

B-10.3 Evaluation of the Holocene sea level and climatic change
relation to modification of the coastal environment

Contact Person Kazuo Ohshima
Section Director, Ibaraki University
Bunkyo2, Mito, Ibaraki, 310 Japan
Phone 81-292-26-1621(Ext. 366), Fax 81-292-27-0960

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Abstract The Holocene coastal sediments of the Nokke-zaki and Saroma lake in Hokkaido facing the sea of Okhotsk are characterized by somewhat warmer conditions(20 to 30) and a higher sea level(possibly up to 5m)which may represent useful analogues for future changes in the present interglacial epoch. Resultant changes in the coastal geomorphology and ecosystem offers an appropriate scenario for the next century in the coastal region of the northwestern Pacific.

Key Words Holocene, sea level changes, Saroma lake, Nokke-zaki cape, PAGES

1. Introduction

The last 10,000 years of Earth's history is a time in which the present ecological conditions, including our present life systems, were developed and in which the human impact on this ecosystem became obvious, first as a result of rapidly expanding agriculture and later through wide spread industrialization and urbanization. It is important to analyse the changes that took place in this time, both to understand the present and to anticipate the future. Paleo-sea levels recorded in coastal landforms are indicators of changes in sea water volume and isostatic and local tectonic movements. Present uncertainties in this area are reflected in the range of predictions that are made, ranging from a few meters to several tens of meters. We need more extensive Holocene sea-level data of a higher degree of accuracy to predict future sea level rise.

2. Results

2. (1) Paleogeographic changes of Nemuro Strait

Nokke-zaki cape protruding into Nemuro Strait in eastern Hokkaido is a compound sand spit(fig.1). Holocene sediments of Nokke-zaki cape boring cores are

