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PELAGIC OSTRACODS (HALOCYPRIDIDAE) OF THE BRANSFIELD STRAIT, ANTARCTICA

Results of the study of pelagic ostracods (Halocyprididae) from the western Bransfield Strait are discussed. The data were obtained using zooplankton samples collected in March 2002 during the 7th Ukrainian Antarctic expedition. Maximum sampling depths varied from 200 to 1000 m. Eight halocyprid species were found. Three species were dominant throughout the entire sampling depth: *Metaconchoecia isocheira* (in the layers 0 – 500 and >500 m it contributed 44 and 31 % respectively to the halocyprid population), *Alacia belgicae* (28 and 23 %), and *Alacia hettacra* (24 and 21 %). The fourth species, *Boroecia antipoda*, was dominant >500 m (21 %). The other species found were *Metaconchoecia skogsbergi*, *Proceroecia brachyaskos*, *Disconchoecia aff. elegans* and *Conchoecissa symmetrica*, which occurred in small numbers at depths of 200 – 500 and >500 m, and at these depths the abundances and biomasses of the halocyprids were at their maxima. Few ostracods occurred in the upper 100 m, but their abundances increased along the frontal zone formed between the water masses advected in from the Bellinghausen and Weddell Seas. The populations of the ostracod species inhabiting water masses of these two Seas had distinctive age structures.

Key words: pelagic ostracods, Halocyprididae, quantitative distribution, age structure, Bransfield Strait, Antarctica

Pelagic ostracods are the key component of Antarctic planktonic communities [5, 11, etc.]. Though history of study of Antarctic ostracods dates back to the early 20th century [11], the knowledge about this group of crustaceans remains inadequate. However, the recent increase in interest in the pelagic communities of the Southern Ocean, mostly because of krill, has lead to a considerable increase in our knowledge about planktonic ostracods [4 –11, 16, 17, 20]. Some of these investigations have focused on the ostracods communities found in the vicinity of the Antarctic Peninsula, particularly in the Bransfield Strait [5 – 9, 16, 17] where the productivity is remarkably high. This report describes the species composition and quantitative distribution and the population structures of the dominant ostracod species in the western Bransfield Strait in March 2002.

Materials and methods. Materials were collected at 21 stations in the western Bransfield Strait from 9 to 18 March 2002 during the 7th Ukrainian Antarctic expedition onboard of the R/V Gorizont (Fig. 1). 110 zooplankton samples were collected. Most were collected using a Juday net with the mouth diameter of 80 cm (i.e. area 0.5 m^2). However, at six stations (NN 21, 23, 31, 35, 36, 50) a Juday net with the mouth diameter of 36 cm (area 0.1 m^2) has been used because of bad weather. Both nets had a mesh size of 120 μm. The sampling depths were usually 0 – 25, 25 – 50, 50 – 100, 100 – 200, 200 – 500, 500 – 1000 m; but maximum sampling depths depended the sounding at each station. Samples have been fixed with 4 % formaldehyde. Each sample was examined under binocular light microscope MBS-9, all ostracods were removed, identified to species, their linear parameters and instars stage determined (Table 1). Biomass was evaluated according to the procedure in Drapun [14].

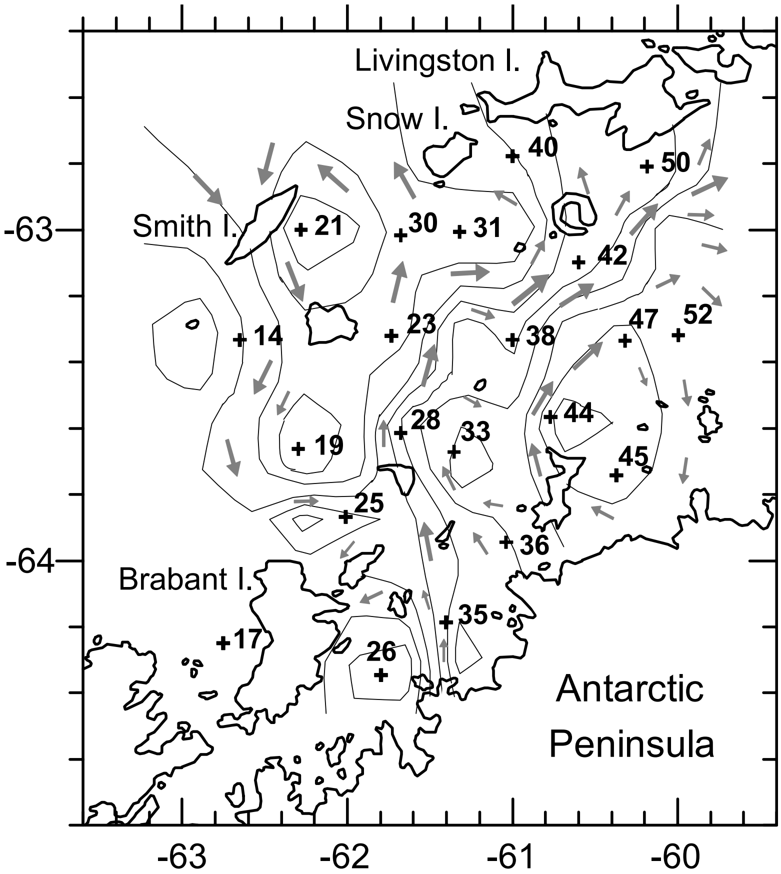

Fig. 1 The map of stations, dynamic peaks distribution and the water mass transfer (from [1, Fig. 2a] in the western Bransfield Strait

Рис. 1. Схема расположения станций, распределение динамических высот и направление преобладающего переноса вод (из [1], рис. 2 а) в западной части пролива Брансфилда

"Mean population stage", $\overline{S}$, was calculate using the equation suggested by Marin [19] and modified by Kock [17]:

$$\overline{S} = (1 \cdot N_{A\text{-}6} + 2 \cdot N_{A\text{-}5} + 3 \cdot N_{A\text{-}4} + 4 \cdot N_{A\text{-}3} + 5 \cdot N_{A\text{-}2} + 6 \cdot N_{A\text{-}1} + 7 \cdot N_{Ad}) / (N_{A\text{-}6} + N_{A\text{-}5} + N_{A\text{-}4} + N_{A\text{-}3} + N_{A\text{-}2} + N_{A\text{-}1} + N_{Ad})$$

where N is abundance, A-6 – A-1 are larval stages and Ad – adults. The notation for the different instars was proposed by Hartmann in 1968 [5].

The identification of ostracod species was based on the papers [1, 13, 21].

Results. Eight ostracod species of the family Halocyprididae were found, of which four species, namely *Alacia belgicae* (Müller, 1906), *A. hettacra* (Müller, 1906), *Boroecia antipoda* (Müller, 1906), and *Metaconchoecia isocheira* (Müller, 1906), were dominant. Four species, namely *Metaconchoecia skogsbergi* (Iles, 1953), *Proceroecia brachyaskos* (Müller, 1906), *Discoconchoecia* aff. *elegans* (Sars, 1865), and *Conchoecissa symmetrica* (Müller, 1906) were infrequent, and occurred only at depths of 200 – 500 m and deeper (Table 2).

Numerically the abundances of the ostracods relative to the total abundances of the mesozooplankton were not large. Only at stations 19, (at 25 – 50 m depth), 33 (500 – 700 m depth) and 26 (100 – 200 m depth) their relative abundances reached as high as 5.9, 5.3 and 4.8 %, respectively. As the sampling depths increased, so did the relative abundances of the ostracods in the plankton (Fig. 2).

