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Unveiling Kieffer's concept of *Rhabdepyris pallidipennis* Kieffer, 1906 (Hymenoptera: Bethylidae)

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Abstract – *Rhabdepyris pallidipennis* Kieffer, 1906 (Hymenoptera: Bethylidae) is revised. In this study the species is re-examined, and its morphological and distributional patterns are discussed based on the original description. We propose to downgrade *Trichotepyris* syn. nov. to a junior subjective synonym of *Rysepyris* Kieffer, 1906, resulting in the new combination *Rysepyris pallidipennis* (Kieffer, 1906) comb. nov.

Key words – *Anisepyris*, Epyrinae, Hungary, Palaearctic Region, *Rysepyris*, taxonomy

INTRODUCTION

Rhabdepyris Kieffer, 1904 was one of the most generalised genera within Epyrinae (Hymenoptera: Bethylidae), originally described by Kieffer (1904) to encompass two species: *Rhabdepyris myrmecophilus* Kieffer, 1904 and *Rhabdepyris pallidinervis* Kieffer, 1904. Kieffer (1906) later divided *Rhabdepyris* into two subgenera, *Rhabdepyris* s. str. and *Trichotepyris* Kieffer, 1906, the former being characterised by glabrous eyes and simple tarsal claws, while the latter by setose eyes and bifid tarsal claws.

In the same work, Kieffer (1906) described seven species belonging to the subgenus *Trichotepyris*; *Rhabdepyris pallidipennis* Kieffer, 1906 was one of them. Subsequently Kieffer (1914) downgraded *Trichotepyris* to a junior synonym of *Rhabdepyris* s. str. Muesebeck & Walkley (1951) designated *Rhabdepyris pallidipennis* as the type species of the subgenus *Trichotepyris*. Evans (1965) re-established *Trichotepyris* as a valid subgenus, emphasising that he had not examined the type species, and noting that species of *Trichotepyris* exhibited trends towards larger size, bright metallic colours, and blotching on the wings.

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Waichert & Azevedo (2009) redefined *Rhabdepyris* based on a phylogenetic analysis of morphological characters. They concluded that *Trichotepyris* was identical with *Anisepyris* Kieffer, 1905, and accordingly downgraded it to a junior synonym of the latter genus. They, however, also did not examine the type species, but based their concept of *Trichotepyris* on Evans (1965), stating that specimens were large and metallic, characteristics found in several species of *Anisepyris*. This nomenclatural act was corroborated by subsequent morphological analyses of Alencar & Azevedo (2013).

In recent years, Azevedo *et al.* (2018) proposed the synonymisation of *Rhabdepyris* with *Epyris* Westwood, 1832, and maintained *Trichotepyris* as a junior synonym of *Anisepyris*. Barbosa & Azevedo (2018) revised *Anisepyris* and reported that they could not find useful information about *Rhabdepyris pallidipennis*, hence the species was excluded from their work. Barbosa (2021) proposed a morphology-based phylogeny for *Anisepyris* but did not mention the species in question. Colombo *et al.* (2022) proposed the so far most robust phylogeny for Epyrinae, and again stated that the type species of *Trichotepyris* is of unknown identity.

Recognising the significance of *Rhabdepyris pallidipennis* as the type species of *Trichotepyris*, along with the complex taxonomic history of these lineages over the years, the objective of the present study is to explore and discuss the morphological characters provided in the original description of this species.

MATERIAL AND METHODS

The holotype of *Rhabdepyris pallidipennis* is supposed to be deposited in the Hungarian Natural History Museum (HNHM), Budapest, Hungary (Gordh & Móczár 1990). However, it has been considered lost for several decades. The second author visited this collection recently and examined virtually all specimens of Bethylidae in an attempt to find the type material in concern, however, without any success. Consequently, the discussion below is based on the original description of this species (Kieffer 1906) and the supplementary information provided by Kieffer (1914).

