Polar Biol (2004) 27: 222–230
DOI 10.1007/s00300-003-0585-x

ORIGINAL PAPER

Magdalena Błażewicz-Paszkowycz
Joanna Sekulska-Nalewajko

Tanaidacea (Crustacea, Malacostraca) of two polar fjords: Kongsfjorden (Arctic) and Admiralty Bay (Antarctic)

Received: 13 June 2003 / Accepted: 18 November 2003 / Published online: 3 February 2004

Abstract The tanaidacean faunas of two polar fjords, Kongsfjorden (Arctic) and Admiralty Bay (Antarctic), were compared. The results show that Tanaidacea in the southern fjord are more diversified than those in the northern one. This difference is especially evident in species richness (12 species vs 3 species, respectively), but is not too significant in terms of diversity. In both polar fjords, the highest densities of tanaids were noted in sites where mud was swept off by the water current or eroded off steep bottom expoing coarser mineral particles used for tube building. The distribution of tanaids is suggested to be based on the joint action of inter alia factors such as the quality of bottom sediments, sedimentation ratio, accessibility of food, predation pressure, behaviour and heterogeneity of habitats.

Introduction

Studies on Arctic Tanaidacea began at the end of the nineteenth century. The pioneer monographs by G.O. Sars (1882), Norman and Stebbing (1886) and Hansen (1913) constituted fundamental papers. Their studies were devoted to Tanaidacea off the coast of Norway, the North Atlantic Islands and the surroundings of Greenland. Further taxonomic research on Arctic tanaids was not carried out for some decades, until the 1970s, when a monograph by Just (1970) on Greenlandic tanaids was published.

The tanaids of the Antarctic have been more extensively studied than those of the Arctic, at least as regards the number of comprehensive studies. Important monographs on the group were prepared by Beddard (1886a, 1886b), Hodgson (1902, 1910), Richardson (1906, 1907), Stebbing (1914), Vanhöffen (1914) and Hale (1937). After the second World War, other important papers were published by Stephensen (1947), Lang (1953), Kusakin (1967), Shiino (1970, 1978), Kusakin and Tzareva (1974), Kudinova-Pasternak (1975, 1981), Tzareva (1982) and Sieg (1983, 1984, 1986a, 1986b).

M. Błażwicz-Paszkowycz (✉) · J. Sekulska-Nalewajko
Department of Polar Biology and Oceanobiology,
University of Łódź, Banacha 12/16,
Łódź, Poland
E-mail: magdab@biol.uni.lodz.pl

Tanaidacea play a rather minor role in Arctic benthos (Włodarska and Węsławski 1996; Brandt 1997; Jørgensen et al. 1999). However, studies of the bottom fauna of the Southern Ocean have indicated that tanaids can be the leading group in zoobenthos due to their sometimes surprisingly high density (Dayton and Oliver 1977; Delille et al. 1985; Jażdżewski et al. 1986; Błażewicz-Paszkowycz and Jażdżewski 2000) and their important role in soft-bottom communities (Lowry 1975; Richardson and Hedgpeth 1977; Siciński 1998).

Differences in species richness and biological diversity between polar areas have been observed by many authors (Hedgpeth 1969, 1971; Hempel 1969; Knox 1970; Knox and Lowry 1977; Dayton 1990; Jażdżewski et al. 1995; Starmans 1997; Gray 2001; Starmans and Gutt 2002). The 164 tanaid species noted in the Southern Ocean (Schmidt and Brandt 2001) exceed the number of Arctic tanaids by about 20% (based mostly on G.O. Sars 1882; Norman and Stebbing 1886; Hansen 1913). The greater species richness in the Antarctic is due to its greater age (Gray 2001). Also, the variable bottom structure of the Antarctic shelf (Knox and Lowry 1977; Jażdżewski et al. 1995) promotes biological diversity (Jumars 1976; Jumars and Gallagher 1982). Coarse sediments transported by icebergs far from the seashore are also responsible for the structural variety of deeper Antarctic ecosystems. Sessile filter-feeders inhabiting patchily distributed drop stones provide extensive three-dimensional substrata. This greater structural heterogeneity of Antarctic bottom habitats is responsible for the higher diversity of benthic invertebrates and for their mosaic distribution. In contrast, the low species richness of the geologically younger Norwegian Sea can be explained by insufficient time for establishment of a full species complement (Gray 2001) and it is augmented by frequent physical disturbance, e.g. iceberg ploughing and mammal foraging activity (Dayton 1990).

During the series of Polish Polar Expeditions to the *H. Arctowski* station (King George Island, South Shetlands, Antarctic) in the 1978/1979 and 1984/1985 seasons, and on R/V *Oceania* (Kongsfjorden, Spitsbergen, Arctic) from 1997 to 1999, a rich collection of Tanaidacea was obtained. The Tanaidacea of Kongsfjorden have never been studied before; therefore, a list of the tanaid species of this fjord and their distribution are presented for the first time in this paper. The tanaids of Admiralty Bay have been already studied by Błażewicz and Jażdżewski (1996) and Błażewicz-Paszkowycz and Jażdżewski (2000). The results obtained by these authors have been supplemented and used for a comparison of the tanaid fauna occurring in two polar fjords: Kongsfjorden in the Arctic, and Admiralty Bay in the Antarctic.

