

UDC 595.773.4

## NEW RECORDS OF ORIENTAL CTENOSTYLIDAE (DIPTERA ACALYPTRATA), WITH DISCUSSION OF THE POSITION OF THE FAMILY

V. A. Korneyev

Schmalhausen Institute of Zoology, vul. B. Khmelnits'kogo, 15, Kyiv-30, MSP, 01601 Ukraine  
E-mail: korval@entom.freenet.kiev.ua

Accepted 15 January 2001

**New Records of Oriental Ctenostylidae (Diptera, Acalyptrata), with Discussion of the Position of the Family.** Korneyev V. A. — *Ramuliseta thaica* sp. n. from Thailand is described. *Nepaliseta mirabilis* Barraclough, 1995 is recorded for the first time from Vietnam. *N. ashleyi* (Barraclough, 1998) comb. n. originally described from males collected in Sulawesi, Indonesia is redescribed based on a female from Taiwan. Diagnosis of the genus *Nepaliseta* Barraclough, 1995 is reconsidered. Based on the study of new material, the phylogenetic relationships of ctenostylids recently excluded from the family Pyrgotidae, are discussed.

Key words: Diptera, Acalyptrata, Ctenostylidae, Pyrgotidae, new species, taxonomy, phylogeny, Oriental Region.

**Новые находки ориентальных Ctenostylidae (Diptera, Acalyptrata) и обсуждение положения семейства.** Корнеев В. А. — Описана *Ramuliseta thaica* sp. n. из Таиланда. Впервые во Вьетнаме найдена *Nepaliseta mirabilis* Barraclough, 1995, известная из Непала. *Nepaliseta ashleyi* (Barraclough, 1998) comb. n., первоначально описанная по самцам, собранным на о. Сулавеси (Индонезия), впервые отмечена с о. Тайвань и переописывается по самке. Пересмотрен диагноз рода *Nepaliseta* Barraclough, 1995. На основании изучения нового материала обсуждаются филогенетические отношения семейства Ctenostylidae, недавно исключенного из состава семейства Pyrgotidae.

Ключевые слова: Diptera, Acalyptrata, Ctenostylidae, Pyrgotidae, новые виды, систематика, филогения, Ориентальная область.

### Introduction

The ctenostylids are tropical schizophorous flies of unusual appearance, and perhaps as rare in collections as they are morphologically and biologically unusual. They are nocturnal, larviparous flies with strongly branching arista and pictured wings, lacking ocelli and having almost transverse mesonotum, and they are distantly reminiscent of members of the Pyrgotidae, where they were tentatively placed as a subfamily Lochmostyliinae (Hendel, 1935; Lopes, 1935; Keiser, 1951; 1952; Hennig, 1952; Aczél, 1956). The nomenclature and position of the family was revised by D. K. McAlpine (1990) who has shown that the senior applicable family-group name is the Ctenostylidae, first proposed as a tribe (with ending -idea) close to Conopidae. D. K. McAlpine also stated that the group to which he assigned a family rank, Ctenostylidae, does not belong to the Pyrgotidae and apparently not even to the superfamily Tephritoidea. Further data on African and Oriental ctenostylids were recently published by Barraclough (1994; 1995; 1998) who confirmed their exclusion from Pyrgotidae as a separate family. However, the superfamily placement of the Ctenostylidae is still not clear. Recently, D. K. McAlpine (1997) has reconsidered certain morphological features and phylogenetic relationships among families of the superfamily Diopsoidea, suggesting that the Ctenostylidae may somehow be related to that group. This hypothesis is discussed further in the present paper and is supported with new data obtained in the course of an analysis of phylogenetic relationships among the families of the higher Tephritoidea (Ulidiidae, Platystomatidae, Pyrgotidae and Tephritidae) (Korneyev, in prep.).

Through the kindness of Dr. Marion Kotrba and Mr. Wolfgang Schacht (Zoologische Staatssammlung München), I have examined material containing 2 specimens of ctenostylids from the Oriental Region and an additional specimen found in my collection, one specimen representing a new species, described below. Two other species are redescribed.

**Material examined.** The material examined is deposited in the Zoologische Staatssammlung München (ZSSM), and in my collection, Kyiv (CVK).

Morphological terminology follows J. F. McAlpine (1981).

Abbreviations: A — apomorphy, P — plesiomorphy, H — homoplasy, SA — synapomorphy, SP — symplesiomorphy.

### Family Ctenostylidae Bigot, 1882

Bigot, 1882: 22 (Ctenostylidae); D. K. McAlpine, 1990: 365; Barraclough, 1994: 5; 1995: 135; 1998 (Ctenostylidae). — Barraclough, 1994: 5 (Ctenostylidae, error).

Type genus: *Ctenostylum* Macquart, 1851.

Synonym: Lochmostyliidae Hendel, 1935.

Type genus: *Lochmostylia* Hendel, 1934.

Hendel, 1935: 52; Lopes, 1935: 365; Keiser, 1951: 113; Aczél, 1956: 26 (Pyrgotidae: Lochmostyliinae).

**Diagnosis.** Medium-sized (wing length 4.0–9.0 mm) larviparous acalyptrate flies with large head almost as bulky as short thorax, long slender legs without large setae, pictured wings, and female tergosternum 7 forming conical oviscape. Head with ocelli and proboscis always lacking, frons weakly sclerotised, with indistinctly delimited fronto-orbital plates, in males sometimes very narrow, face with sclerotised medial carina and transverse lunula, but antennal grooves very weakly chitinised, in females often completely translucent, parafacial setulose along entire length. Thorax wide, with shortened presutural portion; prosternum transverse, sclerotised at ventral margin, widely membranous dorsal upper margins of fore coxae; postpronotum widely triangular, mostly displaced on to anterior surface; notopleuron very large, with posterior notopleural seta only; anepisternum longer than high, with vertical phragma well-developed in posterior portion; pleural wing process inflated, without swollen greater ampulla (subalar knob); anepimeron with numerous setulae and 1–3 longer setae; scutellum short, transverse, with 1–5 pairs of setae; katatergite large, swollen; subscutellum greatly reduced, metanotum very large and swollen, visible in dorsal view; metepimeron well-developed, metathoracal postcoxal area completely membranous medially; both anterior and posterior spiracles round, open, without fringe or setulae. Wing with 2 costal breaks, proximal (humeral) very weak but distinguishable as bare area of costa; distal (subcostal) break broad; setae on costal vein thin and moderately long; no thickened setae on costa before subcostal break; vein sc not reaching costa, ending close to vein  $R_1$  before level of subcostal break; vein  $R_{4+5}$  ending posterior to wing tip; cell bm opened antero-basally, cell bcu closed by arcuate or almost straight vein without any extension along vein  $A_1$ ; vein  $A_2$  developed distally of alula at least as a fold. Legs long and thin; fore coxa thick and short, with rather numerous setae on anterior surface and at ventral margin, mid coxa conspicuously smaller; hind coxa as large as fore coxa; mid tibia without apicoventral spur; pulvilli fringed; claws simple. Abdomen more or less petiolate, sternite 1 medially desclerotised, without any setae, posteriorly fused to sternite 2 with seam; male sternite 6 bare; male abdominal spiracles 6 and 7 absent; phallus simple, tubular, without glans, moderately long and coiled or very short; female sternites 3–6 without antero-medial apodemes, with pouch-like folds between them; oviscape (tergosternite 7) conical, sclerotised, not flattened, without ventro-basal apodeme; eversible membrane without any traces of taeniae; aculeus non-piercing, strongly modified into a weakly sclerotised tube with small, usually blunt bilobate cerci each bearing 2–3 strong setae.

### Descriptions of taxa

#### *Ramuliseta* Keiser, 1951

Type species: *Ramuliseta palpifera* Keiser, 1951, by original designation.

Keiser, 1951: 119; 1952: 325; Aczél, 1956: 27; Hennig, 1960: 326; Steyskal, 1977: 37; 1980: 556; McAlpine, 1990: 369; Barraclough, 1994: 9; 1995: 135; 1998: 122.

