ZOOPLANKTON COMMUNITY IN THE COVE OF CUMBERLAND BAY, SOUTH GEORGIA, IN THE SOUTHERN SUMMER FROM JANUARY TO FEBRUARY 1973

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Abstract: Zooplankton were collected from the littoral water of South Georgia during the period from late January to late February 1973. Ten species of pelagic copepods were identified, of which *Calanus acutus, C. simillimus, Drepanopus forcipatus* and *Oithona frigida* were the main constituents. Most of copepods are known as Subantarctic or Antarctic species. *Drepanopus forcipatus* was the most numerically important species in the littoral water of South Georgia. Numerical abundance of copepods was observed on 1–4 and 19–20 February. Copepod nauplii and the pelagic larvae of benthic worms gave the evidence of active production during the period of sampling. Serial surface samplings showed that *Calanus acutus, C. simillimus* and *Drepanopus forcipatus* swarmed around the water surface at night.

1. Introduction

Although a number of plankton studies concerned with the open waters of the Antarctic Ocean have been recently accumulated, only a few studies are available for the neritic waters around the ocean islands located in the region south of the Antarctic Convergence. The island of South Georgia lies on a submarine ridge, which stretches from the southern end of South America to the Antarctic Peninsula, the region occupied by the Antarctic waters. It is considered that the shelf area around South Georgia plays an important role in dispersing the Subantarctic and/or Antarctic littoral plankton. According to HARDY and GUNTHER (1935) both Antarctic and Subantarctic species of plankton occurred in the waters around South Georgia, and some of oceanic species extended to the shelf area.

One of the present authors, T. HOSHIAI, had an opportunity of staying at South Georgia Station of the United Kingdom during the period from 17 January to 3 March 1973, as a Japanese exchange scientist in accordance with Article III of the Antarctic Treaty. He collected zooplankton and larval fish at the jetty of the Station.

This paper deals with the occurrence of zooplankton, especially pelagic copepods, in the littoral water of South Georgia during the southern summer.

2. Materials and Methods

Zooplankton samples were taken at the jetty of King Edward Cove, Cumberland Bay, South Georgia (54°16′41″S, 36°29′58″W), using two types of nets, a 0.1-mm mesh net of 30 cm in mouth diameter and 100 cm in length, and a coarse dip-net. Twelve samples of a 0.1-mm mesh net were taken by an oblique tow from near the bottom of about 5-m depth to the surface at intervals of 2 to 3 days from 29 January to 28 February 1973. On the other hand, two series of surface sampling were made with a coarse dip-net every hour between 1900–2400LT on 31 January and between 2000–0200LT on 2–3 February at the beach in front of the base commander's office of the Station, to catch the juveniles of *Notothenia rossii marmorata* FISCHER which swarmed around just beneath the surface water.

These plankton samples were not exactly suitable for a quantitative study, because a flow-meter was not equipped on the mouth of a net for estimating the water filtered. Oblique tows, however, were made at nearly constant depth of 5 m in every sampling, and the individual numbers of zooplankters in the respective tows were used in discussing their relative abundance and composition. Among the zooplankters identification of species was carried out only on the pelagic copepods except benthic harpacticoids. A whole or an aliquot of 1/4–1/10 of each sample was examined in accordance with abundance, and the individuals were counted. Large animals obtained with a coarse dip-net were removed from the samples prior to the present study. Nocturnal abundance of large animals was already reported in a separate paper by HOSHIAI (1979).

3. Results

Full data on the individual number of each zooplankter collected with a 0.1-mm mesh net and a coarse dip-net are given in Tables 1 and 2 respectively. Dominant groups of zooplankters in the 0.1-mm mesh net samples were occupied by copepods of the immature stage, and nereid worms of the nectochaete phase. They were often present in considerable numbers giving evidence of active reproduction during the period of sampling. Composition of zooplankters was different between the 0.1-mm mesh net and the coarse dip-net, and the small-sized specimens of zooplankters were hardly collected with a coarse dip-net because they escaped the meshes of the net.

Only ten species of the pelagic copepods were identified; eight species were collected with the 0.1-mm mesh net by the oblique tow and seven were with the dip-net in the surface sampling. Five species, *Calanus propinquus* BRADY, *Calanus simillimus* GIESBRECHT, *Calanus* (*Calanoides*) *acutus* GIESBRECHT, *Drepanopus forcipatus* GIESBRECHT and *Microsetella norvegica* (BOECK) were collected with both nets. *Eucalanus longiceps* MATTHEWS and *Rhincalanus gigas* BRADY were collected in a small number by the surface sampling, and *Centropages* sp., *Oithona frigida* GIESBRECHT and *Oncaea curvata* GIESBRECHT were by the oblique tow.