Table 1 Measurements of females, males and age stages of ostracods from the Bransfield Strait
Табл. 1 Результаты измерений самок, самцов и личинок разных возрастных стадий остракод из пролива Брансфилда

Species	Stage	n_L	L_{min}	L_{max}	$L_{av.}$	S_L	n_H	$(L/H)_{min}$	$(L/H)_{max}$	$(L/H)_{av.}$	$S_{L/H}$
M. isoheira	f	224	1.00	1.15	1.08	0.036	105	1.75	2.14	1.89	0.066
	m	107	0.80	1.00	0.93	0.034	59	1.64	2.00	1.74	0.067
	A-1	114	0.75	0.90	0.82	0.031	47	1.70	1.98	1.85	0.060
	A-2	40	0.60	0.68	0.64	0.024	18	1.58	1.94	1.79	0.097
	A-3	183	0.45	0.55	0.49	0.018	59	1.50	1.96	1.70	0.089
	A-4	138	0.35	0.40	0.37	0.013	50	1.40	1.74	1.61	0.063
	A-5	45	0.27	0.30	0.28	0.009	17	1.40	1.67	1.54	0.072
	A-6	4	0.21	0.23	0.22	0.008	2	1.35	1.38	1.36	0.016
A. belgicae	f	71	2.70	3.13	2.94	0.101	60	1.82	2.08	1.91	0.055
	m	38	2.65	3.00	2.82	0.086	34	1.71	2.00	1.89	0.071
	A-1	171	1.85	2.15	2.02	0.066	101	1.70	1.97	1.83	0.057
	A-2	77	1.25	1.40	1.33	0.035	37	1.65	1.87	1.75	0.058
	A-3	46	0.88	0.97	0.92	0.024	18	1.58	1.76	1.70	0.048
	A-4	77	0.60	0.70	0.66	0.020	23	1.55	1.74	1.63	0.044
	A-5	117	0.45	0.52	0.49	0.013	22	1.44	1.75	1.61	0.090
	A-6	7	0.35	0.38	0.36	0.015	2	1.42	1.59	1.51	0.119
A. hettacra	f	82	2.25	2.62	2.43	0.084	65	1.73	2.13	1.95	0.063
	m	65	1.92	2.15	2.03	0.049	45	1.75	2.05	1.91	0.070
	A-1	42	1.50	1.65	1.56	0.043	29	1.76	2.00	1.88	0.051
	A-2	46	1.01	1.13	1.07	0.028	29	1.68	1.88	1.76	0.045
	A-3	71	0.68	0.83	0.76	0.020	38	1.32	1.92	1.66	0.095
	A-4	42	0.51	0.58	0.55	0.012	16	1.57	1.83	1.65	0.070
	A-5	102	0.38	0.43	0.40	0.009	20	1.48	1.74	1.61	0.057
	A-6	7	0.30	0.35	0.33	0.015	2	1.36	1.44	1.40	0.050
B. antipoda	f	30	3.25	3.50	3.40	0.060	29	1.97	2.15	2.06	0.048
	m	15	3.00	3.27	3.12	0.076	12	2.30	2.42	2.37	0.039
	A-1	36	2.25	2.50	2.38	0.058	33	2.07	2.35	2.21	0.073
	A-2	38	1.50	1.70	1.58	0.033	26	2.07	2.43	2.19	0.081
	A-3	20	1.00	1.13	1.07	0.031	8	2.08	2.18	2.11	0.043
	A-4	14	0.60	0.75	0.70	0.058	9	1.88	2.14	1.99	0.072
	A-5	14	0.50	0.58	0.54	0.019	6	1.89	2.07	1.97	0.057
M. skogsbergi	f	7	1.45	1.60	1.49	0.051	5	1.95	2.11	2.01	0.062
	m	4	1.44	1.48	1.46	0.017	4	2.00	2.06	2.02	0.027
	A-1	2	1.18	1.30	1.24	0.085	2	1.97	2.00	1.98	0.024
	A-2	5	0.91	0.93	0.94	0.018	5	1.83	1.98	1.91	0.056
	A-3	2	0.70		0.70	–	2	1.71	1.75	1.73	0.030
	A-4	1	0.53		–	–	–	–	–	–	–
P. brachiaskos	f	7	1.62	1.75	1.70	0.042	7	2.03	2.19	2.14	0.058
	m	1	1.57		–	–	1	2.09		–	–
	A-1	1	1.33		–	–	1	2.05		–	–
	A-2	2	1.05	1.13	1.09	0.057	2	2.06		2.06	0
	A-3	2	0.88	0.93	0.91	0.035	2	2.02	2.15	2.08	0.088
D. elegans	f	1	1.75		–	–	1	2.69		–	–
	A-2	1	1.10		–	–	1	2.44		–	–
	A-3	2	0.93		0.93	0	2	2.45		2.45	0
C. symmetrica	f	2	4.45	4.73	4.59	0.099	2	1.93	2.06	2.00	0.043
	A-1	1	3.50		–	–	1	2.08		–	–

n_L – number of individuals; n_H – number of individuals with measured height of carapace; L_{min}, L_{max}, $L_{av.}$ – carapace length (minimum, maximum and average, respectively); $(L/H)_{min}$, $(L/H)_{max}$, $(L/H)_{av.}$ – carapace length to height ratios; S_L, $S_{L/H}$ – standard deviation; A-1 – A-6 – age stages

Table 2 Depth ranges of eight ostracod species at the stations in the western Bransfield Strait
Табл. 2 Диапазоны глубин обнаружения восьми видов остракод на станциях в западной части пролива Брансфилда

Station	Time, hours:minutes	Species, depth range (m)							
		A. belgicae	*A. hettacra*	*B. antipoda*	*C. symmetrica*	*D. elegans*	*M. isoheira*	*M. skogsbergi*	*P. brachiaskos*
14	12:00	–	100 – 200	–	–	–	100 – 200	–	–
17	1:00 – 3:00	–	–	–	–	–		–	–
19	6:50 – 8:00	25 – 200	25 – 200	100 – 200	–	–	0 – 200	–	–
21	14:45 – 16:30	25 – 900	25 – 900	500 – 900	–	–	25 – 900	500 – 900	–
23	0:15 – 1:40	50 – 950	50 – 950	200 – 950	–	–	50 – 950	200 – 950	200 – 500
25	12:10 – 13:50	200 – 300	25 – 300	–	–	–	25 – 300	–	–
26	20:40 – 22:35	50 – 1000	100 – 1000	100 – 1000	200 – 1000	200 – 500	50 – 1000	100 – 1000	200 – 1000
28	20:10 – 22:15	100 – 500	100 – 500	100 – 500	–	–	100 – 500	–	–
30	7:07 – 8:10	200 – 500	200 – 500	200 – 500	–	200 – 500	25 – 500	–	–
31	20:15 – 21:25	100 – 200	–	–	–	–		–	–
33	12:10 – 14:20	50 – 700	50 – 700	200 – 700	–	–	0 – 700	–	500 – 700
35	2:25 – 4:05	100 – 400	100 – 400	–	–	–	200 – 400	–	–
36	9:30 – 10:57	–	–	–	–	–		–	–
38	14:30 – 16:05	200 – 500	200 – 500	–	–	–	200 – 500	–	–
40	9:20 – 10:30	0 – 25	0 – 25	0 – 25	–	–	0 – 100	–	–
42	18:50 – 20:27	0 – 600	50 – 600	–	–	–	0 – 600	–	–
44	21:57 – 23:20	100 – 500	200 – 500	–	–	–	200 – 500	–	–
45	13:10 – 15:40	0 – 750	200 – 750	–	–	–	0 – 750	–	–
47	23:45 – 1:27	100 – 400	100 – 400	100 – 400	–	–	50 – 400	–	–
50	19:15	200 – 500	200 – 500	–	–	–	200 – 500	–	–
52	4:20 – 5:50	50 – 700	50 – 700	100 – 700	–	–	100 – 700	200 – 700	100 – 200

The maximum abundances and biomasses of halocyprids (approximating 2151 individuals and 781 mg per 1000 m^3, respectively, at st. 26) were at depths of 200 – 500 m and deeper (Fig. 3; Table 3).

