A new genus of tabanoid flies from the Upper Miocene of Styria (Diptera, Pelecorhynchidae or Oreoleptidae)

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Abstract. – A new genus and species of tabanoid flies are described and figured from an isolated forewing from the Late Miocene (Pannonian) of Styria, Austria. *Paleoglutops styriensis* n. gen., n. sp. is attributable to either the Pelecorhynchidae or the Oreoleptidae, two rather small families of Tabanoidea. Although most features are in agreeance with Pelecorhynchidae, these are symplesiomorphies and therefore familial assignment is left open. Nonetheless, the genus is characterized by unique putative autapomorphies in the relative positions of the veins Sc, R_1, R_{2+3}, and R_{4+5}.

Résumé. – **Un nouveau genre de mouches tabanoïdes du Miocène supérieur de Styrie (Diptera, Pelecorhynchidae or Oreoleptidae)**. Un nouveau genre et une nouvelle espèce de mouches tabanoïdes sont décrits et figurés, sur la base d'une aile antérieure isolée du Miocène supérieur (Pannonien) de Styrie, en Autriche. *Paleoglutops styriensis* n. gen., n. sp. peut être attribué soit aux Pelecorhynchidae soit aux Oreoleptidae, deux familles plutôt petites de Tabanoidea. Bien que la plupart des caractéristiques soient en accord avec les Pelecorhynchidae, il s'agit de symplésiomorphies et l'attribution familiale est donc laissée ouverte. Néanmoins, le genre est caractérisé par des autapomorphies putatives uniques dans les positions relatives des nervures Sc, R_1, R_{2+3} et R_{4+5}.

Keywords. – Austria, Brachycera, Pannonian, Tabanomorpha, Tortonian, taxonomy.

The family Pelecorhynchidae Enderlein, 1922, is a small group of Tabanomorpha, with only five extant genera: *Pelecorhynchus* Macquart, 1850, *Coenura* Bigot, 1857, *Bequaertomyia* Brennan, 1935, *Heterostomus* Bigot, 1857, and *Glutops* Burgess, 1876. The family is distributed in the Australian, Neotropical, Nearctic, and eastern Palaearctic regions. Species of *Pelecorhynchus* are currently known in southeastern Australia, including Tasmania, and the central and southern regions of Chile, while *Heterostomus* and *Coenura* are Chilean (Coscarón *et al.*, 2013; González *et al.*, 2023). At the other polar end, the genera *Bequaertomyia* is found in the Nearctic, while *Glutops* is

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Nearctic and eastern Palaearctic. This bipolar distribution of the family suggests that it was more widely distributed in geological history and has experienced significant extinction. WIEGMANN *et al.* (2011: Fig. S3), hypothesized that the lineage that gave rise to Pelecorhynchidae diverged nearly 150 million years ago, further emphasizing the relict nature and distribution of extant species. Pelecorhynchidae are sister to the combined lineage of Athericidae, Oreoleptidae, and Tabanidae (KERR, 2010) and many features of pelecorhynchids are symplesiomorphic across all of these families. Like Pelecorhynchidae, the Nearctic monospecific tabanomorphan family Oreoleptidae Zloty, Sinclair & Pritchard, 2005, is an obvious relict and likely has a deep history obscured by extinction. In fact, the forewing venation of this family is quite similar, symplesiomorphically, to that of the pelecorhynchid genus *Glutops*.

To date no fossil flies have been attributed to Pelecorhynchidae or Oreoleptidae. Here we describe a fossil forewing of a new genus of flies from the Late Miocene of Paldau in the Styrian Basin, Austria, and which has a distinctive venation, greatly resembling that of *Glutops*.

MATERIAL AND METHODS

The wing was recovered from the Upper Miocene (Lower Pannonian = Lower Tortonian, equivalent global stage) fluvio-lacustrine deposits of Paldau, eastern Styrian Basin (GROSS *et al.*, 2007). During the Late Miocene the Central Paratethys became restricted to the Pannonian Basin, of which the Styrian Basin is situated at its western margin (GROSS *et al.*, 2007). A long-lived, successfully freshening lake appeared, Paleolake Pannon, during this stage (PILLER *et al.*, 2007). Lake level fluctuations lead to repeated interchanges between Paleolake Pannon and neighboring terrestrial environments. A complete fluvial fining-upward cycle of a gravel-bed to gravel-sand meandering river is exposed at the gravel pit of Paldau and it is from this outcrop that the current fossil wing was found. Further accounts of the geological setting are outlined by ENGEL & GROSS (2008, 2009). For the taxonomic descriptions, we follow the wing venation terminology of KERR & SINCLAIR (2017: Fig. 37.8).

