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A Revision of the Dipterous Family Canaceidae

By WILLIS W. WIRTH
Bureau of Entomology and Plant Quarantine, Agricultural Research Administration, United States Department of Agriculture

INTRODUCTION

While I was attempting to rearrange the material in the United States National Museum collections, I noted that several undescribed species were represented among the material from the Pacific which accumulated from collections made during and after World War II. Curran's 1934 key to the genera proved to be inadequate, and further examination of the literature revealed the genera to be so poorly characterized as to make construction of a good generic key impossible. Furthermore, not a single key to species was discovered. In an effort to improve this situation, new generic diagnoses are here offered, new generic and specific keys are presented, 13 species are restudied and redescribed, and one genus and seven species are described as new to science.

The Canaceidae is a small family, numbering 32 species in the present list, but it is well distributed around the world. Many aspects of its distribution and ecology parallel those of the nematocerous subfamily Clunioninae (family Tendipedidae). Both groups are aquatic and almost exclusively coastal in habitat, breeding preferably between tide levels on rocks covered with green algae such as *Enteromorpha* and *Ulva*. Gercke (4)[1] gives a few notes on the biology of *Xanthocanace ranula* (Loew) in Europe, and Williams (12) gives an account of the life histories of two Hawaiian species. Both the Canaceidae and Clunioninae, elsewhere almost exclusively intertidal, have produced freshwater species in the swift mountain streams of Hawaii, five species of *Telmatogeton* in the Clunioninae (Wirth, 13), and one

[1] Numbers in parentheses refer to Bibliography, page 275.

species, *Procanace nigroviridis* (Cresson), in the Canaceidae (Williams, 12). According to de Meijere (9), an additional canaceid species, *Procanace opaca* de Meijere, breeds in fresh water in Java.

A comparison of the geographic distribution of these two intertidal groups is shown in table 1. One of the striking similarities in distributional patterns of these two groups is their relatively greater development on the Pacific shores and their scarcity around the Atlantic. On the other hand, their development is nearly equal in the Northern and Southern Hemispheres.

Table 1.—Number of genera and species found on shores of major oceans[2] and in northern and southern regions.

Region	Clunioninae		Canaceidae	
	Genera	Species	Genera	Species
Pacific	7	33	8	22
Atlantic	5	8	2	4
Indian	4	5	3	5
Arctic	0	0	0	0
Northern (Nearctic, Palearctic and Oriental)	12	20	9	14
Southern (Neotropical, Ethiopian and Australasian)	13	27	11	20

Most of the material for this study is from the collection of the United States National Museum (abbreviated USNM in the distribution records). Through the courtesy of E. C. Zimmerman, I have also studied specimens from Bishop Museum (BPBM), including the Marquesas and Society Islands material described by Malloch (8) and unstudied material collected by Zimmerman on the Bishop Museum Mangarevan Expedition, as well as Swezey and Usinger's Guam collections. The unworked Canaceidae from the important Cresson collection at the Academy of Natural Sciences at Philadelphia (ANSP), as well as specimens of *Canace salonitana* Strobl, *Xanthocanace ranula* (Loew), and *X. orientalis* (Hendel), determined by Bezzi and Cresson, were made available through the kindness of J. A. G. Rehn. Among this material was a small lot from China which had been loaned to Cresson before his death by the Commonwealth

[2] Caribbean and Mediterranean Seas included in Atlantic Ocean; Cape of Good Hope and South and West Australia referred to Indian Ocean.

Institute of Entomology in London. This lot is of special interest, containing a new genus and two new species which are here described. The examination of the type male as well as the undescribed female of *Canaceoides panamensis* (Curran) was made possible by the loan of specimens from the American Museum of Natural History (AMNH) through the courtesy of C. H. Curran.

Family CANACEIDAE

Canacenae Jones, Univ. Calif. Pub. Ent. **1**: 198, 1906.

Canaceinae Hendel, Suppl. Ent. **2**: 93, 1913; **3**: 98, 1914. Malloch, Linn. Soc. N. S. Wales, Proc. **50**: 86, 1925. Cresson, Dipt. Patagonia and South Chile **6** (2): 115, 1931.

Canaceidae Hendel, Ent. Mitteilungen **5**: 297, 1916; Konowia **1**: 264, 1922. Becker, IN Lindner, Flieg. Palearkt. Reg. **10**: 105, 1926. Hendel, Tierwelt Deutsch. 2, Diptera **2**: 108, 1928. Curran, Calif. Acad. Sci., Proc. IV, **21**: 160, 1934; Fam. gen. North Am. Dipt., 356, 1934. Womersley, Brit. Austral. New Zeal. Antarctic Res. Exped., Repts., ser. B, **4** (3): 78, 1937.

Canacidae Enderlein, Tierwelt Mitteleur. **16**: 171, 1936.

Canacinae Malloch, B. P. Bishop Mus. Bull. **114**: 4, (1933) 1935. Williams, Hawaiian Ent. Soc., Proc. **10**: 86, 108, 1938.

Head large, with oral opening very large, clypeus prominent, usually fitting in emargination of the lower margin of face; proboscis large, with fleshy labellae; palpi well-developed; antennae with third segment rounded, arista dorsal, short pubescent to bare. Frons wide in both sexes; three to five pairs of divergent fronto-orbitals; mesofrons often differentiated, with or without one or more pairs of interfrontals; ocellar triangle large, ocellars present and strong; postocellars present or absent; inner and outer verticals strong; postverticals absent. Face slightly convex to concave, upper portion swollen, separating the antennae; usually without bristles except an incurved pair at vibrissal angle; cheeks broad, one or more pairs of genal bristles, usually in an oblique series. Thorax short, four or more pairs of dorsocentrals; prescutellar acrostichals present or absent; one pair of humerals, one or two pairs of notopleurals; one pair of presuturals; usually two supra-alars; mesopleural and sternopleural bristles present or absent; one or two pairs of scutellars. Legs rather short. Costa extending to fourth vein; auxiliary vein (Sc) separate from first vein (R_1) almost to its tip; costa broken once before apex of first vein; basal and anal cells complete; anal vein short. Abdomen with seven segments, the first not strongly differentiated from the elongated second. Male genitalia with ventral processes of ninth tergite more or less produced ventrad and forward under abdomen, with apex simple, bilobed, or hook-shaped. Female ovipositor usually elongate, consisting of a pair of fleshy spinose dorsal lamellae or sclerotized arcuate caudoventral blades.

The Canaceidae has for many years been considered a subfamily of the Ephydridae. In 1916, Hendel elevated it to family rank, followed by Becker (1), Curran (2), and Womersley (14). Most authors (see Hendel, 6) place it between the Ephydridae and the Tethinidae or the Sphaeroceridae. The many points of resemblance to Ephydridae have often been noted; among these, the large mouth opening, prominent exposed clypeus, large fleshy proboscis, and the bristling of the frons have most often been cited. However, as summarized by Becker (1), the Canaceidae are distinct from the Ephydridae in many important respects, such as the lack of the costal fracture near the humeral cross vein; the subcosta is distinct from the first vein its entire length; the discal cell is separated from the second basal cell; the anal cell is small but distinct; the third antennal segment is small and round, with the arista bare to pubescent, and the abdomen is seven-segmented rather than five-segmented.

Key to the genera of Canaceidae

1. First vein haired above on apical half ..... **Macrocanace**
   First vein bare above 2
2. Mesofrons without bristles, only fronto-orbital and ocellar bristles present 3
   Mesofrons with one or more pairs of interfrontal bristles 5
3. Bristles of body long, strongly differentiated and black; frons gradually and only slightly widened from front to back 4
   Bristles weak, pale, and scarcely longer than the abundant body hairs; arista bare on distal half; frons pointed in front, greatly expanded caudad ..... **Xanthocanace**
4. Anterior notopleural absent; prescutellar acrosticals present; two scutellars removed from margin; two pairs of genals; arista bare on distal half ..... **Trichocanace**
   Anterior notopleural present and as strong as the posterior; prescutellar acrostichals absent; four marginal scutellars; three pairs of genals; arista pubescent entire length ..... **Procanace**
5. Mesofrons with at least two pairs of long interfrontal bristles; prescutellar acrostichals present; postocellars strong 6
   Mesofrons with one pair of bristles, just outside ocellars; prescutellar acrostichals absent; postocellars weak or absent 7
6. Anterior notopleural present; scutellum with four marginal bristles ..... **Canace**
   Anterior notopleural absent; pleura naked; scutellum with two bristles removed from margin ..... **Chaetocanace**
7. Four genal bristles; anterior notopleural present but small ..... **Canaceoides**
   Three genal bristles; anterior notopleural absent; scutellars long, apices meeting pincer-like ..... **Nocticanace**

Genus **Macrocanace** Tonnoir and Malloch

Macrocanace Tonnoir and Malloch, Canterbury Mus., Rec. 3: 5, 1926 (genotype: *Milichia littorea* Hutton, original designation).

First longitudinal vein (R_1) with long setulose hairs on apical half; ocellar bristles long; three pairs of long fronto-orbitals; face concave, tumid between antennae, with median carina down to oral margin; clypeus much protruded; arista nude. Mesonotum with 4-5 pairs of dorsocentrals; scutellum with four long bristles and some fine discal hairs; mesopleura and sternopleura each with a strong bristle; legs slender.

Two included species are separated by Tonnoir and Malloch (11) as follows:

Wings brown with clear spots.....**M. littorea** (Hutton), New Zealand Inst., Trans. 34: 174, 1901 (*Milichia*).
Wings unmarked.....**M. australis** (Hutton), loc. cit. (*Ochtiphila*).

Genus **Xanthocanace** Hendel

Xanthocanace Hendel, Suppl. Ent. 3: 98, 1914. Cresson, Am. Ent. Soc., Trans. 62: 270, 1934 (genotype: *Canace ranula* Loew, original designation).

Dinomyia Becker, IN Lindner, Flieg. Palearkt. Reg. **10**: 107, 1926 (genotype: *Canace ranula* Loew, monobasic).

Myioblax Enderlein, Sitzb. Ges. Naturf. Freunde Berlin **1935**: 235, 1935; Tierwelt Mitteleur. **16**: 172, 1936 (genotype: *Canace ranula* Loew, monobasic).

Bristles short, delicate, and pale; frons triangular to heart-shaped, pointed in front and greatly expanded caudad, very flat and broad, mesofrons not differentiated; face twice as broad as high, oral margin strongly excavated, quadrate, filled with the very large clypeus; dorsocentrals very weak, scarcely differentiated from the mesonotal setulae, apparently four pairs in the species seen; fourth vein more or less strongly arcuate on each side of the hind cross vein (or straight in *X. nigrifrons* Malloch); female ovipositor short, apex bifid, curved down and outward; male genitalia with apex of ventral processes of ninth tergite bent inward in a simple broad flattened setose lobe.