An exception to these trends occurred at st. 40 where a relatively higher abundance of ostracods (2240 ind./1000 m^3) comparable to that normally associated with greater sampling depths, was recorded in the upper 0 – 25 m water layer (Table 3). A surprising find in this sample was a 3.15 mm long male specimen of *B. antipoda*; a deepwater species never previously reported at depths <100 m [1, 5, 7 – 9, 11]. This unusually high abundance estimate for the upper layer of the water column may have been the result of the relatively small volume of filtered sea water from this narrow depth range. At st. 40 although only 28 specimens of ostracods were taken in the sample from 0 – 25 m depth, the result of estimating numbers per unit of seawater volume was unusually high. These 28 specimens may have represented in a localized aggregation, which may not have appeared so remarkable if a larger volume of seawater had been filtered. On the other hand, it might be an artifact caused by specimens left in the net from the previous haul. This explanation seems feasible since (except for two individuals found at 50 – 100 m depth) ostracods were absent from all other depths at st. 40 (Table 3) – this station was sampled in the day when the likelihood of finding ostracods in abundance in upper layer is slight. Nevertheless, these data were used in evaluating the numbers of ostracods for the layer 0 – 100 m. Ostracods were sparse (102 ind./1000 m^3 on the average) in this upper 100-m layer at the majority of stations; at 8 of 21 stations they were absent (Fig. 3). Below 100 m the ostracods were distributed more evenly, and their abundances increased with increasing depth. At depths of 200 – 500 m and deeper the estimated abundances exceeded 1000 ind./1000 m^3 (Fig. 3; Table 3).

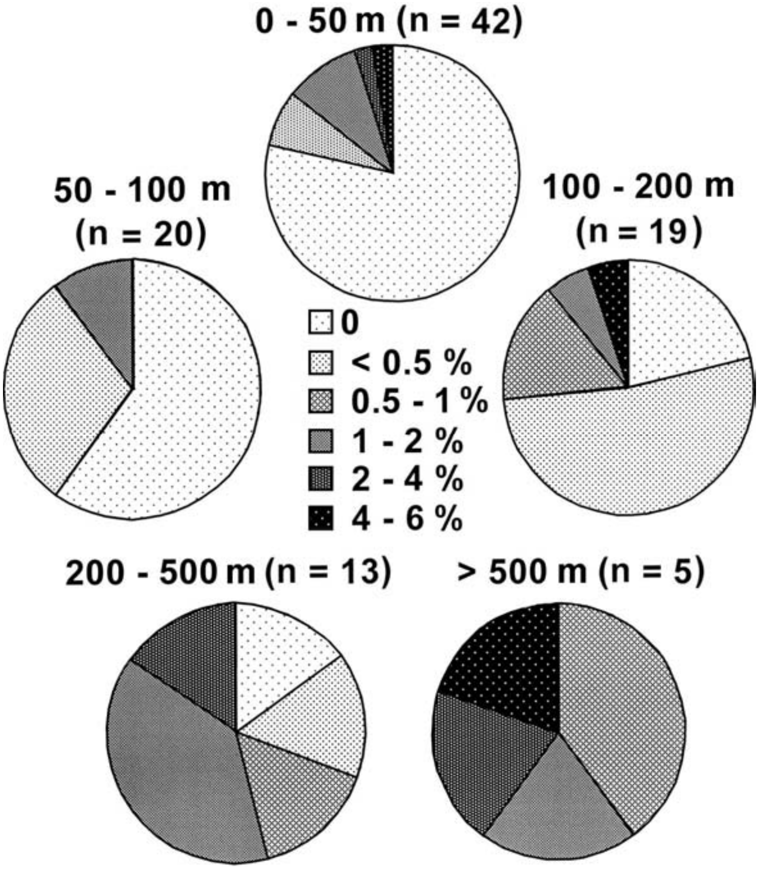

Fig. 2 The ostracods per cent (relative to the total abundances of the mesozooplankton in the samples) at the different depths (n – the number of samples)

Рис. 2 Процент остракод (по отношению к общей численности мезозоопланктона в пробах) на разных глубинах (n – количество проб)

M .isocheira was prevalent in the samples. In 0 – 500 m layer it contributed between 8 % and 61 % (at sts. 42 and 23, respectively) (Fig. 4) of the total halocyprid populations per square meter, averaging 44 %. Two other common species were *A. belgicae* and *A. hettacra*. The former contributed from 8 to 61 % at sts. 30 and 42, respectively (mean 28 %) and the latter from 14 to 32 % at sts. 26 and 38 respectively (mean 24 %) (Fig. 4). These congeneric species differ in their environmental preferences: *A. hettacra* inhabit open oceanic waters whereas the preference of *A. belgicae* for inshore waters has been reported previously [8, 16, 17]. This probably accounts for the wider variations in the relative abundances of *A. belgicae* at the stations located on the shelf of the western Bransfield Strait then of *A. hettacra*, although the corresponding averages are quite similar. The contribution of *B. antipoda* to the total halocyprid abundances in the upper 500 m was trivial – generally 2 – 4 %, except for at station 21 where it contributed 20 %. All the other species collectively contributed ~1 %, and indeed were absent on most of the stations.

At depths >500 m ratios (expressed as percentages of the total population) between the three dominant species, *M. isocheira*: *A. belgicae* : *A. hettacra*, were similar – 31 : 23 : 21 %, respecttively.

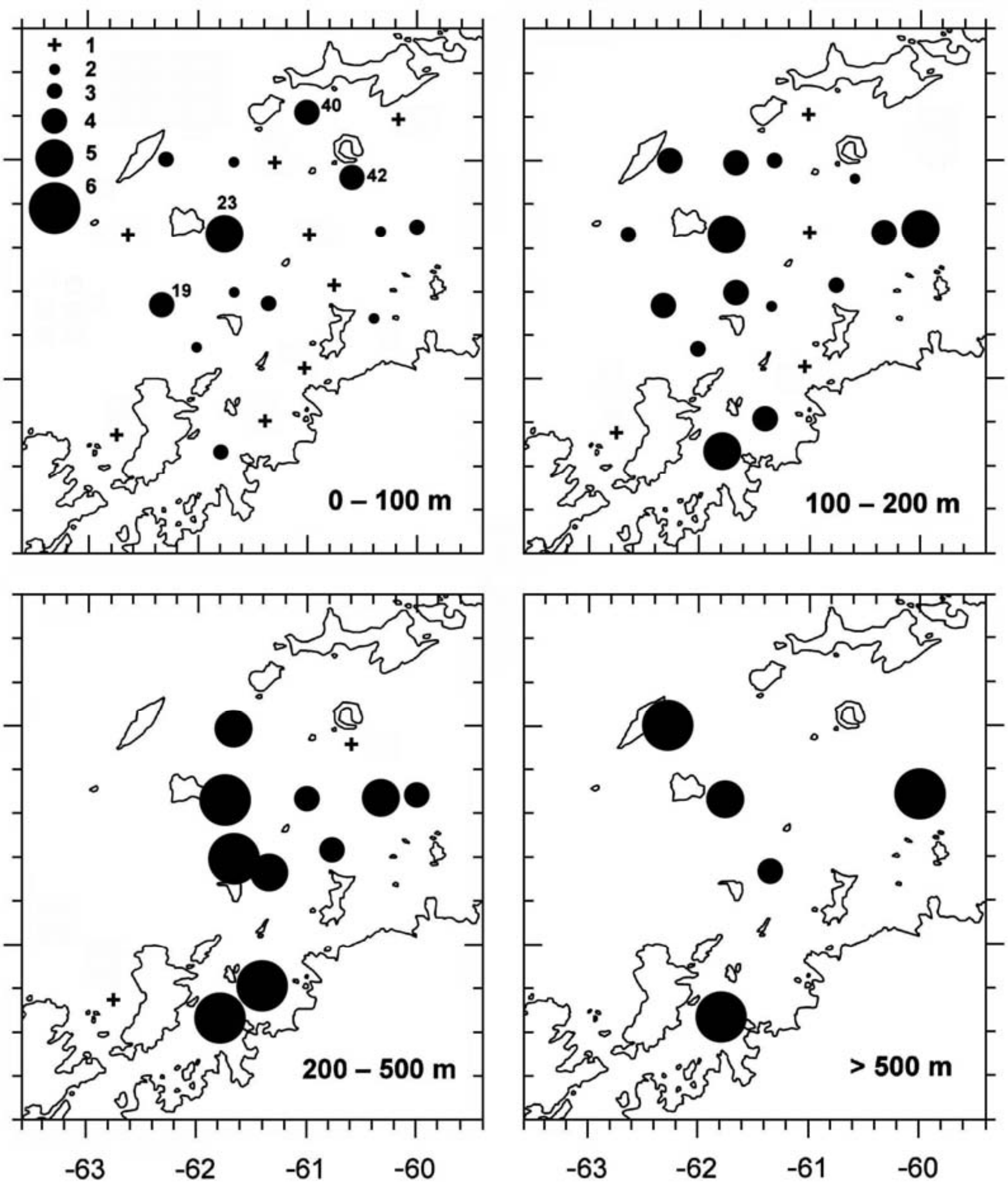

Fig. 3 Abundances of ostracods at the different depths in the western Bransfield Strait. The scales 1 - 6 represent the abundances of 0, 1 – 50, 51 – 100, 101 – 500, 501 – 1000, > 1000 ind./1000 m^3, respectively
Рис. 3 Численность остракод на разных глубинах в западной части пролива Брансфилда. Шкалы 1 – 6 соответствуют величинам численности 0, 1 – 50, 51 – 100, 101 – 500, 501 – 1000, > 1000 экз./1000 $м^3$

The share contributed by *B. antipoda* increased from 5 % at st. 52 to 40 % at st. 23 (averaging 21 %) (Fig. 5).

