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Immatures of Palaearctic species of the weevil genus *Tychius* (Coleoptera, Curculionidae): new descriptions and new bionomic data with an evaluation of their value in a phylogenetic reconstruction of the genus

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ABSTRACT

Larvae of 14 species and pupae of 12 species of Palaearctic *Tychius* Germar, 1817 are described for the first time. Larvae and pupae of *T.meliloti* Stephens, 1831, *T. squamulatus* Gyllenhal, 1835 and *T. quinquepunctatus* (Linnaeus, 1758), are redescribed with addition of new characters. They belong to 10 of 22 groups of species assembled through adult morphological characters in this region and, like all other *Tychius* with known biology, the studied species live on Leguminosae Papilionoideae, belonging to the tribes Genisteae, Loteae, Galegeae, Trifolieae and Vicieae. Generally larvae, but not pupae, show a few characters useful to support some groupings previously postulated on adult morphology, and also suggest some phylogenetic relationships among groups although these are partly weak because of several clear parallelisms or convergences. One of the most numerous and better known group of species, the *T. stephensi* group living on Trifolieae, is supported by two distinctive larval character states, whereas all the other groups seem to be distinguishable from each other at least by a unique larval character state. New bionomic data concerning larval and pupal development and adult emergence are reported for all the described species. These data confirm that this genus is highly homogeneous in habits and times of development, with unique adaptive differences in adult emergence and overwintering according to the single or double seasonal flowering of the host plant. On the basis of morphological characters of immatures and adults, a possible concordance between the evolution of *Tychius* and that of their host plants is discussed.

Key words: Coleoptera, Curculionidae

identifying immatures in these species, as has been done in other groups (Hyperini: Skuhrovec 2006, 2007, *Bagous*: Gosik 2008; Ceutorhynchinae: Gosik 2010; Lixinae: Gosik & Skuhrovec 2011, Gosik & Wanat 2014, Stejskal *et al.* 2014; Entiminae: Gosik & Sprick 2012a, b, 2013). In practice, species identification of larvae with chaetotaxy is relatively easy, and it is generally much cheaper than identification by molecular methods (Hirsch *et al.* 2010). Unfortunately, the current problem in the taxonomic use of the immature stages is the relatively low number of available descriptions in comparison to the great number of known adult weevil species. The same problem exists also in many other groups outside Curculionidae.

With regard to life histories and habits of *Tychius* immatures Clark & Burke (1977) published a careful review of all available data based on about 20 species. We can now add new bionomic data for another 12 species. All the immatures which we studied in laboratory showed habits in prepupal activity, pupation and adult emergence uniform and similar to most species treated by Clark & Burke (1977), and the few differences observed between species consist only in the time of these processes. The observation common to all our immatures can be summarized as follows: larvae emerged from the pods after feeding on seeds and moved almost costantly. When placed on a loose sand-peat moss substrate, they began immediately to burrow under the surface and to tunnel through this material also for several hours. Then they began to form a pupal cell with viscid secretion produced by the anal lobes. The prepupal period and the pupal stage show lack of particular characteristics except for a slight variable duration. Finally, upon emerging from the pupal integument the adult may remain in the pupal cell, possibly until the following season or it may leave the cell after a few days. We have never studied larvae feeding on pods or leaf galls, another type of development reported for a few *Tychius* species like *T. medicaginis* C. Brisout de Barneville, 1863 (D'Aguillar & Perrier 1974), *T. longiclava* Hustache, 1937 (Hoffmann *et al.* 1963), *T. crassirostris* (Mik 1885) and doubtfully *T. polylineatus* (Germar, 1824) (Hoffmann 1954). Finally we can confirm two categories of species in adult emergences and overwintering patterns as observed by Clark & Burke (1977), but we consider this behaviour only due to a single (Galegeae) or double (Trifolieae) annual blooming.

When reviewing the poor and confused literature on the immature stages, Clark *et al.* (1978) expressed the hope that data on the morphology of immatures might be of much value in determination of phylogenetic relationships in *Tychius*, when more data would have been available. Our new data seem to support this opinion, despite high similarity of several species and clear convergence in several character states, and encourage us to actively collect immatures of other species. It is therefore probable that the morphological characters of immatures might support other good phylogenetic indicators such as adult morphology, host plant relationships and incoming molecular studies.

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