Key to the species of Xanthocanace

1. Length 5 mm.....**X. magna**
   Length 2-2.5 mm.....2
2. Last section of fourth vein nearly straight; frons almost glossy black.....**X. nigrifrons**
   Last section of fourth vein arched; frons more or less shining brown, green, or violet.....3
3. Acrostichal setae in four rows; spines of tarsi black; frons shining brown or greenish.....**X. ranula**
   Acrostichal setae in two rows; spines of tarsi yellowish; frons dark violet brown, weakly shining.....**X. orientalis**

Xanthocanace magna (Hendel).

Canace magna Hendel, Suppl. Ent. **2**: 95, 1913 (female, Anping, Formosa).

Xanthocanace magna Hendel, Suppl. Ent. **3**: 98, 1914.

Female. Length 5 mm., wing 4 mm. Lead gray; face, pleura, and abdomen whitish pollinose; frons, mesonotum, and scutellum darker and slightly shining; bristles and setae yellow. Legs dark gray; knees, tibiae at apices, and tarsi yellow; wings milky with yellow veins. Interfrontal bristles not developed; inner and outer verticals present. Prothoracic bristle absent; mesonotal bristles confined to lateral and posterior margins; setae very thick, fine, and nonseriated. Last section of fourth vein strongly arched; approaching third vein toward apex. (Taken from original description.)

Xanthocanace nigrifrons Malloch, Linn. Soc. N. S. Wales, Proc. **69**: 334, 1924 (Australia; type male believed to be in Macleay University Museum, Sydney).

Male. Length 2.5 mm. Black, densely pale gray pruinescent; head more whitish, frontal triangle almost glossy black; mesonotum, scutellum, and abdominal dorsum brownish. All hairs and bristles yellowish. Wings hyaline, veins brown, yellow at bases; legs yellow, coxae and femora, except apices, grayish fuscous; halteres lemon yellow. Propleural bristles absent; no bristles, only setulae on mesopleura and sternopleura; mesonotum with four series of interdorsocentral hairs; disk of scutellum with numerous long hairs which are about as long as the four fine marginal bristles; fourth vein straight on each side of the posterior cross vein, parallel with third toward apex. Genital segment reddish below. (Taken from original description.)

Xanthocanace ranula (Loew).

Canace ranula Loew, Berlin Ent. Zeitschr. **18**: 81, 1874.

Xanthocanace ranula, Hendel, Ent. Suppl. **3**: 18, 1914. Cresson, Am. Ent. Soc., Trans. **62**: 270, 1936.

Dinomyia ranula, Becker, IN Lindner, Flieg. Palearkt. Reg. **10**: 107, 1926. Séguy, Faune de France **28**: 401, 1934.

Myioblax ranula, Enderlein, Sitzb. Ges. Naturf. Freunde Berlin **1935**: 235, 1935; Tierwelt Mitteleur. **16**: 172, 1936.

Female. Length 2-2.5 mm. Dark gray, slightly greenish blue; frons shining brown to green; thorax, abdomen, and femora thickly whitish pollinose; face, clypeus, and cheeks silvery pubescent; antennae brown; palpi, knees, tibiae, tarsi, wing veins, and halteres light yellow.

Bristles reduced, very fine and yellow in color, body thickly covered with erect fine whitish setae. Frons broad, flat, and three-cornered; five pairs of fronto-orbitals over eyes at posterior third of lateral margin of frons; ocellars and postocellars fine, in a rectangle; inner and outer verticals stronger. Face broadly excavated to about half its height, the face nearly filled by the prominent clypeus; about five upcurved hairs on cheek below eye. Antennae with third segment subspherical, thick, and pubescent on basal half, apical half bare and fine.

Dorsocentrals very weak, scarcely differentiated from the abundant setae, apparently four pairs; one humeral; two notopleurals; one presutural; two supra-alars; no prescutellar acrostichals; apparently six marginal scutellars, fine and hairlike, resembling the thick fine discal hairs; one mesopleural; sternopleural absent. Wing with vannal area greatly expanded, broadest at level of basal cells. Legs without strong hairs; tarsal segments with short black spines at apices; claws large and curved.

Abdomen with seventh tergite not excavated; eighth as broad as long, ninth tergite not visible from above, consisting of a caudally hollowed, down-curved plate divided on ventral half into a pair of ovipositor lamellae, each tapered below and bearing at ventrocaudal apex a long, slender, black spine about half as long as height of lamella.

East Friesien Islands, Borkum: Schneider, 1 female (ANSP); July 25, 1901, W. Schnuse, 2 females (determined by Bezzi) (ANSP).

Xanthocanace orientalis (Hendel) (fig. 1, *b, c*).

Canace orientalis Hendel, Suppl. Ent. 2: 94, 1913 (Formosa).

Xanthocanace orientalis, Hendel, Suppl. Ent. 3: 98, 1914.

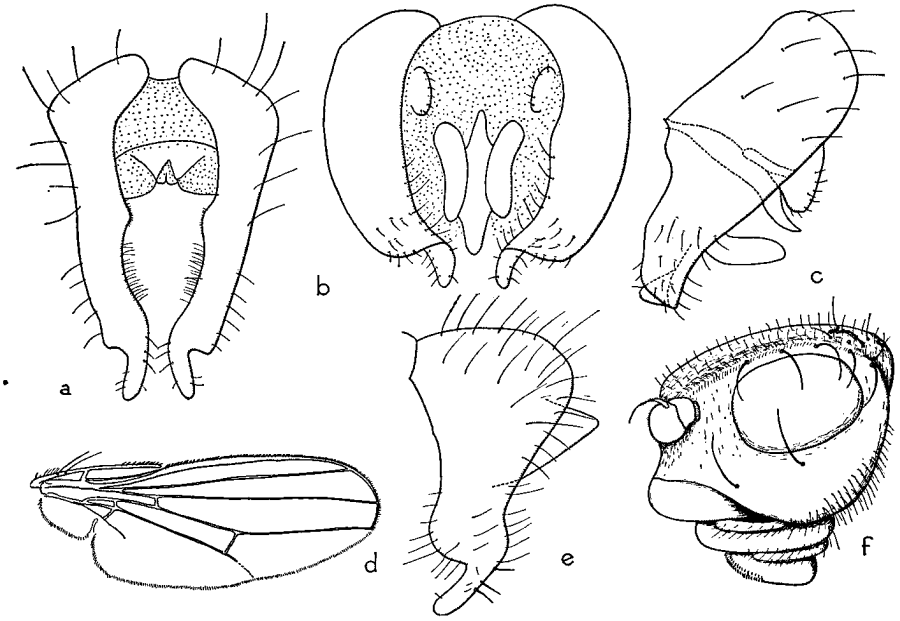

FIGURE 1.—**a,** *Trichocanace sinensis,* male genitalia, ventral view. **b, c,** *Xanthocanace orientalis,* male genitalia: *b,* ventral view; *c,* lateral view. **d-f,** *Trichocanace sinensis: d,* wing; *e,* male genitalia, lateral view; *f,* head, lateral view.

Male, female. Length 2 mm. Very similar to *X. ranula* (Loew), but the bristles even more reduced and the setae much finer and sparser. Frons brownish gray with violet tinge, subshining to dull grayish pruinose. Acrostichal setae in two rows rather than four between the dorsocentrals as in *ranula.* Wing veins yellow, becoming brownish toward apex. Tarsi with the ventral spines reduced and light-colored. Anterior dorsocentrals, presuturals, and supra-alars not differentiated; only the apical pair of marginal scutellars discernible, the disk with two pairs of subapical hairs as long as apicals and with scattered shorter hairs in front; pleura with only a few fine setae; last sections of third and fourth veins arched. Lamellae and spines of female ovipositor smaller than in *ranula.* Male genitalia (fig. 1, *b, c*) with the ventral processes of ninth tergite bluntly tapered and sparsely setose, the caudal margin of apex with a flattened, mesally folded, rounded lobe. External aedeagal sclerotization with a sharp median dorsal point and with a pair of rounded submedian lobes below.

Formosa, Alikang, August, 1907-1909, Sauter, 2 males (ANSP).
China, Foochow, 1935-1936, M. S. Yang, 1 female (ANSP).
India, Bombay, 1902, Biro, 1 female (ANSP).

Genus **Trichocanace,** new genus

Head (fig. 1, *f*) about 0.8 as high as long; frons rather flat, about as broad as long, triangularly produced between antennae with margins gently rounded. Mesofrons not differentiated; no interfrontal bristles; 4-5 strong lateroclinate fronto-orbitals; ocelli not widely separated, ocellar triangle slightly raised; ocellars at level of anterior ocellus, posterior ocellars well behind posterior ocelli, both pairs strong and lateroclinate, bases forming a rectangle; inner and outer verticals strong, former incurved, latter outcurved. Face prominent and vertical in lateral profile, forming a broad carina as in *Canace nasica* Haliday; oral margin broadly excavated the width of face to 0.3 times its height, the space filled by the prominent clypeus. Eyes oval, axis horizontal, slightly lower in front; cheeks as broad as eye height; a strong upcurved bristle at vibrissal angle and another at upper third of cheek below middle of eye. Antennae with third segment slightly broader than long, apex bluntly rounded; arista short, finely pubescent at base, bare on distal half.

Four pairs of strong dorsocentrals, a pair of moderate prescutellar acrostichals; on each side with one strong humeral, one strong posterior notopleural, a strong presutural and two strong supra-alars; one pair of strong scutellars past middle but well removed from margin; mesopleura and sternopleura without differentiated bristles. Legs without bristles, tarsal segments with row of apical ventral spines. Wing venation as in figure 1, *d*; all veins bare; anterior cross vein at three-tenths of length of discal cell; third vein straight, fourth vein straight on each side of posterior cross vein, but distal section slightly angled forward, approaching third vein toward apex; distal section of fifth vein about one-third as long as discal cell and 1.7 times as long as posterior cross vein.

Genotype: *Trichocanace sinensis,* new species.

