Acta Zoologica Academiae Scientiarum Hungaricae 57(4), pp. 315–341, 2011

DESCRIPTION OF A NEW GENUS AND A NEW FAMILY, CIRCUMPHALLIDAE FAM. NOV., OF THE ACALYPTRATE FLIES (DIPTERA)

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Circumphallus gen. n. (type species *C. significans* sp. n.) is described based on a unique male from Vietnam. A monotypic family Circumphallidae fam. n. is established and relationships of the new family with several families of the acalyptrate flies are discussed. The family Pallopteridae is re-defined and it is proposed to be restricted it to the genera *Palloptera*, *Toxoneura*, *Temnosira* and *Gorbunia* (i.e. *Morgea*, *Aenigmatomyia*, *Heloparia*, etc. are removed from Pallopteridae). The peculiarities of the genus *Gorbunia* OZEROV are emphasized. Eurygnathomyiidae is re-instated as a separate family. With 32 original drawings and six photos.

Key words: Circumphallidae, *Circumphallus*, new family, new genus, Pallopteridae, *Gorbunia, Aenigmatomyia*, *Eurygnathomyia,* Eurygnathomyiidae, Diptera taxonomy, Oriental Region

INTRODUCTION

As a result of our most recent collection trip to Vietnam, some peculiar dipterous specimens were captured, prepared and deposited in the collection of the Hungarian Natural History Museum. Among them a previously unknown genus and species was found, which was not compatible to any of the acalyptrate families known to me.

I do not think this paper (or this finding) more important or more interesting than any other paper in dipterology. A consensus of higher taxa is always a result of discussions among fellow dipterists. That is only a way that I would like to describe our peculiar fly below in a new dipterous family. My act will provoke more attention and debate than usual with a paper, I am sure. At the same time I think, all those will result in placing it to the proper rank and place in the system of Diptera.

MATERIALS AND METHODS

The paper is based on material deposited in the Diptera Collection of the Department of Zoology, Hungarian Natural History Museum, Budapest (HNHM).

The right wing of the type specimen has been detached and mounted on a normal slide (Fig. 34). Detached abdomens of specimens were treated with sodium-hydroxide and lactic acid, washed,

etc. on the standard way. Figures are made from temporal preparations in glycerol on a slide with cavity under a cover-slip and studied under an OLYMPUS SZ-ST stereomicroscope usually under 100× magnification; figures were made with the use of OLYMPUS BX40 microscope with an OLYMPUS U-DA drawing attachment. Most of the figures were made under 667× magnification. Abdomen and genital parts were placed in a plastic microvial with glycerol after study pinned underneath specimens. Morphological terminology follows mostly McAlpine (1981*b*); but see Papp (2010) for wing veins and cells. Symmetrical (paired) morphological structures are given in singular.

TAXONOMY

Circumphallus gen. n.
(Figs 1–12, 33–35)

Type species: *Circumphallus significans* sp. n.
Gender: masculine.

Description. A small, rather slender fly with moderately thickened legs (Fig. 33).

Head with protruding lower prefrontal edge and clypeus, chaetotaxy as described for family. Proboscis shorter than head with a medium-sized labella, dorso-apically with a medial 0.06 mm long thick sharp seta. Palpus normal, dark, with a medium-long (0.10 mm) apical seta.

Thorax with chaetotaxy as described for family; in addition, postpronotal seta present, 1 presutural and 1 postsutural supra-alar, 2 notopleural, 1 strong prescutellar acrostichal seta, 1 postalar and 2 scutellar setae, all strong. No propleural, anepisternal or katepisternal setae, posterior margin of anepisternum with 1–2 fine setulae, similar setulae on katepisternum. Acrostichal setulae medially unarranged and scattered.

Legs short and thickened, fore femur with 4 long posteroventral setae, mid tibia with one thickened ventroapical seta ("spur"). Pulvilli large, plumose.

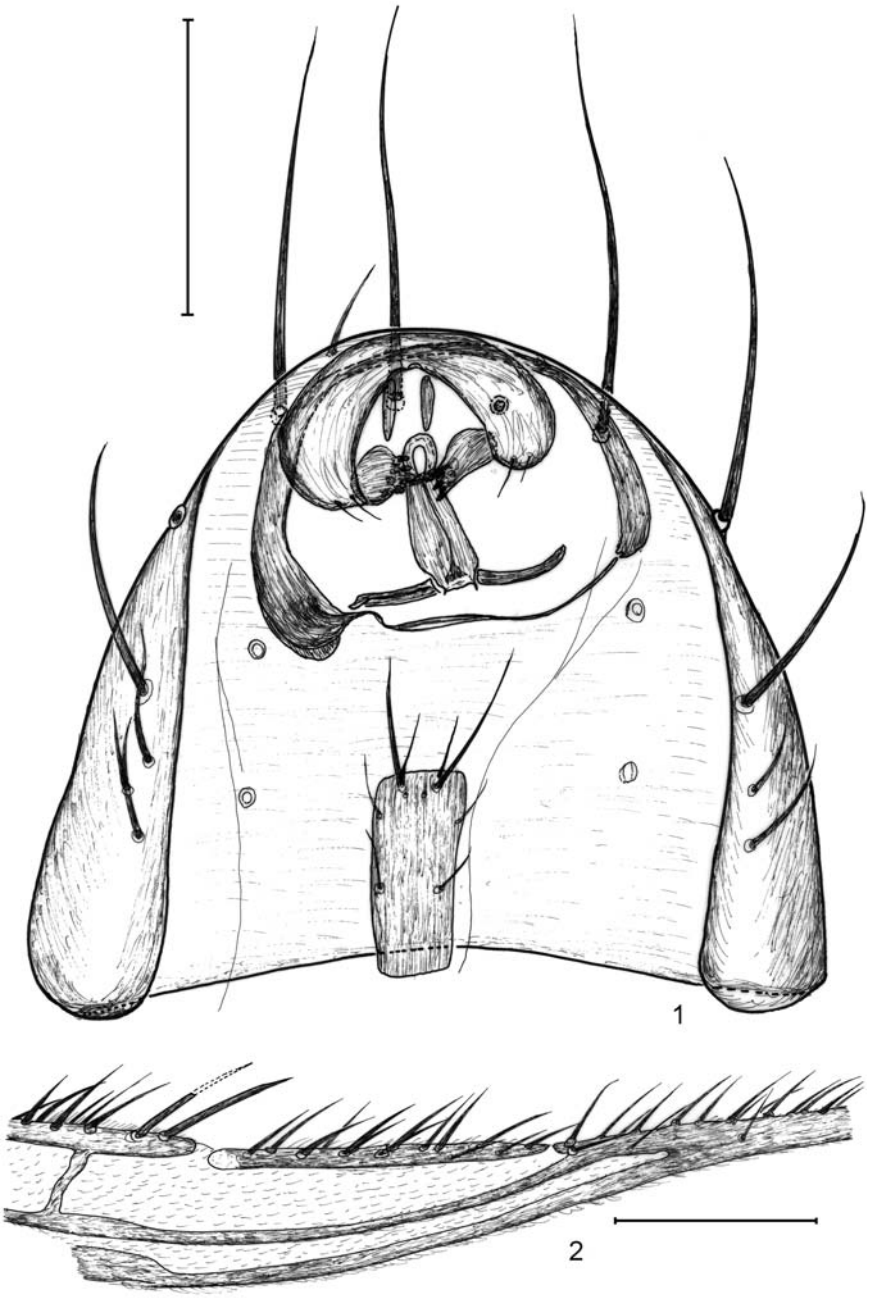
Wings (Fig. 34) hyaline, elongate. Costal vein reaching apex of R_{4+5} but vanishing before M_1 apex, long setulose over whole its length, setulae longer, or as long as vein wide. Subcostal vein strong in its whole length, more or less parallel to R_1 and reaching costal vein without attenuation. Vein R_{4+5} ending anterior of wing apex, cell r_{4+5} twice as wide as cell r_{2+3}. Cell dm short and slightly proximal of R_1 apex. Basal medial cell closed, i.e. basal crossvein present. Cubital cell (cup) short, closed with an arcuate vein. A_1 long, parallel to posterobasal margin in most of its length but reaching wing margin.

Calypters very small, thoracic calypter hardly discernible, alar calypter with sparse dark setulae. Halter normal ochreous.

