

***BAEODROMIA*, A NEW GENUS OF TACHYDROMIINE FLY
FROM THE NEW WORLD
(DIPTERA: EMPIDOIDEA; HYBOTIDAE)**

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Abstract

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Baeodromia n. gen. (Hybotidae: Tachydromiinae: Drapetini) is described to include *Baeodromia pleuritica* (Melander) n. comb., a species from eastern North America originally described in the genus *Stilpon* Loew. The new genus also includes several, as yet undescribed species from the Neotropical Region. The phylogenetic relationships of *Baeodromia* within the tribe Drapetini are discussed.

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Introduction

In a revision of the Nearctic species of the tachydromiine genus *Stilpon* Loew, Cumming and Cooper (1992) excluded the eastern North American species *Stilpon pleuriticus* Melander, indicating that it belongs to an undescribed genus. The purpose of this paper is to describe and validate this new genus, which also contains several undescribed Neotropical species (referred to as “Undescribed Genus A” by Cumming and Sinclair (in press) in their key to genera of Central American and Mexican Empidoidea, exclusive of Dolichopodidae *s. str.*). The new genus belongs to the tachydromiine tribe Drapetini as characterized by Sinclair and Cumming (2006). The phylogenetic relationships of the new genus to other drapetine genera are also discussed based on current knowledge.

Materials and Methods

Materials. This study was based on examination of specimens from the institutions (including curators in brackets) listed below. Acronyms given here are used throughout the text to indicate the depository of specimens. CAS—Department of Entomology, California Academy of Sciences, San Francisco, California (P. H. Arnaud). CNC—Canadian National Collection of Insects and Arachnids, Agriculture and Agri-Food Canada, Ottawa, Ontario. DEBU—Insect Collection, Department of Environmental Biology, University of Guelph, Guelph, Ontario (M. Buck and S. A. Marshall). NCSR—Department of Entomology, North Carolina State University, Raleigh, North Carolina (R. L. Blinn). UNHC—Entomology

Museum, Department of Entomology, University of New Hampshire, Durham, New Hampshire (D. S. Chandler). USNM–National Museum of Natural History [formerly United States National Museum], Smithsonian Institution, Washington, DC, (N. E. Woodley).

Methods. Terms used for structures primarily follow those of McAlpine (1981) and those used in Cumming and Cooper (1992). Homologies of the male terminalia follow those of Cumming et al. (1995), as modified by Sinclair (2000) and Sinclair and Cumming (2006). The figure of the hypopygium (i.e., Fig. 5) was drawn in right lateral view to show most of the components, because of the rotated and asymmetrical nature of male terminalia in the Tachydromiinae. Label data for the holotype of *Stilpon pleuritica* Melander is cited in full, following the system described by O'Hara (1983), with the depository for the type given.

Systematics

Baeodromia n. gen.

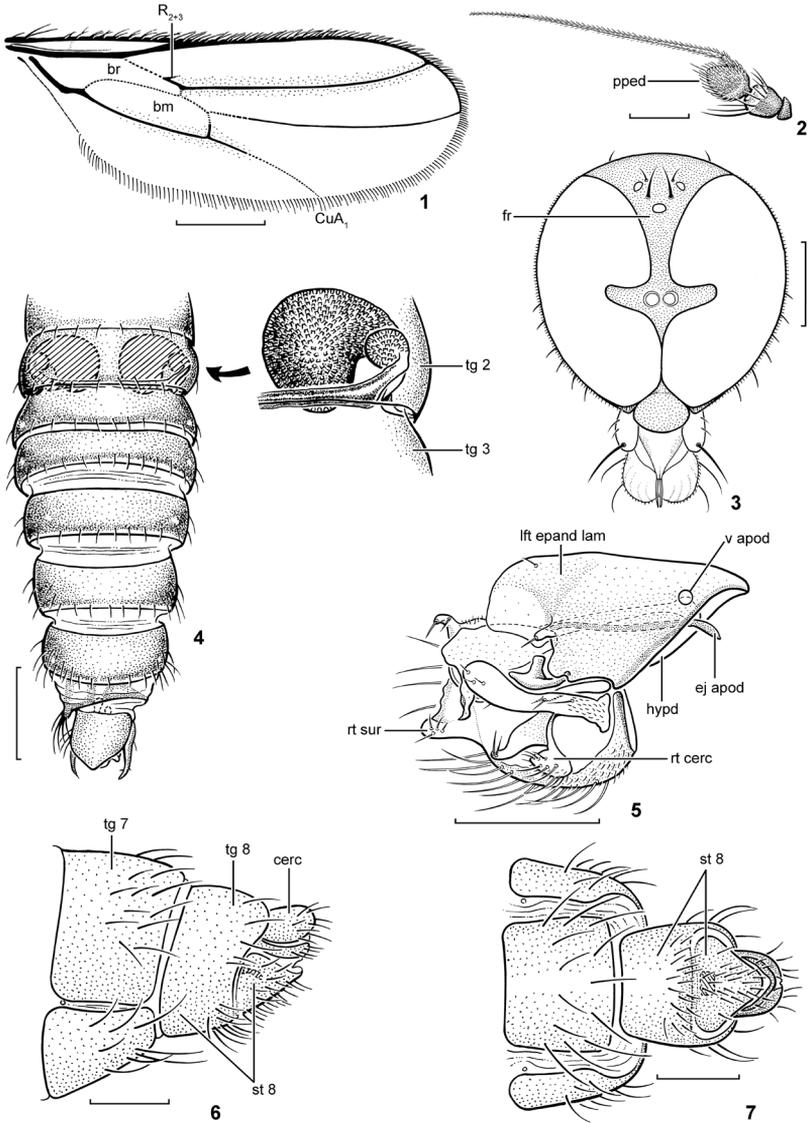
Type species. *Stilpon pleuritica* Melander, 1928, by present designation.

