

Egg Structures and Egg Teeth in Some Orthopterans (Insecta: Polyneoptera)*

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The egg tooth is a cuticular hatching device on the frontal region of insect hatchlings. Egg teeth are found exclusively in Dicondylia and can be regarded as an autapomorphy of the group. Recently, Mashimo *et al.* (2014) compared the egg structures and egg teeth in Zoraptera, Embioptera and Phasmatodea on the basis that these three orders are monophyletic, and suggested that the forms with the egg operculum for hatching more elaborate have less developed egg teeth and *vice versa*, *i.e.*, the forms with the operculum less developed or lacking have well developed egg teeth.

Orthoptera are the most speciose order in Polyneoptera. Orthopterans show a wide-ranging variety of egg teeth in shape and size, from the well-developed to totally lacking (Brookes, 1951; Wada, 1966; Ingrisch, 1984; Pétavy, 1985; Houston, 2007). In the present study, we examined the egg teeth of three species belonging to different superfamilies of Ensifera, namely, *Gryllus bimaculatus* of Grylloidea, *Nippancistroger testaceus* of Gryllacridoidea and *Gampsocleis buergeri* of Tettigoniioidea, and compared them referring to the egg structures of each species.

In *Gampsocleis buergeri*, the egg tooth is well developed, occupying the frons length, and shows a regional differentiation, *i.e.*, the anterior and posterior blades and median spine. The egg of the species lacks any hatching devices such as the operculum or hatching line. Hatching occurs, simply with the chorion torn by the egg tooth. In *Nippancistroger testaceus*, the prelarva has a small-sized egg tooth at the center of the frons, resembling the median spine in *G. buergeri*. The egg has a circular hatching line around the anterior pole of the egg. Hatching occurs, with the anterior pole “operculum” detached from the egg body, as well as with the anterior half of the egg body longitudinally torn by the egg tooth. In *Gryllus bimaculatus*, the egg has a circular hatching line around the anterior pole of the egg as in *N. testaceus* and likely a longitudinal hatching line on the body. The egg tooth is

totally lacking. Hatching occurs, with the anterior pole of the egg or the “operculum” detached and with the egg body torn along the hatching line.

The present study revealed that the hatching devices on the egg such as the “operculum” or “hatching line” are less developed in the ensiferan orthopterans with well-developed egg teeth, contrary that the hatching devices on the egg are well developed in those with egg teeth less or not developed, as generalized in Zoraptera and Eukinolebia (Embioptera + Phasmatodea) by Mashimo *et al.* (2014).

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