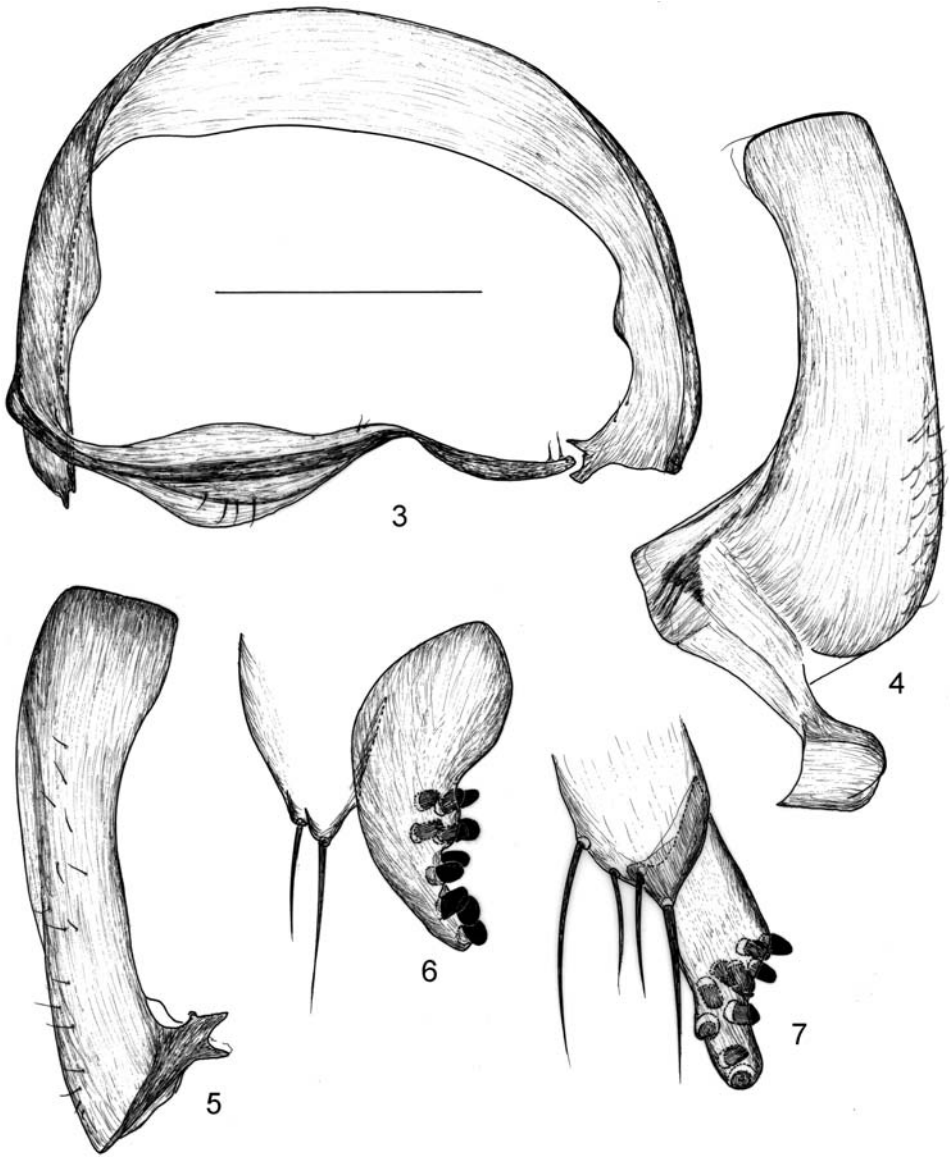
Abdominal tergites 1–5 shiny in anterior half and microtrichose in posterior half (Fig. 33), with long erect setae on disc, but without marginal setae, usually as long as tergite (Fig. 35). Tergites 1–5 on sides ventrally curved, sternites very narrow: sternite 2 in 2 small parts. Tergites 2–5 bipartite (Fig. 35): they consist of a shiny caudal and a dull basal part each, and tergites with extremely long discal (i.e. not marginal) setae. Spiracles, including 6th pair, in membrane, rather far from tergal edges.

Syntergosternite 6–8 very short, forming single irregular ring and deeply hidden underneath tergite 5.

Male genitalia as described for the family.



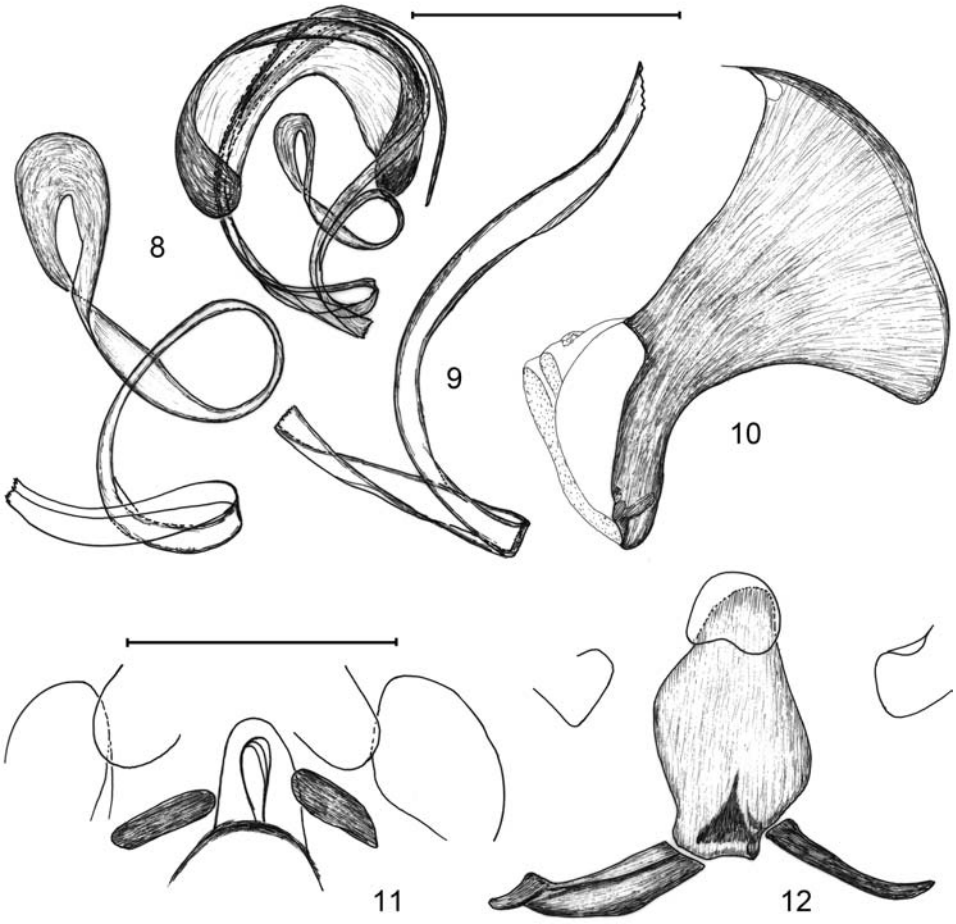
Figs 1–2. *Circumphallus significans* sp. n., holotype male. 1 = 5th abdominal segment and postabdomen with genitalia (ejaculatory apodeme and distiphallus omitted, surstyli schematic), 2 = humeral to R_1 vein portion of the wing. Scales: 0.2 mm for all



Figs 3–7. *Circumphallus significans* sp. n., holotype male. 3 = all postabdominal sclerites (syntergosternite) in the view, when dorsal part is at widest, 4 = postabdominal sclerites (syntergosternite), left lateral view, 5 = same, right lateral view, 6–7 = surstylus: 6 = subanterior-sublateral view, 7 = apical part in broadest view (most of the thorns covered). Scales: 0.1 mm for all

Circumphallus significans sp. n.

Holotype male (HNHM): VIETNAM: Bac Kan Prov., Ba Be NP, Na Mam, forest in the gorge behind the NP HQ, sweeping, Apr 17–18, 2010 – 22.417137° N 105.632505° E, 200 m, VN2010-PL_15, leg. Papp, L., Peregovits, L., Soltész, Z. & Lengyel, G. (right wing on a slide, abdomen and genitalia are kept in a plastic microvial with glycerol).



Figs 8–12. *Circumphallus significans* sp. n., holotype male. 8 = phallus and contours of epandrium, 9 = basal part of phallus and medial part of its second circle in higher magnification, 10 = ejaculatory apodeme, broadest view, 11 = hypandrial plates with basiphallus and contours of epandrium, surstyli and base of phallapodeme ventral view (dashed: insertion surface of phallapodeme and distiphallus/basiphallus), 12 = phallapodeme with edges of surstyli and contours of basiphallus, in its broadest, i.e. subventral view. Scales: 0.2 mm for Fig. 8, 0.1 mm for Figs 9–12

Measurements in mm: body length 2.48, wing length 2.64, wing width 0.97.

Body dark grey (basic colour almost black), partly darker grey microtomentose, all thorax subshiny.

Male.

Frons dull (thick microtomentose). Chaetotaxy as described for family, postvertical and occipital setulae indistinct (fine and short). Pedicel and scape dirty yellow, pedicel with a long (0.12 mm) dorsal seta. First flagellomere dark grey, about as long as broad (0.14 mm). Arista with short (0.02–0.022 mm) dorsal rays and somewhat shorter and less numerous ventral rays. Eye large (height/length ratio 1.11), gena narrower than first flagellomere. Several genal setae present, 1 of them large.

For thoracic chaetotaxy, see family and genus description.

Wing greyish without pattern (Fig. 34), veins light brown. Costa with long thick setae, particularly 2 pairs of very strong setae anterior to posthumeral break (0.15 mm, Fig. 2); at least 3 strong setae also on dorsal surface on section distal to subcostal break. Third costal section 0.105 mm, fourth section 0.325 mm, inter-crossvein section of M_{1+2} 0.33, terminal section of M_{1+2} 1.04 mm. Basal medial cell 0.187 mm, discal cell 0.813 mm. Terminal section of vein M_{3+4} 0.325 mm. Alula minute, c. 0.21×0.05 mm with 10 marginal ciliae of 0.07–0.08 mm long. Calypters very small, thoracic calypter hardly discernible, alar calypter with sparse dark setulae. Halter ochreous.