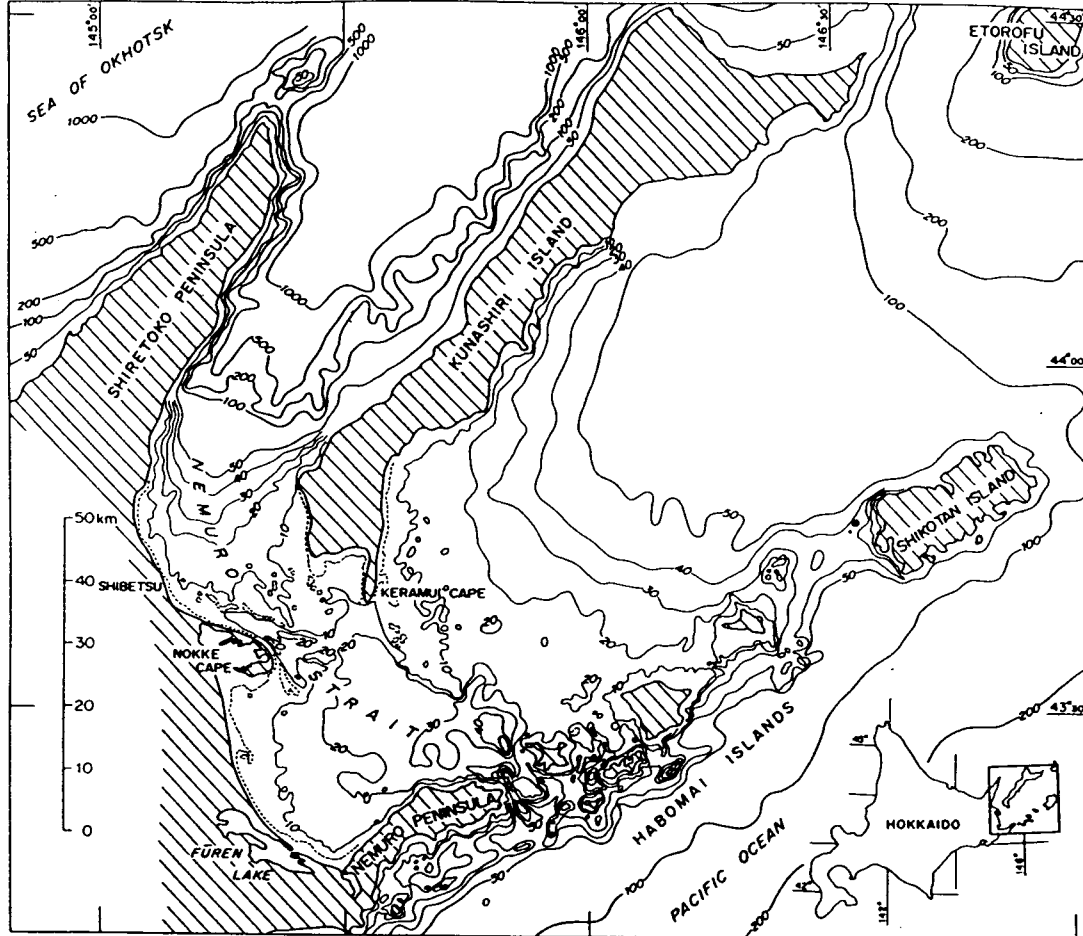


fig.1 Bathymetry of Nemuro Strait. Nokke-zaki cape protruding into Nemuro Strait in eastern Hokkaido.

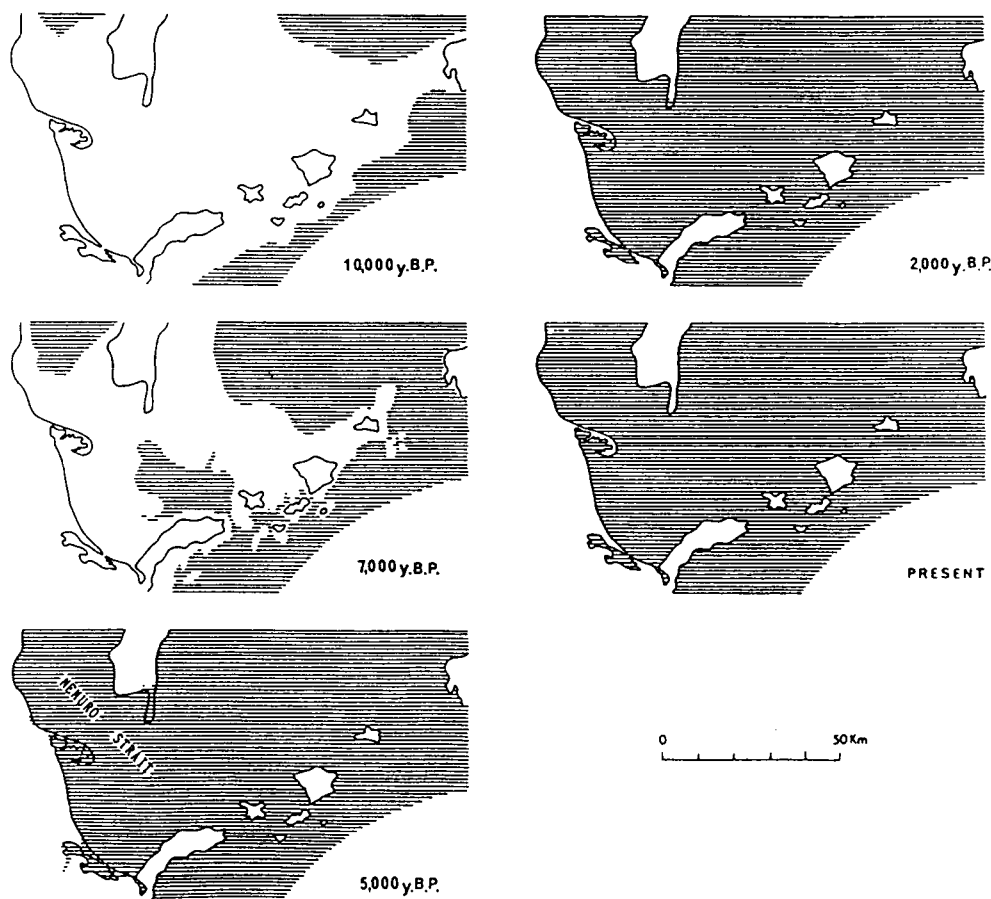


fig.2 Paleogeographic changes of Nemuro Strait.