Drepanopus forcipatus was overwhelmingly dominant throughout the period,

Table 1. Number of individuals in each zooplankter obtained by oblique tow with a 0.1-mm mesh in the cove of South Georgia during the period from 29 January to 28 February 1973. Individuals were expressed in a tow.

		January	February										
		29	1	4	7	11	13	16	19	20	22	25	28
Calanus propinquus	V	1	1	1									
C. simillimus	♀		40	23						1			
	♂		8	5						2			
	V	1	8	38		1		2	10				
	IV		8	6									
	III			1									
C. acutus	♀								1				
	V			2		3	1	3	98	96	1	1	23
	IV		1	4			1	2	14	16			3
	III								1				
Drepanopus forcipatus	♀	2	3073	720	6			4	2	112			
	♂		448						1	4			
	V		25500	9100	37	10	11	6	8				
	I–IV	148	39000	5800	38	7	27	212	52	1000	8	12	232
Centropages sp.	V						1						
Oithona frigida	♀	1	128	8	80	4	2	12	120	40	4	12	8
	♂								8	4	2		8
	I–V	80	1150	260	540	4	10	32	380	380	50	80	180
Oncaea curvata	♀			2	3			4		4		1	
	♂				1					1			
Microsetella norvegica			1	16	100	1	4	16	40	160			100
Benthic Harpacticoid		1	2	55	12	28	57	16	95		7	23	120
Copepod nauplius		20	112500	6800		18	40	840	5000	6500	300	3900	9000
Polychaete larva		7000	1600	260	144	8500	13000	5800	11700	2100	5100	6800	3200
Euphausiid furcilia stage								2	1	4			
Eukrohnia hamata										3			
Clione larval stage										1			

though the number of the individuals largely fluctuated within one month of tows (Fig. 1). Abundance of *D. forcipatus* consisting of the developmental stages and adults was observed on 1 and 4 February. Number of individuals decreased between 7 and 13 February, and increased again on 16 to 20 February. General abundance of copepod nauplii and *Oithona frigida* was almost similar to that of *D. forcipatus*, the number being large on 1, 4, 19 and 20 February. Incubated females of *D. forcipatus* and *O. frigida* were found on 1 February. Between *Calanus simillimus* and *C. acutus* alternation in abundance was observed; *C. simillimus* increased in number on 1 and 4 February, while *C. acutus* increased in number on 19 and 20 February.

Nectochaete phase of nereid worms occurred abundantly for a long period except 4 and 7 February.

Table 2. Number of individuals in each zooplankter obtained by scooping the surface with a coarse dip-net at two nights, 31 January and 2–3 February 1973, at the beach of the King Edward Cove of South Georgia. Individuals were expressed in a scoop.

		January 31 (LT)						February 2 (LT)					February 3 (LT)
		1900	2000	2100	2200	2300	2400	2000	2100	2200	2300	2400	0200
Calanus propinquus	V		1	2	2	4	1						
C. simillimus	♀		32	80	10	14		2	3	6	2	5	5
	♂		3		4							1	
	V	1	40	112	31	8		3		3		2	8
	IV		56	134	6	5			2		1	2	4
C. acutus	♀	1											
	V	7	48	8	8	1	2			5	2	1	
	IV	3	50	8	3	3	3				2	1	
Eucalanus longiceps	♀					1							
Rhincalanus gigas	♀	1											
	♂			1									
Drepanopus forcipatus	♀	10	4400	2700	4100	1800	1300	17	130	2700	1000	230	450
	♂		50	8	60		30				1	5	5
	IV–V	50	100	50	160	20	60	9	10	460	60	7	20
Microsetella norvegica							1						
Benthic Harpacticoid				2	12								
Copepod nauplius				650	400	370	4	6	2				
Polychaete larva								1	1				
Euphausiid furcilia stage									3	15	1		2
Ostracod				3		3					2		
Clione larval stage										1			
Gammarid				10	15	5			1	5	3	3	
Hyperiid				1		1	1						

Abundance profiles of zooplankters within one month indicated that the fluctuation pattern of pelagic copepods was the same, increasing in number on 1, 4, 19 and 20 February, and was completely different from the fluctuation pattern of benthic worm larva.

Hourly night samples exhibited that faunistic abundance at the surface was observed between 2000LT and 2300LT, though the number was different between two nights. *Calanus simillimus*, *C. acutus* and *Drepanopus forcipatus* swarmed around the water surface after sunset. Both *C. simillimus* and *D. forcipatus* sharply increased in number between 2000LT and 2200LT on 31 January (Table 2).