Etymology. The generic name is derived from the Greek word *baios* for small or little, in reference to the very small size of the included species in the genus, and *dromia*, the common tachydromiine suffix for runner. The gender is feminine.

Diagnosis. Adults of *Baeodromia* are distinguished from those of other drapetine genera by a combination of the head with eyes contiguous on face and frons divergent above (Fig. 3), antenna with small ovate postpedicel and dorsoapical arista-like stylus (Fig. 2), wing with cell br much shorter than cell bm at apex (Fig. 1), male abdomen with lateral vessel-like glands under at least tergite 2, relatively small asymmetrical male terminalia with slender ventral apodeme in addition to long ejaculatory apodeme (Fig. 5), and female terminalia characterized by tergite 8 and sternite 8 fused laterally into a ring segment with sternite 8 portion hinged apically to cover genital opening (Figs. 6, 7). Characteristics of the tribe Drapetini are reviewed in the Discussion section.

Description. Length 1.0-2.0 mm.

Male. Head. Ground color light brown to black. Eyes with ommatrichia (=microscopic pubescence); eyes contiguous on face (Fig. 3); facets not enlarged below antennae. Gena not extended below eye. Frons with sides divergent above; narrow above antennae, minimum width only slightly greater than width of median ocellus. One pair of long slightly convergent ocellar setae; one pair of short slightly divergent postocellar setae; one pair of convergent vertical setae; a few occipital setae ventrally. Frons, vertex, occiput, and gena lightly covered in tomentum. Antennae arising near middle of head; scape small; pedicel globose, with several long ventral preapical setae; postpedicel (= first flagellomere) small, ovate, with long arista-like stylus arising dorsoapically (Fig. 2); segments ivory yellow to light brown, paler than head color. Palpus ivory to yellow; elongate-ovate with distinct



FIGURES 1-7. *Baeodromia pleuritica* (Melander). 1. Wing; 2. Antenna; 3. Head, frontal view, antennae removed; 4. Male abdomen dorsal view, with enlarged inset showing internal detail of right lateral vessel-like gland; 5. Male terminalia, right lateral view; 6. Female terminalia, left lateral view; 7. Female terminalia, ventral view. Abbreviations: bm—basal medial cell; br—basal radial cell; cerc—cercus; CuA₁—cubital vein; ej apod—ejaculatory apodeme; fr—frons; hypd—hypandrium; lft epand lam—left epandrial lamella; pped—postpedicel; R₂₊₃—2nd radial vein; rt cerc—right cercus; rt sur—right surstylus; st—sternite; tg—tergite; v apod—ventral apodeme. Scale bars=0.1 mm, except Fig. 4 where scale bar=0.2 mm.