This genus is related most closely to *Procanace, Chaetocanace,* and *Xanthocanace,* all well represented in the Orient. It resembles *Pro-*

canace in the strong black bristling and more or less quadrate bare frons. But it differs in the lack of the anterior notopleural; the presence of prescutellar acrostichals; the presence of two rather than four scutellars, these removed from the margin; the possession of two rather than three genals; and having the arista bare on distal half. It resembles *Chaetocanace* in the absence of the anterior notopleural, mesopleural, and sternopleural bristles, and in the presence of two discal scutellars; but it possesses an additional genal bristle, lacks the row of interfrontals, and the arista is not pubescent to the tip. It resembles *Xanthocanace* in the uniform vestiture of fine whitish hairs, the bare distal half of the arista, and reduction of the scutellars; but it differs markedly in the well-developed black bristles, quadrate frons, and most details of the chaetotaxy.

Trichocanace sinensis, new species (fig. 1, *a, d-f*).

A large dull-gray species; wings and dorsum of body brownish, tarsi yellow; body hairs very long and soft, whitish in color; bristles black.

Male. Length 3.5-4.0 mm., wing 3.5 mm. by 1.2 mm. Gray, body with thick pollen, frons, mesonotum, and scutellum brownish in middle; face, cheeks, antennae, sides of body, and legs bluish gray; tarsi and halteres yellow; wings smoky brown, including veins.

All bristles strong and black; body hairs very long, fine, soft, and white. Frons with very sparse hairs; hairs between fronto-orbitals fine; post-buccal angle with dense patch of hairs; palpi fringed with fine hairs. Thorax with uniform sparse long soft hairs; those on legs half as long as diameter of femur; scutellum with hairs more numerous; hairs on abdomen numerous and longer than those on thorax.

Male genitalia (fig. 1, *a, e*) with ninth tergite much narrower than preceding segments and cleft posteriorly to top margin; ventral processes in form of a pair of sinuate lobes tucked up against ventral surface of abdomen; with a much-narrowed, finger-like, posteromesal lobe at apex, fringed with numerous fine white hairs.

Foochow, China, 1935-1936, M. S. Yang, holotype male, to be returned to the Commonwealth Institute of Entomology for ultimate deposit in the British Museum (Natural History). Paratypes, 3 males, same data as type, one to be returned to the Commonwealth Institute, the remaining two in USNM.

Genus **Procanace** Hendel

Procanace Hendel, Suppl. Ent. 2:93, 1913 (genotype: *Procanace grisescens* Hendel, monobasic).

Frontal triangle reaching only halfway to anterior frontal margin; no marginal interfrontals; three fronto-orbitals with setulae between; ocellars strong,

postocellars very weak. Face high, flat, perpendicular, without carina between antennae, but with ridge separating face from cheeks; oral margin straight, with three bristles on cheek. Dorsocentrals 1:3; no prescutellar acrostichals; two notopleurals; four marginal scutellars; pleura with or without bristles (naked in genotype). Male with ventral apices of ninth tergite usually divided into inner and outer processes of distinctive shape and armature. Female ovipositor with dorsal lamellae separate nearly to base, with two strong black dorsal spines at apex and two pairs of long bristles on eighth tergite.

The following key is provisional, owing to the incomplete descriptions of *P. macquariensis* and *P. opaca,* specimens of which I have not seen.

KEY TO THE SPECIES OF PROCANACE

1. Color black; face and cheeks dark bluish, green, or brown; large species; length over 2.5 mm 2
   Color gray to brown; face and cheeks light gray, yellow, or silvery; length less than 2.5 mm 3
2. Legs and halteres brown ..... **P. nigroviridis**
   Legs and halteres yellow ..... **P. cressoni**
3. Femora and tibiae dark brownish or bluish gray 4
   Legs entirely yellow 5
4. Body grayish brown above, bluish gray below; three genal bristles; frons and mesonotum with abundant well-developed setae ..... **P. williamsi**
   Body dull olive brown above, whitish gray below; two genal bristles (?); frons and mesonotum without setulae (none mentioned) ..... **P. opaca**
5. Frons with anterior margin reddish ..... **P. grisescens**
   Frons unicolorous, not reddish in front 6
6. Pleura bare; mesonotum with scattered setulae ..... **P. macquariensis**
   Pleura with a well-developed mesopleural bristle; mesonotum without scattered setulae, rarely a few on anterior margin ..... **P. townesi**

Procanace nigroviridis Cresson, Hawaiian Ent. Soc., Proc. 6:277, 1926 (Kauai; type male in Bishop Museum). (See figure 2, *a-c.*)

Male, female. Length 2.5-3 mm. Black including halteres and legs, wings opaque; frons, mesonotum, and scutellum with metallic olive-green pollen; face reflecting blue to green or brown, dorsum of abdomen bluish, pleura brown, more grayish below; legs brownish.

Frons with 4-5 minute anterior setulae; face prominent between antennae; mesonotum with four pairs of well-developed dorsocentrals; a few anterior setulae; scutellum with four marginals, no discal setulae; vertical series of setae on middle of mesopleura; claws very long and nearly straight. Seventh sternite of female with two pairs of long bristles; dorsal lamellae very short with two black, blunt dorsal spines at apex; eighth sternites small with five short, curved black spines (fig. 2, *c*). Male genitalia with outer lobe of ventral processes of ninth tergite undeveloped, inner lobe very long and slender, boomerang-shaped, with a few very fine mesal hairs and an outer group of three fine setae near apex (fig. 2, *a, b*).

Hawaiian Islands: Kauai, Wainiha Stream, Sept. 10, 1946, Wirth, 2 males. Oahu, Kaluanui Valley, May 14, 1946, Wirth, 1 male, 3 females; Manoa Valley, April 10, 1946, Wirth, 1 male.

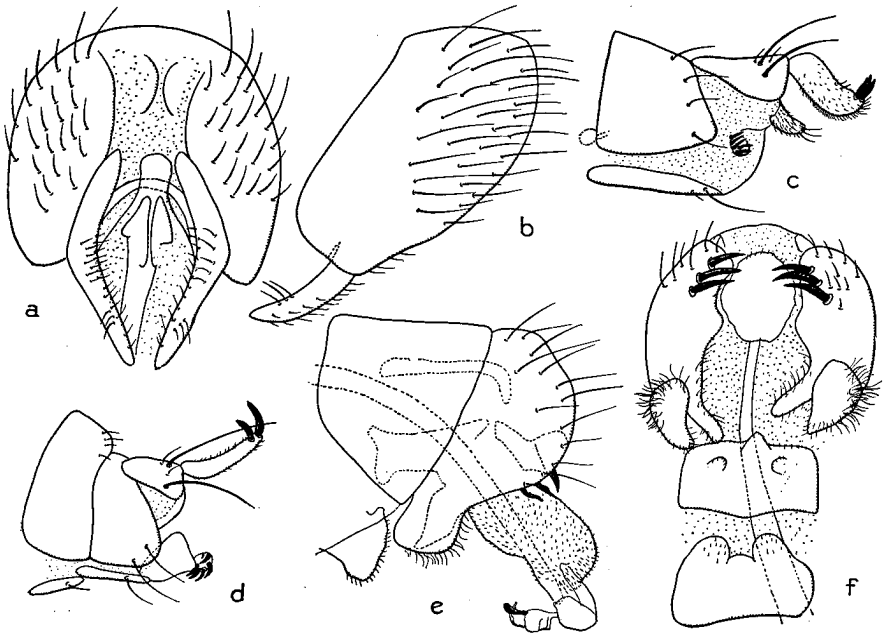

FIGURE 2.—**a-c,** *Procanace nigroviridis: a,* male genitalia, ventral view; *b,* male genitalia, lateral view; *c,* female genitalia, lateral view. **d-f,** *P. townesi*: *d,* female genitalia, lateral view; *e,* male genitalia, lateral view; *f,* male genitalia, ventral view.

Procanace townesi, new species (fig. 2, *d-f*).

A small bare species; olivaceous brown above and pruinose gray below, with yellow legs and long slender ovipositor.

Female. Length 2.2 mm., wing 1.8 mm. by 0.8 mm. Frons, mesonotum, scutellum, and abdomen olivaceous brown, coarsely pollinose; antennae and palpi yellowish; face and cheeks grayish pruinose with touch of rosaceous, clypeus olive pubescent; pleura grayish pruinose; wings grayish hyaline, the veins brown; halteres yellow; distal tarsal segments brownish; all bristles black.

Three strong lateroclinate fronto-orbitals with fine setulae between; mesofrons bare except four setulae on the darkened anterior margin; ocellars strong, slightly proclinate with three fine setulae next to ocelli; inner and outer verticals strong; third segment of antennae rounded, as broad as long, arista finely pubescent; palpi each with a very fine long yellow seta at apex; facials absent, one incurved and two strong upcurved genals in a line near oral margin. Four pairs of strong dorsocentrals; one humeral; two strong notopleurals; two strong

supra-alars; four strong marginal scutellars; one moderate and several minute mesopleurals; setulae absent on thorax; legs slender, with short black and yellow setae; claws short and curved. Abdomen with very sparse but well-developed dorsal setae; eighth tergite with four long bristles and several short setae; dorsal lamellae of ovipositor long and slender with two long black dorsal spines at apex; lobes of eighth sternite each with five short curved black spines (fig. 2, *d*).

Male. Similar to female; ventral margin of fore tibia with rows of minute dark spines; genitalia as in figure 2, *e, f*. Ventral processes of ninth tergite with three large stout incurved spines on caudoventral margin, bearing a long, slender, bent setose inner lobe and a semidetached, expanded, hirsute outer lobe at apex. Fourth sternite with sublateral pair of low, rounded, setigerous lobes on caudal margin; fifth sternite with blunt caudomedian point.

Marshall Islands: Ailinglapalap Atoll, Bigatyelang Island, Aug. 25, 1946, Townes, holotype female (no. 59966, USNM), allotype male; paratypes, 1 male, 3 females, same data as for types; 1 male, Caroline Islands, Kusaie Atoll, Lele Island, Aug. 21, 1946, Townes.

P. townesi is closely related to *P. grisescens* Hendel; but it lacks the reddish anterior margin of the frons, and the male genitalia show an inverse development of the inner and outer lobes of the ventral processes of the ninth tergite.

Procanace cressoni, new species (fig. 3, *e, f*).

A large brownish-black species resembling *nigroviridis* Cresson, but with halteres yellow and legs largely yellowish.

Male, female. Length 3-3.5 mm., wing 3.4 mm. by 1.0 mm. Black; frons, mesonotum, scutellum and abdominal tergites subshining violaceous brownish black; face, cheeks, and pleura dark gray with coarse bluish pollen; clypeus pearly; antennae brown; palpi yellow; legs and halteres yellow, femora and tibiae bluish gray in middle; wings brownish hyaline; all bristles and setae black.