The contributions by *M. skogsbergi* and *P. brachyaskos* were 2.5 and 3.5 %, respectively. *D. aff. elegans* was not found >500 m. At st 26 an A-1 instar of *C.symmetrica* was collected in the layer 200 – 500 m and as two adult females in 500 – 1000 m sample.

The maximum abundances and biomasses of four dominant ostracod species are given in the table 4.

Table 3 The abundances (N, ind./1000 m^3) and biomasses (B, mg/1000 m^3) of ostracods in the studied area
Табл. 3 Численность (N, ind./1000 m^3) и биомасса (B, mg/1000 m^3) остракод в исследованном районе

Station	Depth, m	N	B	Station	Depth, m	N	B	Station	Depth, m	N	B
14	0 – 25	0	0	28	0 – 25	80	23.5	40	0 – 25	2240	677.2
	26 – 53	0	0		28 – 58	0	0		25 – 50	0	0
	53 – 102	0	0		111 – 300	159	70.5		50 – 100	80	5.3
	102 – 207	57	1.6		273 – 577	1461	387.6		106 – 160	0	0
					0 – 116	34	4.5		0 – 50	0	0
17	0 – 25	0	0	30	0 – 26	0	0	42	0 – 25	160	49.5
	25 – 50	0	0		27 – 52	80	0.3		26 – 65	0	0
	50 – 100	0	0		52 – 100	0	0		53 – 116	254	111.0
	127 – 200	0	0		102 – 203	139	5.6		126 – 261	44	3.7
	280 – 400	0	0		204 – 500	635	90.7		260 – 633	0	0
									0 – 633	246	125.4
19	0 – 25	80	11.0	31	0 – 27	0	0	44	0 – 25	0	0
	25 – 58	788	268.0		26 – 58	0	0		24 – 50	0	0
	61 – 116	73	27.3		43 – 116	0	0		52 – 100	0	0
	130 – 261	137	30.4		131 – 261	77	18.1		112 – 200	91	80.2
					0 – 58	0	0		215 – 500	379	90.9
21	0 – 25	0	0	33	0 – 25	80	11.0	45	0 – 25	240	81.9
	22 – 65	698	126.4		25 – 50	83	10.4		0 – 58	0	0
	100 – 261	497	121.0		59 – 102	186	14.1		0 – 160	0	0
	530 – 900	1189	308.6		98 – 200	20	11.1		0 – 261	8	15.3
	0 – 161	0	0		193 – 500	710	235.6		0 – 750	80	42.8
	0 – 633	869	214.5		471 – 710	435	178.3				
					0 – 100	60	2.0				
23	0 – 25	0	0	35	0 – 25	0	0	47	0 – 25	0	0
	21 – 50	0	0		26 – 51	0	0		25 – 50	0	0
	63 – 100	1622	372.7		51 – 101	0	0		50 – 100	40	3.6
	110 – 200	556	117.7		116 – 231	435	475.3		110 – 200	112	134.0
	150 – 600	1156	175.3		231 – 410	1341	311.4		272 – 400	547	183.3
	400 – 950	600	177.5						0 – 100	60	30.6
	50 – 400	743	196.9								
25	0 – 25	0	0	36	0 – 25	0	0	50	0 – 100	0	0
	25 – 52	148	78.1		0 – 50	0	0		0 – 500	1500	336.7
	52 – 100	0	0		52 – 100	0	0				
	95 – 231	88	18.1		100 – 200	0	0				
	220 – 300	275	42.4								
26	0 – 25	0	0	38	0 – 25	0	0	52	0 – 25	0	0
	26 – 57	0	0		28 – 52	0	0		22 – 50	0	0
	57 – 121	125	22.1		31 – 116	0	0		43 – 100	140	72.0
	121 – 212	593	161.7		108 – 231	0	0		100 – 200	780	493.0
	212 – 569	2151	499.0		225 – 500	225	83.5		190 – 500	310	125.3
	559 – 1000	1351	781.0		0 – 116	0	0		440 – 700	1054	358.8
	0 – 126	48	13.8								

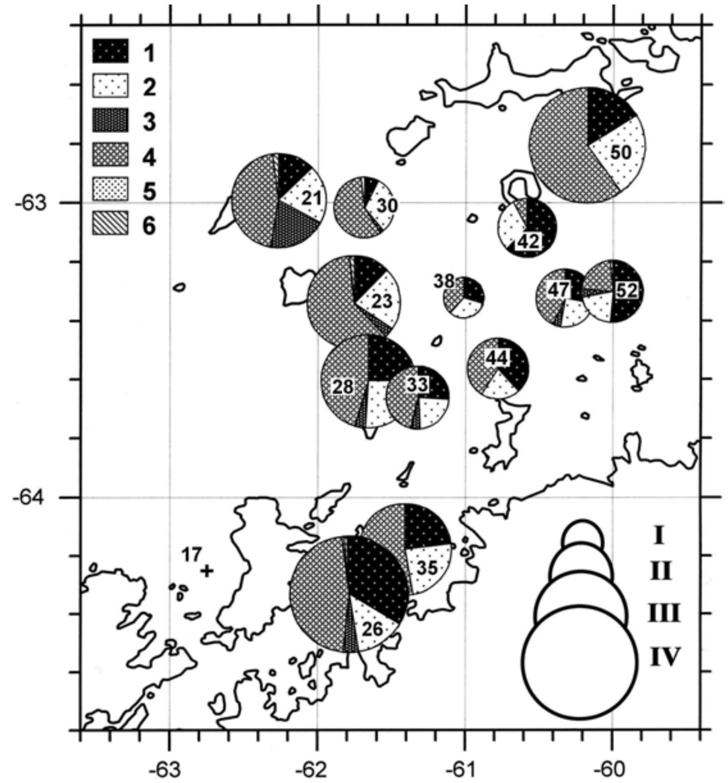

Fig. 4 The ratios of species abundances and the total abundances of halocyprid at the stations in the western Bransfield Strait in the 0 – 500-m water layer (0 – 400-m at sts. 17, 35, 47). 1 – *A. belgicae*; 2 – *A. hettacra*; 3 – *B. antipoda*; 4 – *M. isoheira*; 5 – *D. elegans*; 6 – *M. skogsbergi*. The scales I – IV represent the abundances of 50 – 100, 100 – 250, 400 – 500 and 700 – 750 ind./m^2, respectively

Рис. 4 Соотношение величин численности видов и общая численность галоциприд на станциях в западной части пролива Брансфилда в слое 0 – 500 м (0 – 400 м на станциях 17, 35, 47). 1 – *A. belgicae*; 2 – *A. hettacra*; 3 – *B. antipoda*; 4 – *M. isoheira*; 5 – *D. elegans*; 6 – *M. skogsbergi*. Шкалы I - IV соответствуют величинам численности 50 – 100, 100 – 250, 400 – 500 and 700 – 750 экз./м^2

