

Studies of Canacidae (Diptera), I:
Suprageneric Revision
of the Family, with Revisions
of New Tribe Dynomiellini
and New Genus *Isocanace*

WAYNE N. MATHIS

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ABSTRACT

Mathis, Wayne N. Studies of Canacidae (Diptera), I: Suprageneric Revision of the Family, with Revisions of New Tribe Dynomiellini and New Genus *Isocanace*. *Smithsonian Contributions to Zoology*, number 347, 29 pages, 77 figures, 1982.—A suprageneric classification of the family Canacidae, or beach flies, is proposed, with the family being divided into two subfamilies and two tribes for the first time. The subfamilies Canacinae and Nocticanacinae and, for Canacinae, the tribes Canacini and Dynomiellini are characterized. For the tribe Dynomiellini, the genera (*Canacea* Cresson; *Chaetocanace* Hendel; *Dynomiella* Soika; *Isocanace*, new genus; *Trichocanace* Wirth; *Xanthocanace* Hendel) are diagnosed, with catalogs and keys to included species of each. *Isocanace*, new genus, is revised to include four species in two species groups—the *briani* group: *I. australis*, new species (South Africa); *I. briani*, new name; *I. flava* (Canzoneri and Meneghini); and the *albiceps* group: *I. albiceps* (Malloch). Hypothetical phylogenies for the species of *Isocanace* and for the genera of Dynomiellini are proposed, as character evidence was discovered. Electron micrographs and line illustrations are provided for all genera, mostly of type-species.

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Studies of Canacidae (Diptera), I: Suprageneric Revision of the Family, with Revisions of New Tribe Dynomiellini and New Genus *Isocanace*

Wayne N. Mathis

Introduction

Beach flies, or members of the family Canacidae, are common inhabitants of maritime beaches, and except for extreme northern and southern latitudes, they are found the world over. Although fairly abundant and widespread, most of the world's fauna remained unstudied until this century, when the first and only revision of the family was presented by Wirth (1951). Since then the number of species described in the family has nearly doubled. Moreover, new genera have been proposed (Soika, 1956; Mathis and Wirth, 1978), and several others have been revised (Wirth, 1956a, 1964, 1970; Mathis, in press). To date, however, no attempt has been made to determine relationships among genera or to elucidate the higher classification of the family. My intent herein (and in a second part of this series, in preparation) is to review the family at the generic level, to propose a higher classification, to present a catalog of species, and to provide keys to known species. In this part, I am also revising the genus *Isocanace*.

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METHODS.—The methods and descriptive format used generally in this study were explained in parts I–III and V–VI of the Ephydrinae series (Mathis and Shewell, 1978; Mathis, 1979, 1980, 1982; Mathis and Simpson, 1981).

One new adjective, “anaclinate,” has been introduced to describe the orientation of some genal bristles. It means directed upwards, upturned.

Because the intent of this study is to provide a synoptic review, I have not provided detailed generic descriptions. Instead I have written a “Descriptive Diagnosis” for each genus, which, as the term implies, is a hybrid between a brief diagnosis and an in-depth description. Its immediate purpose is to facilitate recognition and to serve as a springboard for future, more thorough studies.

I have attempted to make the annotations for the various taxa uniform by using the same word(s) for similar references: “list,” usually followed by a locality, indicates the mention of a species from a locality (sometimes a few localities) without additional data; “distribution” is used for citations where several localities are cited or where a summary of the distribution is given; “discussion” applies to references providing infor-

mation of a varied nature, from taxonomic status to nomenclature; "review" is used for references that are essentially a reworking of data previously available; "revision" means that new material, observations, etc., are incorporated in the reference; "catalog," accompanied by an indication of the taxon's zoogeographic region (the catalogs, especially those since 1965, are fairly standard in content, and I feel nothing is gained by citing any unique features of a particular catalog). Where these words are not broadly appropriate, other descriptors, such as "resurrection from synonymy" or "figure of male terminalia," are included. I have attempted to include all pertinent literature that applies to the appropriate species, although some judgment was exercised. An occasional reference was eliminated, usually because there was doubt as to the identity of specimens, or the reference contained only the species epithet, without further elaboration as to natural history, distribution, etc.

ACKNOWLEDGMENTS.—Although this study was based primarily on specimens in the National Museum of Natural History, numerous others were borrowed, particularly type specimens of previously described species. To my colleagues and their institutions, listed below, who lent specimens, I express my sincere thanks. Without their cooperation this study could not have been completed.

ANIC	Australian National Insect Collection, CSIRO, Division of Entomology, Canberra, Australia (Dr. Don H. Colless)
BMNH	British Museum (Natural History), London,

	England (Dr. Brian H. Cogan)
DEI	former Deutsche Entomologische Institute, collections in the Institut für Pflanzenschutzforschung, Zweigstelle Eberswalde, Abteilung Taxonomie der Insekten, Eberswalde, Germany (DDR) (Dr. Günter Morge)
HU	Museum für Naturkunde, Humboldt Universität, Berlin, Germany (DDR) (Dr. H. Schumann)
KMMA	Koninklijk Museum voor Midden-Afrika, Tervuren, Belgium (Drs. J. Decelle and R. Jocque)
MNHN	Muséum National d'Histoire Naturelle, Paris, France (Dr. Loïc Matile)
NMP	Natal Museum, Pietermaritzburg, South Africa (Dr. Brian Stuckenberg)
SPHTM	School of Public Health and Tropical Medicine, Sydney, Australia (Dr. Margaret L. Cook)
TRC	Transvaal Museum Collection, Pretoria, South Africa (Dr. G. L. Prinsloo)
USNM	former United States National Museum, collections in the National Museum of Natural History, Smithsonian Institution, Washington, D.C.
ZIL	Zoological Institute, Lund University, Lund, Sweden (Dr. Hugo Andersson)

I also wish to acknowledge the following for providing information or special assistance: Miss Hollis B. Willams for general technical help; Mr. Victor E. Krantz for photographing wings; Mrs. Susann G. Braden and Ms. Mary-Jacque Mann for taking the scanning electron micrographs; Mr. Young Sohn and Ms. Molly Ryan for executing all habitus illustrations; and Miss Noreen Connell for typing the various drafts of the manuscript. Finally, I wish to thank Drs. Willis W. Wirth, Curtis W. Sabrosky (especially for nomenclatural assistance), and Richard C. Froeschner for critically reviewing the manuscript.

CANACIDAE Jones

Key to Subfamilies and Tribes of Canacidae

1. Laterocline fronto-orbital bristles either 4 or more, or 3 and with sternopleural bristle lacking; female genital lamella with 1 large, apical seta, this usually acutely pointed (*Canacea* Cresson; *Chaetocanae* Hendel; *Dynomiella* Soika; *Isocanace*, new genus; *Trichocanace* Wirth; *Xanthocanace* Hendel) CANACINAE, new subfamily 2
2. Laterocline fronto-orbital bristles 3 and sternopleural bristle present; female genital lamella with 2 large setae, one apical, the other subapical,

- each rather bluntly rounded (*Nocticanace* Malloch; *Canaceoides* Cresson; *Paracanace* Mathis and Wirth; *Procanace* Hendel)
 **NOCTICANACINAE**, new subfamily
2. Laterocline fronto-orbital bristles 4 or more, sternopleural bristle sometimes present (see generic treatments below)
 **DYNOMIELLINI**, new tribe
- Laterocline fronto-orbital bristles 3, sternopleural bristle lacking (*Canace* Haliday) **CANACINI**, new tribe

DISCUSSION.—The subfamily Nocticanacinae will be the subject of the second part of this series (in preparation) and will be dealt with in a similar manner.

The tribe Canacini comprises but one genus, *Canace* Haliday, which was recently reviewed by me (Mathis, 1982) in a study of the beach flies of Israel.

DYNOMIELLINI, new tribe

DIAGNOSIS.—Small to moderately large beach flies, similar to those in Canacini but differing

from it and other members of the family Canacidae by the following characters: large, laterocline, fronto-orbital bristles 4 or more; conformation of head in profile square to rectangular, not as a parallelogram; generally setose or setulose, especially evident on mesonotum, with acrostichal setae and other setae conspicuous; sternopleural bristle sometimes present; female genital lamellae broad basally, width 3–5 times wider than apical width of lamellae, with 1 large, apical, generally acutely pointed bristle; surstylus of male terminalia generally a simple, ventral extension of the epandrium, apex frequently hooklike, hook directed anteriorly.

Key to Genera of Tribe Dynomiellini

1. Sternopleural bristle present, sometimes pale 2
 Sternopleural bristle absent 3
2. Forefemur lacking row of spinelike setae; arista with 2 rows of setulae extending from base to apex; 1 supra-alar bristle (the *briani* group) **Isocanace** (in part), new genus
 Forefemur with row of spinelike setae along apical one-half of antero-ventral surface, usually 4 or 5 setae; apical one-third of arista bare; 2 supra-alar bristles **Canace** Cresson
3. Anterior notopleural bristle present; lateral scutellar bristles 2 pairs 4
 Anterior notopleural bristle absent; lateral scutellar bristles 1 pair 6
4. Vein M with last section arcuate; mesofrons uniformly and densely setulose; 5–6 fronto-orbital bristles; setae generally pale. **Xanthocanace** Hendel
 Vein M with last section more or less straight, not distinctly arcuate; mesofrons with bare areas, not densely setulose; 4 fronto-orbital bristles; setae generally dark colored 5
5. Arista with 2 rows of setulae extending from base to apex, 1 row dorsally and 1 ventrally; postocellar setae conspicuously smaller than ocellar bristles, with proclinate, slightly divergent orientation (the *albiceps* group) **Isocanace** (in part), new genus

- Arista with apical one-third bare; postocellar setae subequal in size and with similar orientation as ocellar bristles *Dynomiella* Soika
6. Mesofrons well sclerotized, distinct from membranous-appearing parafrons; anteroclinate genal bristle, large, black; anaclinate genal bristles lacking; arista with 2 rows of setulae extending to apex; propleuron setulose *Chaetocanace* Hendel
- Mesofrons and parafrons not distinct from each other except by color in some species, both appearing membranous although usually tomentose; anteroclinate genal bristle small, pale; anaclinate genal bristles 2; arista with apical one-third to one-half bare, stylelike; propleuron bare of setulae *Trichocanace* Wirth

Genus *Canace* Cresson

FIGURES 1-12

- Canace* [lapsus].—Malloch, 1924a:52,53 [description of *C. macateei*, diagnosis of genus, see "Discussion" below].—Johnson, 1925:276 [list].—Mathis, in press [discussion].
- Canace* Cresson, 1924:164 [type-species: *Canace macateei* Malloch, by original designation and monotypy; Cresson validated Malloch's name as an indication].
- Canace* [in part].—Malloch, 1933:4 [discussion].—Curran, 1934:356 [discussion, generic key].—Cresson, 1936:264,265 [discussion, description of new species].—Wirth, 1951:259-265 [review]; 1965:733 [Nearctic catalog]; 1970:397-403 [revision]; 1975:1 [Neotropical catalog].—Wheeler, 1952:90,91 [discussion].

DESCRIPTIVE DIAGNOSIS.—Resembling *Dynomiella* Soika but differing from it and other genera by the following combination of characters.

Head (Figures 1-7): Mesofrons distinct from parafrons, shiny, very thinly tomentose, with 3-5 large, proclinate setae along lateral margin, midportion bare of setae; parafrons tomentose, appearing dull (Figure 4); postocellar bristles subequal to ocellar bristles and with similar orientation (Figure 4); 4 large, latero-clinate, fronto-orbital bristles (Figure 5); arista variable, usually with apical one-fourth to one-third bare of setulae, stylelike, some species with minute setulae extending nearly to apex but not appearing plumose (Figure 7); anaclinate genal bristles 2 (Figures 1, 2); anteroclinate genal bristle 1 (Figures 1, 2).