Study area

Arctic Kongsjforden (Fig. 1A) opens to the North Atlantic-Greenland Sea. A number of tidal melting glaciers (Kongsbreen, Kongsvegen, Conwaybreen and Blomstrandbreen) situated in the innermost part of the fjord create a remarkable outflow of freshwater (Svendsen et al. 2001), which is responsible for steep environmental gradients in sedimentation and salinity along the length of the fjord (Hop et al. 2002). The authors divided Kongsfjorden into four zones (Fig. 1A) based on species

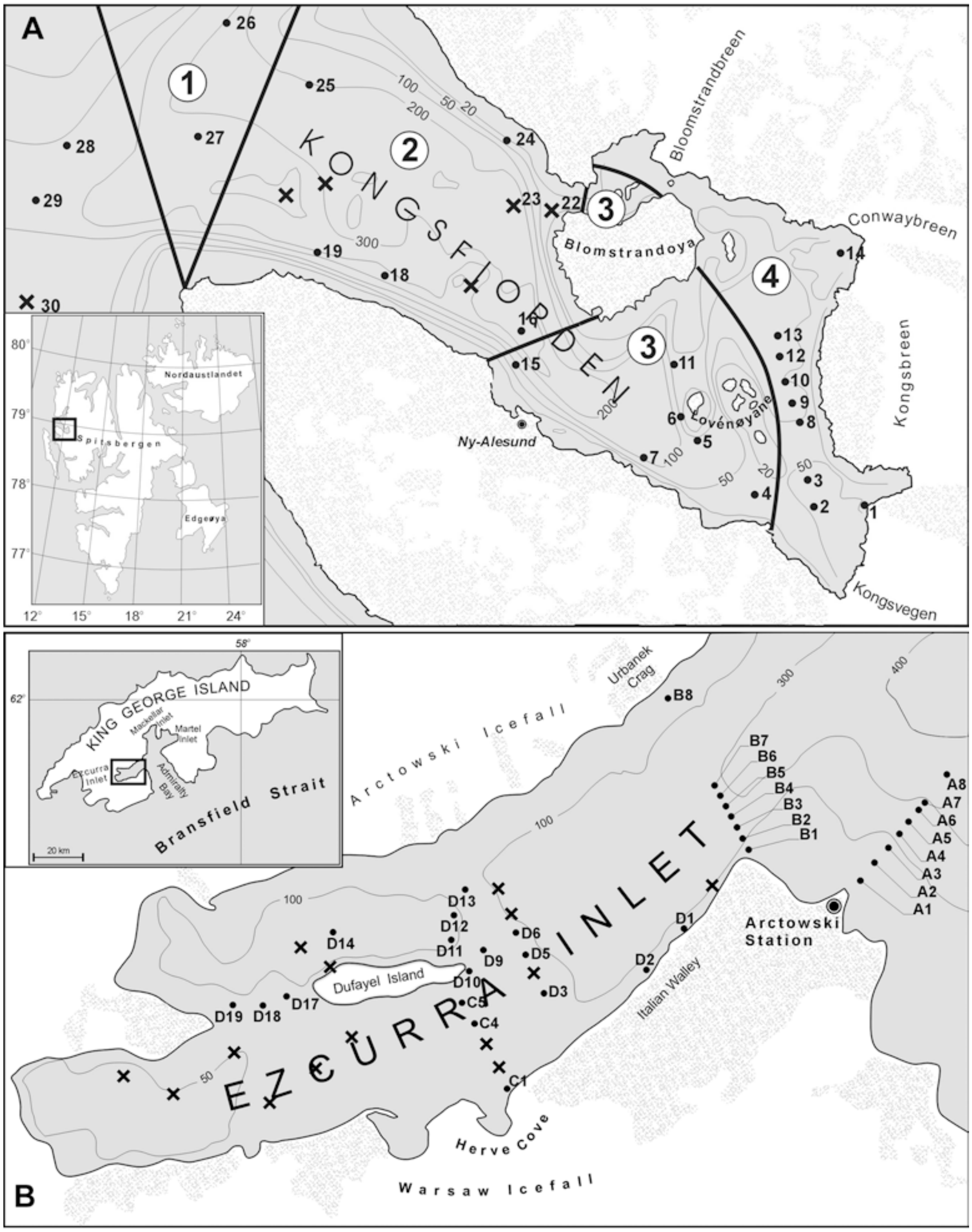

Fig. 1A, B Distribution of the stations inside: **A** Kongsfjorden (Arctic): *numbers* in *circles* indicate four zones after Hop et al. (2002); **B** Admiralty Bay (Antarctic). Tanaidacea absent at the stations are marked with a *cross*