Frons with 10-15 strong setae scattered on anterior half; three strong frontoorbitals with strong setae between; ocellars and postocellars in a close rectangle, ocellars strong and proclinate (postocellars variable, weak to rather strong); inner and outer verticals strong (holotype with pair of moderate preocellars, but these absent in rest of series). Face concave; cheeks broad, with a fine, long, inner, incurved bristle and two outer, strong, upcurved bristles and a few fine setae nearly in line below.

Four pairs of dorsocentrals; one humeral; two notopleurals; one presutural; two supra-alars and four marginal scutellars, all very strong; a few scattered strong setae on anterior half of mesonotum, none on scutellum; mesopleura and sternopleura each with one strong posterior bristle and scattered strong setae. Legs with scattered strong erect hairs, three series of strong hairs on posterior surface of fore femur.

Abdomen with scattered strong hairs; seventh tergite of female elongated dorsoventrally, emarginate above, with posterior row of long hairs on sides; eighth tergite with two pairs of long hairs on posterior margin; lamellae of ovipositor hanging down in vertical position, curved, each with two long black spines curving caudad. Male genitalia (fig. 3, *e, f*) with ventral processes of ninth tergite stout, blunt, and curving mesad below, with rounded apices bearing

a dense patch of short hyaline conical spines on anteromesal side and a few fine hairs fringing posterior side; caudomesal margin of tergite with a pair of stout irregular submedian lobes each bearing three long, slender hyaline spines; aedeagal complex with a pair of submedian, anteroventral, finger-shaped, pubescent lobes.

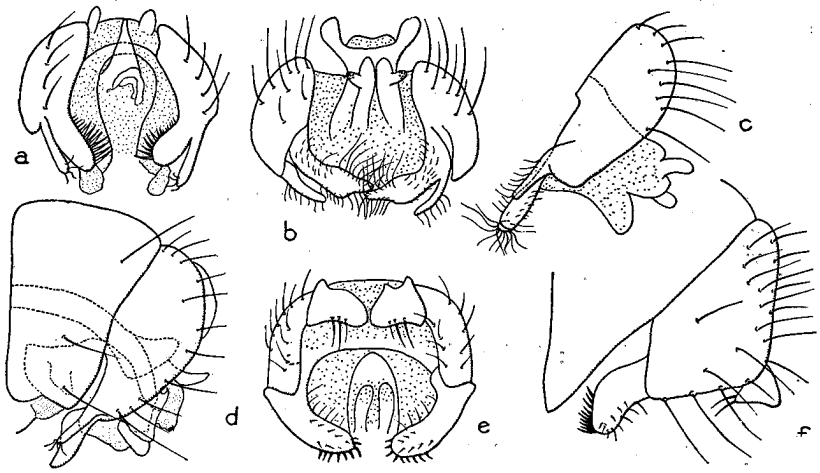

FIGURE 3.—**a,** *Procanace grisescens,* male genitalia, ventral view; **b, c,** *P. williamsi,* male genitalia; *b,* ventral view; *c,* lateral view. **d,** *P. grisescens,* male genitalia, lateral view. **e, f,** *P. cressoni,* male genitalia: *e,* ventral view; *f,* lateral view.

China, Foochow, April 23, 1936, M. S. Yang, holotype male, allotype female, to be returned to the Commonwealth Institute of Entomology, for ultimate deposit in the British Museum (Natural History). Paratypes, 1 male, 1 female, same data as type, retained in USNM.

This variable species shows some features atypical for the genus; in one specimen there are a pair of moderate preocellars, and in still another the postocellars are fairly strong.

Procanace williamsi, new species (fig. 3, *b, c*).

A small, setose, dark brownish-gray species with rosy face, bluish-gray legs, and violaceous wings.

Male. Length 1.8 mm., wing 1.8 mm. by 0.6 mm. Dorsal surface of body dark pollinose grayish brown; face, genae, pleura, and legs bluish gray pruinose; antennae brown; anterior margin of frons, face, and upper genae rosaceous; wings violaceous hyaline; halteres yellowish white, squamae white; tarsi light brown; all bristles and setae black.

Three strong lateroclinate fronto-orbitals with strong setulae between; about 15 strong setae scattered across anterior portion of frons; ocellars strong, proclinate, with three small setae on the triangle; inner and outer verticals strong; antennae with third segment globular, arista short, finely pubescent; face slightly higher than broad, with distinct lateral carina continued around lunular margin; one incurved and two upcurved strong genal bristles, with a strong seta interspersed in line behind each one.

Four pairs of strong dorsocentrals, the posterior pair out of line to side; one strong humeral; two strong notopleurals; one strong presutural; two strong supra-alars; four strong marginal scutellars; one strong mesopleural and one moderate sternopleural; abundant strong scattered setulae on dorsum, except in prescutellar area and on scutellum; a few also on mesopleura and front of sternopleura; legs with abundant strong hairs; claws short and curved.

Abdomen with scattered, moderately large, erect hairs; genitalia as in figure 3, *b, c*; ventral processes of ninth tergite with long, subapically expanded, inner lobe with dense tuft of long fine hairs, and slender outer lobe half as long, with a few marginal hairs; posterior external process of aedeagus with a pair of hyaline finger-like lateral lobes and a pair of small setose ventral lobes.

Hawaiian Islands: Oahu, Kalihi, Honolulu, May 11, 1946, Wirth, light trap near shore, holotype male (type no. 59965, USNM); paratype female. Hawaii, from plane, Nov. 8, 1944.

P. williamsi is readily distinguished by the abundant setulae on the head and thorax, dark-grayish legs, and the distinctive processes of the ninth tergite of the male.

Procanace opaca de Meijere, Tijdschr. voor ent. **59**: 272, 1916 (Java; on mud and gravelly banks along flowing waters, Wonosobo).

Length 1.5 mm. Frons dull olive brown; face and cheeks whitish gray, latter with two upturned bristles; palpi gray; thorax dull olive brown; pleura whitish gray; abdomen dull dark brown, thickly setose; legs dark grayish brown, trochanters, base of femora, and tarsi yellow; wings nearly hyaline; halteres whitish. (Taken from original description.)

Procanace grisescens Hendel, Suppl. Ent. **2**: 93, 1913 (Formosa). (See figure 3, *a, d.*)

Male, female. Length, 2 mm. Vertex, mesonotum, and scutellum dull olive brown; frons dark gray, except reddish on anterior margin; face, cheeks, and pleura ashy gray, nearly white; abdomen dull brownish gray; legs reddish yellow, hind tarsi blackish at tip; wings light grayish hyaline, the veins yellowish; halteres light yellow.

Frons with anterior setulae; mesonotum and scutellum without discal setulae; mid-femur with one or two strong black posteroventral spines at two-thirds length. Female genitalia: eighth tergite with two pairs of long bristles; dorsal lamellae separate over half their length, yellowish, nearly bare, with two long brown spines, each nearly as long as bifid portion of base; eighth sternite not visible in specimen at hand. Male genitalia as in figure 3, *a, d*; ventral processes of ninth tergite with inner and outer lobes subequal in length, the outer slender,

with tuft of about five long, very fine hairs at tip, the inner stout and rounded at apex with a series of 8-10 long sharp yellowish spines on inner margin; aedeagal complex with hyaline external dorsally directed posterior point.

Formosa, Tainan, August 1908, Sauter, 2 males, 2 females, paratypes (USNM).

The small size, yellow legs, and rosaceous anterior portion of the frons are distinctive.

Procanace macquariensis Womersley, 1937, Brit. Austral. New Zeal. Antarctic Res. Exped., Repts., ser. B., **4** (3): 78 (male, female, Macquarie Island, Antarctic; figures of head, mesonotum, wing).

Length 2 mm. Color blackish brown above, light grayish dusted at sides; face, genae, antennae, palpi, legs, and halteres yellow. Frons without anterior setulae, a few toward ocelli; three strong genal bristles; mesonotum with scattered setulae; scutellum without discal setulae, pleura bare. (Taken from original description.)

Genus **Canace** Haliday

Canace Haliday, Ann. Nat. Hist. **3**: 411, 1839. Becker, IN Lindner, Flieg. Palearkt. Reg. **10**: 106, 1926 (genotype: *Canace nasica* Haliday, monobasic).

Canacea Malloch, Ent. Soc. Washington, Proc. **26**: 52, 1924 (lapsus for *Canace*). Cresson, Am. Ent. Soc., Trans. **62**: 265, 1936 (status).

Frons long, mesofrons extending to anterior margin, with several pairs of interfrontal bristles near lateral margins; ocellars and postocellars in a rectangle; face straight across oral margin, vertical in profile; cheeks broad with oblique row of bristles to vibrissal angle. First vein bare above; four pairs of dorsocentrals, a pair of strong prescutellar acrostichals; two humerals, two strong notopleurals; one presutural and several supra-alars; mesopleura and sternopleura bristles; four marginal scutellars; fore femora with or without series of stout anteroventral spines. Female ovipositor slender and arising from lower part of ninth tergite, the subapical spines slender and appressed. Male genitalia with ventral processes of ninth tergite sharply hooked caudad or with greatly narrowed distal finger-like lobe.

Key to the species of Canace

1. Fore femora armed on distal portion of anteroventral margin with a row of stout black spinules 2
   Fore femora unarmed 3
2. Fore femora with 4 to 6 spinules half as long as diameter of femur ..... **C. snodgrassii**
   Fore femora with 8 to 12 spinules one-third as long as diameter of femur ..... **C. aldrichi**

3. Face densely white pruinose with a narrow dark vertical stripe..**C. albiceps**
   Face uniform grayish..... 4
4. Three incurved facial bristles in addition to the oblique series of three upcurved genals in line with middle facial.....**C. nasica**
   Only one facial present, in line with the genals..... 5
5. Two strong upcurved genal bristles..... 6
   Three strong upcurved genal bristles.....**C. maritima**
6. Four marginal setae (interfrontals) on mesofrons.....**C. cala**
   One strong interfrontal bristle and two weak setae just before level of anterior ocellus.....**C. salonitana**

Canace snodgrassii Coquillett, Washington Acad. Sci., Proc. **3**: 378, 1901, male, female (Albemarle Island, Galapagos Islands, type female in USNM). Johnson, New Jersey State Mus. Rept. for 1909, 807, 1911; Boston Soc. Nat. Hist., Occ. Papers **15**:276, 1925 (in *Canacea;* Rhode Island, Massachusetts). Cresson, Am. Ent. Soc., Trans. **62**: 264, 1936. (See figure 4, *c, d.*)

Canacea macateei Malloch, Ent. Soc. Washington, Proc. **26**: 52, 1924 (male, female, Jekyl Island, Georgia, genus inadvertently spelled *Canacea;* type male in USNM). Cresson, Am. Ent. Soc., Trans. **62**: 264, 1936. New synonymy.

