

# 学 位 論 文 概 要

## Dissertation Summary

学位請求論文 (Dissertation)

題名 (Title) Marine invertebrate fossil communities dependent on wood-debris and whale-falls from Japan.

(邦訳) 本邦から産出した沈木および鯨骨に依存する海洋無脊椎動物化石群集

専攻 (Division) : 自然システム学専攻

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学位論文概要 (Dissertation Summary)

The current doctoral thesis comprises three topics related to fossilized biological communities dependent on organic-remains, i.e. whale-falls and drifted- and sunken-wood falls. Modern wood- and whale-fall dependent biological communities were first discovered in the 1970s and 1980s, respectively. Then, those communities have been found in worldwide oceans. After the discoveries, it has been recognized that the faunal compositions are similar to that of vents and seeps. Subsequent molecular studies have revealed several lineages were adapted to vent and seep environments from such organic-fall, i.e., wood- and whale-fall, environments created environments. The fossil record of wood- and whale-fall communities with seep and vent related macro- and mega-fossils are traced back to middle Cretaceous, although the Cretaceous “whale-fall community” was established upon marine reptile carcasses instead of whale remains. Most of examples were discovered from deep-sea sediments, therefore, wood- and whale-fall communities in shallow marine settings are still poorly known. It is also noteworthy that the Cretaceous examples of wood- and saurian-fall communities are limited, especially for the wood-fall communities. In addition, several studies on the recent and ancient wood-fall communities suggested that activity of wood-boring bivalves is the key to establish wood-fall communities. However, fossil record and behavior of Mesozoic wood-boring bivalves are poorly known. The current thesis aims to elucidate those problems; thus, the chapter 1 treated a fossil whale-fall community from shallow environment, and the chapter 2 treated Cretaceous wood-boring bivalves and wood-fall communities from Japan.

### 1. Whale-fall community from Pleistocene shallow water setting in Kanazawa City:

This chapter describes the molluscan communities associated with a whale bone from the Omma Formation, Pleistocene shallow-water sediments, in Kanazawa City. Many *Lucinoma* sp., an infaunal chemosynthetic bivalve, were found around the whalebone. It was densely populated with an autochthonous mode of occurrence, and the faunal composition was very different from normal species composition of the Omma Formation. Therefore, it was recognized that the lucinid dominated community was a fossil whale-fall community. This is the shallowest and youngest fossil record of whale-fall community in Japan. Furthermore, as a result of comparing the depositional environment, age, and characteristic species of fossil whale-fall communities with other regions, epifaunal and semi-infaunal chemosynthetic bivalves were characteristically found from deep-water whale-fall communities, and

shallow-water whale-fall communities were characterized by dominance of infaunal species. This may reflect the difference in depositional rate and predation pressure depending on the depth, and it is necessary to investigate in detail in the future.

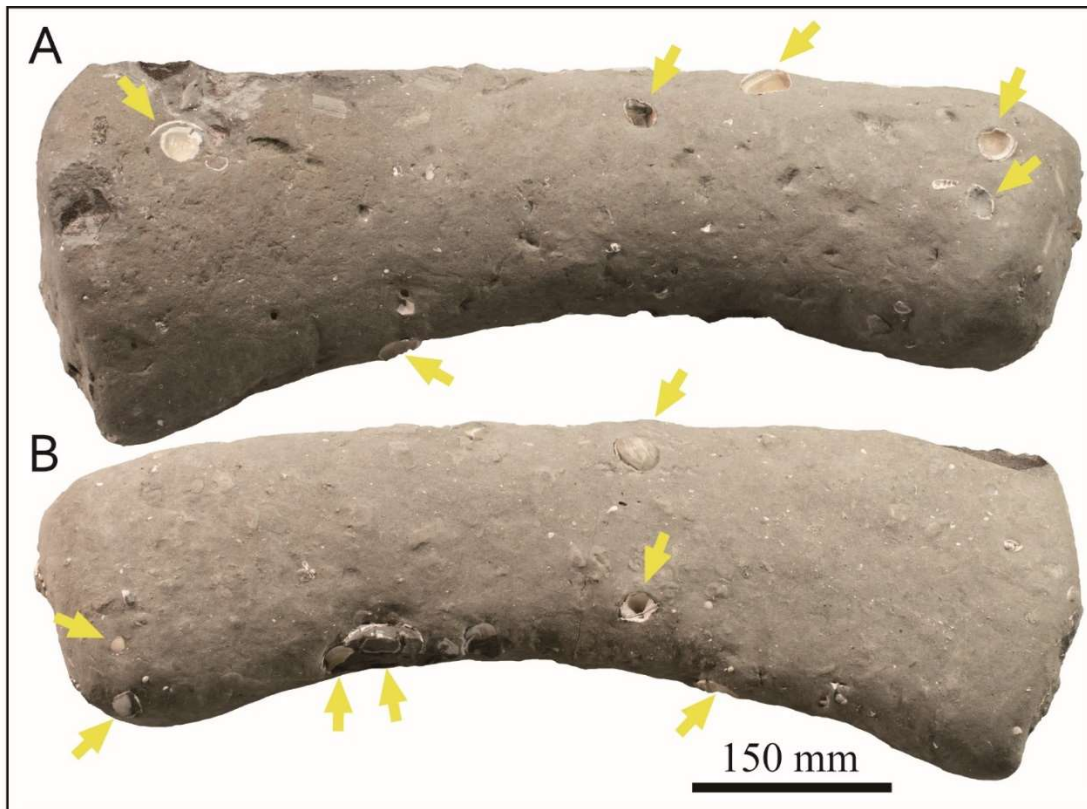


Figure.1 Fossilized right radius bone of balaenopterid whale with associated chemosynthetic lucinid bivalves (yellow arrows) from the Omma Formation in Kanazawa City, Japan. Estimated upper side (A) and lower side (B) in the strata.