apical seta. Proboscis slightly recurved. **Thorax.** Ground color yellowish brown to black. Thoracic macrotrichia relatively thin and short; 1 long postpronotal pair, 2 long notopleural pairs, 1 long postalar pair, 1 short subapical scutellar pair, and 1 long apical scutellar pair of setae; acrostichal setulae in 2 rows, incomplete posteriorly; dorsocentral setulae (including intra-alars) in 4 rows; 1 postpronotal and 1 supra-alar pair of setulae. Postpronotal lobe undifferentiated. Scutum entirely tomentose; postalar callus partially differentiated; scutellum entirely tomentose. Katepisternum shiny, remainder of mesopleuron tomentose. Metakatepisternum shiny; metaepimeron large, tomentose. Halter ivory to yellow. **Wing.** Broad and blunt-tipped; hyaline to slightly infuscate, with darker infuscation arranged along longitudinal veins (Fig. 1); costa with slightly lengthened basal setae; R_s originating half way to slightly beyond half way along R_1 ; R_{2+3} complete in most species, abbreviated before reaching costa (or almost absent) in most specimens of *B. pleuritica* (Melander); cell br short, ending well before apex of cell bm; crossvein bm-cu nearly transverse; CuA_1 slightly arched and reaching wing margin, faint apically in *B. pleuritica* (Melander); CuA_2 and A_1 absent. **Legs.** Short with ground color ivory or yellow to brown. Fore femur moderately to markedly thickened, with pair of prominent ventral preapical setae. Mid femur slender to barely thickened, with pair of prominent anteroventral preapical setae. Hind leg slender; femur with pair of anteroventral preapical setae; tibia not expanded apically. **Abdomen.** Segments 1-7 lightly sclerotized, subequal in length; segment 8 short, partially concealed by segment 7. Lateral vessel-like glands under at least tergite 2, with apparent ducts exiting along posterior margin (probably including intersegmental membrane) of tergite (Fig. 4). Tergites 4 and 5 without squamiform lateral setae. **Terminalia.** Hypopygium relatively small (Fig. 4), asymmetrical, and rotated 90 degrees to the right with most components of the left side reduced in size (Fig. 5). Epandrium completely divided; left epandrial lamella fused to hypandrium; left surstylus short and not divided into components; right epandrial lamella relatively large, positioned ventrally; right surstylus broad. Cerci, including subepandrial sclerite, fused together basally; left cercus long, digitiform; right cercus short. Internally with rod-shaped ejaculatory apodeme and long slender ventral apodeme.

Female. Similar to male except abdominal tergites 1-6 very weakly sclerotized and without setae; lateral vessel-like glands lacking. Terminalia (Figs. 6, 7) with tergite 8 fused laterally to sternite 8 forming ring segment; sternite 8 portion of ring segment with apex hinged as a cover for genital opening; sternite 9 (=genital fork) visible as small internal sclerite; tergite 10 absent; sternite 10 positioned below proctiger, desclerotized basomedially; cercus small. In one undescribed species from Costa Rica (Monteverde, 1500 m) known only from females (CNC), the wing is reduced to tiny stubs and the halter is vestigial.

Included species. The genus currently includes *Baeodromia pleuritica* (Melander) **n. comb.** from eastern North America and at least nine undescribed species from the Neotropical Region (Mexico, Guatemala, Belize, Costa Rica, Dominican Republic, Dominica, Venezuela, and Brazil). Each of the undescribed species is at present known from one or two specimens (often only females) and therefore description of these new species will be deferred until additional material is acquired.

***Baeodromia pleuritica* (Melander) n. comb.**

Stilpon pleuritica Melander 1928: 302.

Stilpon (*Tetraneurella*) *pleuriticus* Melander: Melander 1965: 476.

'*Stilpon*' *pleuriticus* Melander: Cumming and Cooper 1992: 980.

Type material examined. HOLOTYPE, male labelled: "FRANCONIA, N[ew] H[ampshire]."; "TYPE/ pleuritica/ Mel[ander]. [red label]" (USNM). Melander (1928) described this species from a single specimen collected by Mrs. Slosson from the White Mountains of New Hampshire. The holotype from Franconia, Mrs. Slosson's hometown in the White Mountains, is a male specimen with somewhat retracted terminalia, rather than a female as Melander (1928) reported.