Legs ochreous, medial ¾ of femora darker brown. No dorsal preapicals on tibiae. First femur with a posteroventral row of long setae plus 1 strong anterodorsal at apical ¾. Mid tibia with a strong ventro-apical seta. Claws simple, thin curved, pulvilli large plumose.

Abdomen 1.31 mm long, with longest discal setae on tergites 0.3 mm long. Male postabdomen (Fig. 1) very small as described for family above. Postabdomen and genitalia are not visible from the dorsal side (resembling to the situation with males of Ephydridae and Camillidae). Tergite 5 is 0.45 mm long (i.e. 1/3 of the abdomen, remarkable if compared to the whole body length), with 3 pairs of extremely long (0.3 mm) thick setae and several shorter setae. Sternite 5 small narrow subrectangular, 0.14 mm long and only 0.06 mm broad. Postabdomen at most 0.26 mm and shorter than broad. Spiracle pairs of the 5th and 6th segments are clearly seen in the membrane, no more spiracles are discernible.

Postabdominal pregenital sclerites (sternite 6, sternite 7, probably tergites 6 and 7, and the largest dorsal part represented by sternite 8, Figs 3–5) forming narrowly open (on the left ventral side) very short ring. Its dorsal part (sternite 8 ?) only 0.05 mm long (!), longest measurement of postabdomen (sub-ventrally) 0.11 mm.

Male genitalia as described for family, not extendible, in mating position epandrium moves ventrally. Ejaculatory apodeme (Fig. 10) comparatively large, 0.17 mm long, fan-shaped but also with basal part broad.

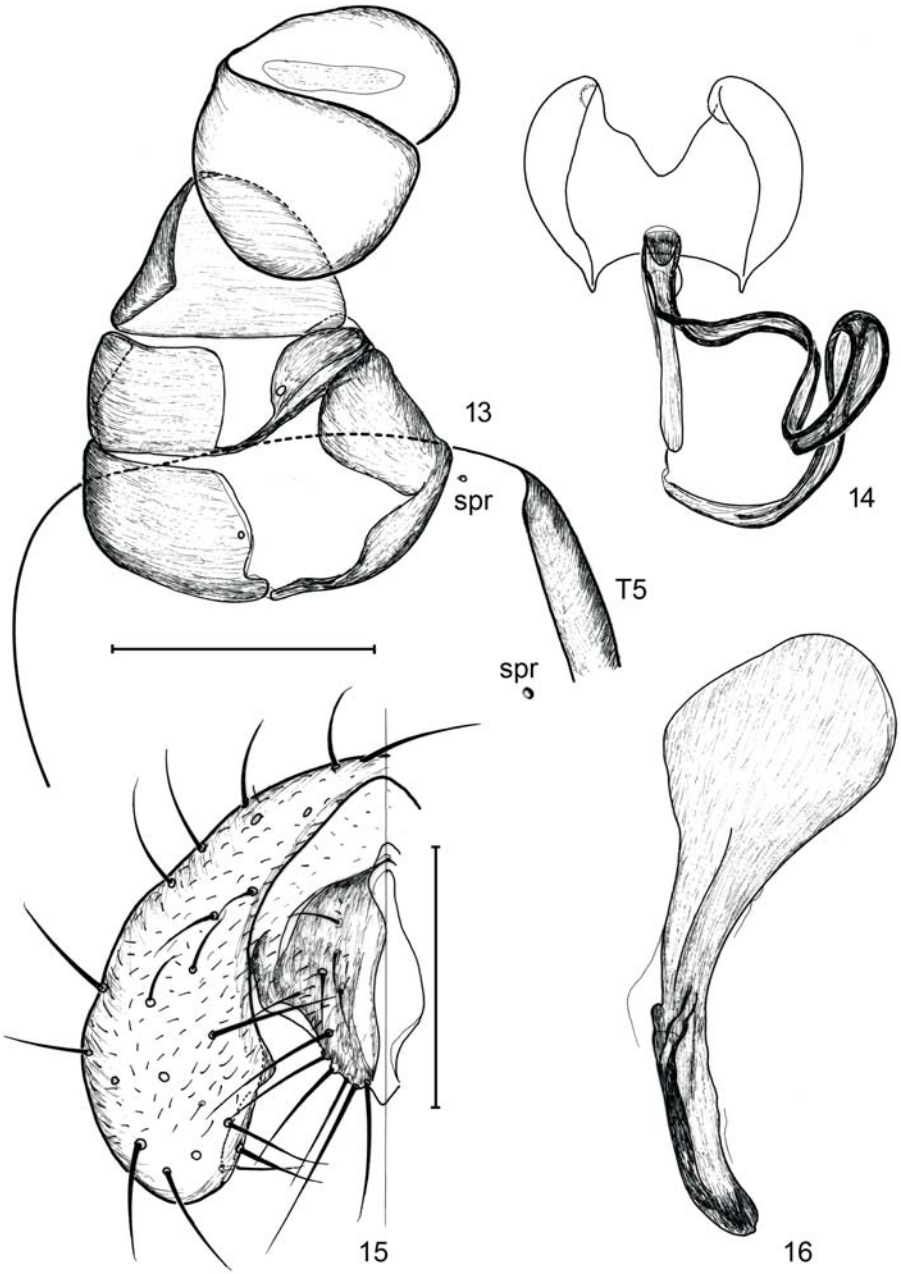
Female unknown.

Etymology. The specific epithet ‘significans’ means important, referring to the outstanding status of the species.

