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# SCIAROKEROPLATINAE, A NEW SUBFAMILY OF KEROPLATIDAE (DIPTERA)*

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A new subfamily of the family Keroplatidae is established through the description of *Sciarokeroplatus* gen. n. (type species *S. pileatus* sp. n.). The type species is described from Taiwan and from the Shaanxi province in China. An analysis of characters in comparison to those of the other families of the superfamily is given. With 14 original figures.

Key words: Keroplatidae, Sciarokeroplatinae, new subfamily, *Sciarokeroplatus*, taxonomy, Oriental region

During a study trip in 2000 to the Division of Entomology, National Museum of Natural Science, Taichung, Taiwan, one male specimen of Sciaroidea had been found in their collection and was loaned to the senior author. The junior author inspected that specimen in the HNHM during his visits in 2001 and 2002 and both authors recognised its peculiarities. Subsequently the junior author borrowed two males of the same species, through the courtesy of Dr. WOLFGANG SCHACHT (Zoologische Staatssammlung, München, Germany), captured in a locality close to that of the former specimen. These specimens have been found by Dr. HANS-GEORG RUDZINSKI in the collection of Sciaridae. And finally, a fourth specimen from South China was found in the materials of the Moravian Museum. A thorough study of all these specimens revealed their characters, which induced us to describe them belonging to a new subfamily.

The type specimens are in the collections of the National Museum of Natural Science, Taichung, Taiwan (NMNS), the Zoologisches Staatssammlung, München, Germany (ZSMC) and of the Moravian Museum, Brno, Czech Republic (MMBC).

## **Sciarokeroplatus** L. PAPP et ŠEVČÍK, gen. n.

Type species: *Sciarokeroplatus pileatus* L. PAPP et ŠEVČÍK, sp. n.

Gender: masculine.

The terminology for the structure of the head follows that used for *Macrocera* by MATILE (1990), but our use of this terminology should not be regarded as a definite acceptance of homologies for the head parts of *Macrocera*. Frons (postfrons) short, cerebral sclerite large, occupying all dorsal part of head. There is a definite furrow (suture) between postfrons and cerebral sclerite (? plus occiput) (Fig. 1). This "vertical" suture is placed rather anteriorly: it runs below dorsal margin of eyes. Consequently, head seems "capped", this is why the specific epithet of the type species is *pileatus*. No ocelli. No eye-bridge above the antennae. A pair of small shallow emarginations are discernible above scape (more on holotype, less seen on paratype), whose function is unknown but they definitely do not correspond to the ocelli. Postgena (? occiput + postgena) large, bulging, distance of left and right halves only 0.04 mm above foramen. Foramen small.

Face extremely short, similar to that of *Macrocera* spp. Clypeus (Fig. 2) largely pentagonal, high with some medium-long setae.

Antenna with 14 flagellomeres (Figs 1–2), scape and pedicel more or less cuboid. Flagellomeres simple.

Mouthparts very small, labella small, fleshy. Palpus four-segmented (Fig. 2): basal segment short, second segment larger and thick, third and fourth segments long and thin cylindrical, ventrally with stumpy sensilla.

