Zootaxa 3926 (2): 229–243
www.mapress.com/zootaxa/

Article

ISSN 1175-5326 (print edition)
ZOOTAXA
ISSN 1175-5334 (online edition)

http://dx.doi.org/10.11646/zootaxa.3926.2.4
http://zoobank.org/urn:lsid:zoobank.org:pub:57A156D8-A3ED-4E3A-997B-55CED2C9695C

Considerations on systematics of the Phytoseiidae (Acari: Mesostigmata), with definition of a new species group and description of a new species

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Abstract

The authors debate some aspects of the classification of the Phytoseiidae, especially the subfamily Typhlodrominae. Within this taxon, the *rhenanus* group is the most numerous species group of *Typhlodromus* (*Anthoseius*), with 206 nominal species. Detailed observation of morphological characters of the species in this group showed a considerable variation, suggesting the presence of different natural lineages. The discovery of the new species here described, *Typhlodromus* (*Anthoseius*) *sandrae* Ragusa & Tsolakis n. sp., allowed the definition of the new *porathi* species group. Definition of the new species group, a dichotomous key as well as the description of the new species are given.

Key words: Phytoseiidae, *porathi* new species group, *Typhlodromus* (*A*.) *sandrae* **n. sp.**

Introduction

Most phytoseiid taxonomists have by now accepted a series of morphological characters that should be taken into account for accurate description of new species. The features considered are reported in illustrations, showing the habitus of the dorsal and ventral shields, dorsal and ventral chaetotaxy and adenotaxy, macrosetae present on leg IV, shape of chelicera, number of teeth on the movable and fixed cheliceral digits, and the shape of the insemination apparatus (usually reported in phytoseiid literature as spermatheca or spermathecal apparatus) (Beard, 2001; Kolodochka, 2005; Castro *et al*., 2010; Kreiter & Tixier, 2010; Ferragut & Ueckermann, 2012; Stathakis *et al*., 2012; Tsolakis *et al*., 2012). When the above characters are not sufficient for the definition of a species, biological tests or DNA analyses can be helpful to clarify complex situations (Tixier *et al*., 2011). Indeed, up to now, 2,709 phytoseiid species have been described and 2,436 of them are to be considered as valid species (Demite *et al*., 2014).

However, it is difficult to find agreement among phytoseiid specialists when the supraspecific classification in this family is considered. Moraes *et al*. (2004), in their important catalogue of the Phytoseiidae, admitted the disagreements between the first three authors of that publication in relation to the supraspecific placement of many species. But, it should be mentioned that at present most of phytoseiid specialists, agree with the classification system proposed by Chant & McMurtry (1994, 2003a, 2003b, 2004a, 2004b, 2005a, 2005b, 2005c, 2006a, 2006b).

In their remarkable work, Chant & McMurtry (2007) reviewed what they had published from 1994 to 2006, sorting out the confusion existing in the systematics of the Phytoseiidae, highlighting cases in which deeper studies should be conducted to unravel the complex tangle of the natural lineages of this family. However, Chant & McMurtry's classification methodology contains some weak points, because it maintains large genera, both in Amblyseiinae and Typhlodrominae, where the recognition of natural lineages is impossible, even adopting the subdivision of the genera into species groups and species subgroups. In our opinion, this is mainly related to the rigid chaetotactic formulae, defined by Chant & Yoshida-Shaul (1989) for the first time, adopted in the many works of Chant & McMurtry as the principal, and very often unique, dichotomic feature for the definition of subfamilies, tribes and genera.

Accepted by B. Halliday: 4 Feb. 2015; published: 5 Mar. 2015

Discussion

Within the subfamily Typhlodrominae, Chant & McMurtry (1994) defined the tribe Typhlodromini by the presence of the opisthosomal setae S4 and JV4, and within this tribe, the genus *Typhlodromus* Scheuten, by the absence of the opisthonotal setae Z1. Chant & McMurtry (1994) divided *Typhlodromus* into two sub-genera, taking into account the presence or absence of the opisthonotal seta S5: *Typhlodromus* (*Typhlodromus*) without S5 and *Typhlodromus* (*Anthoseius*) with S5. Within the latter subgenus, they defined nine species groups, mainly based on the presence/absence of opisthosomal setae, the shape of the dorsal setae, and the shape of the ventrianal shield. Adopting this method, Chant & McMurtry (1994) put about 35% of the species in eight different species groups and more than 65% of the species in a single species group, the *rhenanus* species group, which was, as the same authors agreed, a very heterogeneous group (Chant & McMurtry 1994, p. 254). All the species of the latter species group share the same dorsal setal pattern (12A:8A), and this is the only common feature among the group. On the contrary, other morphological characters, i.e. the shape of insemination apparatus, the form of the dorsal setae, the *habitus* of dorsal and ventral part of the body characterise different lineages inside the *rhenanus* species group.

Comparing the species belonging to the latter species group, we consider the chaetotactic pattern as a plesiomorphic character for this group, and consider the form of the insemination apparatus as the apomorphic feature that characterises this clade. In a recent paper where both morphological and molecular analyses were used (Tsolakis *et al*., 2012), it was demonstrated that the form of the insemination apparatus is a more appropriate feature to define genera, than the dorsal and ventral chaetotaxy.

In our opinion, the differences of morphological characters between the *porathi* group and the other species of the *rhenanus* species group, could be sufficient to define a new genus or a new subgenus. However, in the present paper, in order to avoid new complications in the already complicated situation of the Phytoseiidae systematics, we maintain Chant & McMurtry's classification structure and consider the *porathi* group as a new species group. We repeat that molecular analyses are desirable for the definition of new genera, in order to clarify the apomorphic character state of the insemination apparatus inside the subgenus *Typhlodromus* (*Anthoseius*).

Acknowledgements

Authors are deeply indebted to Prof. G. Papadoulis for providing the slides of *T. krimbasi* and *T. dactyliocalyx*, to Dr. M. Wysoki for translating the description of *T. betulae* from Russian, to Prof. E. Chiavetta for revising the English text and to the anonymous reviewers for their constructive comments.

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