

Studies of Gymnomyzinae (Diptera:
Ephydriidae), VI: A Revision of the
Genus *Glenanthe* Haliday
from the New World

WAYNE N. MATHIS

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Studies of Gymnomyzinae (Diptera:
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ABSTRACT

Mathis, Wayne N. Studies of Gymnomyzinae (Diptera: Ephydriidae), VI: A Revision of the Genus *Glenanthe* Haliday from the New World. *Smithsonian Contributions to Zoology*, number 567, 26 pages, 59 figures, 1995.—New World species of the genus *Glenanthe* are revised. As perspective for this revision, the tribe Lipochaetini, in which *Glenanthe* is placed, is characterized and discussed, and a key to the four included genera (*Glenanthe*, *Homalometopus* Becker, *Lipochaeta* Coquillett, and *Paraglenanthe* Wirth) is provided. *Glenanthe* is demonstrated to be a monophyletic lineage within Lipochaetini. Ten New World species of *Glenanthe* are now known, including six new species as follows (type locality in parenthesis): *G. caribea* (Belize. Stann Creek District: Wee Wee Cay), *G. salina* (United States. Missouri: Howard Co., Boonslick Salt Spring), *G. kobbe* (Panama. Canal Zone: Kobbe Beach), *G. bella* (Dominica (West Indies): Cabrits), *G. ruetzleri* (Belize. Stann Creek District: Twin Cays, Aanderaa Flats), *G. neotropica* (Argentina. Cordoba: L.V. Mansilla, Salina, Route 60).

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Contents

	<i>Page</i>
Introduction	1
Methods	1
Acknowledgments	2
Tribe LIPOCHAETINI Becker	2
Annotated Key to Genera of Lipochaetini Becker	3
Genus <i>Glenanthe</i> Haliday	4
Key to Species of <i>Glenanthe</i> from the New World	5
1. <i>Glenanthe fascipennis</i> Sturtevant and Wheeler	6
2. <i>Glenanthe interior</i> Chillcott	8
3. <i>Glenanthe litorea</i> Cresson	9
4. <i>Glenanthe caribea</i> , new species	12
5. <i>Glenanthe salina</i> , new species	15
6. <i>Glenanthe kobbe</i> , new species	17
7. <i>Glenanthe bella</i> , new species	18
8. <i>Glenanthe ruetzleri</i> , new species	20
9. <i>Glenanthe willinki</i> Lizarralde de Grosso	23
10. <i>Glenanthe neotropica</i> , new species	24
Literature Cited	25

Studies of Gymnomyzinae (Diptera: Ephydriidae), VI: A Revision of the Genus *Glenanthe* Haliday from the New World

Wayne N. Mathis

Introduction

Shore flies of the genus *Glenanthe* Haliday are among the most easily recognized at the generic level largely because of the unusual shape of the compound eye, which is pyriform or like an upside down pear. Certainly among shore flies this eye shape is unique and not only characterizes the genus but is an autapomorphy that confirms the monophyly of the genus.

Although easily recognized and relatively abundant in preferred habitats, specimens are uncommon in collections, due in part to their diminutive size. Few specimens are more than two millimeters in length, and frequently they are smaller than the mesh size of many collecting bags, thus allowing the flies to slip through even when netted.

Their small size and rarity in collections are factors that have detracted from their study, resulting in their neglect and our fragmentary knowledge of the genus. Few species have been described, these usually as isolated descriptions, and the genus has never been substantively revised on even a regional level. Moreover, virtually nothing is known about their natural history or immature stages.

Although largely overlooked, the genus was described relatively early in the nomenclatural history of shore flies (Haliday, 1839) as a subgenus of *Hydrellia* Robineau-Desvoidy, with *H. ripicola* Haliday as its type species by monotypy. Loew (1860) apparently first accorded generic

status to the group, and its type species remained the only included species until late in the 19th century when Becker (1896) described *G. fuscinervis* from specimens collected in Norway. The latter is now considered a junior synonym of the type species (Papp, 1979). In the Old World, four additional species (*G. bimaculata* Hendel, 1934, Mongolia; *G. iranica* Canzoneri and Rampini, 1992, Iran; *G. ismayi* Mathis, 1992, Papua New Guinea; *G. nigripes* Czerny, 1909, Spain) have been described.

In the New World, Cresson (1925) described the first species, *G. litorea*, which remained the only known species from the Americas until Sturtevant and Wheeler (1954) described *G. fascipennis* from specimens collected along the Gulf Coast of Texas. Ten years later, Chilcott (1964) described *G. interior* from specimens collected in Manitoba, Canada, and Lizarralde de Grosso (1977) described the first South American species, *G. willinki*, from Argentinean specimens.

Over the last two decades, I have accumulated specimens that represent new locality records and several new species, the latter primarily from the neotropics. The purpose of this revision is not only to revise the species occurring in the New World but also to provide an important segment to the puzzle of the phylogeny of the tribe Lipochaetini. A secondary purpose is to identify, describe, and provide names for taxa, especially new species, that are part of faunal studies in Belize and the West Indies.

