

Notes on the route of ovulation in a whip-scorpion, *Typopeltis crucifer* (Arachnida, Thelyphonida)

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On the ovulation in the thelyphonids or whip-scorpions, in which the eggs are formed on the cellular stalks (egg-stalks) protruded outward from the ovarian surface, two quite different routes have been supposed. Schimkewitch (1906) suggested that the eggs were ovulated into the ovarian lumen through the stalks and then oviposited through the oviducts. Warren (1939), however, insisted that the eggs were separated from the stalks to be free in the hemocoel and then forced into the oviducts through their walls. Such different interpretations must have arisen from two incompatible understandings of the basic structure of thelyphonid female reproductive system.

In the present study, we report the basic structure of the female reproductive system of a Japanese thelyphonid, *Typopeltis crucifer*, and discuss the route of the ovulation, based on observations of serial paraffin sections.

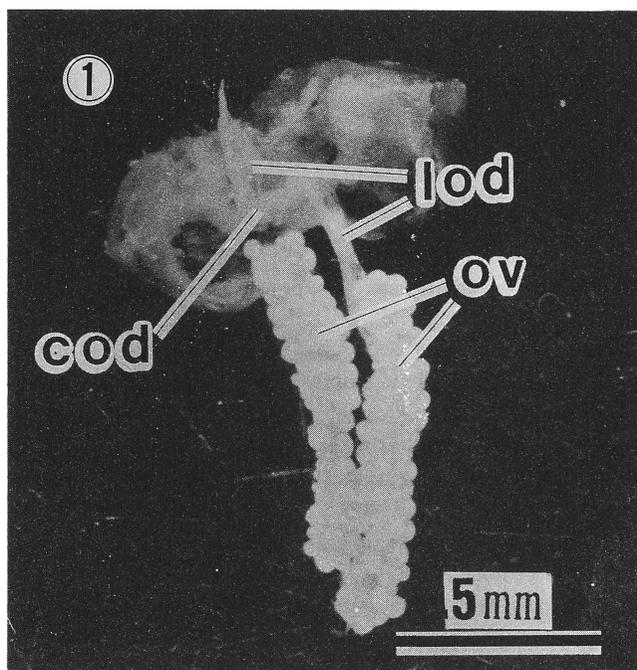


Fig. 1 Female reproductive system of *Typopeltis crucifer* (dorsal view). Midgut gland is removed. Left lateral oviduct is snapped. cod: common oviduct, lod: lateral oviducts, ov: ovaries.

The female reproductive system is located in the abdomen and consists of a pair of longitudinal tubular ovaries, and a pair of lateral oviducts extends antero-ventrally to be fused with a ventromedian genital pore opening at the second abdominal segment through a short common oviduct with a pair of seminal receptacles (Fig. 1). The growing oocytes are protruded outward from the ovarian surface sitting on short cellular stalks (Fig. 2). The walls of the stalks, of the ovary, and of the oviducts are closely connected each other and directly reach the genital pore, completely partitioning the common inner space of the female reproductive system from the outer hemocoel. We could find the ovulated eggs neither in the hemocoel nor in the space of the female reproductive system, but we are convinced that the eggs are ovulated into the ovarian lumen through the inner spaces of the stalks and oviposited from the genital pore through the oviduct because of the direct connections among these inner spaces. Such a route of ovulation is common in most chelicerates and pycnogonids, in which the basic structure of the female reproductive system has been correctly described (see Makioka, 1988; Miyazaki and Makioka, 1990, 1991, 1992).

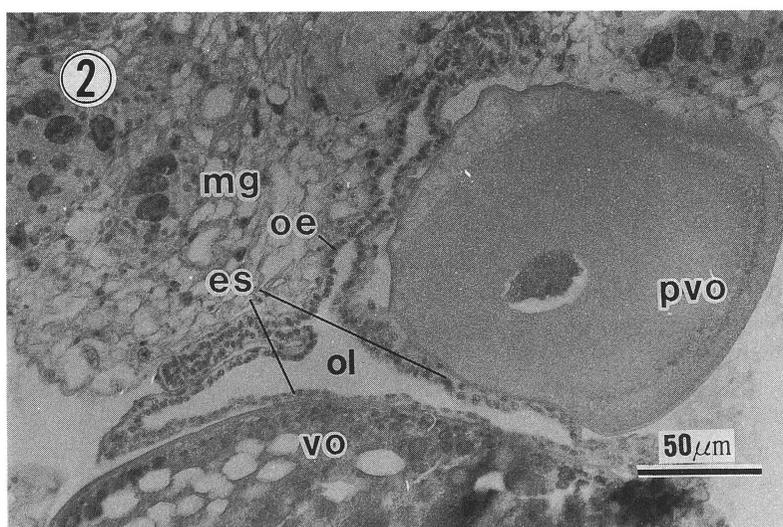


Fig. 2 Cross section of the ovary. Hematoxylin and eosin. es: egg-stalk, mg: midgut gland, oe: ovarian epithelium, ol: ovarian lumen, pvo: previtellogenic oocyte, vo: vitellogenic oocyte.

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