

# AUSTRALIAN MUSEUM SCIENTIFIC PUBLICATIONS

Bickel, Daniel J., 1986. Australian species of *Systemus* (Diptera: Dolichopodidae). *Records of the Australian Museum* 38(5): 263–270. [31 December 1986].

doi:10.3853/j.0067-1975.38.1986.350

ISSN 0067-1975

Published by the Australian Museum, Sydney

nature culture **discover**

Australian Museum science is freely accessible online at  
[www.australianmuseum.net.au/publications/](http://www.australianmuseum.net.au/publications/)  
6 College Street, Sydney NSW 2010, Australia



## Australian species of *Systemus* (Diptera: Dolichopodidae)

DANIEL J. BICKEL

Australian Museum,  
P.O. Box A285, Sydney South, NSW 2000, Australia

ABSTRACT. *Systemus australis* and *S. curryi*, n. spp. are described from eastern Australia and Western Australia, respectively. *Systemus* is regarded as belonging to the dolichopodid subfamily Medeterinae.

BICKEL, DANIEL J., 1986. Australian species of *Systemus* (Diptera: Dolichopodidae). Records of the Australian Museum 38(5): 263-270.

Although adults of *Systemus* are rarely encountered in the field, more is known of the life history and immature stages of *Systemus* than any other dolichopodid genus. The majority of museum specimens are the results of rearings from tree-hole debris and sap-fluxes, supplemented by collections made using passive mass-sampling techniques, such as malaise and light traps. Apart from the two new Australian species treated below, 16 species previously have been described: nine paleartic, six nearctic and one neotropical (Steyskal, 1970; Vaillant, 1978). Of these, larval habitats are known for eight paleartic and four nearctic species, and the larval and pupal morphology of five species has been described in detail (also see Lundbeck, 1912; Wirth, 1952; and Krivosheina, 1973).

The larvae of all known species are characterised by a distinctive thumb-like ventral proleg on the first abdominal segment, readily differentiated from the creeping welts of the posterior segments. Larvae have been reared from moist tree-hole debris and bleeding ulcers associated with a number of north temperate hardwood species. Such microhabitats, especially tree-holes with rotting debris accumulated over a period of years, often support a rich invertebrate fauna, providing suitable prey for *Systemus* larvae. Vaillant (1978), in a review of subject, has termed this microhabitat a 'dendrotelme' biotope. Specimens of the new Australian species were all taken as adults in traps. However, suitable larval tree-hole habitats are commonly encountered in the Australian bush, especially in cavities formed on twisted, broken or partially burnt eucalyptus

trees. Rearings from eucalyptus cavity debris might determine the life history of Australian *Systemus*.

### Materials and Methods

The abbreviations of repositories where specimens are housed are listed in the Acknowledgements. All measurements are in millimetres. Morphological terminology follows McAlpine (1981) and Bickel (1985). In describing the male hypopygium, the terms 'dorsal' and 'ventral' refer to morphological position prior to rotation and torsion. Thus, in figures showing a left lateral view of the hypopygium, morphologically dorsal is at the bottom while morphologically ventral is at the top.

### TAXONOMY

#### Genus *Systemus* Loew

*Systemus* Loew, 1857: 34. Type species, *Rhaphium adpropinquans* Loew (des. Foote, Coulson & Robinson 1966: 517) = *pallipes* (Rosen).

**Description.** The following description of adult *Systemus* is based on examination of the new Australian species and males of two nearctic species, *S. shannoni* and *S. eucerus*, and on published descriptions and figures of the remaining species.

**HEAD:** eyes with tiny setulae between facets; fronto-clypeal suture complete; proboscis projecting anteriorly, keel-like, with 6 unsclerotized pseudotracheae; single

row of postorbitals present; scape without dorsal setae; 1st flagellomere with marked sexual dimorphism: in male lancet shaped, elongate, usually 2–3 times as long as basal width, bearing short apical arista; in female subovate, about as long as wide, bearing long apical arista; postcranium dorsally concave.

THORAX: mesoscutum distinctly flattened posteriorly; acrostichals biserial, posteriormost pair larger and laterally offset; 6 strong dorsocentrals; 1 postalar, 2 postsutural and 2 presutural supraalars, 2 notopleurals, 1 humeral, and 1 posthumeral present; lateral scutellars less than  $\frac{1}{2}$  length of medians.