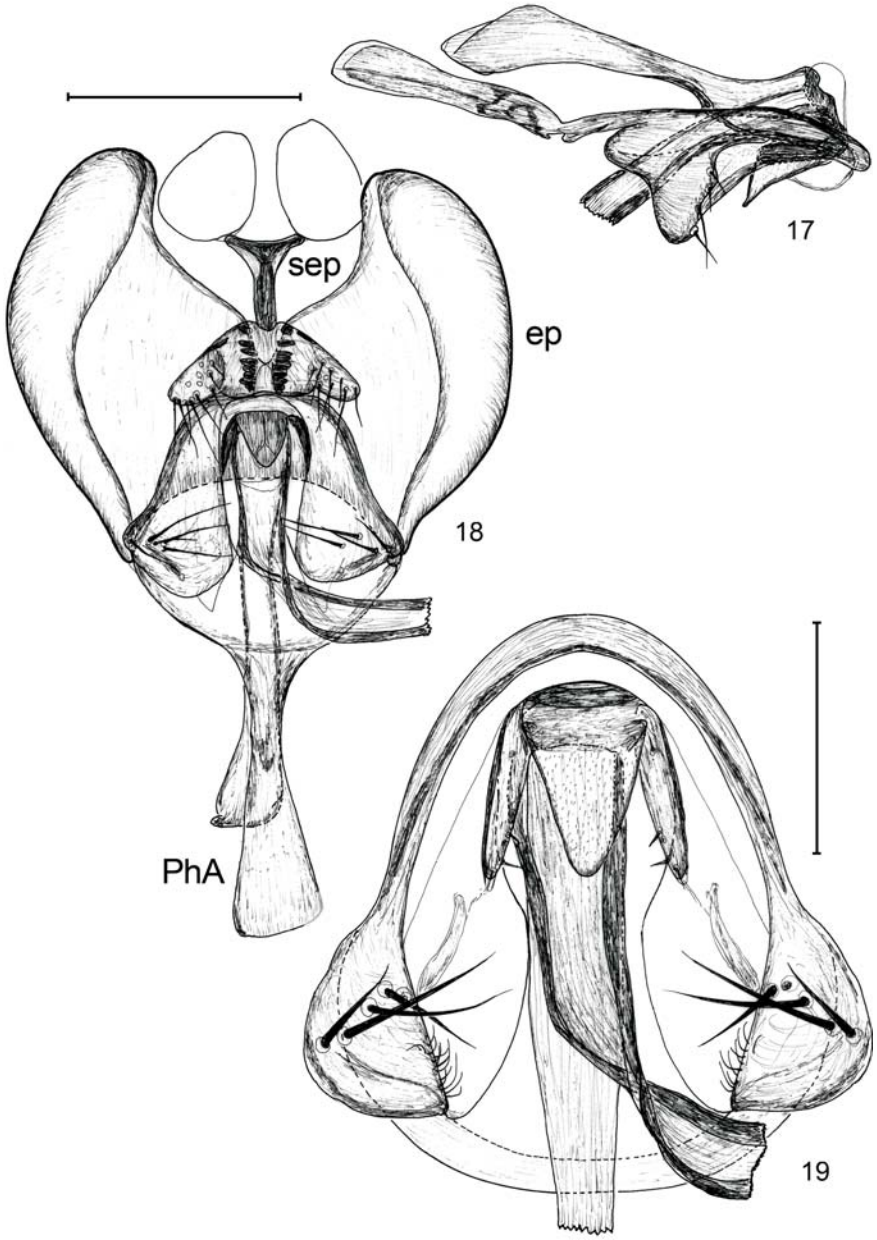
Circumphallidae familia nova

Type genus: *Circumphallus* L. Papp, 2011

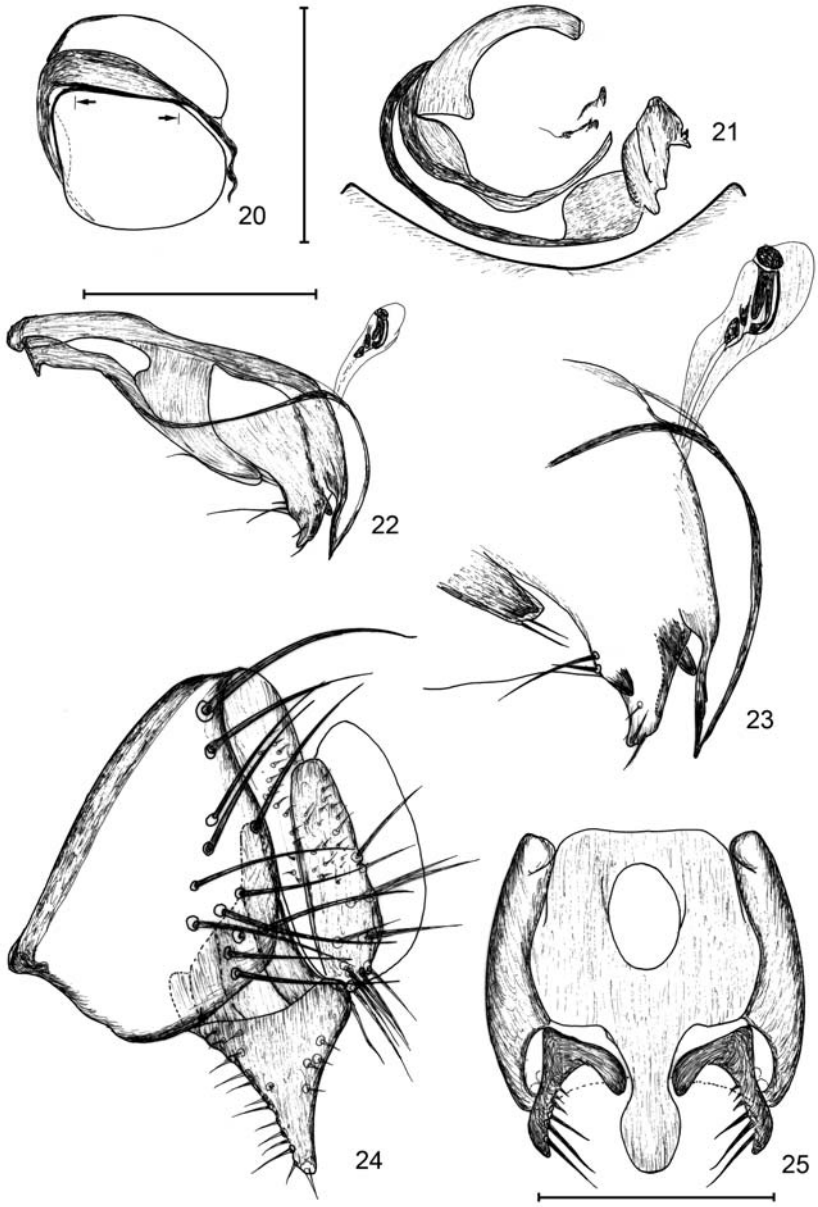
Description. Head with 1 strong fronto-orbital seta, 1 pair of widely divergent postocellars. Outer and inner verticals and ocellars strong, interfrontal setae, as well as vibrissa, absent. Stronger genal setae present. Arista short pectinate dorsally. Proboscis with a thick sharp apical seta.



Figs 13–16. *Gorbunia insularis* OZEROV, 1993, male genitalia.13 = postabdomen and epandrium in an extended position, ventral view (spr: spiracles, T: tergite), 14 = epandrium and phallic complex in ventral view, 15 = epandrium and cercus, caudal view, 16 = ejaculatory apodeme. Scales: 0.2 mm for Figs 13–14, 0.4 mm for Figs 15–16



Figs 17–19. *Gorbunia insularis* Ozerov, 1993, male genitalia. 17 = genitalia except for distiphallus, lateral view (parameres artificially darkened), 18 = genitalia in (sub)ventral view, cerci schematic (ep: epandrium, PhA: phallapodeme, sep: subepandrial sclerite in two parts), 19 = caudal part of hypandrium, postgonites, parameres, basiphallus and epiphallus, ventral view. Scales: 0.2 mm for Figs 17–18, 0.1 mm for Fig. 19



Figs 20–25. *Aenigmatomyia unipuncta* Malloch, 1933, male genitalia. 20 = contours of postabdominal sclerites, subdorsal view (borders of fusion of sternites 7 and 8 are marked by arrows), 21 = postabdominal sclerites with caudal edge of sternite 5, ventral view, 22 = genitalia without phallus, lateral view, 23 = caudal part of genitalia, lateral view, 24 = epandrium, cercus and surstylus in sublateral view (left surstylus at widest), 25 = epiphallus, parameres and gonites in caudal view. Scales: 0.4 mm for Figs 20–21, 0.2 mm for Fig. 22, 0.1 mm for Figs 23–26

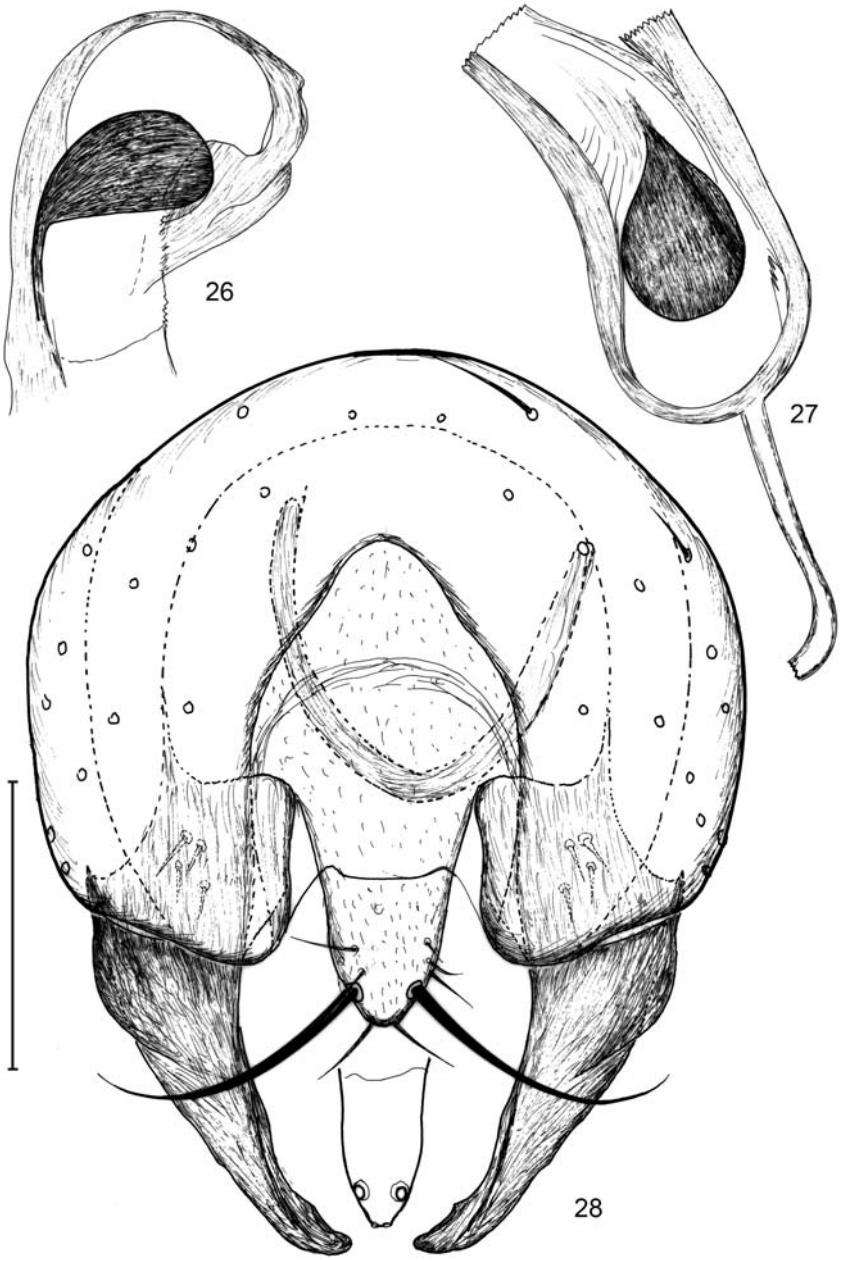
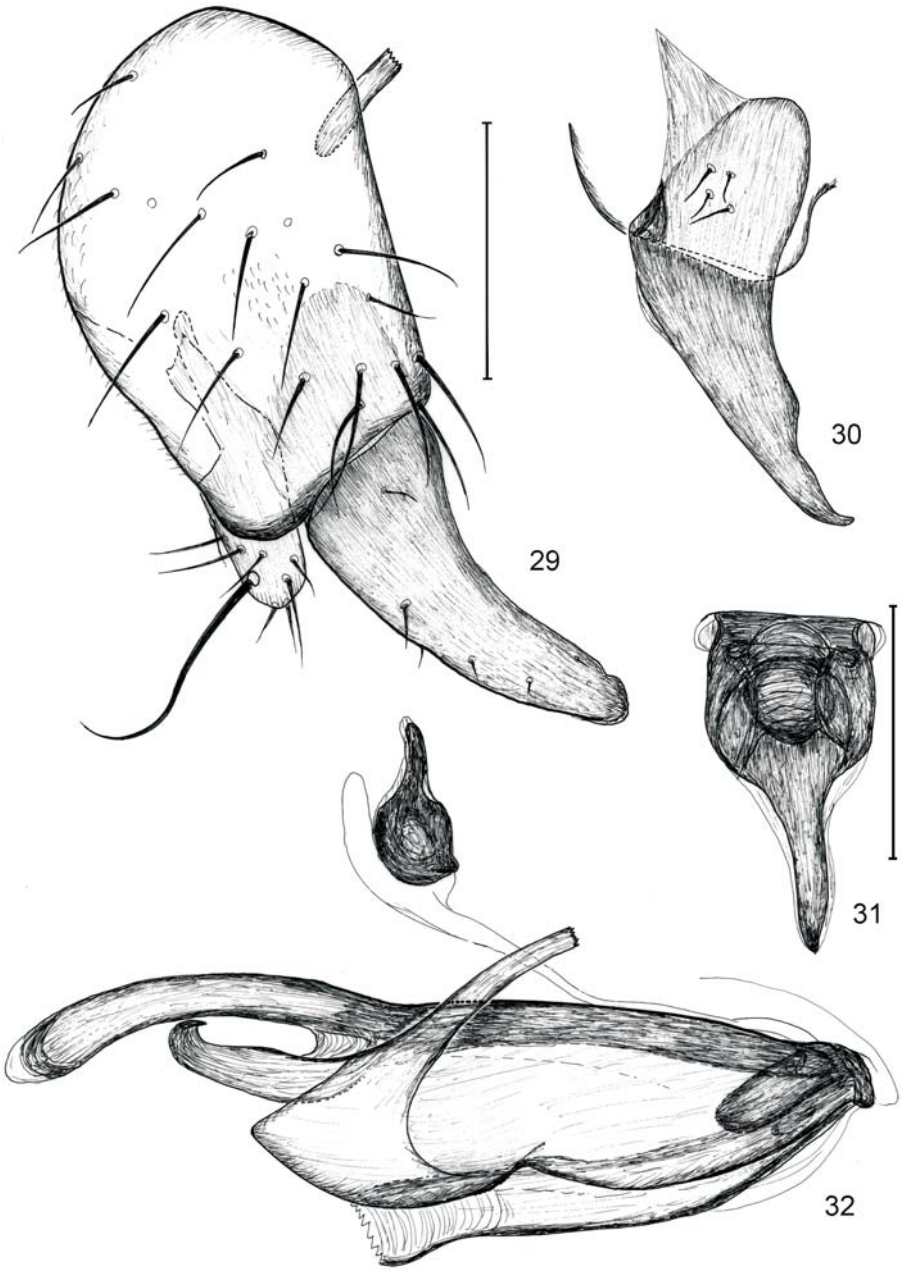
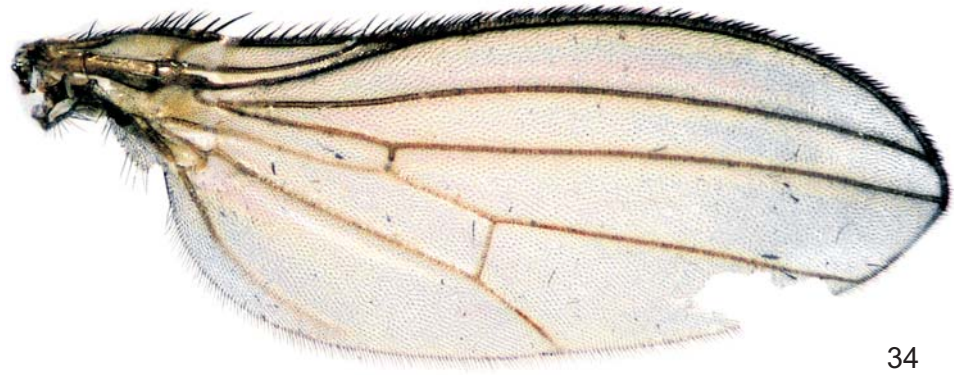