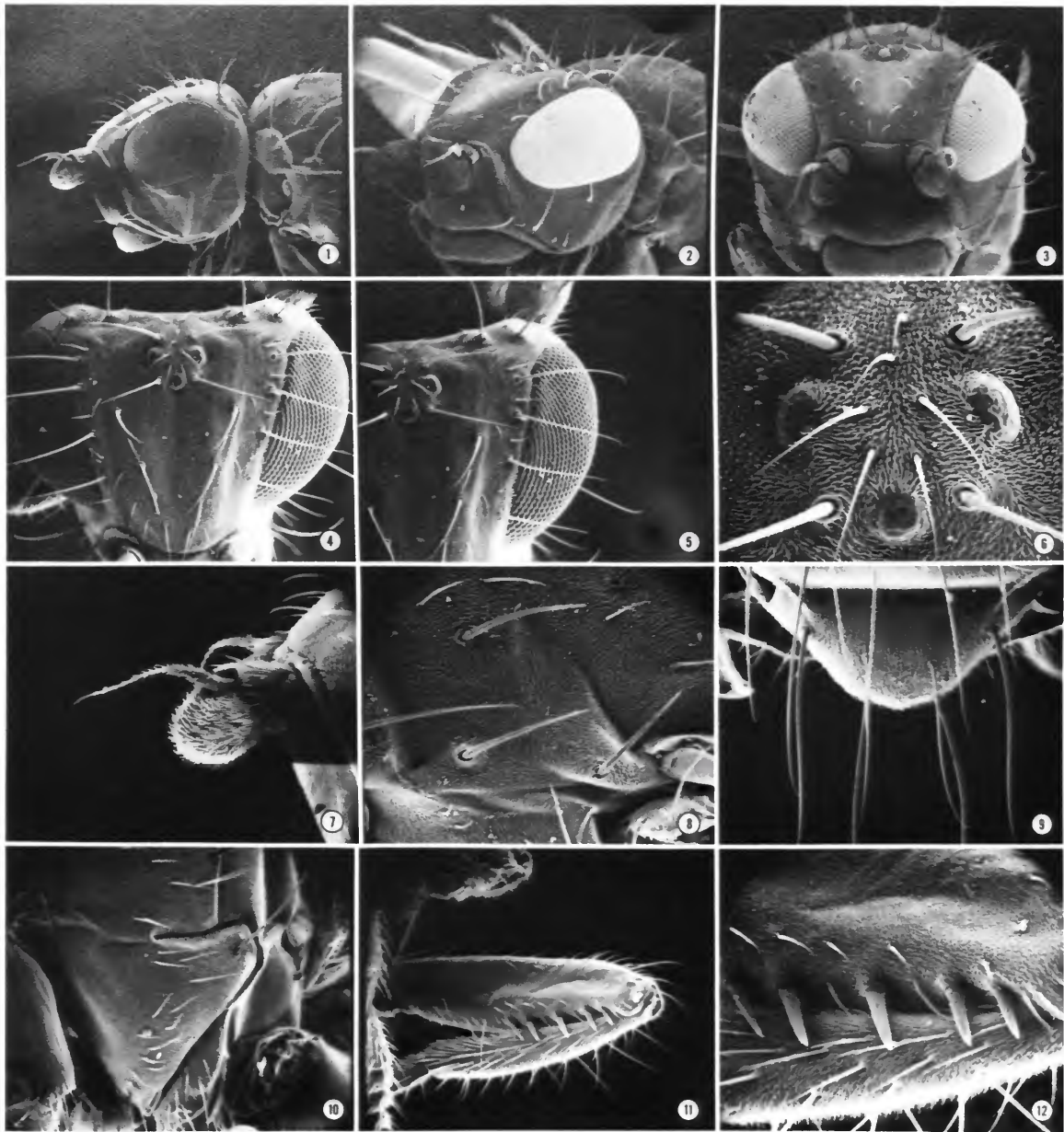
Thorax (Figures 8-12): Dorsocentral bristles 4 (1+3), all subequal in size; acrostichal setae conspicuous, arranged in 4 irregular rows anteriorly,

becoming more regular posteriorly, midrows with setulae slightly larger and with large pair of prescutellar setae; lateral scutellar bristles 2 pairs and with several setae dorsally (Figure 9); supralar bristles 2, anterior bristle only slightly smaller than posterior bristle; 2 notopleural bristles (Figure 8); color of pleural setulae variable, usually black, bristles black; propleuron bare of setulae; 1-2 large, mesopleural bristles; sternopleural bristle present (Figure 10); forefemur with row of 3-12 stout, spinelike setae anteroventrally (Figures 11, 12); hind tibia lacking apical seta anteroventrally; apical section of vein M straight.

Abdomen: Female genital lamellae broad basally, basal one-half roughly triangular to nearly ellipsoidal, apical one-half as 2 parallel-sided, narrow processes, each with 1 long, stout, apical bristle; surstylus with anteriorly curved hook.

ZOOGEOGRAPHIC DISTRIBUTION.—New World. Coasts of North, Central, and South America from 50° north latitude, south to equator.

DISCUSSION.—Malloch (1924a) first published "*Canace*" when he described *C. macateei* as a new species. Most subsequent authors, however, including Malloch (see Curran below), considered this spelling to be a lapsus. Evidence to support the lapsus argument, although mostly circumstantial, is as follows. Curran (1934:356) wrote that in a conversation with Mr. Malloch, the latter had stated, "'*Canace*' was a slip of the pen" and that there was "no intention of establishing a new name." In the original publication itself there is likewise no indication that Malloch intended his spelling to be a new generic proposal.



FIGURES 1-12.—*Canacea macatei*: 1, head, lateral aspect; 2, same, anteroblique aspect; 3, same, anterior aspect; 4, frons, dorsal aspect; 5, same, left side, dorsal aspect; 6, ocelli, dorsal aspect; 7, antenna, lateral aspect; 8, notopleuron and bristles, lateral aspect; 9, scutellum and bristles, dorsal aspect; 10, sternopleuron and bristle, lateral aspect; 11, left foreleg, anterior aspect; 12, same, enlargement of anteroventral spinelike bristles, anterior aspect.

In Malloch's publications of the same era, new genera were proposed with an explicit indication that the names were new. Malloch also had the practice of designating a type-species even if the genus were then monotypic. Furthermore, in the original publication (1924a:52), Malloch mentioned that "there is no species of the genus definitely listed from North America." This statement could imply that species of the genus were known from other zoogeographic regions and were listed elsewhere. In view of this evidence and of the fact that "*Canacea*" was used consistently in the paper (in the table of contents and index as well), I can conclude only that Malloch's usage was a lapsus, and that the name is not thereby made available.

In the same year as Malloch's publication, Cresson (1924:164) did validate the name in his

treatment of "*Canacea macateei*, Malloch." Cresson not only used Malloch's spelling and referred to Malloch's publication (an indication by definition of the Code) but stated: "It [*Canacea macateei*] is the genotype of Malloch's ? genus *Canacea*, which is not congeneric with *Canace* . . ." Some years later, Cresson (1936) again treated the species related to *C. macateei*, and in his discussion (p. 265) of *C. aldrichi*, which was then being newly described, he said, "Should this group [*C. snodgrassii* Coquillett, *C. macateei*, and *C. aldrichi*] prove to warrant recognition, we may use *Canacea* Malloch, 1924, which name was used, apparently unintentionally, with *macateei* when that species was originally described." As already established, "*Canacea*" of Malloch is not valid, but the name was made available by Cresson's subsequent usage.

Key to Species of *Canacea*

(modified from Wirth, 1970)

1. Forefemur with row of 10–12 stout, anteroventral setae (California)
 *C. aldrichi* (Cresson)
 Forefemur with row of 3–5 stout, anteroventral setae (Neotropical, east coast of North America) 2
2. Setulae of mesopleuron and sternopleuron pale; small species, wing length 1.90–2.40 mm (Panama, Ecuador) *C. currani* (Wirth)
 Setulae of pleural sclerites black; larger species, wing length 2.60–3.70 mm (Galapagos Islands, Panama, east coast of North America) 3
3. Surstylus with stem of hook long and narrow, longer than its width (Galapagos Islands, Panama) *C. snodgrassii* (Coquillett)
 Surstylus with stem of hook wide and short, much wider than long (Atlantic and Gulf coasts from Prince Edward Island to Texas)
 *C. macateei* Malloch

***Canacea aldrichi* (Cresson), new combination**

Canace aldrichi Cresson, 1936:264.—Wirth, 1951:262 [review]; 1965:733 [Nearctic catalog]; 1970:401 [review, figure of male terminalia].—Wheeler, 1952:91 [distribution, key].

Canace aldrich [sic, printing error].—Wirth, 1956a:161 [discussion].

PRIMARY TYPE MATERIAL.—Holotype male.

UNITED STATES. *California*: Santa Clara Co., Palo Alto [USNM 51848].

ZOOGEOGRAPHIC DISTRIBUTION.—United States (California).

***Canacea currani* (Wirth), new combination**

Canace currani Wirth, 1970:402 [figure of male terminalia]; 1975:1 [Neotropical catalog].—Wheeler, 1952:90,91 [key, locality data].

PRIMARY TYPE MATERIAL.—Holotype male. PANAMA. *Darien Province*: Jaqué (light trap)[USNM 70341].

ZOOGEOGRAPHIC DISTRIBUTION.—Panama (Darien and Panama provinces, former Canal Zone), Ecuador (Guayas).

Canacea macateei Malloch

Canacea macateei Malloch, 1924a:52.—Cresson, 1924:164 [discussion]; 1936:265 [discussion].—Johnson, 1925:276 [list, Massachusetts, Rhode Island].

Canace snodgrassii [in part, misidentification].—Johnson, 1910:807 [list, New Jersey].—Wirth, 1951:260 [synonymy, review, figure of male and female terminalia]; 1965:733 [Nearctic catalog].

Canace macateei.—Malloch, 1933:5 [note].—Curran, 1934:356 [status].—Wheeler, 1952:90,91 [distribution, key].—Wirth, 1970:399 [resurrection from synonymy, review, figure of male terminalia].—Teskey and Valiela, 1977:545–547 [description of larva and puparium, natural history].

PRIMARY TYPE MATERIAL.—Holotype male. UNITED STATES. *Georgia*: Glynn Co., Jekyll Island [USNM 26883].

ZOOGEOGRAPHIC DISTRIBUTION.—Canada (New Brunswick, Prince Edward Island), United States (Atlantic and Gulf coasts from Maine to Texas).

Canacea snodgrassii (Coquillett), new combination

Canace snodgrassii Coquillett, 1901:378.—Cresson, 1936:264 [review].—Wirth, 1969:578 [review]; 1970:401 [review, figure of male terminalia]; 1975:1 [Neotropical catalog].

Canace snodgrassii [in part].—Wirth, 1951:260 [review, figure of male and female terminalia]; 1956a:161 [discussion].

Canace snodgrassii [sic].—Wirth, 1956b:48 [discussion].

PRIMARY TYPE MATERIAL.—Lectotype male (designated by Cresson 1936:264). GALAPAGOS ISLANDS. Albemarle Island [USNM 4430].

ZOOGEOGRAPHIC DISTRIBUTION.—Galapagos Islands, Panama (former Canal Zone).

Genus *Chaetocanace* Hendel

FIGURES 13–22

Chaetocanace Hendel, 1914:98 [type-species: *Canace biseta* Hendel, by original designation and monotypy].—Malloch,

1924b:333 [generic key].—Curran, 1934:357 [generic key].—Wirth, 1951:265 [review].—Miyagi, 1963:122 [list, Korea].—Delfinado and Wirth, 1977:391 [Oriental catalog].

DESCRIPTIVE DIAGNOSIS.—Resembling *Isocanace* Mathis but differing from it and other genera by the following combination of characters.

Head (Figures 13–19): Mesofrons distinct from parafrons, shinier, less tomentose, with 4–6 large, lateral, generally proclinate setae, middle area bare; postocellar setae subequal to ocellar bristles and with same orientation (Figure 16); 4 pairs of large, laterocline fronto-orbital bristles (Figure 17); arista plumose, length of branching rays nearly equal to double basal arista width (Figure 19); anaclinate genal bristles lacking, anterocline genal bristle 1, inserted near level of anterior margin of eye (Figures 13–15).

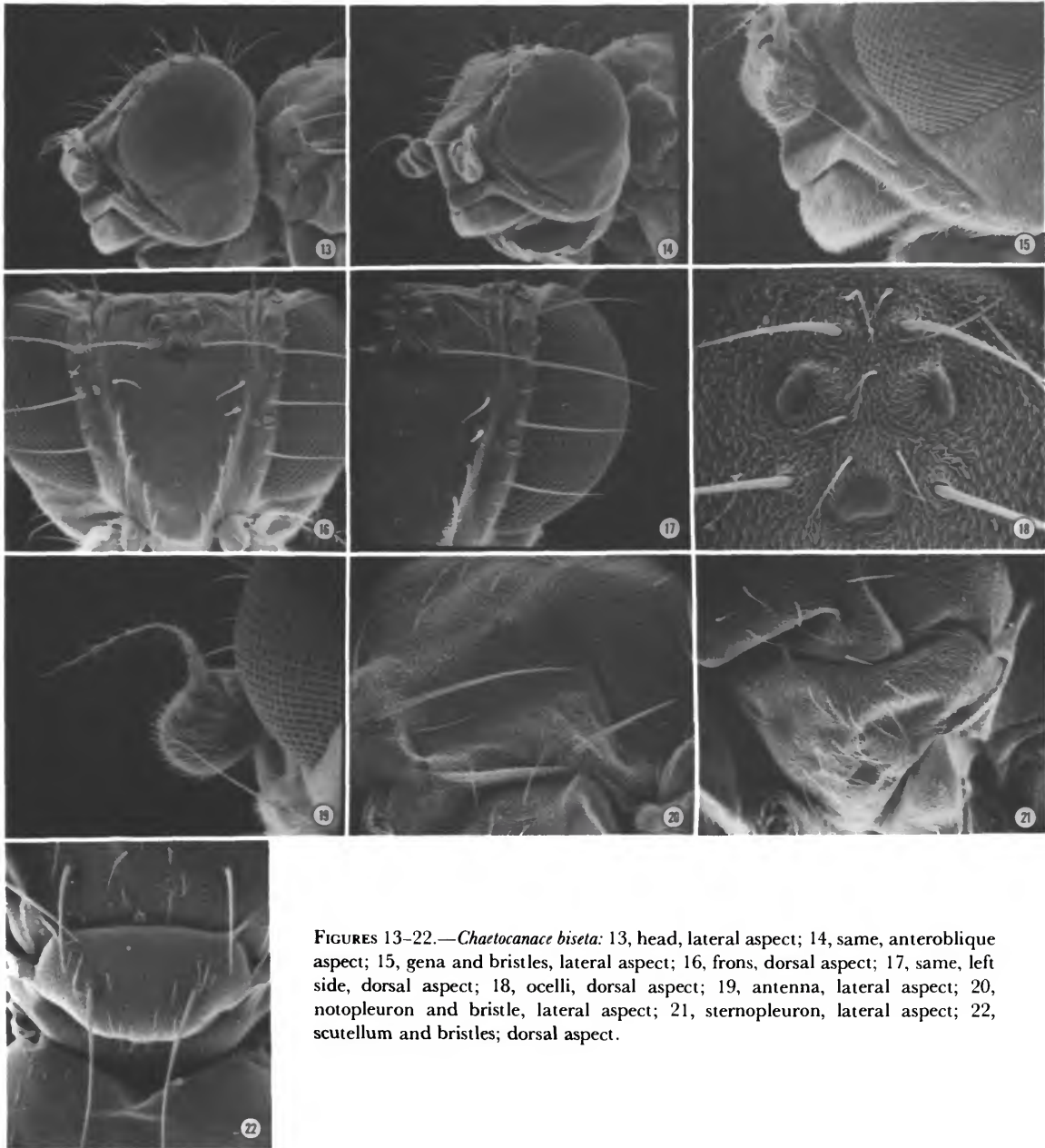
Thorax (Figures 20–22): Dorsocentral bristles 4 (1+3), all subequal in size; acrostichal setae small, arranged in 2 rows, lacking large pair of prescutellar bristles; 1 pair of scutellar bristles (Figure 22); anterior supra-alar bristle lacking; anterior notopleural bristle lacking (Figure 20); mesopleural setae pale; sternopleural bristle lacking (Figure 21); hind tibia with conspicuous, rather stout, apical seta anteroventrally; apical section of vein M straight.