Other material examined. CANADA, **Manitoba:** Ninette, ex. *Betula glandulosa*, 15 July 1958, ♂, ♀, CNC. **New Brunswick:** Kouchibouguac N[at]. P[k]., Code-5466F, 2 July 1977, 2♂, CNC. **Nova Scotia:** Cranberry I[sland], Lockeport, in mouse run among *Carex*, 31 July 1958, ♂, CNC. **Ontario:** Crieff Bog, 3 km W. Puslinch, pt3a sedge meadow, 18-24 July 1987, ♀, DEBU; Damascus, Luther Marsh Bog, Rot T[ra]p, August-October 1984, ♀, DEBU; Gananoque, 18 km E., 9 June-15 July 1977, ♂, 2♀, CNC; Guelph, [University] Arboretum, mushroom traps, 12-14 July 1984, ♀, DEBU; Kaladar, 1 July 1969, ♂, USNM; Mer Bleue, Ottawa, in sphagnum bog, 19 July 1963, ♀, CNC; Mer Bleue, Ottawa, in marsh, 25 June 1964, 3♀, CNC; Richmond, 11 July 1978, ♂, CNC. **Quebec:** Harrington L[ake], Gatineau Pk., 3 July 1963, ♀, CNC; Lac Phillippe, 45°37' N, 76°[10']W, 5 August 1955, ♂, CNC. **UNITED STATES, Florida:** Archibold Biol[ogical] Sta[tion], Lake Placid, 1 October 1979, ♀, CNC; Bradenton, 4 July 1986, 4♀, CNC; Gainesville, 25 April 1952, ♂, CNC. **Georgia: McIntosh Co.,** Sapelo Island, live oak forest, F[light] I[n]tercept T[rap], 20 June-18 July 1987, ♂, CNC. **Indiana: Perry Co.,** In.145, 1.5 mi N. of I-64, shaded weeds & grass, 13 July 1982, ♂, CNC. **Kentucky:** Mammoth Cave Nat. Pk., 23 August 1981, ♀, CNC. **Maryland:** Thurmont, 8 June 1962, ♂, 8♀, CNC. **Massachusetts:** Brewster, 8 August 1964, ♀, CNC; Concord, 17 July 1961, ♀, USNM; Holliston, 6 July, ♀, CNC. **Michigan:** Benton Harbor, orchard sweeps, 17 June 1941, ♀, USNM. **New Hampshire: Straff[ord] Co.,** Spruce Hole, 3 mi SW Durham, sweep on mat, 23 July 1987, ♀, UNHC. **New York:** Adirondacks, Connery Pond, 15 July 1938, ♀, USNM. **North Carolina: Bladen Co.,** Singletary Lk. St. Pk., 34°35'N, 78°27'3"W, malaise [trap], 19-22 May 2003, debu00227321, ♀, DEBU; **Brunswick Co.,** near Longwood, pit fall trap soybean field 3AI Ag1, 1 August 1979, ♂, NCSR; Franklin, 2000', on ground among *Carex* roots, 8 May 1957, 7♂, 4♀, CNC; Franklin, 2000', 10 June 1957, ♂, CNC; **Graham Co.,** Robbinsville, 9 June 1976, ♂, CAS; Highlands, 3800', 1 June 1957, 3 June 1957, 6 June 1957, 2♂, ♀, CNC; Gr[eat] Smoky Nat. Pk., Mingus Creek nr. Cherokee, 2000', 29 May 1957, ♀, CNC. **Virginia: Montgomery Co.,** 8 km NW Blacksburg, 1000 m, M[alaise] T[rap] Rural, 4 June 1987, ♂, 2♀, CNC.

Diagnosis. Antennae with basal segments ivory to yellow, postpedicel and arista-like stylus slightly darker, yellow to light brown; wing length 1.5-1.75X length of head + thorax; R_{2+3} abbreviated (Fig. 1) or sometimes absent, rarely complete (see below under Remarks); legs

ivory yellow to light brown, hind femur with apex darker brown; male fore femur with basal row of anteroventral setae; male fore tibia with apical row of short ventral setae; male mid femur with row of short stout ventral setae; male hind basitarsus not dilated; male with vessel-like gland under each side of abdominal tergite 2, not present under subsequent tergites (Fig. 4); male terminalia with left surstylus short and pointed, right epandrial lamella with long setae, right surstylus broad with two apical projections, left cercus elongate and curved (Fig. 5); female terminalia with tergite 8 portion of ring segment broad medially (Fig. 6).

Distribution. Known from eastern North America: Manitoba, Ontario, Quebec, New Brunswick, and Nova Scotia south through Michigan, Indiana, Kentucky, New York, New Hampshire, Massachusetts, Pennsylvania, Maryland, Virginia, North Carolina, Georgia, and Florida (Pennsylvania record from Melander (1965)).