Fig. 26–28. *Eurygnathomyia bicolor* (Zetterstedt, 1838). 26–27 = the third sclerotised structure (ventral receptacle) of the female inner genitalia: 26 = in the view perpendicular to the broadest, 27 = in the broadest view. 28 = male epandrium, fused cerci (somewhat flattened) and surstyli, caudal view (outset: cerci in normal position). Scales: 0.2 mm for Fig. 28, 0.1 mm for Figs 26–27



Figs 29–32. *Eurygnathomyia bicolor* (ZETTERSTEDT, 1838), male genitalia. 29 = epandrium, surstylus and cercus, right lateral view, 30 = surstylus inner (medial) view, 31 = ejaculatory apodeme, broadest view, 32 = inner genitalia with basal part of distiphallus, lateral view. Scales: 0.2 mm for Figs 29–30, 32, 0.1 mm for Fig. 31



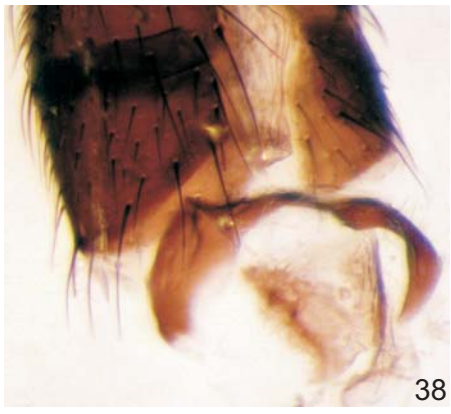
Figs 33–35. *Circumphallus significans* sp. n., holotype male. 33 = habitus; photo taken before abdomen was removed; 34 = right wing; 35 = abdomen, lateral view

Thorax: 1 presutural + 3 postsutural dorsocentral setae. Acrostichals small and not ordered: no sagittal row or paired rows. No propleural (stigmatical), anepisternal or katepisternal setae; katepisternum with some short setulae. Postpronotal seta present.

Wing clear without dark pattern. Costa with subcostal and posthumeral constrictions ("breaks") and prehumeral attenuation. Costal setae long and numerous (Fig. 2). Subcostal vein entire and not broken or thinned apically. Vein R_1 bare, with microtrichia as strong as on wing membrane, as well as other veins except costal. Alula reduced and no remnant of vein A_2 discernible.

Legs: tibiae without long setae, no dorsal preapicals.

Male abdomen: 5 preabdominal segments developed (Fig. 33). Postabdominal segments (including genitalia) hidden underneath tergite 5 (Fig. 1). Postabdominal segments reduced and fused forming a short open ring (Fig. 3), its sternite 6 part narrow, setulose, tergites 6–8 strongly reduced, their remnants fused with other sclerites. Spiracles 5 and 6 paired, symmetrical; spiracle 7 indiscernible or absent. Epandrium bare, except ventral apices bearing 4 setulae. Inner surstylus (Figs 6–7) not



Figs 36–38. *Eurygnathomyia bicolor* (Zetterstedt, 1838), male postabdomen and genitalia. 36 = ventral view, 37 = lateral view; 38 = sclerotised wall of the phallic pocket, perpendicular view

fused to epandrium, with 11 thick blunt prensisetae (thickened setae). Cerci (or proctiger) membranous, indiscernible small vertical without longer setae; no sclerotised subepandrial sclerite present. Phallus with oval basiphallus (no epiphallus) and very thin ribbon-like distiphalus coiled twice over epandrium (Figs 8–9). Ejaculator large, massive, with fan-like apodeme (Fig. 10). Hypandrium plus other genital parts almost entirely membranous, with only 5 sclerotised parts: massive, hollow-like apodeme and two pairs of sclerites attached to it: smaller sclerites attached to apodeme next to basiphallus (remainders of parameres ?) and longer asymmetrical bar-like sclerites attached to apodeme anterior portion (similar apodeme vanes in other Tephritoidea (Fig. 11).

Remarks. The new family belongs probably to the superfamily Tephritoidea in the wide sense (MCALPINE 1989, KORNEYEV 1999) and in the paraphyletic group of so-called "Lower Tephritoidea" (KORNEYEV 1999, HAN & RO 2005) (Pallopteroidea sensu HENNIG 1958) sharing them a unique combination of characters: tibiae without long setae, dorsal preapical tibial setae absent (present only in *Eurygnathomyia*), tergite 6 of male vanishingly small, spiracle 6 of male present, phallus long, ribbon-like, apodeme of ejaculator large, fan-like. The most important characters, including those of the male postabdomen and genitalia are summarised in Table 1.

COMPARATIVE NOTES ON OTHER RELATED TAXA

Pallopteridae – Material studied in the collection of the HNHM: 16 species of *Palloptera* FALLÉN, 1820, with type species *P. umbellatarum* (FABRICIUS, 1775), *Temnosira* ENDERLEIN, 1936 with type species *T. saltuum* (LINNAEUS, 1758) and *Toxoneura* MACQUART, 1835 with type species *T. muliebris* (HARRIS, 1780).