Abdomen: Female genital lamellae very broad basally, basolateral margins rounded, narrowing abruptly near level of cleft, lamellae very narrow from level of cleft to apices, with only 1 large stout, acute, terminal seta at each apex; surstylus a simple ventral projection from epandrium, tapered gradually, subapically slightly “hooked” medially.

ZOOGEOGRAPHIC DISTRIBUTION.—Old World. Australian (Australia), Oriental (Philippines, Sri Lanka, Taiwan), Palaearctic (Japan, Korea).

DISCUSSION.—With only two described species, this is the smallest genus of the tribe and of the family as well.

The identity of the specimens from Japan, Korea, and the Philippines has not been confirmed, and it may be that additional species are involved. I have examined several specimens from



FIGURES 13-22.—*Chaetocnace biseta*: 13, head, lateral aspect; 14, same, anteroblique aspect; 15, gena and bristles, lateral aspect; 16, frons, dorsal aspect; 17, same, left side, dorsal aspect; 18, ocelli, dorsal aspect; 19, antenna, lateral aspect; 20, notopleuron and bristle, lateral aspect; 21, sternopleuron, lateral aspect; 22, scutellum and bristles; dorsal aspect.

Australia (Queensland, Cairns) and can confirm their conspecificity with *C. brincki*. The only character I have relied on in determining a species

identity is the conformation of the male terminalia, particularly the surstylus (see Delfinado, 1975, for illustrations).

Key to Species of *Chaetocanace*

- Surstylus with posterodorsal angle acutely pointed *C. biseta* (Hendel)
 Surstylus with posterodorsal angle bluntly rounded . . . *C. brincki* Delfinado

Chaetocanace biseta (Hendel)

Canace biseta Hendel, 1913:95.

Chaetocanace biseta.—Hendel, 1914:98 [new combination].—Wirth 1951:265 [review].—Miyagi, 1963:122, 125 [review, figures of male and female terminalia]; 1973:82 [list, Philippines].—Delfinado, 1975:221,222 [comparison with *C. brincki*, figure of male terminalia].—Delfinado and Wirth, 1977:391 [Oriental catalog].

Canace (Chaetocanace) biseta.—Hennig, 1941:158 [list of types, DEI].

PRIMARY TYPE MATERIAL.—Syntypes (undetermined number). TAIWAN. Tainan [DEI].

ZOOGEOGRAPHIC DISTRIBUTION.—Japan (Hokkaido, Honshu, Kyushu, Ryukyu Islands, Shikoku), Korea (Seoul), Philippines (Luzon), Taiwan (Tainan).

Chaetocanace brincki Delfinado

Chaetocanace brincki Delfinado, 1975:221.—Delfinado and Wirth, 1977:391 [Oriental catalog].

PRIMARY TYPE MATERIAL.—Holotype male. SRI LANKA. *Northern Province*: Mannar (16 km E), Nay Aru at Pallamadu [ZIL].

ZOOGEOGRAPHIC DISTRIBUTION.—Australia (Queensland), Sri Lanka (Northern Province).

Genus *Dynomiella* Soika

FIGURES 23–31

Dynomiella Soika, 1956:130 [type-species: *Dynomiella arenicola* Soika = *Canace stuckenbergi* Wirth, 1956, by original designation of monotypy].

Canace [in part].—Wirth, 1956b:48–51 [revision, key]; 1960:390 [synonymy of *Dynomiella* with *Canace*].—Cogan, 1980:694 [Afrotropical catalog].

DESCRIPTIVE DIAGNOSIS.—Resembling *Canace* Cresson but differing from it and other genera by the following combination of characters.

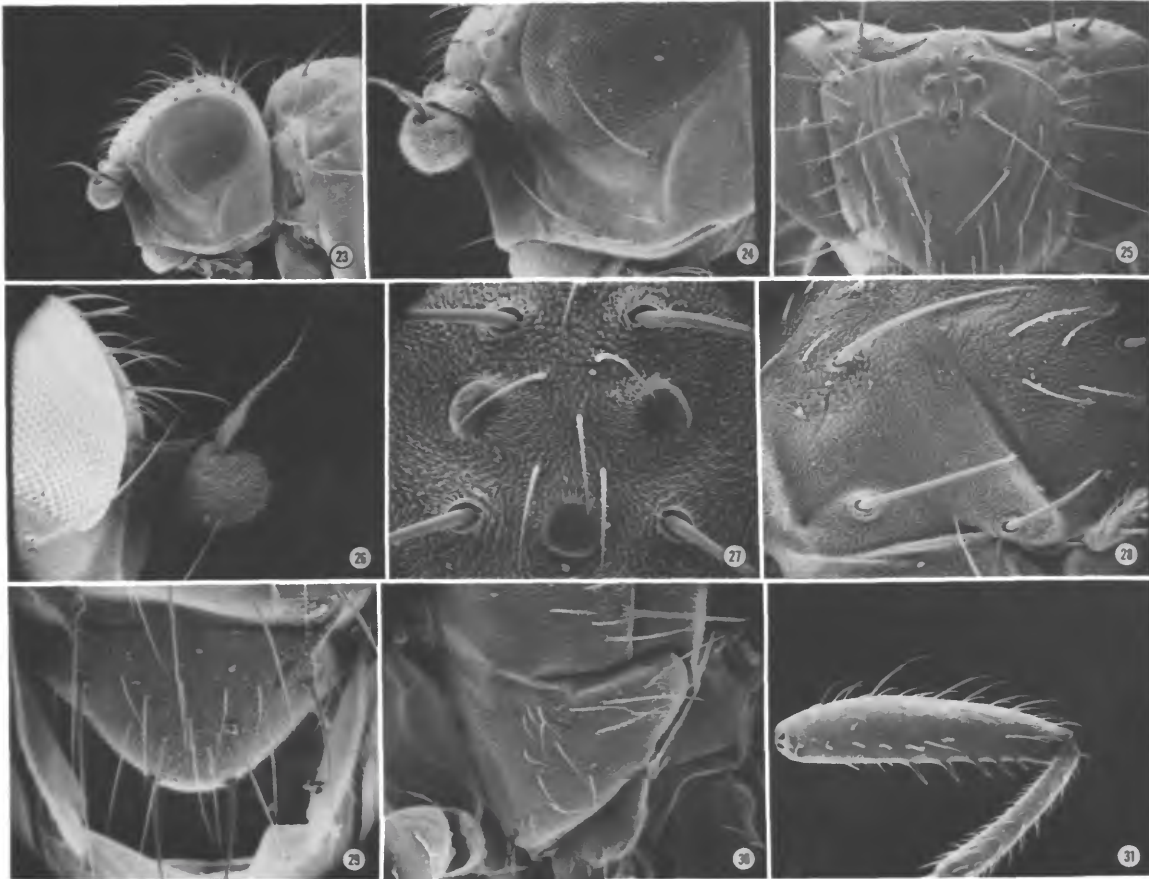
Head (Figures 23–27): Mesofrons similar to parafrons in vestiture, but densely tomentose,

appearing dull, frequently with coloration difference, usually mesofrons darker, brown, with 3–5 large, proclinate setae along lateral margins, mid-portion bare of setae (Figure 25); postocellar bristles subequal to ocellar bristles and with similar orientation (Figure 25); 4 large, laterocline, fronto-orbital bristles; arista short, generally lacking setulae, apical one-third to one-half bare, stylelike (Figure 26); anaclinate genal bristles 2 (Figures 23, 24); anterocline genal bristles 1 (Figures 23, 24).

Thorax (Figures 28–31): Dorsocentral bristles 4 (1+3), all subequal in size; acrostichal setae conspicuous, arranged in 4 irregular rows anteriorly, becoming more regular posteriorly, mid-rows with setulae slightly larger and with large pair of prescutellar setae; lateral scutellar bristles 2 pairs and with several setae dorsally (Figure 29); supra-alar bristle 1, anterior bristle usually lacking; 2 notopleural bristles (Figure 28); color of pleural setulae variable but usually pale, bristles black; propleuron bare of setulae; 1–2 large, mesopleural bristles; sternopleural bristle lacking (Figure 30); forefemur armature variable, some species with row of stout, spinelike setae anteroventrally; hind tibia lacking apical seta anteroventrally (Figure 31); apical section of vein M straight.

Abdomen: Female genital lamellae variable, either only moderately broad basally, short, and with lamellar processes over three-fourths total length, each process gradually tapered to apex; or lamellae very broad basally, subtriangular, long, over one-third total length, with each lamellar process narrow, parallel sided; in both cases apex of each lamellar process bearing 1 large, stout, moderately acutely to acutely pointed bristle; surstylus with slight, anteriorly curved process, slightly hooklike.

ZOOGEOGRAPHIC DISTRIBUTION.—Old World. Afrotropical (Namibia, South Africa).



FIGURES 23-31.—*Dynomiella spinosa*: 23, head, lateral aspect; 24, gena and bristles, lateral aspect; 25, frons, dorsal aspect; 26, antenna, lateral aspect; 27, ocelli, dorsal aspect; 28, notopleuron and bristles, lateral aspect; 29, scutellum and bristles, dorsal aspect; 30, sternopleuron, lateral aspect; 31, left foreleg, anterior aspect.

DISCUSSION.—When Wirth (1956b) revised the species of *Dynomiella* (as *Canace*), he noted (p. 48) that they were “very closely related . . .” and that they “are far more closely related to the American *snodgrassi* [sic] (Cocquillet [sic]) and *aldrichi* Cresson than to the European *nasica* Haliday and

salonitana Strobl.” I concur with Wirth’s observation, and as *Canace*, sensu stricto, is now restricted to species closely related to *C. nasica* Haliday (see Mathis, 1982b), the species related to *D. stuckenbergi* are recognized as a separate genus, under the generic name *Dynomiella* Soika.

Key to Species of *Dynomiella*

(modified from Wirth, 1956b)

1. Setae on lower pleural areas pale and very fine; forefemur lacking anteroventral spines; midfemur of male with prominent, posteroventral series of black bristles 2

- Setae on lower pleural areas black; forefemur with anteroventral spines (except in male of *D. cala*); midfemur of male lacking prominent, posteroventral bristles 3
2. Head greatly produced triangularly in front of eyes, mesofrons attaining lunular margin, with a bare median area between lateral mesofrontal bristles and extending entire length; legs with fine white hair, lacking black bristles except for 1–4 on posteroventral surface of forefemur and in male with 8–12 on posteroventral surface of midfemur *D. glauca* (Wirth)
- Head only slightly produced in front of eyes; mesofrons in form of a triangle extending not more than three-fourths way to lunular margin, median bare area small; legs with abundant black bristles and fine white hairs; midfemur of male with conspicuous posteroventral series of about 15 black bristles *D. stuckenbergi* (Wirth)
3. Forefemur of male lacking black anteroventral bristles, that of female with 6–8 slender bristles close together on distal half; smaller species, 2.75 mm *D. cala* (Cresson)
- Forefemur of both sexes anteroventrally with 4–6 widely spaced, very stout black spines on distal half; large species, 3 mm *D. spinosa* (Wirth)

***Dynomiella cala* (Cresson), new combination**

Canace cala Cresson, 1934:220.—Wirth, 1951:264 [review]; 1956b:49–51 [key, review].—Cogan, 1980:694 [Afrotropical catalog].