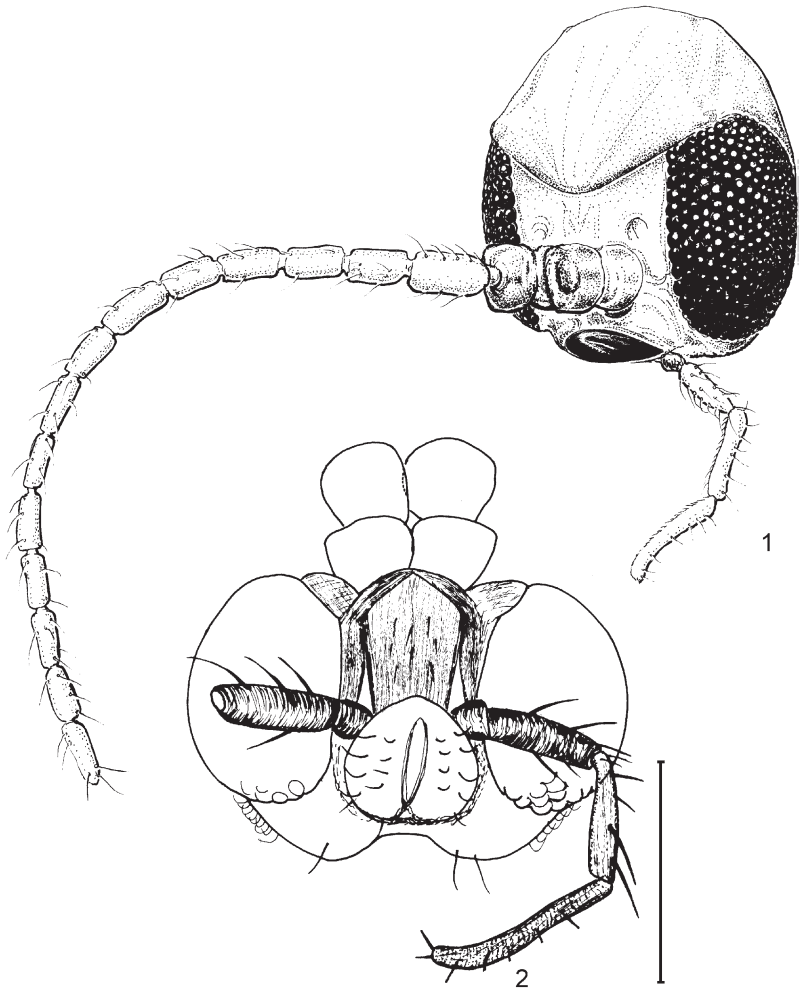
Wing membrane microtrichia even but wholly irregular (Figs 3–4). No strong costal fringe. Costa thick, reaches 1/3 of distance between R5 and M1 (wing vein terminology follows KRZEMIŃSKI & EVENHUIS 2000). Radial veins dorsally with long setae. Vein R4 present (Fig. 3). Cross-vein M–Cu, connecting common trunk of Rs and M1+2 stem vein with base of common trunk of M3 and Cu1, discernible only as a colourless fold (Fig. 4). Base of M2 faint. M1–M2 fork apparently emerges from Rs (due to presence of a radiomedial fusion in which crossvein R–M is obliterated), M3 emerges from Cu1. Cu2 distinct (Figs 3–4) and runs rather far from Cu1. A1 long but also A2 discernible to about 4/5 distance to anal margin. Base and insertion of the two anal veins are completely separated. A distinct alula present between anal angle and wing scale. Alula bears long setulae.

Stalk of halter medially with a subdorsal peg. Knob large, globose.

Femoral and tibial setulae simple, fine and rather long, and not ordered into rows. Coxae remarkably short, the mid and hind coxae about two-thirds as long as the fore coxa. The length of hind coxa about two-thirds of the height of the laterotergite. Tibial spurs 1+2+2, well developed and hairy. Fore tibia anteroapically with a large depressed or evenly emarginated area (Fig. 5) with numerous small pointed setae, similar to Sciaridae, but much more numerous and not ordered into rows as in Sciaridae or in other families of Sciaroidea.

No anterior or posterior combs of small thornlets on mid and hind tibiae. Tarsal claws simple, normal, basal half almost straight. Well-developed pulvilli present; they are as hairy as empodium (Fig. 6).

Abdomen with 8 normal preabdominal segments. Both tergites and sternites broad, in each segment tergite and sternite almost meet laterally, i.e. intervening membranous area rather small. Spiracle pairs 1–7 are situated in this membrane. Tergite 8 transverse, only half as long as sternite 8 or tergite 7. Tergite 9 shorter than long, rounded apically. Sternite 9 very short (Fig. 7).




**Figs 1–2.** *Sciarokeroplatus pileatus* sp. n., type males. 1 = head of holotype sublaterally (as if left flagellum were removed, del. A. Szappanos); 2 = head of a paratype, front view, perpendicular to clypeus. Scale: 0.5 mm for Fig. 1, 0.2 mm for Fig. 2.

Male genitalia extremely simple. Tergite 9 medium-sized, simple. Cerci large and vertical, fleshy with small setulae only (Figs 9–10). Left and right gonocoxites not fused medially (Fig. 7), gonocoxite each similar to a punt with medial seat, i.e. the two medial edges of gonocoxite connected by a concave sclerite. Gonocoxal apodemes not particularly long. Gonostylus similar to a thumb of a glove, with setae and medial apical apex with two flat sharp tooth-like projections (Figs 8, 12). Aedeagus (Fig. 11) simple, comparatively rather small, mostly membranous, apex truncated, with short hairs. Parameres small, weakly sclerotized.