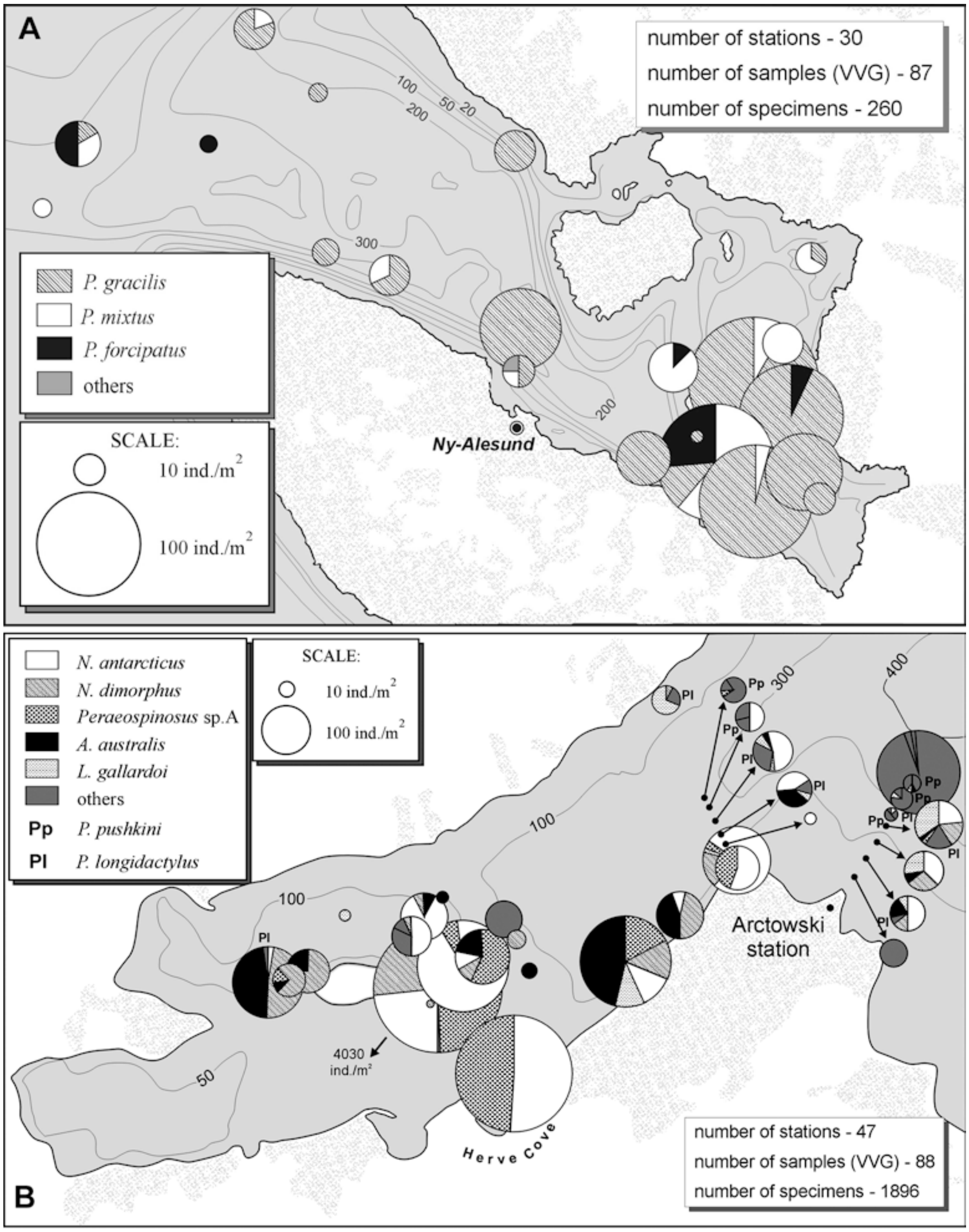

Fig. 2A, B Share of particular tanaid species at the stations in: **A** Kongsfjorden (Arctic) and **B** Admiralty Bay (after Błażewicz and Jażdżewski 1996 and Błażewicz-Paszkowycz and Jażdżewski 2000)

distribution, substrate and overriding environmental gradients. In our analysis, we treated zones 3 and 4 as one, and called it the "inner zone". Detailed morphometric characteristics and the hydrobiological conditions of Kongsfjorden are presented by Węsławski et al. (1991, 1994), Ito and Kudoh (1997), Eilertsen et al. (1989), Hop et al. (2002) and Svendsen et al. (2001).

Admiralty Bay (Fig. 1B) is the largest bay in King George Island (South Shetlands), opening widely to the Bransfield Strait. Its bottom displays great topographical diversity (Puszak 1980). Maximal depths surpassing 530 m are present in its narrow, U-shaped central basin. The northern part of Admiralty Bay is divided into three inner fjords (inlets): Ezcurra, MacKellar and Martel (Fig. 1B). The Ezcurra Inlet is much shallower than the central basin of Admiralty Bay and separated from its central part by a 100- to 130-m-high sill. The eastern part of the inlet forms a trough with depths of 150–270 m. The central and western parts of Ezcurra Inlet are much shallower basins, the bottoms of which are built of ductile clay with stones lying at depths of 70–85 m (Marsz 1983). The hydrobiological conditions and morphometric characteristics of Admiralty Bay are presented by Lipski (1987), Rakusa-Suszczewski (1993), Jażdżewski et al. (1995) and Siciński (1998).

Materials and methods

In Kongsfjorden, material was collected during the expedition on R/V *Oceania* (1995–1999). It consisted of 260 tanaid specimens identified in 87 samples taken using the Van Veen Grab (0.1 m^2) or Box Core (0.1 m^2) at 30 stations (Fig. 1A).