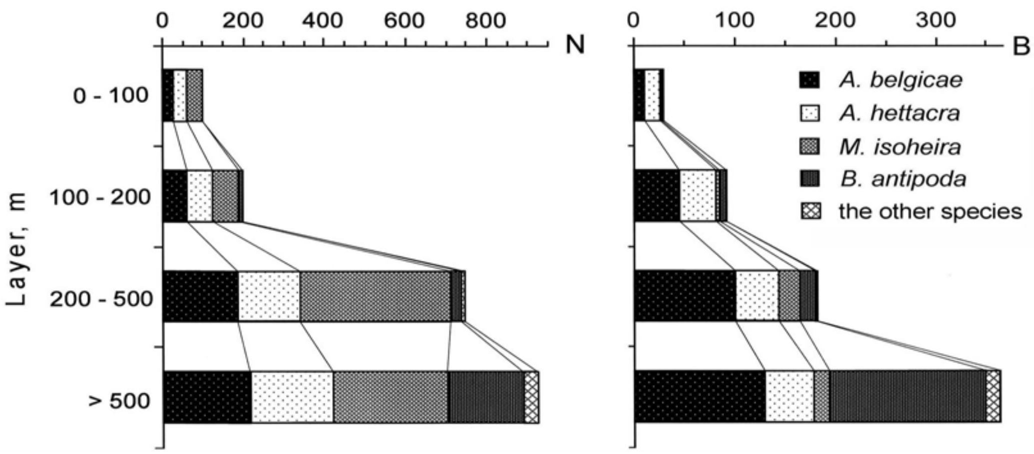

Fig. 5 Bathymetric distributions of the abundances (N, ind./1000 m^3) and biomasses (B, mg/1000 m^3) of ostracod species in the study area

Рис. 5 Вертикальное распределение величин численности (N, экз./1000 м^3) и биомассы (B, мг/1000 м^3) видов остракод в районе исследований

Species	Station	Layer, m	N	B
A. belgicae	26	200 – 500	711	280
	52	100 – 200	440	318
A. hettacra	23	50 – 100	811	346
B. antipoda	26	500 – 1000	313	393
M. isocheira	26	200 – 500	1025	51
	35	200 – 400	782	53

Table 4 Maximum abundances (N, ind./1000 m^3) and biomasses (B, mg/1000 m^3) of the four dominant ostracod species in the western Bransfield Strait in March 2002

Табл. 4 Максимальные значения численности и биомассы четырех массовых видов остракод в западной части пролива Брансфилда в марте 2002

Fig. 5 shows the distribution of abundances and biomasses of the different ostracod species in the water column; the average values calculated for each of the four depth strata sampled are based on the data from all the stations. These average values illustrate the typical pattern of bathymetric distributions of the ostracods in the study area. As depth increases, so the average abundances and biomasses of the ostracods increase, reaching maxima of 921 ind./1000 m^3 and 363 mg/1000 m^3, respectively at depths >500 m. *M. isocheira*, the smallest of the Southern Ocean ostracods (Table 1) was numerically dominant at every depth sampled, contributing from 31 % of the populations collected at depths >500 m to 50 % in the 200 – 500-m layer. However, because it is a small-bodied species it contributed a relatively small share, 4 – 11 % of the total halocyprid biomass. The dominant contribution to the biomass was made by *A. belgicae* and *B. antipoda*, the latter being the largest of the ostracods (Table 1). Their collective share in of the ostracod biomass at depths of 200 – 500 m and >500 m was 66 and 79 %, respectively. At 200 – 500 m *A. belgicae* made the largest contribution and >500-m the deepwater species *B. antipoda* was dominant in biomass terms. Compared to the three other ostracod species, *A. hettacra* is intermediate in the linear parameters (Table 1), numbers and biomass (Fig. 5). The share contributed by the other infrequent halocyprid species to total abundance and biomass of ostracods was insignificant – about 4 % at the depths >500 m.

The presence of the youngest developmental stages (A-5, A-6) in the samples showed that the study was undertaken at the time that all four of the dominant ostracods were reproducing. However, the age ratios differed between the species (Fig. 6).

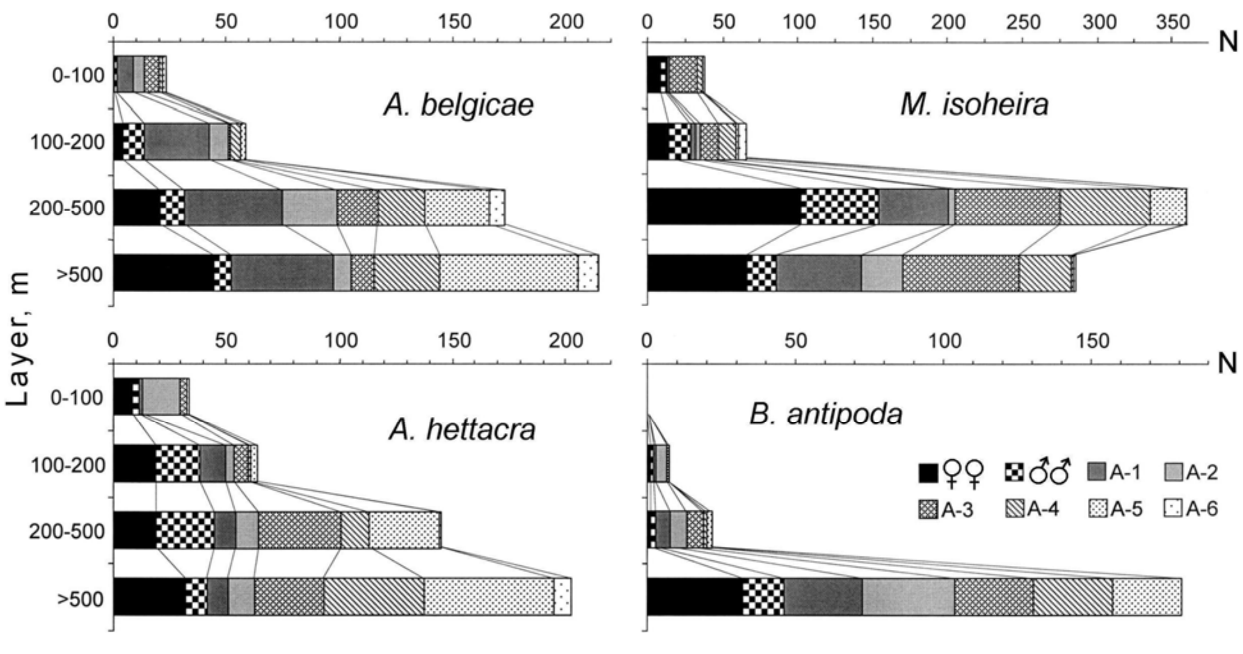

Fig. 6 Bathymetric distribution of the average abundances (N, ind./1000 m^3) of adult specimens and juvenile stages of dominant ostracod species based on the corresponding averages calculated for the study area
Рис. 6 Вертикальное распределение величин численности (N, экз./1000 м^3) взрослых особей и личиночных стадий массовых видов остракод в районе исследований

The population of *A. belgicae* consisted predominantly of adults, the oldest (A-1) and youngest (A-5); the populations of *A. hettacra* were predominantly adults, mid-age and youngest (A-3 and A-5, respectively) with relatively few of the oldest stages (A-1 and A-2). The *M. isocheira* were mostly adults, the oldest (A-1) and mid-age (A-3, A-4) juveniles; the youngest A-6 stage was rarely found. In *B. antipoda* the proportion between instars was quite relatively except for the youngest larvae (A-6) being completely absent. *B. antipoda* is a large species (Table 2) and the absence of the A-6 instar is not because they were extruded through the meshes of the net; probably, but because either these larvae were not present in the plankton at that time or they were located at depths deeper than the lower limit of the sampling (>1000 m). The sieve used for concentrating the zooplankton samples (see **Materials and methods**) was fine enough to retain at least some of the A-6 stage of *M. isocheira*, the smallest of Antarctic ostracods (average carapace length 0.22 mm and height 0.17 mm), and hence would have retained the much larger A-6 instars of *B. antipoda.* The index $\overline{S}$ ("mean population stage") allows the age ratios in the various populations of species to be quantitatively assessed. Fig. 7 A shows how the high $\overline{S}$ in three of the ostracod species decreased with depth indicating that the proportion of younger instars in the populations was increasing. Probably, the female ostracods tend to spawn at depths inhabited by the bulk of the halocyprid populations. The observed increase of the relative abundance of adult females with increasing depth supports this hypothesis (Fig. 7 B).

