



About the validity of *Alloxysta turcica* Tataroğlu & Katılmış, 2023 (Hymenoptera: Cynipoidea: Figitidae: Charipinae)

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Abstract. *Alloxysta turcica* Tataroğlu & Katılmış, 2023, a species recently described from Turkey, is now being synonymized with *A. minuscula* Andrews, 1978. This decision is based on morphological analysis, which has revealed significant similarities between the two species. The reasons and supporting illustrations for this synonymy are provided.

Keywords: Charipinae, *Alloxysta*, Turkey, morphological features

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The Charipinae is a very complex subfamily, with many species described (Ferrer-Suay *et al.*, 2012, 2023) and few diagnostic features to characterize them (Ferrer-Suay *et al.*, 2021). *Alloxysta* Förster, 1869 is a cosmopolitan genus within the subfamily Charipinae. Currently, there are around 200 species described (Ferrer-Suay *et al.*, 2023). It is the most numerous genus of Charipinae and also it is the most usually collected on the field and affecting the aphid biological control programs. Especially, within *Alloxysta* there are only five features to focus on identification: size and shape of the radial cell, presence/absence of pronotal carinae, presence/absence and shape of propodeal carinae, relative size of flagellomeres and starts of rhinaria and club shape (Ferrer-Suay *et al.*, 2021). However, the relation of flagellomeres and beginning of rhinaria and club shape is a feature under consideration because sometimes a few variation within the same species has been seen, so it is recommended to use it in combination with others to separate species. Following these features a key based on *Alloxysta* for worldwide species was prepared (Ferrer-Suay *et al.*, 2019).

Recently, a new species of *Alloxysta* has been described, *Alloxysta turcica* Tataroğlu & Katılmış, 2023, from Turkey. The authors were aware of the similarity of its new species with a previous one. According with the diagnosis of this species, *Alloxysta turcica* Tataroğlu & Katılmış, 2023 is closely related with *A. minuscula* Andrews, 1978 because the two species have a partially open radial cell, absence of propodeal carinae, presence of pronotal carinae and first flagellomere subequal to pedicel (Ferrer-Suay *et al.*, 2019).

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Morphology

Despite these similarities, the authors force the description of the new species based on few characteristics (Tataroğlu & Katılmış, 2023). However, comments about these differences are presented in Table 1. In this table is presented the diagnostic characters of *A. turcica* in the original description, followed by a comparison with the description of *A. minuscula*, along with the reasons for proposing their synonymy.

Table 1. Comparison between *Alloxysta turcica* and *Alloxysta minuscula*.

<i>Alloxysta turcica</i>	<i>Alloxysta minuscula</i>	Comments	Result decisive
Presence of few scattered setae on vertex and above toruli (Fig. 1b)	The head of <i>A. minuscula</i> holotype has very few setae on vertex and denser in lower face, above toruli (Fig. 1a)	There is no difference between this character between <i>A. turcica</i> and <i>A. minuscula</i> . "no setae on vertex" was written in the redescription of <i>A. minuscula</i> . However, revising the images there are a couple of setae. Scattered setae or no setae should not be a robust feature to described a new species. There is a possible intraspecific variability.	Identical character
Transfacial line equal to compound eye height (Fig. 1b)	Transfacial line 1.2x to compound eye height (Fig. 1a)	Measuring the image of the publication we have obtained that the transfacial line/compound eye ration in <i>A. turcica</i> is about 1.16, thus is close to 1.2 in <i>A. minuscula</i>	Intraspecific variation.
F1–F2 thinner and smoother than subsequent flagellomeres; rhinaria and club-shaped begins in F3 (Fig. 2b)	F1–F3 thinner and smoother than subsequent flagellomeres; rhinaria and club-shaped begins in F4 (Fig. 2a)	According to the original description of <i>A. minuscula</i> club shape begin in F4 ("segments 1-5 smooth, narrow, 6-13 ridged, expanded to form distinct club"). However, according to the figure 78 of Andrews (1978) and (Fig. 2a) F3 is a bit expanded.	Identical character
F1 slightly shorter than F2	F1 subequal to F2	The description is not supported by the figure as F1 is not shorter than F2 in <i>A. turcica</i> (Fig. 2b). According with the images available of the <i>A. turcica</i> antennae, F1 is only very few longer than F2 (3/2.8), with this similarity is better to stablish that they are subequal as occurs in <i>A. minuscula</i> (Fig 2a).	Intraspecific variation
Relative F2/F3 length ratio 0.9x	F2 slightly longer than F3	According with the figure of <i>A. minuscula</i> description (Fig. 2a), the two antennae are very similar (Fig. 2), thus it is not enough to differentiate these two species. Moreover, the proportion between flagellomeres to separate between <i>Alloxysta</i> species is a character that is being revising to check if it is robust enough to delimit two species or it could be part of intraspecific variation (Ferrer-Suay <i>et al.</i> , in prep).	Intraspecific variation
Radial cell 2.3 times as long as wide	Radial cell 2.5 times as long as wide	According with the figures the ratio in <i>A. turcica</i> (Fig. 3b) is 2.4 (= 8,4/3,5) then, identical to <i>A. minuscula</i> .	Identical character