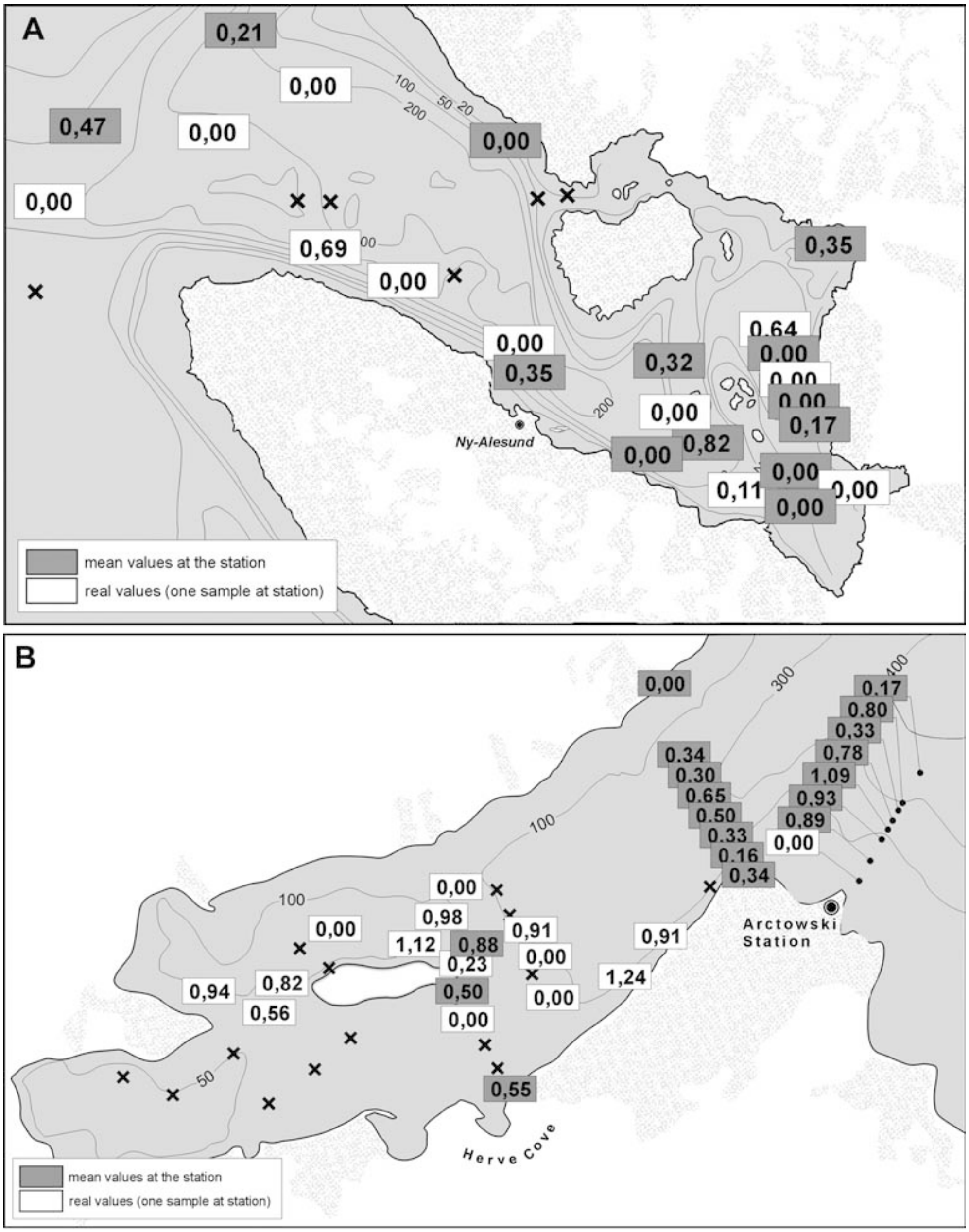

Fig. 3A, B Shannon Index values calculated for tanaids at particular stations in: **A** Kongsfjorden (Arctic); **B** Admiralty Bay (Antarctic)

Materials used for the analysis of tanaids in Admiralty Bay were collected in the season 1978/1979 (series B and C) and in 1984/85 (series A and D) by Polish Antarctic Expeditions to the *H. Arctowski* Station using Van Veen Grab (0.09 m^2). Eighty-eight samples were collected at 47 stations, as presented in Fig. 1B and Table 3.

The graphic presentation of species domination shown in Fig. 2A,B is based on averaged data (“mean values”) calculated for particular stations. In series D (Admiralty Bay), where only one sample was taken at each station, “real values” are given.

Tanaid material was identified to species level using a stereomicroscope Nikon SMZ 800; some detailed morphological characteristics, important for the determination, were observed with the Axiolab Zeiss microscope after preparing slides with glycerine colored with chlorazol black.

The Shannon-Weaver diversity index was calculated for particular stations as $H = \Sigma\ (n_i/N)\ \log_2(n_i/N)$, in which n_i is the density of the *i*th species and *N* is the total tanaid density. The values of the index for each sample (“real value”) are presented in Tables 2 and 3. Figure 3A,B presents the values of the index calculated for the station (“mean value”). For the stations where only one sample was taken (or only one sample consisted of tanaids), the “real value” is presented.

Results

A comparison of the Tanaidacea of Kongsfjorden (Arctic) and Admiralty Bay (Antarctic) is presented below. The systematic was adopted from Larsen and Wilson (2002).

The Tanaidacea in Admiralty Bay are much more diversified in terms of species, genera and families than in Kongsfjorden (12 species vs only 3 species).

Kongsfjorden (Arctic)	Admiralty Bay (Antarctic) supplemented list prepared by Błażewicz and Jażdżewski (1996) and Błażewicz-Paszkowycz and Jażdżewski (2000)
Tanaidae Dana, 1849	
	Zeuxoides ohlini (Sieg, 1980)
Leptognathiidae Sieg, 1976	
Leptognathia longiremis (Scott, 1899)	*Leptognathia gallardoi* Shiino, 1970
	Akanthophoreus australis (Beddard, 1886)*
Colletteidae Larsen *et* Wilson 2002	
	Mirandotanais vorax (Kusakin *et* Tzareva, 1974)
Tanaellidae Larsen *et* Wilson 2002	
	Araphura elongata (Shiino, 1970)
Nototanaidae Sieg, 1976	
Peraeospinosus mixtus (Hansen 1913)	*Nototanais antarcticus* (Hodgson, 1902)
	Nototanais dimorphus (Beddard, 1886)
	Protanaissus longidactylus (Shiino, 1970)
	Paratyphlotanais armatus (Vanhöffen, 1914)
	Peraeospinosus adipatus (Tzareva, 1982)
	Peraeospinosus pushkini (Tzareva, 1982)
	Peraeospinosus sp.A
	Typhlotanaoides sp. A**
Pseudotanaidae Sieg, 1973	
Pseudotanais forcipatus Lilljeborg, 1864	

* This species was noted by Błażewicz and Jażdżewski (1996) and Błażewicz-Paszkowycz and Jażdżewski (2000) as *Paraleptognathia australis*; ** *Typhlotanaoides* sp. A is noted for the first time in Admiralty Bay.