LEGS: coxa III with one strong lateral bristle; femora lacking anterior preapical bristles; only tibiae II and III with notable bristles, scattered dorsals and ventrals, with anterodorsal and posterodorsal pair at  $\frac{1}{4}$ ; basitarsus III  $< \frac{1}{2}$  length second tarsomere III.

WINGS:  $R_{4+5}$  and M subparallel but often bowed or flexed subapically; flexion present in distal sector of M, the 'bosse alaire';  $A_1 + Cu_A$  present.

ABDOMEN: lateral tergal margins of segments 2–5 in females only with 3–4 ovoid depressions, lacking in males.

MALE POSTABDOMEN: segment 7 forming an elongate peduncle, tergum and sternum 7 incompletely fused, separated by partially sclerotized pleural membrane (Fig. 3); hypopygial foramen left lateral; hypandrium fused to epandrium, immovable; 2 bristle-bearing epandrial lobes arising from inner wall of the genital chamber or fused to epandrium with only bristles remaining; surstylus usually bifurcate; cercus elongate, bristly.

FEMALE GENITALIA: fused terga 9+10 divided medially into 2 hemitergites, each bearing 4 spine-like acanthophorites.

#### Key to Australian Species of *Systemus*

1. Femora II, III without anterior preapicals; scape dorsally bare; vertex not deeply excavated on either side of ocellar tubercle; posterior  $\frac{1}{3}$  of mesoscutum distinctly flattened; vein M unbranched; male hypopygium on elongate peduncle formed by segment 7 or greatly enlarged; hypopygium exerted, never encapsulated or enfolded by preceding abdominal segments. . . . . 2  
 — Without above combination of characters. . . . . Various dolichopodid subfamilies
2. Arista apical; legs relatively short, length leg III  $<$  twice wing length; hypopygium usually ovate; peduncle (segment 7) often elongated. . . . . 3  
 — Arista dorsal; legs elongate, length leg III  $>$  twice wing length; hypopygium usually globular, peduncle usually short. . . . . Neurigoninae
3.  $R_{4+5}$  and M subapically bowed; distal sector of M with flexion, the 'bosse alaire'; posterior pair acrostichals (ac) distinctly larger than preceding pairs and offset laterally; 6 strong dorsocentrals (dc); antenna sexually dimorphic; male 1st flagellomere elongate, tapering, with short arista (Fig. 1); female 1st flagellomere subovate with long arista (Fig. 2); peduncle (abdominal segment 7) with tergum and sternum distinct (Fig. 3); female terga 9+10 divided medially into 2 hemitergites, each bearing a row of 4 spines. . . . . *Systemus* . . . 4  
 —  $R_{4+5}$  and M subparallel or M arched anteriorly; 'bosse alaire' absent; all ac aligned in two rows; usually 5 or fewer dc; antennae of both sexes similar, subrectangular to subovate, with apical arista; peduncle with tergum and sternum fused; female oviscapt without rows of spines. . . . . other Medeterinae
4. Antenna entirely black; coxa II with at least basal half dark brown. . . . . 5  
 — Scape and pedicel yellow; coxa II almost entirely yellow (tropical Western Australia). . . . . Undescribed ♀ specimen
5. Coxa I, femur I yellow; surstylus concave, dish-like, with U-shaped excision guarded by 2 incurved setae; cercus bare along ventral margin (Fig. 3) (east. Australia). . . . . *S. australis*  
 — Coxa I dark brown; femur I dark brown almost to apex; surstylus concave with excised curved wedge, distally with 2 ventrally directed curved pedunculate setae; cercus with ventral margin densely pubescent (Fig. 5) (south-west Western Australia). . . . . *S. curryi*

*Systemus australis* n. sp.

Figs 1-4, 6-7

**Type material.** HOLOTYPE ♂: Australian Capital Territory: Black Mountain, 4-xii-1979, malaise site 1, D.H. Colless (ANIC). 6 PARATYPES: 1 ♂, same data as holotype except 19-xi-1979 (ANIC). Queensland: 1 ♂, Shipton's Flat, 15°47' S 145°14' E, 17-x-1980, malaise trap, D.H. Colless (ANIC); 1 ♂, 15 km west of Irvinebank, 17°26' S 145°04' E, malaise trap, D.H. Colless (ANIC); 1 ♀, 3 km north-east of Mt Webb, 15°03' S 145°09' E, 30-iv-1981, malaise trap, D.H. Colless (ANIC); 1 ♂, Bellenden Ker Range, el. 100m, 17-x to 9-xi-1981, rainforest, Earthwatch/Queensland Museum (ANIC); 1 ♂, Austral Forest via Bulburin, 24°34' S 151°29' E, Malaise trap site 3, 23-iii-1975, D.K. McAlpine (AMS).