**Redescription.** Head: compound eyes dichoptic in both sexes. Lunula narrow, deep, setulae, if any present, hidden beneath anterior frontal margin; frons in both male and female wide; face with a broad and flattened medial sclerotised area in male and a narrow and low medial carina in female; palpi developed; head setae fine and rather short, irregularly developed: 0–1 medial vertical, 0–1 lateral vertical, ocellar setae usually well-developed, 1–4 latero-clinate and 0–4 inclinate fronto-orbital setae in posterior half of frons, medial third of frons mostly bare, sides finely but rather densely setulose; male antenna: scape transverse, medially extended beyond margin of pedicel, moderately long and densely setulose; pedicel with 3–5 very

long dorso-lateral and 2–3 ventro-lateral setae; flagellomere 1 apicoventrally with finger-like process 2.5 times as long as basal part; arista short-pubescent, with rays slightly longer than width of aristemere 1 female antenna: scape, pedicel and flagellomere 1 as in male; arista basally subdivided into 2–5 main branches, which further branch into pubescent branches; palpus fine microtrichose. Thorax: proepisternal ridge without setae; mesonotum sparsely setulose, with 1 dorsocentral, 1 intraalar and 1 postalar seta, scutellum with 2–4 setae and 5–7 smaller setulae at margin; anepisternum with 5–10 setulae at posterior margin; anepimeron with 5–6 setulae and 0–1 seta slightly longer than setulae. Abdomen with narrowed tergite 1, somewhat petiolate. Male sternum 6 transverse, moderately long, half as long as sternite 5; sternite 7 mostly membranous, fused to sternite 8; the latter rather wide, setulose, typical for higher Tephritoidea; hypandrium membranous, gonites and parameres indistinguishable; phallapodeme not very long, fused to hypandrium, but without distinctive latero-ventrally directed rods (vanes of phallapodeme); ejaculatory sac very broadly diamond-shaped from postroventral view, with broadly rounded ejaculatory apodeme that is flattened at apex; phallus with short and weakly sclerotised basiphallus and simple, tube-like distiphallus without glans; epandrium rounded, thick and wide, with flattened lobes of subepandrial sclerite bearing numerous short setulae, but no prensisetae; proctiger neither flattened, nor bilobate. Female terminalia (from Barraclough, 1994: figs 3, 5): oviscape conical, without ventro-basal apodeme; eversible membrane without sclerotised taeniae, no scales or microtrichia were figured; aculeus poorly sclerotised, cylindrical, with aperture on the apex and 2 sclerotised areas at the extreme apex on dorsal surface (obviously cerci), each bearing 2 strong setae, and small sclerite basal to them (corresponding to epiproct?); neither spermathecae nor ventral receptacle were found. Additional characters are listed in the description of *R. thaica*.

The genus now includes 3 species: Palaeotropical *Ramuliseta palpifera* Keiser, 1951 (= *R. lindneri* Keiser, 1952), Afrotropical *R. madagascariensis* Hennig, 1960 (Madagascar), and the Oriental *R. thaica* Korneyev, sp. n. The species originally described as *Ramuliseta ashleyi* Barraclough, 1998, is transferred below to the genus *Nepaliseta* Barraclough, 1995.

### ***Ramuliseta thaica* Korneyev, sp. n. (fig. 1–14)**

Material examined. Holotype ♂: “Thailand, Prov. Mae Hong Son, Umg. Passhohe NW Pai (Pai nach Soppong). Lichtfang. 16.04.2000 19°27'11"N /98°18'39"E 1350 m (12/2000) H. & R. Rausch leg.” (ZSSM). Holotype in fair condition: face collapsed inside head and body surface slightly covered with exudate that obscures the microtrichia; left wing and 2 legs glued to a paper rectangle pinned together with the specimen. The abdomen has been detached and placed in a plastic microvial of glycerol pinned under the insect.

Diagnosis. Similar to *R. palpifera* Keiser, 1951, differing in the wing venation and pattern: costal cell mostly brown, rather than with hyaline spot at middle as in *R. palpifera*; distance between apex of cell sc and apex of vein  $R_{2+3}$  at most 1.5 times longer than distance between apices of veins  $R_{2+3}$  and  $R_{4+5}$  (3.3 times as long in *R. palpifera*); apical portion of cell  $r_{2+3}$  with a large triangular hyaline incision rather than wholly brown, cell  $r_{4+5}$  with hyaline spot at base and smoky brown at apex rather than with 2 hyaline marks at base and a dark brown apex, vein dm-cu almost perpendicular to both M and CuA, rather than oblique in *R. palpifera*.

Description. Head (fig. 1–3). Length:height:width ratio=1:1:1.03. Unicolorous, brownish yellow; microtrichia often indistinguishable in the holotype. Frons densely brown setulose, except bare postero-medial triangular impressed area between vertical plates in front of ocellar setae. Vertical plate sparsely microtrichose, with 5 (2 pro-latero-clinate and 3 pro-inclinate) orbital setae. Ocelli indistinguishable; ocellar setae as long as orbital setae. Medial and lateral vertical setae well-developed, subequal. Face membranous, flat, slightly shagreened, in holotype apparently non-translucent. Scape and pedicel dark yellow, rather densely dark brown or black setulose; pedicel with 1 long and several shorter thin dorsal setae in addition to minute setulae. Flagellomere 1 yellowish, rather short, wide at base, extremely narrow, finger-like in apical 0.7 of its length, with arista inserted in dorsal surface at its base. Arista not branching, simple, long pubescent, with rays at most twice as long as basal arista width; extreme tips of both aristae broken off. All setae and setulae brownish-black. Parafacial very narrow, setulose. Mouthparts rudimentary. Palpus present.

Thorax (fig. 1, 4). Ground colour (including disc of scutellum) yellowish-brown. Thorax length from anterior margin of prothorax to the posterior end of postnotum slightly (1.1 times) exceeding its width. Mesonotal scutum measured between notopleural setae as wide as long. At most 1 prescutellar acrostichal, 1 dorsocentral, 1 notopleural, 1 intraalar and 1 postalar seta distinguishable. Mesonotal setulae brown; postsutural acrostichal setulae forming 4–6 very irregular rows. Postpronotal lobe without setae, but 5–6 small setulae. Notopleuron with 3–4 rather long setulae. Scutellum 3 times as wide as long, with 2 pairs of setae (basal and apical) and with at least 2–6 distinguishable setulae on each side. Prosternum poorly visible, transverse, apparently sclerotised only at posteroventral margin. Proepisternum without setae or setulae. Anepisternum wrinkled in antero-ventral portion, on posterior margin with 4–5 setulae half as long as notopleural or katepisternal seta, major setae either broken off or absent. Katepisternum with a strong seta inserted in

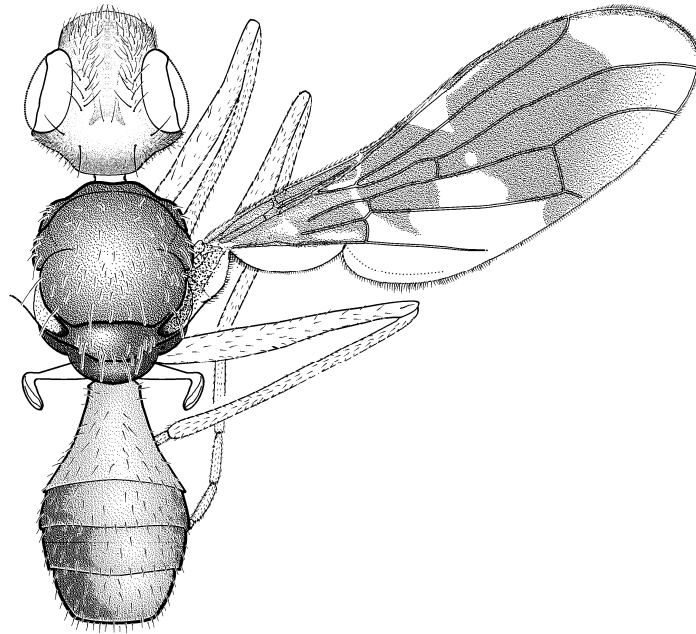


Fig. 1. *Ramuliseta thaica*, holotype ♂.