SYSTEMATIC PALAEONTOLOGY

Family **Pelecorhynchidae** Enderlein, 1922
or **Oreoleptidae** Zloty, Sinclair & Pritchard, 2005

Paleoglutops n. gen.

https://zoobank.org/NomenclaturalActs/EF99DC09-DC9F-4187-B523-F82DC44D0CF9

Type species. – *Paleoglutops styriensis* n. sp.

Diagnosis. – Wing characters only: C continuing around wing, branches of R and M diverging to apical wing margin; cell r_1 open; apices of Sc, R_1, and R_{2+3} distant along anterior wing margin; R_1 reaching apical fifth of wing; R_{2+3} nearly reaching wing apex; R_4 ending posterior to wing apex (unique characters, putative autapomorphies); R_4 and R_5 bent posteriorly; m_{3+4}-cua ending on stem of M_{3+4}; branches of M joining wing margin far below apex of wing, without composite 'diagonal vein'; cell cup narrowly open at wing margin.

Etymology. – The new genus-group name is a combination of the Ancient Greek adjective πᾰ̈λαιός (*pălaiós*, meaning, "old") and the generic name *Glutops* Burgess. The gender of the name is considered masculine.

Paleoglutops styriensis n. sp. (fig. 1–2)

https://zoobank.org/NomenclaturalActs/6a12b58a-e32a-4c5a-bd70-ee259c3519b7
Rhagionidae? Engel & Gross, 2008: 56-57, Fig. 4c.

Type material. – Holotype: UMJG&P 204.155 (a nearly complete forewing), deposited in the Landesmuseum Joanneum (UMJ), Graz, Austria.

Type locality and horizon. – Late Miocene: Early Pannonian, approximately 11.3 Ma, Paldau (46°56′17″N, 15°48′37″E; district Feldbach), Paldau Formation, Styrian Basin, Austria.

Diagnosis. – As for the genus (*vide supra*).

Description. – Wing yellow-brown with a dark pterostigma at apex of Sc and a darkened zone apically, encompassing apical parts of cells r_1, r_{2+3}, r_4, r_5, m_1, m_2, m_3, m_4, and apex of anal lobe; preserved part of wing 6.7 mm long, wing estimated at 7.0 mm long, 2.6 mm wide; Sc straight, apex of Sc nearly at midwing, distance between apices of Sc and of R_1 2.5 mm; distance between apices of R_1 and R_{2+3} 1.3 mm; apex of R_1 situated at apical fifth of wing, R_1 curved posteriorly at apex; apex of R_{2+3} situated near wing apex, R_{2+3} slightly curved posteriorly; stem of R_{4+5} 1.9 mm long; fork of R_{4+5} slightly basad level of m_2-m_3; R_4 and R_5 elongate and curved posteriorly, with their apices situated posterior to wing apex; cell r_4 long and narrow; r_{4+5}-m_{1+2} situated midway between base of M_{1+2} and its fork; cell *d* (discal) 2.1 mm long, 0.3 mm wide; crossvein m_{3+4}-cua meeting M_{3+4} slightly basad its fork; CuA and CuP touching at posterior margin of wing; anal lobe 0.6 mm wide.

Etymology. – The specific epithet combines the name of the Austrian Province from which the fossil originates and the Latin suffix *–ēnsis*, a suffix forming an adjectival toponym.