Surstyli fused to epandrium, in *Temnosira* surstylus present only as lobe. Large tripartite phallus present. Phallapodeme large and not fused to hypandrium, connection is rather membranous. Parameres small, ventral to hypandrium, joining basiphallus membranously. Distinct but not large epiphallus present. Hypandrium large, posteriorly closed, asymmetrical, inserting epandrium, and with caudal postgonites fused to hypandrium (I do not think them hypandrial arms). Hypandrial apodeme short in *Temnosira*, postgonite various, small in *Temnosira*. Postgonites plus hypandrium complex join caudally to subepandrial sclerite, the latter not forming inner surstyli but bearing prensisetae along dorso-medial line (MERZ 1998: fig. 19, see also MERZ & SUEYOSHI 2002, MERZ & CHEN 2005), and caudally reaching but not fused with cerci. In *P. umbellatarum* postgonites without large setae, embracing basiphallus and joining subepandrial sclerite most caudally. Epiphallus large. Ejaculatory apodeme large. Subepandrial sclerite with large black

Table 1. Characters of the family Pallopteridae (*Palloptera, Toxoneura, Temnosira*) and related taxa.

Character	Eurygnathomyia	Pallopterinae	Gorbunia	Circumphallus	Aenigmatomyia
Head					
Fronto-orbital setae	2, anterior short	1	1 small	1 large	1
Interfrontal setulae	numerous unarranged	fine scattered to nil	nil	a row from fr-orb to lunule	numerous unarranged
Postverticals(postocellars)	small but distinct occi pair present	occi short fine or missing	no occi	all pvt or occ setulae indistinct	no occi
Genal setae	numerous short setae on cheeks and genae	at most some posterior genal setae	no genal setae	several, 1 of them large	numerous but very short
Arista	bare, basal 2 aristomeres thickened	usually short rays	moderately long rays	short rays	bare
Palpi	with short setae	several long setae (but Temnosira)	several long setae	1 long apical seta only	no palpal setae
Thorax					
Postscutellum	small but distinct	large	small	large	distinct
Acrostichal setae	single sagittal row	several paired rows or numerous scattered	sparse unarranged	sparse medial unarranged	numerous unarranged
Prescutellar setae	strong pair	strong pair or nil (Temnosira)	no	strong	no
Dorsocentral setae	2 + 4	1 + 3	1 + 3	1 + 3	0 + 2
Propleural setae	1 strong upcurved	distinct or rather weak	no propleural setae	no propleural setae	1 distinct upcurved
Anepisternum	bare	setose or bare	setose	bare	bare
Katepisternal setae	4 (5)	1 (maybe some additional shorter)	1 strong pair	no	0+2
Other thoracic setae	1 strong + 1-2 short pprnt	1 pprnt	1 pprnt	1 pprnt	1 pprnt
Legs					
Dorsal preapical setae	2 pairs on each tibia	no preapicals or a weak one on t2	no	no	no

Table 1 (continued)

Character	Eurygnathomyia	Pallopterinae	Gorbunia	Circumphallus	Aenigmatomyia
Hind femoral setae	1 (or some) dorsal setae	at least some dorsal setae	1 strong dorsal seta	no	no
Fore femoral setae	1 pd and 1 pv rows of long setae on f1	1 pd and 1 pv rows of long setae on f1	1 pd and 1 pv rows of long setae	1 pv row of long setae + 1 pd seta	1 pv and 1 pd rows of long setae on f1
Wings					
Costal breaks	subcostal break not complete, no more breaks	usually both subcostal and posthumeral breaks	only subcostal break	distinct sc & posth breaks	only subcostal break
Costal setae to R1	sparse but long thick setae	dense and short thick setae	no thicker setae	sparse and extremely long	short and weak
Anal region	not reduced, A1 to wing margin, A2 discernible	as in Eurygnathomyia	reduced, A1 short, no A2 vein	no anal region, no A2 vein	anal lobe present, weak A2
Other wing characters	patterned	patterned	patterned	clear	clear
Abdomen					
Tergal setae	moderately long marginal setae	long marginal setae or not developed (Temnosira)	no tergal marginal setae	extremely long	long marginal setae
Male abdomen & genitalia					
Sternite 5	normal	normal, usually quadrate	normal	small elongate	very large
Tergite and sternite 6	rather large, fused to each other	smaller	well shaped, remarkable	T6, S6, T7, S7 & S8 all small and fused into a short ring	S6 with a broad ventral plate, T6 as irregular lateral sclerite
Tergite and sternite 7	T7 membranous	S7 small to very small, T7 membranous (? always)	well shaped, remarkable, also T7		S7 with large dorsal part, T7 present as irregular incrustations
6th spiracles	in membrane	in membrane	right spiracle in membrane, left in S6	in membrane	not even spr 6 discernible in male

Table 1 (continued)

Character	Eurygnathomyia	Pallopterinae	Gorbunia	Circumphallus	Aenigmatomyia
7th spiracles	in the sclerotised wall of phallic pouch	in membrane	right spiracle 7 in the ventral edge of T7	not found	not found
Sternite 8	medium-large, massively fused with S7	smaller	cap-like		large, fused to S7 on dorsal side
Epandrium	large convex	convex, various in size	sub-globular	very small	very short dorsally, broad ventrally
Cerci	small fused with 1 pair of apical setae	normal	rather long subtriangular	small, membranous	comparatively large
Surstyli	free, large	fused to epandrium	not developed	free with large pegs	free, inner wall deeply introduced into epandrial arc
Hypandrium	fused to phallapodeme	large asymmetrical	long strong rod & long arms	2 small horizontal plates	rod not long, a HA-postgonite-epiphallus complex present
(Post)gonites	membranous, without any setae	caudal, fused to hypandrium	short and not fused to hypandrium	not discernible	rather caudal, see more in text
Phallapodeme	fused firmly to hypandrium	large and not fused to hypandrium	comparatively large, setose	3 asymmetrical plates	long; fused broadly to hypandrium
Phallus	long spiralic, structured	large in 3 parts	long ribbon-like, very thin apex	extremely long ribbon-like	long & curved, works through pressure increase
Parameres	no	small, ventral to hypandrium, joining BPh membranously	as lateral projections of BPh	not discernible	very broad basally with a long narrow ventral process
Ejaculatory apodeme	small dark	large	large	large	short, irregularly sclerotised
Subepandrial sclerite	less sclerotised	horizontal, with large black pegs	2 parts, horizontal, with large black pegs	membranous	indistinct
Other important characters	female terminalia jackknived when at rest	female terminalia telescopically withdrawn at rest	peculiar structure of thorax		epiphallus very large

pegs, but subepandrial sclerite horizontal and not oblique (nearly perpendicular) as in *Gorbunia*.

Female tergite 7 – at least partly, in dry specimens – impressed, i.e. concave dorsally (in *Eurygnathomyia* concave ventrally); tergite and sternite 7 fused laterally. Some parts of postabdomen strongly sclerotised (for the detailed morphology of female tephritoid flies see BELCARI & KOZÁNEK 2002). Two long spermathecae (in *T. saltuum* 0.12 mm), ducts sclerotised at short basal section (0.04–0.45 mm) only.

Remarks. As a consequence of pasting various, actually not related, genera into the family Pallopteridae, it has been hard to name synapomorphies for the assemblage. MCALPINE (1989) was able to list only 3 synapomorphies in morphology: vein R_1 bare, proanepimeral setae anteroventrally inclined and mesanepimeron bare.* In our case I do not think the lumping way is necessary better, although we cannot exclude that the splitter way will be proven worse, after new findings and new works in comparative morphology and phylogeny.

Gorbunia insularis OZEROV, 1993 (Figs 13–19) – Material studied: 1 male 1 female (HNHM): KUMAMOTO Pref., Shuratoriyama, 1300 m, Azumi, 10. vii. 1978/9–10. vii. 1973 (T. Saigusa) – "Gorbunia insularis Ozerov, 1993 (Pallopteridae)" det. T. Saigusa, "2006".

Important characters (partly not listed in Table 1):

One short thin fronto-orbital seta, postocellars slightly divergent, interfrontal setulae fine and short, whitish and indistinct. Orbital plate extremely short. Posterior part of head bulging. Basal aristomeres slightly thickened, arista with short rays in all directions. Gena not very broad, no setae on cheeks, peristomals short, only 1–2 long setae most ventrally on gena.

Mesonotum conspicuously produced above antepronotum, conspicuously flattened dorsally: narrowly in presutural part, much wider in postsutural part and on scutellum. Subscutellum very narrow, though discernible. 1 postpronotal, 1 presutural + 1 postsutural supra-alar, 2 notopleural, 1 presutural +3 postsutural dorsocentral and 2 postsutural setae. No prescutellar acrostichal setae; all setulae fine and whitish or pale yellowish. Acrostichal setulae unordered, not arranged in rows; anepisternum on posterior margin and katepisternum dorsally with fine and pale yellowish setulae. No true propleural seta, 1 pale yellow proclinate hair instead. 1 strong black katepisternal seta. 4 posterodorsally directed semierect scutellar setae.

Legs slender, only mid tibia with ventral thickened seta, no dorsal tibial preapical setae. Male with anterodorsal seta on apical third of mid femur and apical fourth of hind femur each.

* This is the dead end of the lumpers way as usual: you keep things strongly together, like dry sand in your fist, until you keep almost nothing.