4. Discussion

Drepanopus forcipatus, which is probably the most important copepod, was exclusively abundant in the littoral water of South Georgia. *D. forcipatus* in South

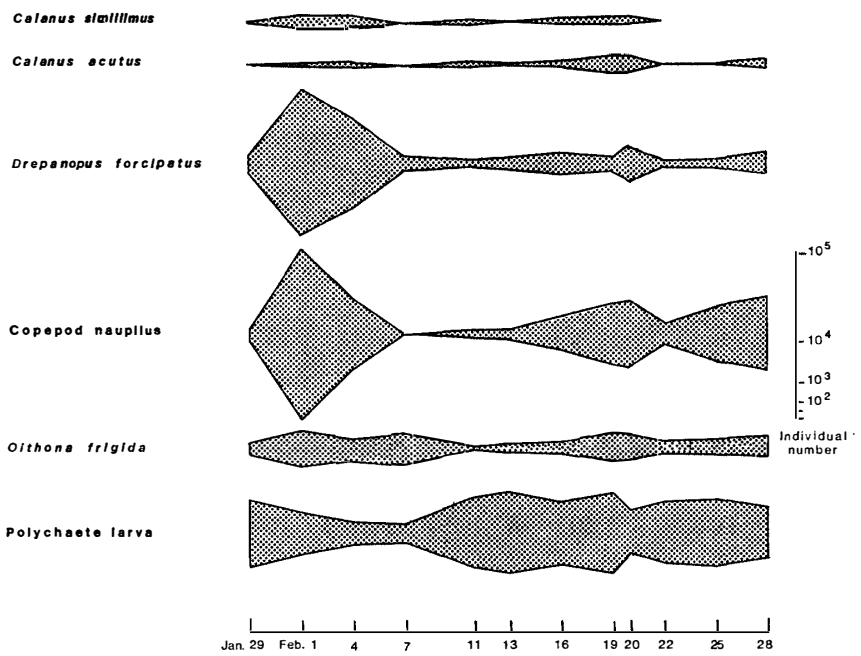

Fig. 1. Numerical fluctuation of six zooplankters in the King Edward Cove of South Georgia during the period from 29 January to 28 February 1973.

Georgia had been recorded only from the dredge samples by PESTA (1930). HARDY and GUNTHER (1935) reported that *Drepanopus pectinatus* BRADY was the most abundant copepod in the shelf region around South Georgia. VERVOORT (1957) suggested that *D. forcipatus* is possibly identical with *D. pectinatus*, because both species appear in the South Georgia waters. Closer inspection of *Drepanopus* species including the developmental stages in the present samples clarified that *D. forcipatus* was morphologically different from *D. pectinatus* as described previously by GIESBRECHT (1892).

HARDY and GUNTHER (1935) reported one hundred species of copepods from the surrounding waters of South Georgia. Most of them inhabit the warm and deep Antarctic water, and only a limited number of species have adapted themselves to the condition of the cold Antarctic surface layer. Among ten species of pelagic copepods found in the cove of the Cumberland Bay, five species such as *Calanus propinquus*, *C. acutus*, *Rhincalanus gigas*, *Oithona frigida* and *Oncaea curvata* are typically Antarctic species (*cf.* BRADFORD, 1971), while *Calanus simillimus* and *Eucalanus longiceps* are Subantarctic (*cf.* VERVOORT, 1957). Furthermore, *C. propinquus*, *C. acutus* and *R. gigas* are widely distributed in the Antarctic surface waters, and recognized as circumpolar species (BAKER, 1954). This study demonstrated that some of the Subantarctic and Antarctic species of oceanic copepods extended their habitat to the shallow cove. The abundance fluctuation patterns of pelagic copepods were almost identical between species, which suggests that the offshore water flows into the cove. Intrusion of offshore species into the cove might depend on their vertical distribution. *Calanus simillimus*, *C. acutus* and *Drepanopus forcipatus* swarmed around the water surface after sunset. HARDY and GUNTHER (1935) report-

ed that *Calanus simillimus* and *Drepanopus pectinatus* showed a marked and rapid vertical migration coming to the surface from the depth greater than 50 m after sunset, and remained in moderate number near the surface for a longer period than any copepods in the surrounding waters of South Georgia. Long stay in the shallow layer probably makes it easy for the pelagic species to disperse over a wide area. Occurrence of the pelagic copepods in the shallow cove may be influenced by the tidal current, because the abundance of copepod individuals incidentally concurs with the new moon on 4 February and the full moon on 18 February, different from the abundance of benthic worms.

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