Remarks. The wings appear to be slightly shortened (i.e., approximately 1.5X the length of head + thorax) in a few female specimens of *B. pleuritica*. The length of vein R_{2+3} is also variable, generally being abbreviated and present as a short spur (Fig. 1), but occasionally completely absent. Rarely vein R_{2+3} is complete, as seen in a single female specimen of *B. pleuritica* from Brewster, Massachusetts and a series of four female specimens from Bradenton, Florida. In addition, there may be some variation in the extent of leg bristling in male specimens, where for example the apical row of short ventral setae on the fore tibia is not very conspicuous, although this may be due to a lack of pigmentation associated with preservation of teneral specimens.

Discussion

Baeodromia belongs to the tachydromiine tribe Drapetini as defined by Sinclair and Cumming (2006), on the basis of the following apomorphies: eyes with ommatrichia, loss of CuA_2 (inadvertently referred to as CuA_1 by Sinclair and Cumming 2006, page 79), and loss of tergite 10 in females (correlated with sternite 10 positioned below the cerci). With the description of *Baeodromia* herein, the tribe currently includes 19 genera. The main phylogenetic patterns within Drapetini were discussed by Cumming and Cooper (1992) and a preliminary analysis of most of the included genera was attempted by Grootaert (1994), although precise relationships still need to be elucidated.

On the basis of the shared apomorphic shortening of the length of the basal radial (br) cell relative to the apex of the basal medial (bm) cell, *Baeodromia* appears related to a group of nine drapetine genera that comprises *Austrodrapetis* Smith, *Crossopalpus* Bigot, *Dusmetina* Gil, *Drapetis* Meigen, *Elaphropeza* Macquart, *Ngaheremyia* Plant and Didham, *Pontodromia* Grootaert, *Sinodrapetis* Yang, Gaimari and Grootaert, and *Stilpon* Loew. Conversely Grootaert (1994) and Plant and Didham (2006) consider *Austrodrapetis*, *Ngaheremyia*, and *Pontodromia* along with a few other genera, to belong to an Australasian–Melanesian clade of Drapetini, based on another shared venational character, the distal origin of the radial sector (R_s) along R_1 . However, this character state is sometimes difficult to code and based on conflicts with other characters, including the distinctly shortened cell

br, appears to have evolved more than once within Australasian–Melanesian drapetines.

The relationships within the hypothesized monophyletic group of nine genera mentioned above are still uncertain, although *Drapetis*, *Elaphropeza*, and *Crossopalpus* (and probably also the monotypic genera *Dusmetina* and *Sinodrapetis*) appear to form a clade (herein referred to as the *Drapetis* group) on the basis of similar male intersegmental gland–like modifications associated with abdominal terga 3–5, and the nearly universal presence of squamiform setae on some of these tergites in both the male and female. It is now known that similar male intersegmental gland–like modifications exist in some Oriental species of *Stilpon* (Shamshev and Grootaert 2004; Shamshev et al. 2006), so it is likely that this genus is related to the other five genera. *Austrodrapetis*, *Pontodromia*, and probably *Ngaheremyia* appear to represent another lineage (herein referred to as the *Austrodrapetis* group) within this group of nine genera, primarily on the basis of the distal origin of R_s . *Austrodrapetis* and *Pontodromia* are very similar and share a number of apomorphies, as indicated by Grootaert (1994). Interestingly like *Baeodromia*, *Austrodrapetis* also possesses lateral vessel–like glands in the male, but these are oriented differently, exiting along the anterior margin of the tergite rather than the posterior margin, and they occur under tergites 3 and 4 rather than tergite 2 (Smith 1964; Smith and Davies 1965). According to Grootaert (1994), *Pontodromia* does not possess lateral vessel–like glands in the male. A single median vessel–like gland also occurs in males of few species of the unrelated drapetine genus *Nanodromia* Grootaert (Grootaert and Shamshev 2003).