Canace macateei, Malloch, B. P. Bishop Mus. Bull. **114**: 5, (1933) 1935. Curran, Fam. Gen. North Am. Dipt., 356, 1934.

Male, female. Length 3-3.5 mm. Black; densely pale greenish gray pruinescent, middle of mesonotum slightly brownish, mesofrons often subshining reddish; face and cheeks silvery white; antennae black; palpi and tarsi yellow; wings brownish hyaline, the veins brownish; halteres whitish.

Frons slightly convex, disk flat; four strong fronto-orbitals curving over eyes, with strong setae between; frontal triangle to anterior margin of frons, with five pairs of strong interfrontal bristles the length of margin, progressively smaller cephalad; orbits with an inner row of finer setae their entire length; ocellars and postocellars strong, divergent, bases forming a rectangle, the ocellars at level of anterior ocellus; six fine setulae within rectangle; inner and outer verticals strong. Face slightly convex, a strong incurved bristle at lower margin; cheeks with two strong upcurved bristles, inner at oral margin, outer near lower margin of eye; oral margin with three pairs of small setae, occiput with row of fine hairs; post-buccal angle with patch of strong setae; third antennal segment as broad as long, nearly circular in outline; arista as long as antennae, pubescent.

Thorax with four pairs of strong dorsocentrals; four irregular series of strong setulae between these rows, other lateral setae present; a pair of distinct prescutellar acrostichals; two humerals; two notopleurals; one presutural; three supra-alars; four strong marginal scutellars with two long and usually several short discal hairs; mesopleura and sternopleura setose, former with two or three long posterior bristles, latter with one strong bristle. Trochanters with golden hairs, hairs of legs moderate; fore femora with 3 to 5 stout anteroventral and 3 to 5 long posteroventral bristles on distal half.

Abdomen with numerous long stout setae; eighth tergite of female (fig. 4, *d*) with posterior margin rounded and setose with row of 6 to 8 moderate posterior hairs; ninth segment vertical with several fine yellow hairs; ovipositor a pair of brownish hyaline, curved, very slender blades arising at ventral margin of ninth segment, with a ventral hair arising at distal half, the part beyond black. Male genitalia (fig. 4, *c*) with ventral processes of ninth tergite longer than height of tergite; triangular with greatly narrowed, abruptly upturned apex; posterior margin with dense row of long setae.

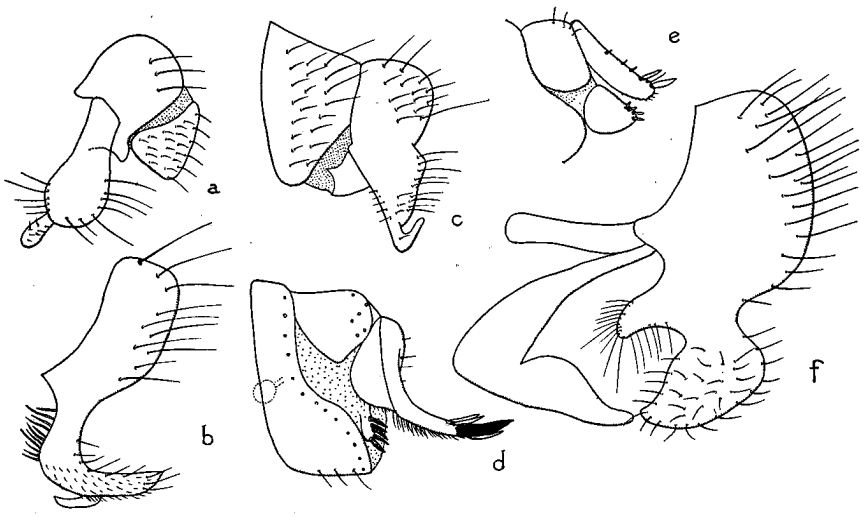

FIGURE 4.—**a,** *Canace salonitana,* male genitalia, lateral view. **b,** *C. nasica,* male genitalia, lateral view. **c, d,** *C. snodgrassii*: *c,* male genitalia, lateral view; *d,* female genitalia, lateral view. **e, f,** *C. maritima*: *e,* female genitalia, lateral view; *f,* male genitalia, lateral view.

United States. Georgia: Jekyl Island, June 23, 1923, McAtee, 2 males, 2 females (USNM) (type series of *macateei*). New Jersey: Atlantic City, May 6, 1 female (USNM). Massachusetts: Gloucester, June 20, 1924, Johnson, 1 female (USNM). New Jersey: Cape May, Aug. 15, 1933, W. Stone, 1 male (ANSP); Wildwood, Sept. 18, 1920, Cresson, 1 male, 3 females (ANSP); Anglesea, May 16, 1909, Haimbach, 1 female (ANSP). Connecticut: Westport, July 13, 1932, Melander, 6 males, 2 females (ANSP). Delaware: Rehoboth, June 25, 1939, Melander, 3 males, 9 females (ANSP). Florida: Cape Sable, Dec. 18, 1949, Sabrosky, 1 male. Texas: Brownsville, June, 1 female (USNM).

Panama: Ancon, Canal Zone, Jan. 23, 1942, Komp, 4 males, 2 females (USNM); Balboa, Canal Zone, Oct. 1946, Krauss, 1 male (USNM).

Galapagos Islands: Narborough, Jan. 13, 1899, 2 males, 2 females (USNM). Albemarle, Jan. 23, 1899, 5 males, 3 females (type series) (USNM).

Canace aldrichi Cresson, Am. Ent. Soc., Trans. **62**: 264, 1936 (male, female, Palo Alto, California; type female in USNM).

Length 3 to 4 mm. As in *snodgrassii* (Coquillett), but the anteroventral margin of fore femur with series of 8 to 12 closely set stout black spinules about one third as long as diameter of femur.

California: Palo Alto, salt marsh, Aug. 11, 1911, Aldrich (type male, USNM).

Canace albiceps Malloch, Linn. Soc. N. S. Wales, Proc. **50**: 87, 1925 (female, Sydney, Australia).

Female. Length 2.0 mm. Frons and thoracic dorsum olive brown, frontal orbits and pleura gray; face pruinescent white with distinctive narrow dark vertical stripe; cheeks silvery; legs brownish gray; apices of femora, tibiae, and most of tarsi yellowish; wings grayish, halteres pale yellow; abdomen gray, dark above, pale below. Cheeks with four bristles; four fronto-orbitals; four pairs of incurved interfrontals; four pairs dorsocentrals; acrostichals sparse; scutellum with four marginals, basal pair short, two discal setulae; sternopleura without strong bristles. (Taken from original description.)

Canace nasica Haliday, Ann. Nat. Hist. **3**: 411, 1839. Becker, IN Lindner, Flieg. Palearkt. Reg. **10**: 106, 1926. Séguy, Faune de France **28**: 401, 1934. (See figure 4, *b*.)

Male, female. Length, 2 mm. Mesofrons, mesonotum, and scutellum densely brownish pollinose; face and cheeks silvery gray pubescent; margins of frons, pleura, legs, and abdomen dark gray pruinose; wings smoky brown; antennae brown; palpi yellowish; tarsi reddish yellow; squamae and halteres whitish.

Frontal triangle to anterior margin; three pairs of strong fronto-orbitals; two strong and one weak anterior, slightly in- and down-curved interfrontals well removed from mesofrontal margin; ocellars and postocellars strong and divergent, in a rectangle; inner and outer verticals strong; mesofrons with minute scattered setulae similar to those between fronto-orbitals. Face perpendicular, robust, three incurved marginal facials, the upper strong, the others weak; three strong upcurved genals in an oblique series from below middle of eye to middle facial; third antennal segment rounded; palpi with weak apical seta; a few weak yellowish post-buccal hairs.

Thorax with four pairs of strong dorsocentrals; one pair strong prescutellar acrostichals; two series of acrostichal setulae, the inner series stronger; fine, scattered, lateral setae elsewhere; two strong prescutellar acrostichals; two notopleurals; one presutural; two supra-alars; four strong marginal and one

pair of weak discal scutellars; mesopleura and sternopleura setulose, the former with one strong posterior bristle. Hairs on legs moderate, fore femora with postero-ventral series of 4-6 long bristles, anterior surface nearly bare.

Abdomen with very strong hairs; eighth tergite of female with subdorsal pair of much longer bristles than others in row; ninth tergite vertical at base, lamellae of ovipositor emerging at ventral margin of ninth tergite, brownish hyaline, slender and curved back and slightly upward as in *snodgrassii,* with long yellow appressed ventral hairs; fine, long yellow hairs on lower sides of seventh tergite. Male genitalia (fig. 4, *b*) with ventral processes of ninth tergite slender, broadly curved ventrad and caudad, with an antero-ventral tuft of blunt brownish spines and scattered hairs on distal portion, a broad, yellow, retrorse, ventral spine near apex.

Canary Islands: Tenerife, December, Becker, 1 male, 1 female (USNM). England: Isle of Wight, Ventnor, Oct. 5, Cockerell, on shore, 1 female (USNM).

Canace maritima, new species (fig. 4, *e, f*).

A medium-sized dark-gray species with brownish dorsum, setae stout and numerous, anterior notopleural weak, female ovipositor with short fleshy lamellae with dorsal spines.

Male, female. Length 1.75-2.0 mm. Black; frons and disk of mesonotum and scutellum brownish pollinose; face and cheeks whitish pruinose; humeri, pleura, abdomen, femora, and tibiae bluish gray pruinose; tarsi yellowish brown; antennae brown; palpi yellow; halteres whitish; wings and squamae brownish; all bristles and setae black except for erect yellowish hairs on bases of femora.

Frons very flat; three strong pairs of fronto-orbitals with setae between; two pairs of strong, proclinate, marginal bristles on mesofrons, the posterior pair at level of anterior ocellus; ocellars strong and lateroclinate, removed laterad to just before lateral ocelli; a pair of strong cruciate postocellars; inner and outer verticals strong, scattered long setae over entire frons; four strong, upcurved genal bristles, a patch of long hairs at post-buccal angle; palpi with a weak, yellow, distal seta.

Thorax with four pairs of strong dorsocentrals; one strong humeral; a strong posterior and a weak anterior notopleural; a strong presutural; two strong supra-alars and a pair of strong prescutellar acrostichals. Four strong marginal scutellars, discal setae not apparent; a strong bristle on mesopleura and sternopleura; mesonotal setae strong and numerous, in evident acrostichal rows, mesopleura also with strong setae; hairs of leg strong and erect; long erect yellow hairs in a series on ventral surface of fore femora and a ventral patch at bases of mid and hind femora.

