

Spinning Organ and Biological Note of a Webspinner, *Oligotoma japonica* Okajima (Insecta, Embioptera)

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The Embioptera are a small group of fragile insects with a soft thin cuticle and weak powers of flight generally. In their habitats these insects generally prefer warm, damp conditions. The most striking feature in the biology of the Embioptera is their habit of constructing silken tunnels which are anchored by silken threads to substrata. So far as the authors are aware, however, there are a few papers concerning the structure of spinning organ (Lesperson, 1937; Alberti and Storch, 1976). The present paper deals with the structure of the spinning organ and some ethological notes of *Oligotoma japonica* Okajima. The full description of ultrastructure of the spinning organ of the species will be given in other papers.

Adults and nymphs of *O. japonica* were collected at Ishigaki-jima island, Okinawa Prefecture in February and March. These insects were kept in a plastic case with a bark, leaves and wet filterpaper at 20–25°C. Pretarsus of male adults were fixed in Karnovsky's fixative at pH 7.5 in cacodylate buffer for 2 hr, postfixed in buffer 1% OsO₄, and embedded in Epon 812.

In *O. japonica*, the males are usually winged (Fig. 1) or apterous and females are apterous. The male adults are attractable to light, and often discovered on leaves of tall trees in the daytime. Under rearing conditions, the insects spend much of daytime within the silken tunnels and emerge to forage food at night. The size of these tunnels is variant, and each tunnel contains only one individual or a female and her young in general.

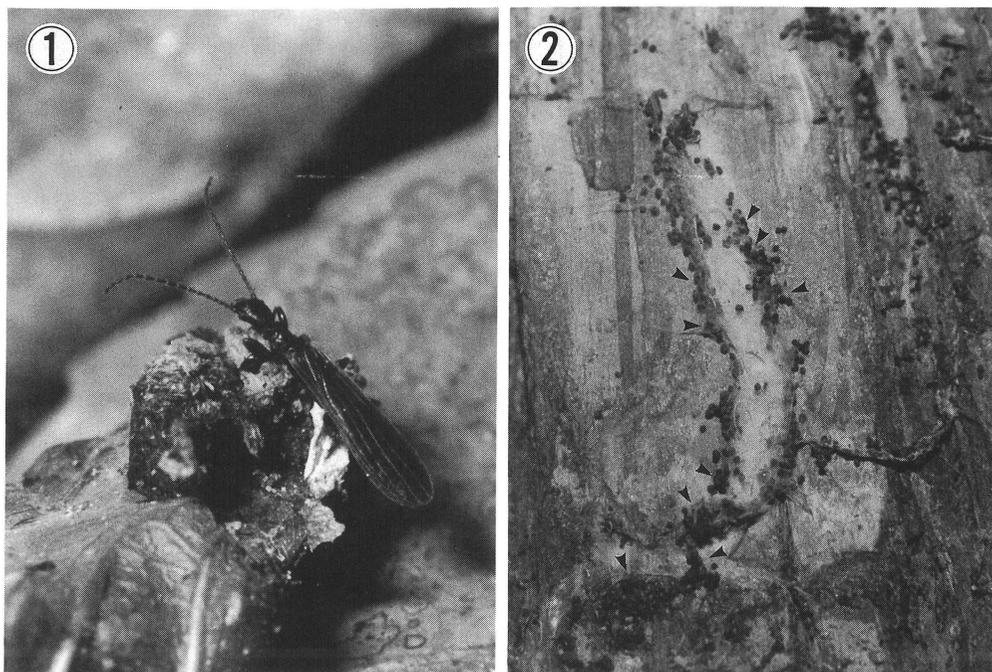


Fig. 1 Male adult of *Oligotoma japonica* (winged type).

Fig. 2 Silken tunnel of *Oligotoma japonica*, faeces (arrows) are accumulated around a tunnel.

Their faeces are not stored in the tunnel but around it (Fig. 2). Mature males live only for a few weeks.

During the construction of the tunnel the fore-legs are constant actively, crossing and recrossing one another repeatedly.

When *O. japonica* are displaced from their normal habitats or tunnels, they spin and finish a new nest extraordinarily quickly, usually in about half an hour. Grassi and Sandias (1898) explained a view that the insects probably seek the protection from a sudden change of atmospheric temperature and humidity. Ananthakrishnan and Ananthasubramanian (1955) observed that *Paraembia* sp. spin more quickly in completely darkened environment, between 32 to 36°C and 32 to 50% R.H.

The females deposited a small number of eggs at night in our laboratory, and generally one at a time along the silken tunnels as in *Embia texana* (Melander, 1903). The eggs were observed during March to May. The eggs are of creamy-white and urn-shaped or ovoidal (1.1×0.5 mm) with a conspicuous operculum at the anterior end.

On the ventral surface of the 1st and 2nd tarsal segments of the fore-legs a number of (about 100) hollow cuticular processes resembled spines which is probably modified microtrichia (Fig. 3). These microtrichia are observed only the ventral surface of the 1st and 2nd segments. Each cuticular process (approx. 100 μm) is connected with a glandular chamber by a fine duct. The glands line up in three files in longitudinal section (Fig. 4), and there are over 80 silk glands in the enlarged 1st segment, but no glands in the 2nd segment (Fig. 4). Each glandular chamber is globular form, the diameter is approx. 80 μm , and bounded by a single layer (approx. 20 μm) of gland cells (Figs. 4, 5). The glandular cells are large, multinuclear cells, usually observed 8 to 12 nuclei in a cell, embracing a voluminous extracellular cavity (Fig. 5). The ductule of the gland is long, has no branch, and a supporting cell is observed at its base (Fig. 6).