[a]This species was noted by Błażewicz and Jażdżewski (1996) and Błażewicz-Paszkowycz and Jażdżewski (2000) as*Paraleptognathia australis*.
[b]*Typhlotanaoides* sp. A is noted for the first time in Admiralty Bay.

The most abundant (76%) and frequent ($f = 81.5\%$) tanaid species in Kongsfjorden was *Paraleptognathia gracilis*, followed by *Peraeospinosus mixtus* and *Pseudotanais forcipatus* (Table 1). Although the share of the last two in the material was clearly lower than the first, none of the species can be considered rare (Table 1). Tables 2 and 3 provide a list of the tanaid species taken in Kongsfjorden and Admiralty Bay.

In Admiralty Bay, the Tanaidacea were dominated by *Peraeospinosus* sp. A (36.65%), although the highest values of frequency were noted for subdominants: *Nototanais antarcticus* (54.84%) and *N. dimorphus* (41.93%) (Table 1). Also, high frequency values were noted for the less abundant species *Peraeospinosus pushkini, Paraleptognathia australis* and *Leptognathia gallardoi*. The rarest species among Tanaidacea in the Antarctic fjord studied were *Mirandotanais vorax, Typhlotanoides* sp., *Paratyphlotanais armatus* (Vanhöffen, 1914) and *Zeuxoides ohlini* (Stebbing, 1914). The two last species were recorded by Błażewicz-Paszkowycz and Jażdżewski (2000) at single stations.

The distribution of tanaid taxa in Kongsfjorden (Fig. 2A) show no clear difference in species composition between the inner, middle, and outer basins of the fjord. Also, no difference in values of the Shannon Index calculated for the stations of the inner, middle and outer

Table 1 Tanaidacea in Kongsfjorden [*N* number of caught specimens, *D* domination in the material, *F* frequency in the total number of samples (grabs) (87), *f* frequency in tanaid samples (48)] and Admiralty Bay [*F* frequency in the total number of samples (88), *f* frequency in tanaid samples (62)]

Species Admiralty Bay	*N*	*D* (%)	*F* (%)	*f* (%)
Kongsfjorden				
P. gracilis	196	76	27.27	81.5
P. mixtus	44	16.9	10.23	37
P. forcipatus	20	7.7	10.23	22.2
Peraeospinosus sp. A	695	36.65	13.48	20.97
N. antarcticus	522	27.75	35.22	54.84
N. dimorphus	406	21.58	29.54	41.93
P. pushkini	105	5.58	22.72	32.26
P. australis	67	3.56	25.00	35.48
L. gallardoi	39	2.07	25.00	35.48
P. longidactylus	23	1.22	13.63	19.35
P. adipatus	10	0.64	11.36	16.13
A. elongata	12	1.53	11.36	16.13
M. vorax	1	0.05	1.14	1.61
Typhlotanoides sp. A	1	05.5	1.14	1.61

Table 2 List of tanaid samples taken in Kongsfjorden (total number of samples 87; 39 without tanaids): *1* number of tanaid sample; *2* station; *3* index of sample; *4* depth (m); *5* date; *6* number of species; *7* density per sample ("real density"); *8* density per station ("mean density"); *9* Shannon-Weaver calculated per sample; *10* Shannon-Weaver calculated per station (see Fig. 3A)

1	2	3	4	5	6	7	8	9	10
1.	1	1	83	1998	1	40	40	0	0
2.	2	2/1	60	1997	1	10		0	
3.		2/2	60	1997	1	110	56.7	0	0
4.		2/3	60	1997	1	50		0	
5.	3	3/1	72	1998	1	50		0	
6.		3/2	72	1998	1	20	26.7	0	0
7.		3/3	72	1998	1	10		0	
8.	4	4/1	38	1997	2	100		0.25	
9.		4/2	60	1997	1	20	120	0	0.108
10.		4/3	38	1997	1	240		0	
11.	5	5/1	72	1998	2	160		0.562	
12.		5/2	72	1998	3	150	133.3	0.853	0.825
13.		5/3	72	1998	3	90		1.061	
14.	6	6	94	1997	1	20	20	0	0
15.	7	7/1	95	1997	1	60		0	
16.		7/2	95	1997	1	10	30	0	0
17.		7/3	95	1997	1	20		0	
18.	8	8/1	50	1998	1	10		0	
19.		8/2	50	1998	1	190	100	0	0.167
20.		8/3	50	1998	2	100		0.5	
21.	9	9/1	53	1997	2	130		0.271	
22.		9/2	53	1997	1	140	160	0	0.227
23.		9/3	53	1997	2	210		0.41	
24.	10	10	-	1999	1	60	60	0	0
25.	11	11/1	78	1998	1	50	40	0	0.318
26.		11/2	78	1998	2	30		0.636	
27.	12	12/1	40	1998	1	20		0	
28.		12/2	40	1998	1	20	16.7	0	0
29.		12/3	40	1998	1	10		0	
30.	13	13	-	1999	2	30	30	0.636	0.636
31.	14	14/1	-	1999	1	10	15	0	0.346
32.		14/2	-	1999	2	20		0.693	
33.	15	15/1	114	1998	1	10	15	0	0.346
34.		15/2	114	1998	2	20		0.693	
35.	16	16	364	1997	1	60	60	0	0
36.	18	18	270	1997	1	10	10	0	0
37.	19	19	306	1997	2	20	20	0.693	
38.	24	24/1	125	1998	1	20		0	
39.		24/2	125	1998	1	10	16.7	0	0
40.		24/3	125	1998	1	20		0	
41.	25	25	125	1998	1	10	10	0	0
42.	26	26/1	308	1998	2	30		0.636	
43.		26/2	308	1998	1	10	16.7	0	0.212
44.		26/3	308	1998	1	10		0	
45.	27	27	255	1998	1	10	10	0	0
46.	28	28/1	258	1998	1	10	30	0	0.475
47.		28/2	258	1998	3	50		0.95	
48.	29	29	256	1998	1	10	10	0	0