Рис. 1. *Ramuliseta thaica*, голотип ♂.

antero-ventral area, medially of fore coxa margin; postero-ventral margin adjacent to mid coxa bare; latero-dorsal area with 1–2 setae and 6–7 smaller setulae. Anepimeron with 1 seta and 3–4 setulae.

Legs (fig. 5–8) yellow, with brownish-black setulae. Fore coxa (fig. 4) robust, slightly compressed in antero-dorsal direction, antero-lateral margin with 14–16 setae arranged in 2 rows, antero-medial margin with 12–15 setae, and antero-distal margin with 8–9 setae; remaining part of anterior surface bare; posterior surface with 6–8 setae at distal margin. Fore trochanter with 2 adpressed setulae. Fore femur and tibia (fig. 5) without strong and long setae, with brown setulae only. Fore tarsus as long as tibia, yellowish-brown setulose; tarsomere 2 slightly more than half as long as tarsomere 1; empodium pennate (fig. 8). Mid coxa conspicuously smaller than fore and hind coxa; eucoxite (anterior) surface with submarginal row of 11–12 setulae; disticoxite (posterior) surface with 9–10 setulae; midcoxal prong fine, lamelliform. Mid trochanter with 2 setulae on dorsolateral surface. Mid femur, tibia and tarsus as in fig. 6; tibia without any thickened setae at apex. Hind coxa large, almost cylindrical, slightly narrowed apically, finely setulose on anterior surface and on sides, posterior surface mostly bare. Hind trochanter with 8–10 fine setulae on posterior surface. Hind femur, tibia and tarsus as in figure 7.

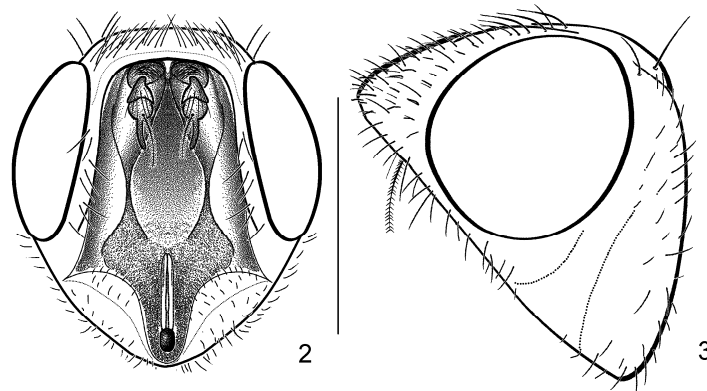


Fig. 2–3. *Ramuliseta thaica*, ♂: 2 — head, anterior aspect; 3 — same, lateral. Scale: 1 mm.

Рис. 2–3. *Ramuliseta thaica*, ♂: 2 — голова, вид спереди; 3 — то же, сбоку. Масштаб: 1 мм.

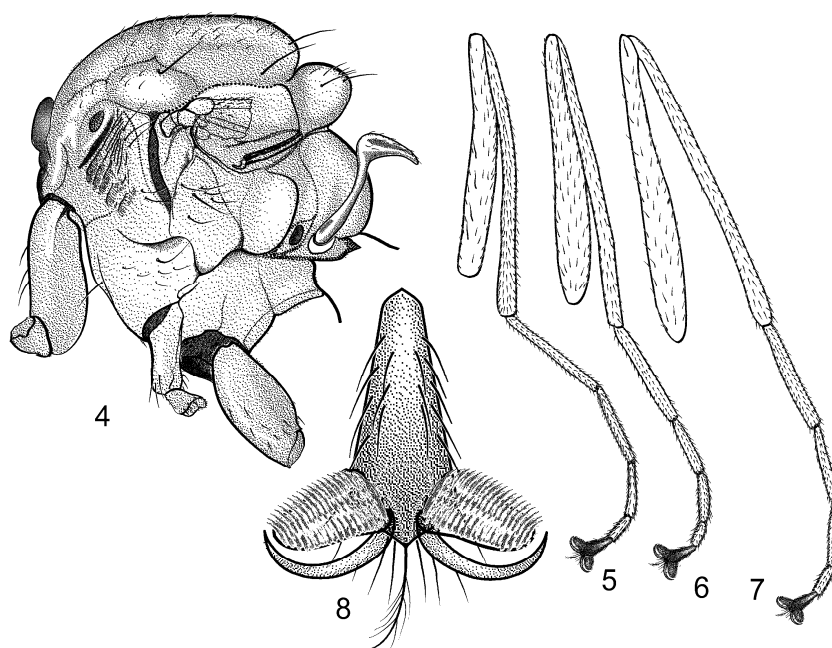


Fig. 4–8. *Ramuliseta thaica*, ♂: 4 — thorax, lateral aspect; 5 — fore leg (coxa and trochanter removed), anterior aspect; 6 — mid leg, same; 7 — hind leg, same; 8 — last tarsomere of fore leg, enlarged.

Рис. 4–8. *Ramuliseta thaica*, ♂: 4 — грудь, вид сбоку; 5 — передняя нога (тазик и вертлуг не показаны), вид спереди; 6 — средняя нога, то же; 7 — задняя нога, то же; 8 — последний тарзомер передней ноги, увеличено.

Wing as in figure 1. Costa thickened, with costagial break, weak humeral break at middle of cell *c*, and broad subcostal break. Humeral vein joining subcostal vein somewhat distad of its separation from  $R_1$ . Subcostal vein broken at apex. Vein  $R_1$  setulose along its whole length on dorsal side; cell  $r_{2+3}$  apically widened; vein  $R_{4+5}$  bare; vein *M* almost parallel to  $R_{4+5}$ ; ratio of its 3 last sections:  $M_2:M_3:M_4=1:1.5:1.6$ , i. e., penultimate section almost as long as ultimate and much longer than second one. Wing pattern, as in most ctenostylines, with brown basal cells and well-developed pattern in apical two thirds. Apical portion of cell  $r_{2+3}$  with very narrow dark stripe along costal vein and large hyaline sector between it and vein  $R_{4+5}$ . Brown subapical spot gradually fading to greyish shading at apices of cells  $R_{4+5}$  and *M*. Cell  $cua_1$  and postero-medial corner of anal lobe pale greyish. Vein  $CuA_2+A_1$  in apical 2/5 of its length fold-like, but visible to its extreme tip. Alula narrow, hyaline, slightly darkened on anterior margin. Upper calypter narrow, with fringe of rather long and sparse microtrichia; lower calypter almost linear. Haltere brownish-yellow, with large sparsely microtrichose knob, in dry specimen somewhat bent, giving L-shaped appearance to whole haltere.

Abdomen. General shape somewhat petiolate (fig. 1, 9). Syntergite 1+2 yellowish-brown, tergites 3–5 black, covered with moderately dense blackish setulae. Tergite 1 narrow and elongate, fused with trapezoidal widened tergite 2. Sternites brownish-yellow, black setulose. Sternite 1 longitudinal, as well as sternite 2, sternites 4 and 5 transverse. Membrane without any setulae, short microtrichose. Protandrium weakly sclerotised, sternites 6 and 7 without setulae; setulose sclerite on the left side is presumed to be sternite 8 rather than tergite 6. Male genitalia as in figures 11–14. Hypandrium weakly sclerotised, without conspicuous associated structures (parameres, gonites, epiphallus). Phallapodeme moderately short, partly fused to hypandrium bottom. Phallus long, bare, simple, ribbon-like, without sclerotised taeniae. Basiphallus short. Epandrium subglobose, subepandrial sclerite setulose, without any large, tooth-like setae (prensisetae). Proctiger almost membranous, setulose.

Female not known.

Measurements (length in mm). Body 5.6, wing 5.0.

Discussion. *R. thaica* is the second member of the genus *Ramuliseta* known from the male (*Ramuliseta ashleyi* Barraclough is transferred to the genus *Nepaliseta*), while *R. madagasacariensis* Hennig is known from females only. Taking into account the sexual dimorphism of the wing pattern known in some related genera, certain differences in the wing pattern of the female can be expected. However, the wing venation usually shows no such dimorphism, and the length of the penultimate section of the costal vein is considered to be a consistent character of this species. This character is not known elsewhere in the Ctenostylidae, except in the new genus described below. The new species shares this character, as well as the long phallus, with species of the genus *Nepaliseta*, differing by having ocellar setae and at most 1 dorsocentral and 2 scutellar setae on each side.

