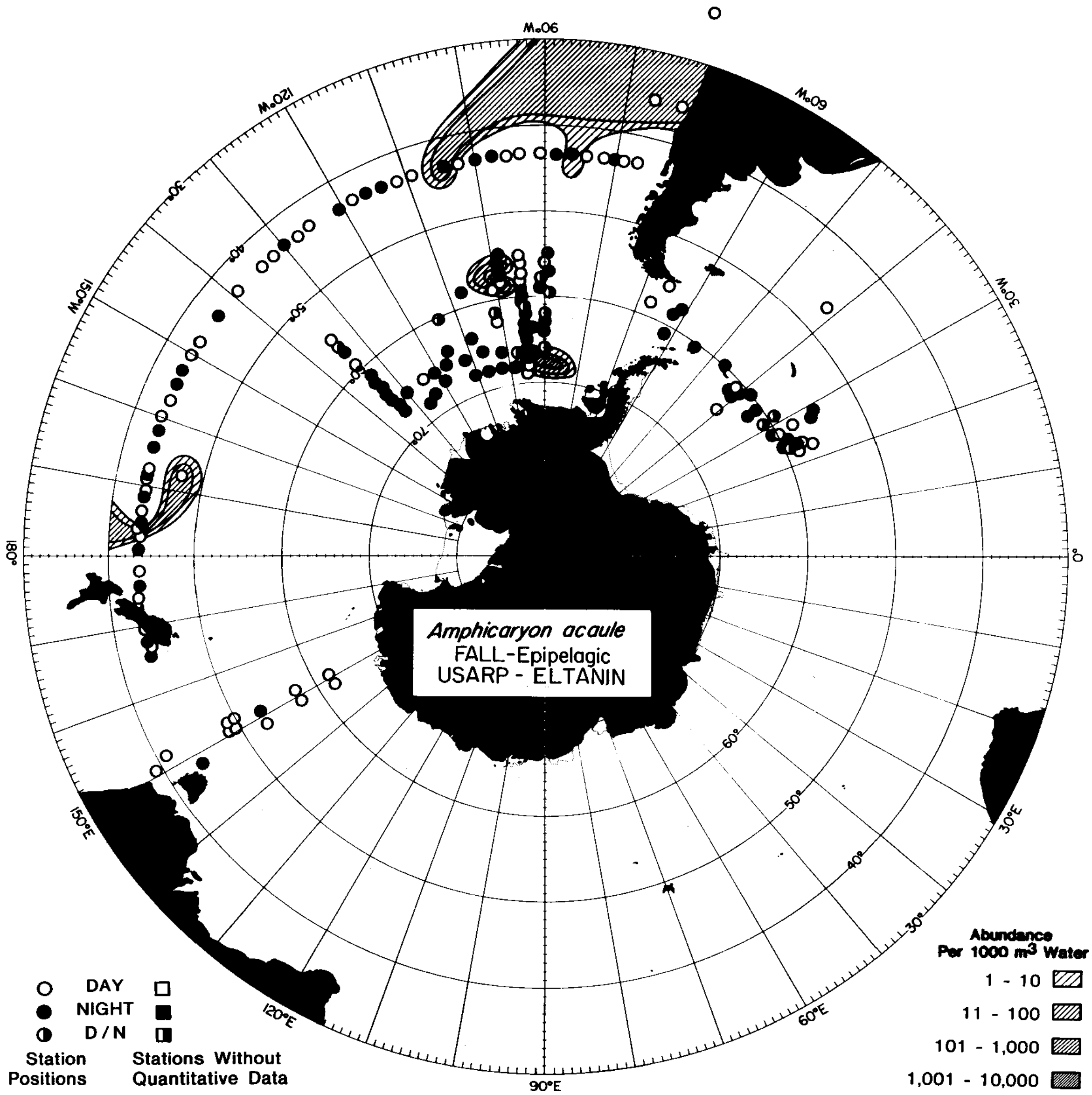
Map A32. The distribution of *Amphicaryon acaule* during the spring in the epipelagic zone.



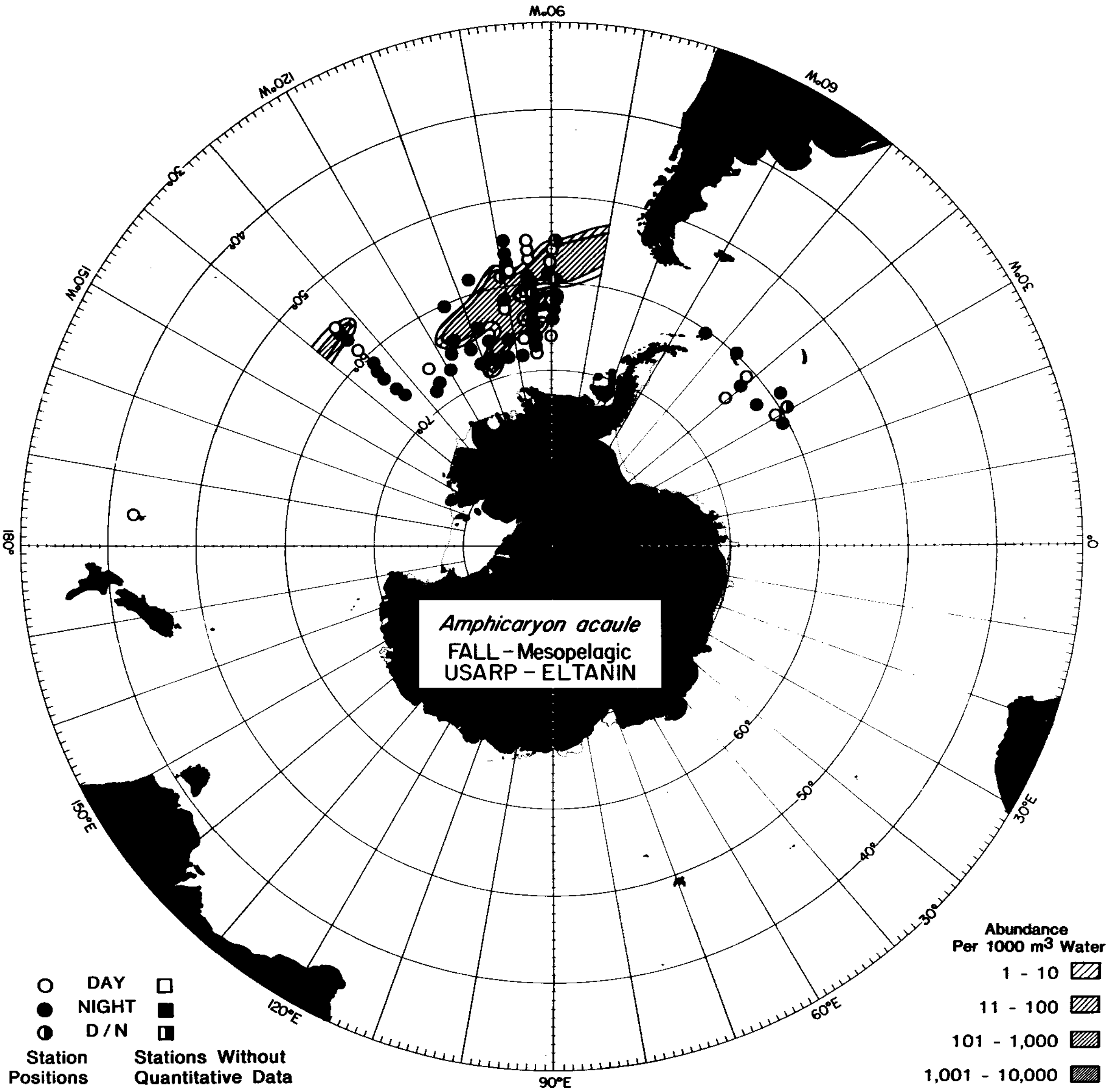
Map A33. The distribution of *Amphicaryon acaule* during the spring in the mesopelagic zone.



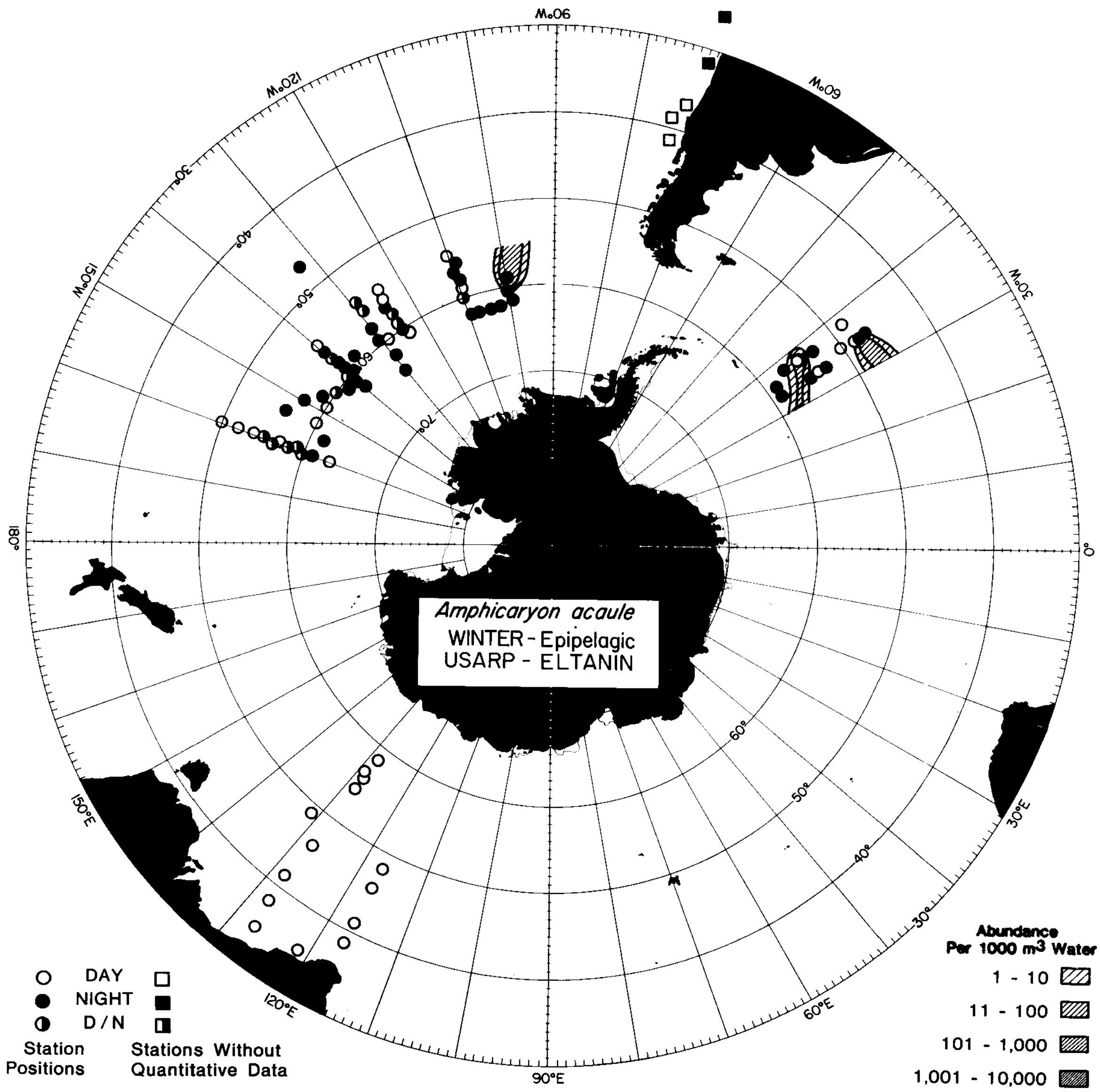
Map A34. The distribution of *Amphicaryon acaule* during the summer in the mesopelagic zone.



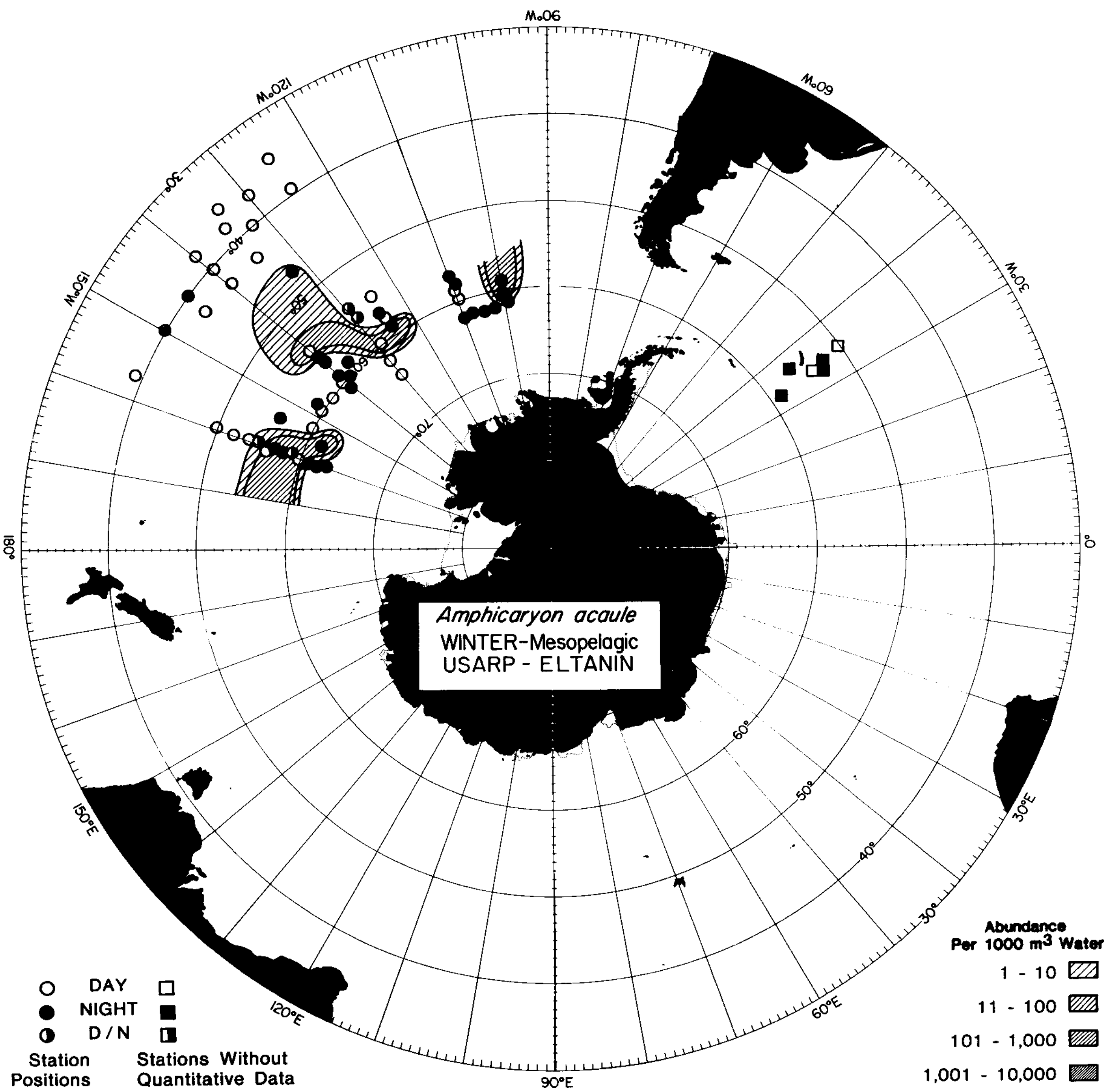
Map A35. The distribution of *Amphicaryon acaule* during the fall in the epipelagic zone.



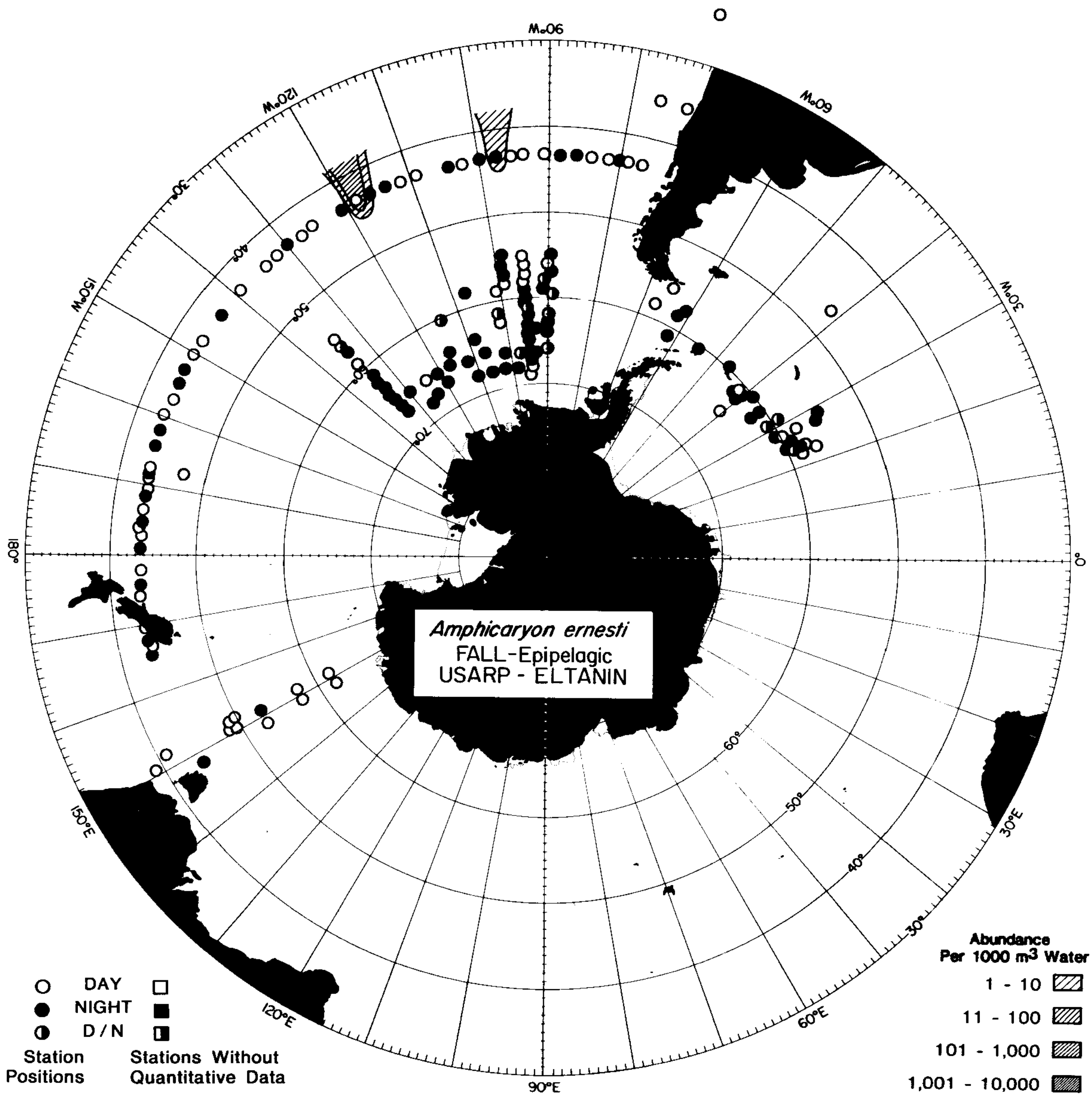
Map A36. The distribution of *Amphicaryon acaule* during the fall in the mesopelagic zone.



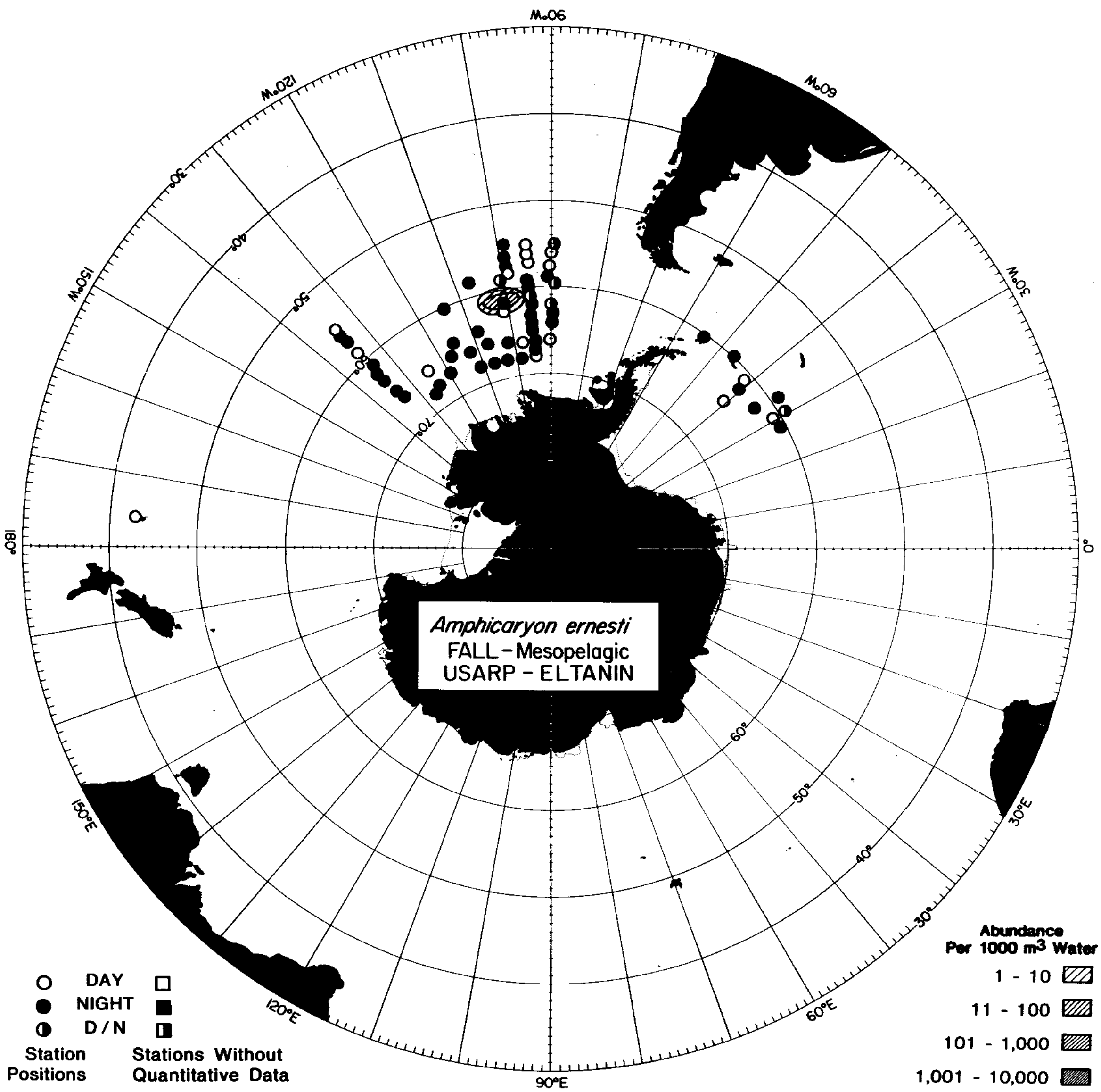
Map A37. The distribution of *Amphicaryon acaule* during the winter in the epipelagic zone.



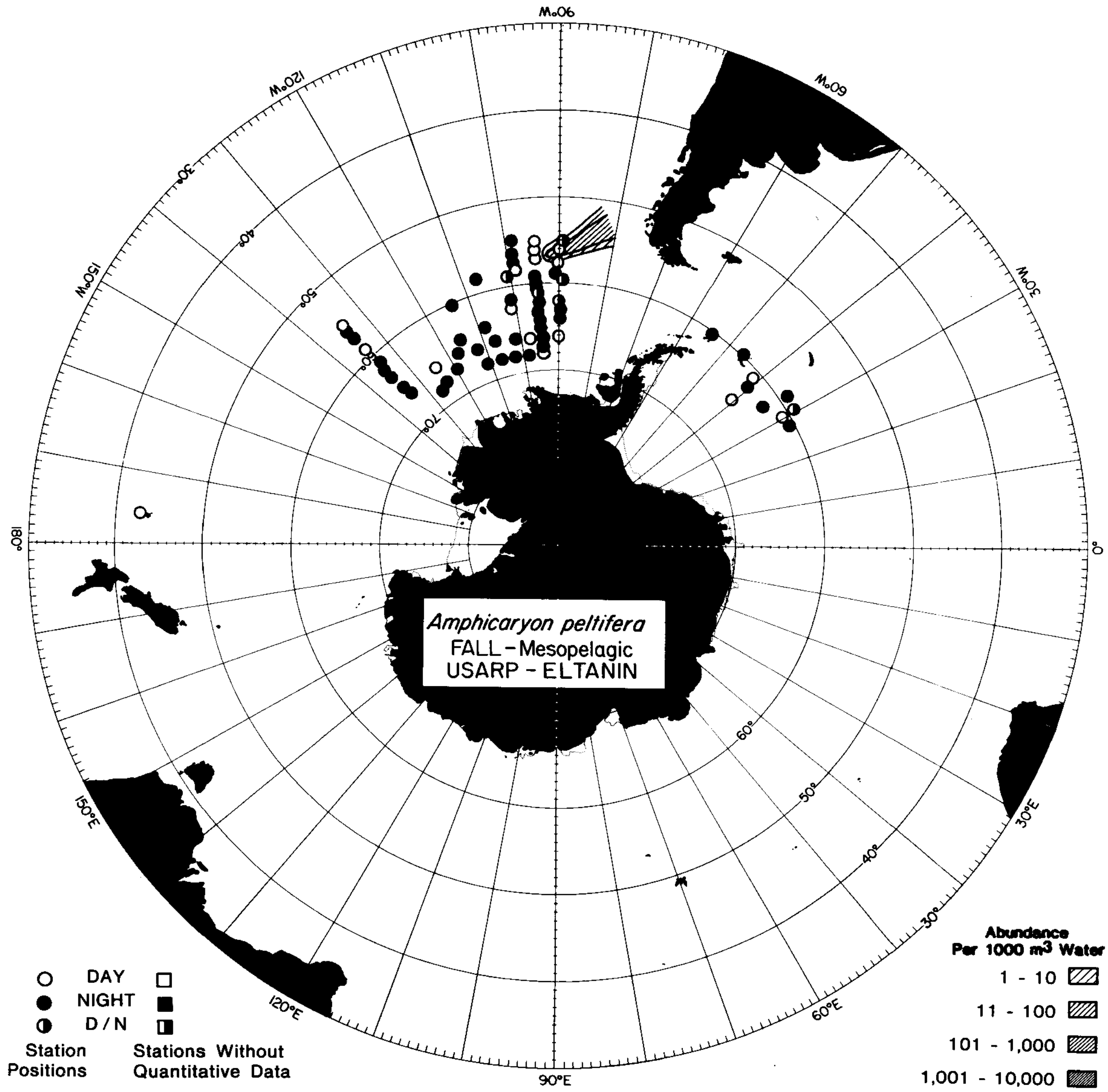
Map A38. The distribution of *Amphicaryon acaule* during the winter in the mesopelagic zone.



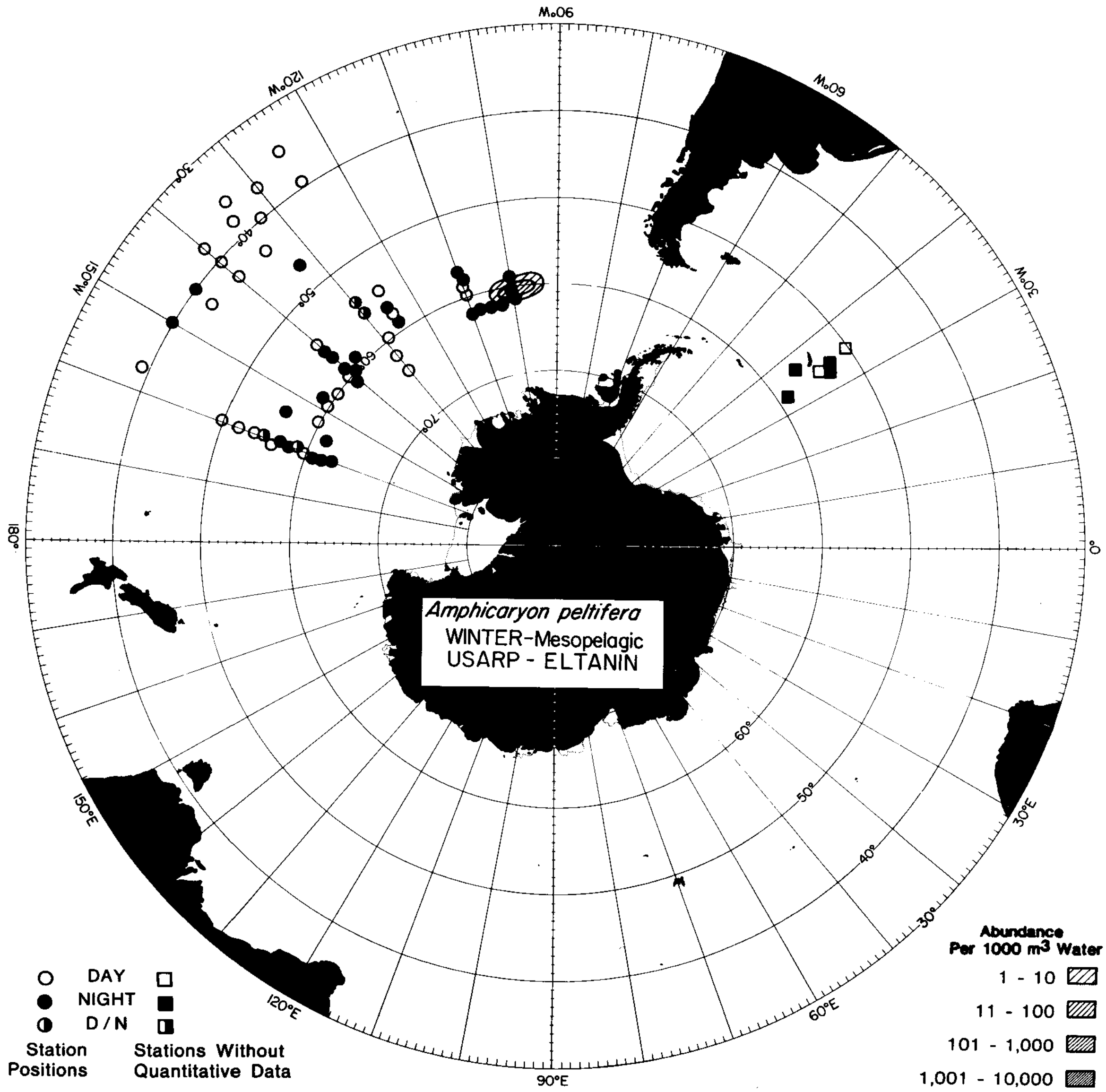
Map A39. The distribution of *Amphicaryon ernesti* during the fall in the epipelagic zone.



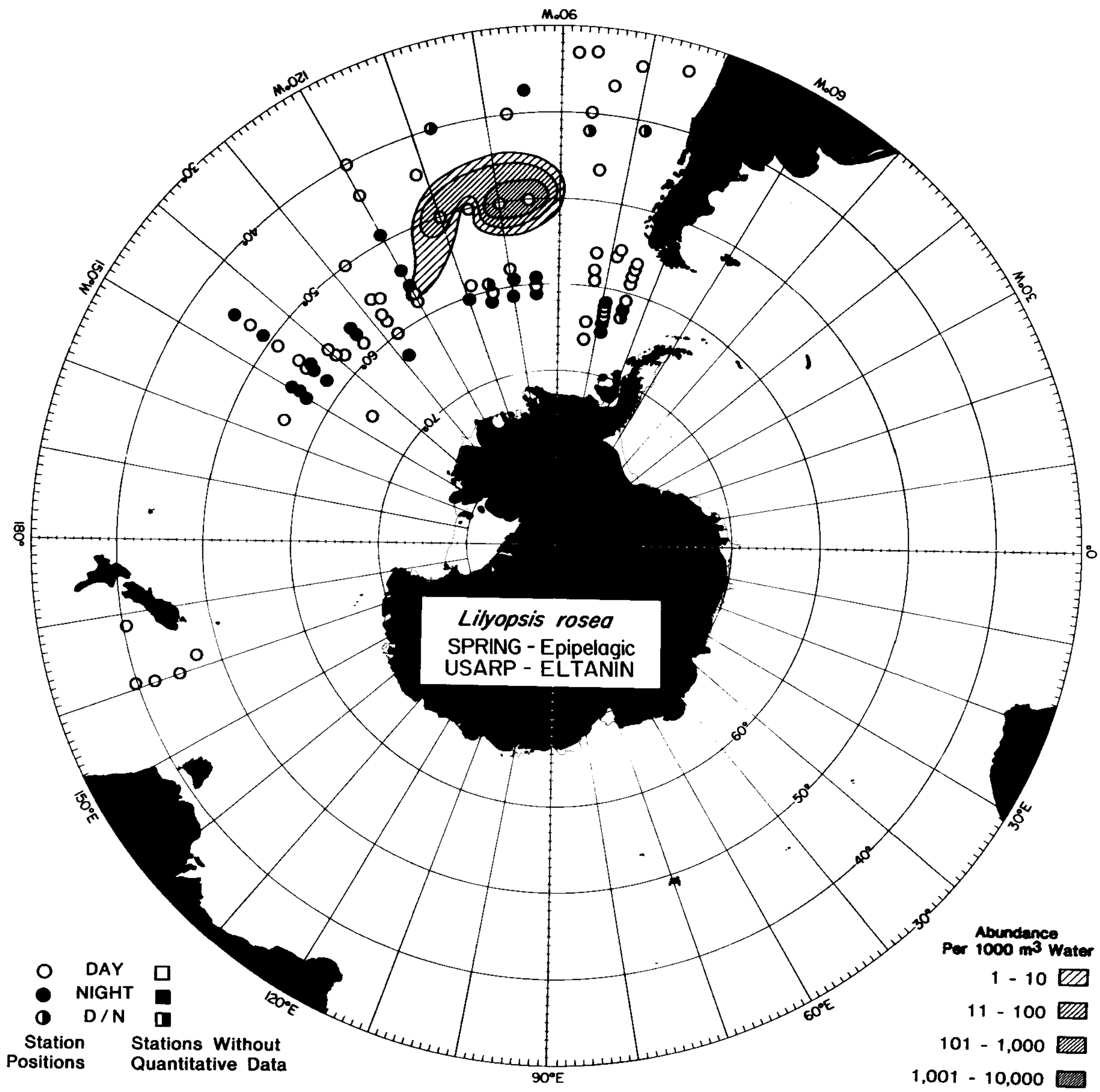
Map A40. The distribution of *Amphicaryon ernesti* during the fall in the mesopelagic zone.



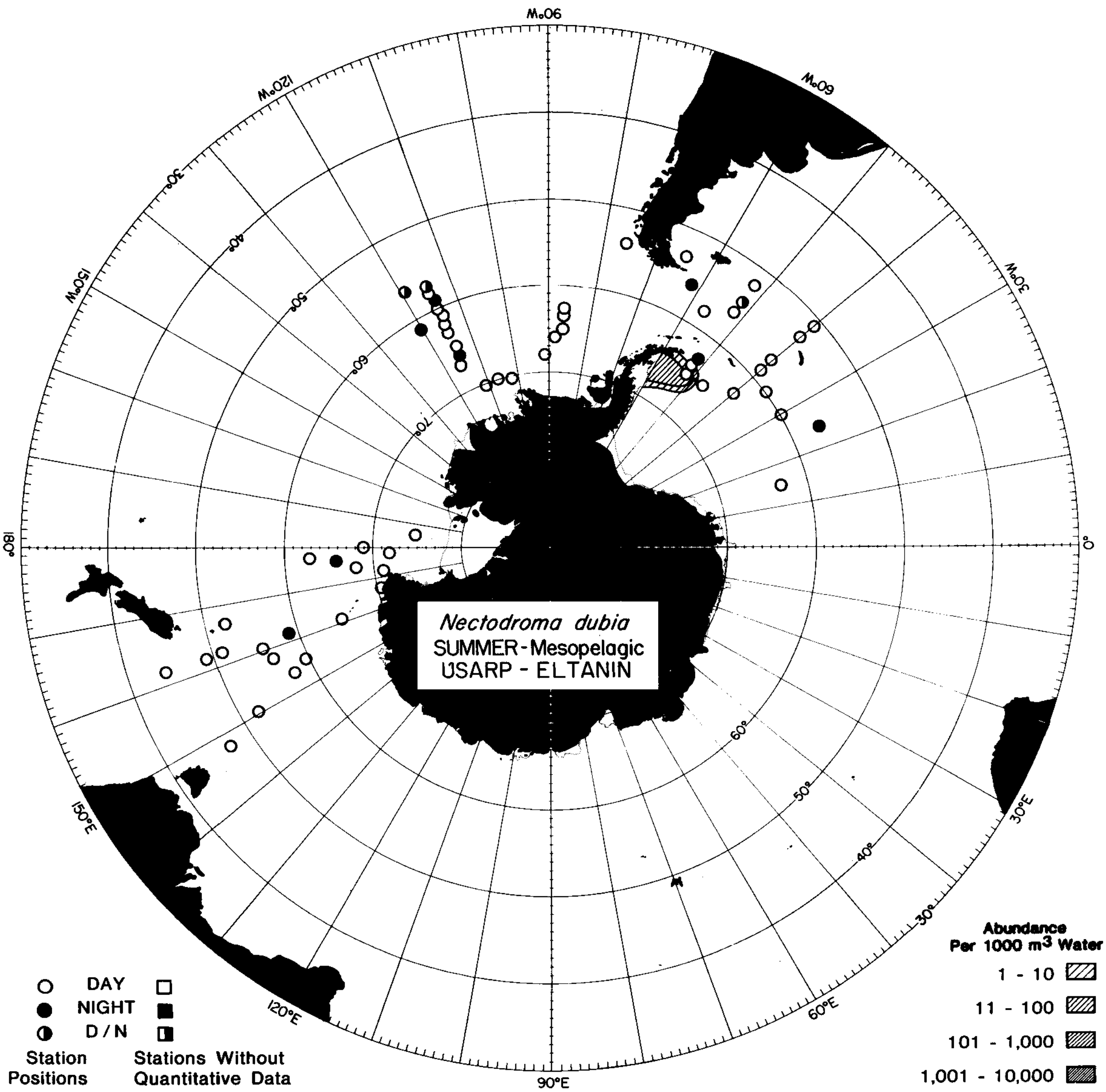
Map A41. The distribution of *Amphicaryon peltifera* during the fall in the mesopelagic zone.



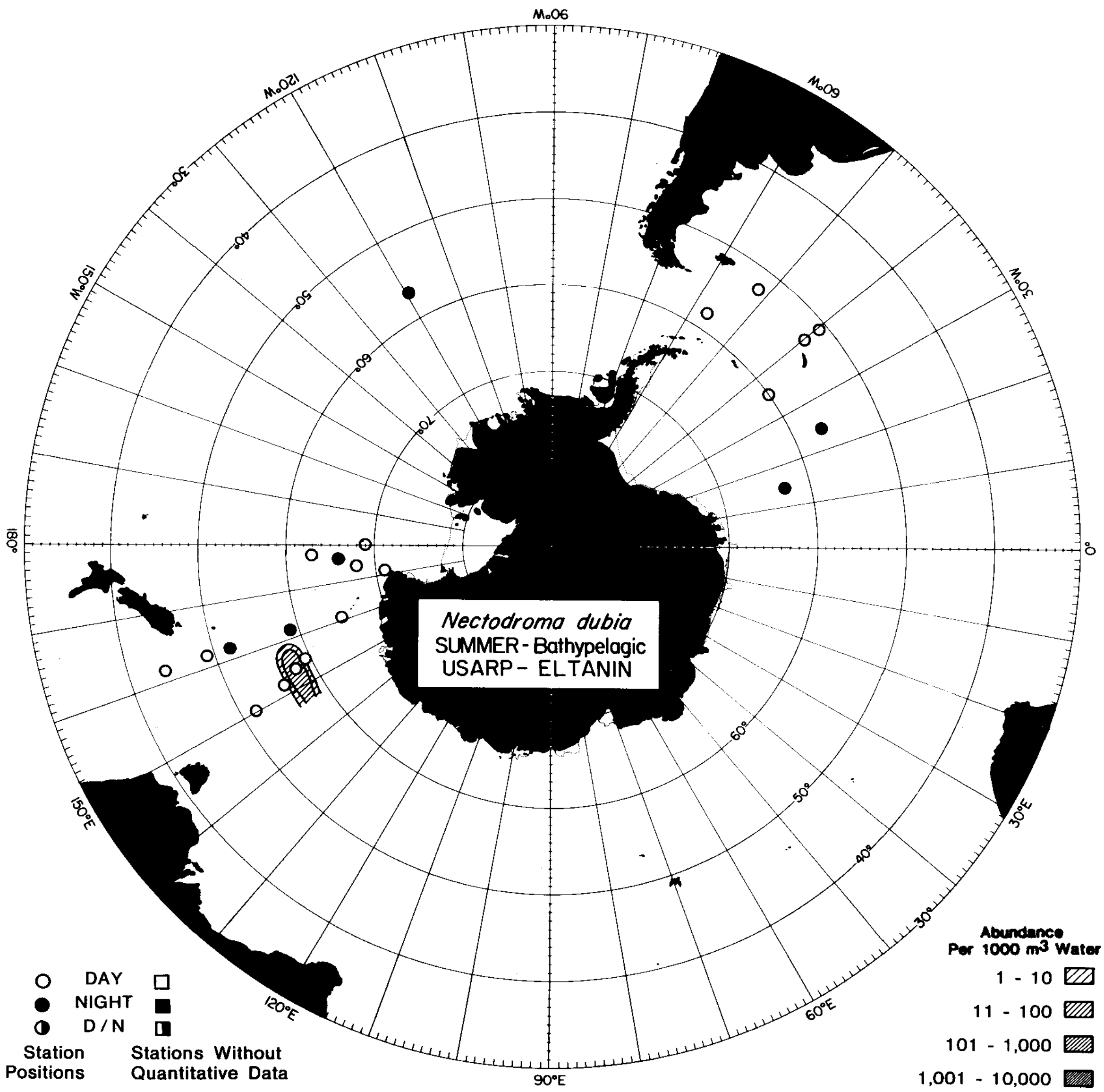
Map A42. The distribution of *Amphicaryon peltifera* during the winter in the mesopelagic zone.



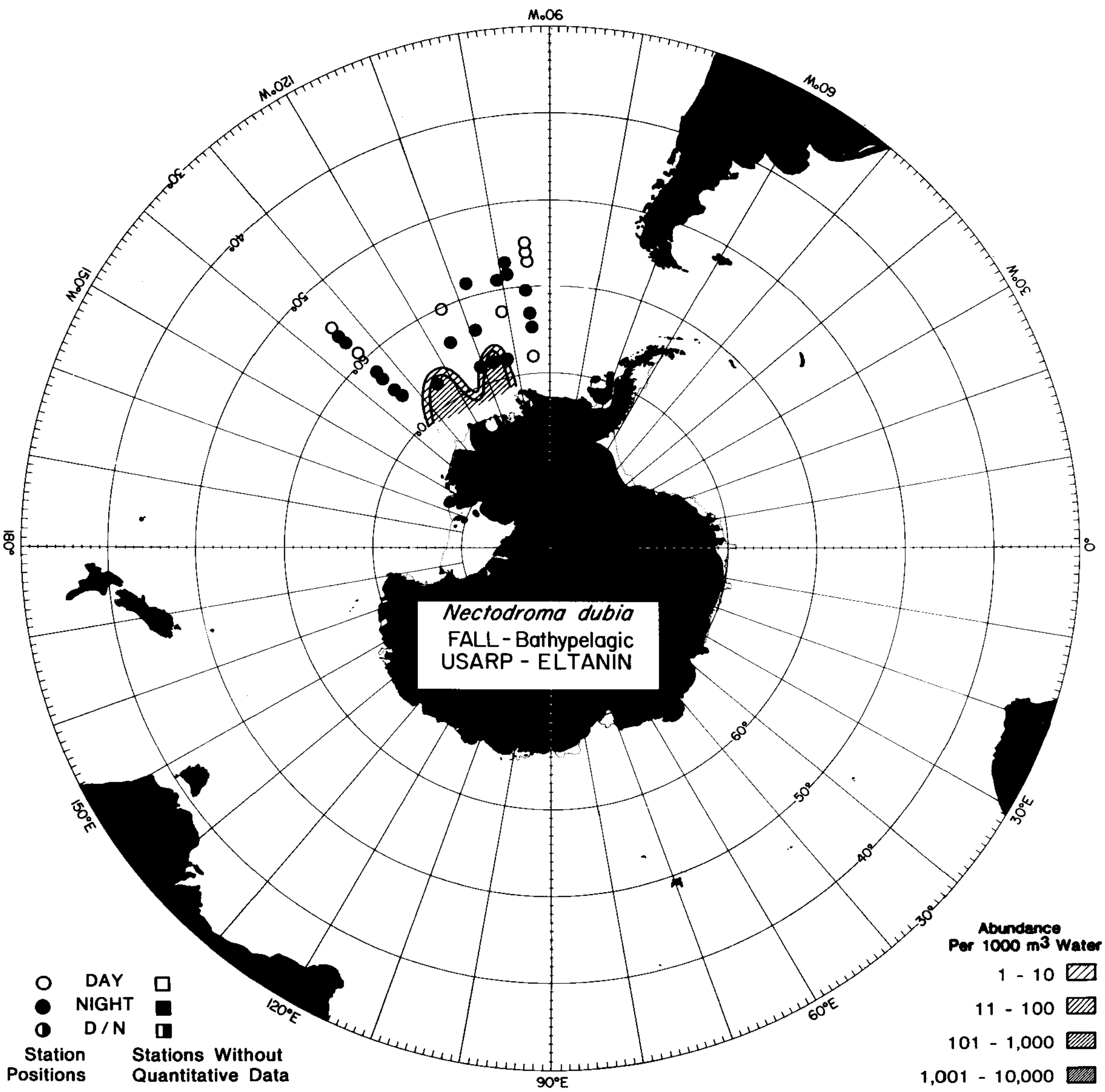
Map A43. The distribution of *Lilyopsis rosea* during the spring in the epipelagic zone.



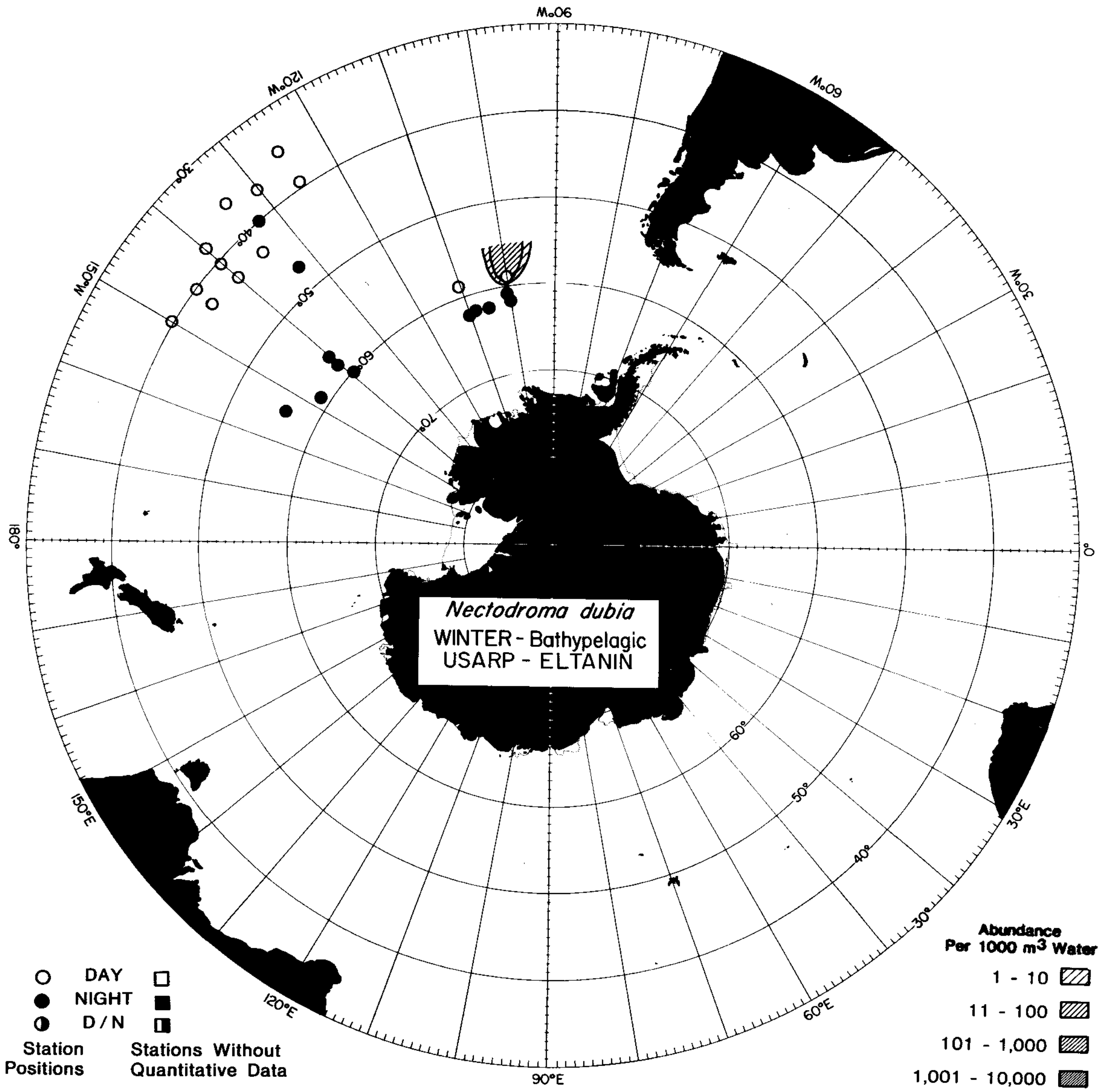
Map A44. The distribution of *Nectodroma dubia* during the summer in the mesopelagic zone.



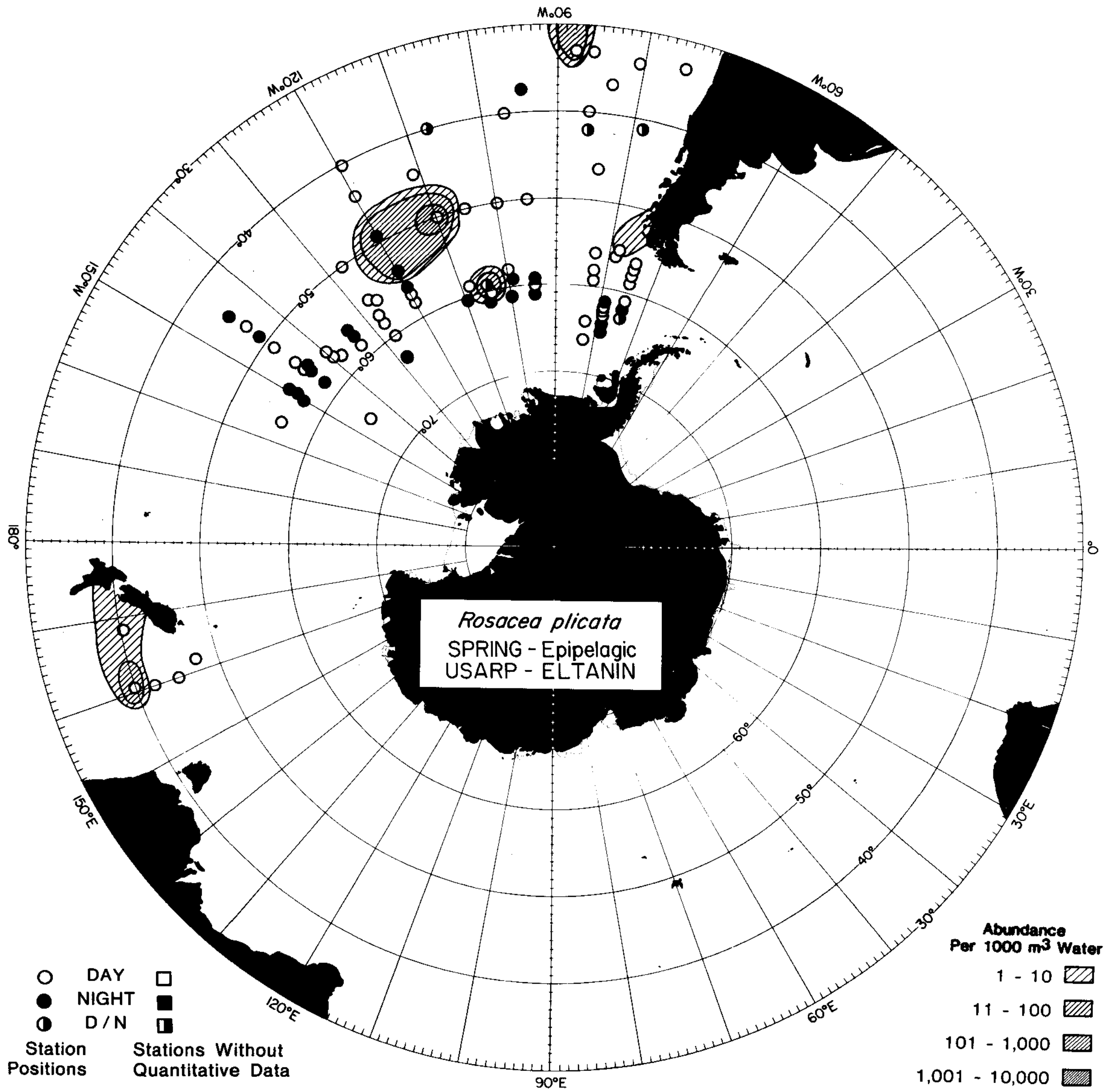
Map A45. The distribution of *Nectodroma dubia* during the summer in the bathypelagic zone.



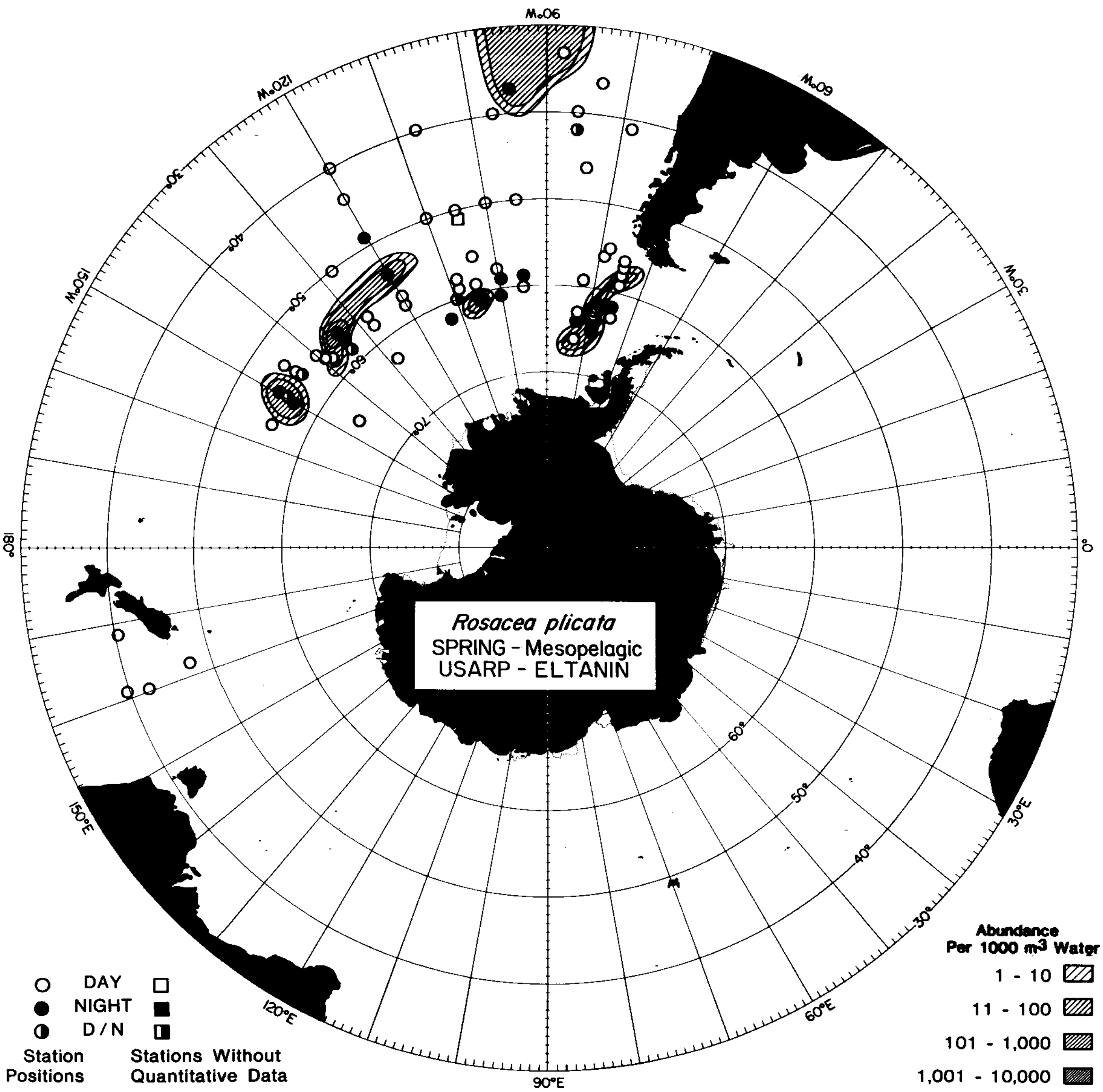
Map A46. The distribution of *Nectodroma dubia* during the fall in the bathypelagic zone.



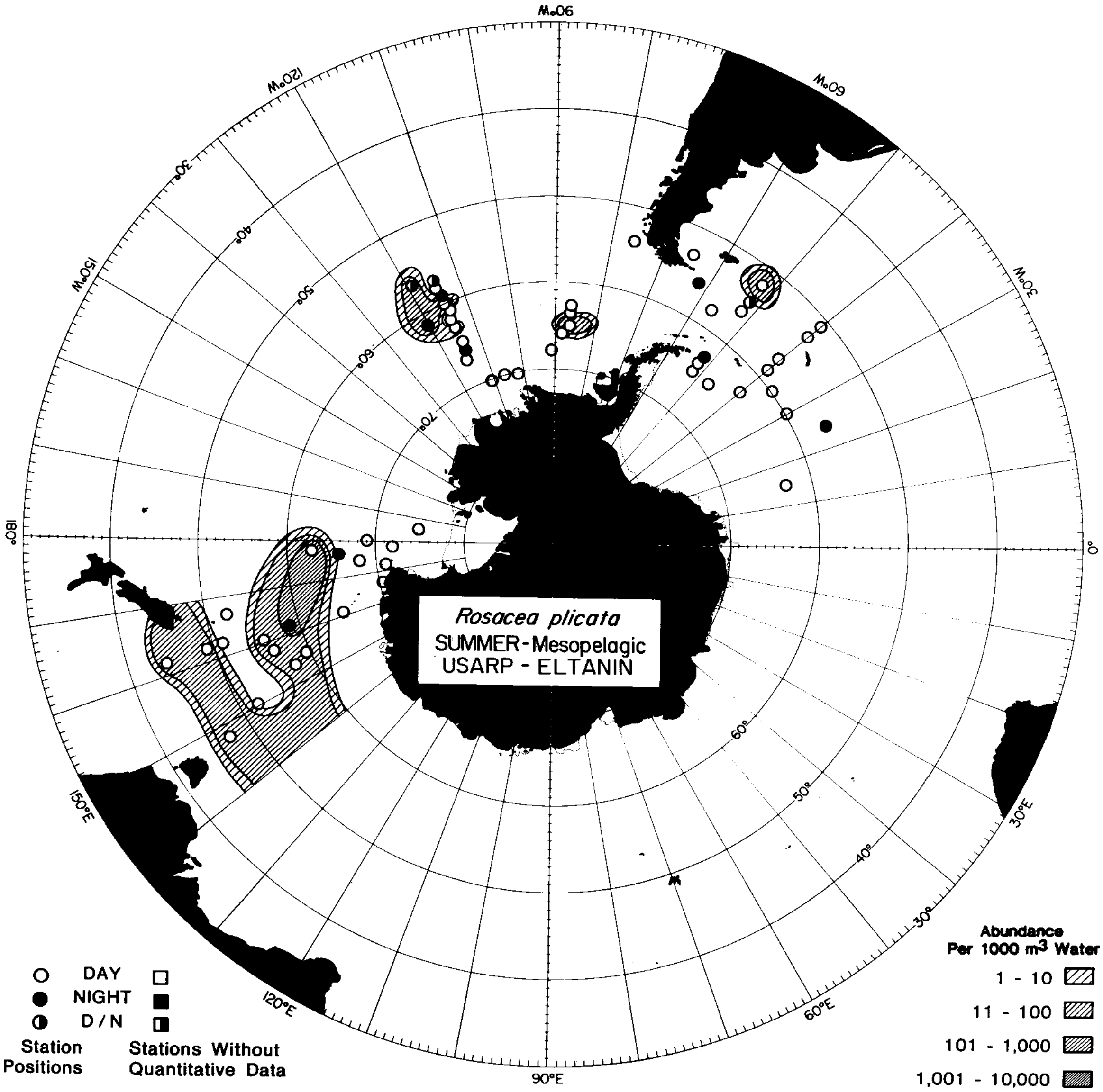
Map A47. The distribution of *Nectodroma dubia* during the winter in the bathypelagic zone.



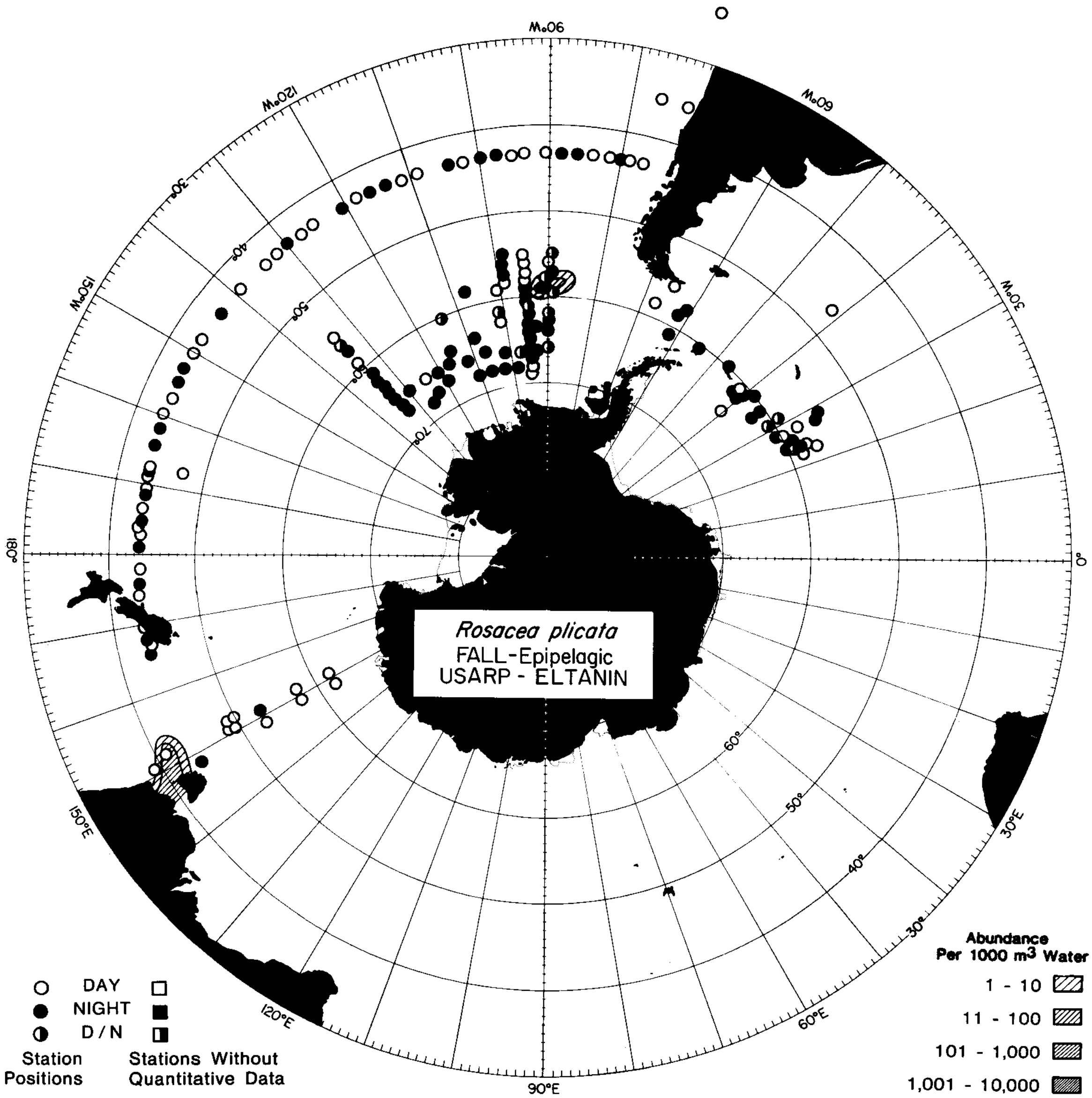
Map A48. The distribution of *Rosacea plicata* during the spring in the epipelagic zone.



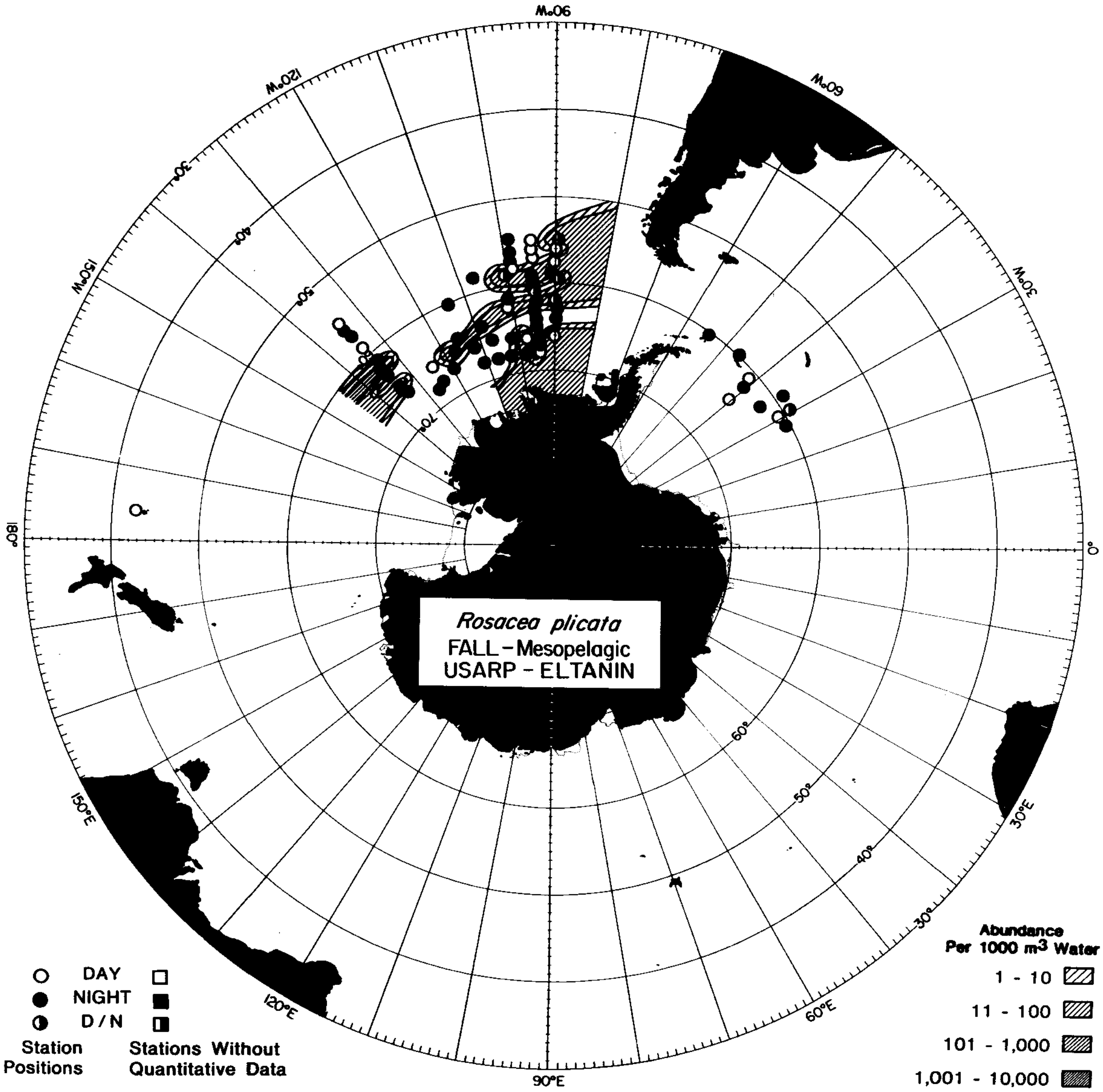
Map A49. The distribution of *Rosacea plicata* during the spring in the mesopelagic zone.



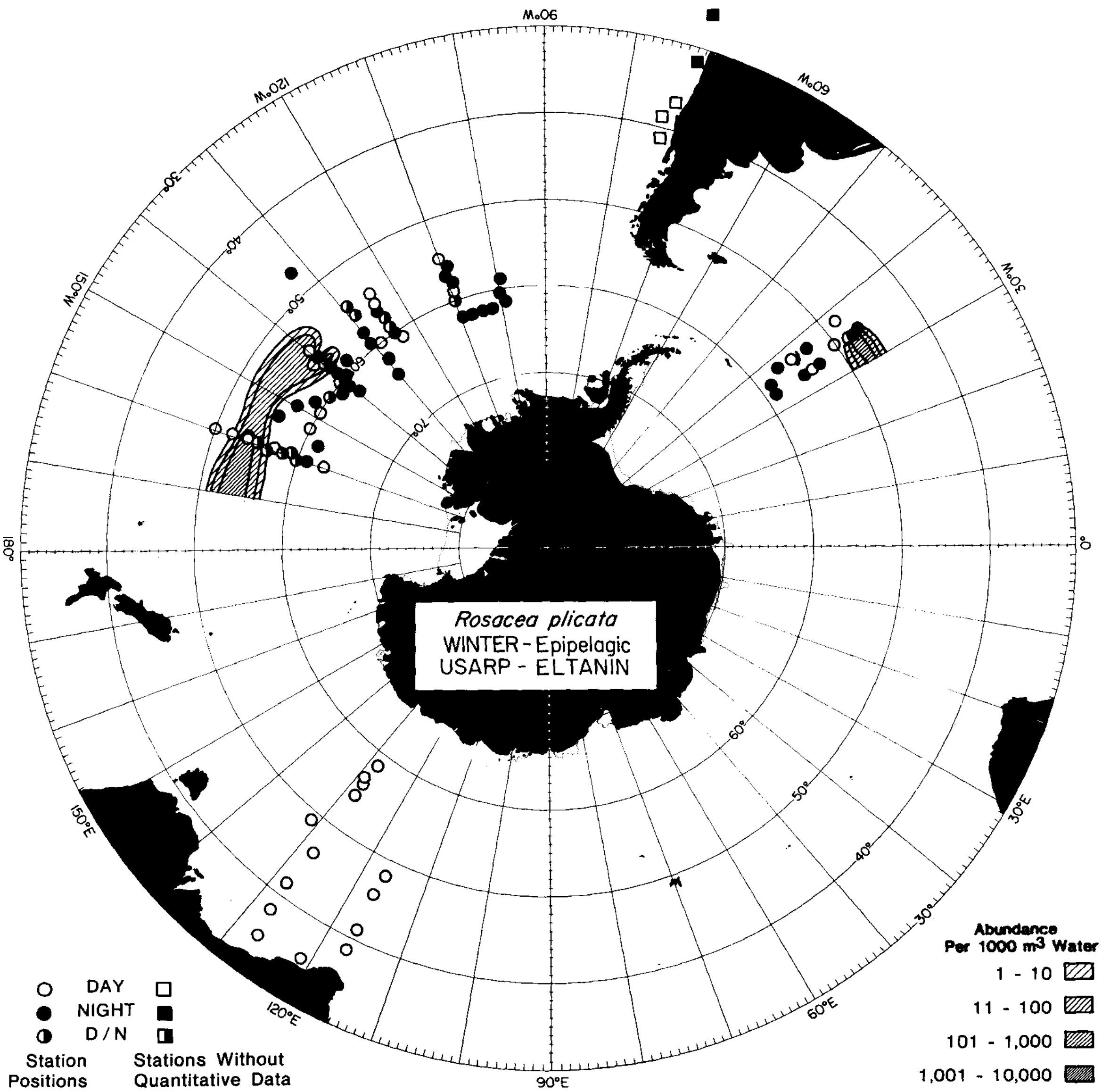
Map A50. The distribution of *Rosacea plicata* during the summer in the mesopelagic zone.



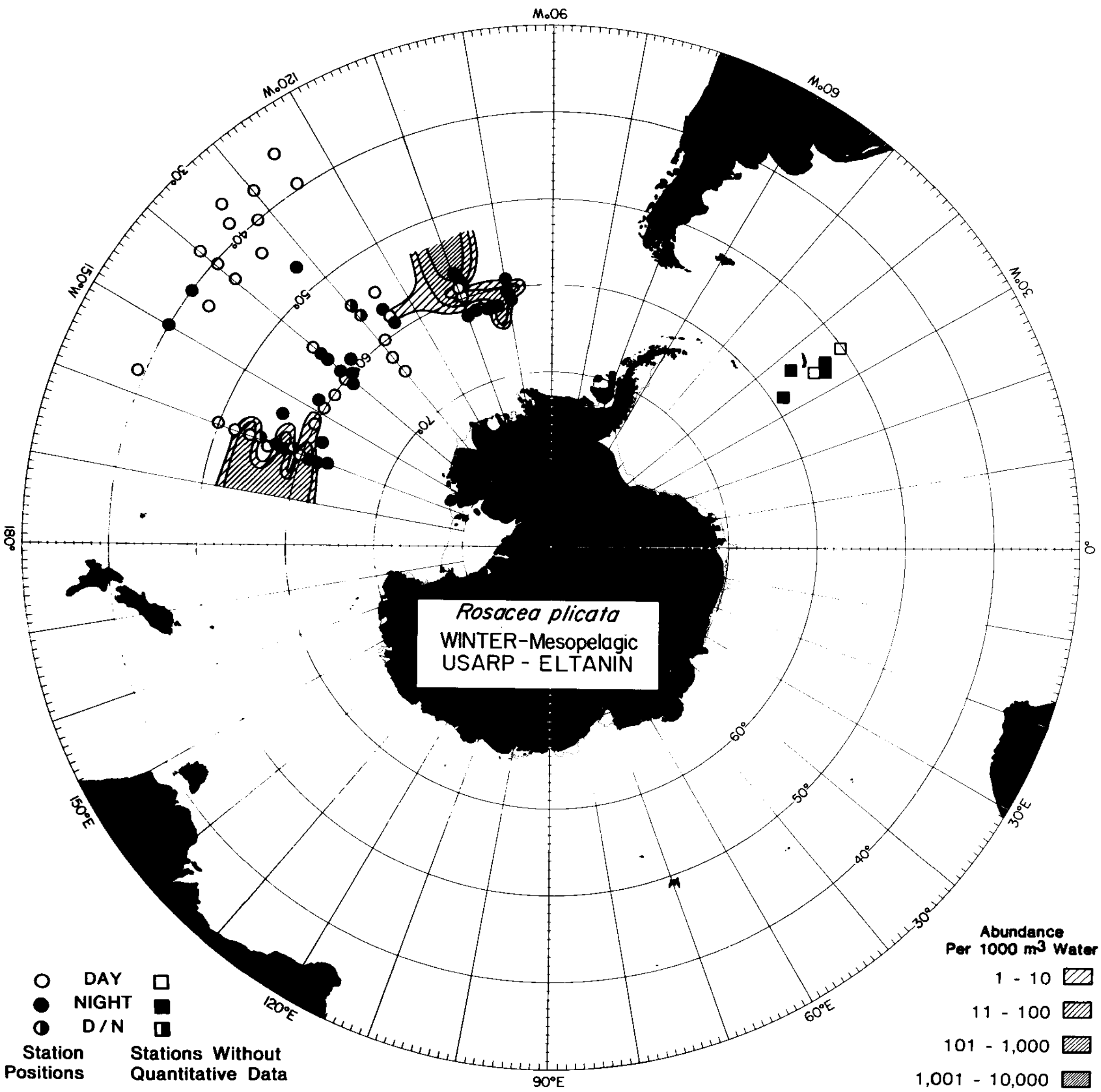
Map A51. The distribution of *Rosacea plicata* during the fall in the epipelagic zone.



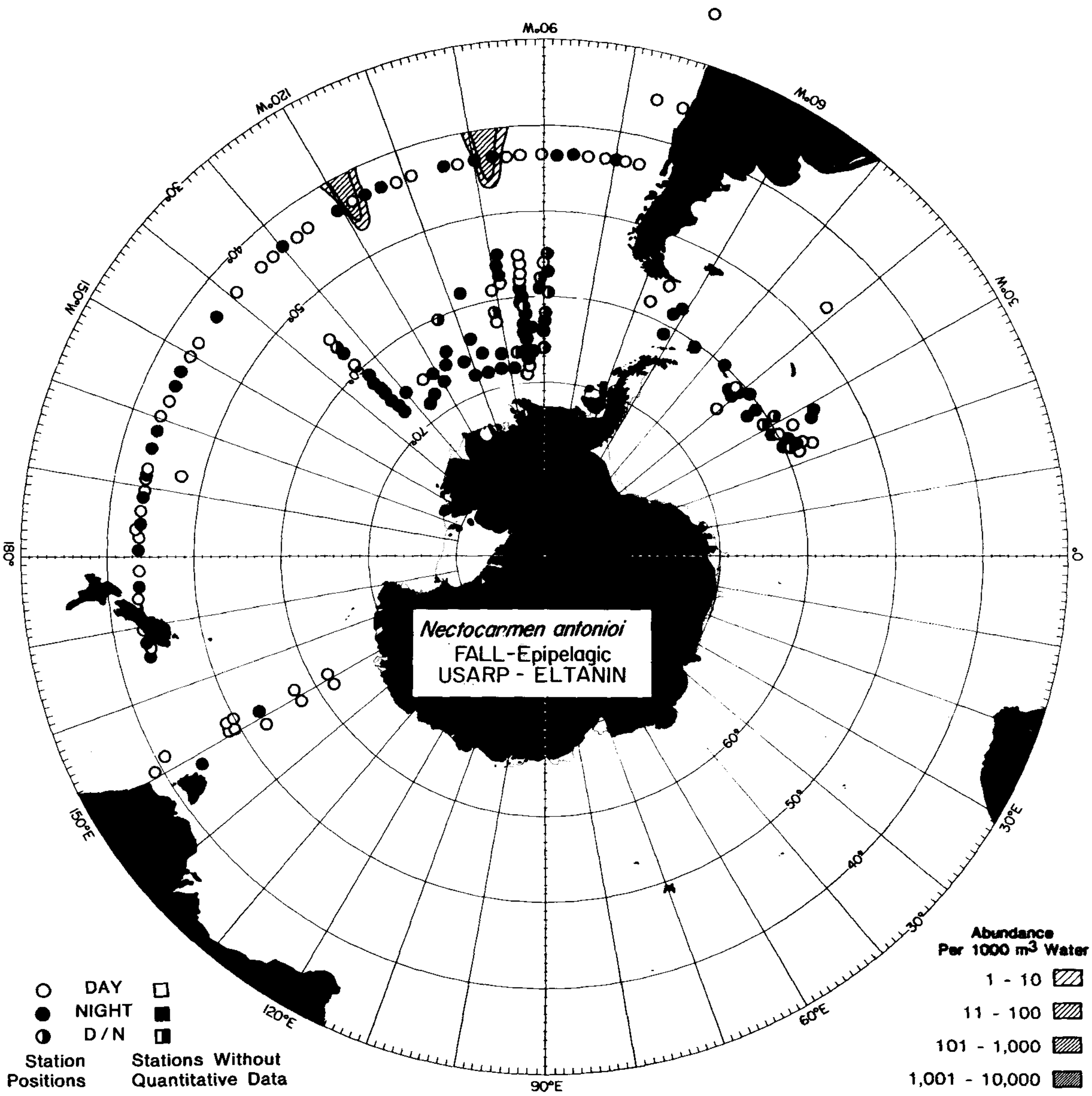
Map A52. The distribution of *Rosacea plicata* during the fall in the mesopelagic zone.



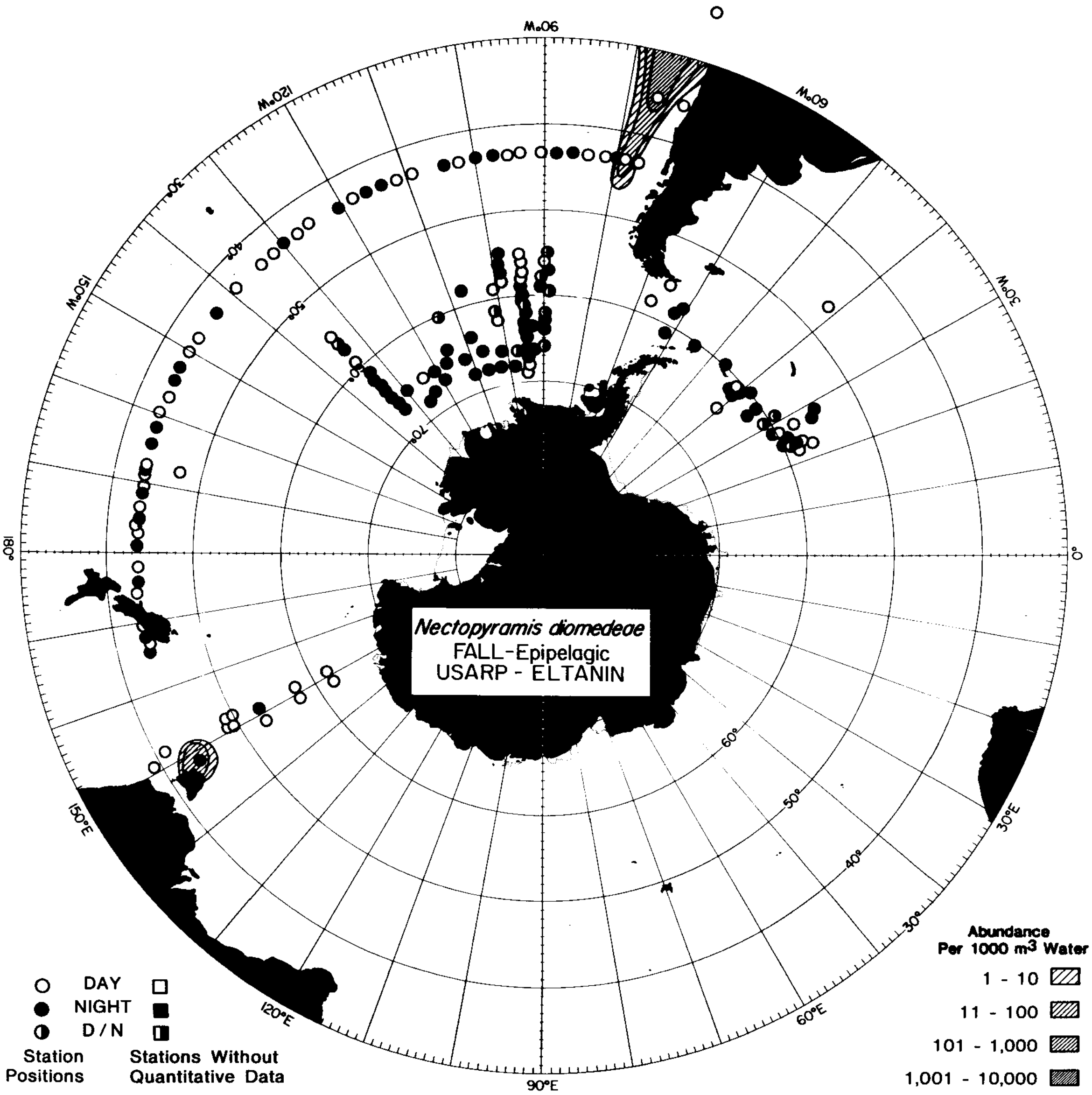
Map A53. The distribution of *Rosacea plicata* during the winter in the epipelagic zone.



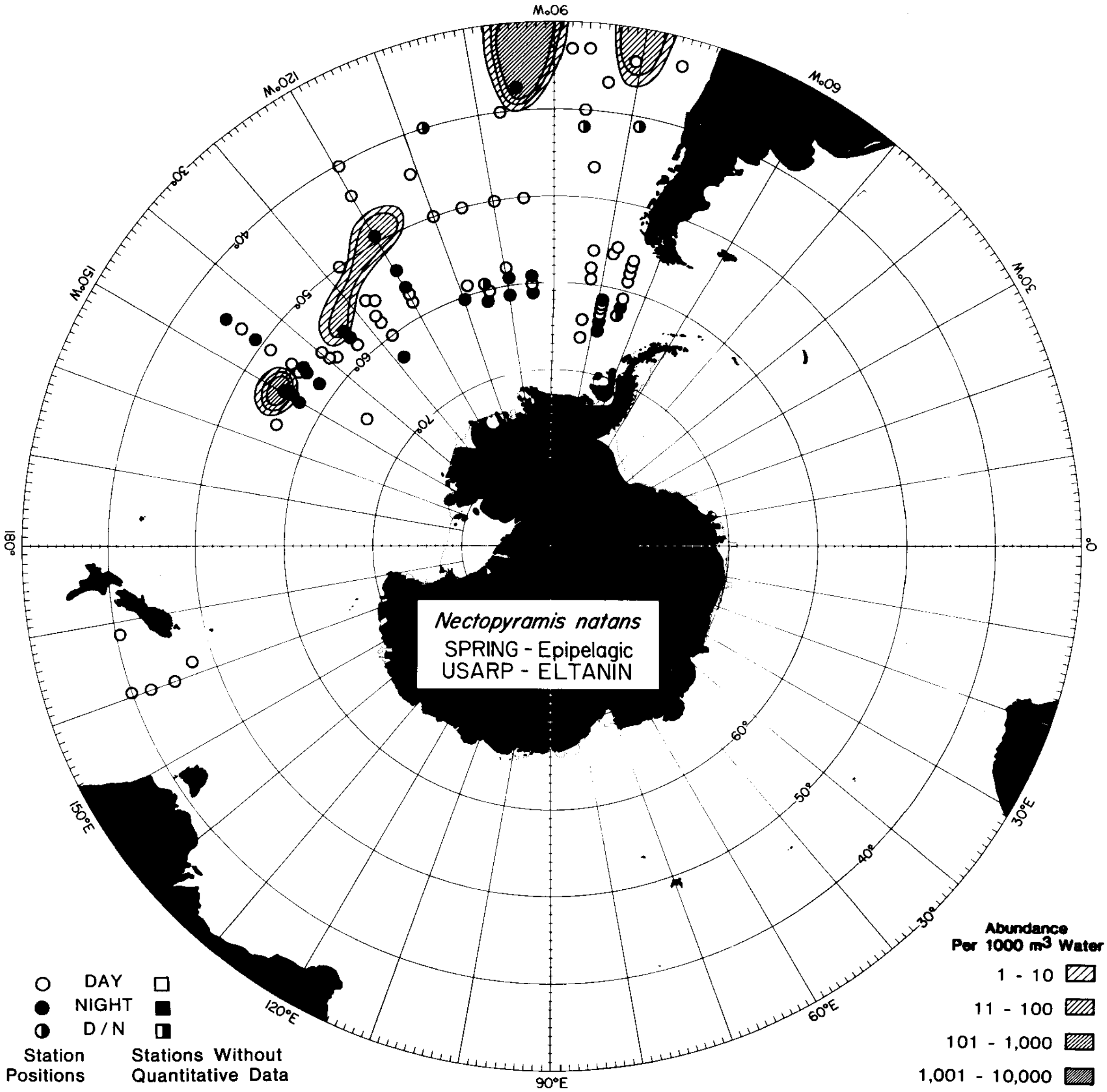
Map A54. The distribution of *Rosacea plicata* during the winter in the mesopelagic zone.



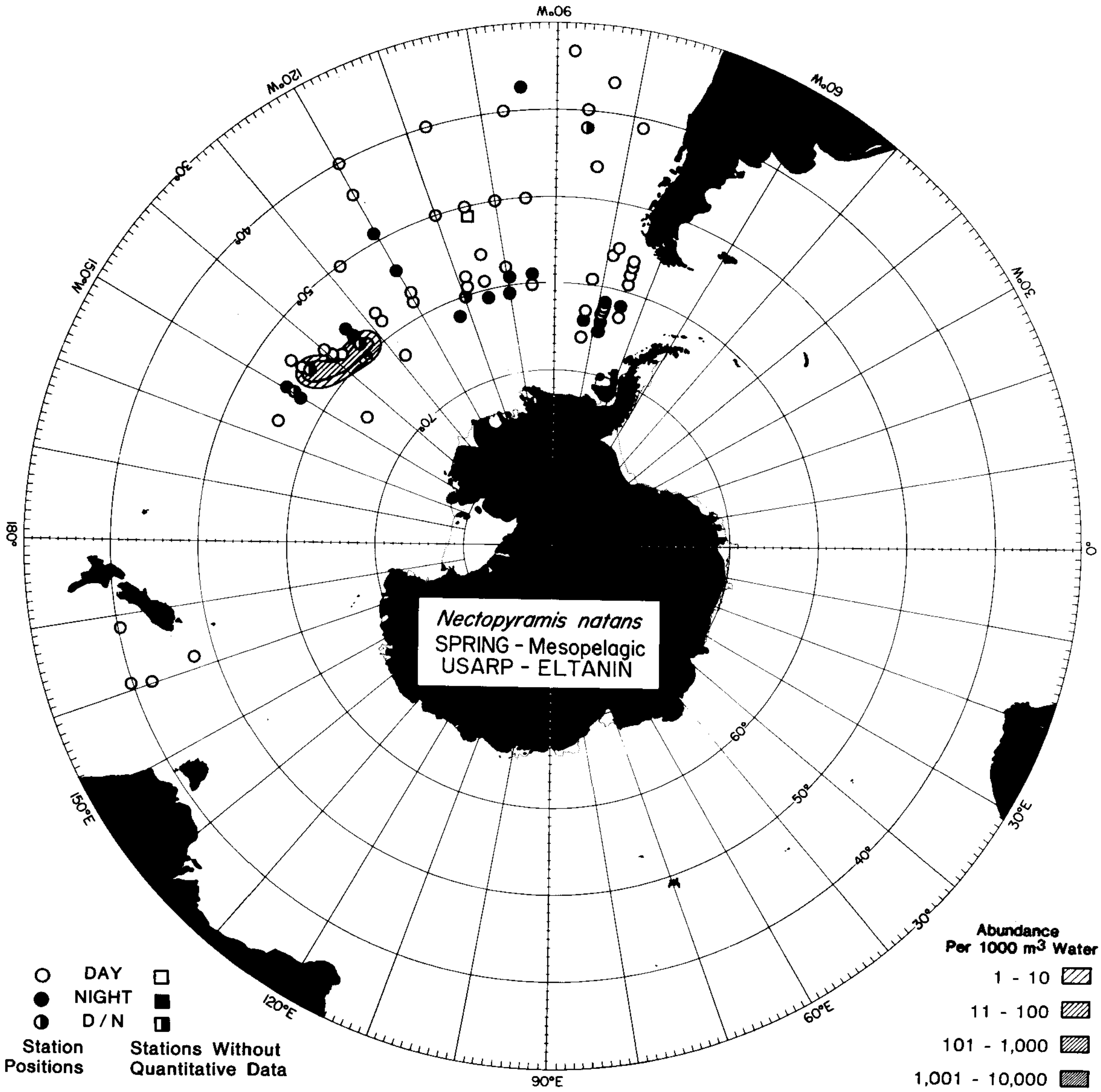
Map A55. The distribution of *Nectocarmen antonioi* during the fall in the epipelagic zone.



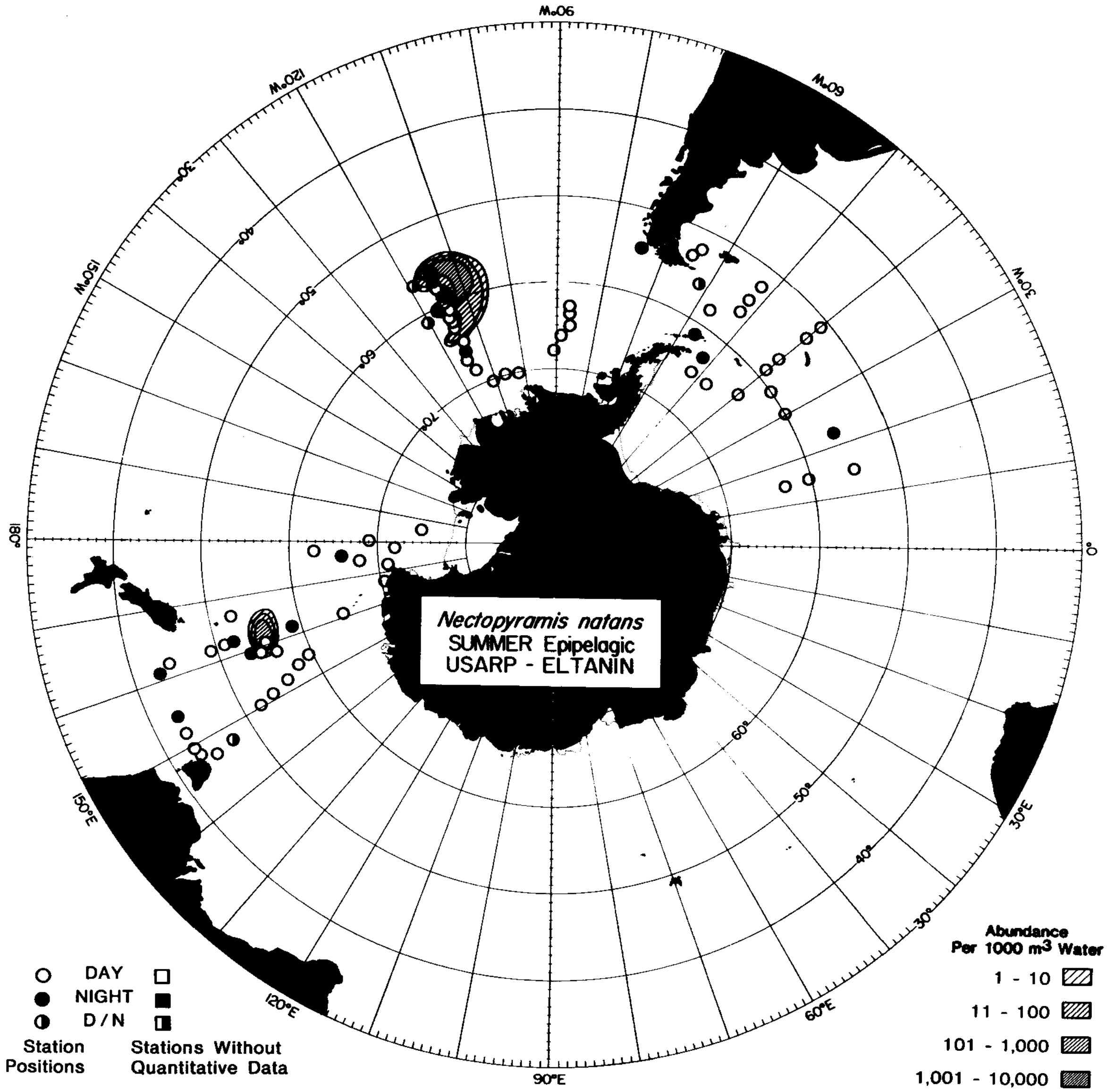
Map A56. The distribution of *Nectopyramis diomedeae* during the fall in the epipelagic zone.



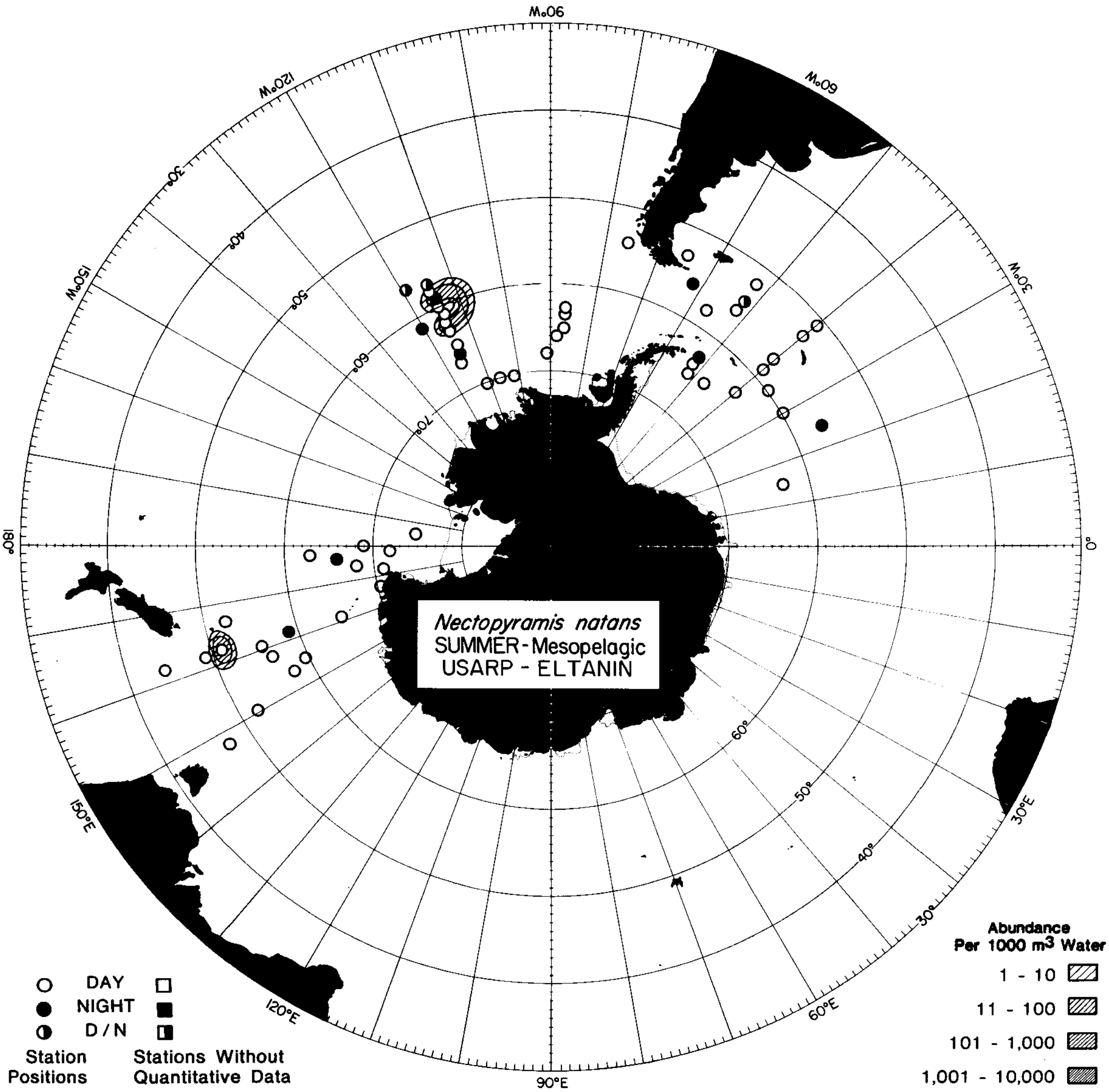
Map A57. The distribution of *Nectopyramis natans* during the spring in the epipelagic zone.



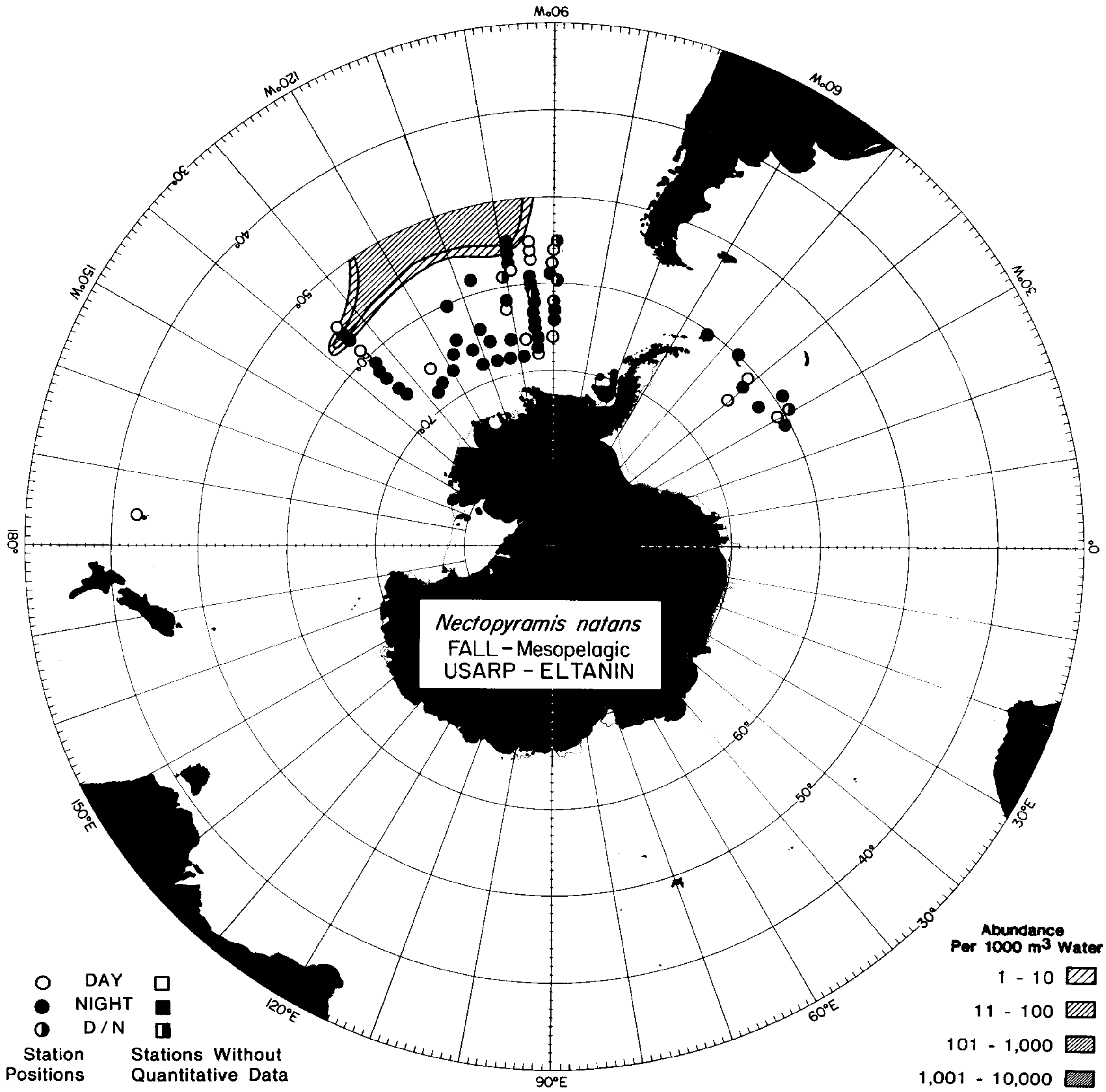
Map A58. The distribution of *Nectopyramis natans* during the spring in the mesopelagic zone.



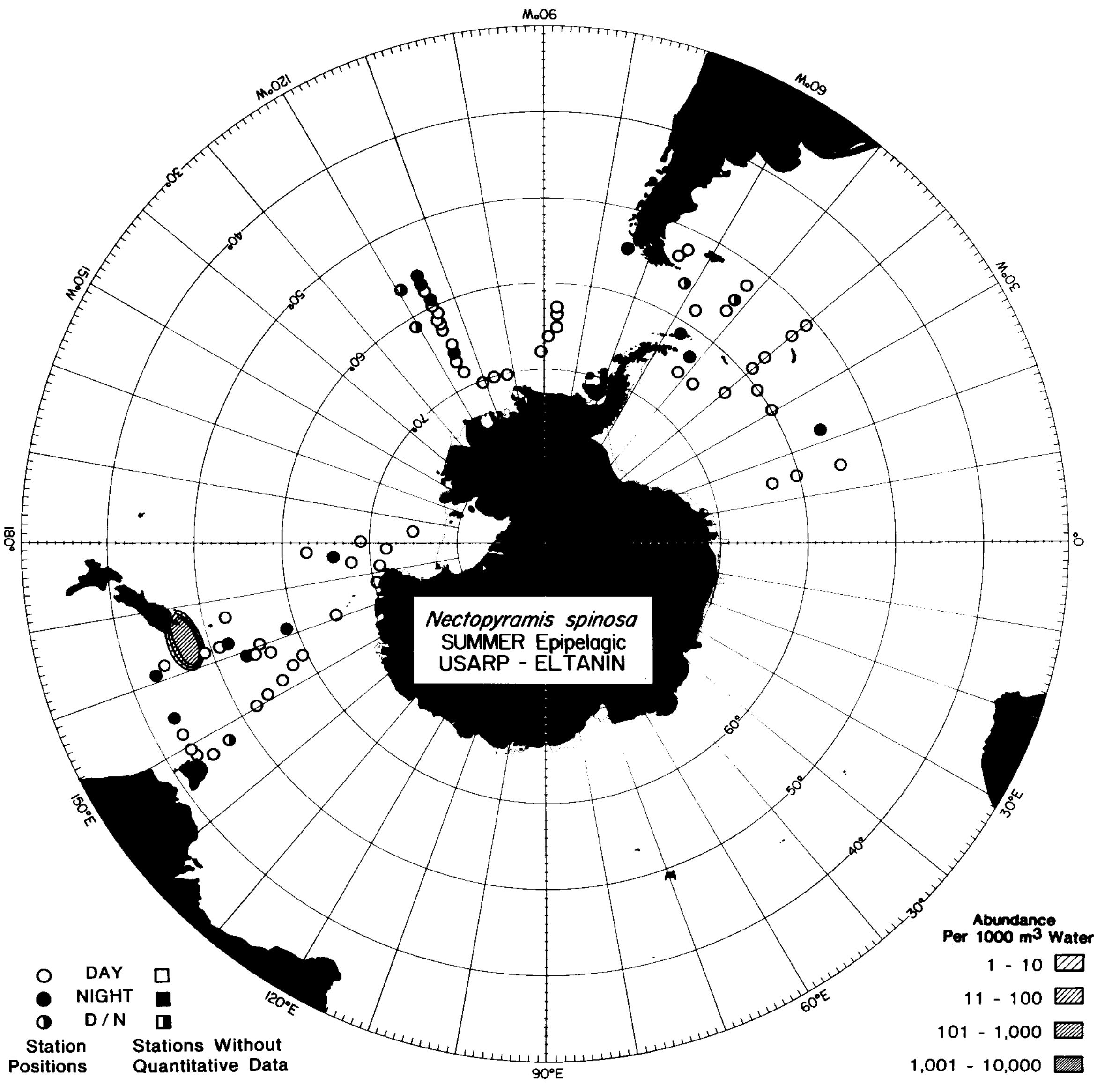
Map A59. The distribution of *Nectopyramis natans* during the summer in the epipelagic zone.



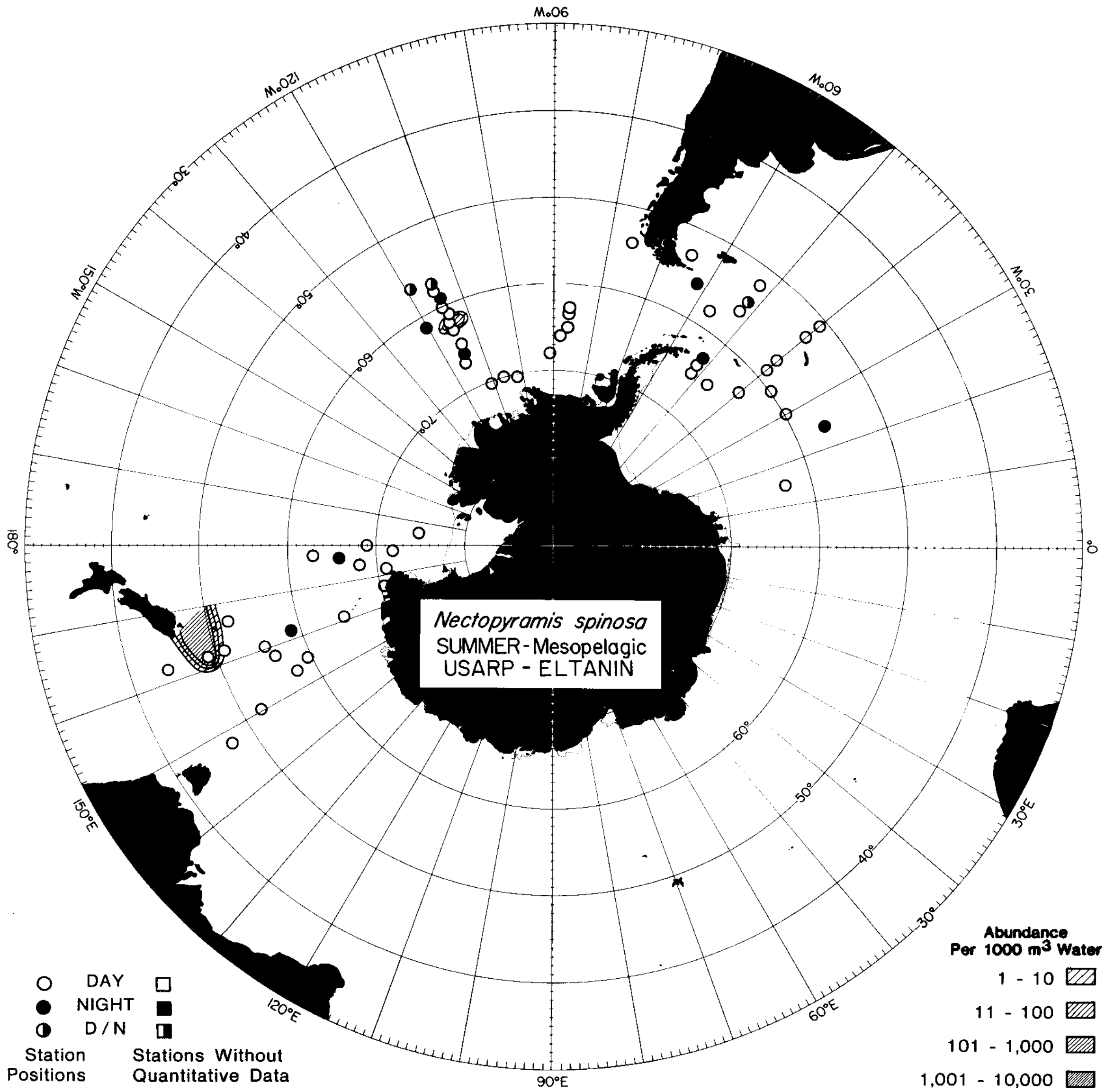
Map A60. The distribution of *Nectopyramis natans* during the summer in the mesopelagic zone.



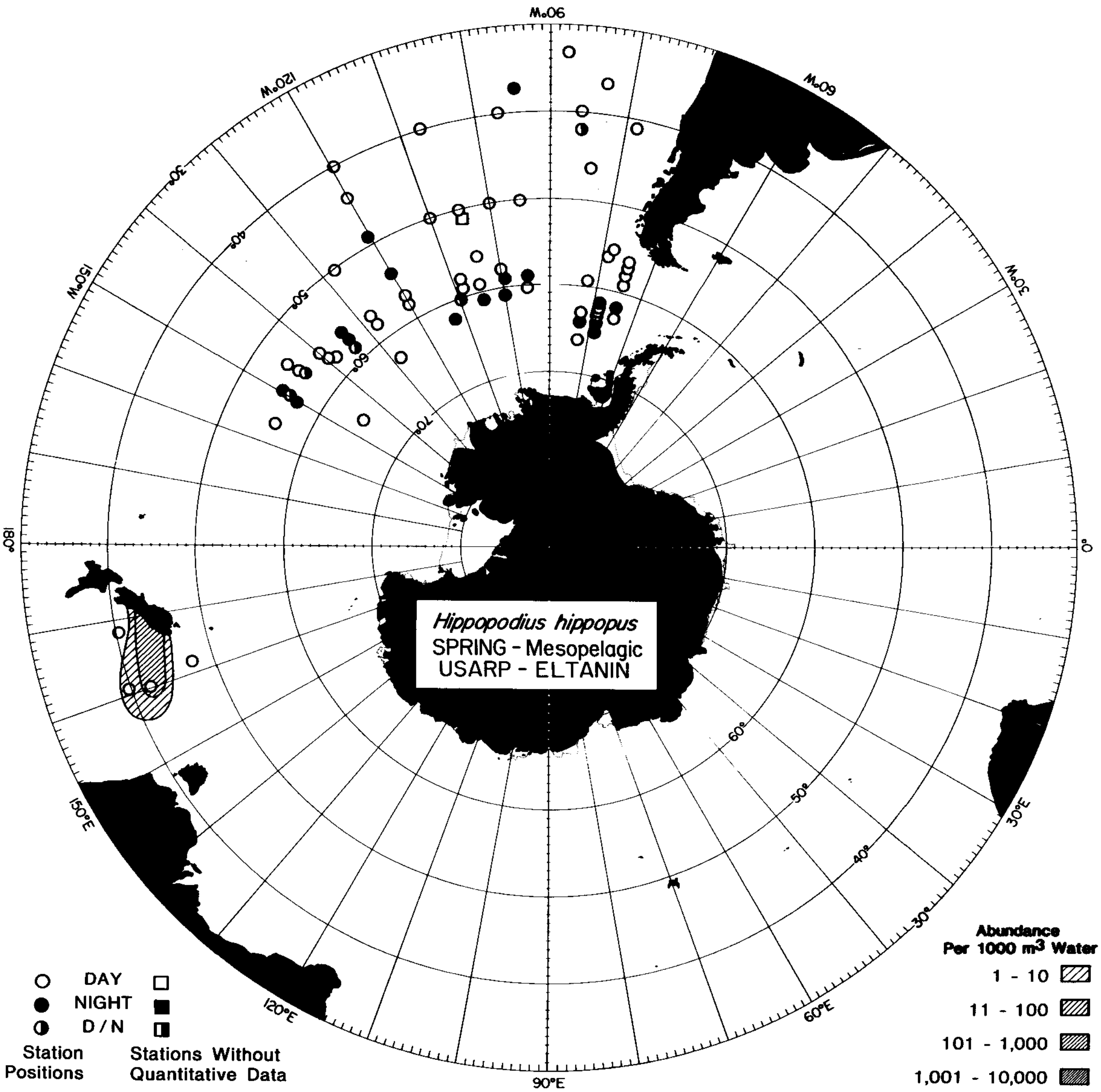
Map A61. The distribution of *Nectopyramis natans* during the fall in the mesopelagic zone.



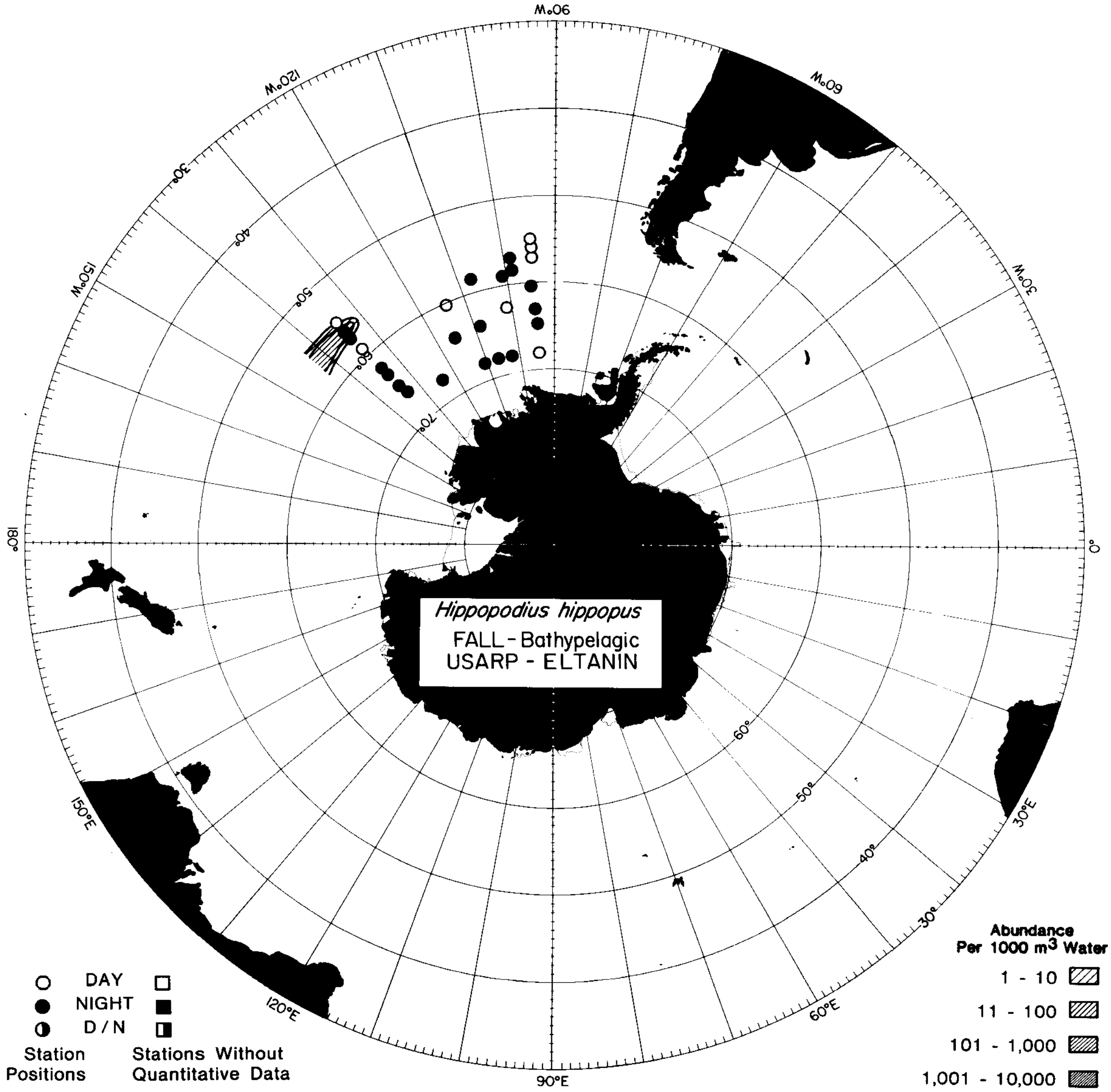
Map A62. The distribution of *Nectopyramis spinosa* during the summer in the epipelagic zone.



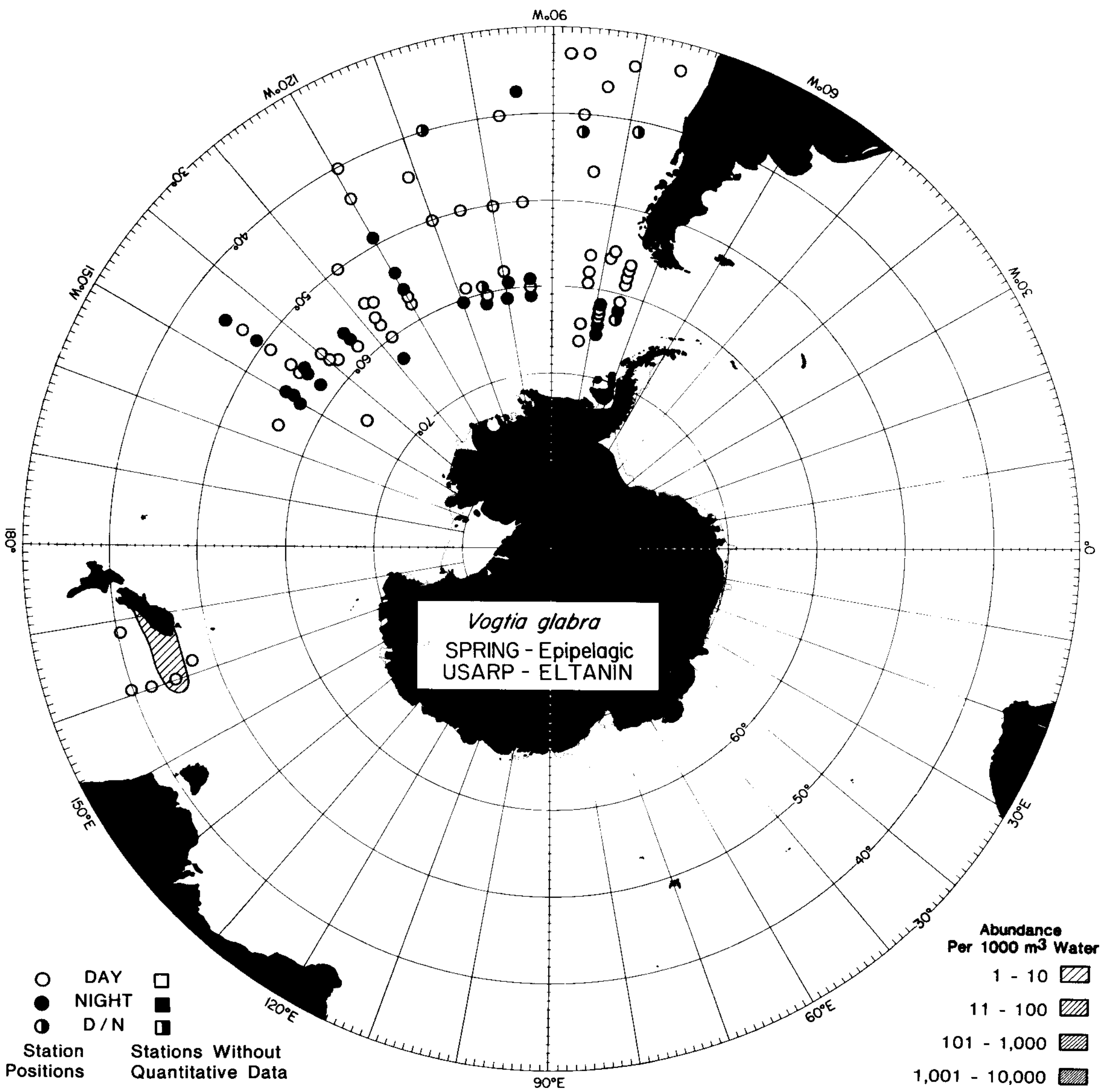
Map A63. The distribution of *Nectopyramis spinosa* during the summer in the mesopelagic zone.



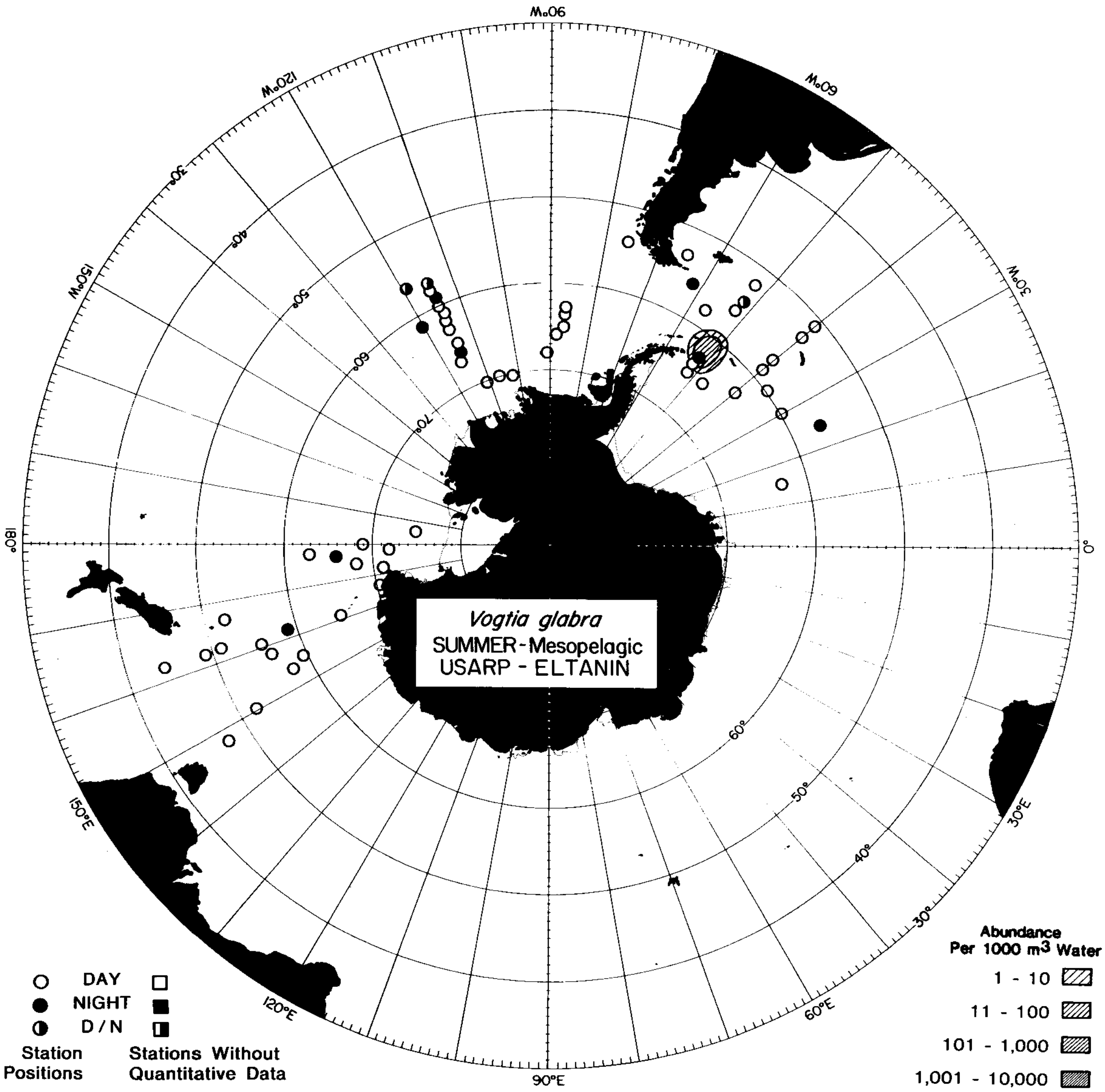
Map A64. The distribution of *Hippopodius hippopus* during the spring in the mesopelagic zone.



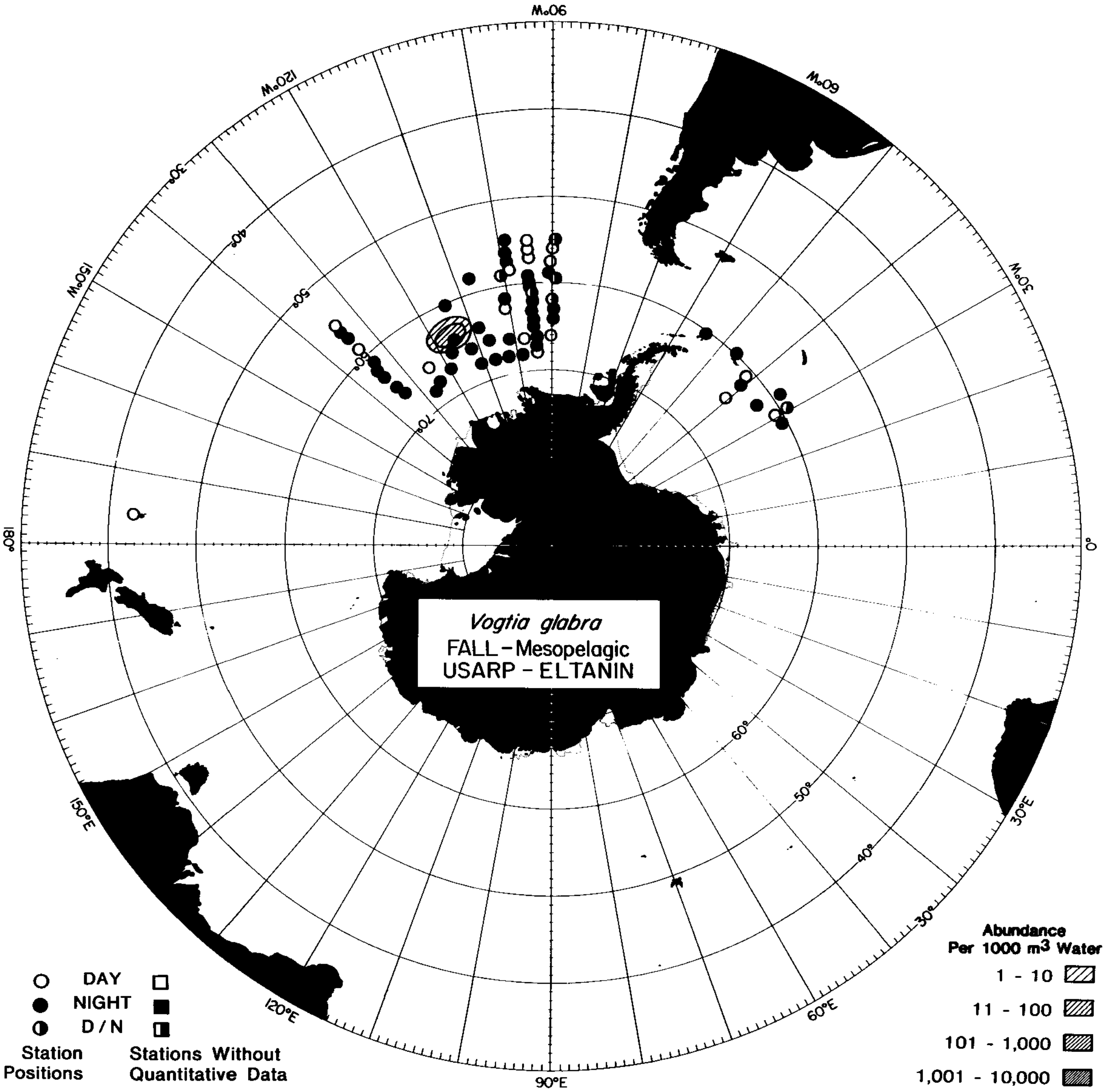
Map A65. The distribution of *Hippopodius hippopus* during the fall in the bathypelagic zone.



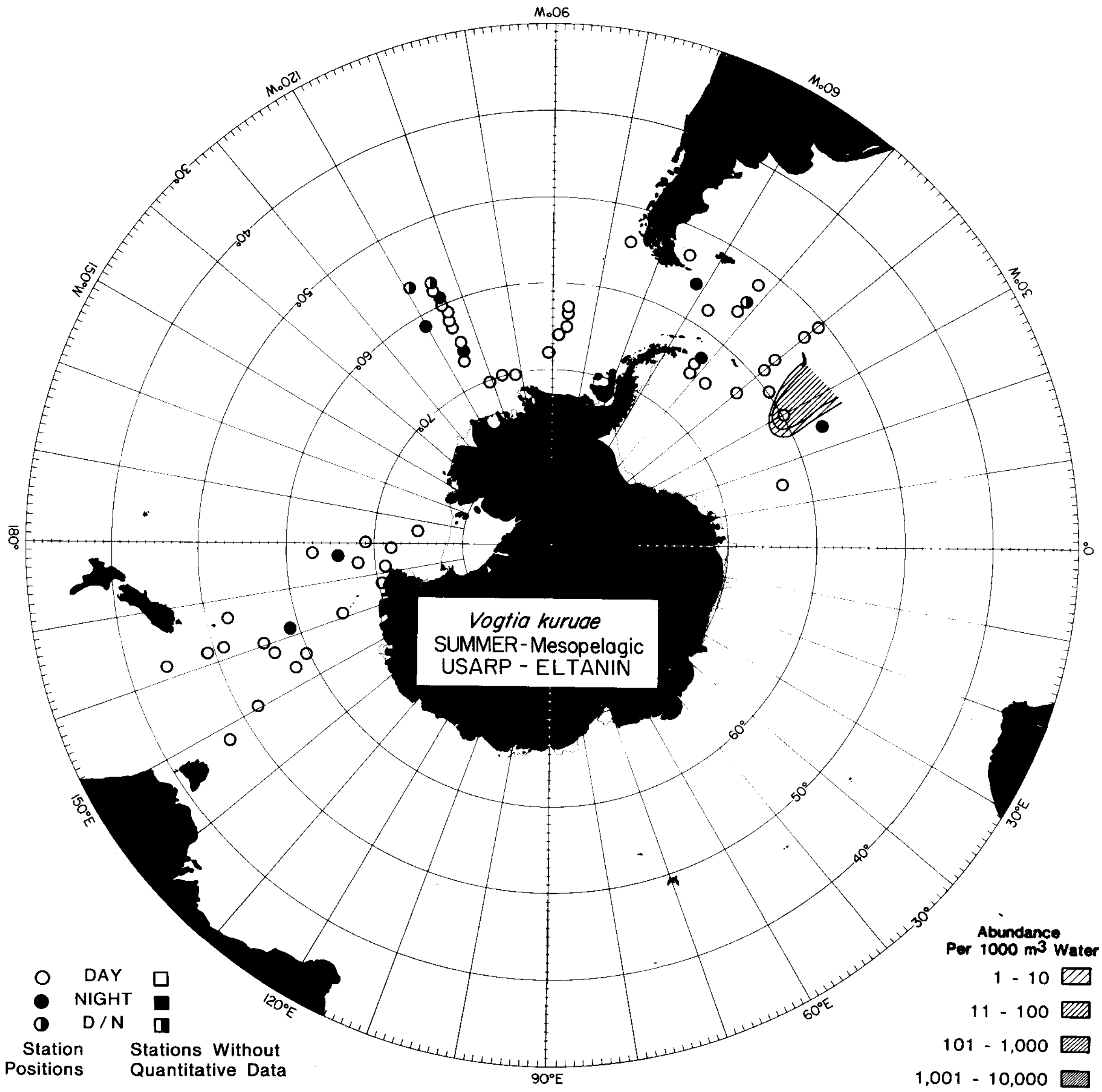
Map A66. The distribution of *Vogtia glabra* during the spring in the epipelagic zone.