Abdominal hairs very strong and erect; eighth tergite of female with fine short hairs on posterior margin; dorsal lamellae of ovipositor short, with two stout flattened black spines on outer dorsal side at apex and a few small dorsal setae; lobes of eighth sternite with four long black spines (fig. 4, *e*). Male genitalia (fig. 4, *f*) with ventral processes of ninth tergite greatly constricted at base, then abruptly expanded in an irregularly ovoid apical lobe with a distinct anteroventral point, outer surface densely covered with long fine hairs; anterodorsal margin of process near base with a short lobe with sparse, long, fine hairs. Last sternite in form of a sclerotized ventral arch bearing a pair of bare arcuate posterior processes opposed to the ventral processes of tergite.

Galapagos Islands, Bartholomew Island, July 1948, K. Vinton, edge mangrove, holotype male, allotype female (type No. 59967, USNM).

The shape of the head and the reduction of the series of interfrontals ally this species with *Canace salonitana* Strobl, but the reduction of the anterior notopleural and the structure of the female ovipositor strongly suggest affinities with *Canaceoides*.

Canace cala Cresson, Am. Ent. Soc., Trans. **60**: 220, 1934 (East London, Cape Province, South Africa; type female in Transvaal Museum).

Female. Length 2.75 mm. Opaque olivaceous brownish above; grayish on face, cheeks, pleura, venter, and legs; halteres yellow; wings infumated. Mesofrons narrowly attaining lunular margin, with four marginal setae; four fronto-orbitals; face nearly twice as broad as long, one bristle near oral margin; cheeks with two upturned bristles. Dorsocentrals 1:3; mesonotal setulae well-developed, especially acrostichal series; mesopleura setulose; sternopleura sparsely setulose. (Taken from original description.)

Canace salonitana Strobl, Diptera v. Bosn. u. Herzegow, 635, 1900. Becker, IN Lindner, Flieg. Palearkt. Reg. **10**: 107, 1926. Séguy, Faune de France **28**: 398, 1934. (See figure 4, *a*.)

Male, female. Length 2.6 mm. Black; frons, mesonotum, and scutellum coppery brownish pollinose, mesonotum greenish brown pollinose towards sides and on pleura; face, cheeks, and clypeus whitish gray; antennae, palpi, legs, and abdomen dull brown; wings smoky brown, halteres whitish; bristles black, the fine setae brown.

Frontal triangle slightly raised, reaching anterior margin of frons; a pair of strong in- and down-curved bristles and two weak setae near lateral margin just before level of anterior ocellus, otherwise nearly bare, a few minute setulae; ocellars and postocellars strong, divergent, bases in a rectangle with a few minute setae between; three pairs of strong fronto-orbitals curving over eyes with fine setae between; inner and outer verticals strong. Face only slightly convex, median carina not developed; three pairs of strong genal bristles in an oblique row from middle of lower eye to vibrissal angle, with a few weak setae between and below; post-buccal angle nearly bare.

Thorax with four pairs of strong dorsocentrals, the posterior pair stronger and out of line to side; a pair of strong prescutellar acrostichals; two strong humerals, two strong notopleurals; one strong presutural; two strong supra-alars; four strong marginal scutellars, the disk bare; mesonotum with only scattered, very fine, brown setulae; mesopleura with about six strong bristles on lower and posterior margins; sternopleura without bristle, a few setae present. Hairs of legs stout and semierect, a series of strong bristles on posteroventral surface of fore femur.

Abdomen with scattered strong bristle-like hairs. According to Becker (1), female ovipositor consists of four spine-shaped organs, the ventral pair short and yellow, the dorsal pair longer and black; these figured by Séguy (10, fig.

557). Male genitalia (fig. 4, *a*) with ventral processes of ninth tergite long, constricted at base, and bulbous subapically, with a suddenly constricted finger-like apical lobe.

Canary Islands: Tenerife, Dec. 1, Becker, 3 males (USNM), 2 females (ANSP).

The presence of a series of interfrontals, even though only the posterior one is strong, the ocellars and postocellars in a rectangle, the prescutellar acrostichals, strong anterior notopleurals, and the shape of the female ovipositor place this species in *Canace*. However, there are several strong points of resemblance to *Canaceoides;* for instance, the shape of the face and the reduction of the facial series of bristles, the shortening of the frons and reduction of all but the posterior interfrontals, and the shape of the ventral process of the male genitalia.

Genus **Chaetocanace** Hendel

Chaetocanace Hendel, Suppl. Ent. **3**: 98, 1914 (genotype: *Canace biseta* Hendel, original designation).

As in *Canace,* but face somewhat broader than high, excavated quadrate at oral margin, the space filled by the clypeus; pleura without bristles; scutellum with only two bristles.

Chaetocanace biseta (Hendel).

Canace biseta Hendel, Suppl. Ent. **2**: 95, 1913 (Formosa).

Chaetocanace biseta, Hendel, 1914, Suppl. Ent. **3**: 98, 1914 (type of *Chaetocanace,* new genus).

Male. Length 2.5 mm. Black; frontal triangle, top of face, dorsum of thorax and scutellum dull reddish olive brown; face, clypeus, cheeks, frontal orbits, sides of mesonotum, and pleura ashy gray dusted; abdomen dull brownish gray, brighter gray on sides; antennae black; palpi yellowish; legs yellow, coxae and femora ashy gray dusted; wings brownish hyaline, with veins yellowish; halteres yellow.

Four strong fronto-orbitals; five pairs strong incurved marginals on mesofrons; ocellar triangle small; a pair of strong ocellars just laterad of anterior ocellus and in front of posterior ocelli; a moderate pair of postocellars just behind and mesad of posterior ocelli; inner and outer verticals strong; one strong incurved bristle at vibrissal angle; third antennal segment as broad as long, rounded, arista long pubescent; palpi with a minute apical hair.

Four strong pairs of dorsocentrals; two humerals, one posterior notopleural, the anterior notopleural absent; one presutural, two supra-alars; pleura with a few weak yellow setae, mesopleural and sternopleural absent; a few scattered black setae on mesonotum; one pair of parallel scutellars, these well removed from margin. Legs with very fine yellowish hairs; a few strong black ventral

bristles at apex of tibiae and each tarsal segment. Abdomen with strong dark bristle-like setae.

Formosa: Tainan, April 1909, Sauter, 1 male (USNM).

Genus **Canaceoides** Cresson

Canaceoides Cresson, Am. Ent. Soc., Trans. **60**: 221, 1934 (genotype: *Canace nudata* Cresson, original designation).

Procanace Curran (not Hendel), Calif. Acad. Sci., Proc. IV, **21**: 160, 1934 (genotype: *Procanace panamensis* Curran, original designation).

Neocanace Curran, Fam. gen. North Am. Dipt., 357, 1934 (new name for *Procanace* Curran, 1934, not Hendel, 1913). New synonymy.

Similar to *Canace* Haliday, but with one pair of interfrontals more or less aligned with ocellars, not removed to the lateral margin of the often short mesofrons; postocellars absent; face short and rather concave; four genal bristles including the one at vibrissal angle; acrostichals absent or hairlike; two notopleural bristles, the anterior pair weak; four marginal scutellars, the apical pair not strongly upcurved. Female abdomen with ninth tergite reduced, arising from dorsocaudal angle of eighth; lamellae more or less fleshy with strong dorsoapical spines; ventral processes of ninth tergite of male genitalia variable in shape, not with recurved hook in known species.

Key to the species of Canaceoides

1. Frons bare in front; mesonotum without numerous seriated acrostichal setae; disk of scutellum with 2 to 6 setae 2
   Frons setulose in front; mesonotum with numerous seriated acrostichal setulae; disk of scutellum bare ..... **C. chilensis**
2. Two to six discal scutellar setae; lobes of ventral processes of male genitalia stout and blunt; separated by a cleft not longer than diameter of lobe ..... **C. nudata**
   Two discal scutellar setae; lobes of ventral processes of male genitalia very long, slender and unequal, separated by a cleft over four times as long as diameter of lobe ..... **C. panamensis**

Canaceoides nudata (Cresson) (fig. 5, *b, c*).

Canace nudata Cresson, Am. Ent. Soc., Trans. **52**: 257, 1926 (male, female, Los Angeles County, California). Bryan, Hawaiian Ent. Soc., Proc. **6**: 279, 1926 (Oahu, Wake Island, Lisiansky Island). Williams, Hawaiian Ent. Soc., Proc. **10**: 108, 1938 (biology, figures).

Canaceoides nudata, Cresson, Am. Ent. Soc., Trans. **60**: 221, 1934.

Male, female. Length 3 mm. Opaque black; dorsum black tinged with brownish; antennae and palpi brownish black; face and cheeks pruinose gray; pleura, venter of abdomen, and femora tinged with pruinose gray; wings and squamae opaque brownish with dark veins; halteres whitish.

Frons broader than long, nearly flat in front; three strong fronto-orbitals bent closely outward over eyes, the interspaced setae about half as long; one pair strong proclinate interfrontals; ocellars strong, triangle with 6 to 8 strong scattered setae; inner and outer verticals strong. Face bare, median carina strong between antennae; genae with four strong upcurved bristles, the inner slightly incurved; lower buccal margin with a few long setae. Third antennal segment slightly longer than broad, arista thick at base, short pubescent; palpi with 3 to 4 long setae on outer apex.

Thorax with four pairs of strong dorsocentrals; one strong humeral; one posterior notopleural, a strong seta near position of anterior notopleural; one strong presutural; two strong supra-alars; four strong marginal scutellars, the apical pair not strongly upcurved; one strong lower and about four well-developed posterior mesopleurals plus several long setae; one fine sternopleural. Long, well-developed setae on humeri and between humeri on anterior margin of mesonotum; 2 to 6 strong hairlike discal setae on scutellum. Hairs of legs well-developed and erect, posterior surface of fore femora with three series of moderately long bristles; distal tarsal segments greatly expanded and flattened.

Abdomen with strong scattered setae. Eighth tergite of female with row of 8 to 10 fine hairs on posterior margin; dorsal lamellae of ovipositor rather stout, with a long apical and a shorter subapical black dorsal spine, dorsal surface with many long fine hairlike setae. Male genitalia (fig. 5, *b, c*) with ventral processes of ninth tergite flattened and expanded and bent inward on ventral side of body, apex with two subequal lobes; the anterodorsal lobe with about 10 closely set stout spines at tip; posteroventral lobe bare at tip, inner and dorsal surface with dense, fine hair.

