Micro-organisms in amber from the Aptian (Cretaceous) of Yezo Group, northern Japan.

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Micro- and soft-bodied organisms such as insects and fungi play an important role in terrestrial ecosystems during the Earth's history. Especially, they have promoted evolution of plants that are essential elements of terrestrial environment. Angiosperms, which arose in the Early Cretaceous and now accounts for 98% of living terrestrial plants species, have also co-evolved with insects and fungi by their pollination, decomposition and nutrient supply.

Fossil records of micro- and soft-bodied organisms are mostly restricted to amber because amber protects them from pressure, decomposition or oxidization (Martínez-Delclòs et al., 2004; Perrichot and Girard, 2009). In amber, we can observe three-dimensionally preserved organisms. The Mid-Cretaceous represents the most important period for understanding the initial co-evolution between insects, fungi and angiosperms. Though Mid-Cretaceous amber localities are rare, we recovered new amber containing deposits in northern Japan.

Geological Settings and Methods

The Yezo Group is exposed in a belt roughly 1200 km long from Sakhalin Island to southern Hokkaido and consists of a thick Aptian to Paleocene fore-arc siliciclastic sequence. Amber-concentrated strata are intercalated in the lowest part of the Yezo Group in Nakagawa area, northern Hokkaido, Japan. To clarify depositional environments and processes of ambers, sedimentary and ichnofacies analyses have been done. The geological age was determined by age diagnostic ammonites and SHRIMP U-Pb dating of zircon in the intercalated tuff. Bio-inclusions of amber are observed under a digital zoom microscope for systematic determinations.

Results and Discussion

Amber is highly abundant in proximal turbidites, which overlies the deep-sea mudstone of the uppermost part of the Sorachi Group. This observation implies the existence of an enigmatic sedimentary event at the boundary between the Sorachi and the Yezo Group, which

transported numerous resins into the deep sea by turbidity currents. The depositional age of amber-turbidites is about 118 Ma (late Early Aptian). Numerous terrestrial bio-inclusions occur in the amber, such as arthropods (e.g., Diptera, Chacidoidea and mite), fungi (unidentified mycelium, spore-like objects, and septum), pollens (*Classopollis*? and Cyatheaceae?) and plant fragments (tracheids and a stellate hair). These occurrences are the first reports of bio-inclusions in the Aptian amber from the eastern Eurasia. Tricolpate pollen, the pollen type of predominant angiosperm groups at present (Eudicots), has recently been reported from uppermost part of Sorachi Group in the same area (Barremian?-Aptian) (Tanaka and Hirano, 2009). This represents the oldest record of Eudicots in Asia at all. Further studies of the Aptian amber bio-inclusions will provide critical information about earliest co-evolutionary history of angiosperm and micro-biota.

References

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