Shako, a new Miocene stomatopod Crustacea from Japan

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Abstract. The monotypic genus Shako (Crustacea, Stomatopoda) is erected with S. tomidae sp. nov. from the Miocene Auyagawa and Mizunami Groups (Lower Miocene) of Central Japan. This is the second record of the Stomatopoda from Cenozoic deposits of Japan. It appears that S. tomidae preferred a brackish water environment.

Key words: Crustacea, Stomatopoda, Shako, Miocene, Japan

Introduction

The order Stomatopoda Latreille, 1817 (Crustacea) contains 15 extant families, the Carboniferous Tyrannophontidae Schram, 1969 and the Jurassic–Cretaceous family Sculdidae Dames, 1886 (Schram, 1966; Müller, 1994). Fossil records of the Stomatopoda are rare in Mesozoic and Cenozoic deposits throughout the world. In the review of fossil records by Holthus and Manning (1969; RS41), four extinct sculcid and four extant squillid genera (i.e. Gonodactylus Berthold, 1827, Hemisquilla Hansen, 1965, Squilla Fabricius, 1787, Chloriella Miers, 1890—Clorida Eydoux and Souleyet, 1842) are recorded. According to Manning’s 1980 classification, Gonodactylus belongs to the family Gonodactyldidae Giesbrecht, 1910 and Hemisquilla to the family Hemisquillidae Manning, 1980.

Secretan (1975) assigned Squilla antiqua Münster, 1842, from the Upper Eocene of Italy to Lysiosquilla Dana, 1852 (Lysiosquillidae), while Squilla wetherelli Woodward, 1879 from the Eocene London Clay of England was assigned to the genus Bathysquilla Manning, 1963 (Bathysquillidae) by Quayle (1987). Schram (1968) erected a new monotypic genus, Paleosquilla (Gonodactyldidae), from the Upper Cretaceous of Colombia, South America. Förster (1982) described three new species, Squilla hollandi (Squillidae) and ? Pseudosquilla wuli (Pseudosquillidae), from the Upper Eocene of North Germany, and Lysiosquilla nkporoensis from the Upper Cretaceous of Nigeria. Yun (1985) gave detailed descriptions of five fossil species in three genera, Squilla, Leesquilla Yun, 1965 and Pohsquailla Yun, 1965, of the Squillidae from the Miocene of Korea. Karasawa and Nakagawa (1992) recorded Oratosquilla ? sp. (Squillidae) from the Miocene Shimo Formation of Fukui Prefecture. Thus, eleven genera in five extant families have been recognized as fossils.

The purpose of this paper is to describe a new genus and species of squillid from the Ayugawa and Mizunami Groups of Central Japan, and discuss the paleoecology of this species based on the associated decapod fauna.

Systematics

Family Squillidae Latreille, 1803
Genus Shako gen. nov.

Type species.—Shako tomidae sp. nov. by monotypy; masculine gender; Early Miocene; Japan.

Derivation of name.—The name is derived from the Japanese word for stomatopod.

Diagnosis.—Moderate sized squillid, total length less than 150 mm. Eye small, cornea bilobed, stalk long. Carapace narrowed anteriorly, without median carina; cervical groove distinct; anterolateral angles spined; posterolateral margins strongly convex. Last three thoracic somites with well developed submedian and intermediate carinae; lateral process of 5th thoracic somite developed as single, narrow, gently curved spine, directed anterolaterally; lateral processes of next two somites posterolaterally rounded. Abdomen with submedian, intermediate, lateral and marginal carinae, 4th and 5th somites with median carinule. Telson inflated, slightly broader than long, tapering posteriorly, with dorsal median carina and 6 small, triangular marginal teeth; submedian points with fixed apices; intermediate denticles in a sharp oblique, slightly convex row; dorsal surface of telson finely granulated. Dactylus of raptorial claw with 5 teeth on inner margin; outer margin of dactylus sinuate; inner margin of propodus pectinate; dorsal ridge of carpus unarmed.

Discussion.—This new genus is assigned to the Squillidae by having a carinate dorsal body, a pectinate inner margin of the propodus, and the telson with a distinct median carina and 18 intermediate denticles, although the ocular scales, the propodi of 3rd and 4th thoracic appendages and the basal prolongation of the uropod are unknown.

Manning (1968) indicated that there were four generic groups within the Squillidae. Shako belongs to his third group in that the lateral process of the 5th thoracic somite is
Figure 1. *Shako tomidai* gen. et sp. nov., MFM39013 (holotype). 1. ×1.5, dorsal view of anterior part of body. 2. ×2.0, dorsal view of eye and anterior part of carapace. 3, 4. ×1.5, lateral view. 5. ×1.5, dorsal view of posterior part of body.
developed as a single spine, the eye is small, and the carapace and an inflated abdomen have a reduced complement of carinae. **Shako** differs from **Cloridopsis** Manning, 1968, and **Lenisquilla** Manning, 1977, in structure of the lateral process of the 5th thoracic somite and in the telson with fixed spines. The new genus differs from **Cloridopsis** in the lack of a median carina on the carapace, the shape of the lateral process of the 6th and 7th thoracic somites, presence of median carinules on the 4th and 5th abdominal somites, and the dorsal surface of the telson. Presence of median carinules on the 4th and 5th abdominal somites and the prelateral lobe of the telson, and short marginal teeth of the telson readily distinguish **Shako** from **Lenisquilla**.