## DISCUSSION

We cannot find a close relative of *Sciarokeroplatus* among the known keroplatids. Of the fossil Keroplatidae listed by EVENHUIS (1994: 137–143), only *Schlueterimyia* MATILE, 1981 (type species *S. cenomanica* MATILE, 1981, Upper Cretaceous) deserves more attention (*Kelneria* MATILE, 1979 is a "true" member of the Macrocerinae, cf. MATILE 1981: fig. 51), and is not closely related, nor are other fossil genera that are referable to the subfamily Keroplatinae). There is no dorsal row of setae on the hind tibia of *Sciarokeroplatus*, as in *Schlueterimyia*. Unfortunately, there is no information on the alula or the head structure of the fossil genus. The form of the wing is rather similar, but the connections of veins on the basal part of the wing are slightly different; vein A2 of *Schlueterimyia* must be much weaker than that of *Sciarokeroplatus*, and, on the other hand, vein A1 of *Schlueterimyia* is stronger and reaching wing margin. Vein Sc is longer in *Sciaro-*

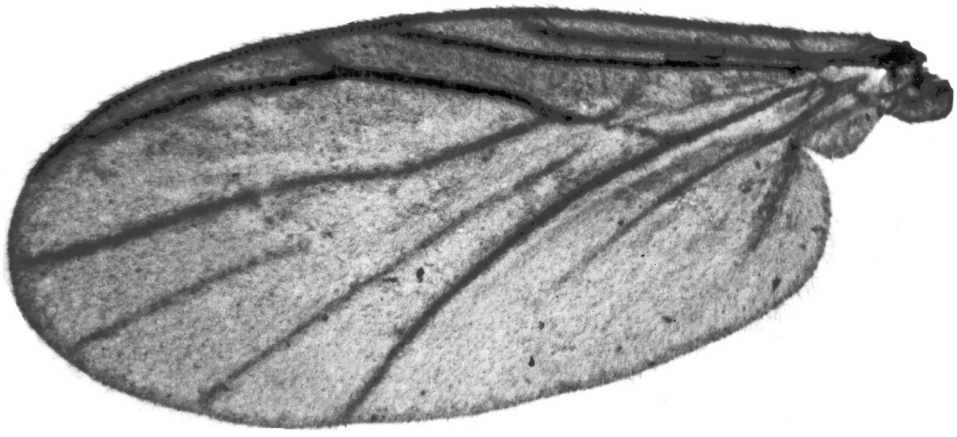
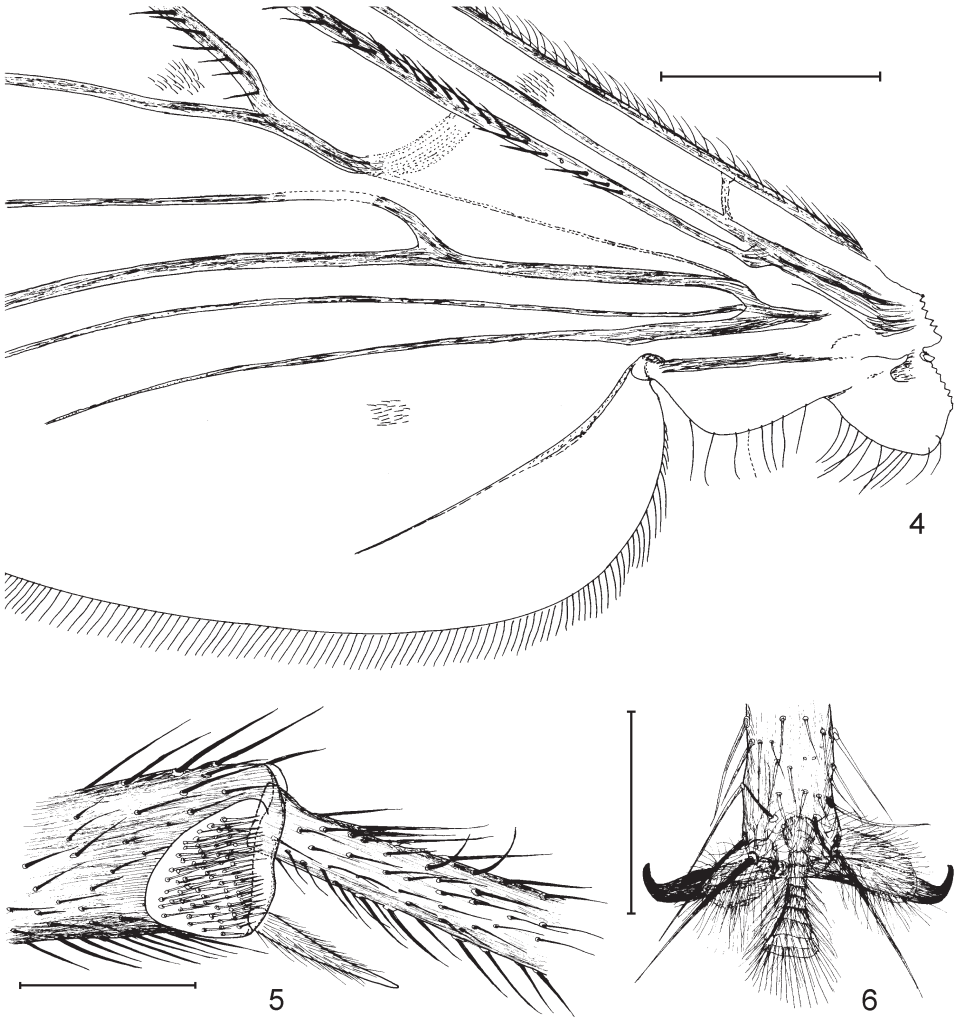