Within the study area the population structure of the dominant ostracod species differed (Fig. 8, 9; Table 5). At the stations located in the western and in the northwestern parts of the western Bransfield Strait, i.e. in the zone most influenced by water masses from the Bellinghausen Sea, values of $\overline{S}$ computed for three ostracod species prevailing in 0 – 500-m layer were significantly lower than those computed for the southeastern region influenced by water from the Weddell Sea (t-test < 0.01) (Table 5). Thus the ostracod populations in the Bellinsgausen Sea Waters were younger than ones in the Weddell Sea Waters (Fig. 8, 9). No comparisons could be made for the populations at greater depths (>500 m) because deeper samples were only collected at five stations.

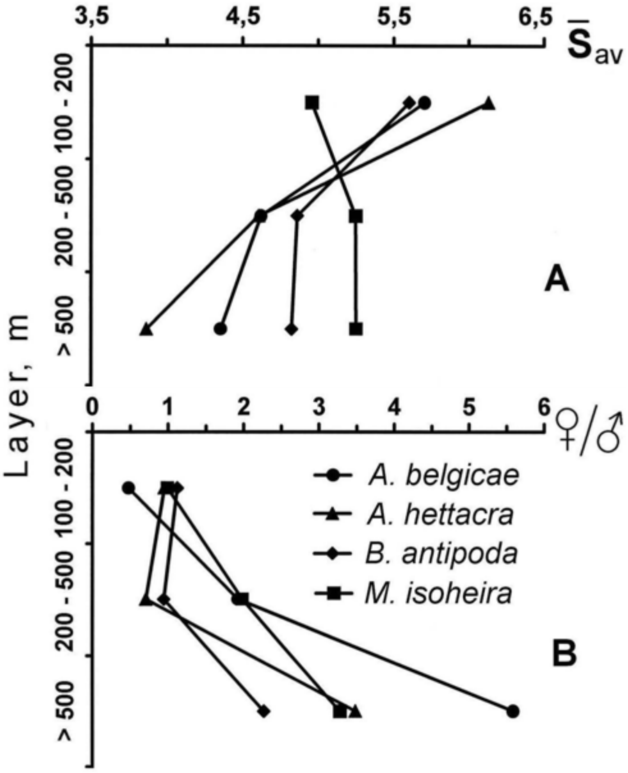

Fig. 7 Bathymetric distribution of the "mean population stages" ($\overline{S}_{av}$, A) and sex ratios (♀/♂, B) in the populations of the dominant ostracod species in the western Bransfield Strait in March 2002

Рис. 7 Вертикальное распределение величин показателя "mean population stages" ($\overline{S}_{av}$, A) и соотношения полов (♀/♂, Б) в популяциях массовых видов остракод в западной части пролива Брансфилда в марте 2002 г.

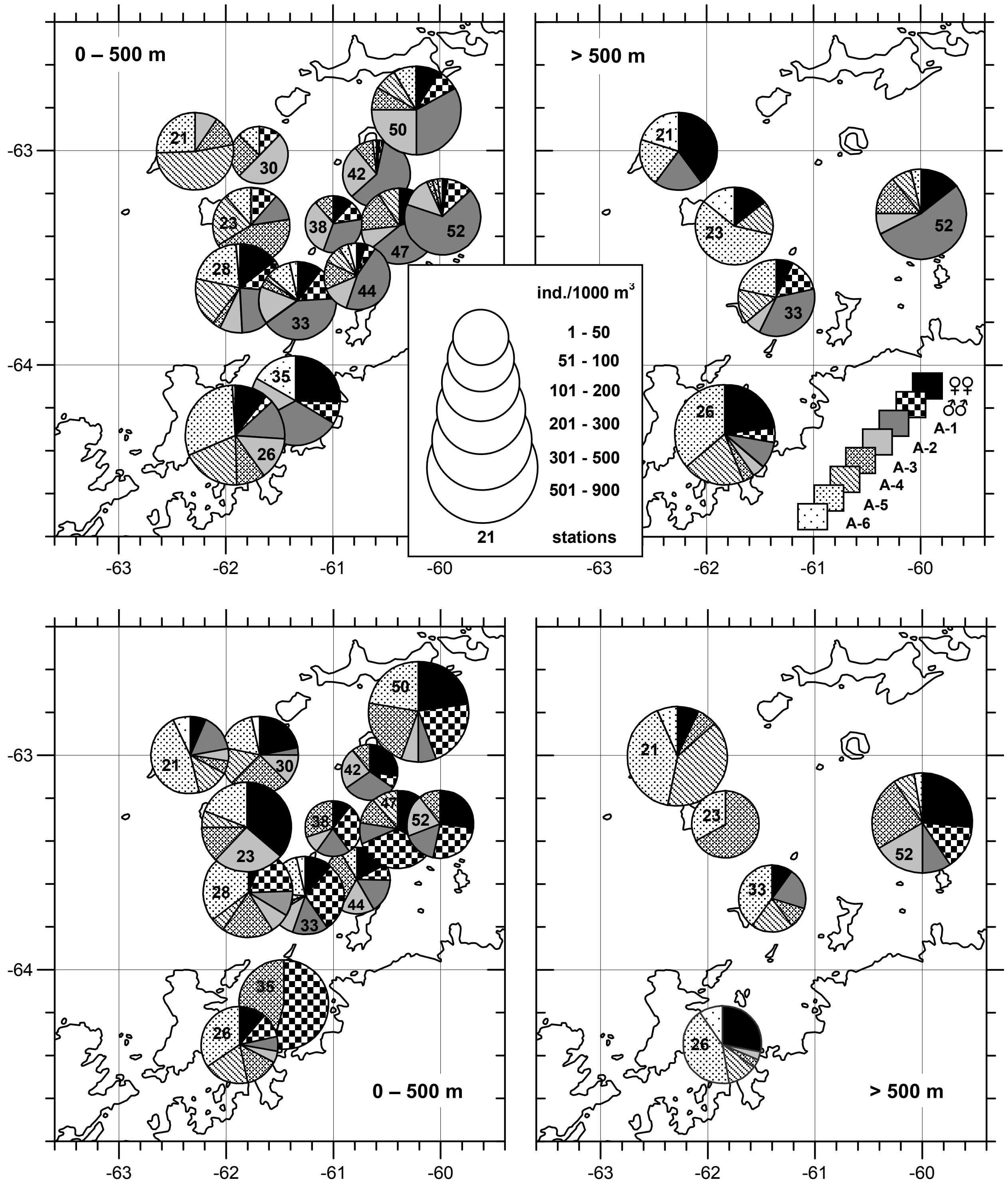

Fig. 8 The ratios of the age stages abundances and total abundances of *A. belgicae* (above) and *A. hettacra* (below) at the stations in western Bransfield Strait in March 2002

Рис. 8 Соотношение возрастных стадий и численность *M. isoheira* (вверху) and *B. antipoda* (внизу) на станциях в западной части пролива Брансфилда в 2002