PRIMARY TYPE MATERIAL.—Holotype female. SOUTH AFRICA. *Cape Province*: East London [TMC].

ZOOGEOGRAPHIC DISTRIBUTION.—South Africa (Cape Province).

***Dynomiella glauca* (Wirth), new combination**

Canace glauca Wirth, 1956b:49.—Cogan, 1980:694 [Afrotropical catalog].

PRIMARY TYPE MATERIAL.—Holotype male. SOUTH AFRICA. *Cape Province*: Port Elizabeth (56 km E), Gamtoos River (lower reaches, within 3 km of ocean) [USNM 62712].

ZOOGEOGRAPHIC DISTRIBUTION.—South Africa (Cape Province).

***Dynomiella spinosa* (Wirth), new combination**

Canace spinosa Wirth, 1956b:51.—Cogan, 1980:694 [Afrotropical catalog].

PRIMARY TYPE MATERIAL.—Holotype male.

SOUTH AFRICA. *Cape Province*: Port Elizabeth (56 km E), Gamtoos River (lower reaches, within 3 km of ocean)[USNM 62714].

ZOOGEOGRAPHIC DISTRIBUTION.—South Africa (Cape Province).

***Dynomiella stuckenbergi* (Wirth), new combination**

Canace stuckenbergi Wirth, 1956b:50.—Cogan, 1980:694 [Afrotropical catalog].

Dynomiella arenicola Soika, 1956:130. [Synonymy by Wirth, 1960:391.]

PRIMARY TYPE MATERIAL.—Holotype male of *D. stuckenbergi*. SOUTH AFRICA. *Cape Province*: Port Elizabeth (56 km E), Gamtoos River (lower reaches, within 3 km of ocean)[USNM 62713]. Holotype male of *D. arenicola*. NAMIBIA. Walfish Bay (= Walvis Bay)[KMMA].

ZOOGEOGRAPHIC DISTRIBUTION.—South Africa (Cape Province), Namibia (Walvis Bay).

***Isocanace Mathis*, new genus**

FIGURES 32–59

TYPE-SPECIES.—*Isocanace briani* Mathis, new name for *Canace stuckenbergi* Mathis and Wirth

[preoccupied by *C. stuckenbergi* Wirth (1956)], by present designation.

DESCRIPTIVE DIAGNOSIS.—Resembling *Chaetocanace* Hendel but differing from it and other genera by the following combination of characters.

Head: Mesofrons distinct from parafrons, shinier, less tomentose, with 2–3 large, lateral, generally proclinate setae (Figures 37, 52); post-ocellar bristles smaller than ocellar bristles and with more proclinate orientation (Figures 37, 52); 4 pairs of large, latero-clinate, fronto-orbital bristles (Figures 38, 53); arista plumose, length of branching rays varying from approximately subequal to nearly twice basal aristal width (Figure 40); anaclinate genal bristles 2–3 (Figures 35, 36, 50, 51); antero-clinate genal bristle 1.

Thorax: Dorsocentral bristles 4 (1+3); acrostichal setae evident, arranged in 2 rows but lacking large pair of prescutellar acrostichal setae; 2 pairs of scutellar bristles and frequently with some smaller setae inserted dorsally (Figures 42, 56); with only 1 pair of supra-alar bristles; 1–2 notopleural bristles, if only 1, anterior bristle lacking; color of pleural setae variable, pale to black; propleuron bare of setulae; sternopleural bristle present or absent (Figures 43, 57); 1 large mesopleural bristle; hind tibia lacking apical seta anteroventrally; apical section of vein M straight.

Abdomen: Female genital lamellae very broad basally, basolateral margins rounded, narrowing rather abruptly at level of cleft, lamellae very narrow from level of cleft to apices, with only 1 large, stout, acute terminal bristle at each apex; surstylus quite variable, generally slender and with apical curvature.

ZOOGEOGRAPHIC DISTRIBUTION.—Old World. Afrotropical (Zaire, South Africa, Madagascar, and Seychelles Islands), Australian (New South Wales).

PHYLOGENETIC CONSIDERATIONS.—The relationships of the genus within the tribe Dynomiellini are discussed and diagrammed at the conclusion of this report (page 25). The cladistic relationships between some of the known species of *Isocanace* are diagrammed in Figure 32. Three species (*I. australis*, *I. briani*, and *I. flava*) form an

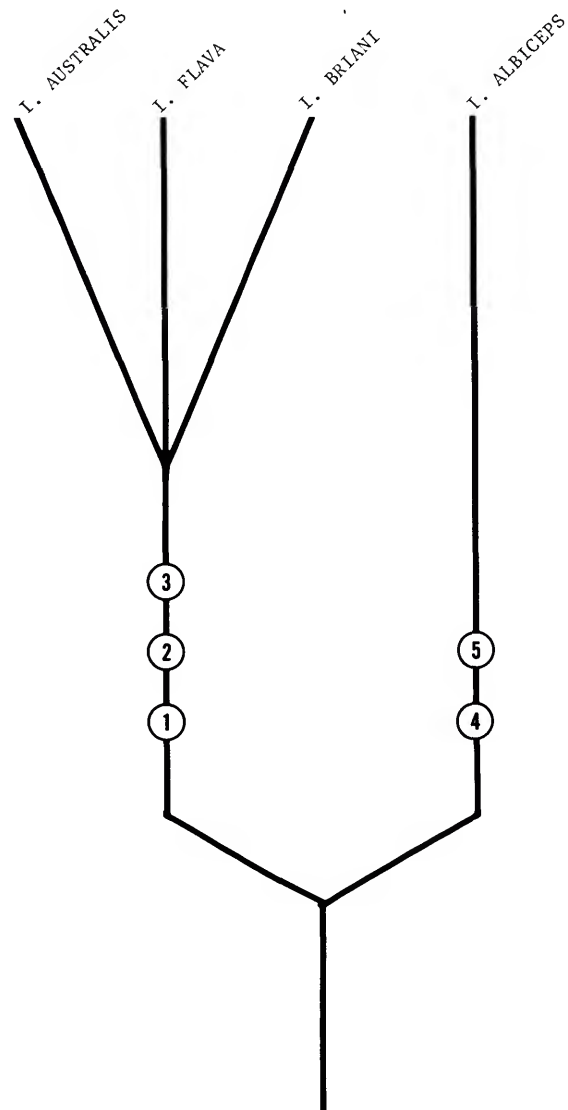


FIGURE 32.—Hypothetical phylogeny for the species and species groups of *Isocanace*.

unresolved trichotomy. Supportive character evidence is as follows (numbers correspond with those on the cladogram).

1. *Development of Anterior Notopleural Bristle:* Usually this bristle is as well developed as the posterior bristle. Its “weaker” condition is unique to this lineage and is autapotypic.

2. *Number of Anaclinate Genal Bristles:* The gen-

eralized condition is for two anaclinate genal bristles. The presence of three in this lineage is interpreted to be autapotypic.

3. *Vestiture of Mesofrons*: Generally the mesofrons has only larger bristles, and these are usually along the margins. Members of this lineage have a few scattered setulae in addition to the marginal setae.

4. *Number of Acrostichal Setulae*: Usually there are approximately 12 setulae in each acrostichal row, but in this species, there are fewer, about 5–6, a condition I interpret to be autapotypic.

5. *Sternopleural Bristle*: The generalized condition is for a large sternopleural bristle. In specimens of *I. albiceps*, the bristle is lacking. This character is variable within this subtribe, apparently having arisen several times, each independently.

DISCUSSION.—When Mathis and Wirth (1979) treated the Canacidae of Madagascar, they noted

(in the remarks section of “*Canace stuckenbergi*,” p. 788) that this species plus

an undescribed species from South Africa, and *C. albiceps* are quite similar and evidently are closely related. When a generic revision of the whole family is done, these three species might merit generic recognition. In some respects, i.e. size, coloration, chaetotaxy, this group resembles *Chaetocanace*, and they [it] may well be more closely related to that genus than to *Canace*.

Since then, I have concluded that this group of species indeed does form a monophyletic lineage that is more closely related to *Chaetocanace* than to *Canace*, *sensu stricto*, and accordingly, I have accorded it generic status. Furthermore, study of the type series of *Canace flava* Canzoneri and Meneghini has revealed that this species, too, is closely related to “*Canace stuckenbergi*,” making a total of four described species, although others will undoubtedly be discovered.

Key to Species Groups and Species of *Isocanace*

1. Sternopleural bristle lacking; mesofrons bare in middle; number of acrostichal setae reduced, usually less than 10, and usually paired; anterior notopleural bristle subequal to posterior bristle; 2 anaclinate genal bristles (Australian; the *albiceps* group) ***I. albiceps*** (Malloch)
- Sternopleural bristle present, although sometimes pale; mesofrons with scattered setulae on middle; acrostichal setae numerous, usually more than 15 and not strictly paired; anterior notopleural bristle distinctly smaller than posterior bristle or lacking; 3 anaclinate genal bristles (Afrotropical; the *briani* group) 2
2. Arista with branching rays long, some nearly double arista width at base; mesopleural and usually sternopleural bristle pale, mostly yellowish (Madagascar and Aldabra Islands) ***I. briani***, new name
- Arista with branching rays shorter, at most slightly longer than arista width at base; mesopleural and sternopleural bristle black (South Africa and Zaire) 3
3. Anterior notopleural bristle present, although weaker than posterior bristle; surstylus in lateral view narrow, with subapical posterior swelling bearing several pale setae, apical one-third curved posteriorly (South Africa) ...
- ***I. australis***, new species
- Anterior notopleural bristle lacking; surstylus wider in lateral view, with subapical anterior swelling, apical one-third narrowed considerably and curved anteriorly, posteroventral curvature with 2 larger setae (Zaire) . .
- ***I. flava*** (Canzoneri and Meneghini)

The *briani* Group

DIAGNOSIS.—Similar to the *albiceps* group but differing as follows: mesofrons with scattered setae, sometimes arranged in rows; postocellar bristles usually not as short or with as much proclinate orientation; anaclinate genal bristles 3, posterodorsal 2 usually inserted closer to each other; anterior notopleural bristle distinctly smaller than posterior bristle or lacking; sternopleural bristle present, although sometimes pale.

DISCUSSION.—The shape and armature of the surstylus in males of the *briani* group differ markedly from that of the generalized condition (see "Phylogenetic Considerations," page 25), and for each species, these features appear to be excellent discriminating characters.

This group is entirely Afrotropical in distribution.

Isocanace australis, new species

FIGURES 33, 34

DIAGNOSIS.—Specimens of this species are similar to those of *I. flava* but are separable from them and closely related congeners by the following combination of characters: branching rays of arista shorter, at most slightly longer than basal aristal width; anterior notopleural bristle present, although weaker than posterior bristle; mesopleural and sternopleural bristles black; surstylus in lateral view narrow, with subapical posterior swelling bearing several pale setae, apical one-third curved posteriorly.

DESCRIPTION.—A small beach fly species, length 1.58 to 1.94 mm.

Head (Figure 33): Two large setae along lateral margins of mesofrons, posterior one inclinate, anterior one mostly proclinate, inserted at about same level as fronto-orbital bristles; mesofrons moderately tomentose, becoming more thinly so anteriorly, with grayish brown to brown coloration, quite distinct from parafrons; midportion of mesofrons with 2 rows of about 5 setulae, extending from medial ocellus to anterior margin of mesofrons; postocellar setae distinct, about one-

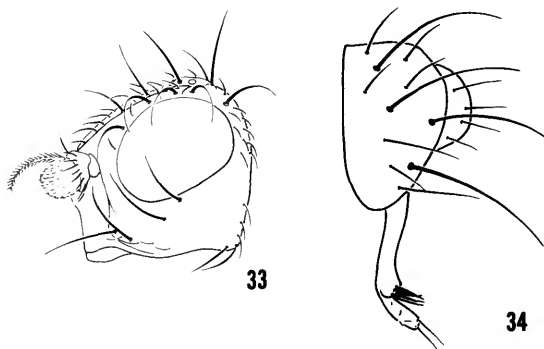
half length of ocellar bristles, proclinate and slightly divergent; parafrons grayish to blackish, appearing dull and membranous; arista minutely plumose, branching rays at most slightly longer than basal aristal width; anaclinate genal bristles 3.

Thorax: Acrostichal setulae in about 4 irregular rows anteriorly and posteriorly, with approximately 11–15 setulae per row, posterior pair of setulae slightly but distinctly larger than other setulae; scutellum with 2 pairs of subequal, lateral bristles, or apical pair only slightly larger; anterior notopleural bristle present but smaller than posterior bristle, sometimes pale; propleuron bare of setulae; sternopleural and mesopleural bristles present, subequal, both usually black; hind tibia lacking apical anteroventral bristle.

Abdomen: Male terminalia as in Figure 34 and as described in "Diagnosis."

PRIMARY TYPE MATERIAL.—Holotype male is labeled "Port St. Johns South Africa B. & P. Stuckenberg 20–25 Nov. 1961/♂/HOLOTYPE *Isocanace australis* Mathis ♂ [red, handwritten]." The holotype is double mounted (minute nadel in polyporus block), is in good condition (a few setae misoriented), and is deposited in the Natal Museum, Pietermaritzburg, South Africa.