Costal vein with short and moderately fine, ordered setulae, without longer or thicker setae. Subcostal break incomplete, posthumeral and prehumeral breaks indistinct, only 1 costal seta each missing there. Anal lobe narrowed but vein A_2 clearly visible, at least as a fold, overrunning the short vein A_1, latter not longer than cubital cell.

In male postabdomen (see also SUEYOSHI 2006) sternite 6, tergite 6, sternite 7, tergite 7 and sternite 8 clearly identifiable (Fig. 13). Both sternite 6 and tergite 6 rather large, separated by very narrow membranous area, not fused at their meeting point, almost in sagittal line ventrally. Tergite 7 large. Sternite 8 cap-like. Right spiracle 6 in membrane, left spiracle 6 inside sternite 6. I seem to find right spiracle 7 in the ventral edge of tergite 7 but I cannot exclude that I missed it for an insertion of a trichoid sensilla.

Epandrium sub-globular, long setose. *No outer surstyli*, not even any surstylar lobe on epandrium (Fig. 15). Cerci rather long sub-triangular with several long setae (Fig. 15). Subepandrial sclerite (Fig. 18) is composed of two parts. Its posterior part narrow, almost Y-shaped, rather horizontal and joins cerci. Anterior part with robust medial part bearing two rows of dark blunt prensisetae and oblique setose lateral lobes not connected to epandrial wall and movable inside epandrial cavity, but joined to caudalmost part of hypandrium (in Fig. 18 joining surface visible but anterior part of subepandrial sclerite largely perpendicular to that).

Hypandrium with very long and strong apodeme anteriorly, closed posteriorly, i.e. with long arms joined to epandrium laterally on one side, and seemingly fused forming large arcuate sclerite posterior to epiphallus (Fig. 17), which covers parameres in lateral view, on the other. However, that U-formed sclerite maybe interpreted also as extended caudal part of the postgonites. Since I seem to detect an additional thin *caudal* pair of hypandrial processes to basiphallus, I am inclined to accept this latter hypothesis. Postgonites (Figs 17–19) comparatively large (deep) with widened ventral part and with a number of long setae.

Phallus long, thin ribbon-like with very thin seta-like apex. Caudal fork of phallapodeme very short. Phallapodeme shorter than hypandrial apodeme and not fused to hypandrium; connected only basally to basiphallus with membrane, i.e. flexible. Basiphallus laterally fused to paired setulose sclerites, obviously parameres (Figs 17–19), posteriorly with comparatively large triangular epiphallus (Fig. 19). Ejaculatory apodeme (Fig. 16) large, distal part not particularly broad, its stalk rather long and slightly curved.

Female with long abdominal tergites. Seventh tergite and sternite long, almost bare, strongly sclerotised, other segments withdrawn here when at rest. Both tergite 8 and sternite 8 consists of 2 long bare lateral rectangular sclerites. Ovipositor with minute cerci.

Eurygnathomyiidae – *Eurygnathomyia bicolor* (ZETTERSTEDT, 1838) (Figs 26–32, 36–38) – Material studied: 2 males 5 females (HNHM): [Austria] "Gastein 4./17./22. 7.[July] [19]07." [? Pokorny's collection] "Eurygnathomyia opomyzina Zett." det. Á. Soós 19.

Characters not listed in Table 1: Postocular setulae numerous. Tibial spur on both mid and hind tibia, female fore basitarsus ventro-apically with 1 large plus 1 shorter thick black thorns.

Cerci fused into a single sclerite, which bears a large pair of setae apically (Fig. 28). Hypandrium joining epandrium rather dorsally (Fig. 29). Phallapodeme fused firmly to hypandrium (Figs 29, 32). Postgonites membranous and without any setae. No parameres discernible.

Subepandrial sclerite thinly sclerotised only, forms half of a ring, without black thorns or any other structures, joining hypandrial arms more strongly than hypandrium to the epandrium. On the other hand, subepandrial sclerite connects dorsal edges of the inner wall of surstyli (quite alien character in the Pallopteridae complex). Its caudal part joins cerci membranously. As a consequence of the above described structures, hypandrium – phallic complex can move on longer depth dorso-ventrally below epandrium in the genital cavity. The huge distiphallus (Figs 36–37) is based on a more or less thick ring of basiphallus (Fig. 32). Ejaculatory apodeme (Fig. 31) small but strongly sclerotised and melanised.

Female abdominal sternite 1 rather large; female 7th tergite and sternite partly fused on lateral margin, almost bare, strongly sclerotised and forming double-walled shell, with segments 8 to 10 (half stretched) turned back ventrally ("jack-knifed"). Female abdominal segments 8 to 10 not much lengthened when everted but not visible from dorsal side when at rest (either completely withdrawn or jack-knifed). Aculeus shaft only membranous, lateral laths weakly sclerotised, elastic. Two globular spermathecae; they are possibly the paired spermathecae of the 2+1 spermathecal ground-plan, since they are located close to each other. The sclerotised ducts are rather long but do not meet (MERZ 1998: fig. 26). There is a third sclerotised structure in the inner genitalia (Fig. 26–27, the ventral receptacle?). It consists of a central more melanised (darker) part, which is inside a larger globular cavity. I do not dare identifying its function but it seems important to call attention to it, since in lower magnification it may be missed for a third spermatheca.

Comments. I should like to stress that here phallapodeme is fused to hypandrium, i.e. the mechanism of moving phallus must be different from those of the true Pallopteridae.

Familiar position uncertain – *Aenigmatomyia unipuncta* Malloch, 1933 (Figs 20–25) – 1 male (HNHM): S. Chile, Penins. Brunswick, c. 70 km W P. Arenas – Laguna Parillar, soil traps, 23. 01. 85., leg. M. Vogel – "Aenigmatomyia

unipuncta MALL." Det. L. Papp 1986. 1 male (HNHM, without head): S. Arg. RioNegro, El Bolsón, Topál. Nr. 693., 3.XI.61. 1 male 2 females: Lag. Anxxrga, Natales, E. of Mt. Payne, 200 m. Magellanes, CHILE, 14–20. XII. '60. Pena. – "Aenigmatomyia unipuncta MALL. ♂/♀" Det. J. F. McAlpine 1983.

In the collection of the HNHM there is also a male of a new species of the genus *Aenigmatomyia* (S. Arg., Rio Negro, El Bolsón, [György] Topál – Nr. 612, 20.X.61.).

Head large, compressed to thorax, which is of double size of the head; also abdomen short, i.e. this is a plump black little fly. Head slightly concave posteriorly. One very posterior fronto-orbital present, inner and outer verticals strong but ocellars short, postverticals rather long, divergent. Arista with thickened basal aristomeres, arista bare. Interfrontal setae short, numerous and not arranged. Palpus almost bare, without stronger setae.

Anepisternum bare (!), 2 pairs of katepisternals, 1 weak upcurved propleural seta present.

Costal vein with subcostal break only, other breaks or attenuations not discernible. No longer costal setae but 1 single seta anterior to break. Anal region of wing not reduced but without any distinct remnant of A_2. Vein A_1 short, c. 1.5 times as long as cubital cell.

Legs short, tarsomeres 3–5 much shortened.

Male postabdomen and genitalia very characteristic. Sternite 5 very broad (Fig. 21, see also GRIFFITHS 1972: fig. 144). Postabdomen small. Sternites 6 and 7 not fused; sternites 7 and 8 fused on dorsal side only (Fig. 20). Postabdominal sclerites consist of transversely long, narrow and dark pigmented sternite 6 and sternite 7 parts. Broad plate joined to narrow part of sternite 6 ventrally and additional irregular sclerite, apparently tergite 6, laying more laterally. Membrane bordering body cavity between sternite 7 and hypandrium with one additional irregular incrustation (sclerotisation) (Fig. 21), obviously derivative of tergite 7. As both sternites 6 and 7 have large dorsal parts, the interpretation of 2 larger ventral sclerites is uncertain. Sternite 8 comparatively large. Spiracles 6 and 7 in male absent (indiscernible).

Epandrium very short dorsally, widely rounded and broadly open ventrally (Fig. 24), bearing long dorsal-subapical and ventral setae but no microsetae on it. Cerci with long setae on their ventral half, but microsetae on their dorsal half only. Surstylus free, double walled part largely triangular from outside, caudally joins ventral edge of cercus; inner wall consists of 2 broad plates stretching dorsally deep into epandrium. Surstylus with short setae only. Phallus long and curved (GRIFFITHS 1972: fig. 145) forming a simple but comparatively thick coil in an arc of 0.55 mm long and 0.4 mm wide, microtrichose, its apex is broadened and form-

ing a concave cube. Black thorns emerge from the inner wall of that cube. Contrary to *Circumphallus*, in *Aenigmatomyia* phallus works through pressure increases inside, no sclerotised side lines present. Phallapodeme longer than hypandrial rod (Fig. 22), fused broadly to hypandrium. Epiphallus very large (Figs 22–23, 25). In lateral view all this looks as a sharp shovel. Epiphallus with large dorsal part and narrow, even narrowly necked ventral part (Fig. 25). Postgonites rather caudal, in lateral view (Fig. 23) covering almost completely parameres (this is why GRIFFITHS (1972) did not see them). Parameres (Fig. 25) very broad basally with long narrow ventral process bearing medio-caudally directed setae. Ejaculatory apodeme short and irregularly sclerotised (Fig. 23).