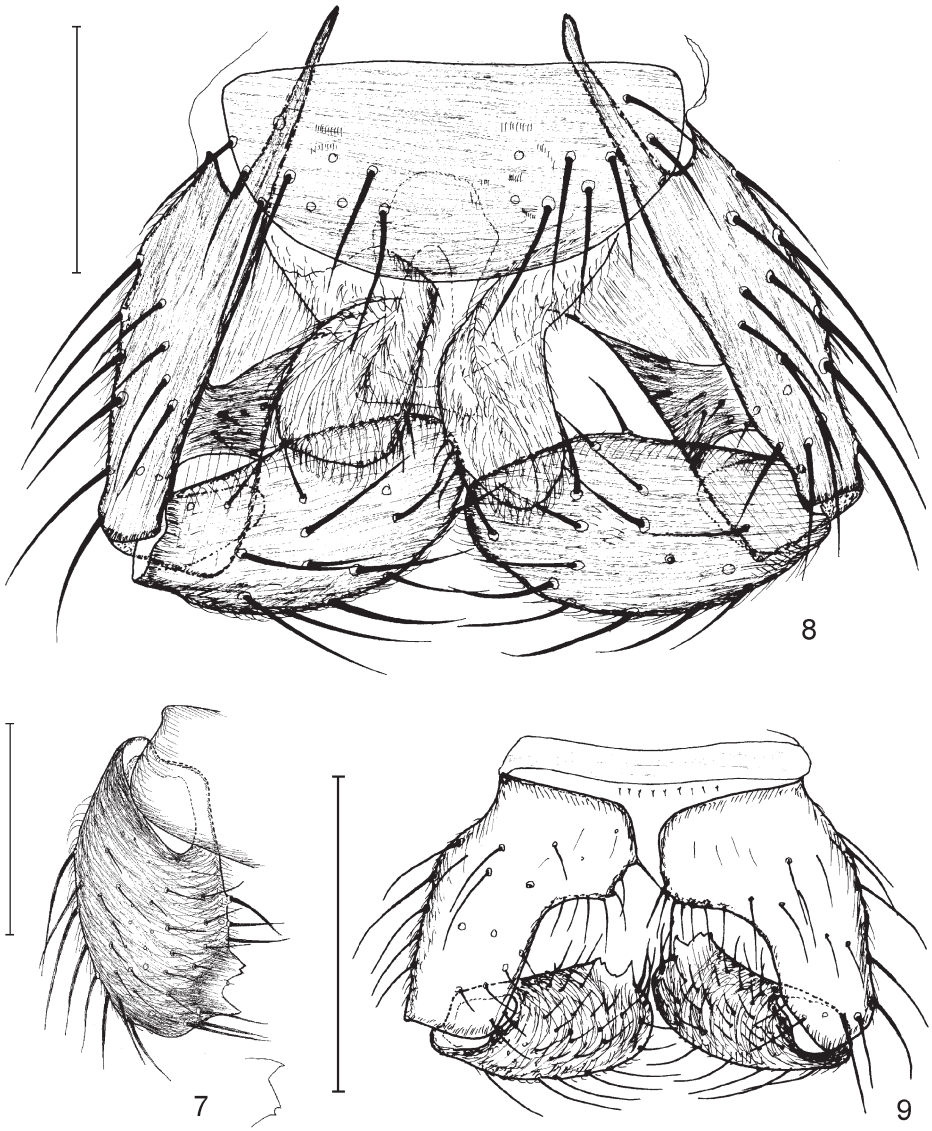
**Fig. 3.** *Sciarokeroplatus pileatus* sp. n., paratype male. 3 = photo of left wing dorsally