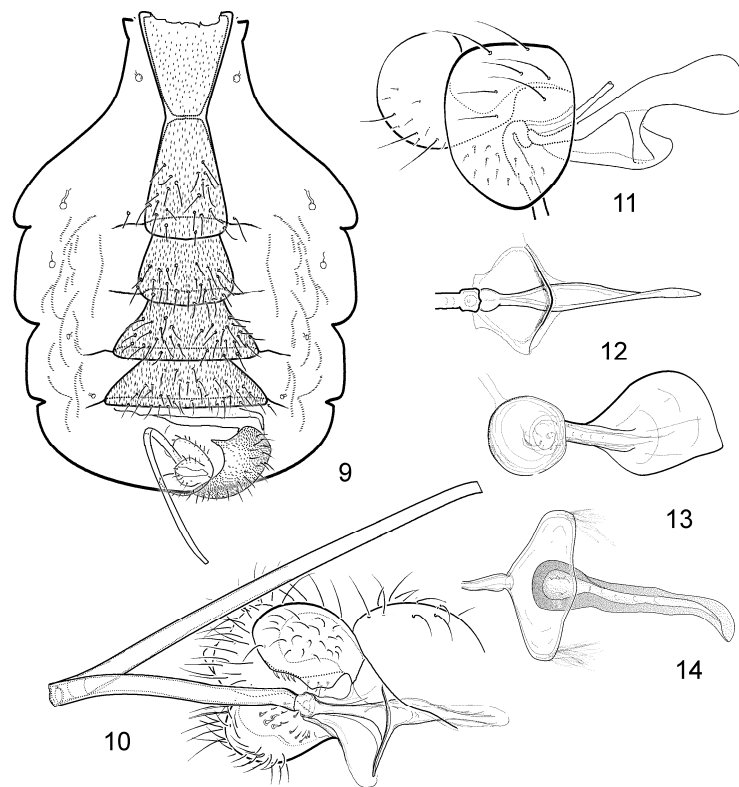


Fig. 9–14. *Ramuliseta thaica*, ♂: 9 — male abdomen, ventral aspect; 10 — male postabdomen, ventro-lateral aspect; 11 — male genitalia, right lateral aspect; 12 — hypandrium and phallosome; 13 — sperm pump, lateral; 14 — same, ventral aspect.

Рис. 9–14. *Ramuliseta thaica*, ♂: 9 — брюшко самца, вид снизу; 10 — постабдомен самца, вид сбоку и снизу; 11 — гениталии самца, вид справа; 12 — гипандрий и фаллопоема; 13 — эякулятор, сбоку; 14 — то же, снизу.

### *Nepaliseta* Barraclough, 1995

Type species: *Nepaliseta mirabilis* Barraclough, 1995, by original designation.  
Barraclough, 1995: 136.

**Diagnosis.** This genus fits near *Ramuliseta* Keiser and *Furcisetia* Aczül, sharing with them the low bare lunula (A?), well-developed palpi (P) and almost parallel veins  $R_{4+5}$  and M (P), and differing in lacking a ventroapical projection on female flagellomere 1 (A) and ocellar setae (A) and possessing 3–4 pairs of scutellar setae (unresolved polarity). Having 3 pairs of dorsocentral setae, as in *Furcisetia* (unlike 1 pair in *Ramuliseta*) is also of unresolved polarity. In the key to the genera of Ctenostylidae (D. K. McAlpine, 1990: 369), it runs near *Ramuliseta*, differing from the latter by the presence of more than 1 pair of dorsocentral setae and more than 2 pairs of scutellar setae, and the rounded, short flagellomere 1 of female without a finger-like projection.

**Redescription.** Head: compound eyes almost holoptic in male, dichoptic in female; lunula rather low, bare, wide in male and rather narrow in female; in female frons wide, in male strongly narrowed; face with broad and flattened medial sclerotised area in male and narrow and low medial carina in female; palpi developed; head setae fine and rather short, irregularly developed: 0 postocellar, 0–1 medial vertical, 0–2 lateral vertical, ocellar setae absent, 3–4 lateroocellate and 2–3 inclinate fronto-orbital setae in posterior half of female frons, (1–2 lateroocellate and 0–1 inclinate fronto-orbital setae in posterior half of male frons), medial third of female frons depressed, mostly bare, sides slightly raised, finely but rather densely setulose; ptilinal suture long, distinct as far as lower eye margin or more; parafacial setulose along entire length; female

antenna: scape transverse, medially extended beyond margin of pedicel, very long and densely setulose; pedicel with 2–3 very long dorso-lateral, 1–2 ventro-medial and 4–5 ventro-lateral setae; flagellomere 1 short and rounded, apicoventrally without finger-like process; arista basally subdivided into 2–5 main branches, which divide further into pubescent branches; male antenna: scape  $\Gamma$ -shaped, medially and ventrally extended almost beyond margins of pedicel, moderately setulose, less than in female; pedicel with 2–3 very long setae; flagellomere 1 short and rounded, apicoventrally with long finger-like process; arista simple, pubescent, but not subdivided into branches (like in *Ramuliseta* male); palpus finely microtrichose; proboscis vestigial; gena setulose; occiput with 4–5 rows of setulae; median occipital sclerite bare, without distinctive supracervical setae; occipital setae forming 4–5 irregular rows. Thorax: prosternum bare, transverse, broadly membranous with a ventral sclerotised area and lateral arms joined laterally to proepisternum; proepisternal ridge without setae; cervical sclerite large, triangular in profile; postpronotum small, flattened, without setae, bearing 2–3 setulae; mesonotum presuturally sparsely setulose and much more densely setulose postsuturally; 0 acrostichal, 3 dorsocentral setae (anterior close to suture, posterior in line with intraalar), 1 intraalar and 1 postalar seta, scutellum with 6–10 setae and numerous setulae over most of its disc; anepisternum with distinct vertical phragma; prephragmal area of its disc with 12–15, and area posterior of phragma with 5–8 setulae and 1–2 somewhat longer setulae; anepimeron with 10–12 setulae and 0–1 slightly longer seta; katepisternum with 1–3 setae inserted in antero-ventral area, and medially of fore coxa margin; its postero-ventral margin adjacent to mid coxa at most with 1 seta, latero-dorsal area with 1 seta and 8–10 setulae. Wing as in other ctenostylids, Sc incomplete;  $R_1$  setulose; cell  $r_1$  without crossveins between  $R_{2+3}$  and costa;  $R_{4+5}$  bare, almost straight; M moderately curved posteriorly,  $R_{4+5}$  and M rather divergent; vein  $Cu_2+A_1$  well-developed in proximal half and at least as fold in distal half; vein A2 distinct, distad of alula, as fold. Alula and upper calypter well-developed; lower calypter linear. Haltere as in *Ramuliseta*, with a large, elongate knob which gives a L-shaped shape to whole haltere. Abdomen with narrowed tergite 1, somewhat petiolate. Sternite 1 microtrichose elongate, weakly sclerotised except lateral margins; sternite 2 elongate, without desclerotised window at anterior margin, fused to sternum 1; sternites 3–6 transverse, without antero-medial apodemes. Female terminalia: oviscape conical, without ventro-basal apodeme; eversible membrane without sclerotised taeniae, covered with microtrichia; aculeus poorly sclerotised, cylindrical, with aperture at the apex and 2 sclerotised areas at extreme apex on dorsal surface (obviously cerci), each bearing 2 strong setae, and small sclerite basal to them (corresponding to epiproct?); neither spermathecae nor ventral receptacle found. Vagina full of eggs containing 1<sup>st</sup> instar larvae; mouthhooks appearing non-downcurved (fig. 30).

This genus includes 2 species: *Nepaliseta ashleyi* (Barraclough), comb. n. and *N. mirabilis* Barraclough.

