

# Holocene ostracoda and sedimentary environment implication in the core NG93-1 from the Great Wall Bay, Antarctica

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**Abstract** The Holocene ostracode are analyzed from the core sample NG93-1 collected in the Great Wall Bay, Antarctica during 1992~1993. Totally 11 genera 21 species have been identified in the sediments, of which the most abundant is *Loxoreticulatum fallax*, the second abundant are *Xestoleberis keguelenensis*, *Xestoleberis* spp., *Semicytherura* spp., *Australicythere polylyca*, etc. Most species of ostracodes are those known in Antarctic area. Base on the study of ostracodes from the core NG93-1, their sedimentary environment may be of shore-shallow sea.

**Key words** the Great Wall Bay, Antarctica, ostracoda, sedimentary environment.

## 1 Introduction

Ostracode faunas of Antarctic area have been briefly reported in the early days of this century in a few of papers (Brady, 1907; Müller, 1908; Scott, 1912). Most of them are modern Podocopida since then, papers about ostracodes in modern sediments from South Oceanica have been published in succession (Chapman, 1919; Skogsberg, 1928; Benson, 1964; Neale, 1967; Kornicker, 1970). Papers about ostracode faunas of Antarctic area are not many in China. Gou and Li(1985) firstly reported the Holocene ostracode faunas from the DWI profile of Wazi Lake in Weisidefuerde Hill country, Antarctica. Ostracodes have been analyzed from this profile, totally 14 genera 19 species have been identified and a comparison of them has been made with the known modern ostracode genera or species in Antarctic area. Based on the time and space distribution of known Holocene ostracode faunas in Wazi Lake, ecological environments have been fully described. Later, Gou (1994) has also reported the ostracodes from some bottom samples in the Great Wall Bay of King George Island, Antarctica, but unfortunately the ostracode faunas are very scarce, only a few of shell segments have been found. Except the above, few papers have been published about the ostracodes in Antarctic area. In the development of Antarctic research, more and more data will be obtained.

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## 2 Materials and methods

In January of 1993 core NG93-1 was taken from the continental shelf in the Great Wall Bay of King George Island, Antarctica by Chen Shaomu and Wang Baogui, the members of South China Sea Institute of Oceanology. The sample site is located in 62°14.74'S and 58°49.91'W from water depths between 60 m and 90 m. The length of the core is 83 cm. Samples were taken at an interval of 2.5 cm, totally 30 sample horizons have been examined for foraminifer and ostracode study. All samples were ovened in laboratory for analysis. The abundance of ostracodes are expressed as amounts of shells in per 50 g ovened samples.

## 3 Results

There are five sample horizons (No. 2, 10, 18, 19, 28) lacking of ostracode shells, the distribution ostracodes was listed in Table 1. According to statistics results, 86 ostracode shells composed of 11 genera 21 species (including indeterminate ones) were counted in the core NG93-1, all belonging to Podocopida. In a whole, the most abundant ostracode is *Loxoreticulatum fallax* (Müller), accounting for 30.23% of total ostracode fauna. The second abundant ostracodes are *Xestoleberis kerguelenensis*, *Xestoleberis rigusa*, *X. spp.* (include *Xestoleberis simplex*, *Xestoleberis cf. nana*,) etc., with their abundance being 10.46%, 12.79% respectively. Next are *Australicythere polylyca*, *Semicytherura clandestina*, *Cytheropteron antarcticum*, *Cytheropteron abyssorum* and *Parakrithe sp.*, which amount to 6.97%, 6.74%, 4.65%, 2.32% and 6.74% respectively. Others are very low in content, only occurred in a few sample horizons.