The terminology of the integument generally follows Harris (1979), that of the external morphology Lanes *et al.* (2020).

RESULTS

Taxonomy

Genus *Rysepyris* Kieffer, 1906

Rysepyris Kieffer, 1906: 341. Type species: *Holepyris numicidus* Kieffer, 1906, by subsequent designation (Kieffer 1914: 397).

Trichotepyris Kieffer, 1906: 376. Type species: *Rhabdepyris pallidipennis* Kieffer, 1906, by subsequent designation (Muesebeck & Walkley 1951: 729). **Syn. nov.**

Misepyris Kieffer, 1913: 108. Type species: *Holepyris remotus* Kieffer, 1911, by subsequent designation (Kieffer 1914: 398). Synonymised by Colombo *et al.* (2022: 21).

Parepyris Brèthes, 1913: 87. Type species: *Parepyris sylvanidis* Brèthes, 1913, by original monotypy. Synonymised by Colombo *et al.* (2022: 21).

***Rysepyris pallidipennis* (Kieffer, 1906) comb. nov.**

Rhabdepyris pallidipennis Kieffer, 1906: 382–383. Syntype(s): ♀, Hongrie [= Hungary], Budapest; HNHM? (not found).

Rhabdepyris pallidipennis: Kieffer (1908: 32) (catalogue), Kieffer (1914: 348, 351) (redescription), Bernard (1939: 165) (checklist and new record for Spain), Muesebeck & Walkley (1951: 729) (designated as type species of *Rhabdepyris*), Evans (1964: 92) (taxonomic list); Evans (1965: 79) (revalidation of the subgenus *Trichotepyris*), Macek *et al.* (2007: 32) (new records for Czech Republic and Slovakia).

Anisepyris pallidipennis: Waichert & Azevedo (2009: 23) (new combination), Barbosa & Azevedo (2018: 8, 255) (as of uncertain placement), Colombo *et al.* (2022: Table S1) (checklist).

Diagnosis (based on the original description) – Female. Length 3.0 mm. Body black. Forewing hyaline or yellowish. Antenna, legs and mandible brown. Head subrounded. Frons coriaceous, with indistinct punctures. Eye densely setose, height of eye about as long as vertex-ocular line. Pedicel obconical. Flagellomere I as long as flagellomeres II–V together. Thorax coriaceous and opaque. Dorsal pronotal area twice as long as wide. Notauli converging posterad; mesoscuto-scutellar sulcus wide and deep. Metapectal-propodeal disc transversely ridged, with three parallel dorsal ridges, posterior propodeal projection absent.

Distribution – Europe (Hungary, Czech Republic, Slovakia, Spain) (Bernard 1939, Macek *et al.* 2007).

DISCUSSION

The presence or absence of a sulcus between the mesoscuto-scutellar foveae is likely the most crucial taxonomic character for recognising the genera of Epyrinae (Colombo *et al.* 2022). In the original description of *Rysepyris pallidipennis* comb. nov., Kieffer (1906: 382) emphasised wide and deep mesoscuto-scutellar sulcus. Among the 19 currently recognised genera of Epyrinae, only eight exhibit an evident sulcus between the mesoscuto-scutellar foveae: *Anisepyris*, *Austrepyris* Colombo, Tribull & Azevedo, 2022, *Chlorepyris* Kieffer, 1913, *Disepyris* Kieffer, 1905, *Holepyris* Kieffer, 1904, *Laelius* Ashmead, 1893, *Rysepyris*, and the fossil genus *Gloxinius* Colombo & Azevedo, 2021 (Colombo *et al.* 2022).

The second pivotal taxonomic character provided by Kieffer (1906: 182) is the pilosity of the eyes. The densely setose eyes of the species in concern were so distinctive that Kieffer (1906) used them to differentiate *Trichotepyris* from *Rhabdepyris* s. str. Among the above listed genera of Epyrinae possessing a mesoscuto-scutellar sulcus, only *Anisepyris*, and several species of *Disepyris*, *Holepyris*, and *Rysepyris* exhibit this character state.