#### Key to species of the genus *Nepaliseta*

##### Таблица для определения видов рода *Nepaliseta*

- |    |   |                                 |
|----|---|---------------------------------|
| 1. | Hyaline interval between two brownish-yellow spots in cell $r_{2+3}$ short, at most as wide as long at anterior margin (fig. 20). ..... | <i>N. ashleyi</i> (Barraclough) |
| —  | Hyaline interval between two brownish-yellow spots in cell $r_{2+3}$ twice as long as wide (fig. 26). ...                               | <i>N. mirabilis</i> Barraclough |

#### *Nepaliseta ashleyi* (Barraclough), **comb. n.** (fig. 15–20)

Barraclough, 1998: 136 (*Ramuliseta*) (male).

Material examined. } : “NE-Taiwan, Fushan Botanical Garden, 650 m, ca. 24°47' N/21°33' E, 17.–22.VI.2000). leg. W. Schacht” (ZSSM). In rather good condition: left wing somewhat broken.

**Diagnosis.** Differs from *N. mirabilis* only in details of wing pattern as noted in the key above.

**Redescription.** Body and setae uniformly brownish-yellow in colour. Mesonotum with 2 submedian longitudinal vittae and 4 rounded spots of darkened cuticle at the points where muscles attach.

**Female** (first description). Head as in figures 15–18. Area of antennal grooves completely translucent. Height:length:width ratio=1:0.86:1.07. Vertical plate with 4–5 latero-clinate and 2–4 inclinate orbital setae. Vertex with second major seta distally of lateral vertical seta on each side. Thorax as in figure 19. Mesonotum length (without scutellum) to width (measured between notopleural setae) ratio = 0.9. Wing 2.67 times longer than wide, with brownish-yellow wing pattern, as in figure 20; anal lobe, alula and upper calypter with brown stripe. Haltere with brownish knob. Female abdomen unicolorous, not dissected.

Measurements (length in mm). Female. Body 6.0, wing 6.0, oviscape 1.0.

**Discussion.** This species was described from a male and originally placed in the genus *Ramuliseta*; however, Barraclough (1998) has noted in the end of its description: “The wing patterning and venation of *R. ashleyi* differ strongly from *R. madagascariensis* and *R. palpifera*..., but are similar to that of *Nepaliseta mirabilis* Barraclough... *Nepaliseta mirabilis* differ mainly in having much broader hyaline region on the apical half of wing, just beyond its mid-length”. Discovery of the female that possess all the important characters of the male, except for terminalia structure and the frons broad (certainly a sexually dimorphic character, which is common in the Ctenostylidae), and is similar to females of *N. mirabilis* in all the main features, shows that *R. ashleyi* is another species of the genus *Nepaliseta*. Both species of the latter genus share the ocellar setae

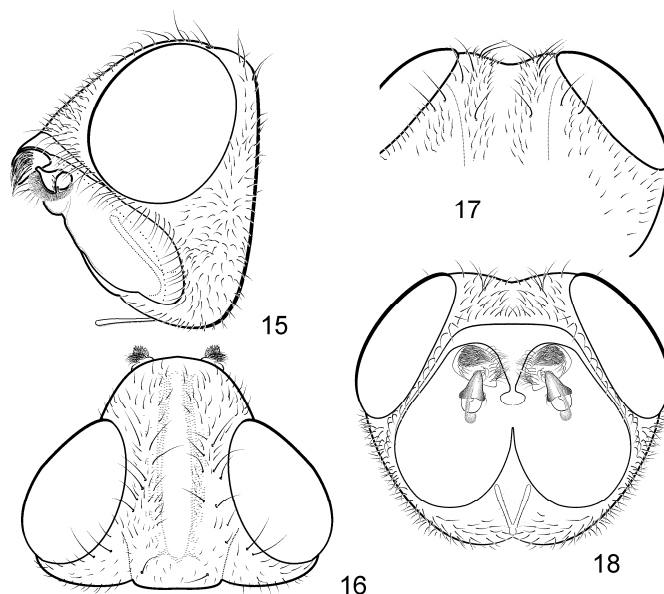


Fig. 15–18. *Nepaliseta ashleyi*, ♂, head: 15 — lateral left aspect; 16 — dorsal aspect; 17 — posterior aspect (upper portion of occiput and vertex); 18 — anterior aspect.

Рис. 15–18. *Nepaliseta ashleyi*, ♂, голова: 15 — вид слева; 16 — вид сверху; 17 — вид сзади (верхняя часть затылка и темя); 18 — вид спереди.

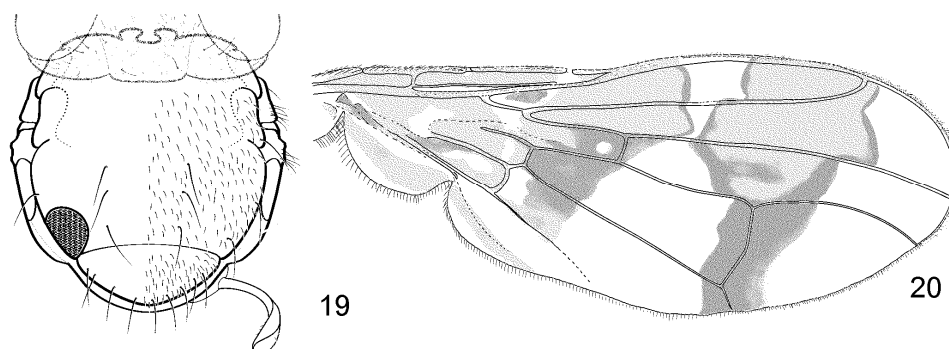


Fig. 19–20. *Nepaliseta ashleyi*, ♂; 19 — thorax, dorsal aspect; 20 — right wing.

Рис. 19–20. *Nepaliseta ashleyi*, ♂; 19 — грудь, вид сверху; 20 — правое крыло.

lacking and numerous scutellar setae (3–5 pairs) and setulae. However, males of *N. ashleyi* have the finger-like projection of the flagellomere 1 well-developed, whereas in the female described above, such an appendix is absent like in *N. mirabilis*, which is believed to be a sexually dimorphic feature.

### *Nepaliseta mirabilis* Barraclough (fig. 21–30)

Barraclough, 1995: 136.

Material examined. ♂: «Вьетнам, Хошонбинь, Бави, 10.VI.1986, Горохов» [Vietnam, Hochonbin: Bavi, Gorokhov leg.] (CVK). In fair condition. 2 hind legs and 1 fore leg are missing; left wing partially broken and glued; abdomen has been detached and placed in a plastic microvial with glycerol pinned under the insect.

Redescription. Body colour brownish-yellow with irregular spots of darker tinge; setae brownish-yellow. Area of antennal grooves completely translucent.

Female. Head as in figures 21–22. Height:length:width ratio=1:1.0:1.0. Vertical plate with 4–6 latero-clinate and 0 inclinate orbital setae. Lateral vertical seta on each side and additional seta close to it absent. Thorax as in figures 24–25. Mesonotum length (without scutellum) to width (measured between notopleural