Name of genera of species of ostracoda in Core NG93-1  
from the Great Wall Bay, Antarctica

<i>Australicythere polylyca</i> (Müller)	<i>Semicytherura sp.</i>
<i>Argilloecia cylindrica</i> Sars	<i>Xestoleberis kerguelenensis</i> (Müller)
<i>Argilloecia elliptica</i> Ruan	<i>Xestoleberis rigusa</i> (Müller)
<i>Cytheropteron antarcticum</i> Chapman	<i>Xestoleberis sp.</i>
<i>Cytheropteron abyssorum</i> (Brady)	<i>Xestoleberis simplex</i> Brady
<i>Lobosocytheropteron sp.</i>	<i>Xestoleberis cf. nana</i> (Brady)
<i>Loxoreticulatum bucellatum</i> Whatley et al.	<i>Parakrithe?</i> sp.
<i>Loxoreticulatum dictyotos</i> Whatley et al.	<i>Patagonacythere sp.</i>
<i>Loxoreticulatum fallax</i> (Müller)	Gen et sp.
<i>Loxoreticulatum sp.</i>	Gen1 et sp1.
<i>Semicytherura clandestina</i> Whatley et al.	

The ostracodes are uneven in distribution from top to bottom in core NG93-1. The most abundant ostracode shells occurred in depth of 32.5~35 cm (No. 14), with the abundance being up to 36%. The most abundant species *Loxoreticulatum fallax* and *Xestoleberis spp.* mainly occurred in there. The depths of 7.5~10 cm, 15~17.5 cm, 55~57.5 cm (No. 4, 7, 23) also contain ostracode shells usually 5 or so in number, but

Table 1. Ostracod distribution in core NG931 from the Great Wall Bay, Antarctica (in specimens/50g)

Samples No.	Depth (cm)	Percent of total(%)																													
		2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	bottem	Total
<i>Australythera polylyca</i> (Müller)		1	3				1																							5	6.97
<i>Argilloecia cylindrica</i> Sars			1																											1	1.16
<i>Argilloecia elliptica</i> Ruan			1																											1	1.16
<i>Cytheropteron antarcticum</i> Chapman				1																										4	4.65
<i>Cytheropteron abyssorum</i> (Brady)																				1									2	2.32	
<i>Lobocytheropteron</i> sp.													1																2	2.32	
<i>Loxoreticulatum dictyotos</i> Whatley												1																	1	1.16	
<i>Loxoreticulatum bucellatum</i>																				2									2	2.32	
<i>Loxoreticulatum fallax</i> (Müller)							3	1	3	1	3	1	16	1								1							26	30.23	
<i>Loxoreticulatum</i> sp.							1																						3	3.48	
<i>Semicytherura clandestina</i>												1		1									2						6	6.74	
<i>Semicytherura</i> sp.																													2	2.32	
<i>Xestoleberis kerguelensis</i> (Müller)							1						7													1			9	10.46	
<i>Xestoleberis rigusa</i> + spp.													9	2															11	12.79	
<i>Parakrithe?</i> sp.													2							2	1			1					6	6.74	
<i>Patagonacythere</i> sp. ,																							1						1	1.16	
Gen1 et sp1.					1																								1	2.32	
Gen et sp.																									1				3	2.32	
Number of total shells		1	5	2	1	5	2	1	3	1	3	36	3	1	3	3	1	2		3	3	1	4	2	1	3	1	1	1	86	
Number of ostracoda		1	3	2	1	3	2	1	1	1	3	6	2	1	1	1	1			2	2	1	3	2	1	2	1	1	1		

conspicuously they are lower in the content of shells than that of 32.5~35 cm(No. 14). Ostracode shells occurred scarcely and sporadically in the other sample horizons.

#### 4 Discussion

Great Wall Station is on the east of the Fields Peninsula, to the southeast of King George Island. The core site is in the Great Wall Bay to the southwest of Great Wall Station. The environment of the core site did not survey detailedly because of the then conditions. It is reported (Wang and Song, 1991) that the coastal topography in the Great Wall Bay are mostly of marine-built terrace and marine-cut terrace, especially the marine-built topography. Water depths and topography under the water are changeable areas. Although the length of the core NG93-1 is 85 cm, the analyzed one is only 83 cm long. Lithologic characters vary very little in eye examination from top to bottom of the core NG93-1, which is gray-dark silty clay with some organic matters but from the depth of 57.5 cm, downwards which is deep gray silty clay. By the analysis of grain size the sediments are composed of clayey silt with little extremely fine sand or clayey fine sand and silt above the depth of 10 cm, clayey silt with little extremely fine sand below the depth. In fact the lithological characters of the core NG93-1 are nearly the same though they show somewhat color differences.