Table 3 List of tanaid samples taken in Admiralty Bay (total number of samples 88; 26 without tanaids): *1* number of tanaid sample; *2* station; *3* index of sample; *4* depth (m); *5* date; *6* number of species; *7* density per sample ("real density"); *8* density per station ("mean density"); *9* Shannon-Weaver calculated per sample; *10* Shannon-Weaver calculated per station (see Fig. 3B)

1	2	3	4	5	6	7	8	9	10
1.	A1	A1/1	37	15.03.1985	1	11.1	5	0	0
2.	A2	A2/1	55	08.11.1985	3	211.1		0.91	
3.		A2/2	59	17.03.1985	2	22.2	100	0.693	0.891
4.		A2/4	60	17.03.1985	4	100		1.07	
5.	A3	A3/1	88	08.11.1985	3	88.9		1.082	
6.		A3/2	88	08.11.1085	2	33.3	83.3	0.636	0.932
7.		A3/3	97	22.03.1984	3	155.6		1.079	
8.	A4	A4/1	119	11.05.1985	2	55.6		0.673	
9.		A4/2	120	08.02.1985	5	133.3	96.6	1.327	1.086
10.		A4/3	126	08.02.1985	5	133.6		1.259	
11.	A5	A5/1	164	27.09.1985	2	22.2	26.7	0.693	0.78
12.		A5/2	175	21.02.1985	3	66.7		0.867	
13.	A6	A6/1	251	30.01.1985	1	11.1		0	
14.		A6/2	252	11.05.1985	2	100	43.3	0.349	0.328
15.		A6/3	254	23.07.1985	2	33.3		0.636	
16.	A7	A7/1	278	23.07.1985	3	66.7		1.011	
17.		A7/2	280	21.01.1985	2	44.4	40	0.693	0.799
18.		A7/3	280	08.11.1985	2	22.2		0.693	
19.	A8	A8/1	335	03.11.1985	3	233.3	250	0.38	
20.		A8/2	337	08.01.1986	1	211.1		0	0.17
21.		A8/3	349	09.03.1985	2	388.9		0.13	
22.	B1	B1/1	14	02.01.1980	1	33.3	90	0	0.345
23.		B1/2	15	02.01.1980	2	166.7		0.691	
24.	B2	B2/1	25	20.12.1979	1	22.2		0	0.16
25.		B2/2	27	20.12.1979	2	477.8	160	0.48	
26.		B2/3	35	20.12.1979	1	33.3		0	
27.	B3	B3/1	44	20.12.1979	3	444.4	136.7	0.652	0.326
28.		B3/3	69	07.02.1980	1	11.1		0	
29.	B4	B4/1	73	20.12.1979	1	11.1		0	
30.		B4/2	89	07.02.1980	3	133.3	66.7	0.824	0.502
31.		B4/3	87	27.12.1979	2	77.8		0.683	
32.	B5	B5/1	106	27.12.1979	1	66.7		0	
33.		B5/2	122	27.12.1979	5	166.7	77.7	1.263	0.652
34.		B5/3	126	07.02.1980	1	22.2		0.693	
35.	B6	B6/1	165	07.02.1980	1	22.2		0	
36.		B6/2	170	07.02.1980	3	122.2	46.7	0.907	0.302
37.		B6/3	187	07.02.1980	1	11.1		0	
38.	B7	B7/1	240	04.01.1980	2	44.4		0.562	
39.		B7/2	242	04.01.1980	2	66.7	40	0.45	0.338
40.		B7/3	262	04.01.1980	2	22.2		0.693	
41.	B8	B8/1	33	04.01.1980	1	11.1	43.3	0	0
42.		B8/3	43	04.01.1980	2	133.3		0.562	
43.	C1	C1/1	15	07.03.1980	2	2166.7	720	0.688	0.549
44.		C1/3	18	07.03.1980	2	233.3		0.41	
45.	C4	C4/1	32	07.03.1980	1	11.1	3.33	0	0
46.	C5	C5/1	10	07.03.1980	3	6388.9		0.537	
47.		C5/2	12	07.03.1980	2	55.6	3626.7	0.143	0.502
48.		C5/3	17	07.03.1980	3	5644.4		0.825	
49.	D1	D1	52	16.02.1985	3	144.4		0.911	
50.	D2	D2	56	16.02.1985	5	488.9		1.237	
51.	D3	D3	70	13.01.1985	1	11.1		0	
52.	D5	D5	73	13.01.1985	1	22.2		0	
53.	D6	D6	81	11.01.1985	2	55.6		0.562	
54.	D9	D9	26	05.01.1986	4	166.7		1.077	
55.	D10	D10	20	05.01.1986	2	544.4		0.23	
56.	D11	D11	129	01.10.1985	4	122.2		1.121	
57.	D12	D12	127	01.10.1985	3	155.6		0.98	
58.	D13	D13	127	01.10.1985	1	11.1		0	
59.	D14	D14	132	28.03.1985	1	11.1		0	
60.	D17	D17	45	06.11.1985	3	133.3		0.824	
61.	D18	D18	45	06.11.1985	2	88.9		0.562	
62.	D19	D19	48	06.11.1985	4	322.2		0.943	