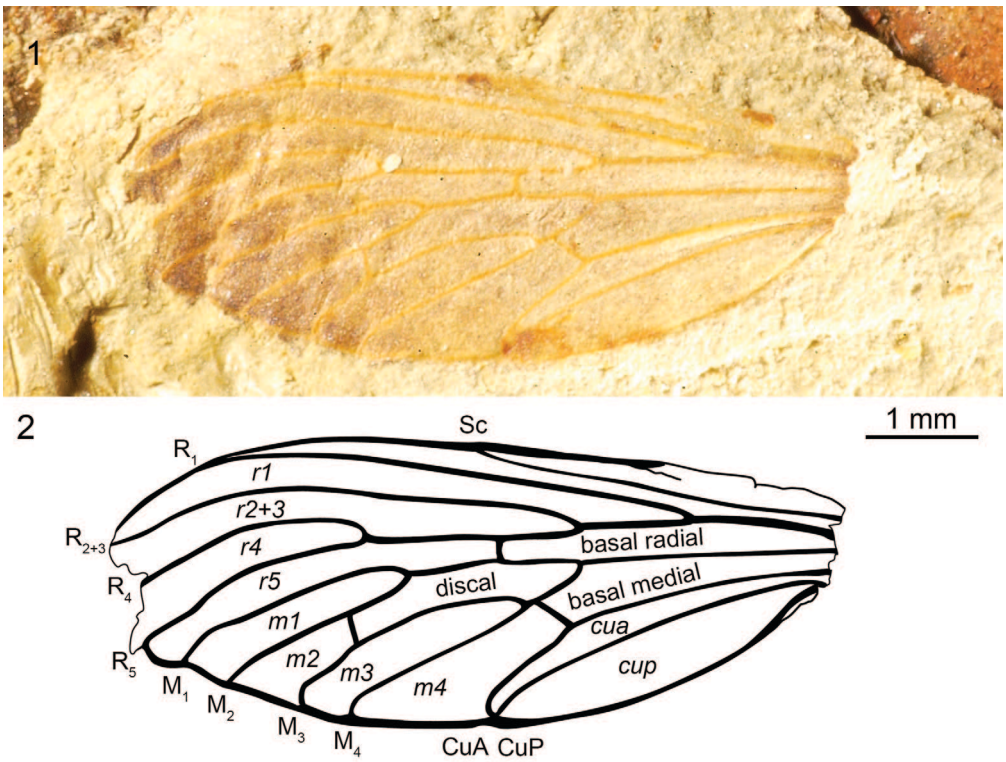

Fig. 1–2. – *Paleoglutops styriensis* n. gen., n. sp., holotype UMJG&P 204.155. – **1**, Photograph. – **2**, Line drawing. Both images to the same scale. Scale bar = 1 mm.

DISCUSSION

The venation exhibited by the current fossil is of a generalized 'tabanid' form and found across several families, *videlicet* Pelecorhynchidae, Oreoleptidae, Tabanidae, Athericidae, Rhagionidae, Xylophagidae, Xylomidae, Therevidae, Vermileonidae, Asilidae, and Mesozoic Archisargoidea. Attribution of the fossil is challenging given the absence of body characters but a refinement of its placement is possible to a remarkable degree.

The Asilidae and Archisargoidea have the apices of R_1 and R_{2+3} close to each other *versus* distant in the new fossil. Vermileonidae have cell m_3 closed or strongly narrowed at the wing margin, which is not the case here and so this family can be excluded. Likewise, the families Therevidae, Tabanidae, and Rhagionidae (except Spaniinae) have the R_1 ending close to the apex of Sc, rather than far distal as it is in the current fossil (JAMES, 1981a). The Xylophagidae and Athericidae have this same character plus the apex of R_{2+3} is close to that of R_1, and quite different from the quite distant positions of these veins in the Paldau wing (JAMES, 1981b; FACHIN *et al.*, 2024). Xylomidae have the apices of R_1 and R_{2+3} distant from each other but crossvein r-m is near the base of cell d rather than nearly midway as in the fossil here (fig. 1) (JAMES, 1981c; WEBB, 1984; YANG & NAGATOMI, 1993; FACHIN & DE SOUZA AMORIM, 2014). There are more similarities, albeit most plesiomorphically, with Rhagionidae. The rhagionine genus *Atherimorpha* White, 1915 and the Spaniidae (or subfamily Spaniinae of Rhagionidae depending on the classification adopted) have R_1 rather distant from Sc, but significantly less so than in the Paldau fossil (COSCARÓN & COSCARÓN, 2008). Additionally, *Spania* Meigen, 1830, *Spaniopsis* White, 1914, *Spatulina* Szilády, 1942, and *Ptiolina* Zetterstedt, 1842, have the apex of R_{2+3} close to that of R_1 (FERGUSON, 1915; HARDY & MCGUIRE, 1947; NAGATOMI, 1982; YANG *et al.*, 1997), while *Archicera* Szilády, 1934, and *Litoleptis* Chillcott, 1963, have the apices of R_1 and R_{2+3} more distant than in *Spania* but much less so than in the new fossil (Fig. 1). Furthermore, their R_{2+3} is strongly curved anteriorly (PAPP, 2018), which is definitely not the case in the wing from Styria. Moreover, *Litoleptis* has a simple M_{3+4} (GRIMALDI, 2018), while these diverge in the current fossil (fig. 1).