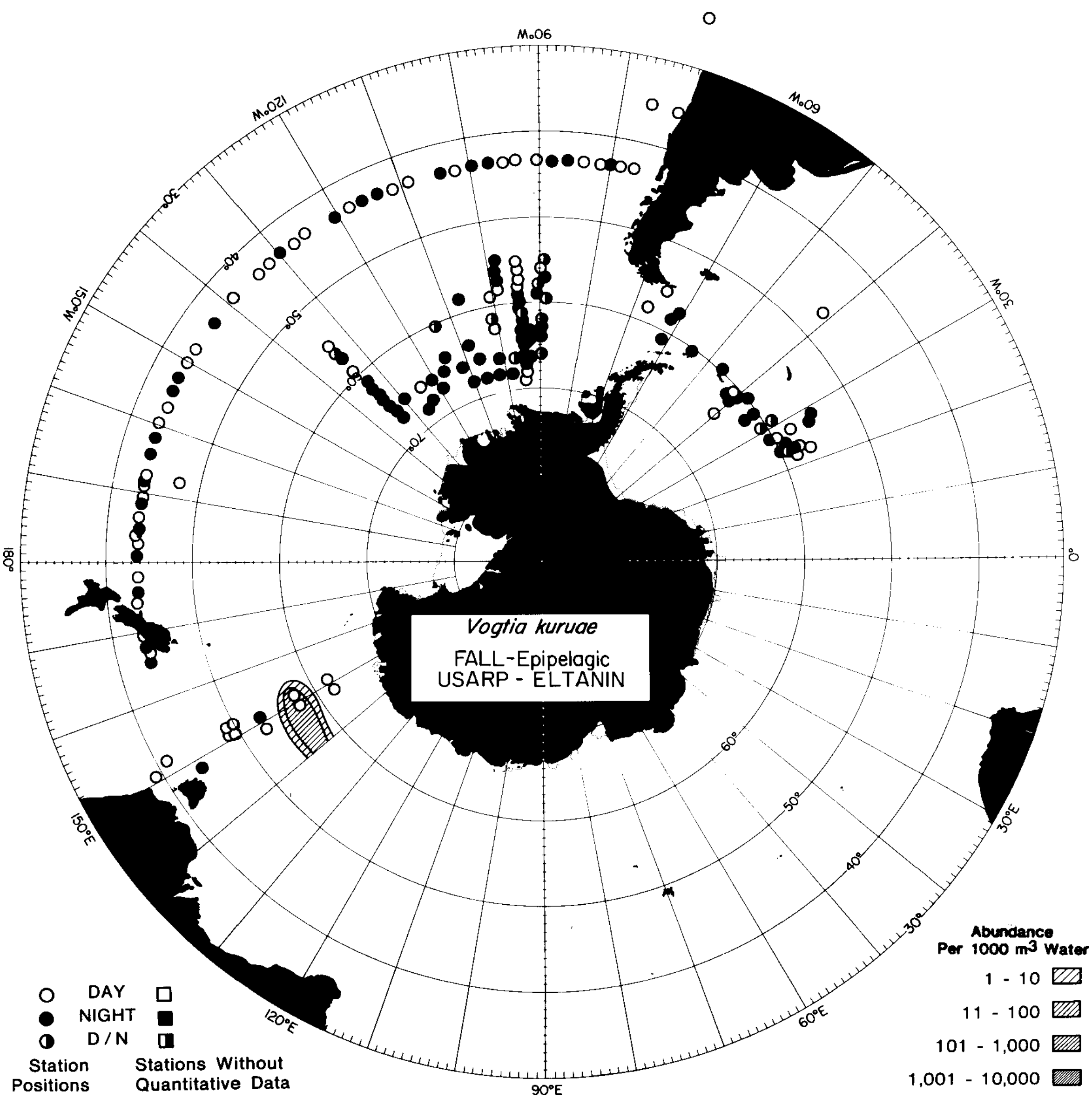
Map A67. The distribution of *Vogtia glabra* during the summer in the mesopelagic zone.



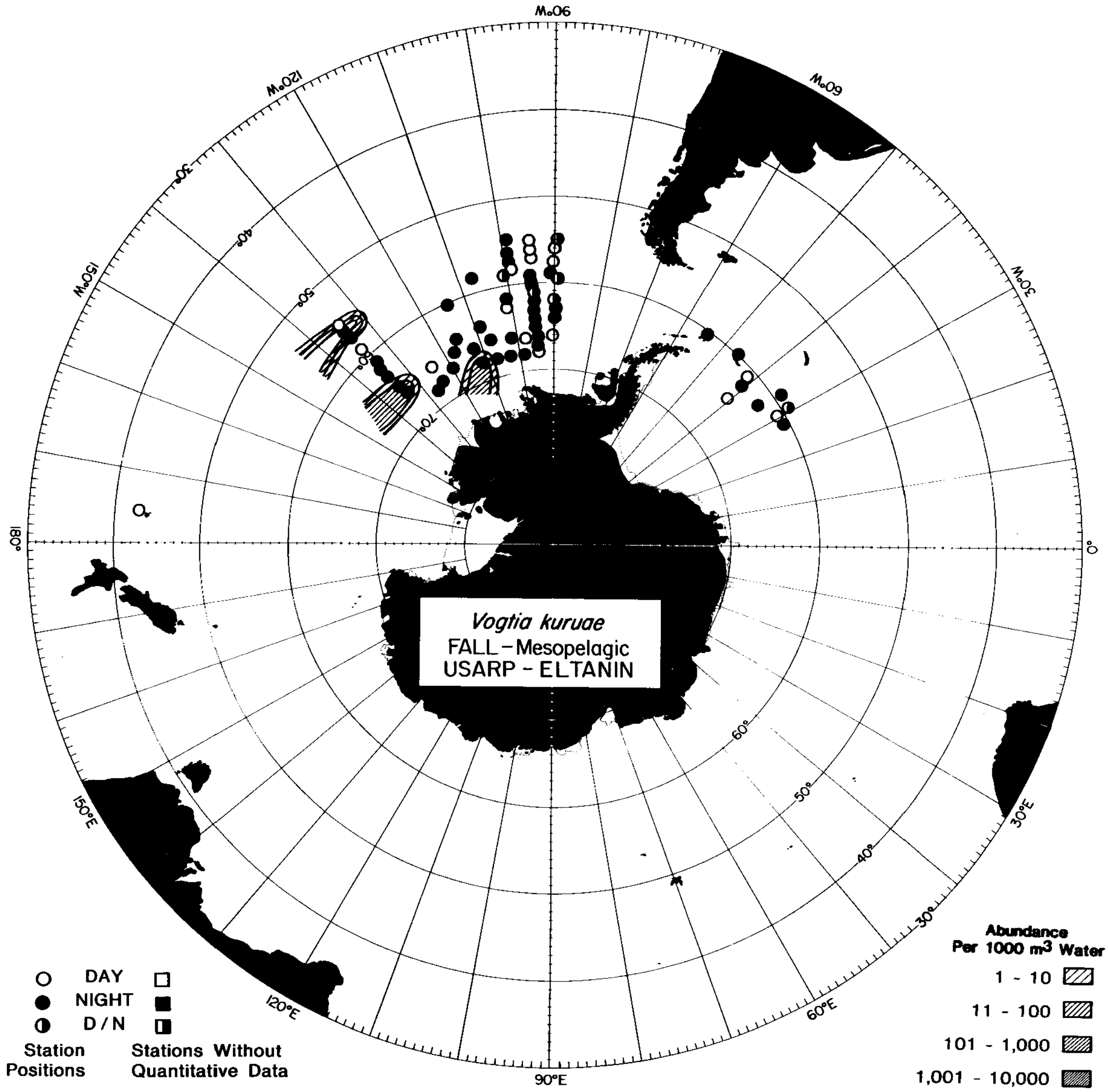
Map A68. The distribution of *Vogtia glabra* during the fall in the mesopelagic zone.



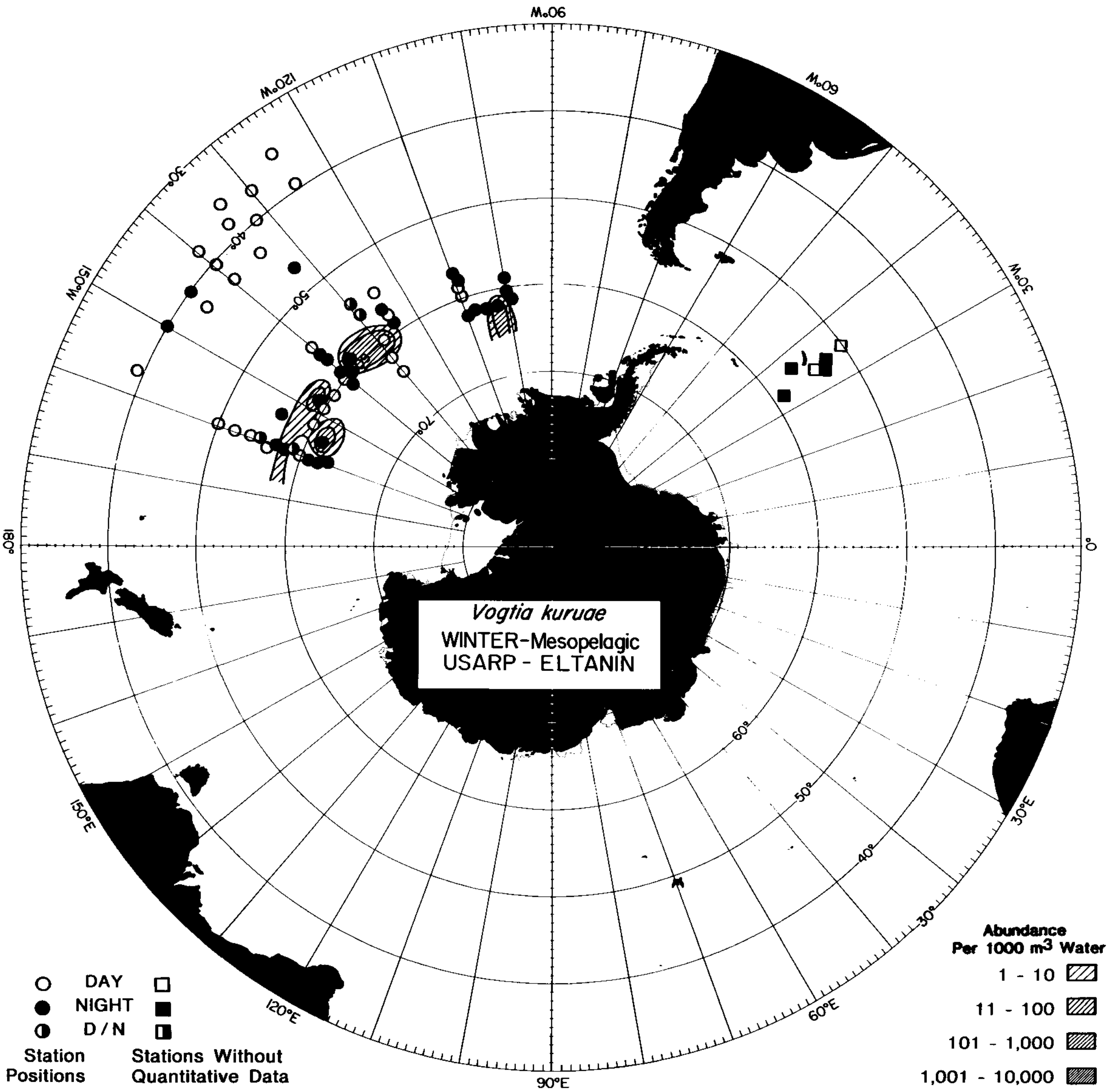
Map A69. The distribution of *Vogtia kuruae* during the summer in the mesopelagic zone.



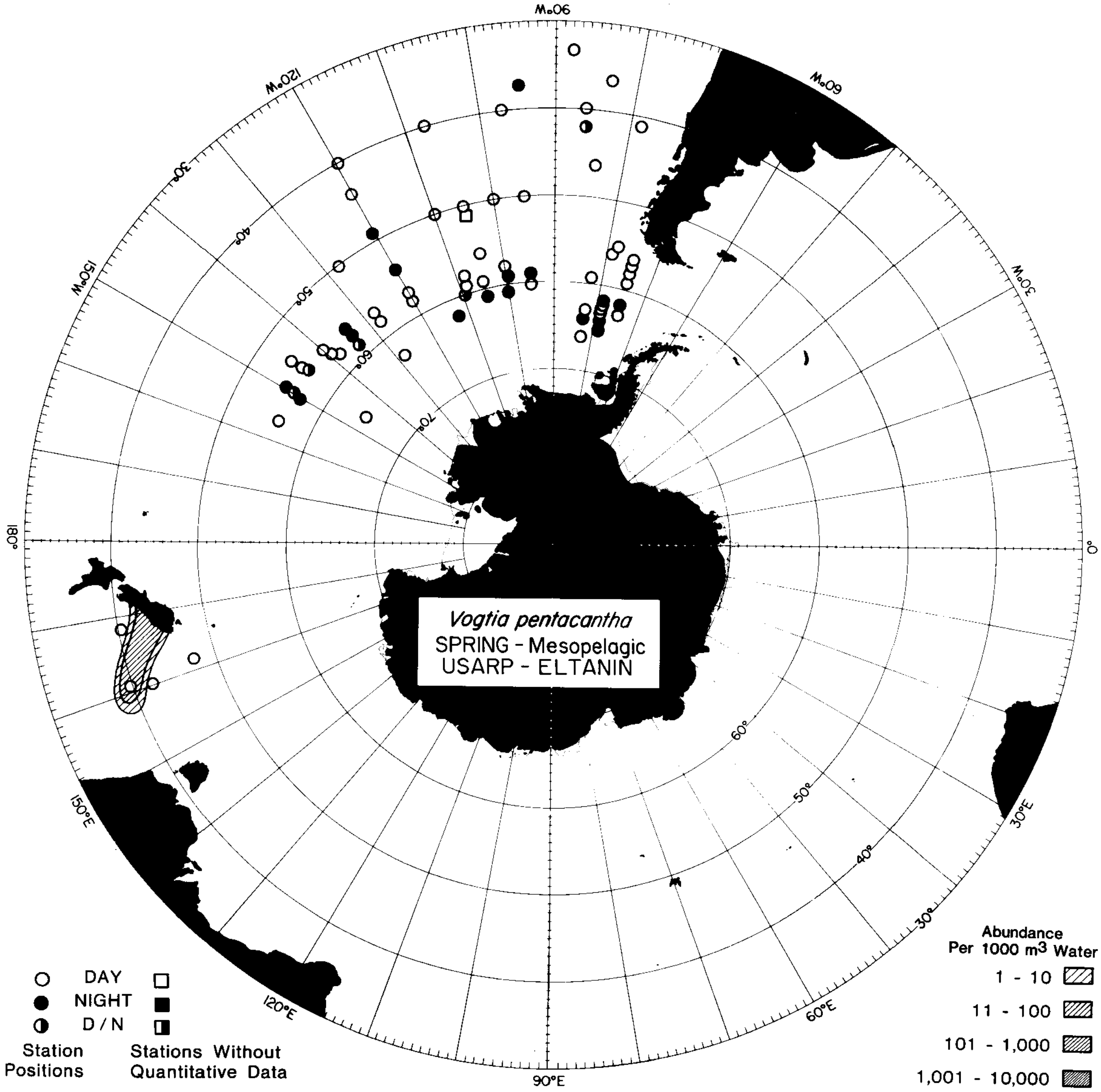
Map A70. The distribution of *Vogtia kuruae* during the fall in the epipelagic zone.



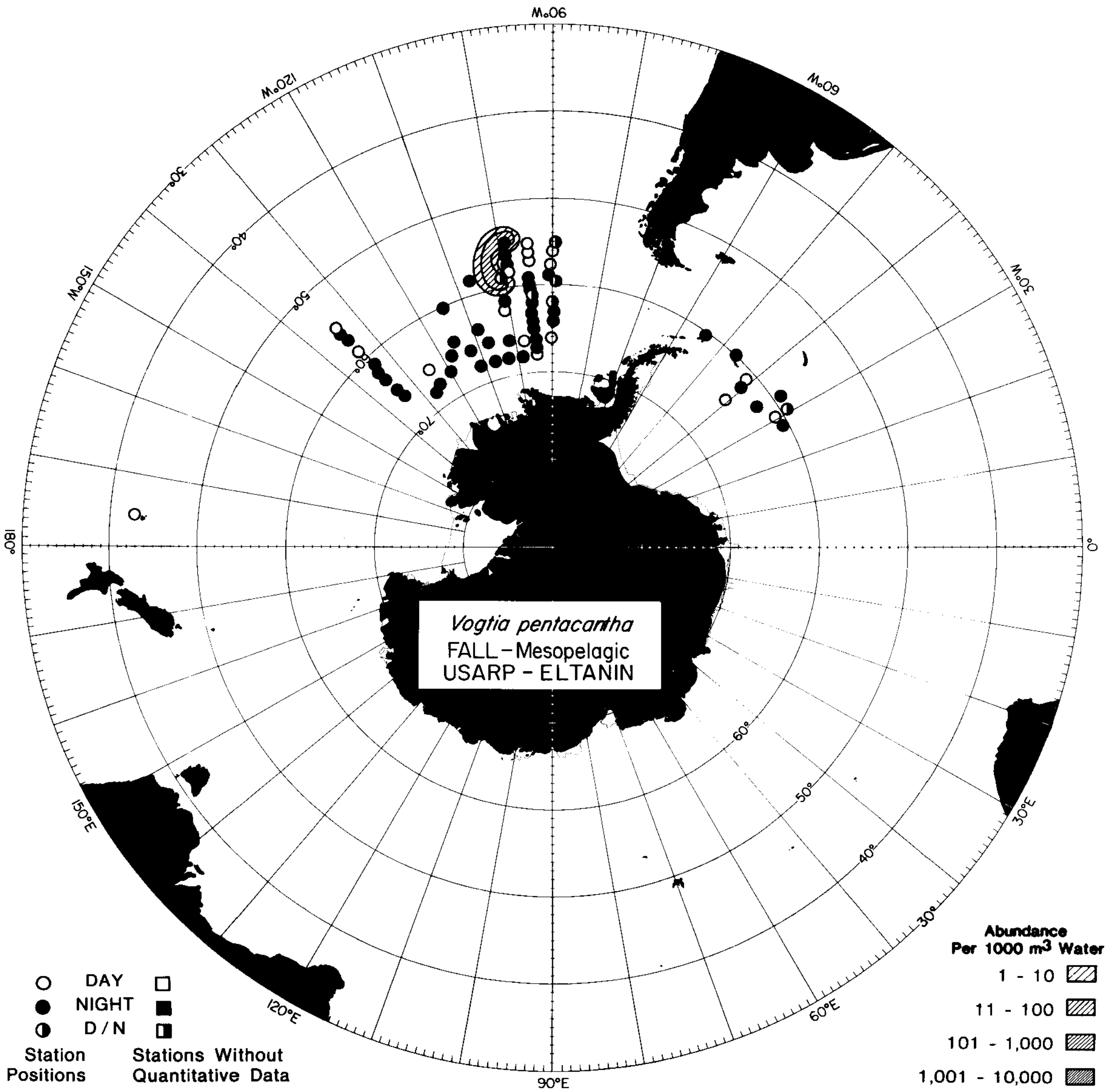
Map A71. The distribution of *Vogtia kuruae* during the fall in the mesopelagic zone.



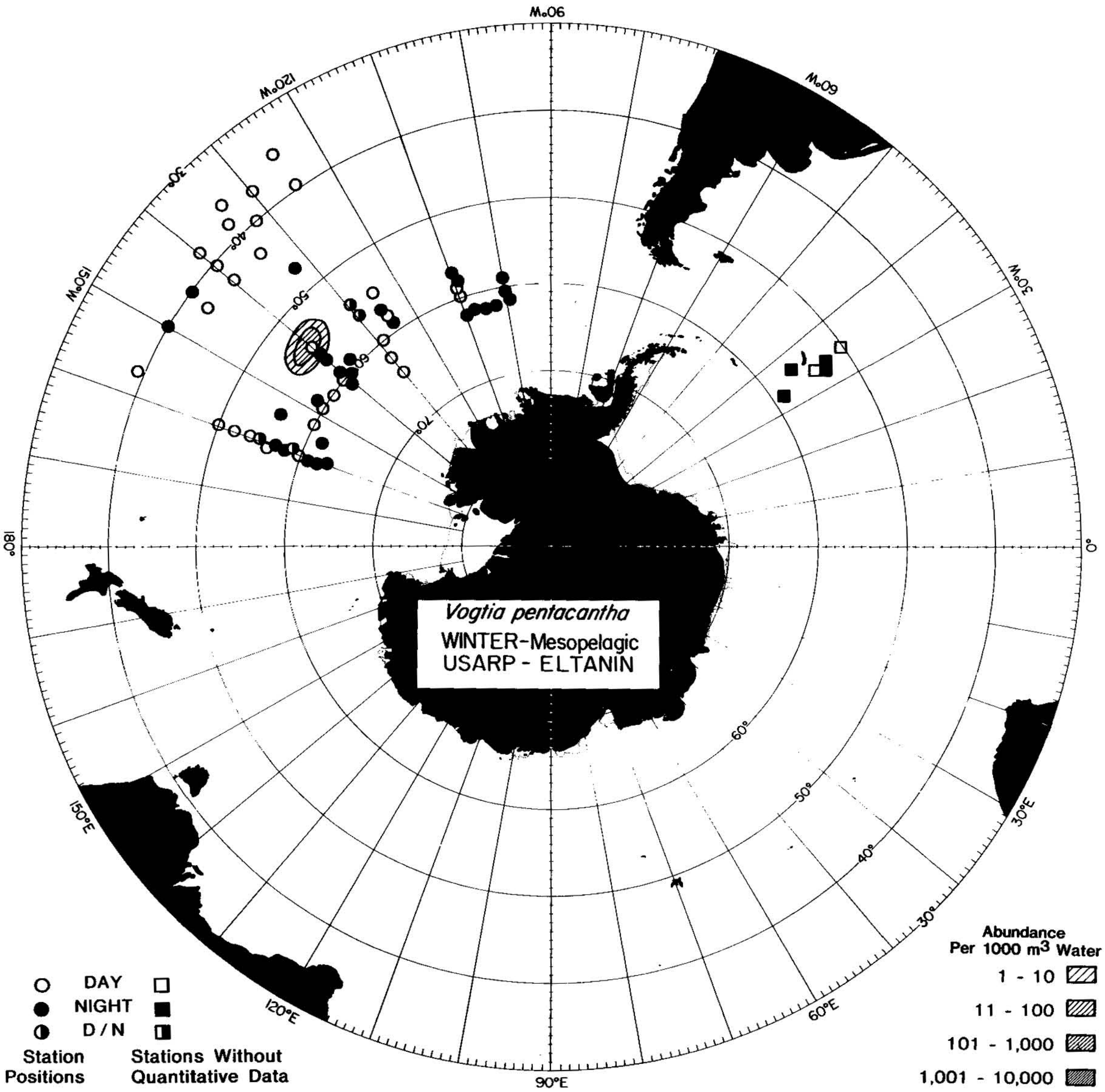
Map A72. The distribution of *Vogtia kuruae* during the winter in the mesopelagic zone.



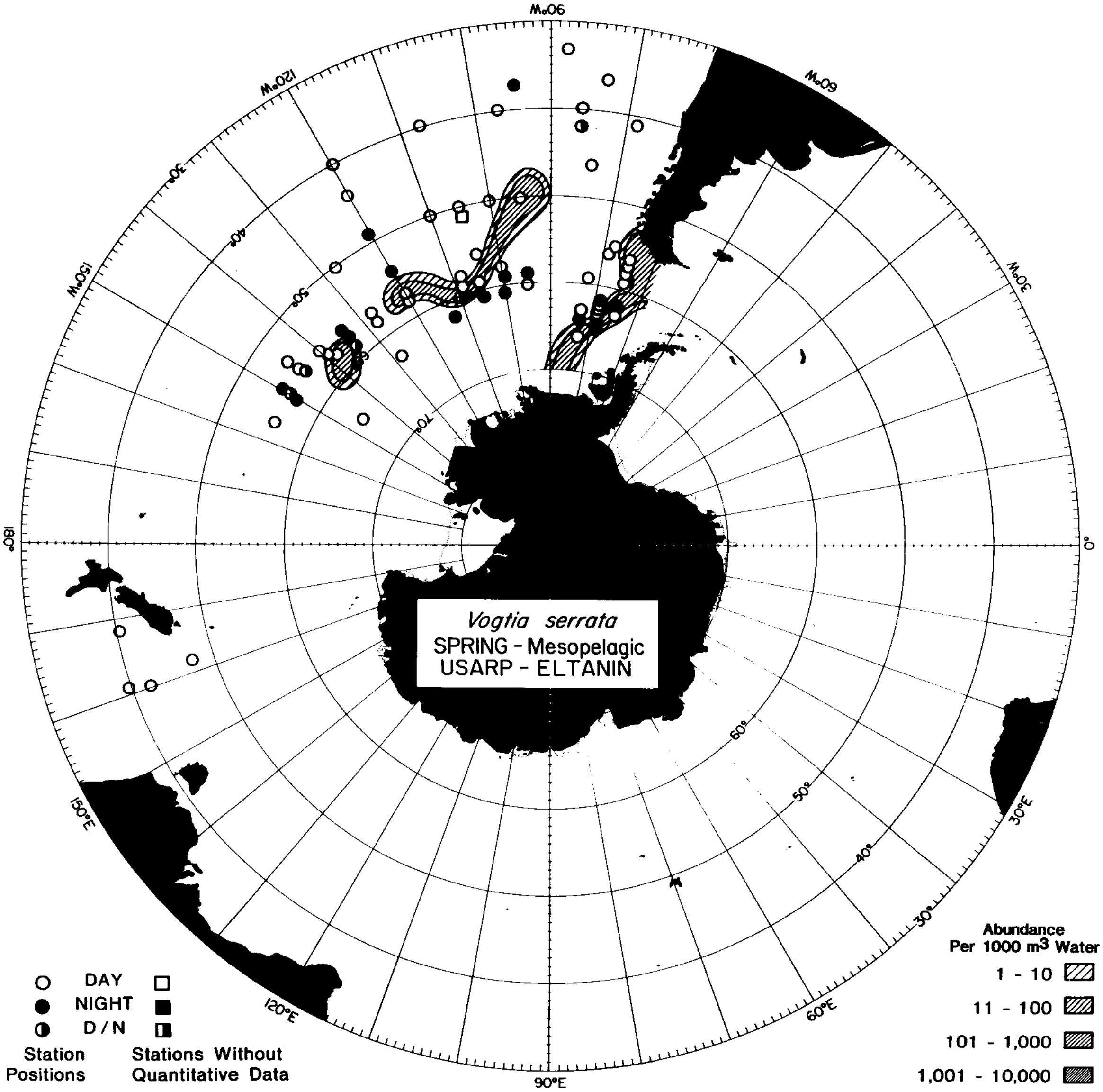
Map A73. The distribution of *Vogtia pentacantha* during the spring in the mesopelagic zone.



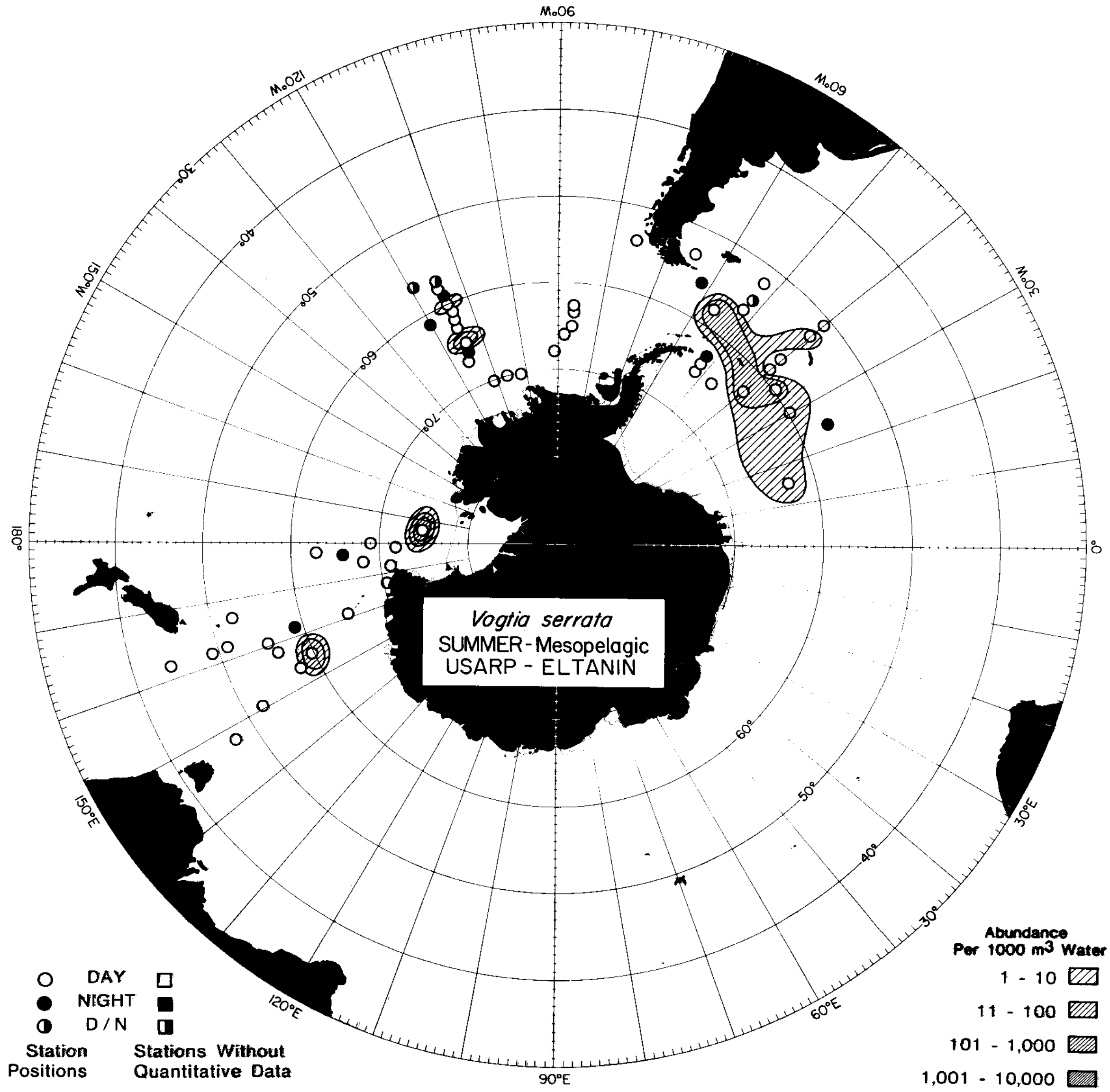
Map A74. The distribution of *Vogtia pentacantha* during the fall in the mesopelagic zone.



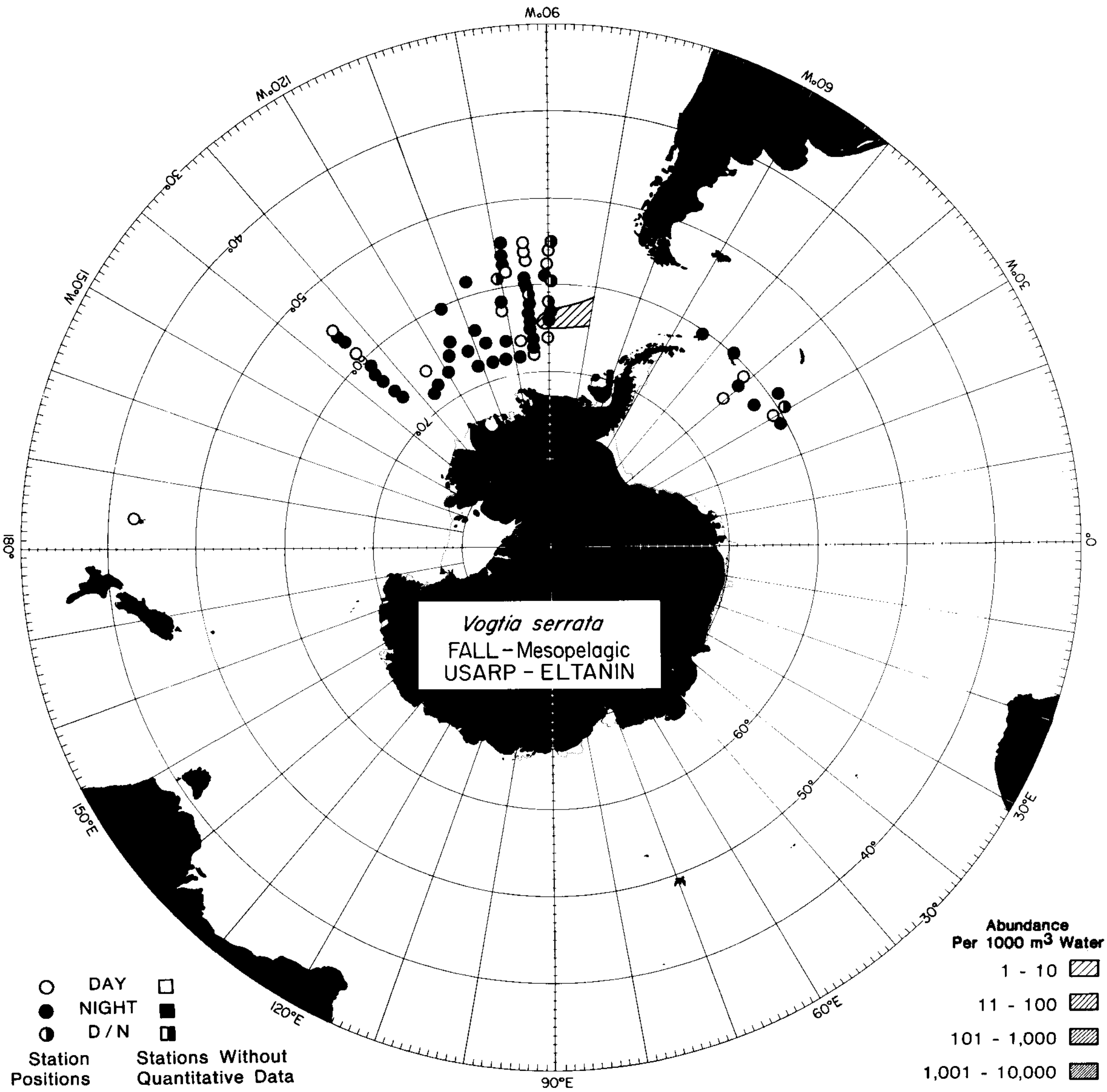
Map A75. The distribution of *Vogtia pentacantha* during the winter in the mesopelagic zone.



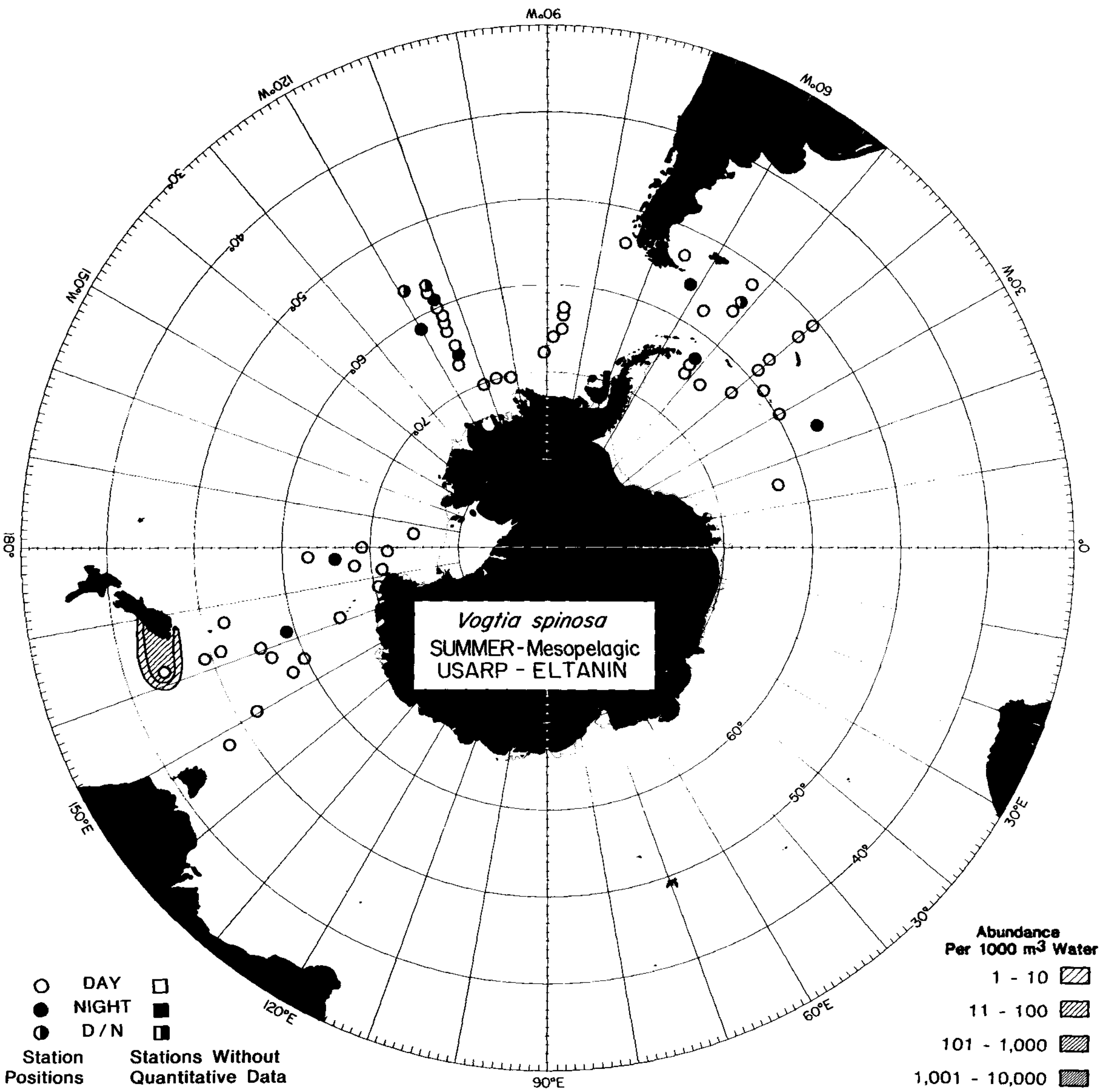
Map A76. The distribution of *Vogtia serrata* during the spring in the mesopelagic zone.



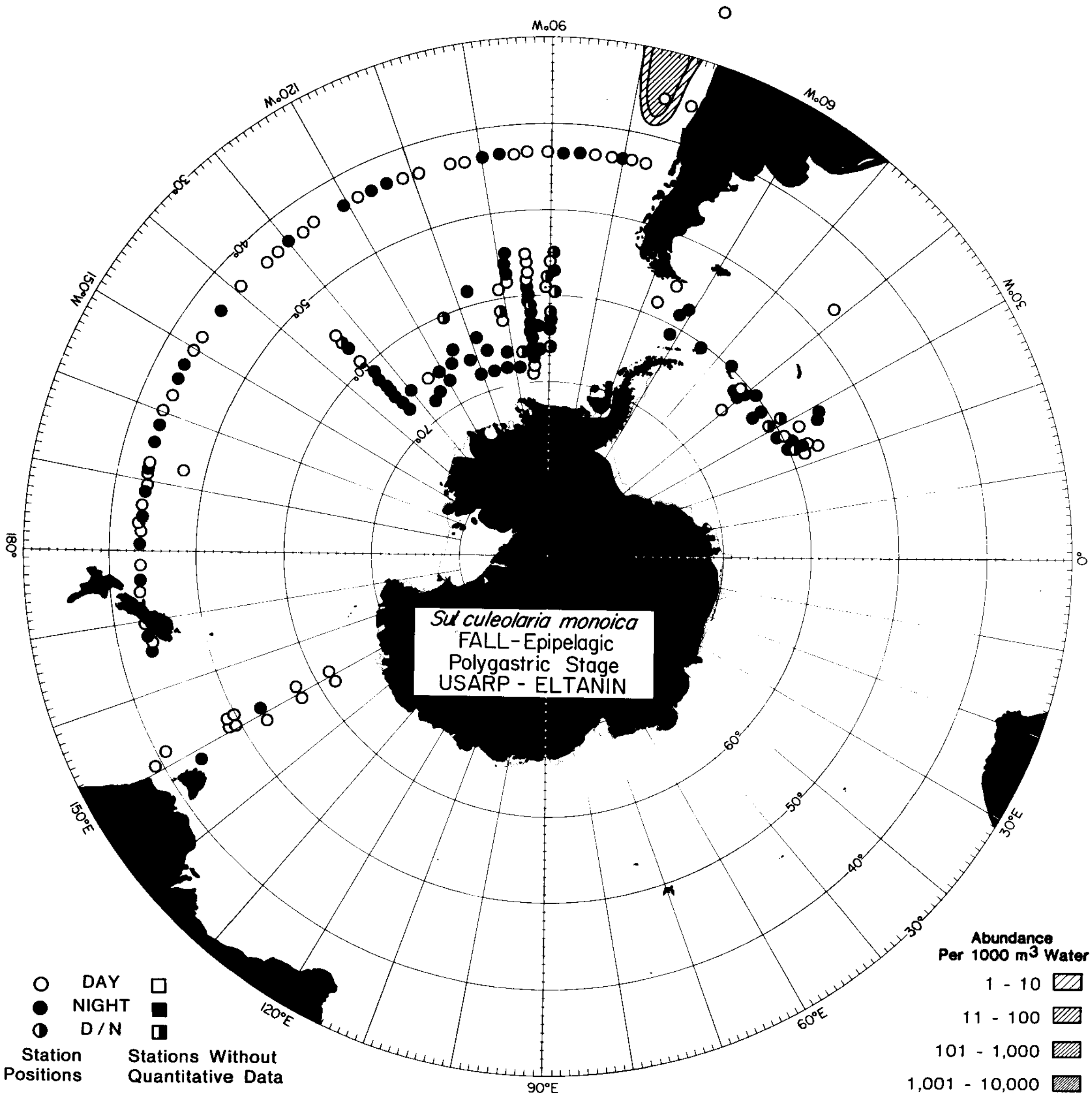
Map A77. The distribution of *Vogtia serrata* during the summer in the mesopelagic zone.



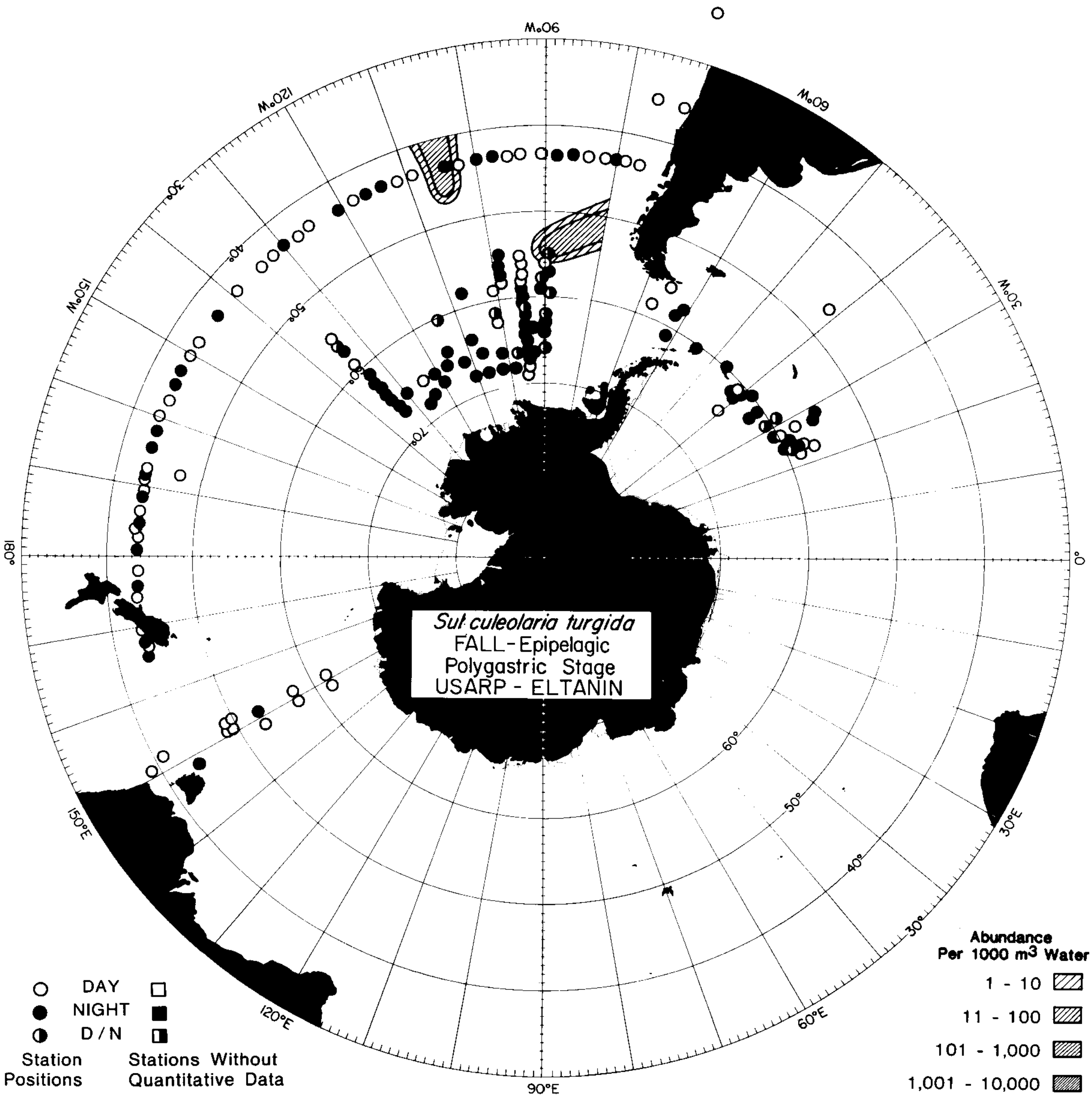
Map A78. The distribution of *Vogtia serrata* during the fall in the mesopelagic zone.



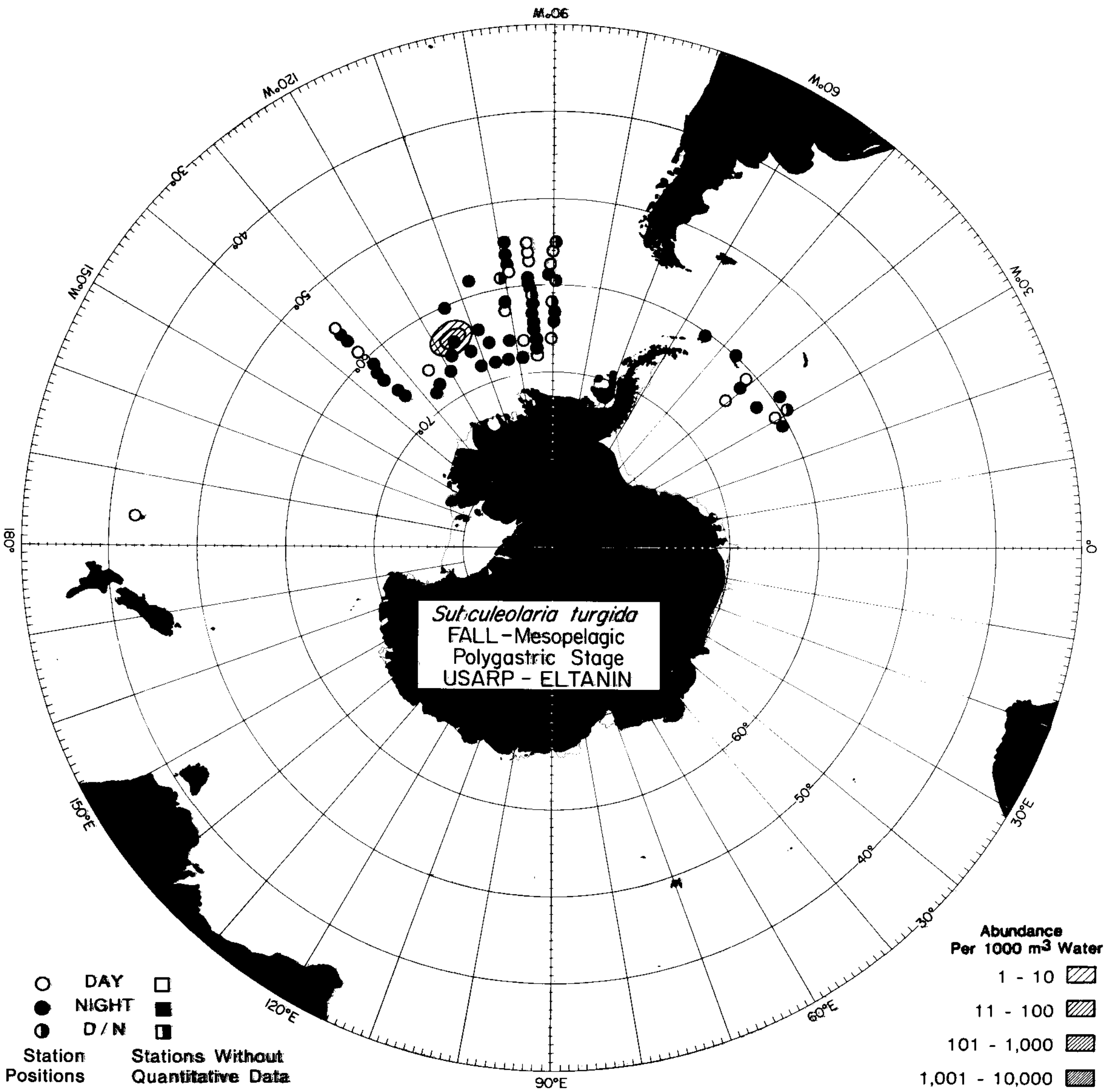
Map A79. The distribution of *Vogtia spinosa* during the summer in the mesopelagic zone.



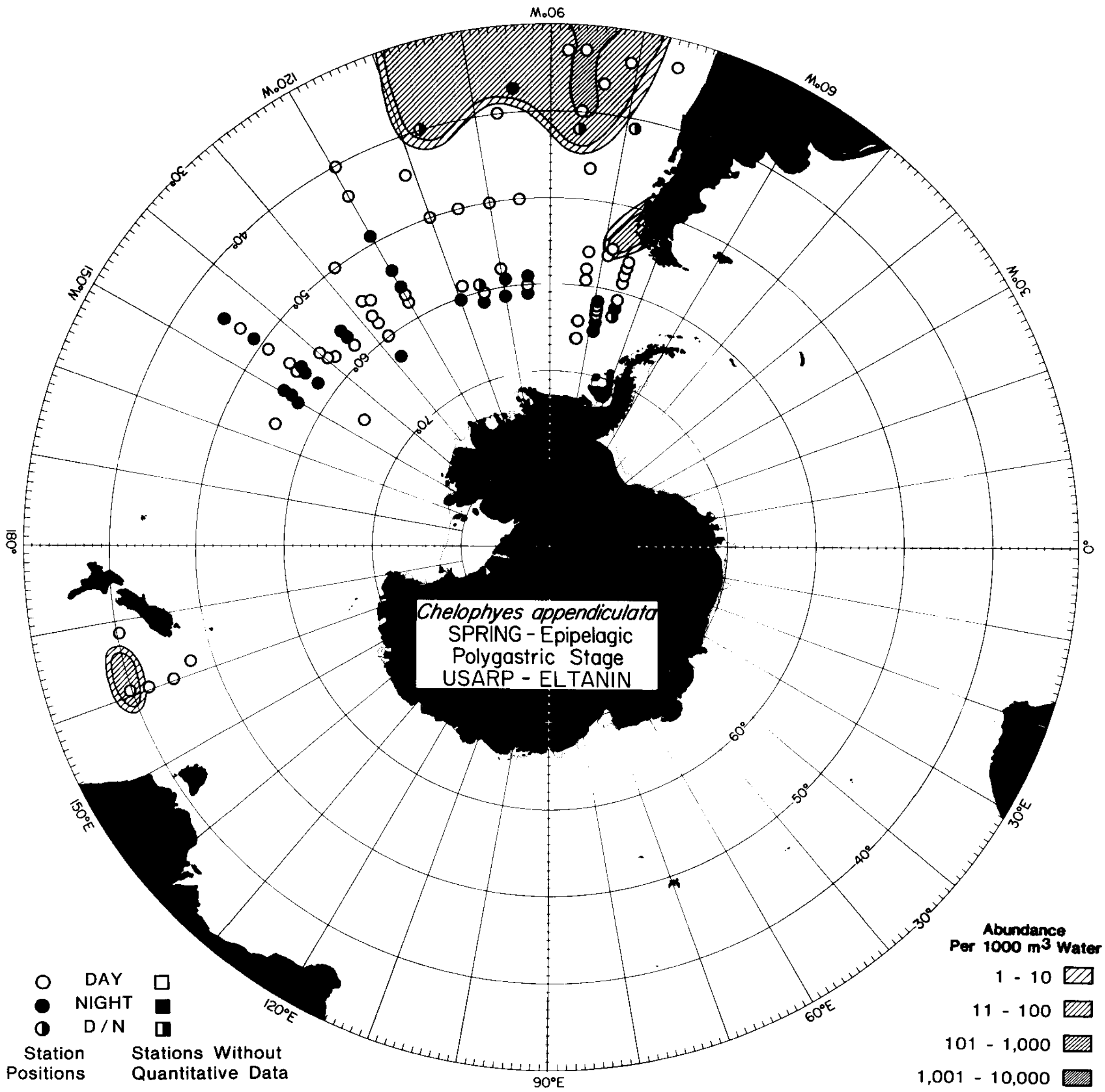
Map A80. The distribution of the polygastric stage of *Sulculeolaria monoica* during the fall in the epipelagic zone.



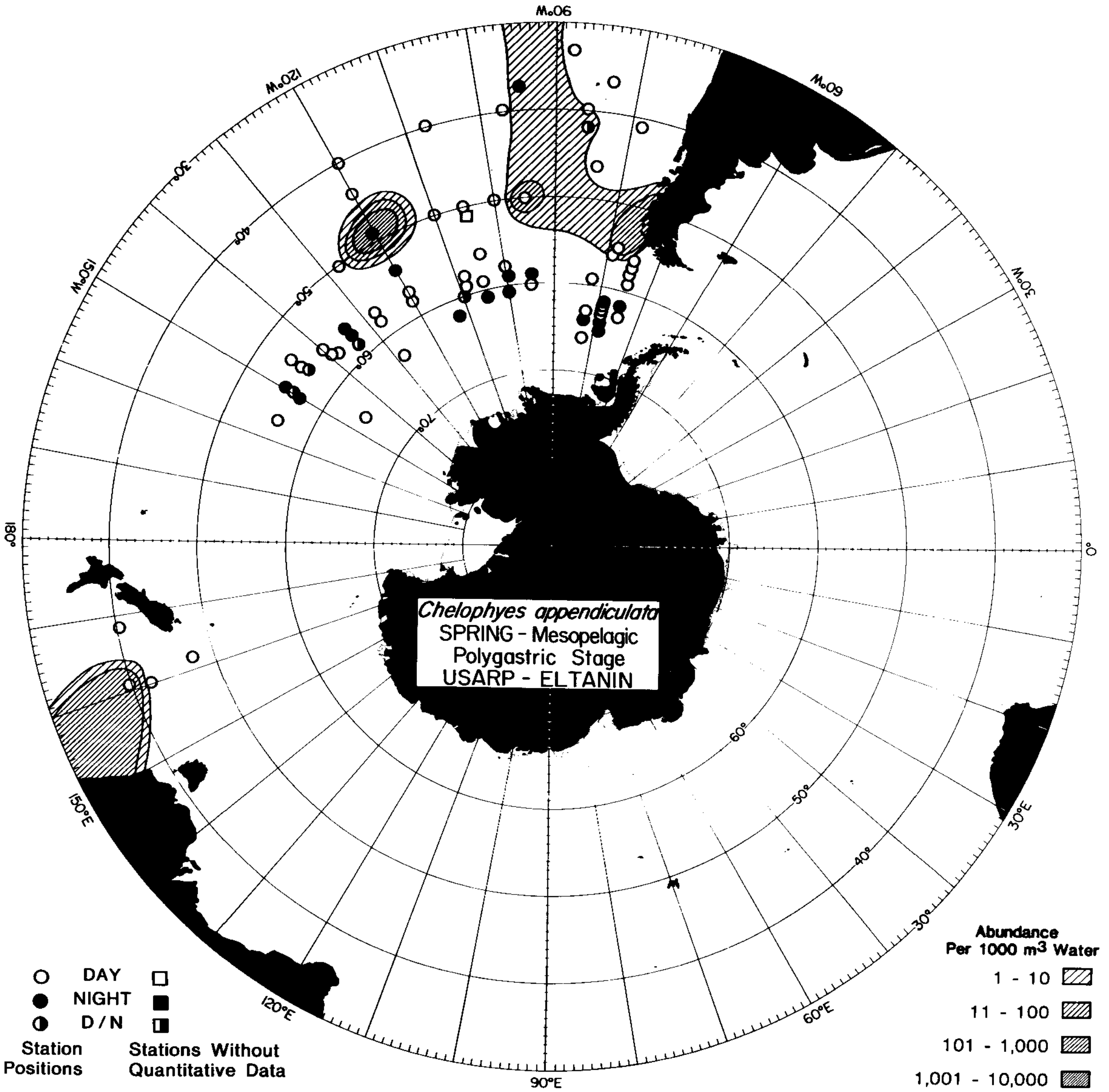
Map A81. The distribution of the polygastric stage of *Sulculeolaria turgida* during the fall in the epipelagic zone.



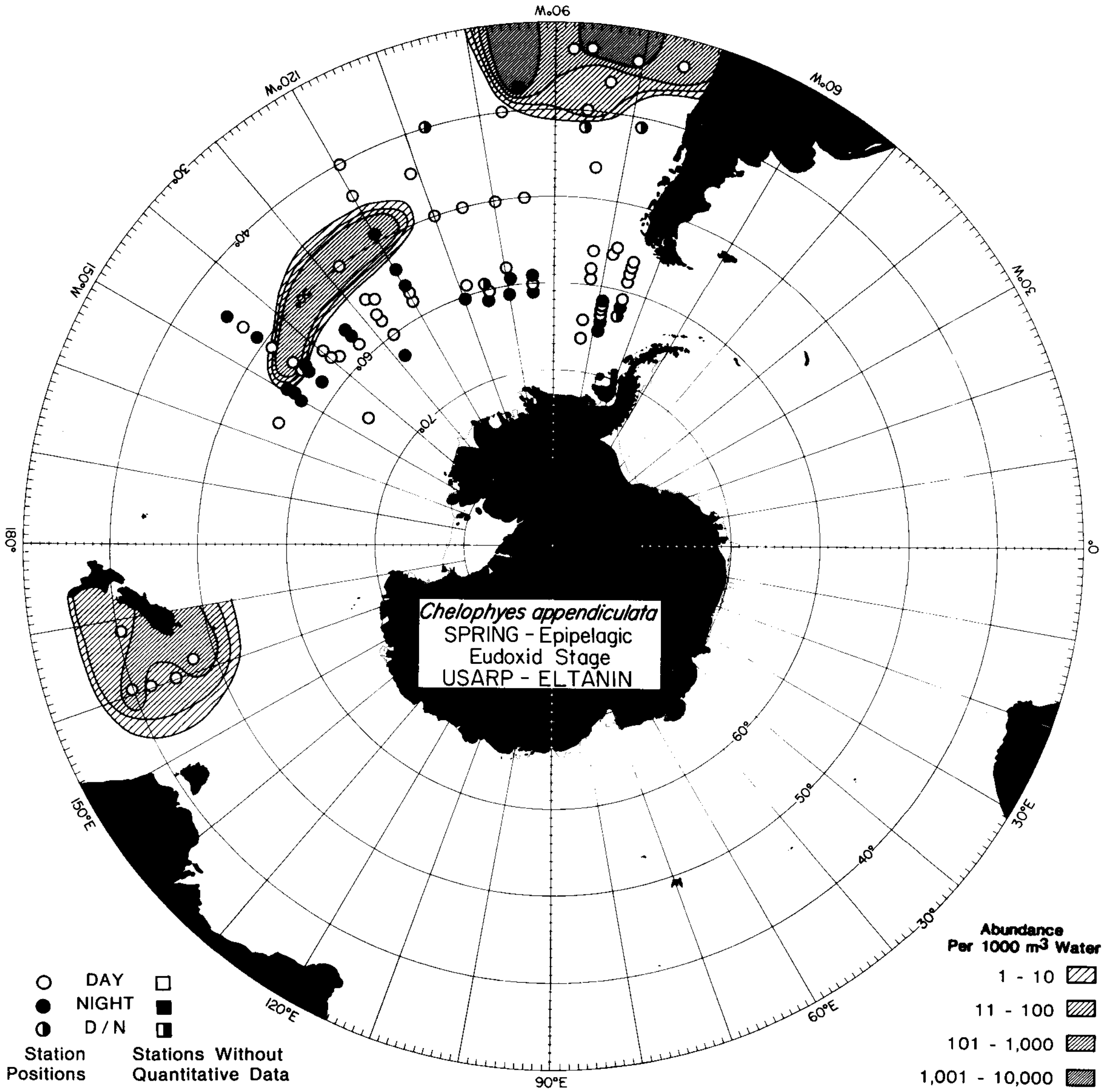
Map A82. The distribution of the polygastric stage of *Sulculeolaria turgida* during the fall in the mesopelagic zone.



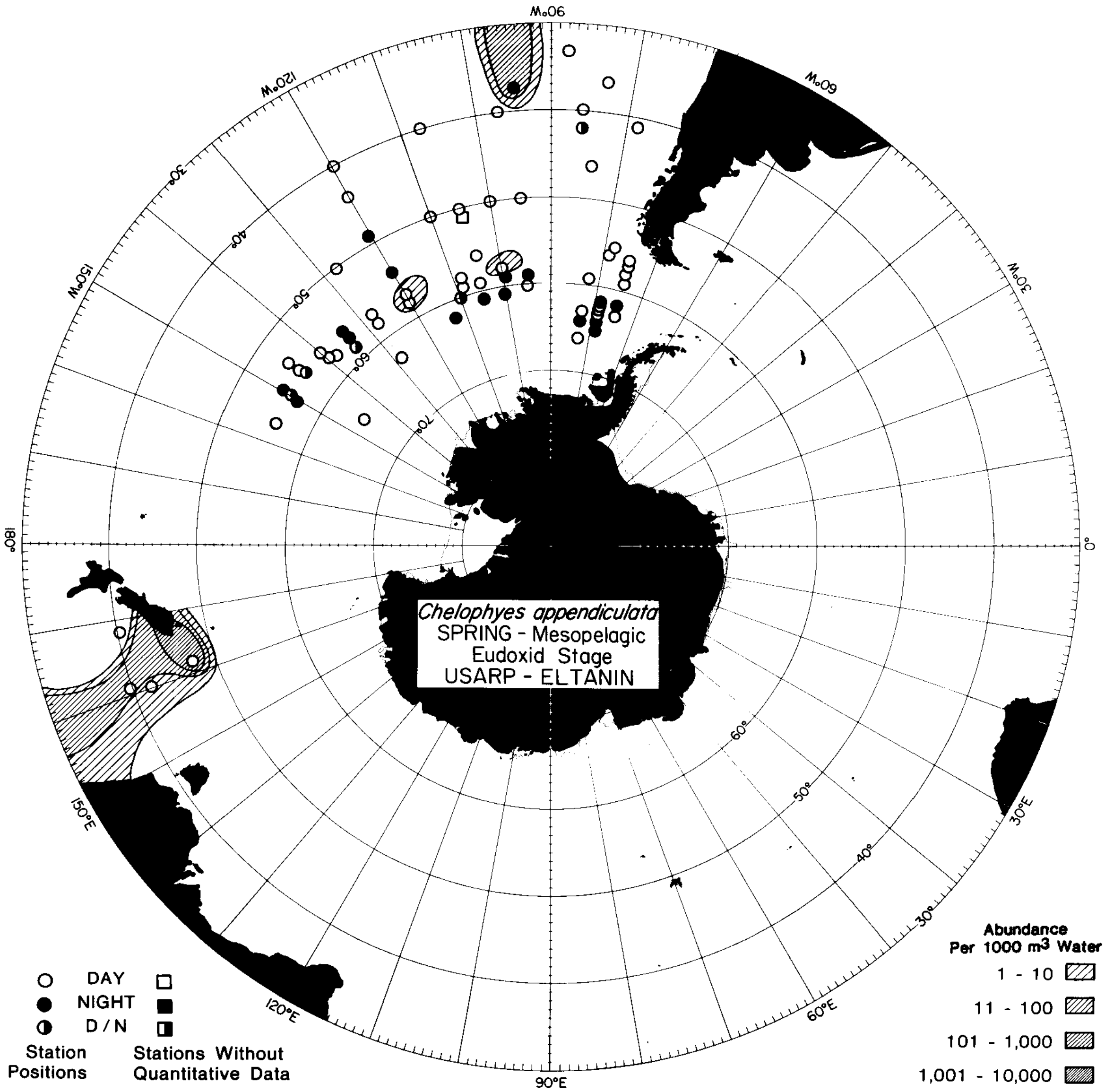
Map A83. The distribution of of the polygastric stage of *Chelophyes appendiculata* during the spring in the epipelagic zone.



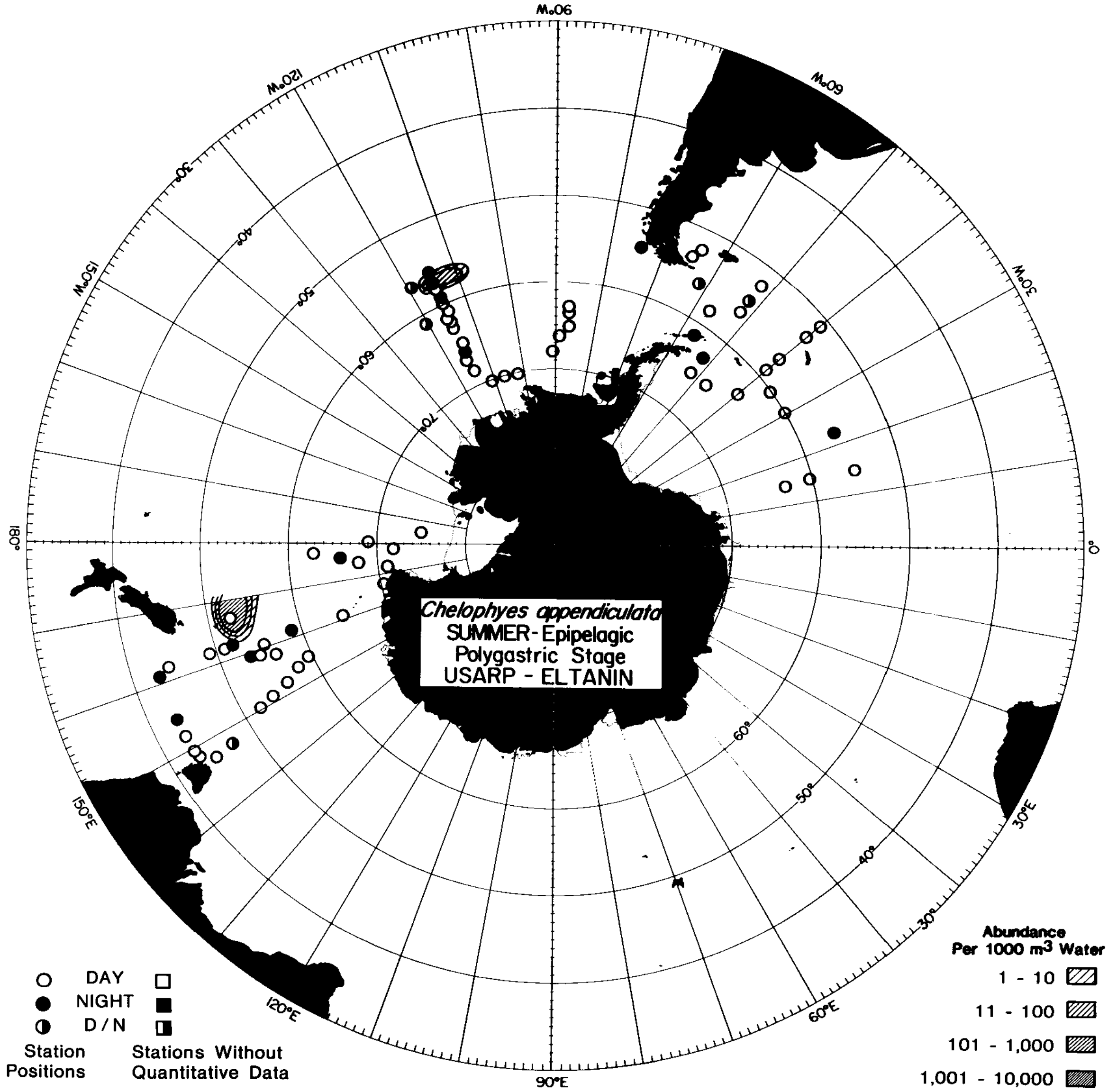
Map A84. The distribution of the polygastric stage of *Chelophyes appendiculata* during the spring in the mesopelagic zone.



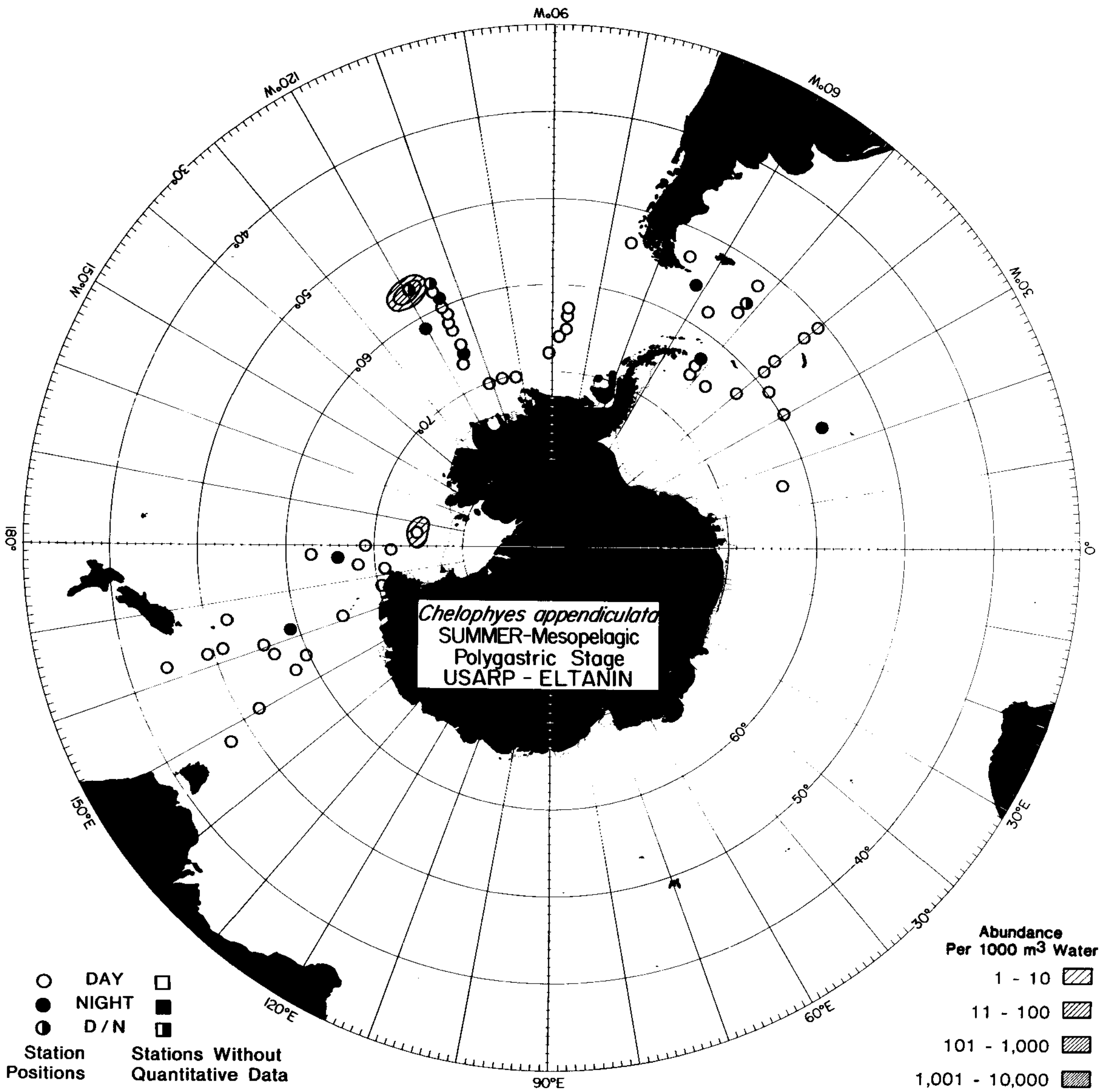
Map A85. The distribution of the eudoxid stage of *Chelophyes appendiculata* during the spring in the epipelagic zone.



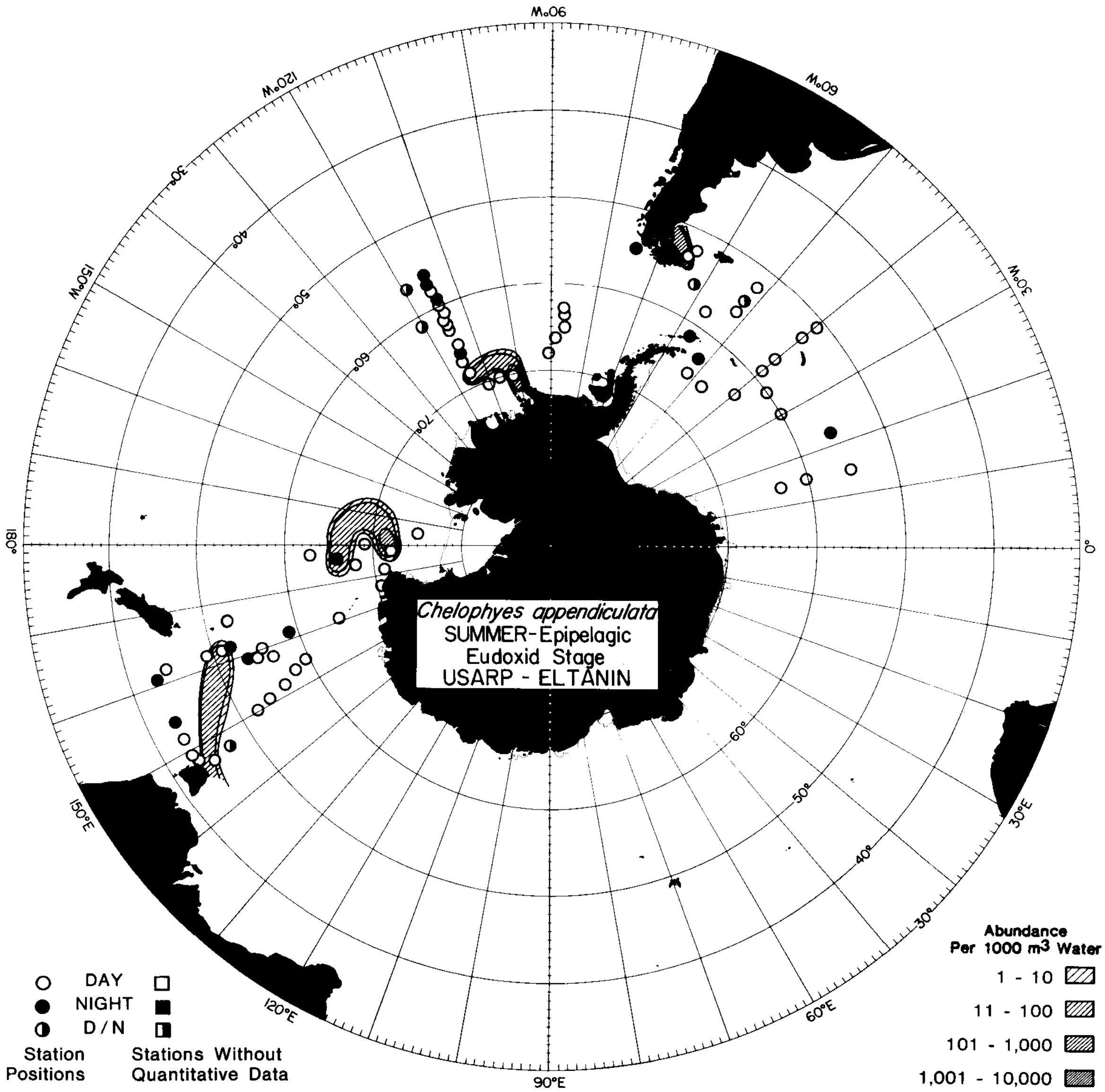
Map A86. The distribution of the eudoxid stage of *Chelophyes appendiculata* during the spring in the mesopelagic zone.



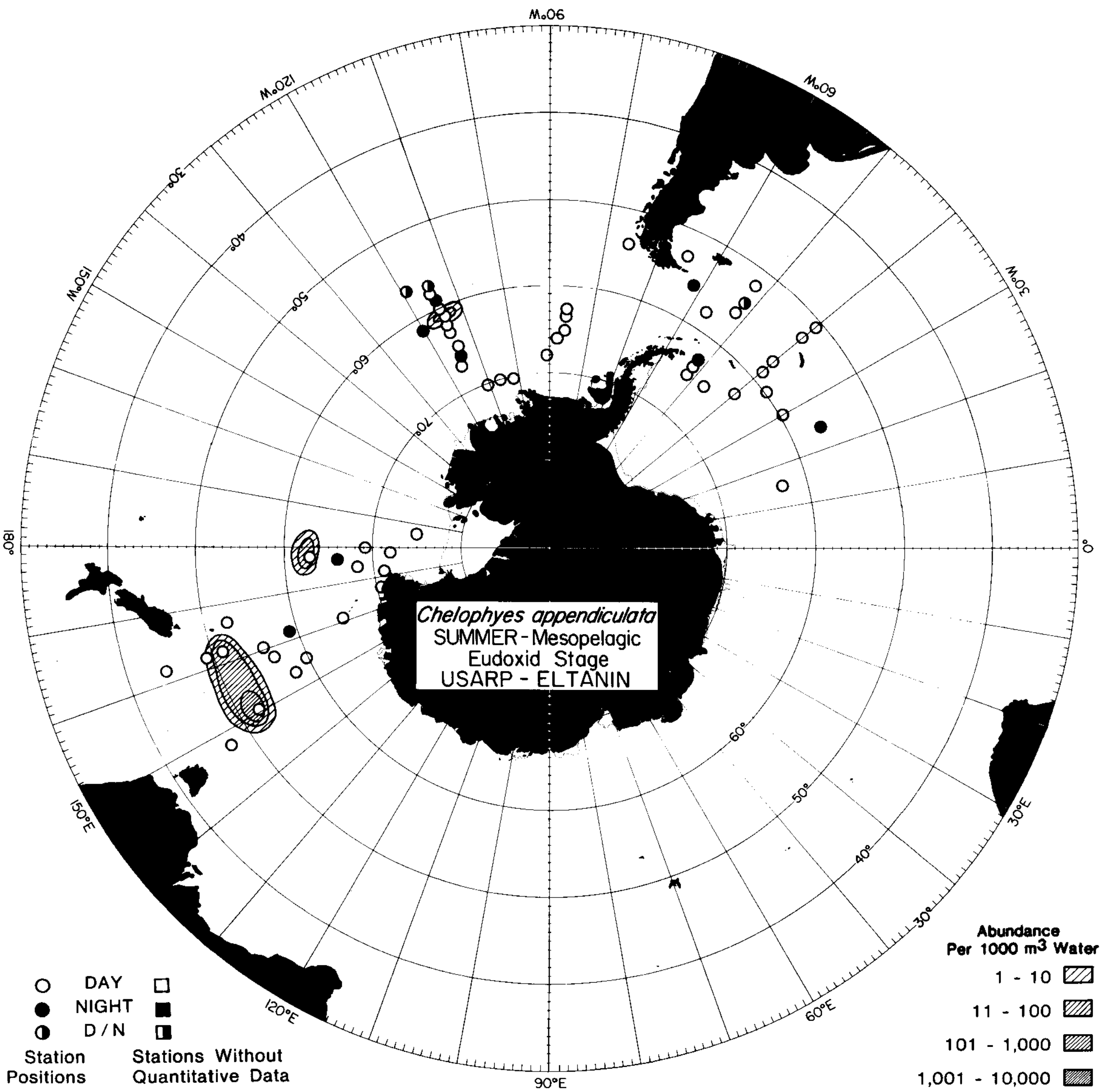
Map A87. The distribution of the polygastric stage of *Chelophyes appendiculata* during the summer in the epipelagic zone.



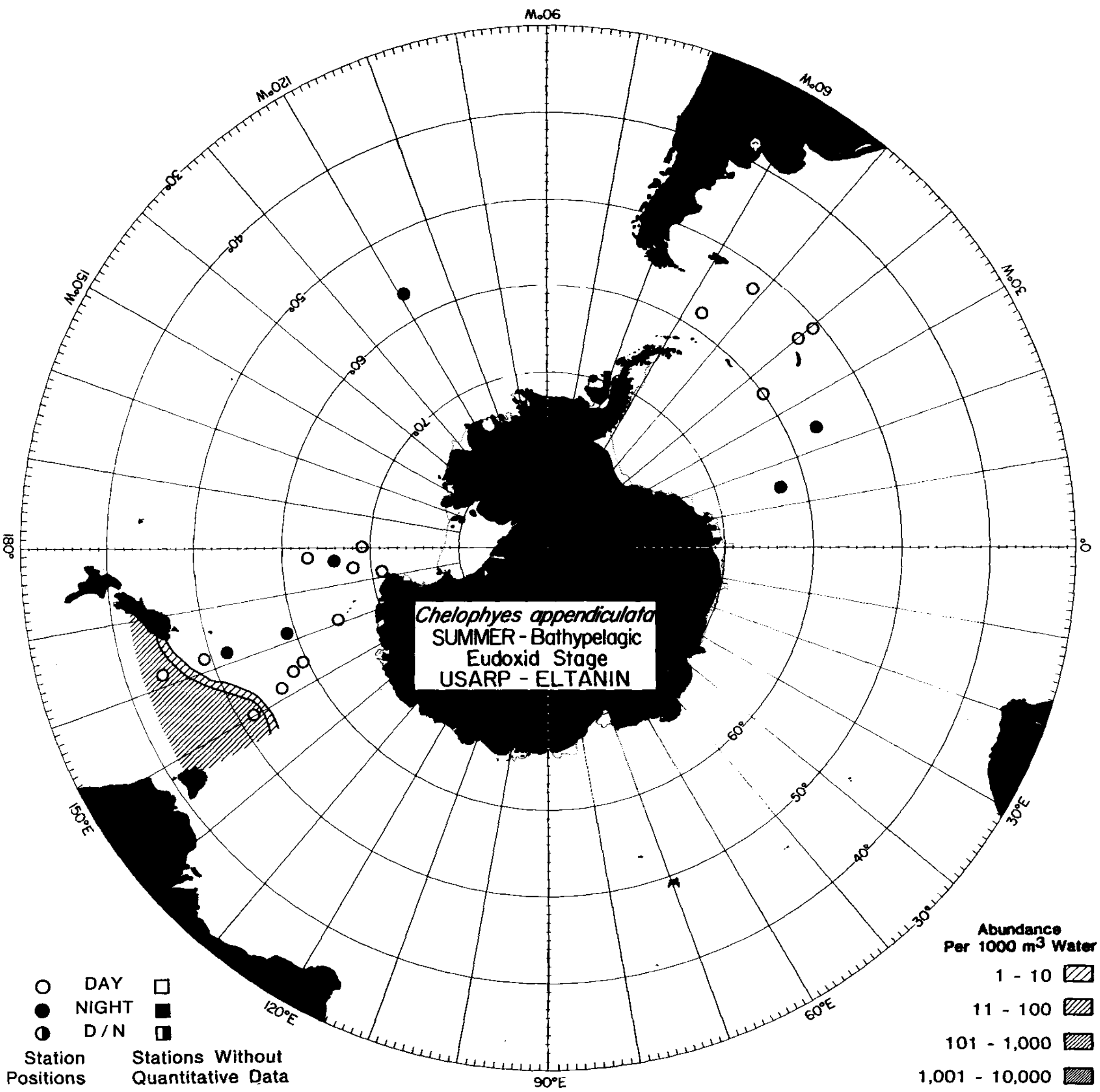
Map A88. The distribution of the polygastric stage of *Chelophyes appendiculata* during the summer in the mesopelagic zone.



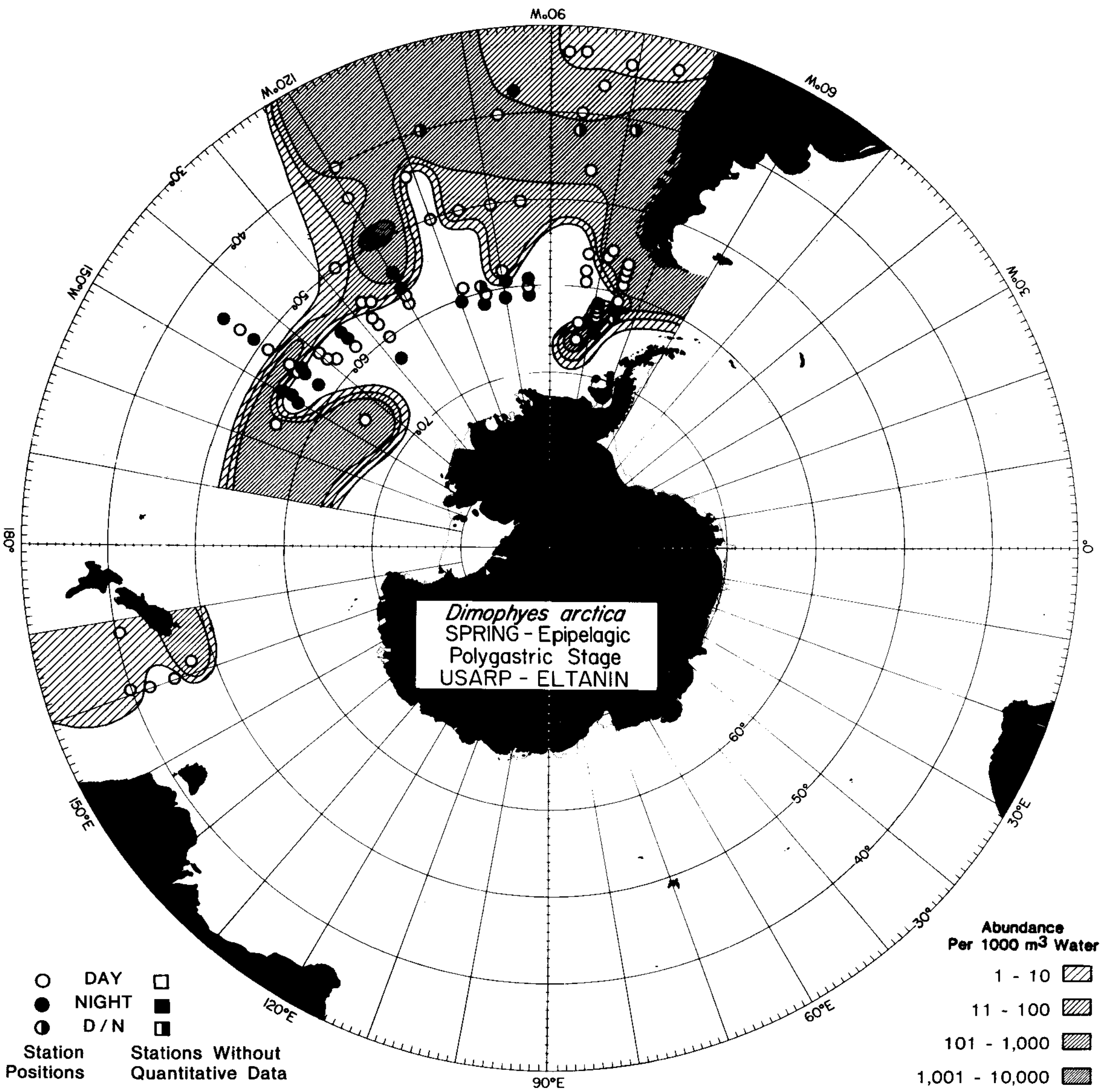
Map A89. The distribution of the eudoxid stage of *Chelophyes appendiculata* during the summer in the epipelagic zone.



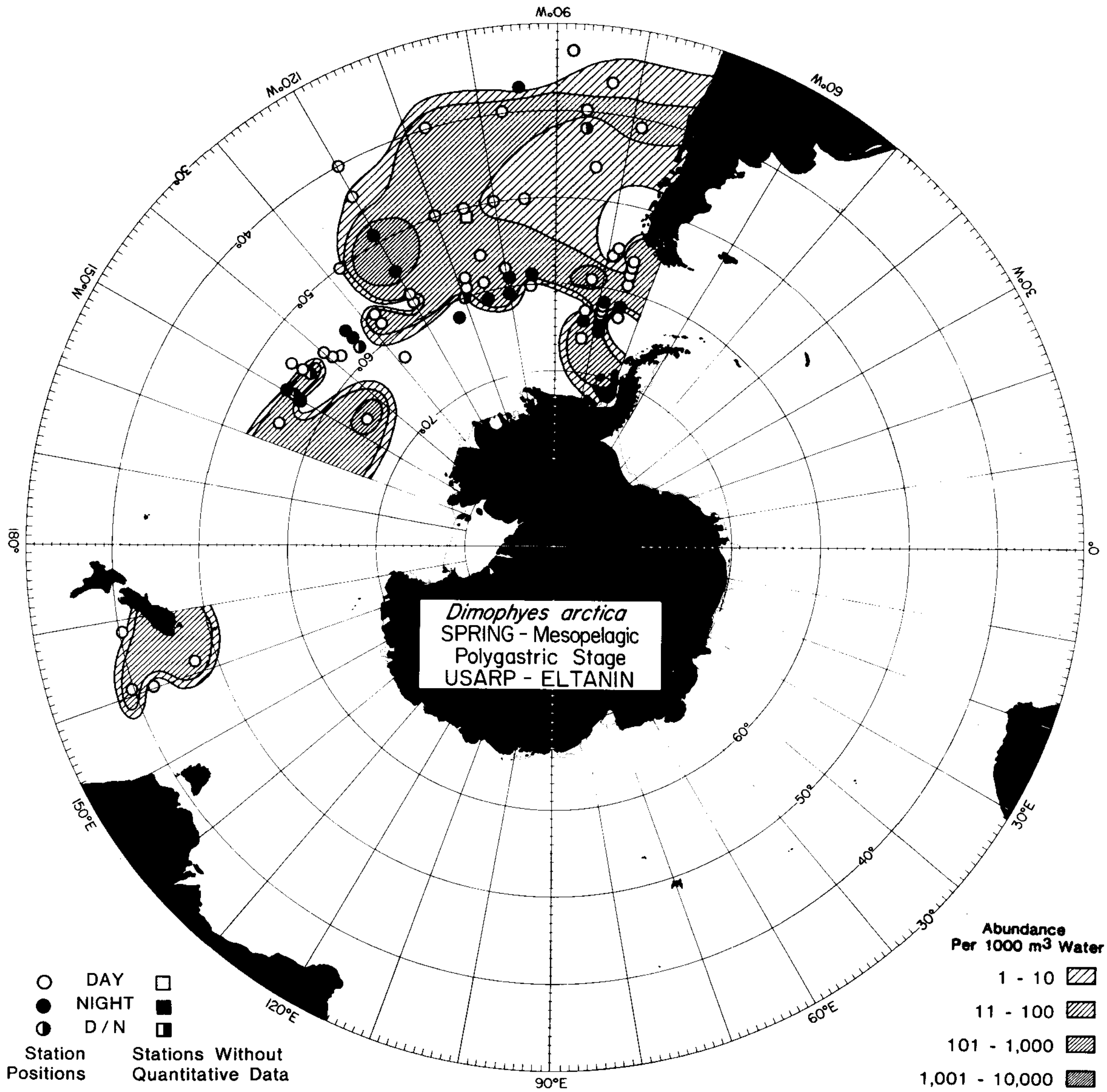
Map A90. The distribution of the eudoxid stage of *Chelophyes appendiculata* during the summer in the mesopelagic zone.



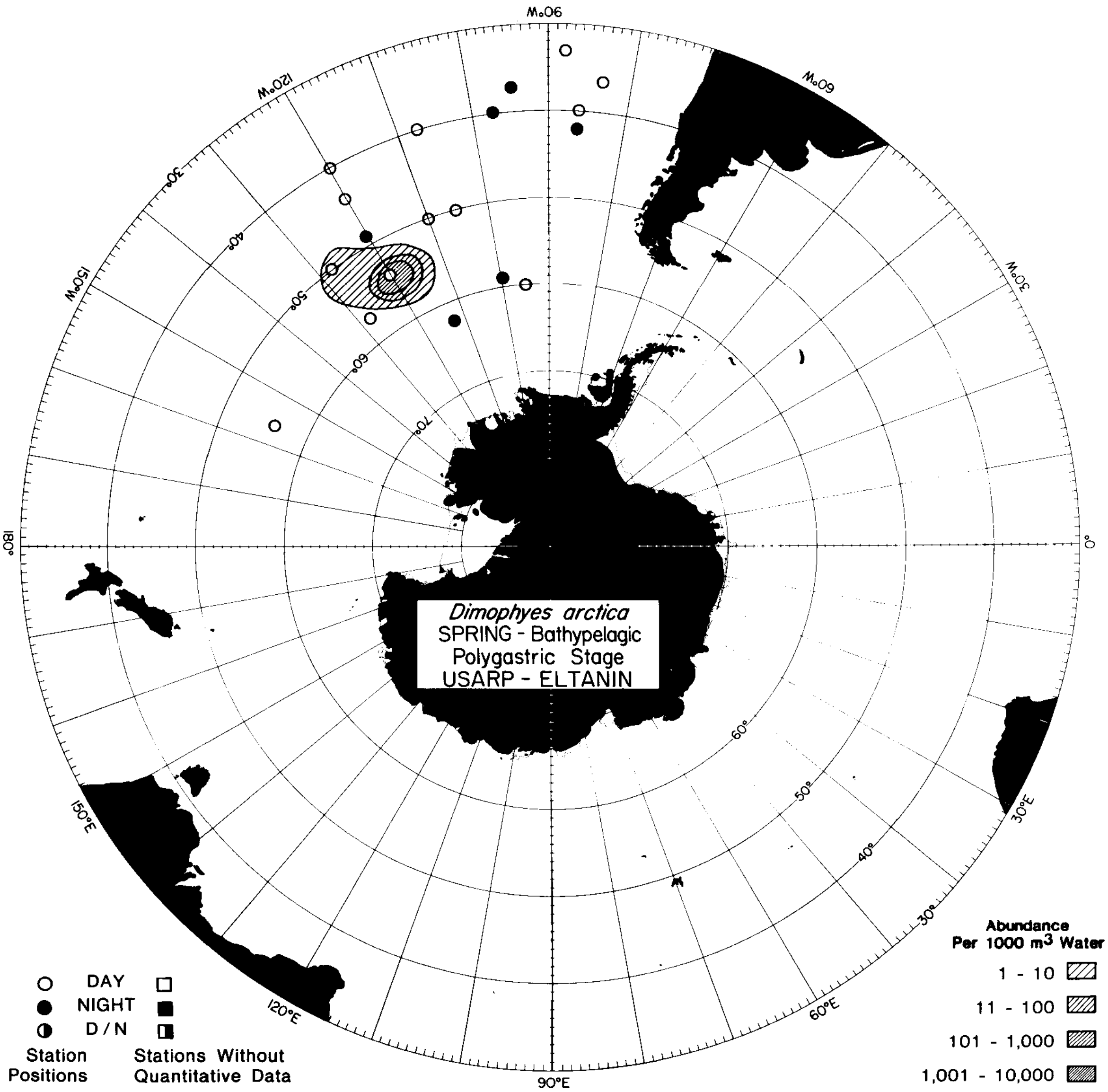
Map A91. The distribution of the eudoxid stage of *Chelophyes appendiculata* during the summer in the bathypelagic zone.



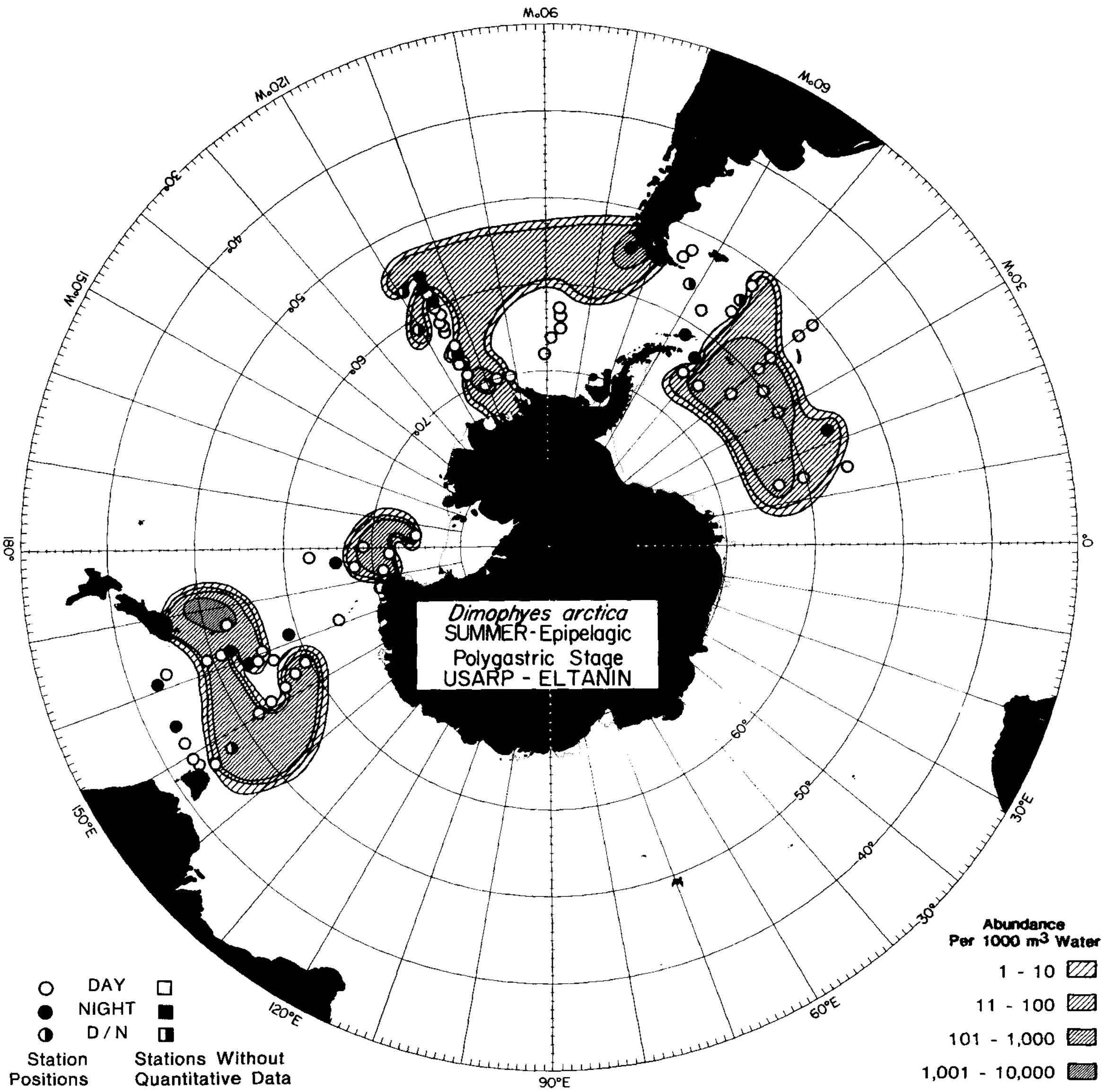
Map A92. The distribution of the polygastric stage of *Dimophyes arctica* during the spring in the epipelagic zone.



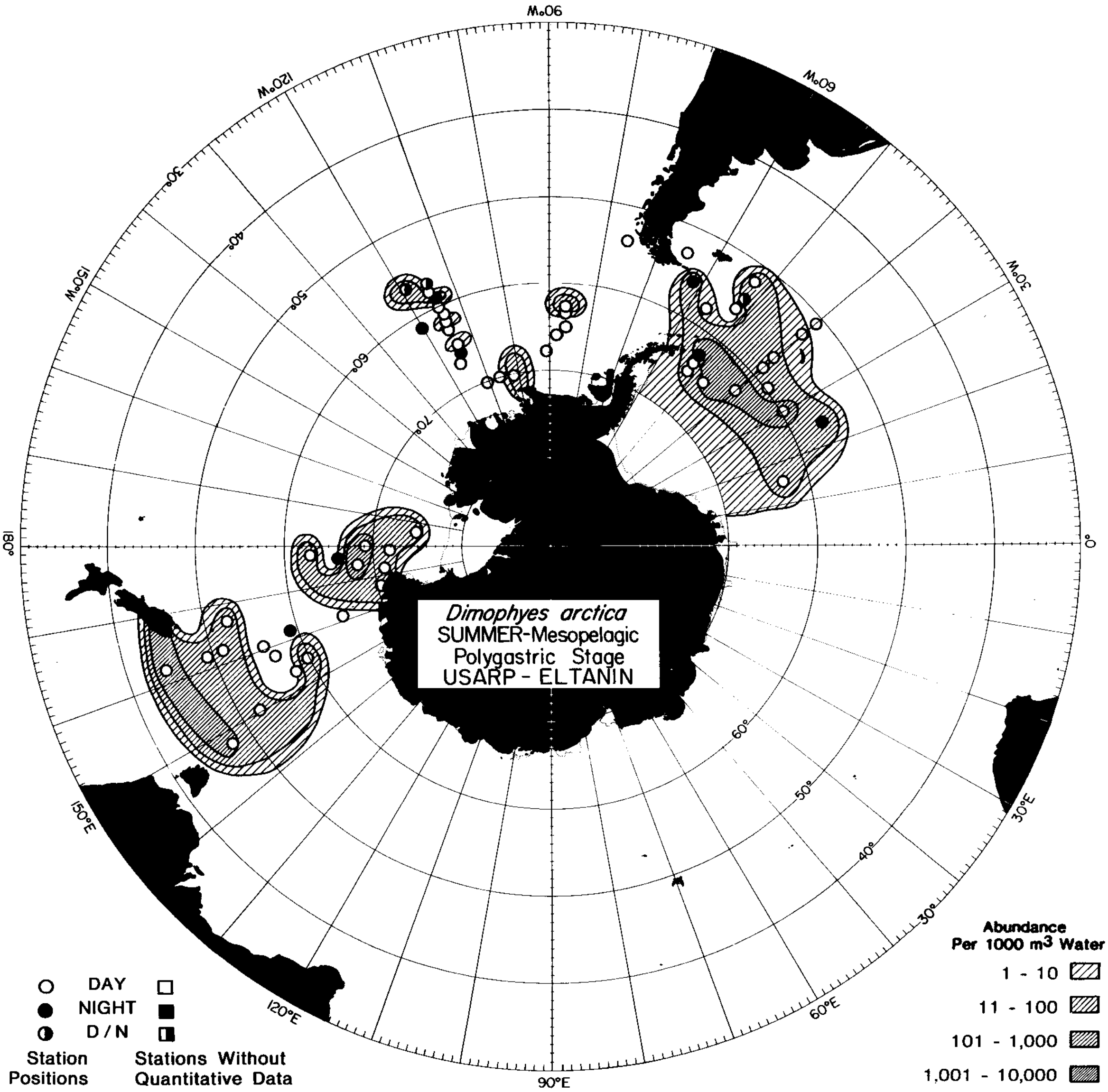
Map A93. The distribution of the polygastric stage of *Dimophyes arctica* during the spring in the mesopelagic zone.



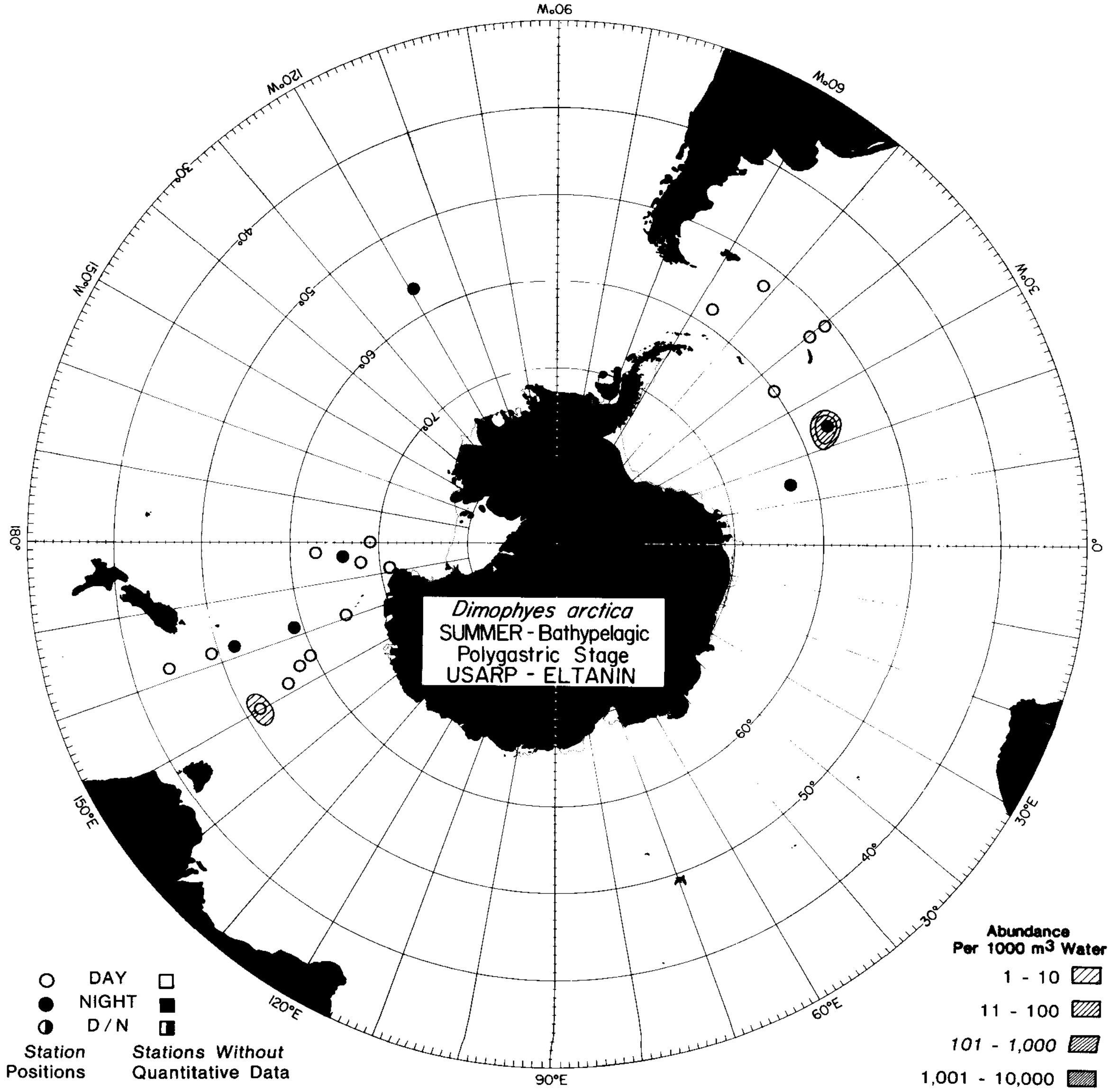
Map A94. The distribution of the polygastric stage of *Dimophyes arctica* during the spring in the bathypelagic zone.



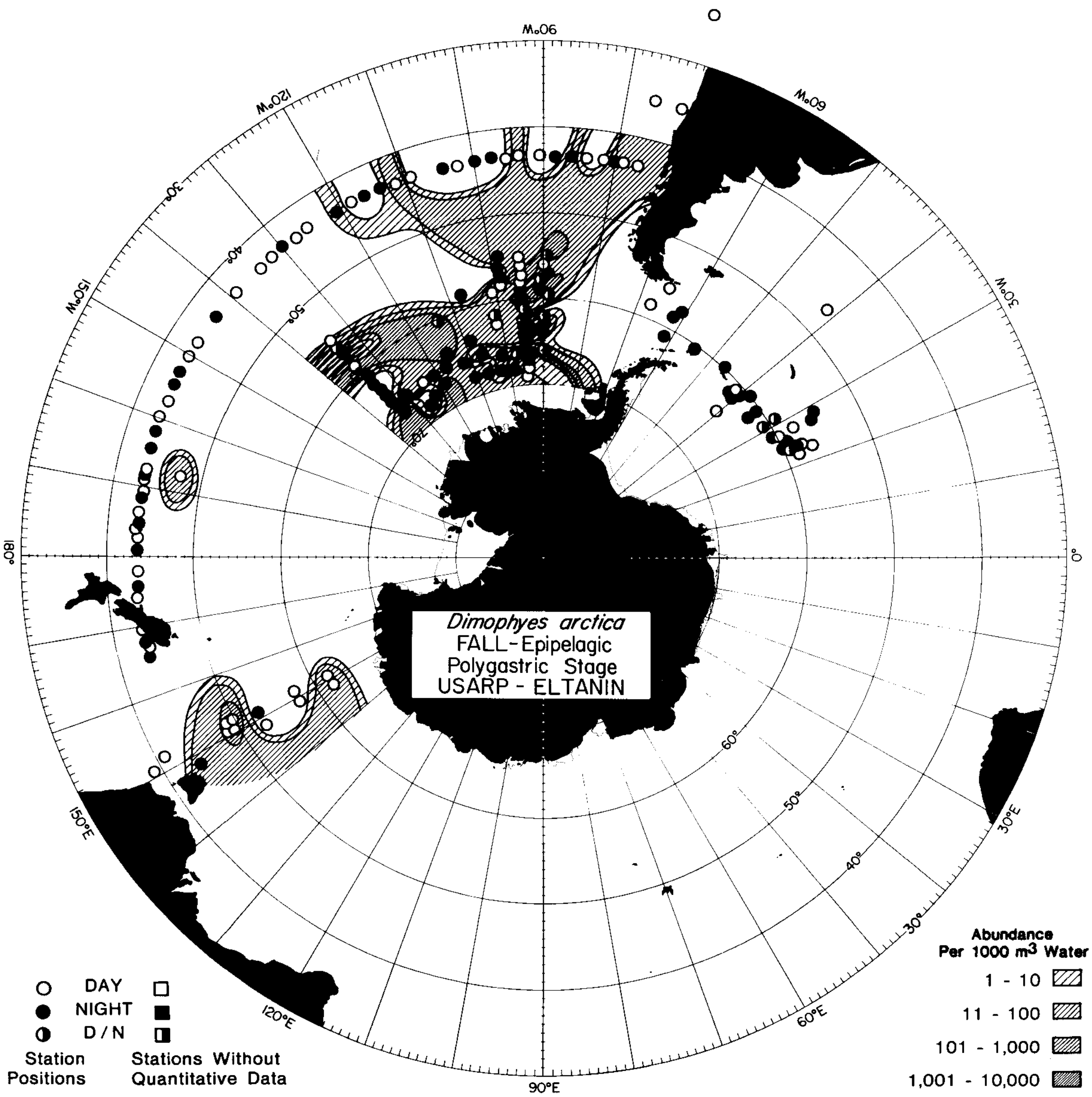
Map A95. The distribution of the polygastric stage of *Dimophyes arctica* during the summer in the epipelagic zone.



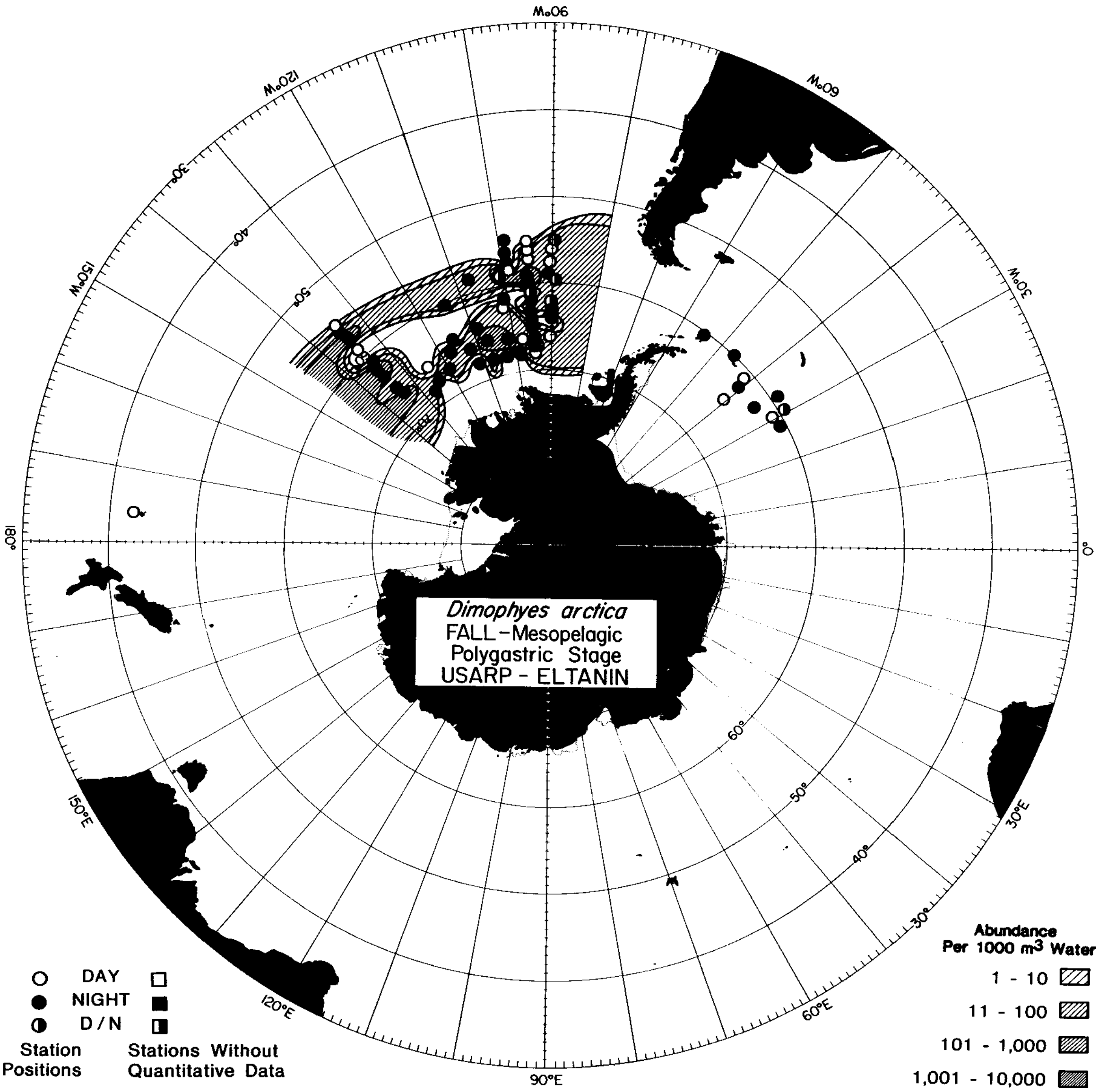
Map A96. The distribution of the polygastric stage of *Dimophyes arctica* during the summer in the mesopelagic zone.



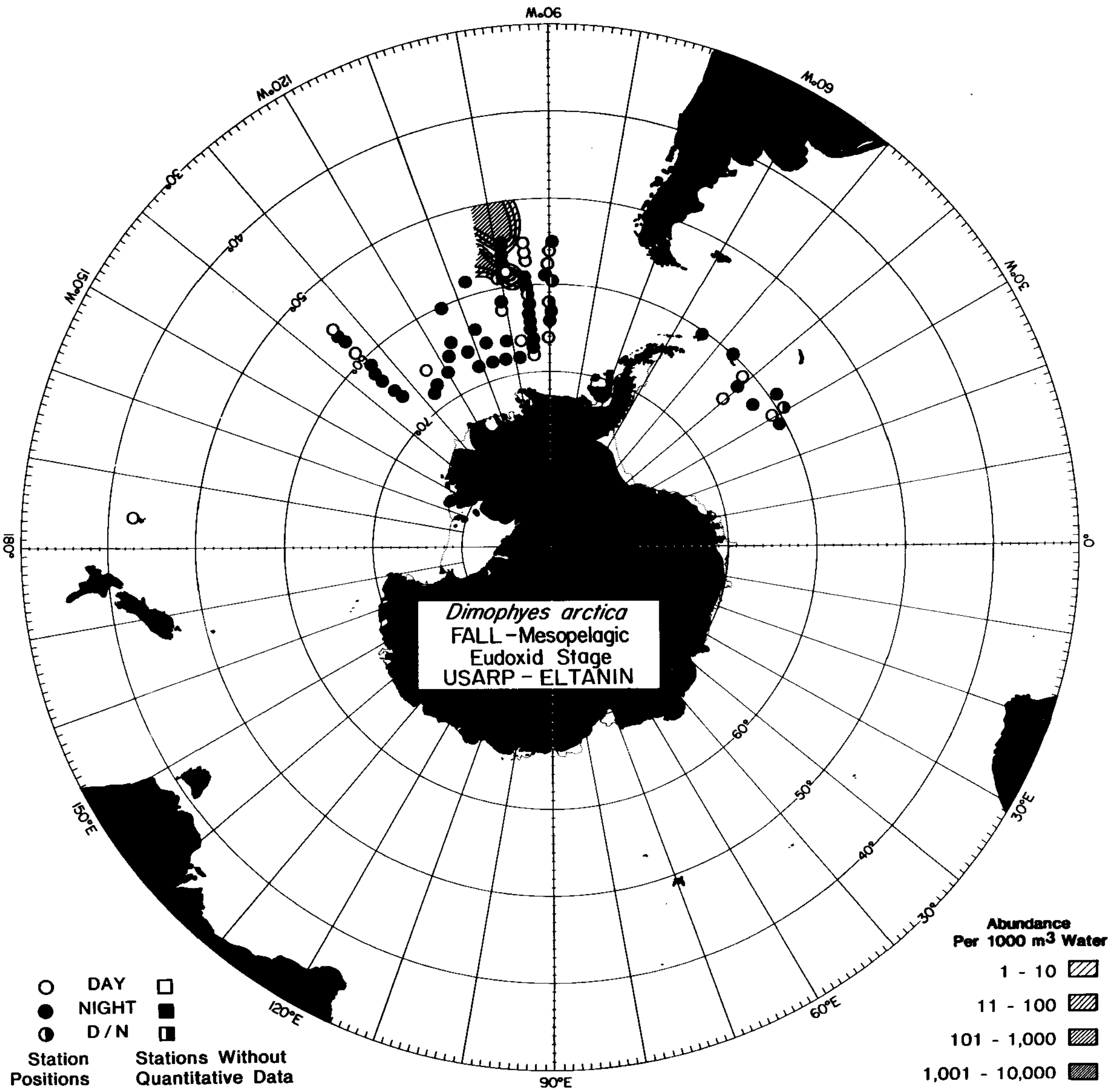
Map A97. The distribution of the polygastric stage of *Dimophyes arctica* during the summer in the bathypelagic zone.



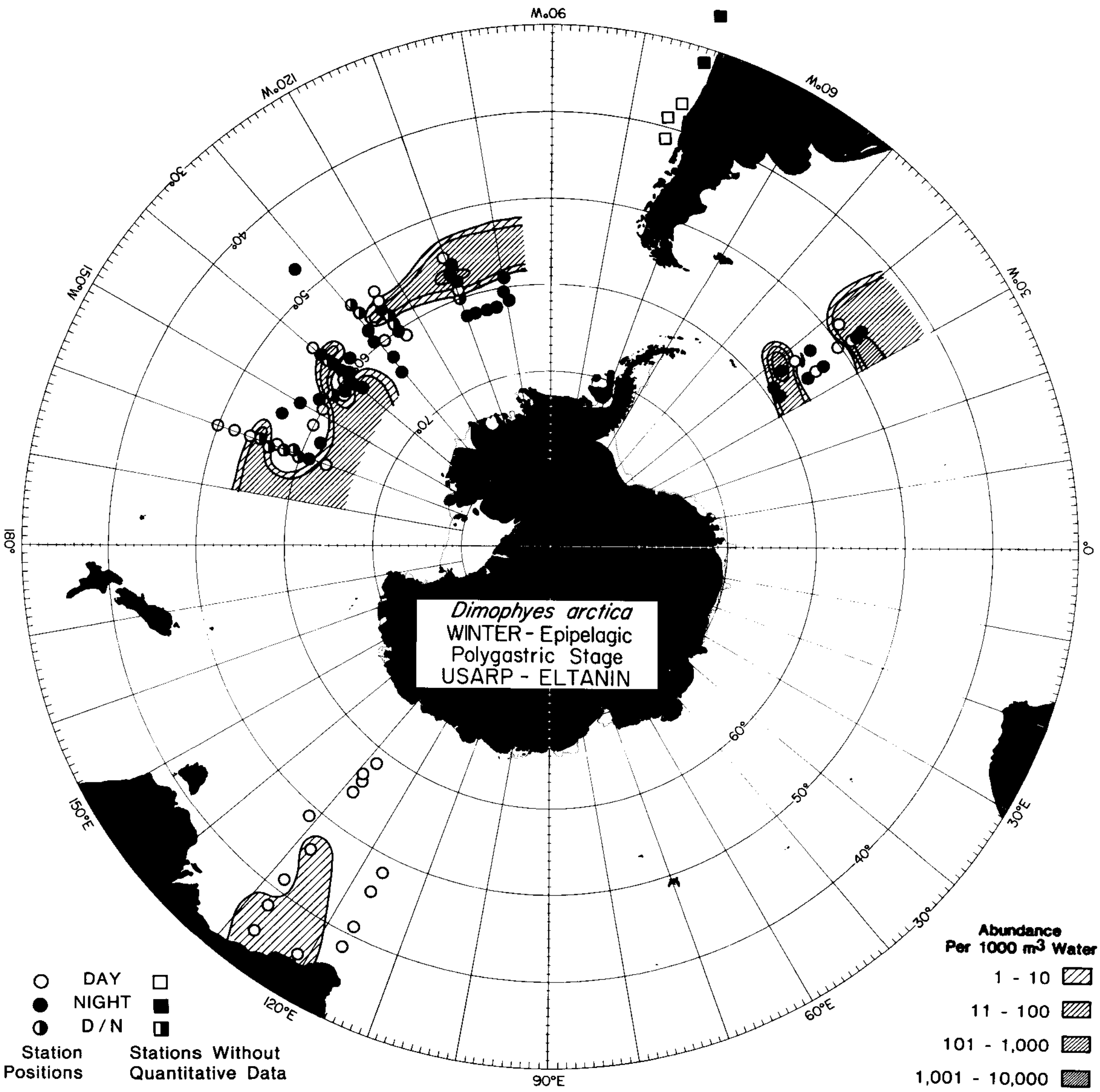
Map A98. The distribution of the polygastric stage of *Dimophyes arctica* during the fall in the epipelagic zone.



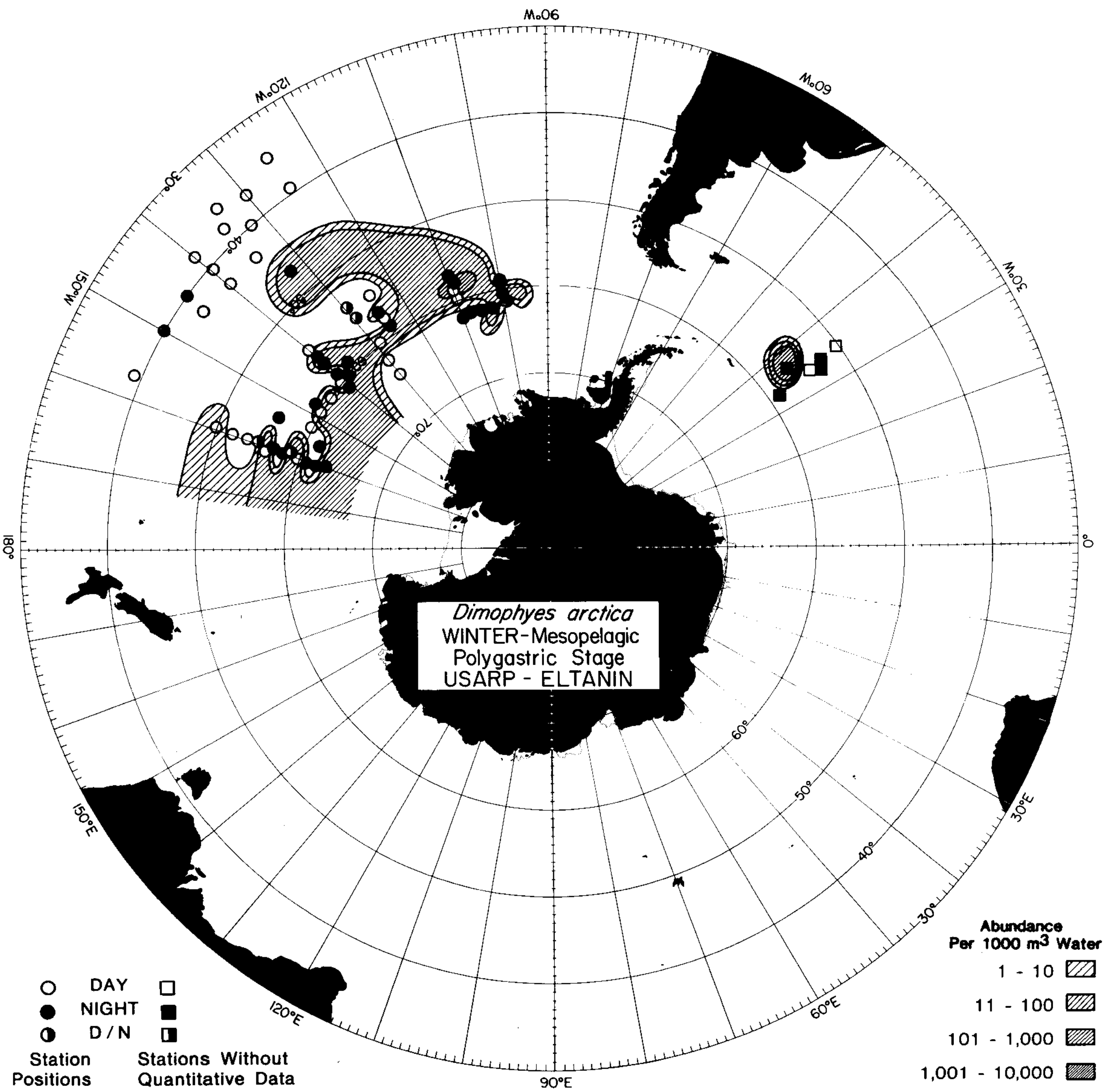
Map A99. The distribution of the polygastric stage of *Dimophyes arctica* during the fall in the mesopelagic zone.



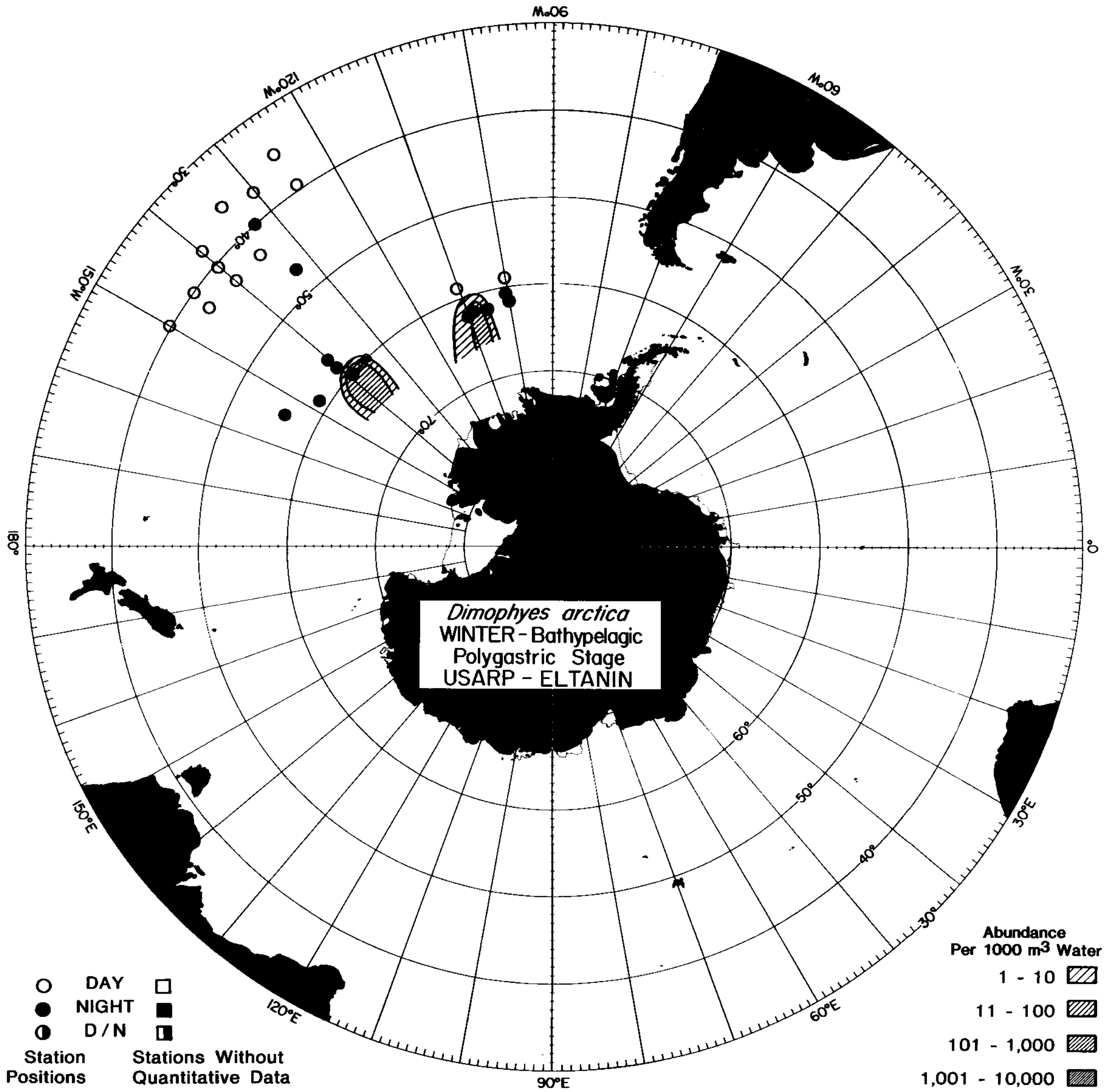
Map A100. The distribution of the eudoxid stage of *Dimophyes arctica* during the fall in the mesopelagic zone.



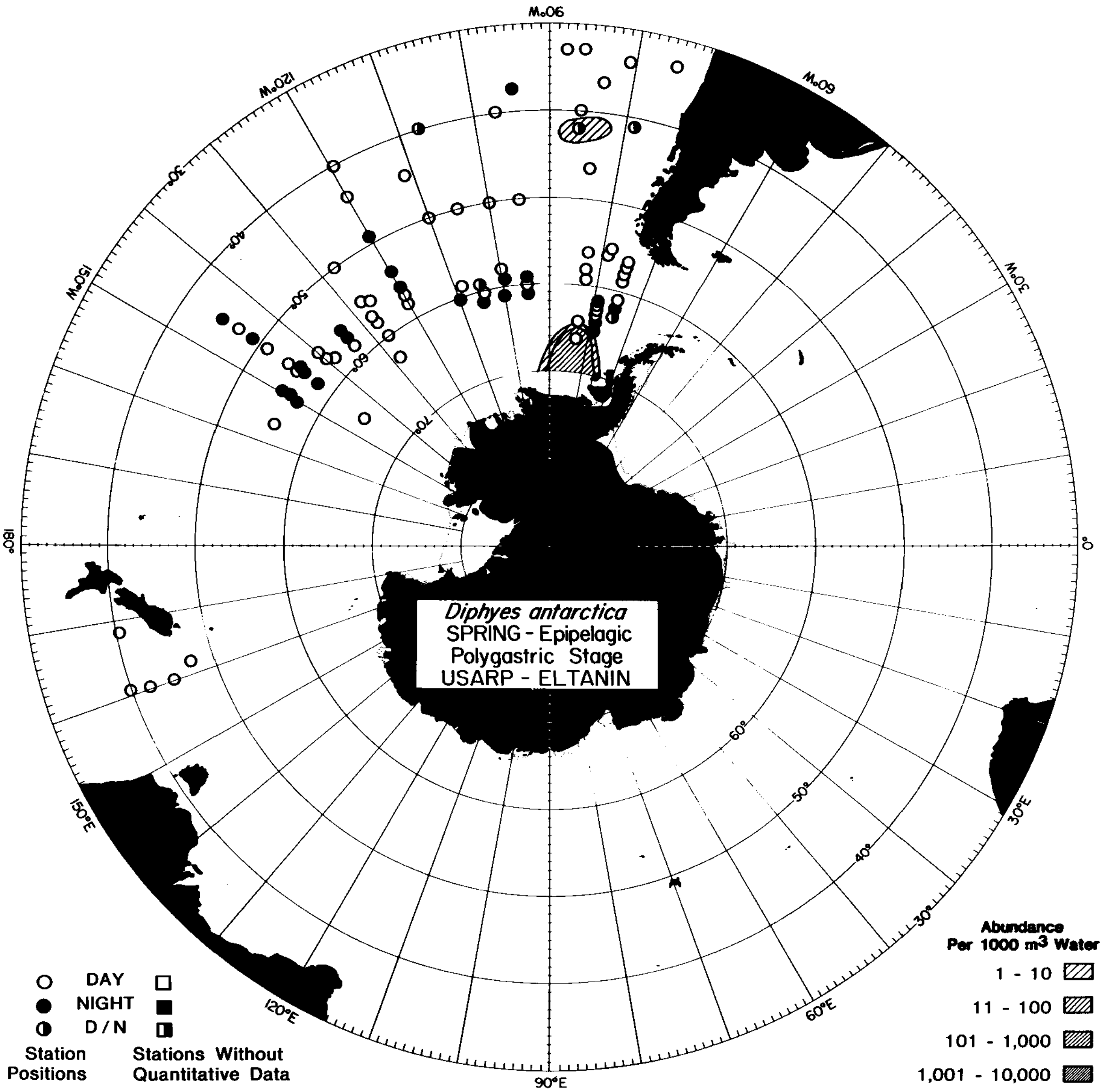
Map A101. The distribution of the polygastric stage of *Dimophyes arctica* during the winter in the epipelagic zone.