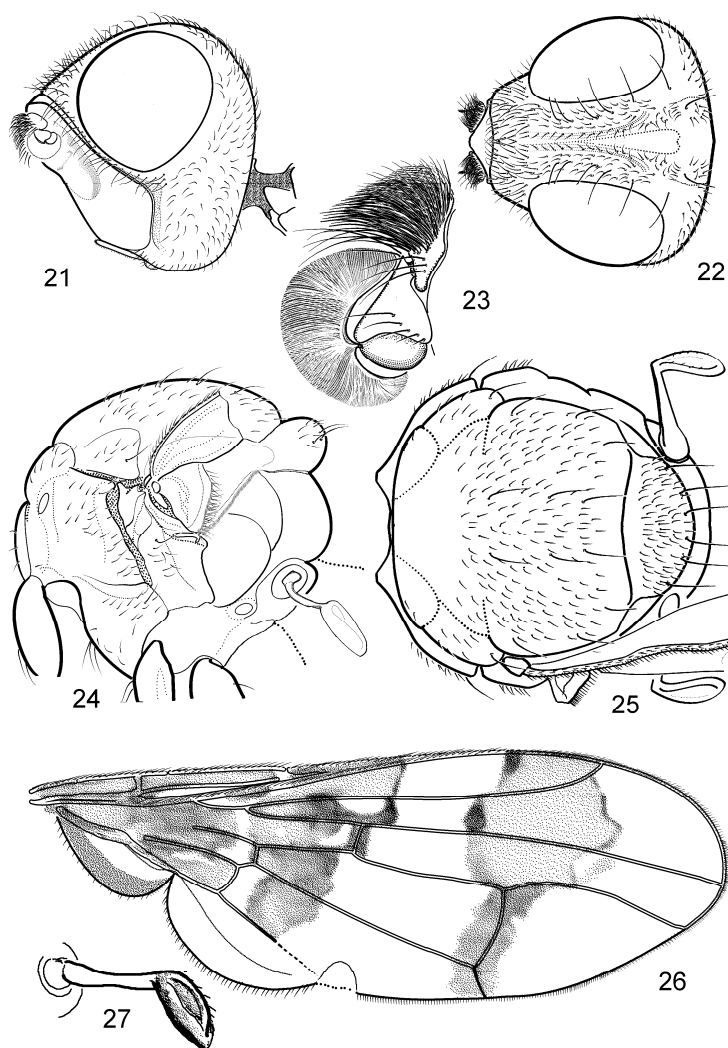


Fig. 21–27. *Nepaliseta mirabilis*, ♀: 21 — head, lateral left aspect; 22 — same, dorsal aspect; 23 — left antenna, lateral aspect; 24 — thorax, lateral aspect; 25 — same, dorsal aspect; 26 — right wing; 27 — right calypter.

Рис. 21–27. *Nepaliseta mirabilis*, ♀: 21 — голова, вид слева; 22 — то же, вид сверху; 23 — левая антенна, вид сбоку; 24 — грудь, вид сбоку; 25 — то же, вид сверху; 26 — правое крыло; 27 — правое жужжальце.

setae) ratio = 0.8. Wing 2.86 times as long as wide, with brownish-yellow pattern as in figure 26, hyaline crossband broad, anal lobe, alula and upper calypter with brown stripe. Haltere (fig. 27) with brownish knob. Female abdomen unicolorous, as in figures 28–29.

Measurements (length in mm). Female. Body 2.7–5.4, wing 4.0–5.3, oviscapae 0.8.

### Relationships of Ctenostylidae

The fact that ctenostylid species were originally assigned to the family Pyrgotidae seems reasonable, taking into account the absence of ocelli, receding face profile, pictured wings with two costal breaks, setulose vein  $R_1$  and posteriorly bowed  $R_{4+5}$  and  $M$ , fused abdominal sternites 1 and 2, male subepandrial sclerite finely setulose without prensisetae, conical oviscapae and finally, nocturnal activity, attraction to light and apparently zoophagous larvae. In the Pyrgotidae, the genus *Toxopyrgota* Hendel, 1914, shares certain features with the Ctenostylidae such as the very oblique face profile, short mesonotum, long legs and arched vein closing cell  $b_{cu}$ , but otherwise is a typical

pyrgotide, quite different from ctenostylids (Steyskal, 1972: Figs 11–15). The similarity of ctenostylids and pyrgotids is so strong that it encourages the hypothesis that the inconsistency of other characters is the result of strong secondary modification, which has considerable credibility because of the extremely aberrant appearance of ctenostylids. However, detailed study shows that many “homologies” in ctenostylids and pyrgotids are actually homoplasies.

The characters supporting and contradicting the assignment of the Ctenostylidae to the Tephritoidea, were discussed by D. K. McAlpine (1990). He arrived at the general conclusion that ctenostylids are not tephritoids at all, and he supported this hypothesis with the following arguments: 1) male preabdomen with a well-developed tergite and sternite 6, whereas segments 7 and 8 are vestigial; 2) phallus short and simple rather than long, coiled and bearing terminal glans; 3) in female, terminal structure of the telescopic ovipositor non-sclerotised, except for apical structures dorsally of the gonopore with strong setae which McAlpine (1990) considered to be cerci.

In the Tephritoidea, these three characters are all present in the derived state. The male tergite 6 is vestigial in some Lonchaeidae (see Morge, 1963: Figs 58, 59, 62) and completely absent in other Tephritoidea that consists one of synapomorphies of that superfamily. Commonly, and apparently in the ground plan of the subfamily Tephritoidea, the phalli are ribbon-like, but short pipe-like or non-ribbon-like phalli are known in some Lonchaeidae (see Morge, 1963: Figs 65–66) and a few Platystomatidae and Pyrgotidae (D. K. McAlpine, 1973; 1990). However, in *Ramulisetia thaica* (fig. 9), which I dissected, the protandrial sclerites were rather soft and shrivelled, and I cannot support nor disprove that the setulose sclerite postero-dorsad of the epandrium is the tergite 6 rather than the sternite 8 as it is in Pyrgotidae and other higher Tephritoidea; the asymmetrical position of this sclerite may indicate that it is sternite 8 rather than tergite 6. Moreover, in this species and in *Nepaliseta ashleyi* (see Barraclough, 1998: Figs 8–9) the phallus is long and somewhat coiled, but has no terminal glans. The latter feature does not contradict the placement of ctenostylids in the Pyrgotidae: it is rather similar to this in at least *Cardiacera miliacea* Hendel. However, the structure of the terminal portion of the telescopic ovipositor in ctenostylids cannot be treated as a derived state of the sclerotised, elongate complex aculeus that forms another synapomorphy of the Tephritoidea (Korneyev, 1999).

On the other hand, ctenostylids share certain features with families usually referred to the superfamily Diopsoidea: Psilidae, Nothybidae, Tanypezidae and others. Some of them are so similar that the diopsoid hypothesis of ctenostylid relationships is worth serious consideration. The morphological characters and some phylogenetic hypotheses about Diopsoidea families were recently considered by D. K. McAlpine (1997), facilitating further discussion of both the pyrgotid and the diopsoid hypotheses of the origin of the Ctenostylidae.

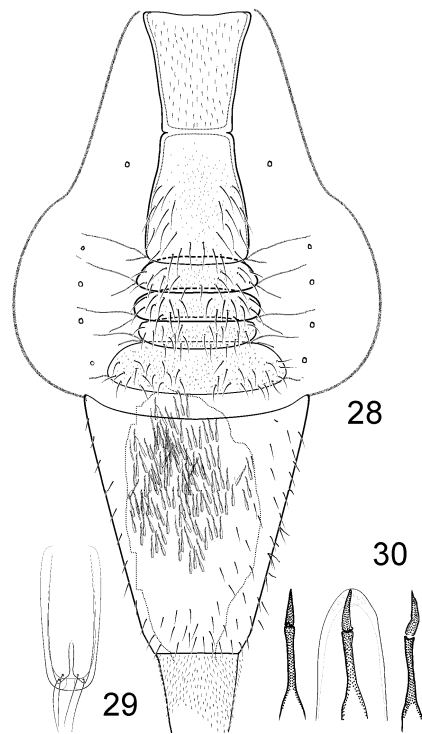


Fig. 28–30. *Nepaliseta mirabilis*: 28 — female abdomen, ventral aspect; 29 — aculeus, dorsal aspect; 30 — cephalopharyngeal skeletons of 1<sup>st</sup> instar larvae.

Рис. 28–30. *Nepaliseta mirabilis*: 28 — брюшко самки, вид снизу; 29 — акулеус, вид сверху; 30 — цефалофарингеальные скелеты личинок 1-го возраста.