Two families are clearly most similar to the Paldau wing, these being the Oreoleptidae and Pelecorhynchidae. In Oreoleptidae the apices of R_1 and R_{2+3} are distant from each other, crossvein r-m is nearly midway along cell *d*, and R_4 and R_5 are nearly straight, as in the new fossil (ZLOTY *et al.*, 2005: Fig. 2). Nevertheless, the distances between the apices of Sc, R_1, and R_{2+3} are much smaller in *Oreoleptis* than in the current fossil. Some Pelecorhynchidae fit well with the new fossil in the distinctly distant apices of Sc, R_1 and R_{2+3}. This is, however, not the case in *Pelecorhynchus*, in which the apex of R_1 is close to that of Sc (MACKERRAS & FULLER, 1941; LLANOS *et al.*, 2015). In *Coenura*, the apex of R_1 is more distant from that of Sc than in *Pelecorhynchus*, but R_4 forms a strong anterior curve (GONZÁLEZ *et al.*, 2023), all of which distinguishes these genera from the Paldau wing. Likewise, this is also the case for *Bequaertomyia*. *Heterostomus* shares with the new fossil R_4 and R_5 terminating near the wing apex and in crossvein m_{3+4}-cua meeting the stem of M_{3+4}, but this genus differs from the fossil in that R_{2+3} forms a strong sigmoidal curve (NAGATOMI, 1985: Fig. 1; COSCARÓN *et al.*, 2013: Fig. 13). The genus *Glutops* has the apices of Sc, R_1, and R_{2+3} distinctly distant, *plus* R_{2+3} and R_4 proceeding straight to margin, as in the Paldau fossil (Fig. 1) (KRIVOSHEINA, 1971). Nonetheless, the new fossil differs from *Glutops* in that R_4 is bent posteriorly and terminates into the wing margin posterior to the wing apex rather than R_4 and R_5

embracing the wing apex, the apex of R_1 much more distal and far from that of Sc, and the apex of R_{2+3} much closer to the wing apex. Two further, but perhaps less important, differences are that crossvein m_{3+4}-cua meets M_{3+4} rather than M_4, and cell *cua* is closed rather than open, albeit greatly narrowed at the margin (fig. 1) (Burgess, 1876: Fig. 2c; Nagatomi, 1955: pl. 6, fig. 1; Teskey, 1970, 1981: Fig. 30-3; Nagatomi & Saigusa, 1970: pl. 4; Krivosheina, 1971: Fig. 2).

Glutops and *Oreoleptis* have quite similar venations, the main difference being that cell *cua* is open in the former *versus* closed and petiolate in the latter. The separation between Oreoleptidae and Pelecorhynchidae is based on other body characters, not available in the current fossil. Most likely the fossil belongs to the Pelecorhynchidae but available wing features are plesiomorphies for this clade and so we hesitate in making a definitive assignment. Nonetheless, it represents an interesting element in the Pannonian fauna of Styria.

Conclusion

The new fossil can be attributed to a new genus, on the basis of the presence of unique characters, putative autapomorphies as defined in the diagnosis. It is not possible to accurately attribute it to the Oreoleptidae rather than to the Pelecorhynchidae, or even another extinct family. This discovery suggests that this type of fly was more diverse and widespread in the Miocene than today. The pelecorhynchid larvae are known to live in damp margins of swamp areas, feeding on earthworms. The larvae of *Oreoleptis* Zloty, Sinclair & Pritchard, 2005 are aquatic and predate on mayfly larvae. *Paleoglutops miocenicus* n. gen., n. sp. was possibly also a predator living in humid habitats.

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