By the microbiological analysis, there are many shells of different kinds, such as foraminifers, diatoms, ostracodes, bivalves, sponge spicules or even fragmentary bryozoans. In each samples the foraminifer and diatom are most in abundance and great in diversity. Ostracode is the second, and bivalve is only present in a few samples with monospecies and low abundance. It must be underlined that sponge spicules is very rich in some samples between the depths of 17.5 cm and 37.5 cm, which may be influenced by environmental factors.

12 species have been identified in the core NG93-1, most of them are known ostracode species in Antarctic area. Some are similar to the ostracode species from Wazi Lake sediments in Weisidefuerde Hill Country, Antarctica, but some are similar to those from different water depths in high latitude and circum-Antarctic continental shelf area such as Gauss Station, McMurdo Bay and Halley Bay. Although there are some differences in abundance and in main species at different areas, the ostracodes belong to Podocopida.

A comparison of some ostracode species in core NG93-1 of the Great Wall Bay with those in other areas of Antarctica will be useful to understand their relationship, by which some implications could be found for sedimentary environments of the core NG93-1 (Table 2).

For example, *Loxoreticulatum fallax* is the dominant ostracode species in core NG93-1. Its abundance is up to 30.23% of the fauna. In the other area *Loxoreticulatum fallax* is also the main ostracode species with high abundance as known in Gauss site, but it is not the abundant ostracode species in Halley Bay, the DWI profile of Wazi Lake and McMurdo Bay, etc. *Xestoleberis rigusa* and *Xestoleberis kerguelensis* are also the main ostracode species of the core NG93-1, and they are the dominant species in the DWI profile of Wazi Lake. The other species of *Xestoleberis* genus are poor in Gauss Station

and McMurdo Bay. *Astraliccythere polylyca* is not the main species in core NG93-1, but it is the dominant species in Halley Bay, of which the abundance is up to 39% of the ostracode fauna, or four times as many as other species. Although it is also present in Gauss Station and Wazi Lake. Its abundance is very low, particularly in DWI profile of Wazi Lake.

Table 2. Comparison of some ostracod species in the core NG93-1 of the Great Wall Bay with those in other areas of Antarctica

Main genera or species of ostracoda	Core NG93-1 in the Great Wall Bay	DWI profile in Wazi Lake	Gauss sites (water depth 385 m)	McMurdo Bay (water depth 57 m)	Halley Bay (water depth 206 m)
<i>Loxoreticulatum fellax</i>	++	—	++	—	—
<i>Xestoleberis kerguelenensis</i> + <i>X. rigusa</i>	++	+++	—	—	
<i>Xestoleberis</i> spp.	++		—		—
<i>Semiccytherura clandestina</i> + sp.	+	—	—		
<i>Astraliccythere polylyca</i>	—	—	—	++	+++
<i>Cytheropteron antarcticum</i> + <i>Cytheropteron abyssorum</i>	—				
<i>Lobosocytheropteron</i> sp.	—	—			
<i>Patagonacythere</i> sp.	—	Only occurred in a few sites with low abundances	—	+++	—

The genus of *Patagonacythere* is very high in abundance in McMurdo Bay and it occupies the first place in the ostracode fauna, but in other areas of Antarctica, it is few in number. Only fragmentary and incomplete shells have been found in core NG93-1.