Female with all abdominal sternites broad, broader to much broader than long. Sternite 7 narrower than tergite 7, both not fused to each other at all. Sternite 6 broader than sternite 7. Tergite 7 convex in all its length. Sclerites of aculeus less sclerotised than in Pallopteridae. Two globular spermathecae far from each other: the right one in segment 7, the left one in segment 6 (restricted by the length of their duct), when ovipositor is stretched. Consequently, I think them different from those of the *Eurygnathomyia*; there paired spermathecae remained, while in *Aenigmatomyia* one of the paired spermathecae may have reduced.

Comments. Since we have no reason to hypothesise a double walled epiphallus, we can rather say that epiphallus fused with the caudal part of the hypandrial postgonite complex.

DISCUSSION

The structure of the male genitalia in muscoid flies is clear if one takes the following scheme into consideration. The inner genital organs are: phallapodeme, phallus, parameres and epiphallus. The "covering structures" are: hypandrium, pregonite (if developed), postgonite and subepandrial sclerite ("decasternum" in other acalyptrate families). The outer shell is composed of the epandrium, surstyli and cerci. It is not seldom, that workers miss one point: body cavity must not be open ventrally. Thus, there are always ventral (usually strong) membranous parts, which connect ventral postabdominal sclerites and hypandrium (in numerous families also the base of phallus). It is usually the connecting surface of the phallapodeme and border of basi- and disti-(meso)-phallus, where body cavity is closed. Consequently phallapodeme is always in the body cavity, most parts of the phallus outside it. Male of *Eurygnathomyia* shows a peculiar situation, where the mem-

brane of the concave "outer" cavity, which forms a pocket for the large phallus, is with sclerotised wall (Fig. 38).

There is another important structural question with these families, in general, with all dipterous families where phallus is large. It is for sure that none of them are intromittent organs, at most their short and thin apical structures are so. The main function of the large phallus is to fix female postabdomen in a position proper for successful mating. The development of the large phallus among the "acalyptrate" flies is highly various and manifold. Not only in "Tephritoidea" but also in Carnidae, Acartophthalmidae, etc.; one can have an overall impress, if one glances through GRIFFITHS's (1972) book.

It is commonplace to observe that the presence of large phallus is always paralleled with long female ovipositor. The long female ovipositors are homologous organs in tephritoid flies, but the structure of the postabdomen of *Eurygnathomyia* females shows peculiarities. Such structures may have emerged several times in the evolutional history of the flies as convergence.

On the other hand, long female ovipositor is not always paralleled with particularly long large phallus, e.g. in Agromyzidae.

I should like to call attention to HENNIG's (1950) original views by which one must make the cladistic analysis through as analysis of inter-relationships only (the plesiomorphic or apomorphic states are to be established only as a result of direct relations in the taxa involved). The unbiased way of doing so is to make comparison of two taxa (here: families) only. In order to facilitate correct judgement of the characteristics of the new family in comparison to some other families, I made a list of those morphological traits (changes) which are *convergences rather than synapomorphies* when somebody compare more than two families, for instance (bold: characteristics used also here):

- **loss of vibrissa**,
- **reduction of interfrontal setae**,
- long proboscis,
- reduction of dorsocentral setae (particularly so for pre-sutural ones),
- **costal breaks**,
- **presence of costal thorn(let)s**,
- reduction of basal cross-vein,
- **reduction of anal vein(s)**,
- "killer" type of fore femur and tibia,
- enlarged pulvilli,
- reductions in armature of tibiae and femora,
- symmetry in male postabdomen and genitalia,
- **fusion of phallapodeme to hypandrium**,

– **long distiphallus**,
– **hairs on distiphallus**.

On the other hand – based on my experience in studies of "acalyptrate" flies – we can make another list of those traits, which are probably "forbidden" reversals of characters, as follow:

– re-emergence of pedicel seam,
– **costal breaks**,
– re-emergence of basal cross-vein,
– **sagittal acrostichal line back to paired medial lines**,
– re-emergence of spermathecae,
– symmetrical male postabdomen and/or genitalia to asymmetrical,
– **enlargement of reduced postabdominal sclerites**,
– ? re-emergence of interfrontal setae,
– **long female ovipositor**,
– **retractable female postabdomen**,
– **seeming loss (desclerotisation) of postabdominal sclerites**.

As for the identification of the new genus, I have tried some of the identification keys to families in order to identify it.

In GRIFFITHS's (1972) key we can reach couplet 37, but beyond that there is no way to get closer to a concrete family.

In MCALPINE's (1981*b*) key it runs to the family Pallopteridae. It fits well into its concept of this family (MCALPINE 1981*a*).

In BARRACLOUGH's (1995) key our fly does runs to any definite point (but to couplet 48). One may say that Pallopteridae is not represented in the Afrotropical region, so that key is not for the identification of *Circumphallus* at all. However, what seems important for me, that it does not approximate any of the families of Tephritoidea.

OOSTERBROEK's (1998) key does not include Pallopteridae; *Circumphallus* keys out to Curtonotidae, which are not related.

In PAPP and SCHUMANN's (2000) key for the Palaearctic Diptera families its runs to couplet 128 (Pallopteridae/Lonchaeidae), but it does not fit to them.

I compared the characters of *Circumphallus* also to some genera of uncertain affinities, like *Mallochianamyia* SANTOS-NETO (syn. *Gayomyia* MALLOCH) (for details see WHEELER 2000), *Melanthomyza* MALLOCH, *Paraleucopis* MALLOCH and *Schizostomyia* MALLOCH (the first two genera have been studied in the HNHM). No closer relationships were found.

In order to summarise the relationships of Circumphallidae to the other families and genera discussed, I made an identification key for them, as follows.

1 Male abdomen with 5 preabdominal segments: all postabdomen and genitalia are covered by the large tergite 5 dorsally (Fig. 1). Postabdominal sclerites reduced to a short open ring (Fig. 3), phallus very thin ribbon-like and coiled twice over epandrium (Figs 8–9). Hypandrium reduced to small quadrate plates (Fig. 11), no sclerotised subepandrial sclerite present. Costa with subcostal and posthumeral breaks and also with a prehumeral attenuation. Costal setae numerous and long (Fig. 2). Alular area of wing reduced and no remnant of vein A_2 discernible. Surstylus (Figs 6–7) not fused to epandrium at all, with numerous thick blunt pegs.

Circumphallidae familia nova

– Male postabdomen and epandrium well visible dorsally, at least sternites 6, 7 and 8 not reduced. Hypandrium large, with or without a cranial apodeme. Costa with subcostal break only (a posthumeral attenuation usually discernible). Costal setae inconspicuous, or short thick and numerous or longer but scarce. Even if alular area is reduced on wing, remnant of A_2 discernible. Presence and insertion of surstylus various. 2

2 Tibiae with 2 pairs of dorsal subapical setae. Acrostichal setae in 1 sagittal row. 4 (5) large katepisternal setae present. Costal vein with sparse but long black setae. Cerci fused into a single sclerite (Fig. 28), male surstyli free (not fused to epandrium). Distiphallus very large coiled and rests in a sclerotised left-side cavity (pocket) of the abdomen (Fig. 38). Females with less sclerotised terminal sclerites, ovipositor if half-stretched may be jack-knifed under sternite 7. Two closely set globular spermathecae, each with a longer section of sclerotised ducts. A third sclerotised structure of the inner genitalia (ventral receptacle ?) present (Figs 26–27). 2 +3 pairs of dorsocentral setae. Eurygnathomyiidae, **family reinstated**

– Tibiae without dorsal preapical setae. Acrostichal setae in paired rows or numerous unarranged acrostichals present. At most 2 katepisternal pairs present. Costa without thicker black setae, or those setae are more dense and short. Male cerci not fused. Distiphallus short or if long, coiled over the epandrium. Female postabdominal terminal sclerites strongly sclerotised, forming a strong ovipositor. Female inner genitalia different. 3

3 1+3 pairs of dorsocentral setae. 2 pairs of scutellar setae. Male surstyli fused to epandrium, forming a surstylar lobe or not even a surstylar lobe discernible. Two longish spermathecae. Pallopteridae

– 0+2 pairs of dorsocentral setae (*Morgea* HENNIG, 1967, *Aenigmatomyia* MALLOCH, 1933), or 1+3 pairs (*Heloparia* MALLOCH, 1933, *Pseudopyrgo-*

ta MALLOCH, 1933) but in latter cases 3 or 4 scutellar pairs present. Male surstyli are always significant and not fused to epandrium. Two spermathecae on separate ducts far from each other or three globular spermathecae present. Genera excluded from the Pallopteridae (*Morgea, Aenigmatomyia*, etc.)

*

Acknowledgements – I am grateful to Dr JINDŘICH ROHÁČEK (Slezské zemské Muzeum Opava, CR) and to Dr BERNHARD MERZ (Geneva) for advice and to Mr ZOLTÁN SOLTÉSZ (PhD student of the Eötvös Loránd University, Budapest) for his help with the photos. I would like to thank V. A. KORNEYEV (Kiev) and an anynomous reviewer for their most useful corrections and advice.

The research (particularly so for collections in Vietnam) was established by the support of the National Office for Research and Technology (Grant No. VN-10/2006), Hungary.

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Revised version received December 7, 2010, accepted May 12, 2011, published October 28, 2011