part of the fjord could be observed (Fig. 3A). Quantitative data show that tanaids were much more abundant at the majority of the shallowest stations (38–72 m) of the inner part of Kongsfjorden (Fig. 2A), with maximal density reaching 240 ind./m^{-2}. However, these crustaceans were absent in numerous samples collected in the middle or outer basin; when present at all, their density was not usually higher than a few ind./m^{-2}. The exception here was one station situated near Ny Alesund, where at the depth of 364 m the density of tanaids surpassed 60 ind./m^{-2} (station 16).

The tanaid fauna of Admiralty Bay was more diversified in the central basin than in the inside inlets (Fig. 2B). From the list of 12 tanaid species listed for Admiralty Bay (Błażewicz and Jażdżewski 1996; Błażewicz-Paszkowycz and Jażdżewski 2000), 5 occurred almost exclusively in the central part (*Peraeospinosus adipatus*, *Araphura elongata*, *M. vorax*, *Z. ohlini*, *Paratyphlotanais armatus*), while two others (*L. gallardoi* and *Peraeospinosus pushkini*) were common in the central basin but were considered as incidental species inside Ezcurra Inlet.

The calculation of tanaid species diversity in Admiralty Bay yields different results to the quantitative data (Figs. 2B, 3B). Maximal value of density of 6,388.9 ind./m^2 (mean 4030 ind./m^2) was noted inside Ezcurra Inlet near Deception Island (station C5). In contrast, at stations situated in the central part of Admiralty Bay in front of *H. Arctowski* station (series A), where tanaid species richness was higher than inside the inlet, maximal values of tanaid density did not usually surpass 10 ind./m^2. The Shannon Index calculated for tanaids for particular stations in Admiralty Bay indicates a patchy character to their distribution, e.g. both high and low values were observed in Ezcurra Inlet, as well as in the central basin of Admiralty Bay (Fig. 3B).

Shannon-Weaver indices and mean species number per sample calculated for both regions show a higher species diversity in Admiralty Bay than in Kongsfjorden (Fig. 4). *K*-dominance curves were calculated for all samples (Fig. 5). The curve representing the Admiralty Bay region lies below the curve for the Kongsfjorden region. It indicates a more diversified tanaid fauna in Admiralty Bay than in Kongsfjorden.

Discussion

The differences in species richness, diversity, and distribution composition of tanaids in Kongsfjorden and Admiralty Bay are attributed to a number of factors, either alone or in combination with others. Without a better knowledge of the behaviour and habitat/microhabitat preferences of the group, it is almost impossible to determine the causes of species' distribution in the two basins studied. However, some possible factors are discussed below.

The list of tanaids found in Kongsfjorden is undoubtedly incomplete and more detailed studies

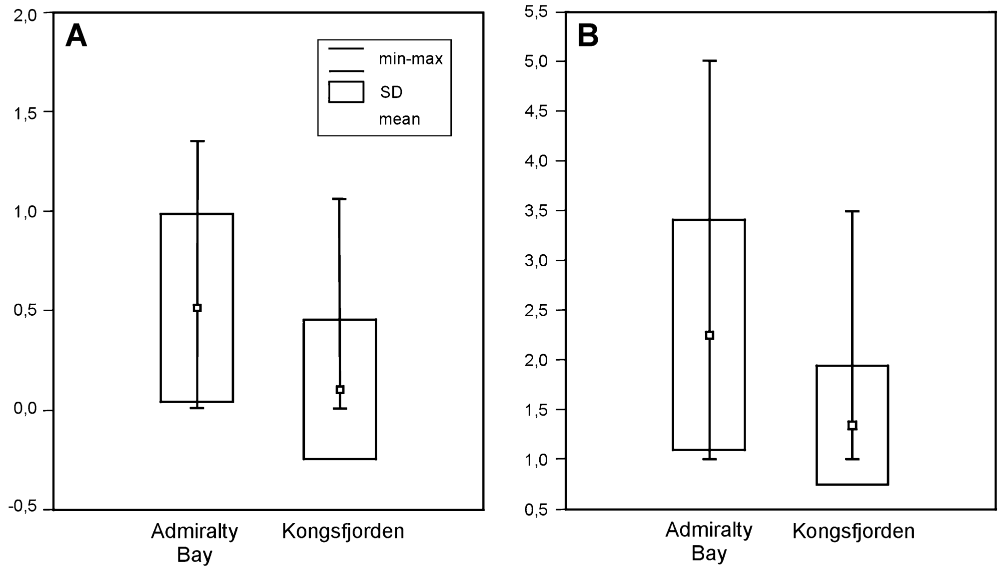

Fig. 4A, B Number of species and Shannon Index values in the studied Antarctic and Arctic regions

should add, at least, rare and accidental taxa. Investigations of benthos in Kongsfjorden done by Kendall et al. (2003) enabled the recording of one more tanaid species—*Sphyraphus anomalus*, belonging to the suborder Apseudomorpha. This species does not build tubes in sediments but, similar to the other members of Apseudomorpha, lives on the surface of sediments. Reidenauer and Thistle (1985) observed the tanaids of the deep North Atlantic, and revealed that high near-bottom current velocity has no noticeable influence on tube dwellers, although it limits surface-living mobile fauna. Therefore, it is probable that high currents of tidal flow, present in the shallows of zone 4 in Kongsfjord, limits epibenthic tanaids.