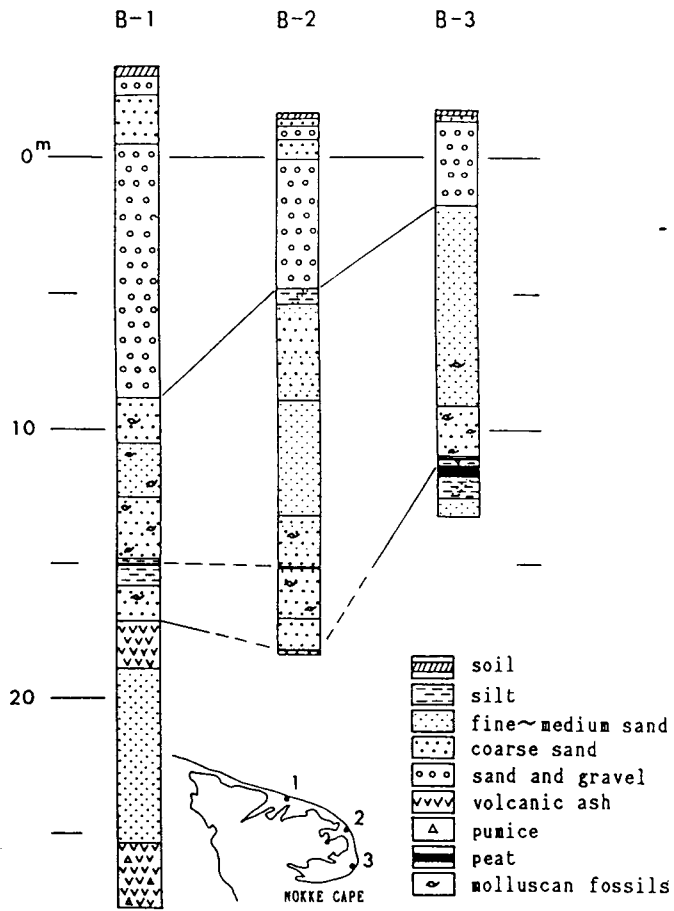


fig.3 Boring core sections of Nokke-zaki cape in eastern Hokkaido.