*keroplatus* reaching behind the R–M fusion. Although pulvilli of *Schlueterimyia* are really well developed, its claws are as small as in other Macrocerinae, while claws of *Sciarokeroplatus* are indeed large (Fig. 6). We do not want to stress the importance of differences in size, but body length of *Schlueterimyia* must be about 5.0 mm, i.e. about double that of our fly. We also compared our flies to some fossil taxa of Bibionomorpha and Anisopodomorpha (see KRZEMIŃSKI 1992), which do




**Figs 4–6.** *Sciarokeroplatus pileatus* sp. n., paratype male. 4 = basal portion of wing, in higher magnification, 5 = apex of fore tibia, inner (medial) view, 6 = apex of fore tarsus, ventral view. Scales: 0.4 mm for Fig. 4, 0.1 mm for Figs 5–6

not seem to be closely related. The recently described fossil genus *Hegalari* BLAGODEROV et ARILLO, 2002 (type species *H. antzinako* BLAGODEROV et ARILLO, 2002, Lower Cretaceous) is similar to *Schlueterimyia*, but it has an even shorter vein Sc, and relatively long coxae. There is, however, no mention in the




**Figs 7–9.** *Sciarokeroplatus pileatus* sp. n., paratype male, genitalia. 7 = gonostylus in ventral view (Taiwan paratype), 8 = genitalia in dorsal view, 9 = ventral view. Scale: 0.2 mm for Fig. 9, 0.1 mm for the others

original description by BLAGODEROV and ARILLO (2002) of the alula, basal part of wing, ocelli or empodia.

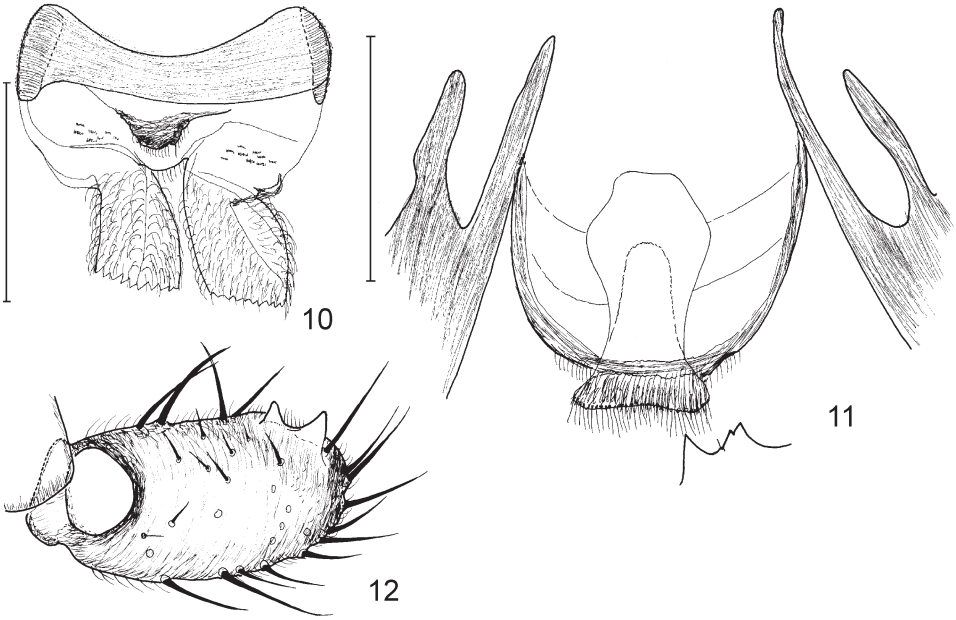
More comparison to other higher taxa is given under the description of the subfamily.

## **Sciarokeroplatus pileatus** L. PAPP & ŠEVČÍK, sp. n.
(Figs 1–14)

Holotype male (NMNS): Taiwan: Nantou, Nanhuashan, 6/V/1992, Yang & Huang, Sweeping Net – 1447–1198 [glued on tip of a pointed card].

Paratypes: 2 males (ZSMC): Taiwan, N Nantou Co., Road No. 14, NE Puli, Yuanfeng to Taroko NP, cca 24°07'N / 121°16'E, 2700–3000 m, 11. 5. 2001, leg. W. Schacht et al. [in alcohol, one of them dissected, its right hind tibia and tarsi, as well as left 3 apical flagellomeres were missing]. 1 male (MMBC): China, Shaanxi Province, Qinling Mts., 1000–1300 m, Xunyangba (6 km E), 23.5.–13.6.2000, V. Kubán leg. [in alcohol].