In both polar fjords, the highest density of tanaids were noted in sites of dynamic sedimentation: in front of the underwater ridge isolating Herve Cove from Ezcurra Inlet (station C1), on the steep bottom near Deception Island in Admiralty Bay, and in the shoal in the vicinity of Lovénøyane in Kongsfjorden (Fig. 2A,B) (see also Błażewicz-Paszkowycz and Jażdżewski 2000). Sediments of such habitats are continuously disturbed by tidal currents sweeping fine sediment off and exposing some coarser materials (e.g. sand), which may be important material for tube building. Many authors noted that the quality of bottom sediments definitely influences the distribution of tube dwellers (Hassack and Holdich 1986; Siciński 1998; Błażewicz-Paszkowycz and Jażdżewski 2000). It was also observed that the shape of the tube and the material it is constructed with are characteristic for the particular tanaid taxa. The study on the Admiralty Bay tanaids showed that *Nototanais antarcticus* does not build typical tubes but rather makes muddy corridors inside fine sediments, while *Peraeospinosus* sp. A uses fine mineral particles (ø = 0.2–0.07 mm) for constructing its tubes (personal observation).

The environments influenced by icefall outflow are characterised by high plankton mortality due to osmotic shock (Węsławski and Legeżyńska 1998; Zajączkowski and Legeżyńska 2001) and the ingestion of fine mineral particles (Lewis and Syvitsky 1983). The dead zooplankton sinks and contributes to the high value (around 10%) of organic matter in the benthic biomass (Węsławski and Legeżyńska 1998). Most tanaids are regarded as non-selective deposit-feeders (Dennell 1937; Bückle-Ramirez 1965; Mendoza 1982; Messing 1983; Kudinova-Pasternak 1981, 1991; Błażewicz-Paszkowycz and Ligowski 2002); therefore, the accessibility of organic matter and the development of its bacterial stock may also have an influence on the pattern of tanaid distribution. A positive correlation between concentration of bacteria density and feeding on them *Allotanais hirsutus* has already been observed by Delille et al. (1985). One of the results of heavy sedimentation, which can be observed at the front of glaciers (Svendsen at al. 2001), is the fast dilution of organic matter in the

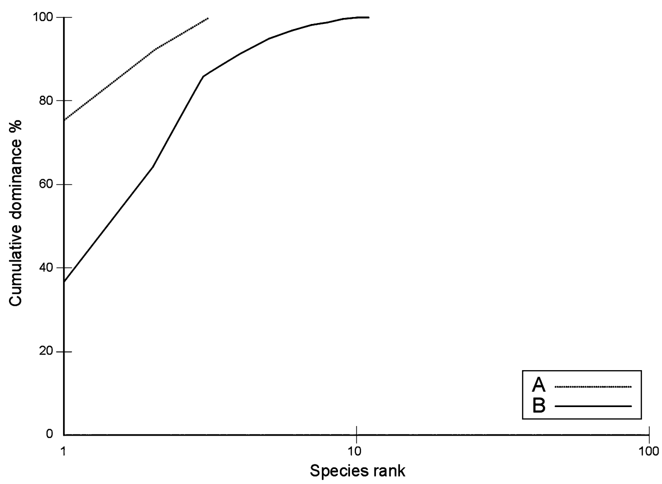

Fig. 5 *K*-dominance plots for species data of studied regions: *A* Kongsfjorden; *B* Admiralty Bay

sediments. However, some tanaids have been observed to bury in sediments deeper than 3 cm (Reidenauer and Thistle 1985), and thus it is quite possible they can feed on buried debris.

It has been also mentioned that the lower transparency of water decreases predator pressure. Demersal fish, which are the main predators of benthic crustaceans (Klekowski and Węsławski 1990), are absent in the inner part of the fjords due either to the low transparency of water caused by strong sedimentation, or simply lower salinity, and the lack of hiding places there.

The distribution of tanaids may also be influenced by their behaviour or life-style, which are still unknown. The animals living in environments of strong sedimentation have to avoid being covered by sediments. Some tanaids are known to deal with heavy sedimentation by extending their tubes. This seems to be very probable for *N. antarcticus*, which makes elongated, muddy tubes. Relatively short tubes of other tanaids (*Peraeospinosus* sp. A, *Typhlotanaoides rostralis*) suggest the existence of some other behaviours or mechanisms that protect them from intensive sedimentation.

From our paper, it can be concluded that Tanaidacea in Admiralty Bay are different than those in Kongsfjorden. This difference is especially significant in species richness (12 species vs 3 species) but less obvious in terms of diversity. The distribution of tanaids is based on the combined action of several factors. The results obtained indicate that these animals prefer sites with unstable sediments. Mud swept off by the water current or eroded off steep bottoms exposes coarser particles used for tube building.

Acknowledgements We are grateful to our colleagues from the Department of Polar Biology and Oceanobiology (University of Łódź) and Institute of Oceanobiology (Polish Academy of Science in Sopot) for collecting material and making it available for study. Many thanks are due to Professor Marcin J. Węsławski and Dr. Marek Zajączkowski (PAS in Sopot) for fruitful discussions. Jürgen Guerrero-Kommritz (Zoologisches Institut und Zoologisches Museum Hamburg) kindly read the manuscript.

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