## Comparison of Key Characters of Ctenostylidae and Allied Taxa

## Сравнение ключевых признаков Ctenostylidae с таковыми ближайших таксонов

N	Ctenostylidae	Diopsoidea and allied families	Pyrgotidae
1	2	3	4
1.	Head. Ocellar triangle vestigial; ocelli always absent. <b>AA or SA with some Pyrgotidae</b>	Ocellar triangle always large, usually reaching anterior margin of frons, with well-developed ocelli.	Ocellar triangle small or vestigial; ocelli present in the ground-plan of the family.
2.	Head. Vertical plate in female rather long and wide, extending into anterior third of frons. <b>SP with Psilidae and other Diopsoidea?</b>	Vertical plate in females rather long and wide, joined to eye, extending into anterior third of frons in Psilidae; with some reservations, also in Diopsidae and Tanypezidae; not in Nothybidae, Gobryidae.	Vertical plate in both sexes quite short, more or less separated from eye margin, restricted to posterior third of frons.
3.	Head. Postocular seta equal to well-developed lateral vertical seta (in <i>Nepaliseta</i> ). <b>SA or convergence with Psilidae</b>	Postocular seta equal to well-developed lateral vertical seta in Nothybidae and Psilidae.	No large postocular setae.
4.	Head. No series of postocular setae can be distinguished from occipital setulae. <b>SA or convergence with Psilidae</b>	Differentiated series of postocular setulae absent in Psilidae, Diopsidae, and allied families, but not in Tanypezidae.	Series of postocular setae well differentiated.
5.	Head. Vertical plate in female with 3–5 partially laterocline setae poorly distinguishable among frontal setulae. <b>SP with Psilidae and other Diopsoidea?</b>	Vertical plate with 2–5 partially laterocline setae poorly distinguishable among frontal setulae at least in Psilidae; apparently similar in Tanypezidae	1–2 strong reclinate orbital setae.
6.	Head. Arista (in males) with short erect pubescence. <b>SP with Psilidae and Tanypezidae?</b>	Arista (in both sexes) with short erect pubescence in Psilidae; also in Tanypezidae	Arista almost bare.
7.	Thorax. Precoxal prothoracal bridge not developed; precoxal area membranous. <b>P</b>	In Psilidae prosternum normally developed, but not forming sclerotised precoxal bridge; in other families (including Tanypezidae) precoxal bridge well-developed (synapomorphies or convergence).	Precoxal prothoracal bridge not developed; precoxal area membranous.
8.	Thorax. Proepisternum without row of strong setae. <b>P</b>	Proepisternum without row of strong setae.	Proepisternum with a distinct row of strong setae, at least in the subfamily Pyrgotinae (including Toxurini).
9.	Thorax. Proepimeral seta absent. <b>P</b>	Proepimeral seta absent.	Proepimeral seta absent. SA of Platystomatidae, Pyrgotidae and Tephritidae.
10.	Thorax. Prothoracic spiracle circular, almost devoid of hairs on its margins. <b>SA or SP with Psilidae and Nothybidae</b>	In Psilidae and Nothybidae prothoracic spiracle circular, almost devoid of hairs on its outer margins. In Diopsidae, Syringogastridae, Gobryidae and Tanypezidae various, but neither circular, nor almost bare	Prothoracic spiracle vertical, with fine hairs on its margins.
11.	Thorax. Notopleuron setulose. <b>SP with Psilidae</b>	Notopleuron setulose in Psilidae; bare in Tanypezidae.	Notopleuron without setulae. SA of Tephritoidea or Tephritoidea + Tanypezidae. (Reversal in some Platystomatidae.)
12.	Thorax. Anterior notopleural seta absent. <b>SA or HP with most Diopsoidea, except Tanypezidae</b>	Anterior notopleural seta absent in Psilidae, Diopsidae, Gobryidae and Nothybidae.	Anterior notopleural seta present. P

1	2	3	4
13.	Thorax. Anepisternum with setae on postero-dorsal margin. <b>SA or HP with Tephritoidea and Tanypezidae</b>	Anepisternum without setae on postero-dorsal margin in most Diopsoidea, except Tanypezidae.	Anepisternum with setae or longer setulae on postero-dorsal margin in all Tephritoidea.
14.	Thorax. Anepimeron setulose. <b>SA or convergence with Platystomatidae, Pyrgotidae and Tephritidae or with Tanypezidae</b>	Anepimeron bare in all Diopsoidea except Tanypezidae; in Tanypezidae finely setulose.	Anepimeron with setae and setulae in Platystomatidae, Pyrgotidae and Tephritidae.
15.	Thorax. Katepisternal setae present. <b>P</b>	Katepisternal setae absent in all Diopsoidea and Tanypezidae.	Katepisternal setae present in the ground-plan of Tephritoidea.
16.	Thorax. Metathoracic post-coxal bridge not developed. <b>P</b>	Metathoracic postcoxal bridge developed in all Diopsidae, Syringogastridae, but not in the ground-plan of Psilidae and Tanypezidae. State of this character in Nothybidae and Gobryidae not known to me.	Metathoracic postcoxal bridge not developed in the ground-plan of Pyrgotidae.
17.	Wing. Vein Sc broken at apex. <b>SA either with Psilidae or with Pyrgotidae, or AA (convergence)</b>	Vein Sc broken in apical portion in all Psilidae, some Tanypezidae ( <i>Strongylophthalmyia</i> Heller).	Vein Sc broken in apical portion in many Pyrgotidae and in the Tephritidae.
18.	Wing. Vein R <sub>1</sub> setulose. <b>SA or AA convergent with Platystomatidae, Pyrgotidae and Tephritidae</b>	Vein R <sub>1</sub> bare or microtrichose in all Diopsoidea and Tanypezidae.	Vein R <sub>1</sub> setulose in Platystomatidae, Pyrgotidae and Tephritidae.
19.	Wing. Vein A <sub>2</sub> developed distally of alula at least as a fold. <b>P</b>	Vein A <sub>2</sub> completely absent distally of alula in all Diopsoidea and in the Tanypezidae. <b>SA?</b>	Vein A <sub>2</sub> developed distally of alula at least as a fold.
20.	Legs. Fore femur without series of postero-ventral erect setae. <b>SA with Diopsoidea or Tanypezidae?</b>	Fore femur without series of postero-ventral erect setae, except in some Diopsidae, where the convergence is obvious (J. F. McAlpine, 1997).	Fore femur with series of postero-ventral erect setae.
21.	Legs. Tibiae without dorsal preapical setae. <b>Apparently SA with Nerioidae, Diopsoidea, Tanypezidae and Tephritoidea</b>	Tibiae without dorsal preapical setae.	Tibiae without dorsal preapical setae.
22.	Legs. Mid tibia without ventroapical seta ("mid-tibial spur"). <b>AA of Ctenostylidae</b>	Mid tibia with ventroapical seta.	Mid tibia with ventroapical seta.
23.	Abdomen. Sternite 1 bare. <b>AA of Ctenostylidae</b>	Sternite 1 at least in ground-plan of Diopsoidea and Tanypezidae setulose.	Sternite 1 setulose at least laterally.
24.	Abdomen. Sternite 2 lacking anterior membranous window, fused to sternite 1. <b>SA or convergence with Pyrgotidae</b>	Sternite 2 with anterior membranous window, free from sternite 1.	Sternite 2 lacking anterior membranous window, fused to sternite 1.
25.	Abdomen. Male sternite 6 bare. <b>SA or convergence with Pyrgotidae and other higher Tephritoidea</b>	Male sternite 6 setulose.	Male sternite 6 bare.
26.	Abdomen. Male tergite 6 well-developed, setulose, symmetrical. (?) <b>SP with Diopsoidea</b>	Male tergite 6 well-developed, setulose, symmetrical.	Male tergite 6 almost or completely reduced in Pyrgotidae; in lower Tephritoidea, remnants of tergite 6, if present, are bare.

1	2	3	4
27.	Abdomen. Female tergite and sternite 7 forming conical oviscape (tergosternite 7). <b>SA or convergence with Pyrgotidae and other Tephritoidea</b>	Female tergite and sternite 7 separate in Diopsoidea. In Tanypezidae Strongylophthalmyiinae tergite and sternite 7 fused.	Female tergite and sternite 7 forming conical oviscape (tergosternite 7) (synapomorphy of the superfamily Tephritoidea).
28.	Abdomen. Female cerci not fused with tergite 8. <b>P</b>	Female cerci not fused with tergite 8.	Female cerci fused with tergite 8 forming stiletto-like aculeus.

The relationships of the Ctenostylidae, though still not clear, may be restricted to a narrower list of superfamilies. First, despite the setulose parafacial, a character known mostly in the Calyptrata (and a few genera of Platystomatidae), and the almost holoptic eyes in males of some species, they do not belong in the calyptrate series, because of the almost inconspicuous transverse thoracic suture and tibiae completely devoid of any setae. They apparently belong to the group of acalyptrate superfamilies in which the dorsal preapical setae on tibiae are absent (synapomorphy of Neriioidea, Diopsoidea, Tanypezidae and Tephritoidea?). In the Neriioidea, Tanypezidae and Diopsoidea, any traces of  $A_2$  distad of the alula vein are absent (? synapomorphy), while in ctenostylids this vein is quite well-developed. This may mean that the Ctenostylidae is the sister-group of the Neriioidea + Diopsoidea + Tanypezidae, but it is also probable that  $A_2$  was lost in some of these groups independently. The presence of rather numerous features shared by the Ctenostylidae and Psilidae (Diopsoidea) makes such a hypothesis rather more credible.