From the above statement, we can conclude that the main ostracode species of core NG93-1 are closely similar to those of the other areas of Antarctica though they show difference in abundance, which may be caused by different sites, different water depths or other environmental factors. In a whole we can conclude that the main species of ostracode fauna in core NP93-1 are similar to those of Wazi Lake and Gauss Station, especially to the Holocene ostracode species in DWI profile of Wazi Lake. So we extrapolate that the environmental ecology of the three areas may be alike and the sedimentary environment is of shore-shallow sea.

In addition, two samples from depths of 0~5 cm and 80~83 cm are determined by  $^{14}\text{C}$  dating to be  $(5390 \pm 500)$  a B. P. and  $(7230 \pm 530)$  a B. P. respectively (analyzed by Geochemistry Institute of Guangzhou, Chinese Academy of Sciences), all belonging Holocene. The abundance and distribution of ostracode fauna in core NG93-1 changed unclearly because the core sample is only 83 cm, so it is undesirable to study the changes of sedimentary environment by ostracode fauna. For example, although foraminifer and diatom, most of which live in shore-shallow sea, are the main faunas in core NG93-1, there are no definite changes in the distribution except the abundance at different depths.

Based on the study of abundance and distribution of ostracode fauna of which the abundance is lower than those of foraminifer and diatom, we can conclude that most of them also live in shore-shallow sea.

According to the study of sea areas in South China Sea and Nansha Islands, we think the genus of *Xestoleberis* usually lives in littoral and shallow sea areas. Although living in broad areas, *Xestoleberis*, the main species of ostracode faunas in core NG93-1, is regarded as a typical genus of shallow sea environment. Further more, bivalve shells and even fragmentary bryozoans, though they are very few, have been found in about one third of core NG93-1, which suggests the shallow sea sedimentary environment. From the above, we conclude that the sedimentary environment of core NG93-1 should be shallow sea.

Except for abundant diatoms in core NG93-1, there are also a lot of sponge spicules in the sample, of which the abundance is up to 90% of the fauna. Whether this is related to low content of carbonate is not clear at present, but in order to solve this problem, further study should be needed.

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## Directions of plates

(All plates of samples were taken with scanning electron microscope)

## Plate I

- |  |   |
|--|---|
| 1~2. 8. <i>Loxoreticulatum fallax</i> (Müller) ×89                   | 4. 5. Lateral view of left valve                  |
| 1. Lateral view of right valve                                       | 6. Lateral view of right valve                    |
| 2. Lateral view of left valve  |   |
| 8. dorsal view ×80   | 7. <i>Cytheropteron abyssorum</i> (Brady) ×80     |
|  | Lateral view of right valve                       |
| 3. <i>Loxoreticulatum dictyotos</i><br>(Whatley <i>et al.</i> ,) ×77 | 9~10 <i>Australicythere polylyca</i> (Müller) ×73 |
| Lateral view of left valve   | 9. Lateral view of right valve                    |
|  | 10. Lateral view of left valve                    |
| 4~6. Gen et sp. ×89  |   |

## Plate I

- |  |   |
|--|---|
| 1. <i>Xestoleberis kerguelenensis</i> (Müller) ×77 | 7. <i>Parakrithe?</i> sp. ×80             |
| Lateral view of right valve                        | Lateral view of complete valve            |
| 2. <i>Argilloecia elliptica</i> Ruan ×73           | 8. <i>Argilloecia cylindrica</i> Sars ×75 |
| Lateral view of right valve                        | Lateral view of left valve                |
| 3. <i>Xestoleberis</i> sp. ×77                     | 9~10. <i>Lobosocytheropteron</i> sp. ×77  |
| Lateral view of left valve                         | 9. Lateral view of left valve             |
| 4~5. <i>Xestoleberis simplex</i> ×56               | 10. Lateral view of right valve           |
| Lateral view of left valve                         |   |
| 6. <i>Xestoleberis</i> cf. <i>nana</i> Brady ×56   | 11. <i>Semicytherura</i> sp. ×105         |
| Lateral view of right valve                        | Lateral view of right valve               |