**Description.** MALE: length 2.3-2.7 (Fig. 1).

**HEAD:** vertex, frons, face, dark metallic green with thick brownish pruinosity; clypeus dark blue-green with less pruinosity; palpi black with strong apical seta; proboscis brownish, projecting anteriorly, keel-like; mouthparts: labrum not elongated, epipharyngeal armature with two prongs, labium with 6 unsclerotised pseudotracheae, as in Group IV of Cregan (1941); anterior eye facets slightly enlarged; single row of strong pale postorbitals becoming black near vertex; antenna black; pedicel short, with ring of apical setae; 1st flagellomere large, tapering, at least 3 times as long as basal width; densely pubescent; arista short, bare.

**THORAX:** dorsum metallic green with bronze reflections and thin grey pruinosity; bronze vittae over acrostichal band extending laterad along dorsocentral setae; pleura green with dense grey pruinosity; posterior third of mesonotum distinctly flattened; thoracic setae black; 12-14 pairs of acrostichals, of equal length except those of posterior pair bordering mesonotal depression, which are larger and offset laterad; 6 strong dorsocentrals, decreasing in size anteriorly with few short setae anteriorly; 2 pairs scutellars, laterals about ½ length of medians; 1 pale proepisternal just above coxa I, subtended dorsally by shorter seta.

**LEGS:** coxa I yellow, coxae II, III dark brown basally, yellowish distally; remainder of legs yellow with only distal tarsomeres darkened; coxae I, II with pale anterior setae; coxa III with 1 strong pale lateral bristle; major leg setae black; relative proportions of podomeres given in the formula: femur; tibia; tarsomere 1/2/3/4/5; I: 4.0; 3.7; 2.0/1.2/0.7/0.5/0.5; II: 4.0; 4.5; 2.1/1.5/1.0/0.5/0.5; tibia II with strong anterodorsal (ad) and posterodorsal (pd) at ¼, the pd slightly basad of ad; a short pd at ¾ (sometimes indistinct); an irregular row of ventral setae projecting beyond vestiture; an apical ring of 4 strong bristles; III: 4.2; 5.7; 1.0/2.3/1.3/0.7/0.5; tibia III with row of 5-6 dorsal setae and 7-8 shorter ventral setae.

**WING:** dimensions 1.9-2.3 x 0.8-0.9; R<sub>2+3</sub> and R<sub>4+5</sub> diverging to wing apex; R<sub>4+5</sub> and M bowed outwards subapically; anal vein and anal cell present; wing ratio (length cross vein m-cu/distal section CuA) somewhat variable: 0.4-0.7; lower calypter pale with black marginal setae; haltere yellowish.

**ABDOMEN:** metallic bronze-green with dusting of grey pruinosity; posterior margin of tergum 1 with row of long dark setae; terga 2-5 lacking ovoid depressions along lateral margin; sterna 2-6 membranous or only weakly sclerotised, somewhat recessed.

**POSTABDOMEN:** segment 7 forming elongate peduncle, glabrous, without setae; sternum and tergum 7 elongated, incompletely fused, separated by somewhat sclerotised pleural membrane, and sternum 7 somewhat twisted to right (Fig. 3); elongated external side of tergum 7 appearing V-shaped, representing posterior tergal margin; segment 8 represented by sternum only, forming cap-like covering over hypopygial foreamen on left side of epandrium (when postabdomen is retracted towards preabdomen, segment 7 is enfolded by terga 5 and 6, leaving only hypopygium visible; hypopygium (Figs 3,4) dark brown with yellowish surstyli and cerci; hypandrium an inverted trough, fused to epandrium, immovable (Fig. 4); aedeagus simple; 2 epandrial lobes, each bearing strong bristle, arising along lateral walls of genital chamber; surstyli not solidly fused to epandrium, but with line of weakness along join; in lateral view surstyli appearing as concave dish with U-shaped excavation behind 2 distinctive incurved setae, and bordered along ventral margin with mound of 6-7 strong setae, and with distal arm incurved medially bearing strong apico-ventral setae; cercus stout basally, tapering into long narrow arm with strong dorsal and apical setae, and bare along ventral surface.