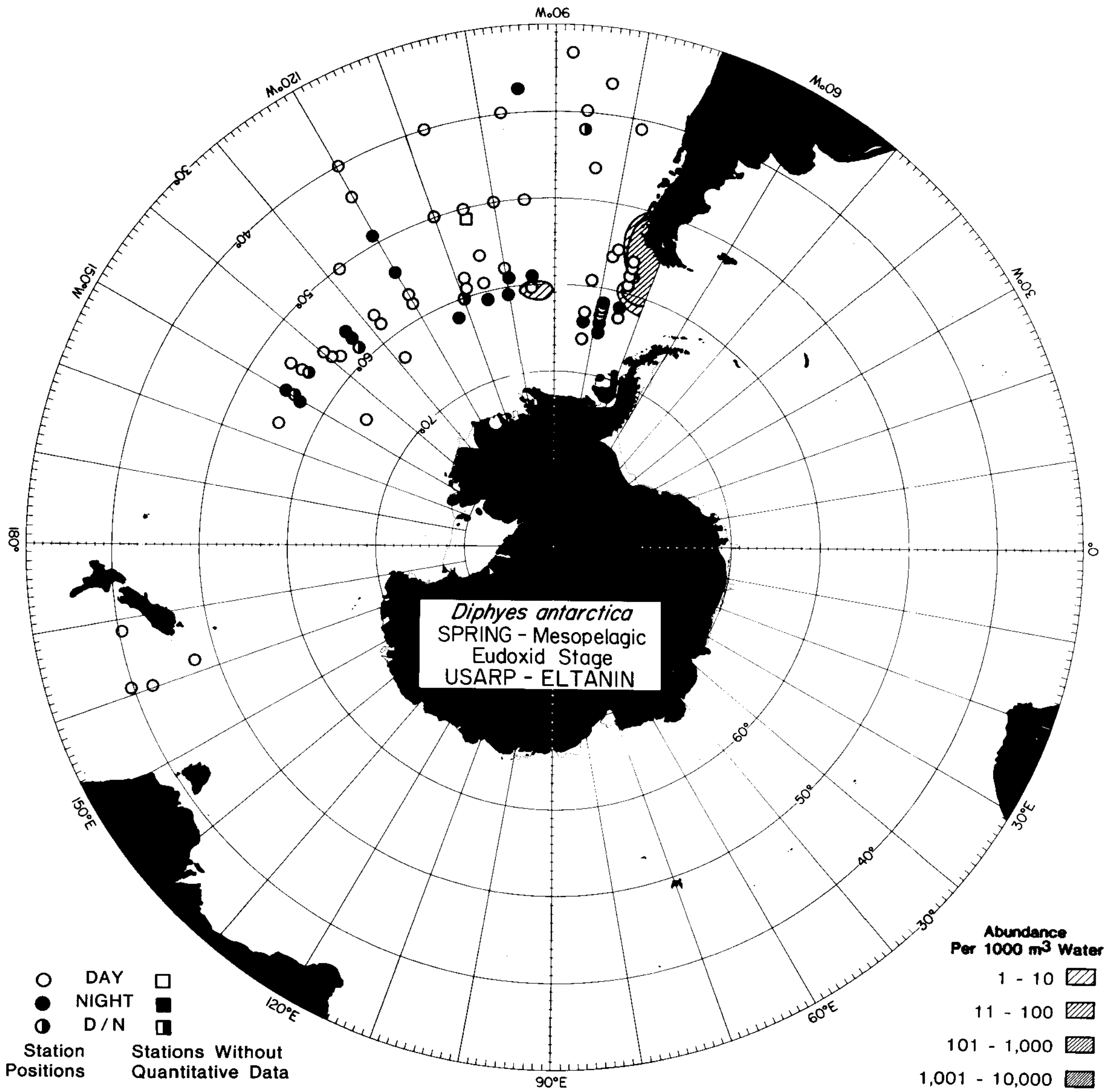
Map A102. The distribution of the polygastric stage of *Dimophyes arctica* during the winter in the mesopelagic zone.



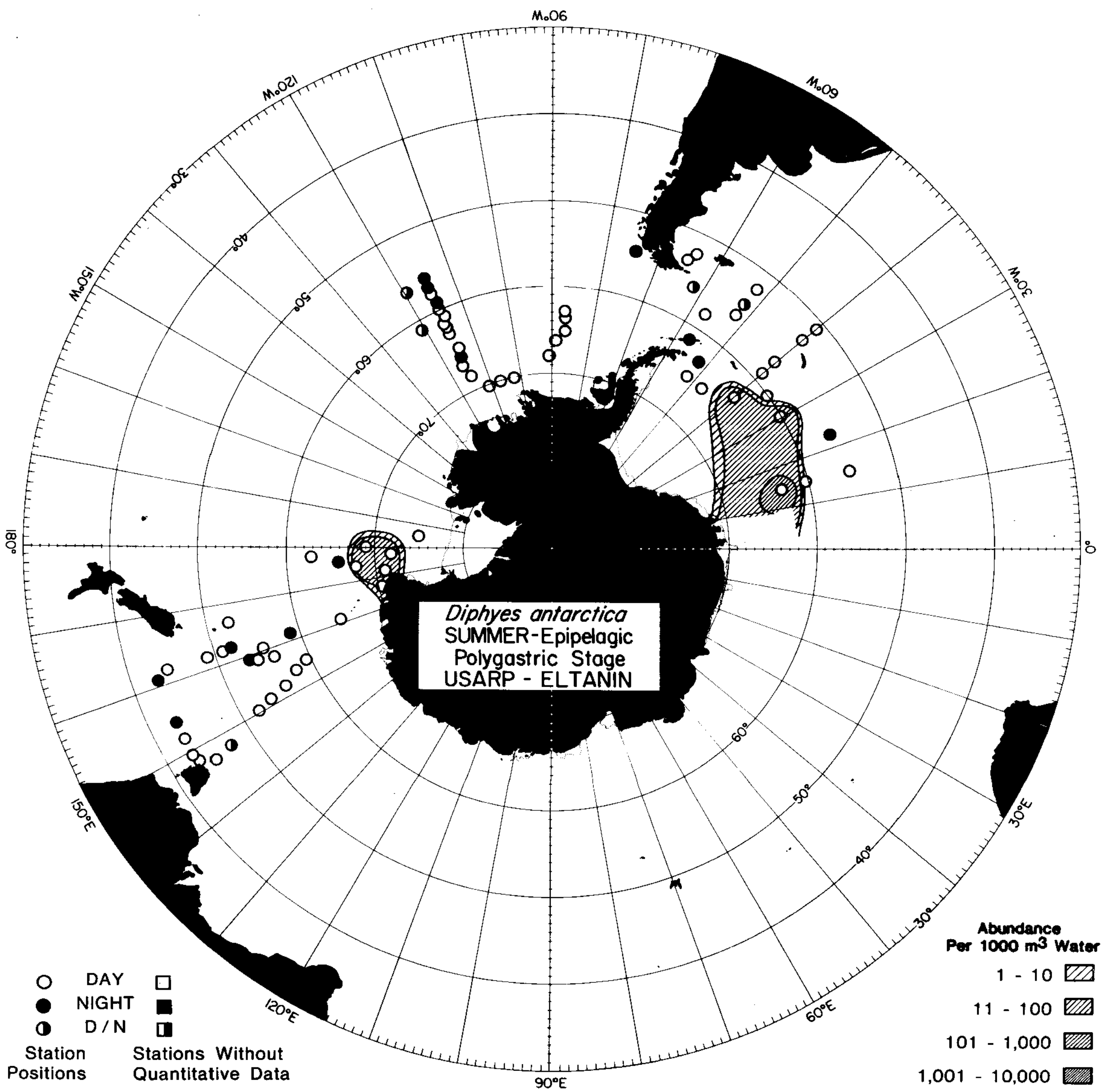
Map A103. The distribution of the polygastric stage of *Dimophyes arctica* during the winter in the bathypelagic zone.



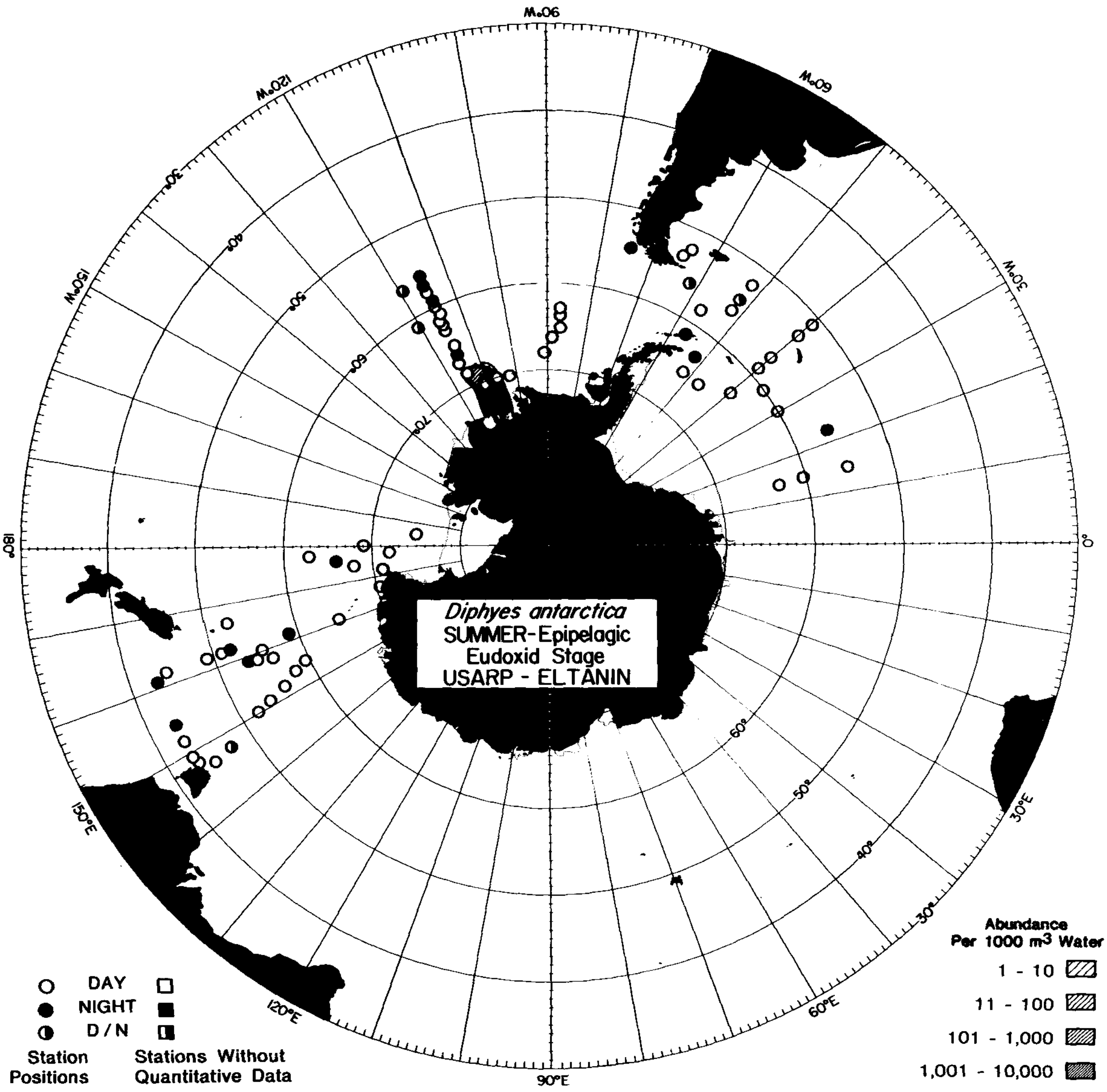
Map A104. The distribution of the polygastric stage of *Diphyes antarctica* during the spring in the epipelagic zone.



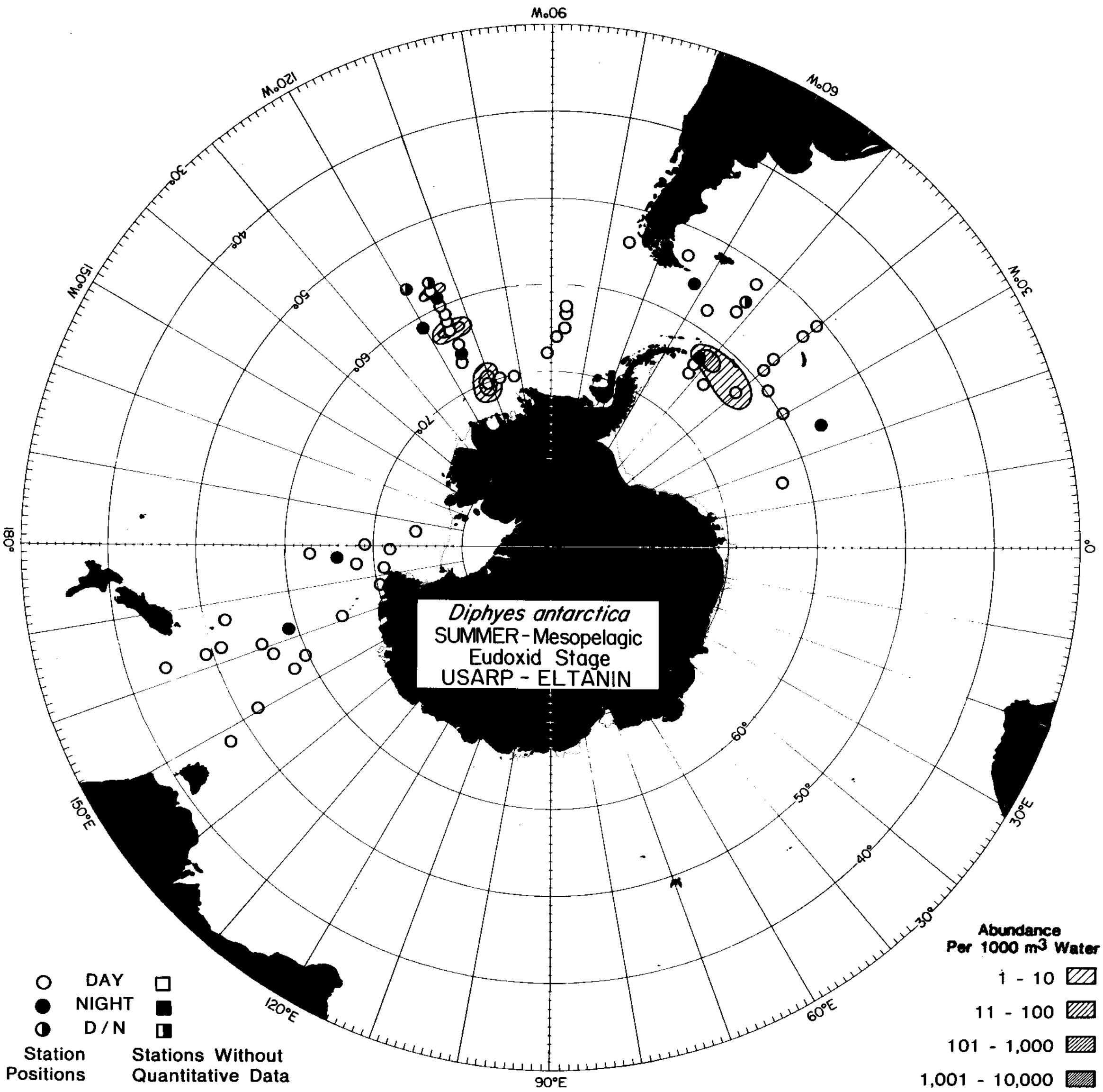
Map A105. The distribution of the eudoxid stage of *Diphyes antarctica* during the spring in the mesopelagic zone.



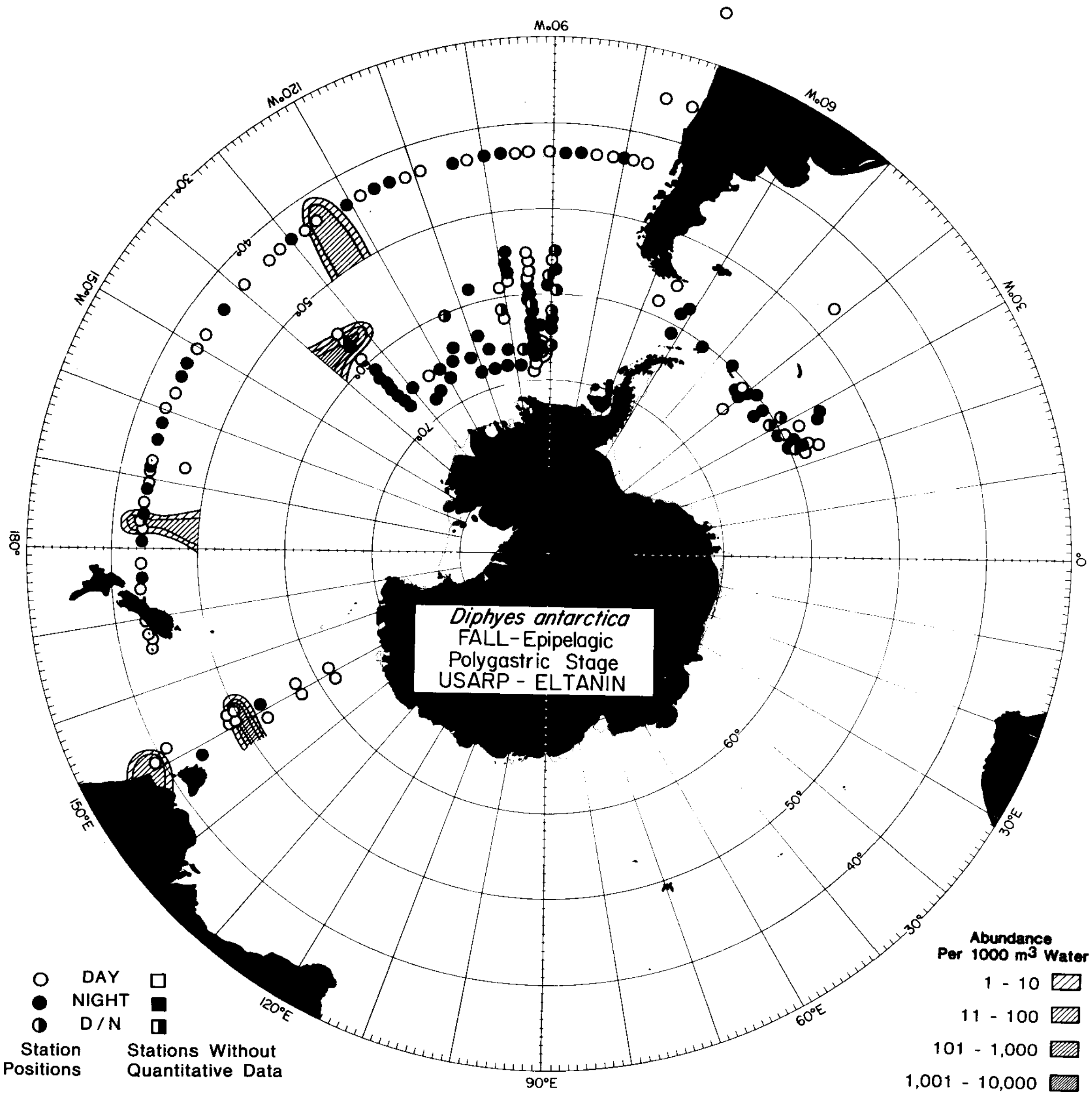
Map A106. The distribution of the polygastric stage of *Diphyes antarctica* during the summer in the epipelagic zone.



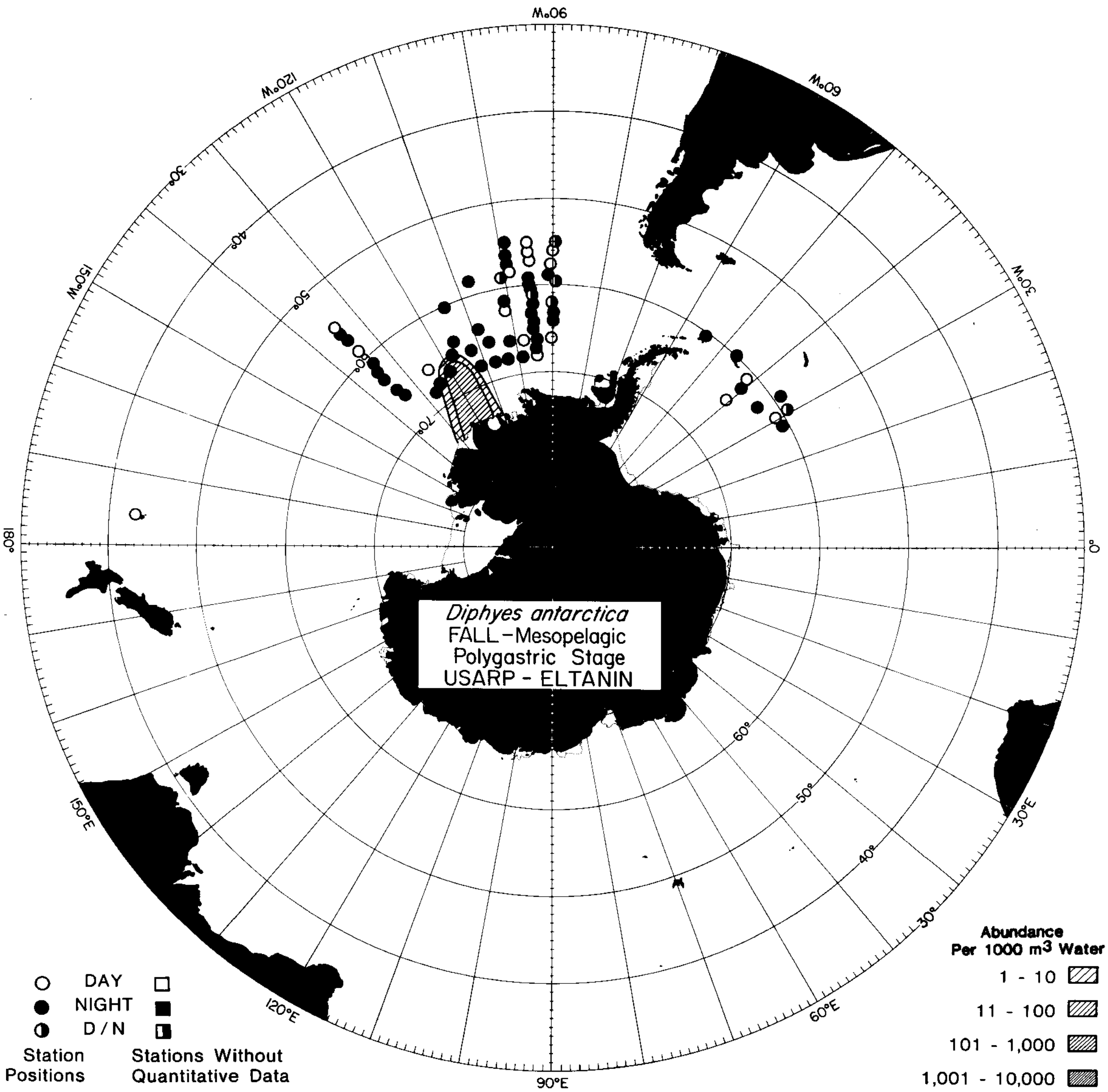
Map A107. The distribution of the eudoxid stage of *Diphyes antarctica* during the summer in the epipelagic zone.



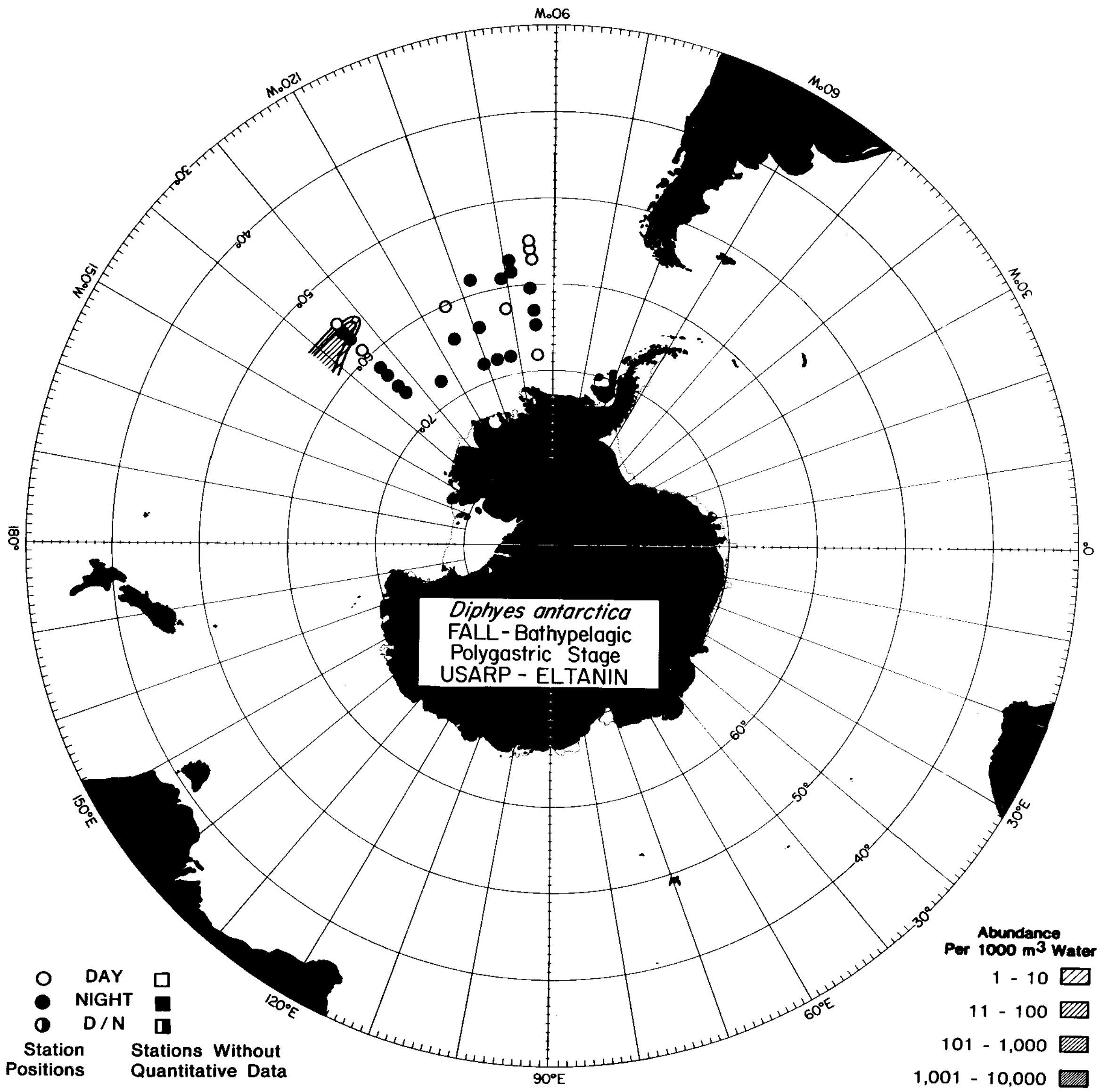
Map A108. The distribution of the eudoxid stage of *Diphyes antarctica* during the summer in the mesopelagic zone.



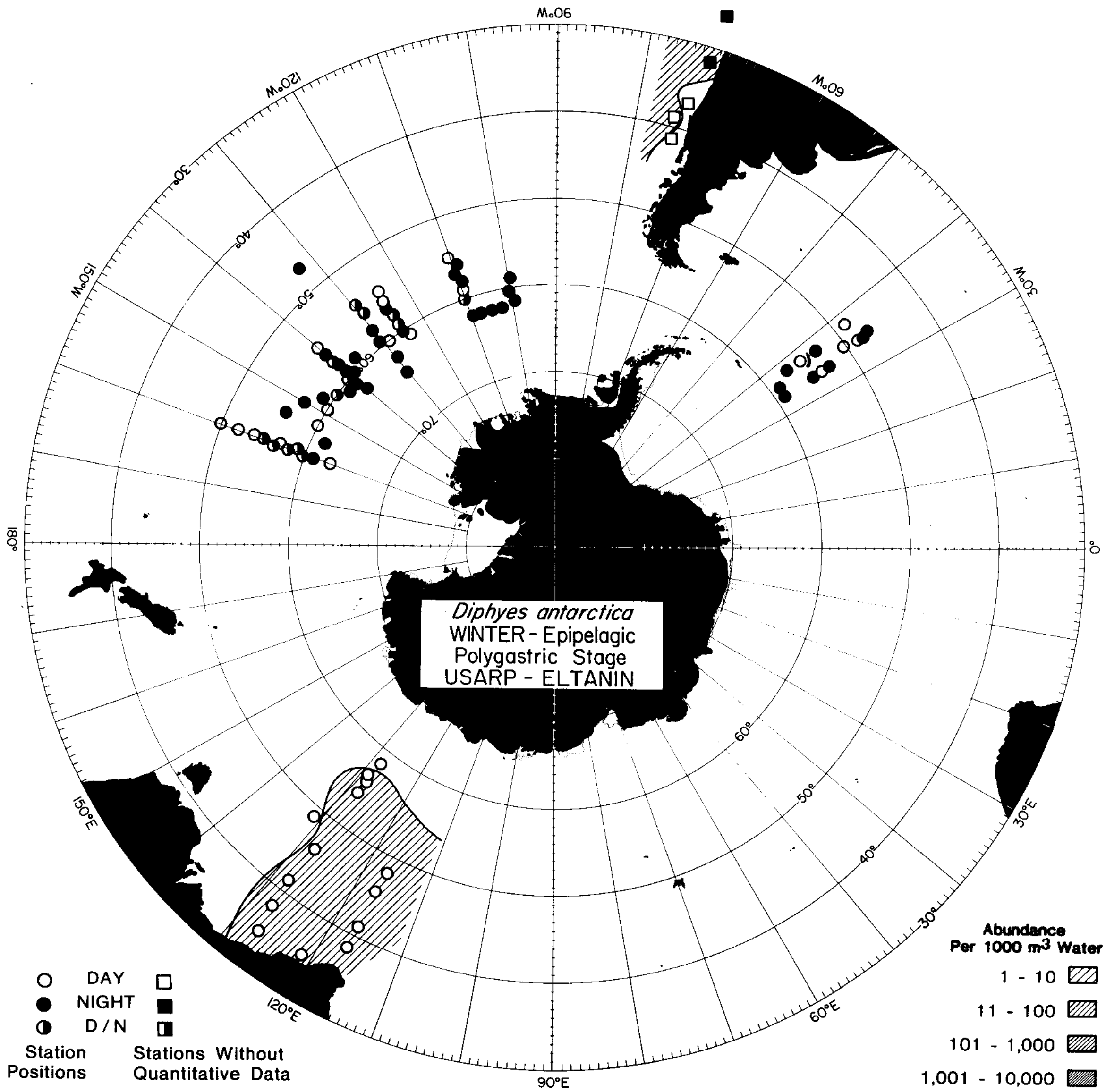
Map A109. The distribution of the polygastric stage of *Diphyes antarctica* during the fall in the epipelagic zone.



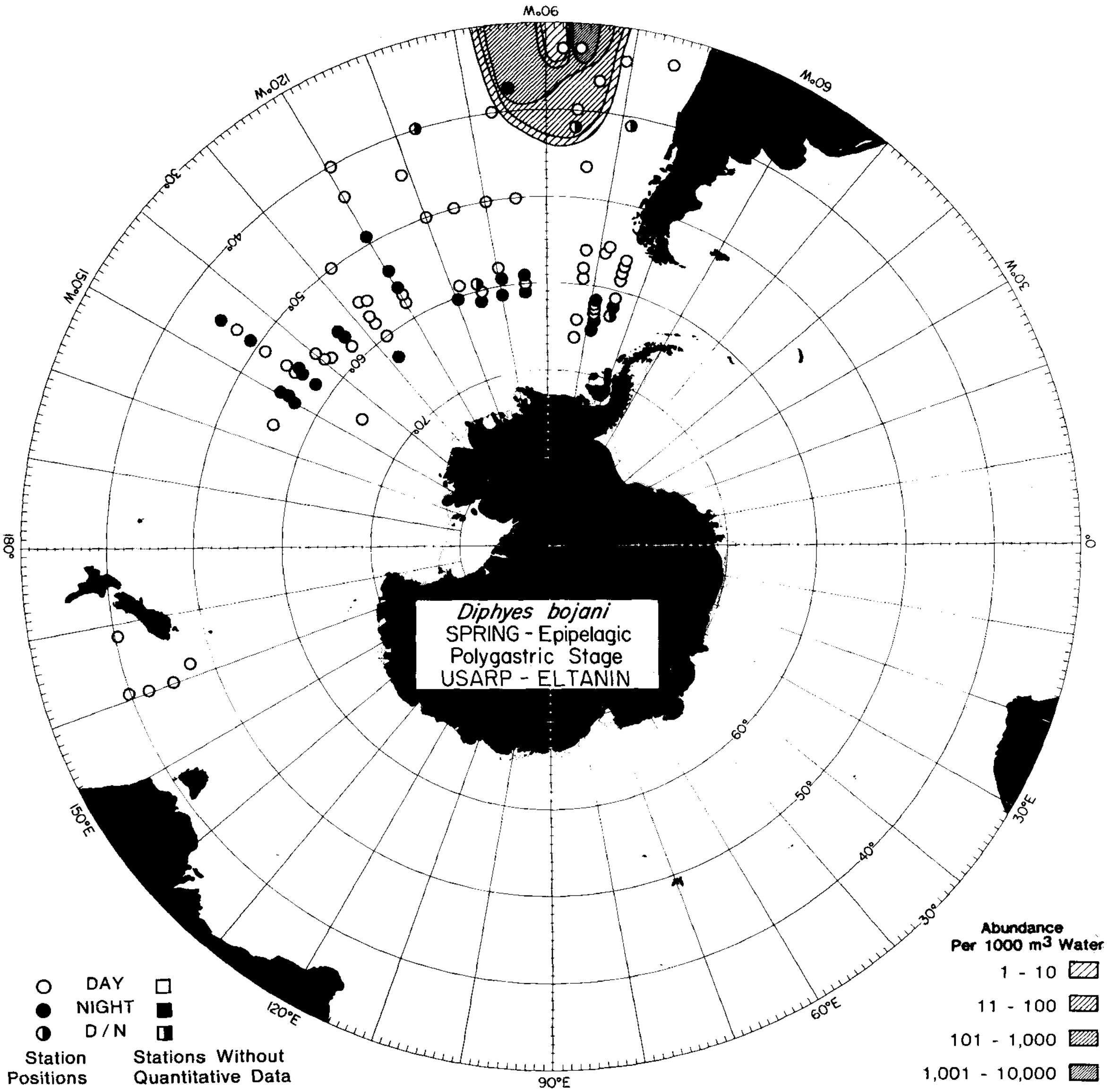
Map A110. The distribution of the polygastric stage of *Diphyes antarctica* during the fall in the mesopelagic zone.



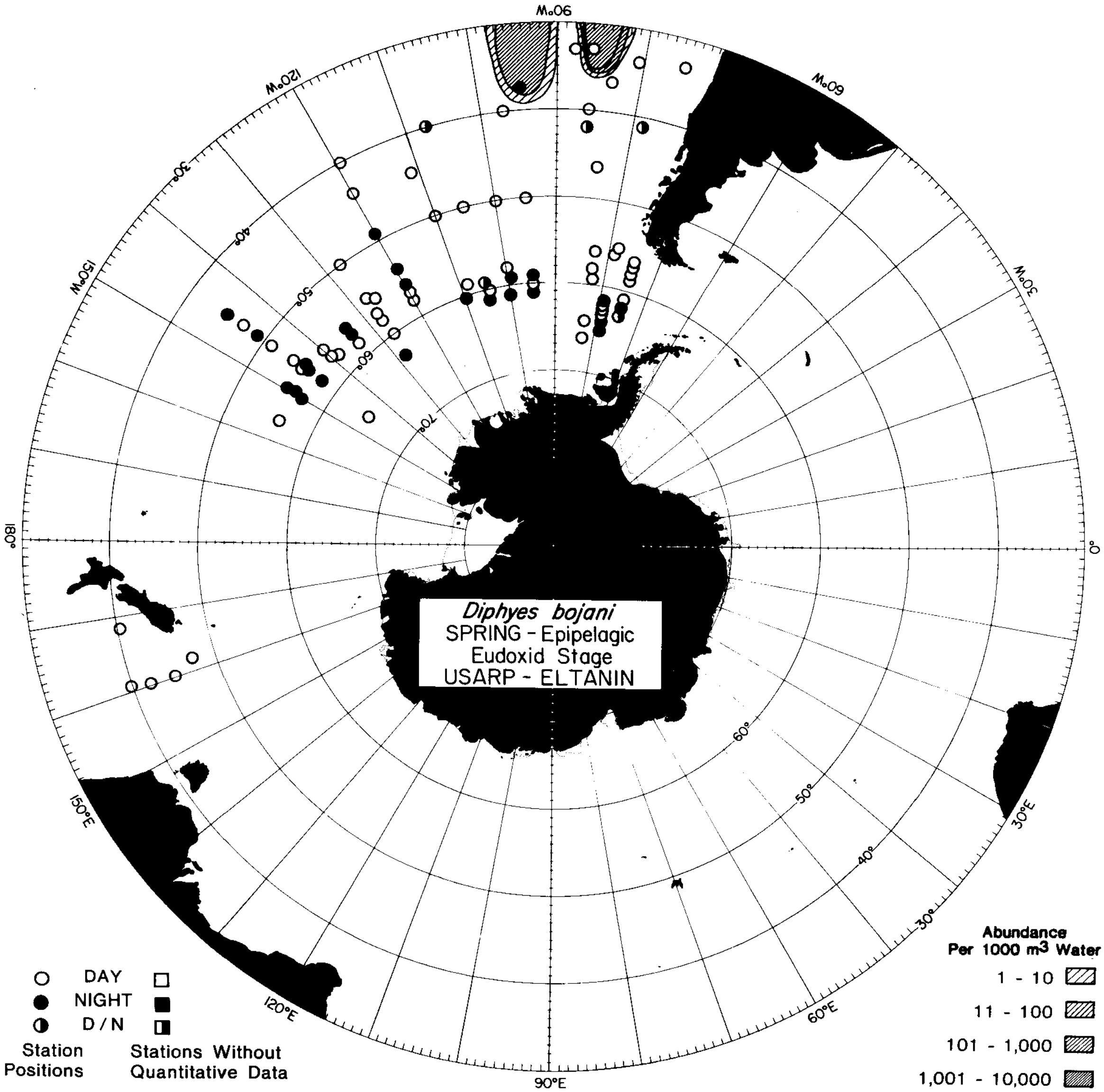
Map A111. The distribution of the polygastric stage of *Diphyes antarctica* during the fall in the bathypelagic zone.



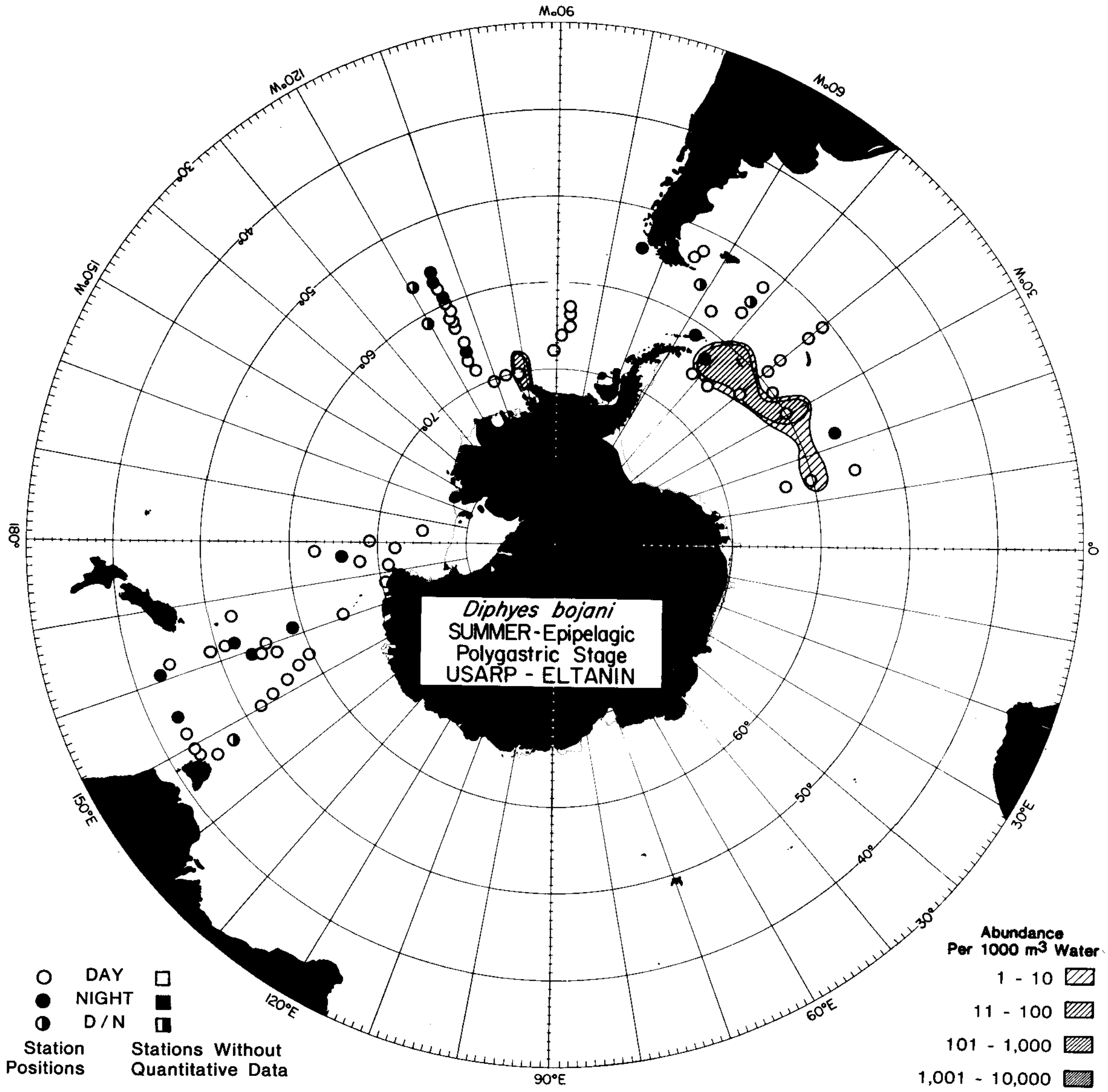
Map A112. The distribution of the polygastric stage of *Diphyes antarctica* during the winter in the epipelagic zone.



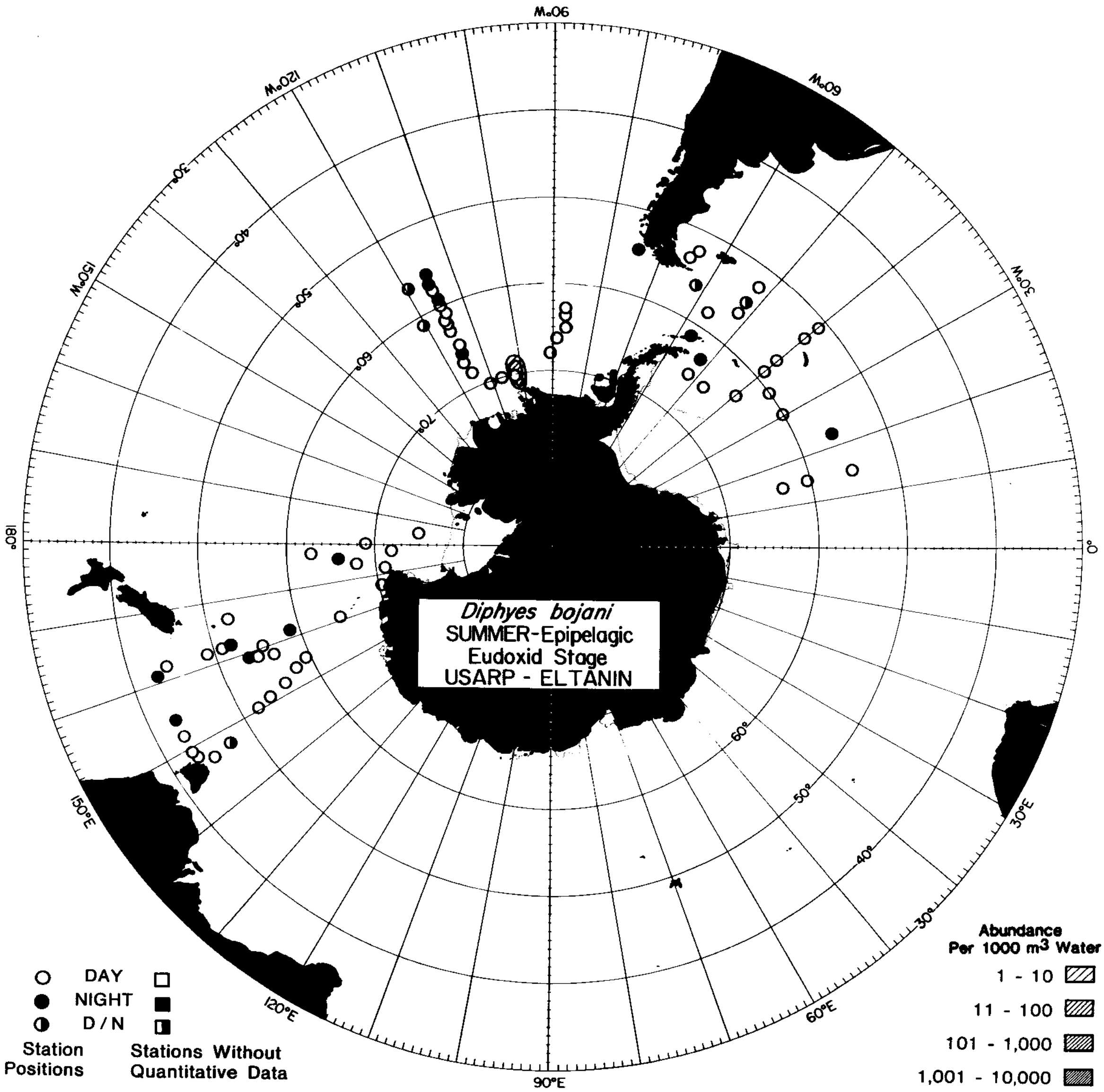
Map A113. The distribution of the polygastric stage of *Diphyes bojani* during the spring in the epipelagic zone.



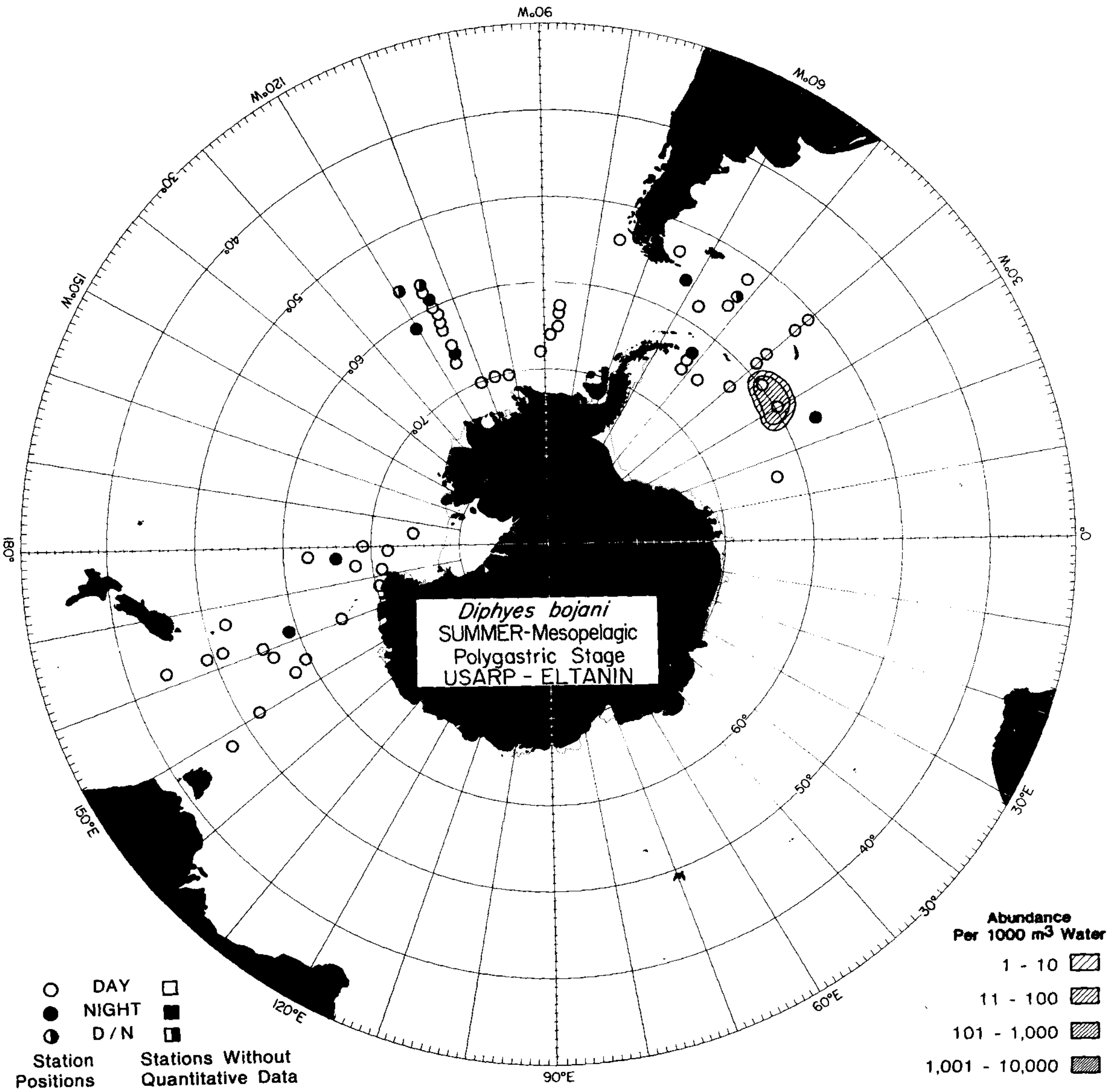
Map A114. The distribution of the eudoxid stage of *Diphyes bojani* during the spring in the epipelagic zone.



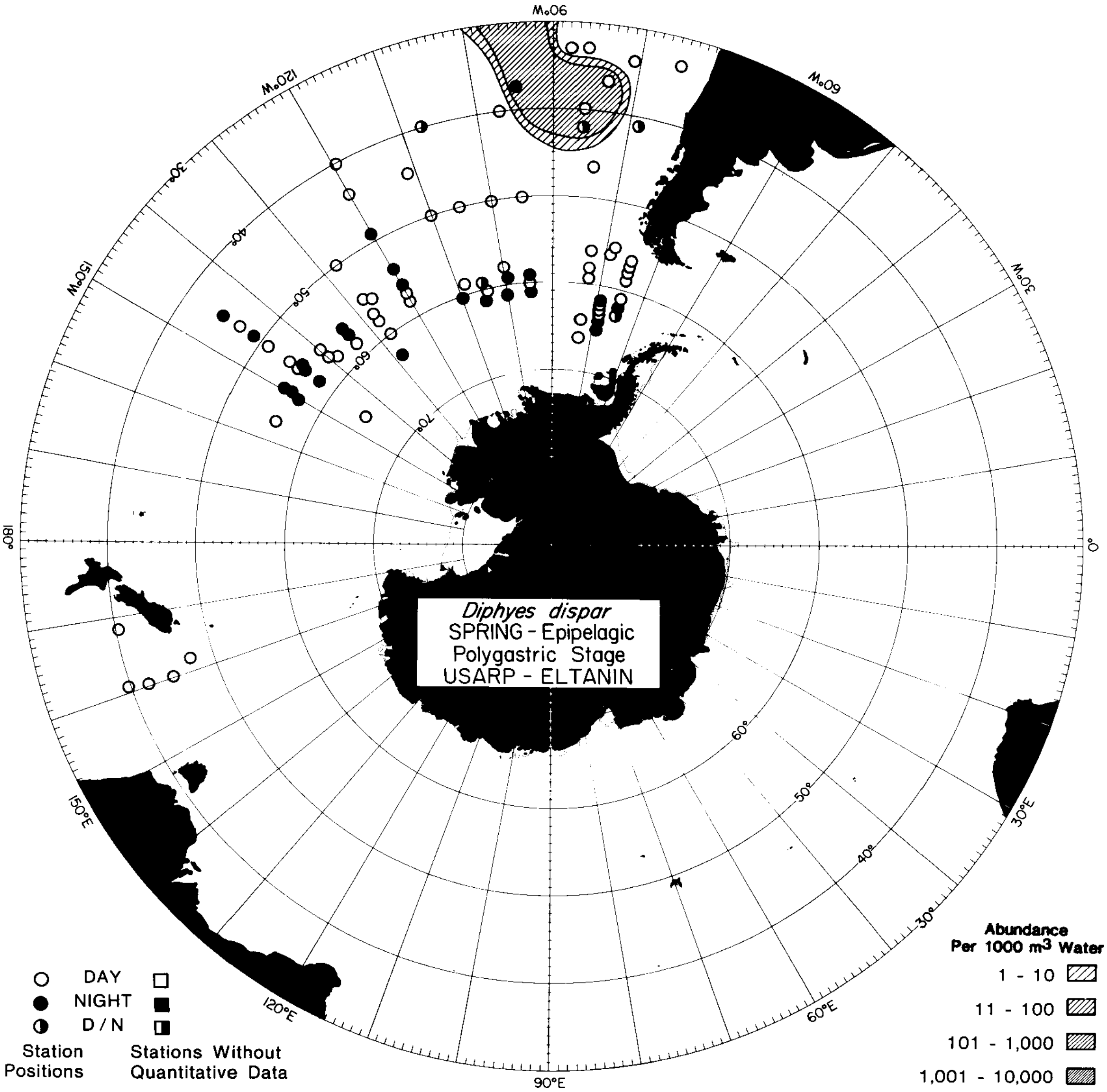
Map A115. The distribution of the polygastric stage of *Diphyes bojani* during the summer in the epipelagic zone.



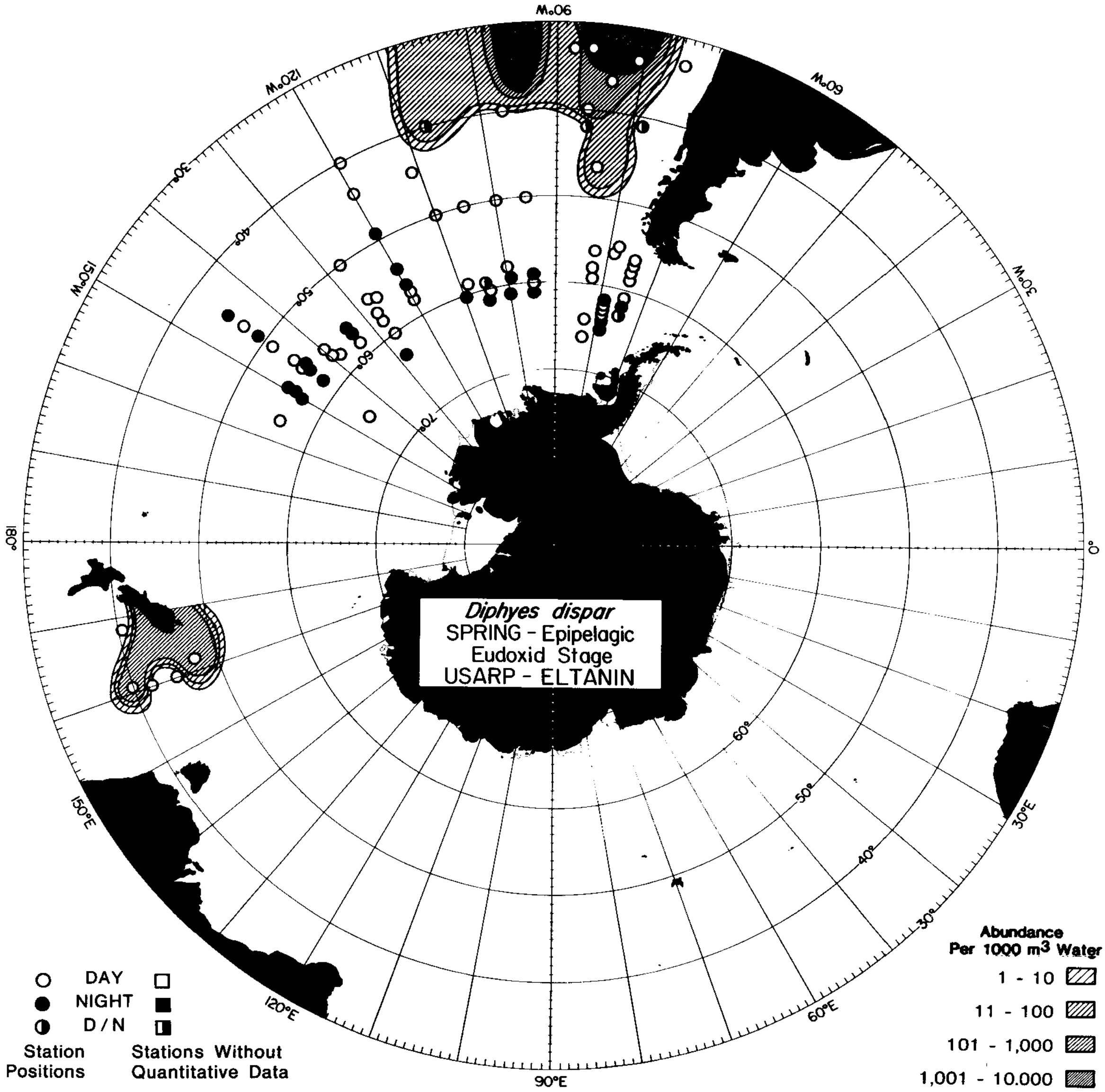
Map A116. The distribution of the eudoxid stage of *Diphyes bojani* during the summer in the epipelagic zone.



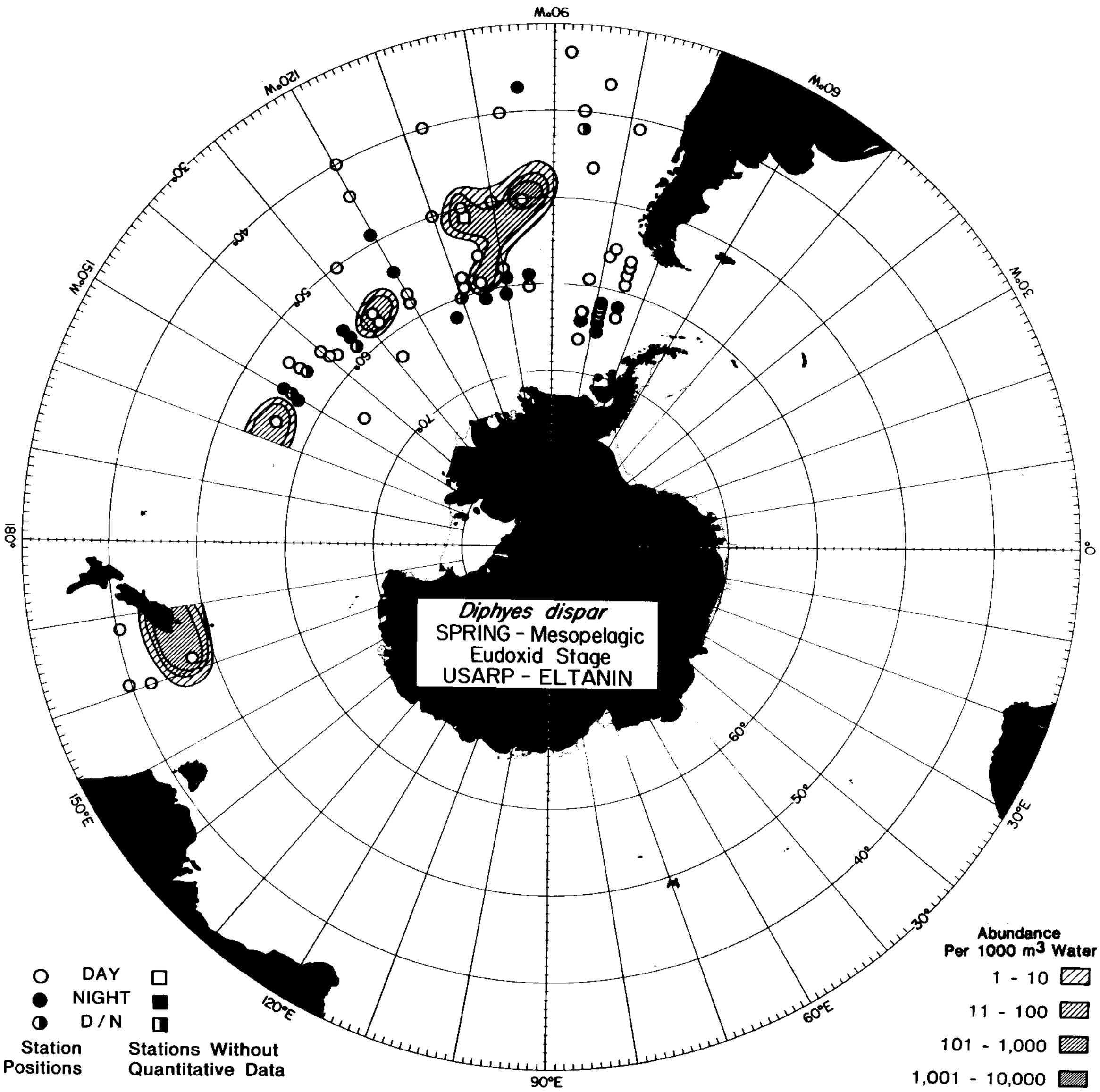
Map A117. The distribution of the polygastric stage of *Diphyes bojani* during the summer in the mesopelagic zone.



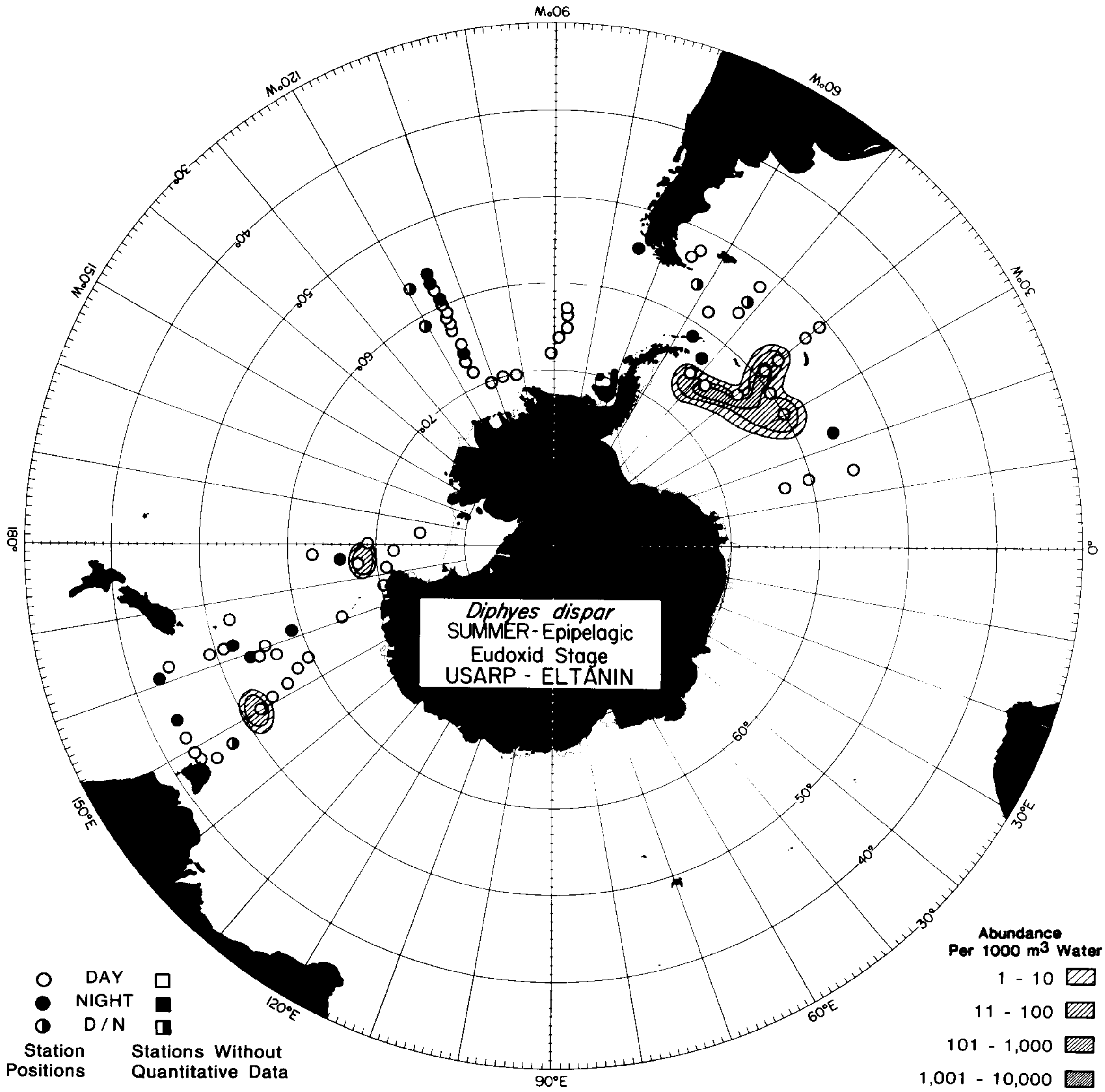
Map A118. The distribution of the polygastric stage of *Diphyes dispar* during the spring in the epipelagic zone.



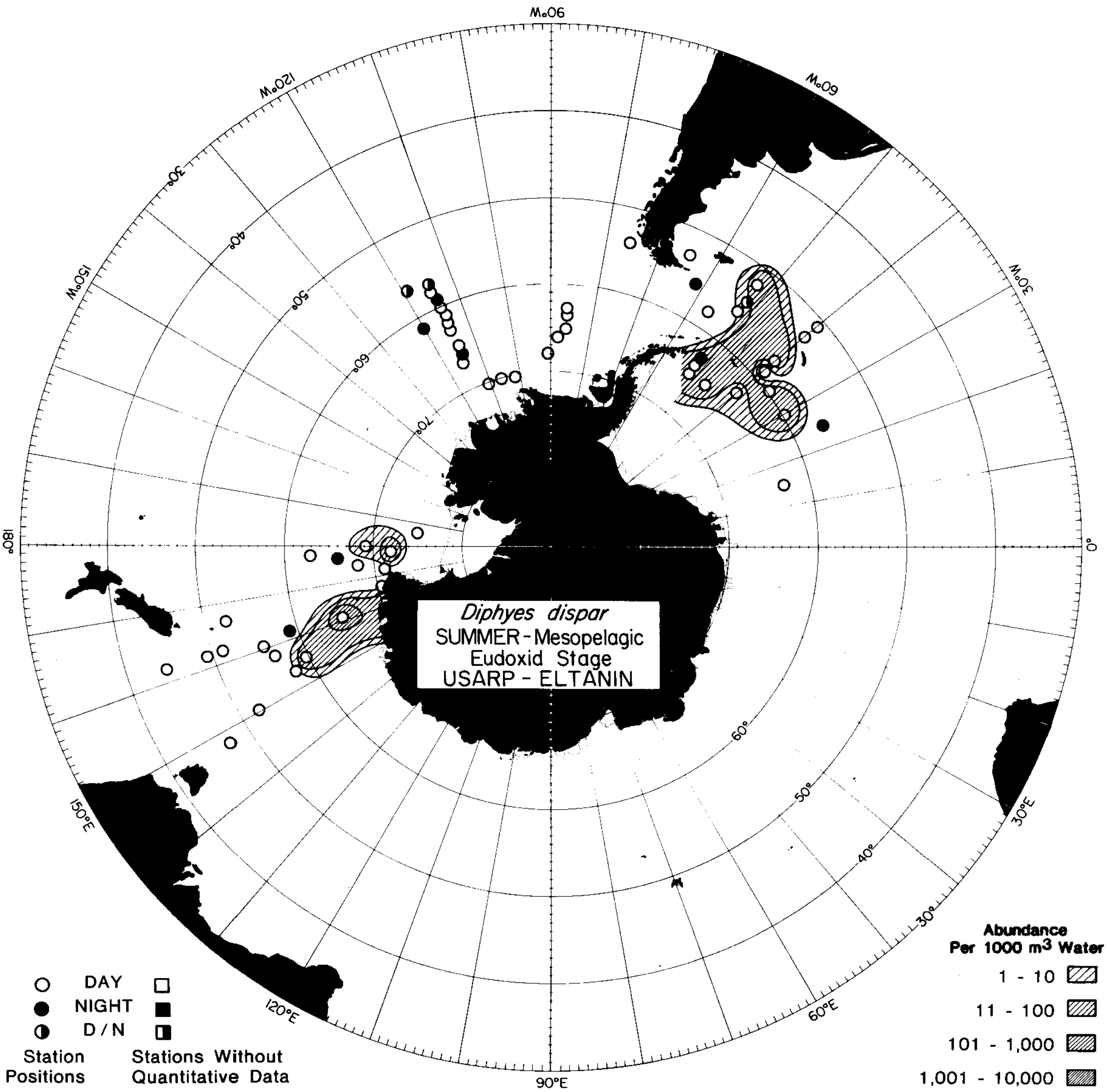
Map A119. The distribution of the eudoxid stage of *Diphyes dispar* during the spring in the epipelagic zone.



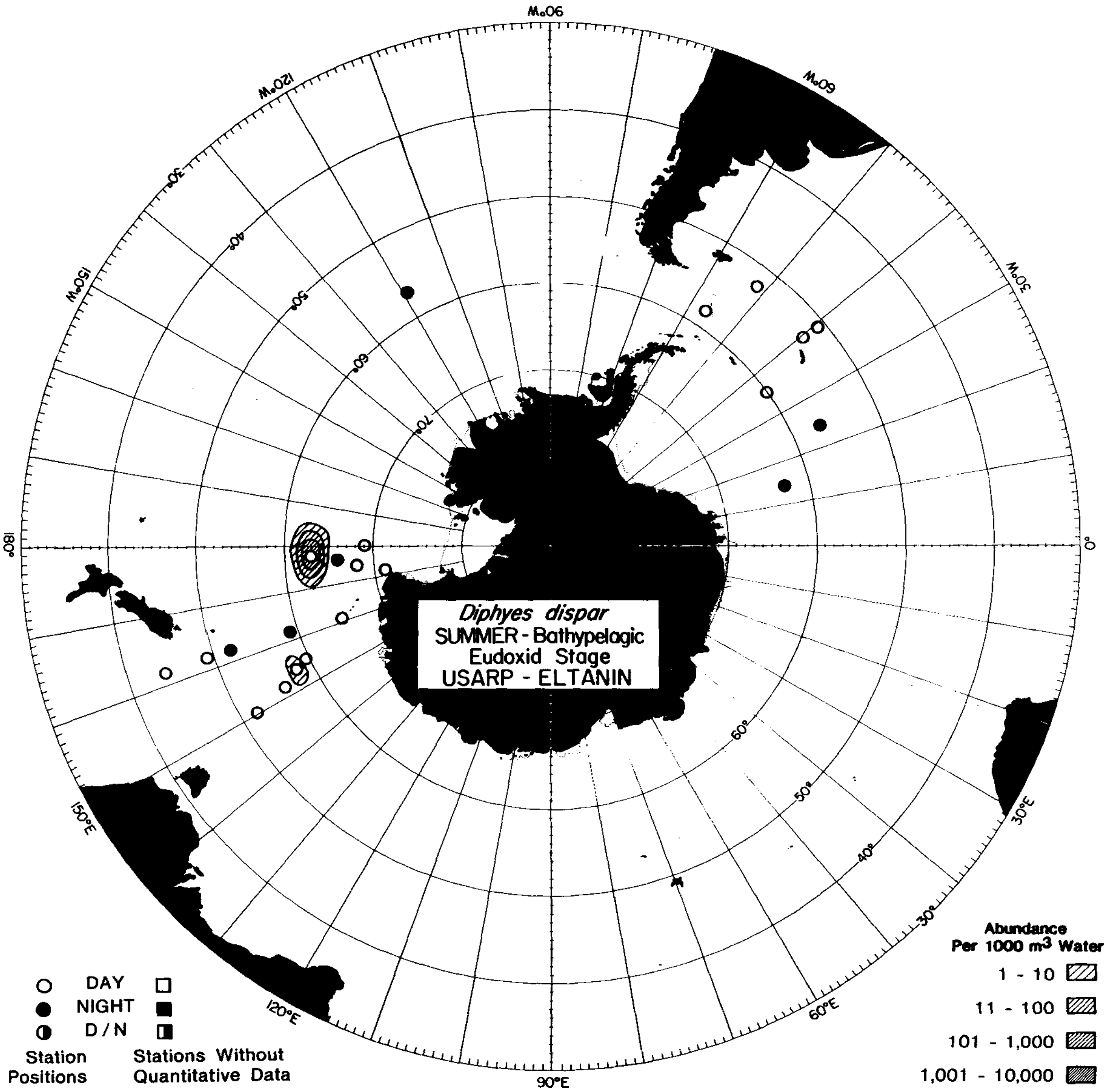
Map A120. The distribution of the eudoxid stage of *Diphyes dispar* during the spring in the mesopelagic zone.



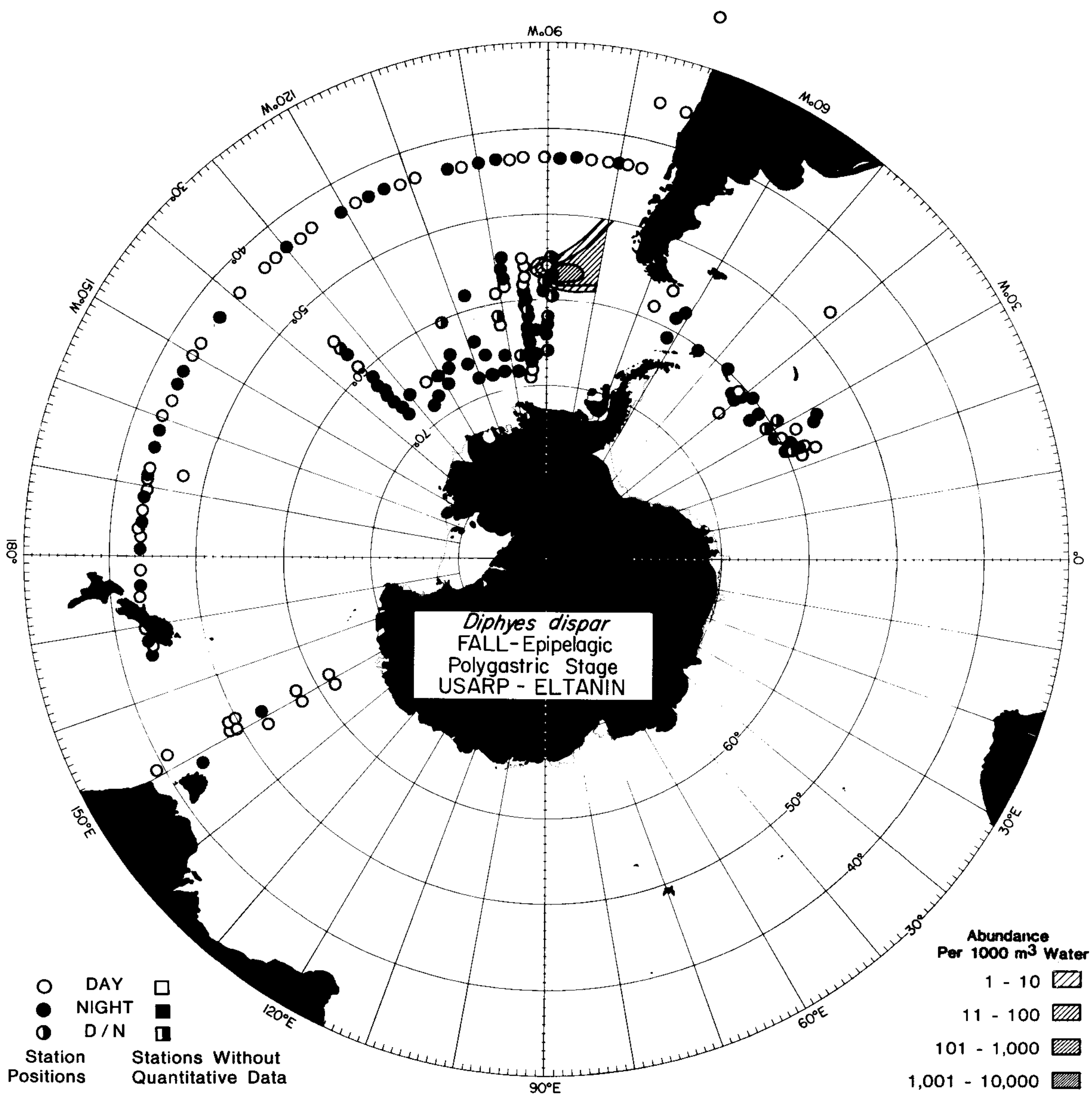
Map A121. The distribution of the eudoxid stage of *Diphyes dispar* during the summer in the epipelagic zone.



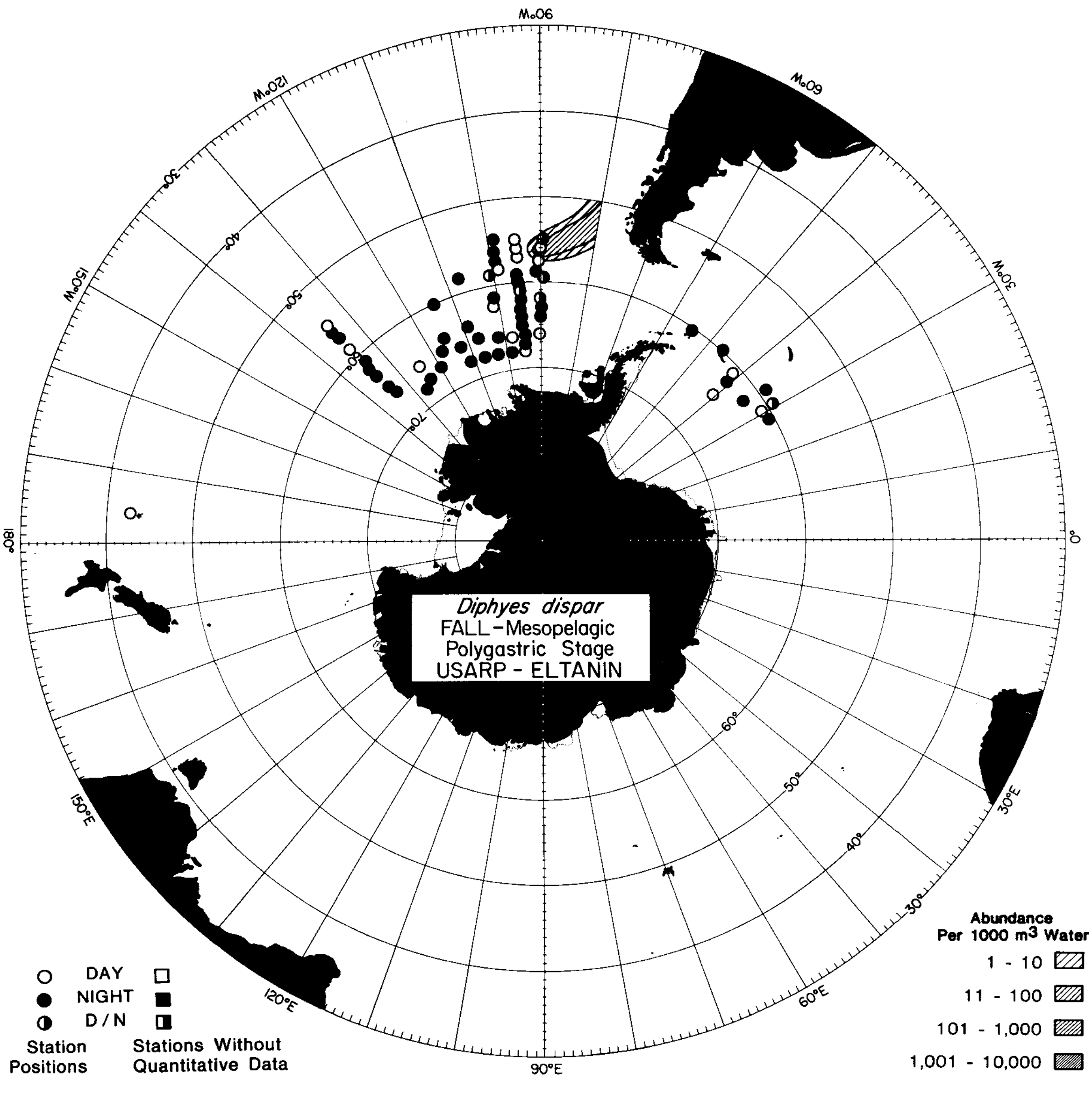
Map A122. The distribution of the eudoxid stage of *Diphyes dispar* during the summer in the mesopelagic zone.



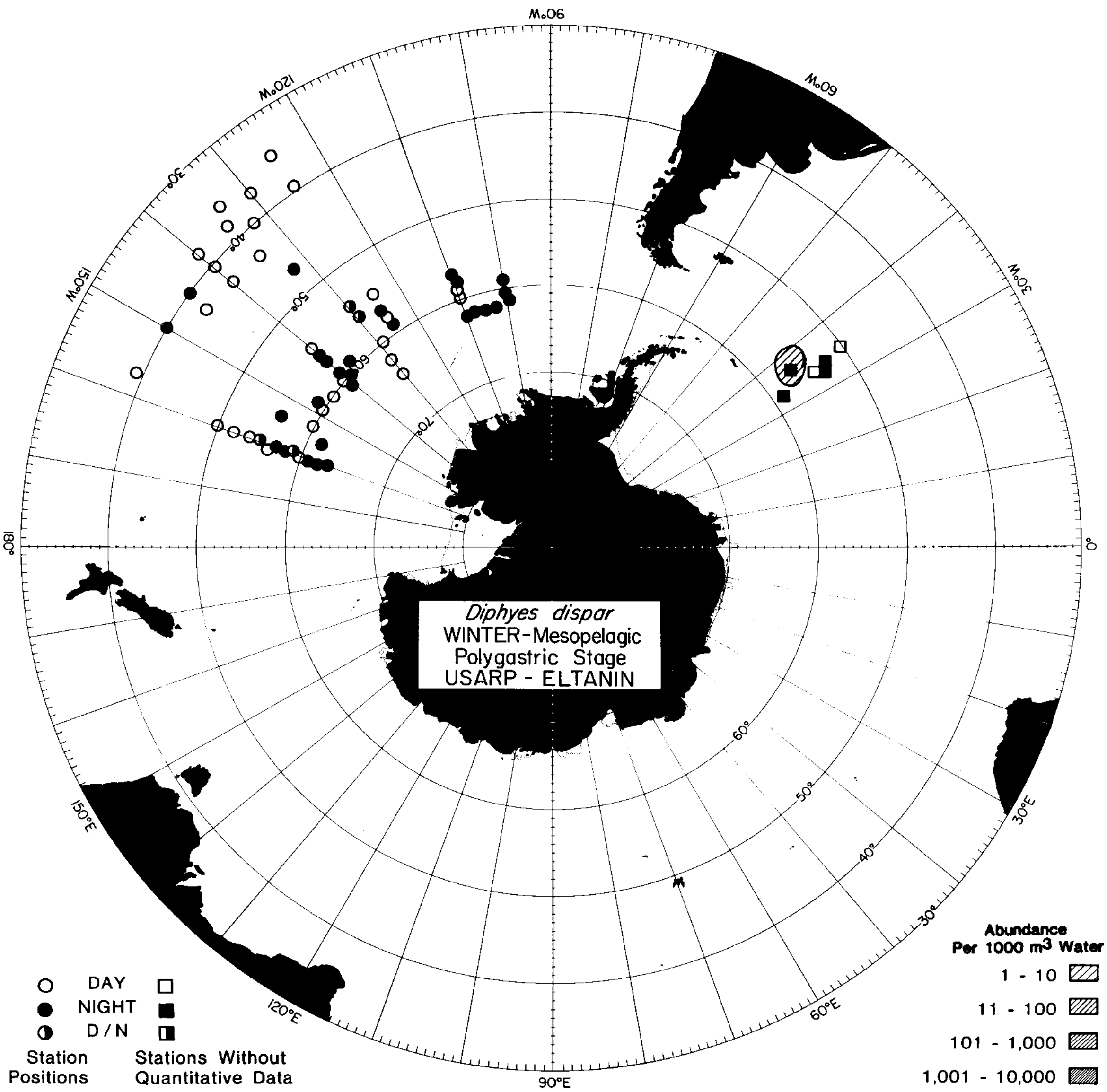
Map A123. The distribution of the eudoxid stage of *Diphyes dispar* during the summer in the bathypelagic zone.



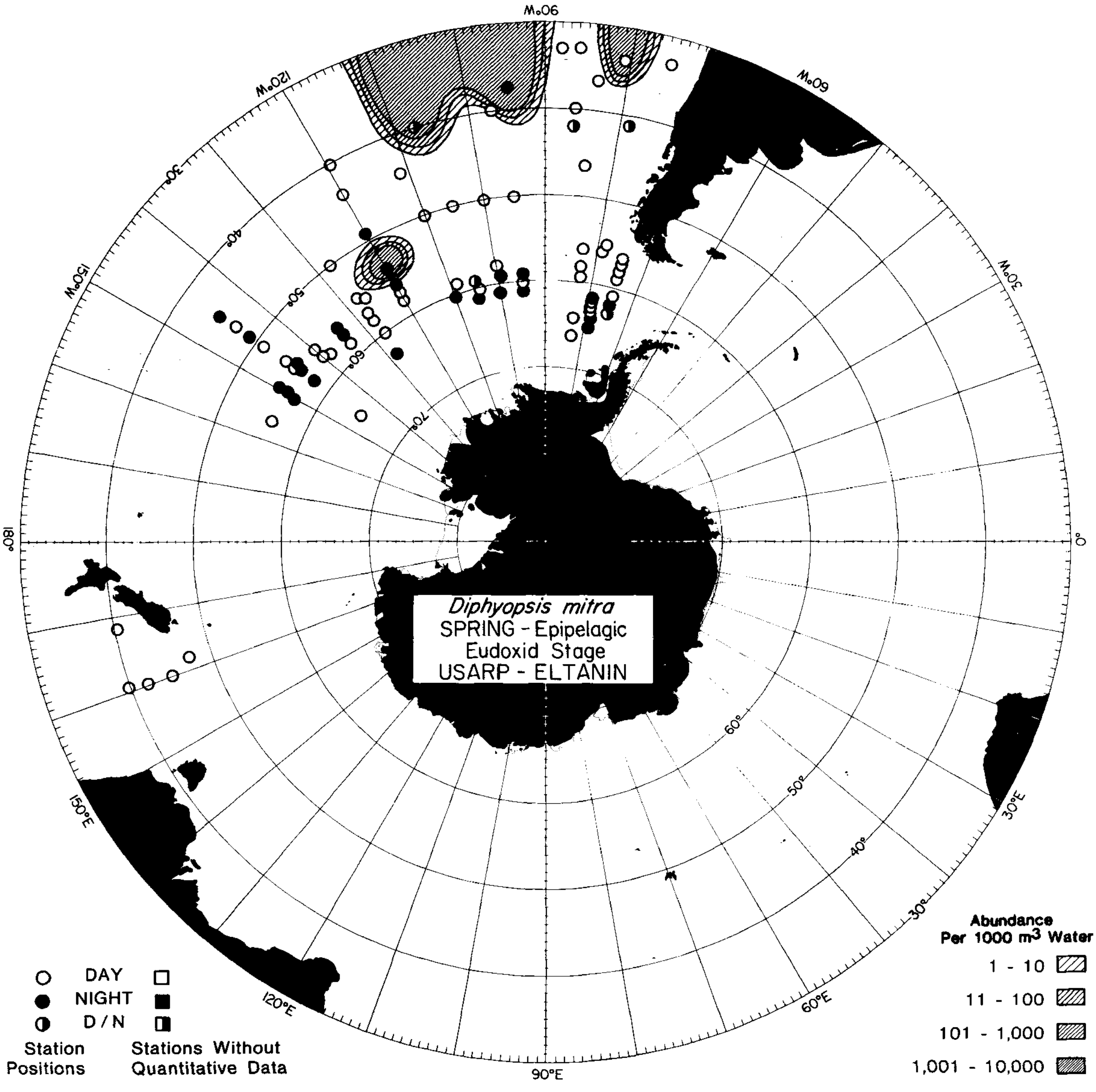
Map A124. The distribution of the polygastric stage of *Diphyes dispar* during the fall in the epipelagic zone.



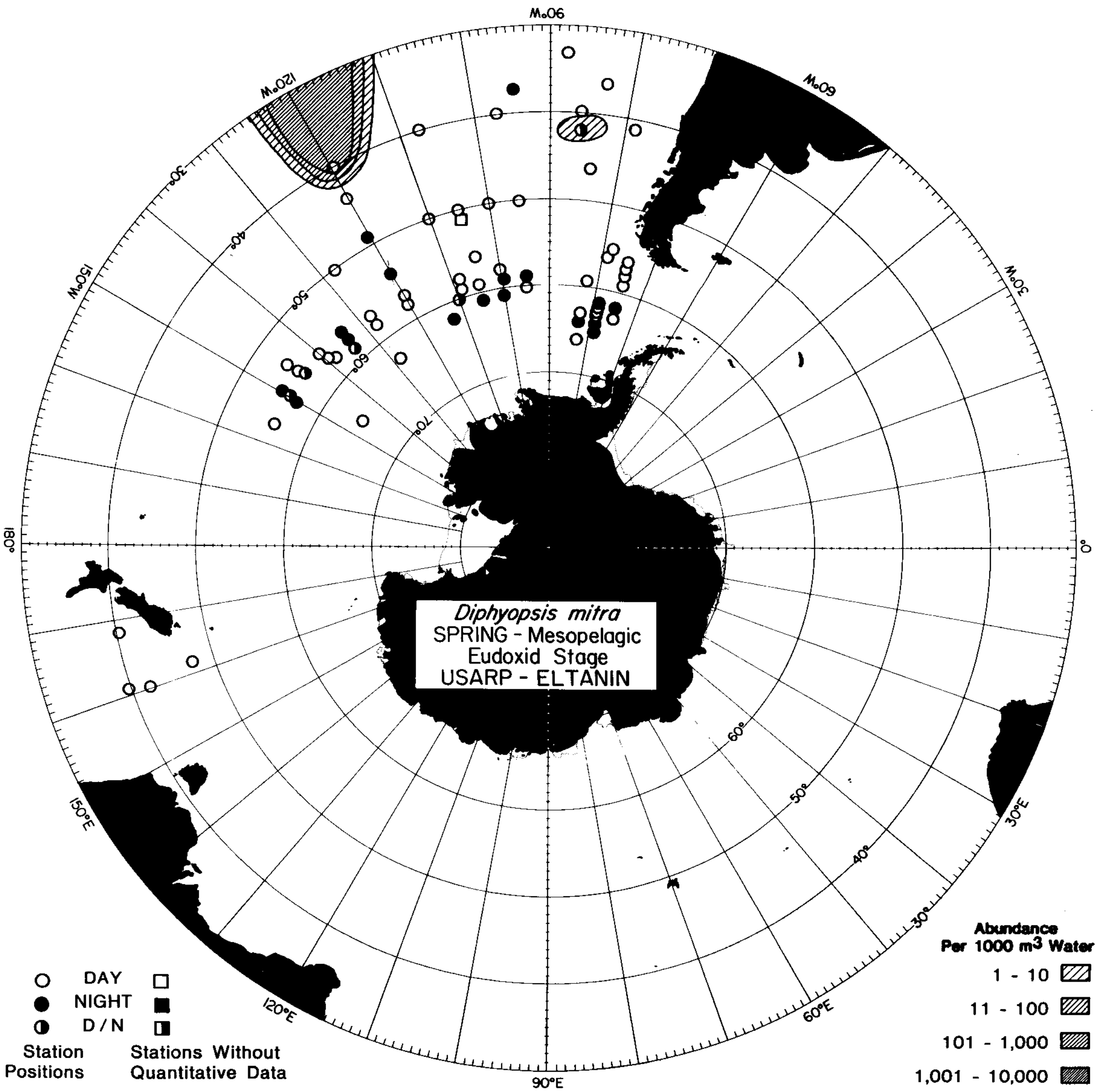
Map A125. The distribution of the polygastric stage of *Diphyes dispar* during the fall in the mesopelagic zone.



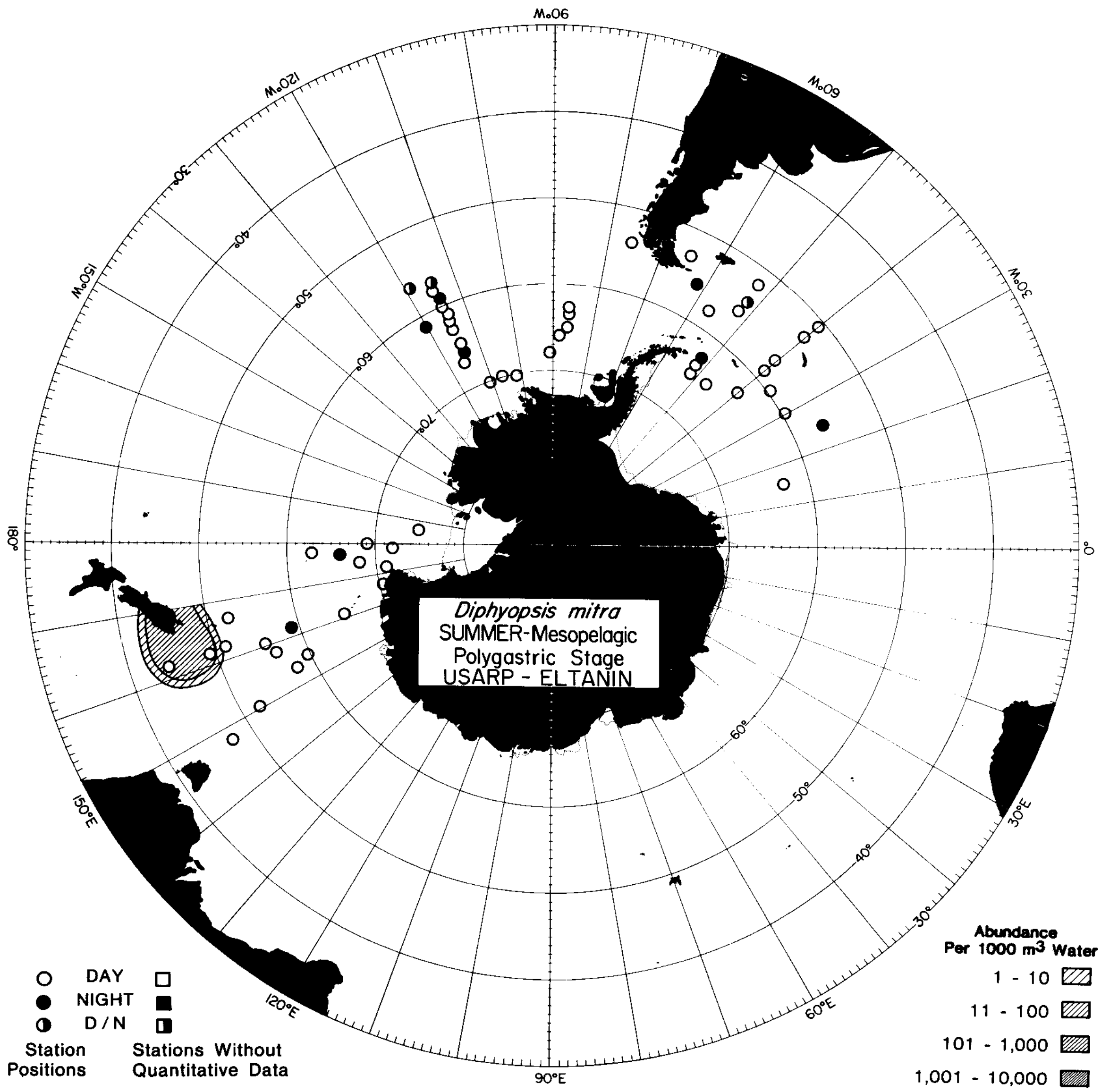
Map A126. The distribution of the polygastric stage of *Diphyes dispar* during the winter in the mesopelagic zone.



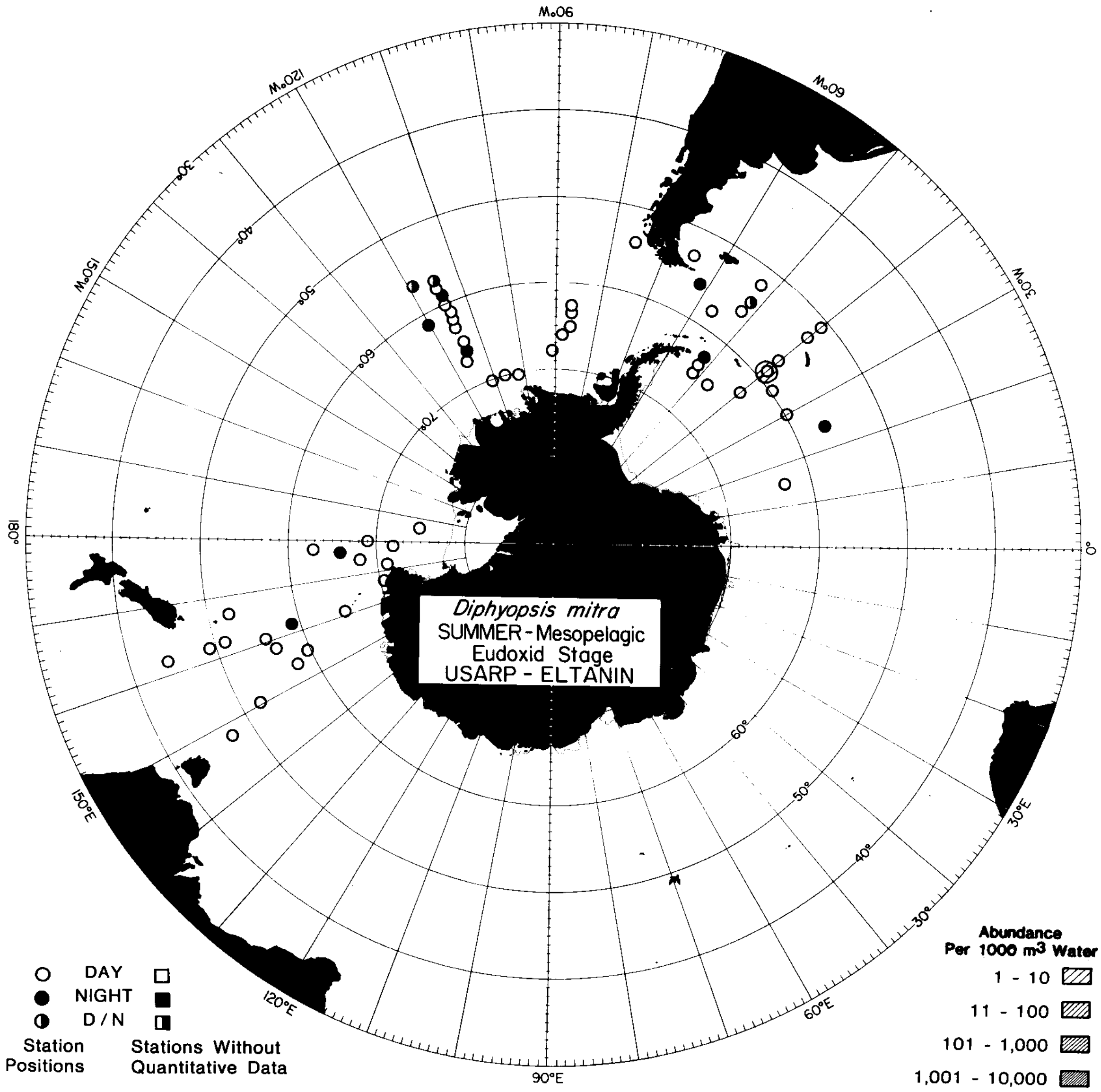
Map A127. The distribution of the eudoxid stage of *Diphyopsis mitra* during the spring in the epipelagic zone.



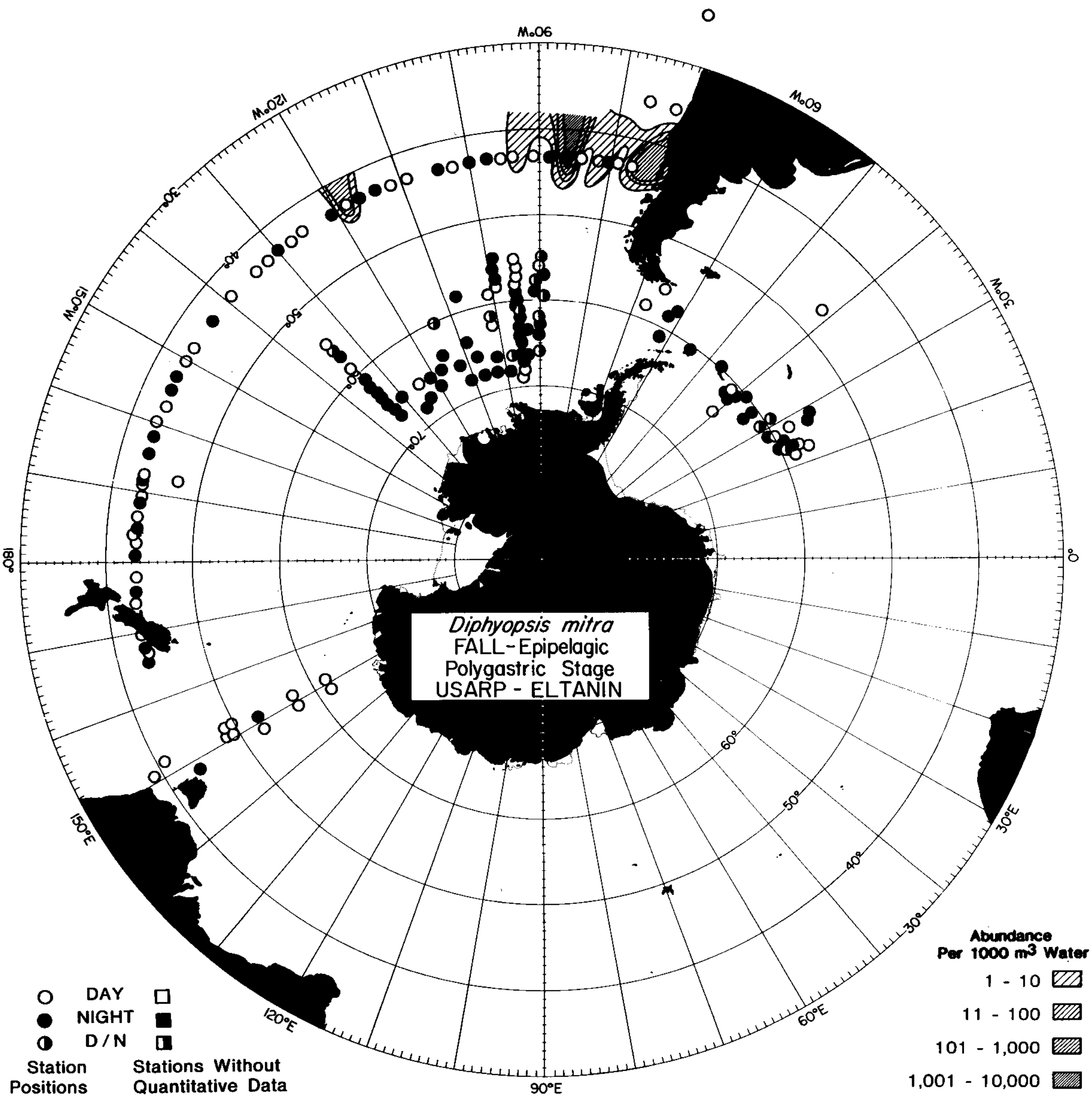
Map A128. The distribution of the eudoxid stage of *Diphyopsis mitra* during the spring in the mesopelagic zone.



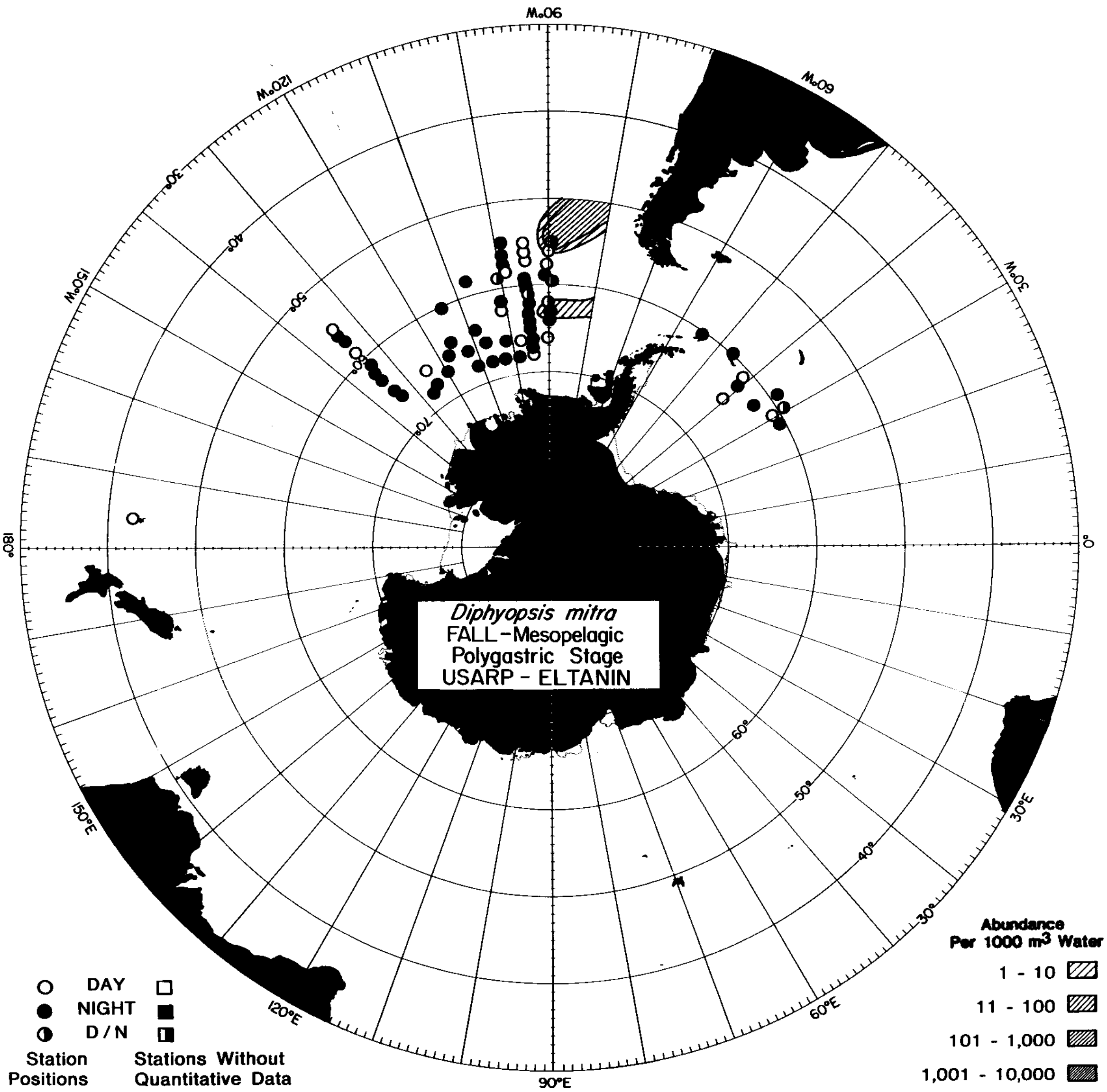
Map A129. The distribution of the polygastric stage of *Diphyopsis mitra* during the summer in the mesopelagic zone.



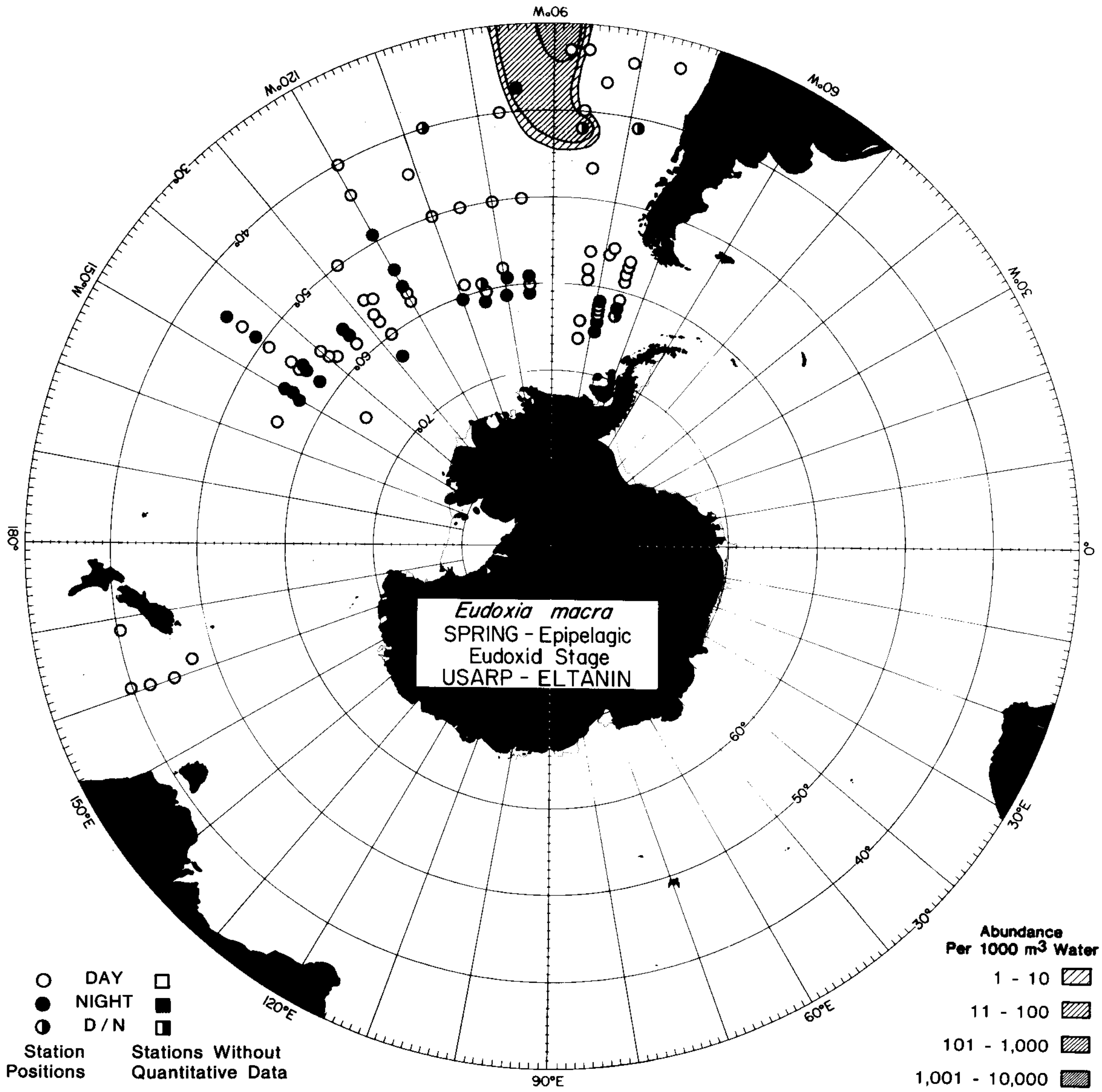
Map A130. The distribution of the eudoxid stage of *Diphyopsis mitra* during the summer in the mesopelagic zone.



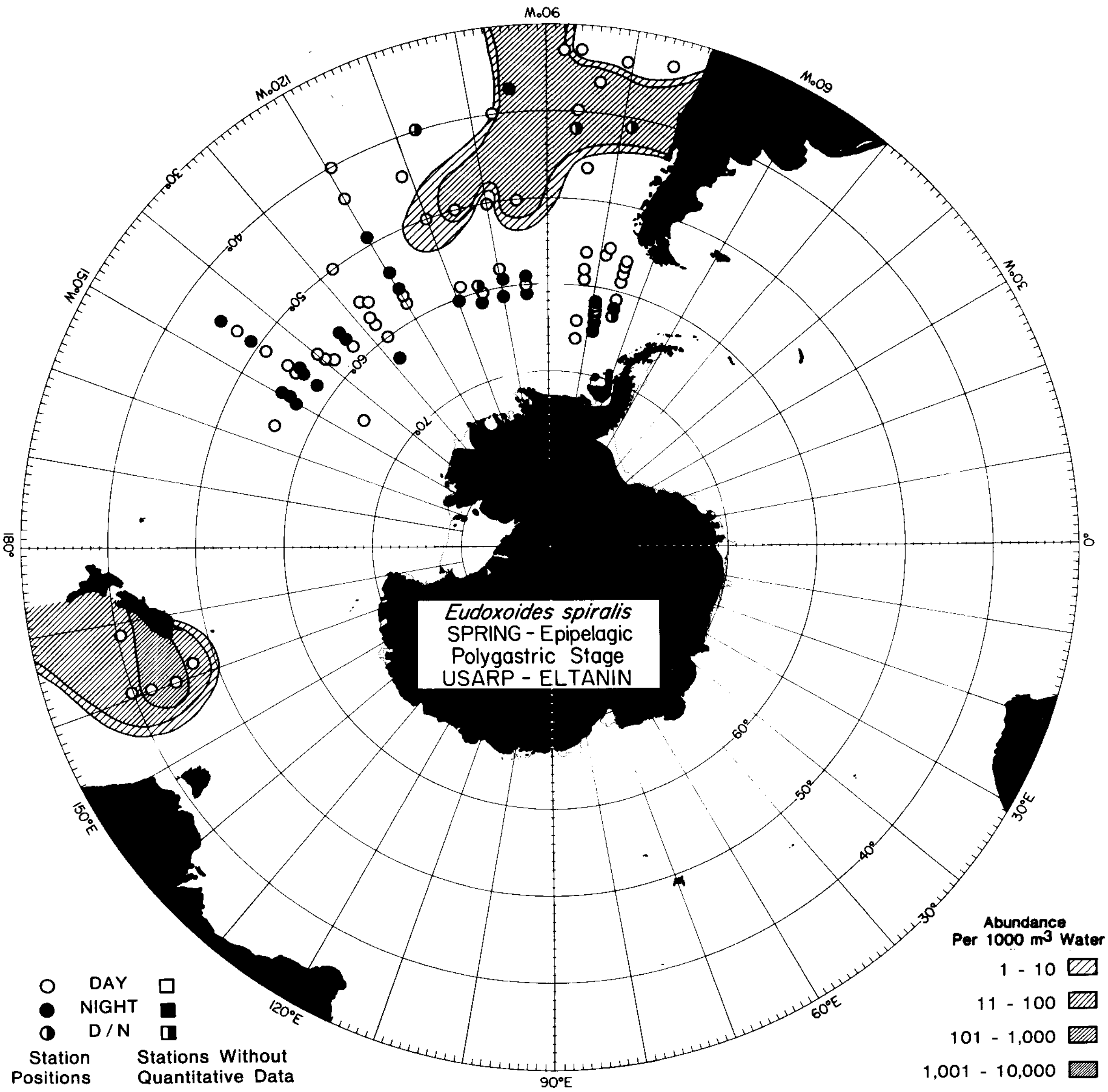
Map A131. The distribution of the polygastric stage of *Diphyopsis mitra* during the fall in the epipelagic zone.



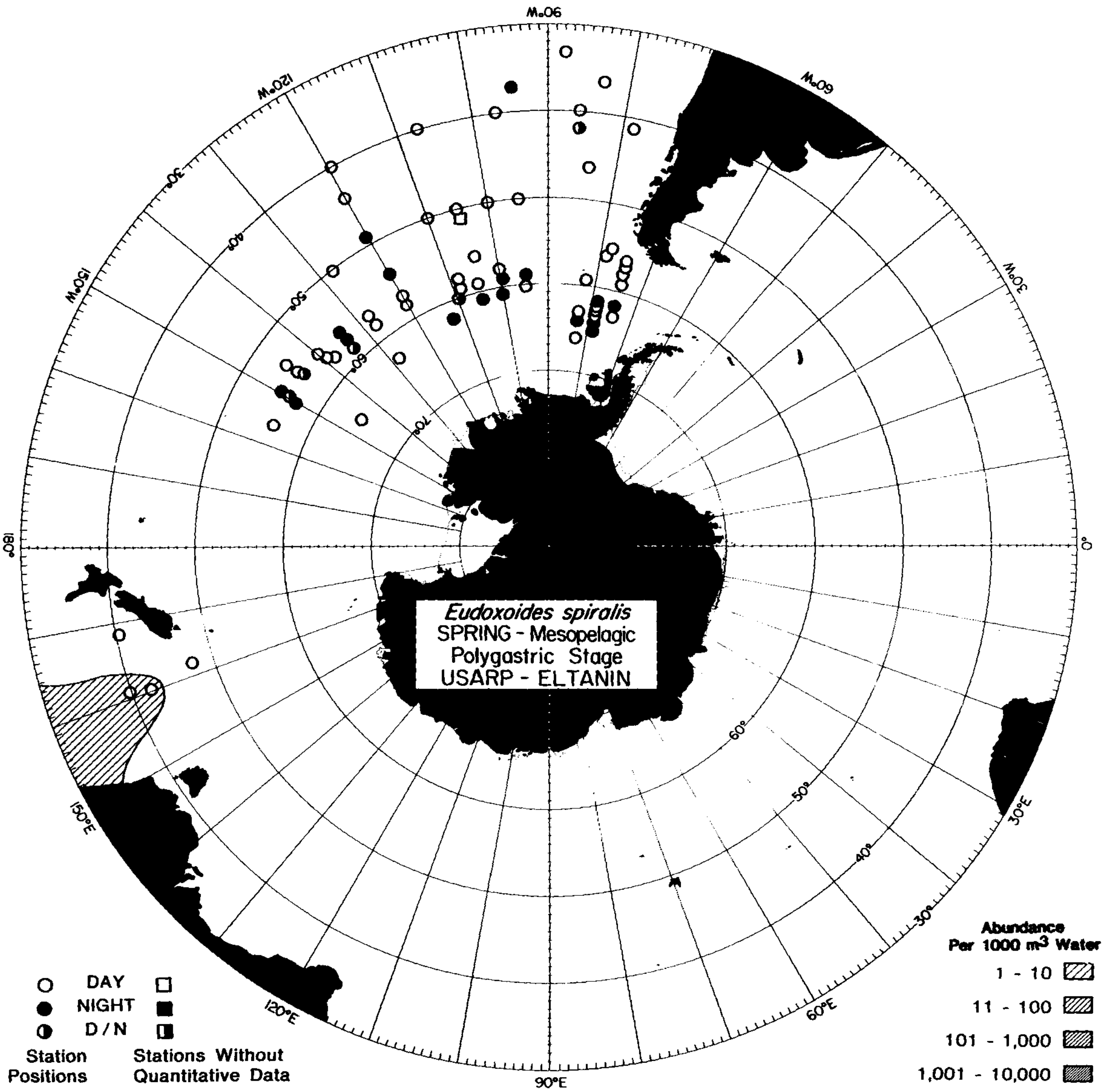
Map A132. The distribution of the polygastric stage of *Diphyopsis mitra* during the fall in the mesopelagic zone.



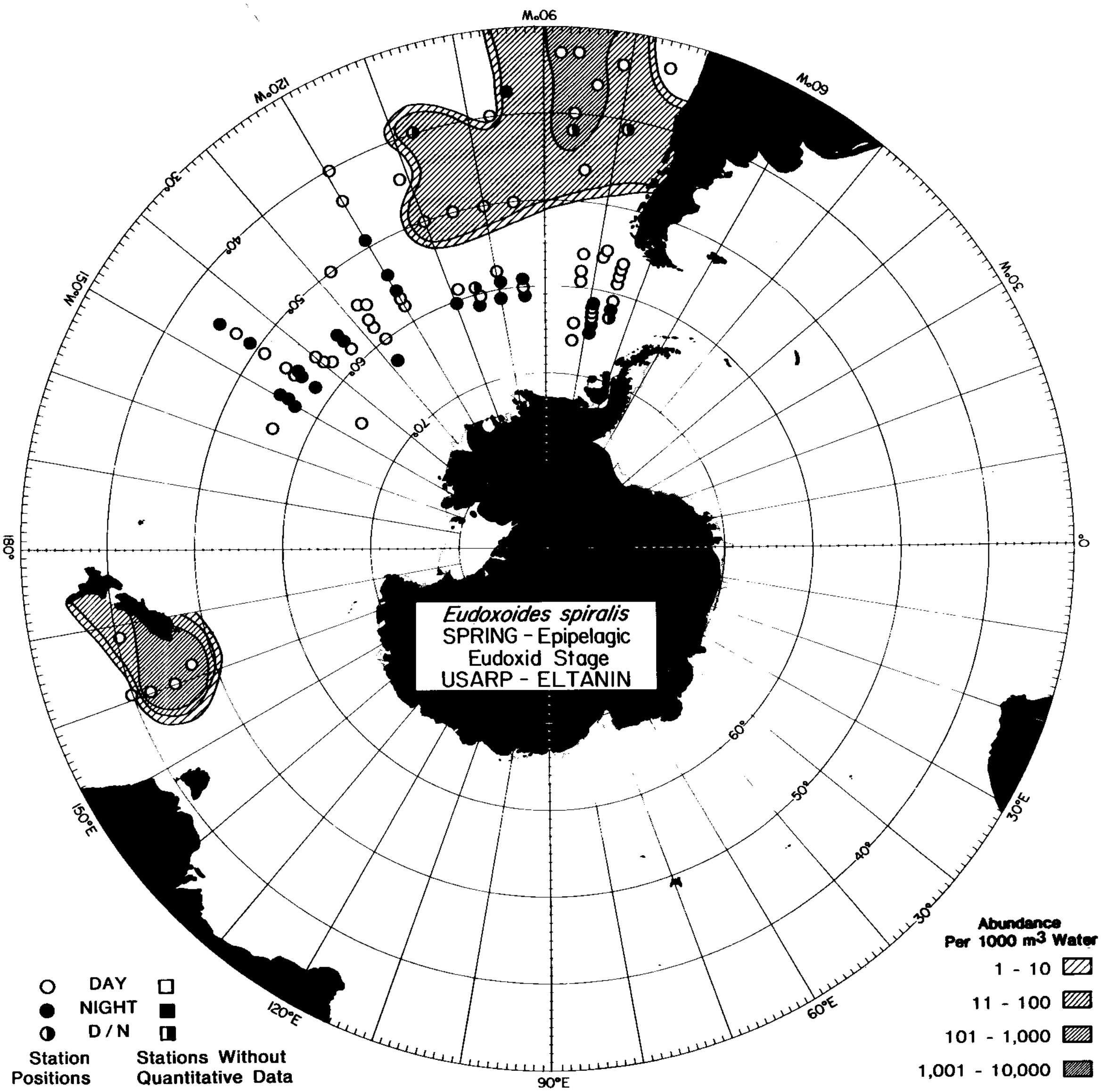
Map A133. The distribution of the eudoxid stage of *Eudoxia macra* during the spring in the epipelagic zone.



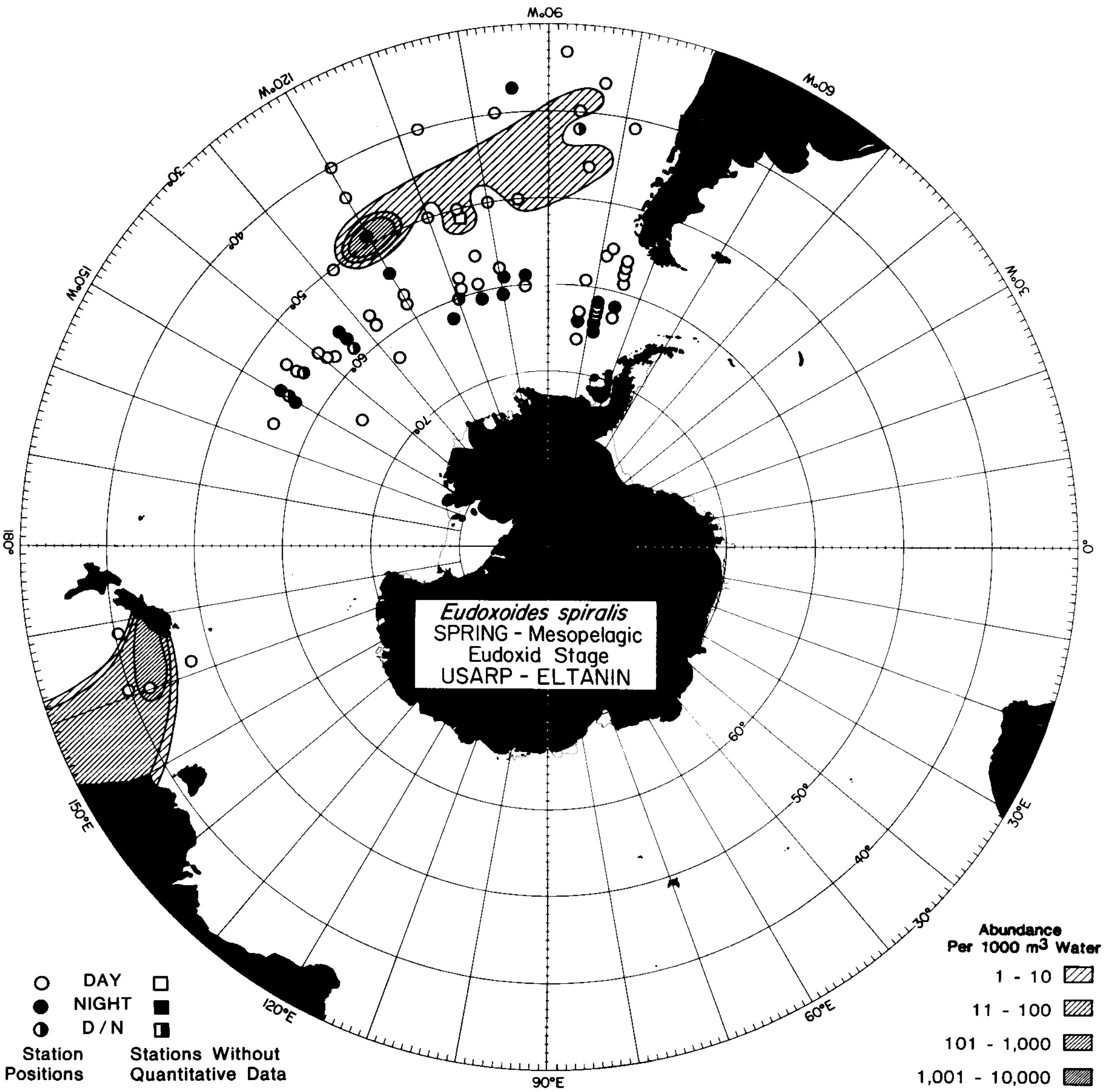
Map A134. The distribution of the polygastric stage of *Eudoxoides spiralis* during the spring in the epipelagic zone.



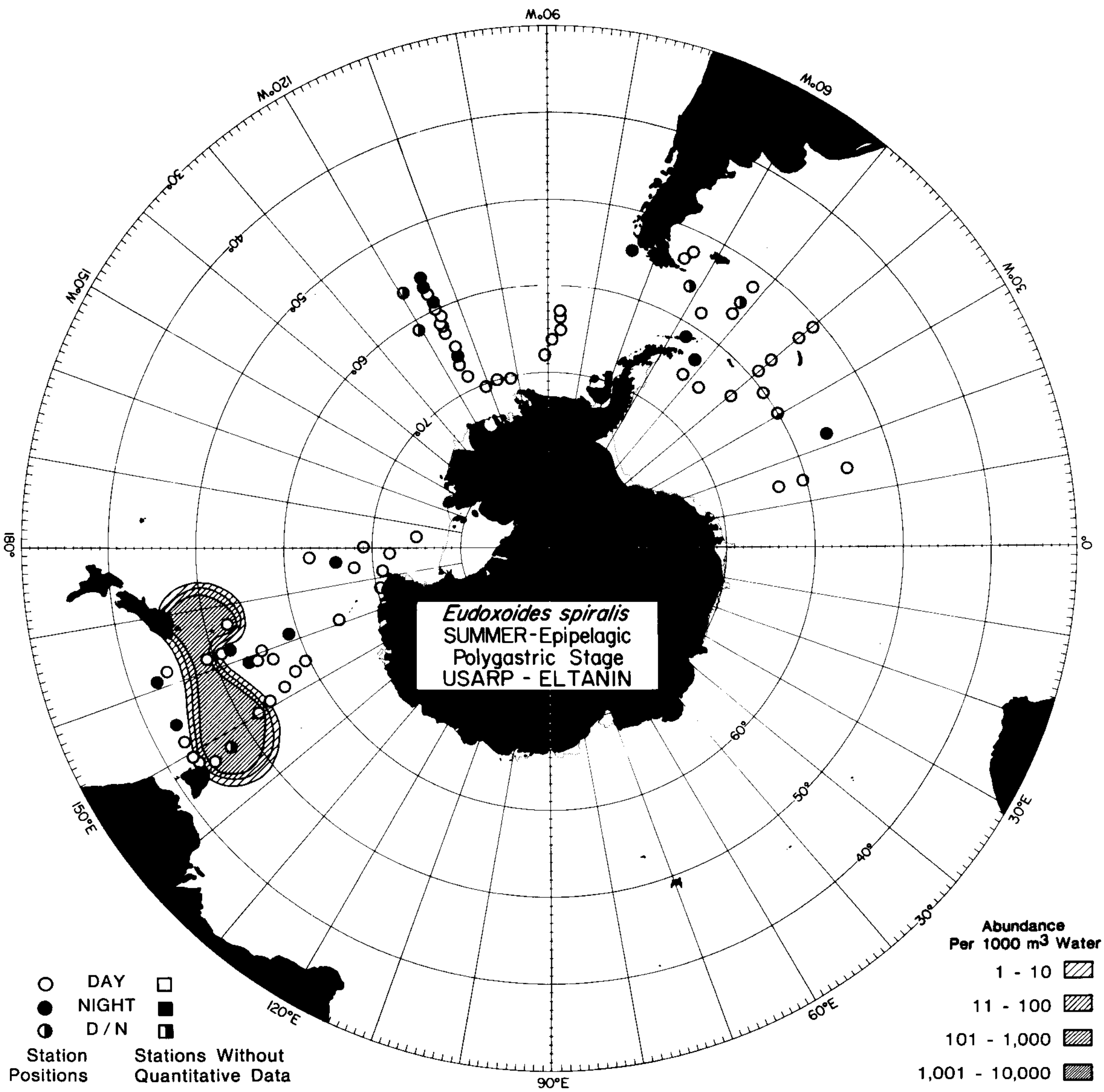
Map A135. The distribution of the polygastric stage of *Eudoxoides spiralis* during the spring in the mesopelagic zone.



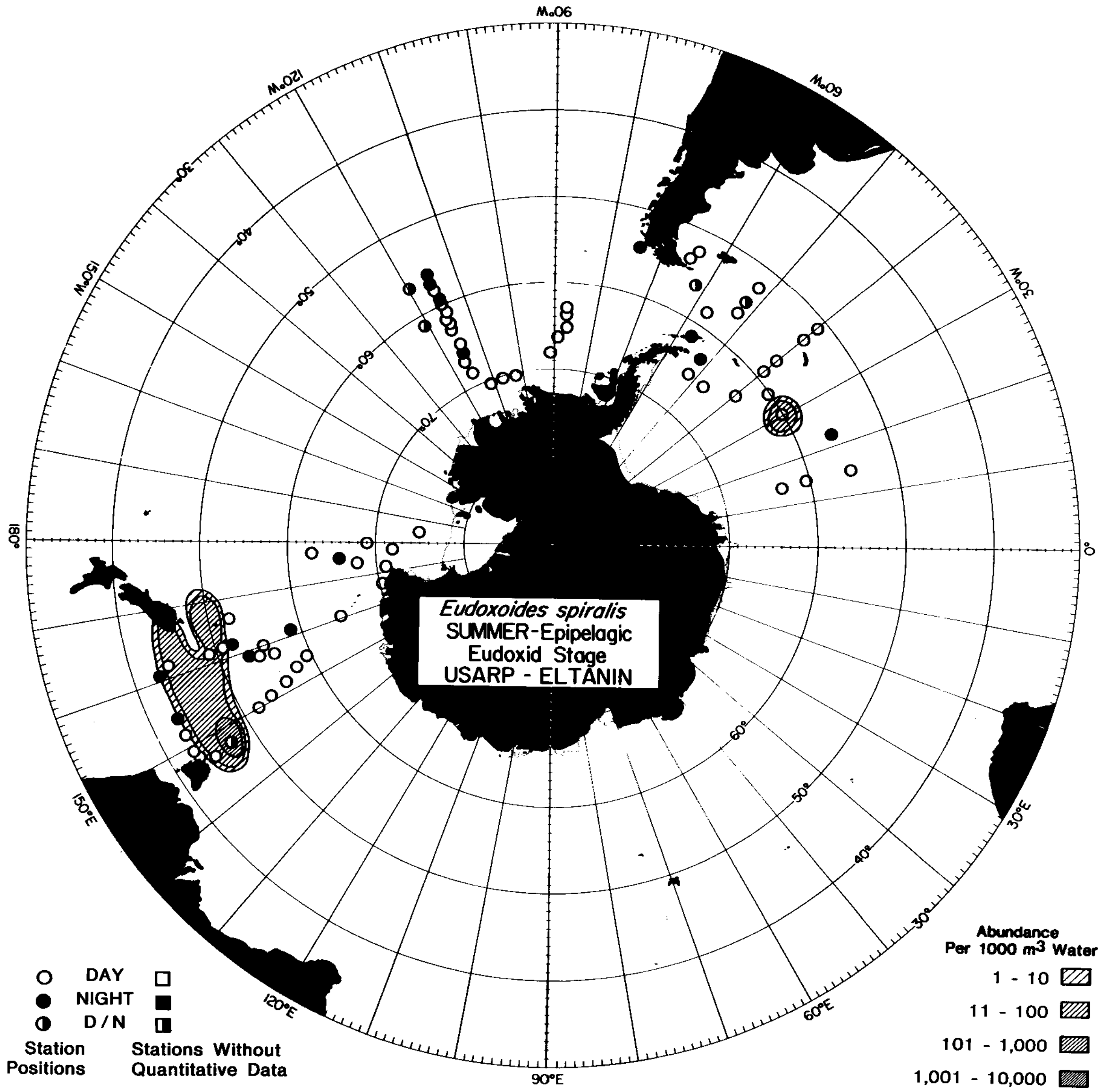
Map A136. The distribution of the eudoxid stage of *Eudoxoides spiralis* during the spring in the epipelagic zone.



