

Quadrifina Reviews

Recent Papers with Impact

YACK, J.E., SCUDDER, G.G.E. & FULLARD, J.H. 1999: Evolution of the metathoracic tympanal ear and its mesothoracic homologue in the Macrolepidoptera (Insecta).- Zoomorphology 119 (2): 93-103.

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This is an important contribution to the understanding of the evolutive development of the ear sensory organ in Macrolepidoptera, especially Sphingidae and Noctuoidea. Serial homology and phylogenetic character mapping have been used as techniques to investigate the evolutionary origin of the tympanal organ in noctuid moths. A novel mesothoracic chordotonal organ in the Sphingidae *Manduca sexta* (LINNAEUS, 1763) is described and found to be serially homologous to the metathoracic tympanal organ of the Noctuoidea. This mesothoracic chordotonal organ consists of a proximal scolopidial region and a long, flexible strand that connects to an unspecialized membrane ventral to the axillary cord of the posterior notal wing process of the forewing. The anatomical comparisons of the meso- and metathoracic nerve system and their peripheral attachment sites on the cuticle support the hypothesis of homology of these sensory organs. The structure of the wing-hinge chordotonal organ in both thoracic segments was strikingly conserved in several superfamilies of Lepidoptera. An interesting exception is the tympanal ear of the metathorax of the Noctuoidea: Just one (Notodontidae) or two (remaining noctuid families) cells have been found. One of the mainstream findings of this paper is that the three-celled wing-hinge chordotonal organ, believed to be a proprioceptive organ, represents the plesiomorphic state of the "tympanal ear" of Noctuoidea. A trend towards simplicity and cell reduction was found and is discussed in the paper. In contrast to other "sound detecting" systems (Acrididae, Tettigoniidae and others) which exhibit a tendency to increase the number of cells from the pretympanal to the tympanal state, the cell number in the metathoracic ear of the Noctuoidea is reduced. A possible explanation for this obvious difference could be a basically different "intention" of the regarded organ. While tympanal organs of sound producing species are primarily used for identifying and localizing songs of potential partners during the mating behaviour the "ears" of Lepidoptera are mainly used as "bat-detectors". This possibly implies a better, quicker or even more precise response to high frequency sounds of the potential predators. The derivation of the noctuid tympanal organ from proprioceptive wing-hinge chordotonal organs is one of the major implications. The proprioceptive character of the plesiomorphic states of "hearing organs" is one of the findings of prior interest to us. Our studies on the complex system of sclerites and membranes of noctuid wing-hinges concentrate more and more on the following question: Are the ligament system of the wing sclerites and the attachment sites on the sides of the thorax more than just a membranous connection? We focus on the morphology and function of the axillary cord and the extended membranes of the posterior notal wing process (LÖDL 2000: Quadrifina 3: 303 ff). A detailed comparative analysis of the complete neuronal set of the ligament and membrane system of the basal wing-hinge region is highly required.

In the reported paper the Noctuidae (Plusiinae) species *Trichoplusia ni* (HÜBNER, [1803]) is reported and illustrated in comparison to *M. sexta*. A very informative and detailed information on the dissection and conservation procedure of the chordotonal organ is given.

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FÄNGER, H. 1999: Comparative morphology of tergal phragmata occurring in the dorsal thoraco-abdominal junction of ditrysian Lepidoptera (Insecta).- Zoomorphology 119 (3): 163-183.

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This paper presents a valuable and extensive comparative SEM study of the transphragma of ditrysian Lepidoptera. The transphragma is the medioanterior margin of the first abdominal tergum. Transformation series of gradual modifications have been found and are illustrated on more than ninety informative SEM's. Unfortunately the Noctuidae are poorly represented in this study which in spite of this is a remarkable contribution to the higher classification of Lepidoptera. One more time it is shown that morphological structures "under the surface of scales" are highly commendable for systematic research. In addition to the terminology of BROCK (1971, Journal of Natural History, 5: 29-102) the terms epinotum, euphragma and neotergite are introduced and defined. The euphragma is an addition to the ground plan of the Obtectomera, containing the Macrolepidoptera, the Thyrididae and Hyblaeidae, the Pyraloidea and Copromorphae and the family Immidae. The reduction of the euphragma in several groups of Macrolepidoptera and the Copromorphae is discussed. The potential autapomorphies of various subordinate groups of taxa are also discussed.

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Zeitschrift/Journal: [Quadrifina](#)

Jahr/Year: 2000

Band/Volume: [3](#)

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Artikel/Article: [Quadrifina Reviewais Recent Papers with Impact. 324-325](#)