## 2. Late Cretaceous wood-boring bivalves from Hokkaido, Japan:

This chapter describes wood-boring bivalves from the Upper Cretaceous of Japan. Totally seven species of three genera of wood-boring pholadoid bivalves were collected and identified from the Upper Cretaceous of Hokkaido. One of the genera, *Turnus*, from the Upper Cretaceous is the youngest fossil record of the genus in the world. Detailed observations of the *Turnus* specimens not only the shell surface but also internal features revealed that the specimens contained elongated ‘tube’-like shape with densely packed wooden material in internal cavity of the shells. It is interpreted as wood-storing cecum, and thus the *Turnus* was xylophagous behavior at least in the Late Cretaceous.



Figure 2. Late Cretaceous *Turnus* sp. and inhabited wood fossil (Sbt01), from Shibunnai-touge-no-sawa, Nakagawa Town, Hokkaido.

### 3. Late Cretaceous sunken-wood communities from Hokkaido, Japan:

Two Late Cretaceous fossils marine invertebrate communities associated with woods from Obira (Turonian) and Nakagawa (Coniacian) area, Hokkaido were described. The Obira sample characterized by association of articulated *Acharax*, chemosynthetic solemyid bivalve, and some small gastropods, and the Nakagawa sample contained articulated *Myrtea*, chemosynthetic lucinid bivalve and many relatively large gastropods. Those chemosynthetic bivalves were situated in close proximity of heavily bored wood trunks. The faunal compositions were differed from normal faunal composition of Upper Cretaceous in Hokkaido. Based on mode of occurrences and species compositions, these specimens were identified as fossil wood-fall communities. One of the samples, which is associated with *Acharax*, was analyzed carbon isotopic compositions of authigenic carbonate minerals to check the sample wasn't originated in cold seep environment. As a result, the isotopic composition didn't show methane influence, and thus it was confirmed that the community was wood-fall community. The *Acharax* is the first report from a wood-fall community, and it is the oldest wood-fall community in the world. Summarizing two newly described examples herein and already known one example, the Cretaceous wood-fall communities were characterized by infaunal chemosynthetic bivalves with some few species of gastropods, which would live on woods and/or on surface of seafloor near woods.

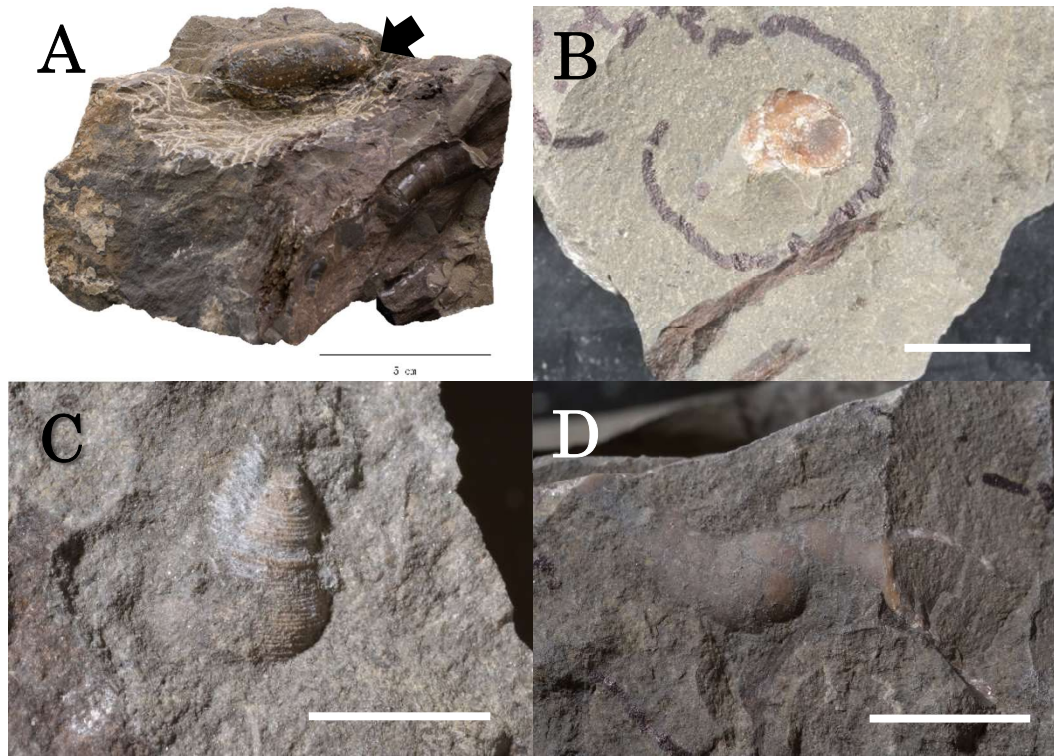


Figure 3. Part of wood-fall specimen with associated molluscan fossils, KMSBw01, from Shukuba-nosawa Creek, Tappu area in Obira Town, Hokkaido. A. *Acharax* sp. is closely located to wooden fossil. Wooden material was bored. B. Skeneiid gastropod situated near the wooden fragment. C. Collonid gastropod found very close to wooden fragment. D. Elongated boring trace with thick calcareous linings. w, wood; b. borings. White bars with no indication: 1 cm.