The original description of the species (Kieffer 1906) also stressed that the length of the eye was equal to the distance between the eye and the margin of the occiput. Consequently, the eyes cannot be remarkably large, as observed in *Disepyris* and *Holepyris*, which, in turn, occupy almost all sides of the head (Azevedo *et al.* 2018, Colombo *et al.* 2022). Thus, only two genera remain to potentially accommodate such a species: *Anisepyris* or *Rysepyris*. However, most of *Anisepyris* also have large eyes similarly to the condition found in *Disepyris* and *Holepyris* (see Barbosa & Azevedo 2018).

Most recent authors (Azevedo *et al.* 2018, Barbosa & Azevedo 2018, Colombo *et al.* 2022) place the species into *Anisepyris*, following the proposal of Waichert & Azevedo (2009). *Anisepyris*, however, is a Pan-American genus with over 250 species, and if *Rhabdepyris pallidipennis* indeed belongs to this genus, then it is the single member of the genus distributed in the Palaearctic Region. Although there are no documented records of *Anisepyris* hosts, it is probable that similarly to members of other genera of Epyrinae they parasitise beetles (Azevedo *et al.* 2018). This raises the possibility of an anthropogenic introduction of *Anisepyris* species into the Palaearctic Region through the transportation of infested wood, as it was documented for other Bethylidae, such as the American species *Laelius utilis* Cockerell, 1920 that was detected in Sweden in imported timber (Hedqvist 1975) or *Cephalonomia tarsalis* Ashmead, 1893, an apparently cosmopolitan species associated with stored products (Gordh & Móczár 1990). Still, as no species of *Anisepyris* has ever been recorded from any regions other than the New World, it seems unlikely that *Rhabdepyris pallidipennis* pertains to a species of *Anisepyris*.

We found specimens in various European museums that were identified as *Rysepyris pallidipennis* comb. nov. The species was also included in checklists of local faunas, e.g. by Bernard (1939) and Macek *et al.* (2007) for Spain, Czech Republic and Slovakia, respectively. These identifications were probably based on the characters mentioned in the original description of the species. These specimens mostly represented species of *Rysepyris*, in accordance with the analysis of morphological characters presented above. As a summary, based on both morphological and biogeographical considerations, *Rhabdepyris pallidipennis* most probably pertains to the genus *Rysepyris*, and accordingly the combination *Rysepyris pallidipennis* comb. nov. is proposed. Unfortunately, the type material of this species has apparently been lost. Although it is formally transferred to *Rysepyris* here, the identity of the species remains uncertain, and it should be fixed by selecting a neotype.

It is important to note that among the seven species originally described in *Trichotepyris* by Kieffer (1906), two were subsequently transferred to *Chlorepyris*: *C. fasciatus* (Kieffer, 1906), and *C. hemipterus* (Kieffer, 1906); one to *Dolus* Motschulsky, 1863: *D. retteri* (Kieffer, 1906); one to *Epyris*: *E. fuscipes* (Kieffer, 1906); one to *Holepyris*: *H. fuscipennis* (Kieffer, 1906); one to a genus of Mesitiinae, *Bradepyris* Kieffer, 1905: *B. proximus* (Kieffer, 1906); and finally, *Rysepyris pallidipennis* comb. nov., prior to this paper, to *Anisepyris*. This indicates that *Trichotepyris* was likely a poorly delimited genus composed of species from various other genera, as reported by Evans (1965) and Waichert & Azevedo (2009). Additionally, in the key of Kieffer (1906), the species closest to *Rysepyris pallidipennis* comb. nov. is *Holepyris fuscipennis*, further supporting the evidence that the species discussed here is a *Rysepyris*, as both genera were considered synonymous for almost 60 years and were only separated through molecular analyses, given their high degree of morphological similarity (see Colombo *et al.* 2022).

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