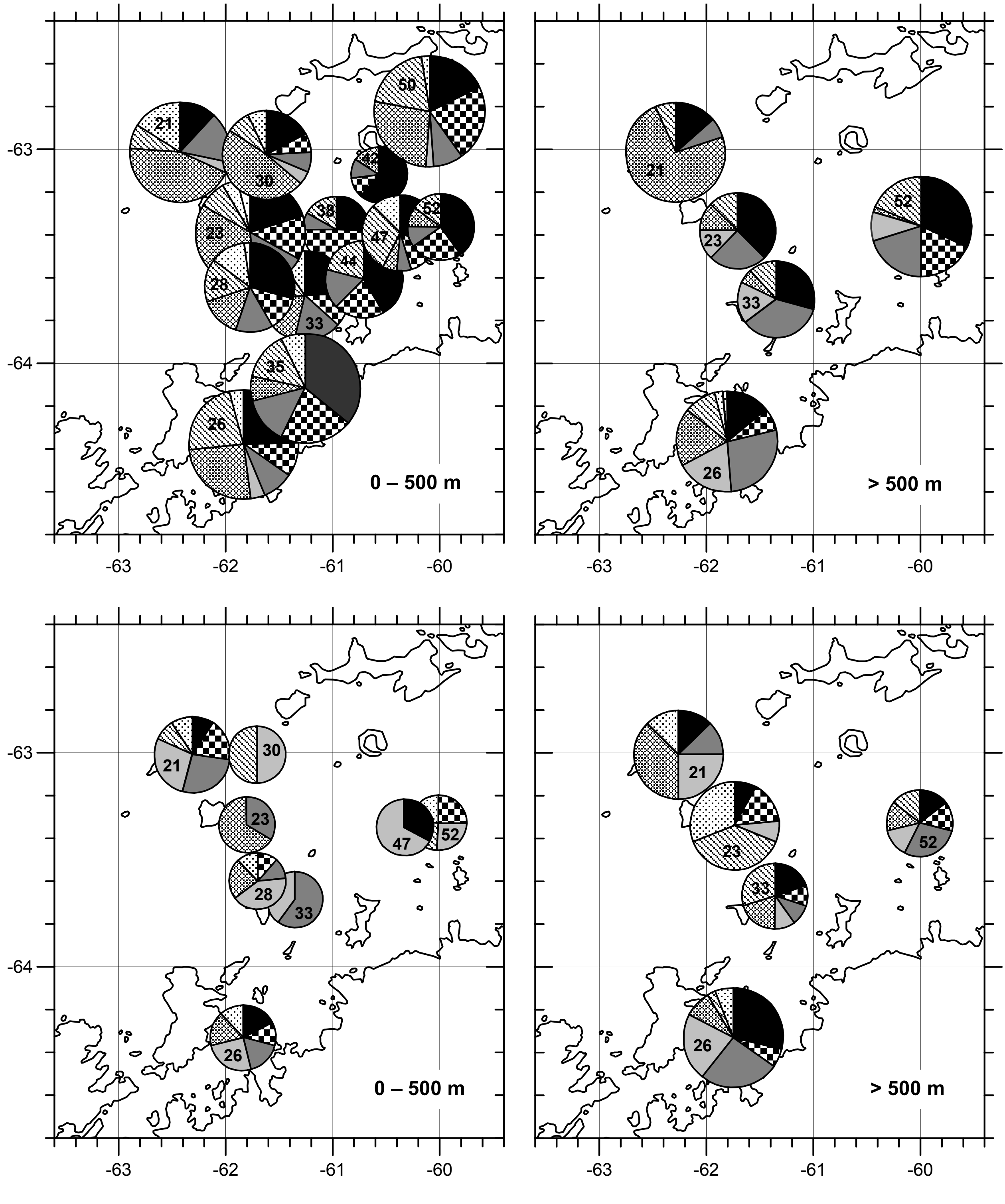

Fig. 9 The ratios of the age stages abundances and total abundances of *M. isoheira* (above) and *B. antipoda* (below) at the stations in western Bransfield Strait in March 2002

Рис. 9 Соотношение возрастных стадий и численность *M. isoheira* (вверху) and *B. antipoda* (внизу) на станциях в западной части пролива Брансфилда в 2002

Table 5 "Mean population stage" ($\overline{S}$) evaluated for the populations of four dominant ostracod species from the different areas of the western Bransfield Strait

Табл. 5 Величины показателя "mean population stage" ($\overline{S}$), рассчитанные для четырех массовых видов остракод из разных районов западной части пролива Брансфилда

Region	Station	Species, layer (m)							
		A. belgicae		*A. hettacra*		*M. isoheira*		*B. antipoda*	
		0 – 500	> 500	0 – 500	> 500	0 – 500	> 500	0 – 500	> 500
Bellinsgausen Sea Waters	21	3.1	4.6	3.3	2.8	4.3	4.5	5.4	4.6
	23	4.1	2.7	4.9	3.3	5.0	5.6	4.7	3.8
	26	4.0	4.1	3.9	3.6	5.0	5.2	5.2	5.6
	28	4.7	-	4.2	-	5.0	-	4.8	-
	30	4.6	-	4.2	-	4.7	-	4.0	-
Average		4.09		4.11		4.81			
Standard deviation		0.66		0.58		0.31			
Weddell Sea Waters	33	5.4	4.9	5.0	3.7	5.1	5.7	5.6	4.9
	35	5.3	-	5.6	-	5.7	-	0	-
	38	5.7	-	5.7	-	6.3	-	0	-
	42	5.5	-	5.9	-	6.3	-	0	-
	44	5.0	-	5.1	-	6.0	-	0	-
	47	5.5	-	6.1	-	4.9	-	5.7	-
	50	5.2	-	5.1	-	5.2	-	0	-
	52	5.8	5.4	6.1	5.5	6.0	5.8	4.3	5.4
Average		5.42		5.58		5.68			
Standard deviation		0.26		0.47		0.55			
t-test		0.0001		0.0002		0.0042			

Discussion. The hydrological conditions in the western Bransfield Strait (Fig. 1) are known to be complex. Warm, low salinity water from the Bellinghausen Sea advected into the Strait from the southwest interacts with cold saline water from the Weddell Sea flowing from the east along the northwestern coast of Antarctic Peninsula to form a frontal zone that is clearly seen in the fields of temperature, salinity and dynamic peaks [2, Fig. 2; 3, Fig. 1, 2] and is the western extremity of the Weddell Sea Front (FWS).

FWS traverses the study region from southwest to northeast and coincides with the direction of the main geostrophic stream. The frontal zone divides study area into two parts. In one sea surface temperatures (SSTs) of 1.5 – 2.0º C, stretch from the west to the northwest. In this hydrographic area the upper water column structure consists of the water mass that forms in winter and has a minimum subsurface temperature at 75 – 150 m and in underlain by the Circumpolar deepwater mass (CDWM), which enters the Strait between Smith and Snow Islands and has a temperature maximum at 300 – 500 m and a salinity maximum at 500 – 700 m. In the other hydrographic region, an SST of ~0.5º C extends southeastwards. Water temperature decreases with depth, whereas salinity increases. This structure is typical of the deep water region of the Bransfield Strait. The FWS extends down to a depth of 200 m. Below this depth CDWM with a higher salinity and temperature interacts with cold and low salinity sea water of the Bransfield Strait to form another front, which coincides with the position of the upper front but has the opposite salinity gradient [2, 3].

The four dominant ostracod species, *A. belgicae*, *A. hettacra*, *M. isocheira* and *B. antipoda*, inhabit all these waters, whereas the less common species *C. symmetrica*, *M. skogsbergi*, *D. aff. elegans* and *P. brachyaskos* were found in single samples, containing 3, 21, 4 and 13 individuals, respectively. It is probable, that these species had been advected in by CDWM. A similar assemblage of species has been reported by Polish and German researchers around the Antarctic Peninsula [5 – 9, 16, 17], and by American and Italian investigators in the Ross Sea [4, 12, 20] and by V. Chavtur in the Antarctic divergence area in the Australian-New Zealand sector of the Southern Ocean [10, 11].

The majority of the planktonic halocyprid ostracods found in the Southern Ocean prefer deeper epipelagic, meso- and bathypelagic depths [1]. Among eight species found in the Bransfield Strait four are interzonal (*A. belgicae*, *A. hettacra*, *D. aff. elegans*, *M. isocheira*) occur at maximum abundances in the mesopelagic, whereas the others (*B. antipoda*, *C. symmetrica*, *M. skogsbergi* and *P. brachyaskos*) inhabit deeper waters [11] with their maximum abundances >500 m. Based on the materials having been collected during the 16th expedition of the R/V Dmitry Mendeleev, V. Chavtur characterized *M. isocheira* as deepwater species [11, Table 1]. However, in the Bransfield Strait *M. isocheira* was distributed at depths similar to those inhabited by the interzonal species *A. belgicae* and *A. hettacra* (Fig. 5).

