Further Notes on Sand-Pipes

By

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In a previous article,¹⁾ the writer discussed and figured several sand-pipes or peculiar shaped concretions, which he had discovered in the lower part of the Neogene Suenomatsuyama series in the Ninohe district, Mutsu province. The peculiar shaped concretions, was then attributed to the activities of certain burrowing crabs, mainly for the reasons that the sand-pipe like specimens well agreed with the descriptions and figures given by the late S. TAKAHASHI and I. HAYASAKA.²⁾ The concretion, which was dealt with at that time appears to be the only record in literature concerning Japan, of the fossil occurrence of such interesting sand-pipes.

More recently,³⁾ sand-pipes were again dealt with, mainly on field observations and on the specimens collected from a few localities. The problems relating to sand-pipes was given at that time, and their mode of occurrence as well as sketches of some which had been observed in the field were illustrated. However, in regard to the origin or causes, definite explanations were not stated.

In the following lines the writer wishes to describe several other sand-pipes, chiefly for the reason that until more descriptions are known, explanations to the making of the sand-pipes can not be given in detail. Furthermore, we should know of the different kinds of sand-pipes that exist and their different kinds of modes in occurrence, for this appears to be most important at the present time.

While collecting fossils from the Pliocene Wakimoto sandy shale beds in Taihei-mura, Minami-Akita-gun, Ugo province, an interesting sand-pipe of moderate preservation was found. The pipe, whose vertical section was well exposed, measured about 30 cm long by nearly 10-15 cm broad. Embedded in a bluish colored sandy shale of marine origin, the pipe consisted of a brownish colored outer ring filled with a soft sandy clay of a little lighter color. It was nearly straight with its sides quite parallel to each other, and gradually changed downward into the mother rock. In its uppermost portion was found embedded an internal mould of a moderate size bivalve with the umbones directed into the sand-pipe. The bivalve, which was unfortunately broken into pieces when being dug for, may have belonged to the genus *Cardium*. Only partially exposed and completely broken into pieces without trace of external sculpture, the precise generic position is doubtful. How-

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1) S. NOMURA and K. HATAI: On the Occurrence of Peculiar Shaped Concretions Probably Due to Decapod Crustaceans. Jap. Jour. Geol. Geogr., XIII, 57-61, 1 pl., 1936.

2) For literature see article by S. NOMURA and K. HATAI, op. cit.

3) S. NOMURA and K. HATAI: Preliminary Notes on some Sand-Pipes. Saito Ho-on Kai Mus., Res. Bull., XIII, 147-153, 8 figs., 1937.

ever, it is interesting to find a mould of a bivalve embedded in the uppermost portion of the sand-pipe.

Whether this bivalve is responsible for the making of this sand-pipe or is related to its construction, is at present unsettled, in the view that living bivalves of the mentioned genus have not been proven to make such burrows. The chances for such an explanation seem not unreasonable. Another such sand-pipe was found in the same beds at Hutatui, Yamamoto district in the same province, but instead of containing a doubtful *Cardium*, it contained a fair size specimen of *Mya*, probably belonging to *Mya cuneiformis* (БöHM). This case may also, to some degree, uphold the explanation that bivalves may be, in some cases, responsible or related to the construction of sand-pipes.

The sand-pipe figured, is not fully preserved, as its lower part is broken and the upper is not entirely preserved. It was found among a collection of fossil molluscs from the Pliocene Byöritu beds of Taiwan (Formosa).

In its preserved state it measures 11.5 mm at the lower part, 15.5 mm at the part where the expansion begins, 28.0 mm at the point of greatest expansion, and the total preserved length is only 73.0 mm. Observed at the lower broken end, the sand-pipe consists of a band of iron-oxidized sand about 3.0 mm wide, which inwardly becomes brownish. The whole surface is reddish brown as is by iron-oxidation. The sand-grains are coarse on the outer surface and finest at the core. Near and at the top, sand-grains are coarse and pebbles and shell-fragments are intermingled, a fact suggesting that this may have been near the surface of the sea-bottom in natural condition. This sand-pipe is well shown in the figure, and the surface sculpture is of particular interest.

Especially noteworthy is the fact that a species of Pliocene mollusc, *Venericardia granulifera* NOMURA, is found occupying the broadest upper portion of the sand-pipe. Although it is now only partly preserved, that particular species may have been related to the making of the pipe. If, this pipe actually were longer upwardly, it can be assumed that the fossil shell probably had some connection with the making of the pipe. Remains of minute organisms were not found in the sand-pipe as in the cases of those made by burrowing decapods. The writer, feels that the said mollusc may have some bearing on the construction of the sand-pipe but is in not position to press such an explanation in this case.

The entire surface of the sand-pipe is sculptured by rather small bulgings and narrow valleys or interspaces. These bulgings are irregularly arranged but are close together, well rounded and in more or less parallel position in upward counting. These small protuberances continue upward to the point where the expansion begins, thereon upwardly, they have either been obliterated by subsequent phenomenon or were not preserved because of the material being coarser. Whatever

may be the cause or cause of the small protuberances on the surface of the sand-pipe, it is certainly interesting to find a small molluscan shell embedded at its upper expanded portion.

Without further specimens at hand, the writer wishes to hold his opinions to explanations for the making of sand-pipes for a later article.