**FEMALE:** length 2.1 (one specimen only). Similar to male except where noted: face slightly wider than in male; 1st flagellomere (Fig. 2) distinctly shorter, subovate; arista longer; wing dimensions 1.8 x 0.7; CuAx ratio: 0.5

**ABDOMEN:** segments 1-6 with well developed, sclerotised terga and sterna; lateral margins of terga 2-5 each with 3-4 ovoid depressions; segment 7 usually retracted under segment 6; segment 8 acting as struts for fused segments 9+10; terga 9+10 divided medially into 2 hemitergites, each bearing 4 spines and lateral seta; sterna 9+10 with setae as figured and with fused cercus (Figs 6, 7).

**Remarks.** The colouration of coxae II and III varies from dark brown only basally to almost entirely dark brown. The extent of darkening on the coxae may be a direct function of age. The tropical Queensland males are distinctly smaller (wing length 1.90-2.05) than the two Australian Capital Territory males (wing length 2.15, 2.30). The CuAx ratios appear to vary greatly (this ratio usually is fairly constant within species of dolichopodids), but this might be related to wing size: wing ratios Queensland males: 0.4-0.5; Australian Capital Territory males: 0.6, 0.7. Despite the size variation mentioned above, the male genitalia of all specimens are identical, and thus conspecific.

*Systemus australis* is found in various forested habitats along the coasts and ranges of eastern Australia, from tropical rainforests in northern Queensland to montane eucalypt woodland in the Australian Capital Territory. All specimens were taken in malaise traps.