Measurements in mm: body length 2.53 (holotype), 2.75–3.0 (paratypes), wing length 3.05 (holotype), 2.62–3.27 (paratypes), wing width 1.28 (holotype), 1.19–1.42 (paratypes).




**Figs 10–12.** *Sciarokeroplatus pileatus* sp. n., paratype male, genitalia. 10 = anal parts, ventral view (as if apex of cerci cut off), 11 = aedeagus and parameres with gonocoxal apodemes, dorsal view (T9 removed); 12 = gonostylus in ventral view (Shaanxi paratype). Scales: 0.1 mm

Body dark grey with some brownish hue on edges of sclerites, microtomentose (specimens in alcohol lighter brown).

No eye-bridge above antennae. Length of left flagellomeres of the paratype: 11.5, 9.5, 8.0, 8.0, 8.0, 8.0, 8.0, 7.5, 8.0, 8.0, 7.0, 7.5, 7.5, 8.0 (apical); right 1st and 2nd: 13.0, 6.5 units (1 unit = 0.011 mm), width of flagellomeres 0.055 mm.

Pronotum clearly visible behind head in dorsal view. Pleural sclerites bare, including laterotergite, except for a patch of short setae caudal to anterior spiracle. Scutellum short, with ca. 10 upright medium-long setae. Postpronotum with a bunch of medium-long setae. No acrostichal microchaetae. Dorsocentrals tend to be 2-serial anteriorly; some irregularly distributed intra-alar setae present. Metanotum large, insertion of abdomen is rather ventral and on a comparatively small surface of thorax, i.e. most of mediotergite left free. In this respect *Sciarokeroplatus* is closer to other Keroplatidae than to Sciaridae.

Costa continued to 9/23, i.e. 0.4 section of apices of R5 and M1. Costal sections (base to virtual apex of Sc, to R1, R1–R4, R4–R5): 126–40–29–29 units (1 unit = 0.011 mm). No true connection between M1+2 and M3. Halter dark.

Fore leg (paratype male) ratios: coxa 39, trochanter 12, femur 55, tibia 68, basitarsus 39, tarsomeres 2–5: 18, 16, 8, 13.5 units. Length of tarsomeres on mid leg: 41, 18, 15, 11, 13.5 units. Length of tarsomeres on hind leg: 49, 19, 16, 12, 14 units (1 unit = 0.011 mm).

Male genitalia as given in Figs 7–12.

Female unknown.

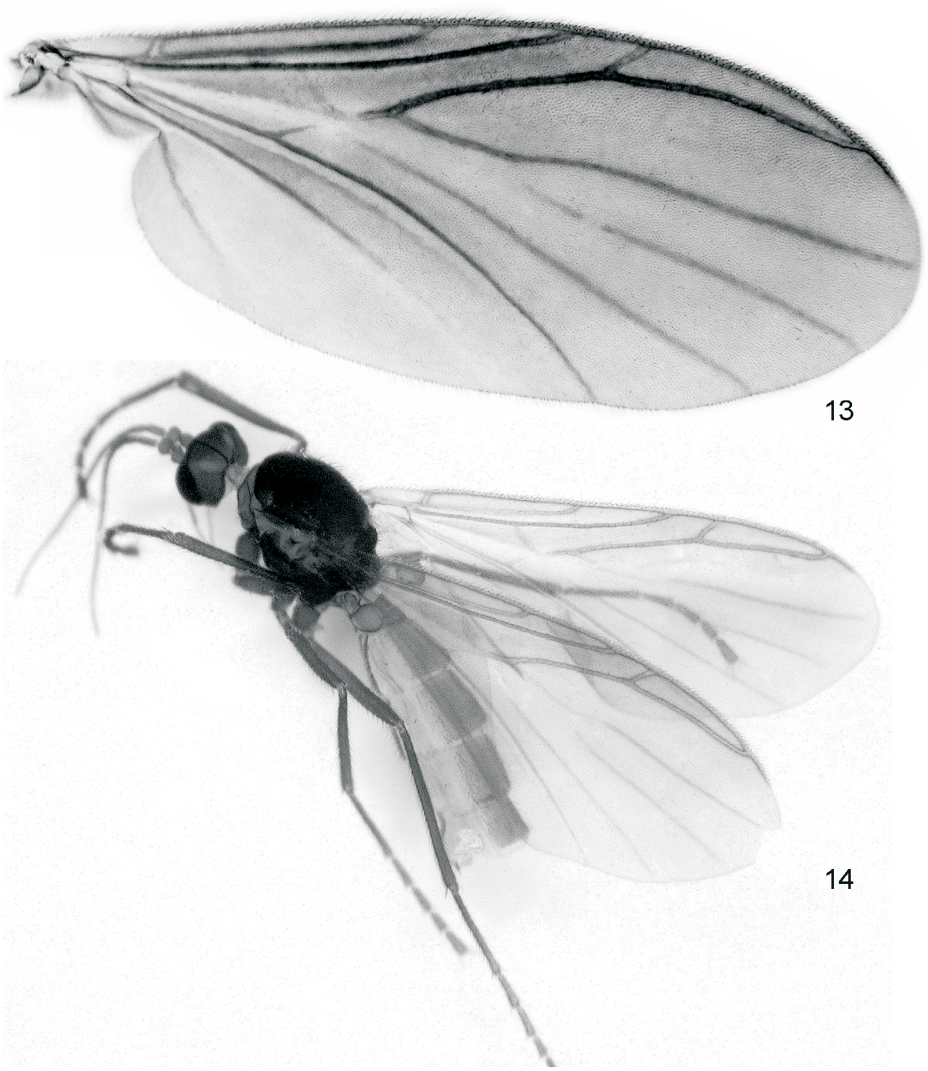
## **Sciarokeroplatinae** subfamilia nova