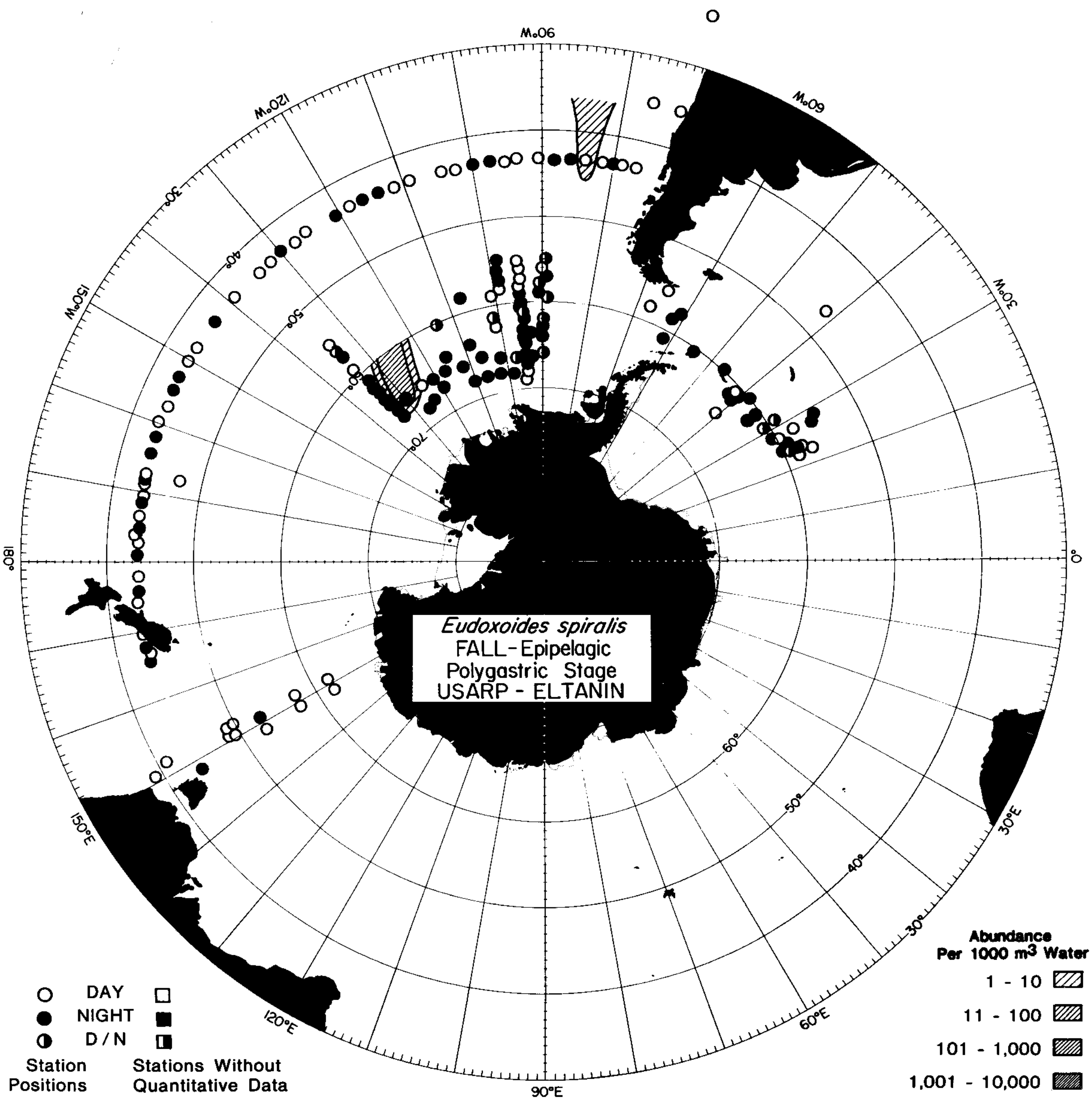
Map A137. The distribution of the eudoxid stage of *Eudoxoides spiralis* during the spring in the mesopelagic zone.



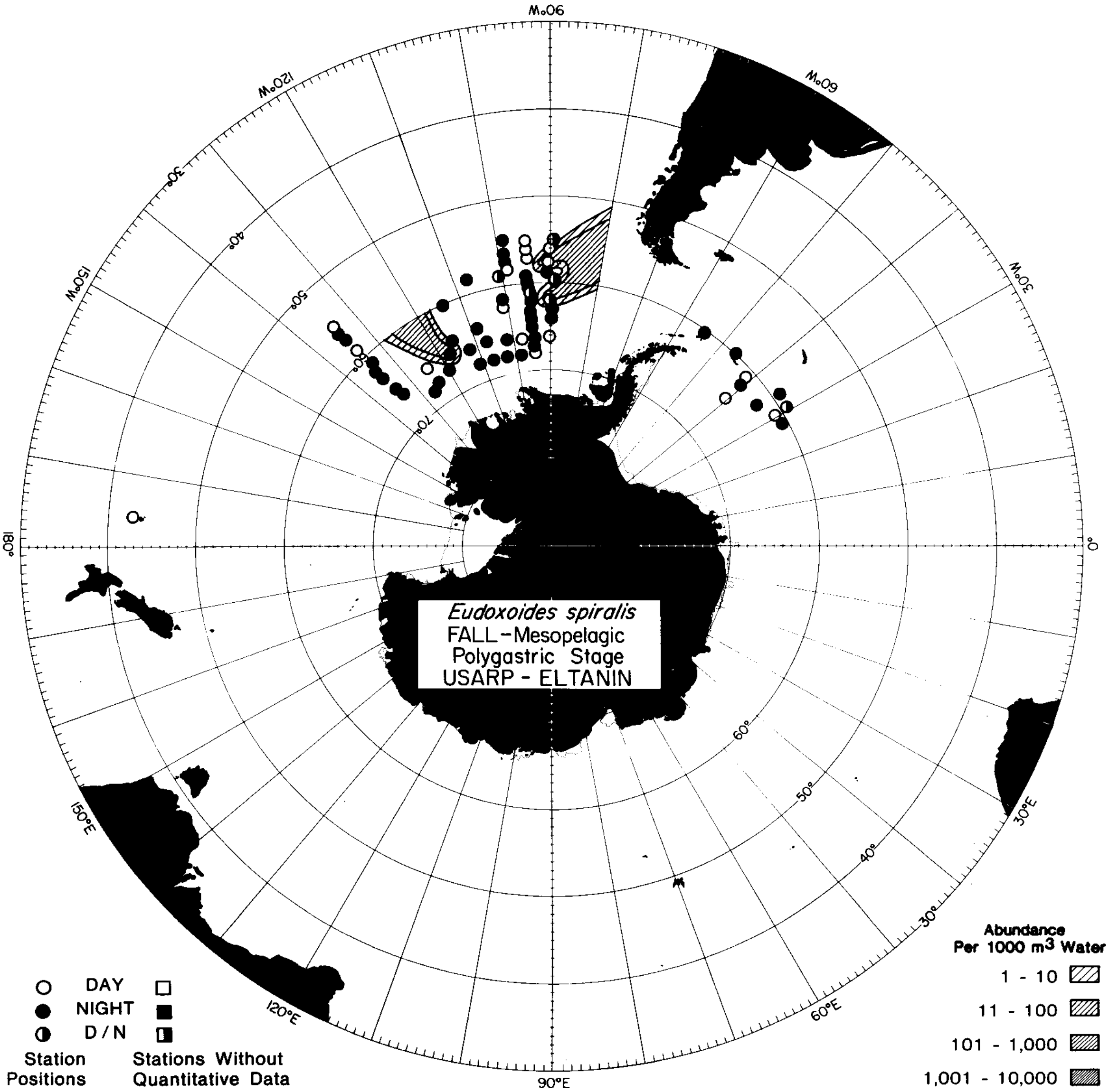
Map A138. The distribution of the polygastric stage of *Eudoxoides spiralis* during the summer in the epipelagic zone.



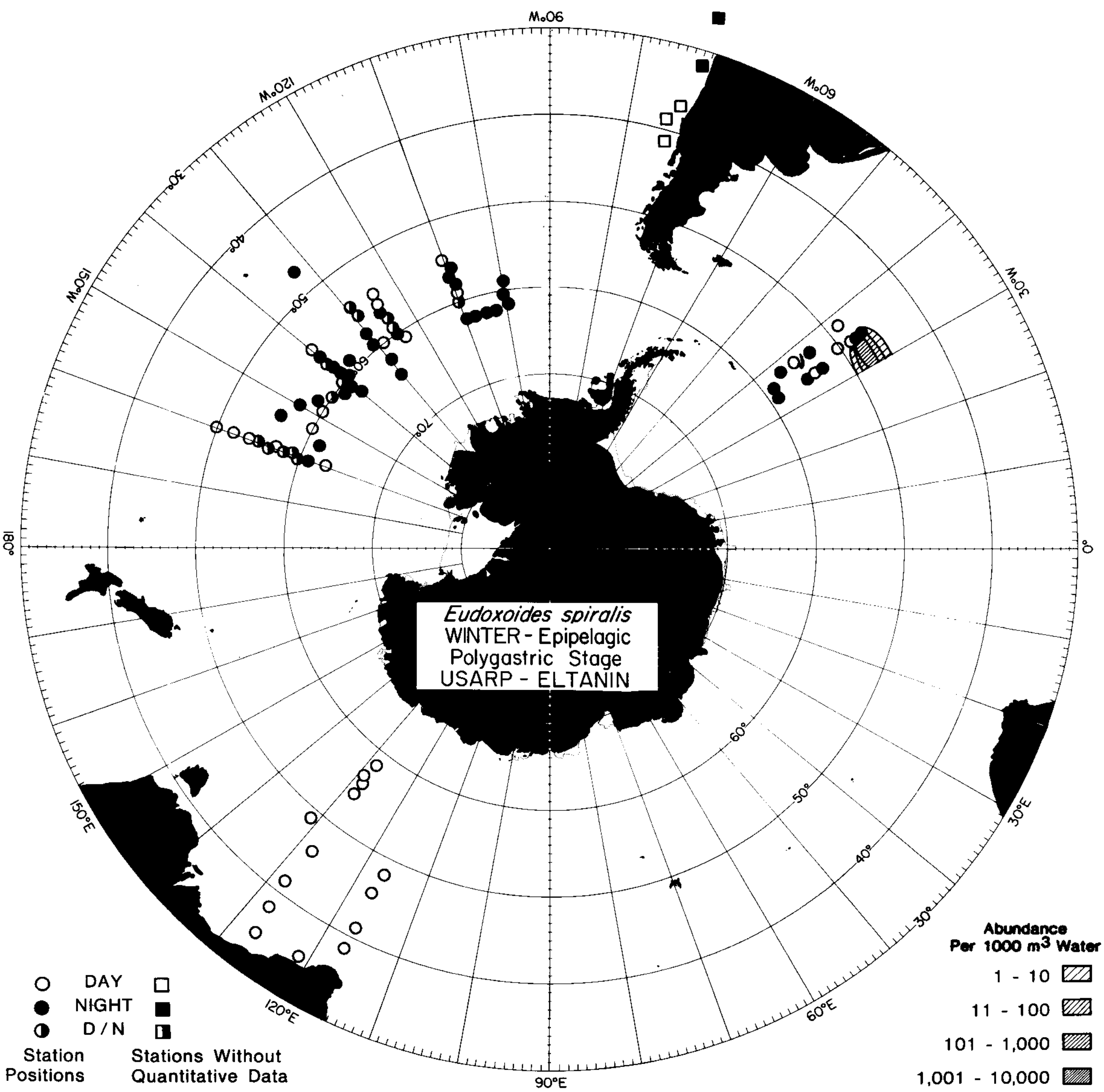
Map A139. The distribution of the eudoxid stage of *Eudoxoides spiralis* during the summer in the epipelagic zone.



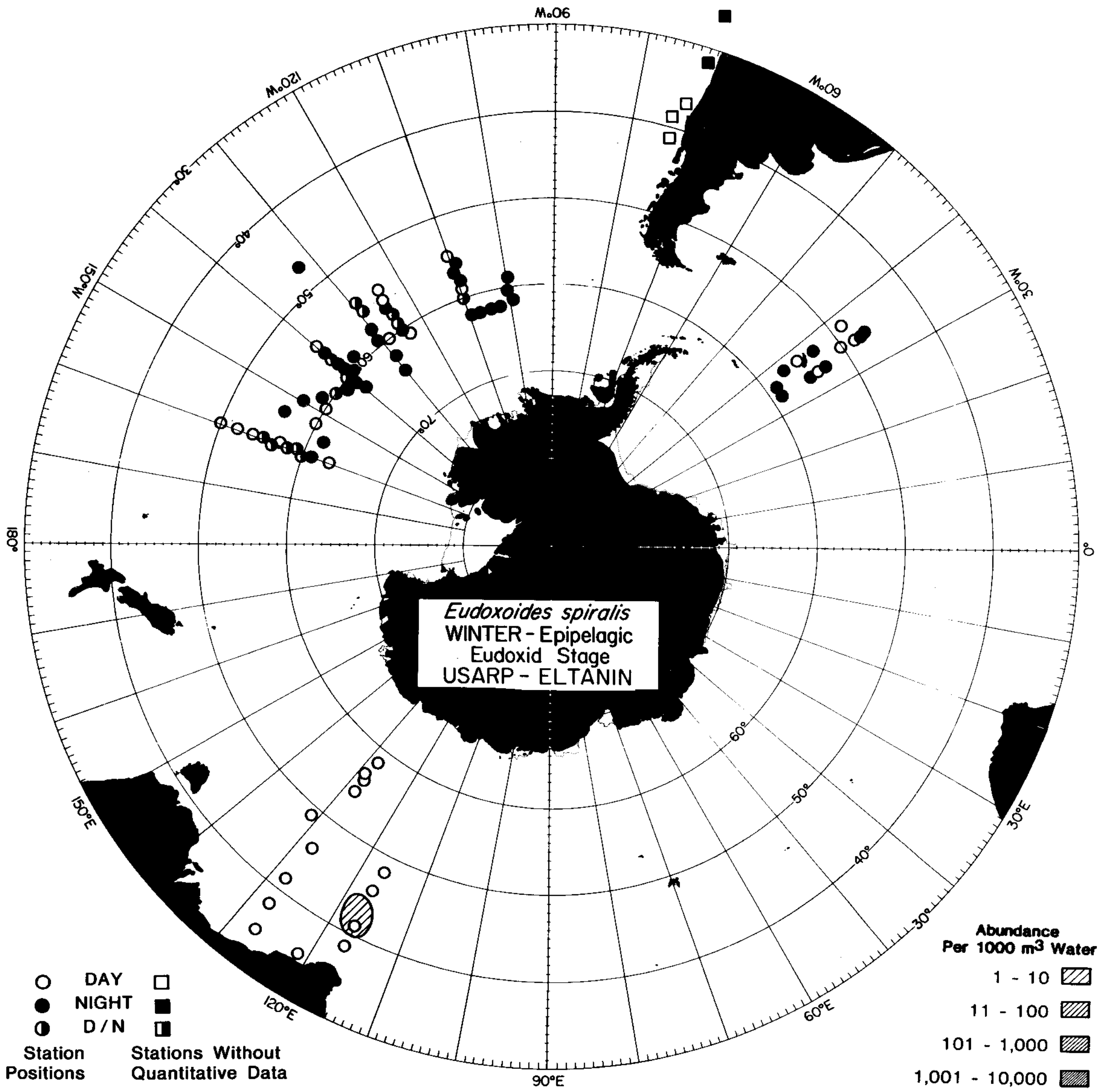
Map A140. The distribution of the polygastric stage of *Eudoxoides spiralis* during the fall in the epipelagic zone.



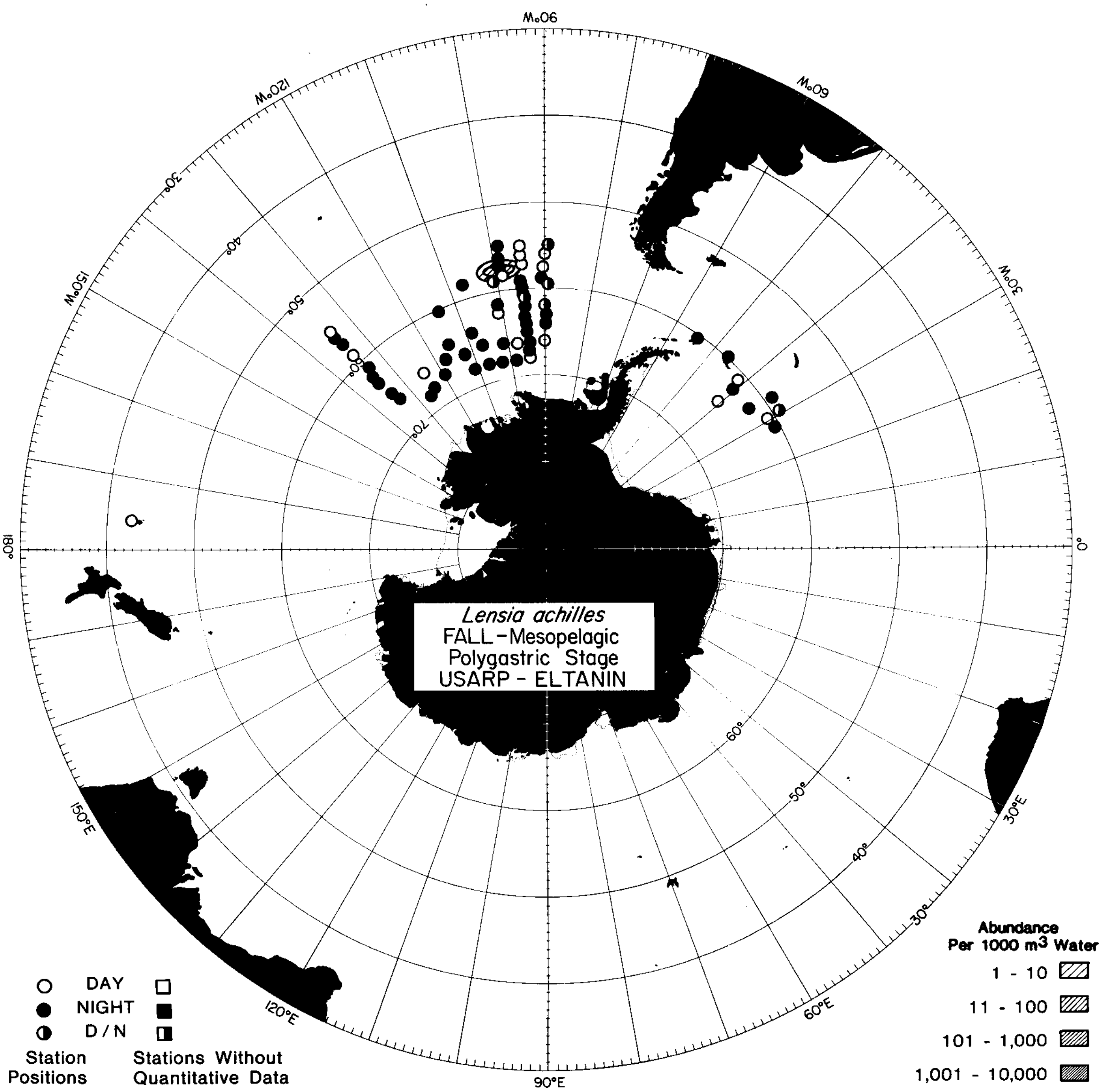
Map A141. The distribution of the polygastric stage of *Eudoxoides spiralis* during the fall in the mesopelagic zone.



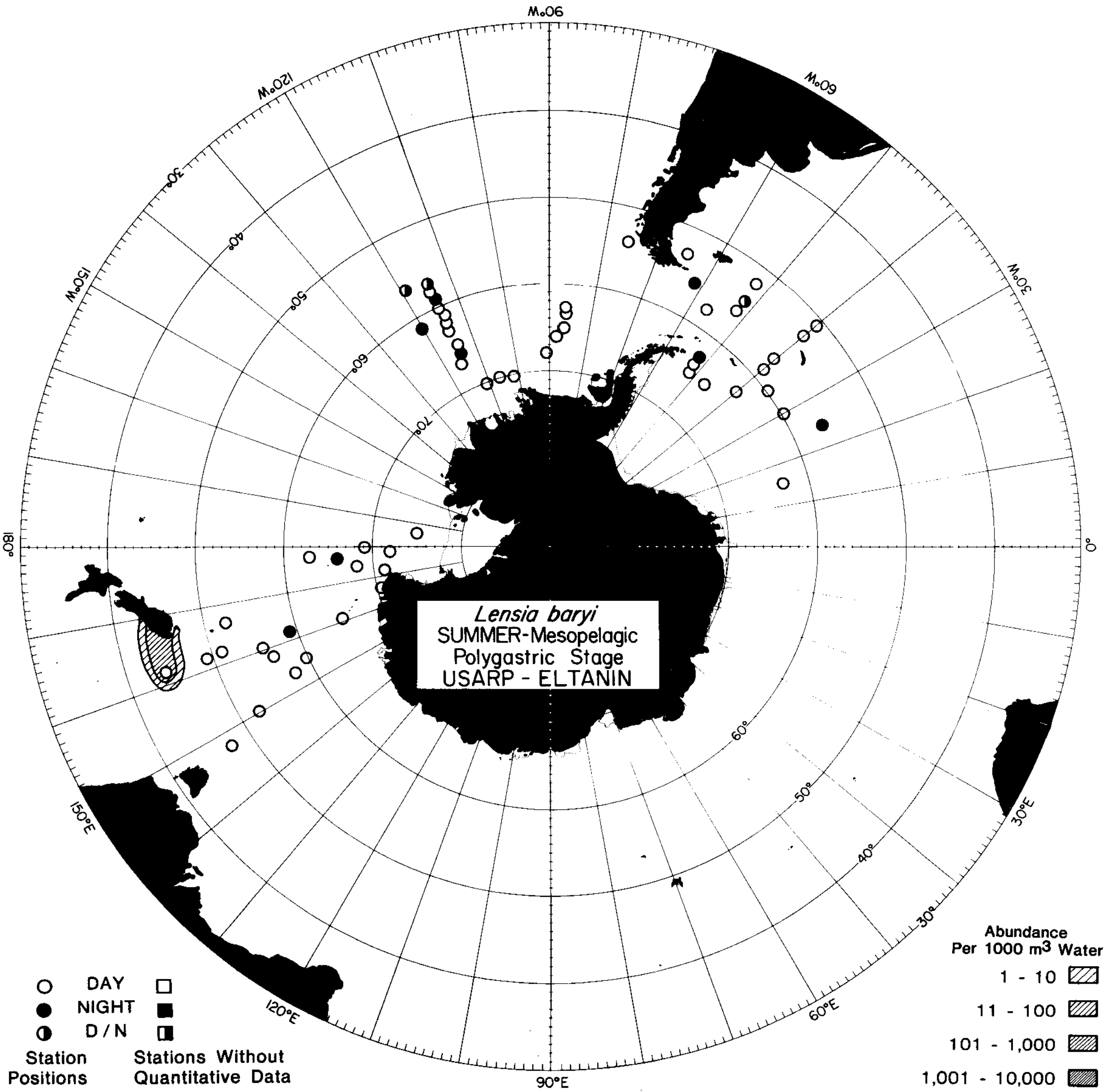
Map A142. The distribution of the polygastric stage of *Eudoxoides spiralis* during the winter in the epipelagic zone.



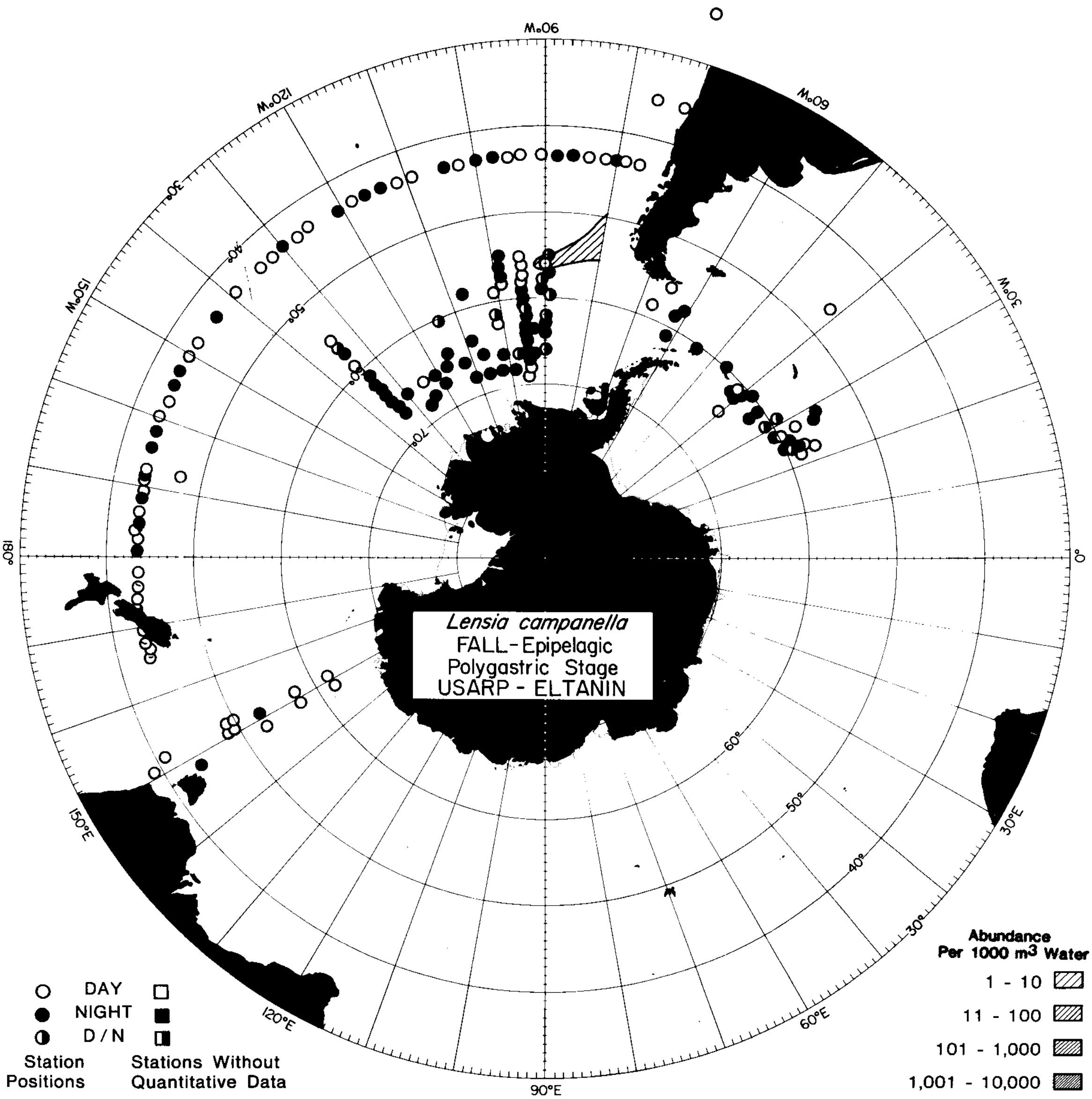
Map A143. The distribution of the eudoxid stage of *Eudoxoides spiralis* during the winter in the epipelagic zone.



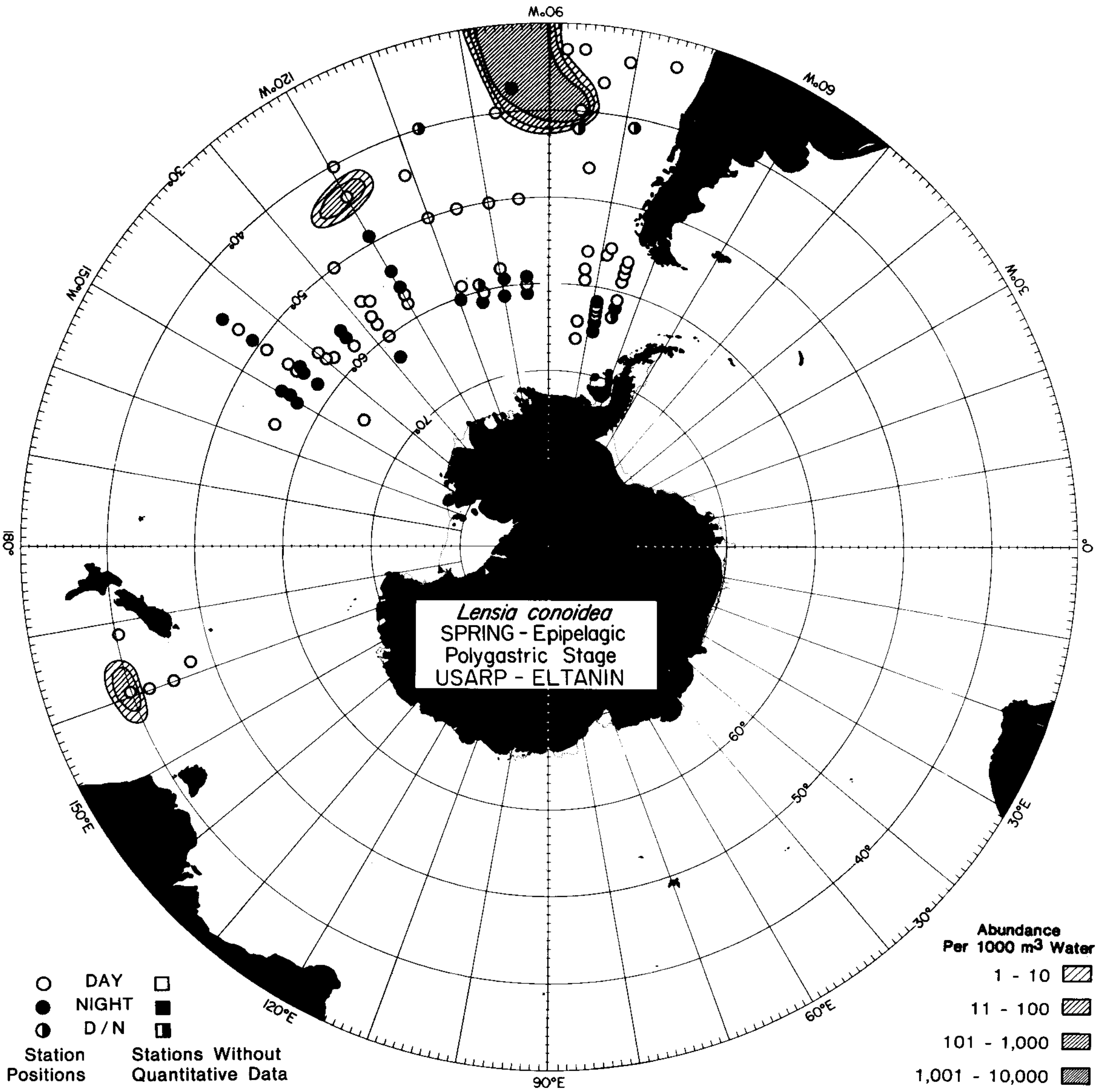
Map A144. The distribution of the polygastric stage of *Lensia achilles* during the fall in the mesopelagic zone.



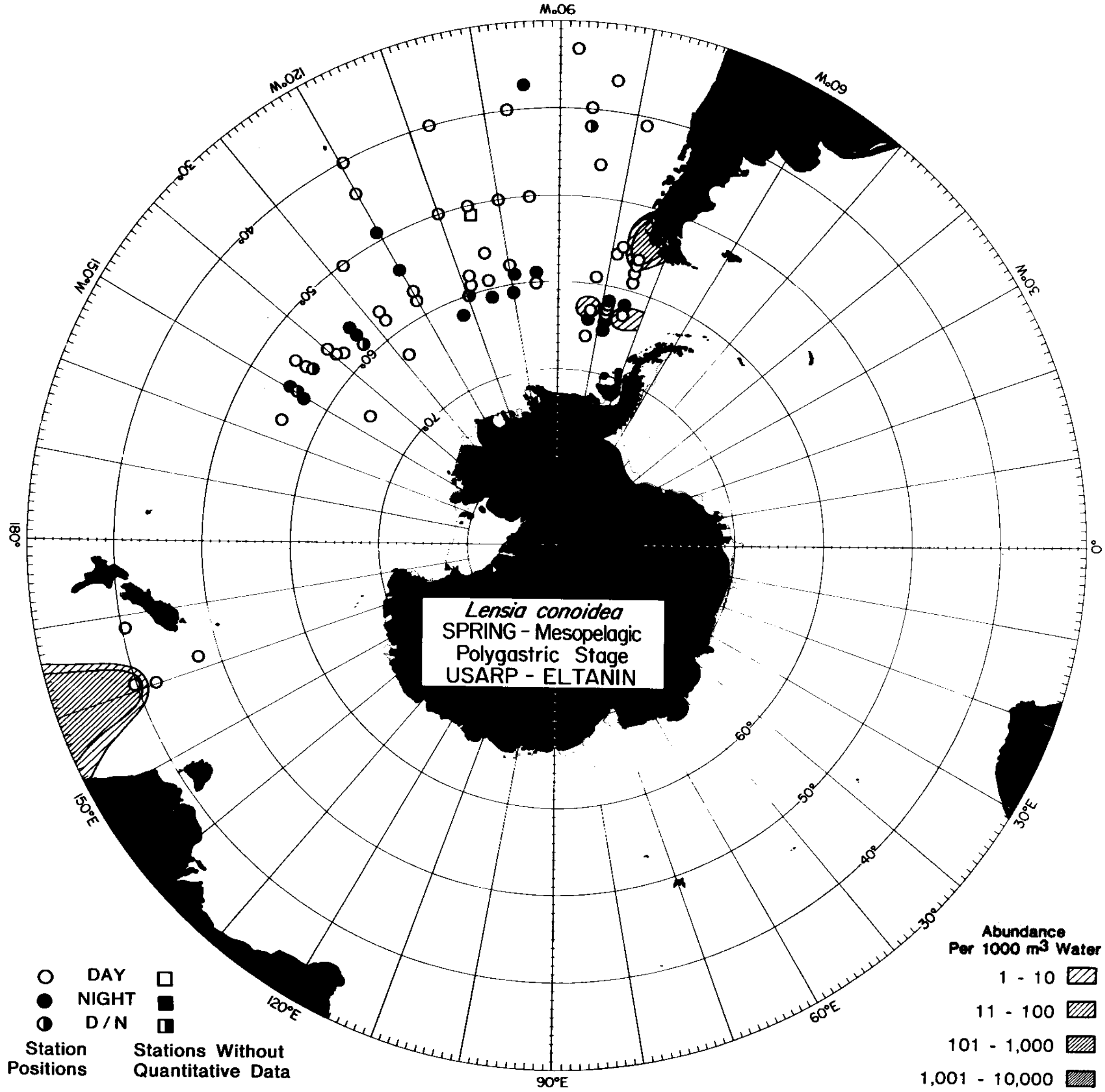
Map A145. The distribution of the polygastric stage of *Lensia baryi* during the summer in the mesopelagic zone.



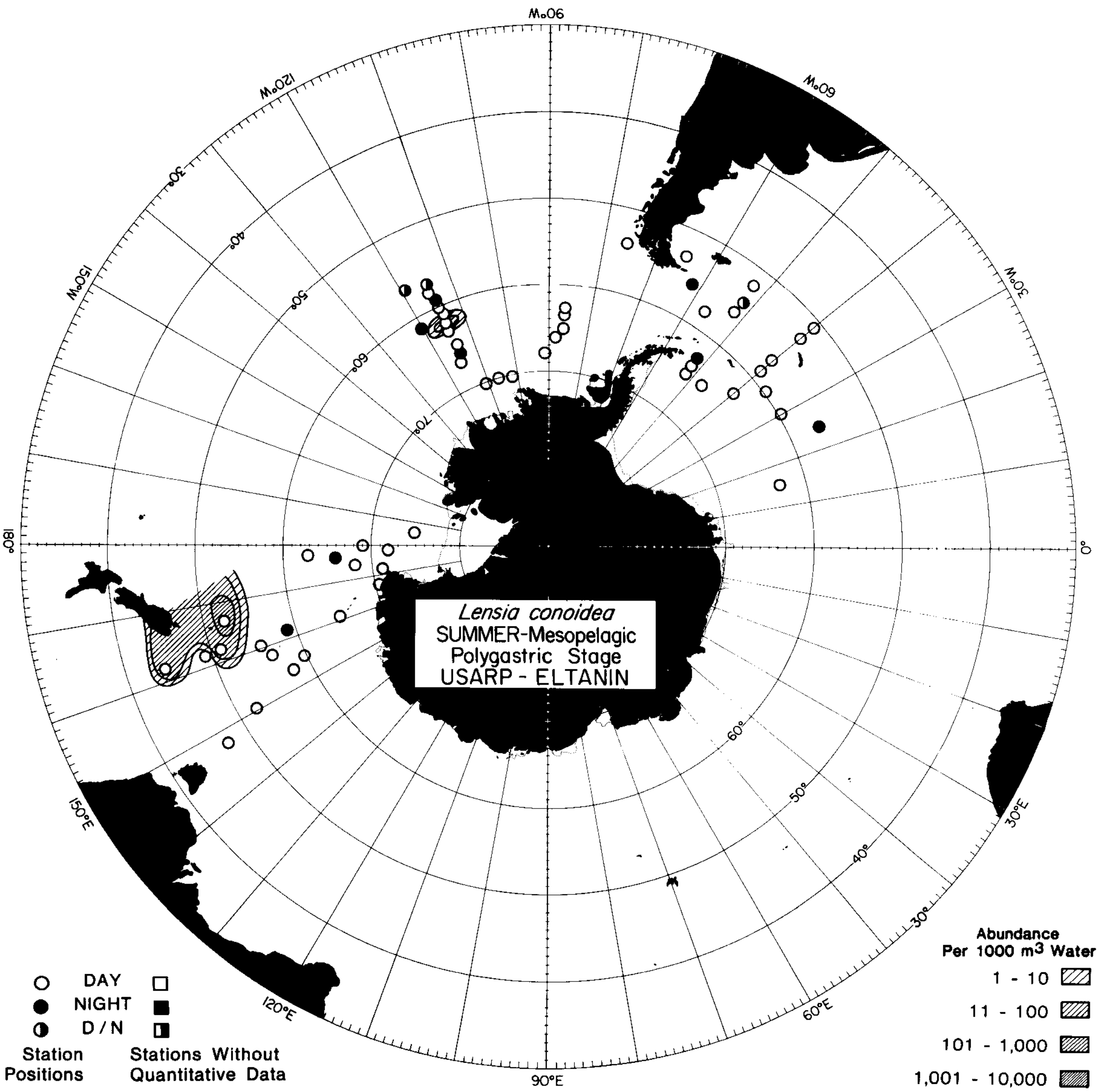
Map A146. The distribution of the polygastric stage of *Lensia campanella* during the fall in the epipelagic zone.



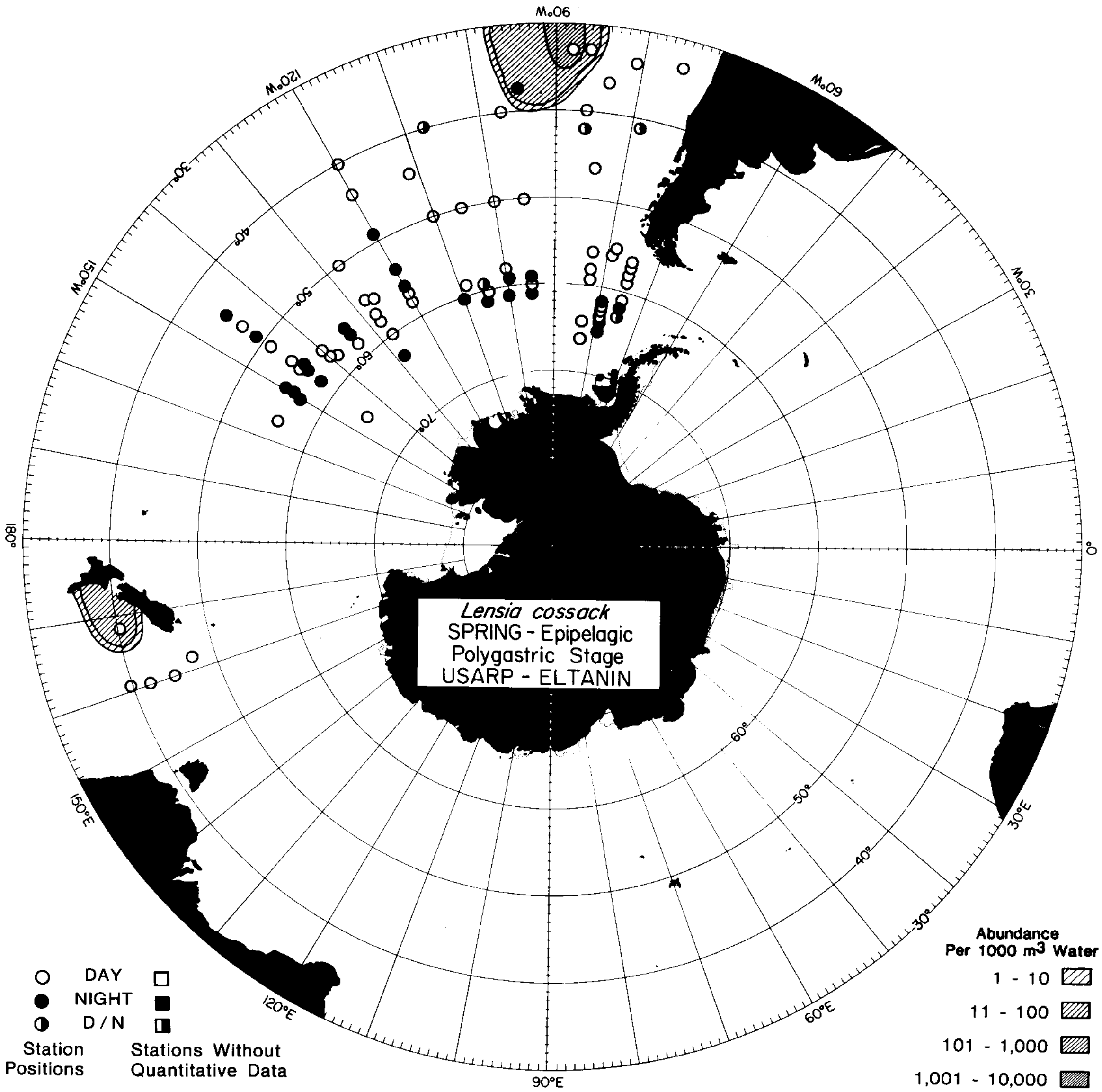
Map A147. The distribution of the polygastric stage of *Lensia conoidea* during the spring in the epipelagic zone.



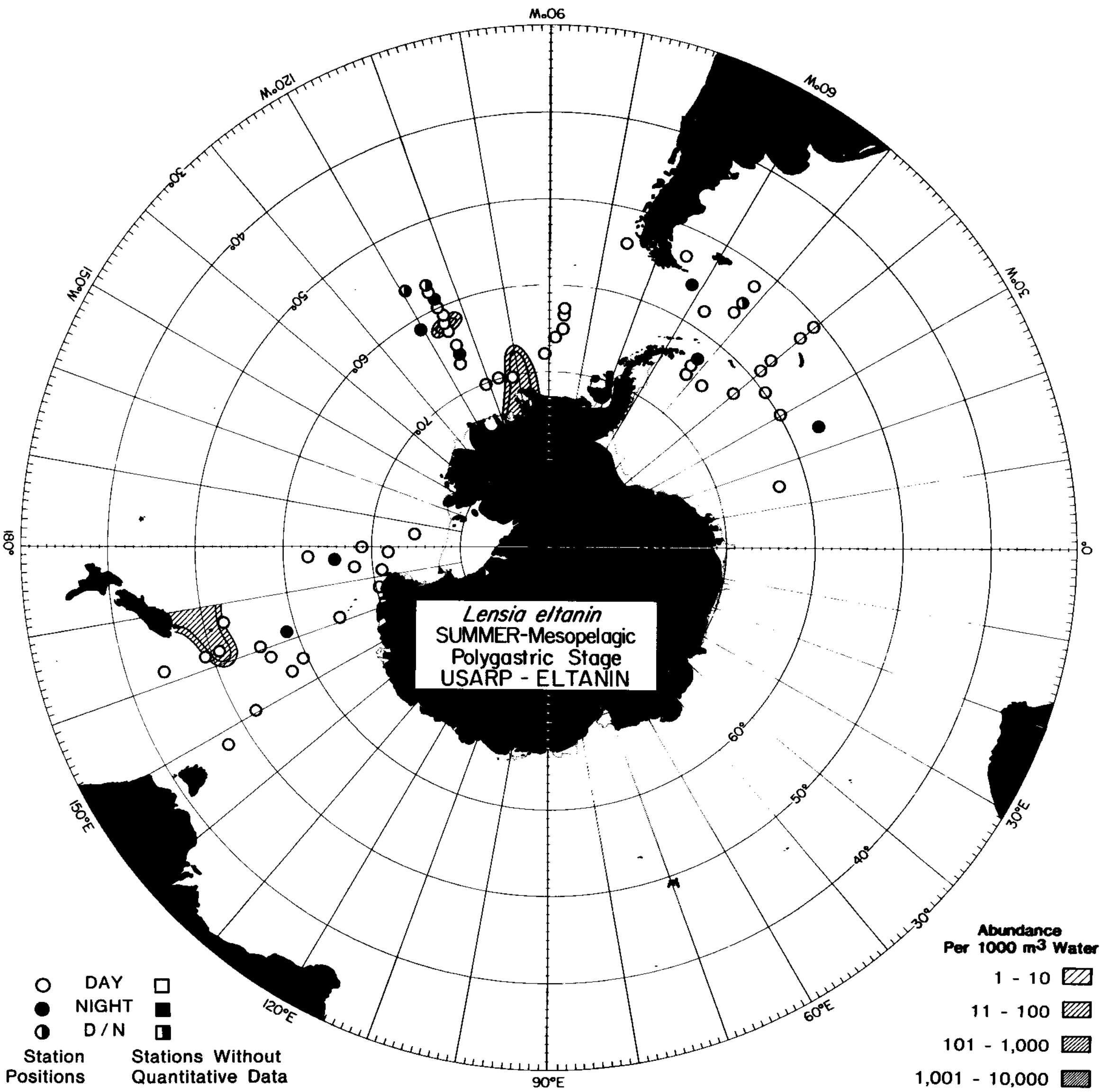
Map A148. The distribution of the polygastric stage of *Lensia conoidea* during the spring in the mesopelagic zone.



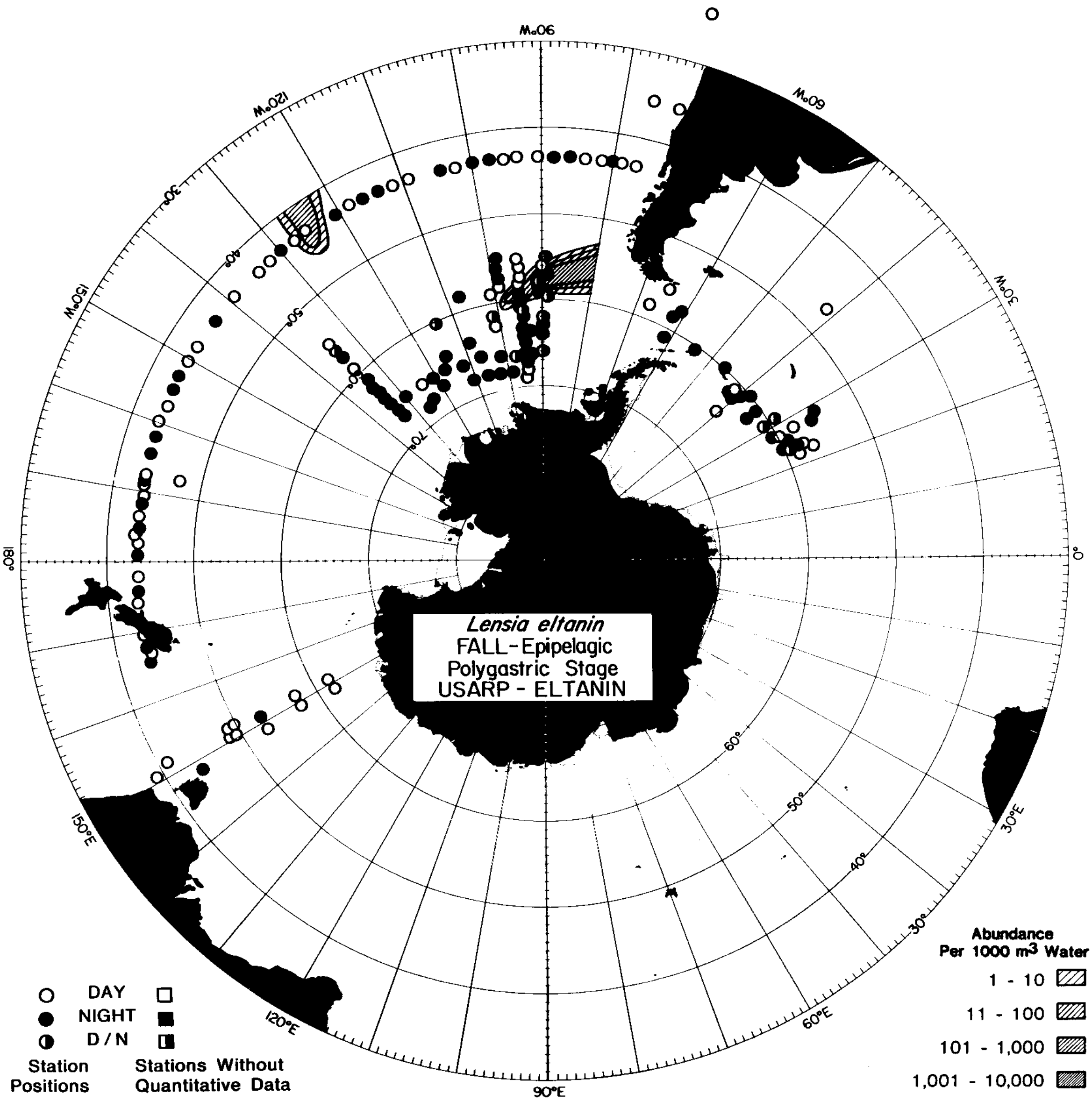
Map A149. The distribution of the polygastric stage of *Lensia conoidea* during the summer in the mesopelagic zone.



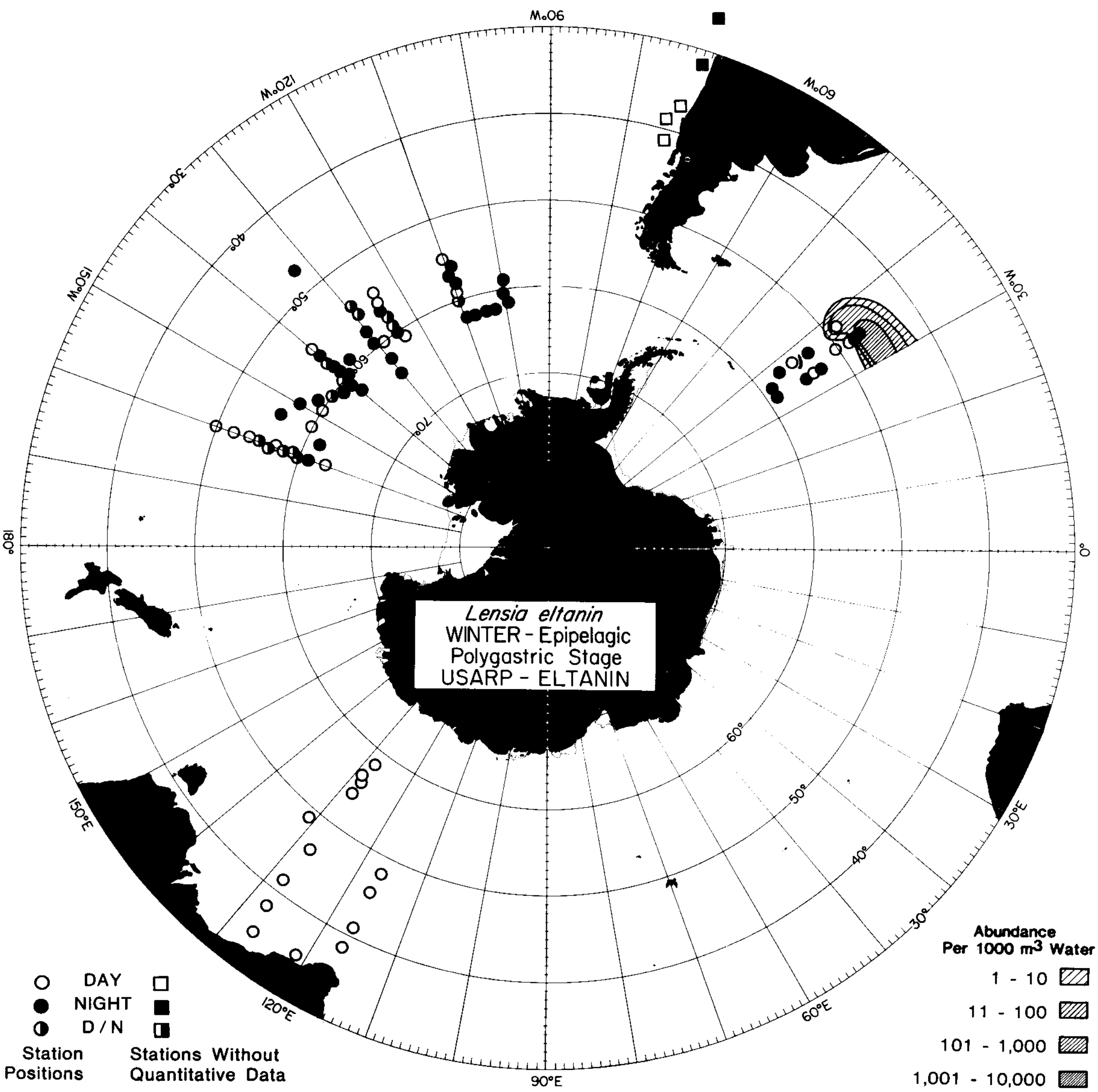
Map A150. The distribution of the polygastric stage of *Lensia cossack* during the spring in the epipelagic zone.



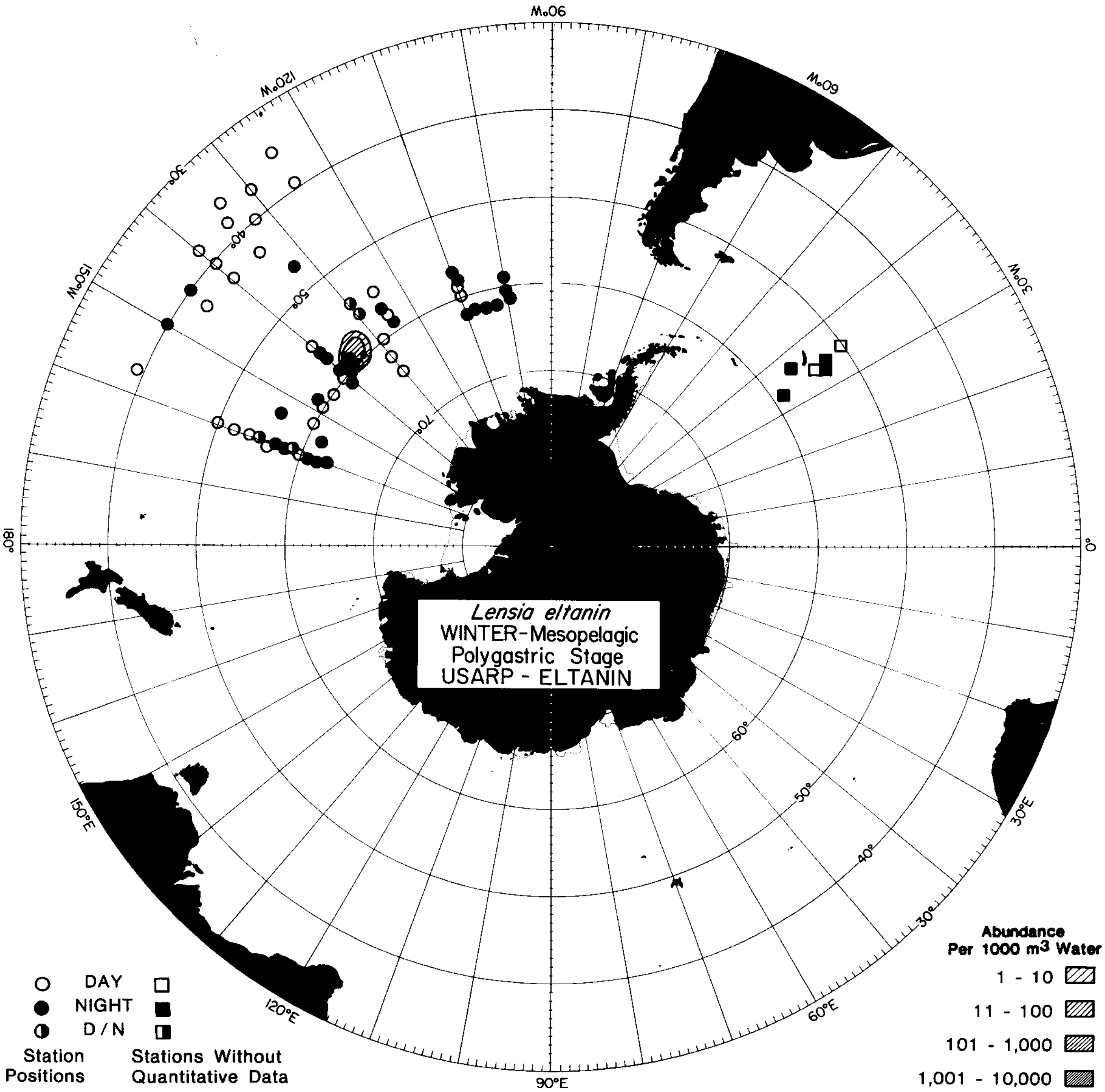
Map A151. The distribution of the polygastric stage of *Lensia eltanin* during the summer in the mesopelagic zone.



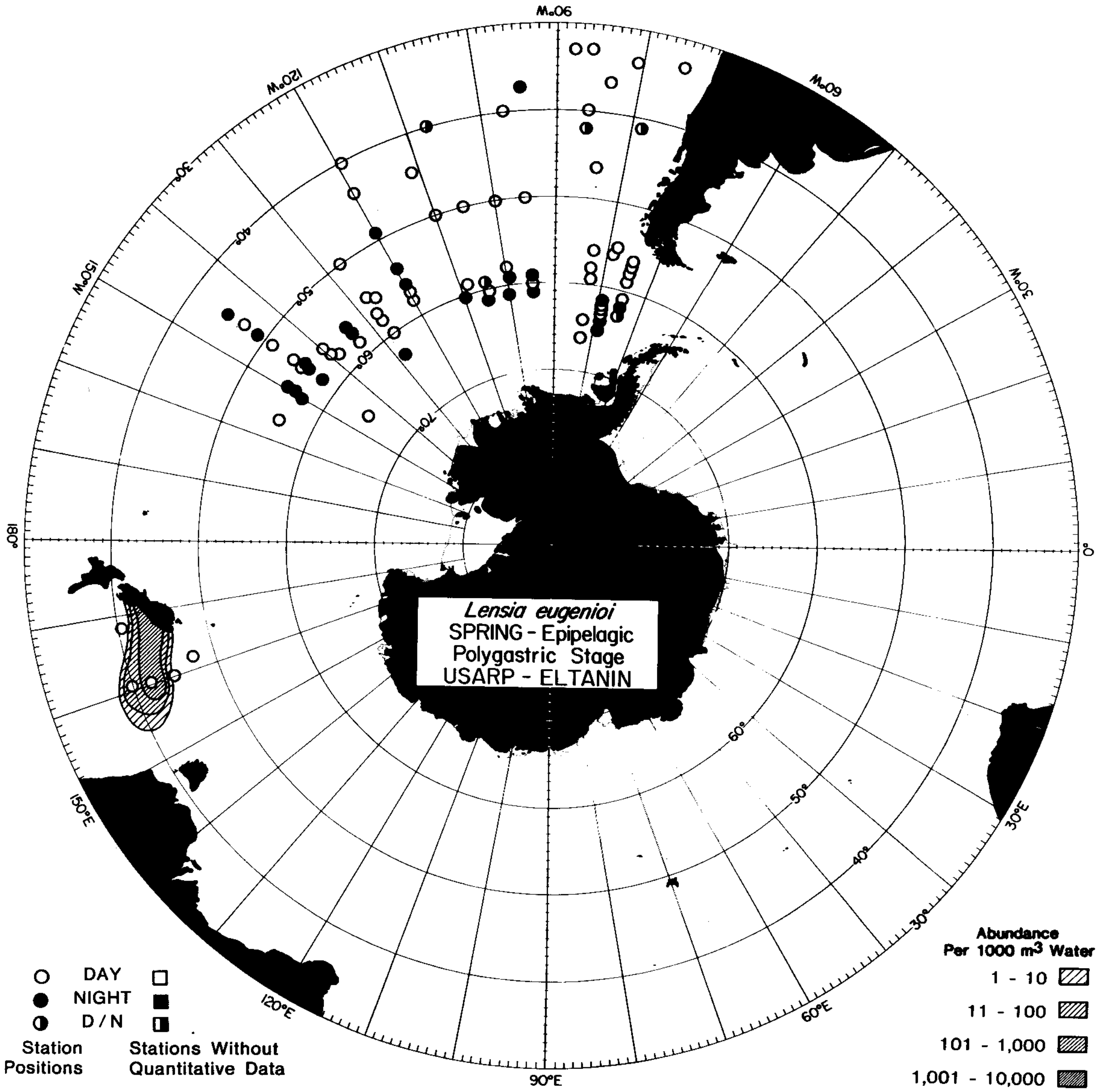
Map A152. The distribution of the polygastric stage of *Lensia eltanin* during the fall in the epipelagic zone.



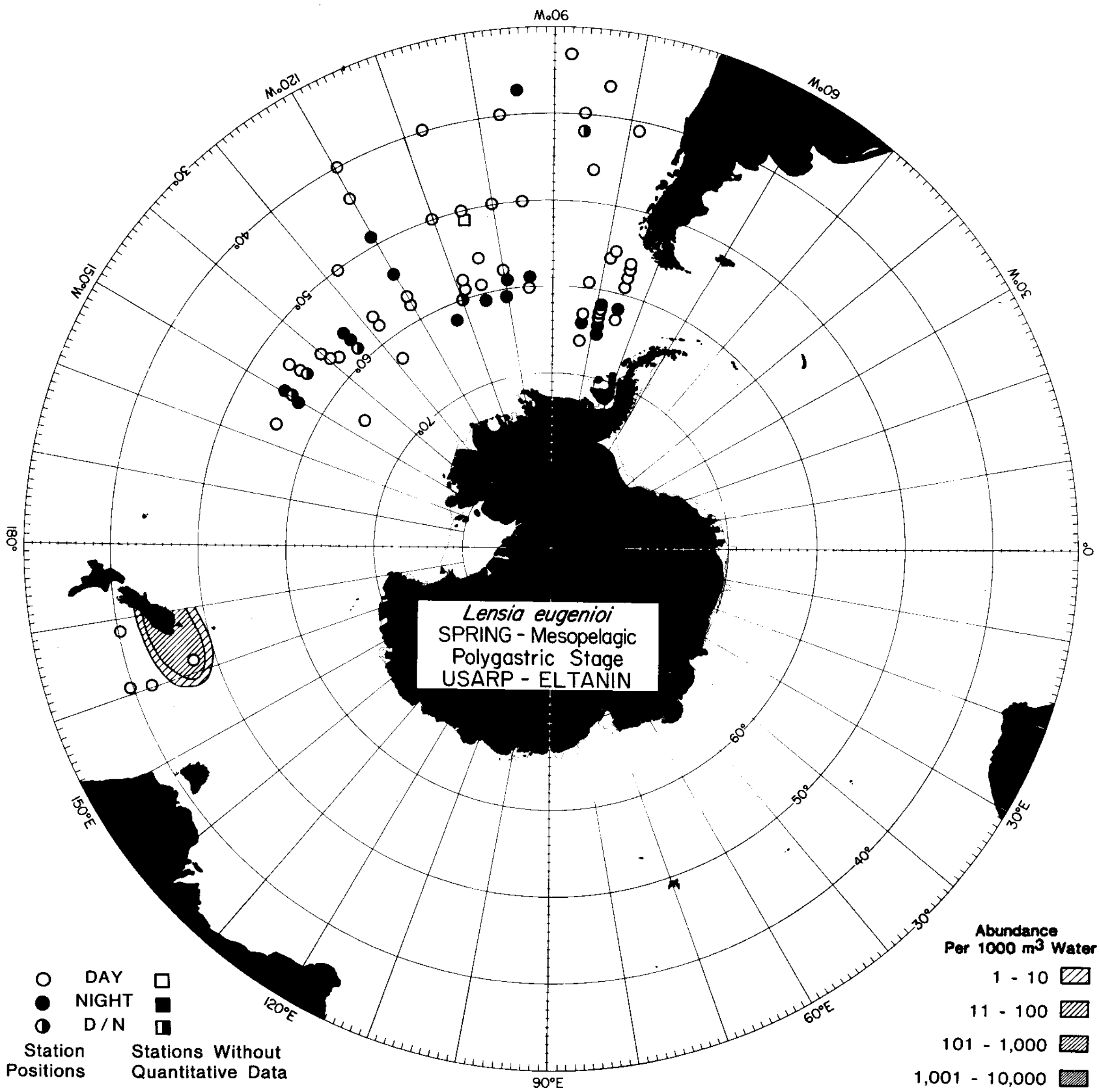
Map A153. The distribution of the polygastric stage of *Lensia eltanin* during the winter in the epipelagic zone.



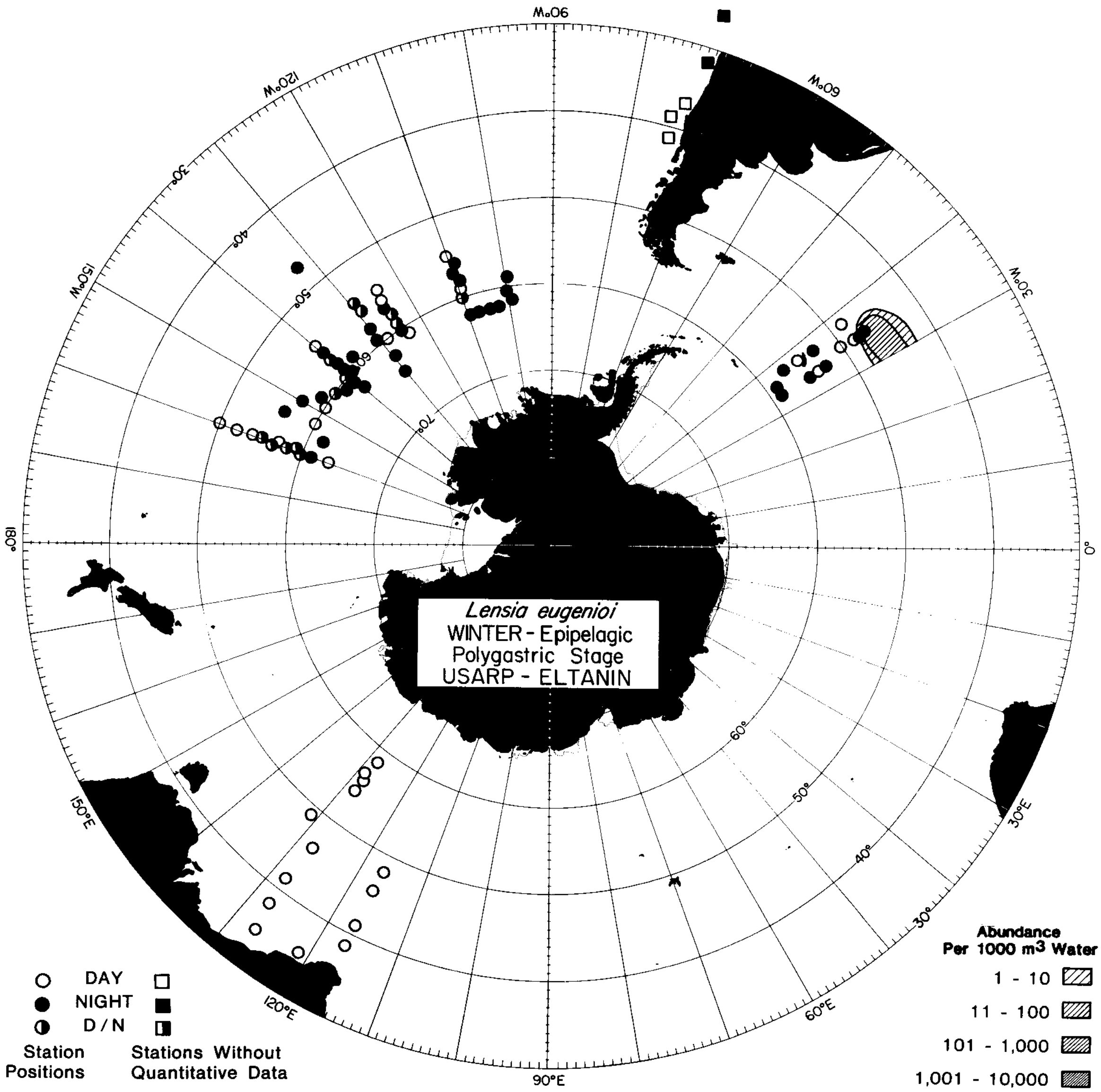
Map A154. The distribution of the polygastric stage of *Lensia eltanin* during the winter in the mesopelagic zone.



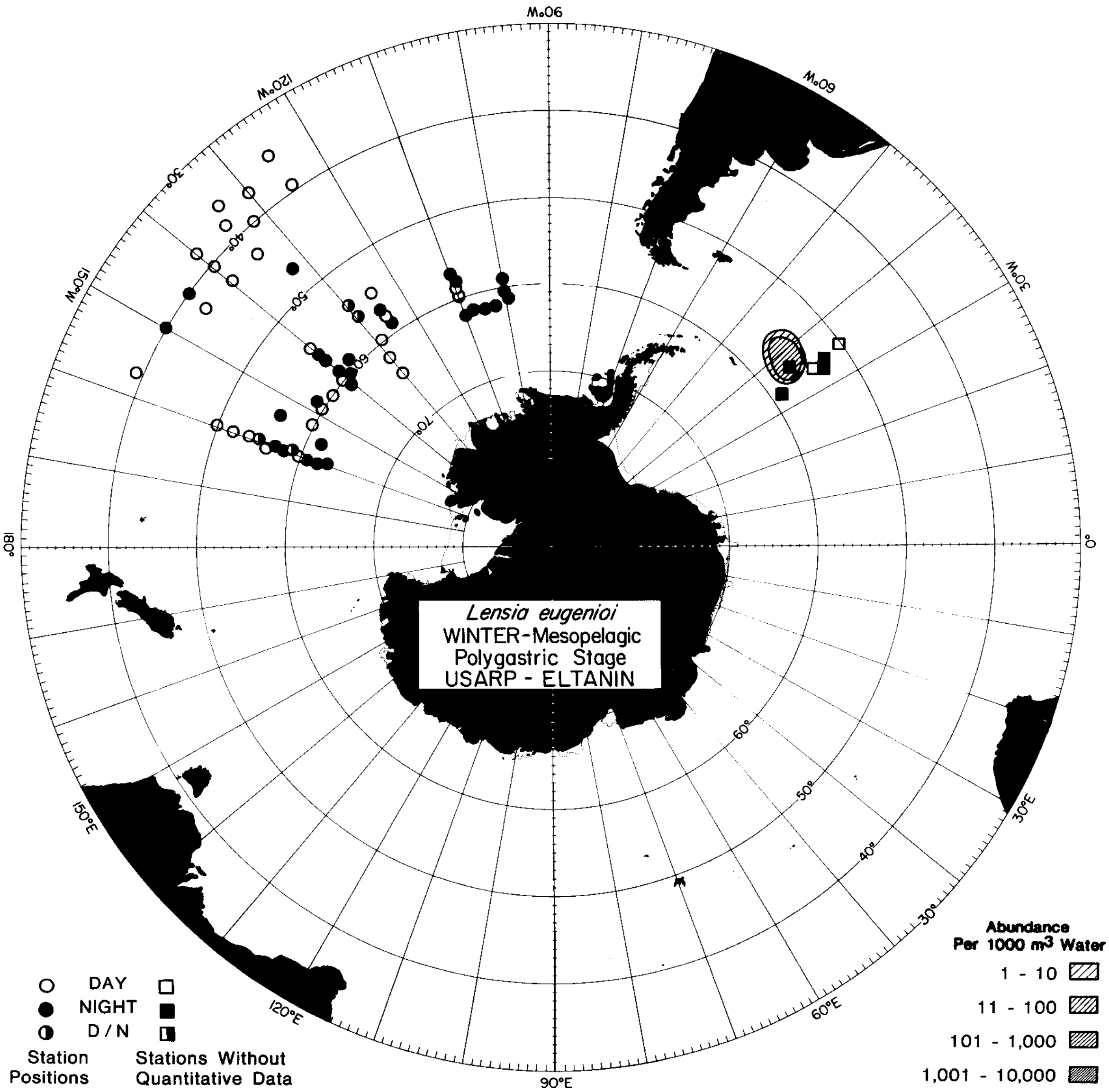
Map A155. The distribution of the polygastric stage of *Lensia eugenioi* during the spring in the epipelagic zone.



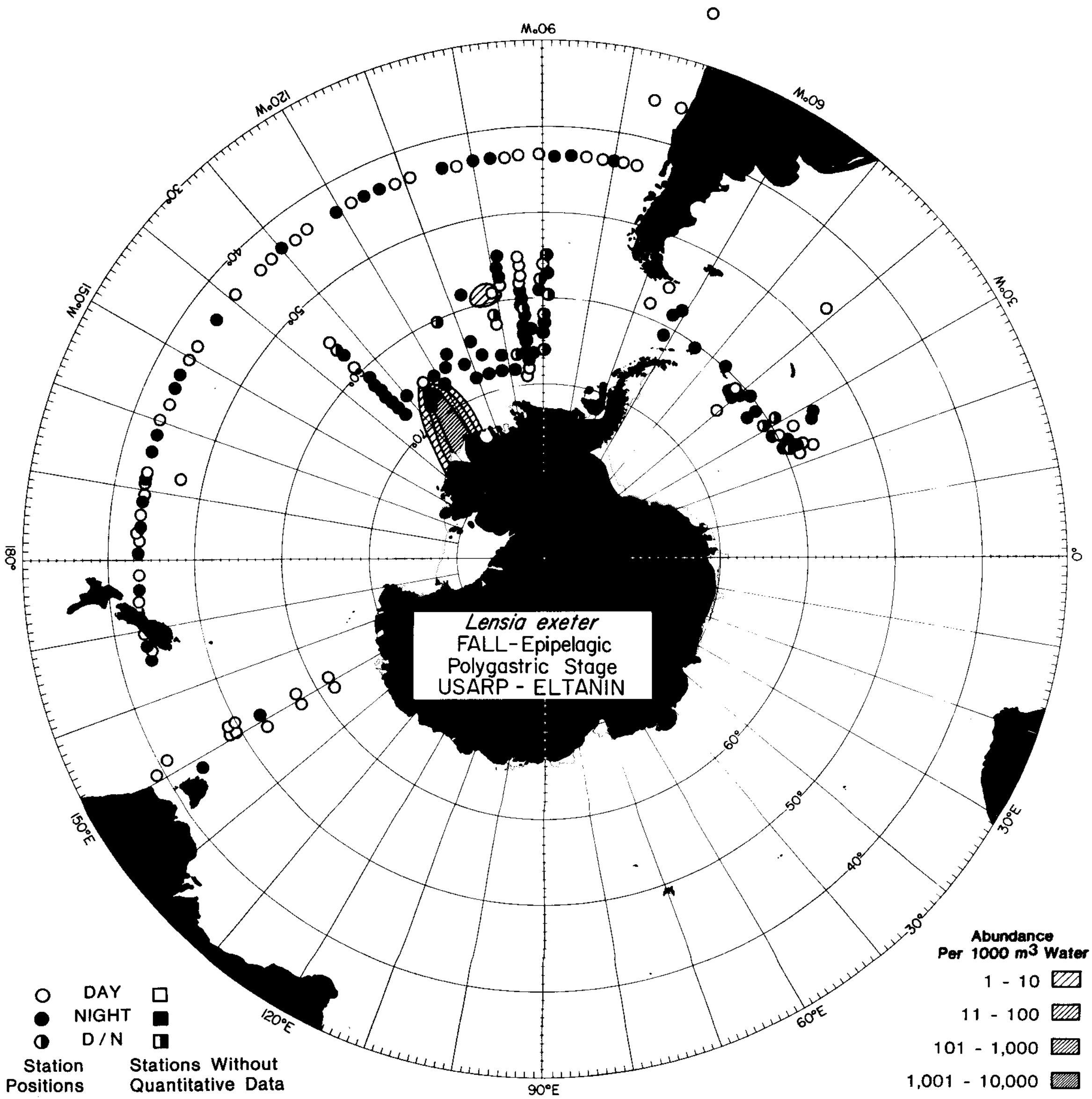
Map A156. The distribution of the polygastric stage of *Lensia eugenioi* during the spring in the mesopelagic zone.



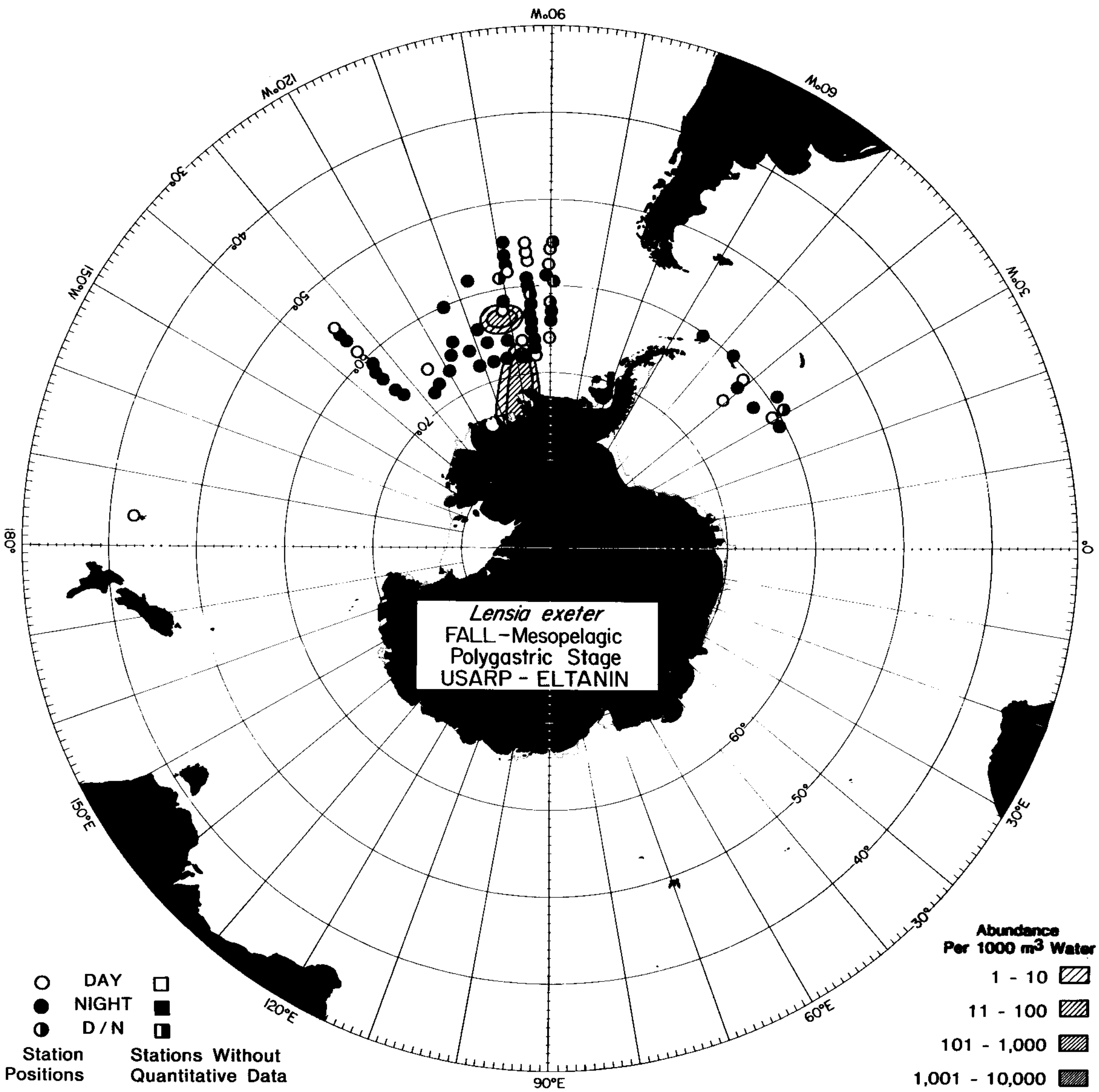
Map A157. The distribution of the polygastric stage of *Lensia eugenioi* during the winter in the epipelagic zone.



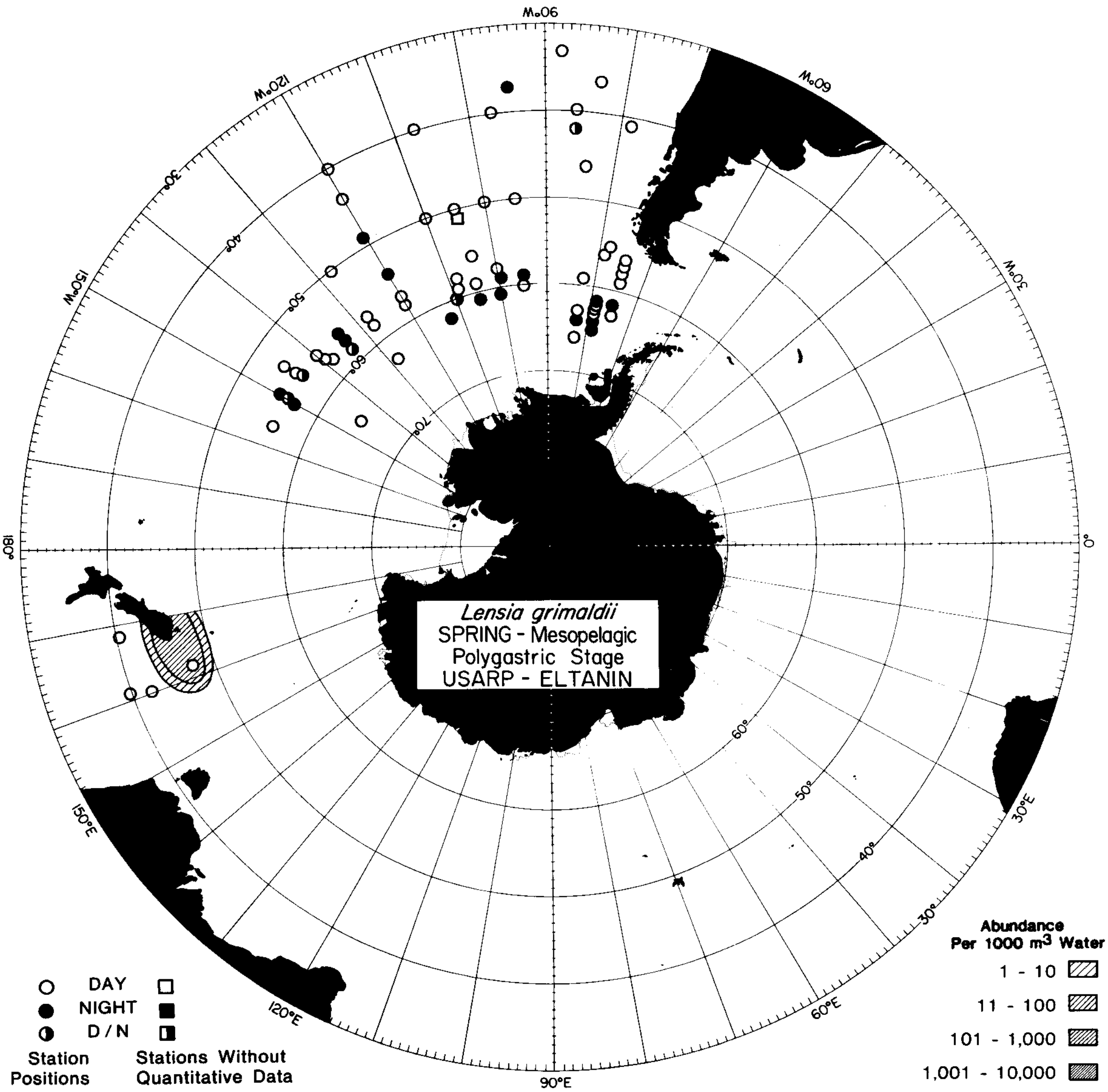
Map A158. The distribution of the polygastric stage of *Lensia eugenioi* during the winter in the mesopelagic zone.



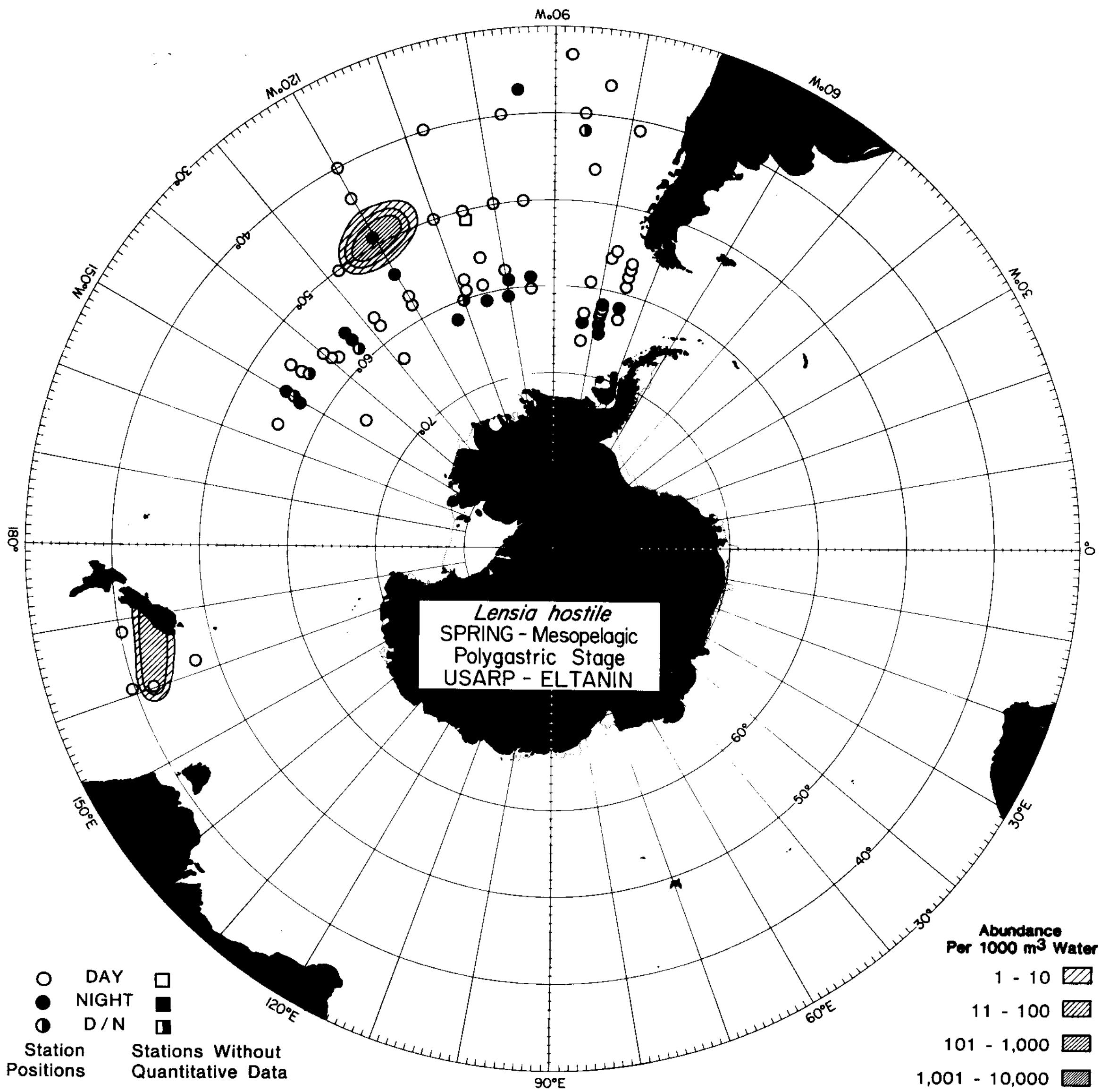
Map 159. The distribution of the polygastric stage of *Lensia exeter* during the fall in the epipelagic zone.



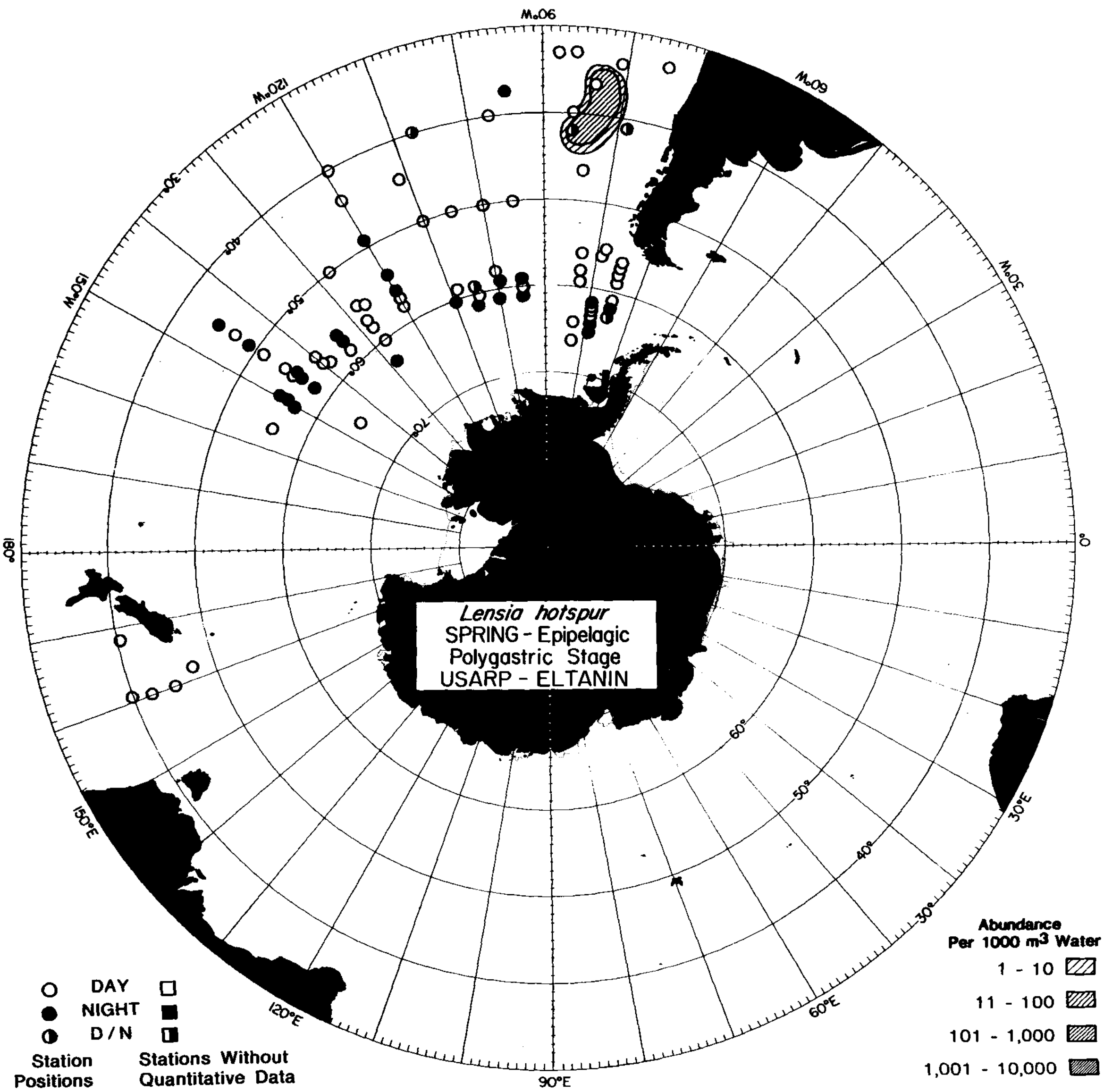
Map A160. The distribution of the polygastric stage of *Lensia exeter* during the fall in the mesopelagic zone.



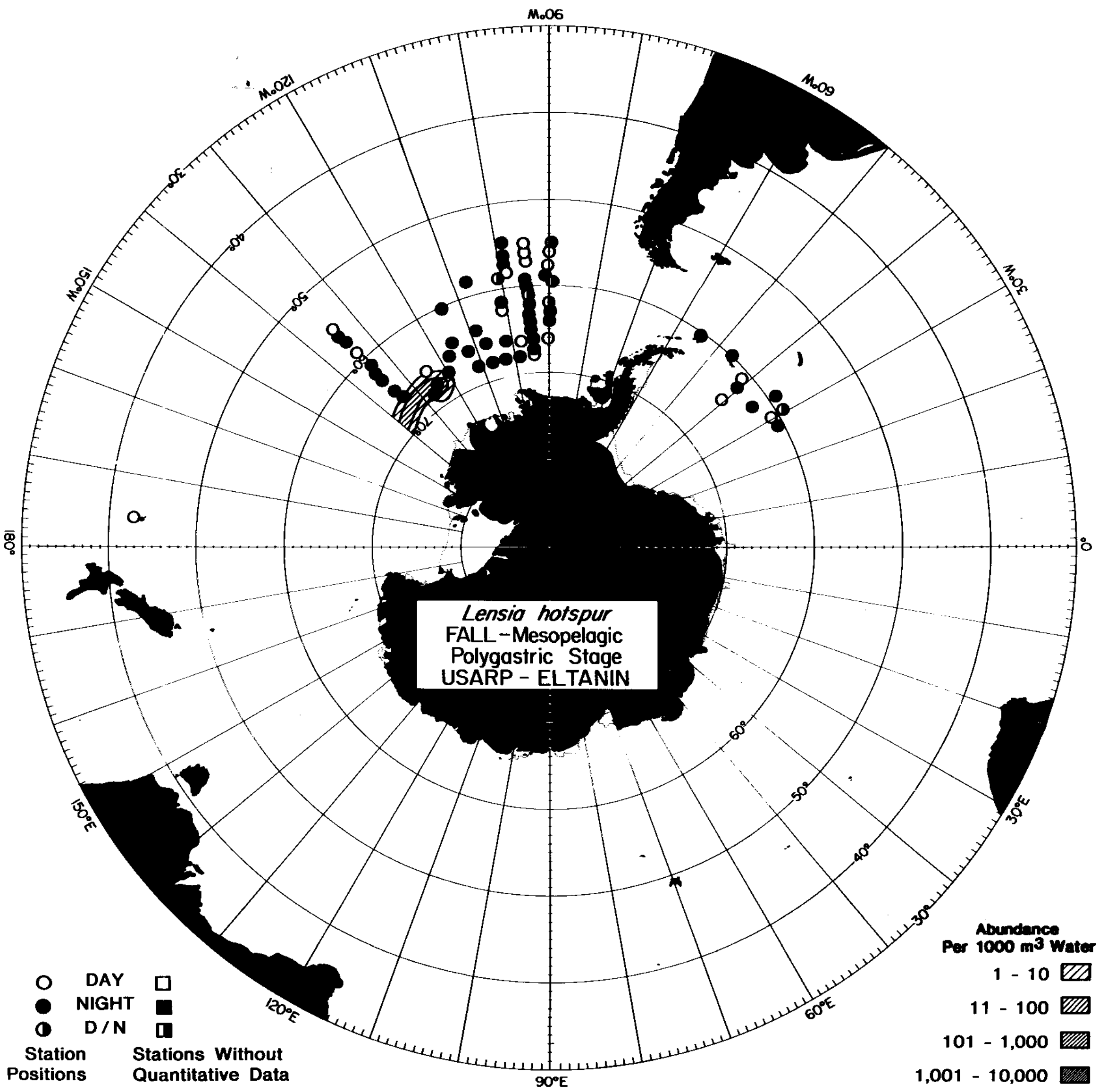
Map A161. The distribution of the polygastric stage of *Lensia grimaldii* during the spring in the mesopelagic zone.



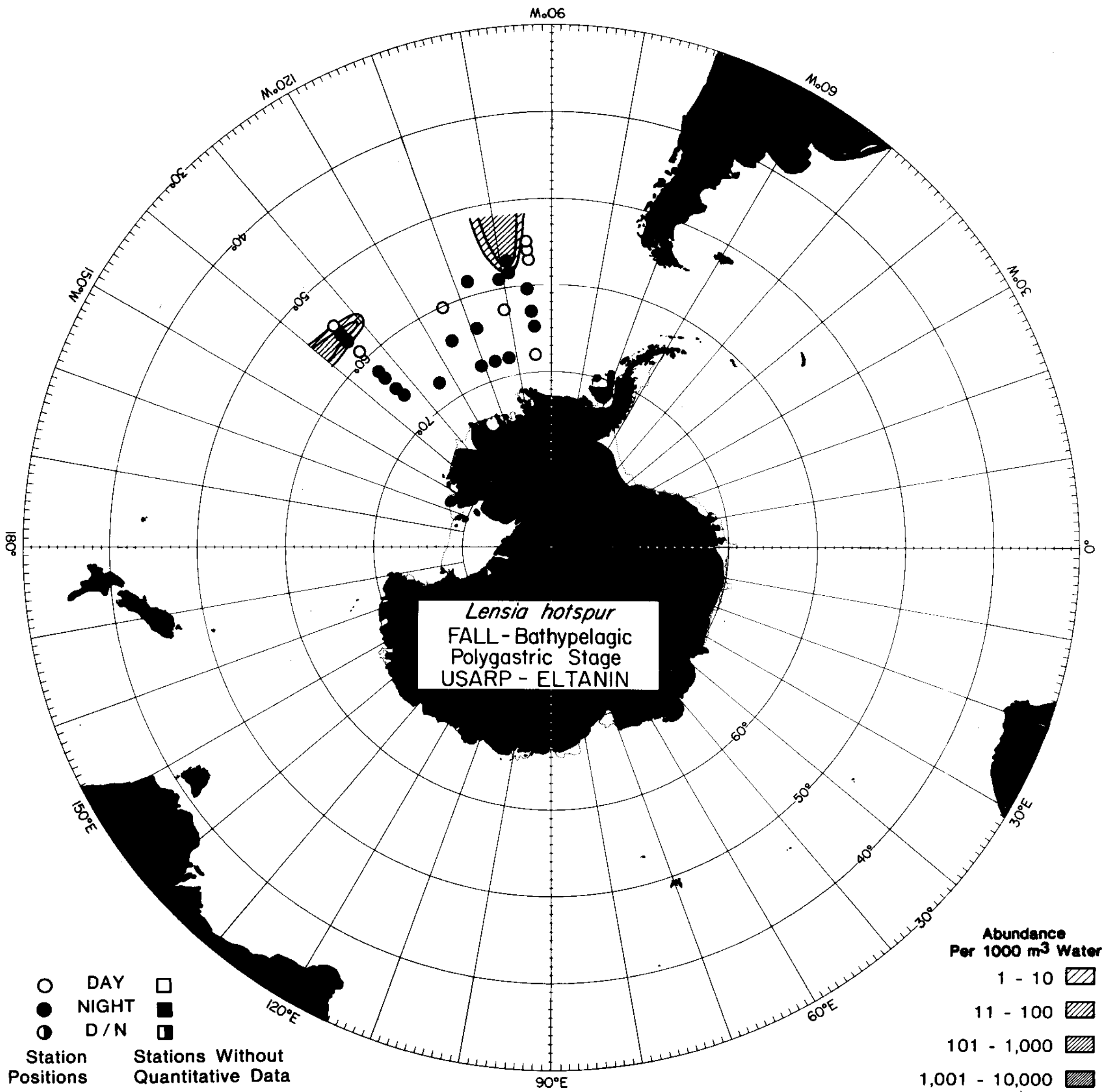
Map A162. The distribution of the polygastric stage of *Lensia hostile* during the spring in the mesopelagic zone.



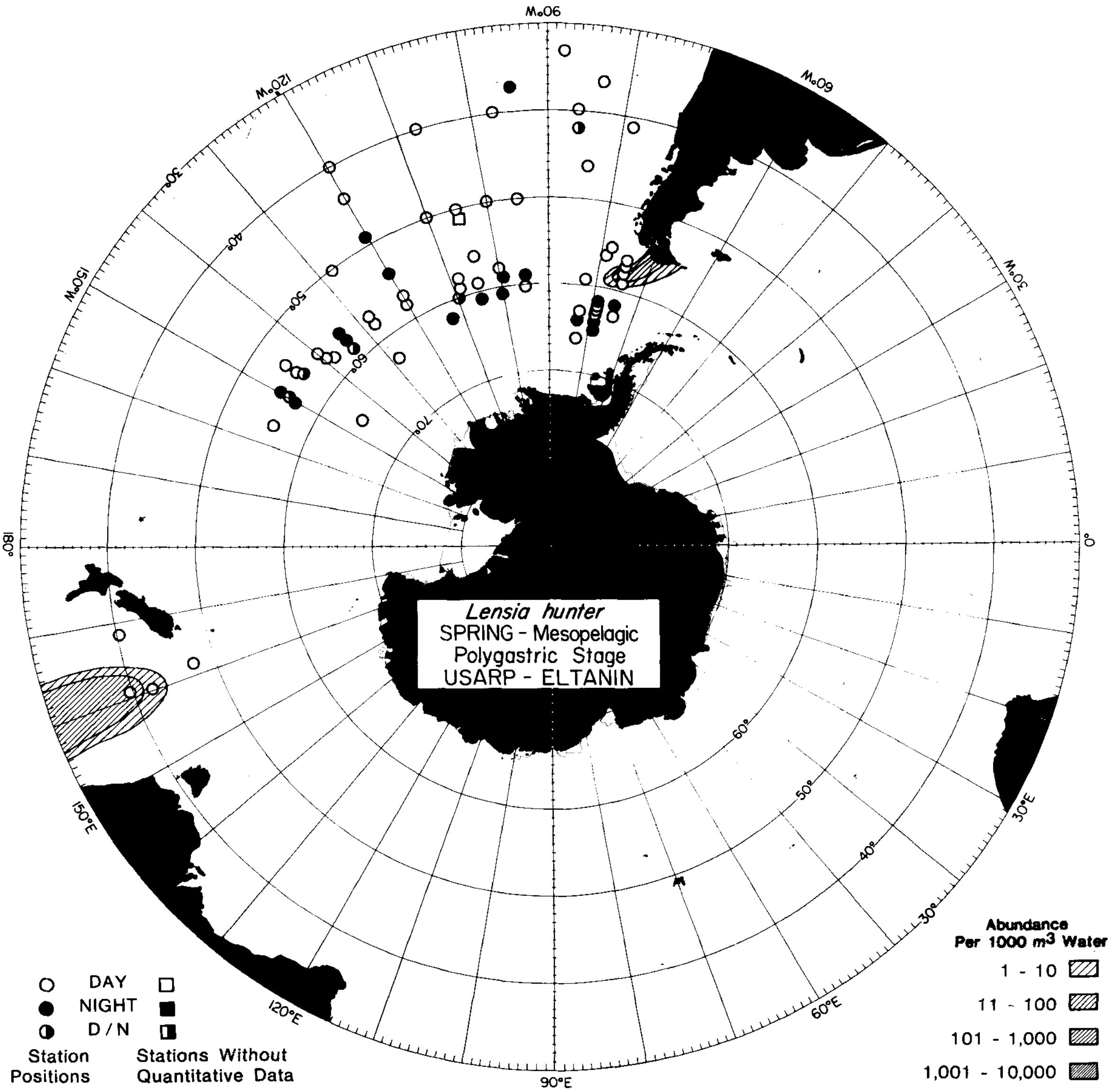
Map A163. The distribution of the polygastric stage of *Lensia hotspur* during the spring in the epipelagic zone.



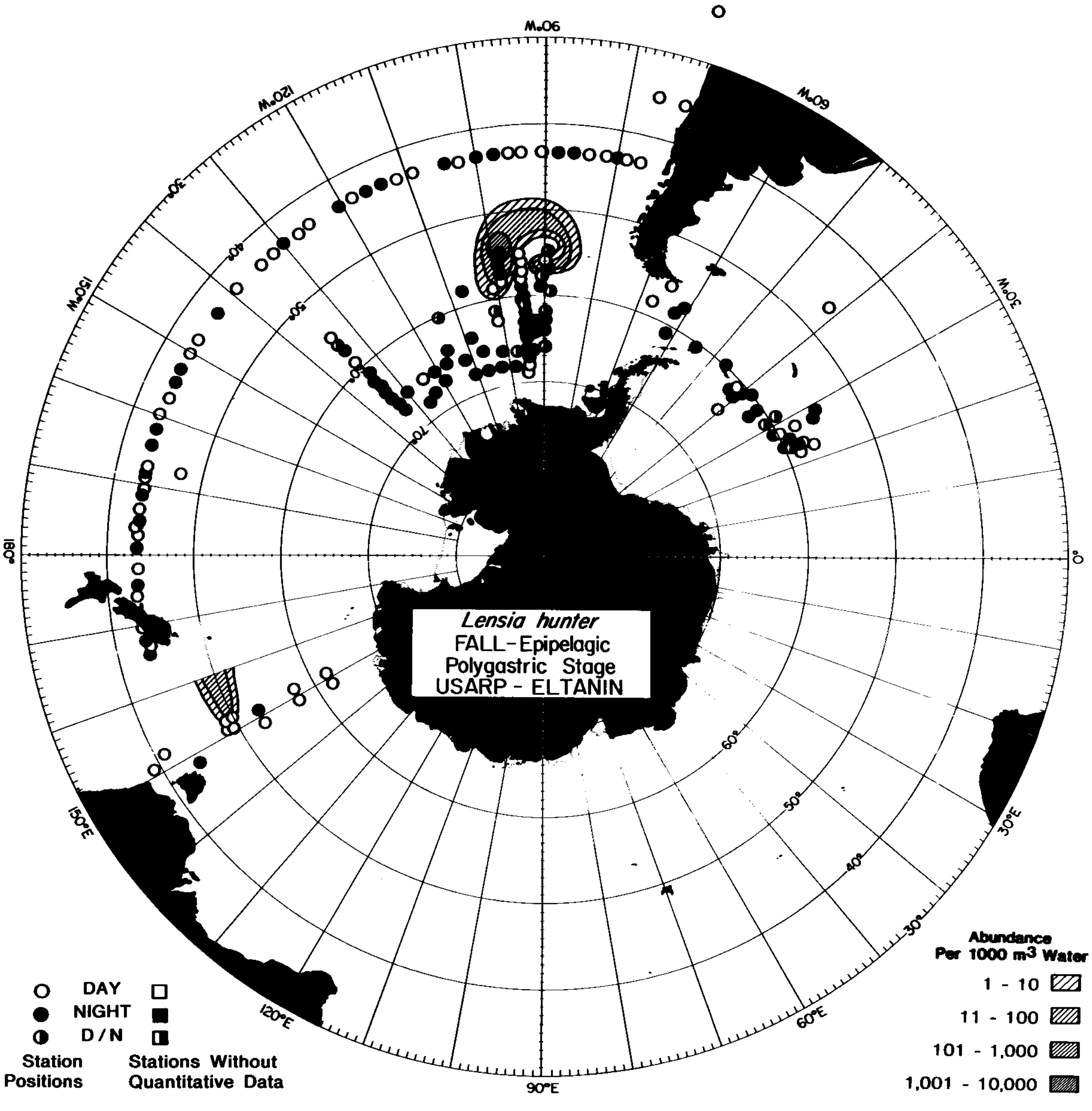
Map A164. The distribution of the polygastric stage of *Lensia hotspur* during the fall in the mesopelagic zone.



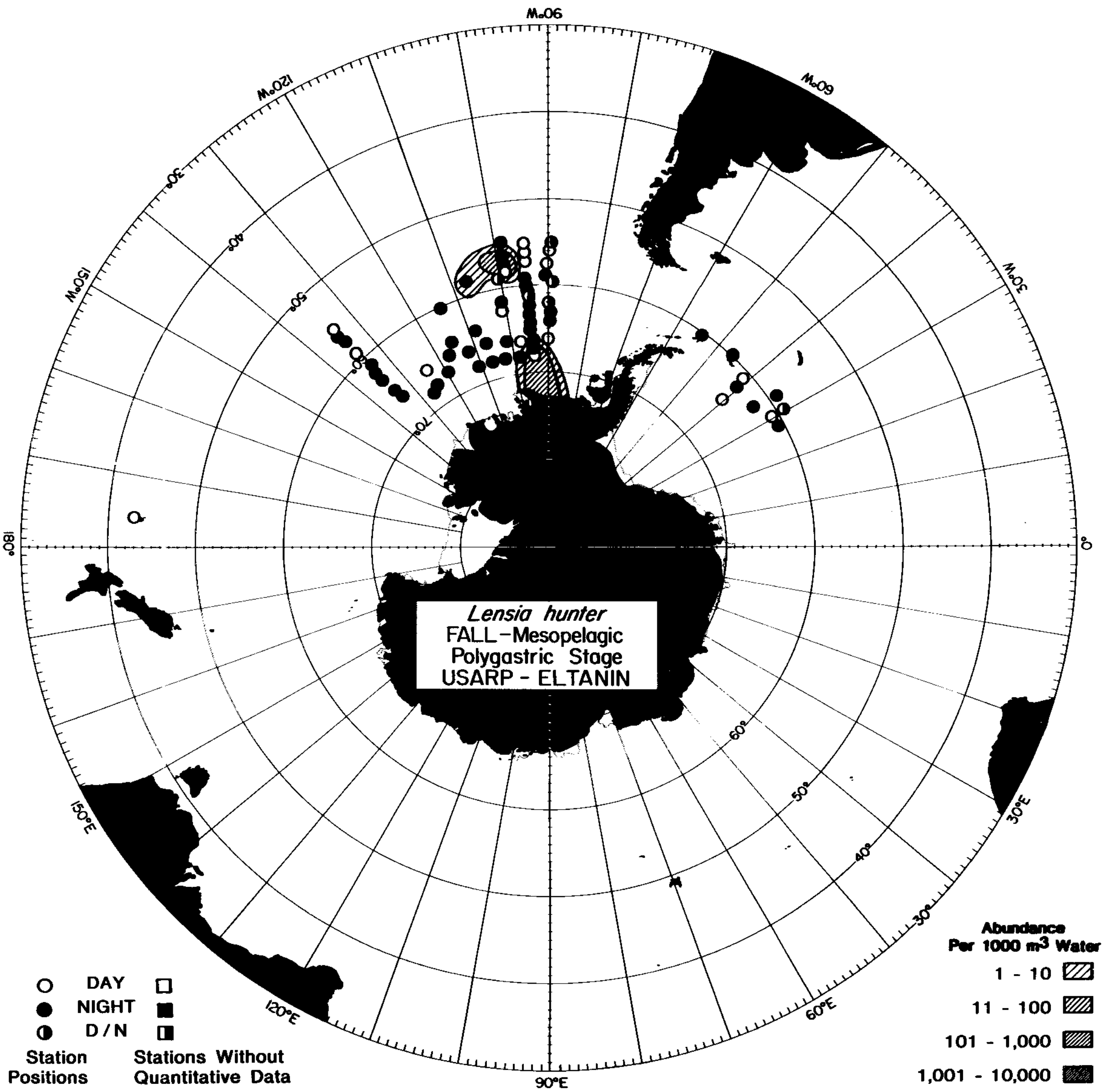
Map A165. The distribution of the polygastric stage of *Lensia hotspur* during the fall in the bathypelagic zone.



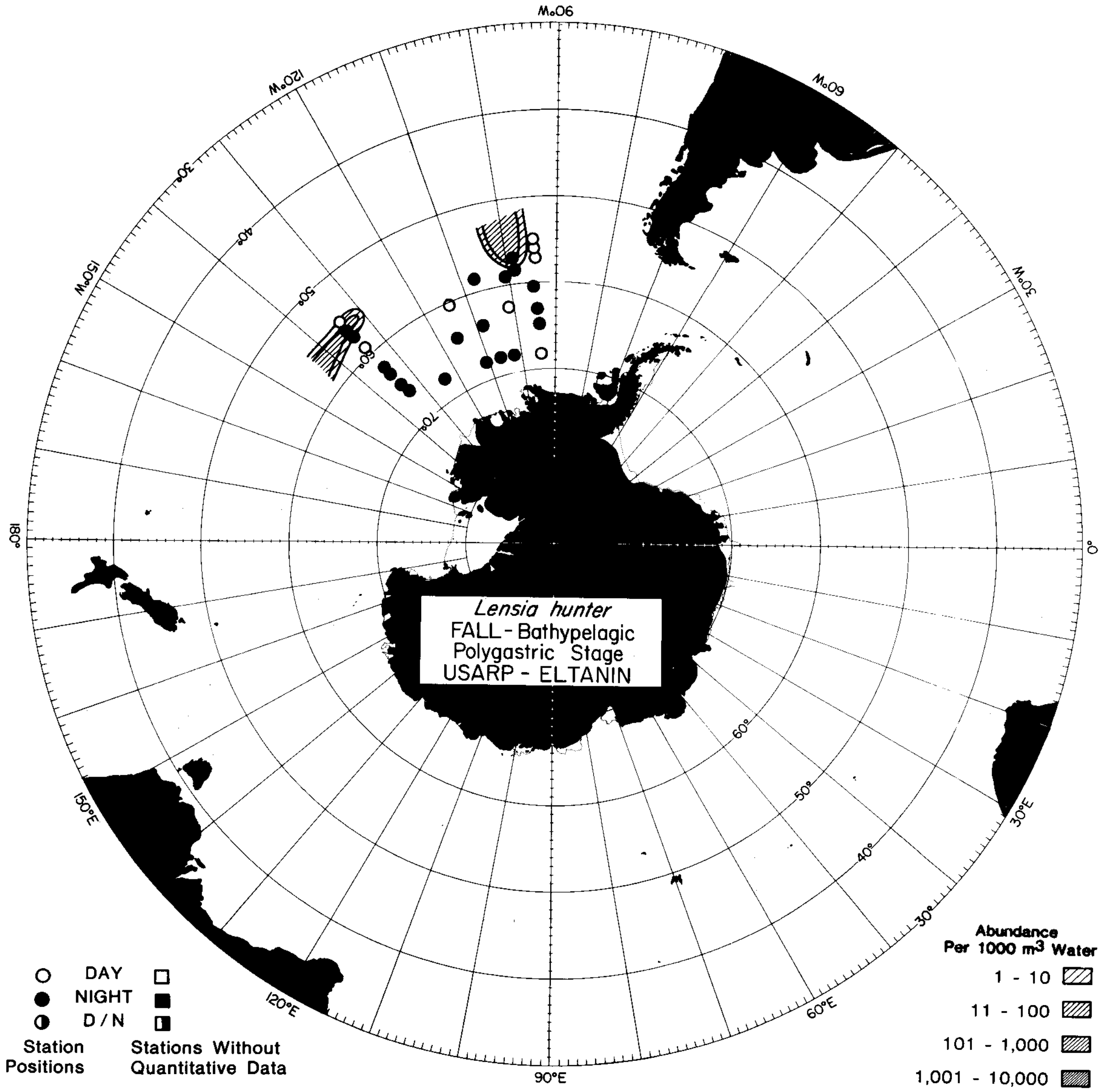
Map A166. The distribution of the polygastric stage of *Lensia hunter* during the spring in the mesopelagic zone.



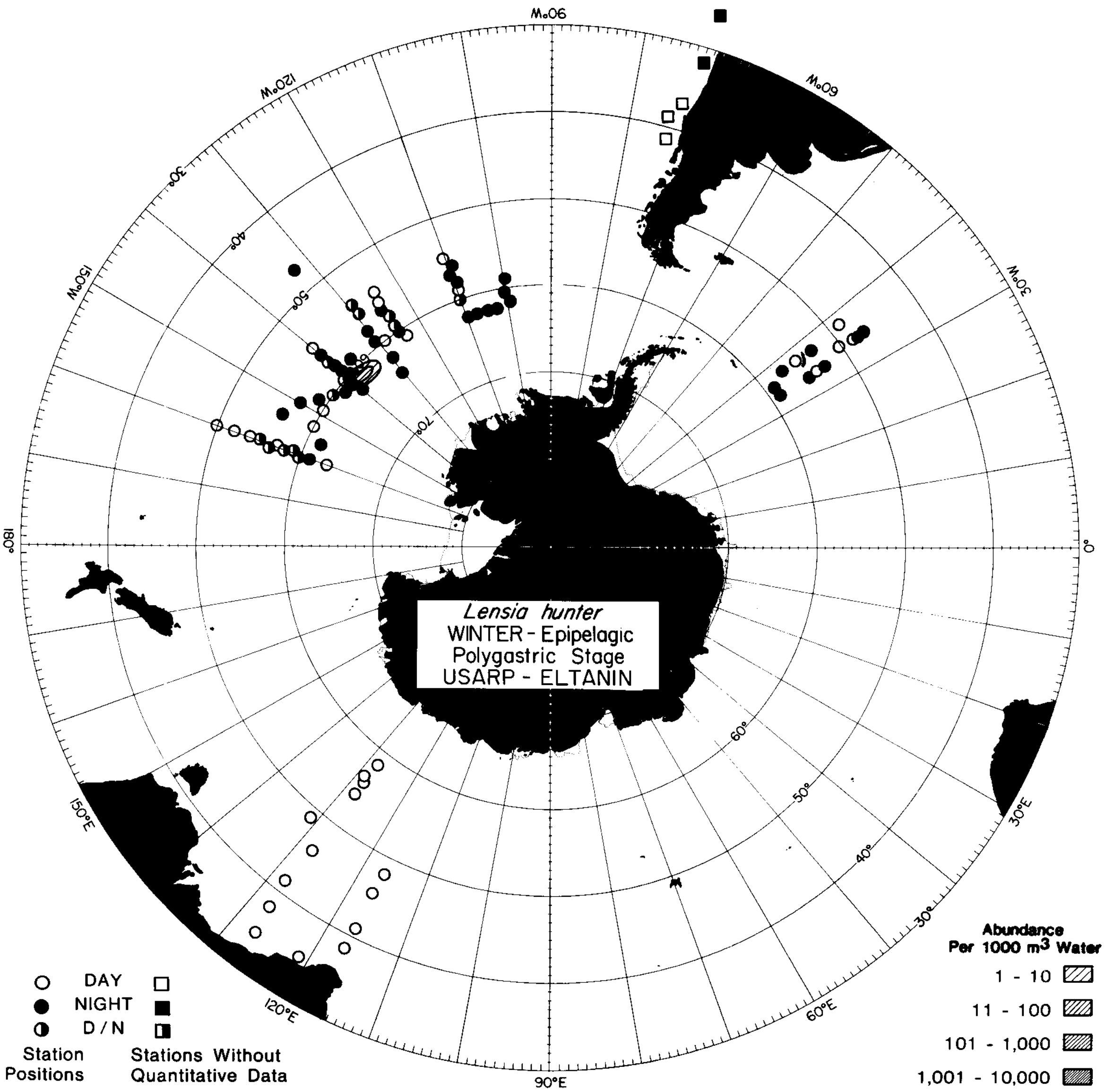
Map A167. The distribution of the polygastric stage of *Lensia hunter* during the fall in the epipelagic zone.



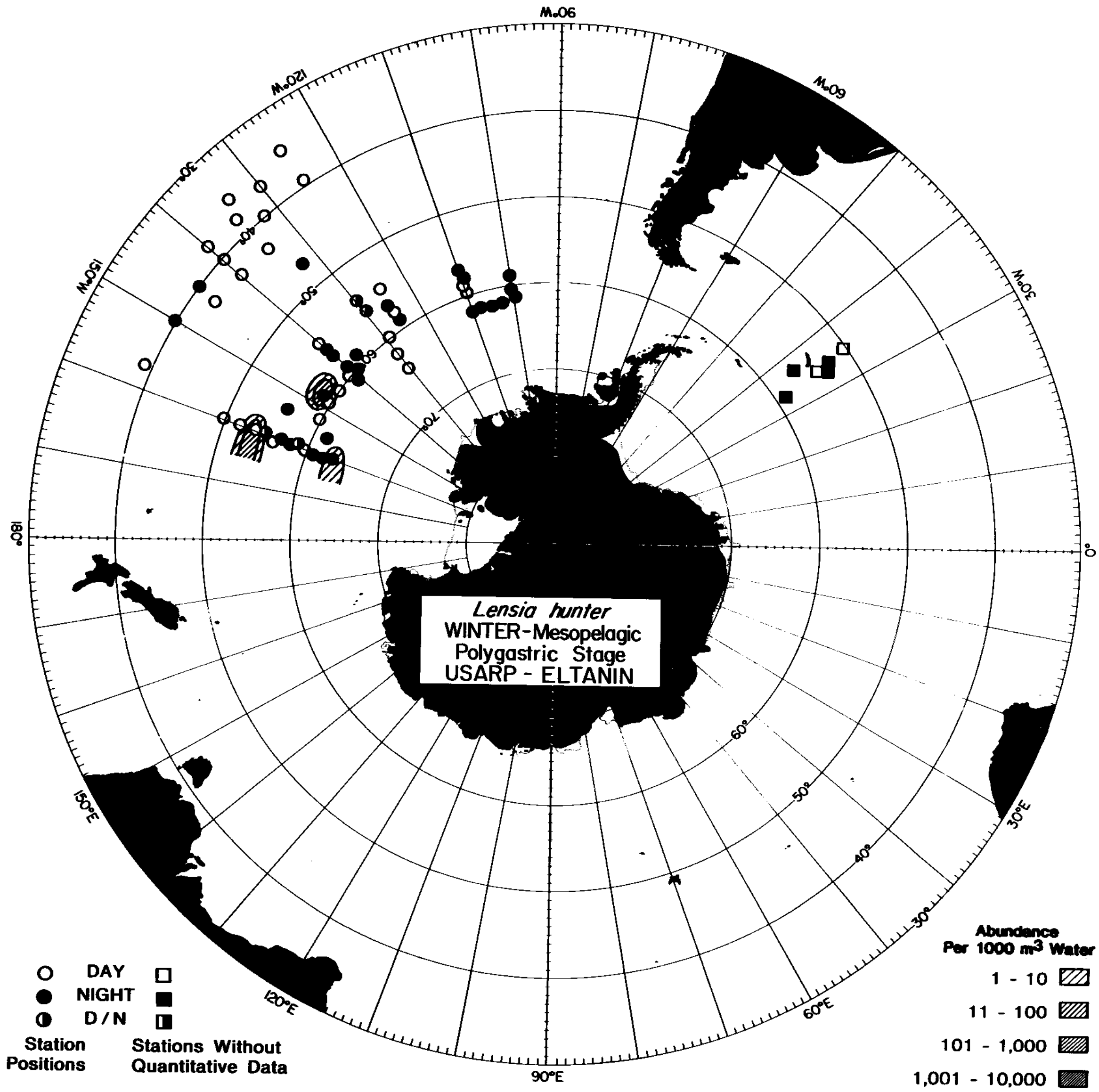
Map A168. The distribution of the polygastric stage of *Lensia hunter* during the fall in the mesopelagic zone.



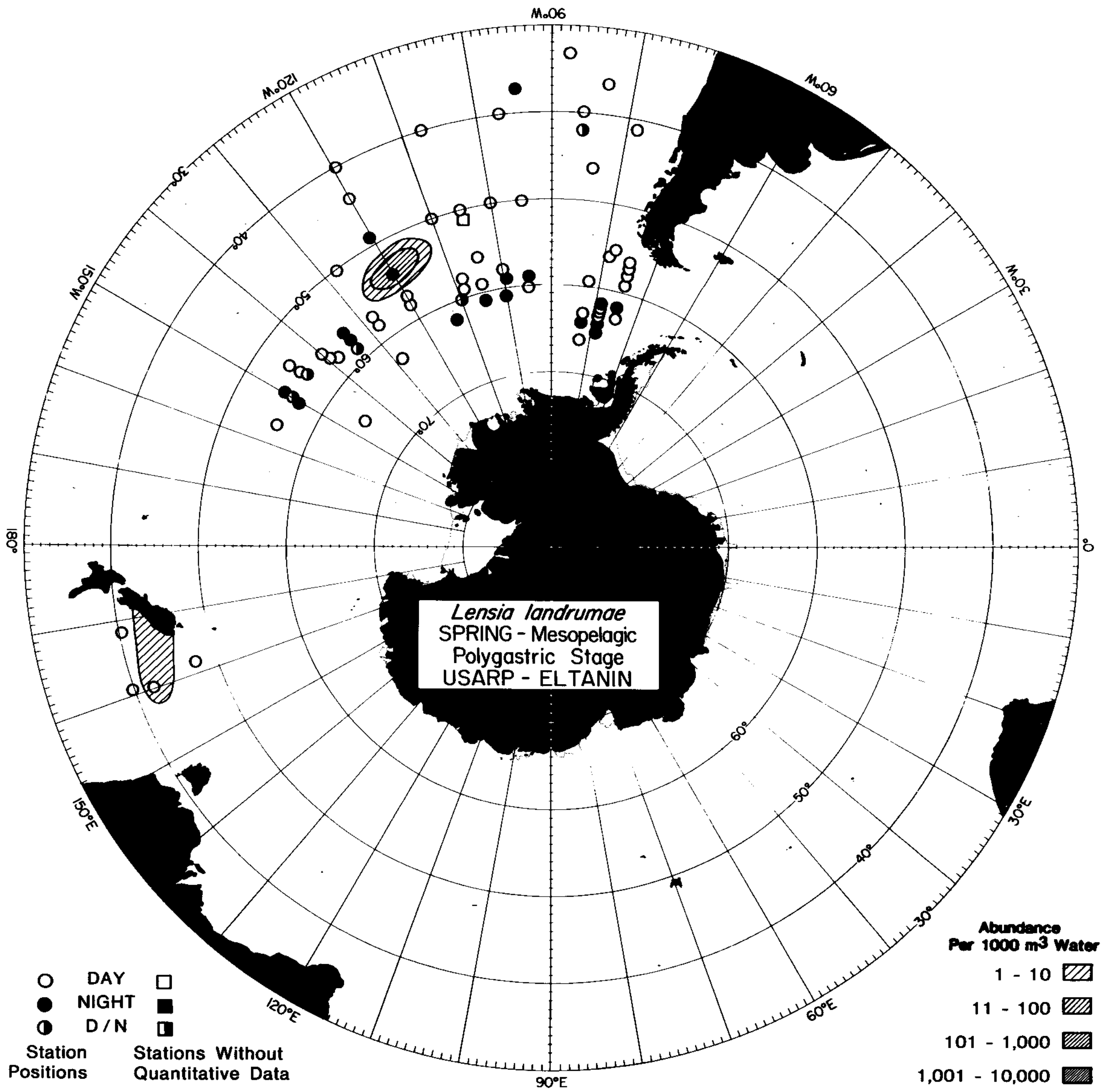
Map A169. The distribution of the polygastric stage of *Lensia hunter* during the fall in the bathypelagic zone.



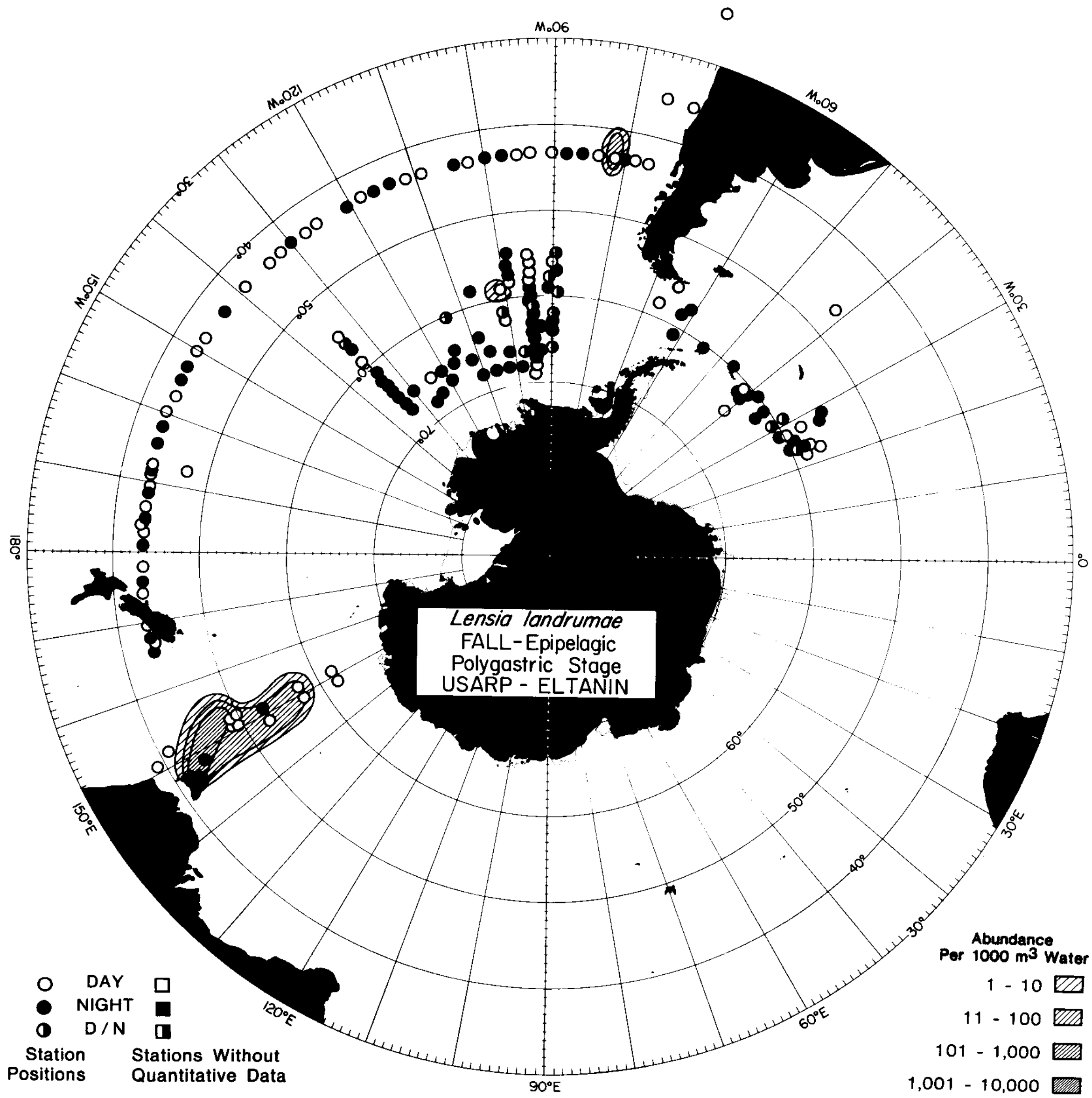
Map A170. The distribution of the polygastric stage of *Lensia hunter* during the winter in the epipelagic zone.



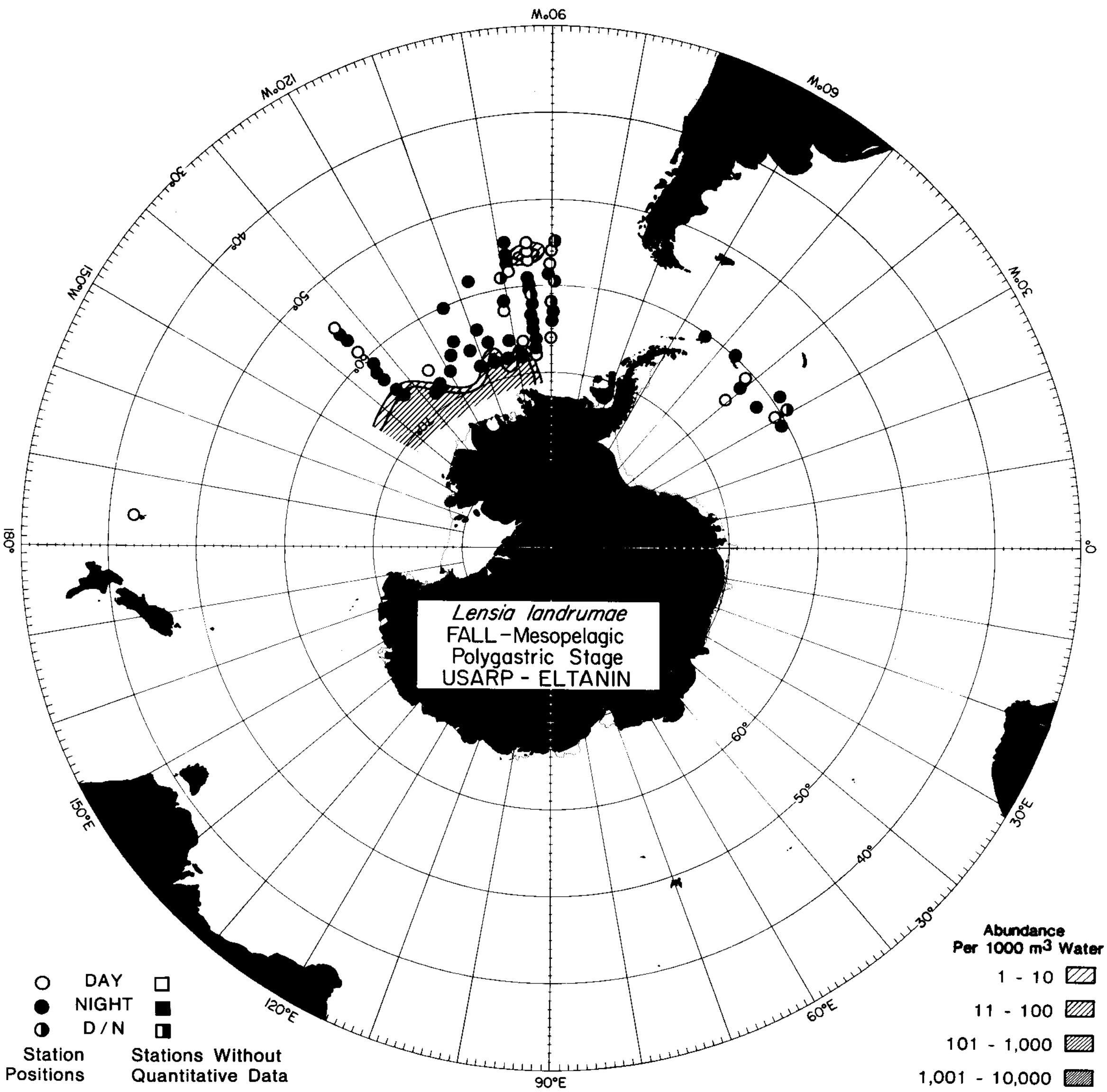
Map A171. The distribution of the polygastric stage of *Lensia hunter* during the winter in the mesopelagic zone.