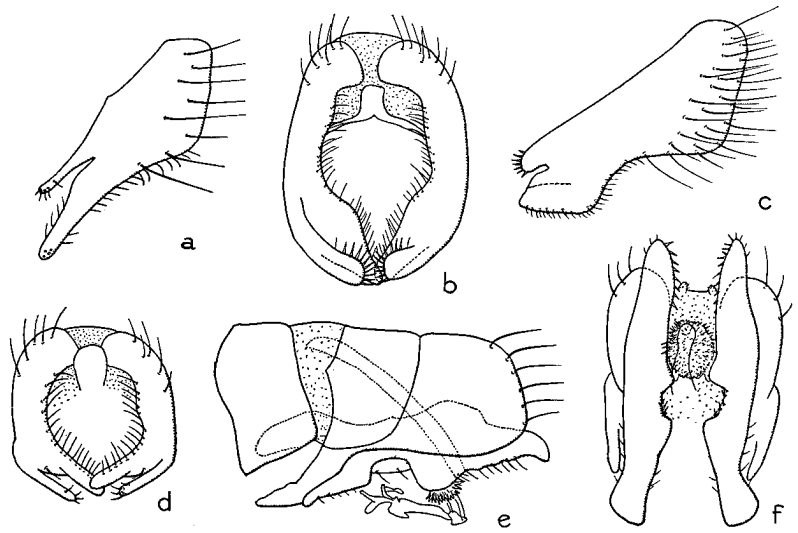

FIGURE 5.—**a,** *Canaceoides panamensis,* male genitalia, lateral view; **b, c,** *C. nudata,* male genitalia: *b,* ventral view; *c,* lateral view. **d,** *C. panamensis,* male genitalia, ventral view. **e, f,** *C. chilensis,* male genitalia; *e,* lateral view; *f,* ventral view.

United States. California: Los Angeles County, Feb. 28, 1915, M. C. Van Duzee, 2 males, 5 females (CAS); Pacific Grove, May 1906, 2 males (USNM); Monterey, Sept. 25, 1934, Melander, 1 male (ANSP); Point Lobos, Feb. 11, 1948, Wirth, 11 males, 13 females; Moss Beach, March 21, 1948, Wirth, 1 male, 2 females; San Leandro, Jan. 14, 1948, Wirth, 2 males, 2 females; Santa Barbara, July 6, 1917, Aldrich, 1 male, 2 females (USNM); Laguna, Aug. 13, 1932, Aldrich, 1 male, 2 females (USNM); Laguna, Aug. 13, 1932, Aldrich, 1 male, 4 females (ANSP); San Diego, Aug. 3, 1932, Aldrich, 3 males, 2 females (USNM). Washington: Ilwaco, June 28 to July 12, 1925, Melander, 2 males, 3 females (ANSP).

Hawaiian Islands. Oahu: Waimea, Jan. 15, 1946, Wirth, 24 males and females; Rabbit Island, Aug. 30, 1946, Wirth, 1 female; Koko Head, June 25, 1946, Wirth, 1 female; Lanikai, Dec. 1945, Wirth, 1 male; Maile, Jan. 8, 1946, Wirth, 1 female; Sand Island, May 22, 1946, Wirth (light trap), 1 male. Kauai: Kilauea, Sept. 8, 1946, Wirth, 1 female; Nawiliwili, Sept. 7, 1946, Wirth, 1 female. Hawaii: Hilo, Dec. 1945, Wirth, 1 female.

Canaceoides panamensis (Curran), new combination (fig. 5, *a, d*).

Procanace panamensis Curran, Calif. Acad. Sci., Proc. IV, **21**: 161, 1934 (Canal Zone; type male in American Museum of Natural History).

Male. Length 1.75 mm. Frons pale brownish, gray pollinose toward anterior border; face and cheeks whitish pollinose; antennae black; thorax black, cinereous pollinose, dorsum brownish; legs blackish, femora paler and cinereous pollinose; wings brownish; halteres and palpi yellow; abdomen greenish black with pale-brown pollen. Frontal orbits with the interposed setae rather strong; ocellars long, postocellars weak and gently diverging; outer verticals strong; cheeks with three strong upwardly curved bristles besides the incurved one at vibrissal angle; apical bristle of palpi weak; antennae with third segment as wide as long, rounded; arista pubescent. Scutellum with a pair of discal hairs in addition to the four marginals; mesopleura with a single downwardly directed bristle; only one sternopleural.

Male genitalia (fig. 5, *a, d*) with ventral processes of ninth tergite very long and slender, the anterodorsal lobe about 0.6 times as long as the posteroventral, rod-shaped with about six distinct apical spines; the posteroventral lobe densely fringed with long hairs on inner margin and on posterior margin toward base. Female genitalia as in *C. nudata* (Cresson).

Panama: Patilla Point, Canal Zone, Jan. 15, 1929, Curran, 1 male (type), 1 female (AMNH).

This species is almost identical with *C. nudata* (Cresson) in appearance, but is readily distinguished by the long slender lobes of the ventral processes of the male genitalia, which are very short and blunt in *C. nudata.*

Canaceoides chilensis (Cresson) (fig. 5, *e, f*).

Canace chilensis Cresson, Dipt. Patagonia and South Chile 6 (2): 116, 1931 (Chile; type male in British Museum).

Canaceoides chilensis, Cresson, Am. Ent. Soc., Trans. **60**: 221, 1934.

Male, female. Length 2.7 mm. Black, opaque; brassy to coppery tinged above; bluish gray pruinose below and on abdomen; halteres whitish yellow.

Frons uniform metallic; mesofrons setulose, a strong interfrontal at level of anterior ocellus; three strong fronto-orbitals curved over eyes; third antennal segment as broad as long; palpi with several subapical setae. Face with narrow interantennal area forming carina; cheeks with 4 to 6 stout bristles, lower buccae setulose. Mesonotum setulose; four pairs of strong dorsocentrals; one weak humeral; two weak notopleurals; one strong presutural; two strong supra-alars; four marginal scutellars; one strong mesopleural; one sternopleural. Legs with strong erect setose hairs, fore femora with a ventroposterior series of four long curved bristles.

Abdomen strongly setulose; eighth tergite of female with a subdorsal pair of long slender hairs and scattered long setae; dorsal lamellae of ovipositor very long, slender, separate nearly to base, nearly bare, with a subbasal dorsal seta and a pair of short flattened appressed apical brown spines; ventrolateral sclerites each with a row of six long, curved brown spines. Male genitalia (fig. 5, *e, f*) with ventral processes of ninth tergite very large and heavily sclerotized; infolded toward midline and prolonged forward as a submedian pair of flattened, spatulate processes appressed to the ventral surface of the abdomen, the apices overlapping and extending forward to the fourth segment.

Chile: Antofagasta, May 1912, Porter, 3 females (USNM); Tocopilla, April 10, 1931, sea beach, Bullock, 2 males, 4 females (USNM).

Canaceoides species.

A single female from Antofagasta, Chile, May 1912, C. E. Porter in the ANSP collection resembles *C. nudata* (Cresson) and *C. panamensis* (Curran), but it is in such poor condition that closer comparison is impossible.

Genus **Nocticanace** Malloch

Nocticanace Malloch, B. P. Bishop Mus., Bull. **114**: 4, (1933) 1935 (genotype: *Nocticanace peculiaris* Malloch, monobasic).

Mesofrons not differentiated, without marginal setae, except a pair of strong interfrontal bristles nearly in line with anterior ocellus; three pairs of fronto-

orbitals; ocellars strong, postocellars minute. Face concave in profile below antennae, more or less carinate, bare; three bristles on cheek. Mesonotum with four pairs of dorsocentrals; anterior notopleural absent; four marginal scutellars; sternopleura and mesopleura each with one bristle. Female abdomen with dorsal lamellae of genitalia bifid half their length, each lobe with strong apical and subapical flattened spines and series of short fine hairs; eighth tergite with pair of long hairs reaching apex of lamellae; lobes of eighth sternite each bearing a number of stout setae or hooks. Male abdomen with ventral processes of ninth tergite usually rather broad, flattened, and convex, without long hairs, the anterior margin often modified.

The following key is provisional, as I have not seen *N. galapagensis* (Curran), *N. mahensis* (Lamb), and *N. caffraria* (Cresson).

Key to the species of Nocticanace

1. Halteres brown; large species, length 3 mm ..... **N. galapagensis**
   Halteres yellow; length under 2.5 mm 2
2. Legs uniformly brownish or grayish black 3
   Legs with knees and bases of tarsi yellowish; ventral process of male genitalia with short anterior thumb and slender posterior finger ..... **N. marshallensis**
3. Color uniformly dull brownish black; ventral process of male with sharp-pointed angular apex ..... **N. zimmermani**
   Color dull brown to black above; face, cheeks, and pleura more or less silvery to light-gray pruinose 4
4. Mesonotum brownish 5
   Mesonotum dark gray ..... **N. mahensis**
5. Sternopleural bristle absent ..... **N. caffraria**
   Sternopleural bristle present; ventral process of male with posterior apex pointed, the anteromesal corner flattened, cupped, and bluntly rounded ..... **N. peculiaris**

Nocticanace peculiaris Malloch, B. P. Bishop Mus., Bull. **114**: 4, (1933) 1935 (Marquesas Islands; type male in Bishop Museum). (See figure 6, *a, b, e.*)

Male, female. Length 2 mm. Dull black; frons, mesonotum, and scutellum brownish pollinose; mesonotum gray-dusted laterally; pleura, abdomen, face, and cheeks white-dusted; legs black; wings grayish hyaline; halteres pale yellow.

Mesofrons not differentiated, a few setae at anterior margin of frons; a pair of interfrontals at level of anterior ocellus; ocelli minute and widely spaced; three pairs of fronto-orbitals with setulae between; face slightly carinate between antennae; cheeks with three bristles and a pair of minute setae below and between. Mesonotum with four pairs strong dorsocentrals; anterolateral angle setulose; anterior notopleural and prescutellar acrostichals absent; sternopleura and mesopleura each with one bristle and a number of strong setulae.

Ninth tergite of male genitalia (fig. 6, *a, b;* Mangareva) with inner margin of ventral processes expanded, flattened and folded mesad, the internal

side cupped, the external side convex and pubescent, ventromesal apex bluntly rounded. Dorsal lamellae of female ovipositor (fig. 6, *e*) slender, apical dorsal spines long and flattened, preapical dorsal setae more or less spine-like.