Type genus: *Sciarokeroplatus* L. PAPP et ŠEVČÍK

A subfamily of Keroplatidae.

Small anisoneuran flies with Sciaridae-like appearance but without eye-bridge or ocelli, 14-segmented flagellum, four-segmented palpi (in most Sciaridae three-segmented, but four-segmented in genera like *Ohakunea* and *Colonomyia* (see COLLESS 1963), and also in *Heterotricha* and allied genera (as CHANDLER (2002) wrote, "a short palpiger and three longer palpomeres"); wing venation similar to that of Keroplatidae (Cu2 distant from Cu1, A2 well developed) but with well-developed alula, and with well-developed pulvilli (and well-developed claws at the same time). Short coxae, especially of the mid and hind legs. Male genitalia are as simple as those of Cecidomyiidae (see SKUHRAVÁ 1997) and simpler than that of the Sciaridae (cf. MENZEL & MOHRIG (2000), a rich source of information on male genitalia of Sciaridae). The structure of the head sclerites is unique, but comparable though much different from that of Macrocerinae. If we homologize the dorsal sclerite of the head with the cerebral sclerite of *Macrocera*, as given by MATILE (1990: figs 6–9, etc.), it keys to Macrocerinae in MATILE's (1990: 125) key to the subfamilies of Keroplatidae. However, we do not think that its inclusion in that subfamily would be correct.

Well-developed pulvilli must be a character in the groundplan (stem-species) of Sciaroidea. There are discernible pulvilli in Cecidomyiidae, in Sciaridae and in the *Heterotricha* group but there are also small but detectable pulvilli in Bolitophilidae. In our opinion the very small hairy structures in the species of Macrocerinae and Diadocidiidae are also true pulvilli. So if we are right, the loss of




**Figs 13–14.** *Sciarokeroplatus pileatus* sp. n. 13 = wing (other Taiwan paratype), 14 = habitus photo (Shaanxi paratype)

pulvilli in Sciaroidea must be a parallel process (in Ditomyiidae, in Keroplatidae, in Mycetophilidae + Lygistorrhinidae). This conclusion, when related to the hypothesised tree of the Sciaroidea families (e.g. SØLI *et al.* 2000), is in complete congruence with previous conclusions based on many other characters.

Vein A2 is present in most genera of Keroplatidae, but weaker. A2 is similarly strong and a small alula present in *Sylvicola* and *Olbiogaster* (Anisopodidae). Again, A2 is rather strong in *Mesochria* and *Mycetobia* (Mycetobiidae), but neither of them have an alula. The well-developed alula of *Sciarokeroplatus* is very similar to that of some species in Bibionidae and Pleciidae. (cf. presence of alula in some "Oligoneura" from Upper Triassic: KRZEMIŃSKI (1992: figs 5b, 6b, 10b)).

We tried to identify *Sciarokeroplatus* to family through OOSTERBROEK's (1998) key, which is the best available key to the families of Oriental Diptera. We cannot find its relatives if we follow no. 8 (ocelli absent). If we follow the opposite alternative (no. 23: ocelli present), we can reach couplet 28 (discal cell absent, costa not continuous around wing) with some trouble at couplet 25: our fly has well-developed pulvilli and empodium, its antenna arises distinctly below the level of the centre of the eye, and it has no closed basal cell. We can reach Keroplatidae only, if we follow the statement that vein M3 (CuA1 of OOSTERBROEK) connected with stem of veins of M1 and M2, which is not the case of *Sciarokeroplatus*.