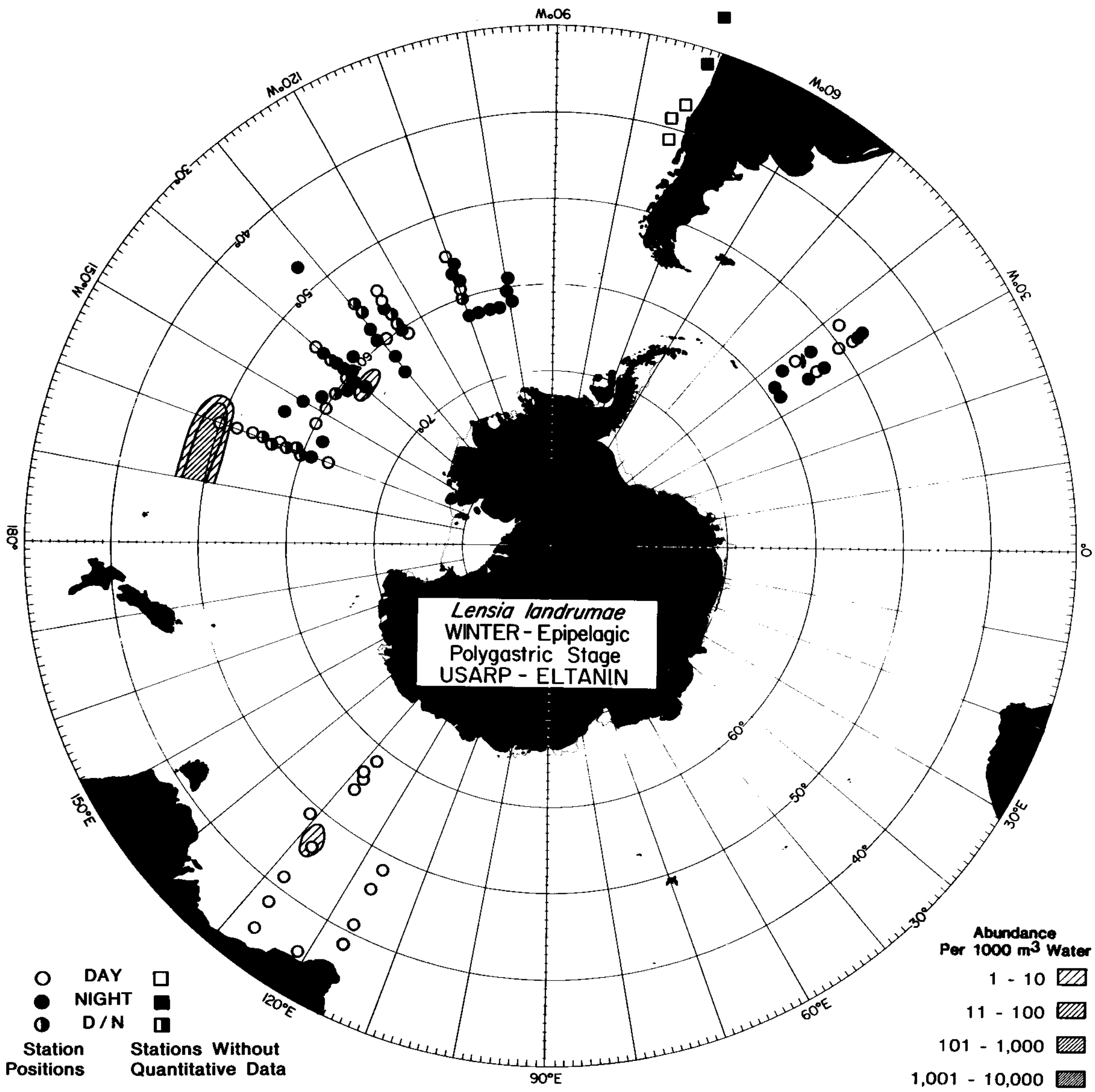
Map A172. The distribution of the polygastric stage of *Lensia landrumae* during the spring in the mesopelagic zone.



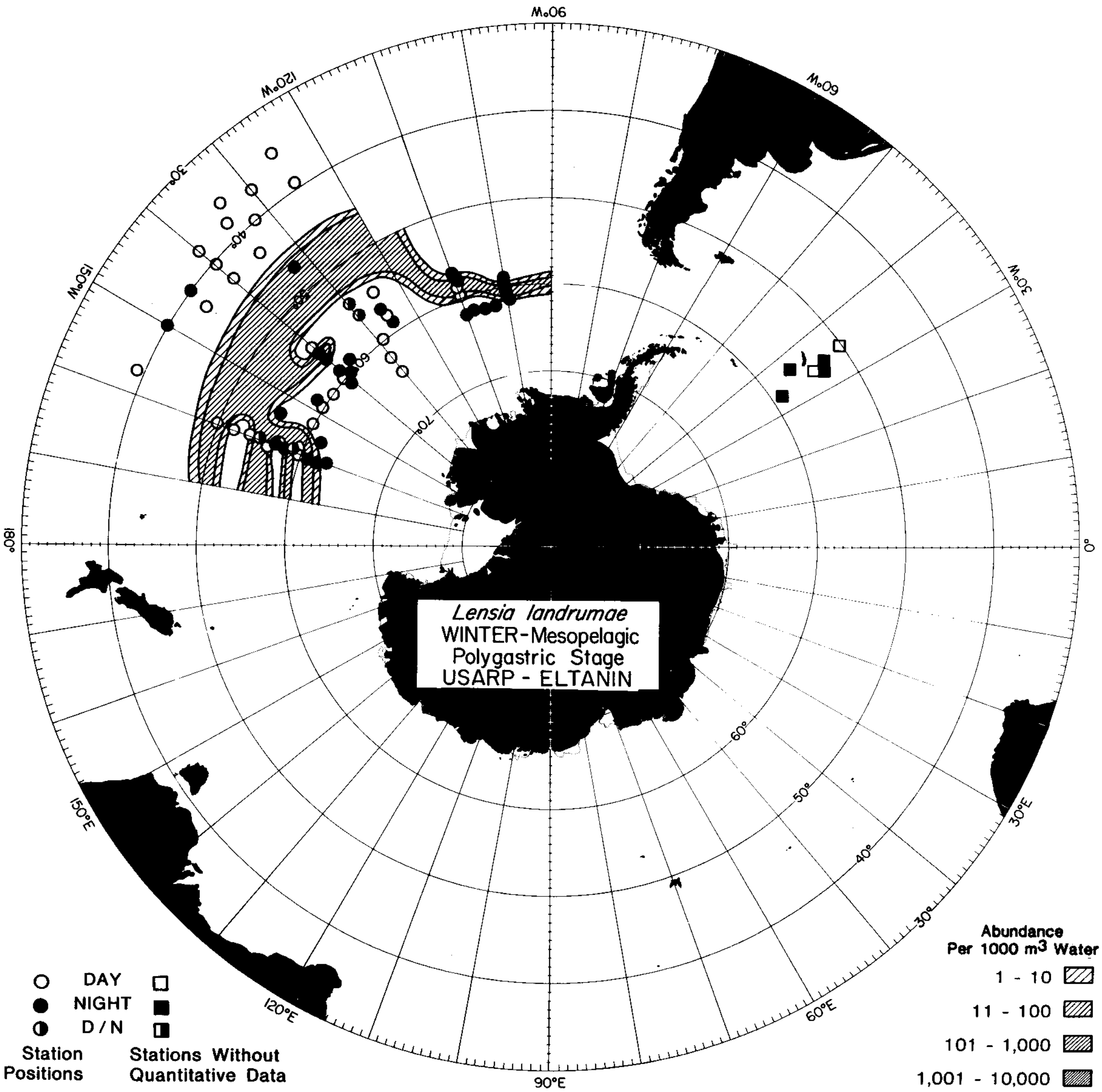
Map A173. The distribution of the polygastric stage of *Lensia landrumae* during the fall in the epipelagic zone.



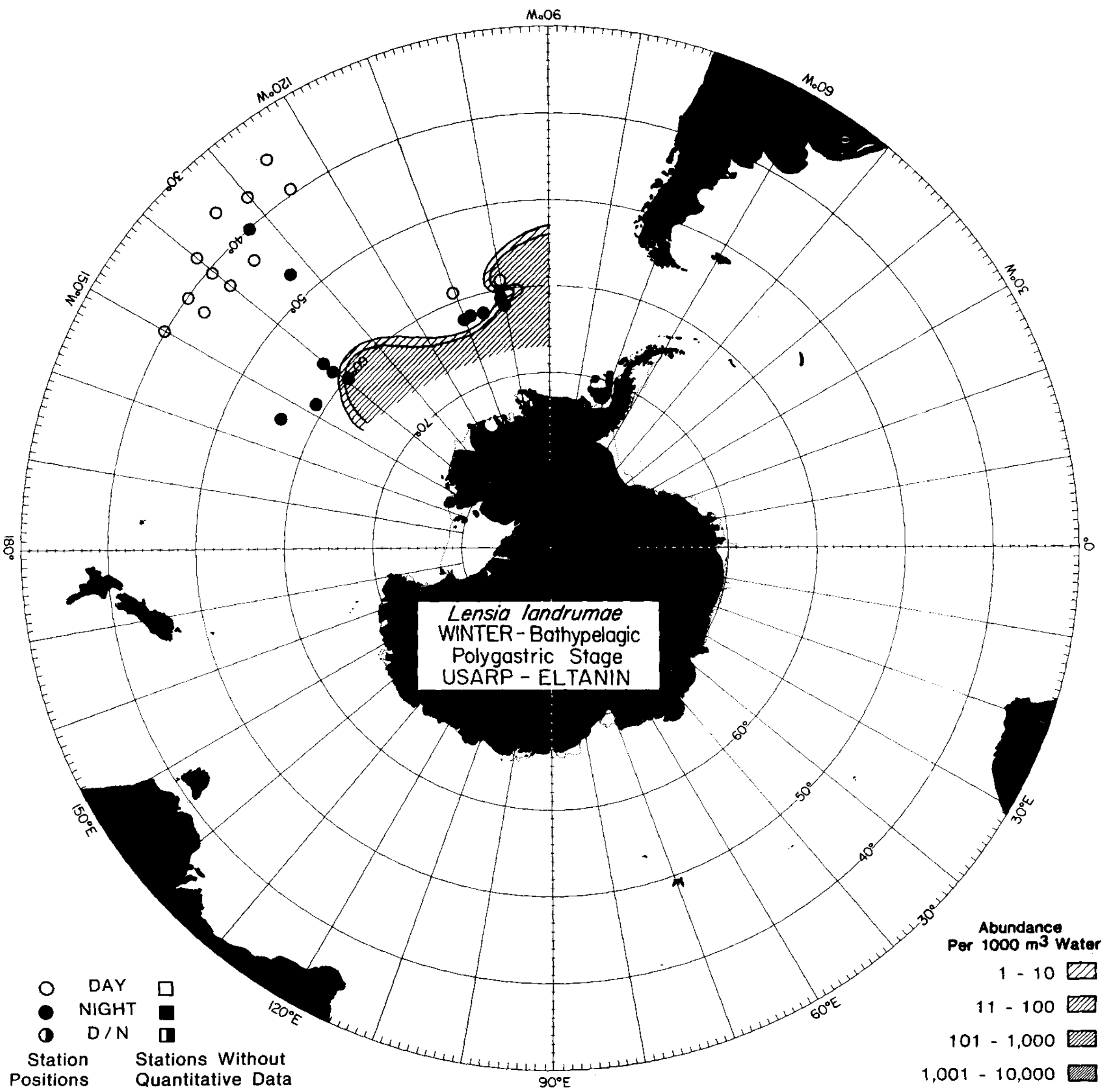
Map A174. The distribution of the polygastric stage of *Lensia landrumae* during the fall in the mesopelagic zone.



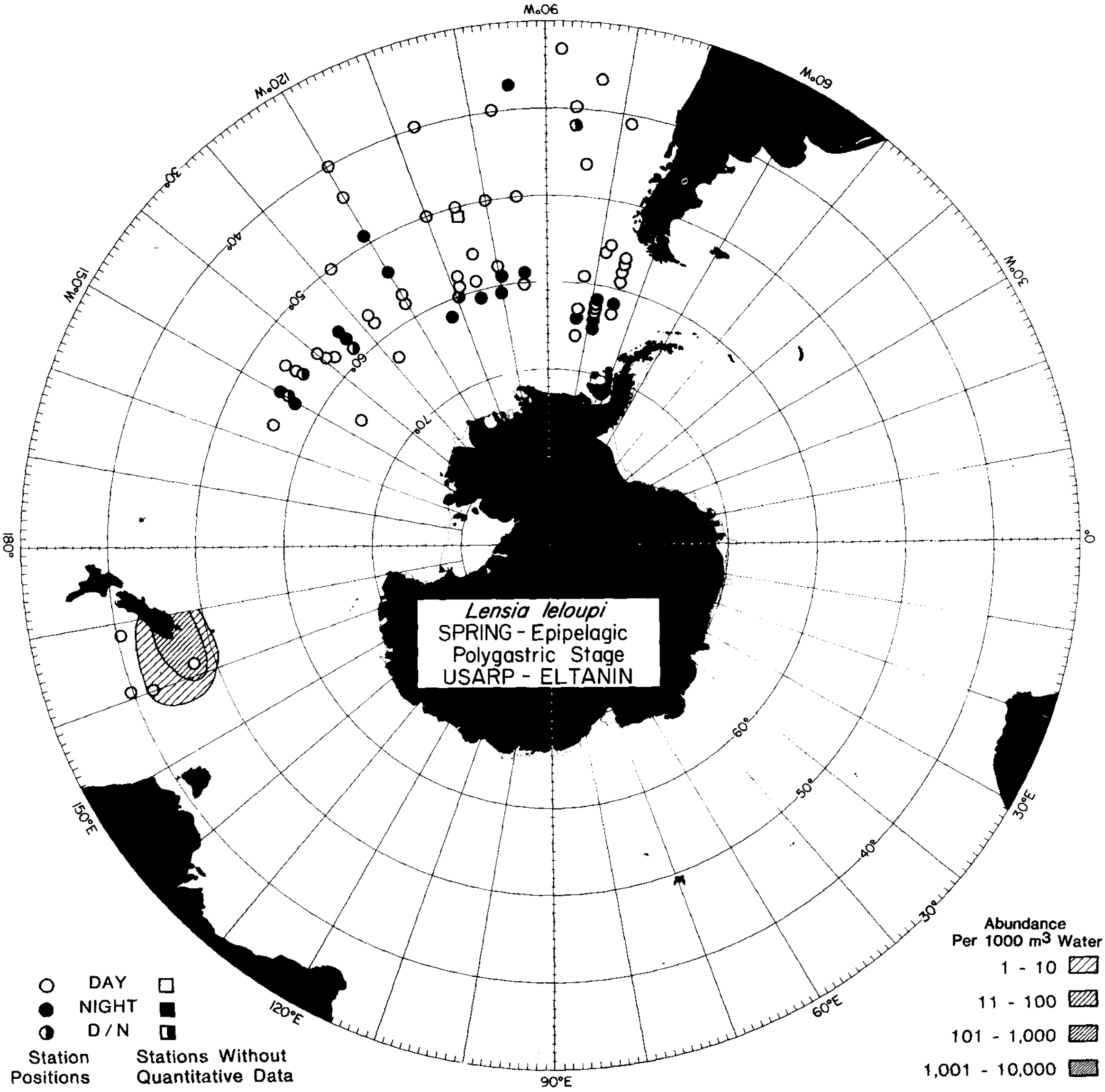
Map A175. The distribution of the polygastric stage of *Lensia landrumae* during the winter in the epipelagic zone.



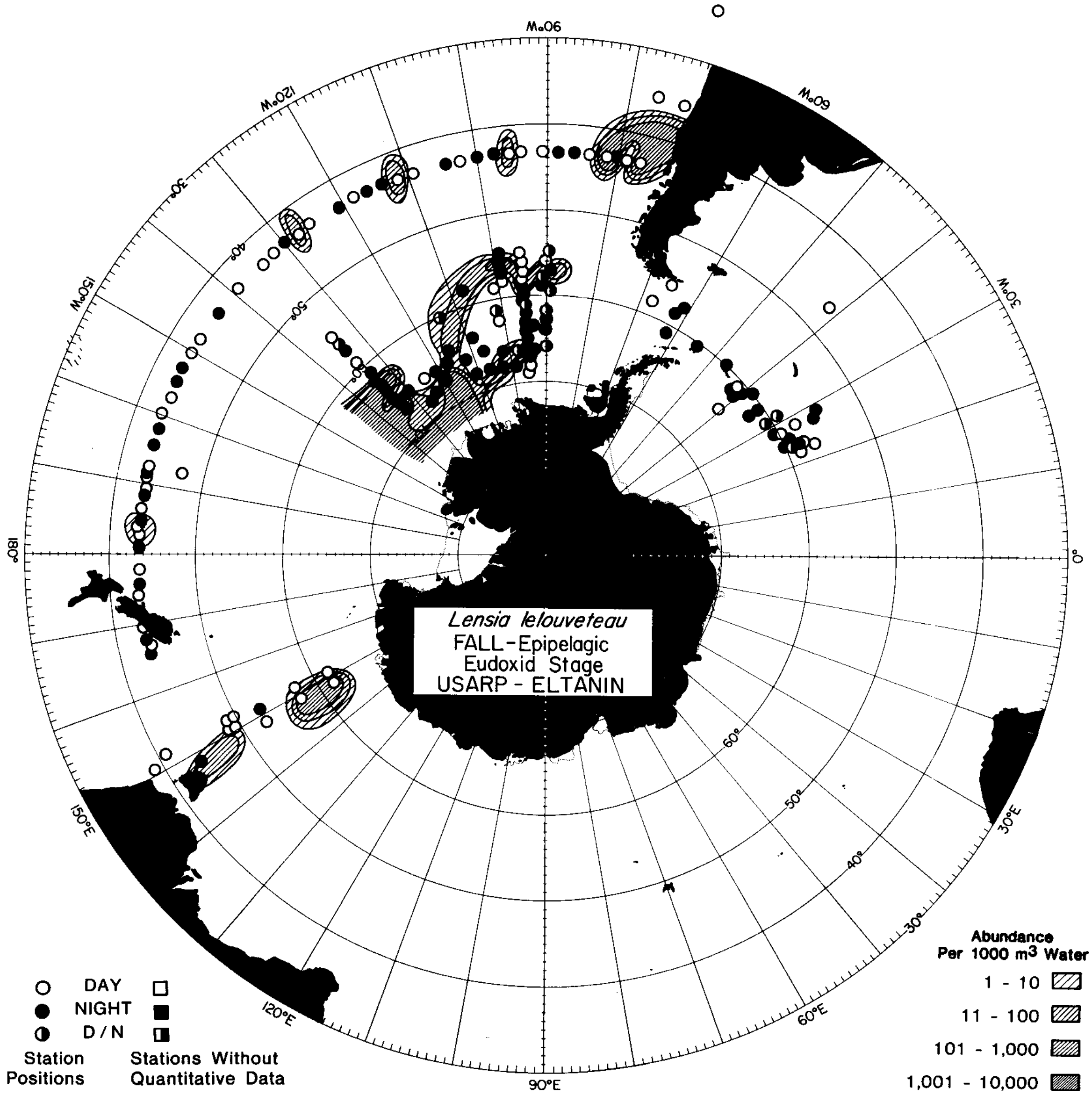
Map A176. The distribution of the polygastric stage of *Lensia landrumae* during the winter in the mesopelagic zone.



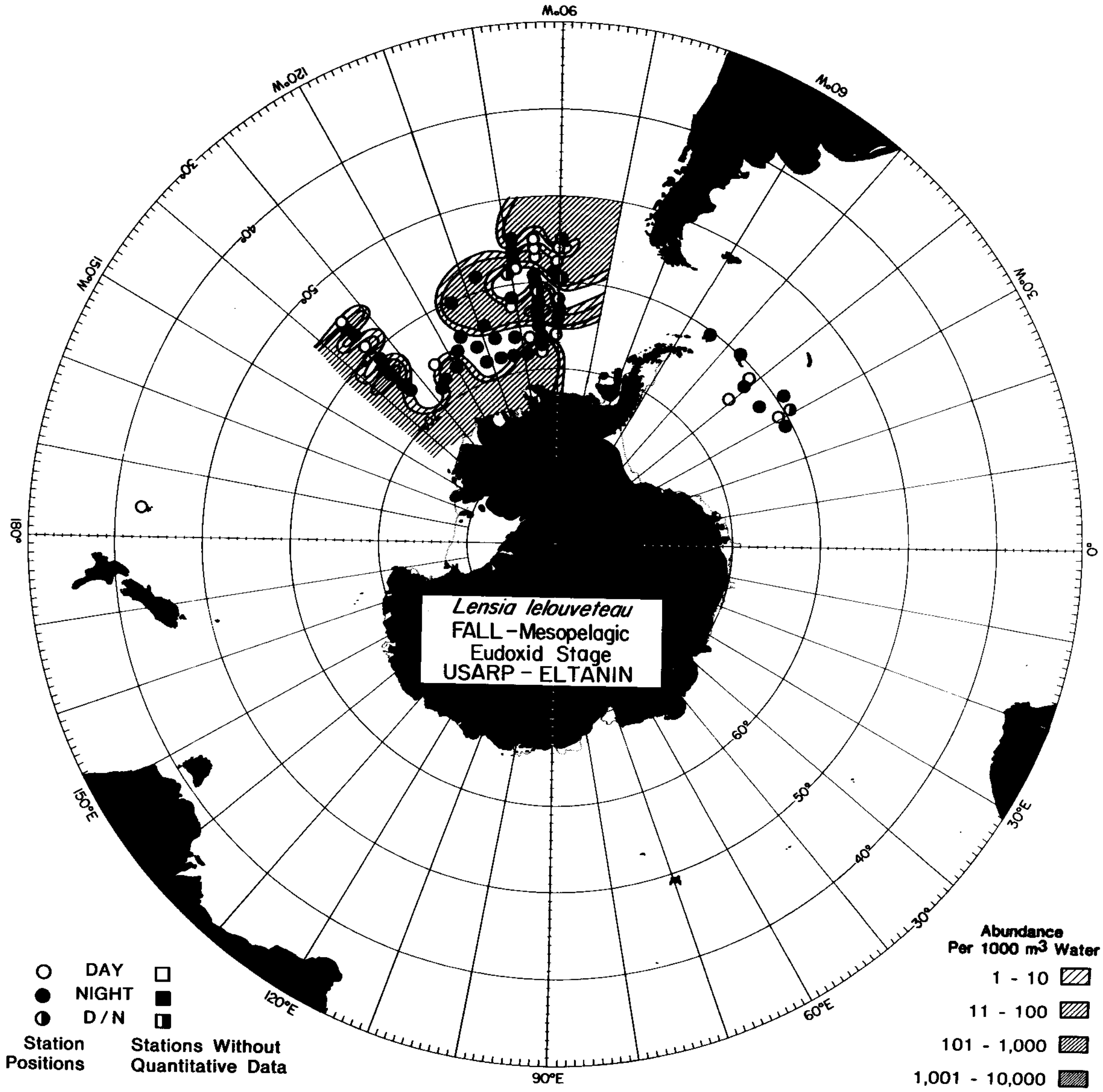
Map A177. The distribution of the polygastric stage of *Lensia landrumae* during the winter in the bathypelagic zone.



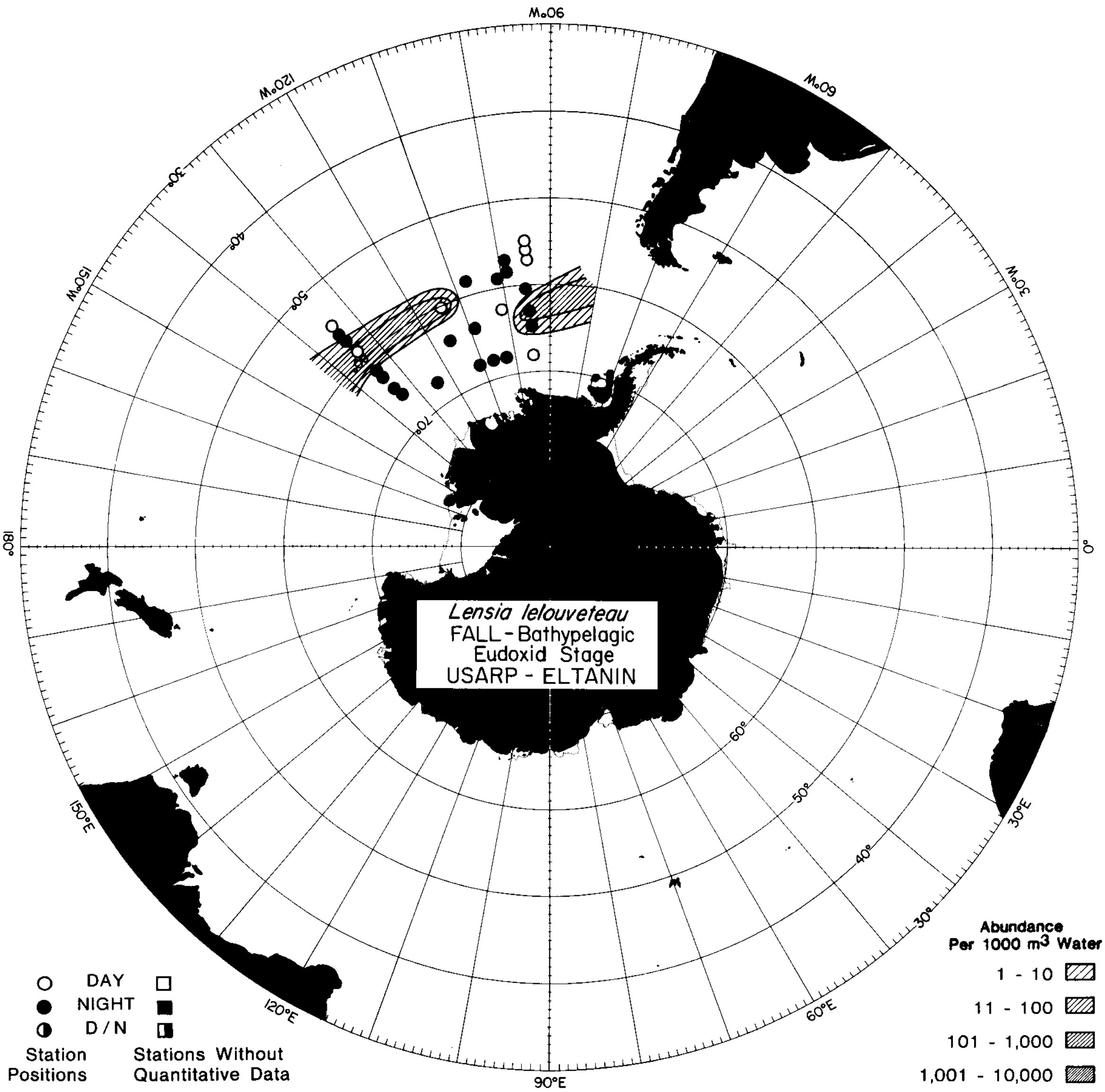
Map A178. The distribution of the polygastric stage of *Lensia leloupi* during the spring in the epipelagic zone.



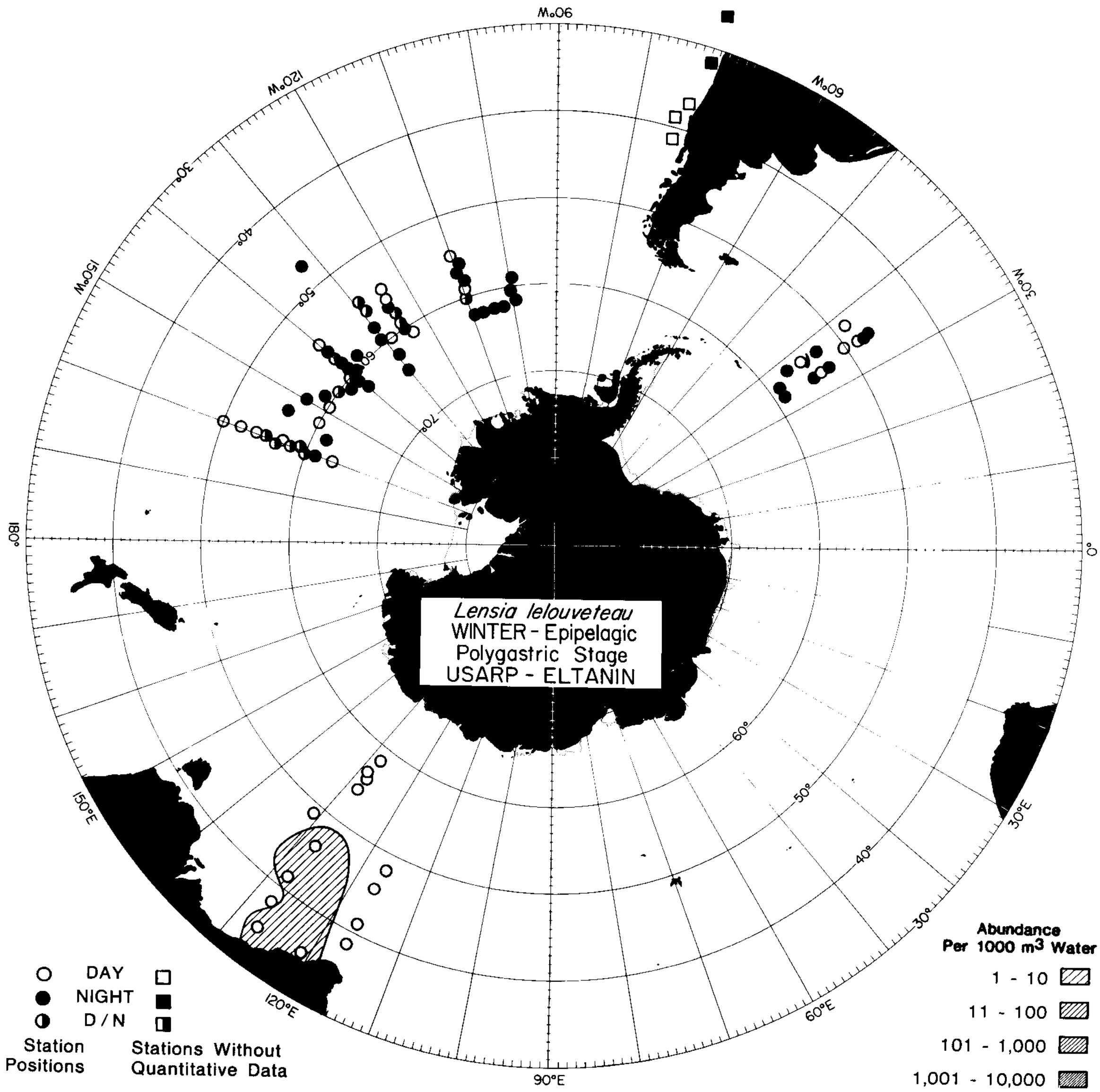
Map A179. The distribution of the eudoxid stage of *Lensia lelouveteau* during the fall in the epipelagic zone.



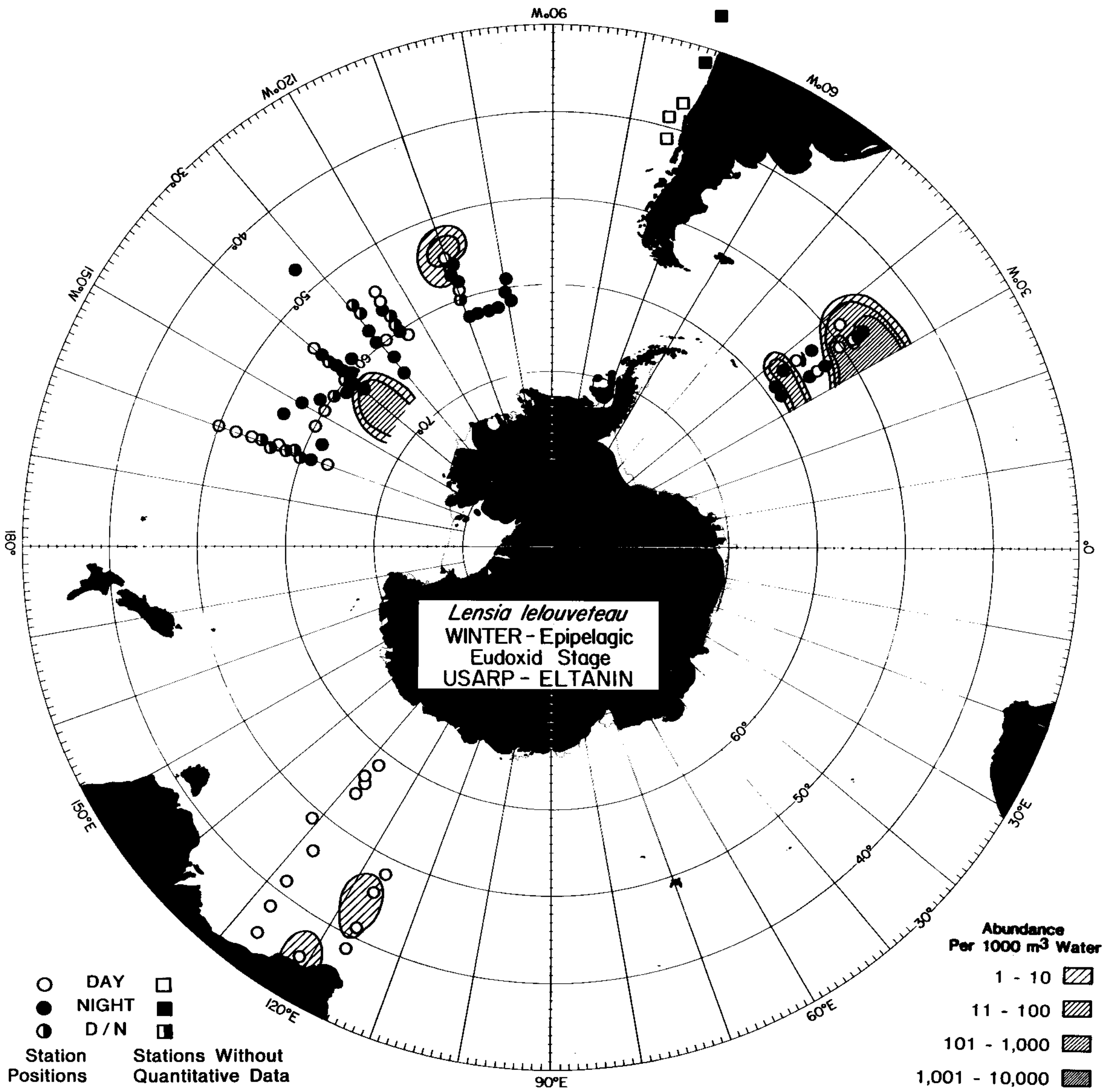
Map A180. The distribution of the eudoxid stage of *Lensia lelouveteau* during the fall in the mesopelagic zone.



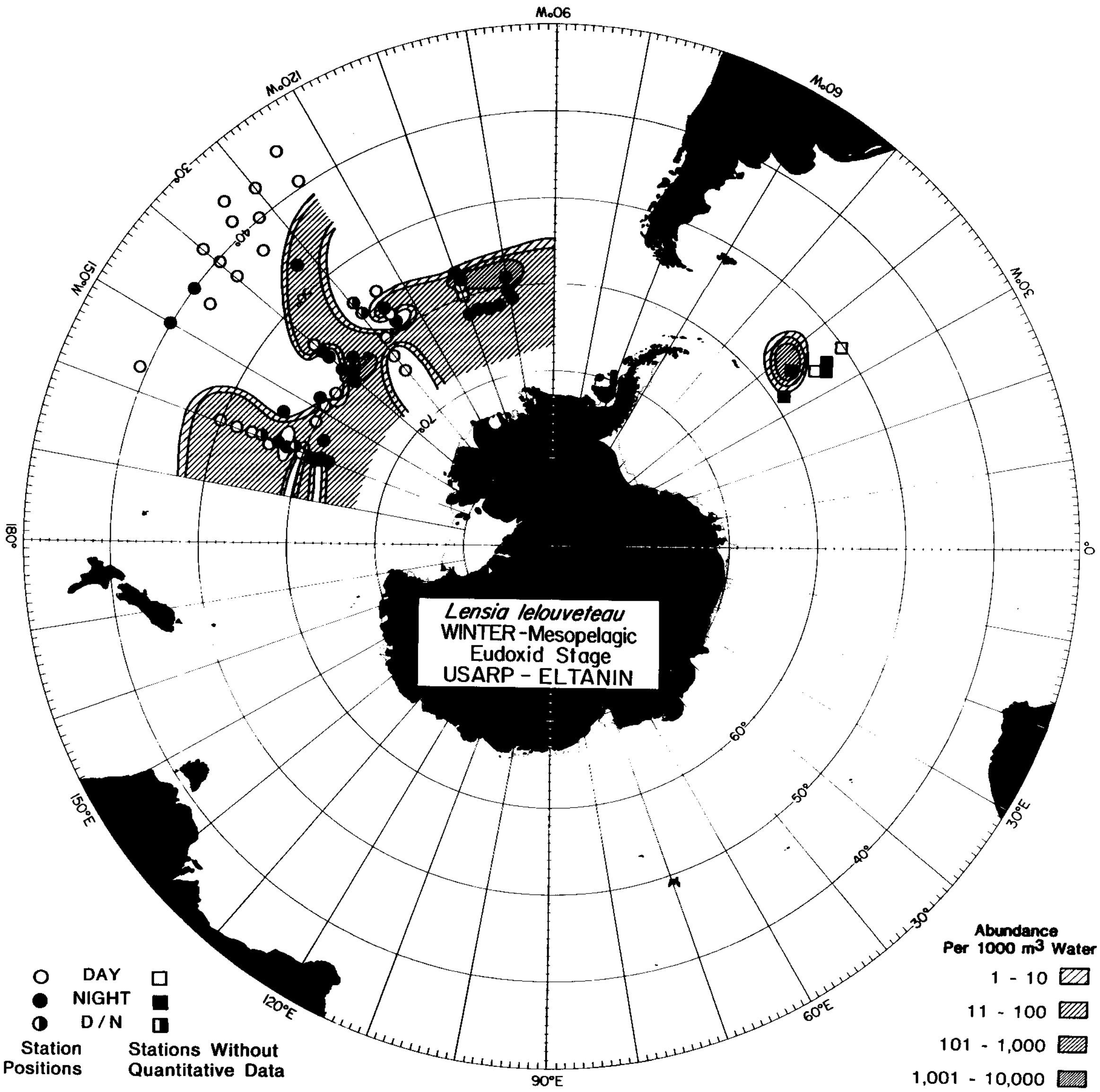
Map A181. The distribution of the eudoxid stage of *Lensia lelouveteau* during the fall in the bathypelagic zone.



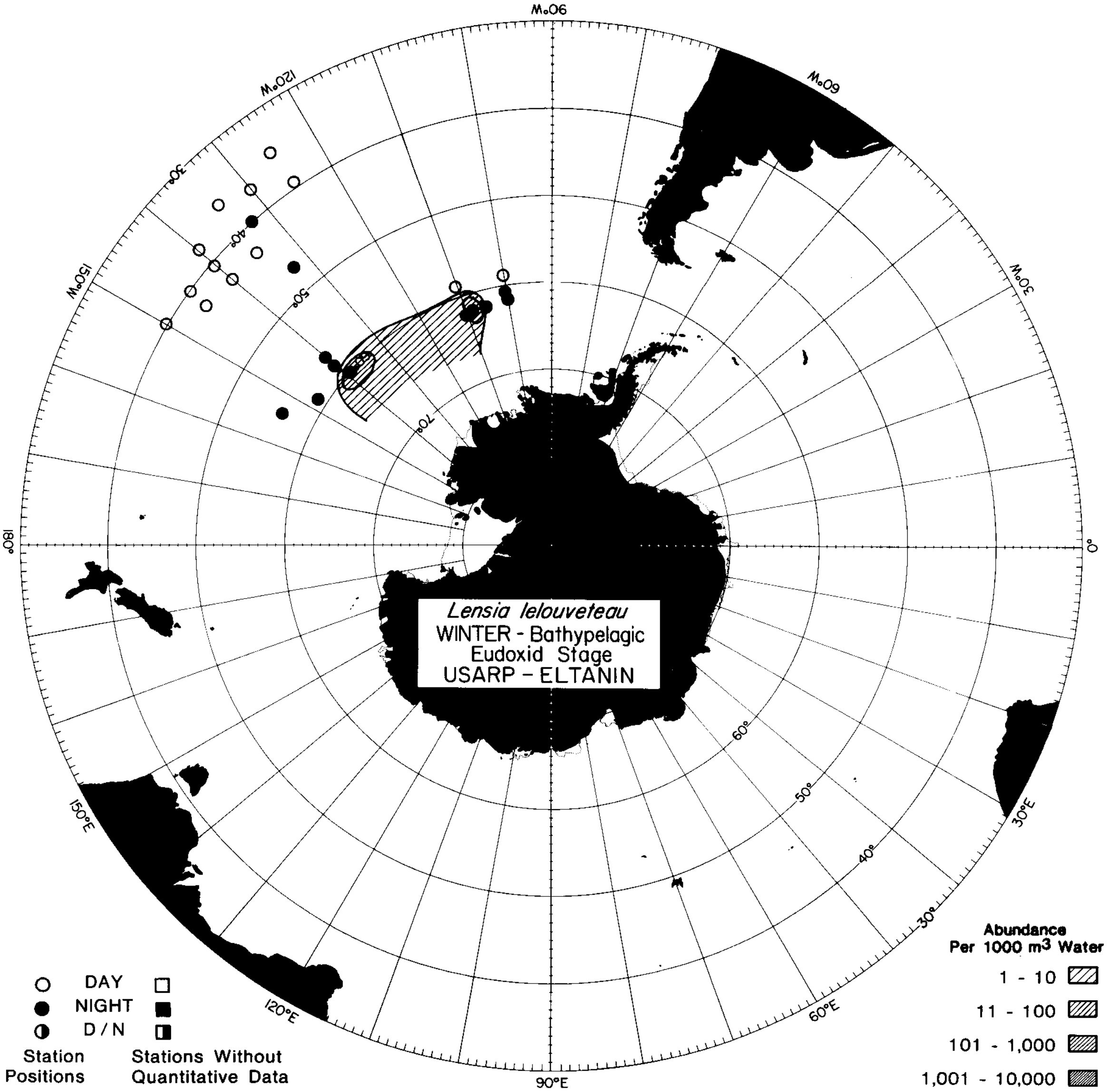
Map A182. The distribution of the polygastric stage of *Lensia lelouveteau* during the winter in the epipelagic zone.



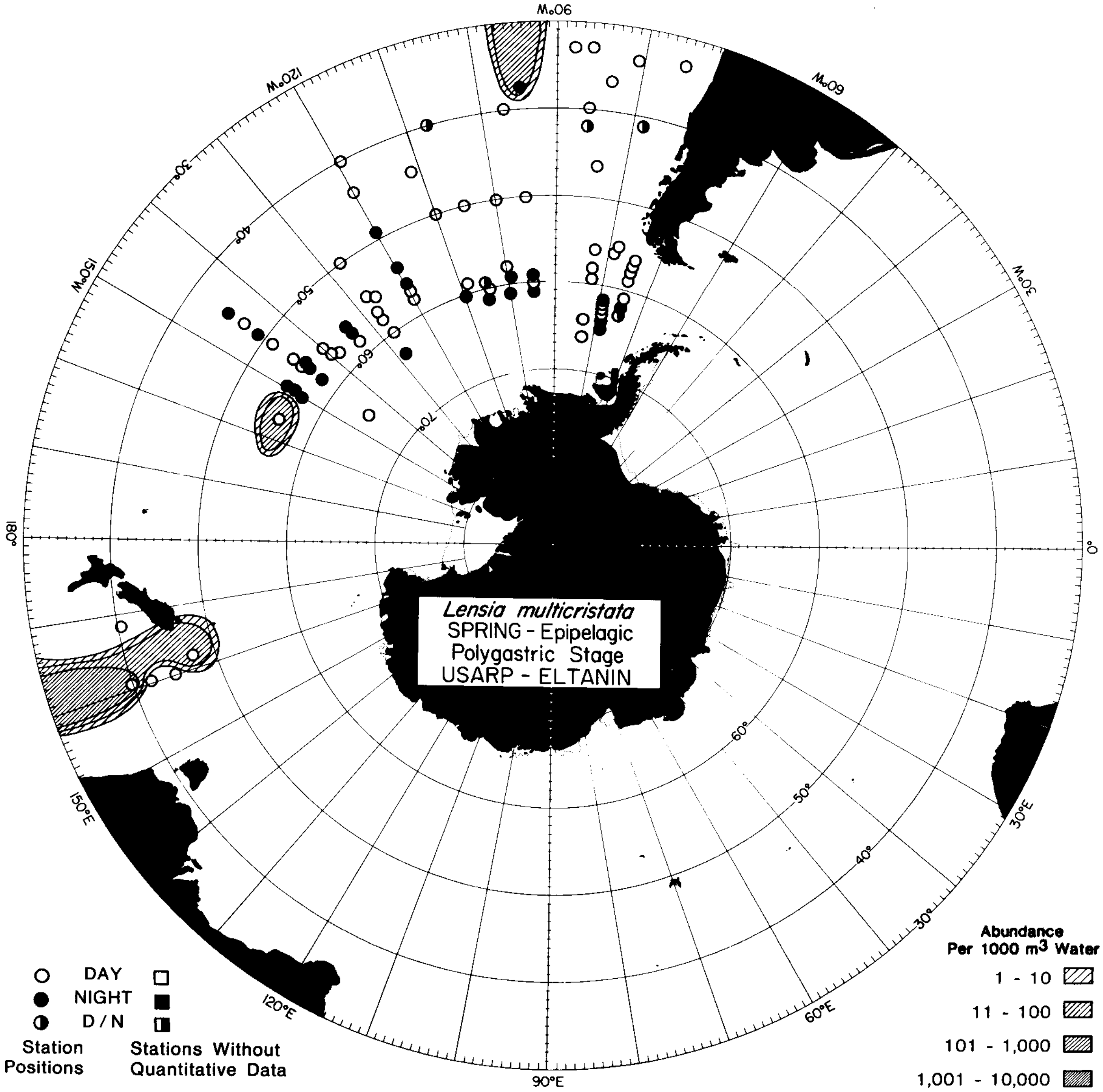
Map A183. The distribution of the eudoxid stage of *Lensia lelouveteau* during the winter in the epipelagic zone.



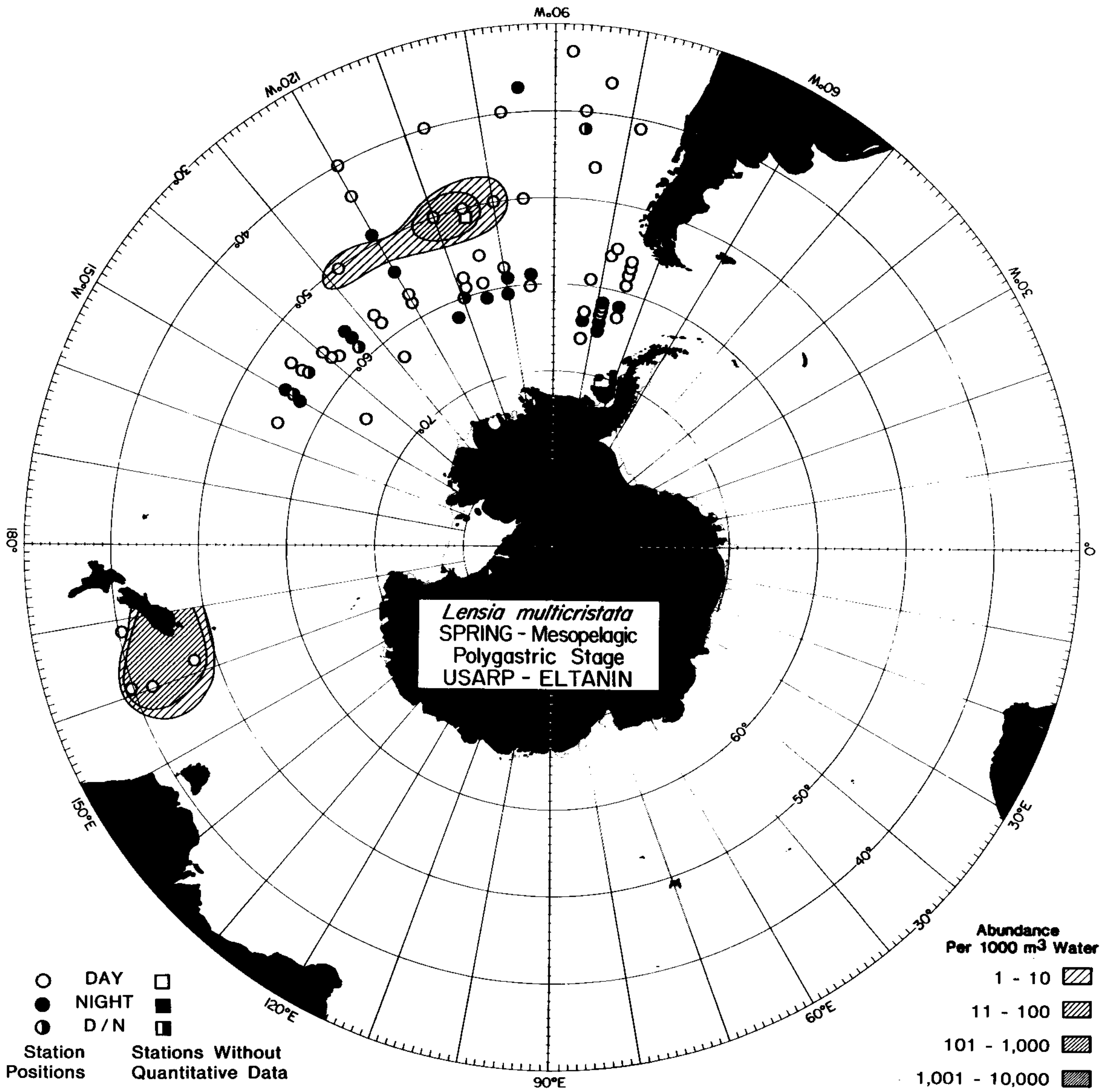
Map A184. The distribution of the eudoxid stage of *Lensia lelouveteau* during the winter in the mesopelagic zone.



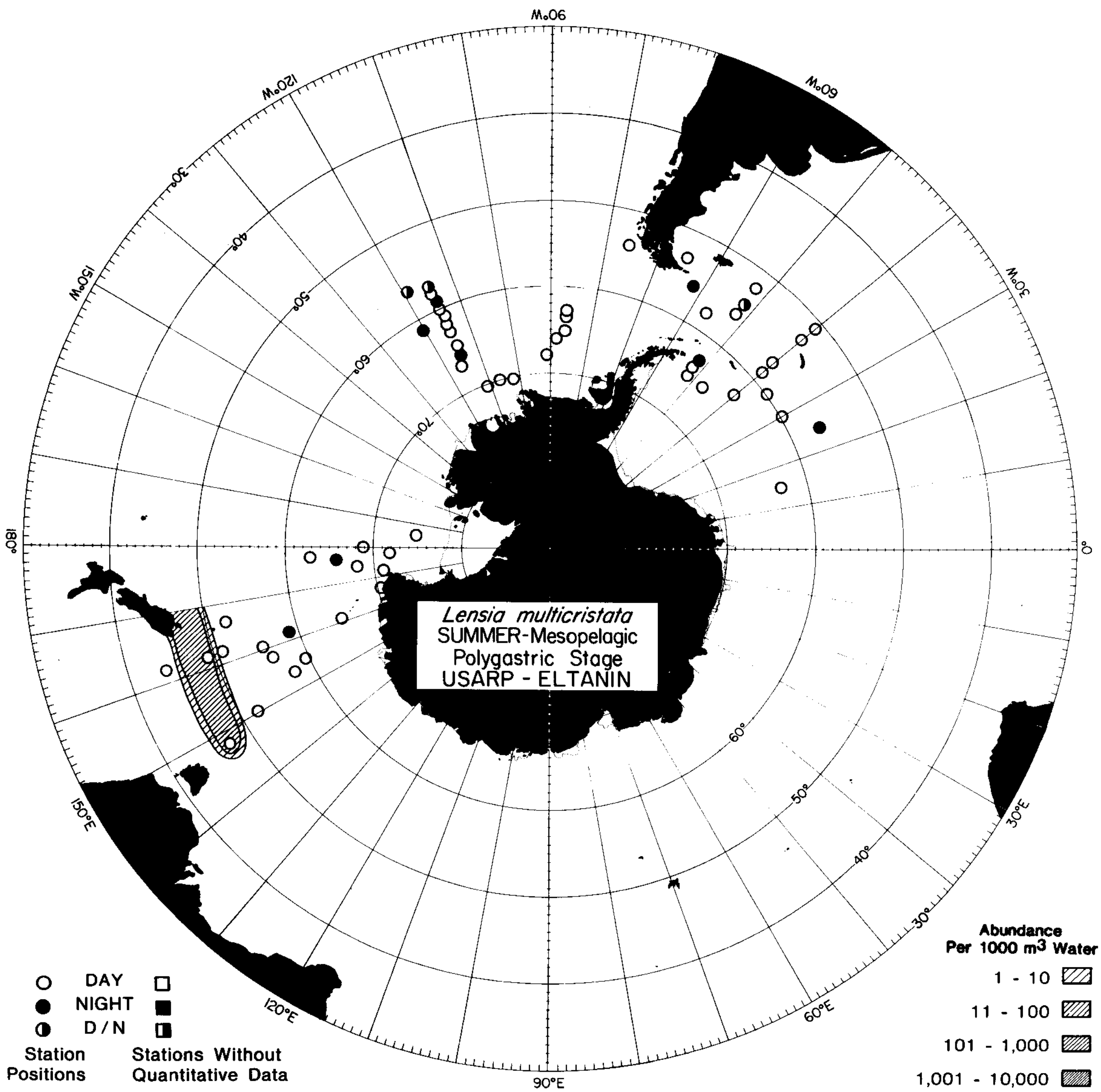
Map A185. The distribution of the eudoxid stage of *Lensia lelouveteau* during the winter in the bathypelagic zone.



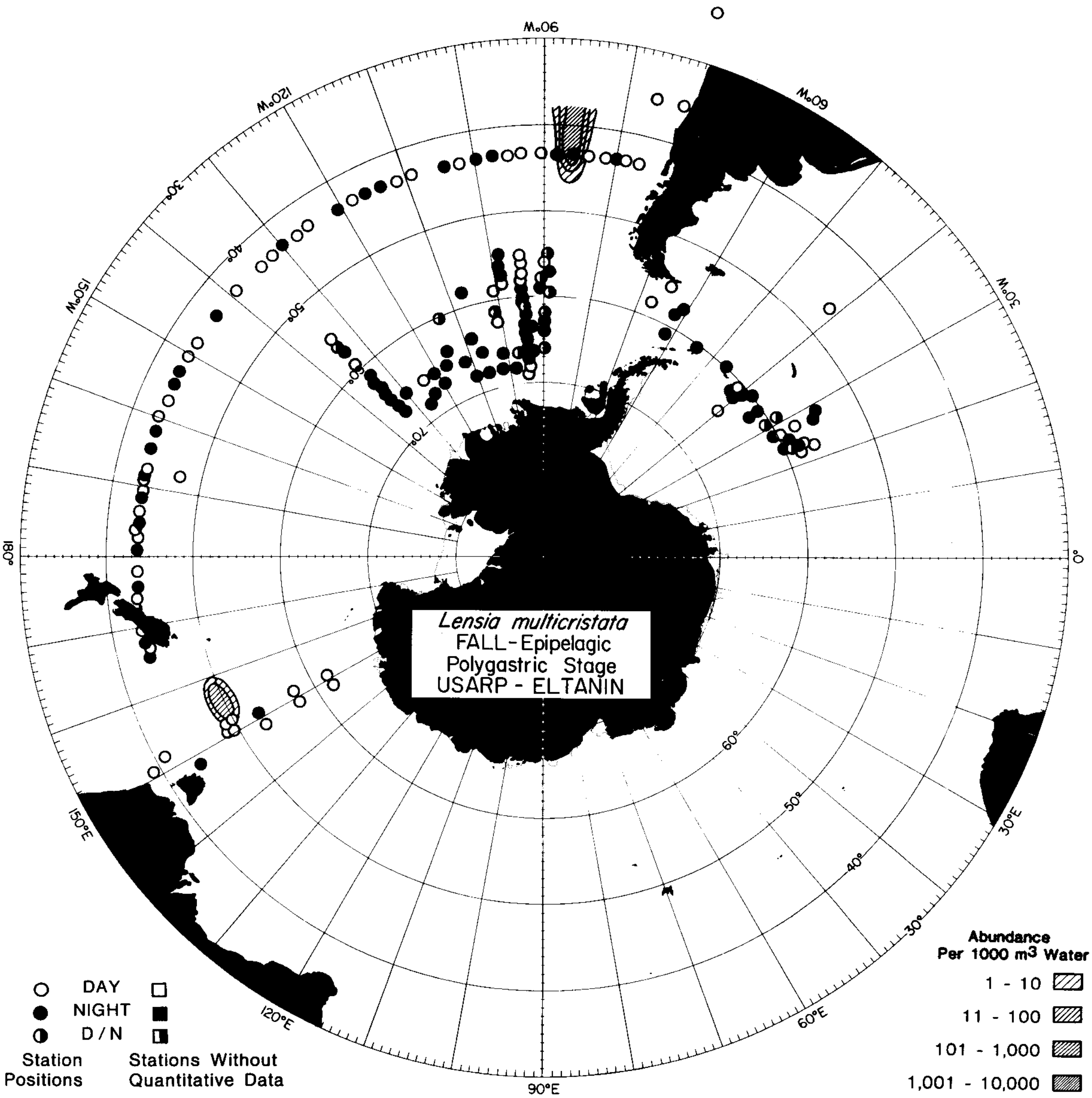
Map A186. The distribution of the polygastric stage of *Lensia multicristata* during the spring in the epipelagic zone.



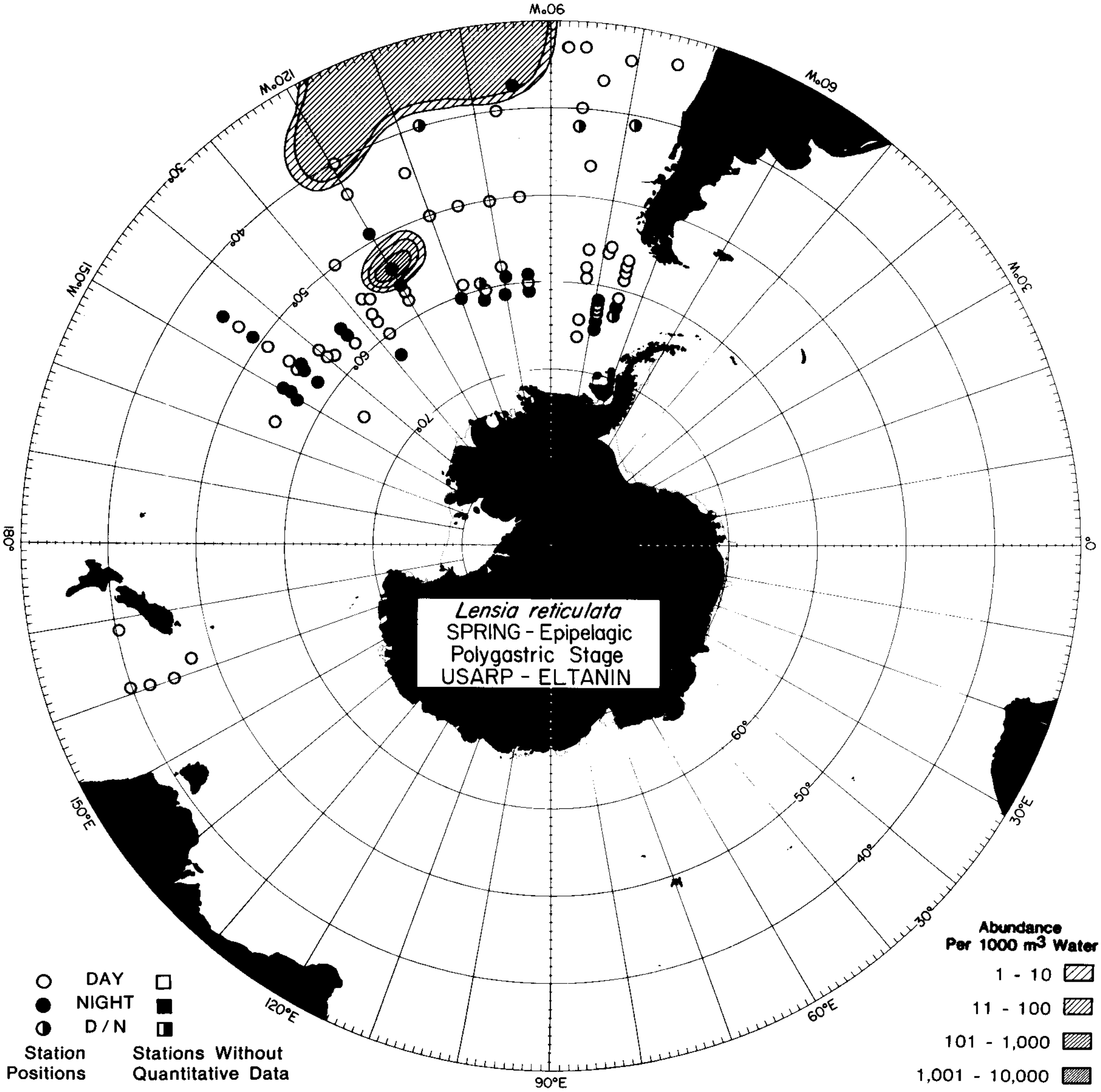
Map A187. The distribution of the polygastric stage of *Lensia multicristata* during the spring in the mesopelagic zone.



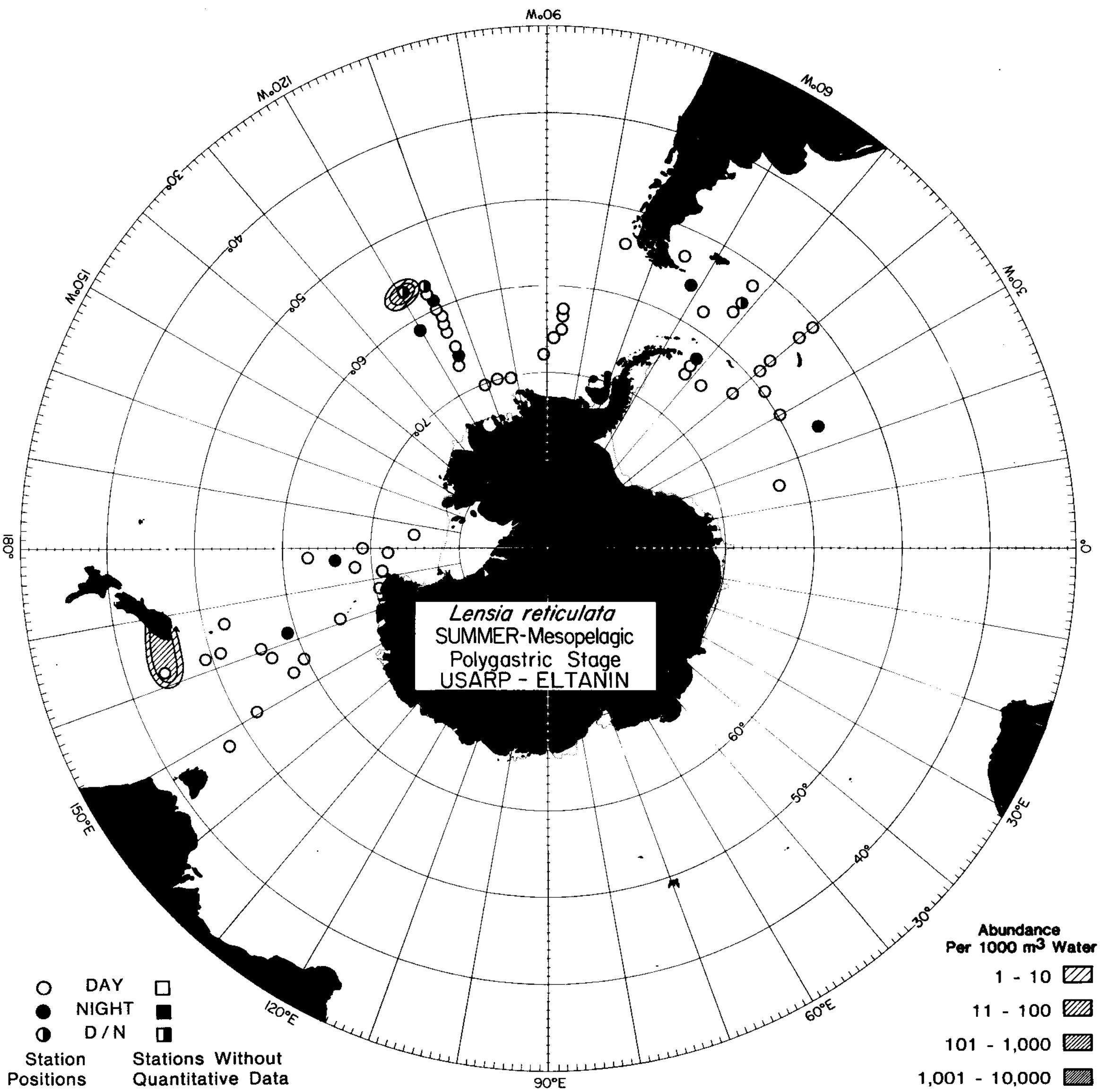
Map A188. The distribution of the polygastric stage of *Lensia multicristata* during the summer in the mesopelagic zone.



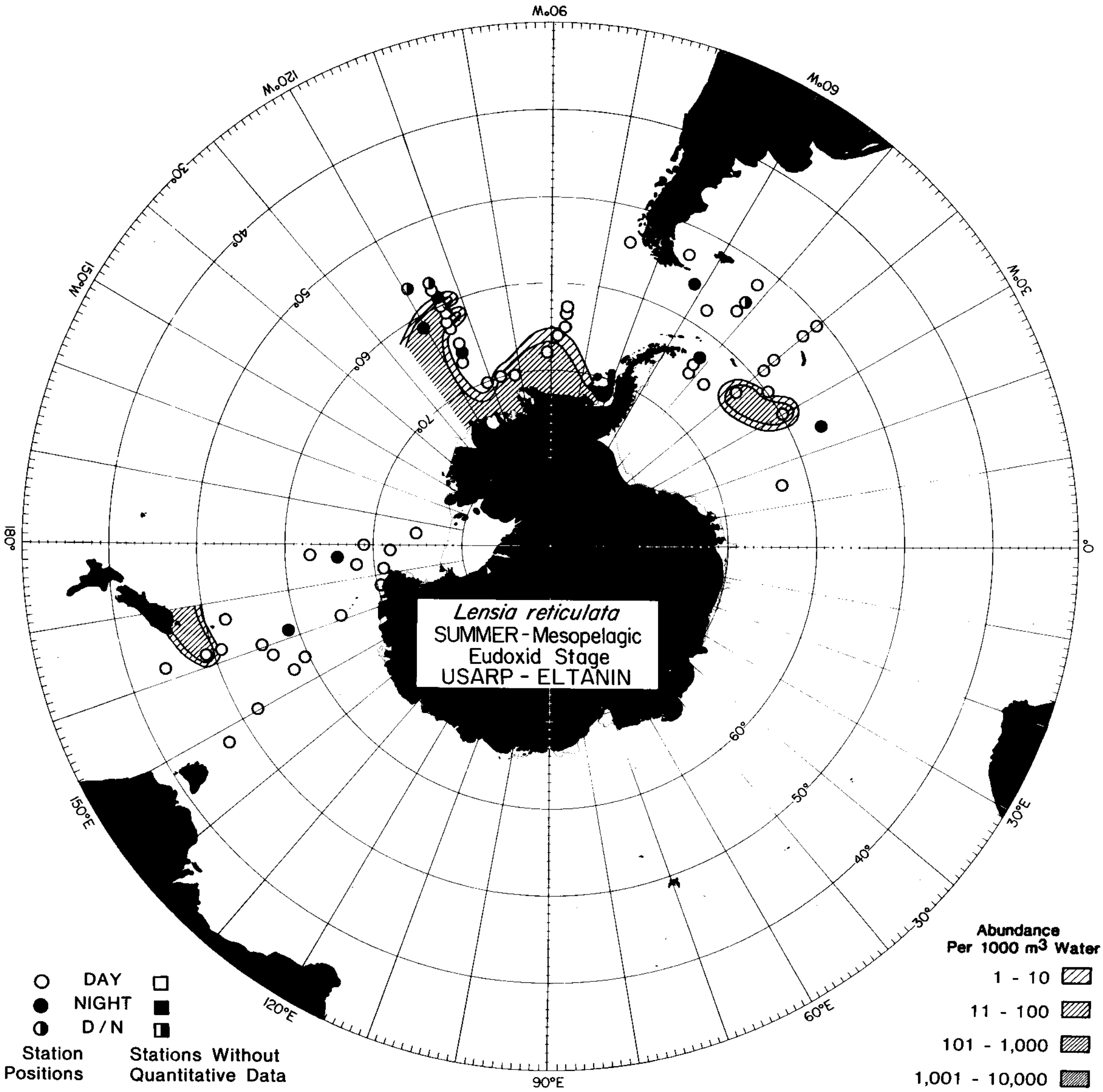
Map A189. The distribution of the polygastric stage of *Lensia multicristata* during the fall in the epipelagic zone.



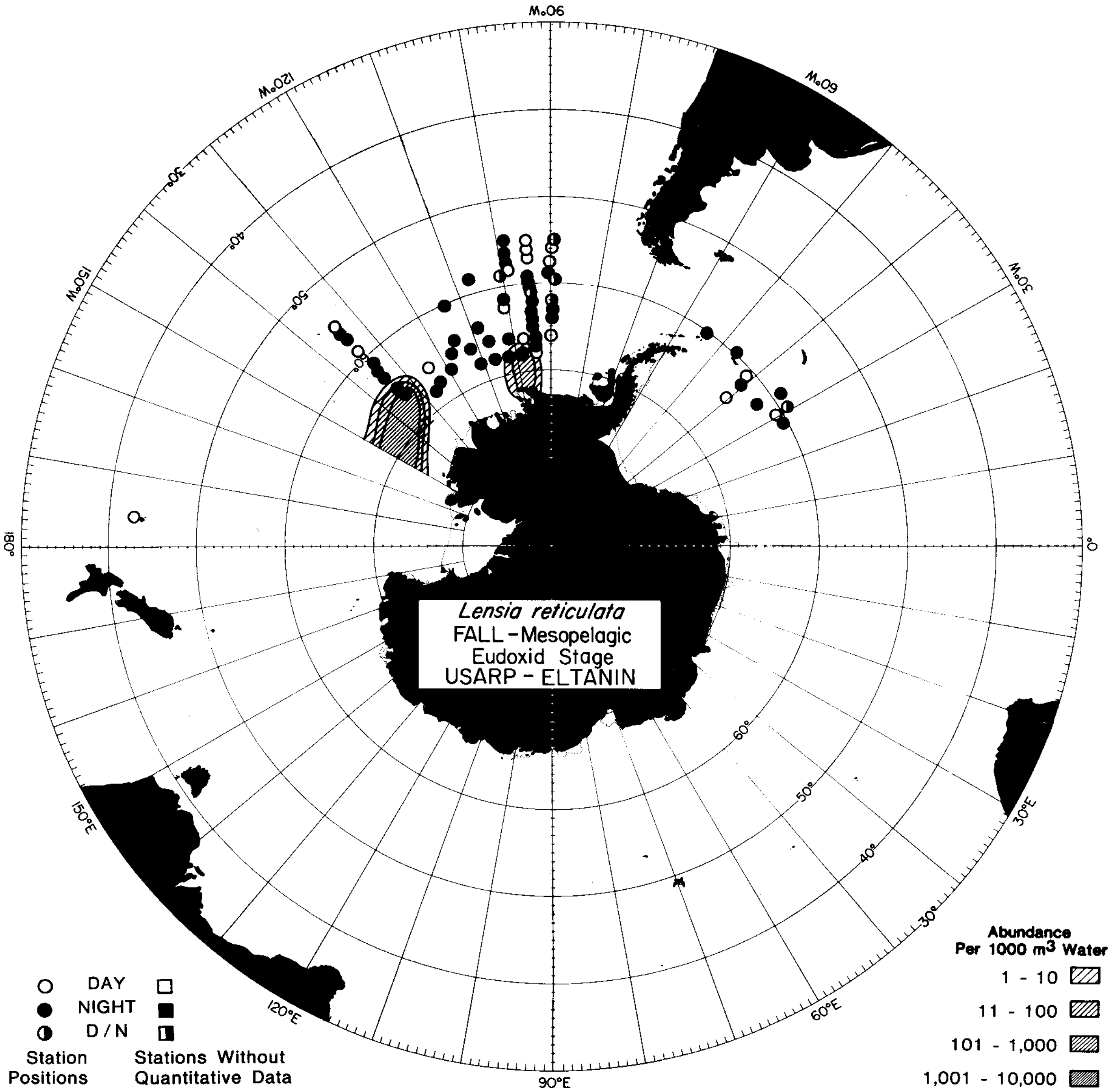
Map A190. The distribution of the polygastric stage of *Lensia reticulata* during the spring in the epipelagic zone.



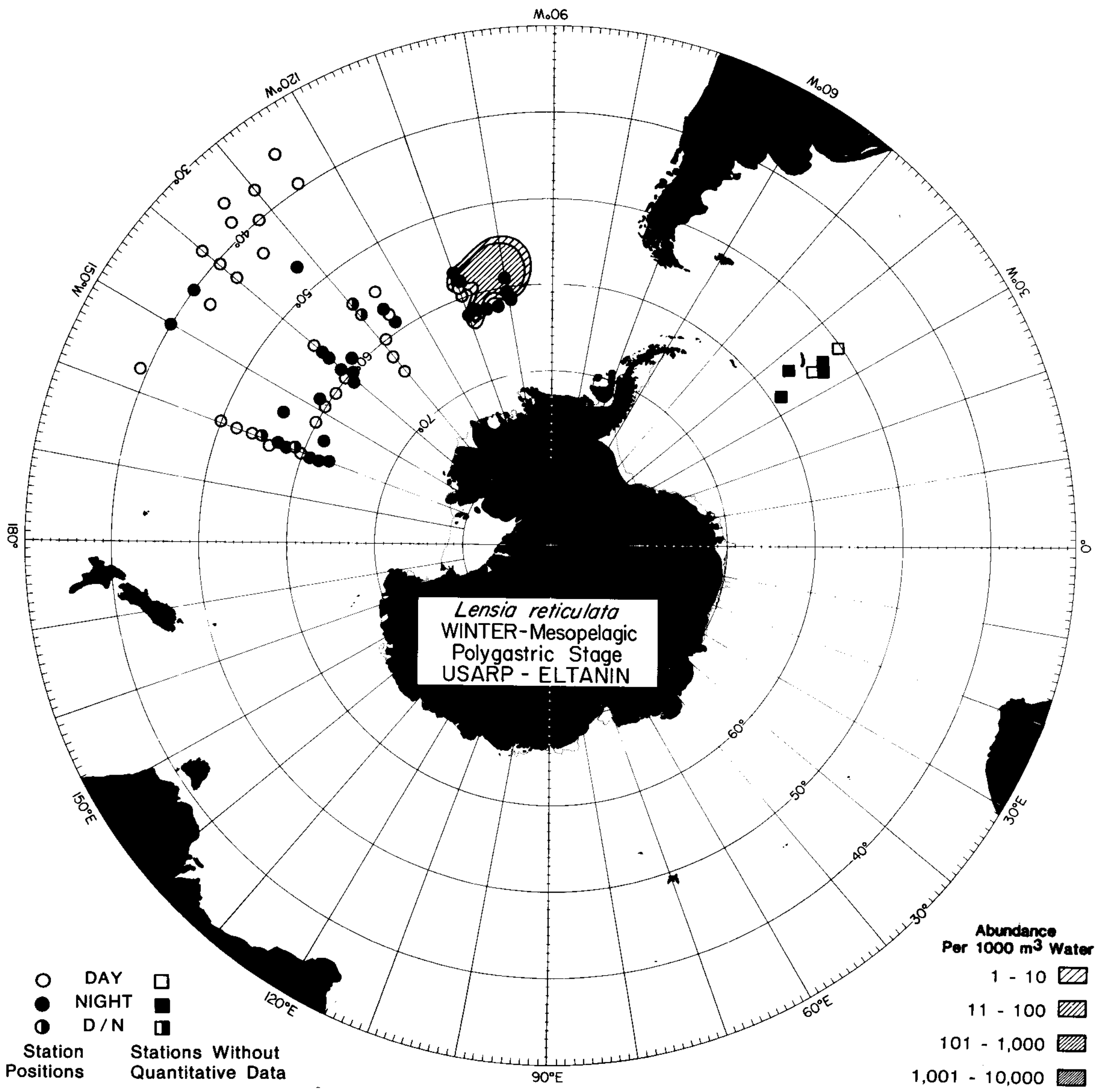
Map A191. The distribution of the polygastric stage of *Lensia reticulata* during the summer in the mesopelagic zone.



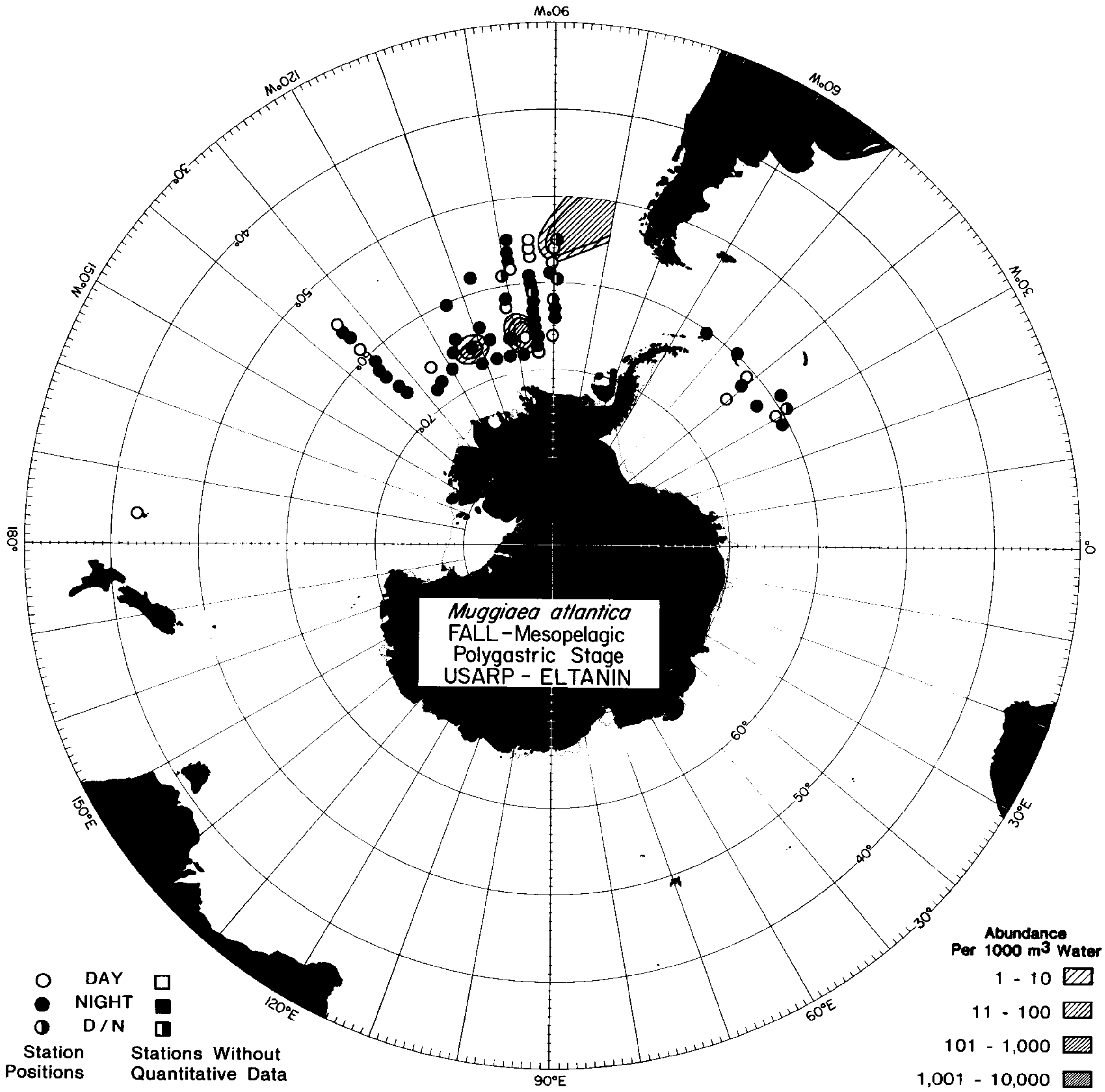
Map A192. The distribution of the eudoxid stage of *Lensia reticulata* during the summer in the mesopelagic zone.



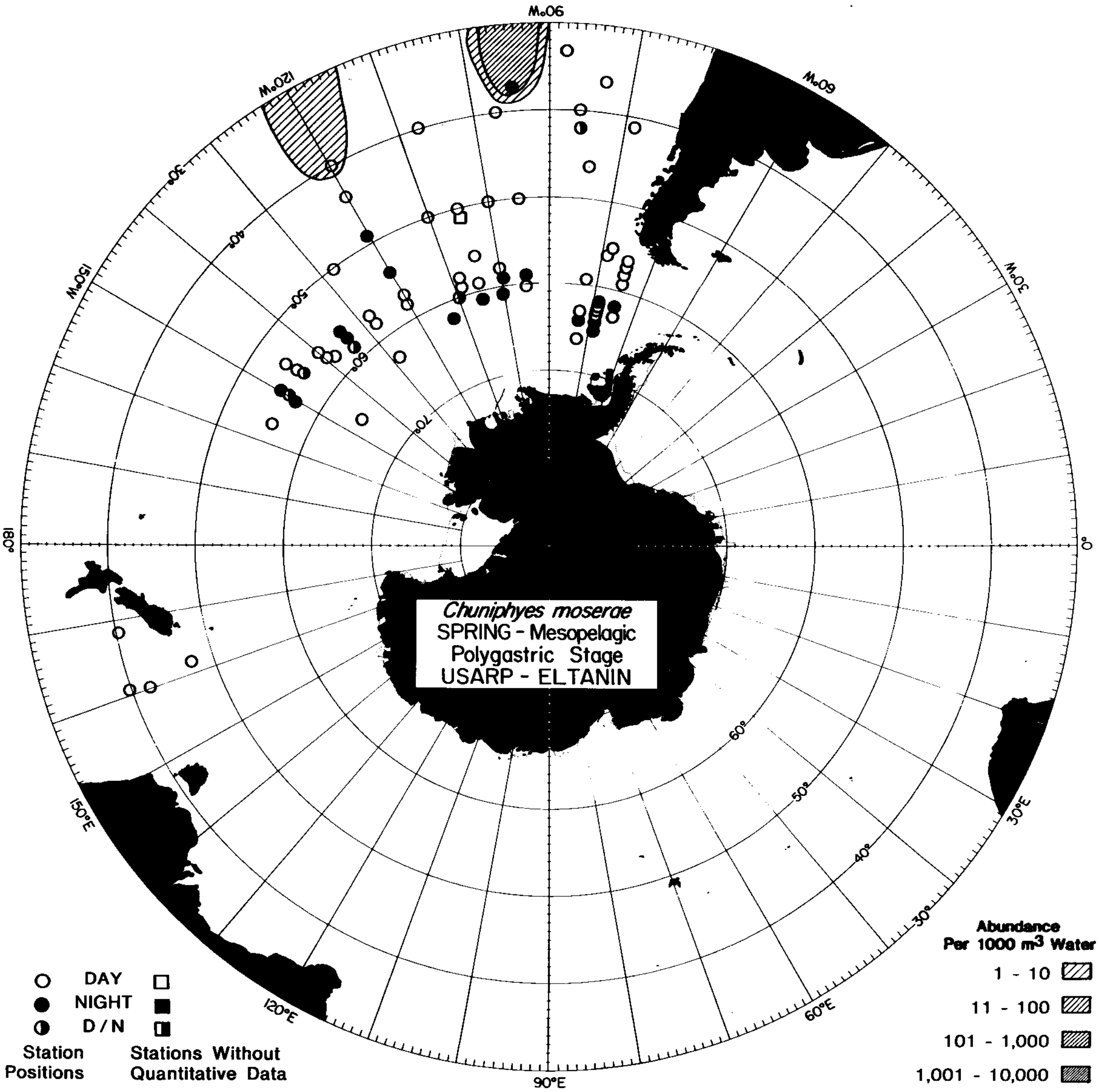
Map A193. The distribution of the eudoxid stage of *Lensia reticulata* during the fall in the mesopelagic zone.



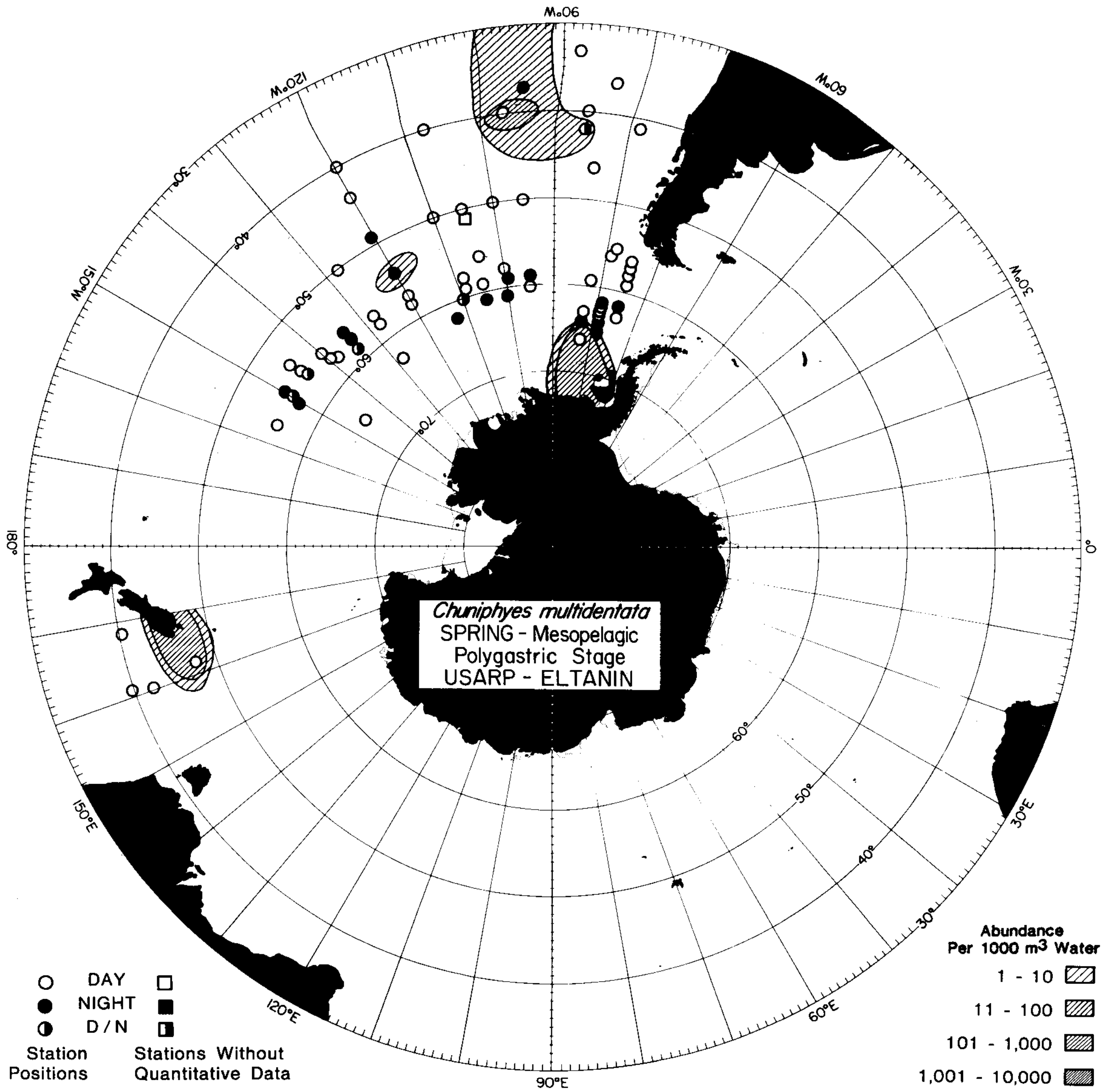
Map A194. The distribution of the polygastric stage of *Lensia reticulata* during the winter in the mesopelagic zone.



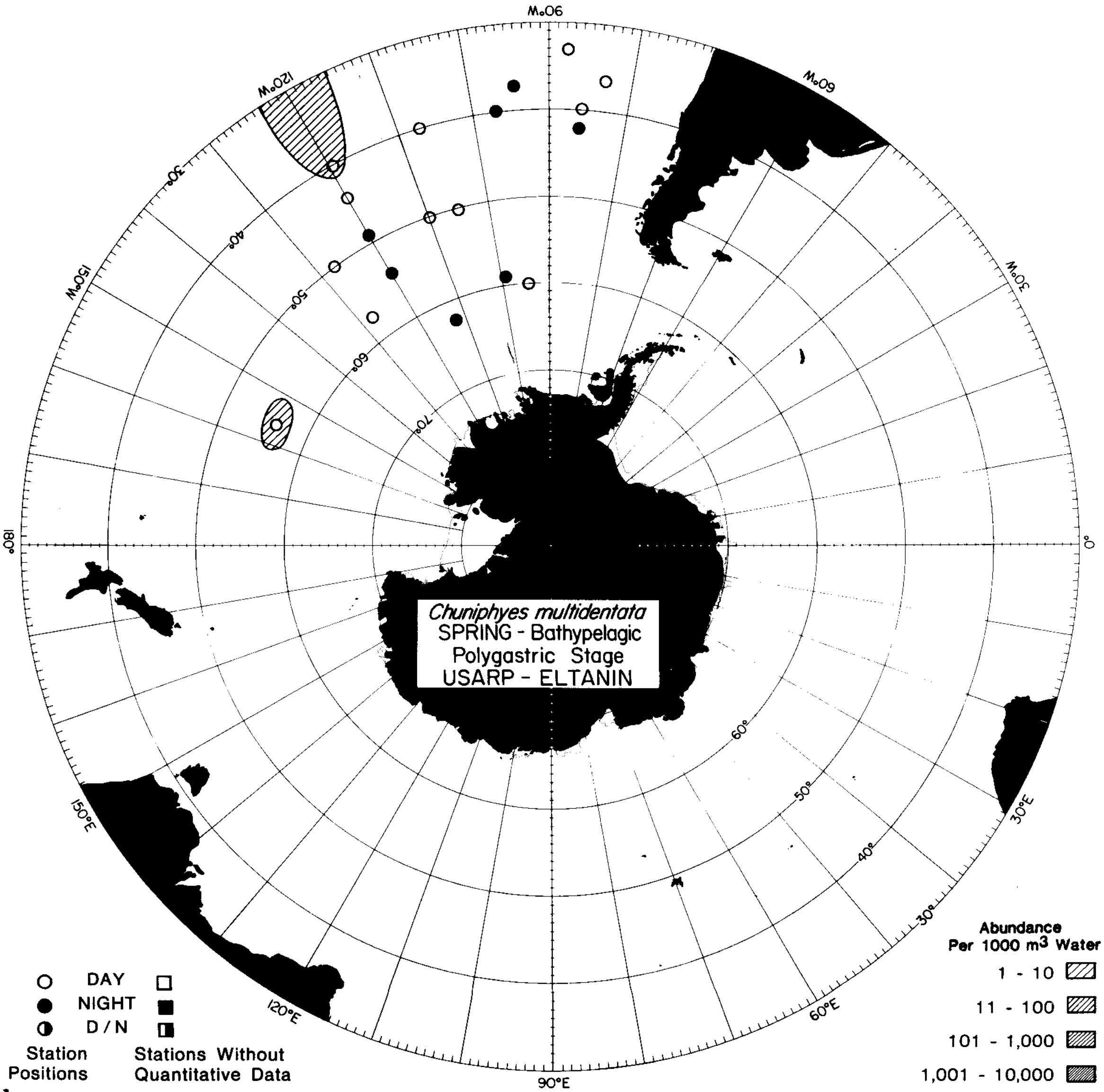
Map A195. The distribution of the polygastric stage of *Muggiaea atlantica* during the fall in the mesopelagic zone.



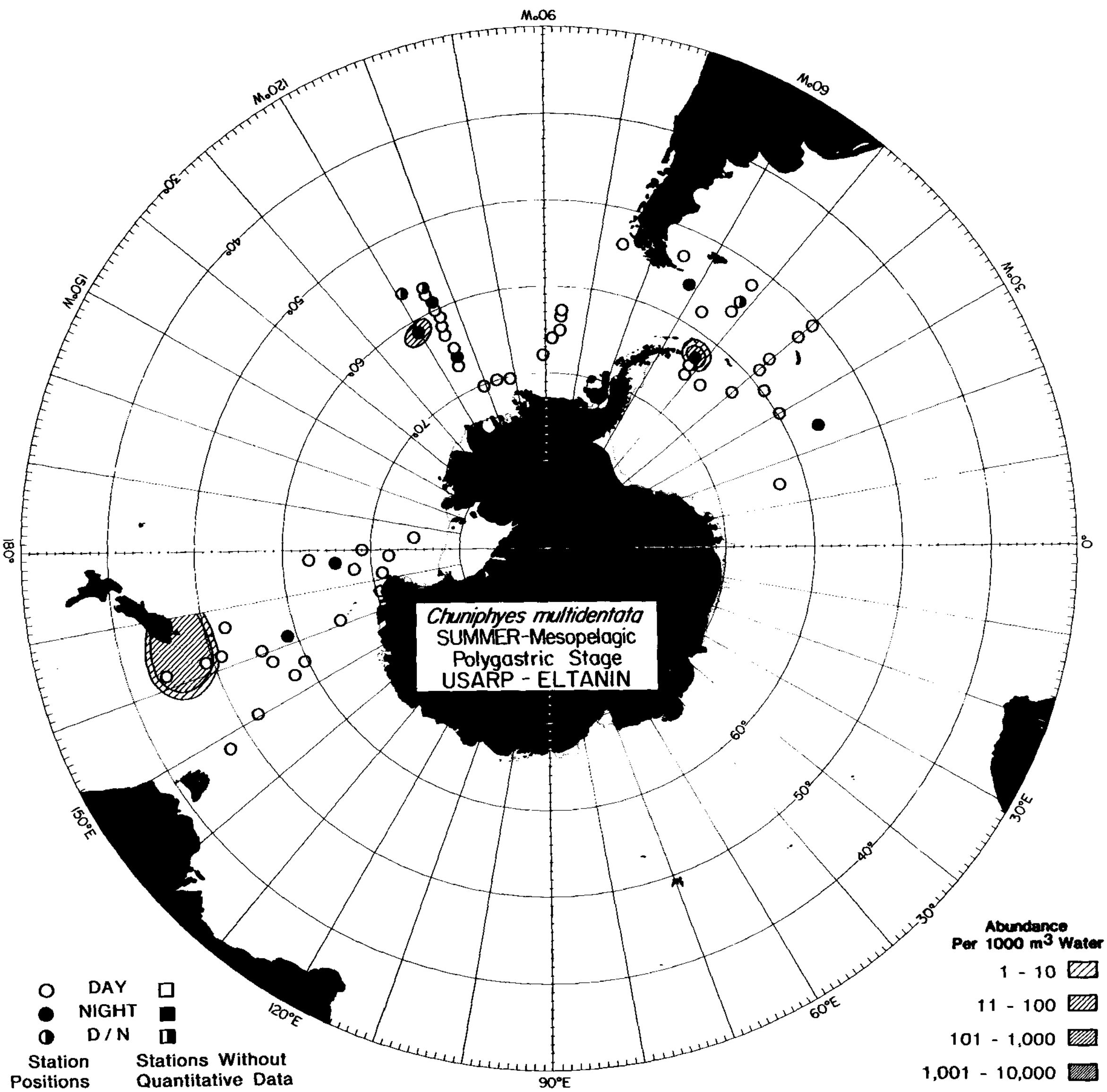
Map A196. The distribution of the polygastric stage of *Chuniphyes moserae* during the spring in the mesopelagic zone.



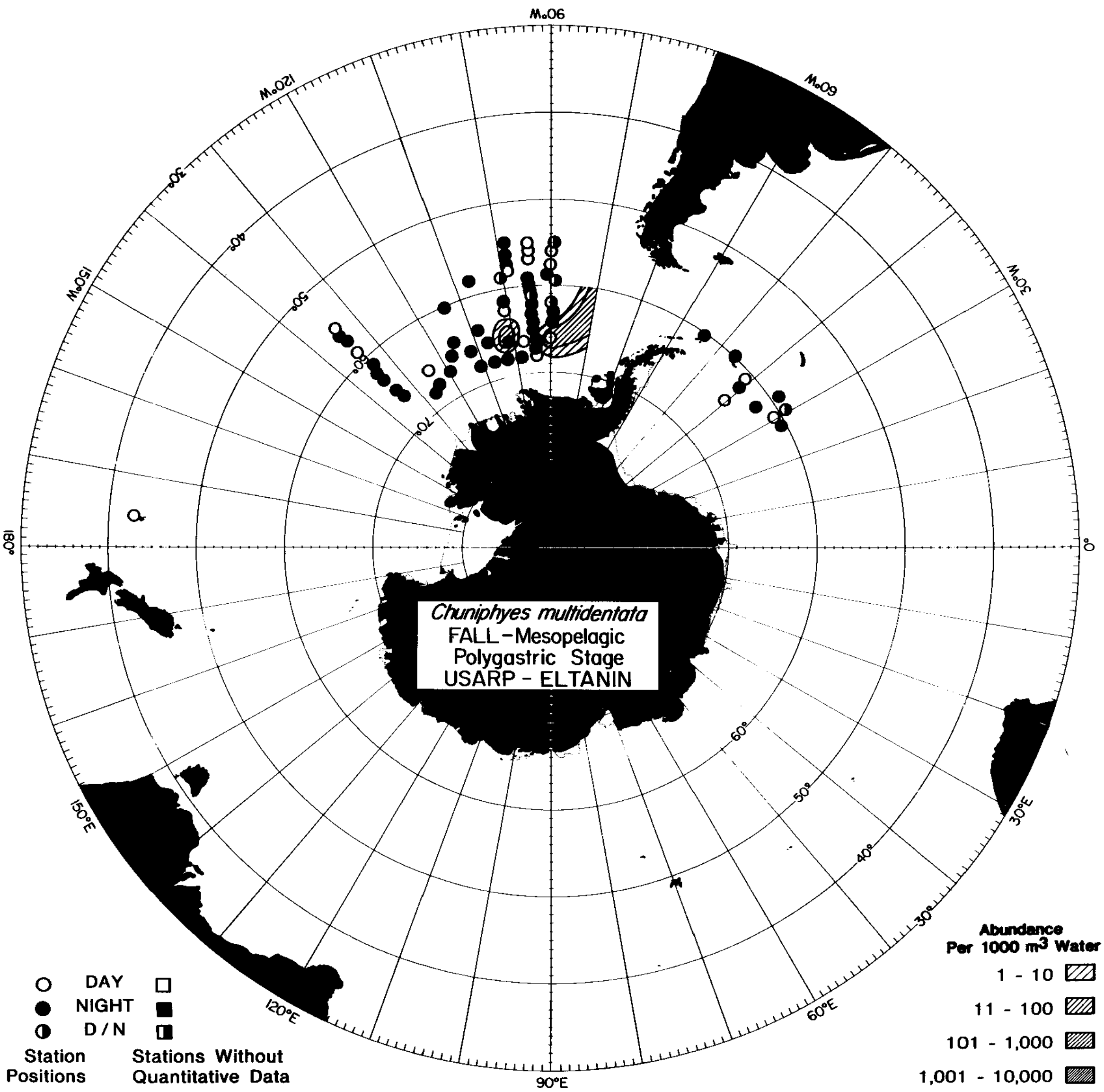
Map A197. The distribution of the polygastric stage of *Chuniphyes multidentata* during the spring in the mesopelagic zone.



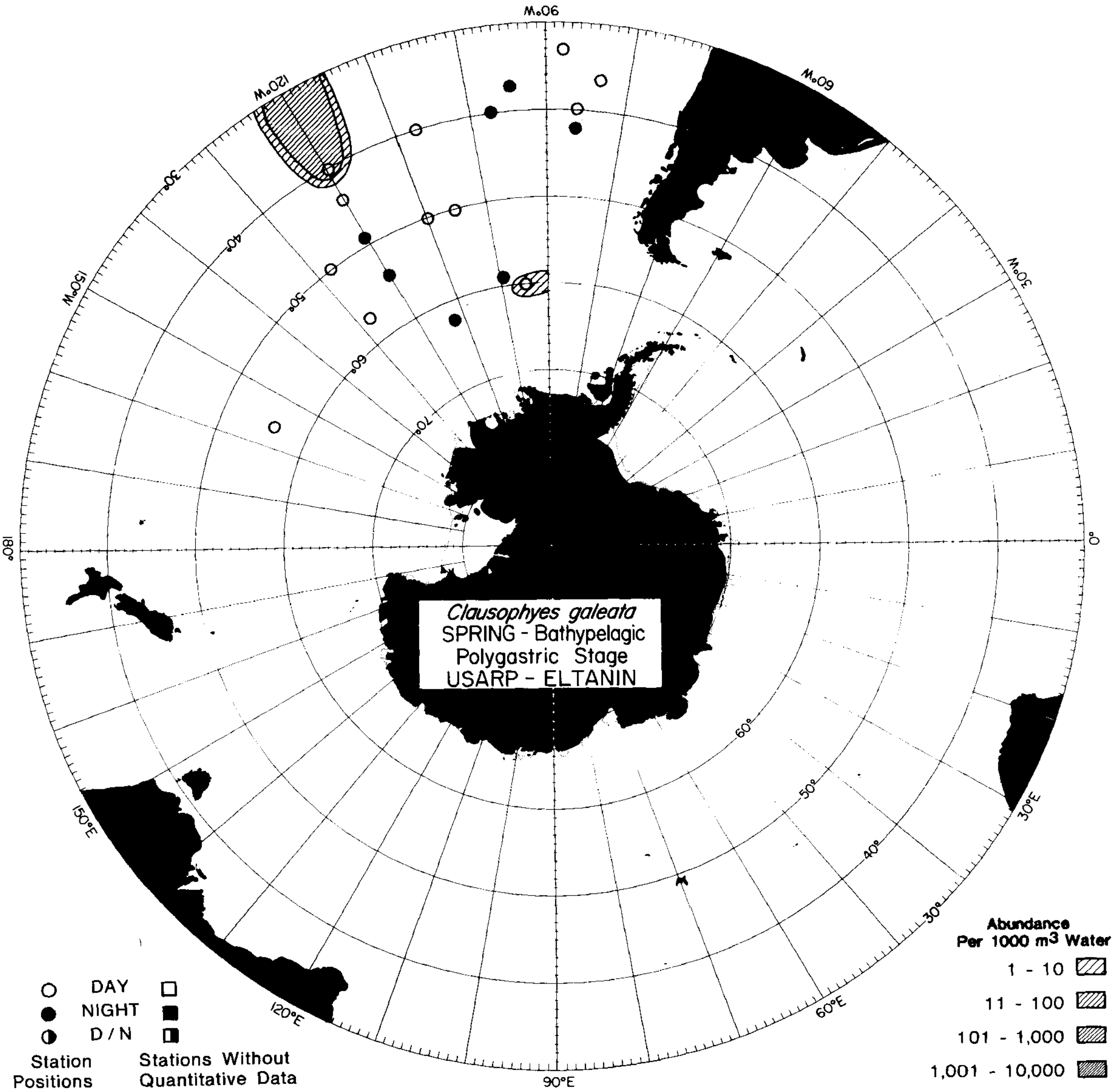
Map A198. The distribution of the polygastric stage of *Chuniphyes multidentata* during the spring in the bathypelagic zone.



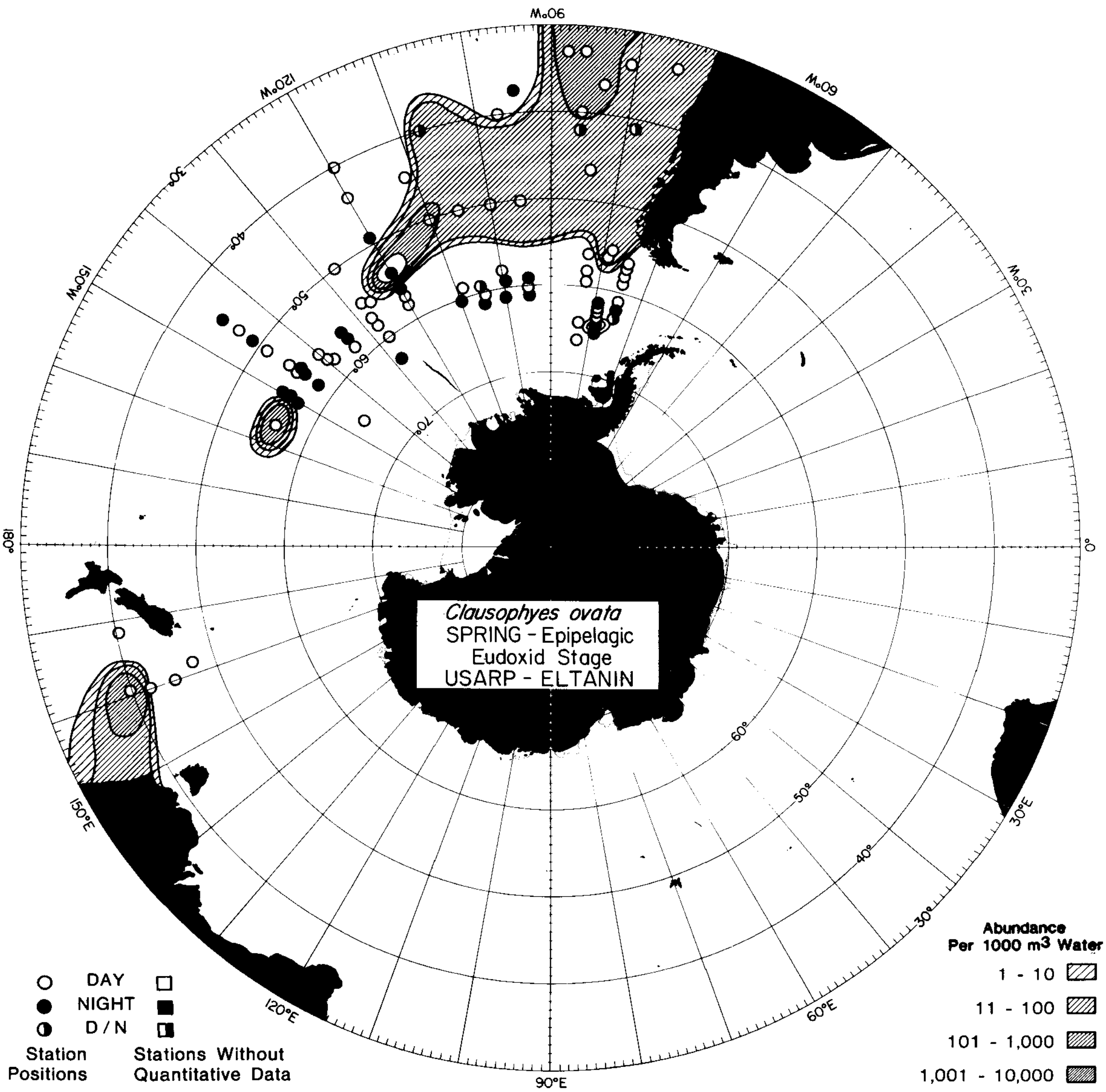
Map A199. The distribution of the polygastric stage of *Chuniphyes multidentata* during the summer in the mesopelagic zone.



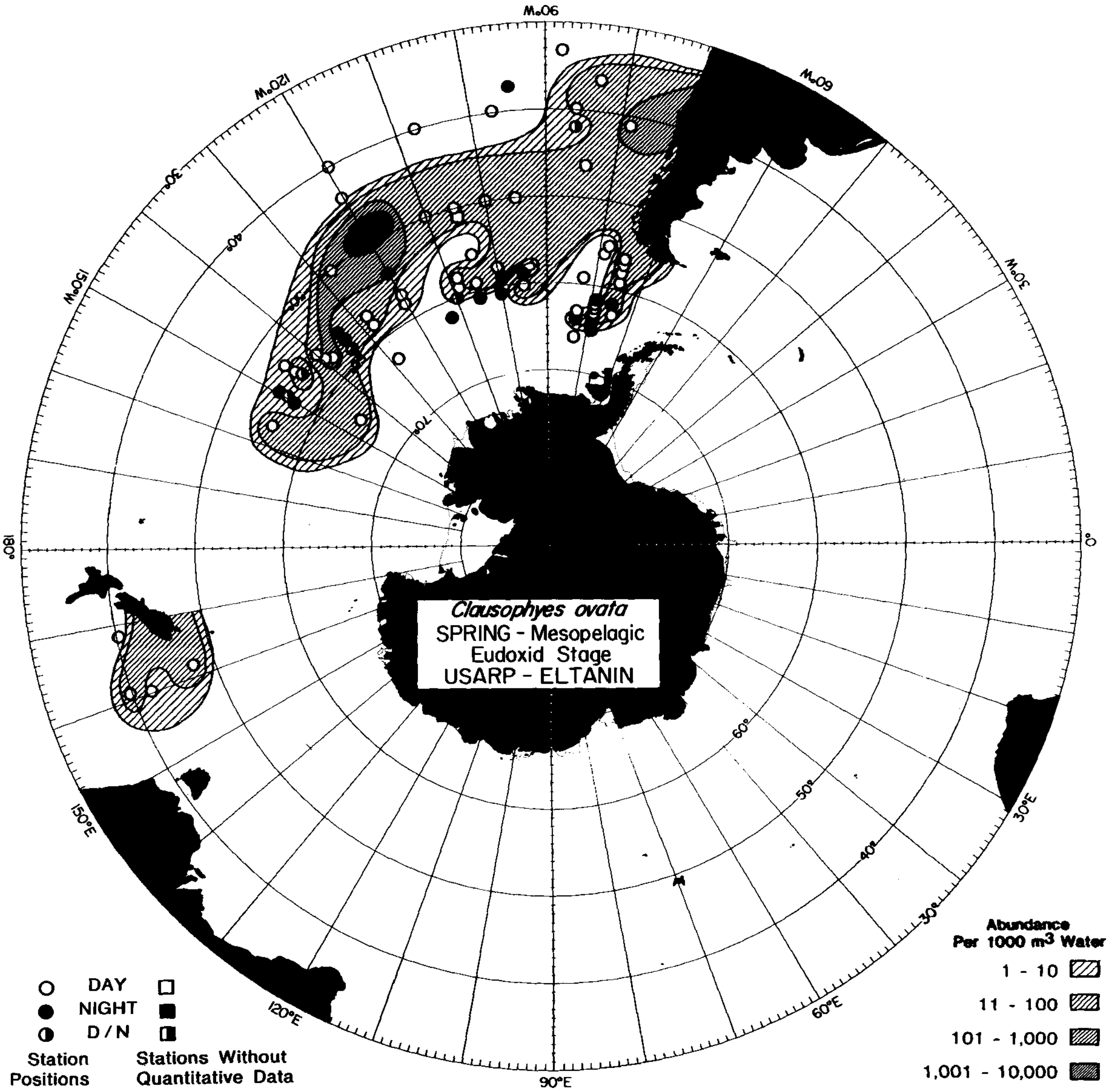
Map A200. The distribution of of the polygastric stage of *Chuniphyes multidentata* during the fall in the mesopelagic zone.



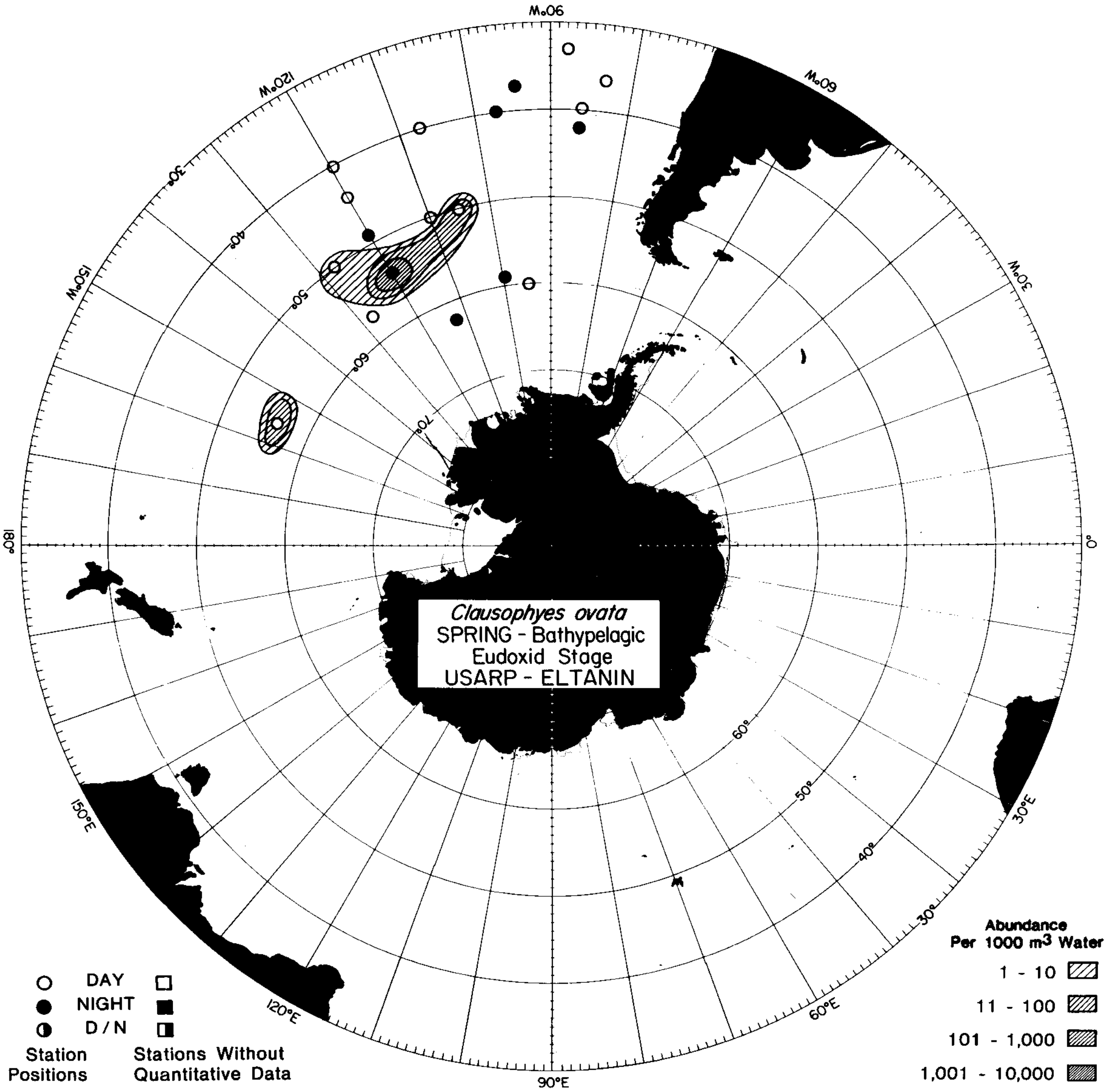
Map A201. The distribution of the polygastric stage of *Clausophyes galeata* during the spring in the bathypelagic zone.



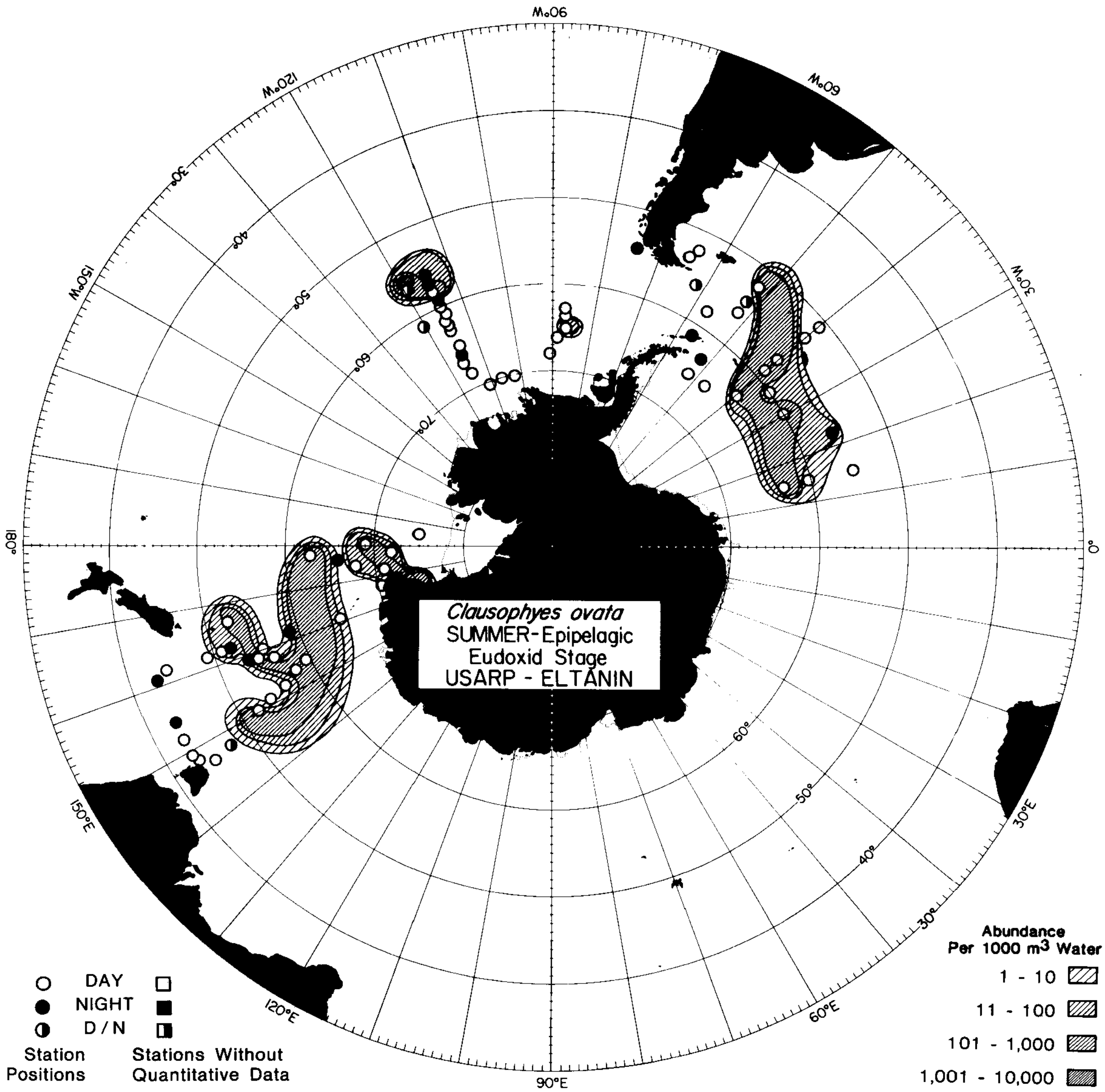
Map A202. The distribution of the eudoxid stage of *Clausophyes ovata* during the spring in the epipelagic zone.



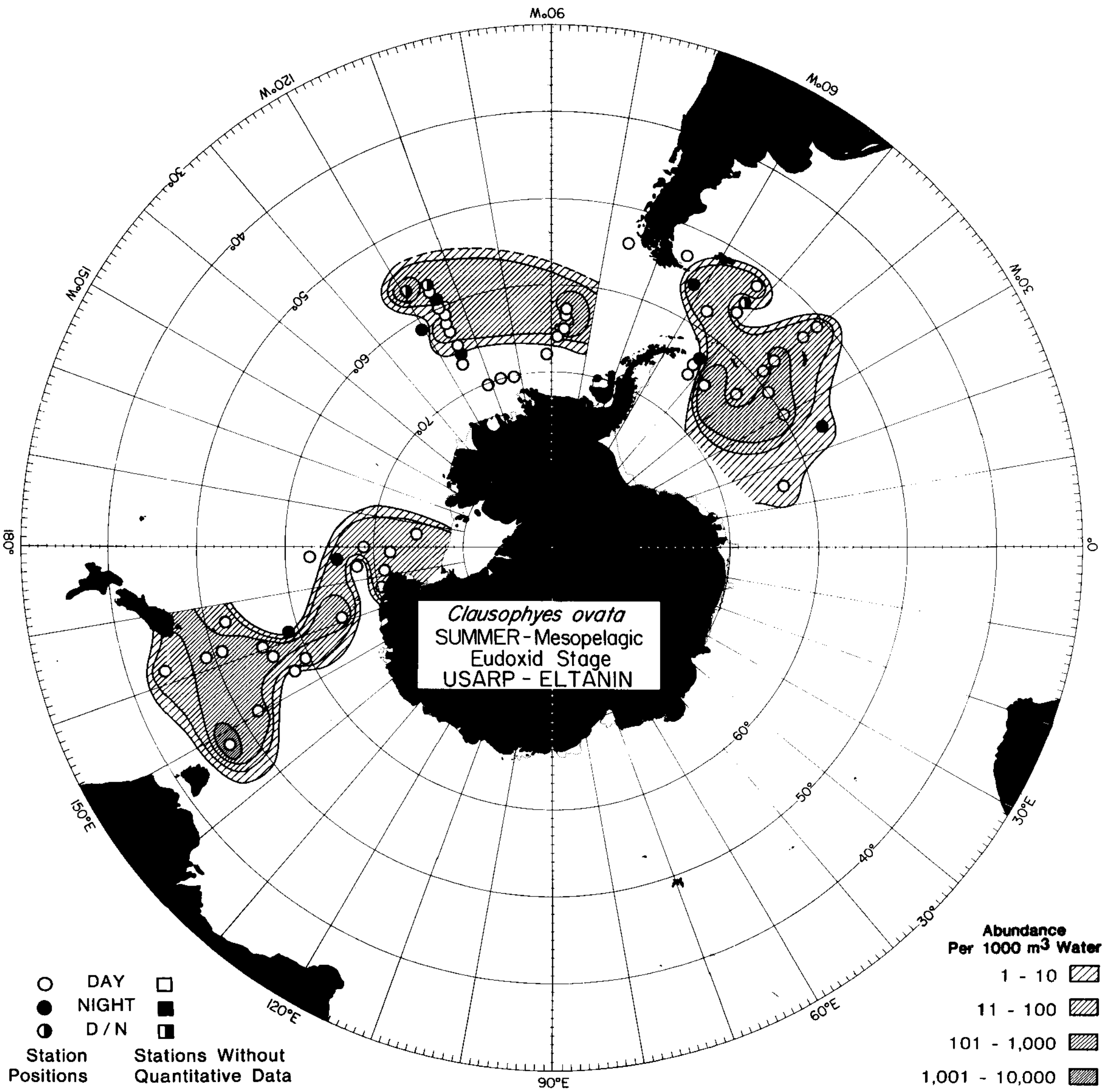
Map A203. The distribution of the eudoxid stage of *Clausophyes ovata* during the spring in the mesopelagic zone.



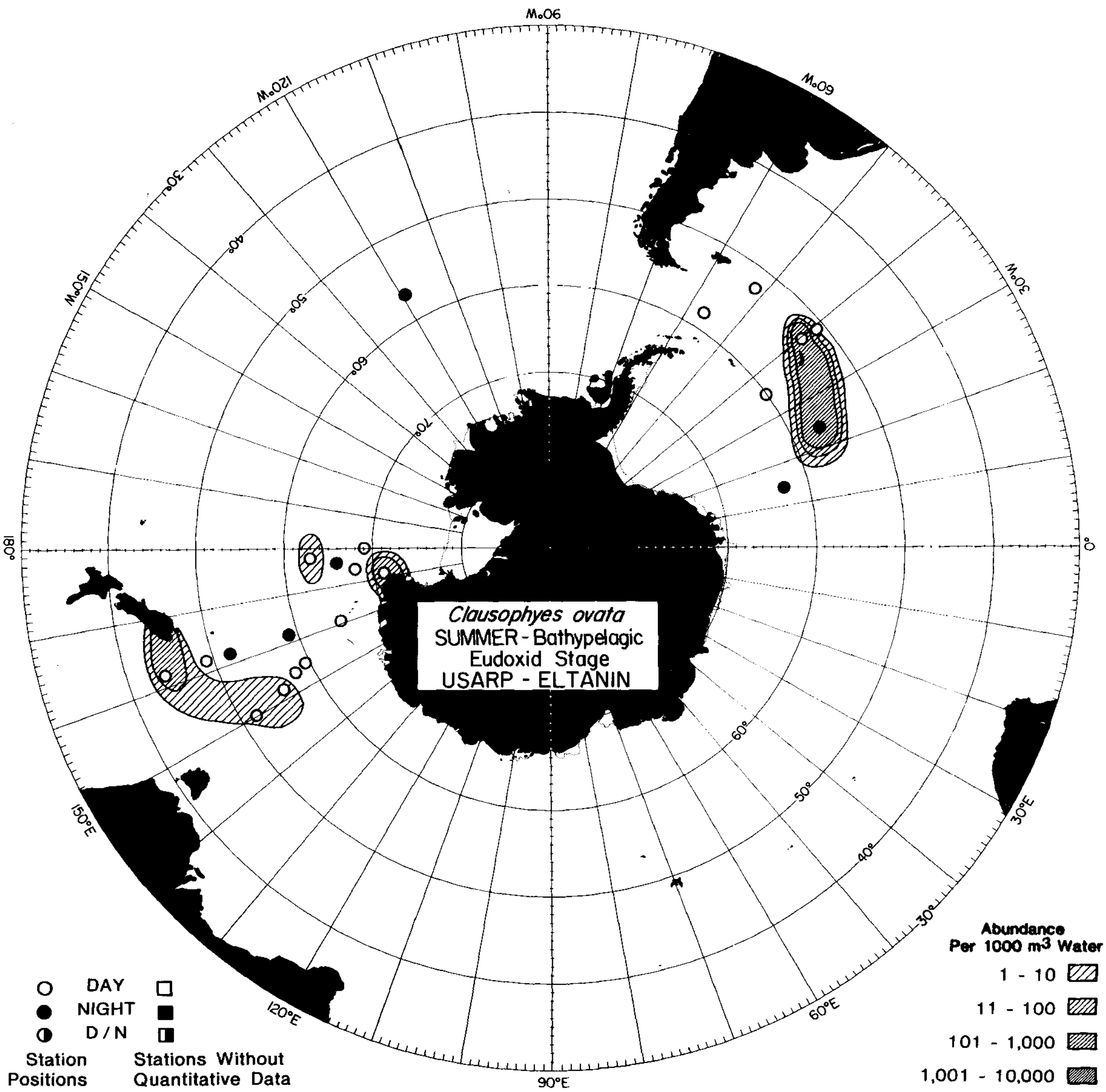
Map A204. The distribution of the eudoxid stage of *Clausophyes ovata* during the spring in the bathypelagic zone.



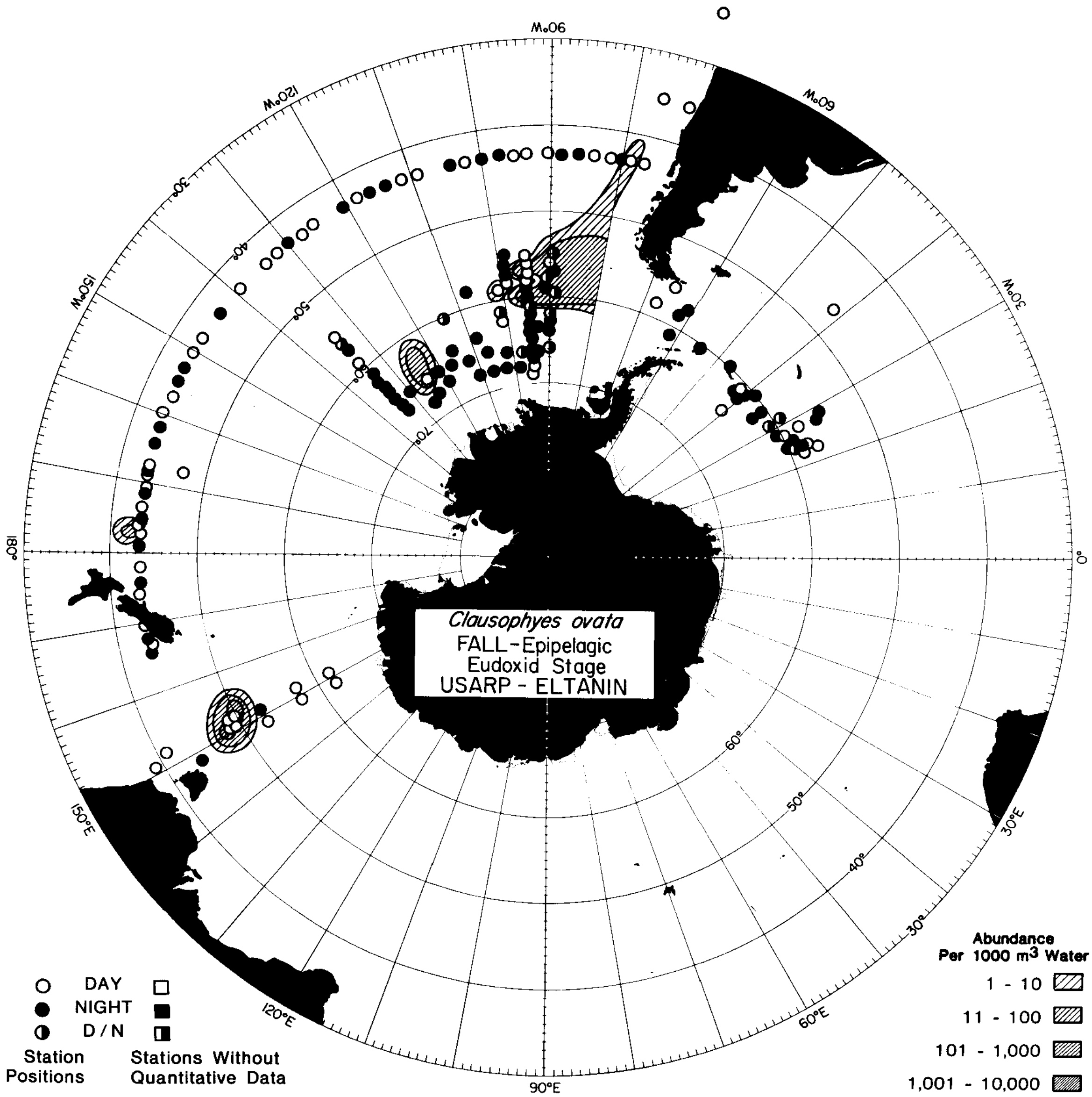
Map A205. The distribution of the eudoxid stage of *Clausophyes ovata* during the summer in the epipelagic zone.



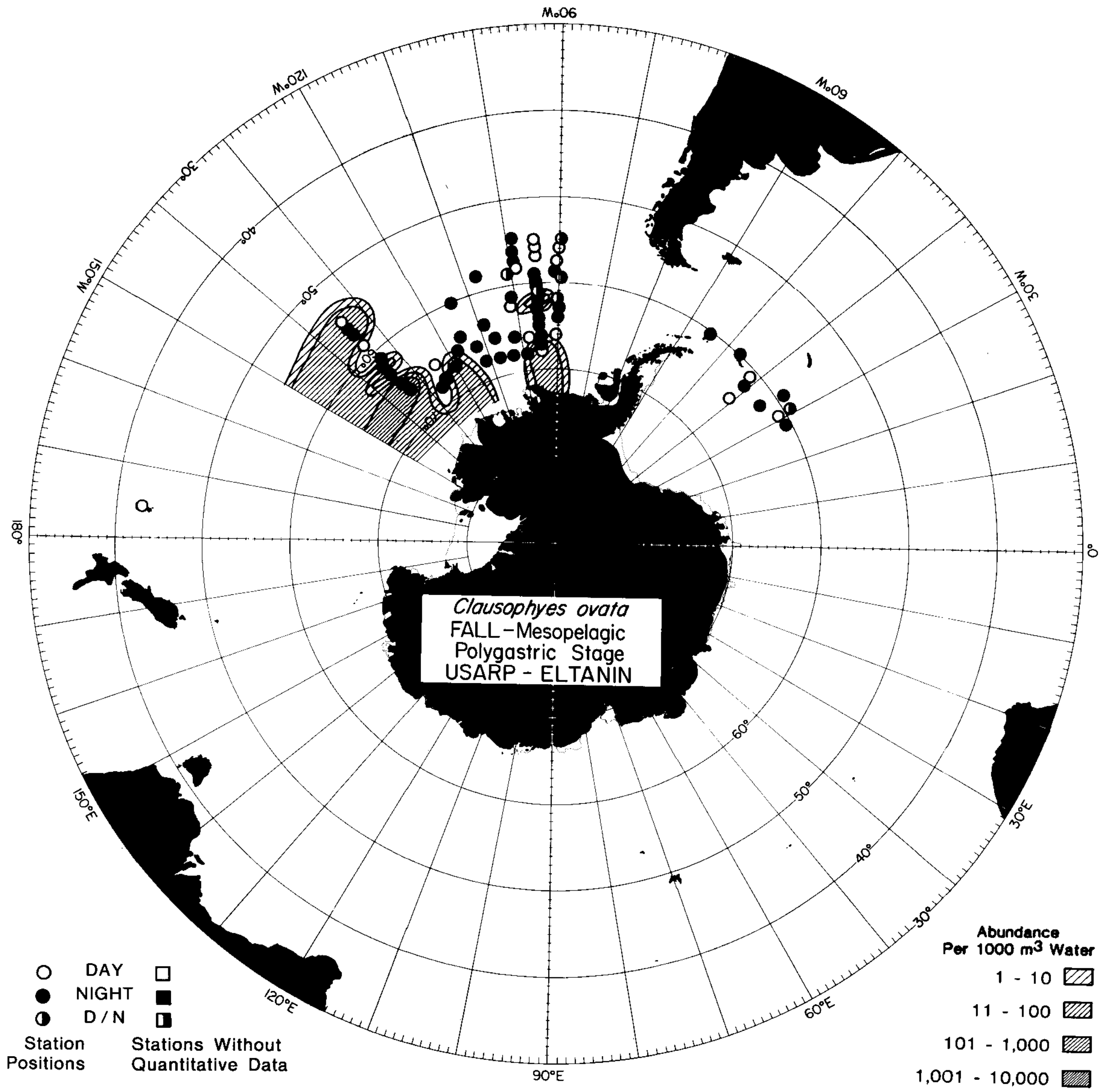
Map A206. The distribution of the eudoxid stage of *Clausophyes ovata* during the summer in the mesopelagic zone.



