

Entognathy Formations of Three Entognathan Orders: A Phylogenetic Argument*

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“Entognatha-Ectognatha System”, which is formulated as “Entognatha (= Ellipura (= Protura + Collembola) + Diplura) + Ectognatha”, has been widely accepted as a most reliable phylogeny of Hexapoda (Insecta s. lat.). However, it has been recently challenged from various disciplines, especially on the monophyly of and the interordinal relationships of Entognatha. Entognathy has been regarded as a most reliable synapomorphy for three entognathan orders, Protura, Collembola, and Diplura. We compare the entognathy formations of these three orders based on the knowledge accumulated for the last couple of decades (on Protura: Fukui and Machida, 2006, 2009, in prep.; Fukui, 2010; on Collembola: Tomizuka and Machida, 2011, 2012, in prep.; on Diplura: Ikeda and Machida, 1998, Sekiya and Machida, 2009, 2011, in prep.) to examine the homology of their entognathies, and discuss the “Entognatha”.

The entognathy formation of Protura and Collembola are revealed to closely resemble each other in major points, such as concerning: 1) the origin of mouth folds, which are formed by the fusion and ventral extension of terga of intercalary and three gnathal segments, and 2) the origin of the posterior limit of entognathy, which is accomplished by the fusion of (possibly the labial tergal territories of) mouth folds in both sides. However, the entognathy of Diplura is constructed in an utterly different manner, which is characterized by: 1) the mouth fold is formed by the fusion of ventrally extended terga of intercalary and three gnathal segments and labial coxae, 2) the rotation of labial appendages is involved in the entognathy formation, 3) the posterior limit of entognathy is accomplished by the fused labial subcoxae which form the postmentum, and 4) the posteromedial area of mouth fold is partitioned as the admentum, which is labial coxal in origin.

Thus, the manners of entognathy formation in Protura and Collembola closely resemble each other, being named “Ellipura type”. The homology between their entognathies is

strongly supported, and the monophyly of Ellipura is well supported as well. The manner of entognathy formation in Diplura is, however, much different from the Ellipura type, which can be called the “Diplura type”. Hence, the homology of entognathies between Ellipura and Diplura is not always verified, and the monophyly of Entognatha cannot always be substantiated.

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