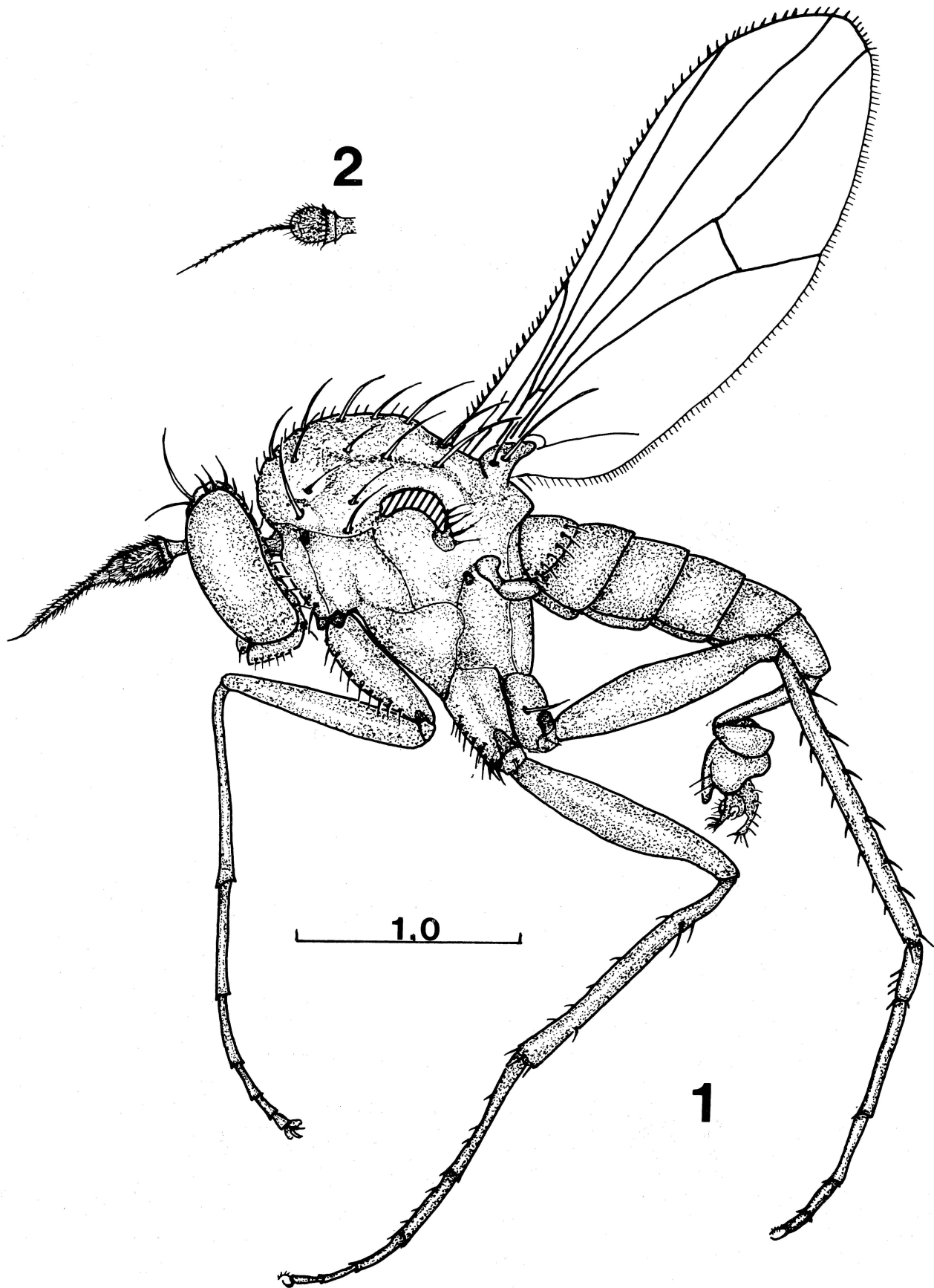


Plate I

Figs 1-2. *Systemus australis*, Black Mtn, ACT: 1, male habitus, left lateral; 2, female antenna, left lateral.

*Systemus curryi* n. sp.

(Fig. 5)

**Type material.** HOLOTYPE, ♂: Western Australia: Crowea State Forest, near Pemberton, December, 1976, light trap, S.J. Curry (ANIC).

**Description.** MALE: length 2.1: (single male specimen mounted out of alcohol is somewhat shrunken and discoloured). Similar to male *S. australis* except as noted.

THORAX: dark metallic green with bronze vittae.

LEGS: all coxae dark brown, femur I dark brown to 'knee'; remainder of leg I, legs II and III entirely yellow except for darkened distal tarsomeres, leg chaetotaxy similar.

WINGS: dimensions 2.1 x 0.7; wing ratio: 0.7.

HYPOPYGIUM (Fig. 5): similar to *S. australis* except for details of surstyli and cercus; surstyli more compact, in lateral view with concave dish-like depression from which curved wedge is excised, and distally with 2 ventrally directed curved setae, dorsal seta on long pedicel, ventral seta on shorter pedicel; 3 strong setae arising from ventral side of depression; surstyli with ventral prominence and ventral setae as figured, with the distalmost setae distinctly hooked; cercus with ventral margin covered by dense hairs and lacking prominent apical setae.

FEMALE: unknown.

**Remarks.** This species was taken in the wet sclerophyll eucalypt forests of south-western Western Australia. *Systemus curryi* and *S. australis* have similar surstyli and cerci and, in comparison with genitalic figures of palearctic and nearctic species, appear to represent a natural species group. The presence of species pairs in the disjunct eucalypt forests of eastern Australia and south-western Western Australia is a common pattern in the Australian fauna (Keast, 1981). This pattern reflects increasing post-Miocene aridity which divided a once continuous southern Australian biota into a number of refugia, perhaps thereby facilitating allopatric speciation.

**Other Australian *Systemus***

An isolated female *Systemus* sp. from tropical Western Australia (Drysdale River, 15°02'S 126°55'E, 3 to 8-viii-1975, ANIC) may represent a new species. Although it shows similarities to the *S. australis* female, its scape and pedicel are distinctly yellow and coxa II almost entirely yellow. Until it can be associated with a male, it remains undescribed.

**Discussion**

Because of similar sexually dimorphic antennae, species of *Systemus* were originally described in *Rhaphium* Meigen. Although *Systemus* was erected by Loew in 1857, the genus was long retained in the subfamily Rhaphiinae (e.g. Becker, 1917-18; Parent,

