

## 13-layered large tsunami traces in Gakkara Coast: The research of tsunami traces along Nemuro coastal zone (Preliminary report 1)

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Along the Pacific coastal zone of Eastern Hokkaido, research tsunami deposits in lake deposits and peat layers in the Holocene, have been increasingly conducted since the first report by Nanayama and Shigeno (1998). It is thus believed that this growing academic interest contributed to the establishment of stratigraphy for the large tsunami traces extending from Tokachi coast to Kiritappu marsh (Nanayama et al., 2003). Meanwhile, the stratigraphy for large tsunami traces along the Nemuro coastal zone has not been fully explained in detail. In the middle of last October, our team carried out a survey of tsunami traces along Gakkara coast located on the edge of southwestern Nemuro. Here, the survey will be outlined with new findings. The Gakkara Coast includes a narrow coastal marshland extending about 180 m east and west and about 200 m north and south. 1.6m-high continuous erosion exposures. In the beginning, an estimated direction of tsunami run-up was considered, and a course of traverse was determined to traverse the marshland perpendicularly to the current shoreline. The distance from the shoreline was measured and differential leveling was performed. Additionally, our survey team confirmed deposits on the course of traverse using a large boring stick and shovel and provided a detailed description of the succession of strata at 4 measuring points. The survey found the formation of about 2.2m-thick peat layer in its deepest zone within the subject area. In the peat layer of the erosion exposure on the coast, 5-layered volcanic ashes and 13-layered sand layers were confirmed. With silt- to granule-sized in particular, the volcanic ashes consist of strata, such as Ta-a from Mt. Tarumai in 1739, Ko-c2 from Mt. Komagatake in 1694, Ma-b from Mt. Mashu in the 10th century, or B-Tm from Mt. Baitousan in the 10th century, Ta-c2 from Mt. Tarumai in ca. 2.5 ka and Ma-d from Mt. Mashu in ca.4.3 ka according to macroscopic examination and the stratigraphy on existing volcanic ashes in surrounding areas. A major component of the 13-layered sand layers (Tg1 to Tg 13) is very well sorted fine sand, with each layer thickness ranging from few centimeters to tens of centimeters. Many of the sand layers are characterized by their obvious grading and erosion bases, and some of the bases include pebble 1.0 to 1.5 cm in diameter. In particular, sand layers which were generated in the 17th century and located immediately beneath Ko-c2, contains gravel with a maximum diameter of 35.0cm. In addition, 5 to 10cm beneath the surface of a previous sand dune at an altitude of about 11.2 m, Ko-c2 and granules (2 to 3mm in diameter) are found. These substances are estimated to have been accreted in the same period of this sand layer, and if they provide some indication of tsunami traces, the tsunami height can far exceed 11 m. From the above observations and a comparison of this research and the conventional research on the Pacific coastal zone of eastern Hokkaido (Nanayama et al., 2000; Nanayama et al., 2003; Soeda et al., 2004), these 13-layered sand layers probably show an obvious indication of large tsunami traces which were generated during the past thousands of years. Meanwhile, this survey found an 8-layered large tsunami trace between the Ta-c2 and Ko-c2 strata. In fact, this trace involves 2 more layers than other large tsunami traces extending from the Tokachi coast to Kiritappu marsh. It has been concluded that it is necessary to estimate other tsunami sources off the Habomai and Shikotan islands as well, other than tsunami sources caused by multi-segment interplate earthquake Tokachi and Nemuro.