METHODS.—The methods used generally in this study were explained previously (Mathis, 1986a, 1986b). Because of the small size of the specimens, study and illustration of the male terminalia required use of a compound microscope. To assure more effective communication about structures of the male terminalia, I have adopted the terminology of other workers in Ephydriidae (see references in Mathis, 1986b). Usage of these terms, however, should not be taken as an endorsement of them

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from a theoretical or morphological view over alternatives that have been proposed (Griffiths, 1972; McAlpine, 1981; Wood, 1991; Zatwarnicki, 1992). Rather, I am deferring to tradition until the morphological issues are better resolved. The terminology for structures of the male terminalia is provided directly on Figures 1–4 (*Glenanthe fascipennis*) and is not repeated for comparable illustrations of other species.

Two venational ratios are used commonly in the descriptions and are defined here for the convenience of the user (ratios are averages of three specimens).

1. Costal vein ratio: the straight line distance between the apices of veins R_{2+3} and R_{4+5} /distance between the apices of veins R_1 and R_{2+3} .

2. M vein ratio: the straight line distance along vein M between crossveins (r-m and dm-cu)/distance apicad of crossvein dm-cu.

ACKNOWLEDGMENTS.—As is typical of revisionary studies, the assistance of many people and institutions has contributed to the final product, and I gratefully acknowledge and thank all who have assisted. In particular I thank the following institutions and their respective curators for the loan of specimens.

ANSP	Academy of Natural Sciences of Philadelphia, Pennsylvania (Don Azuma and Jon K. Gelhaus)
CAS	California Academy of Sciences, San Francisco, California (Paul H. Arnaud, Jr.)
CNC	Canadian National Collection, Ottawa, Ontario, Canada (Bruce Cooper)
DLD	Personal collection of D.L. Deonier, Gainesville, Florida
IML	Instituto Miguel Lillo, Tucumán, Argentina (M. Lizarralde de Grosso)
UMSP	University of Minnesota, St. Paul, Minnesota (Philip J. Clausen)
USNM	former United States National Museum, collections now in the National Museum of Natural History, Smithsonian Institution, Washington, D.C.
UTA	University of Texas, Austin, Texas (collection on long-term loan at the Smithsonian Institution, Washington, D.C.)
WSU	Washington State University, Pullman, Washington (Richard S. Zack)

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Tribe LIPOCHAETINI Becker

Lipochaetini Becker, 1896:275 [as Lipochaetinae; Type genus: *Lipochaeta* Coquillett, 1896].

DIAGNOSIS.—*Head*: Frontal vitta (or ocellar triangle) setulose; ocellar seta either greatly reduced or absent (sometimes with a pair of intrafrontal setae that are slightly larger than other setulae, this pair inserted in front of anterior ocellus); pseudopostocellar seta reduced or lacking; fronto-orbital setae 3 (reduced secondarily in *Lipochaeta*), anterior 2 setae proclinate, posterior seta reclinate. Pedicel lacking prominent, spine-like seta; arista with cuticular hair dorsally and ventrally, appearing macropubescent or brush-like. Eye bearing numerous interfacetal microsetulae (apparently from each interfacet). Genal seta reduced or lacking.

Thorax: Dorsocentral setae weakly developed, only posteriormost pair conspicuous; acrostichal setulae in 2–4 rows, frequently with a prescutellar pair better developed; postsutural supra-alar seta lacking; frequently postpronotal and presutural supra-alar seta reduced or lacking; posterior notopleural seta inserted above level of anterior seta. Wing with vein R_{2+3} long, extended nearly to level of apex of vein R_{4+5} . Legs lacking conspicuous setae; femora and tibiae usually gray to light brown; tarsi yellow.

Abdomen: 5th tergite of male longer than 4th. Male terminalia as follows: epandrium emarginate posteriorly or incomplete dorsally; surstylus well developed, usually elongate, frequently as long or longer than epandrium; aedeagus elongate, slender, tubular, apex with flap recurved posterodorsally, apical flap in groove at rest; ejaculatory apodeme present, compressed laterally; aedeagal apodeme L-shaped, sometimes with extended ventromedial process; gonites (pre- and postgonites) lacking, possibly fused with hypandrium; hypandrium well sclerotized, usually V- or U-shaped; 5th sternite deeply V- or U-shaped into which the surstyli and aedeagus lie at rest.

NATURAL HISTORY.—This tribe is unusually tolerant of alkaline or saline aquatic environments, and species of most genera occur on seashores or are associated with inland aquatic habitats that are saline or alkaline.