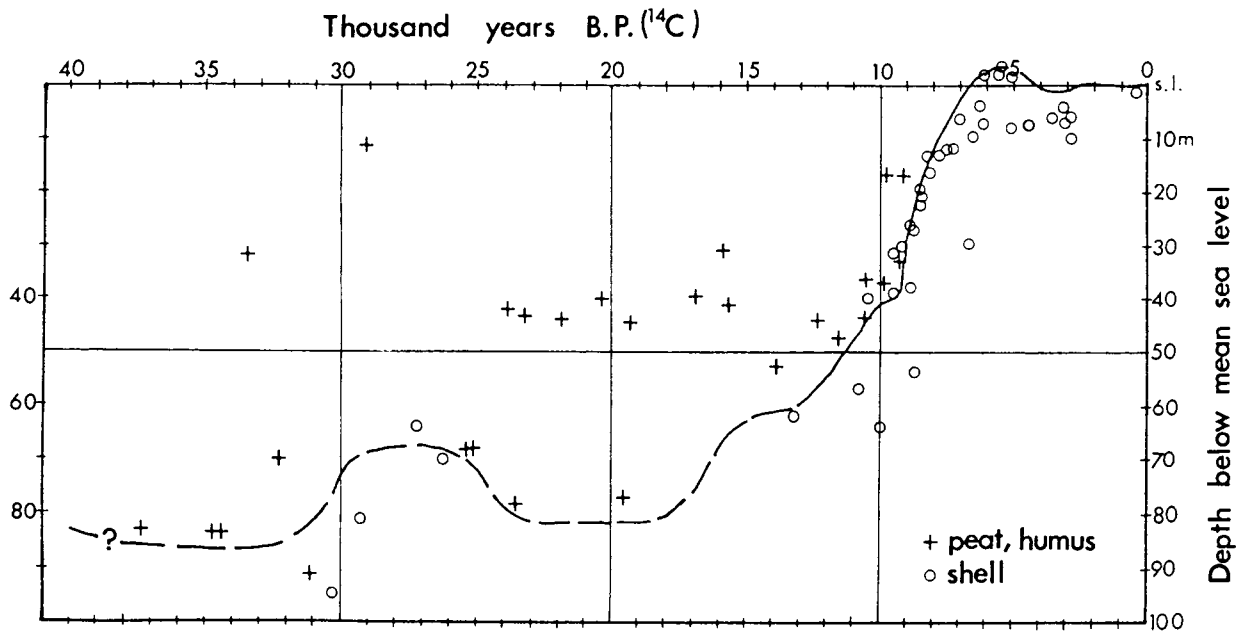


fig.4 Fluctuations of sea level, from radiocarbon data in Japan.

thickest, 20m or more, and are divided into three members with a 10m thick marine sand bed in the lower part(fig.3). According to the restored history(fig.2), in earliest Holocene(10,000y.B.P.) when the sea-level down to -45m, the Nemuro terrace had emerged from the now strait. The transgression continued further, and 7,000 to 6,000 years ago the sea rose to a level roughly the same as the present (fig.4), but Nemuro terrace not submerged. About 5,000 to 4,000 years ago the sea level was supposedly a little higher than at present, Nemuro Strait was formed at Jomon transgression. Investigation of their altitude and age revealed that the top surface of marine sediments of Jomon transgression period all lies at 3 to 5m above the sea level. Then, the latest Jomon the climate turned somewhat cool again. Along with the cool climate a small regression occurred, to be succeeded by a small transgression which fixed the sea level at the present position.

2.(2) Environmental changes of Saroma Lake

Saroma lake is cut off from the Okhotsk sea by bay mouth bars. We might presume from the presence of the bar that the area was once a swamp, then open bay and lagoon. Holocene sediments of Saroma lake boring cores are thickest, 20m or more, and are divided into three members with a 15m thick marine mud bed in the middle part. Warm water bivalves such as *Meretrix meretrix lusoria*, *Macra veneriformis* and *Trapezium japonicum*, occurred in in the mud. Oyster (*Crassostrea gigas*) evidently common at many place of the Saroma lake side as shown by many shell heaps were left by the Jomon people and after the use of oysters by fishers. Their near-extinction in the lake may have been due to the overexploitation or disease. But one of the most important cause is the destruction of spawning environments. Optimum temperature for spawning of oyster is found to be between 23°C and 25°C. After replacing the lake mouth(1929A.D.), the surface water temperature of the lake does not rise to suitable temperature for spawning. Present environments of the lake is suitable for spawning and growing of scallops.

The history of Saroma lake can be traced to 10,000years ago when the plain was initially a swamp or marsh. In the earliest Jomon(ca. 9,000y.B.P.), the sea level still lay far beyond the present sea level. Distribution of many neolithic shell-mounds and shell layers on the coastal plain side relevantly indicates that during the warm period from 6,000 to 4,000y.B.P., the sea invaded far into the land, probably causing a slight rise of sea level(4±1m). The fall of sea level during the relative regression, from 4,000 to 2,000y.B.P., was 1 to 2m below the present. After the Okhotsk cultural age(1,500y.B.P.), the sea level rose again to the present.