1938), despite obvious incongruities. The genus *Rhaphium* has a flat or convex dorsal postcranium, lacks a distinct fronto-clypeal suture, has 6 sclerotized pseudotracheae, an unflattened posterior part of the mesoscutum, coxa III with 2 external bristles, usually with abundant long hairs on the proepisternum near the anterior thoracic spiracle, and, most importantly, the hypopygium is encapsulated at the end of the abdomen with only a short internal segment 7. Robinson (1970) correctly removed *Systemus* from the Rhaphiinae and placed it as the sole representative of a new subfamily, the Systeminae. Ulrich (1981) accepted the Systeminae but claimed that a monogeneric subfamily was unsatisfactory. He tentatively placed the genera *Xanthina* Aldrich, *Achalcus* Loew, *Epithalassius* Mik and *Euxiphocerus* Parent in the subfamily because of similarity of habitus and antennal structure. I have examined specimens of the neotropical *Xanthina plumicauda* Aldrich and the presence of anterior preapicals on femora II and III, a dorsal arista, and a large encapsulated hypopygium of complex structure unlike *Systemus* would place it in the Peloroepodinae or Xanthochlorinae of Robinson (1970). Descriptions and figures of *Achalcus* (Parent, 1938) and examination of New Zealand specimens which have been called *Achalcus* (Parent, 1933) would exclude this genus on the basis of anterior femoral preapicals and male postabdominal morphology. Figures of the male terminalia of the palearctic *Epithalassius* (Parent, 1938) and the afrotropical *Euxiphocerus* (Parent, 1935) would similarly exclude these two genera.

In summary, none of the additional genera Ulrich proposed for the Systeminae belong in the subfamily because of a distinctly different male postabdominal morphology. The genus *Systemus* is most closely allied to the Medeterinae as suggested by Robinson (1970) and discussed below.

Of the distinctive characters of *Systemus*, the following character states are ascribed (see Bickel, 1985 for further discussion).

**A.** Plesiomorphic character states with respect to the groundplan of the Dolichopodidae.

1. Eyes with tiny hairs between facets.
2. 'Bosse alaire' present, a flexion in the distal sector of wing vein M.
3. Anal vein present.
4. Female abdominal terga 9 + 10 divided medially, each hemitergite bearing a curved row of spine-like acanthophorites.

**B.** Synapomorphies (shared derived characters) with the subfamily Medeterinae.

1. Postcranium dorsally concave.
2. Femora II, III lacking anterior preapical bristles.
3. Segment 7 of male forming an elongate external peduncle for the hypopygium.
4. Two epandrial lobes present, each bearing a strong bristle.
5. Surstyli as only distal projection from epandrium.
6. Mesoscutum flattened posteriorly.
7. Larva associated with arboreal habitats (?)