The possible relationship of Ctenostylidae and Diopsoidea sensu D. K. McAlpine (1997) is supported by the round almost bare prothoracic spiracles, fore femora lacking posteroventral setae, occiput without a series of postocular setulae but with the postocular seta next to lateral vertical seta, similar structure and chaetotaxy (laterocline setae present) of the vertical plate of frons, as well as having only posterior notopleural seta and incomplete subcosta; all these characters are either synapomorphies of Psilidae, or of Psilidae and allied Diopsoidea, or of larger range of taxa, with a high probability of homoplasy.

The combination of the presence of vein  $A_2$ , the plesiomorphous state characterising the Ctenostylidae, with numerous autapomorphies (reduction of ocellar triangle, with frontal vitta medially unsclerotized; well sclerotised, transverse, setulose lunula; short and robust form of thorax; setose anepisternum, katapisternum and anepimeron; bare male sternite 6; reduction of gonites and parameres; and finally, fusion of female tergite and sternite 6 into a tergosternite) may be considered to contradict an assignment to the Diopsoidea. However, the independent disappearance of  $A_2$  in Psilidae and other Diopsoidea is one of the most believable assumptions.

The possibility of a relationship between the Ctenostylidae and Tephritoidea is not to be ruled out completely as the identity of the male protandrial sclerites remains vague. If they belong in the Tephritoidea, they certainly are the members of the Higher Tephritoidea, and of the cluster Platystomatidae + Pyrgotidae + Tephritidae, however they do not belong to any of these families.

Furthermore, no reliable results from a computer cladistic parsimony analysis can be expected until the homologies of the structures discussed above are explicitly proved and the outgroup is determined.

**Conclusion.** The results of a more detailed morphological comparison of ctenostylids with other cyclorrhaphous Diptera show that they are related to the Neriioidea + Diopsoidea + Tanypezidae + Tephritoidea group of superfamilies. There are several almost equal alternative hypotheses of sister-group relationships of the Ctenostylidae. Of the hypothesised taxa, those most supported by possible synapomorphies are the Psilidae (of the Diopsoidea) and the Pyrgotidae (of the Tephritoidea). Some of presumed synapomorphies may actually be homoplasies, and further cladistic

analysis must involve more detailed and extensive morphological studies to serve as a basis for further phylogenetic reconstructions. This is unlikely to be possible until more extensive material is collected or becomes available for study and analysis.

#### Acknowledgements

I greatly appreciate the kindness of Wolfgang Schacht and Marion Kotrba for making available material of Ctenostylidae and Pyrgotidae from the Zoologische Staatssammlung München. I also wish to express my sincere thanks to David Barraclough, Bernhard Merz, Adrian Pont, and Andrew Whittington, for reading this manuscript and for useful critical comments.

- Áczél M. Revisión parcial de las Pyrgotidae neotropicales y antárticas, con sinopsis de los pécros y especies (Diptera, Acalyptrata). Parte III (Concluso) // Revista Brasileira de Entomologia — 1956. — 6. — P. 1–38.
- Barraclough D. A. A review of Afrotropical Ctenostylidae (Diptera: Schizophora: ?Tephritoidea), with redescription of *Ramuliseta lindneri* Keiser, 1952 // Annals of the Natal Museum. — 1994. — 35. — P. 5–14.
- Barraclough D. A. *Nepaliseta mirabilis*, a remarkable new genus and species of Ctenostylidae (Diptera: Schizophora) from Nepal // Annals of the Natal Museum. — 1995. — 36. — P. 135–139.
- Barraclough D. A. The missing males of *Ramuliseta* Keiser (Diptera: Schizophora: Ctenostylidae) 39 // Annals of the Natal Museum. — 1998. — 39. — P. 115–129.
- Bigot J. M. F. Diptères nouveaux ou peu connus. 19e partie. XXIX. Genres *Roeselia*, *Actia*, *Melia*, *Phytomyptera* et tribu des *Anthomyzidae* (Schiner, Rondani, Meade). XXX. Genre *Ctenostylum* // Annales de la Societe Entomologique de France. — 1882. — (6) 2. — P. 5–22.
- Hendel F. Bemerkungen zu "The families and genera of North-American Diptera", by C. H. Curran, New York, 1934 // Konowia, 1935. — 14. — S. 51–51.
- Hennig W. Bemerkenswerte neue Acalyptraten in der Sammlung des Deutschen Entomologischen Instituts (Diptera: Acalyptrata) // Beiträge zur Entomologie. — 1952. — 2 (6). — S. 604–618.
- Hennig W. Pyrgotidae de Madagascar (Diptera) // Mémoires de l'Institut Scientifique de Madagascar (Serie E). — 1960. — 11 (1959). — P. 321–353.
- Keiser F. Die Unterfamilie der Lochmostyliinae (Dipt., Pyrgotidae) // Mitteilungen der Schweizerischen Entomologischen Gesellschaft. — 1951. — 24. — S. 113–124.
- Keiser F. *Ramuliseta lindneri* n. sp. eine Lochmostyliine aus Ostafrika (Dipt. Pyrgotidae). (Ergebnisse der Deutschen Zoologischen Ostafrika-Expedition 1951/52, Gruppe Lindner, Nr. 1) // Bonner Zoologische Beiträge. — 1952. — 3 (314). — S. 325–327.
- Korneyev V. A. Phylogenetic relationships among the families of the superfamily Tephritoidea // Fruit Flies (Tephritidae): Phylogeny and Evolution of Behavior / Eds. M. Aluja, A. L. Norrbom. — Boca Raton ; London ; New York ; Washington : CRC. — 1999. — P. 3–22.
- Lopes H. de S. Um novo gênero de Diptera Acalyptratae e considerações sobre a familia Ctenostylidae // Archivos do Instituto de Biologia Vegetal. — 1935. — 2. — P. 247–253.
- McAlpine D. K. The Australian Platystomatidae (Diptera, Schizophora) with a revision of five genera // Memoirs of the Australian Museum. — 1973. — 15. — P. 1–256.
- McAlpine D. K. The taxonomic position of the Ctenostylidae (= Lochmostyliinae: Diptera: Schizophora) // Memórias do Instituto Oswaldo Cruz. — 1990. — 84 (1989). — P. 365–371.
- McAlpine D. K. Gobryidae, a new family of acalyptrate flies (Diptera: Diopsoidea), and a discussion of relationships of the diopsoid families // Records of the Australian Museum — 1997. — 9. — P. 167–194.
- McAlpine J. F. Morphology and terminology // McAlpine J. F. et al. (coords.). Manual of Nearctic Diptera. Vol. 1. — Ottawa : Research Branch, Agriculture Canada. — 1981. — P. 9–63. (Monograph of the Biosystematics Research Institute, No. 27).
- Morge G. Die Lonchaeidae und Pallopteridae Österreichs und der angrenzenden Gebiete. Eine Revision auf der Grundlage der Linzer Sammlungen und anderer österreichischer Kollektionen. 1. Teil: die Lonchaeidae // Naturkundliches Jahrbuch der Stadt Linz. — 1963. — 9. — S. 123–312.
- Steyskal G. C. African Pyrgotidae // Stuttgarter Beiträge zur Naturkunde. — 1972. — N 238. — P. 1–11.
- Steyskal G. C. Family Pyrgotidae // Delfinado, M. N., Hardy N. E. A Catalog of the Diptera of the Oriental Region, Volume III, Suborder Cyclorrhapha, (excluding Division Aschiza). — Honolulu : University of Hawaii Press. — 1977. — P. 37–43.
- Steyskal G. C. 42. Family Pyrgotidae // Catalogue of the Diptera of the Afrotropical Region / Ed. R. W. Crosskey. — London : British Museum (Natural History). — 1980. — P. 556–562.