Other Types: Allotype and three paratypes (1♂, 2♀) with the same locality data as the holotype. One male and one female paratype are in the National Museum of Natural History, Smithsonian Institution, Washington, D.C.



FIGURES 33, 34.—*Isocanace australis*: 33, head, lateral aspect; 34, male terminalia, lateral aspect.

ZOOGEOGRAPHIC DISTRIBUTION.—This species is known only from the type-locality.

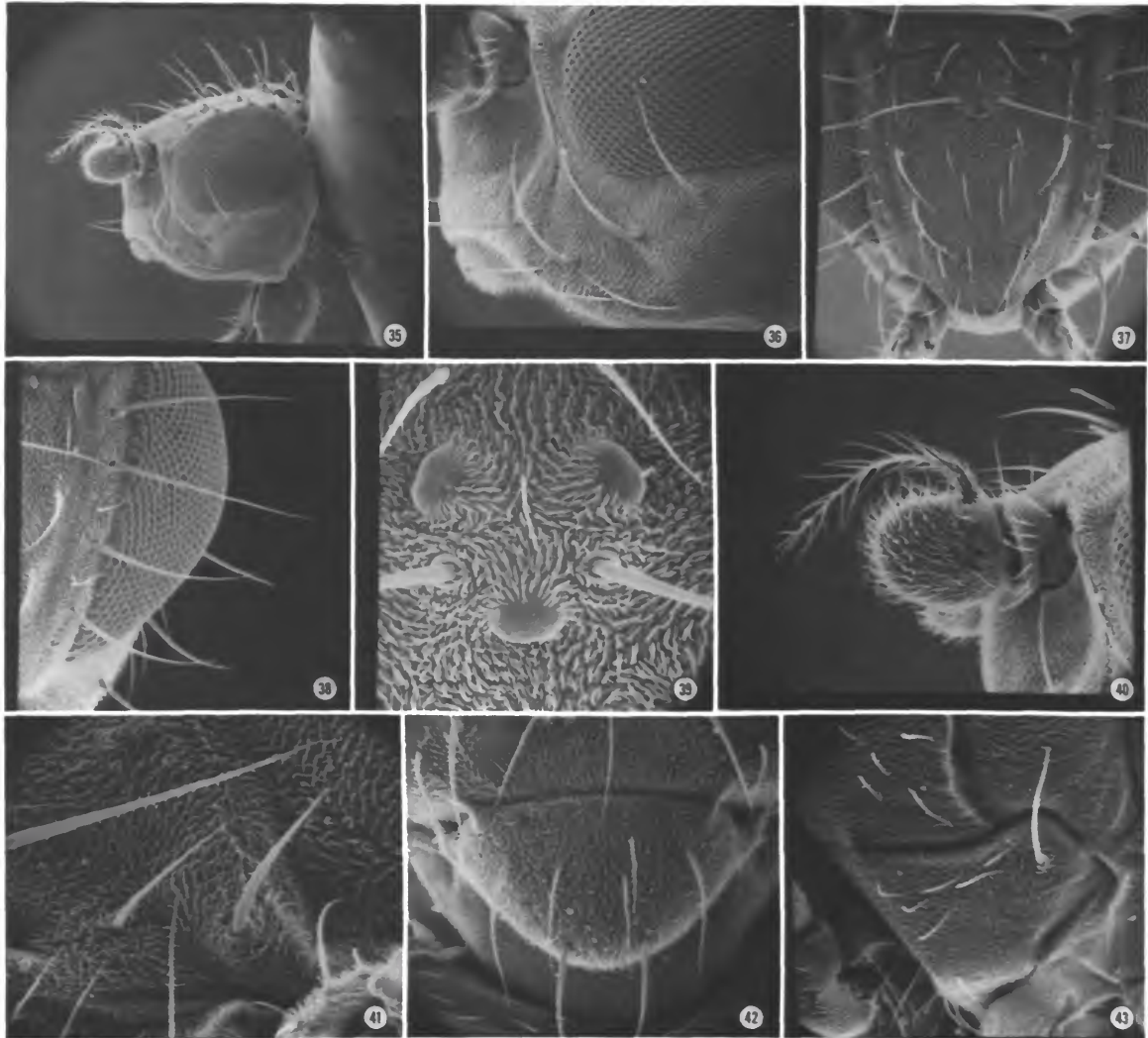
REMARKS.—The configuration of the male terminalia, particularly the surstylus, is quite unique and serves to distinguish this species from congeners.

***Isocanace briani*, new name**

FIGURES 35–45

Canace stuckenbergi Mathis and Wirth, 1979:786 [junior primary homonym, see Wirth, 1956b:50].

DIAGNOSIS.—Specimens of this species are similar to those of *I. flava* and *I. australis* but are



FIGURES 35–43.—*Isocanace briani*: 35, head, lateral aspect; 36, gena and bristles, lateral aspect; 37, frons, dorsal aspect; 38, same, left side, dorsal aspect; 39, ocelli, dorsal aspect; 40, antenna, lateral aspect; 41, notopleuron and bristles, lateral aspect; 42, scutellum and bristles, dorsal aspect; 43, sternopleuron and bristles, lateral aspect.

separable from either by the following combination of characters: branching rays of arista longer, some nearly double basal aristal width; mesopleural and usually sternopleural bristle pale, mostly yellowish; anterior notopleural bristle present, although weaker than posterior bristle; surstylus in lateral view narrow dorsally, becoming distinctly swollen preapically with posterior, somewhat angulate swelling, apex slightly curved anteriorly.

DESCRIPTION.—A small beach fly species, length 1.48 to 1.92 mm.

Head (Figures 35–40): Two to 3 large setae along lateral margins of mesofrons, inclinate and slightly proclinate, inserted at about same level as fronto-orbital bristles (Figure 37); mesofrons tomentose, dull appearing, grayish brown to

brown; midportion of mesofrons with 2 rows of about 4 setulae, irregular (Figure 37); postocellar setae distinct, about one-half length of ocellar bristles, proclinate and slightly divergent (Figure 37); parafrons grayish black to blackish, appearing dull and membranous; arista moderately plumose, longest branching rays only slightly longer than basal aristal width; anaclinate genal bristles 3 (Figures 35, 36).

Thorax (Figures 41–43): Acrostichal setulae in about 4 rows anteriorly, reduced to 2 rows posteriorly, median 2 rows with larger setulae, numbering approximately 12, posterior pair distinctly larger; scutellum with 2 subequal, lateral bristles (Figure 42); anterior notopleural seta present but smaller than posterior bristle, frequently pale (Figure 41); propleuron bare of setulae; sternopleural and mesopleural bristles present, subequal, both usually pale, occasionally former black (Figure 43); hind tibia lacking apical, anteroventral bristle.

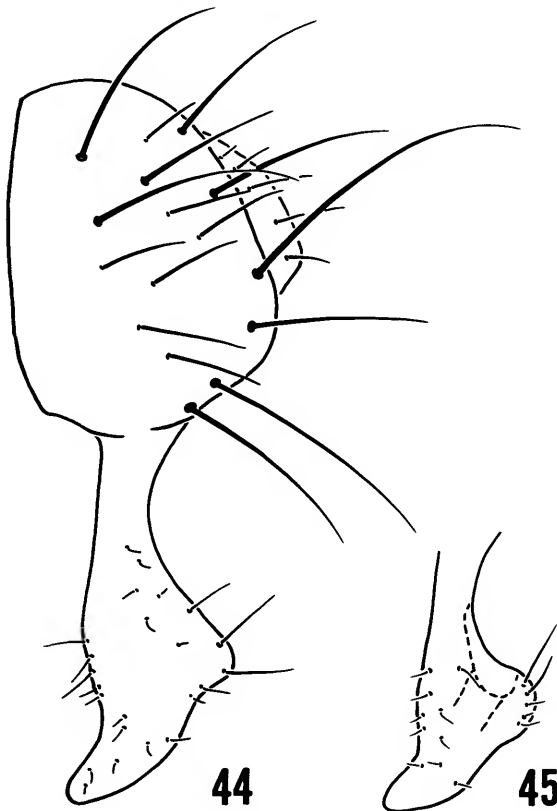
Abdomen (Figures 44, 45): Male terminalia as in Figures 44, 45 and as described in "Diagnosis."

PRIMARY TYPE MATERIAL.—Holotype male is labeled "rocks on beach [typewritten]/Madagascar Sambirano Lokobe Nossi-Be 6m 9-23.XI.57 B. Stuckenberg/♂ /HOLOTYPE Canace stuckenbergi Mathis and Wirth [red, handwritten]." The holotype is double mounted (minute nadel wired to pin), is in excellent condition, and is in the Museum National d'Histoire Naturelle, Paris.

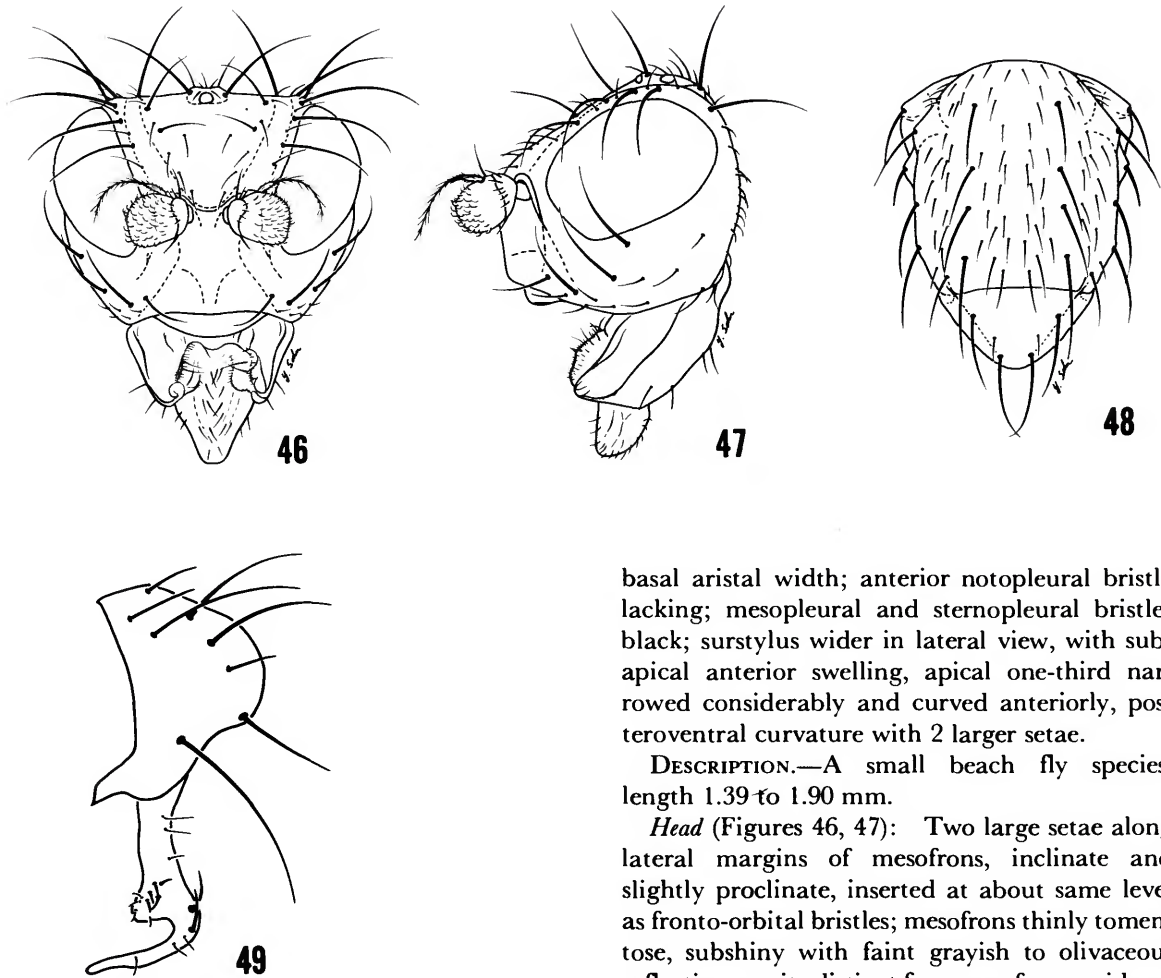
OTHER SPECIMENS EXAMINED.—In addition to the paratype series, all from the type-locality, I have examined the following: **ALDABRA. South Island:** Cinq Cases, 23–29 Jan 1968, B. Cogan and A. Hutson (1♀; BMNH); Point Hodoul, 27 Jan 1968, B. Cogan and A. Hutson (1♂, 2♀; BMNH). **Middle Island:** near East Channel, 18–23 Feb 1968, B. Cogan and A. Hutson (1♂, 1♀; BMNH).

ZOOGEOGRAPHIC DISTRIBUTION.—Madagascar and Seychelles Islands (Aldabra).

REMARKS.—Specimens from Aldabra differ only slightly from those of the type-locality, primarily in the shape of the male surstylus. The footlike ventral portion of the surstylus has a more pronounced "heel" (Figure 45), due to a subapical, posteroventral emargination.



FIGURES 44, 45.—*Isocanace briani*: 44, male terminalia (from type-locality), lateral aspect; 45, same (from Aldabra Islands), lateral aspect.