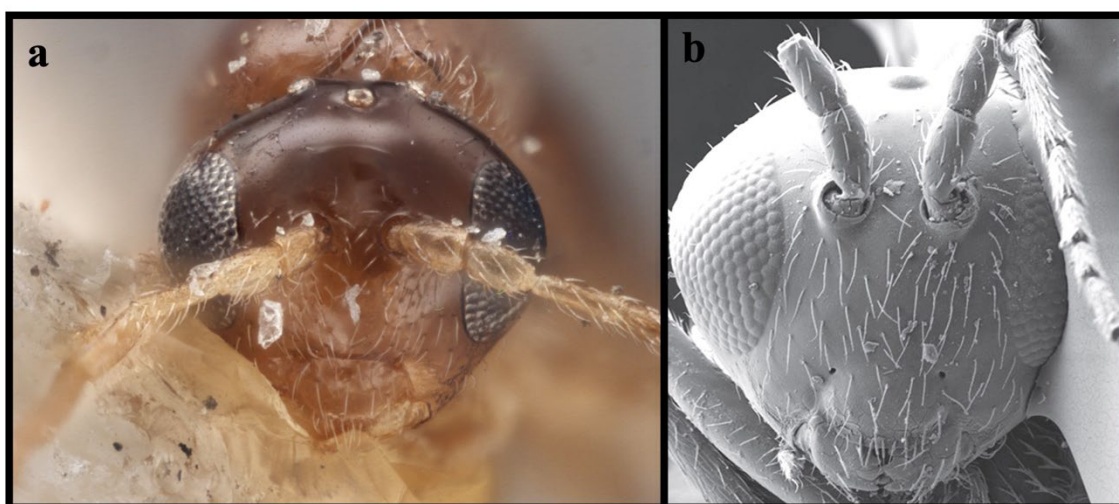


Fig. 1. a) *Alloxysta minuscula*, head (holotype); b) *Alloxysta turcica*, head (extracted from Tataroğlu & Katılmış 2023).



Fig. 2. a) *Alloxysta minuscula*, antennae female (Andrews, 1978); b) *Alloxysta turcica*, antennae female (extracted from Tataroğlu & Katılmış 2023).