We encounter similar difficulties with PAPP and SCHUMANN's (2000) key: we have to follow the "Ocelli present… 23" branch at couplet 13. At couplet 37 the term "cubital fork" is misleading: it means M3 and Cu1. However, in *Sciarokeroplatus* base of M1+2 (even if we combine it with Rs) is not connected to M3. There is a shallow colourless area between them, which may be evaluated as "a memory of former connection" but it is definitely not a real connection. It is even more difficult to decide since adjacent section of M3 disappears. If we follow then no. 38, it runs to Macroceridae (Macrocerinae).

We did not try to make a cladistic analysis of *Sciarokeroplatus* here. Our main reason is that since we think of its closer relatives as fossils, there would have been difficult to make a reliable data matrix for all those taxa. The taxonomy of the higher (family group) taxa of Sciaroidea has been in rapid development. In the situation when that is still a question whether *Heterotricha* and the allied genera are offshoots of the stem group of Mycetophilidae or Sciaridae (CHANDLER 2002), our failure may be excusable, at least we hope so. It is a matter of course, that further studies are necessary in order to know the phyletic relations of *Sciarokeroplatus*.

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## REFERENCES

BLAGODEROV, V. A. & ARILLO, A. (2002) New Sciaroidea (Insecta: Diptera) in Lower Cretaceous amber from Spain. *Studia dipterologica* **9**: 31–40.

CHANDLER, P. (2002) Heterotricha Loew and allied genera (Diptera: Sciaroidea): offshoots of the stem group of Mycetophilidae and/or Sciaridae? *Annales de la Société entomologique de France* **38**(1–2): 101–144.

COLLESS, D. H. (1963) New species of Ohakunea Edwards and a related new genus with notes on the relationships of Heterotricha Loew (Diptera). *Proceedings of the Linnean Society of New South Wales* **67**(1962)(3): 303–308.

EVENHUIS, N. L. (1994) *Catalogue of the fossil flies of the World (Insecta: Diptera)*. Backhuys Publishers, Leiden, 600 pp.

KRZEMIŃSKI, W. (1992) Triassic and Lower Jurassic stage of Diptera evolution. *Mitteilungen der Schweizerischen Entomologischen Gesellschaft* **65**: 39–59.

KRZEMIŃSKI, W. & EVENHUIS, N. L. (2000) 1.14. Review of the Diptera palaeontological records. Vol. 1. Pp. 535–564. In: PAPP, L. & DARVAS, B. (eds): *Contribution to a Manual of the Palaearctic Diptera*, Science Herald, Budapest, 978 pp.

MATILE, L. (1981) Description d'un Keroplatidae du Crétacé moyen et données morphologiques et taxinomiques sur les Mycetophiloidea (Diptera). *Annales de la Société entomologique de France N. S.* **17**(1): 99–123.

MATILE, L. (1990) Recherches sur la systématique et l'évolution des Keroplatidae (Diptera, Mycetophiloidea). *Mémoires du Muséum National d'Histoire Naturelle Paris Sér A, Zoologie* **148**: 1–654.

MENZEL, F. & MOHRIG, W. (2000) Revision der paläarktischen Trauermücken (Diptera: Sciaridae). *Studia dipterologica Supplement* **6**(1999): 1–761.

OOSTERBROEK, P. (1998) *The families of Diptera of the Malay Archipelago*. Fauna Malesiana Handbooks, Vol. 1. Brill, Leiden, 300 pp.

PAPP, L. & SCHUMANN, H. (2000) 1.5. Key to families – adults. Pp. 163–200. In: PAPP, L. & DARVAS, B. (eds): *Contributions to a Manual of Palaearctic Diptera*, Vol. 1: General and applied dipterology. Science Herald, Budapest, 978 pp.

SKUHRAVÁ, M. (1997) 2.7. Family Cecidomyiidae. Pp. 71–204. In: PAPP, L. & DARVAS, B. (eds): *Contributions to a Manual of Palaearctic Diptera*, Vol. 2: Nematocera and Lower Brachycera. Science Herald, Budapest, 592 pp.

SØLI, G. E. E., VOCKEROTH, J. R. & MATILE, L. (2000) A.4. Families of Sciaroidea. Appendix, pages 49–92. In: PAPP, L. & DARVAS, B. (eds): *Contributions to a Manual of the Palaearctic Diptera*. Science Herald Budapest, 604 pp.

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