

## Miocene abyssochrysoid gastropod *Provanna* from Japanese seep and whale-fall sites

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We describe three Miocene species of *Provanna* from Japan, two new and one in open nomenclature, that represent the only known fossil examples from whale-falls and a considerable increase in the Miocene diversity of the genus. *Provanna hirokoe* sp. nov. comes from the latest Middle Miocene Kuroiwa seep site in central Honshu. The shells of this species are mostly recrystallized, but contain relict crossed lamellar microstructures. *Provanna alexi* sp. nov. is from the early Middle Miocene Shosanbetsu whale-fall site in northwestern Hokkaido, and has well preserved shells comprising an outer simple prismatic layer and an inner crossed lamellar layer. The two *Provanna* specimens from the Middle Miocene Rekifune whale-fall site, in eastern Hokkaido, are preserved as external moulds only, so are left in open nomenclature. Based on current knowledge, the presence of an outer prismatic layer and an underlying crossed lamellar layer seems to be a common feature in the shells of *Provanna*, as well as in other genera belonging to the family Provannidae and the superfamily Abyssochrysoidea. Although the oldest occurrence of *Provanna* was in the Late Cretaceous, the genus did not spread geographically and ecologically until the Miocene (with four, or possibly five species), a date concordant with some molecular estimates. However, this could be an artefact of the fossil record because the known pre-Miocene seep and whale-falls are more geographically restricted than those from the Miocene.

**Key words:** Mollusca, Gastropoda, *Provanna*, seep, whale-fall, Miocene, Japan.

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