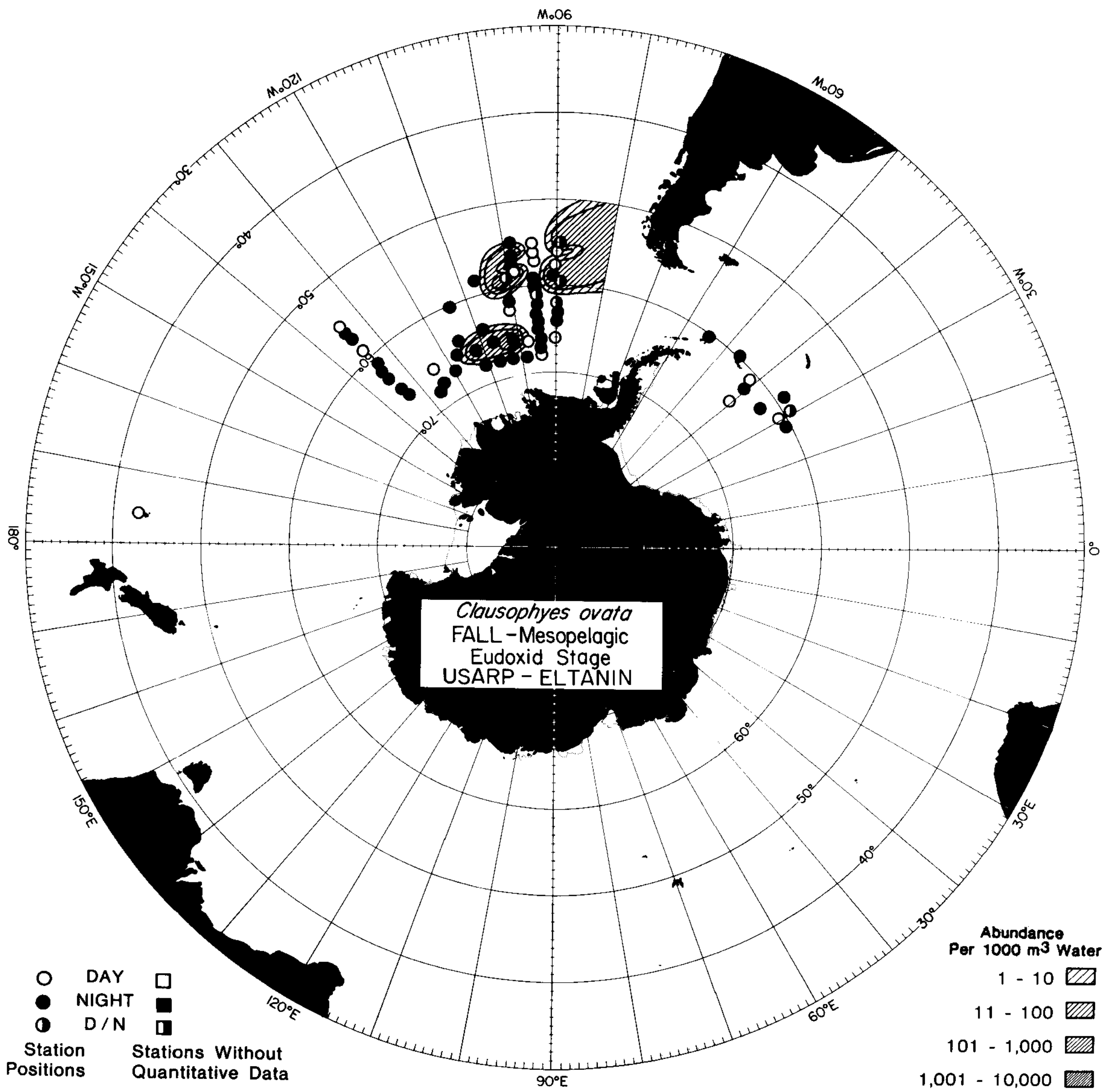
Map A207. The distribution of the eudoxid stage of *Clausophyes ovata* during the summer in the bathypelagic zone.



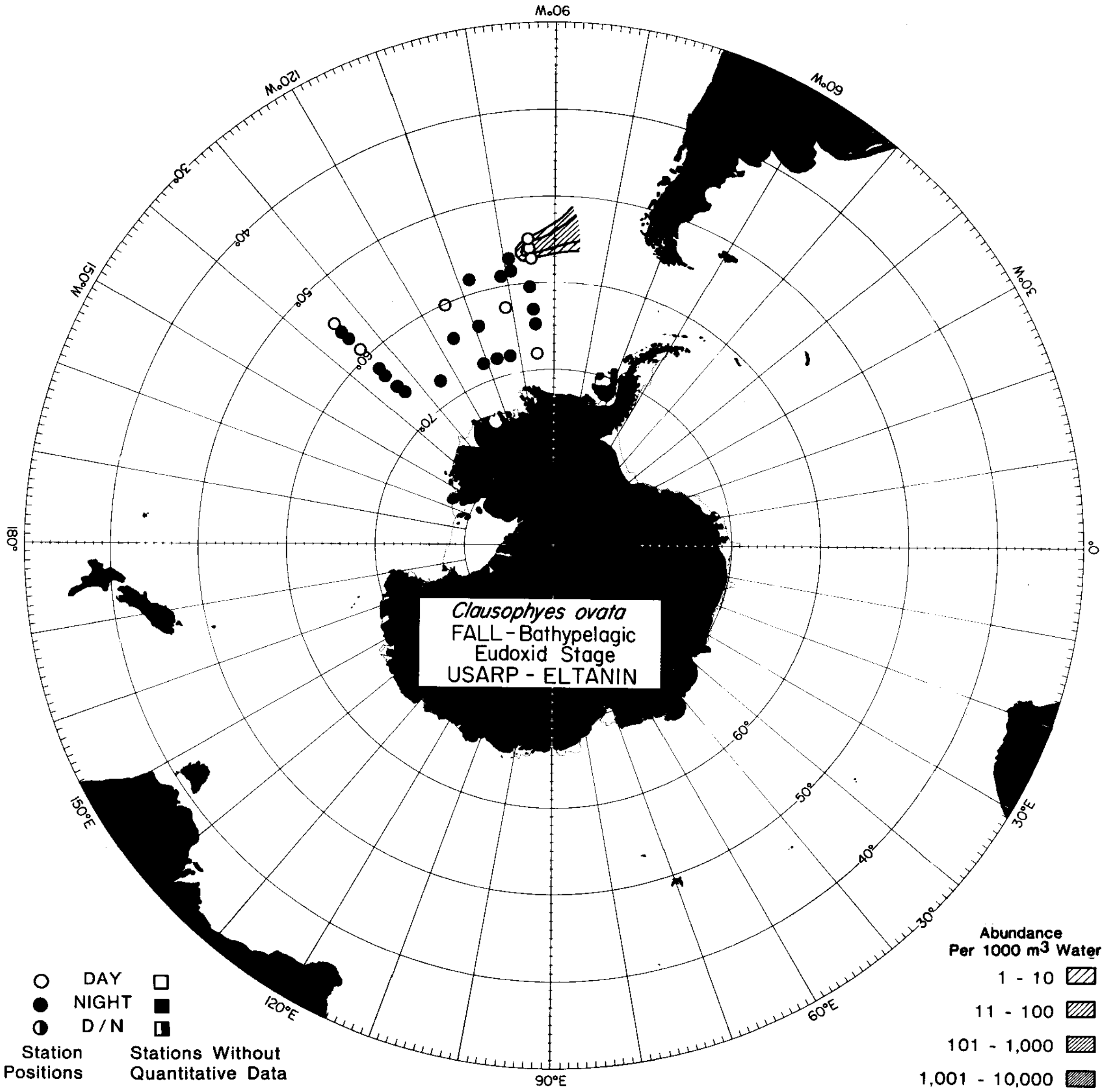
Map A208. The distribution of the eudoxid stage of *Clausophyes ovata* during the fall in the epipelagic zone.



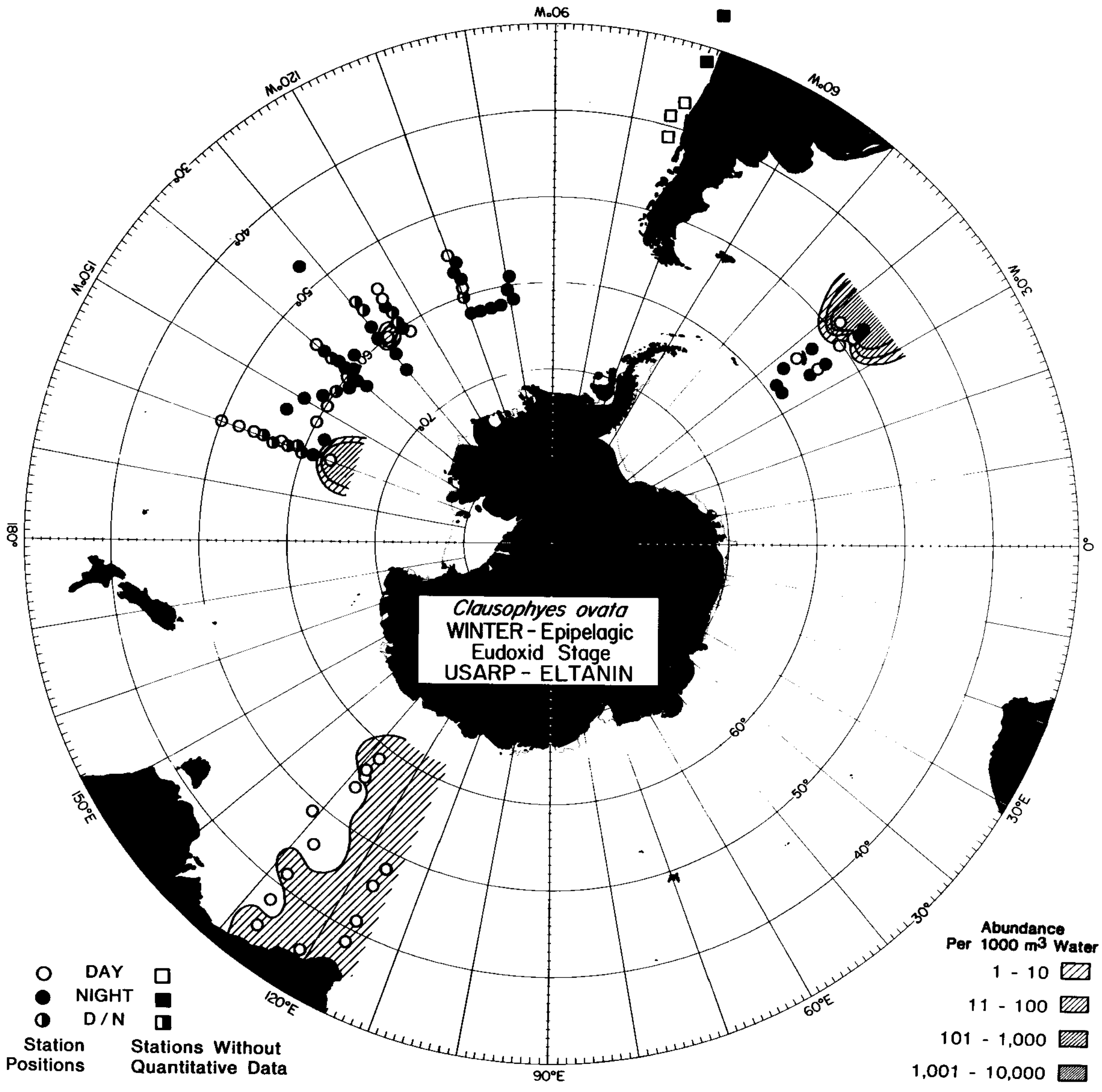
Map A209. The distribution of the polygastric stage of *Clausophyes ovata* during the fall in the mesopelagic zone.



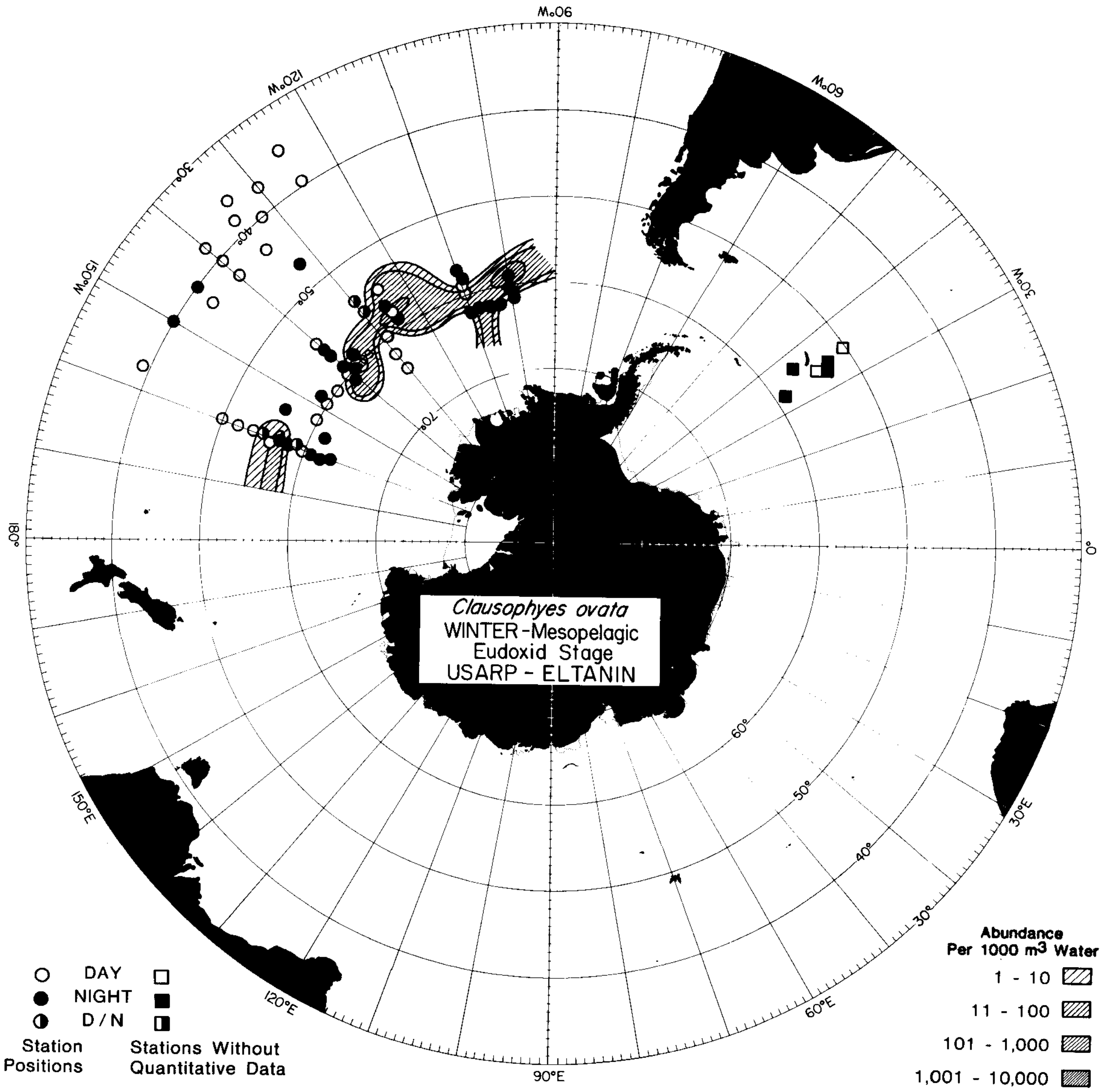
Map A210. The distribution of the eudoxid stage of *Clausophyes ovata* during the fall in the mesopelagic zone.



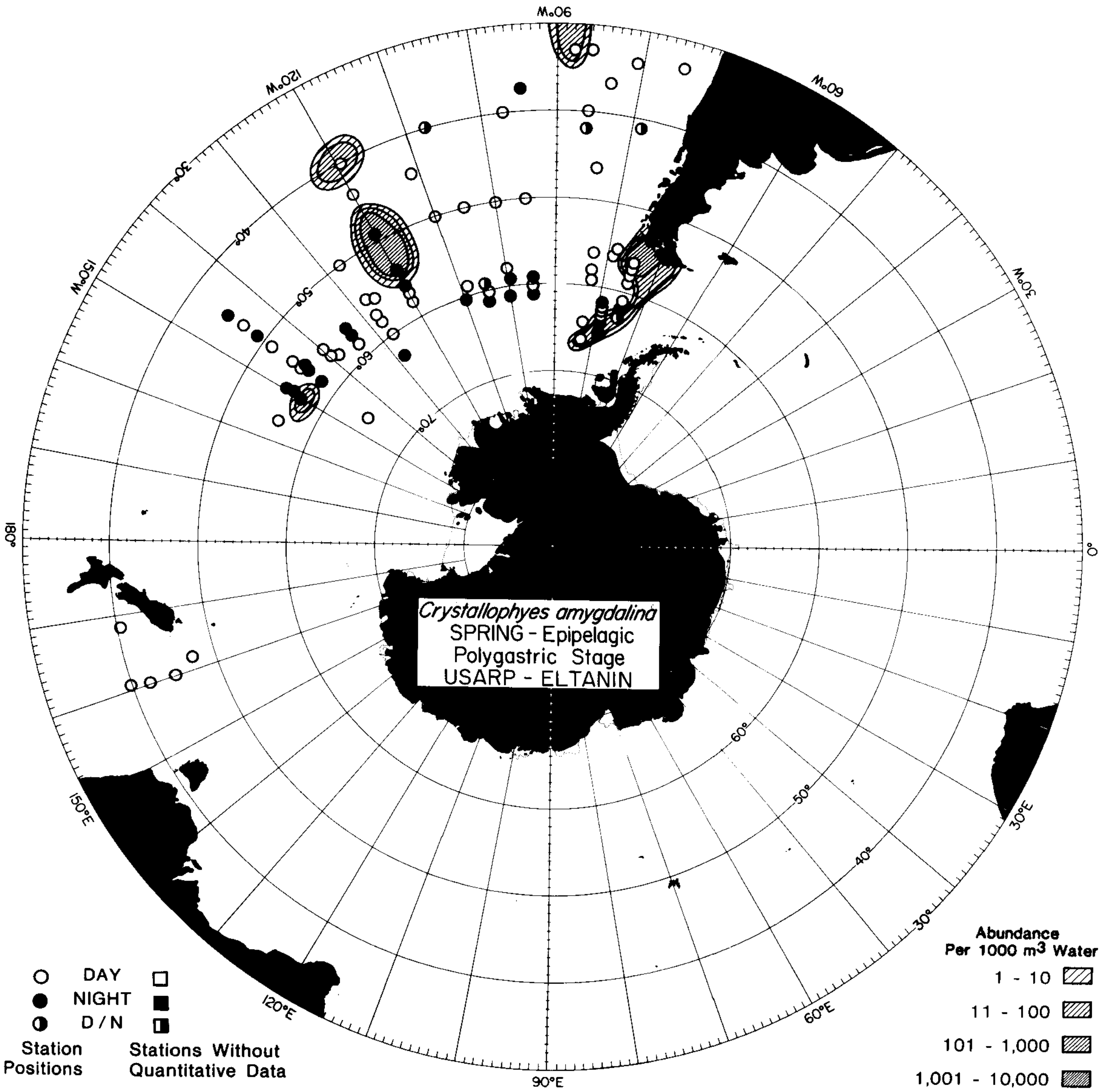
Map A211. The distribution of the eudoxid stage of *Clausophyes ovata* during the fall in the bathypelagic zone.



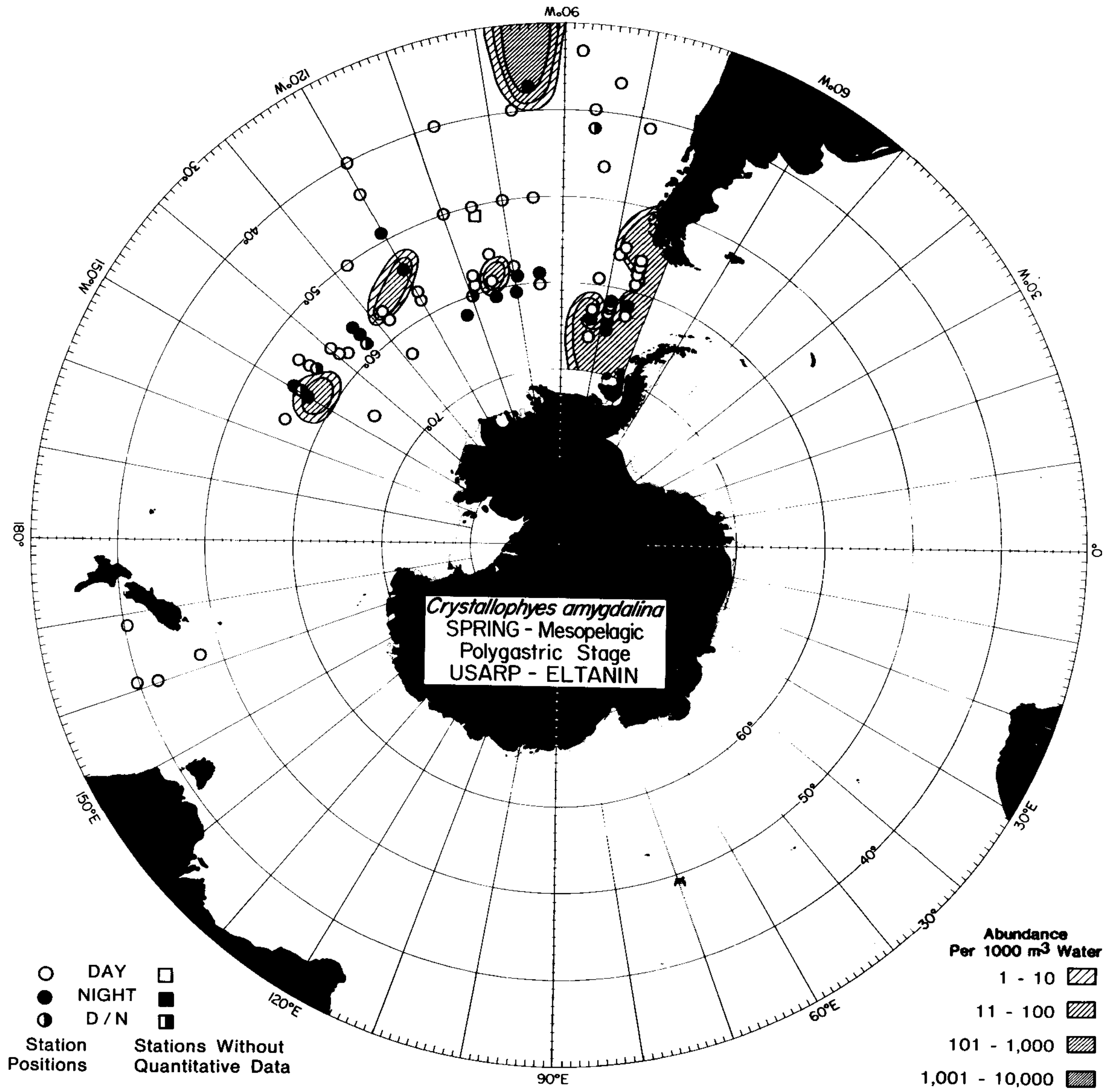
Map A212. The distribution of the eudoxid stage of *Clausophyes ovata* during the winter in the epipelagic zone.



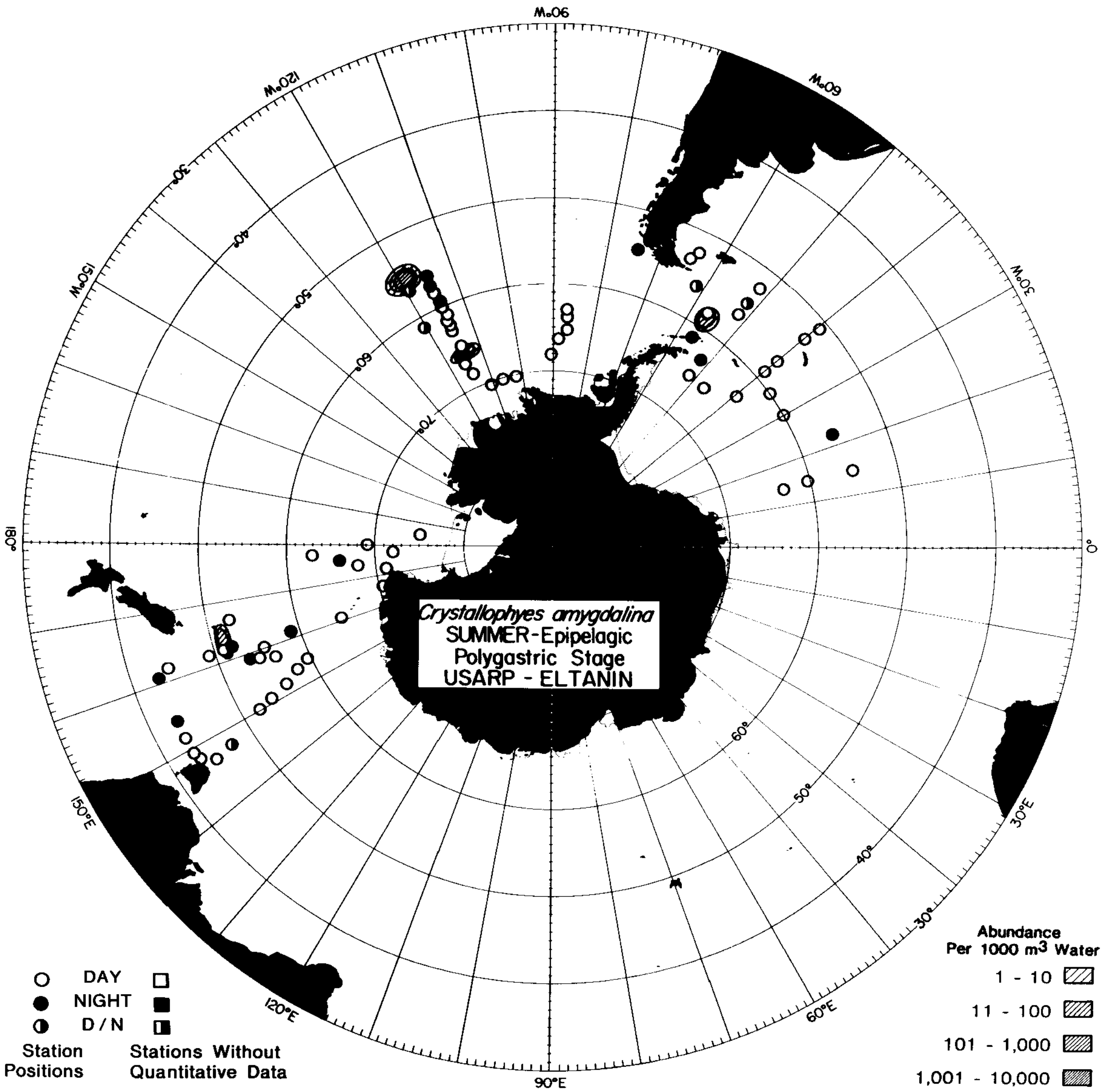
Map A213. The distribution of the eudoxid stage of *Clausophyes ovata* during the winter in the mesopelagic zone.



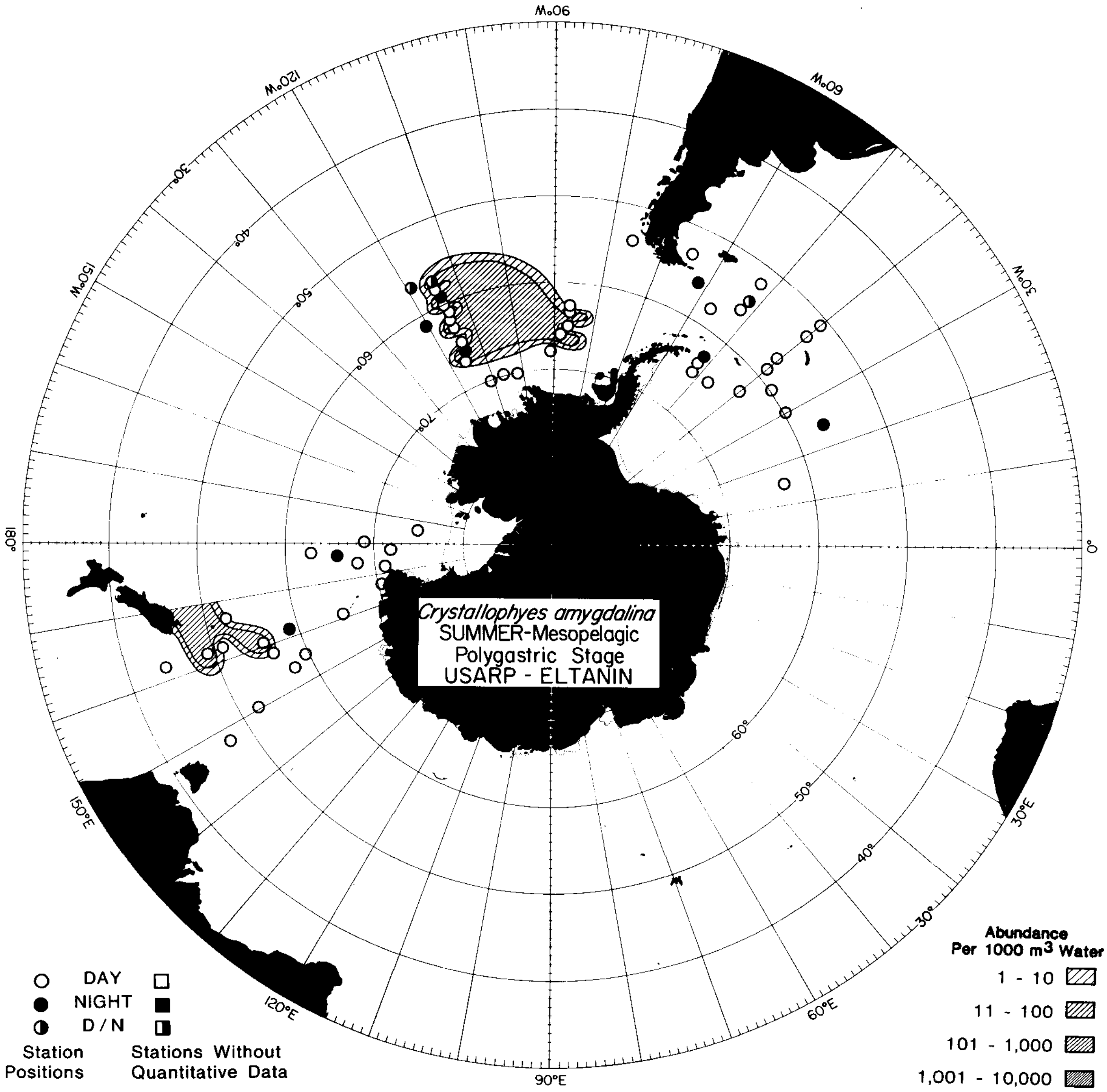
Map A214. The distribution of the polygastric stage of *Crystallophyes amygdalina* during the spring in the epipelagic zone.



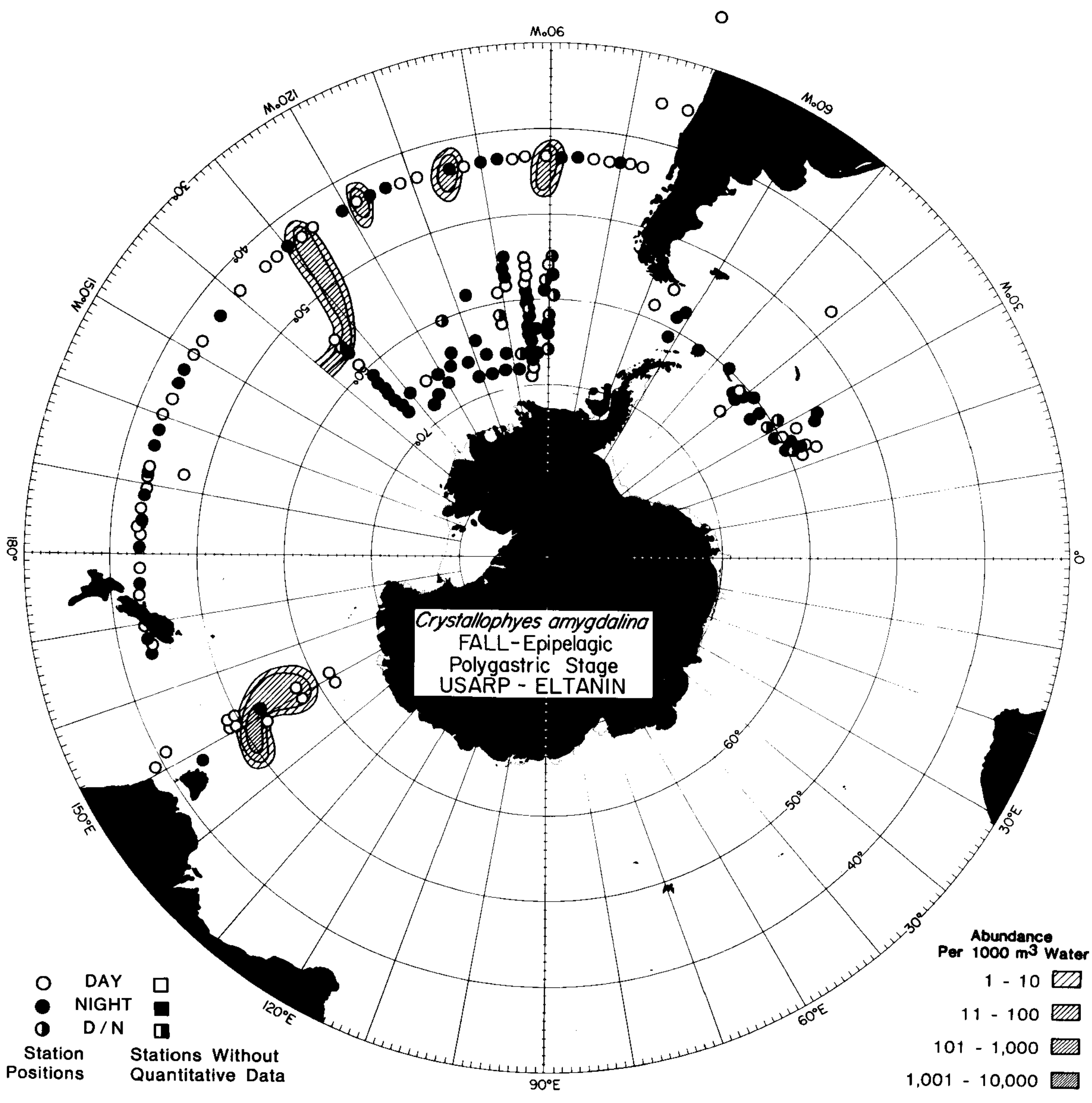
Map A215. The distribution of the polygastric stage of *Crystallophyes amygdalina* during the spring in the mesopelagic zone.



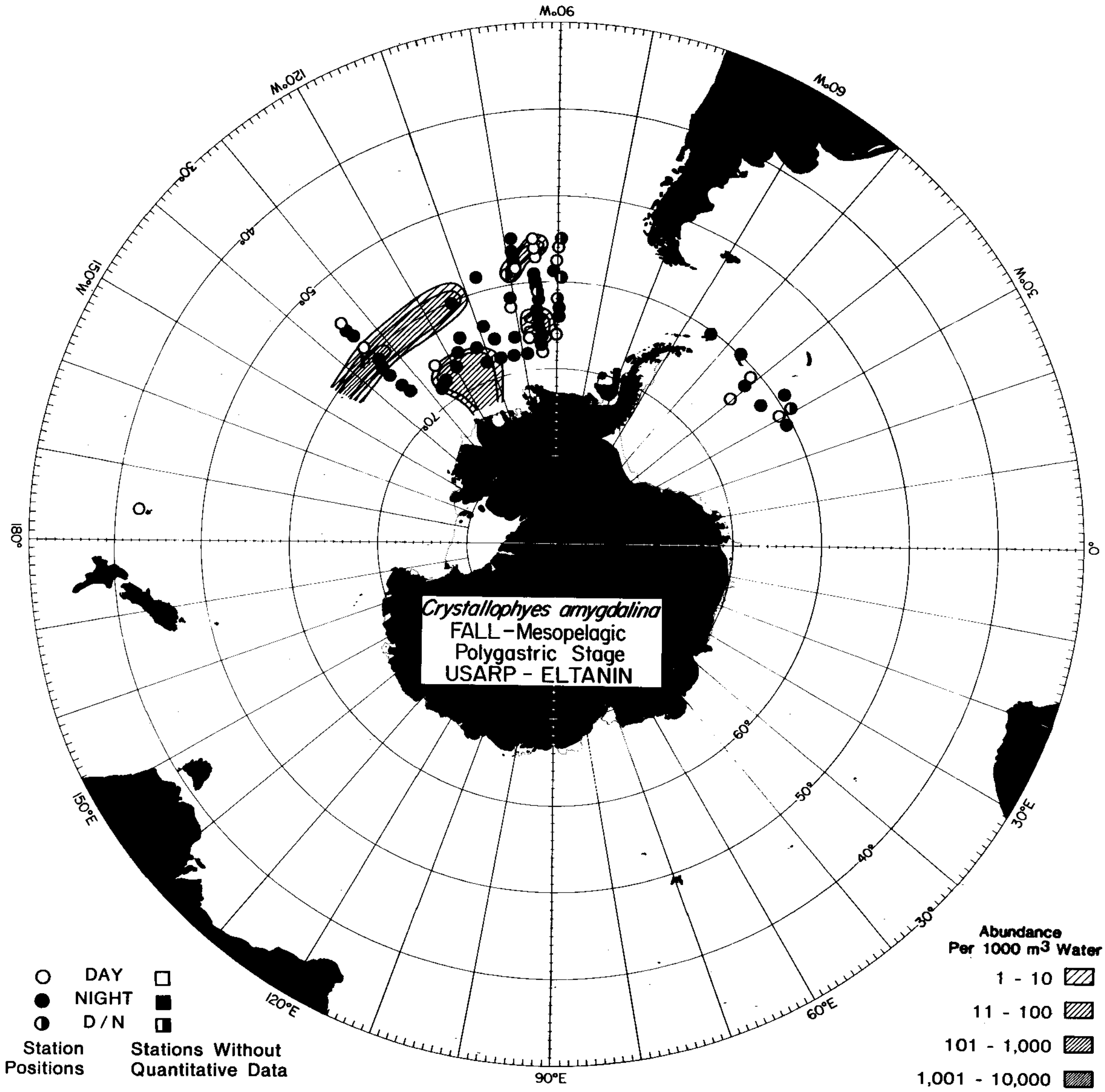
Map A216. The distribution of the polygastric stage of *Crystallophyes amygdalina* during the summer in the epipelagic zone.



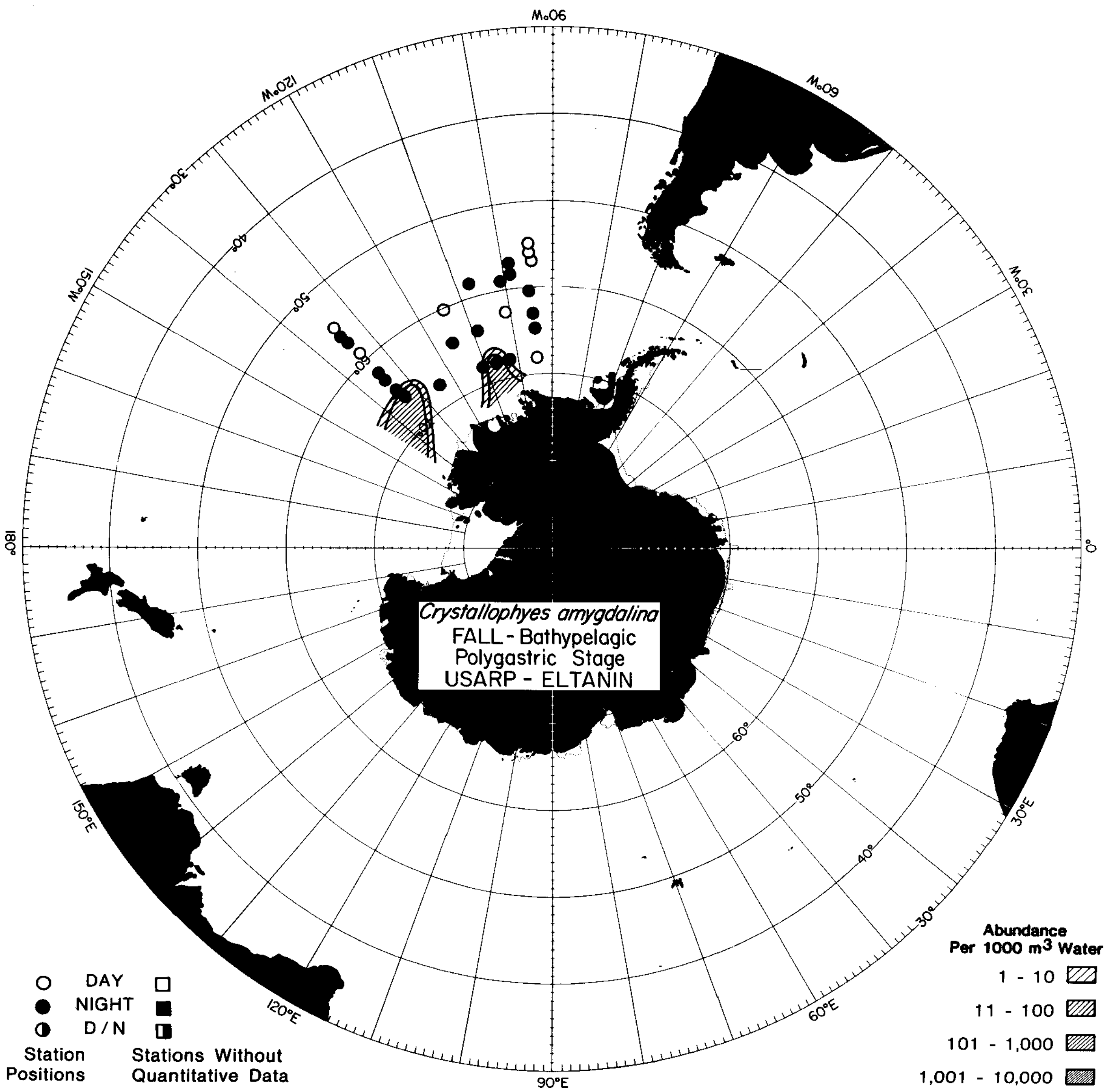
Map A217. The distribution of the polygastric stage of *Crystallophyes amygdalina* during the summer in the mesopelagic zone.



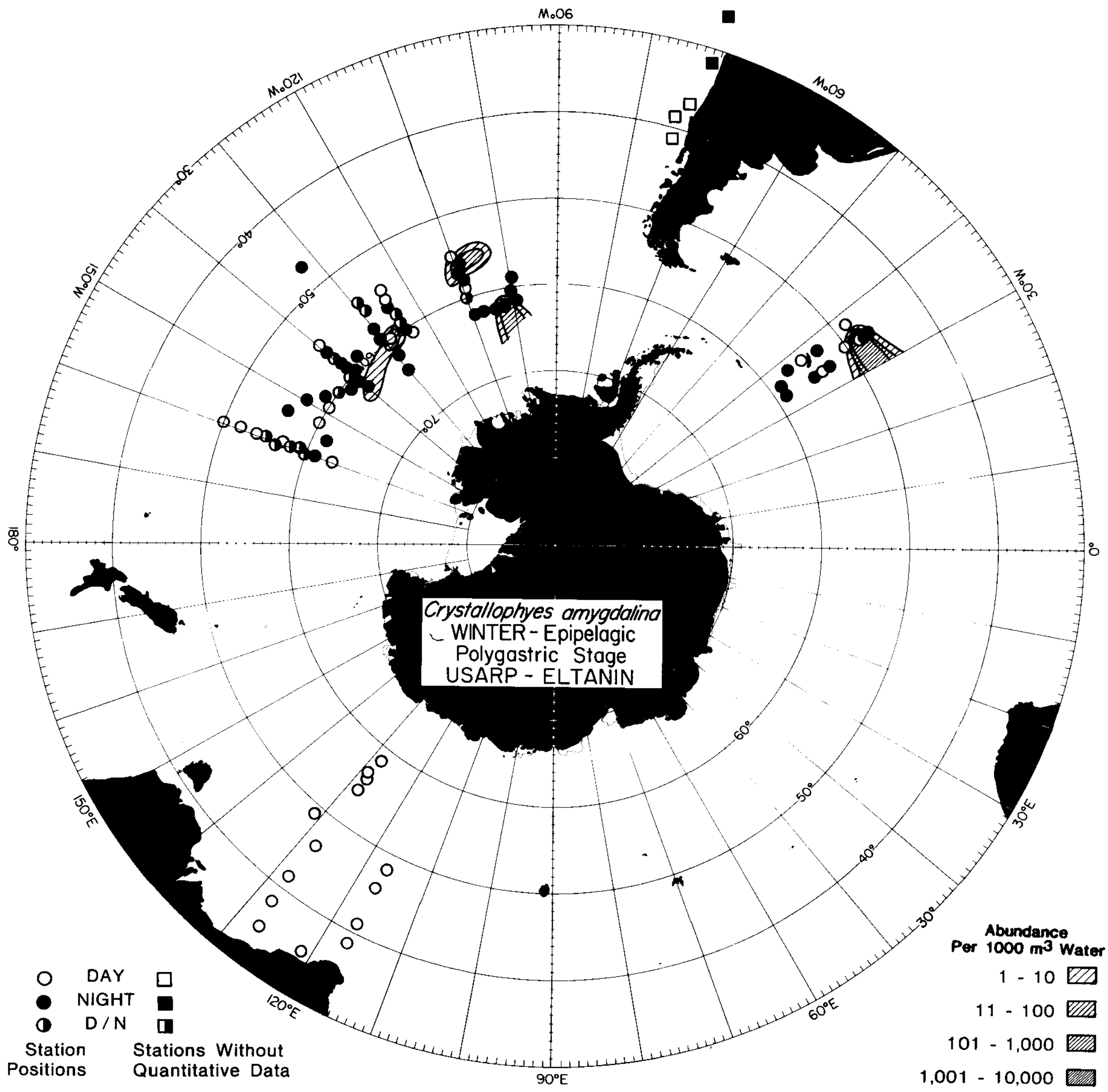
Map A218. The distribution of the polygastric stage of *Crystallophyes amygdalina* during the fall in the epipelagic zone.



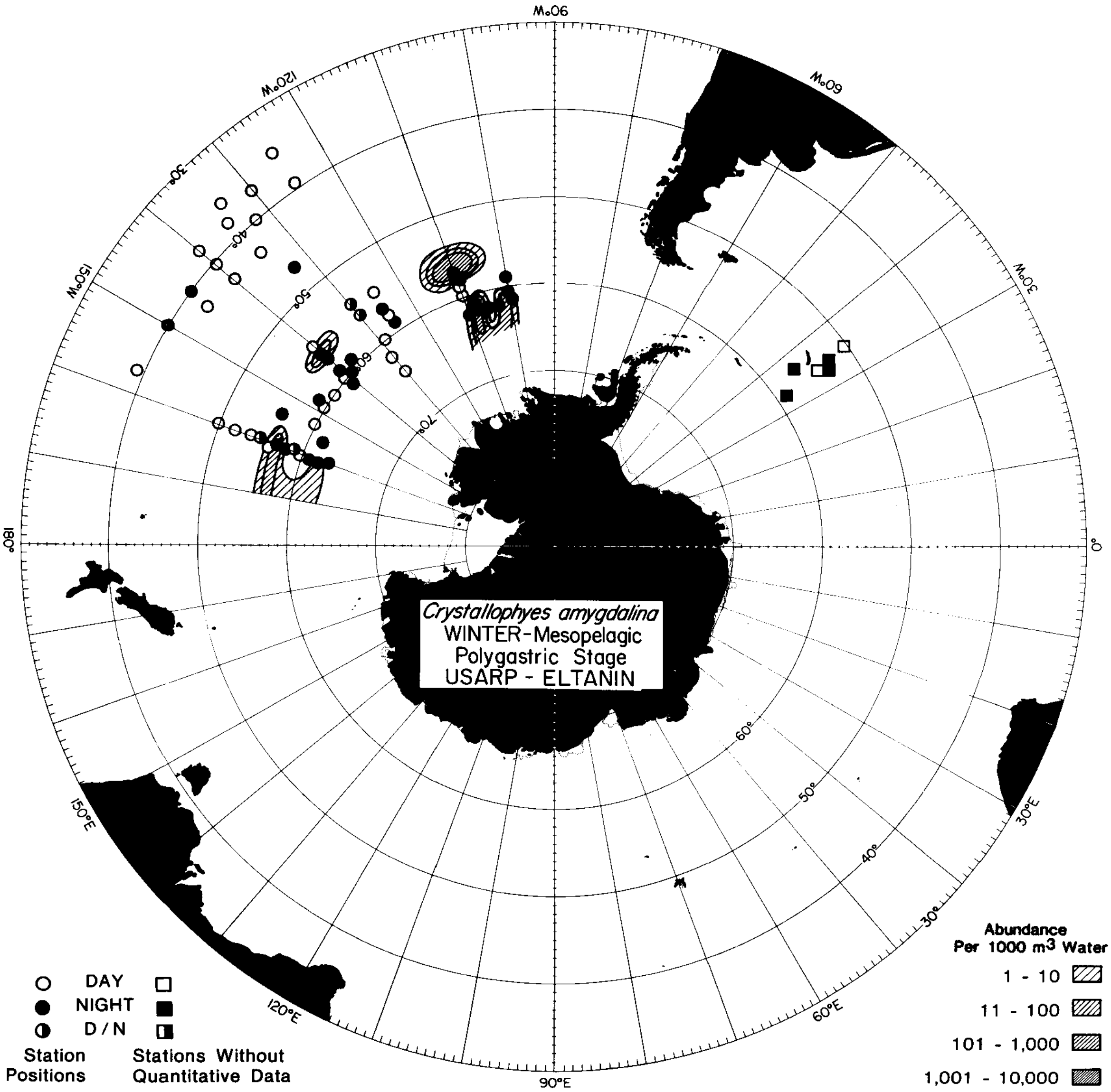
Map A219. The distribution of the polygastric stage of *Crystallophyes amygdalina* during the fall in the mesopelagic zone.



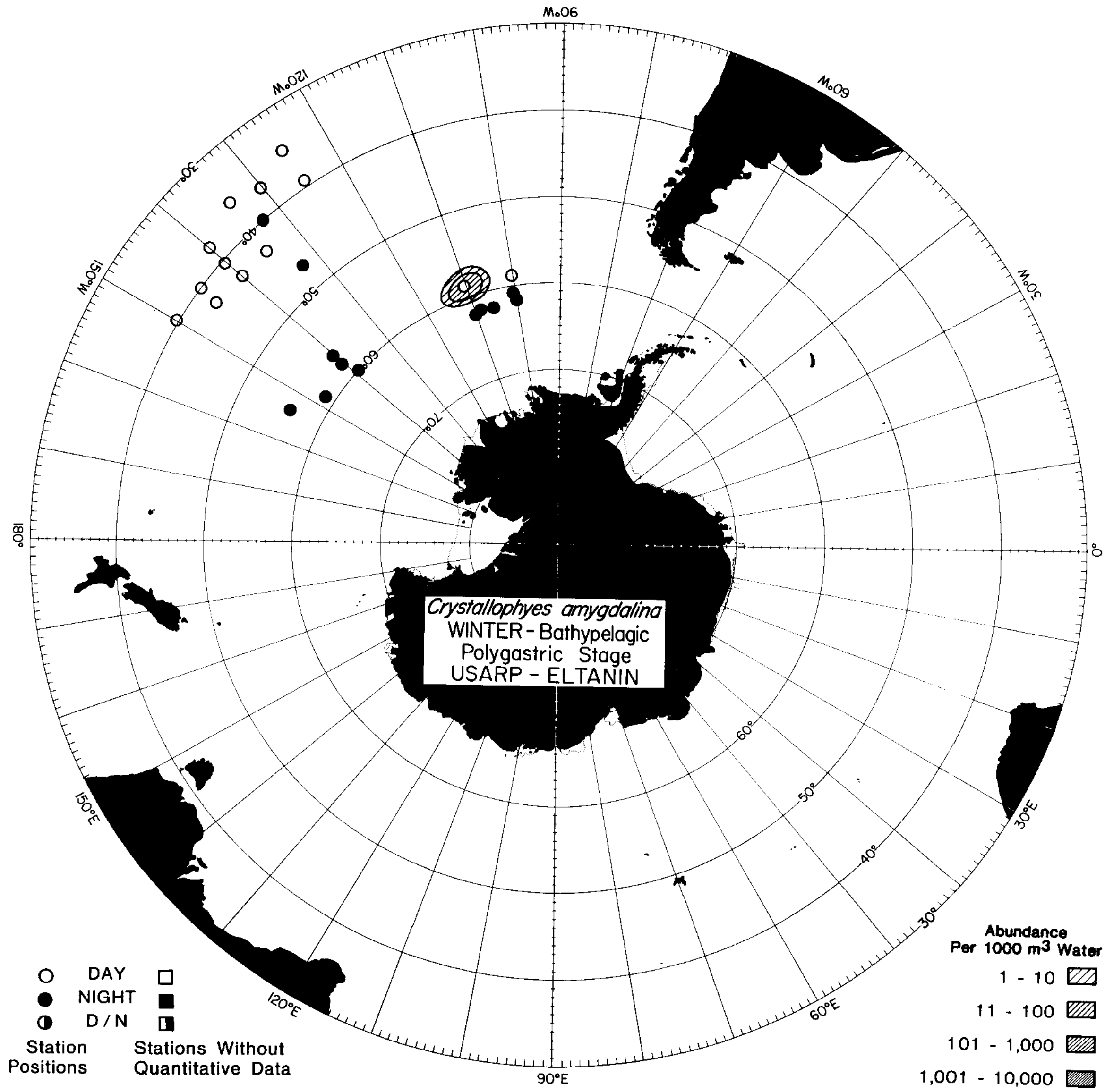
Map A220. The distribution of the polygastric stage of *Crystallophyes amygdalina* during the fall in the bathypelagic zone.



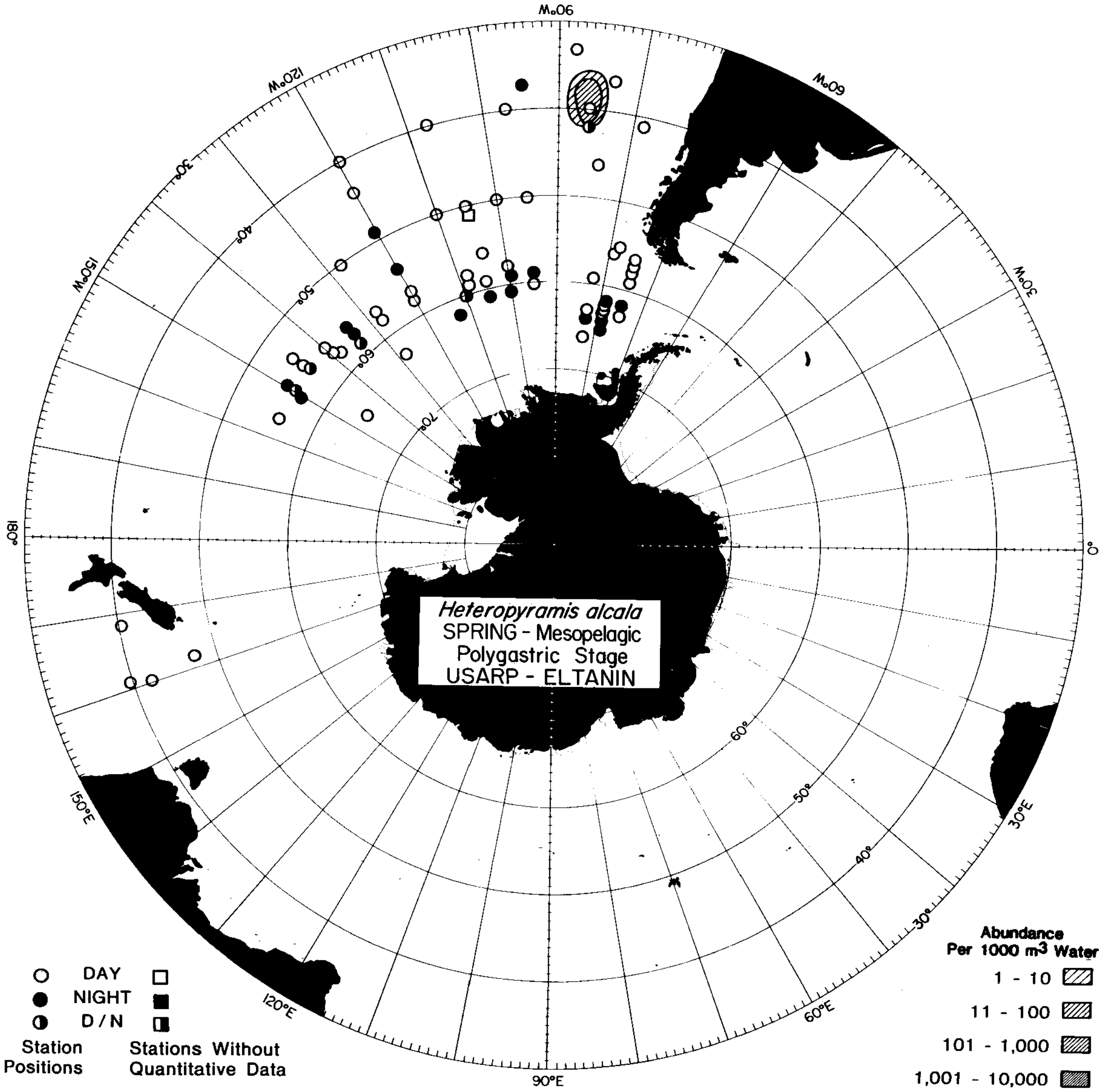
Map A221. The distribution of the polygastric stage of *Crystallophyes amygdalina* during the winter in the epipelagic zone.



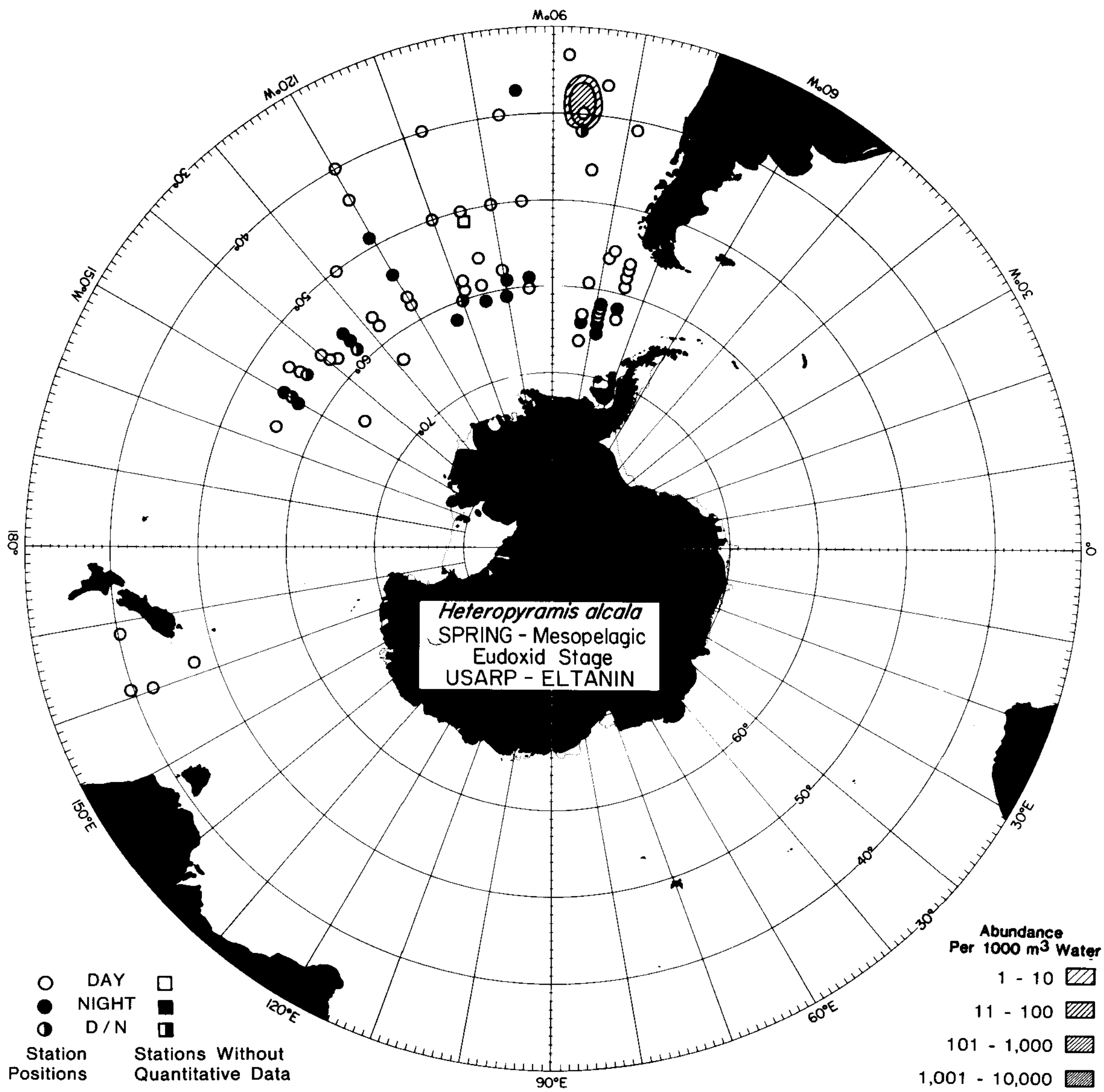
Map A222. The distribution of the polygastric stage of *Crystallophyes amygdalina* during the winter in the mesopelagic zone.



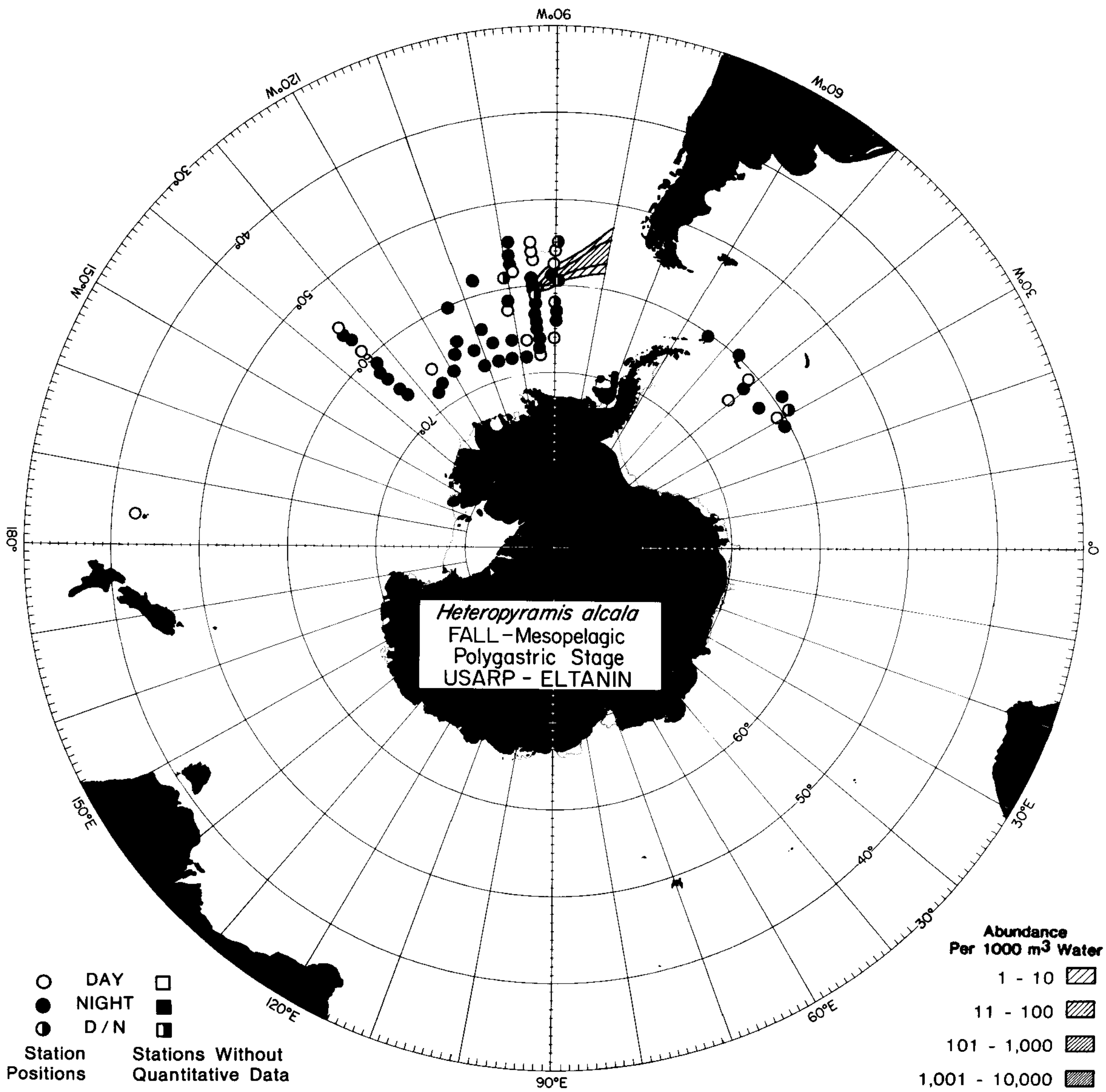
Map A223. The distribution of the polygastric stage of *Crystallophyes amygdalina* during the winter in the bathypelagic zone.



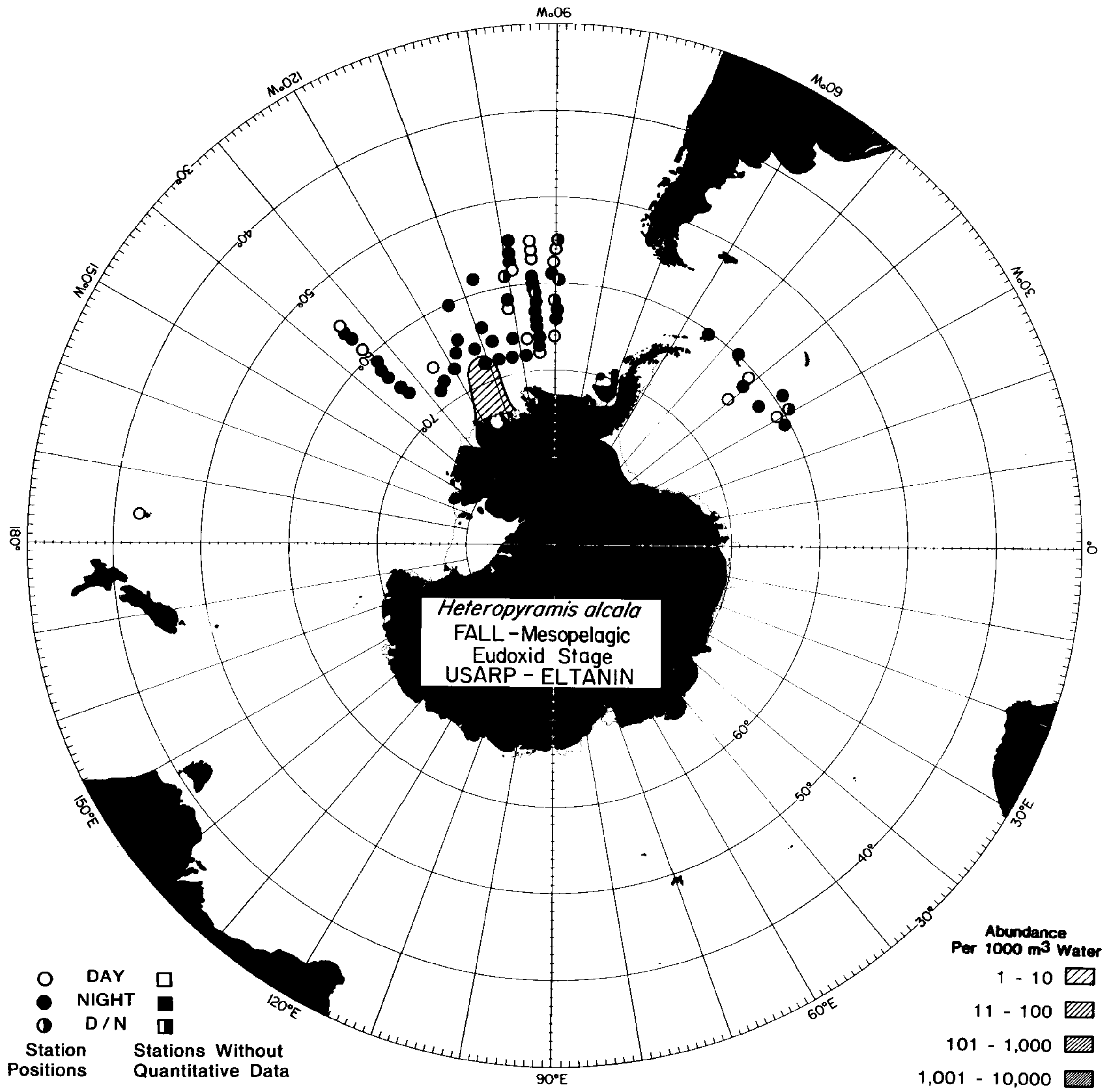
Map A224. The distribution of the polygastric stage of *Heteropyramis alcala* during the spring in the mesopelagic zone.



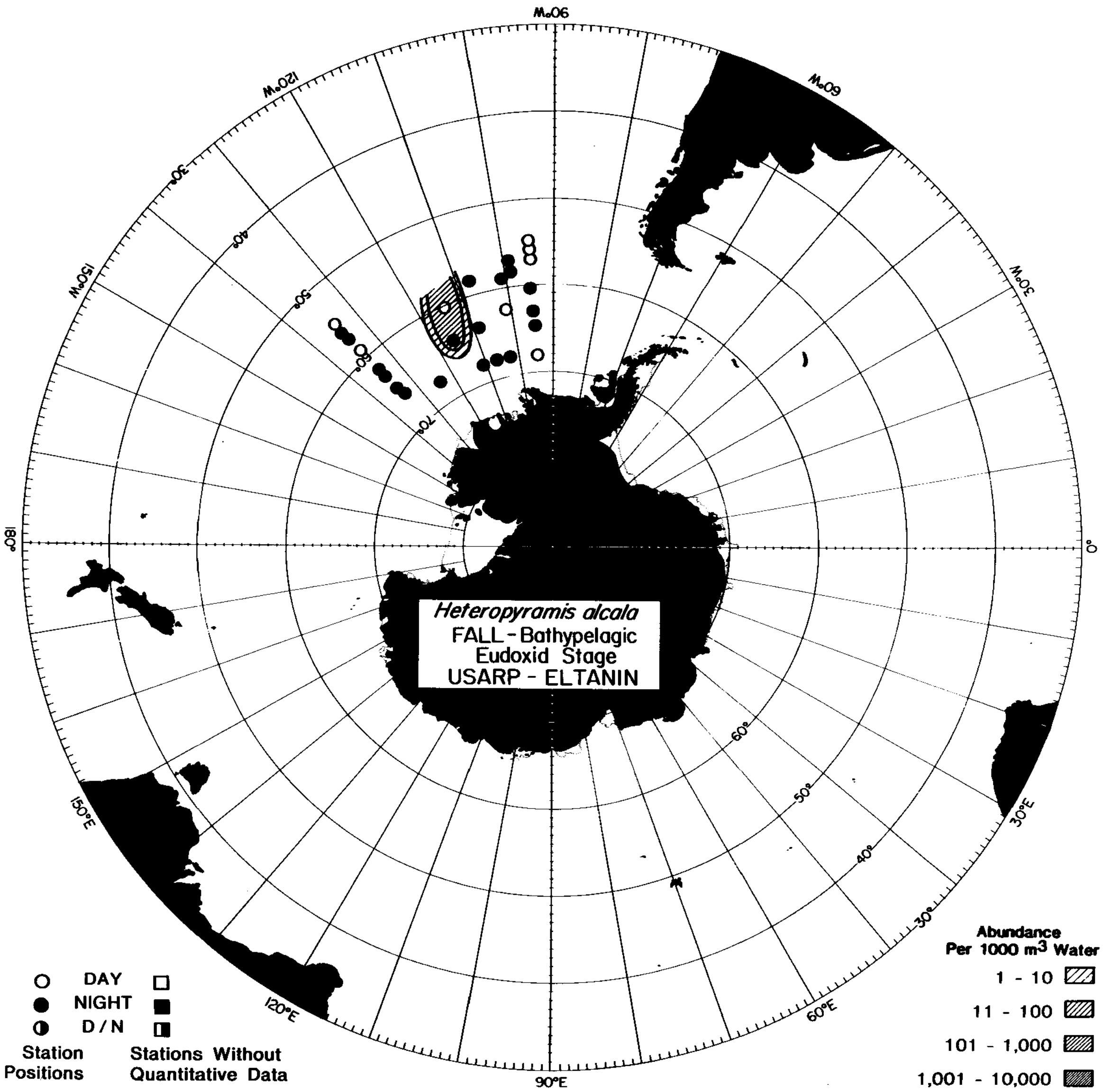
Map A225. The distribution of the eudoxid stage of *Heteropyramis alcala* during the spring in the mesopelagic zone.



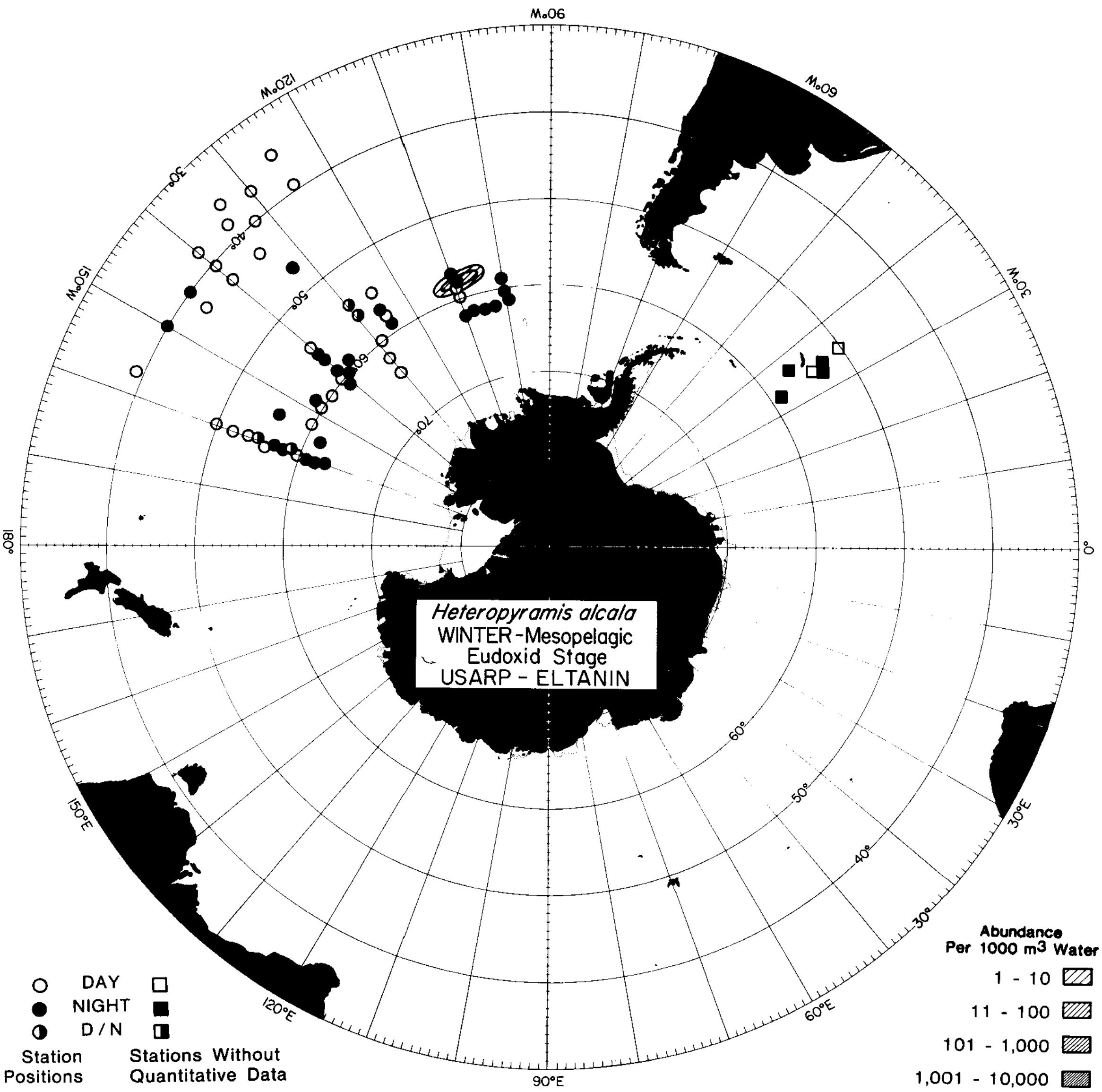
Map A226. The distribution of the polygastric stage of *Heteropyramis alcala* during the fall in the mesopelagic zone.



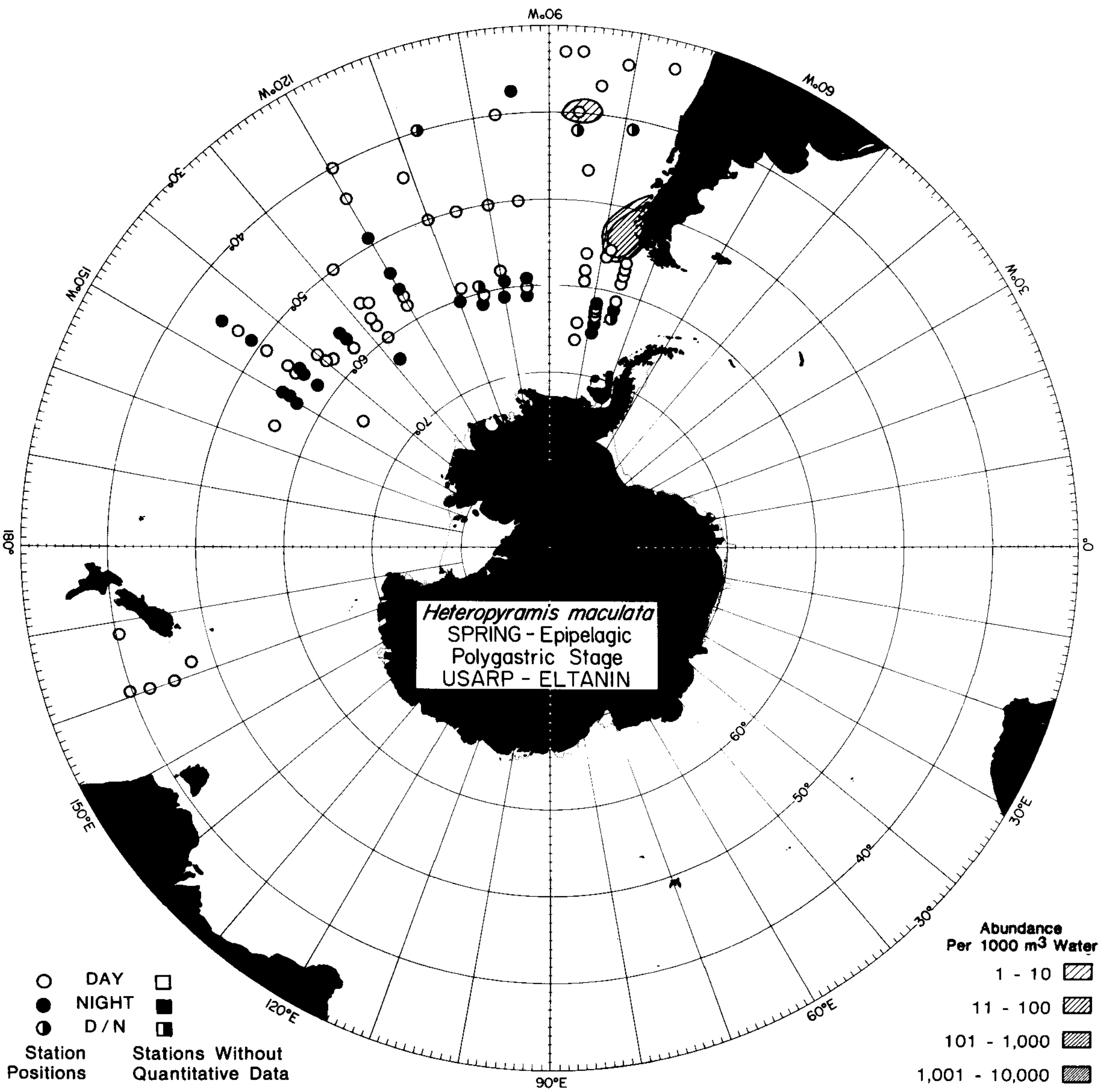
Map A227. The distribution of the eudoxid stage of *Heteropyramis alcala* during the fall in the mesopelagic zone.



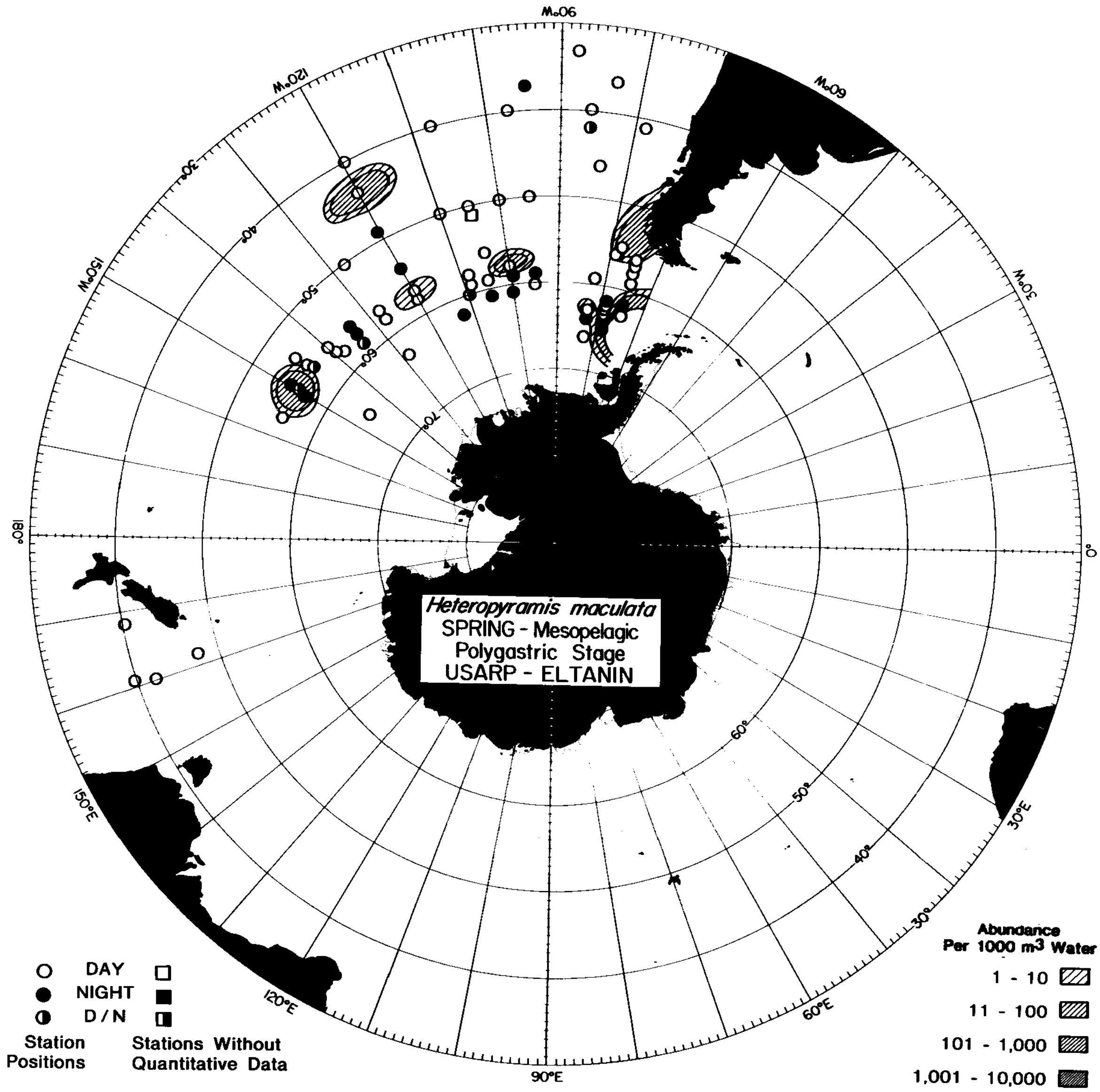
Map A228. The distribution of the eudoxid stage of *Heteropyramis alcala* during the fall in the bathypelagic zone.



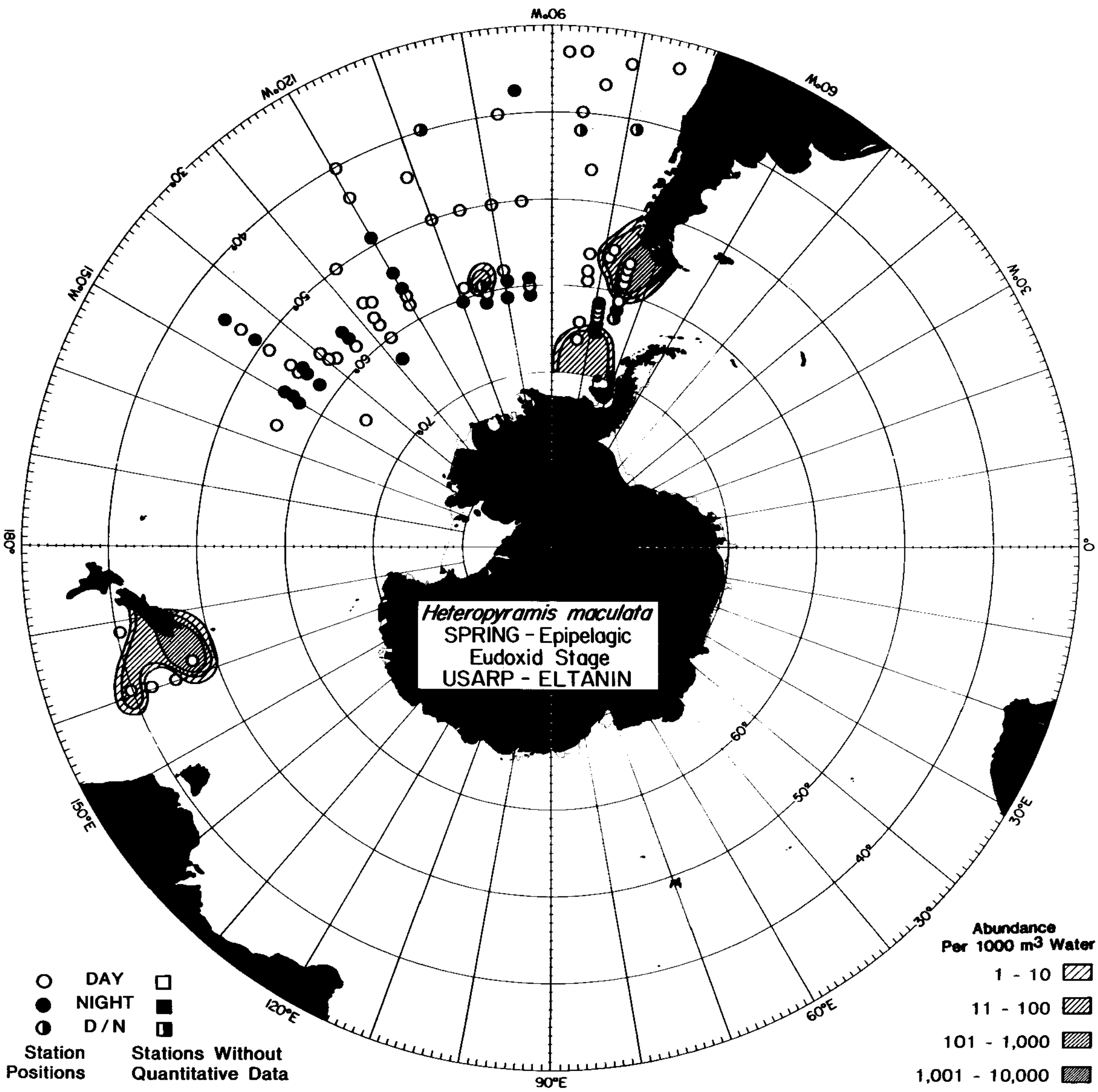
Map A229. The distribution of the eudoxid stage of *Heteropyramis alcala* during the winter in the mesopelagic zone.



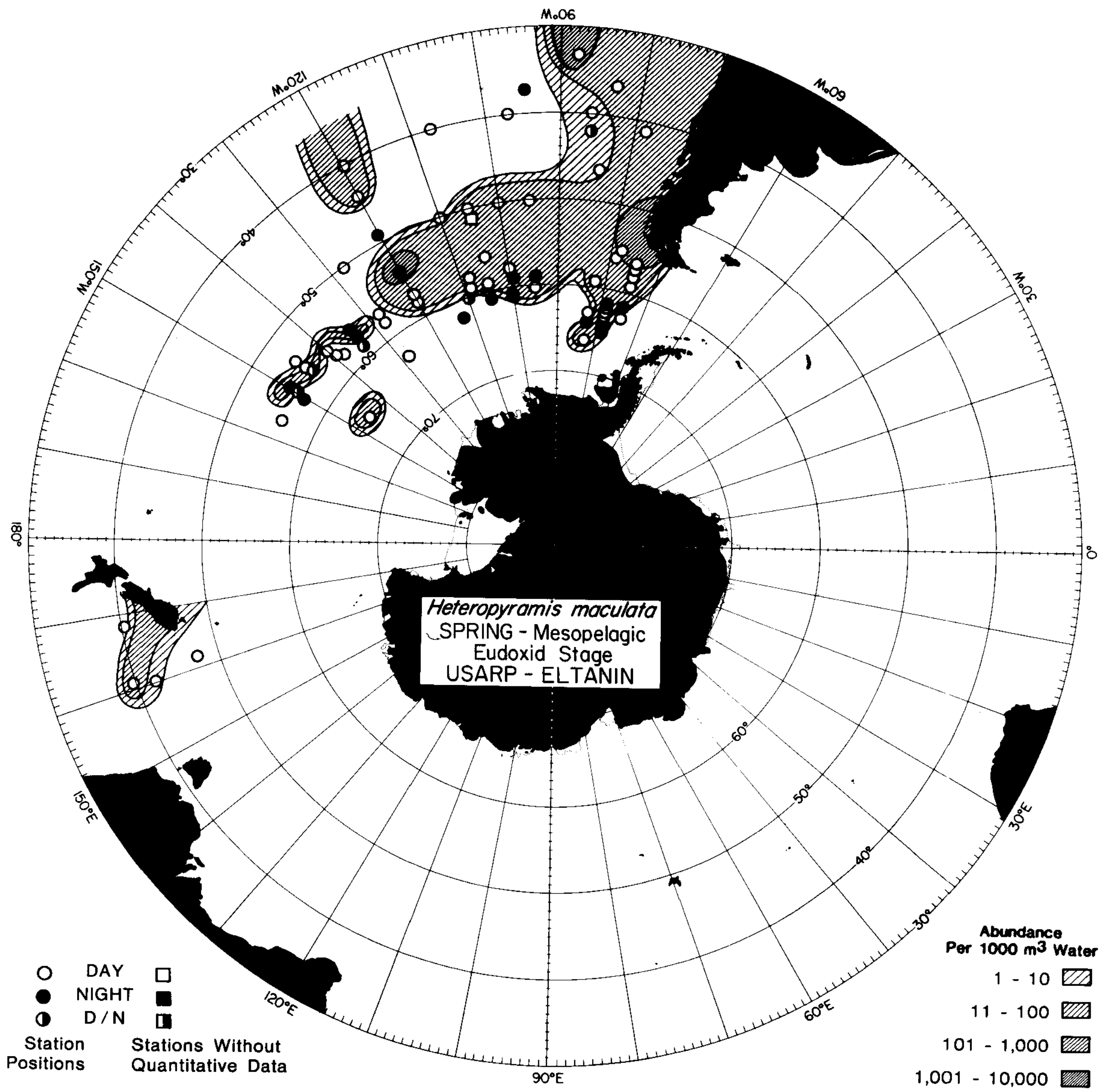
Map A230. The distribution of the polygastric stage of *Heteropyramis maculata* during the spring in the epipelagic zone.



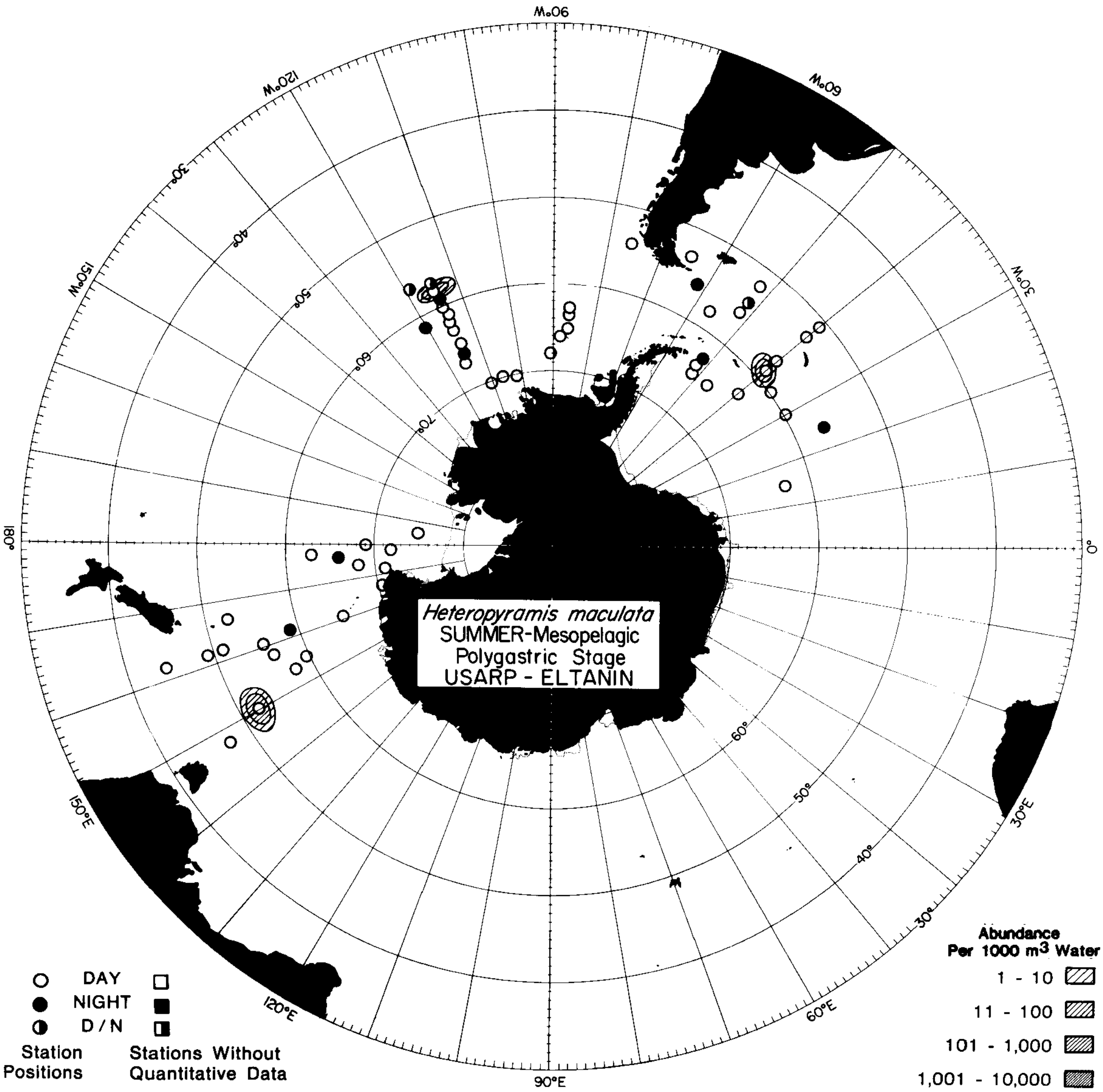
Map A231. The distribution of the polygastric stage of *Heteropyramis maculata* during the spring in the mesopelagic zone.



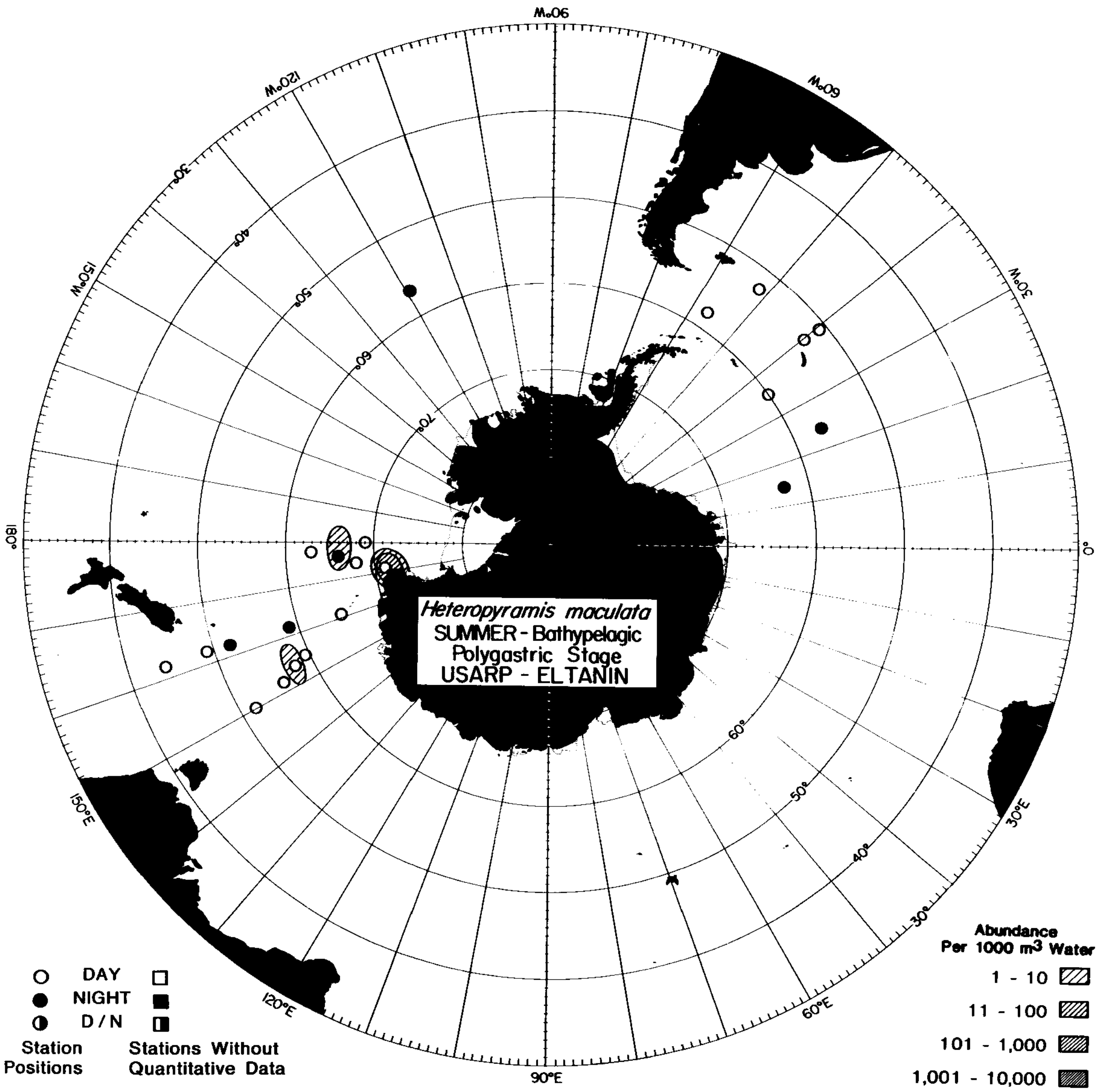
Map A232. The distribution of the eudoxid stage of *Heteropyramis maculata* during the spring in the epipelagic zone.



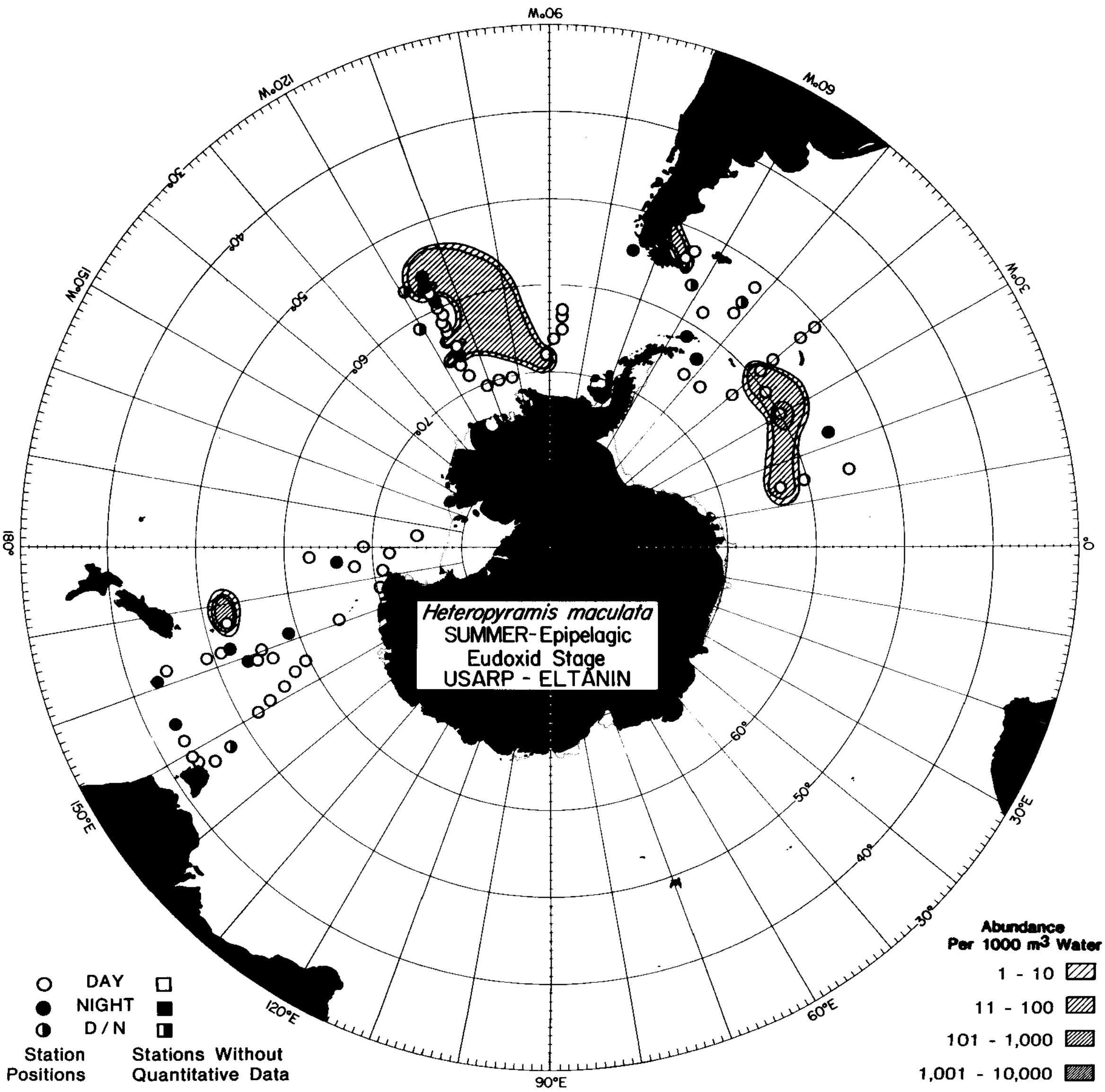
Map A233. The distribution of the eudoxid stage of *Heteropyramis maculata* during the spring in the mesopelagic zone.



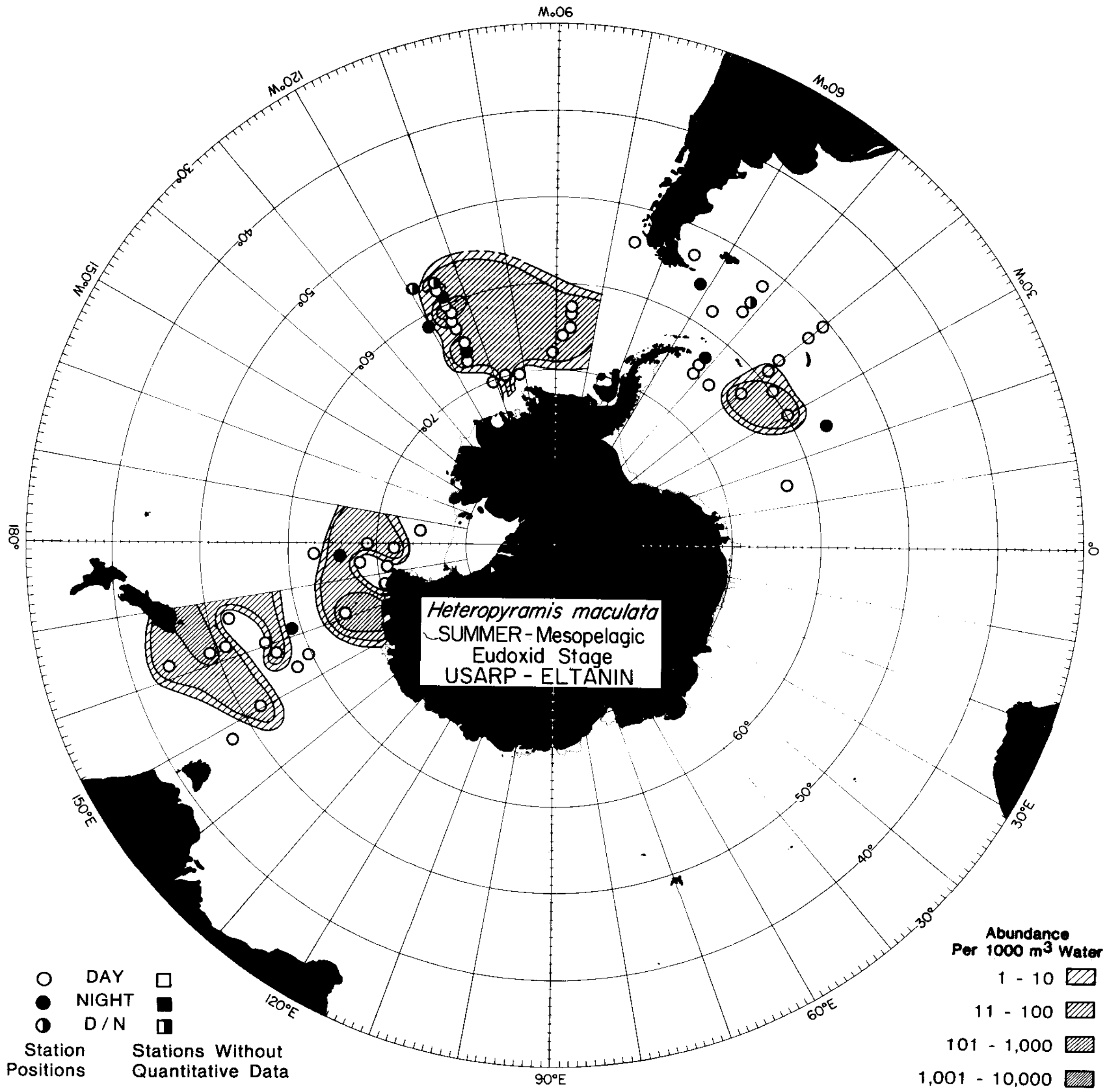
Map A234. The distribution of the polygastric stage of *Heteropyramis maculata* during the summer in the mesopelagic zone.



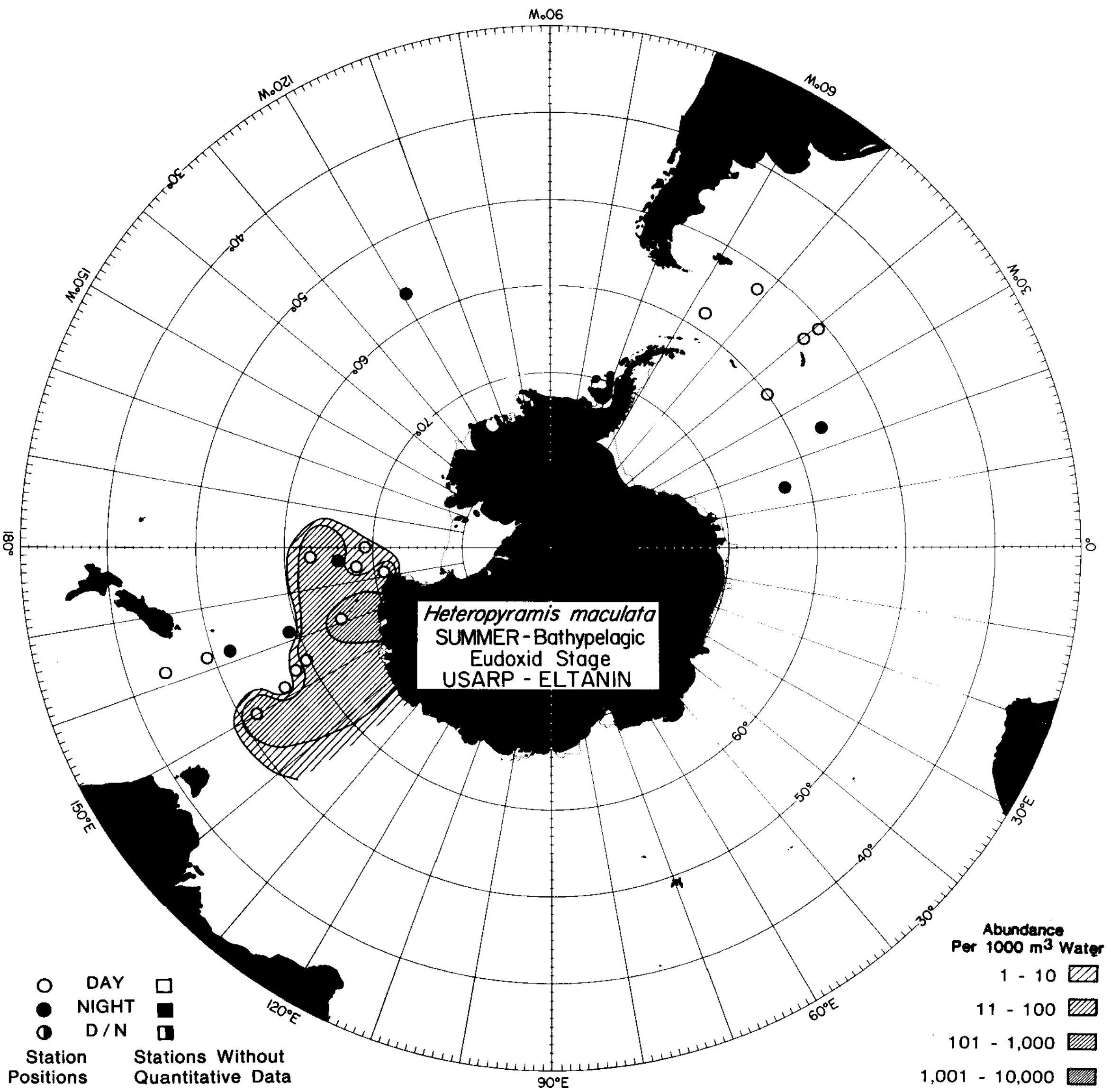
Map A235. The distribution of the polygastric stage of *Heteropyramis maculata* during the summer in the bathypelagic zone.



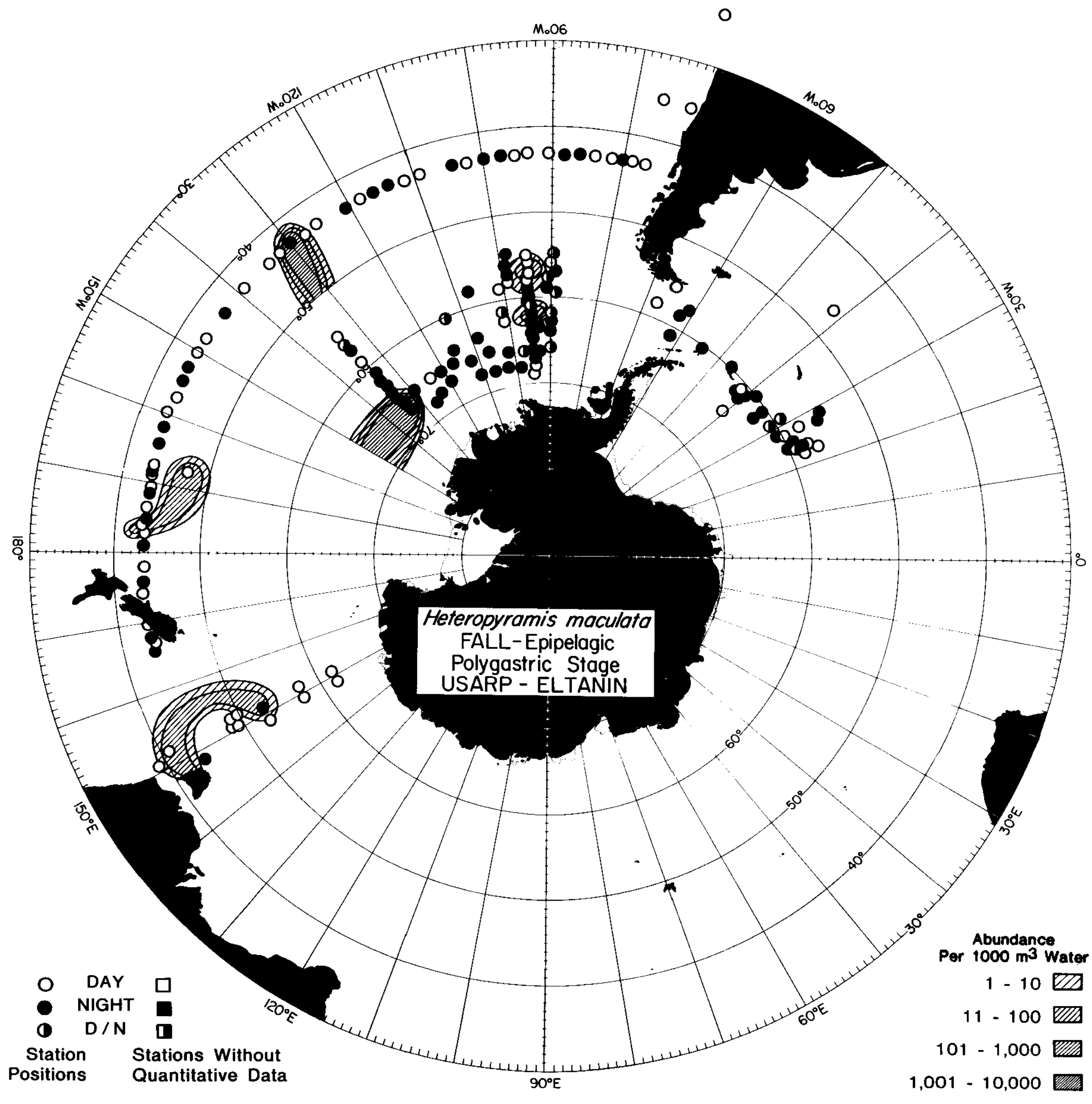
Map A236. The distribution of the eudoxid stage of *Heteropyramis maculata* during the summer in the epipelagic zone.



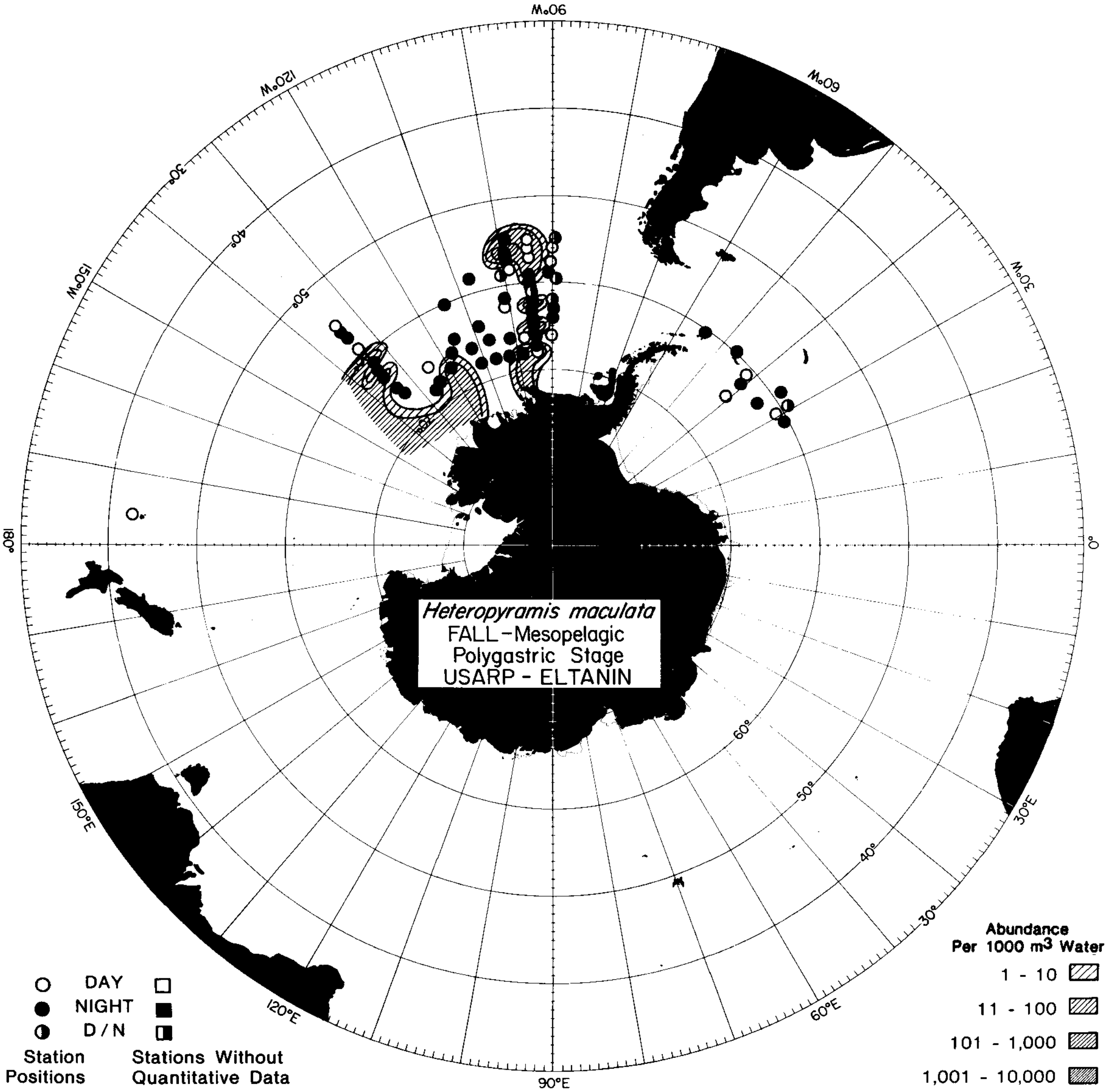
Map A237. The distribution of the eudoxid stage of *Heteropyramis maculata* during the summer in the mesopelagic zone.



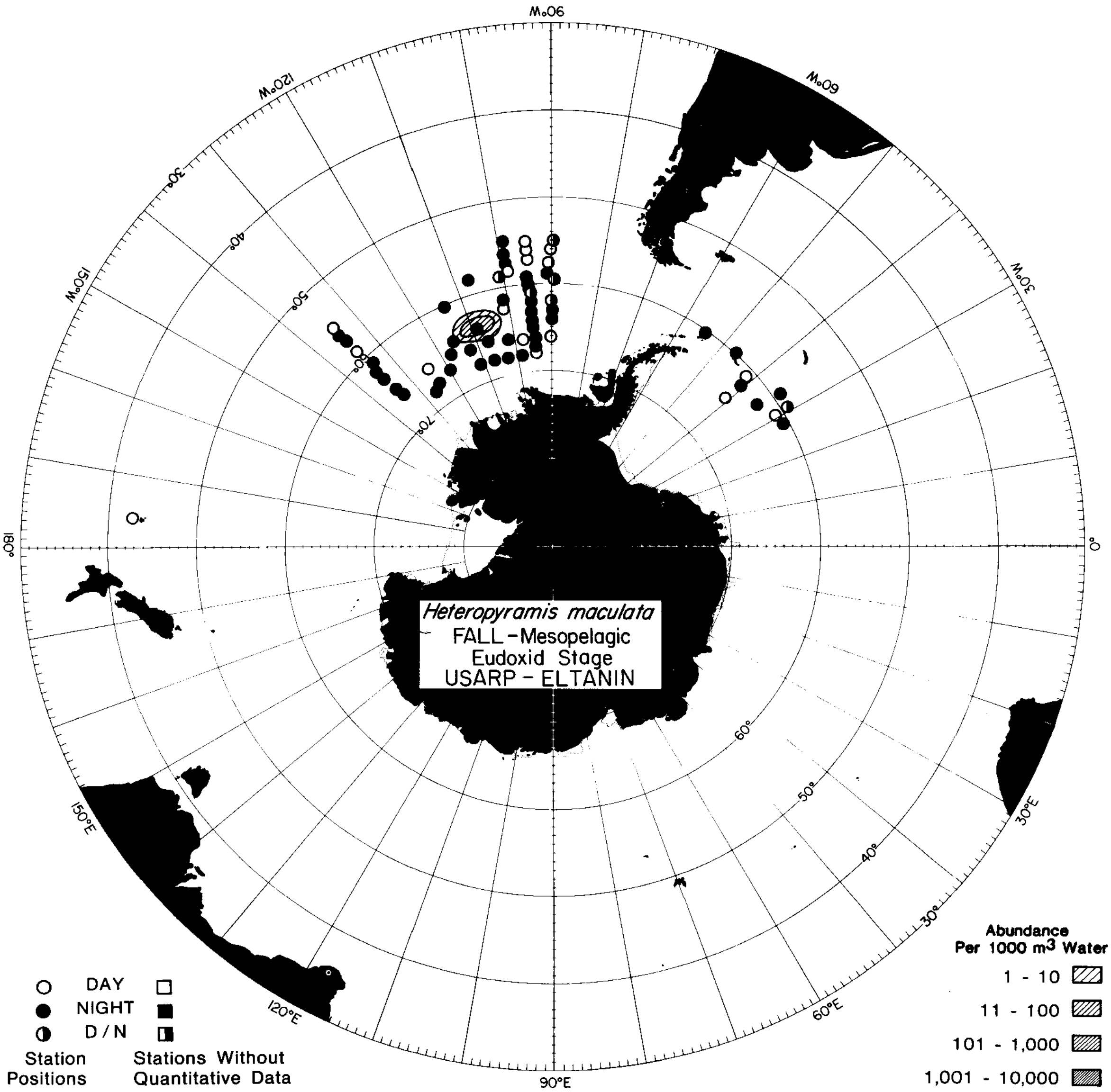
Map A238. The distribution of the eudoxid stage of *Heteropyramis maculata* during the summer in the bathypelagic zone.



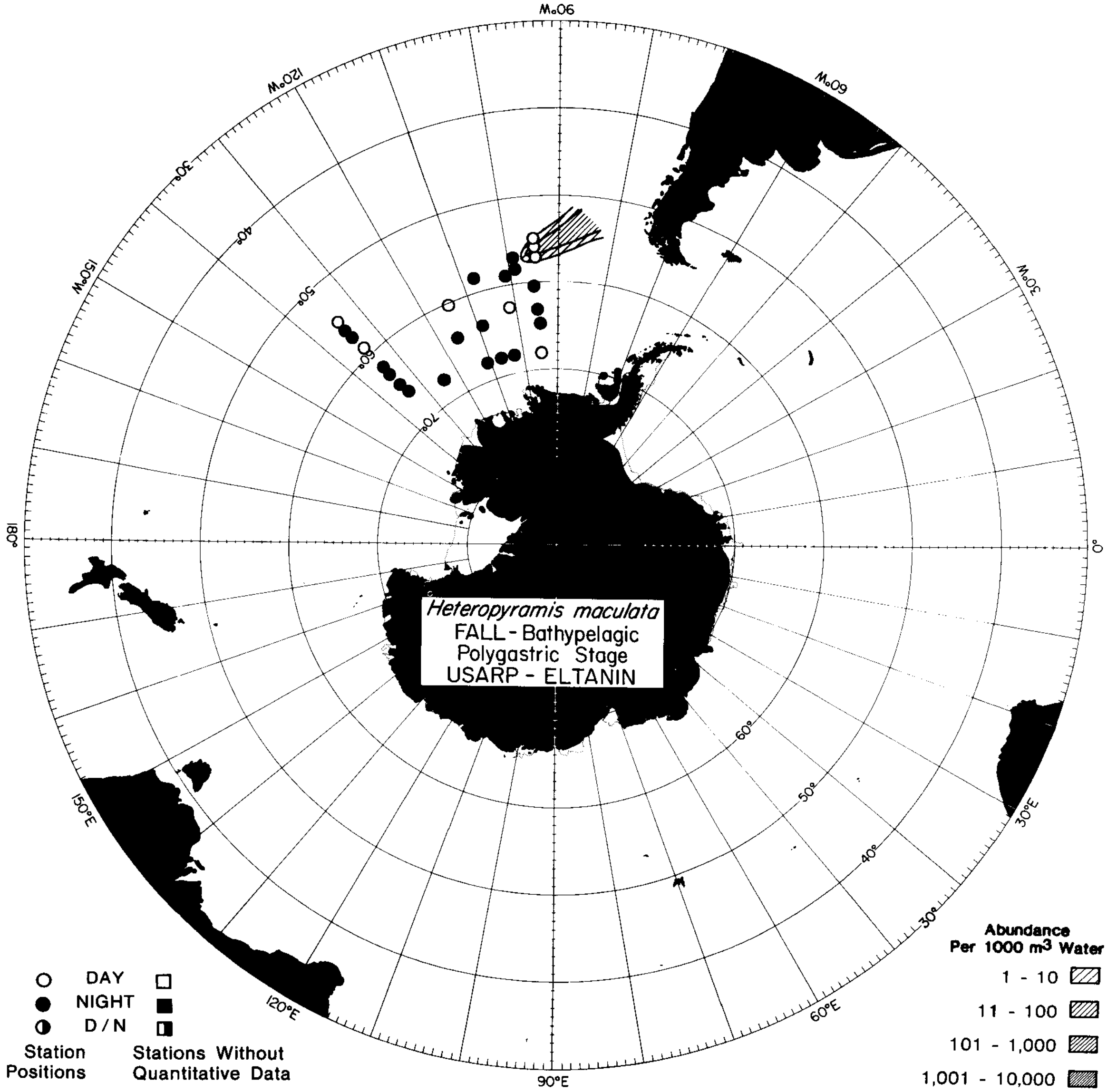
Map A239. The distribution of the polygastric stage of *Heteropyramis maculata* during the fall in the epipelagic zone.



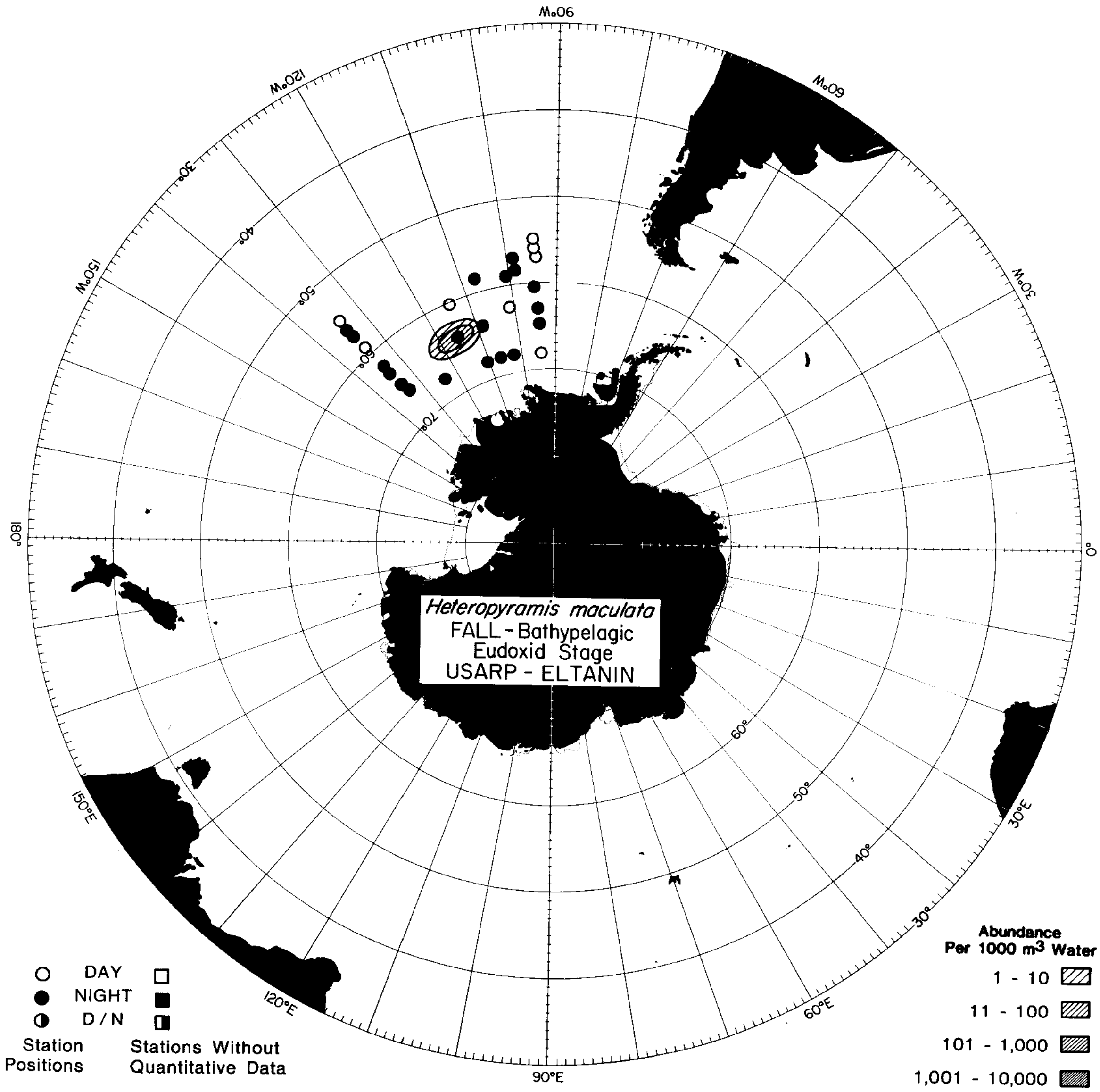
Map A240. The distribution of the polygastric stage of *Heteropyramis maculata* during the fall in the mesopelagic zone.



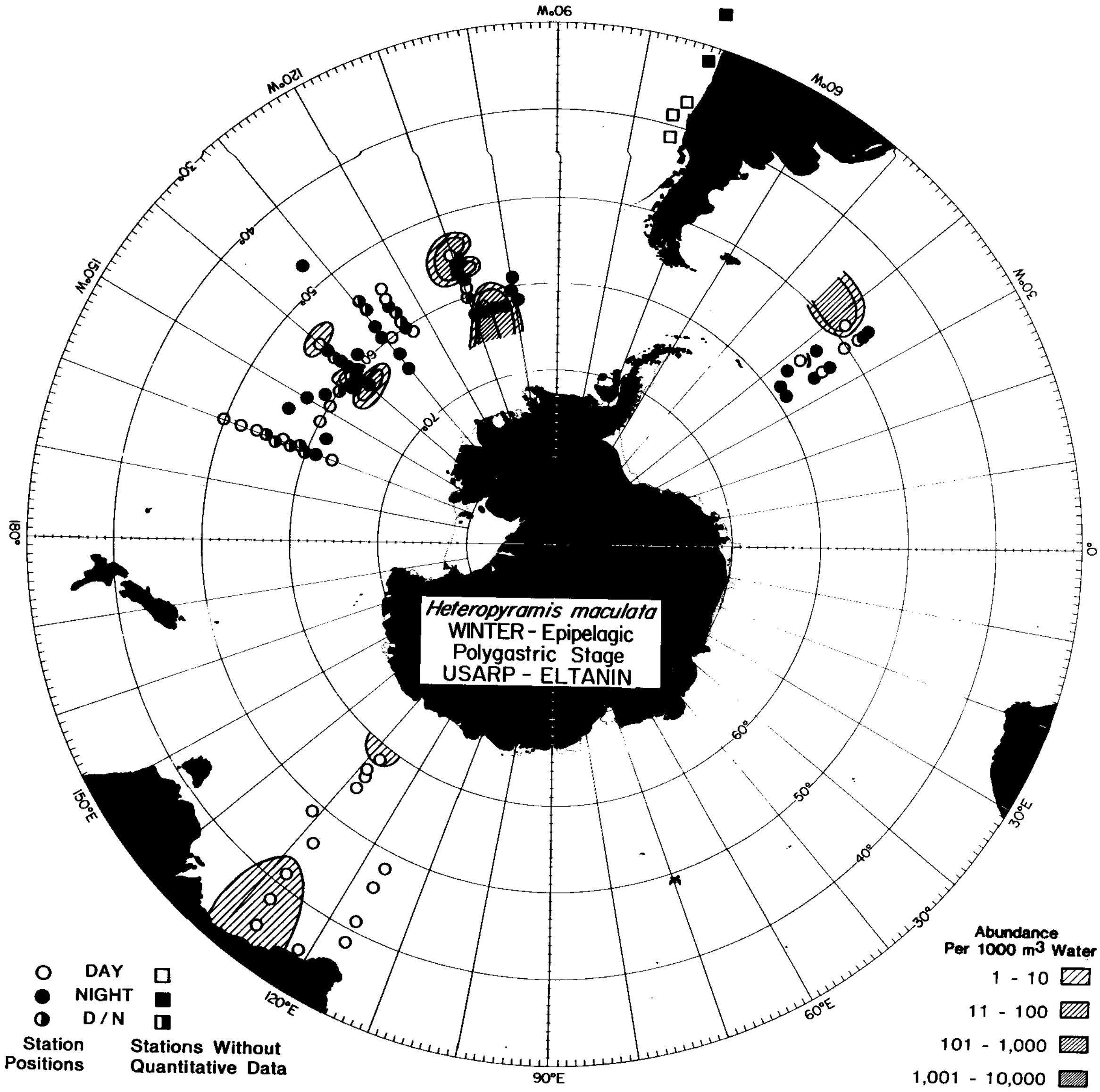
Map A241. The distribution of the eudoxid stage of *Heteropyramis maculata* during the fall in the mesopelagic zone.