Few ostracods inhabit the upper 100-m layer, but those that do have spatial distributions that are apparently related to some of the specific hydrological features of the region. Fig. 3 (0 – 100 m) shows how the maximum abundances of the ostracods (up to 811 ind./1000 m^3 at stations 19, 23, 40, 42) were located along the northwestern boundary of the hydrological front (Fig. 1). It is noteworthy that stations 19 and 40 samples were sampled in daylight and stations 23 and 42 at night (Table 2). The material available does not allow conclusions to be drawn about vertical migrations of ostracods in the area, although the differences between the day and night distributions have been documented for ostracods in the Bransfield Strait [9]. The observed increases in abundance in the 0 – 100 m layer are, probably, in response to the hydrological conditions, in particular, to the front. Moreover, in the western and in the northwestern parts of the Strait, which are under the influence of the Bellinghausen Sea, ostracods were found at 9 of 13 stations and in larger numbers (144 ind./1000 m^3 on the average) then in the southeastern region, which was influenced by the Weddell Sea (at 4 of 8 stations, average 33 ind./ 1000 m^3).

In March 2002 similar spatial distributions was observed in other planktonic organisms of the western Bransfield Strait in the upper 100-m layer. For instance, it was observed that bacteria were much more abundant in the northern and northwestern regions of the Strait, than in the central, eastern and southeastern regions [22]. The highest abundances and biomass of tintinnids [15], the eggs and nauplii of copepods [Gavrilova, unpubl. data] and phytoplankton blooms [18] were also found along the frontal zone and in the northwest of the Strait.

The Fig. 4 is analogous to Fig. 2 of Blachowiak-Samolyk and Zmijewska [8], and allows comparisons to be made between the distributions and relative abundances of the ostracods in the western Bransfield Strait during December – January 1983 – 1984 [8] and in March 2002. The Polish researchers collected samples from depths down to 500 m only at three stations in similar hydrographic conditions as those investigated later onboard of the R/V *Gorizont*. Despite the differences in the seasons during which the two seta of observations were carried out, the total abundances of ostracods observed during mid-austral summer 1983 – 1984 and in early autumn 2002 were similar; ~700 ind./1000 m^3 and ~750 ind./1000 m^3, respectively. The relative abundances of the species also proved to be similar.

The population structure of dominant ostracod species inhabiting the vicinity of the Antarctic Peninsula was discussed in detail by K. Blachowiak-Samolyk [5 – 7], and in one of these papers [6] she gave an analysis of the population structures of two of the ostracod species (*A. belgicae* and *M. isocheira*) in different seasons.

No conclusions can be drawn about the life cycles of the ostracod species based solely on our month-long series of data. However, differences in the age structures of ostracod species observed in the western Bransfield Strait in March 2002 indicates that either the individual species began their reproduction at different time or they had different rates of development depended upon the environmental conditions they experienced (the influence of the Bellinghausen Sea or the Weddell Sea). Thus, the observed differences in the quantitative distributions and population structures of the planktonic ostracods are mostly responses to differences in the hydrological regimes prevailing in the different regions of the western Bransfield Strait.

Conclusions. Eight species of planktonic ostracods belonging to the family Halocyprididae were found in the western Bransfield Strait. Four species, *M. isocheira*, *A. belgicae*, *A. hettacra* and *B. antipoda*, were dominant, the other four *M. skogsbergi*, *P. brachyaskos*, *D. aff. elegans*, and *C. symmetrica* occurred in small numbers at the deeper depths sampled (200 – 500 m and >500 m).

The proportion of ostracods in total mesozooplankton communities increased with depth as did their absolute abundances of numbers and biomasses.

Highest values of ostracod abundance and biomass (>1000 ind./1000 m^3 and up to 500 - 780 mg/1000 m^3, respectively) generally occurred at depths of 200 – 500-m and >500 m. The ostracods occurred in low abundances in the upper 100-m (mean density 102 ind./1000 m^3), and they were absent from the upper water column at 8 of the 21 stations. Their abundances increased to 811 ind./1000 m^3 along the frontal zone between the different water masses flowing in from the Bellinghausen and the Weddell seas.

In March 2002 *M. isocheira* was the most abundant species throughout the western Bransfield Strait, contributing 44 % to the total ostracod numbers in the 0 – 500-m depth, but in terms of biomass were less important then the large-bodied species *A. belgicae* and *B. antipoda*. *B. antipoda* made the largest contribution to the ostracod biomass (43 %) at depth >500 m.

The populations of the dominant ostracod species consisted of large numbers of the youngest instars (A-5 and A-6) as well as numerous adults, suggesting that reproduction was ongoing.

Population structures of dominant ostracods showed local differences within the study area. At stations that were influenced by the slightly warmer and more saline waters advected in from the Bellinghausen Sea the populations contained a higher proportion of early instars than those influences by inflows from the Weddell Sea (i.e. $\overline{S}$ values were lower). These differences are considered to result from local differences in the development rates as a result of the environmental conditions.

The values of index $\overline{S}$ decreased with depth in populations of *A. belgicae*, *A. hettacra* and *B. antipoda* but showed no change in *M. isocheira*; while sex ratios (i.e. the proportion of females relative to males) increased in all ostracod species.

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Получено 16 октября 2006 г.

Пелагические остракоды (Halocyprididae) пролива Брансфилда, Антарктика. И. Е. Драпун. Представлены результаты исследования пелагических остракод (Halocyprididae) западной части пролива Брансфилда, полученные на основе зоопланктонных материалов 7-ой Украинской антарктической экспедиции, собранных в марте 2002 г. Максимальная глубина лова варьировала от 200 до 1000 м. Обнаружены восемь видов галоциприд. Три из них доминировали во всем обловленном слое: *Metaconchoecia isoheira* (в слоях 0 – 500 и >500 м составила, соответственно, 44 и 31 % всей популяции галоциприд), *Alacia belgicae* (28 и 23 %) и *A. hettacra* (24 и 21 %). Четвертый вид, *Boroecia antipoda*, доминировал глубже 500 м (21 %). Остальные виды, *Metaconchoecia skogsbergi, Proceroecia brachiaskos, Discoconchoecia aff. elegans* и *Conchoecissa symmetrica*, встретились в небольшом количестве на глубинах 200 – 500, > 500 м. В тех же слоях отмечены наибольшие плотность и биомасса галоциприд. В верхнем 100-метровом слое остракоды были немногочисленны, повышенные величины численности наблюдались вдоль фронтальной зоны, формирующейся при взаимодействии вод морей Беллинсгаузена и Уэдделла. Популяции видов остракод, населяющих водные массы этих двух морей, имели различную возрастную структуру.

Ключевые слова: пелагические остракоды, Halocyprididae, количественное распределение, возрастная структура, пролив Брансфилда, Антарктика

Пелагічні остракоди (Halocyprididae) протоки Брансфілда, Антарктика. І. Є. Драпун. Представлено результати дослідження пелагічних остракод (Halocyprididae) західної частини протоки Брансфілда, отримані на основі зоопланктонних матеріалів 7-ий Української антарктичної експедиції, зібраних у березні 2002 р. Максимальна глибина лову варіювала від 200 до 1000 м. Виявлено вісім видів галоціприд. Три з них домінували у всьому шарі, що досліджувався: *Metaconchoecia isoheira* (у шарах 0 – 500 й >500 м склала, відповідно, 44 й 31 % всієї популяції галоціприд), *Alacia belgicae* (28 й 23 %) і *A. hettacra* (24 й 21 %). Четвертий вид, *Boroecia antipoda*, домінував глибше 500 м (21 %). Інші види, *Metaconchoecia skogsbergi, Proceroecia brachiaskos, Discoconchoecia aff. elegans* й *Conchoecissa symmetrica*, зустрілися в невеликій кількості на глибинах 200 – 500, > 500 м. У тих же шарах відзначені найбільші чисельність і біомаса галоціприд. У верхньому 100-метровому шарі остракоди були нечисленні, підвищені величини чисельності спостерігалися уздовж фронтальної зони, що формується при взаємодії вод морів Беллінсгаузена й Уедделла. Популяції видів остракод, що населяють водні маси цих двох морів, мали різну вікову структуру.

Ключові слова: пелагічні остракоди, Halocyprididae, кількісний розподіл, вікова структура, протока Брансфілда, Антарктика