

Comparative Embryology of Plecoptera (Insecta)*

Shodo MTOW and Ryuichiro MACHIDA

Sugadaira Montane Research Center, University of Tsukuba, Sugadaira Kogen, Ueda, Nagano 386-2204, Japan
E-mail: s610@sugadaira.tsukuba.ac.jp (SM)

Stoneflies, of which nymphs are aquatic, live around mountain streams, and represent a polyneopteran order, Plecoptera. It is divided into suborders Antartoperlaria (four families) and Arctoperlaria (12 families) (Zwick, 2000). Nine families of Arctoperlaria inhabit Japan.

The basal position within Polyneoptera has been often bestowed to Plecoptera, but its affinity with other polyneopteran orders has been variously argued (*e.g.*, Beutel *et al.*, 2014). For phylogenetic discussion like the reconstruction of groundplan and phylogeny, the comparative embryological approach is one of the most useful methods. However, our embryological knowledge on Plecoptera remains fragmentary, being restricted to the relatively detailed studies on two arctoperlarian families (*e.g.*, Miller, 1939, 1940; Kishimoto and Ando, 1985) and some brief reports on few other families of the same suborder. In such a background, to reconstruct the groundplan and phylogenetic affinity of Plecoptera, we have started a comparative embryological study of Plecoptera, as the first step, using nine all arctoperlarian families from Japan. In the present talk, we provide the outlines of the embryonic development of these plecopterans.

Based on the comparison of the embryogenesis of nine arctoperlarian families referring to the previous studies, the embryonic development of Plecoptera is characterized by: 1) the formation of the embryo at the posterior pole of the egg, 2) elongation of the embryo along the egg surface, 3) immersion of the embryo into the yolk with its cephalic and caudal ends left on the egg surface, and 4) blastokinesis involving the reversion of embryo's axis (except for Scopuridae). These

features may be considered to be the groundplan of Arctoperlaria. In Peltoperlidae (*Yoraperla uenoi*), which have flattened eggs, the embryo shows the reversion accompanied with rotation of embryo during blastokinesis, as known in Pteronarcyidae (*Pteronarcys proteus*), of which eggs are likewise flattened in shape (Miller, 1939, 1940). However, the embryos in Scopuridae (*Scopura montana*) were revealed to suffer from neither reversion nor rotation during blastokinesis. Although this may be a potential apomorphy of the family, the phylogenetic reevaluation of it is a future subject.

References

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