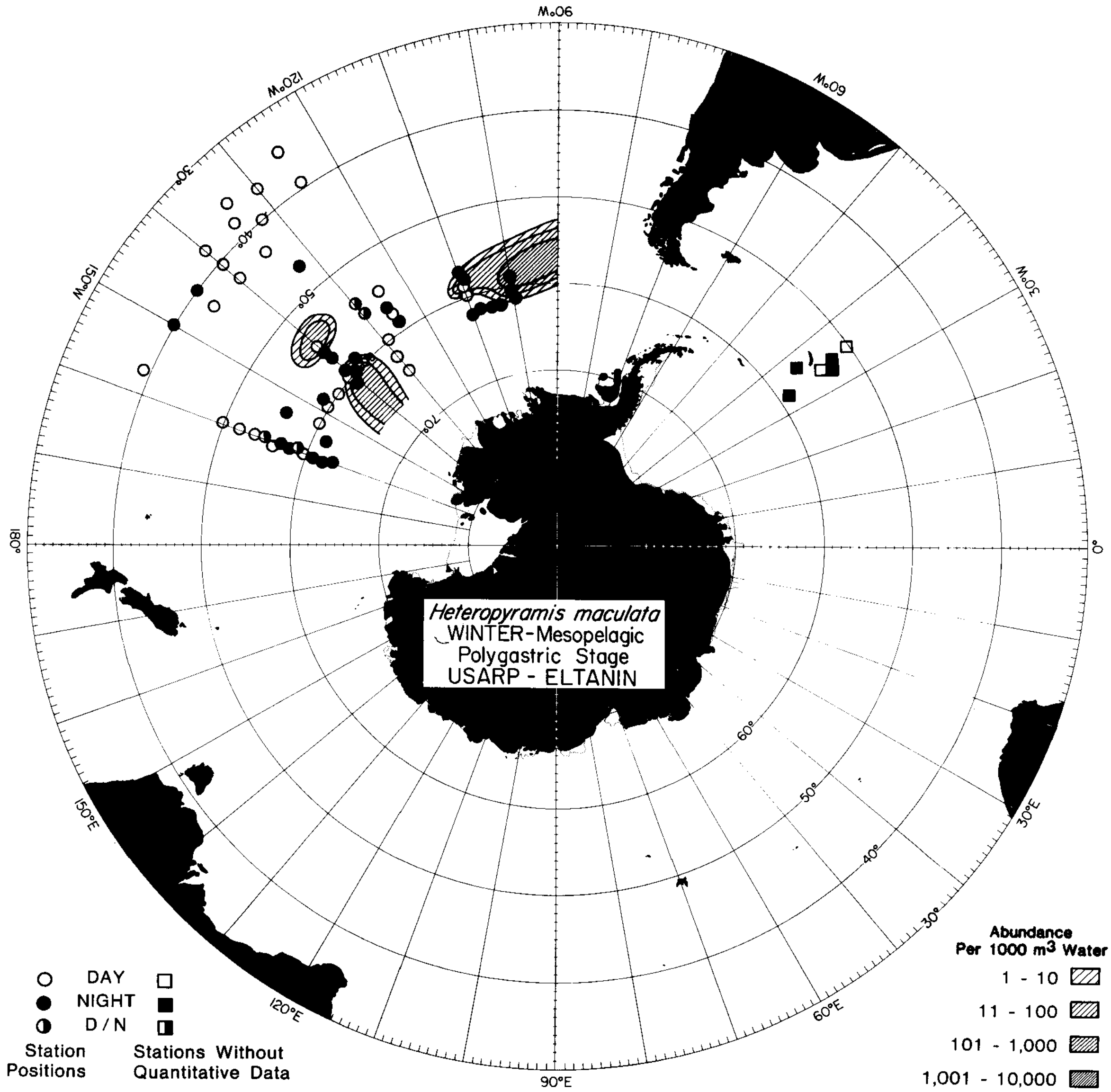
Map A242. The distribution of the polygastric stage of *Heteropyramis maculata* during the fall in the bathypelagic zone.



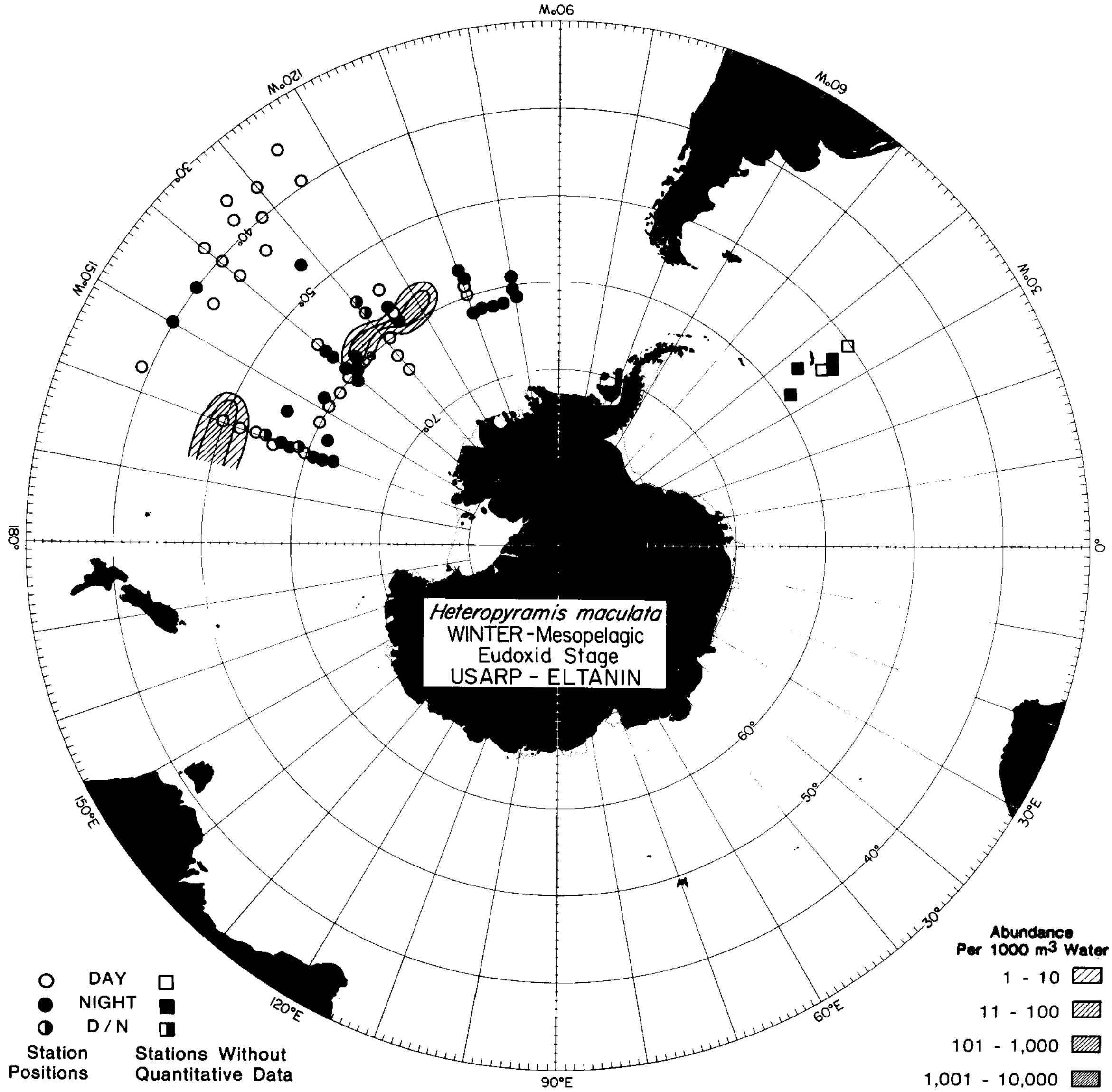
Map A243. The distribution of the eudoxid stage of *Heteropyramis maculata* during the fall in the bathypelagic zone.



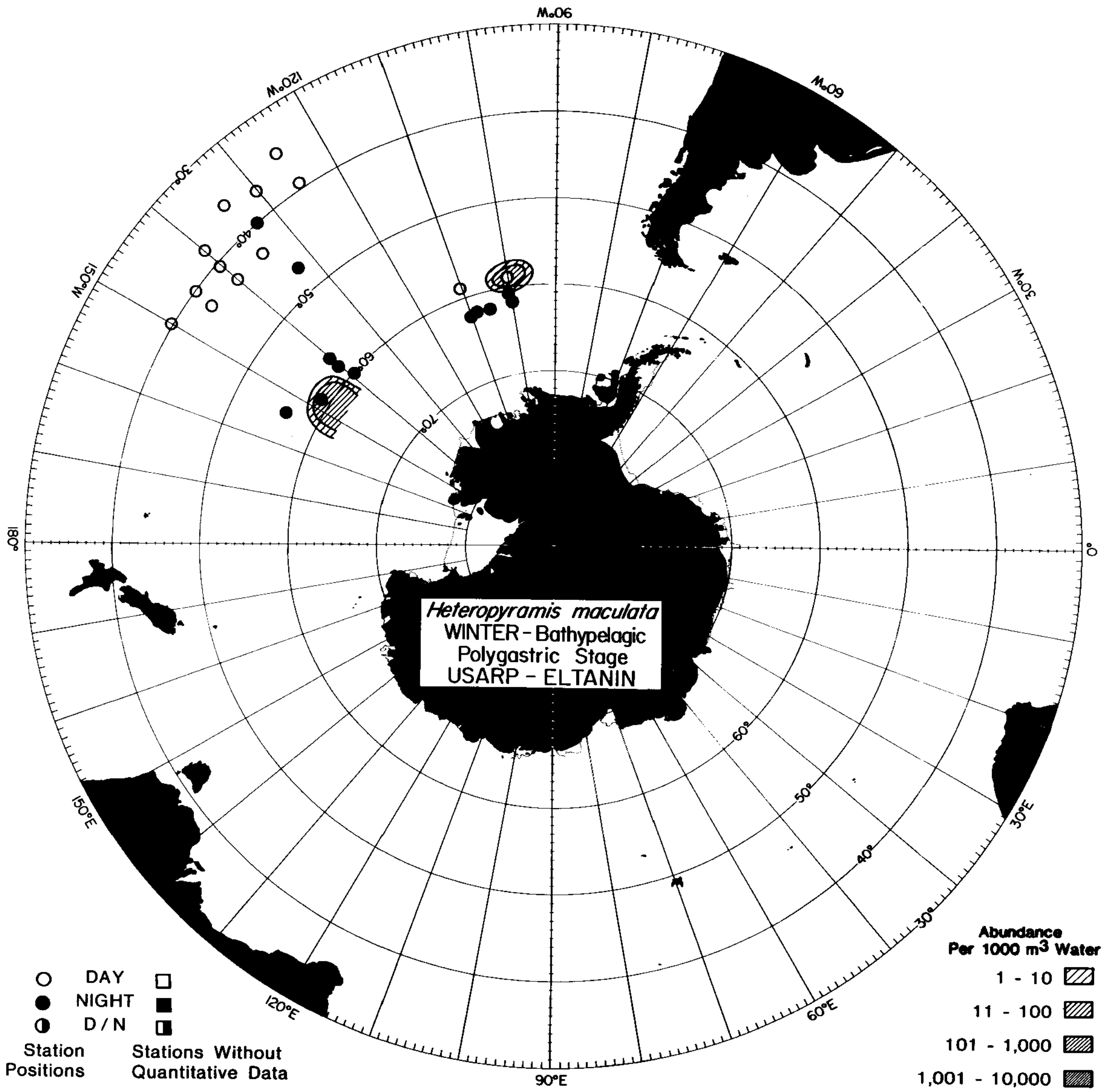
Map A244. The distribution of the polygastric stage of *Heteropyramis maculata* during the winter in the epipelagic zone.



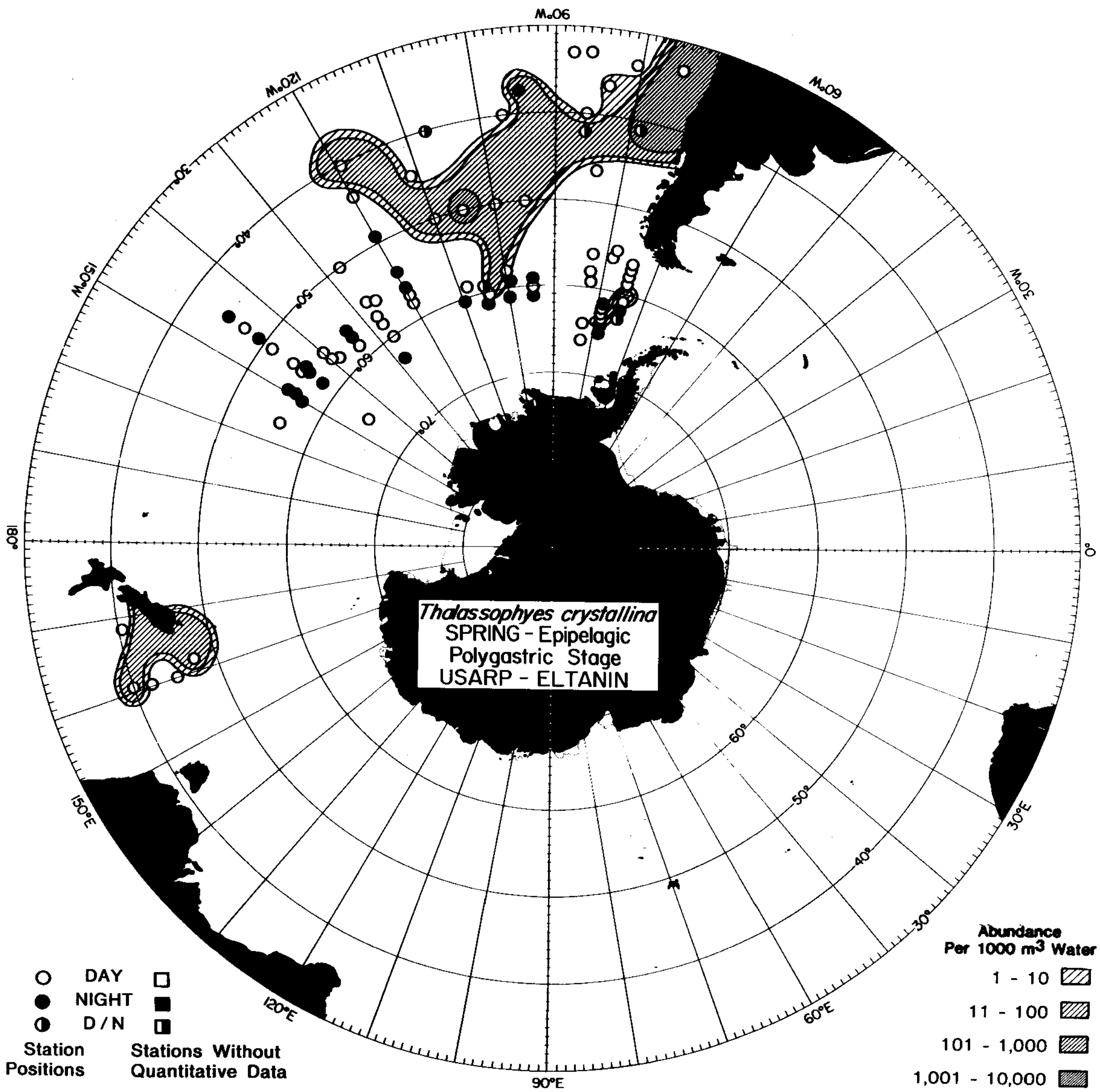
Map A245. The distribution of the polygastric stage of *Heteropyramis maculata* during the winter in the mesopelagic zone.



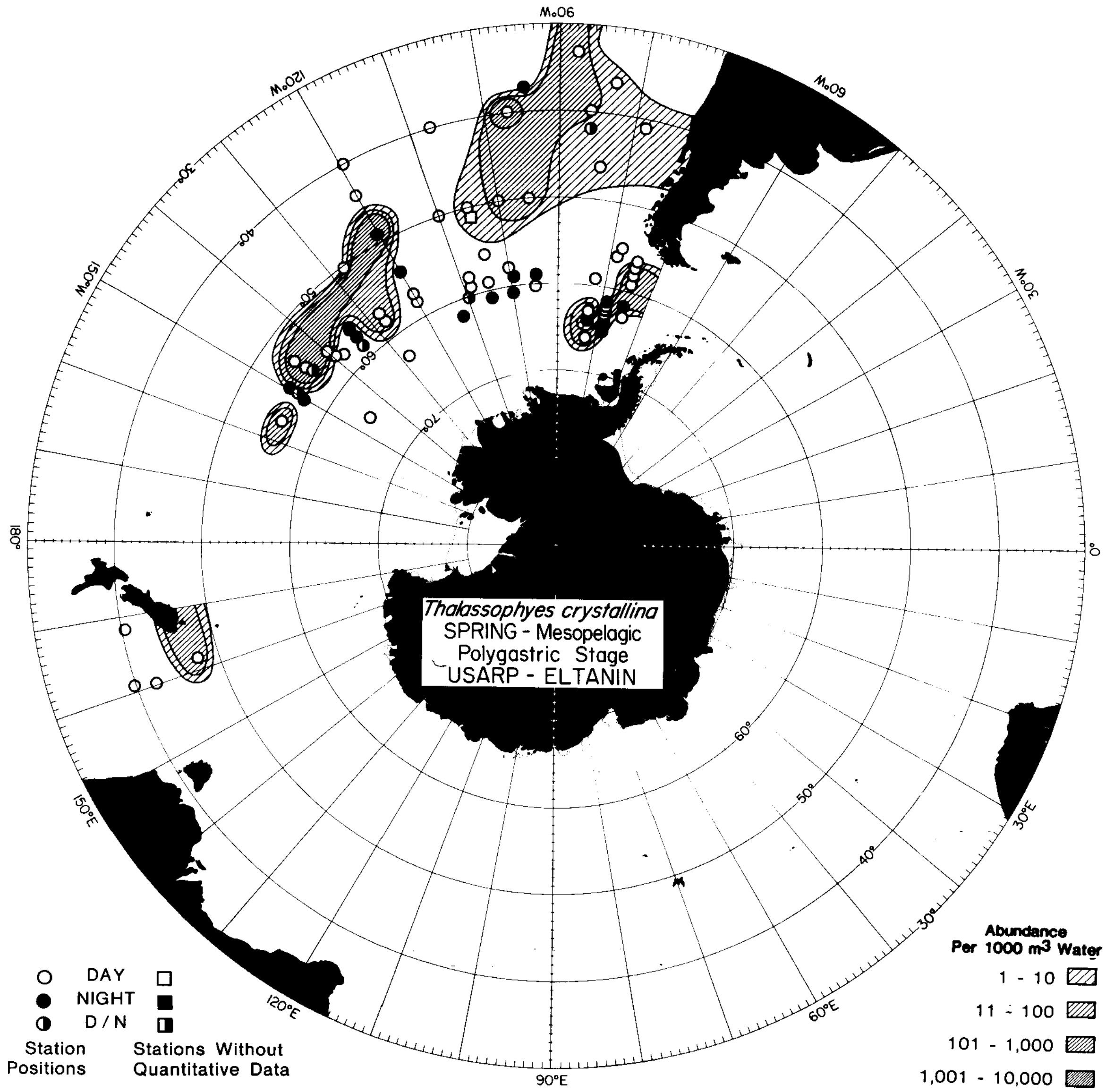
Map A246. The distribution of the eudoxid stage of *Heteropyramis maculata* during the winter in the mesopelagic zone.



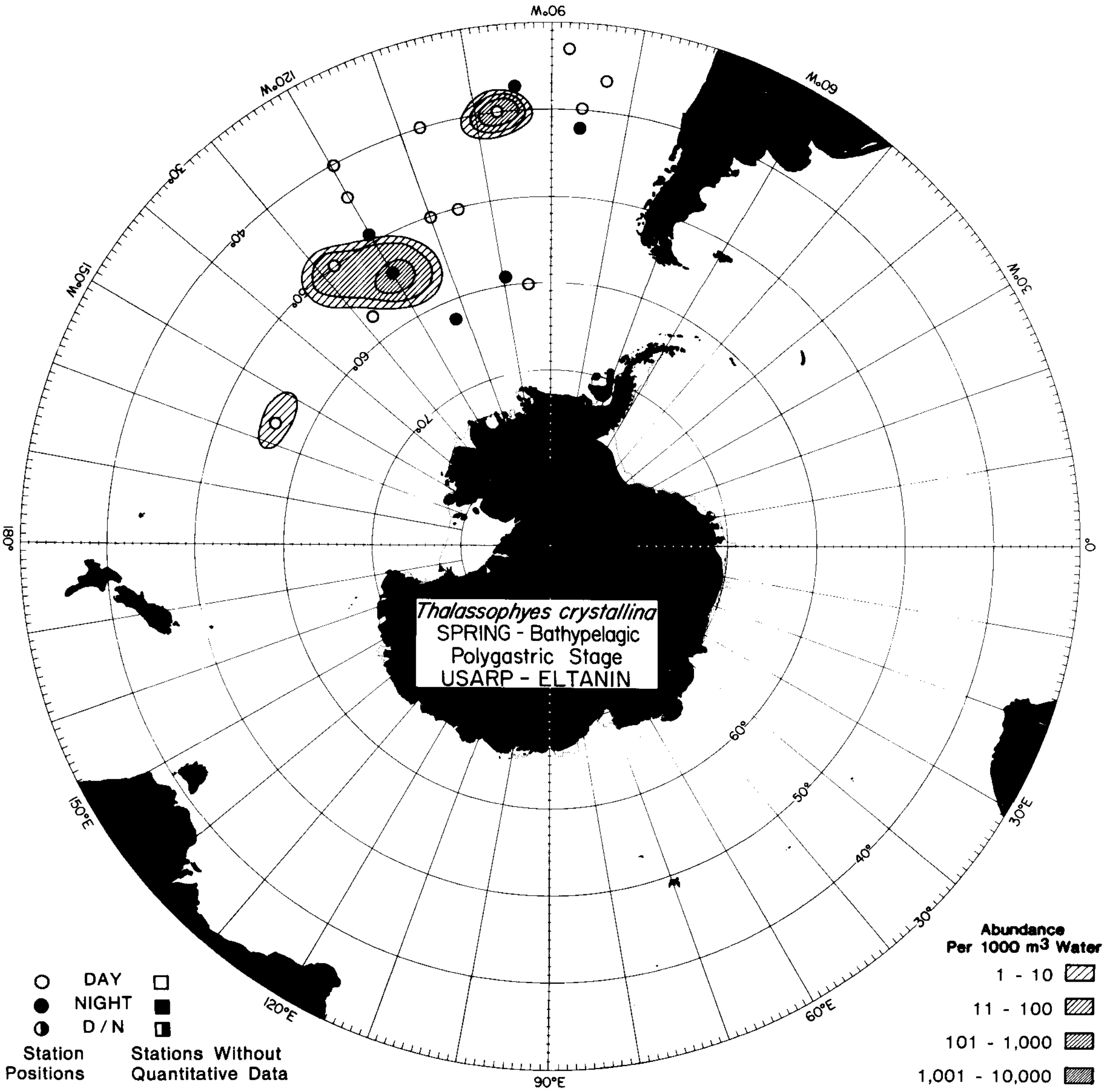
Map A247. The distribution of the polygastric stage of *Heteropyramis maculata* during the winter in the bathypelagic zone.



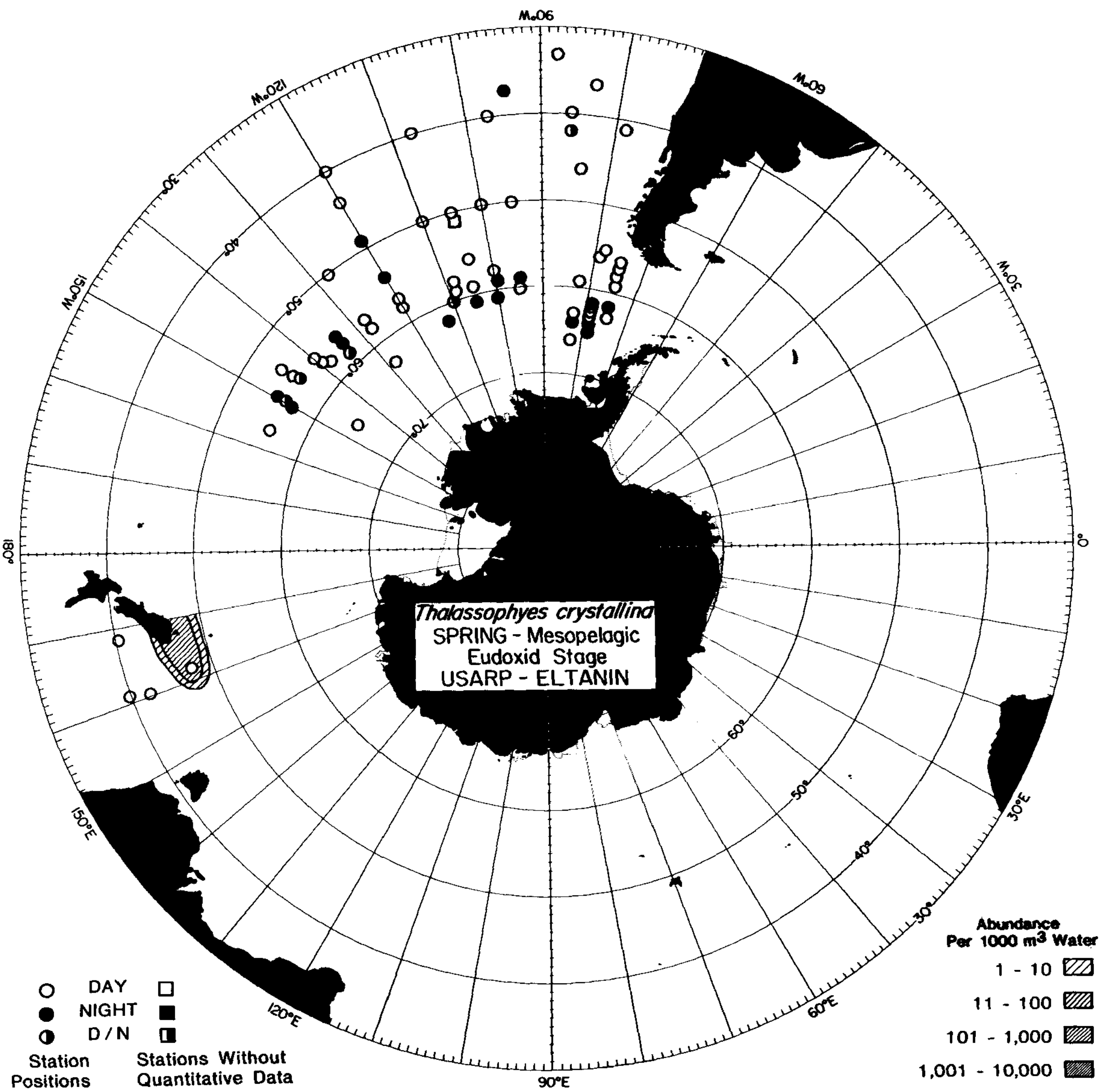
Map A248. The distribution of the polygastric stage of *Thalassophyes crystallina* during the spring in the epipelagic zone.



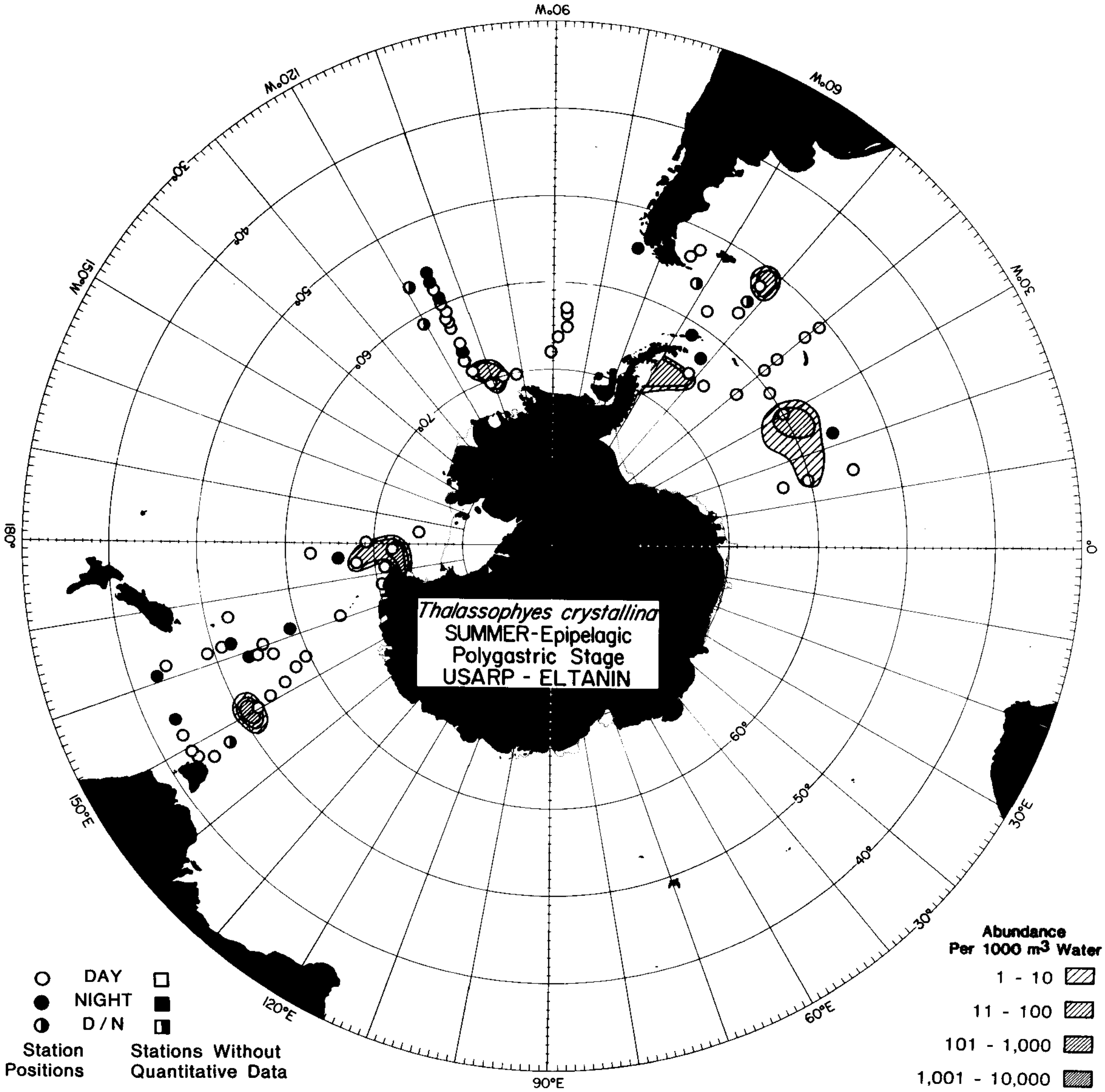
Map A249. The distribution of the polygastric stage of *Thalassophyes crystallina* during the spring in the mesopelagic zone.



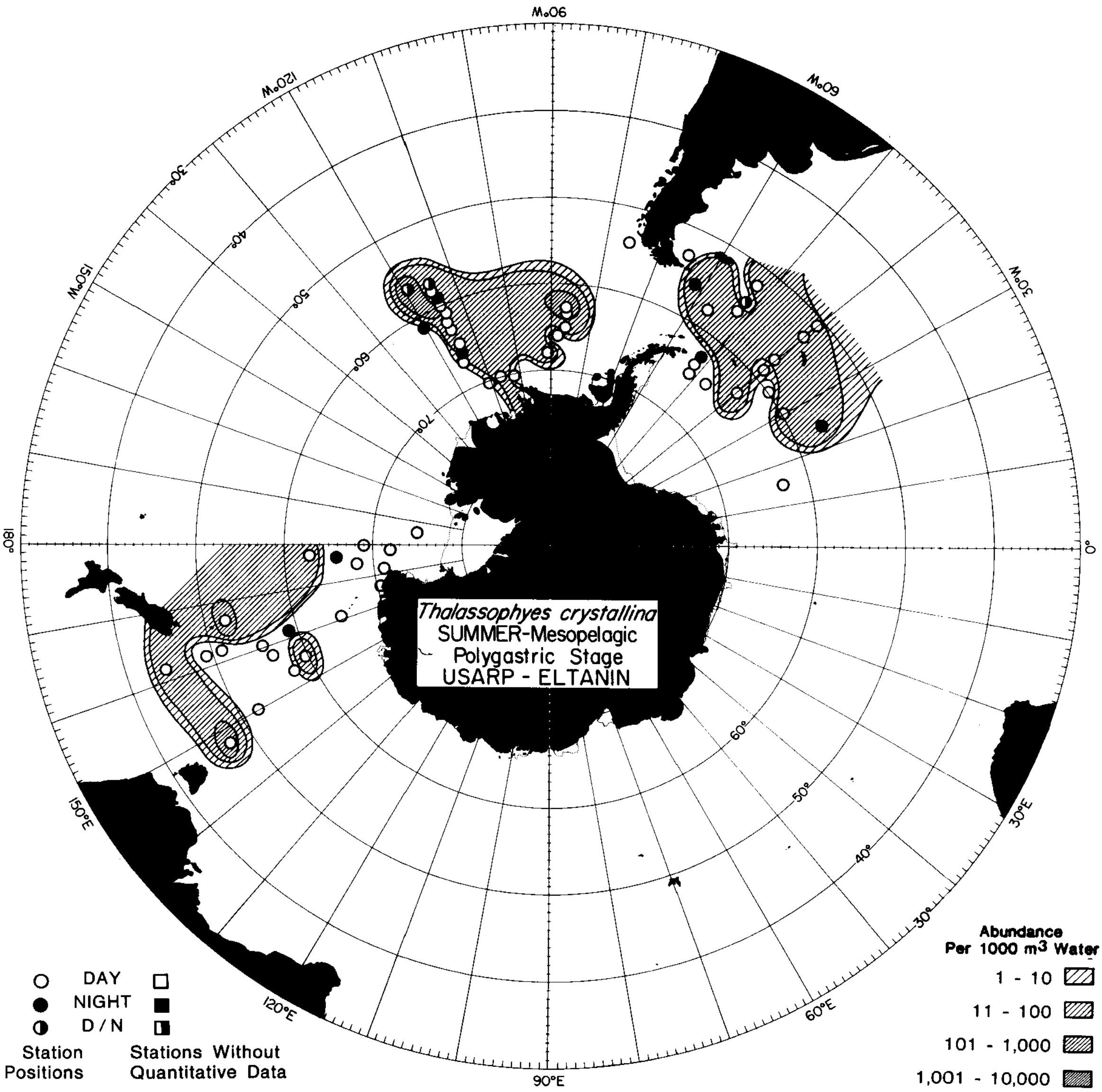
Map A250. The distribution of the polygastric stage of *Thalassophyes crystallina* during the spring in the bathypelagic zone.



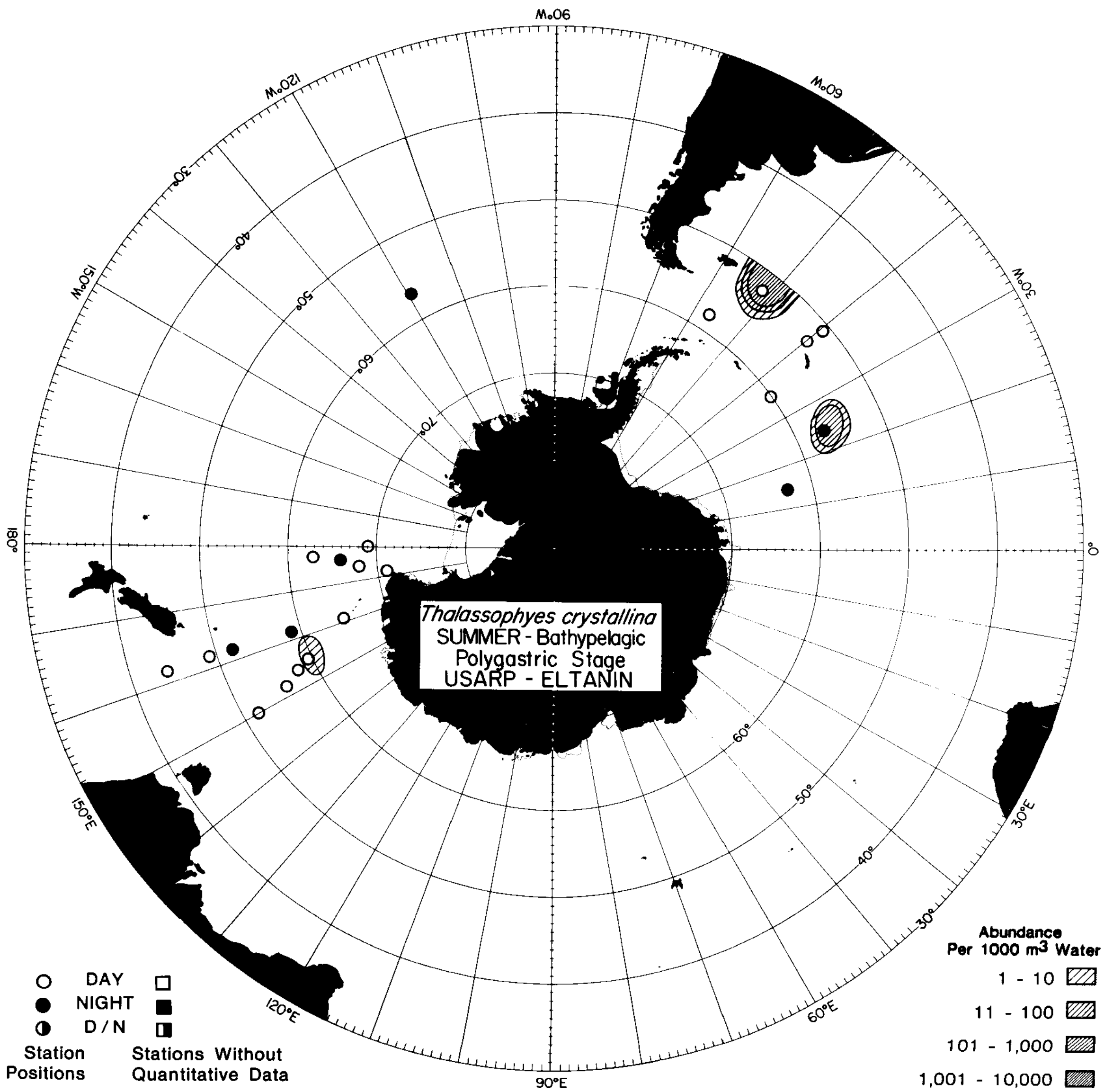
Map A251. The distribution of the eudoxid stage of *Thalassophyes crystallina* during the spring in the mesopelagic zone.



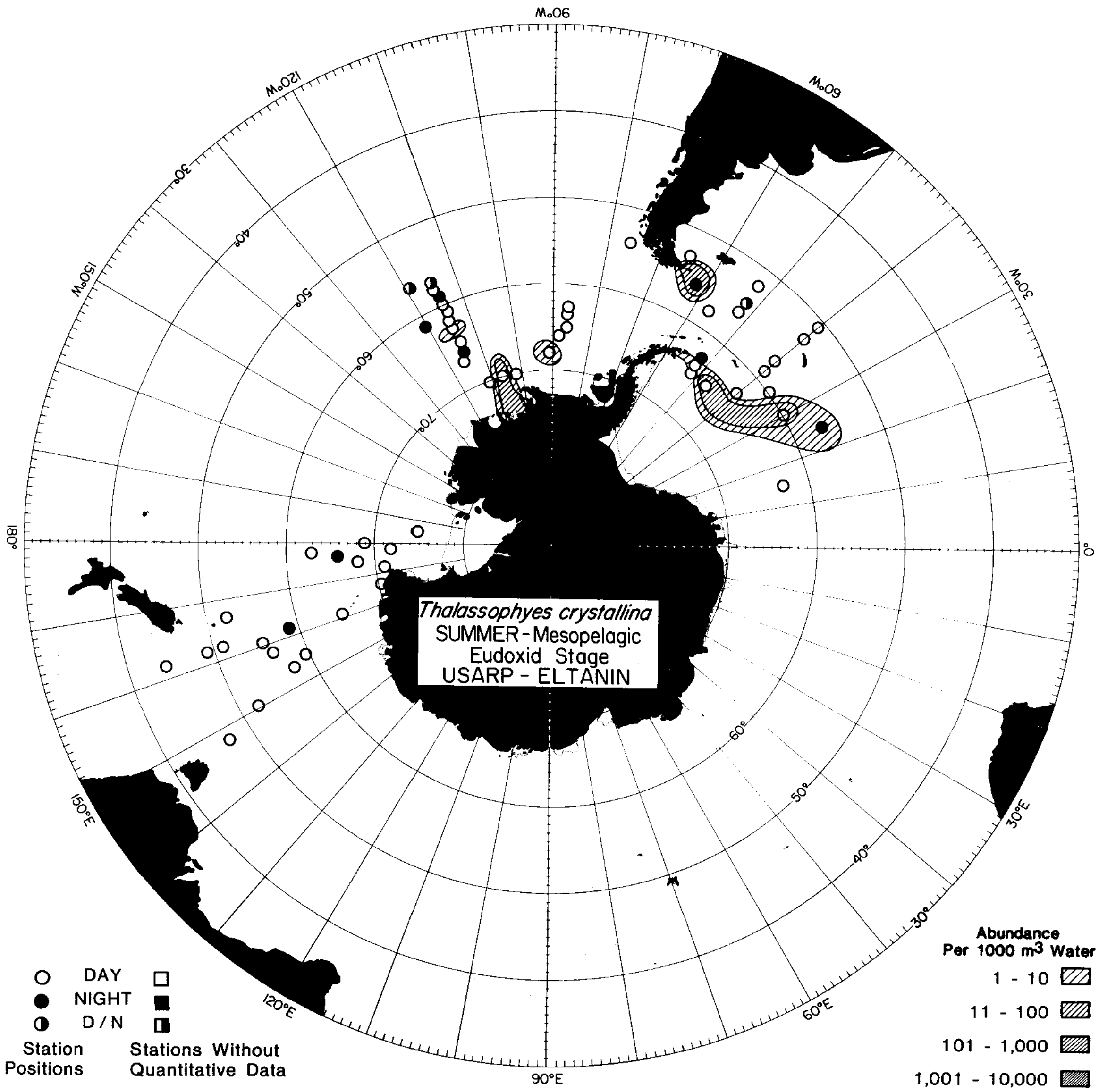
Map A252. The distribution of the polygastric stage of *Thalassophyes crystallina* during the summer in the epipelagic zone.



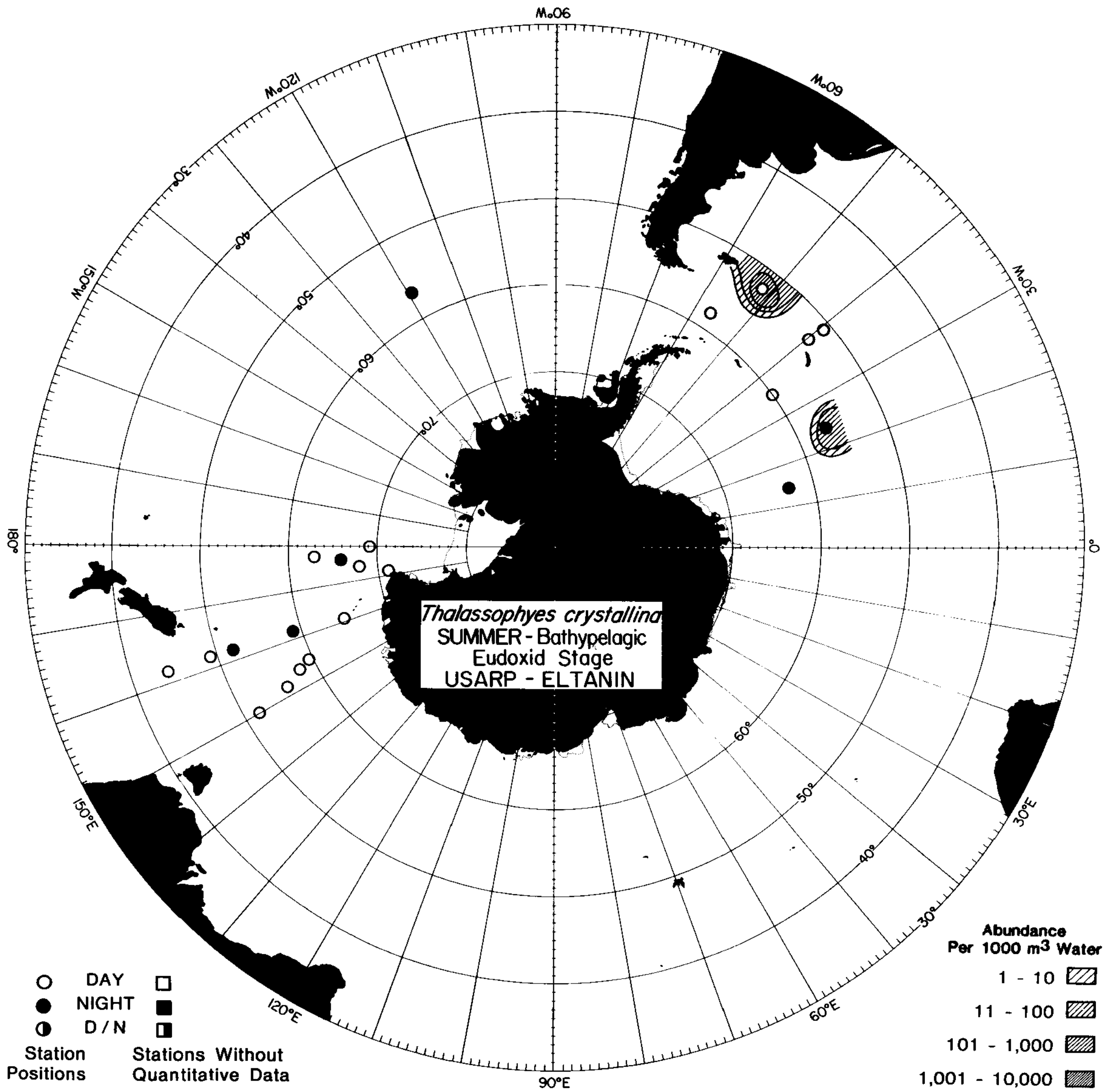
Map A253. The distribution of the polygastric stage of *Thalassophyes crystallina* during the summer in the mesopelagic zone.



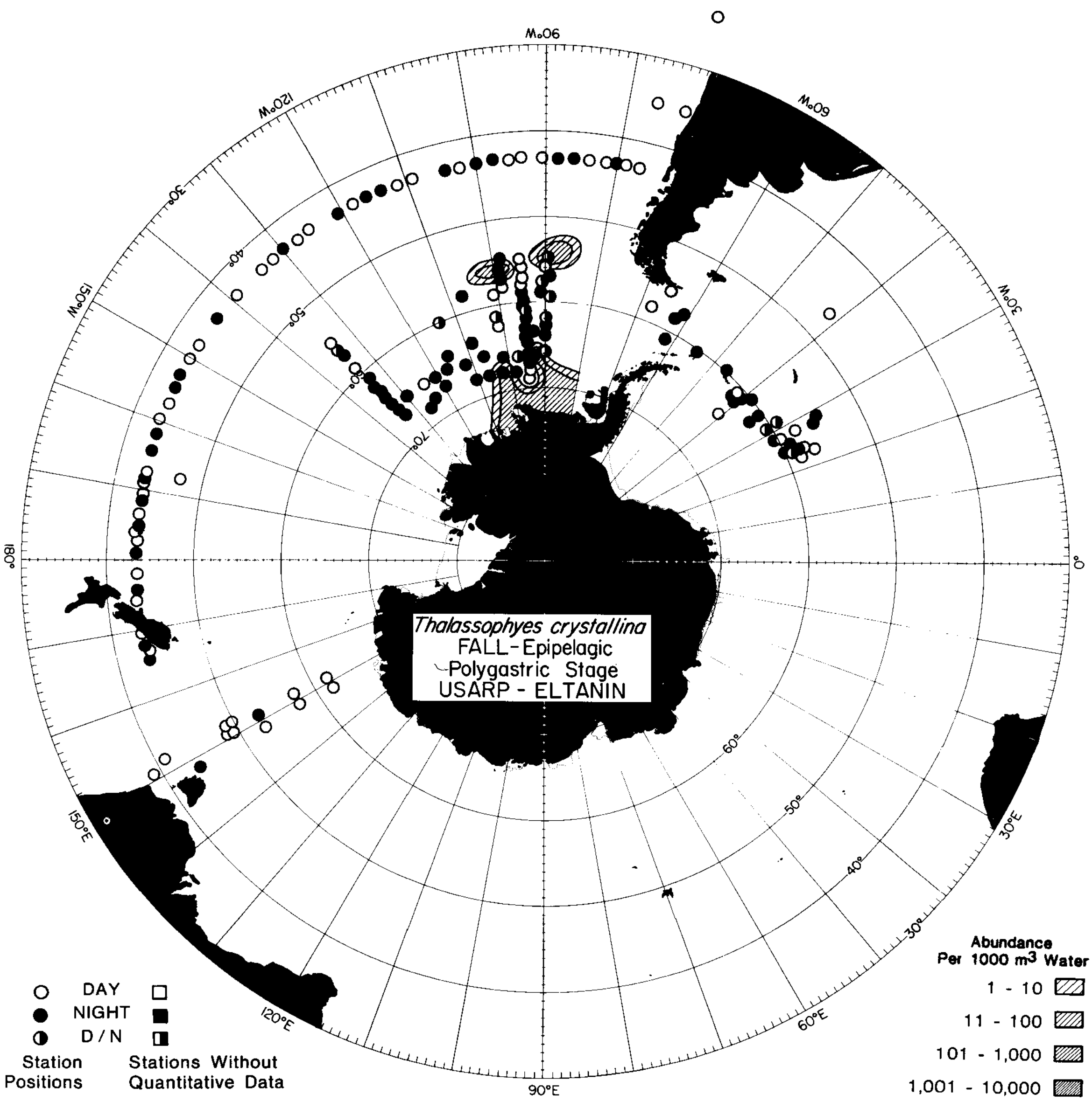
Map A254. The distribution of the polygastric stage of *Thalassophyes crystallina* during the summer in the bathypelagic zone.



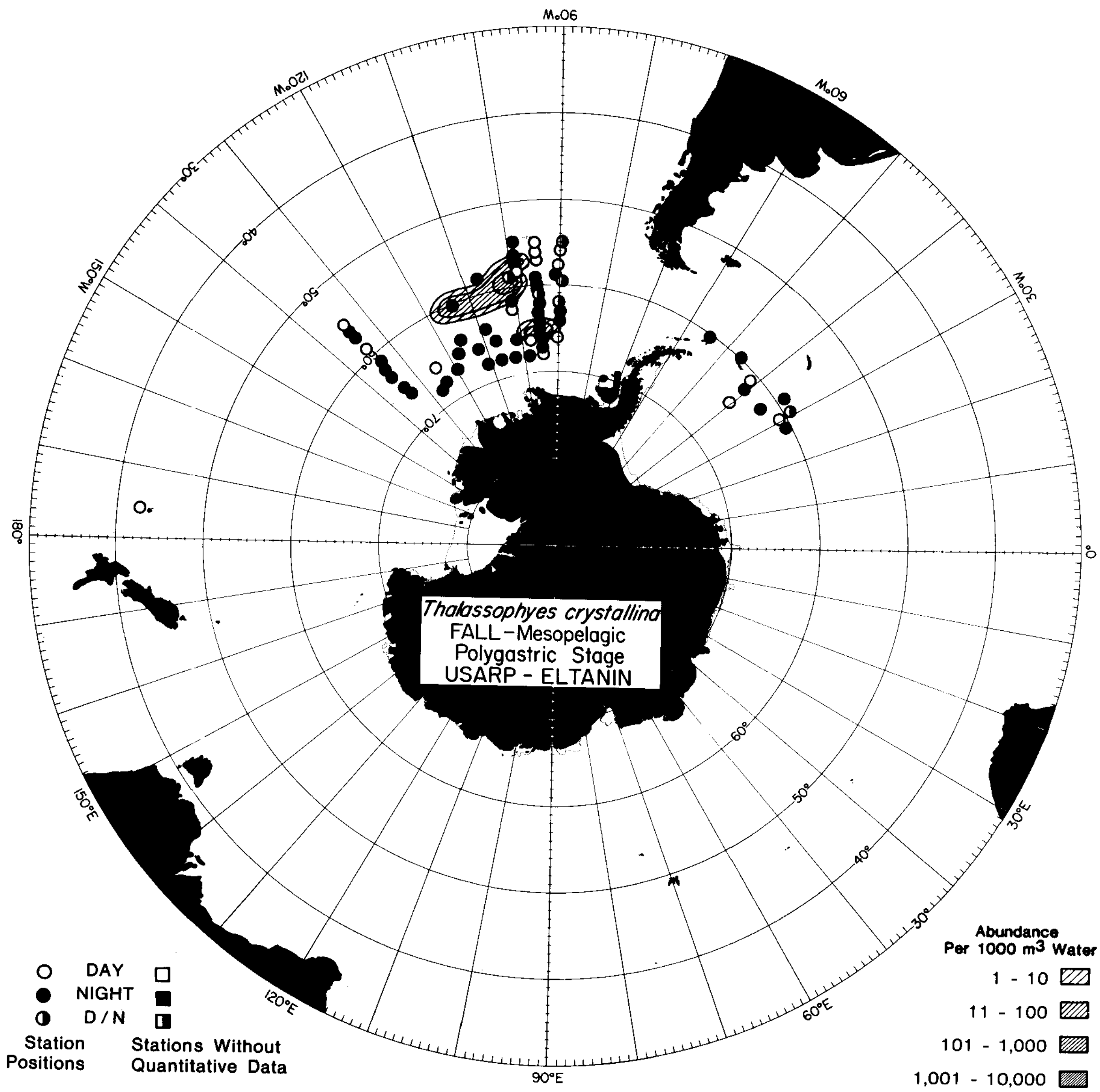
Map A255. The distribution of the eudoxid stage of *Thalassophyes crystallina* during the summer in the mesopelagic zone.



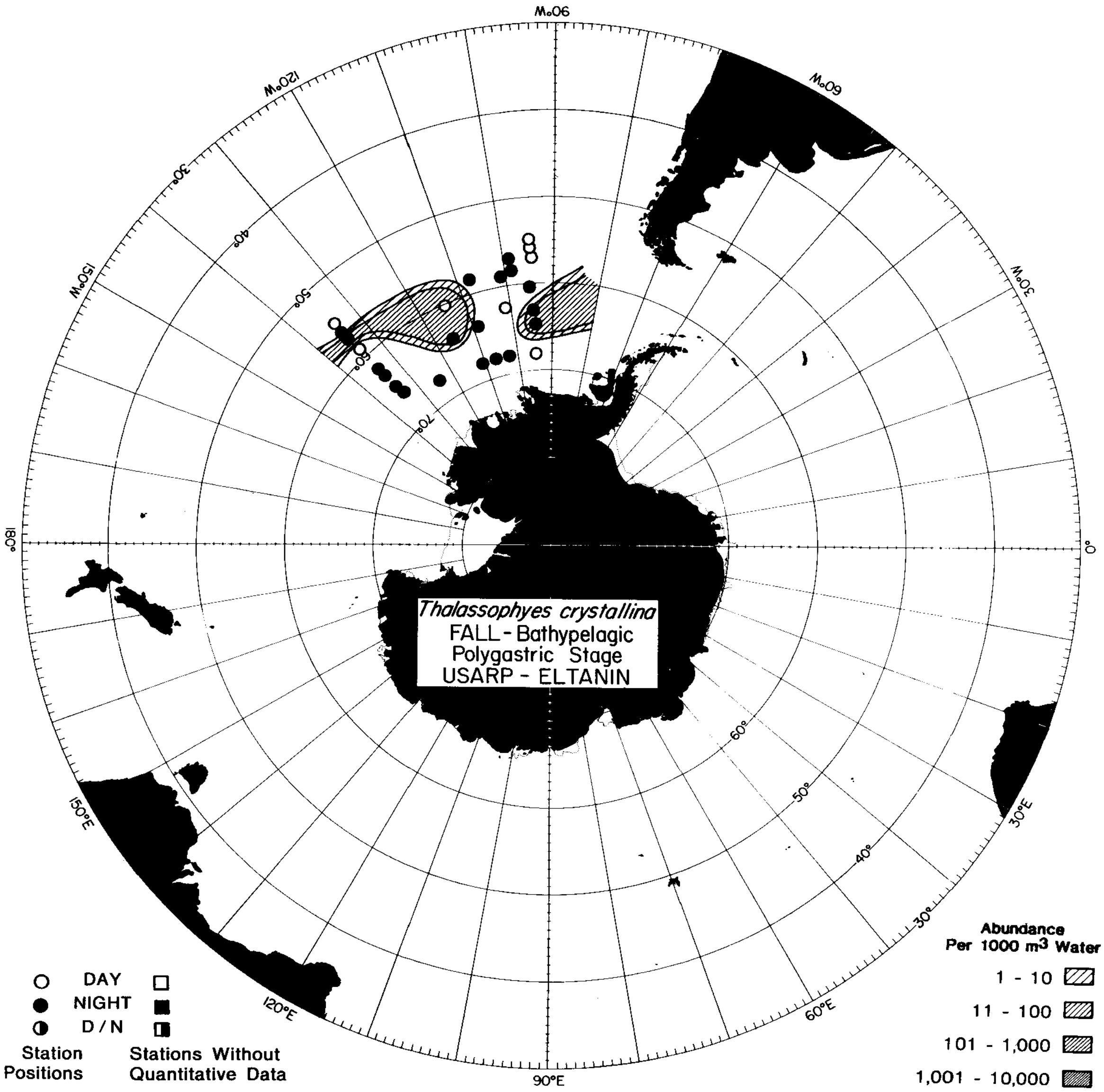
Map A256. The distribution of the eudoxid stage of *Thalassophyes crystallina* during the summer in the bathypelagic zone.



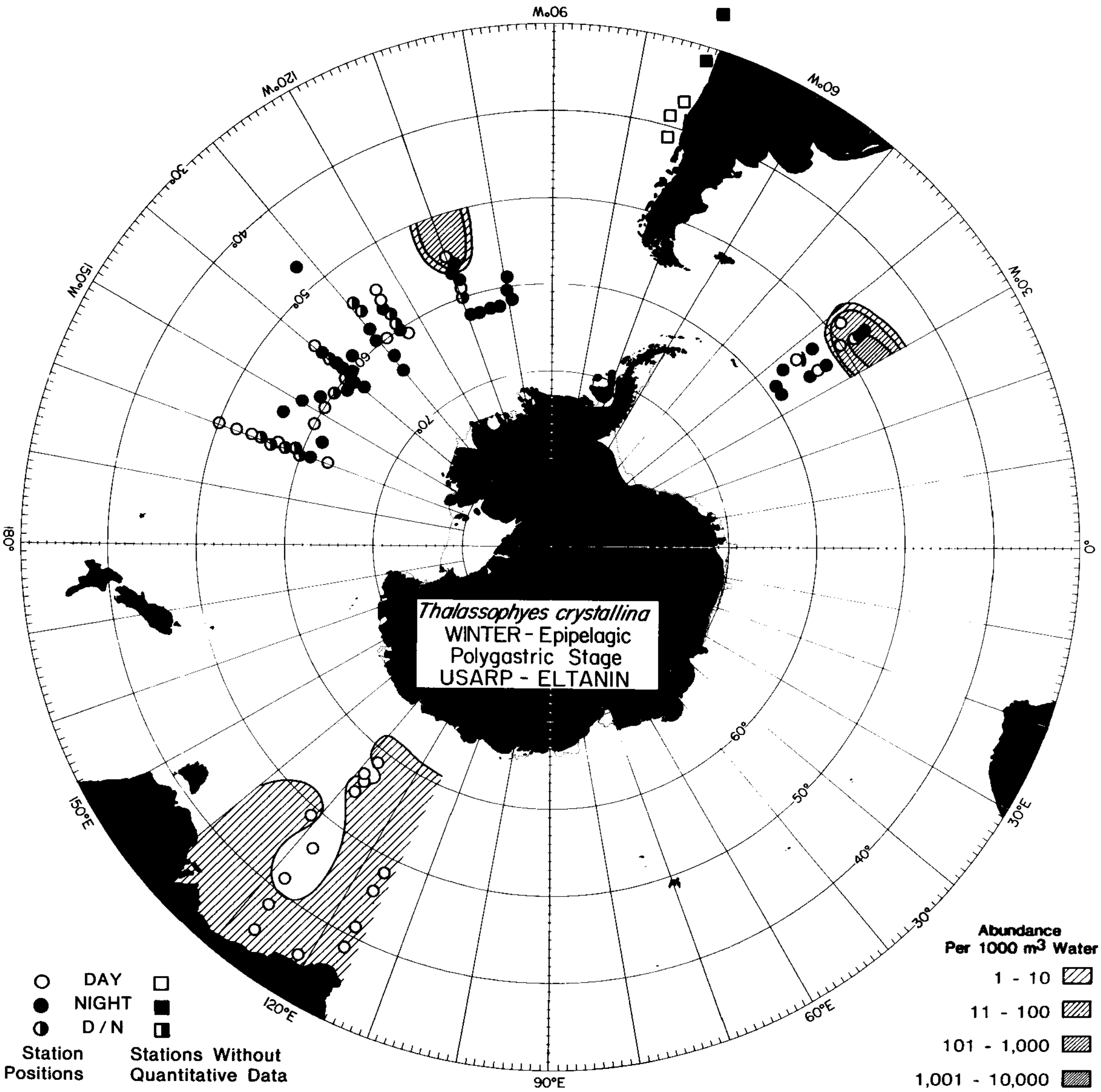
Map A257. The distribution of the polygastric stage of *Thalassophyes crystallina* during the fall in the epipelagic zone.



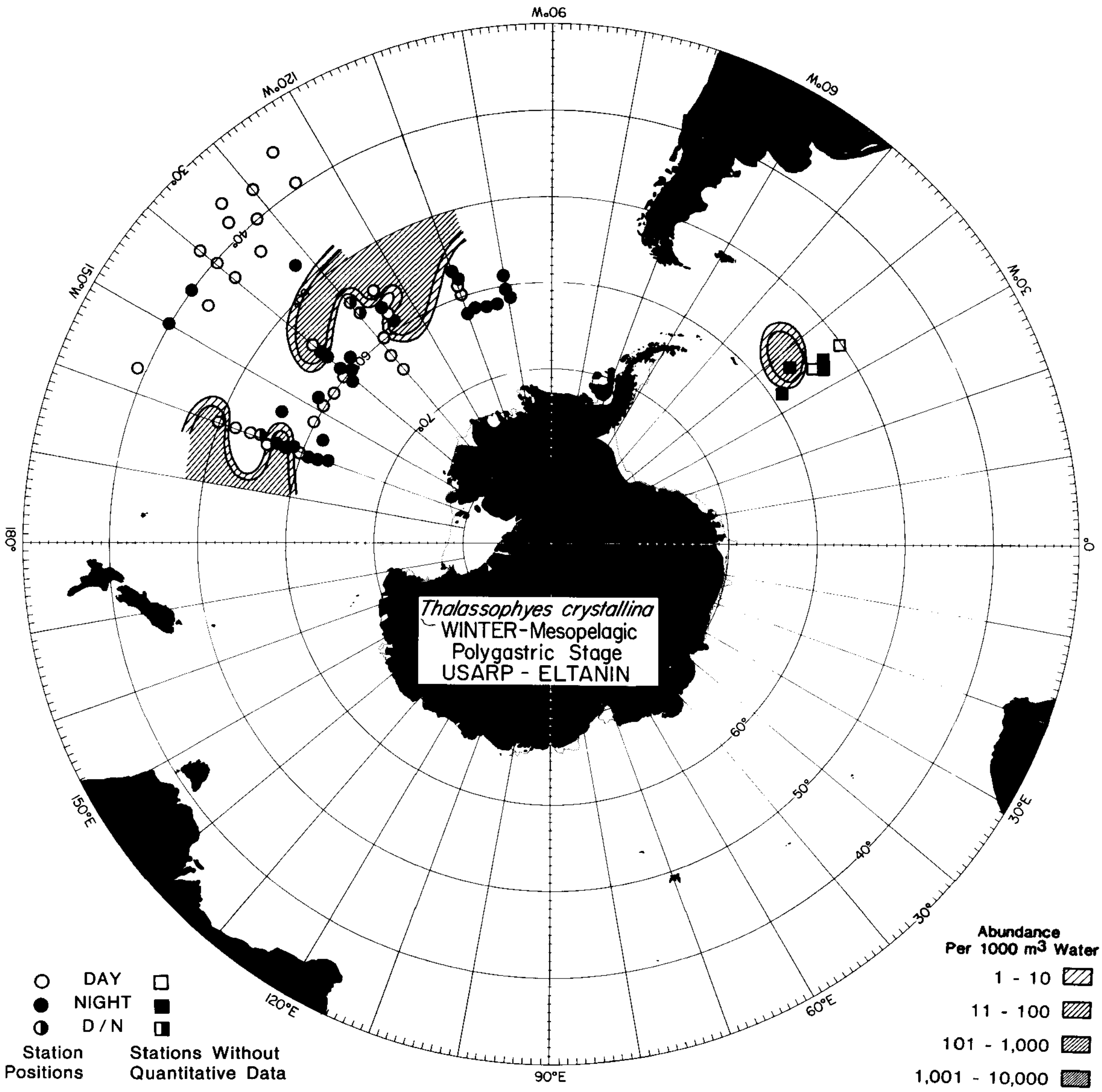
Map A258. The distribution of the polygastric stage of *Thalassophyes crystallina* during the fall in the mesopelagic zone.



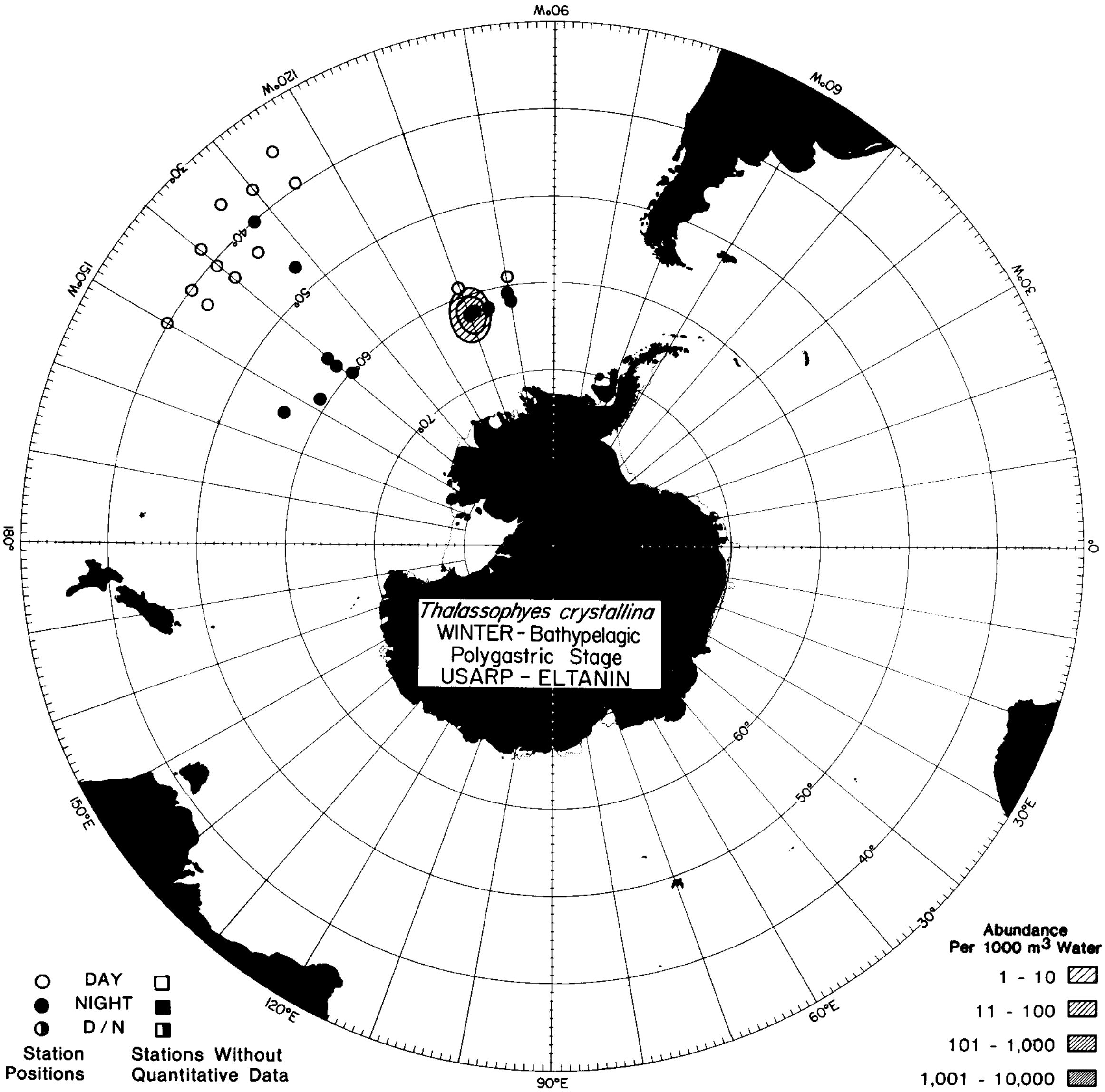
Map A259. The distribution of the polygastric stage of *Thalassophyes crystallina* during the fall in the bathypelagic zone.



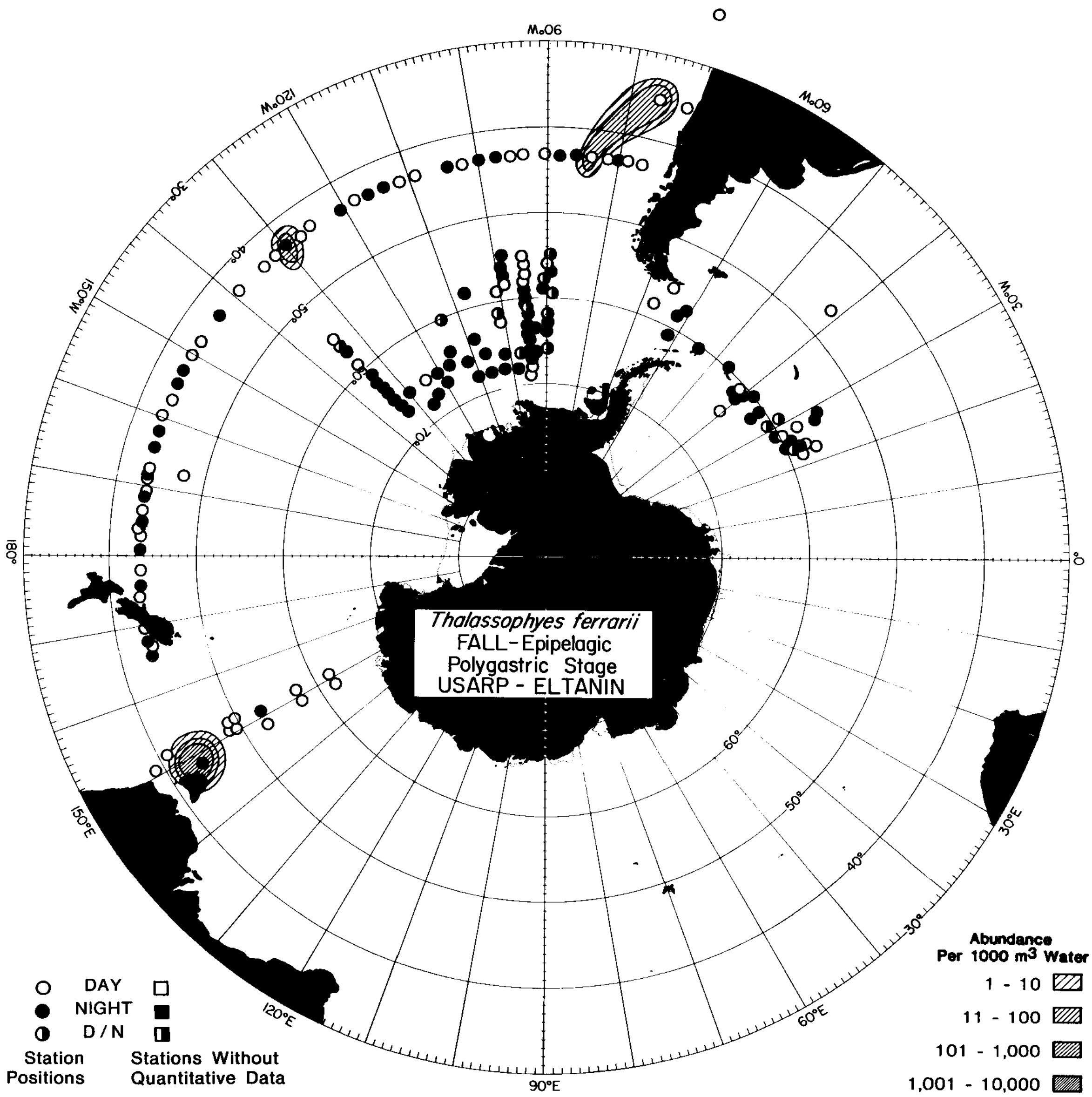
Map A260. The distribution of the polygastric stage of *Thalassophyes crystallina* during the winter in the epipelagic zone.



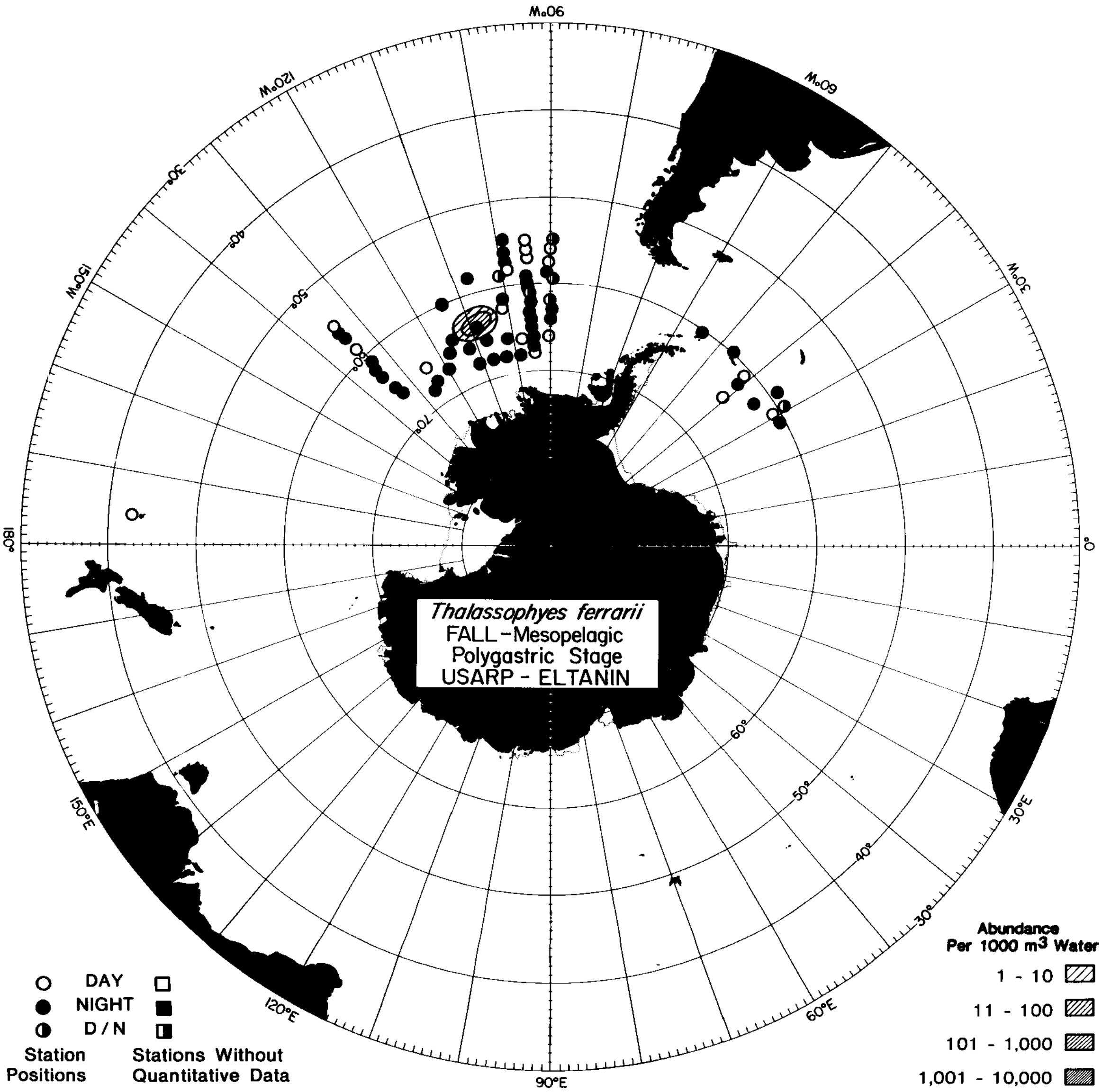
Map A261. The distribution of the polygastric stage of *Thalassophyes crystallina* during the winter in the mesopelagic zone.



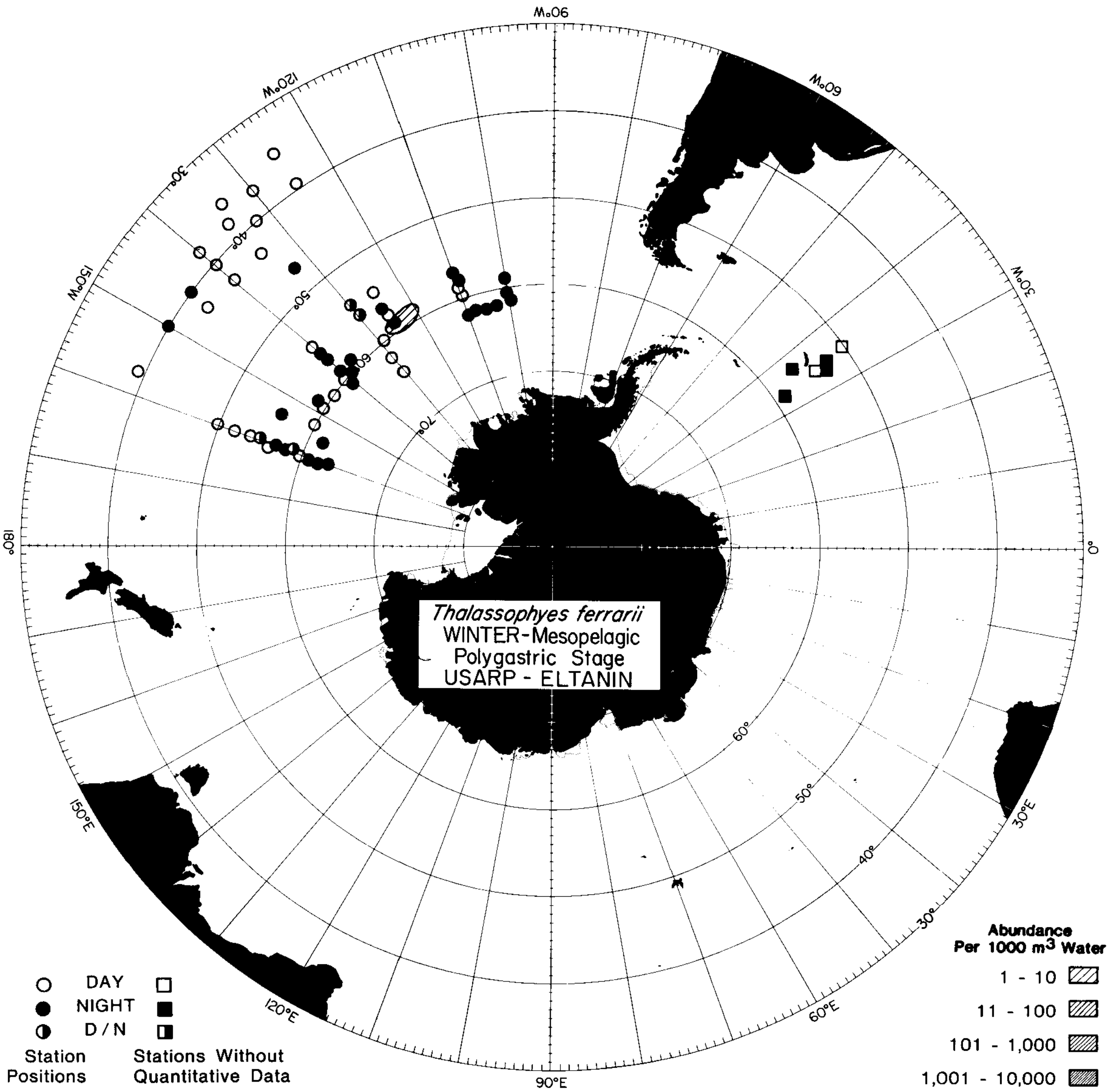
Map A262. The distribution of the polygastric stage of *Thalassophyes crystallina* during the winter in the bathypelagic zone.



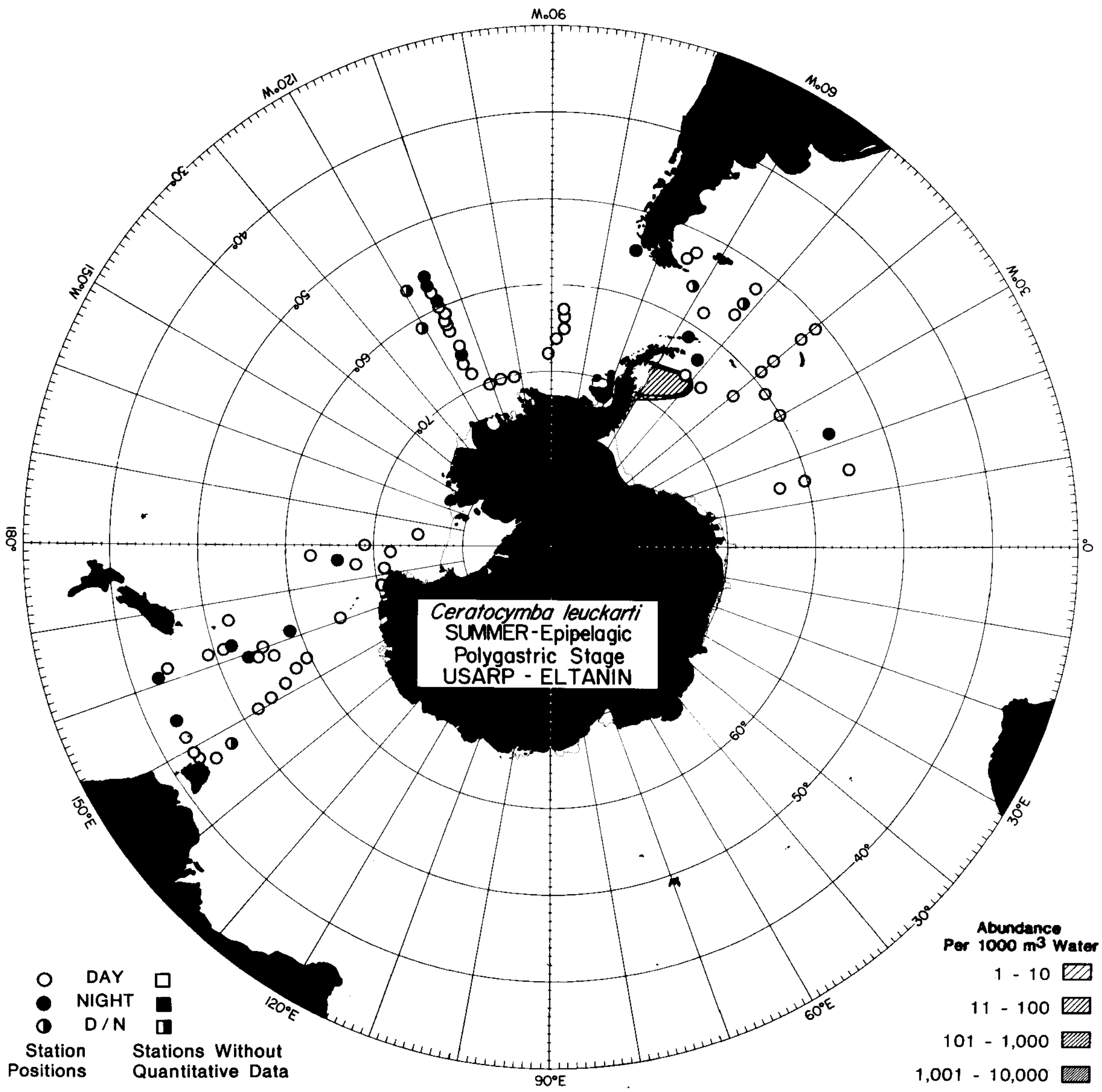
Map A263. The distribution of the polygastric stage of *Thalassophyes ferrarii* during the fall in the epipelagic zone.



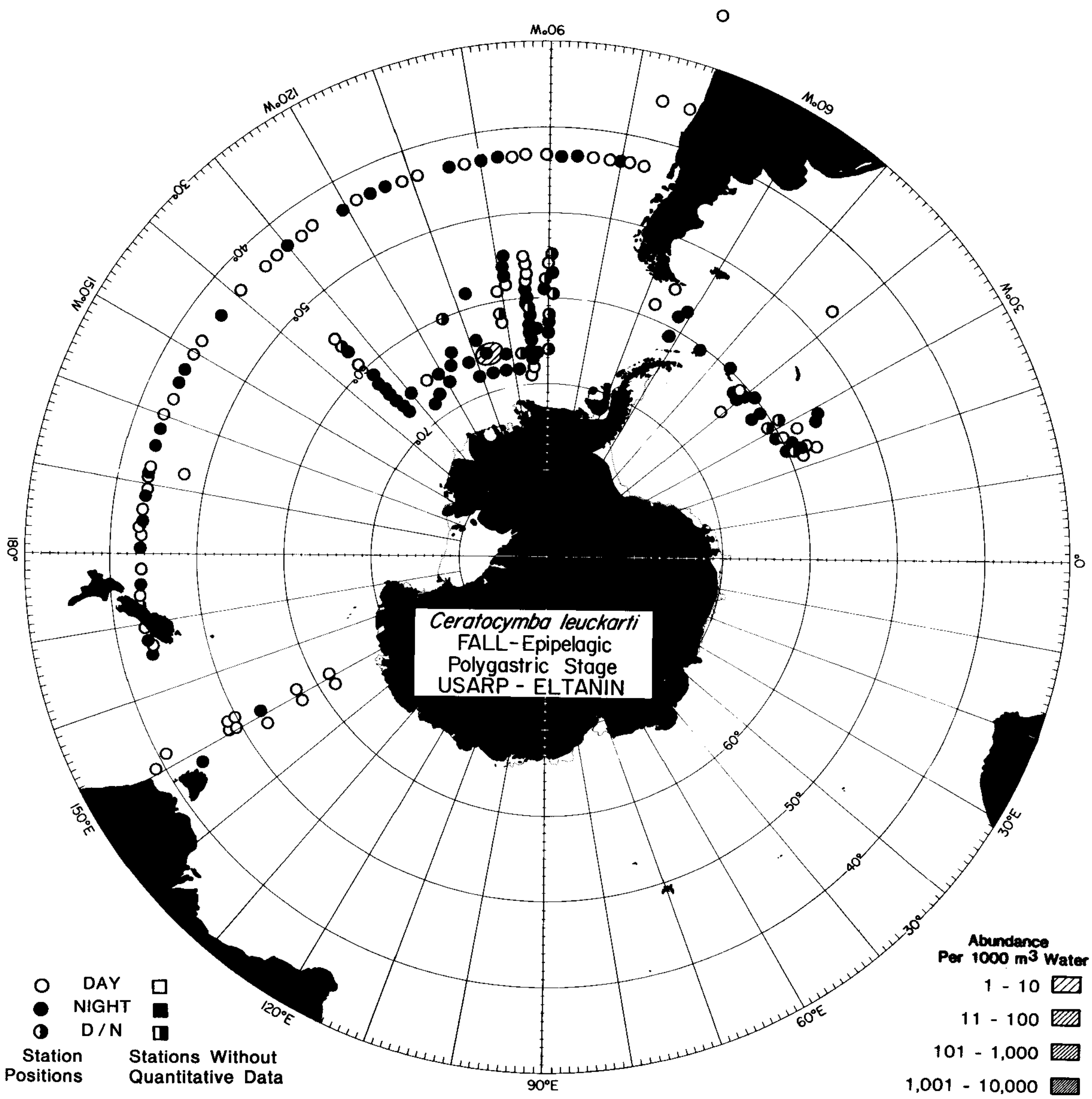
Map A264. The distribution of the polygastric stage of *Thalassophyes ferrarii* during the fall in the mesopelagic zone.



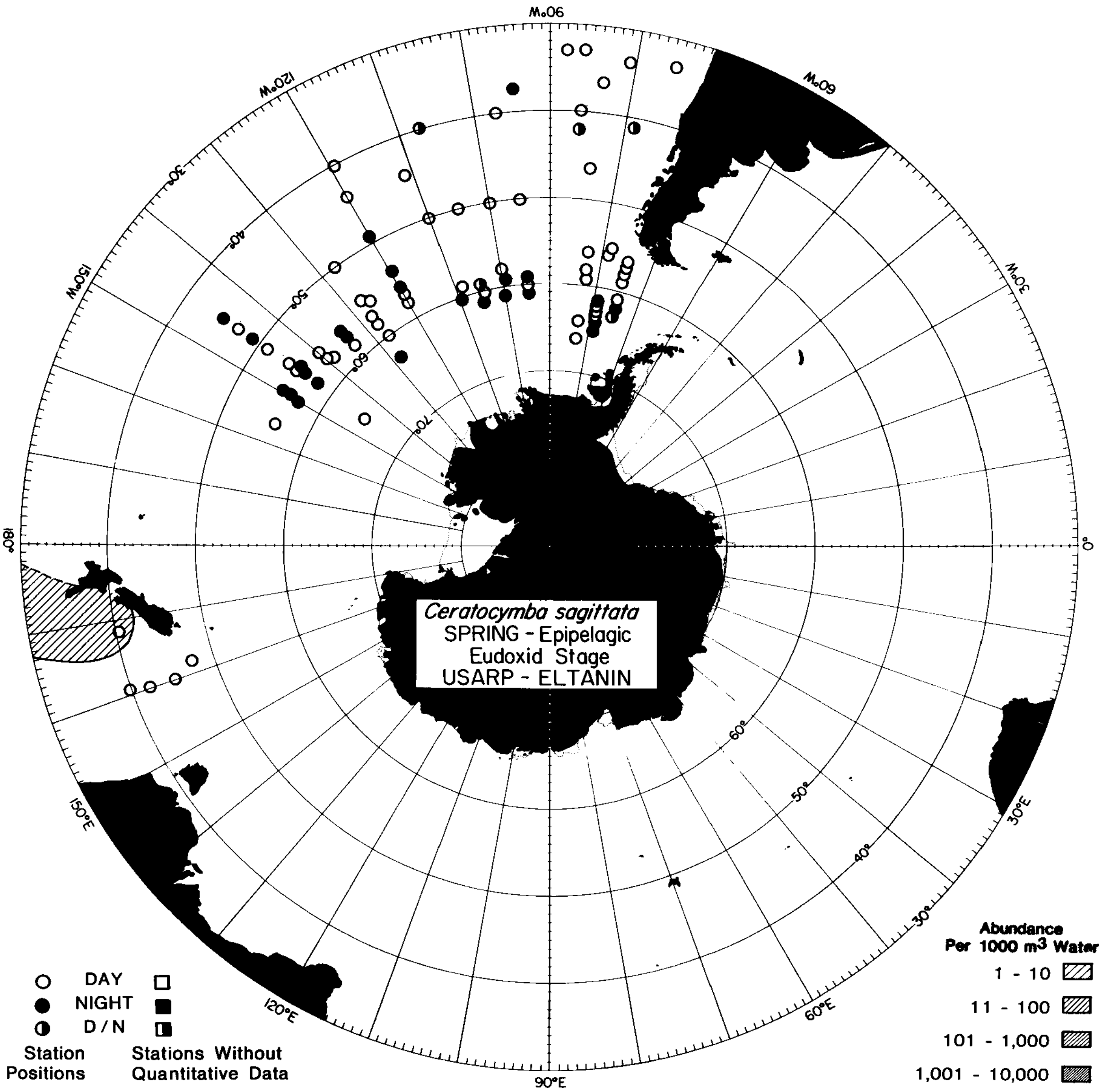
Map A265. The distribution of the polygastric stage of *Thalassophyes ferrarii* during the winter in the mesopelagic zone.



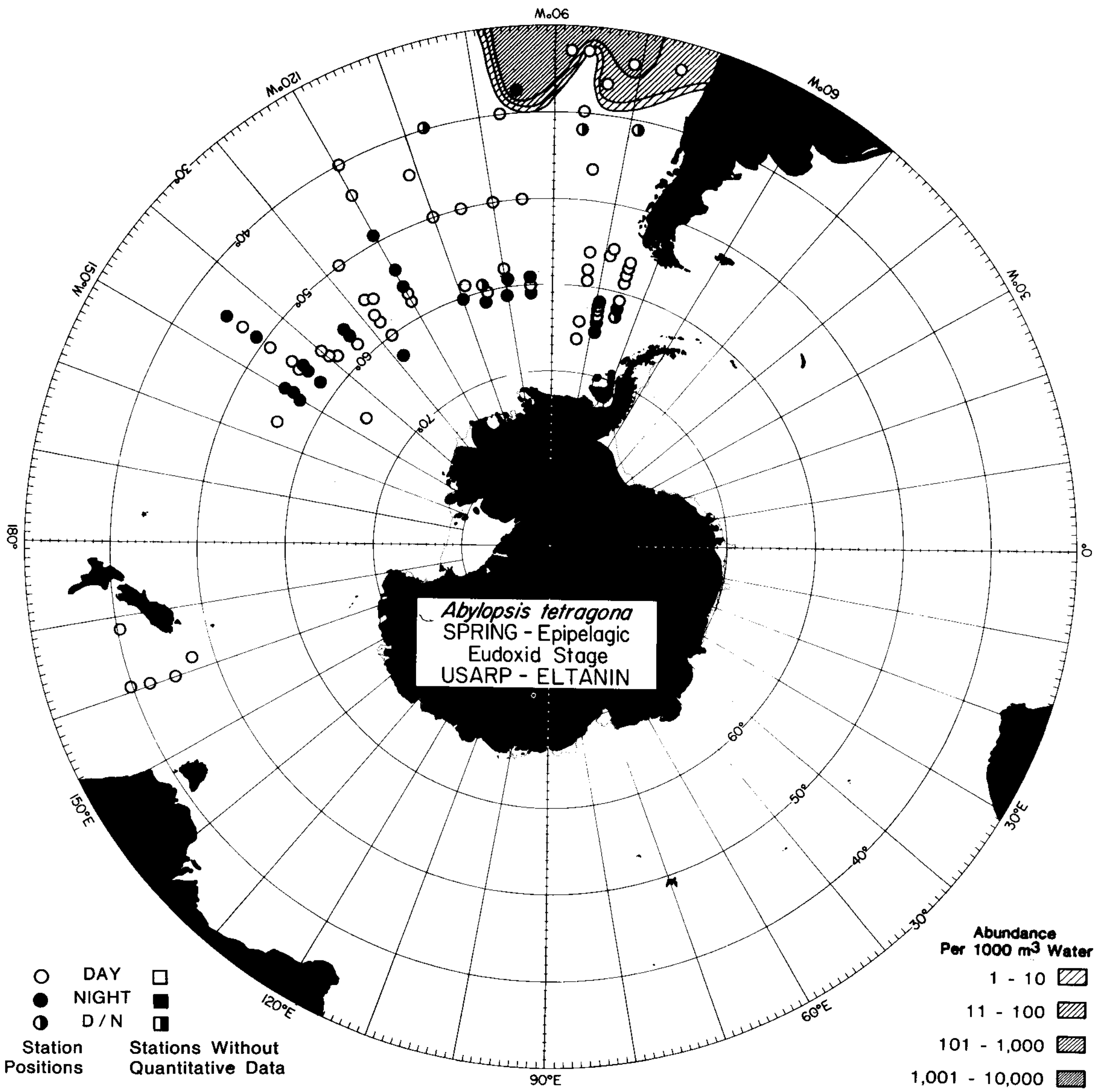
Map A266. The distribution of the polygastric stage of *Ceratocymba leuckarti* during the summer in the epipelagic zone.



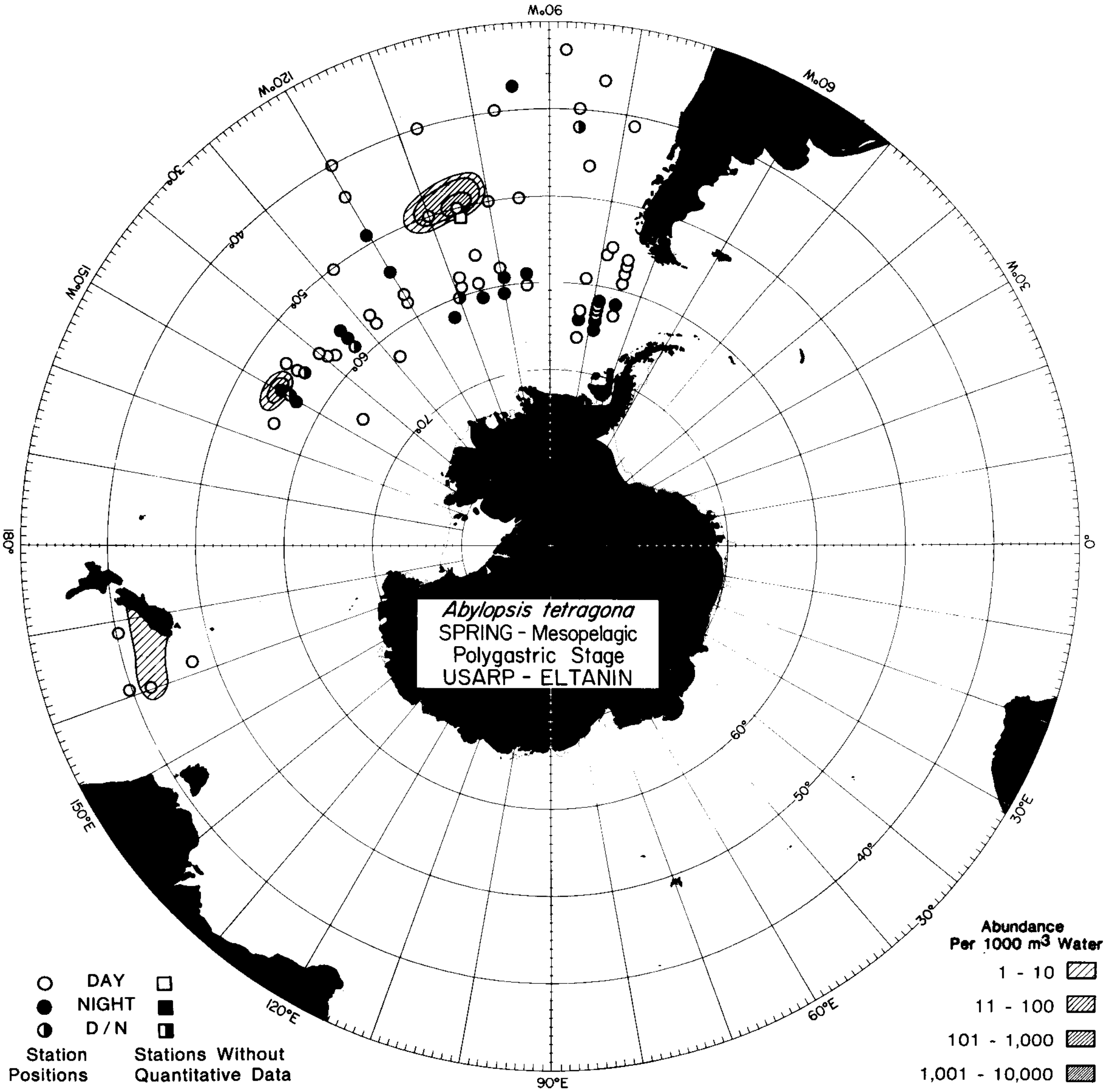
Map A267. The distribution of the polygastric stage of *Ceratocymba leuckarti* during the fall in the epipelagic zone.



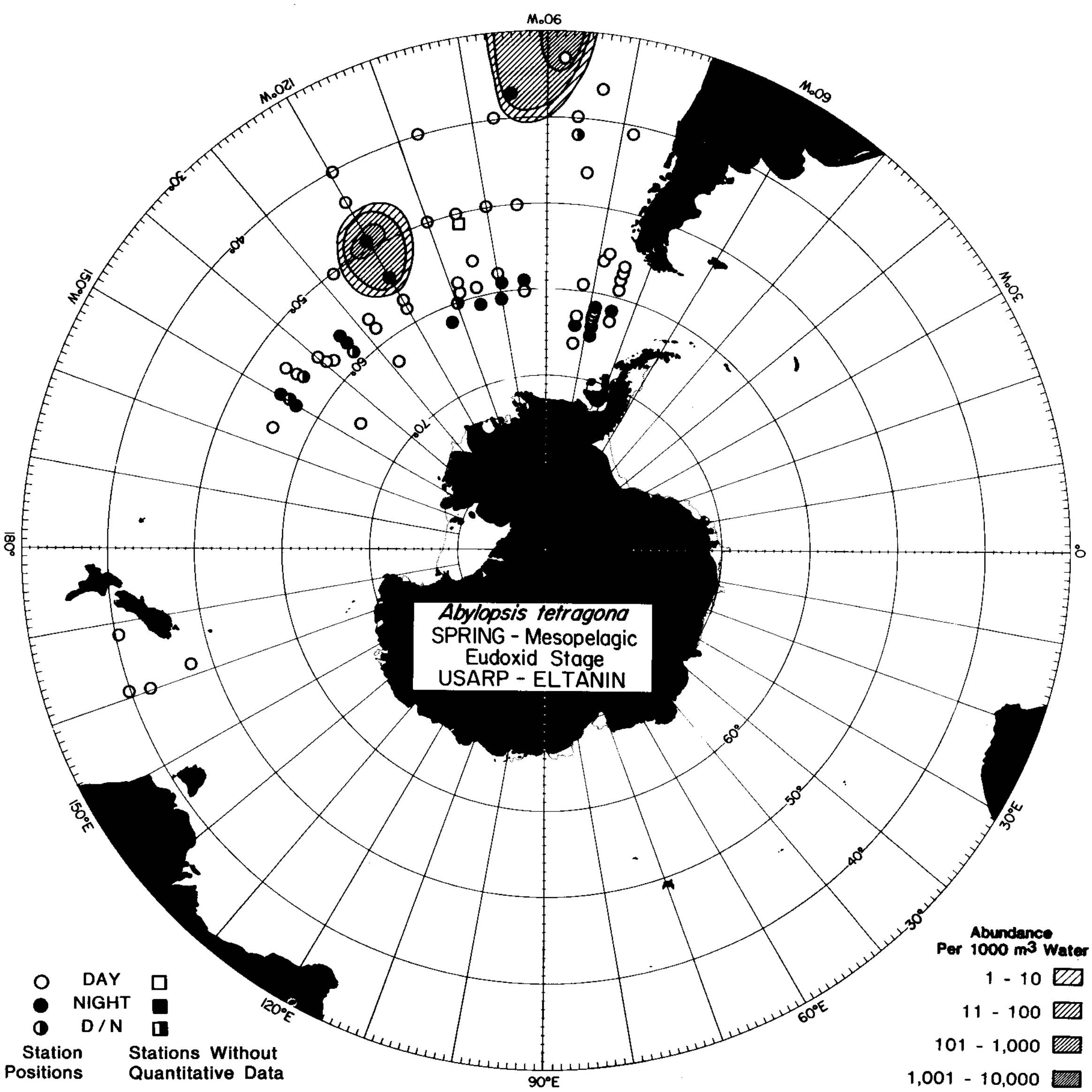
Map A268. The distribution of the eudoxid stage of *Ceratocymba sagittata* during the spring in the epipelagic zone.



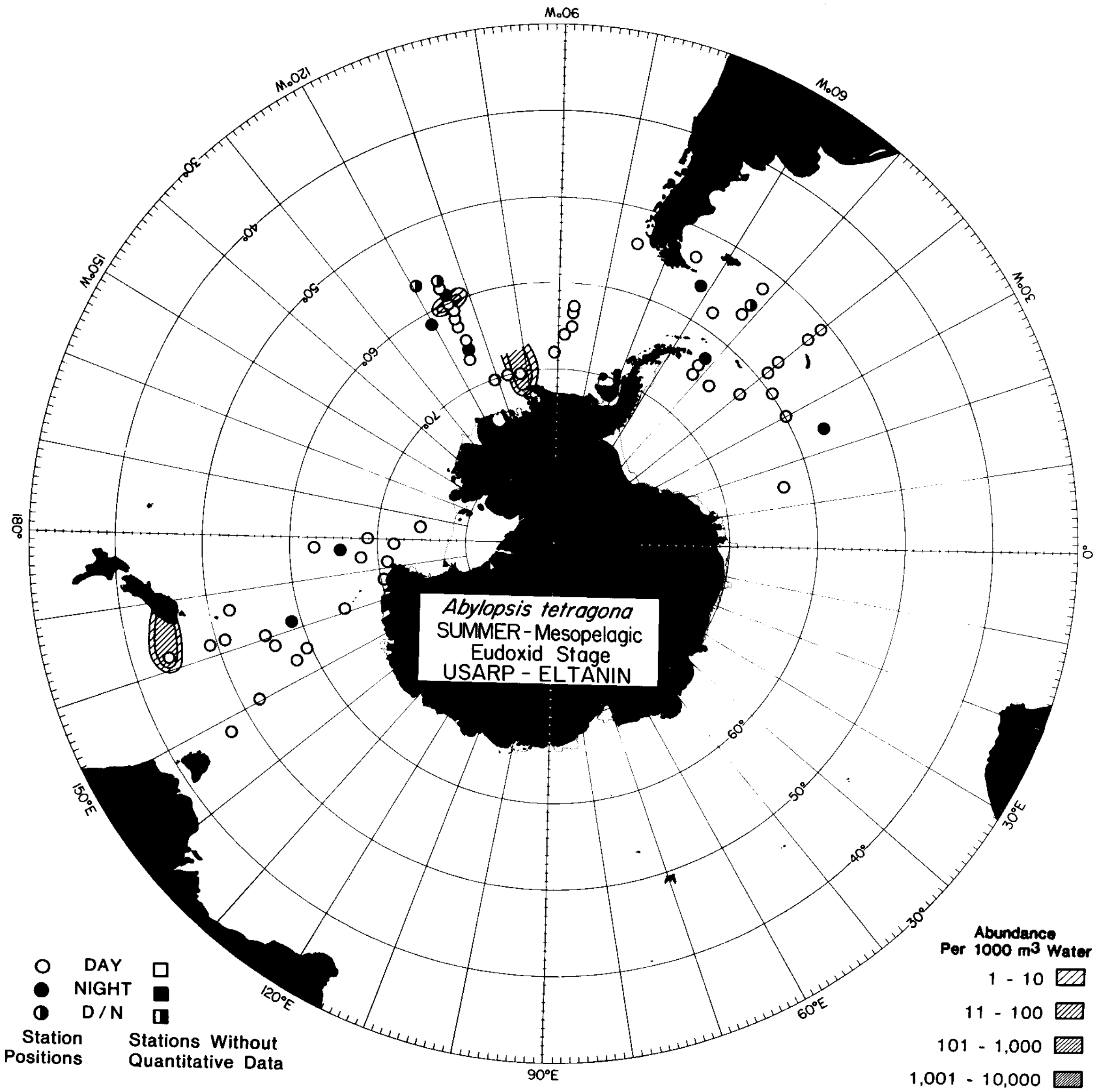
Map A269. The distribution of the eudoxid stage of *Abylopsis tetragona* during the spring in the epipelagic zone.



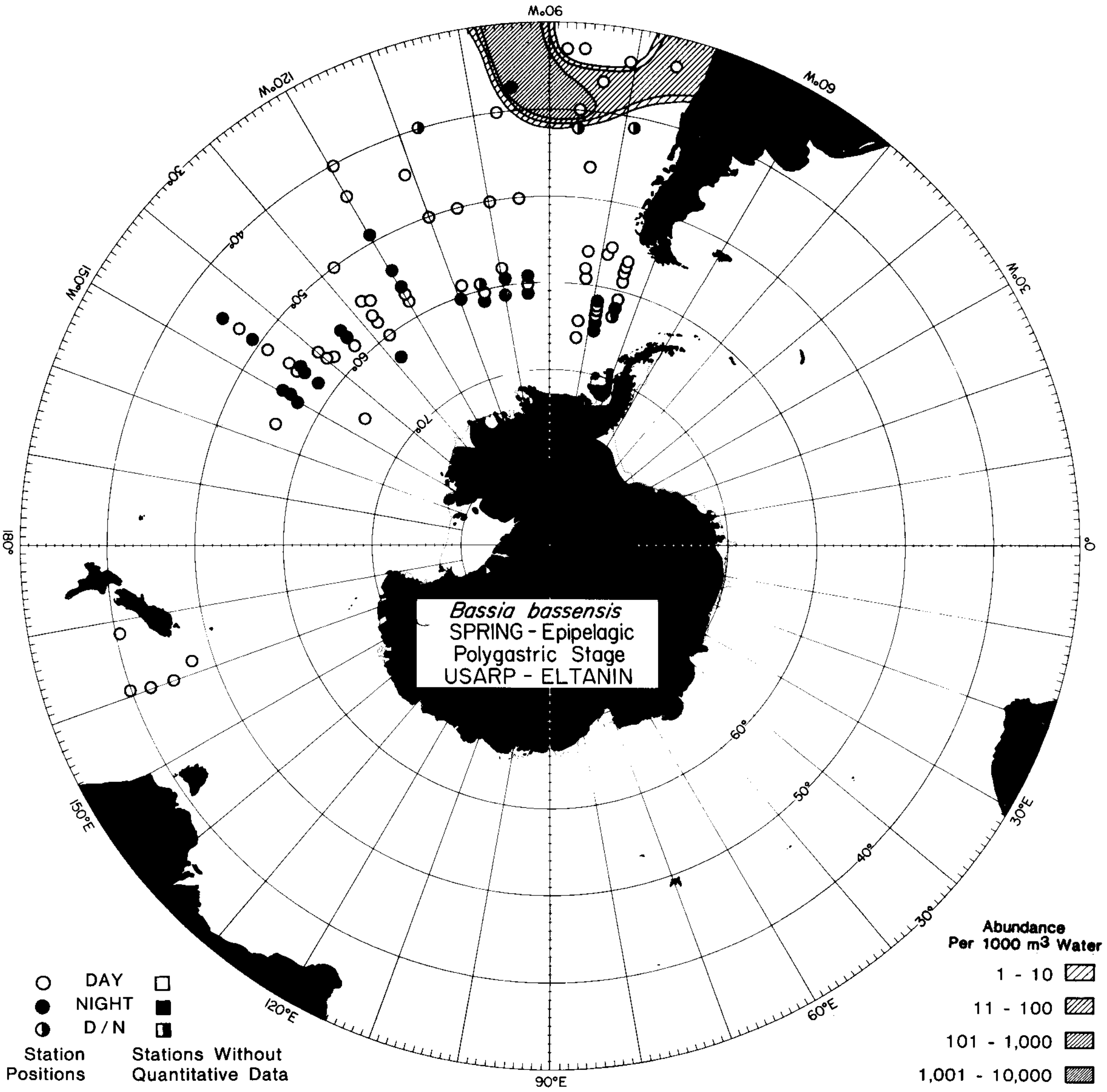
Map A270. The distribution of the polygastric stage of *Abylopsis tetragona* during the spring in the mesopelagic zone.



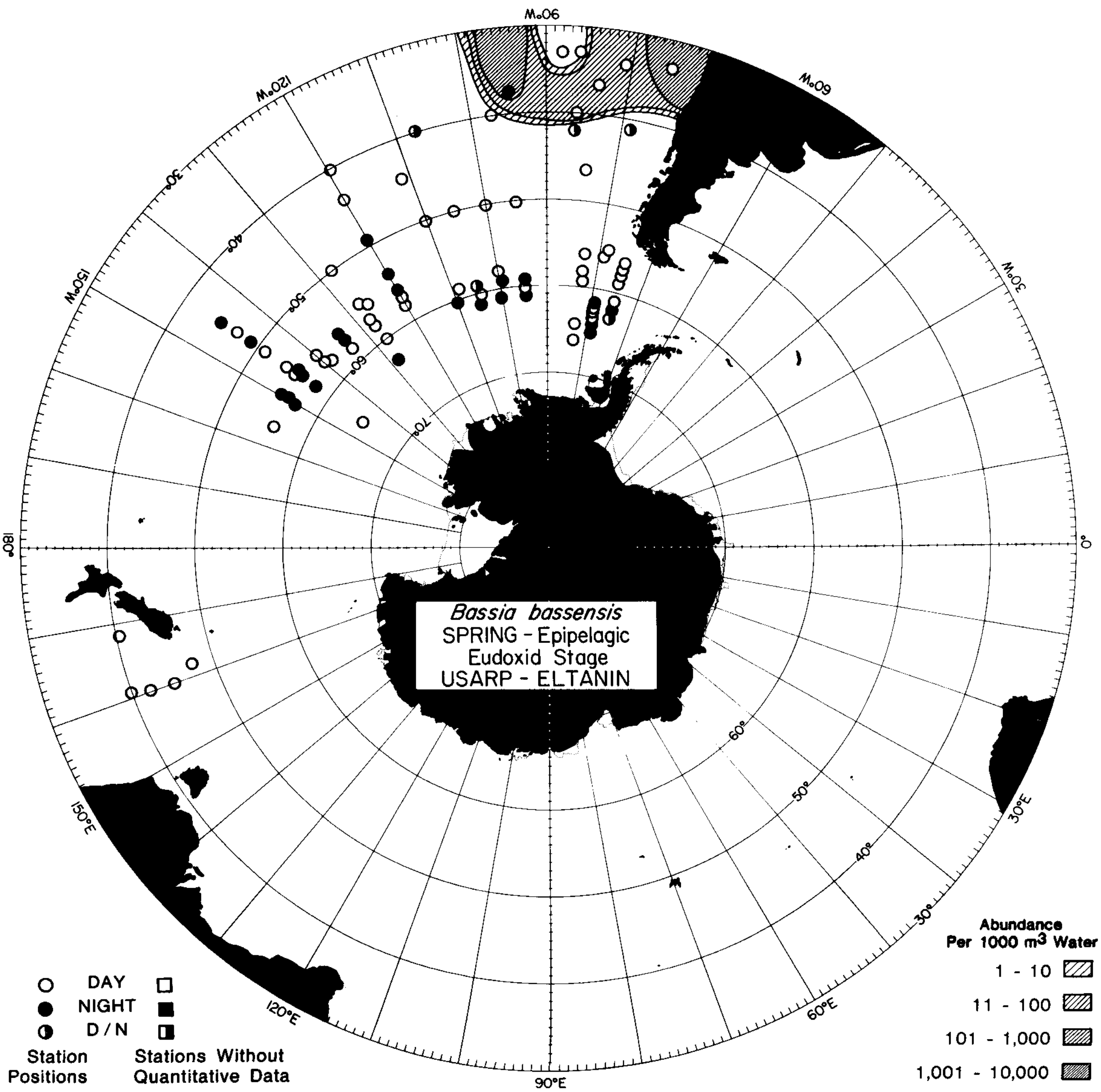
Map A271. The distribution of the eudoxid stage of *Abylopsis tetrogona* during the spring in the mesopelagic zone.



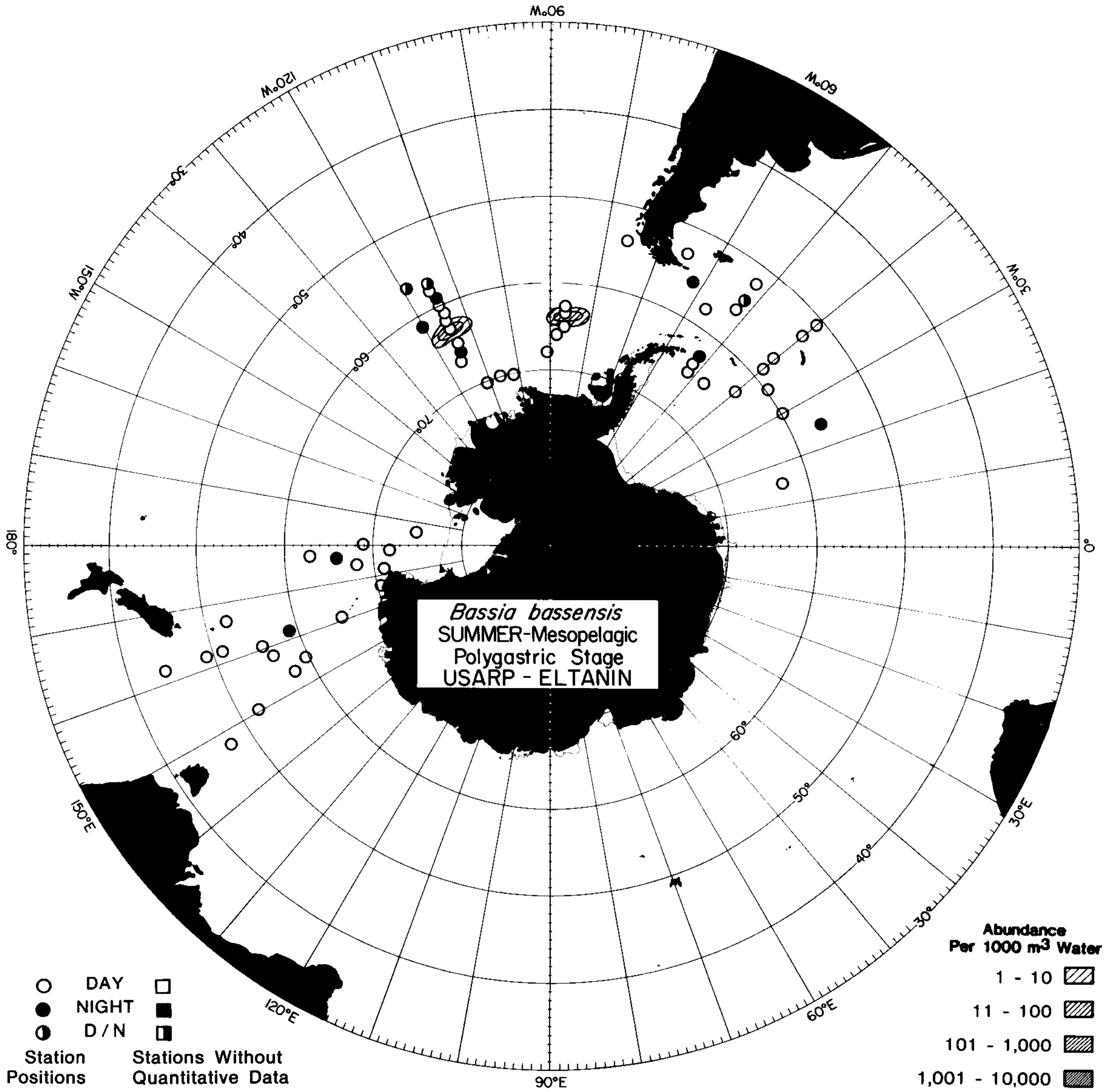
Map A272. The distribution of the eudoxid stage of *Abylopsis tetragona* during the summer in the mesopelagic zone.



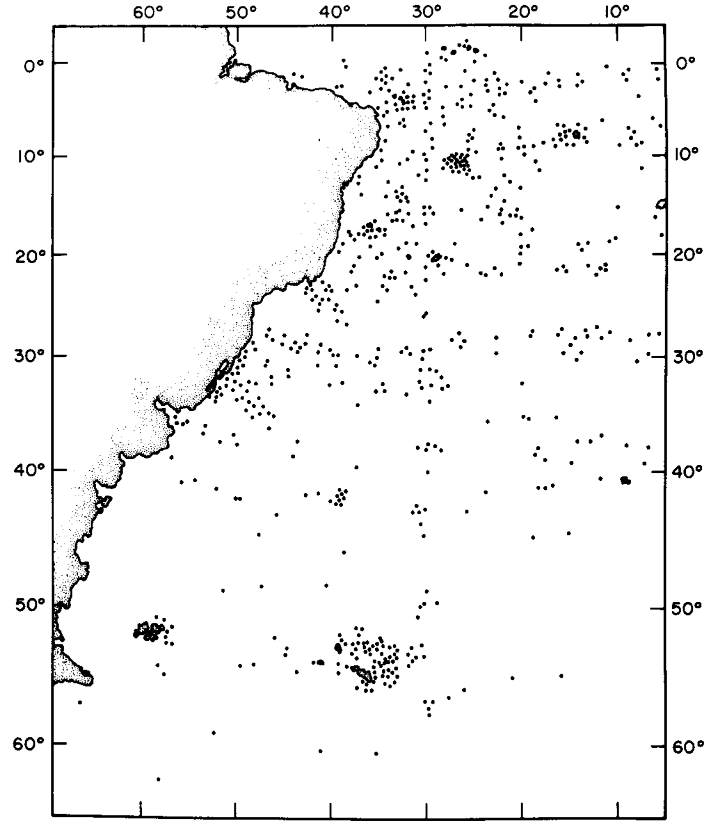
Map A273. The distribution of the polygastric stage of *Bassia bassensis* during the spring in the epipelagic zone.



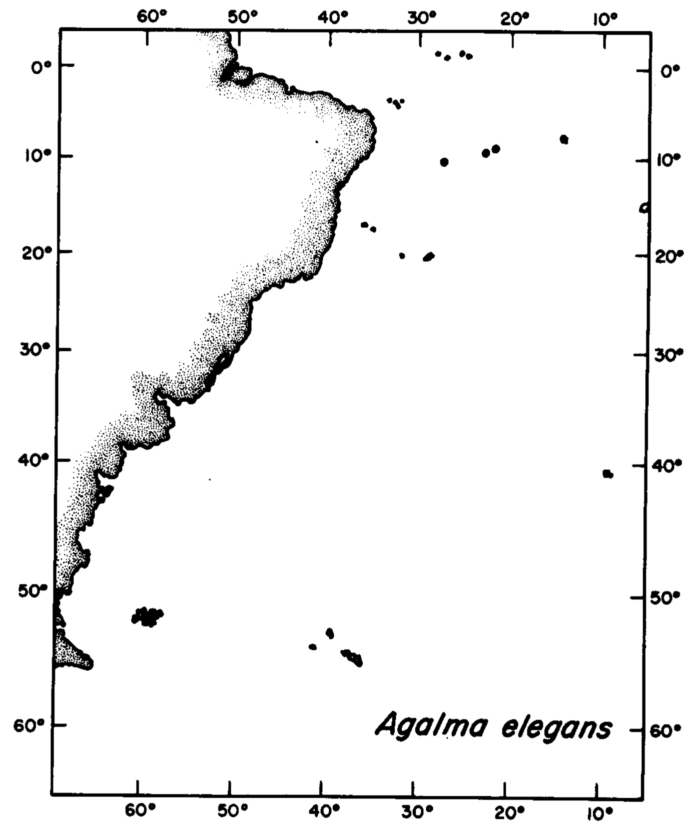
Map A274. The distribution of the eudoxid stage of *Bassia bassensis* during the spring in the epipelagic zone.



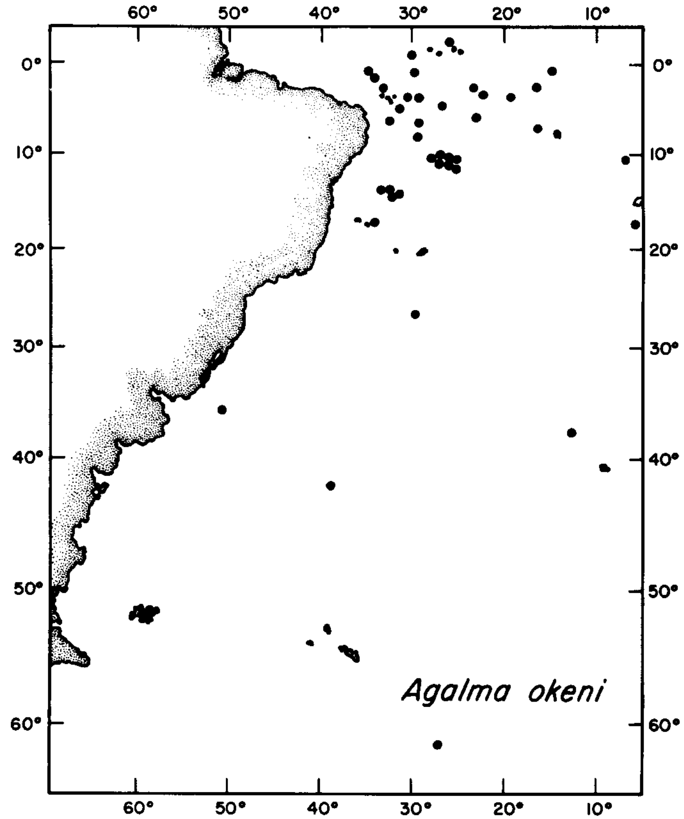
Map A275. The distribution of the polygastric stage of *Bassia bassensis* during the summer in the mesopelagic zone.



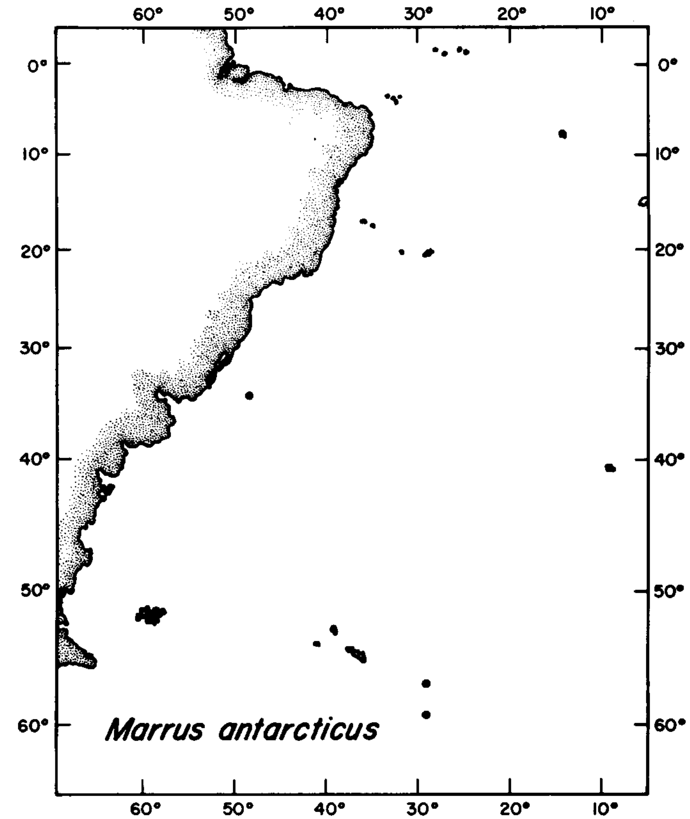
Map B1. The location of published records of Siphonophora in the South Atlantic Ocean west of 0°.



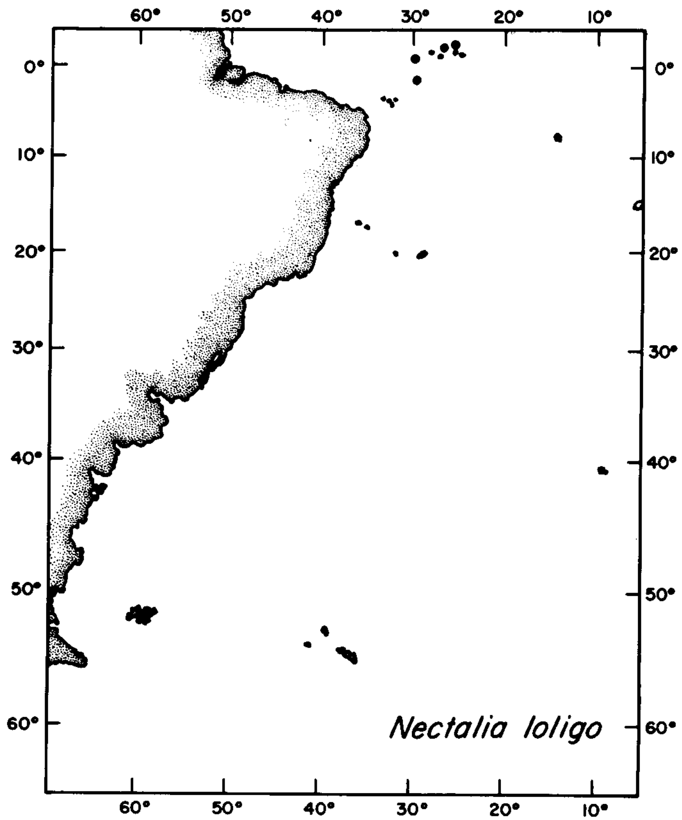
Map B2. The distribution of *Agalma elegans* in the South Atlantic Ocean west of 0°.



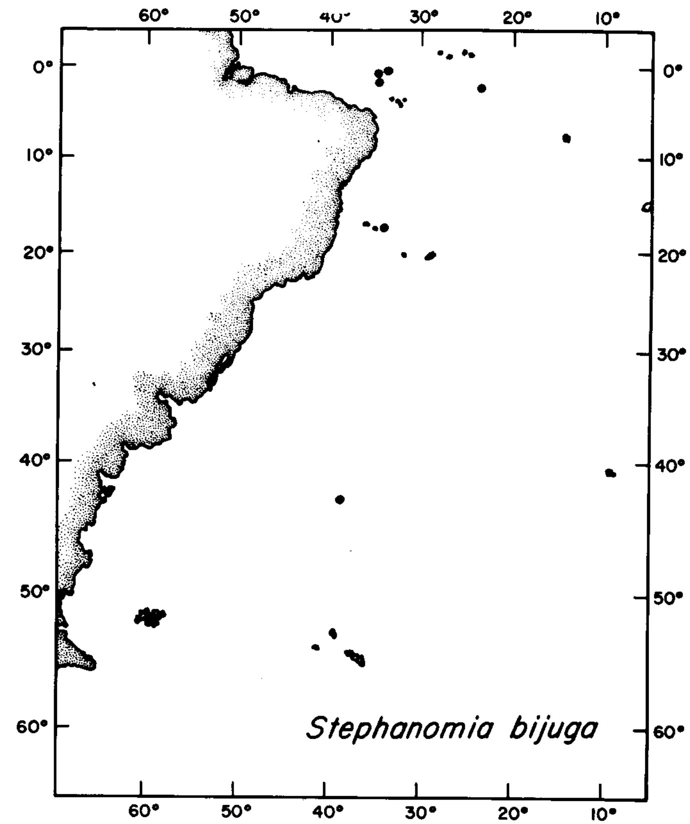
Map B3. The distribution of *Aglama okeni* in the South Atlantic Ocean west of 0°.



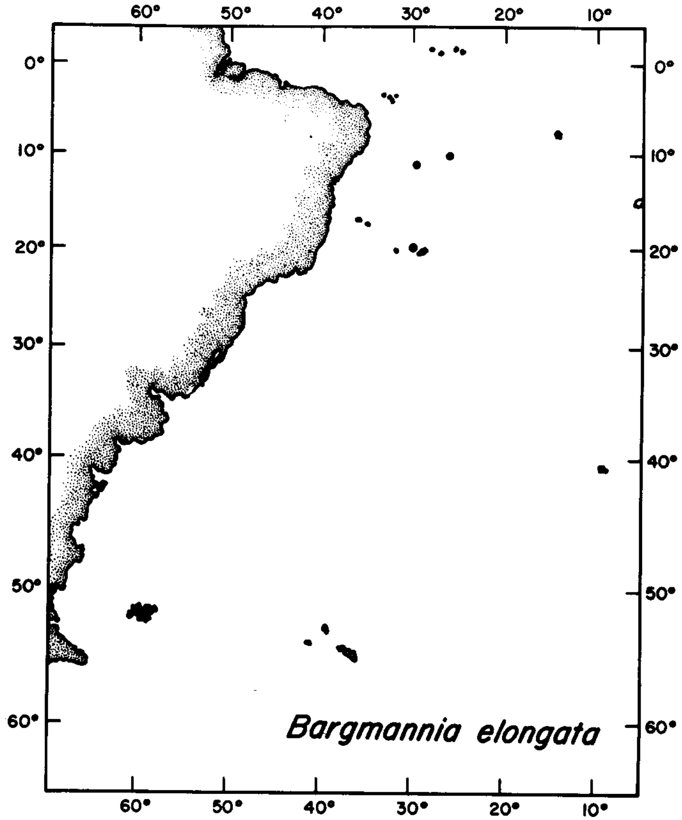
Map B4. The distribution of *Marrus antarcticus* in the South Atlantic Ocean west of 0°.