**Shako** appears to show an affinity with the Korean Miocene genus, **Lenisquilla**, Yun, 1985 in the shape of the lateral processes of the 5th–7th thoracic somites, but differs in having a small eye, and lacking a median carina on the carapace and abdominal somites. The lateral process of the 5th thoracic somite in **Shako** is a narrow, gently curved spine, whilst in **Lenisquilla** it is a large, acute spine strongly directed anteriorly. The dactylius of the raptorial claw in **Shako** has five teeth, whereas in **Lenisquilla** it has four. Short, triangular marginal teeth of the telson readily distinguish **Shako** from **Lenisquilla** and the second Korean Miocene genus **Polsquilla** Yun, 1985.

**Shako tomita** sp. nov.

Figures 1-4

Material examined. — MFM39013 (holotype), a road cut of Nishino, Ayugawa, Tsuchiyama cho, Koga-gun, Shiga Prefecture (34°56'32"N, 136°19'24"E), collected by M. Kamekata; Sendai Sandstone Mudstone Member, Tsuchiyama Formation, Ayugawa Group (Lower Miocene, Zones N7–N8 of Blow's scale by Yoshida, 1992)— MFM9042 (paratype), Loc.36 of Karasawa (1991), dry riverbed southeast of Shomasamahora, Tsukiyoshi, Akeyo-cho, Mizunami City, Gifu Prefecture (35°22'42"N, 137°14'E), collected by T. Kaede; Tsukiyoshi Member, Akeyo Formation, Mizunami Group.

Repository. — All type specimens are housed in the Mizunami Fossil Museum, Yamanouchi, Akeyo-cho, Mizunami, Gifu, 509-61 Japan.

Derivation of name. — In honor of my friend, Dr. Susumu Tomida (Chukyo Gakuin University, Gifu), a molluscian.
paleontologist, who studied decapod fossils from the Mizunami Group in his early years.

**Diagnosis.**—As for genus.

**Description.**—Size moderate, total length less than about 150 mm. Eye small, cornea bilobed and slightly broader than stalk, stalk length about 0.75 times as long as eye length. Antennal scale less than half as long as carapace. Antennular somite poorly preserved. Ocular scales not preserved. Rostral plate broken.

Carapace narrowed anteriorly. Anterior margins of carapace concave. Anterolateral spine weak, not extending to base of rostral plate. Median carina lacking, intermediate carinae not extending to cervical groove, lateral and marginal carinae well developed. Posterolateral margins strongly convex.

Lateral process of 5th thoracic somite developed as single, narrow, gently curved spine, directed anterolaterally, posterior margin gently convex. Lateral processes of 6th and 7th somites posterolaterally rounded. Somites decreasing in size anteriorly with well developed, unarmed submedian and intermediate carinae, and without median carina.

Abdomen strongly carinate, increasing in width posteriorly, but 6th somite narrower than 5th. Articulated anterolateral plates of abdomen absent. Submedian, intermediate, lateral and marginal carinae distinct; submedian carinae slightly divergent posteriorly on 2nd to 5th somites and inflated, slightly convergent on 6th somite; 4th and 5th somites with interrupted median carinule. None of all abdominal spines armed posteriorly.

Telson longitudinally convex, slightly broader than long, tapering posteriorly. Lateral, intermediate and submedian teeth small, triangular. Submedians with fixed apices. All marginal teeth inflated at the base. Two lateral, 18 intermediate and 6 submedian denticles small, rounded; intermediate denticles in a sharp oblique, slightly convex row. Dorsal surface finely granulated without radial ornamentations, strong median carina well developed without distal spine.

Raptorial claw large. Dactylus slender, about 0.75 times as long as carapace length, with 5 teeth decreasing in size.
proximally on inner margin, outer margin of dactylus sinuate. Propodus with fine pectinations on inner margin. Carpus bearing 4 small, bluntly triangular teeth on outer margin, dorsal ridge of carpus unarmed.

Paleoecology.—The holotype specimen was collected from mudstone of the Ayugawa Group of Shiga Prefecture, associated with a pelecypod, Trapezium modiolaeforme Oyama and Saka (Tanaka and Kimura, per. com.). T. modiolaeforme is found in the Cyclina–Vicarya and Vicaryella bacula–Cyclina assemblages which represent a shallow estuarine environment from the Ayugawa Group (Shibata, 1975).


The depositional environment of the localities was interpreted as an intertidal zone of muddy bottom (Karasawa, 1991). The brackish-water molluscs Cyclina japonica Kamada, Vicarya yokoyamai Takeyama, Batillaria mizunamiensis Itoigawa and Vicaryella ishiiana Yokoyama were found at the decapod-bearing localities (Karasawa, 1991). Thus, it appears that S. tomidai preferred to inhabit a muddy bottom in the intertidal zone under the influence of low-salinity water.

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