## Plate I

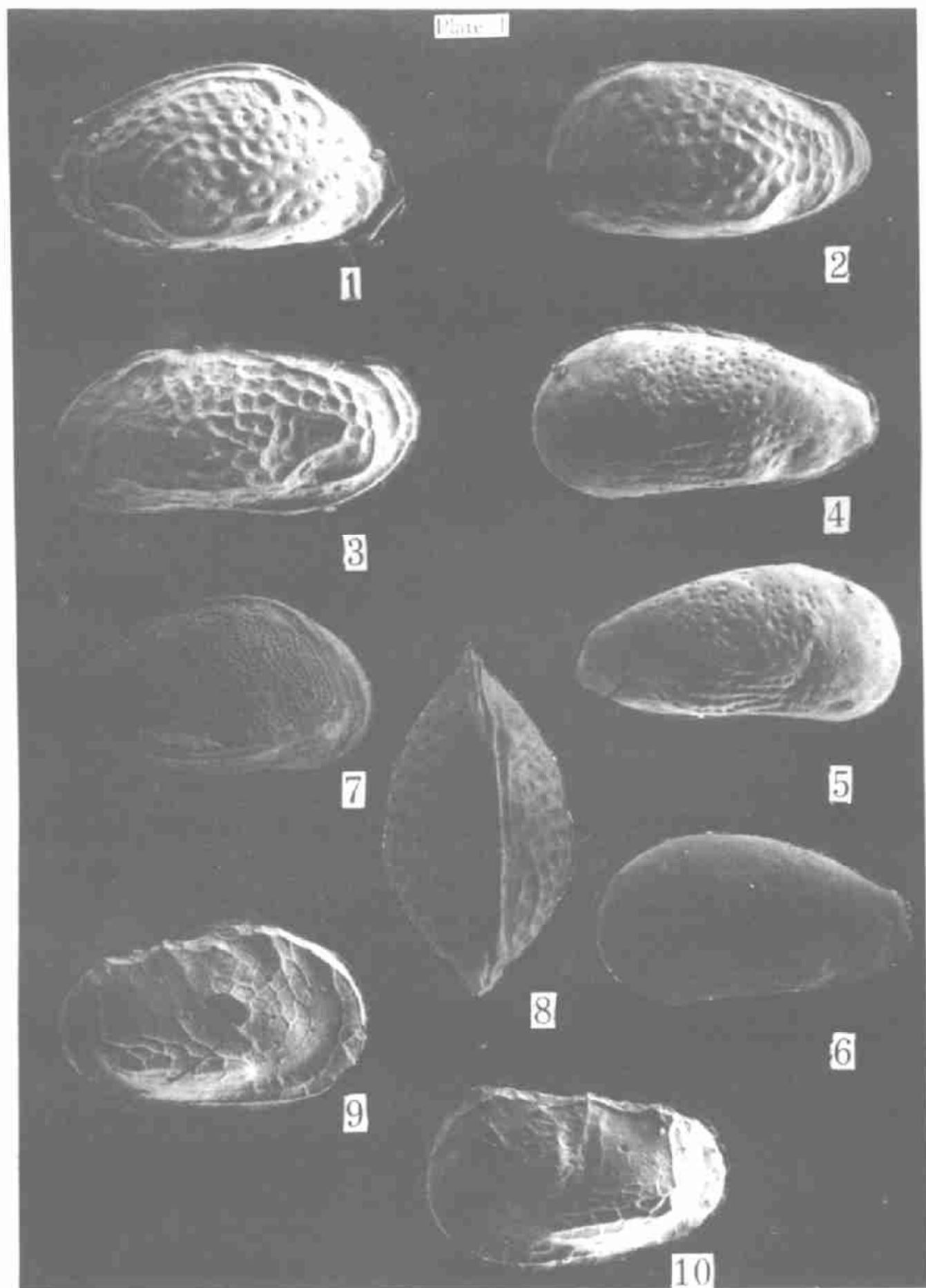




Plate 1

Plate 1