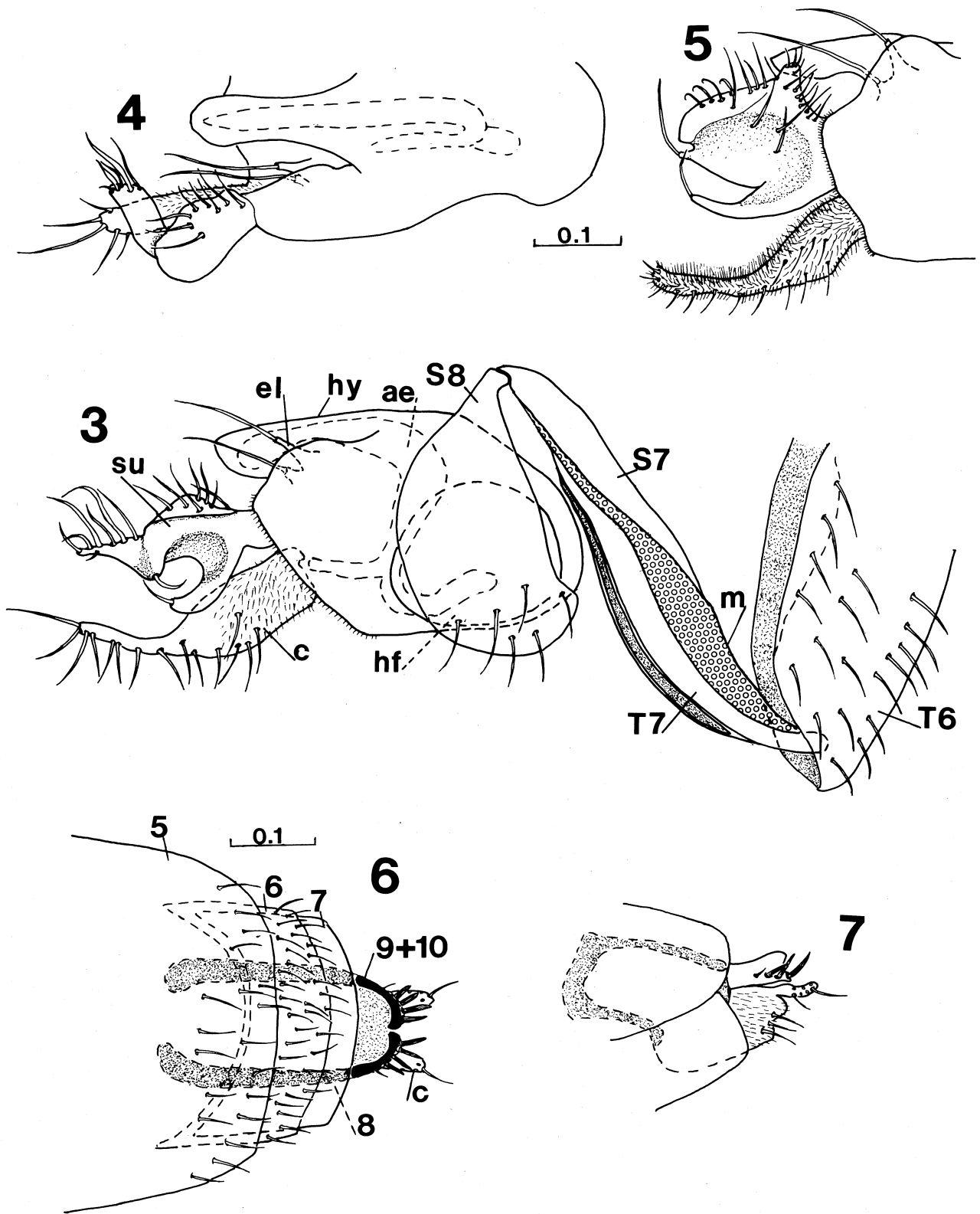


Plate II

Figs 3-4. *Systemus australis*: 3, male postabdomen, left lateral: S, sternum; T, tergum; ae, aedeagus; c, cercus; e.l., epandrial lobe; hf, hypopygial foramen; hy, hypandrium; m, pleural membrane; su, surstyli; 5, 6, etc., abdominal segments. 4, male hypopygium, ventral view, left side only.

Fig. 5. *Systemus curryi*, Crowea State Forest, WA, male hypopygium, left lateral, distal appendages.

Figs 6-7. *Systemus australis*, Mt Webb, Qld, female terminalia: 6, dorsal view; 7, lateral view.

C. Apomorphic characters shared with the subfamily Rhaphiinae, although probably homoplastic (convergent).

1. Antennae strongly sexually dimorphic, the male 1st flagellomere elongate tapering with short arista; female 1st flagellomere ovate with longer arista.

D. Autapomorphies

1. Thumb-like proleg on first abdominal segment of larva.
2. Posterior pair of acrostichals longer than preceding pairs and offset laterad.
3. Loss of ovoid depressions on the lateral margins of male abdominal terga.
4. Hypandrium fused to epandrium, immovable.

If the Medeterinae were interpreted to include the 'bosse alaire' in its groundplan, *Systemus* could easily be incorporated into the subfamily, perhaps as a separate tribe. The hypopygium of *Systemus* bears strong similarities to that of *Medetera* (see figures in Negrobov, 1971-77; and Bickel, 1985) with the presence of 2 bristle-bearing epandrial lobes, similar configuration and position of the surstyli (with no other distal epandrial appendages except the cerci), aedeagus with similar structure, internal curvature and formation of ejaculatory bulb, similar left lateral position of the hypopygial foramen, and similar form of the cerci. In addition, the relative proportions of the podomere segments are similar among *Systemus*, *Medetera* and *Thrypticus* (Medeterinae). A number of new medeterine genera await description and other included genera need redefinition before the position of *Systemus* within the Medeterinae can be ascertained. *Systemus* was the sole genus in the Systeminae (see Discussion, above), and since it is now included in the Medeterinae, there is no longer any need to maintain the subfamily Systeminae.

#### Additional Notes on *Systemus*

I have twice collected adult *Systemus* in North America (*S. eucenus* in New York State and *S. shannoni* in Maryland) as isolated individuals resting on tree trunks. They were orientated with head vertical, body parallel to the trunk. *Medetera* commonly rests on trunks in a similar manner. This habit of *Systemus* may provide further evidence for a link with the Medeterinae.

In a recent key to nearctic Dolichopodidae, (Robinson & Vockeroth, 1981), the second part of couplet 12, leading to *Systemus* + *Neurigona*, which states "tergite 7 mostly hidden, bare", does not hold for *Systemus*. Segment 7, the peduncle (formed of both tergum and sternum), will appear hidden only if retracted and enclosed by terga 5 and 6, whereas in *Neurigona*, it is always hidden. Also the tergum 7 of the nearctic *S. shannoni* is distinctly haired in specimens I have collected and in Fig. 3 of the original description (Wirth, 1953).