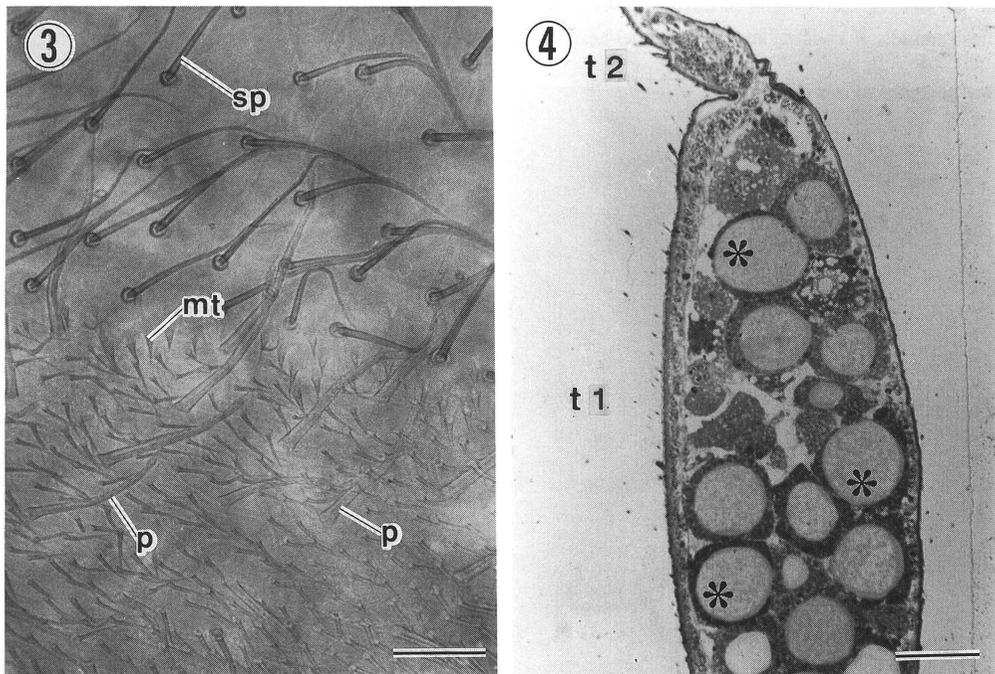


Fig. 3 Ventral and lateral surfaces of the 1st tarsal segment. Up-lateral direction. Scale=50 μm . mt, microtrichia; p, cuticular process; sp, spine.

Fig. 4 Longitudinal section of the 1st (t-1) and 2nd (t-2) tarsal segments. The enlarged 1st segment is full with many glands (*). Scale=100 μm

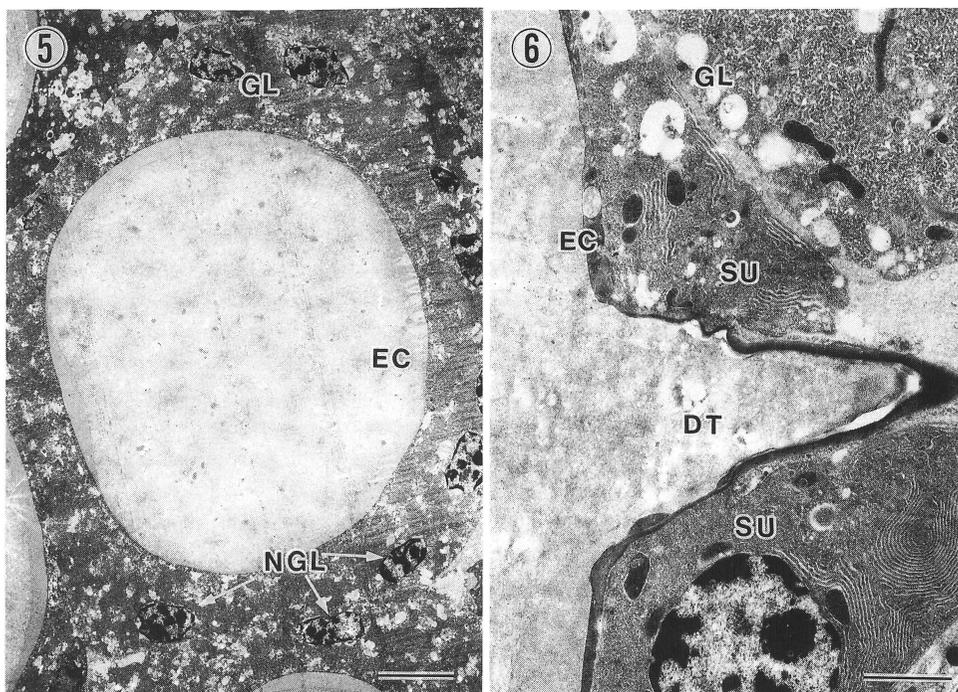


Fig. 5 Electronmicrograph of a silk gland, showing a large and multinuclear gland cell. Scale=10 μ m. EC, extracellular cavity; GL, gland cell; NGL, nucleus of gland cell.

Fig. 6 Electronmicrograph of the base of a fine duct (DT) from extracellular cavity (EC). Scale =2 μ m. GL, gland cell; SU, supporting cell of duct.

The cytoplasmic component of the glandular cell is characterized by well developed rough endoplasmic reticulum and numerous Golgi complexes that segregate secretory globules, and chromatins of the nuclei are also well developed. Silk glands of the Embioptera may be the dermal origin derived from the hypodermis, although the ultrastructure is very similar to that of labial gland cells (Sefnal and Akai, 1990). In a voluminous extracellular cavity or lumen is filled with viscid secretion, probably fibroin fibres.

References

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