FIGURES 46-49.—*Isocanace flava*: 46, head, anterior aspect; 47, same, lateral aspect; 48, thorax, dorsal aspect; 49, male terminalia, lateral aspect.

***Isocanace flava* (Canzoneri and Meneghini),
new combination**

FIGURES 46-49

Canace flava Canzoneri and Meneghini, 1969:184.—Cogan, 1980:694 [Afrotropical catalog].

DIAGNOSIS.—Specimens of this species are similar to those of *I. australis* but are separable from the latter and closely related congeners by the following combination of characters: branching rays of arista shorter, at most slightly longer than

basal aristal width; anterior notopleural bristle lacking; mesopleural and sternopleural bristles black; surstylus wider in lateral view, with subapical anterior swelling, apical one-third narrowed considerably and curved anteriorly, posteroventral curvature with 2 larger setae.

DESCRIPTION.—A small beach fly species, length 1.39 to 1.90 mm.

Head (Figures 46, 47): Two large setae along lateral margins of mesofrons, inclinate and slightly proclinate, inserted at about same level as fronto-orbital bristles; mesofrons thinly tomentose, subshiny with faint grayish to olivaceous reflections, quite distinct from parafrons; midportion of mesofrons with 2 rows of about 5 setulae extending from median ocellus to anterior margin of mesofrons; postocellar setae small, less than one-half length of ocellar bristles, proclinate to slightly divergent; parafrons mostly grayish to faintly blackish, appearing dull and membranous; arista moderately plumose, longest branching rays only slightly longer than basal aristal width; anaclinate genal bristles 3.

Thorax (Figure 48): Acrostichal setulae in about 4 irregular rows anteriorly and posteriorly, with approximately 12 setulae per row, posterior setulae only slightly larger than other setulae; scutellum with 2 pairs of subequal lateral bristles; anterior notopleural bristle absent; propleuron

bare of setulae; sternopleural bristle present, black, size and color similar to largest mesopleural bristle; hind tibia lacking apical anteroventral bristle.

Abdomen (Figure 49): Male terminalia as in Figure 49 and as described in diagnosis.

PRIMARY TYPE MATERIAL.—Holotype male is labeled "HOLOTYPUS ♂ [orange with black submargin; male sex symbol handwritten]/Congo belge: P. N. A. May ya Moto 950m. 6 au 9 - xi - 1934 G. F. de Witte: 729/COLL. MUS. CONGO (ex coll. I. P. N. C. B.) [black margin]/HOLOTYPUS ♂ *Canace flava* nov. [red, male sex symbol and name handwritten]." The holotype is double mounted (minute nadel in polyporus block), is in poor condition (the right wing and several legs and setae are lacking), and is deposited in Koninklijk Museum voor Midden-Afrika, Tervuren, Belgium.

Other Types: I have examined also the female allotype and a male and female paratype, all with the same locality data.

OTHER SPECIMENS EXAMINED.—ZAIRE (Congo). Albert National Park, 20 Sep 1937, J. Ghesquiere (♂, 1♀; USNM).

ZOOGEOGRAPHIC DISTRIBUTION.—Zaire (Haut-Zaire).

REMARKS.—Aside from a few species of the genus *Procanace* Hendel, this is the only known species of the family not known to occur at a maritime habitat.

The *albiceps* Group

DIAGNOSIS.—Similar to the *briani* group but differing as follows: mesofrons bare in middle; postocellar shorter and with more proclinate orientation; anaclinate genal bristles 2; anterior notopleural bristle subequal to posterior bristle; sternopleural bristle lacking.

DISCUSSION.—Similar to the generalized condition (see "Phylogenetic Considerations," page 25), the surstylus in males of the *albiceps* group is a simple ventral extension of the epandrium that terminates in a bluntly rounded hook. The hook, however, is curved posteriorly.

This group comprises one species, *I. albiceps*, which is known only from Australia.

Isocanace albiceps (Malloch), new combination

FIGURES 50-59

Canace albiceps Malloch, 1925:87.—Wirth, 1951:262 [review].

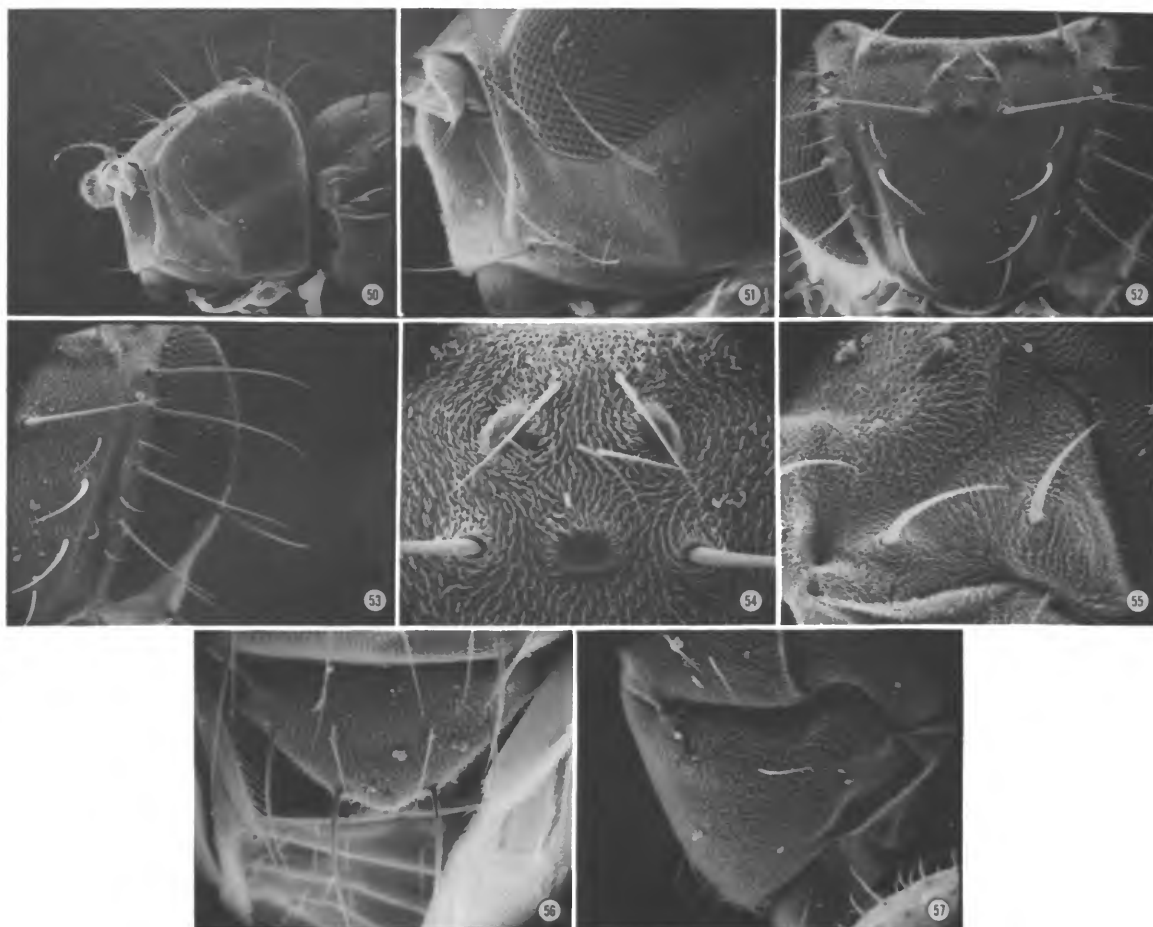
DIAGNOSIS.—Specimens of *I. albiceps* are similar to those of the *briani* group but are separable from them by the characters of the species group, with the addition of the following: branching rays of arista longer, some nearly double basal arista width; mesopleural bristles pale, mostly yellowish; surstylus comparatively wide in lateral view, narrowing subapically, but apex widening again, slightly bulbous, with median projecting process, posterior margin curved, anterior margin more or less straight.

DESCRIPTION.—A small to moderately small beach fly species, length 1.57 to 2.27 mm.

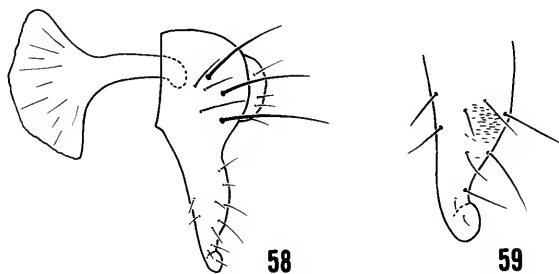
Head (Figures 50-54): Two to 3 large setae along lateral margin of mesofrons, inclinate and slightly proclinate, inserted on anterior two-thirds of mesofrons (Figure 52); mesofrons tomentose, dull, quite distinct from parafrons, brown; mid-portion of mesofrons lacking setulae (Figure 52); postocellar setae small, length about one-half ocellar bristles, proclinate and slightly divergent (Figure 52); parafrons mostly grayish black, appearing dull and membranous; arista plumose, longer branching rays nearly twice basal arista width (Figure 50); anaclinate genal bristles 2 (Figures 50, 51).

Thorax (Figures 55-57): Acrostichal setulae in 2 rows, sparse, approximately 5-6 per row, posterior pair distinctly larger; scutellum with 2 pairs of lateral scutellar bristles (Figure 56); anterior notopleural bristle present, subequal to posterior bristle (Figure 55); propleuron bare of setulae; mesopleural bristle present but pale; sternopleural bristle lacking; hind tibia lacking apical anteroventral bristle (Figure 57).

Abdomen (Figures 58, 59): Male terminalia as in Figures 58, 59 and as described in diagnosis.



FIGURES 50-57.—*Isocnace albiceps*: 50, head, lateral aspect; 51, gena and bristles, lateral aspect; 52, frons, dorsal aspect; 53, same, left side, dorsal aspect; 54, ocelli, dorsal aspect; 55, notopleuron and bristles, lateral aspect; 56, scutellum and bristles, dorsal aspect; 57, sternopleuron, lateral aspect.



FIGURES 58, 59.—*Isocnace albiceps*: 58, male terminalia, lateral aspect; 59, same, enlargement of surstylus, lateral aspect.

PRIMARY TYPE MATERIAL.—Holotype female is from Sydney (Australia, New South Wales) and was collected 10 Sep 1921. The holotype is deposited in the School of Public Health and Tropical Medicine, University of Sydney. I have not examined the holotype, and the information cited is taken from the original description (Malloch, 1925) and Lee et al. (1956).

OTHER SPECIMENS EXAMINED.—AUSTRALIA. *New South Wales*: Careel Bay, 28 Aug-23 Oct 1956, W. W. Wirth (30♂, 42♀; USNM). *Queensland*: Decep-

tion Bay, 23 May 1966, Z. Liepa (1♂; ANIC).

ZOOGEOGRAPHIC DISTRIBUTION.—Eastern Australia (New South Wales and Queensland).

REMARKS.—I have not examined the holotype of this species but feel confident that it is conspecific with the specimens noted above. The specimens agree with Malloch's description, and those from Careel Bay are virtually topotypical.

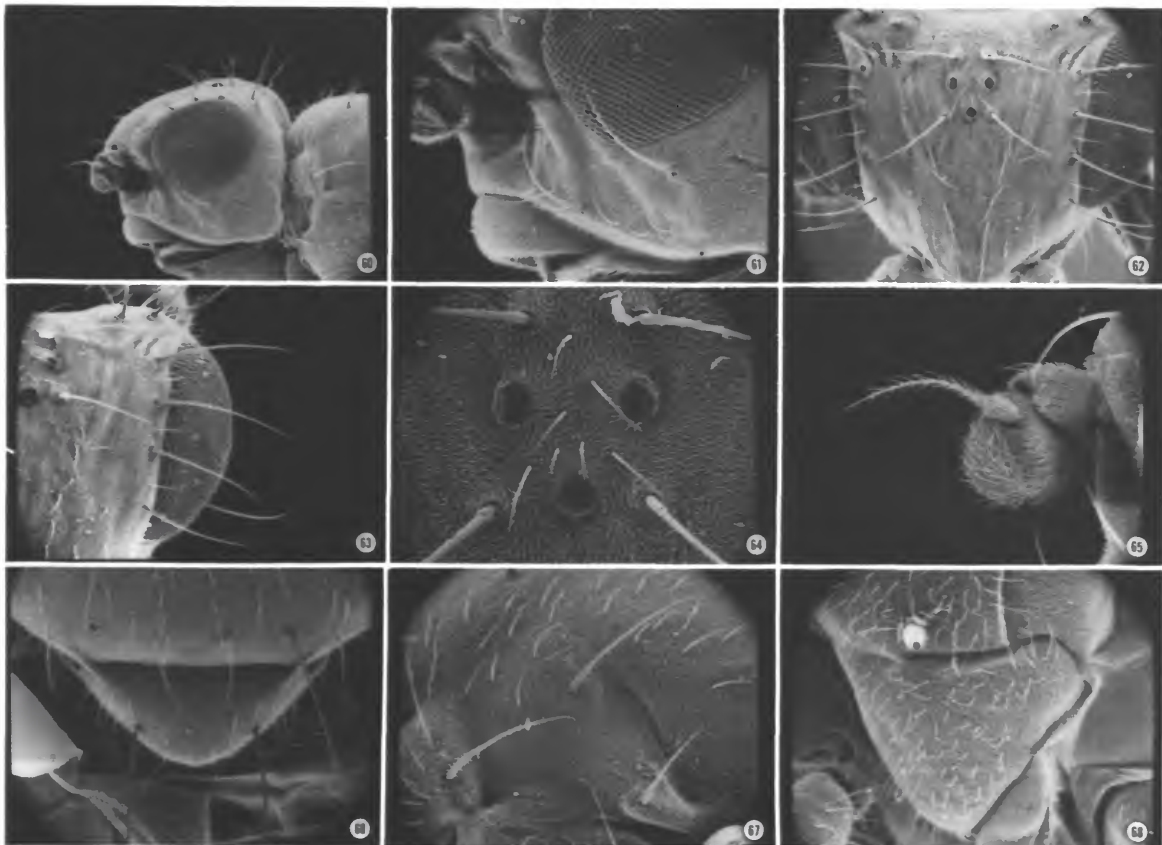
Genus *Trichocanace* Wirth

FIGURES 60–68

Trichocanace Wirth, 1951:252 [type-species: *Trichocanace sinensis* Wirth, by original designation and monotypy]; 1964:225–227 [revision; key].—Delfinado and Wirth, 1977:392 [Oriental catalog].—Cogan, 1980:694 [Afrotropical catalog].