A useful generic key-character present in all specimens I have examined is the distinctly longer, laterally offset

posterior pair of acrostichals (ac). This character is present on both sexes and does not occur in genera usually keyed out with *Systemus*.

ACKNOWLEDGEMENTS. I wish to thank D.H. Colless, Australian National Insect Collection, Canberra (ANIC) and D.K. McAlpine, Australian Museum, Sydney (AMS) for the loan of specimens. Z. Liepa of the ANIC generously supplied photocopies of two journal articles.

#### References

- Becker, T., 1917-1918. Dipterologische Studien. Dolichopodidae. Nova Acta Academiae Caesareae Leopoldino Carolinae 102: 113-361; 103: 203-315; 104: 35-214.
- Bickel, D.J., 1985. A revision of the Nearctic *Medetera* (Diptera: Dolichopodidae). United States Department of Agriculture Technical Bulletin 1692: 1-109.
- Cregan, M.B., 1941. Generic relationships of the Dolichopodidae based on a study of the mouthparts. Illinois Biological Monographs 18: 1-68.
- Foot, R.H., J.R. Coulson & H. Robinson, 1965. Family Dolichopodidae. In "A Catalog of the Diptera of America North of Mexico" (A. Stone et al., editors). United States Department of Agriculture, Agricultural Handbook 276: 1-1696.
- Keast, A. (editor), 1981. Ecological biogeography in Australia. 3 vols. W. Junk, The Hague.
- Krivosheina, N.P., 1973. Larvae of the genus *Systemus* (Diptera: Dolichopodidae). Zoologicheskii Zhurnal 52: 1095-1097 (in Russian, English summary).
- Loew, H., 1857. Neue Beiträge zur Kenntnis der Dipteren Fünfter Beitrag. Königlichen Realschule zu Meseritz, Programm 1857: 1-56.
- Lundbeck, W., 1912. Diptera Danica, Part IV: Dolichopodidae. S. Gad, Copenhagen, 416 pp.
- McAlpine, J.F., 1981. Morphology and Terminology - Adults. In "Manual of Nearctic Diptera" (J.F. McAlpine et al., editors) Vol. 1: 9-64. Research Branch Agriculture Canada, Monograph 27, Ottawa, 674 pp.
- Negrobov, O.P., 1971-1977. Dolichopodidae, Unterfamilie Medeterinae. In "Die Fliegen der palaearktischen Region" (E. Lindner, editor) 29: 269-353, Lieferungen 284 (1971), 289 (1972), 302 (1974), 303 (1974), 316 (1977). Schweizerbart, Stuttgart.
- Parent, O., 1933. Étude monographique sur les Diptères Dolichopodides de Nouvelle Zélande. Annales de la Société scientifique de Bruxelles (B) 53: 323-441.
- 1935. Diptères Dolichopodides du Congo belge. Nouvelle contribution. Revue de Zoologie et de Botanique Africaines 27: 112-129.
- 1938. Diptères Dolichopodidae, Faune de France 35: 1-720.
- Robinson, H., 1970. The subfamilies of the family Dolichopodidae in North and South America (Diptera). Papéis Avulsos de Zoology, São Paulo 23(6): 53-62.
- Robinson, H. & J.R. Vockeroth, 1981. Dolichopodidae. In "Manual of Nearctic Diptera" (J.F. McAlpine et al., editors) Vol. 1: 625-639. Research Branch Agriculture Canada Monograph 27, Ottawa, 674 pp.



- Steyskal, G.C., 1970. Revisionary notes on the genus *Systemus* with a description of immature stages from tree cavities. *Proceedings of the Entomological Society of Washington* 72: 107-111.
- Ulrich, H., 1981. Zur systematischen Gliederung der Dolichopodiden (Diptera). *Bonner Zoologische Beiträge* 31: 385-402.
- Vaillant, F., 1978. Les *Systemus* et leur habitat dendrotelme (Dipt. Dolichopodidae). *Bulletin de la Société entomologique de France* 83(3-4): 73-85.
- Wirth, W.W., 1952. Three new nearctic species of *Systemus* with a description of their immature stages from tree cavities. *Proceedings of the Entomological Society of Washington* 54: 236-244.

Accepted 1st April 1986