

Akihiko SUZUKI¹, Takafumi ENYA² and Masahito TANAKA³ : A beach cobble bearing a trace fossil of *Teredolites longissimus* washed ashore on Hirau beach in Samani Town, Hokkaido

鈴木明彦¹・圓谷昂史²・田中正人³ : 北海道様似町平宇海岸の打ち上げ礫にみられた生痕化石 *Teredolites longissimus*

Introduction *Teredolites* are club-shaped borings in woody substrates that can mainly be attributed to teredinid and pholadid bivalves (Kelly and Bromley 1984). These ichnofacies, which occur in Jurassic to Holocene marine strata (Kelly 1988; Evans 1999), have primarily been observed within in situ composite wood substrates and likely represent shallow marine facies (Bromley et al. 1984; Savrda 1991).

In July 2010, a beach cobble bearing the ichnogenus *Teredolites* was discovered on Hirau beach in Samani Town, Hokkaido. In this paper, we briefly describe the characteristics, distribution and the sequence stratigraphic significance of *Teredolites* and associated fossils. In addition, the relationship between *Teredolites* ichnofacies and the characteristics of the coastal environment are also considered.

Materials and methods The Samani area to the west of the Hidaka Mountains is chiefly occupied by Cretaceous strata and metamorphic rocks (Kanie and Sakai 2002). The Kamikineusu Formation unconformably covers Cretaceous strata such as accretionary complexes and the Yezo Supergroup, and from the base consists of a basal conglomerate, sandstone and siltstone in ascending order (Suzuki et al. 1983). Based upon diatom, radiolarian, and molluscan fossils, the formation has been assigned to the late Early Miocene and the middle Middle Miocene (Haga et al. 1999).

The study site, Hirau beach, which is located on the Samani coast in Hokkaido (Fig. 1), consisted mainly of a wave-cut bench composed of fine-grained sandstone of the Kamikineusu Formation (Suzuki 2011; Fig. 2A). Calcareous concretions associated with flotsam that had washed ashore were collected on 10 June 2010 (Fig. 2B).

The cobble bearing the trace fossil was identified based on comparisons with ichnological literature (Kelly and Bromley 1984; Kelly 1988; Evans 1999), and geological characteristics such as the paleoenvironment and sequence significance were inferred based on previous studies (Bromley et al. 1984; Savrda 1991; Gingras et al. 2004).

Results and discussion The cobble specimen that washed up on Hirau beach measured 83.7 × 80.7 × 44.5 mm (Fig. 3A). The borings consisted of very slightly tapered, elongated tubes, generally orientated parallel to the grain of the woody matrix (Fig. 3B). The maximum tunnel length was approximately 30 mm and the tunnel diameter ranged from 1 to 5 mm, with length-to-width (L:W) ratios typically exceeding 5. While some of the tunnels were contoured, most were straight and all were circular in cross section along their length. The borings

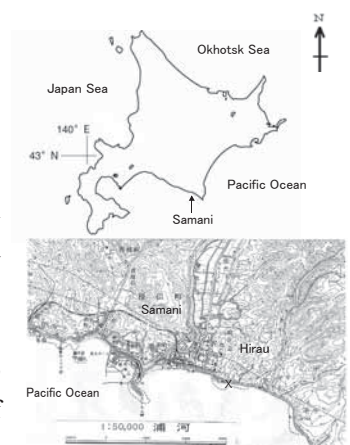


Fig.1 Map showing the location of Hirau beach in Samani Town, Hokkaido. X: Sample locality.



Fig.2 Photograph of Hirau beach. A. View of the beach in early June 2010. Arrows: calcareous concretions. B. Calcareous concretion bearing a Cymatid gastropod, shallow marine dweller, on the wave-cut bench of the beach.

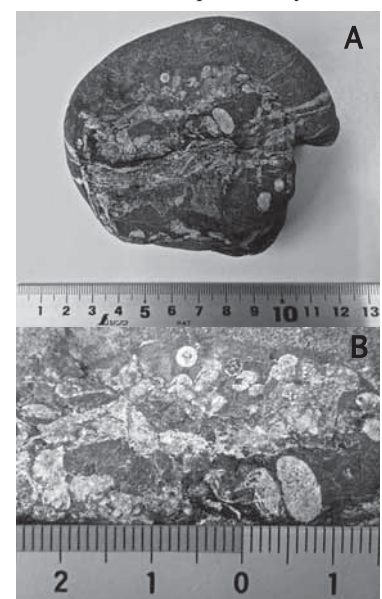


Fig.3 *Teredolites longissimus* washed up on Hirau beach. A. A cobble bearing *T. longissimus*. B. Close-up of *T. longissimus*.

described here were identified as those of the ichnotaxon *Teredolites longissimus* Kelly and Bromley.

The majority of the borings were cast by either the surrounding sediment or by a diagenetic mineral fill (probably calcite), both of which were integral to the preservation of *Teredolites*. To date, no identifiable body fossils of borers belonging to the Teredinidae (shipworms) have been identified in *Teredolites* from the Kamikineusu Formation.

However, dense *Teredolites longissimus* borings have been found in the woody core of a calcareous concretion from the marine facies of the Kamikineusu Formation. The sediments of the lithofacies were considered to be shallow marine facies (Suzuki et al. 1983; Suzuki 2011). These extensively bored wood samples are considered to have drifted into shallow marine settings prior to the formation of the calcareous concretion.

The abundance of *Teredolites* ichnofacies appears to be closely related to an increase in sea level (Bromley et al. 1984; Savrda 1991). Based on molluscan fossils, the sediments associated with the *Teredolites* ichnofacies are considered to indicate a transgressive phase and a rise in sea level (Suzuki et al. 1983; Suzuki 2011). Thus, the high density of *T. longissimus* borings observed in the sample collected in this study was considered to be associated with marine transgression during the Middle Miocene.

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要約：2010年7月、北海道様似町平宇海岸において、生痕化石を含む打ち上げ礫を採集した。この礫は、海岸を構成する新第三系上杵臼層に由来するものである。礫に含まれていた化石を検討した結果、木材に穿孔した生痕化石 *Teredolites longissimus* であることが判明した。本種は上杵臼層からは初めての産出であり、本層上部に海進期堆積相があることが示唆された。

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