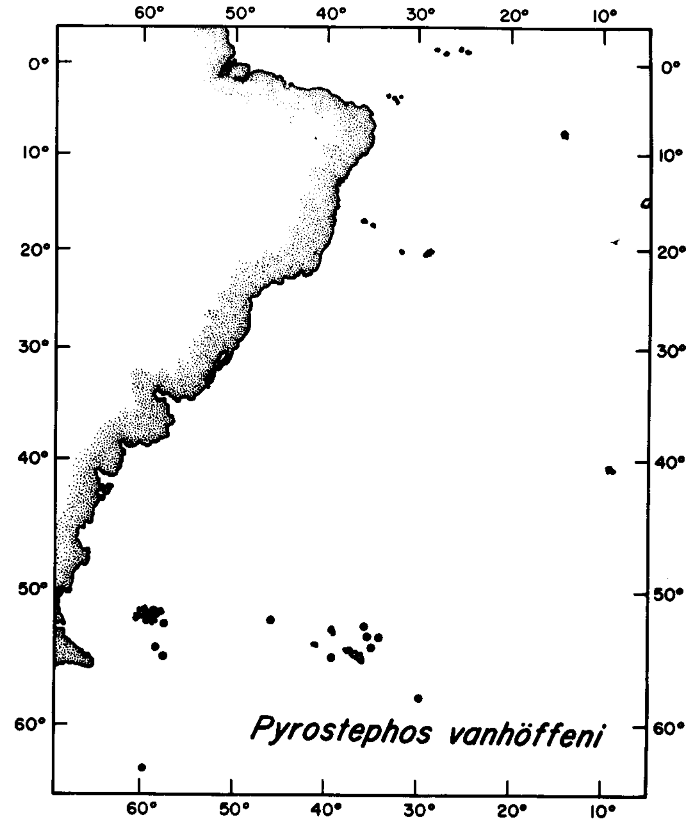
Map B5. The distribution of *Nectalia loligo* in the South Atlantic Ocean west of 0°.



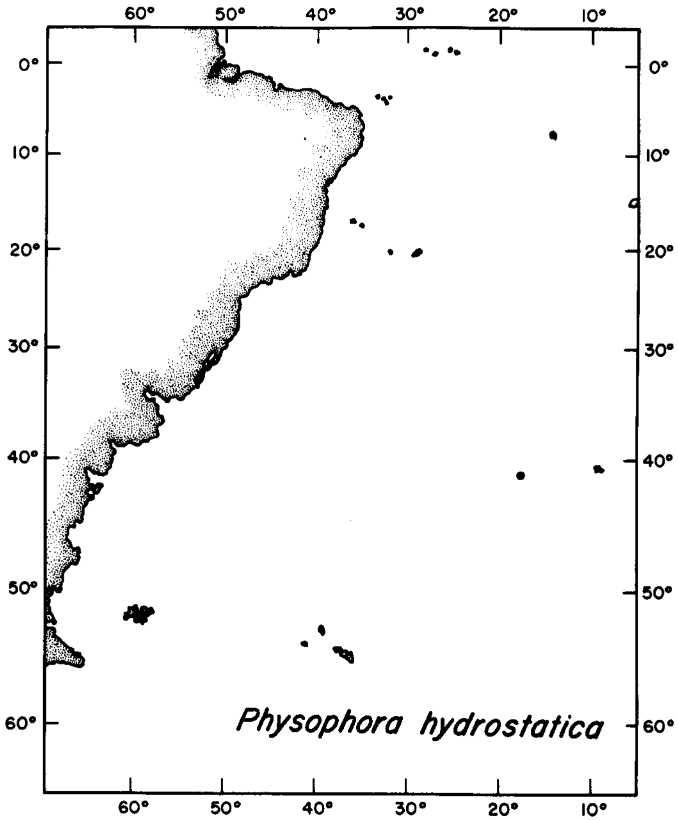
Map B6. The distribution of *Stephanomia bijuga* in the South Atlantic Ocean west of 0°.



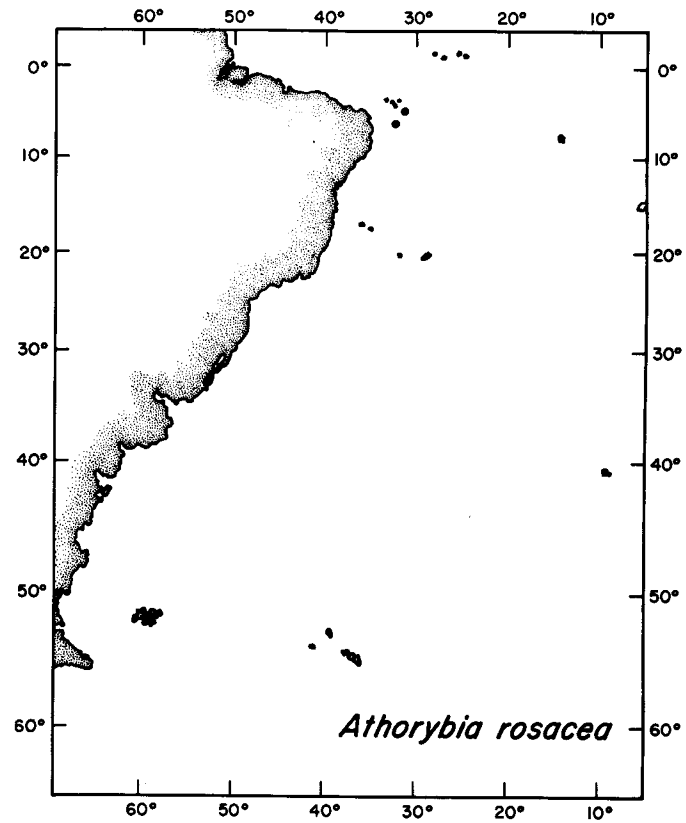
Map B7. The distribution of *Bargmannia elongata* in the South Atlantic Ocean west of 0°.



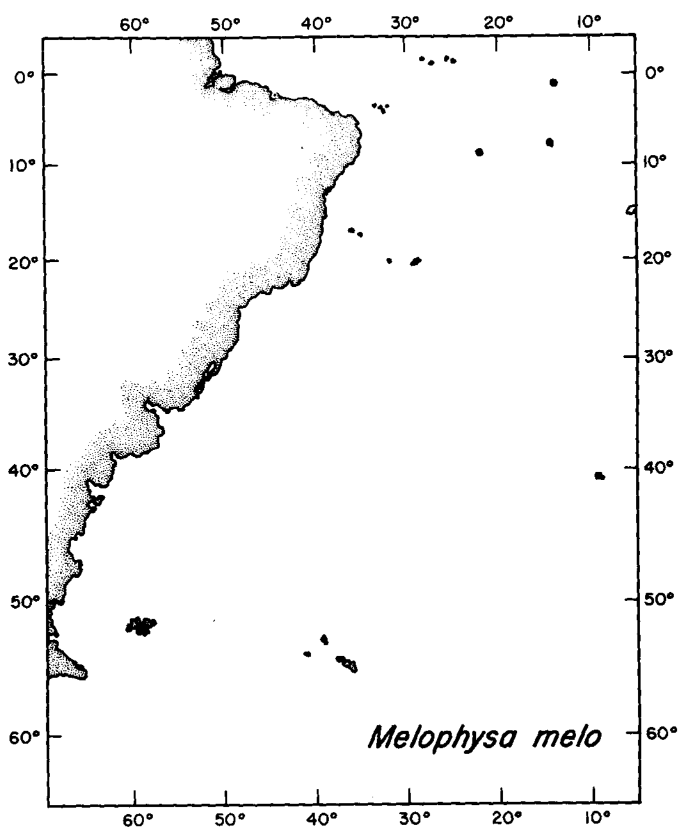
Map B8. The distribution of *Pyrostephos vanhoeffeni* in the South Atlantic Ocean west of 0°.



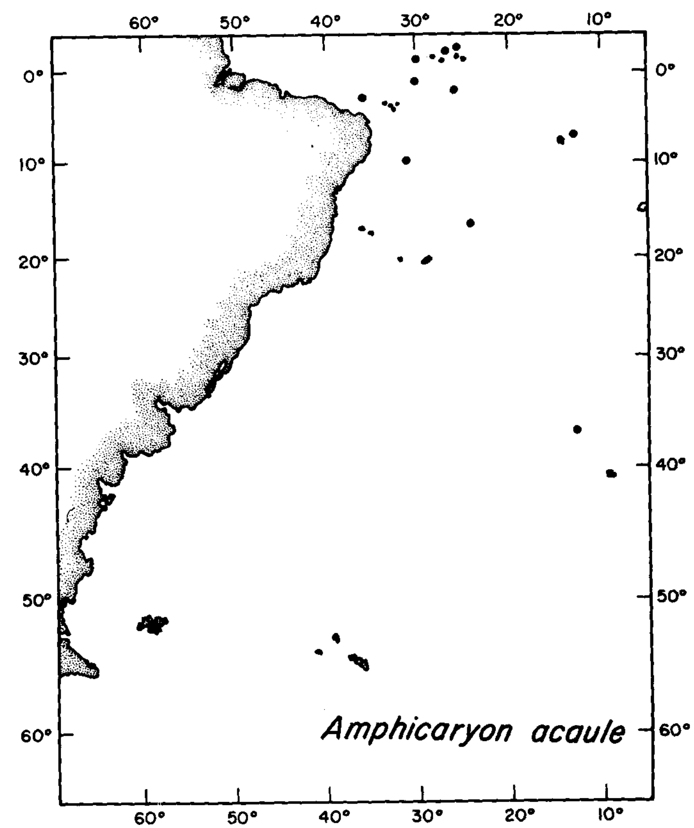
Map B9. The distribution of *Physophora hydrostatica* in the South Atlantic Ocean west of 0°.



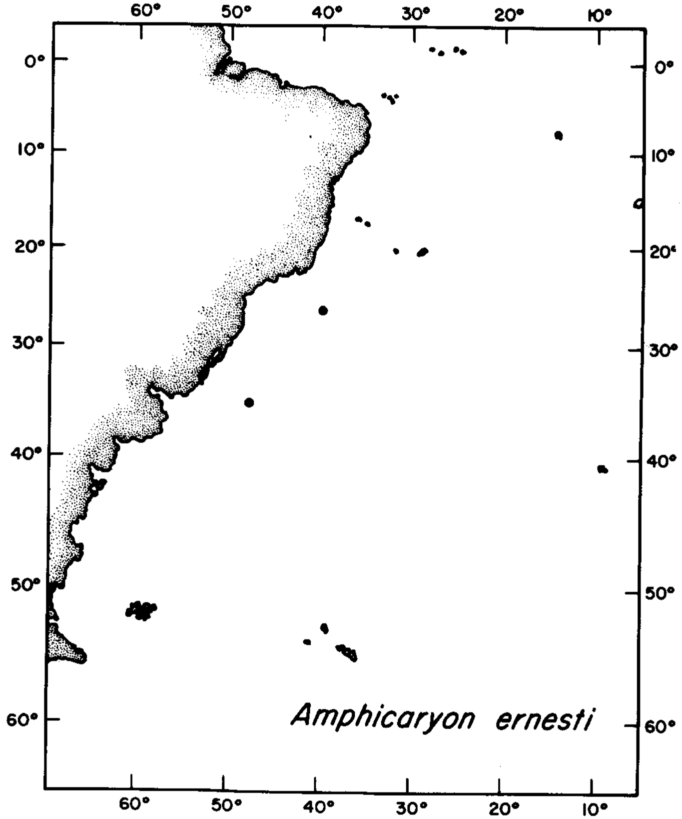
Map B10. The distribution of *Athorybia rosacea* in the South Atlantic Ocean west of 0°.



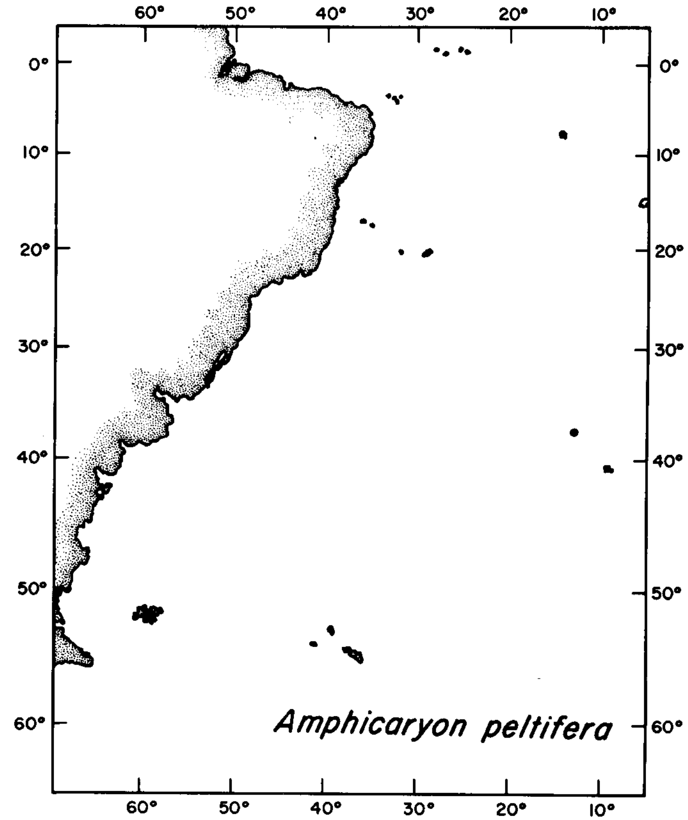
Map B11. The distribution of *Melophysa melo* in the South Atlantic Ocean west of 0°.



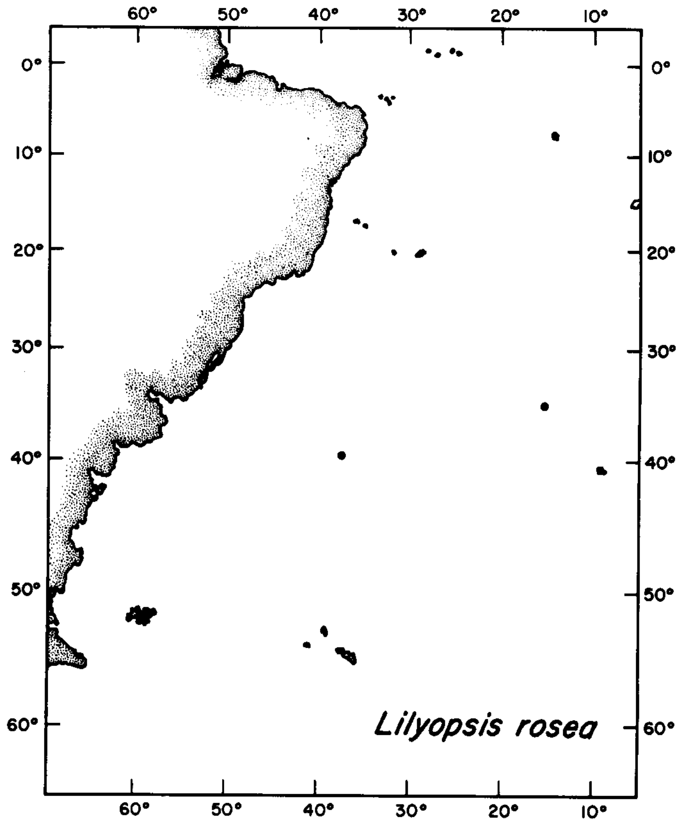
Map B12. The distribution of *Amphicaryon acaule* in the South Atlantic Ocean west of 0°.



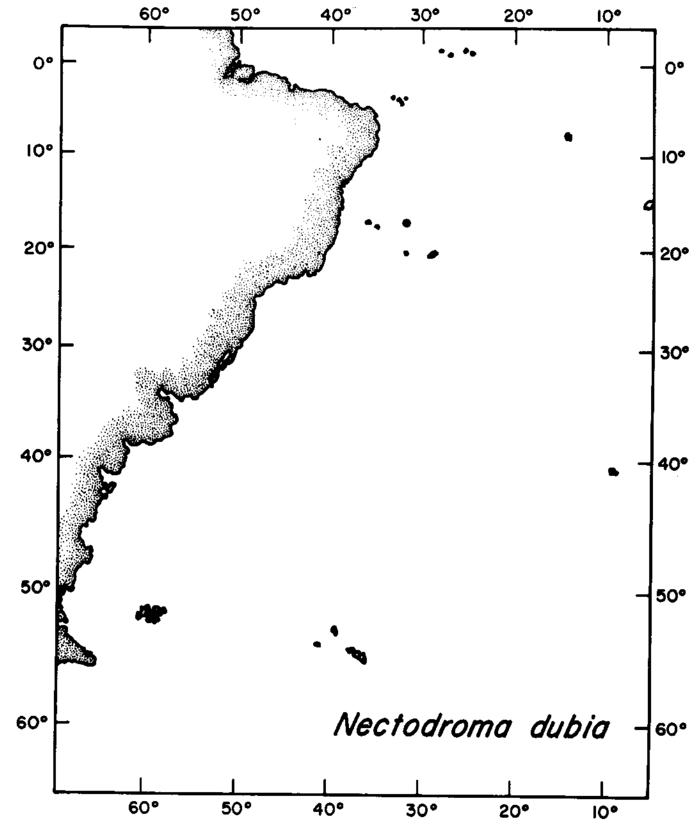
Map B13. The distribution of *Amphicaryon ernesti* in the South Atlantic Ocean west of 0°.



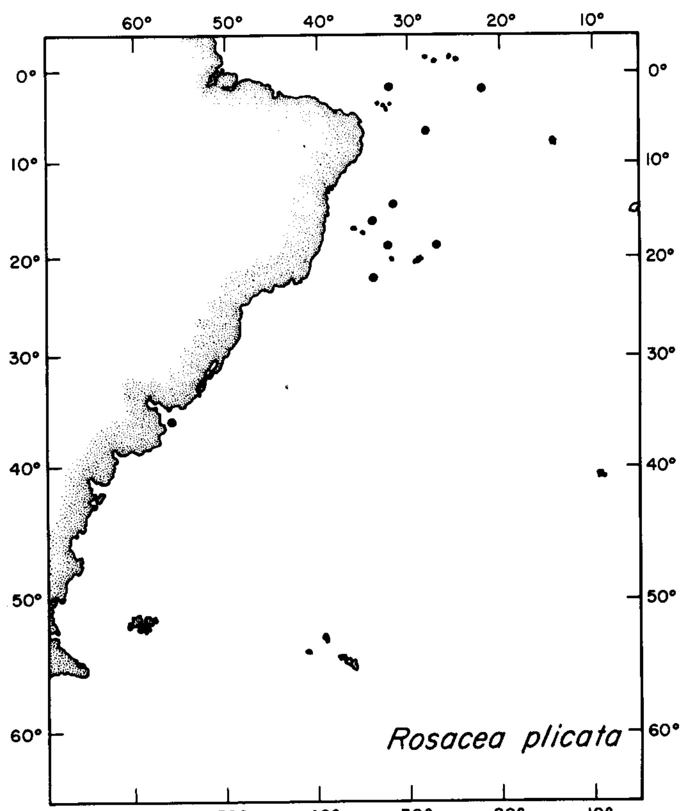
Map B14. The distribution of *Amphicaryon peltifera* in the South Atlantic Ocean west of 0°.



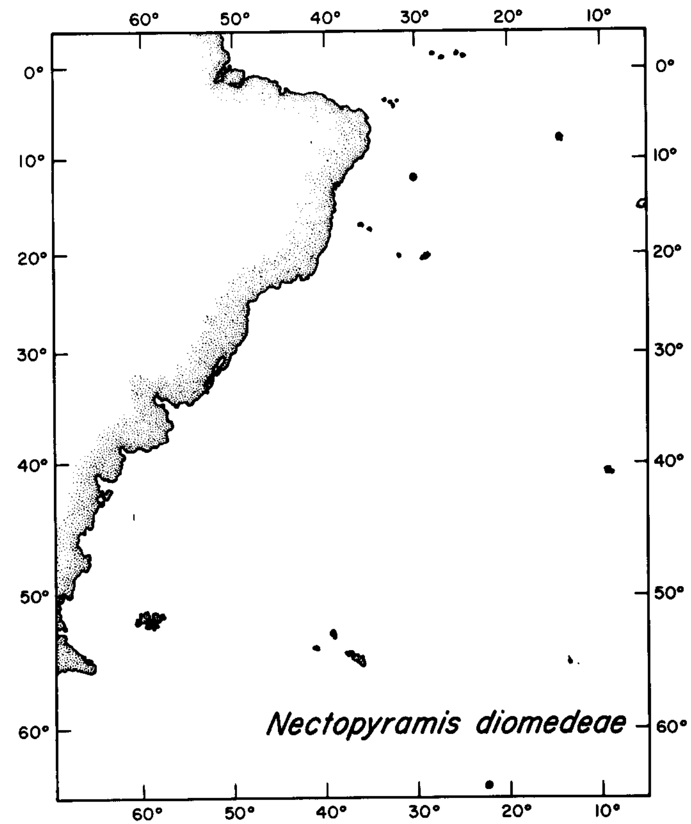
Map B15. The distribution of *Lilyopsis rosea* in the South Atlantic Ocean west of 0°.



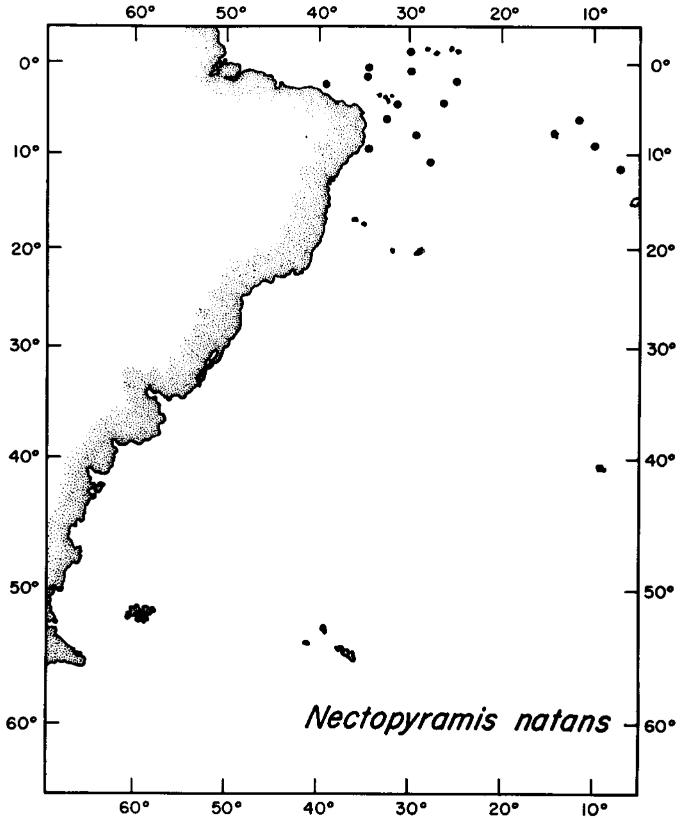
Map B16. The distribution of *Nectodroma dubia* in the South Atlantic Ocean west of 0°.



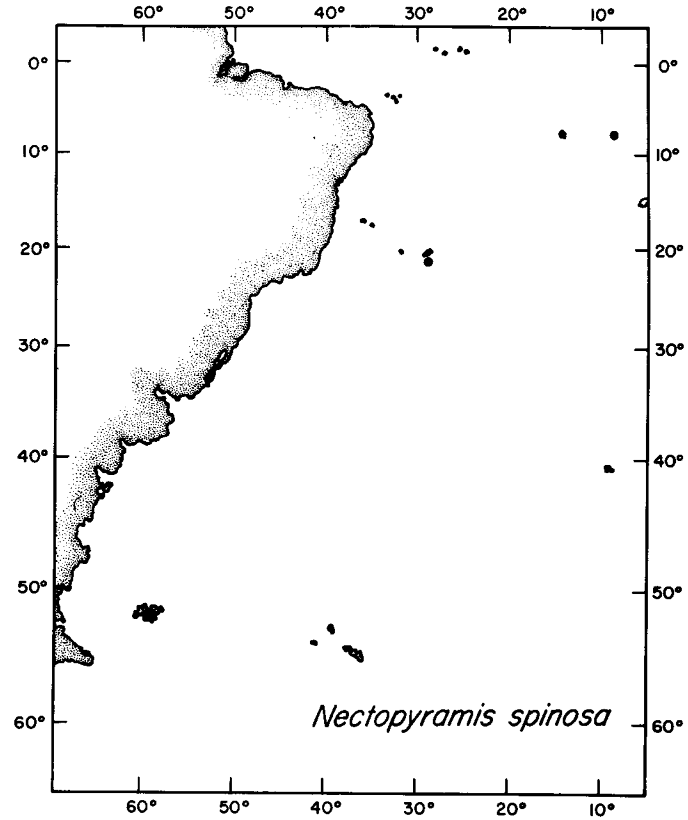
Map B17. The distribution of *Rosacea plicata* in the South Atlantic Ocean west of 0°.



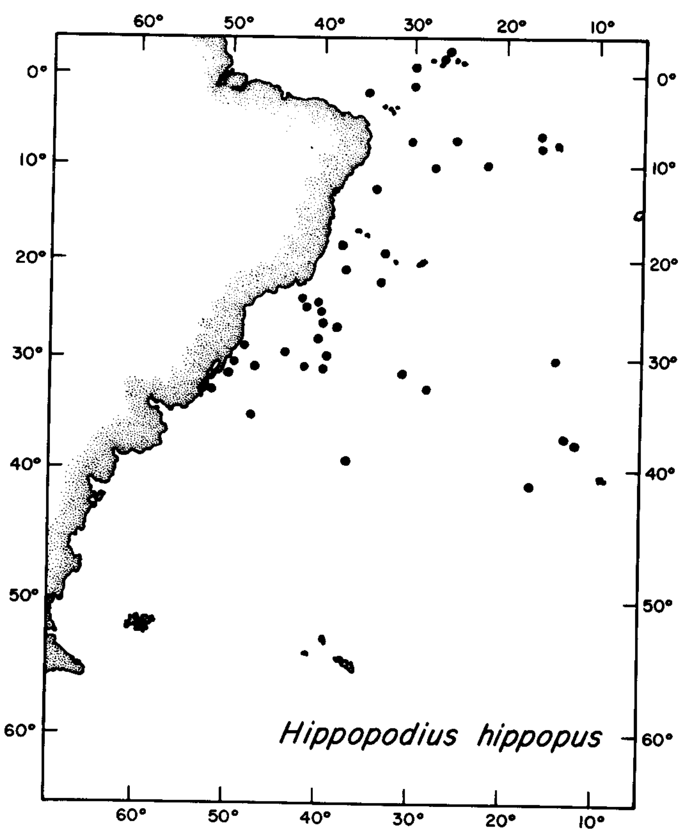
Map B18. The distribution of *Nectopyramis diomedeae* in the South Atlantic Ocean west of 0°.



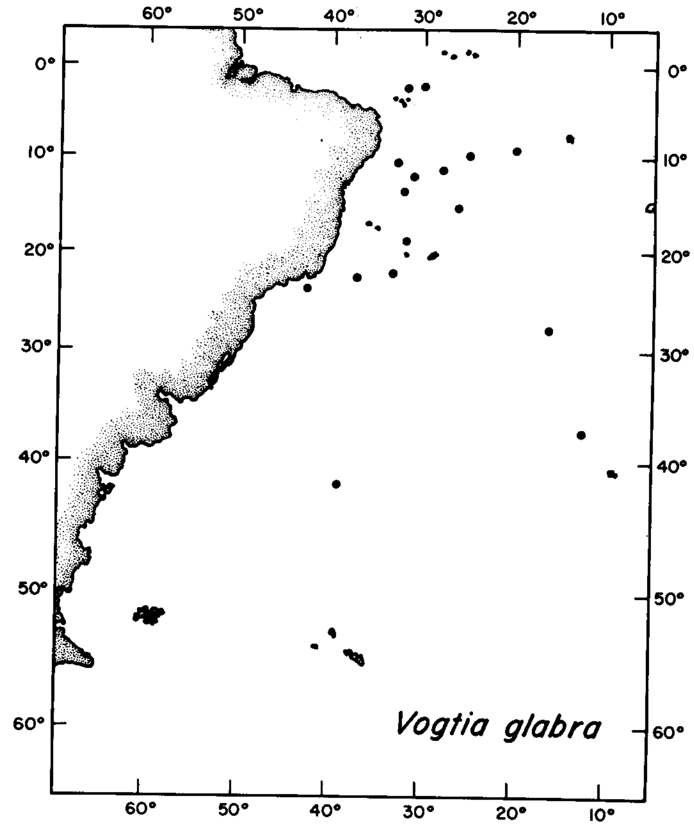
Map B19. The distribution of *Nectopyramis natans* in the South Atlantic Ocean west of 0°.



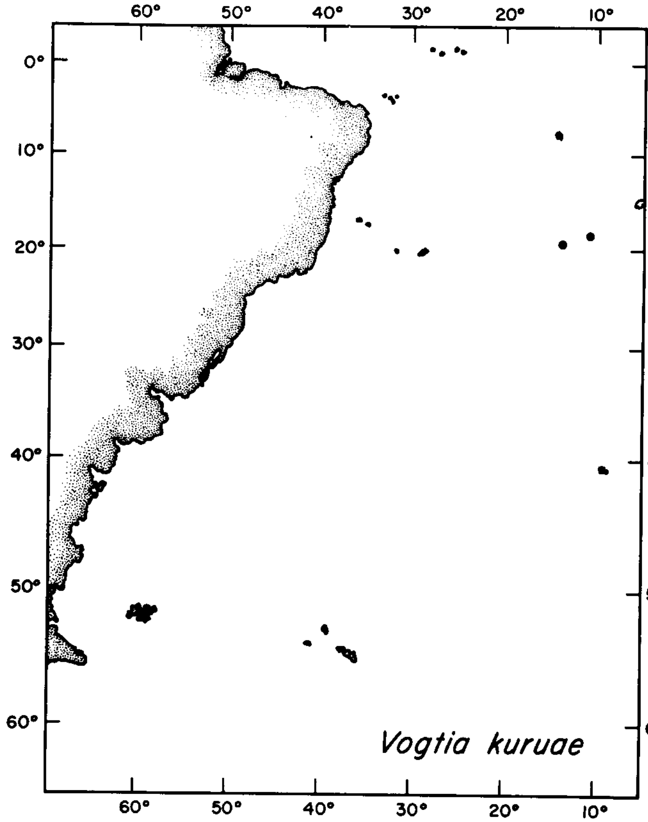
Map B20. The distribution of *Nectopyramis spinosa* in the South Atlantic Ocean west of 0°.



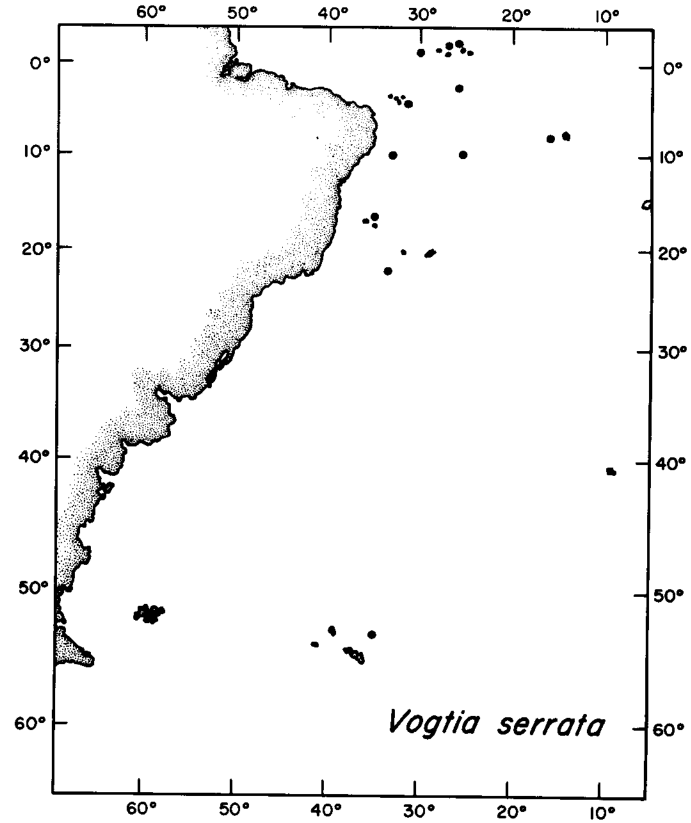
Map B21. The distribution of *Hippopodius hippopus* in the South Atlantic Ocean west of 0°.



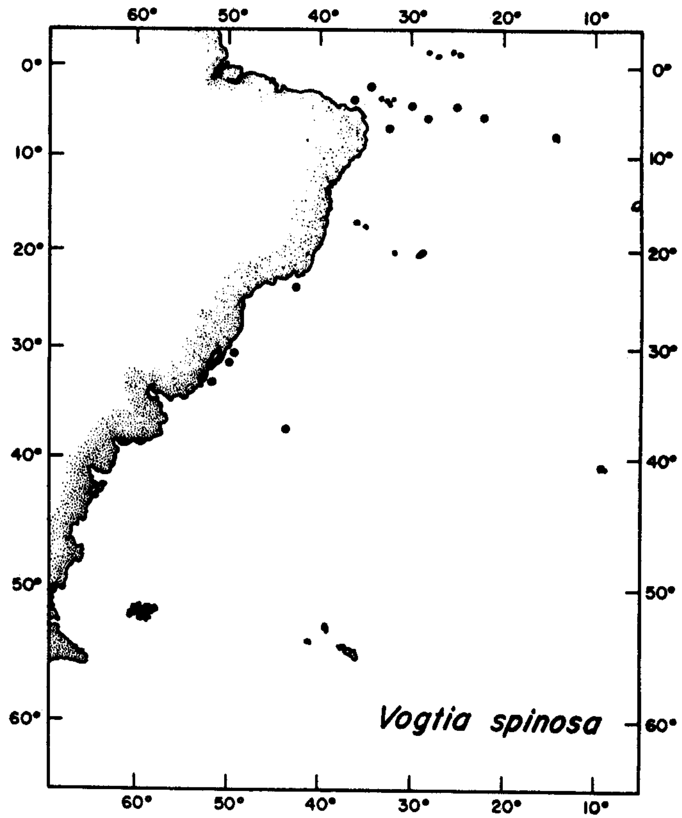
Map B22. The distribution of *Vogtia glabra* in the South Atlantic Ocean west of 0°.



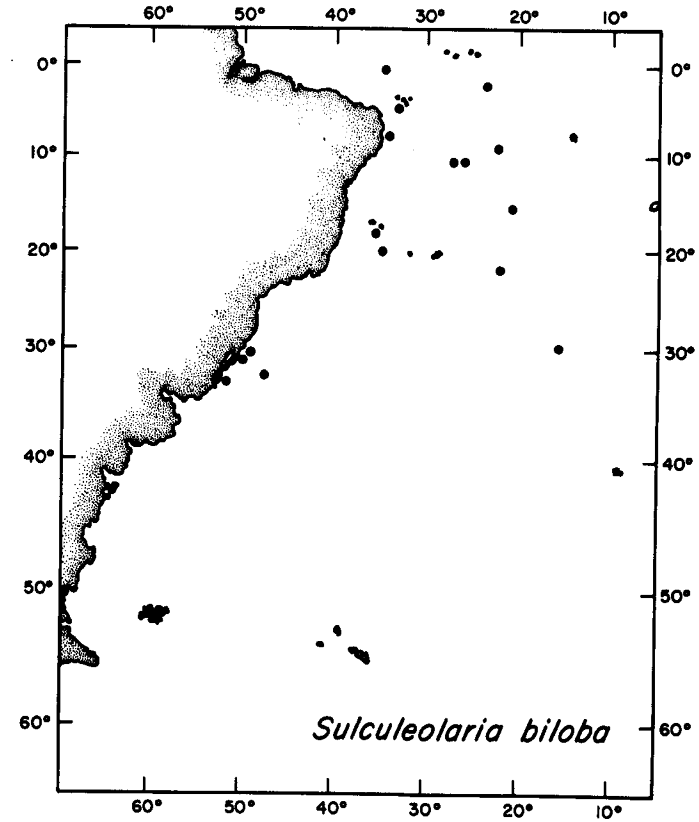
Map B23. The distribution of *Vogtia kuruae* in the South Atlantic Ocean west of 0°.



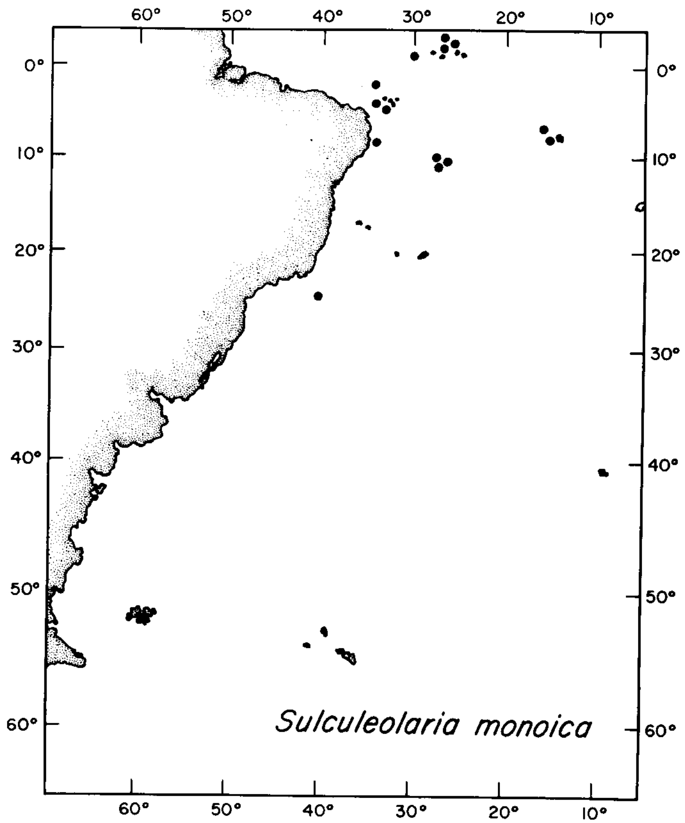
Map B24. The distribution of *Vogtia serrata* in the South Atlantic Ocean west of 0°.



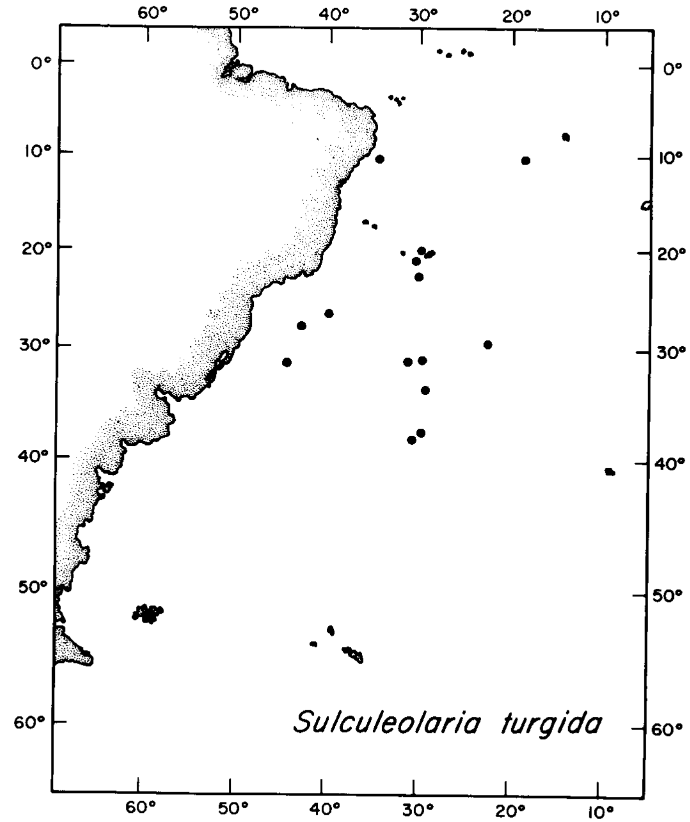
Map B25. The distribution of *Vogtia spinosa* in the South Atlantic Ocean west of 0°.



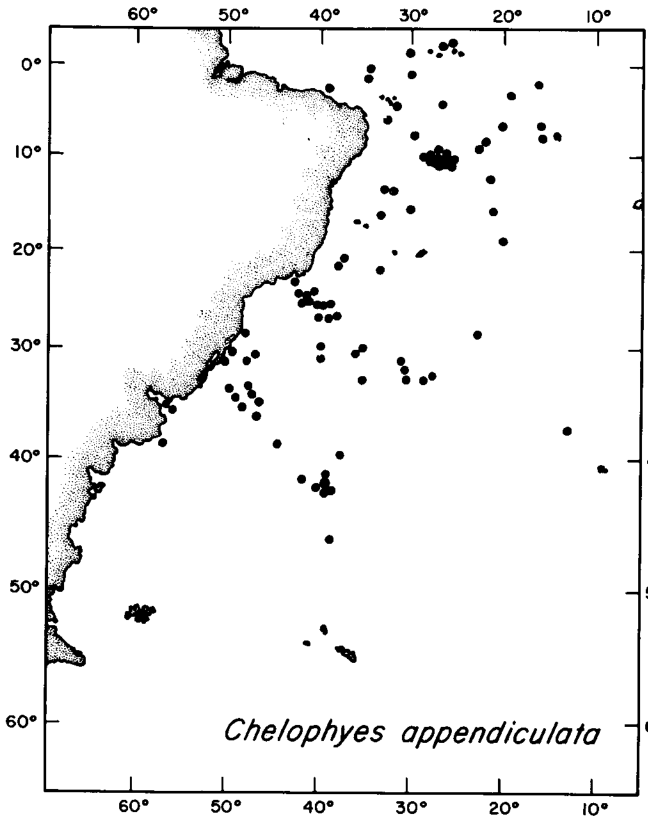
Map B26. The distribution of *Sulculeolaria biloba* in the South Atlantic Ocean west of 0°.



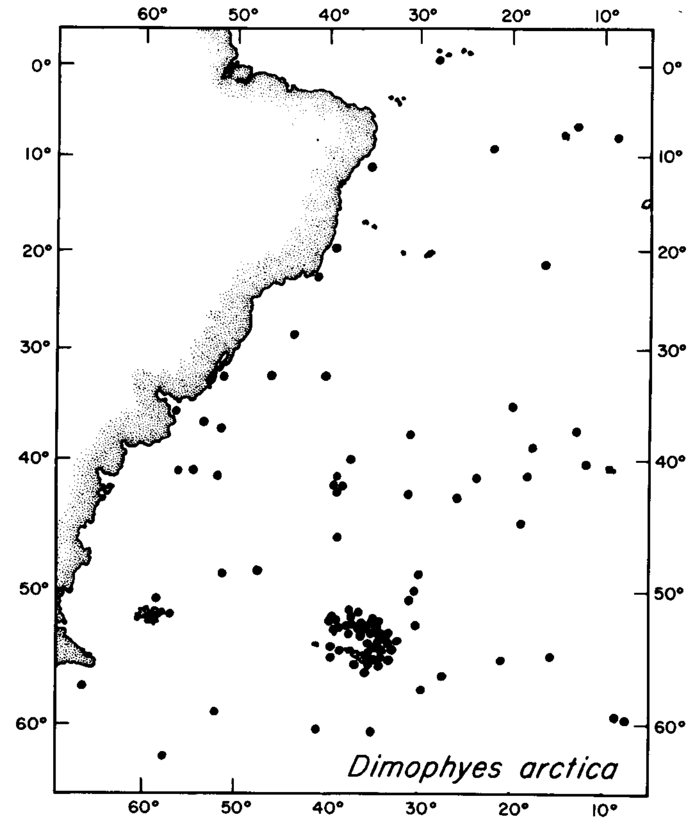
Map B27. The distribution of *Sulculeolaria monoica* in the South Atlantic Ocean west of 0°.



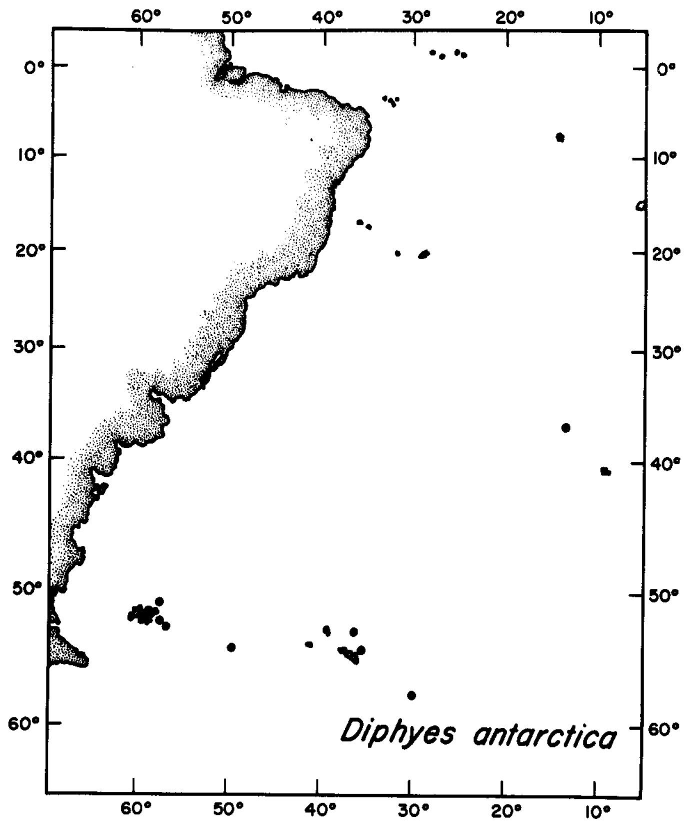
Map B28. The distribution of *Sulculeolaria turgida* in the South Atlantic Ocean west of 0°.



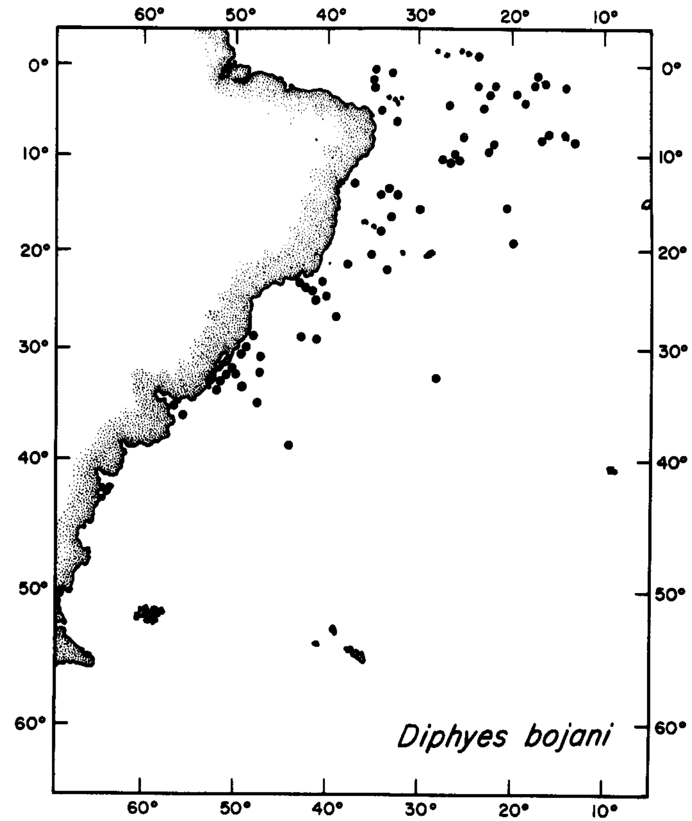
Map B29. The distribution of *Chelophyes appendiculata* in the South Atlantic Ocean west of 0°.



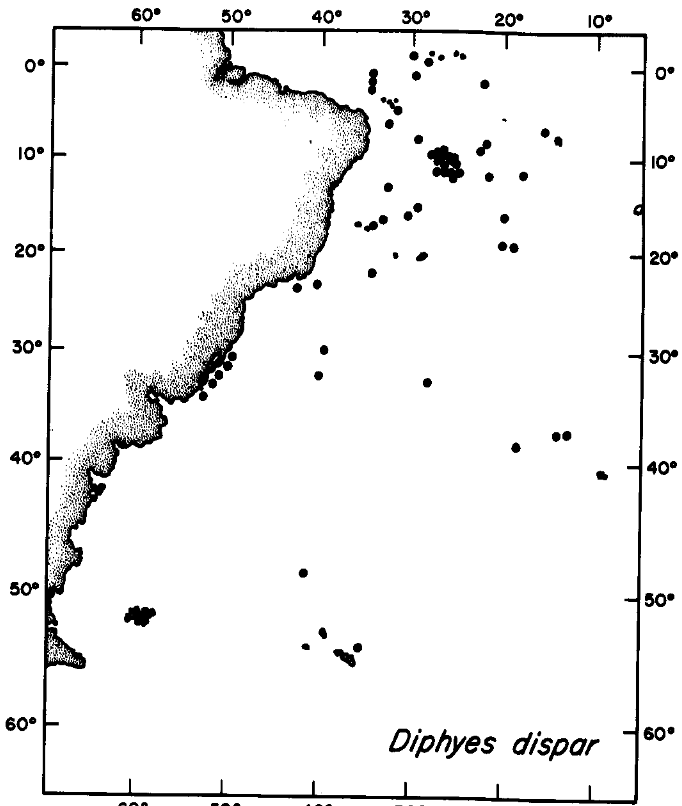
Map B30. The distribution of *Dimophyes arctica* in the South Atlantic Ocean west of 0°.



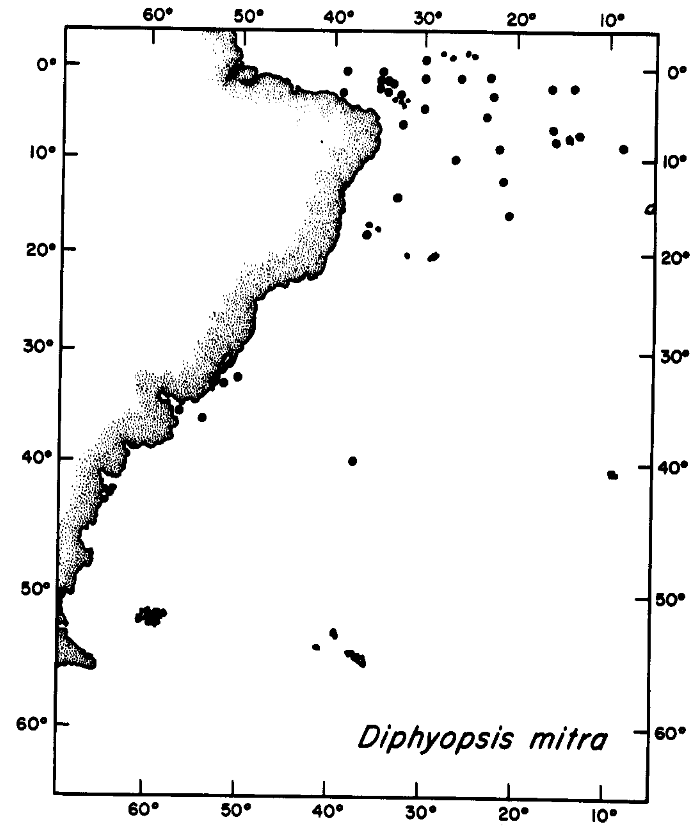
Map B31. The distribution of *Diphyes antarctica* in the South Atlantic Ocean west of 0°.



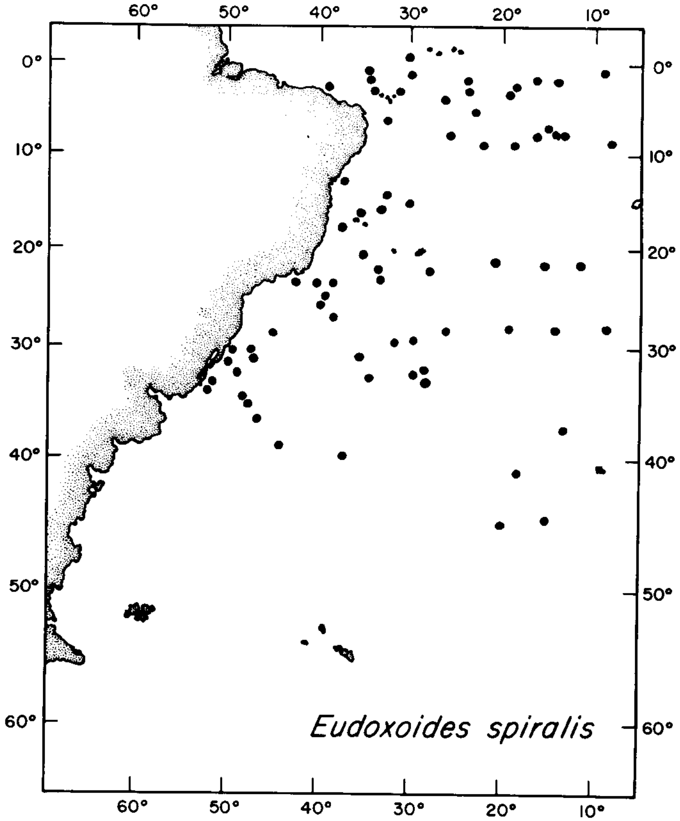
Map B32. The distribution of *Diphyes bojani* in the South Atlantic Ocean west of 0°.



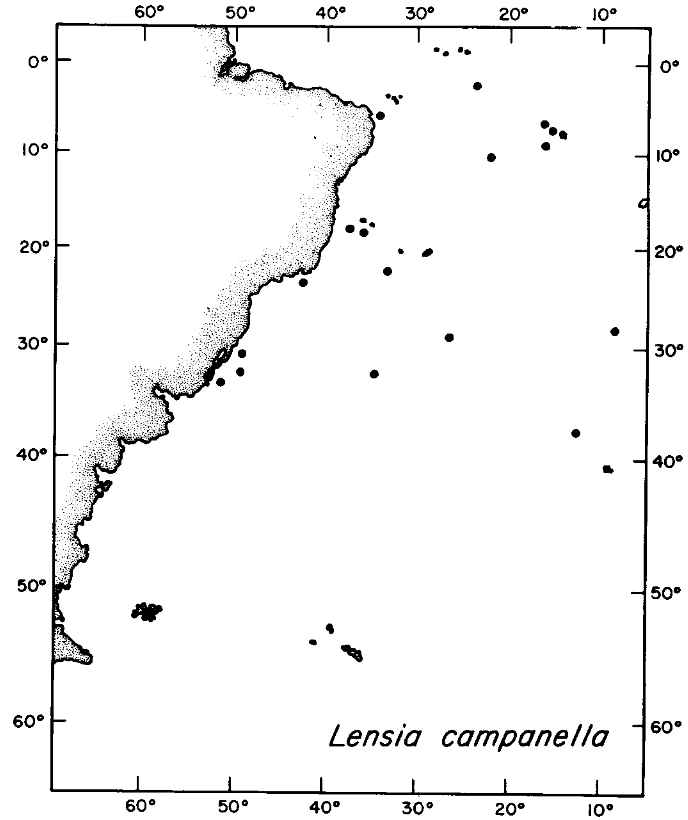
Map B33. The distribution of *Diphyes dispar* in the South Atlantic Ocean west of 0°.



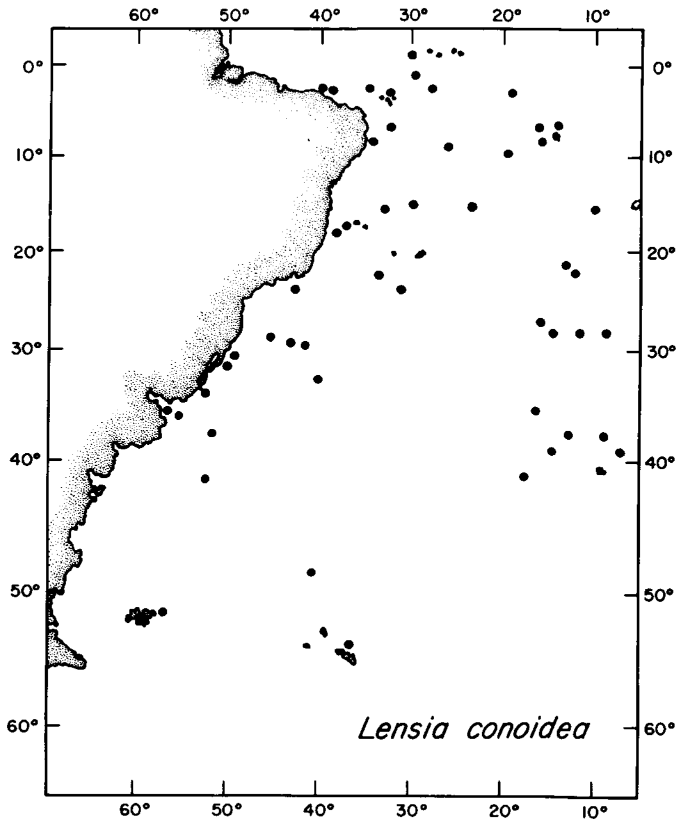
Map B34. The distribution of *Diphyopsis mitra* in the South Atlantic Ocean west of 0°.



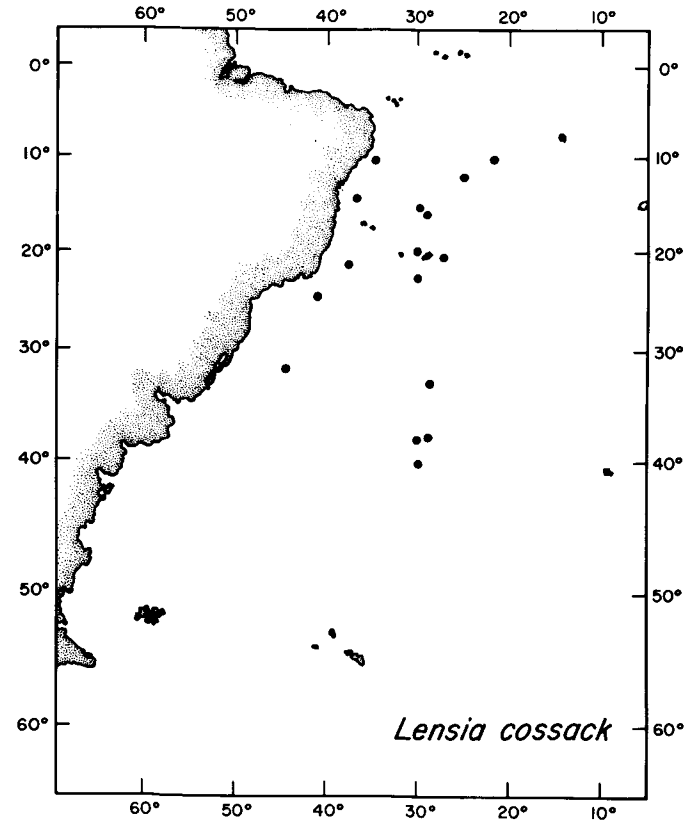
Map B35. The distribution of *Eudoxoides spiralis* in the South Atlantic Ocean west of 0°.



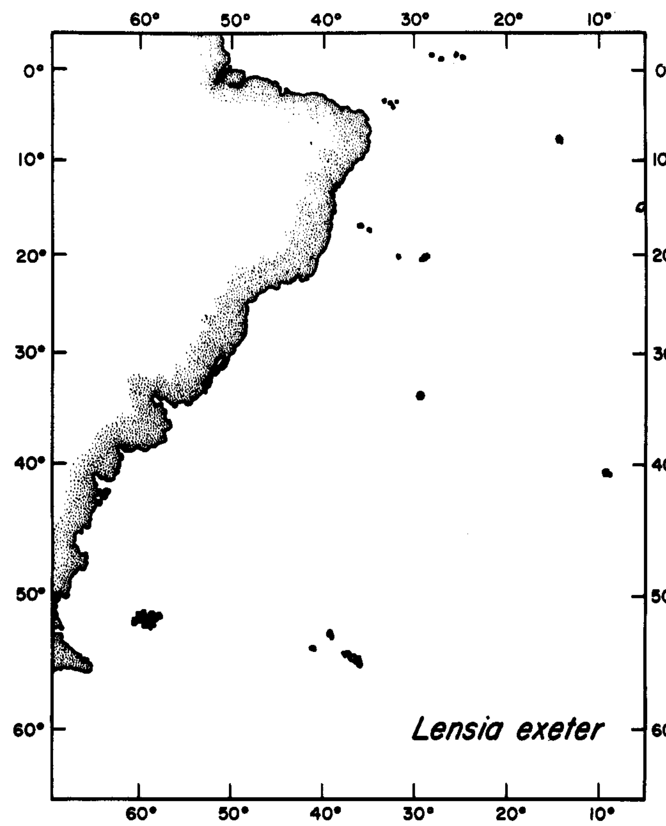
Map B36. The distribution of *Lensia campanella* in the South Atlantic Ocean west of 0°.



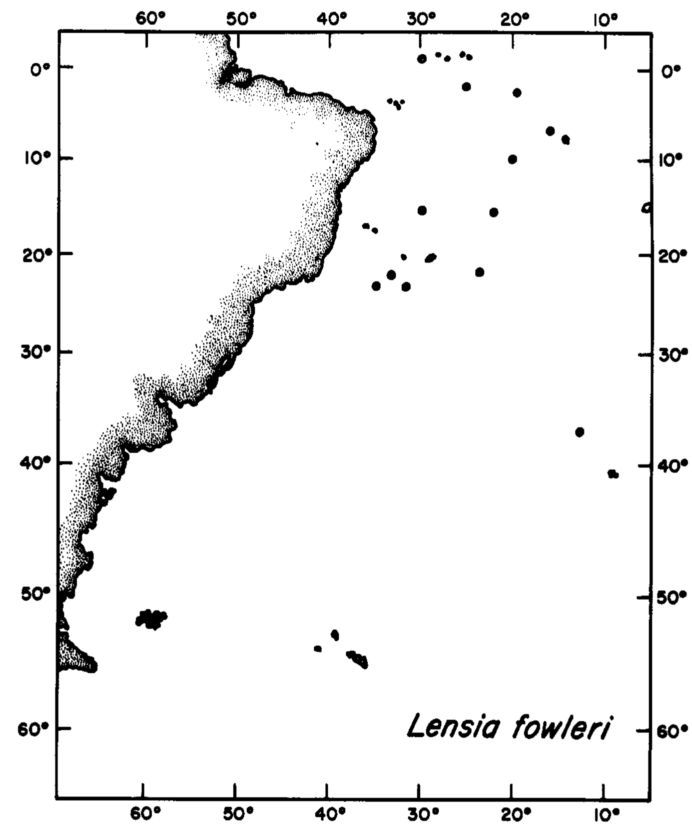
Map B37. The distribution of *Lensia conoidea* in the South Atlantic Ocean west of 0°.



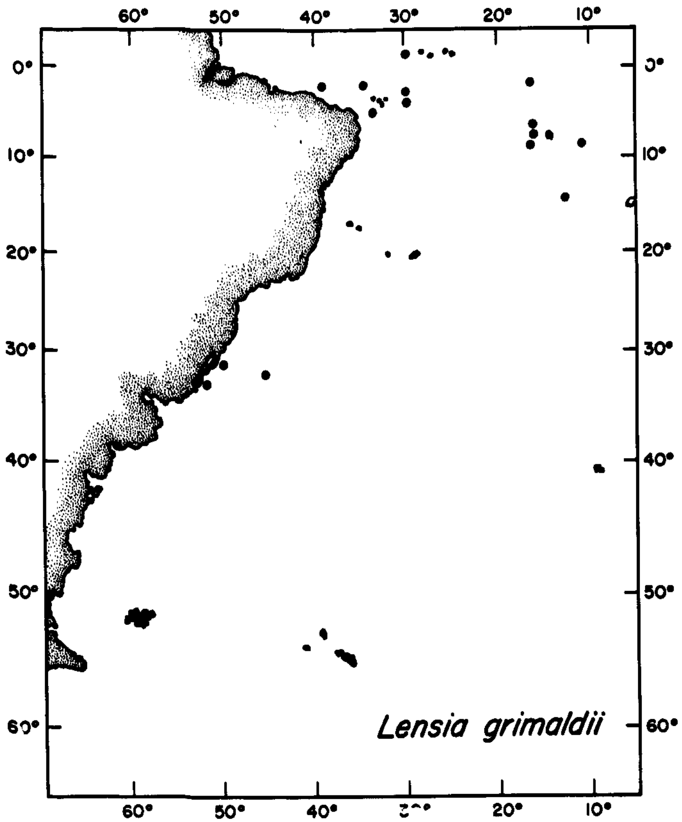
Map B38. The distribution of *Lensia cossack* in the South Atlantic Ocean west of 0°.



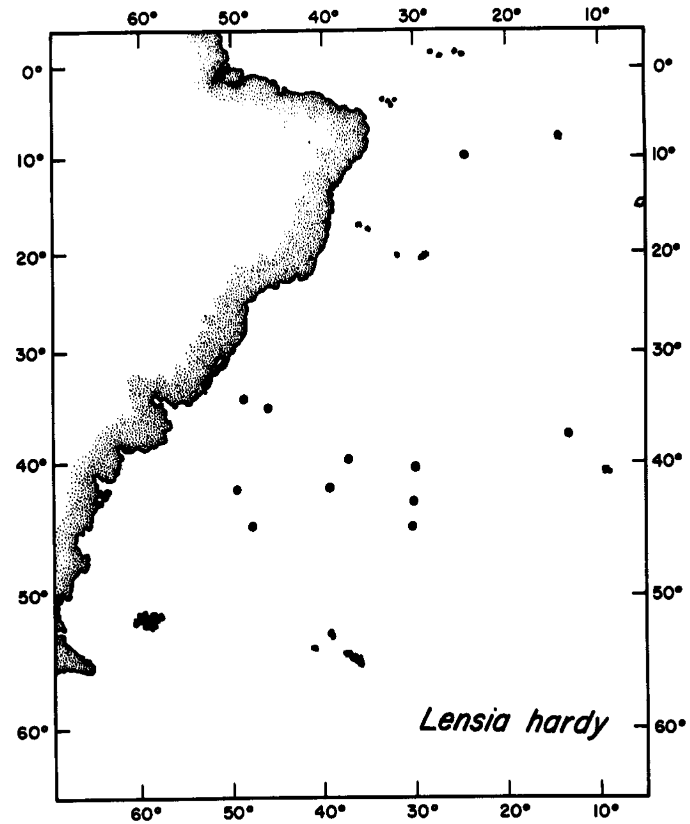
Map B39. The distribution of *Lensia exeter* in the South Atlantic Ocean west of 0°.



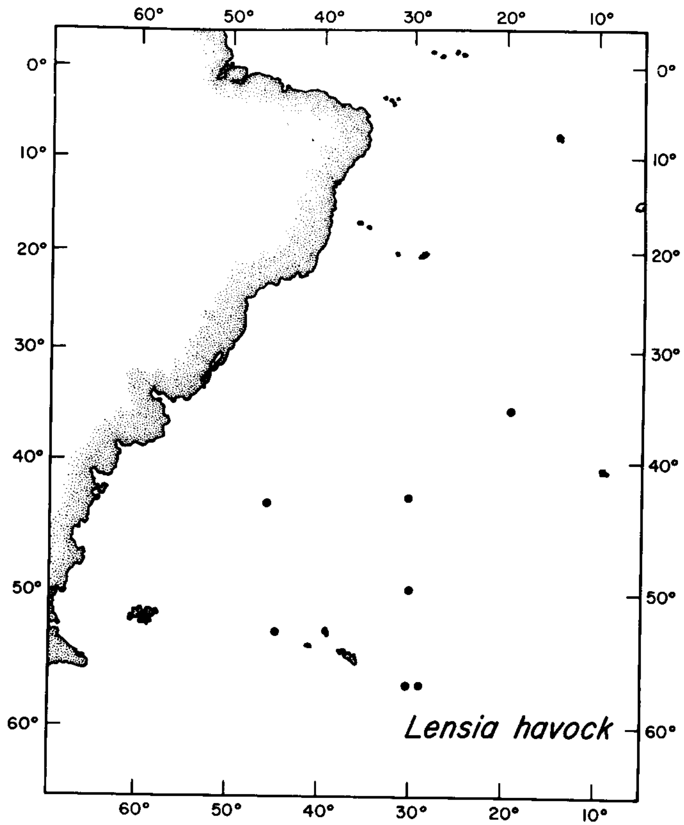
Map B40. The distribution of *Lensia fowleri* in the South Atlantic Ocean west of 0°.



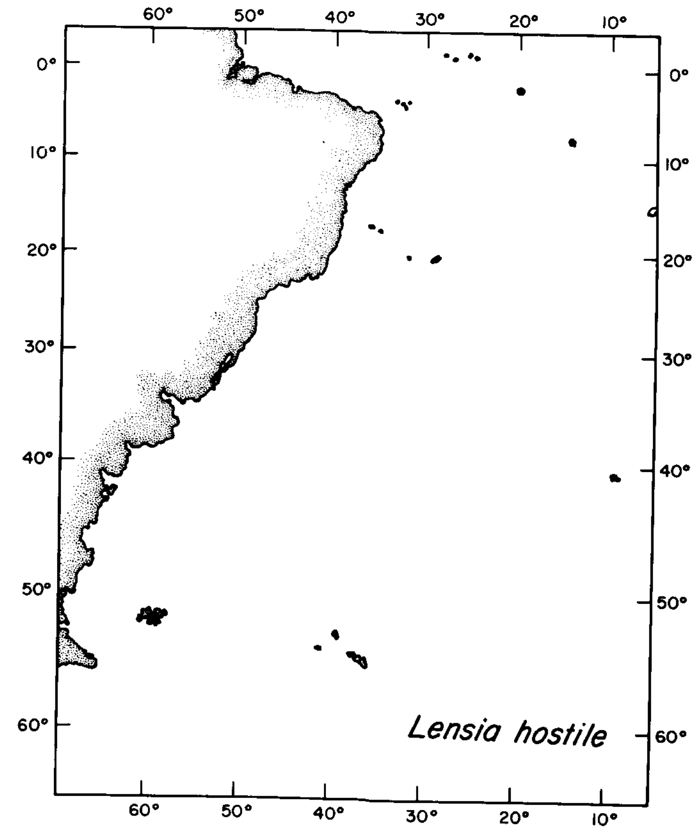
Map B41. The distribution of *Lensia grimaldii* in the South Atlantic Ocean west of 0°.



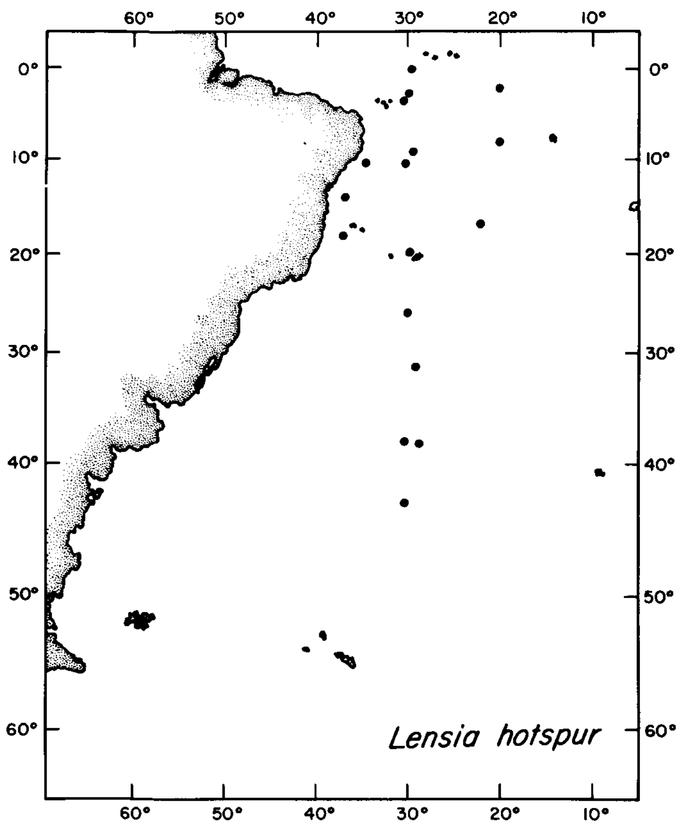
Map B42. The distribution of *Lensia hardy* in the South Atlantic Ocean west of 0°.



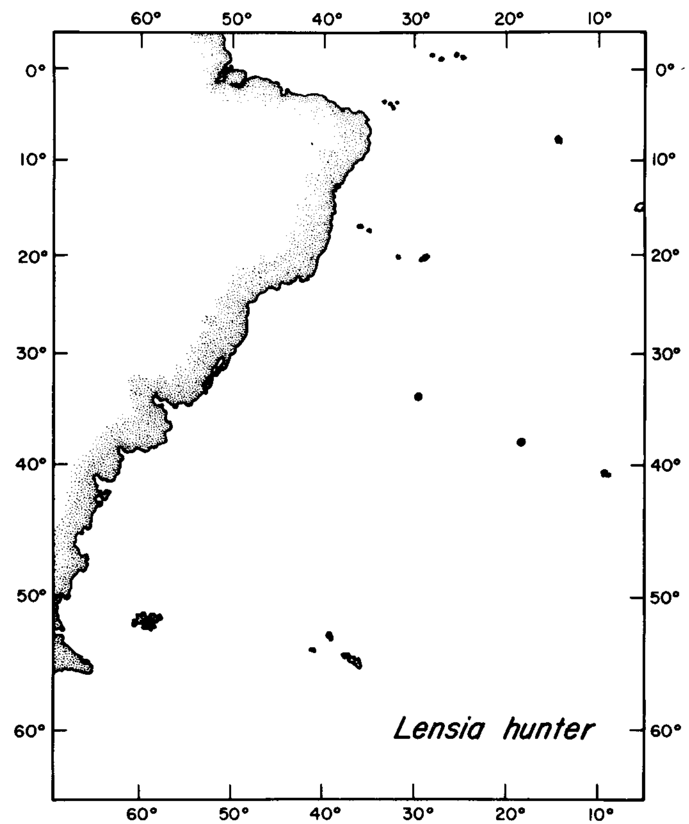
Map B43. The distribution of *Lensia havock* in the South Atlantic Ocean west of 0°.



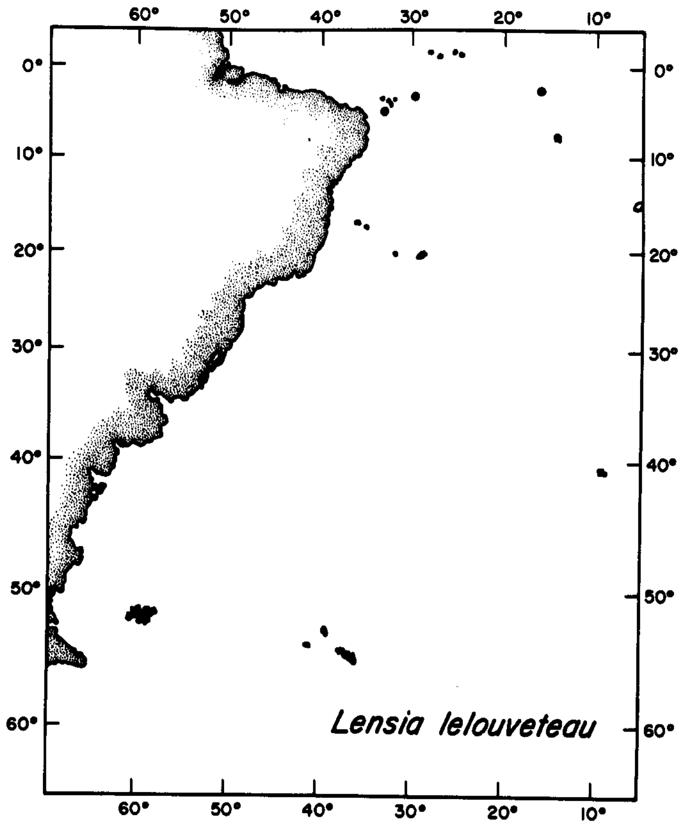
Map B44. The distribution of *Lensia hostile* in the South Atlantic Ocean west of 0°.



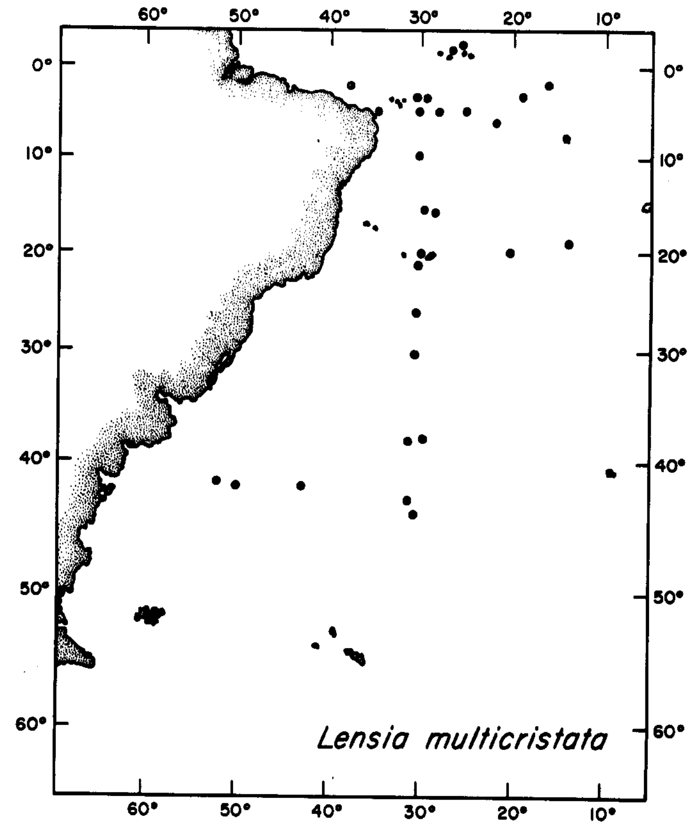
Map B45. The distribution of *Lensia hotspur* in the South Atlantic Ocean west of 0°.



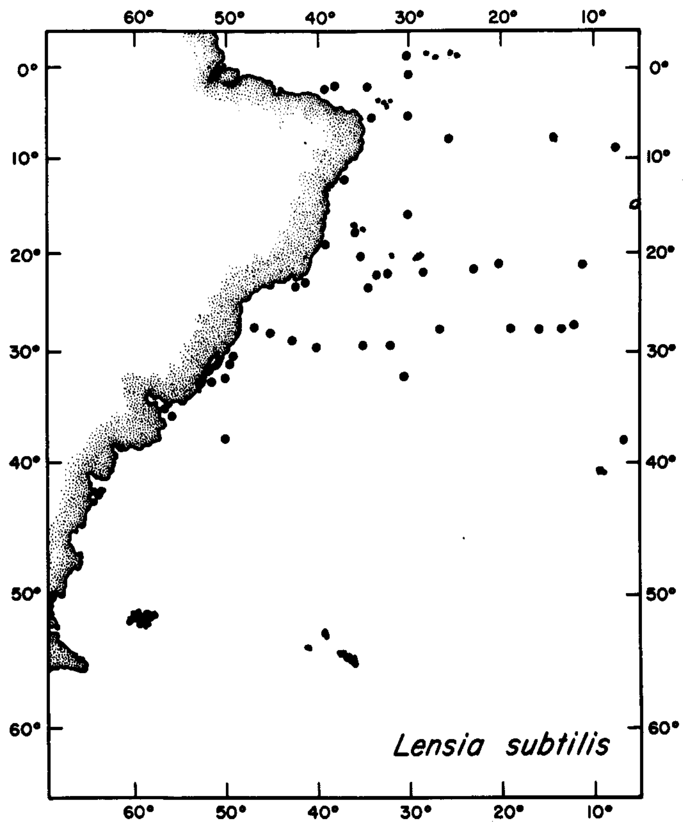
Map B46. The distribution of *Lensia hunter* in the South Atlantic Ocean west of 0°.



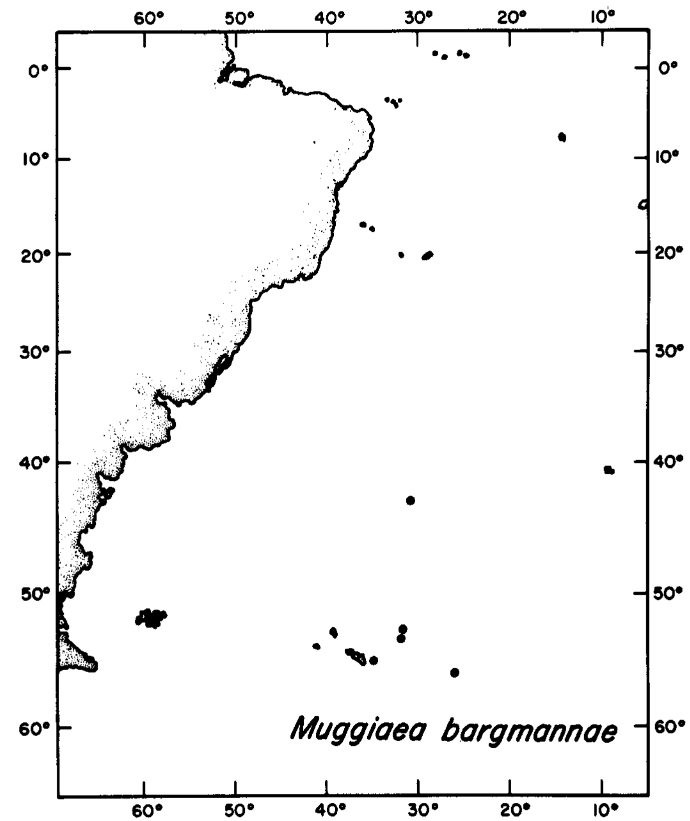
Map B47. The distribution of *Lensia lelouveteau* in the South Atlantic Ocean west of 0°.



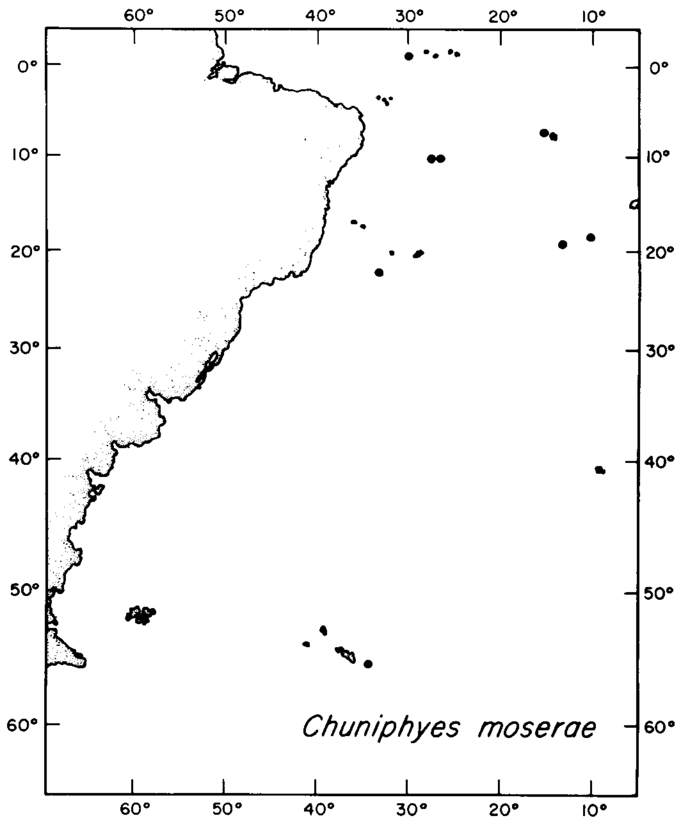
Map B48. The distribution of *Lensia multicristata* in the South Atlantic Ocean west of 0°.



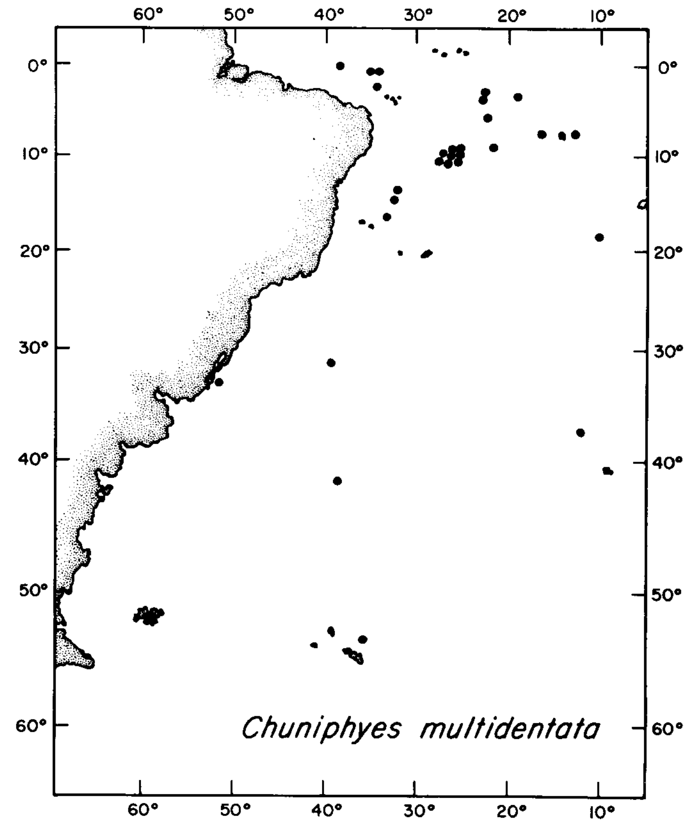
Map B49. The distribution of *Lensia subtilis* in the South Atlantic Ocean west of 0°.



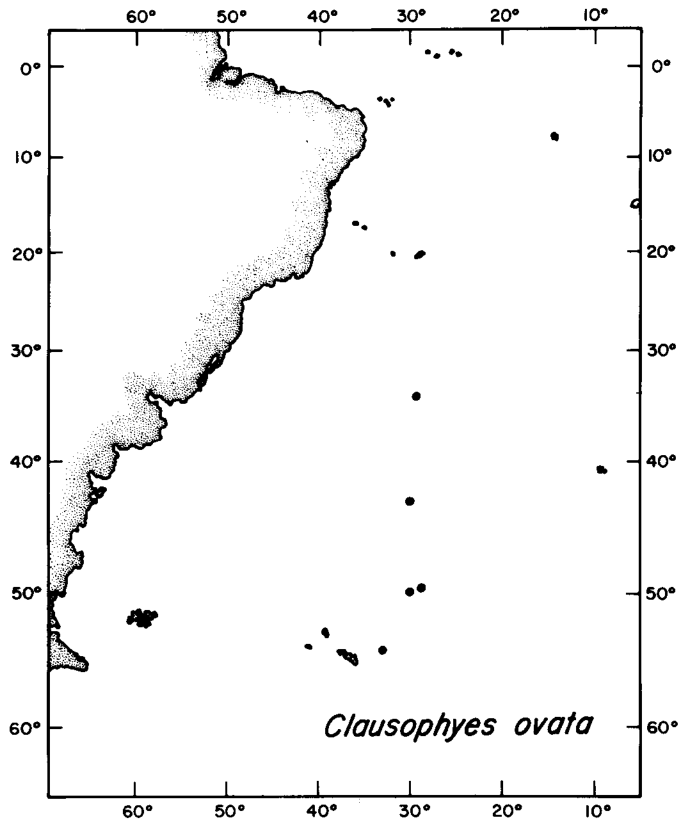
Map B50. The distribution of *Muggiaea bargmannae* in the South Atlantic Ocean west of 0°.



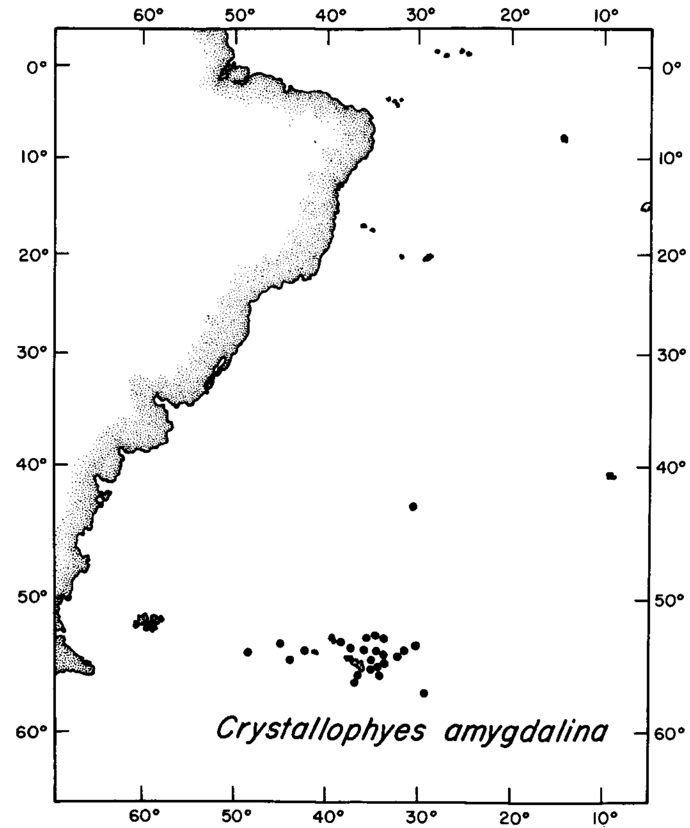
Map B51. The distribution of *Chuniphyes moserae* in the South Atlantic Ocean west of 0°.



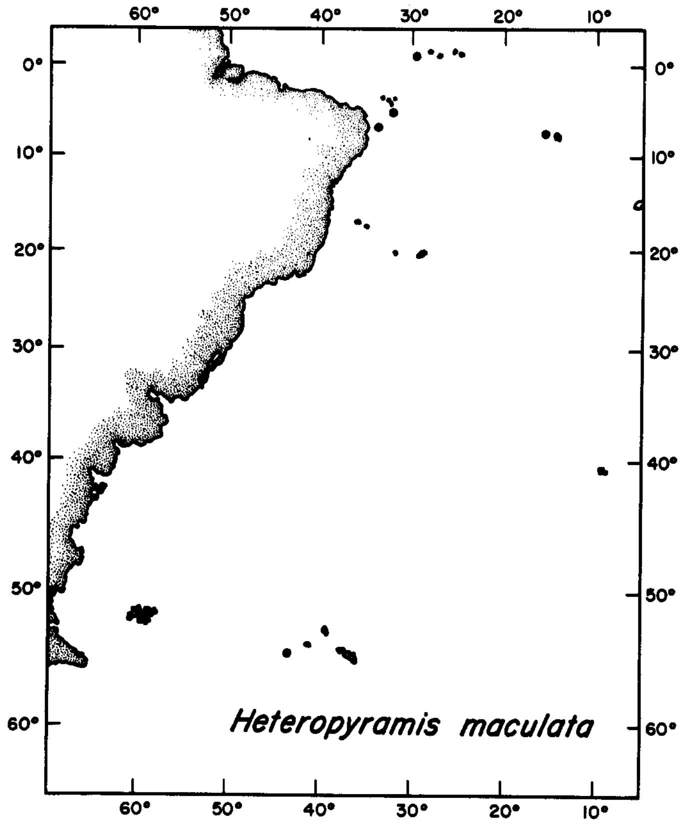
Map B52. The distribution of *Chuniphyes multidentata* in the South Atlantic Ocean west of 0°.



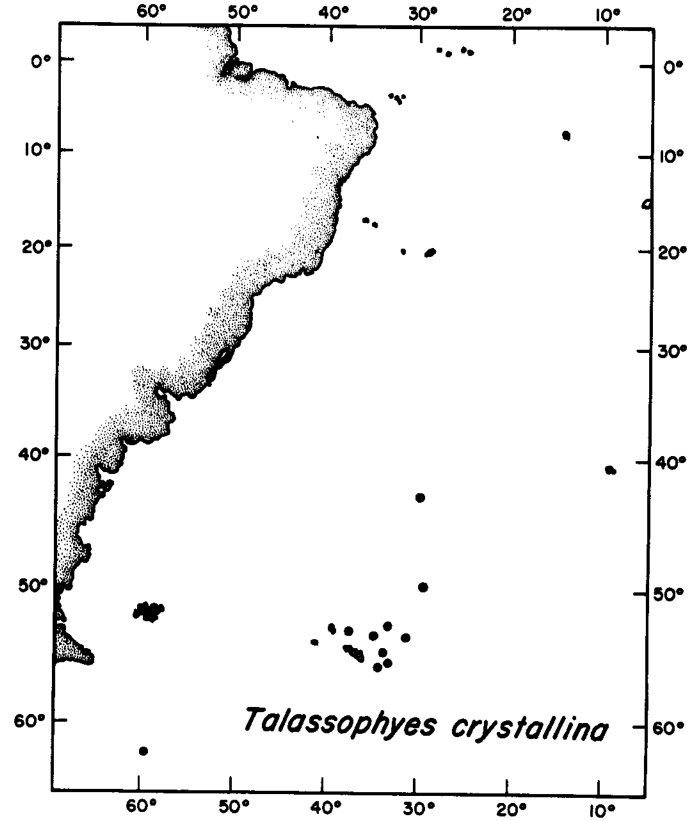
Map B53. The distribution of *Clausophyes ovata* in the South Atlantic Ocean west of 0°.



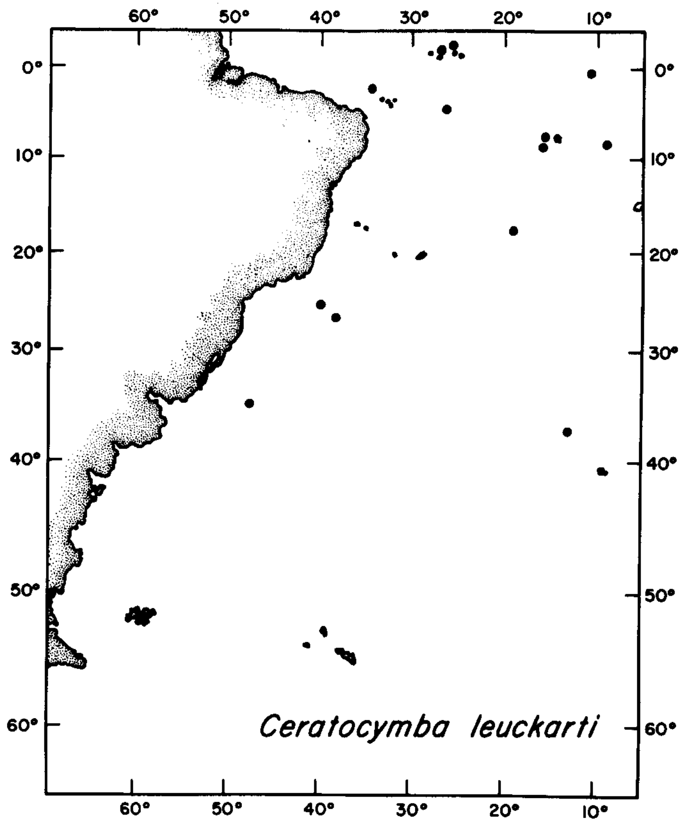
Map B54. The distribution of *Crystallophyes amygdalina* in the South Atlantic Ocean west of 0°.



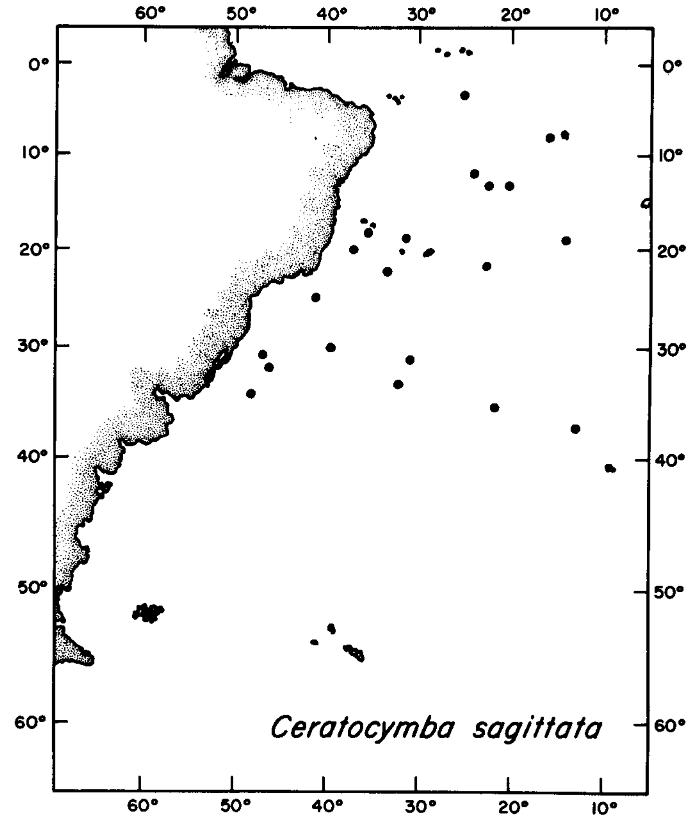
Map B55. The distribution of *Heteropyramis maculata* in the South Atlantic Ocean west of 0°.



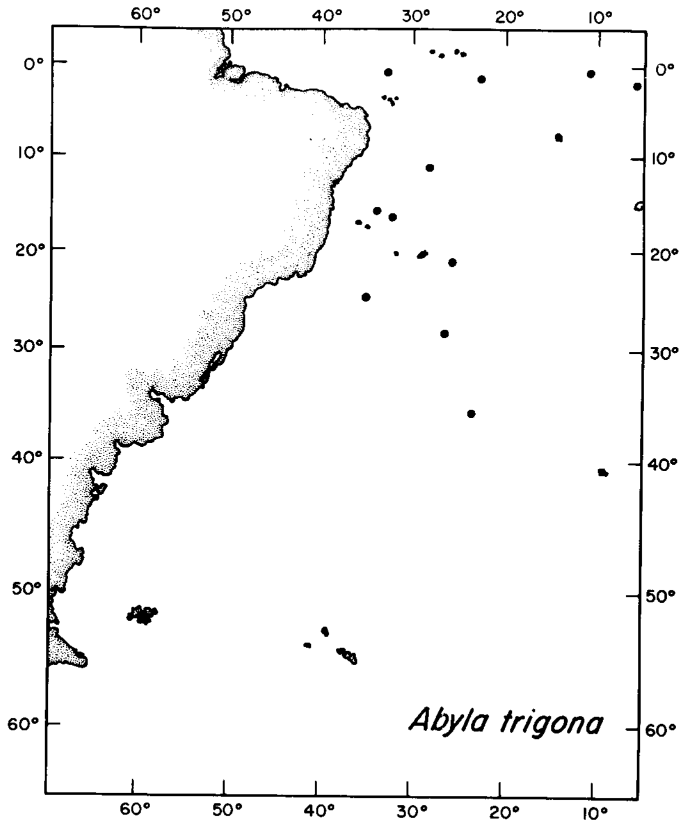
Map B56. The distribution of *Thalassophyes crystallina* in the South Atlantic Ocean west of 0°.



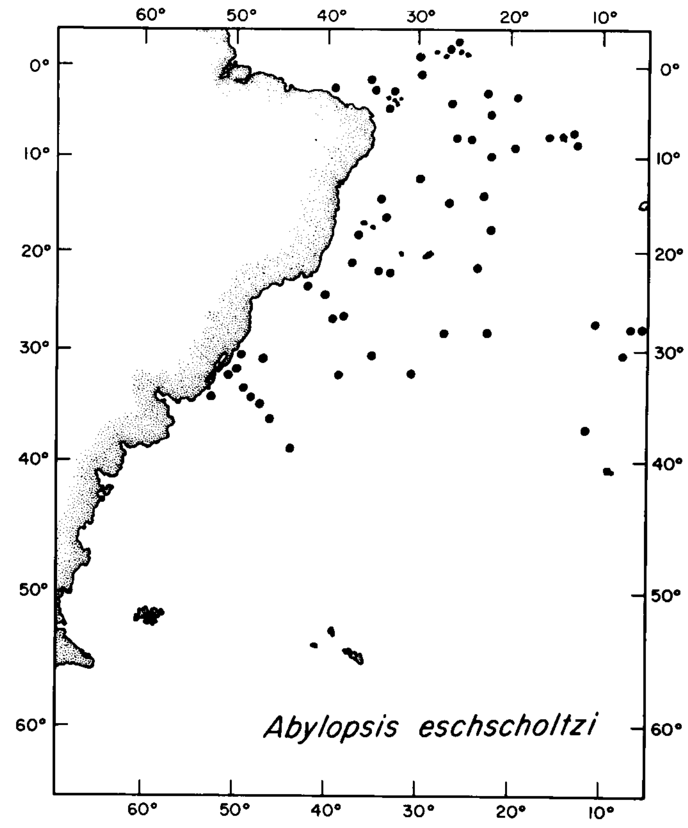
Map B57. The distribution of *Ceratocymba leuckarti* in the South Atlantic Ocean west of 0°.



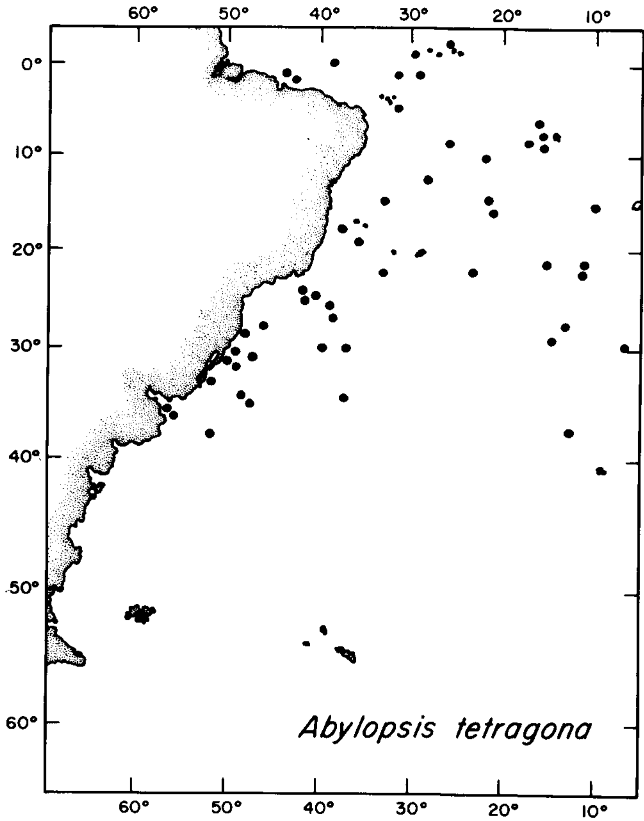
Map B58. The distribution of *Ceratocymba sagittata* in the South Atlantic Ocean west of 0°.



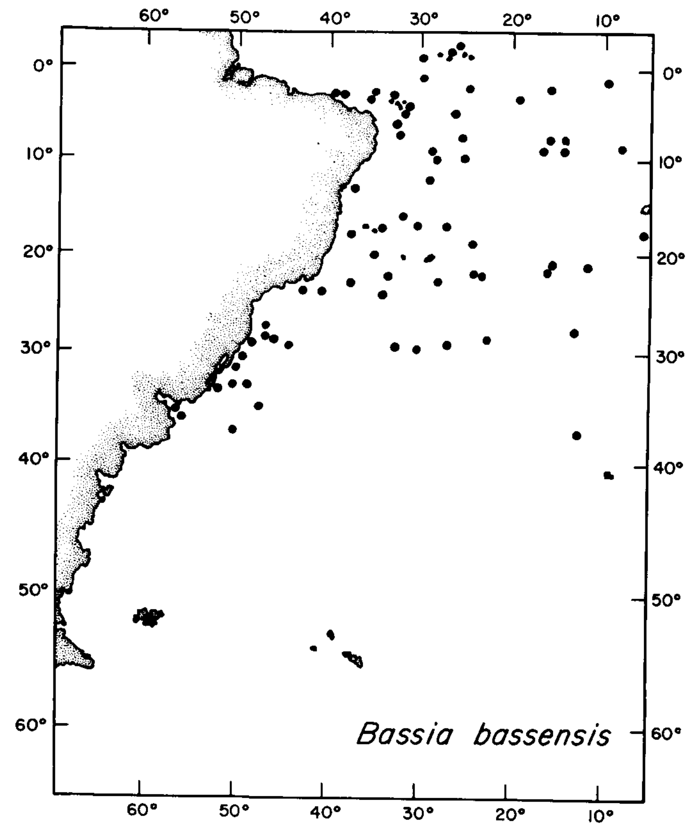
Map B59. The distribution of *Abyla trigona* in the South Atlantic Ocean west of 0°.



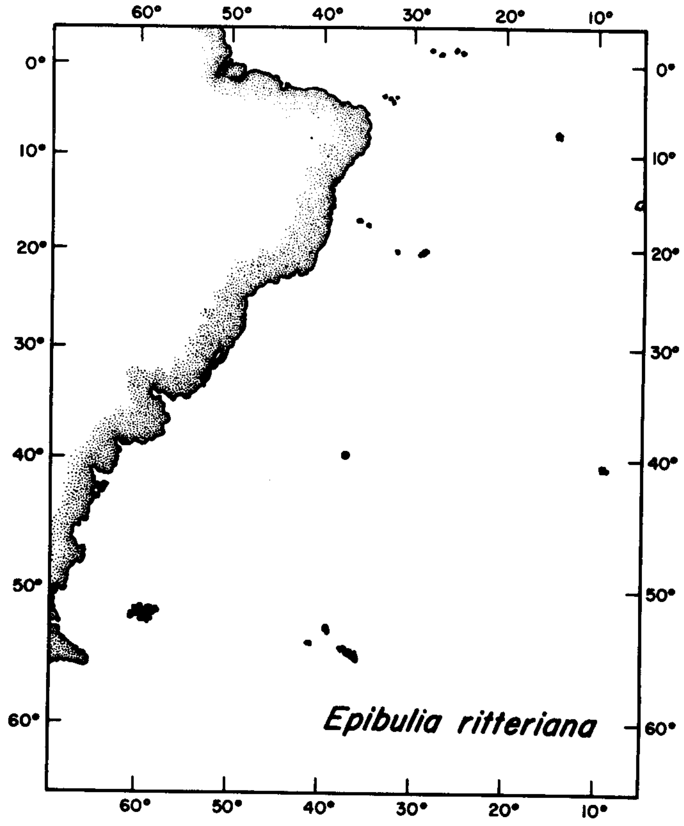
Map B60. The distribution of *Abylopsis eschscholtzi* in the South Atlantic Ocean west of 0°.



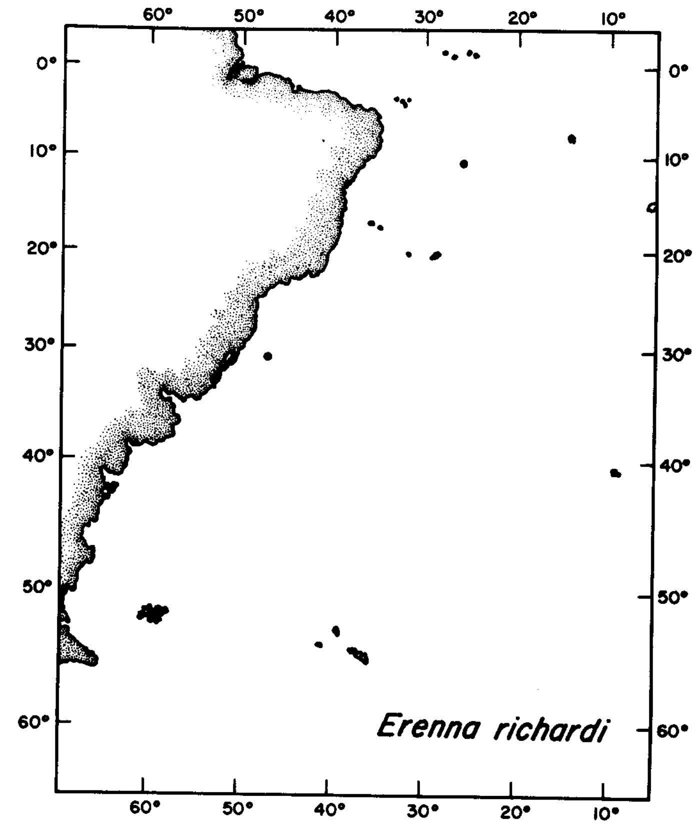
Map B61. The distribution of *Abylopsis tetragona* in the South Atlantic Ocean west of 0°.



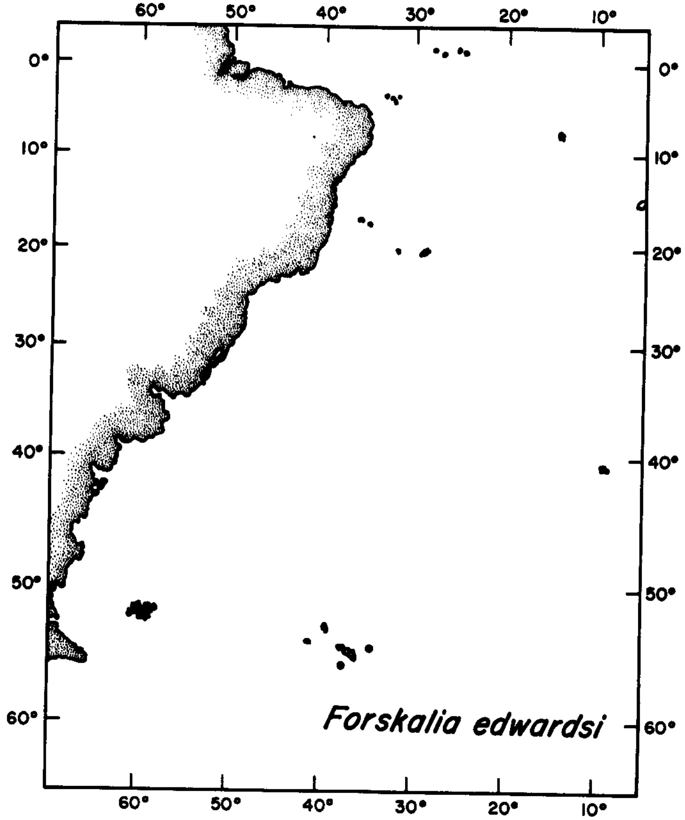
Map B62. The distribution of *Bassia bassensis* in the South Atlantic Ocean west of 0°.



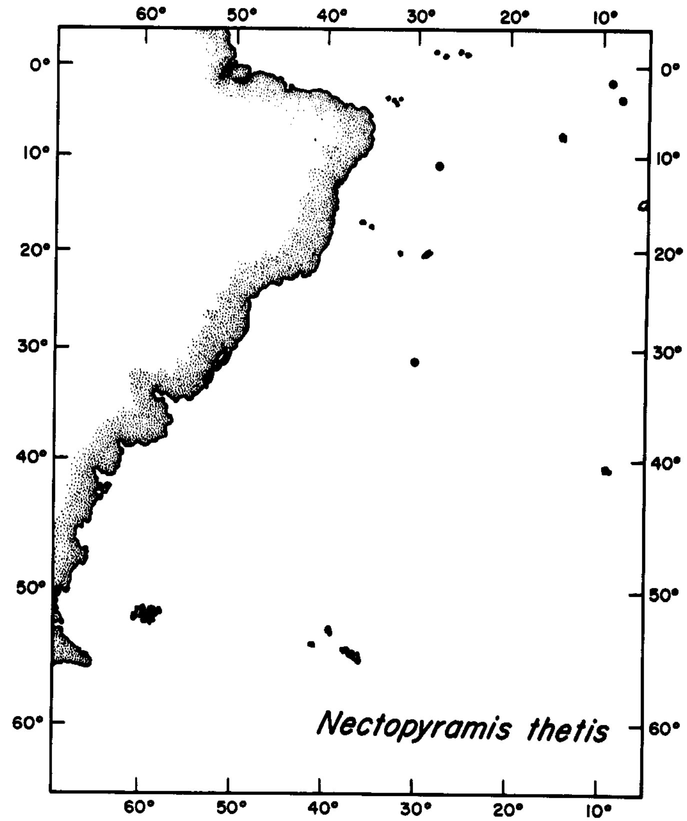
Map B63. Distribution of *Epibulia ritteriana* in the South Atlantic Ocean west of 0°.



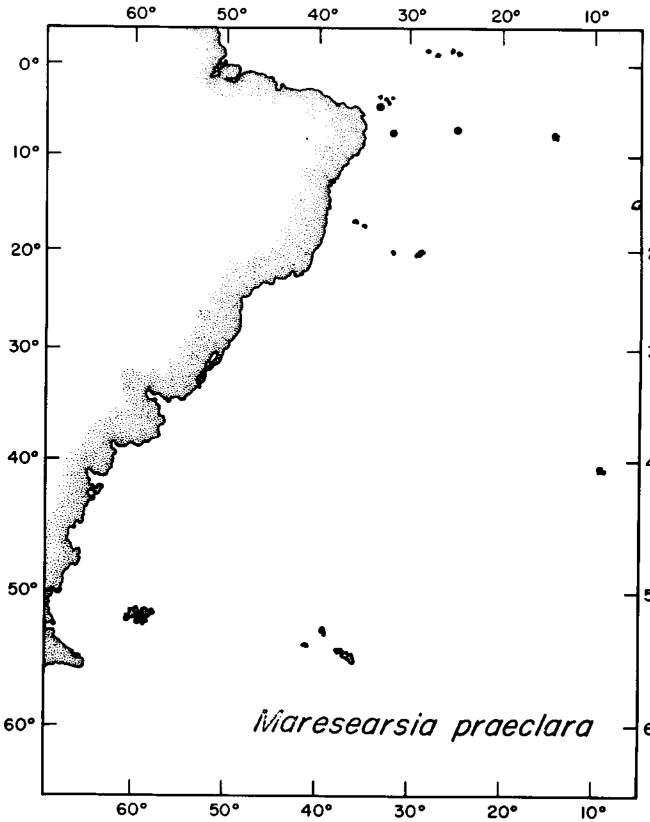
Map B64. The distribution of *Erenna richardi* in the South Atlantic Ocean west of 0°.



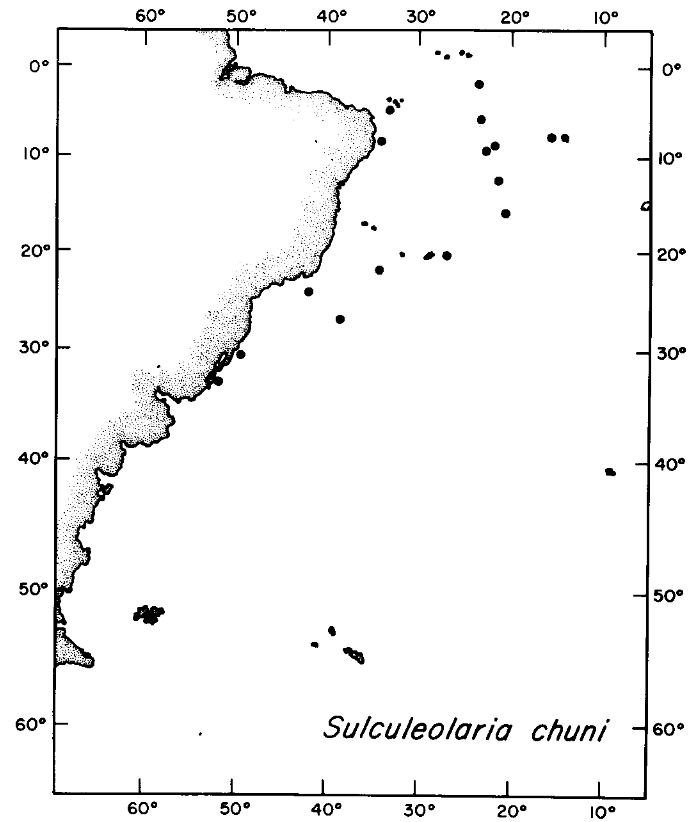
Map B65. The distribution of *Forskalia edwardsi* in the South Atlantic Ocean west of 0°.



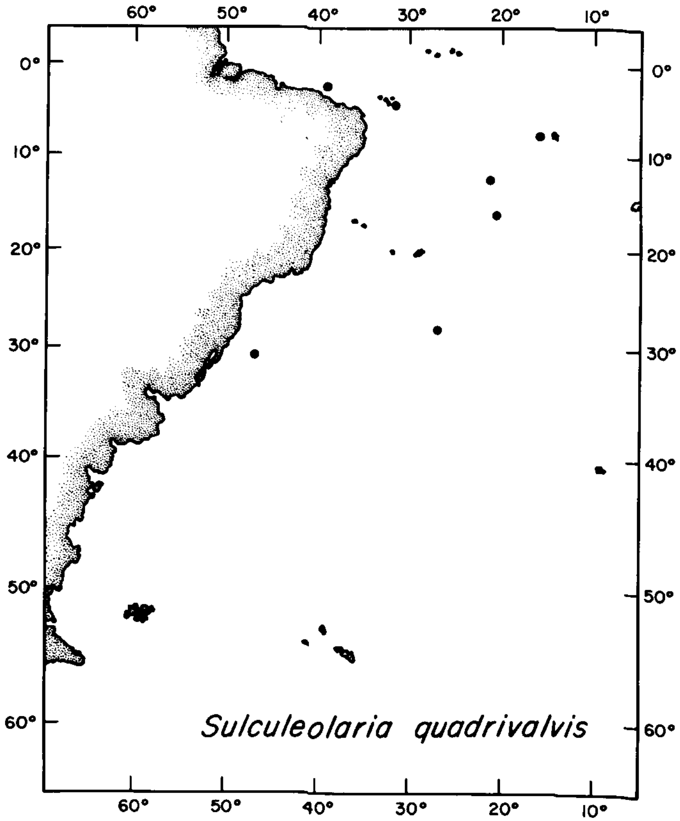
Map B66. The distribution of *Nectopyramis thetis* in the South Atlantic Ocean west of 0°.



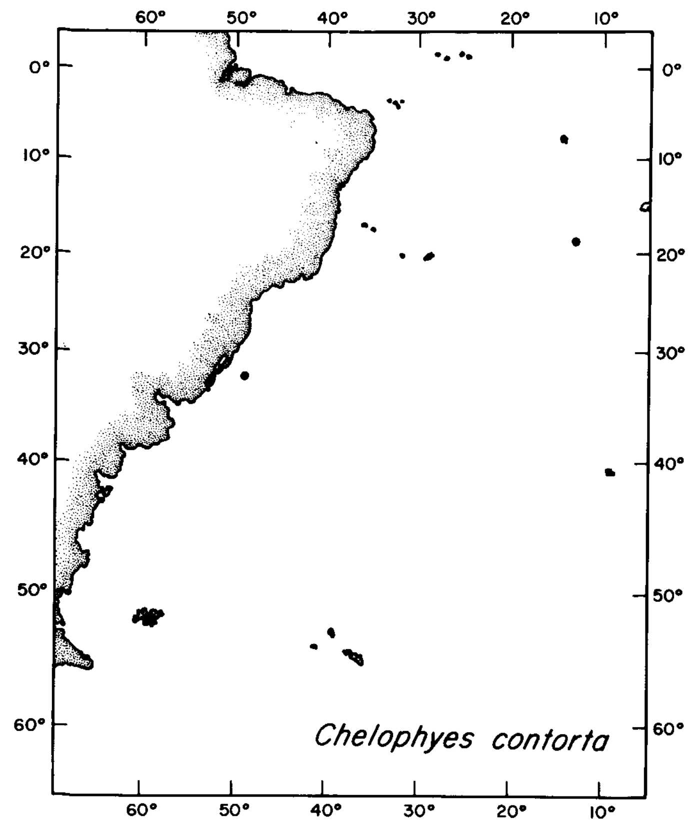
Map B67. The distribution of *Maresearsia praeclara* in the South Atlantic Ocean west of 0°.



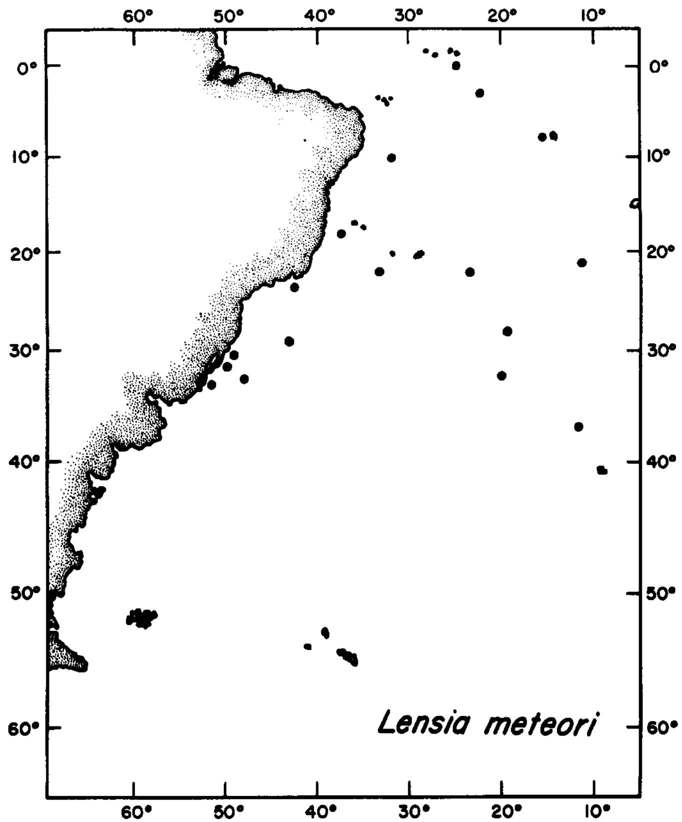
Map B68. The distribution of *Sulculeolaria chuni* in the South Atlantic Ocean west of 0°.



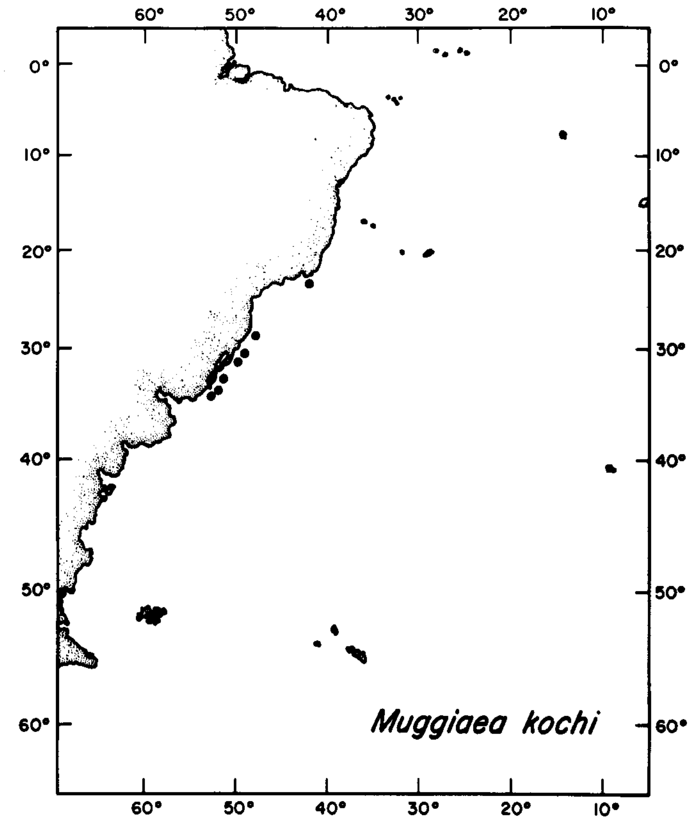
Map B69. The distribution of *Sulculeolaria quadrivalvis* in the South Atlantic Ocean west of 0°.



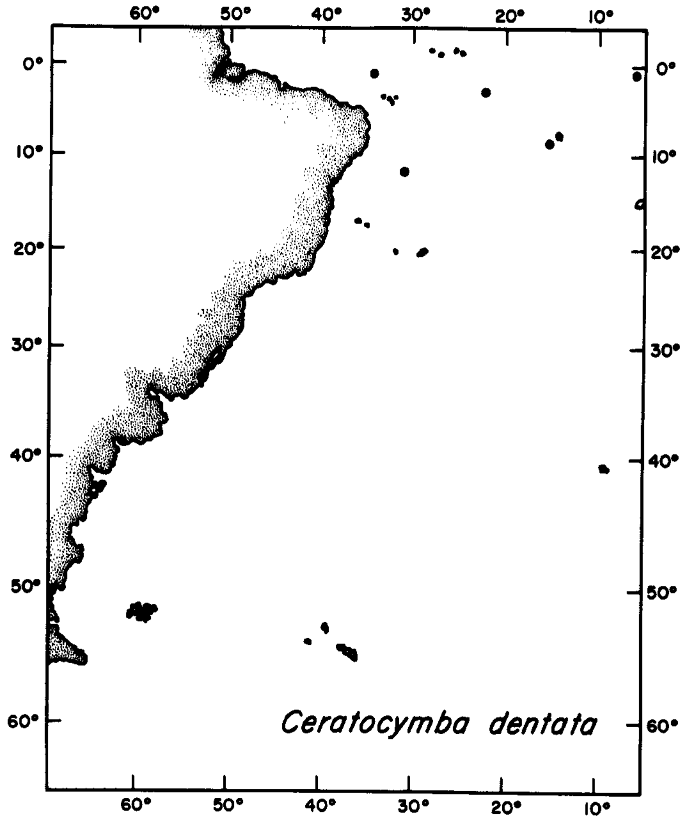
Map B70. The distribution of *Chelophyes contorta* in the South Atlantic Ocean west of 0°.



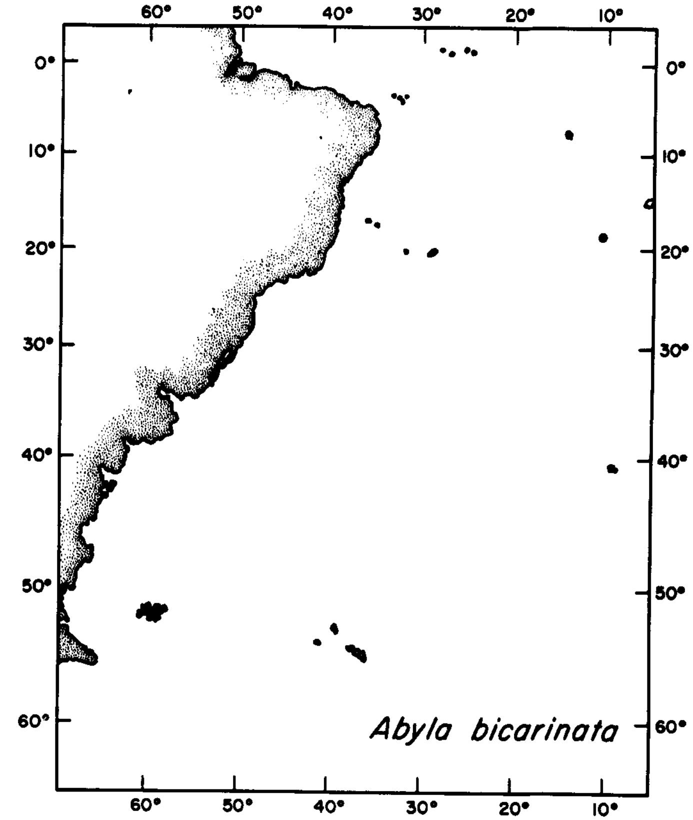
Map B71. The distribution of *Lensia meteori* in the South Atlantic Ocean west of 0°.



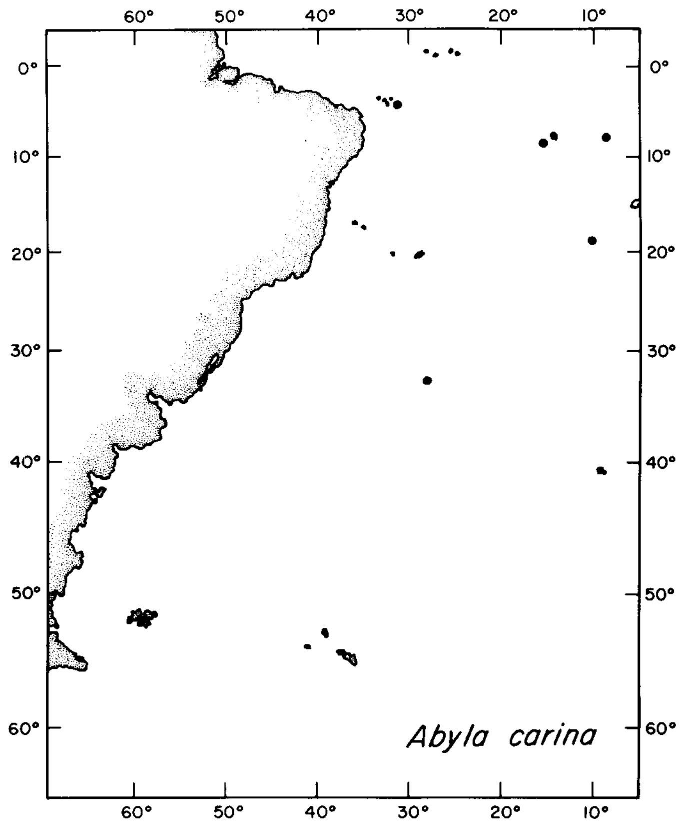
Map B72. The distribution of *Muggiaea kochi* in the South Atlantic Ocean west of 0°.



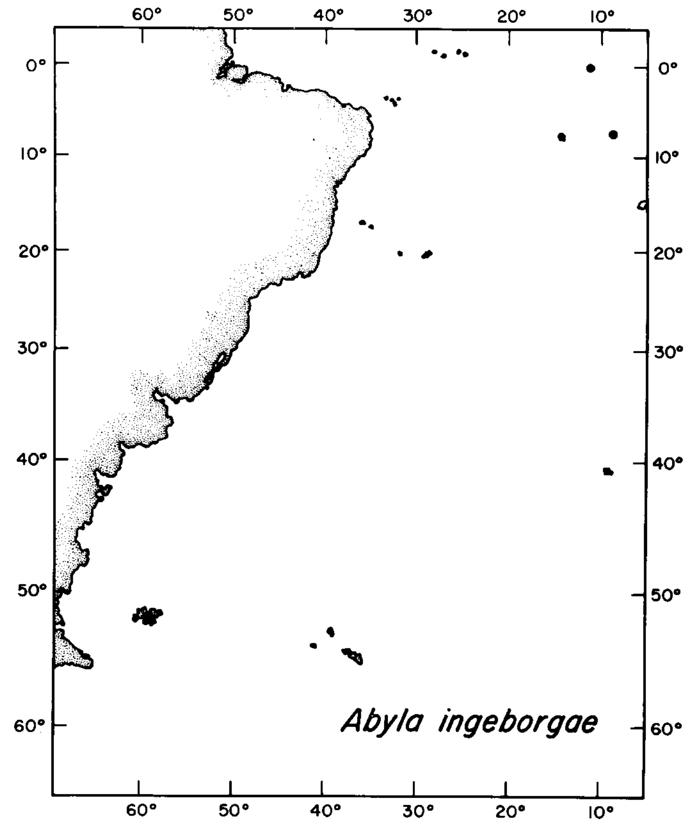
Map B73. The distribution of *Ceratocymba dentata* in the South Atlantic Ocean west of 0°.



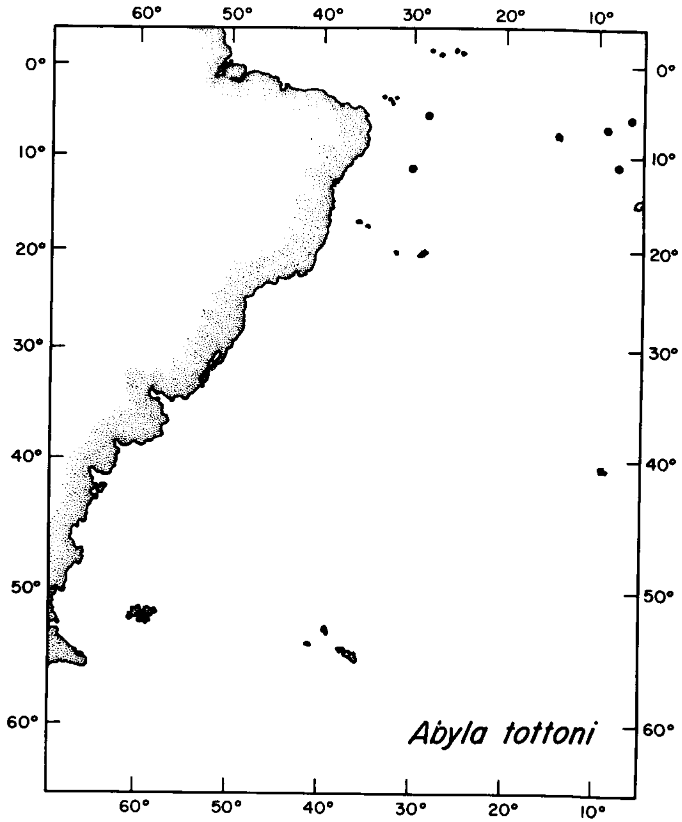
Map B74. The distribution of *Abyla bicarinata* in the South Atlantic Ocean west of 0°.



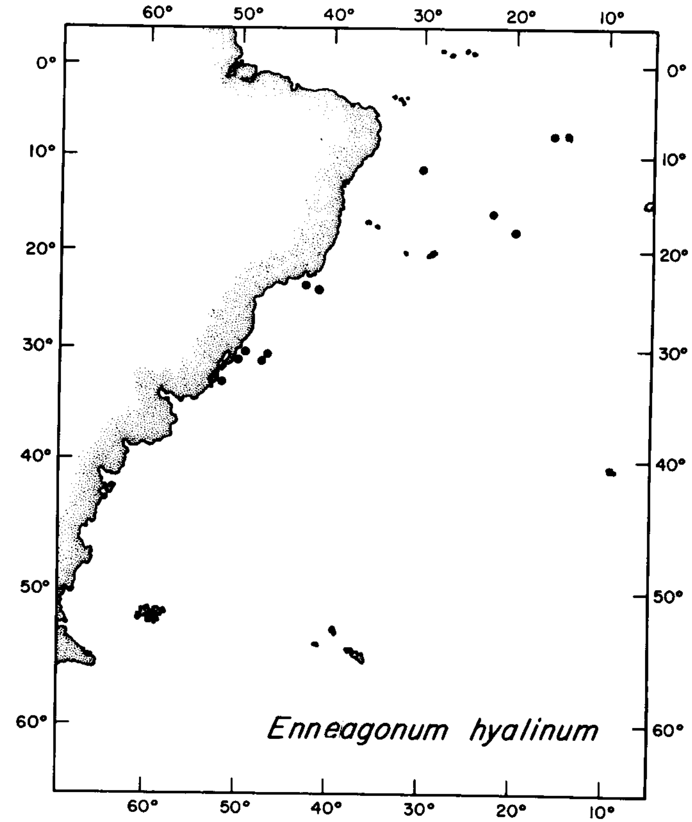
Map B75. The distribution of *Abyla carina* in the South Atlantic Ocean west of 0°.



Map B76. The distribution of *Abyla ingeborgae* in the South Atlantic Ocean west of 0°.



Map B77. The distribution of *Abyla tottoni* in the South Atlantic Ocean west of 0°.



Map B78. The distribution of *Enneagonum hyalinum* in the South Atlantic Ocean west of 0°.

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