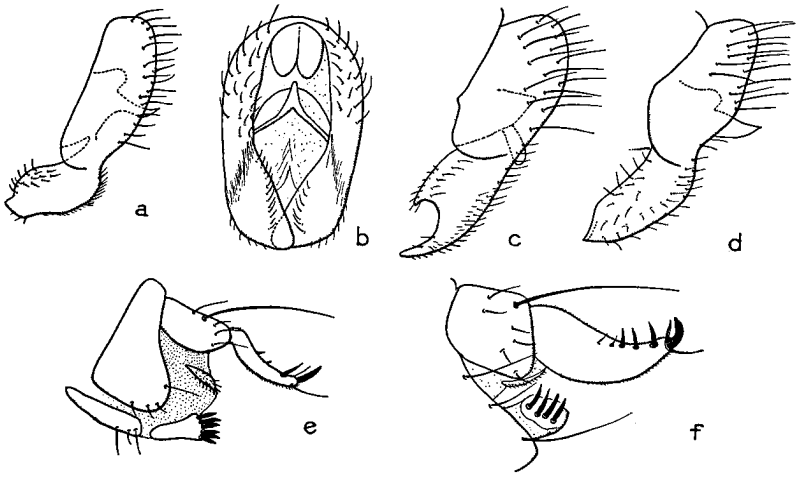

FIGURE 6.—**a, b,** *Nocticanace peculiaris,* male genitalia: *a,* lateral view; *b,* ventral view. **c,** *N. marshallensis:* male genitalia, lateral view. **d,** *N. zimmermani,* male genitalia, lateral view. **e,** *N. peculiaris,* female genitalia, lateral view. **f,** *N. zimmermani,* female genitalia, lateral view.

Marquesas Islands: Eiao, Vaituha, Oct. 2, 1929, Adamson, 1 male, 3 females (BPBM, type series); Hivaoa, Tahauku, July 10, 1929, Mumford and Adamson, 2 females (BPBM).

Society Islands: Tahiti, Papeete, June 27, 1927, MacDaniels, 1 female (BPBM).

Mangareva Islands: Mangareva, Atituiti, May 25, 1934, Zimmerman, 9 males, 9 females (BPBM); Taraururoa, May 28, 1934, Zimmerman, 16 males, 16 females (BPBM); Makaroa, May 31, 1934, Zimmerman, 5 males, 13 females (BPBM).

Austral Islands: Tabai [Tubuai?], Rautaro, Aug. 19, 1934, Zimmerman, 3 males, 6 females (BPBM).

Marianas Islands: Rota, June 23, 1946, Townes, 3 males, 6 females (USNM); Agrihan, Aug. 12, 1945, Borror and Holder, 2 males, 3 females (USNM); Guam, Point Ritidian, June 1945, Gressitt, 1 male (USNM); Guam, Tarague, July 10, 1929, Bryan, 2 males, 4 females (BPBM).

Okinawa: Chizuka, Bohart and Harnage, 1 female (USNM).

Nocticanace zimmermani, new species (fig. 6, *d, f*).

Male, female. Length 2.0 to 2.4 mm., wing 2.1 mm. by 0.8 mm. Very near *N. peculiaris* Malloch, chaetotaxy almost identical. Color uniformly dull brownish black, including face, pleura, and legs; face, cheeks, and pleura with only slight violaceous gray pruinescence; squamae brown, halteres yellowish. Dorsal lamellae of female ovipositor (fig. 6, *f*) with preapical dorsal setae well-developed and spine-like, about half as large as the flattened apical spines. Male genitalia (fig. 6, *d*) with the ventral processes of the ninth tergite not greatly flattened or bent, greatest width at base, abruptly narrowed at distal third on anterior side with a sharp pointed angular apex; a patch of long setae near base on dorsomesal surface.

Rapa Island, Karapo Rahi Islet, July 18, 1934, holotype male, allotype, 118 male and 106 female paratypes, Zimmerman (BPBM).

Although very close to the widespread species *N. peculiaris* Malloch, this species is quite distinct in the uniform dull brownish-black color and in the shape of the ventral process of the ninth tergite in the male genitalia. In these respects it resembles *N. galapagensis* (Curran). I am pleased to name this species in honor of its collector, E. C. Zimmerman, who kindly made available a large series of Ephydridae and Canaceidae from the Bishop Museum collections.

Zimmerman (15, pp. 128-130) calls attention to the unique biota of Rapa and suspects that part of it at least may have come from a much older and extensive island to the east, represented today by Marotiri, a group of low rocky islets.

Nocticanace marshallensis, new species (fig. 6, *c*).

A small dark bluish-gray pruinose species; ninth tergite of male with ventral process shaped like the fixed portion of a chela.

Male, female. Length 2.1 mm., wing 2.0 mm. by 0.7 mm. Dark gray; frons, dorsum of thorax, and abdomen dull violaceous pruinose, with brownish cast toward middle; face, cheeks, humeri, and pleura dusted with light bluish gray, the face and cheeks more whitish; antennae, proboscis, legs, and wings brownish; femora and tibiae bluish gray in middle, trochanters, knees and base of tarsi yellowish; halteres and squamae yellowish; all bristles and setae black.

Three strong lateroclinate fronto-orbitals with small anterior setae interspersed in line; a pair of strong proclinate preocellars halfway between anterior ocellus and lateral margin of frons; ocellars strong and lateroclinate, ocellar triangle on a convexity with about eight small scattered setae; inner and outer verticals strong. Third antennal segment about as broad as long; arista short pubescent. Three strong upcurved genal bristles in an oblique line from vibrissal angle to middle of lower eye margin, the posterior two with a small seta between.

Four strong pairs of dorsocentrals; one strong humeral; one strong posterior notopleural; one strong presutural; two strong supra-alars; a row of fine setae

just inside humeri; four strong marginal scutellars, the posterior pair strongly upcurved; a strong bristle on both mesopleuron and sternopleuron, the former with scattered setae and the latter with one fine hair. Anterior femora with strong dorso- and ventroposterior rows of about five long curved bristles, other hairs on legs moderate; apical tarsal segments strongly flattened.

Abdomen with rows of strong setae; seventh tergite of female strongly excised in middle, sides with about four pairs of short hairs; eighth tergite with a pair of long dorsal bristles and a row of about five lateral pairs of shorter hairs. Dorsal lamellae of ovipositor separated half their length, stout and upcurved, apices with outer pair of long black spines, dorsal margin with about five long fine setae; lobes of eighth sternite with about six very long, curved, black spines. Ninth tergite of male genitalia (fig. 6, *c*) with ventral processes nearly as long as height of main portion; distal half of process with a curved anterior emargination forming a short anterior thumb and a very slender posterior finger.

Marshall Islands: Ailinglapalap Atoll, Bigatyeling Island, Aug. 25, 1946, Townes, holotype male, allotype, 26 male and 18 female paratypes (type no. 59968, USNM); Eniwetok Atoll, Aomon, May 16, 1946, Townes, 18 males, 5 females; Eniwetok Atoll, Japan Island, May 17, 1946, Townes, 1 female; Bikini Atoll, Bikini Island, Aug. 11, 1947, Cole and Bayer, 2 males, 1 female; Murle Atoll, Kwajalein, April 22, 1948, Maehler, 3 females (all from USNM collection).

Nocticanace caffraria (Cresson), new combination.

Canaceoides caffraria Cresson, Am. Ent. Soc., Trans. **60**: *222*, 1934 (East London, Cape Province; type male, in Transvaal Museum).

Male. Length 1.75 mm. Black; opaque, gray to silvery below, brownish above; halteres yellow, wings smoky. Frons much narrowed in front, mesofrons far from attaining lunular margin, bare except one pair of interfrontals nearly in line with anterior ocellus; three strong fronto-orbitals with interposed setulae. Face as broad as long, concave in profile; cheeks with one strong incurved bristle at vibrissal angle and two strong upcurved posterior bristles. Dorsocentrals 1:3, no mesonotal setulae except a few on humeri; scutellum bare with four marginals; mesopleura and sternopleura, at most, sparingly setose, former with one bristle. (Taken from original description.)

The change in generic combination is made on the strength of the presence of three bristles on the face and cheeks rather than four as in *Canaceoides*. A more positive character is the presence or absence of the anterior notopleural which, unfortunately, is not stated in Cresson's description. Moreover, South Africa is outside the present known geographic range of *Canaceoides*.

Nocticanace mahensis (Lamb), new combination.

Canace mahensis Lamb, Linn. Soc. London, Trans. II, Zool. **15**: 328, 1912 (female, Mahe, Seychelles).

Female. Length, 1.75 mm. Color uniformly dark gray; face, clypeus, pleura, and legs silvery; antennae black. Three strong lateroclinate fronto-orbitals; one pair of interfrontals midway between ocellars and fronto-orbitals; ocelli widely spaced, ocellars midway between lateral ocelli and anterior ocellus; inner verticals convergent, outer verticals finer. Three equally spaced genal bristles, the anterior down-curved, the other two up-curved over eyes; antennae with arista faintly pubescent. Four pairs of long dorsocentrals; four marginal scutellars, the basal pair directed backward, the apical pair upward; disk of scutellum and mesonotum without setae. Legs with five long bristles on fore femora. Abdomen with a pair of long bristles on last tergite. (Taken from original description.)

Lamb (7) states that this species was collected from seaweed on the beach at Long Island, Mahe, in the Seychelles. The generic combination is made on the basis of Lamb's description and figure of the bristling of the head, the characteristic direction of the scutellar bristles, and the presence of a pair of long bristles on the last abdominal tergite.

Nocticanace galapagensis (Curran), new combination.

Procanace galapagensis Curran, Calif. Acad. Sci., Proc. IV, **21**: 160, 1934 (Albemarle Island, Galapagos Islands; type female in California Academy of Sciences).

Female. Length, 3 mm. Black; face and cheeks gray pollinose; palpi brown; antennae black; thorax black with dull-brown tinge in some lights; legs and abdomen black; wings, squamae, and halteres brown. Three pairs of strong, divergent fronto-orbitals with fine setae between; a pair of strong interfrontals at level of anterior ocellus; ocellars strong and divergent; postocellars weak and parallel; three strong genal bristles; palpi with apical bristles, antennae with third segment rounded apically, somewhat longer than wide; arista pubescent. Four pairs of strong dorsocentrals with an irregular row of setae inside each row; two pairs of marginal scutellars, the disk bare; mesopleura with one bristle in middle of ventral margin and another near posterior margin with scattered short bristly hairs; two sternopleurals. Lamellae of ovipositor moderately long with three short stout bristles on outer side apically. (Taken from original description.)

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