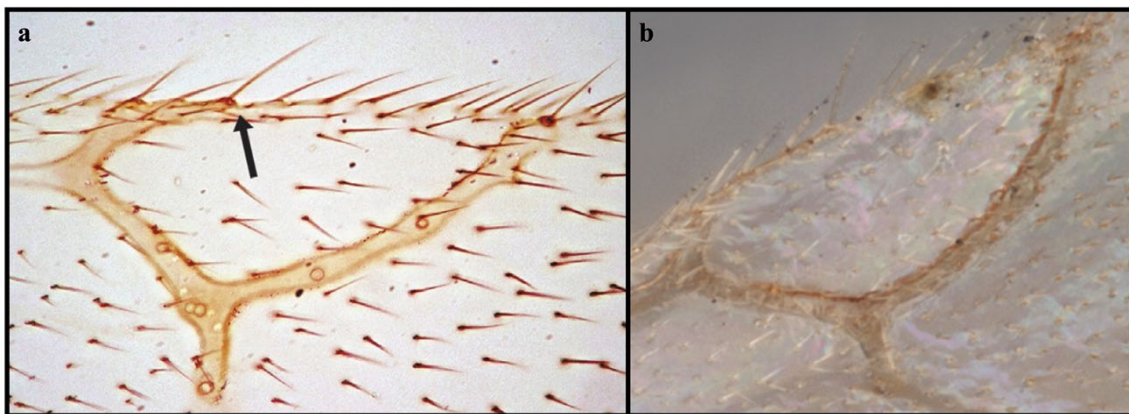


Fig. 3. a) *Alloxysta turcica*, radial cell (extracted from Tataroğlu & Katılmış 2023); b) *Alloxysta minuscula*, radical cell (holotype).

Distribution

Alloxysta minuscula is a Nearctic species (Ferrer-Suay *et al.*, 2013), while *A. turcica* is a Palearctic species (Tataroğlu & Katılmış, 2023).

It is common for some species to occur in both the Nearctic and Palearctic regions, as has been widely registered previously (Ferrer-Suay *et al.*, 2012). This large distribution is mentioned for example in *Alloxysta brevis* (Thomson, 1862), which initially described in Europe but later identified in USA as *Alloxysta megourae* (Ashmead, 1887). Therefore, distribution is not considered as an important character within the subfamily Charipinae.

According to our analysis, we conclude that the differences mentioned in the original description of *A. turcica* are neither sufficient nor some of them valid to differentiate *A. turcica* and *A. minuscula*. As a result, we synonymized here both species: *A. turcica* **new synonymy** of *A. minuscula*. Although we recommend that

conducting molecular and phylogenetic studies in the future can assist in clarifying the taxonomic status of these two species.

Author Contributions

Mar Ferrer-Suay: conceptualization, investigation, draft preparation, final review and edit. **Juli Pujade-Villar:** final review and edit, supervision. **Rachid T. Bouhraoua:** final review and edit, supervision. **Latifa Belhoucine-Guezouli:** final review and edit, supervision. **Jesús Selfa:** final review and edit, supervision.

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Data Availability Statement

The specimens listed in this study are deposited in USNM (Smithsonian National Museum of Natural History) and the Entomology Research Laboratory, Pamukkale University (PAU), Denizli, Türkiye and are available from curator, upon request.

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Ethics Approval

Insects were used in this study. All applicable international, national, and institutional guidelines for the care and use of animals were followed. This article does not contain any studies with human participants performed by any of the authors.

Conflicts of Interest

The authors declare that there is no conflict of interest regarding the publication of this paper.

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ارزیابی اعتبار گونه *Alloxysta turcica* Tataroğlu & Katılmış, 2023 (Hymenoptera: Cynipoidea: Figitidae: Charipinae)

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مکیده

Alloxysta turcica Tataroğlu & Katılmış 2023، که به تازگی از ترکیه توصیف شده است هم نام گونه‌ی *A. minuscula* Andrews 1975، معرفی می‌شود. این تصمیم بر اساس بررسی و تجزیه و تحلیل شواهد مورفولوژیک است که شباهت‌های قابل توجهی را بین این دو گونه نشان داده است. در این نوشتار، دلایل این بازنگری و تصاویری که این هم‌نامی را تایید می‌نماید ارائه شده است.

کلمات کلیدی: *Alloxysta*. Charipinae، ترکیه، ویژگی‌های مورفولوژیکی

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