DESCRIPTIVE DIAGNOSIS.—Resembling *Xanthocanace* Hendel and *Chaetocanace* Cresson but differing from them and other genera by the following combination of characters.

Head (Figures 60–65): Mesofrons and parafrons appearing dull, membranous-like, with tomentose vestiture, distinguished from each other by color and in one species by density of tomentosity, with larger setulae along lateral margins and a few smaller setulae on midportion, but with bare area anterior of median ocellus (Figure 62); postocellar setae subequal to ocellar bristles and with same orientation, ocellar bristles inserted anterolaterad of ocellar triangle (Figure 62); 4 pairs of large, laterocline, fronto-orbital bristles



FIGURES 60–68.—*Trichocanace marksae*: 60, head, lateral aspect; 61, gena and bristles, lateral aspect; 62, frons, dorsal aspect; 63, same, left side, dorsal aspect; 64, ocelli, dorsal aspect; 65, antenna, lateral aspect; 66, scutellum and bristles, dorsal aspect; 67, notopleuron and bristles, lateral aspect; 68, sternopleuron, lateral aspect.

(Figure 63); arista with setulae basally, setulae not longer than arisal base, apical one-fourth or less bare, stylelike (Figure 65); anaclinate genal bristles 2, posterior bristle inserted directly ventrad of midportion of eye, anterior bristle inserted in alignment with anterior margin of eye (Figures 60, 61); anteroclinate genal bristle present, although small and pale (Figures 60, 61).

Thorax (Figures 66–68): Dorsocentral bristles 4 (1+3), anterior 2 smaller than posterior bristles; acrostichal setulae small, pale, arranged in 4–6 rows, lacking large, prescutellar pair of bristles; scutellar bristles 1 pair, large, with a few smaller, pale setulae dorsally (Figure 66); supra-alar bristle 1, anterior bristle lacking; anterior notopleural bristle lacking (Figure 67); mesopleural and sternopleural setae pale, numerous, mostly long and thin, appearing pilose; sternopleural bristle lacking (Figure 68); hind tibia without conspicuous, stout, apical seta anteroventrally; apical section of vein M rather straight, not arcuate.

Abdomen: Female genital lamellae broad basally, basal one-third to one-half more or less elliptical, with dorsal surface extended, apical one-half to two-thirds as 2 parallel-sided, narrow processes, each bearing 1 large, apical, acutely pointed, stout bristle and several smaller setae; surstylus a simple ventral process from epandrium, variously shaped, but usually with apex slightly to obviously curved anteriorly.

ZOOGEOGRAPHIC DISTRIBUTION.—Old World, Afrotropical (Madagascar), Australian (Australia), Oriental (China, Malaya, Philippines, Thailand).

DISCUSSION.—*Trichocanace* was last reviewed by Wirth (1964), who named all of the known species and, in an earlier paper, the genus as well (Wirth, 1951). Aside from the descriptive taxonomic data, virtually nothing, as to biology, is known of the genus, except that specimens were collected in intertidal habitats.

Key to Species of *Trichocanace*

(modified from Wirth, 1964)

1. Large black species, with heavy gray to pearl-gray tomentum, dorsum of thorax subshiny; frons dull black laterally, with broad, median, pearl-gray vitta and gray, tomentose, posterior margin; both sexes with conspicuous, anteroventral and posteroventral combs, each with 6–10 strong, black spines on distal one-half of forefemur ***T. atra*** Wirth
Dull gray species; frons not black vittate; forefemur with only anteroventral comb, or combs absent 2
2. Large species, wing length 3.5 mm; forefemur lacking combs
..... ***T. sinensis*** Wirth
Small species, wing length 2.4 mm; forefemur with inconspicuous, anteroventral comb of 6–8 brownish, slender, sharp spines on distal one-half ***T. marksae*** Wirth

***Trichocanace atra* Wirth**

Trichocanace atra Wirth, 1964:227 [figure of male terminalia].—Delfinado and Wirth, 1977:392 [Oriental catalog].

PRIMARY TYPE MATERIAL.—Holotype male. AUSTRALIA. *Queensland*: Cairns [USNM 67135].

ZOOGEOGRAPHIC DISTRIBUTION.—Australia (Queensland), Philippines (Mindanao), Thailand (Cholburi).

***Trichocanace marksae* Wirth**

Trichocanace marksae Wirth, 1964:226 [figure of male terminalia].

PRIMARY TYPE MATERIAL.—Holotype male. AUSTRALIA. *Queensland*: Cairns (bayshore) [USNM 67134].

ZOOGEOGRAPHIC DISTRIBUTION.—Australia (Queensland).

***Trichocanace sinensis* Wirth**

Trichocanace sinensis Wirth, 1951:253 [figure of head, wing, male terminalia]; 1964:225 [review].—Delfinado and Wirth, 1977:392 [Oriental catalog].—Mathis and Wirth, 1979:795 [review].—Cogan, 1980:694 [Afrotropical catalog].

PRIMARY TYPE MATERIAL.—Holotype male. CHINA. *Fukien Province*: Foochow (= Minhow) [BMNH].

ZOOGEOGRAPHIC DISTRIBUTION.—China (Fukien Province), Madagascar (sud-Ouest), Malaysia (Negri Sembilan), Australia (Queensland), Thailand (Bangkok).

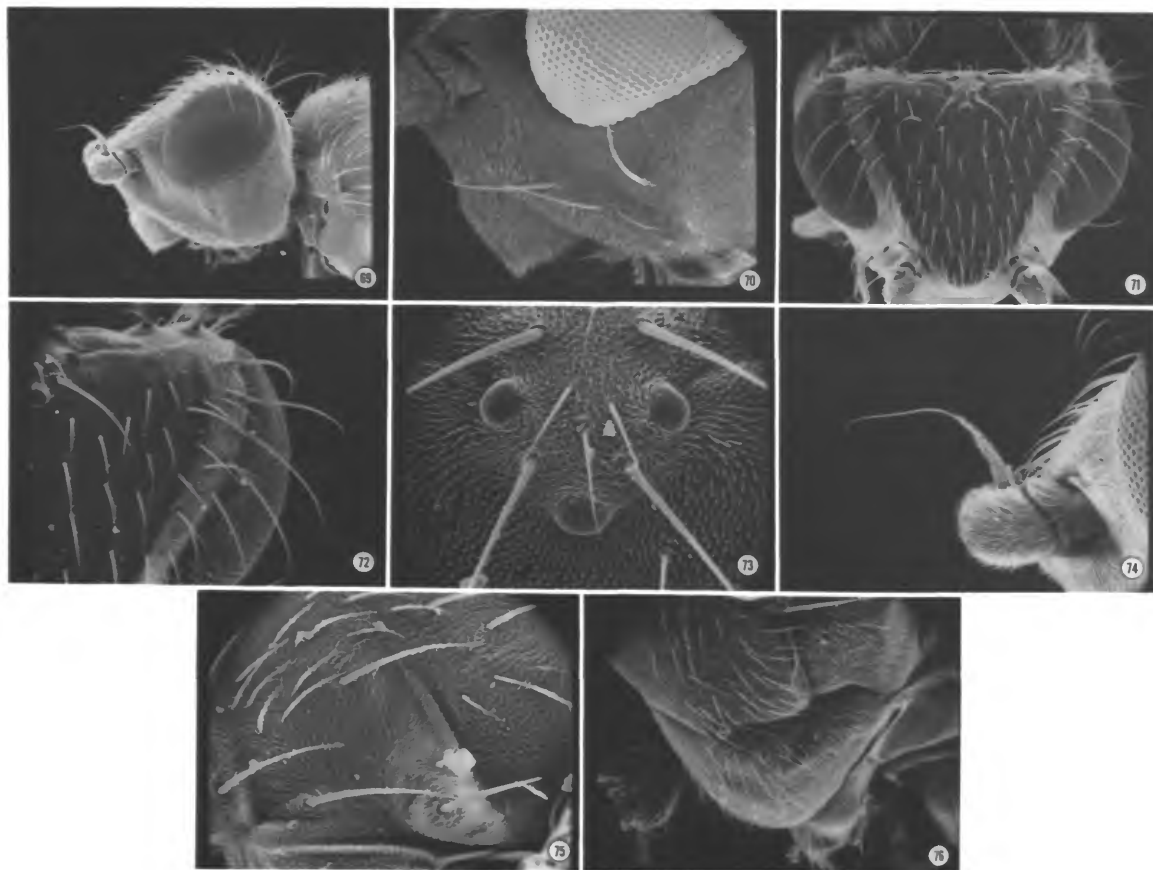
Genus *Xanthocanace* Hendel

FIGURES 69–76

Xanthocanace Hendel, 1914:98 [type-species: *Canace ranula* Loew, by original designation].—Malloch, 1924:334 [discussion, generic key].—Cresson, 1934:270 [synonymy, discussion].—Curran, 1934:357 [generic key].—Wirth, 1951:249 [review, key].—Miyagi, 1963:123 [review, key].—Delfinado and Wirth, 1977:393 [Oriental catalog].—Cogan, 1980:694 [Afrotropical catalog].

Dinomyia Becker, 1926:107 [type-species: *Canace ranula* Loew, by monotypy, preoccupied, Dyar, 1909].—Séguy, 1934:401 [generic key].—Cresson, 1936:270 [synonymy of name with *Xanthocanace*].

Myioblax Enderlein, 1935:235 [type-species: *Canace ranula*



FIGURES 69–76.—*Xanthocanace nigrifrons*: 69, head, lateral aspect; 70, gena and bristles, lateral aspect; 71, frons dorsal aspect; 72, same, left side, dorsal aspect; 73, ocelli, dorsal aspect; 74, antenna, lateral aspect; 75, notopleuron and bristles, lateral aspect; 76, sternopleuron, lateral aspect.

Loew, by monotypy]; 1936:172 [review].—Cresson, 1936: 270 [synonymy of name with *Xanthocanace*].

DESCRIPTIVE DIAGNOSIS.—Resembling *Trichocanace* Wirth but differing from it and other genera by the following combination of characters.

Head (Figures 69–74): Mesofrons distinct from parafrons, frequently shiny with metallic reflections, with numerous, uniformly scattered, pale setulae but lacking larger setae along lateral margins, anterior margin extended anteriorly beyond antennal bases (Figure 71); postocellar bristles subequal to ocellar bristles, with slightly more divergent orientation (Figure 71); 5–6 pairs of large to moderately sized, pale, laterocline, fronto-orbital bristles, anterior 1–2 with slight to nearly complete procline orientation (Figure 72); arista with apical one-third to one-half bare, lacking branching rays, stylelike (Figure 74); anaccline genal bristles lacking, anterocline genal bristles 1–3, inserted along anteroventral margin of gena (Figures 69–71).

Thorax (Figures 75, 76): Dorsocentral bristles variable, usually only posterior 1–2 bristles conspicuously larger than surrounding setae, but some specimens with up to 6 large bristles, some presutural, but posterior ones larger; acrostichal setulae arranged in 4 to several rows, these more evident anteriorly, lacking large pair of prescu-

tellar bristles; 2 pairs of scutellar bristles, pale, numerous dorsal setae; 1–2 supra-alar bristles present, anterior one usually lacking; anterior notopleural bristle present (Figure 75); mesopleural setulae pale; sternopleural bristle lacking (Figure 76); hind tibia without conspicuous, apical seta anteroventrally; apical section of vein M arcuate.

Abdomen: Female genital lamellae moderately wide basally, not narrowing abruptly near level of cleft, with only 1 large, stout, acute terminal seta at each apex; surstylus a simple ventral projection from epandrium, tapered gradually, apex acute to blunt.

ZOOGEOGRAPHIC DISTRIBUTION.—Old World. Afrotropical (South Africa), Australian (Australia), Palaearctic (Belgium, Denmark, England, Germany, Spain), Oriental (China, India, Korea, Sri Lanka, Taiwan).