The exact relationship of *Baeodromia* to these three lineages (i.e., *Drapetis* group, *Stilpon*, and *Austrodrapetis* group) is presently uncertain. Although the genus shares two characters (i.e., a dorsoapical arista–like stylus and eyes contiguous on the face) with *Stilpon*, both features have developed independently numerous times within the Tachydromiinae. Homoplasy in the dorsoapical arista in particular, is very frequent in tachydromiine genera, such as *Stilpon* and *Baeodromia* that tend to be of very small body size. Although generic relationships of *Baeodromia* are unsure, the separate status and monophyly of the genus is substantiated by the apomorphic form of the arista, contiguous eyes on the face, unique form of the male abdominal glands, and the female terminalia with segment 8 fused into a ring. Further study of additional characters, such as the male abdominal glands, will hopefully improve our knowledge of the phylogenetic relationships within the Drapetini, allowing for a more precise placement of *Baeodromia*.

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References

- Cumming, J. M. and B. E. Cooper. 1992. A revision of the Nearctic species of the tachydromiine fly genus *Stilpon* Loew (Diptera: Empidoidea). *The Canadian Entomologist* 124: 951-998.
- Cumming, J. M., B. J. Sinclair, and D. M. Wood. 1995. Homology and phylogenetic implications of male genitalia in Diptera – Eremoneura. *Entomologica Scandinavica* 26: 121-151.
- Cumming, J.M. and B.J. Sinclair. *In press*. Empididae (dance flies, balloon flies, predaceous flies). *In Manual of Central American Diptera*, Volume 1. B.V. Brown et al. (eds.), NRC Research Press, Ottawa.
- Grootaert, P. 1994. Two new genera of empidoid flies (Diptera, Empidoidea, Hybotidae, Tachydromiinae) from Melanesia. *Studia dipterologica* 1: 141-156.
- Grootaert, P. and I. V. Shamshev. 2003. New species of the genus *Nanodromia* Grootaert (Diptera, Empidoidea, Hybotidae) from Thailand. *The Natural History Journal of Chulalongkorn University* 3: 41-52.
- McAlpine, J. F. 1981. Morphology and Terminology—Adults [Chapter] 2. pp. 9-63, *In Manual of Nearctic Diptera*, Volume 1. Agriculture Canada Monograph, J. F. McAlpine, B. V. Peterson, G. E. Shewell, H. J. Teskey, J. R. Vockeroth, and D. M. Wood (Coords.), 27, vi + 674 pp.
- Melander, A. L. 1928. Diptera, Fam. Empididae. *In Genera Insectorum*. P. Wytzman (ed.), 185 (1927): 1-434.
- Melander, A. L. 1965. Family Empididae (Empidae, Hybotidae). pp. 446-481, *In A catalog of the Diptera of America north of Mexico*. A. Stone, C. W. Sabrosky, W. W. Wirth, R. E. Foote, and J. R. Coulson (eds.), United States Department of Agriculture, Agricultural Research Service, Agriculture Handbook 276: iv + 1696 pp.
- O'Hara, J. E. 1983. Classification, phylogeny and zoogeography of the North American species of *Siphona* Meigen (Diptera: Tachinidae). *Quaestiones Entomologica* 18 (1982): 261-380.
- Plant, A. R. and R. K. Didham. 2006. A new genus of Drapetini (Diptera: Hybotidae: Tachydromiinae) from New Zealand. *Entomologist's Monthly Magazine* 142: 41-47.
- Shamshev, I. V. and P. Grootaert. 2004. A review of the genus *Stilpon* Loew, 1859 (Empidoidea: Hybotidae) from the Oriental region. *The Raffles Bulletin of Zoology* 52: 315-346.
- Shamshev, I. V., P. Grootaert, and A. Stark. 2006. Notes on a remarkable abdominal structure in some *Crossopalpus* Bigot species (Diptera: Hybotidae) with records from Southeast Asia. *Studia dipterologica* 12 (2005): 331-336.
- Sinclair, B. J. 2000. [Chapter] 1.2. Morphology and terminology of Diptera male terminalia. pp. 53-74 *In Contributions to a Manual of Palaearctic Diptera* (with special reference to flies of economic importance), Volume 1. General and Applied Dipterology. L. Papp and B. Darvas (eds.), Science Herald, Budapest, 978 pp.
- Sinclair, B. J. and J. M. Cumming. 2006. The morphology, higher-level phylogeny and classification of the Empidoidea (Diptera). *Zootaxa* 1180: 1-172.

- Smith, K. G. V. 1964. A remarkable new genus and two new species of Empididae (Tachydromiinae, Drapetini) from the Cook Islands. *Pacific Insects* 6(2): 247-251.
- Smith, K. G. V. and R. G. Davies. 1965. Gland-like abdominal structures of possible epigamic function in the Diptera. *Nature* 207: 321-322.