DISCUSSION.—Of the five genera comprising Dynomiellini, *Xanthocanace* has the most species—eight. It is also the most widespread, being known from all major zoogeographic regions of the Old World. The paucity of natural historical information for the tribe is also apparent for this genus, as only minimal data are available for one species, *X. ranula*.

Key to Species of *Xanthocanace*

(modified from Miyagi, 1963)

1. Large species, wing length 4 mm; mesofrons of female shiny; tibiae gray ***X. magna*** (Hendel)
 Small species, wing length 2–3 mm 2
2. Midfemora of male with posteroventral comb of 5–10 small black spines on distal half 3
 Midfemora of male lacking armature as above 4
3. Mesofrons of male and female tomentose, appearing dull; tibiae grayish ***X. pollinosa*** Miyagi
 Mesofrons of male and female bare to very thinly tomentose, appearing shiny to subshiny; tibiae yellowish ***X. orientalis*** (Hendel)
4. Mesofrons of male and female tomentose, appearing dull
 ***X. capensis*** Wirth
 Mesofrons of male bare to thinly tomentose, appearing shiny 5

5. Mesofrons of female shiny **X. ranula** (Loew)
 Mesofrons of female appearing dull, tomentose to thinly tomentose 6
6. Larger species, length 2.5 mm or larger **X. nigrifrons** Malloch
 Smaller species, length 2.00 mm or less 7
7. Tibiae grayish; mesofrons of male with lateral margins shallowly arched;
 setulae of mesofrons sparse, thin, inconspicuous . **X. seoulensis** Miyagi
 Tibiae yellowish; mesofrons of male with lateral margins slightly emarginate;
 setulae of mesofrons abundant, conspicuous
 **X. zeylanica** Delfinado

***Xanthocanace capensis* Wirth**

Xanthocanace capensis Wirth, 1956:47.—Miyagi, 1963:125,126 [distribution, key].—Cogan, 1980:694 [Afrotropical catalog].

PRIMARY TYPE MATERIAL.—Holotype male. SOUTH AFRICA. Cape Province, Port Alfred, Kleinemonde River (sea water) [USNM 62711].

ZOOGEOGRAPHIC DISTRIBUTION.—South Africa (Cape Province).

***Xanthocanace magna* (Hendel)**

Canace magna Hendel, 1913:95.

Xanthocanace magna.—Hendel, 1914:98 [new combination].—Malloch, 1924b:334 [list].—Wirth, 1951:250 [review].—Miyagi, 1963:125,126 [distribution, key].—Delfinado and Wirth, 1977:393 [Oriental catalog].

Canace (Xanthocanace) magna.—Hennig, 1941:158 [listing of syntype in DEI].

PRIMARY TYPE MATERIAL.—Syntypes (2). TAIWAN (Formosa). Anping [DEI].

ZOOGEOGRAPHIC DISTRIBUTION.—Taiwan (Anping).

***Xanthocanace nigrifrons* Malloch**

Xanthocanace nigrifrons Malloch, 1924b:334 [figures of head].—Wirth, 1951:250 [review].—Miyagi, 1963:125,126 [distribution, key].—Griffiths, 1972:256 [discussion of male terminalia].

PRIMARY TYPE MATERIAL.—Holotype male. AUSTRALIA. *New South Wales*: Woy Woy [SPHTM].

ZOOGEOGRAPHIC DISTRIBUTION.—Australia (New South Wales).

***Xanthocanace orientalis* (Hendel)**

Canace orientalis Hendel, 1913:94.

Xanthocanace orientalis.—Hendel, 1914:98 [new combination].—Malloch, 1924b:334 [list].—Wirth, 1951:251 [review, figures of male terminalia].—Miyagi, 1963:125,126 [distribution, key].—Delfinado and Wirth, 1977:393 [Oriental catalog].

Canace (Xanthocanace) orientalis.—Hennig, 1941:158 [listing of syntypes in DEI].

PRIMARY TYPE MATERIAL.—Syntypes (14). TAIWAN (Formosa). Anping [DEI].

ZOOGEOGRAPHIC DISTRIBUTION.—China (Fukien Province), India (Bombay), Taiwan (Ali-kang, Anping), Thailand (Bangphra).

***Xanthocanace pollinosa* Miyagi**

Xanthocanace pollinosa Miyagi, 1963:124.

PRIMARY TYPE MATERIAL.—Holotype male. KOREA. Seoul [USNM].

ZOOGEOGRAPHIC DISTRIBUTION.—Japan (Hokkaido), Korea (Seoul), Malaysia (Negri Sembilan, Perak).

***Xanthocanace ranula* (Loew)**

Canace ranula Loew, 1874:81.—Gercke, 1887:1–4 [discussion, mouthparts].—Becker, 1896:247 [review, figures of head and wing]; 1905:215 [Palaeartic catalog].—Czerny and Strobl, 1909:266 [list, Spain].—Frey, 1921:140–142 [discussion, figures of mouthparts].

Xanthocanace ranula.—Hendel, 1914:98 [new combination]; 1928:108 [list, figures of head and wing].—Malloch, 1924b:334 [list].—Wirth, 1951:250 [review].—Miyagi, 1963:125 [distribution, key].—Rald, 1976:77–79 [list, Denmark, figure of head and mouthparts, key].—Cogan, 1976:87 [list, British insects].

Dinomyia ranula.—Becker, 1926:110 [new combination, review].—Séguy, 1934:401 [review].—Goetghebuer, 1942:8 [list, Belgium].

Myioblax ranula.—Enderlein, 1935:235 [new combination]; 1936:172 [key].

Canace nasica [misidentification].—Haliday, 1855:64 [review, figure of head and habitus (dorsal aspect)].

PRIMARY TYPE MATERIAL.—Syntypes (number undetermined). GERMANY. Coast of North Sea [HU].

ZOOGEOGRAPHIC DISTRIBUTION.—Europe. Belgium, Denmark, Germany, England, Spain.

***Xanthocanace seoulensis* Miyagi**

Xanthocanace seoulensis Miyagi, 1963:123.

PRIMARY TYPE MATERIAL.—Holotype male. KOREA. Seoul [USNM].

ZOOGEOGRAPHIC DISTRIBUTION. — Korea (Seoul).

***Xanthocanace zeylanica* Delfinado**

Xanthocanace zeylanica Delfinado, 1975:223.—Delfinado and Wirth, 1977:393 [Oriental catalog].

PRIMARY TYPE MATERIAL.—Holotype female. SRI LANKA. *Northwestern Province*: Puttalan (5 km N, salt pan) [ZIL].

ZOOGEOGRAPHIC DISTRIBUTION.—Sri Lanka (Northwestern Province).

Phylogenetic Considerations

The discussion of characters, to follow, is to elaborate evidence in support of the cladogram (Figure 77). I have elected to present the character evidence in discussion form rather than in a table to permit further descriptions of plesiotypic (generalized) versus apotypic (derived) characters. The numbers used for each character discussed correspond with those on the cladogram.

1. *Number of Fronto-orbital Bristles*: The generalized condition is for the presence of two or three bristles. The condition of four or more bristles is unique within the family and seldom appearing elsewhere in Diptera (four bristles are also found in some Milichidae, Chloropidae, and Tachinidae—Dr. Curtis W. Sabrosky, pers. comm.).

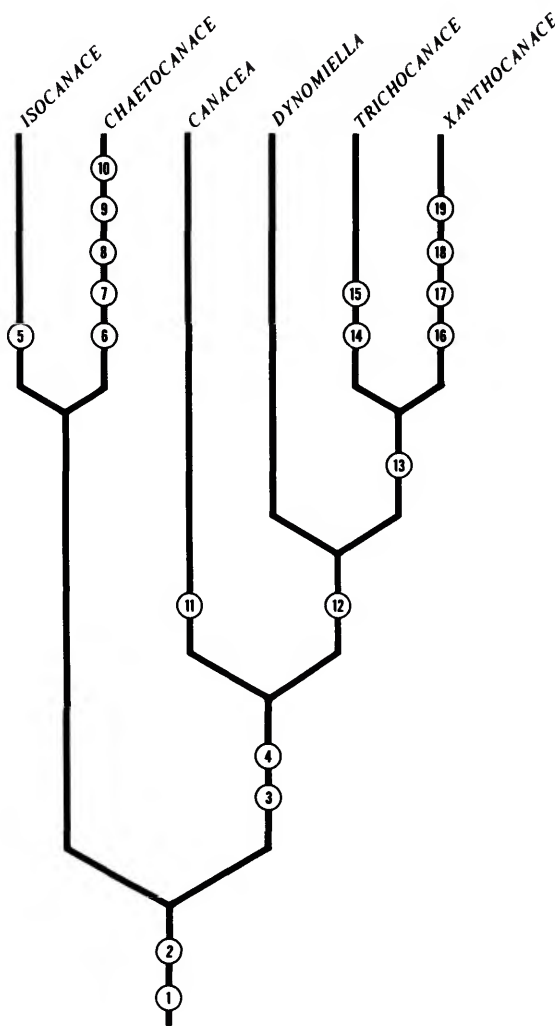


FIGURE 77.—Hypothetical phylogeny of genera of tribe Dynomiellini.

2. *Marginal Setae of Mesofrons*: The plesiotypic condition is for large setae along the margins of the mesofrons, but also a few larger setae arising from the midareas of the mesofrons. For the tribe Dynomiellini, there are larger setae only along the margin, the absence from the midareas is a condition I interpret to be synapotypic.

3. *Setulae of Arista*: The generalized condition is for two rows, usually one dorsal and the other ventral, of setulae to extend from the base of the

arista to its apex. The apotypic condition is for the apex to be bare.

4. *Armature of Anteroventral Surface of Forefemur:* Throughout most of the family, the anteroventral surface of the forefemur lacks salient features. In specimens of this stem lineage, there is an apical row of anteroventral bristles that are stout and short, spinelike. Although this character is not universal, it is evident in at least some species of each genus and for all known species of *Canacea*. I consider the presence of this row to be synapotypic. The few species of these lineages that lack the row represent a secondary reversal, apparently each independent of the others.

5. *Orientation of Postocellar Bristles:* For most members of this tribe and for those of its sister group (tribe Canacini), the postocellar bristles are oriented in the same direction as the ocellar bristles, divergent and slightly proclinate. In the species of *Isocanace*, the postocellar orientation is only slightly divergent and mostly directly anteriorly. This latter condition I interpret to be apotypic.

6. *Armature of Hind Tibia:* The plesiotypic condition is for the anteroventral apex to be bare of a large bristle. In specimens of *Chaetocanace*, there is a conspicuous, curved and stout seta, a condition unique within the tribe.

7. *Number of Scutellar Bristles:* The prevailing condition in the family and in related groups is for two pairs of lateral bristles. In members of *Chaetocanace*, only one pair is present, the other pair apparently being lost. The presence of one pair is an apotypic character.

8. *Vestiture of Propleuron:* Generally this pleural region is bare of setae, but in members of *Chaetocanace* there are numerous setulae, although difficult to see unless the lighting is properly directed and there is sufficient magnification. Their presence is an apotypic condition.

9. *Number and Orientation of Genal Bristles:* Except for members of *Chaetocanace*, specimens of Canacidae have at least one or two anaclinate genal bristles. Their absence in this genus is interpreted to be an apotypic condition.

10. *Anterior Notopleural Bristle:* Although this bristle is usually present and of about the same

strength as the posterior bristle, it is lacking in several lineages that are not immediately related. Its loss in *Chaetocanace* is an apotypic condition and is not indicative of relation with the other taxa that also lack the bristle.

11. *Anterior Supra-alar Bristle:* Members of the genus *Canacea* are the only taxa to have consistently an anterior supra-alar bristle. Elsewhere in the family only the posterior bristle is present.

12. *Sternopleural Bristle:* This bristle is usually present in the family, but in members of this lineage and the genus *Chaetocanace*, it is lacking. The loss of this bristle in each case has apparently occurred independently and is an apotypic character.

13. *Prescutellar Acrostichal Bristles:* In the tribe Dynomiellini, these bristles are generally present and are quite conspicuous. In members of *Trichocanace* and *Xanthocanace*, these bristles are lacking.

14. *Scutellar Bristles* (see number 7): As above, the presence of only one pair of scutellar bristles is an apotypic character. The loss of one pair in this lineage is apparently independent of the lineage giving rise to *Chaetocanace*.

15. *Anterior Notopleural Bristle* (see number 10): Again, the loss of this bristle is interpreted to be apotypic and to have occurred independent of the lineage giving rise to *Chaetocanace*.

16. *Vein M:* The last section of this vein is usually straight, although frequently at a slightly different angle than the anterior section. In members of *Xanthocanace*, the last section is arcuate, an apotypic condition.

17. *Coloration of Setae:* Setae are generally dark colored, usually black. Most setae of the genus *Xanthocanace* are pale, including the setulae.

18. *Number of Fronto-orbital Bristles* (see number 1): In all lineages of the tribe Dynomiellini except for *Xanthocanace*, there are four bristles. In members of *Xanthocanace*, there are five to six bristles, an apotypic character.

19. *Vestiture of Mesofrons:* Throughout the tribe there are usually a few larger bristles along the margins and frequently arising from the midareas as well. In members of *Xanthocanace*, the mesofrons is fairly densely setulose, a character unique within the family.

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