DISCUSSION.—The nomenclatural history of Lipochaetini and its included taxa reflect the evolution and development of classifications within the Ephydriidae, especially the transition from classifications based on overall similarities and differences to those based on cladistic approaches. Becker (1896)

first described this tribe as a subfamily for the peculiar genus, *Lipochaeta* Coquillett, which is highly modified structurally for psammophilous habitats that are associated with maritime beaches of the New World (Cheng and Lewin, 1974). Although clearly an ephydrid, and so recognized by most subsequent workers, Williston (1897:8) felt that its singular and remarkable habitus indicated an affinity with the subfamily "Ochthiphilinae in the vicinity of *Rhichnoessa*," a genus of the family Tethinidae. *Lipochaeta* is indeed an oddity, which is perhaps why E.T. Cresson, Jr., the primary specialist on the Ephydridae during the first half of this century, was silent on its placement. Cresson's successors (Sturtevant and Wheeler, 1954; Wirth, 1965, 1968; Mathis, 1977; Cogan, 1980), although not conferring subfamilial rank, did accord tribal status to the genus in the subfamily Parydrinae, because they apparently felt that it was related to Parydrini and Hyadinini. Giordani Soika (1981), however, was of the opinion that the tribe Lipochaetini is related to *Isgamera* Giordani Soika and *Asmeringa* Becker, two Old World genera that occur on the seashores of the Mediterranean and Africa. Giordani Soika suggested that the occurrence of Lipochaetini in the New World was due to continental drift and that the group has greater antiquity than was previously thought. I (Mathis, 1984a) concurred with Giordani Soika in removing *Lipochaeta* from Parydrinae and placing it close to *Isgamera* and *Asmeringa* in the subfamily Gymnomyzinae.

All of the above cited studies were based on phenetic or overall differences and similarities, and although the placement of *Lipochaeta* did change from Parydrinae to Gymnomyzinae, its position close to *Isgamera* and *Asmeringa* is incorrect. Certainly the latter two genera are similar externally, but these characters, for the most part, represent independent and convergent adaptations to psammophilous environments that are associated with seashores.

Another advance in the phylogenetic position and composition of Lipochaetini was the recognition that the tribe Atissini, as then characterized, was polyphyletic and included genera

that are more closely related to *Hecamede* Haliday (Hecamedini; Mathis, 1992) and to *Lipochaeta* (Lipochaetini; Mathis, 1991; Zatwarnicki, 1992). Zatwarnicki (1992) suggested evidence indicating that the tribe Atissini is related to taxa in the subfamily Hydrelliinae, whereas Hecamedini and Lipochaetini are in the subfamily Gymnomyzinae. The principal source of characters (synapomorphies) for these studies was structures of the male terminalia. The latter studies, especially Zatwarnicki (1992), indicate that the tribe Lipochaetini is closely related to the tribe Hecamedini and includes four genera (date and author(s) who first placed the genus in Lipochaetini are noted in parenthesis): *Glenanthe* (Mathis and Zatwarnicki, 1990), *Paraglenanthe* Wirth (Zatwarnicki, 1992), *Lipochaeta* (Becker, 1896), and *Homalometopus* Becker (Mathis, 1984b). Recent revisionary and phylogenetic studies of genera of the tribe are Mathis (1984b) and Munari (1988) on *Homalometopus*.

Although the tribe Lipochaetini and each of the included genera are readily characterized, often with substantial evidence that they are monophyletic, the relationships among the genera are not well understood. In the key that follows, for example, I have included numerous characters, nearly all autapomorphies, that facilitate identification of the genera but contribute virtually nothing to resolution of their phylogenetic relationships. A further complicating factor is the debatable status or polarity of the few characters that may indicate relationships. For example, a gaping oral cavity and a wide clypeus are character states that are common to *Lipochaeta* and *Homalometopus*, whereas a narrow oral opening and clypeus occur in *Glenanthe* and *Paraglenanthe*. The problem is that both the narrow and wide conditions occur in the outgroup, Hecamedini, as well as commonly elsewhere in the Ephydridae, so that it is unclear which character state is apomorphic within the Lipochaetini. A more definitive study at the tribal level, which is beyond the scope of this paper, will be needed to clarify these important issues.

Annotated Key to Genera of Lipochaetini Becker

1. Eye pyriform, distinctly narrowed ventrally; gena short, less than one-fourth eye height; katepisternal seta present along the posterior margin, moderately well developed *Glenanthe* Haliday
(15 species (including 6 that are described herein), worldwide)
- Eye oval or round, not distinctly narrowed ventrally; gena high, one-third or more of eye height; katepisternal seta greatly reduced or lacking 2
2. Antenna reduced, inserted in well-separated cavity, arista atrophied, bud-like; face short, height subequal to length of reduced antenna; clypeus band-like; oral opening gaping; body setae and setulae pale; wing between subcosta and vein R₁ sclerotized, yellow, stigma-like *Lipochaeta* Coquillett
(1 species, *L. slossonae* Coquillett, New World; 2 additional species, both from Chile, are known but undescribed)

- Antenna normally developed, not in deep cavity, arista as long as flagellomere 1; face well developed, height much more than length of antenna; clypeus variable; oral opening narrow or gaping; setae and setulae largely black; wing between subcostal vein and vein R_1 membranous, not stigma-like 3
3. Mesofrons large, occupying most of frons, plate-like, subrectangular, uniformly and evenly setulose; ventral facial margin flat; clypeus wide, band-like; oral opening large, gaping *Homalometopus* Becker
(7 species, Eastern Hemisphere (Mediterranean);
Mathis, 1984b; Munari, 1988)
- Frons lacking differentiated mesofrons, at most with frontal or ocellar triangle or vitta that is weakly differentiated from remainder of frons; ventral facial margin emarginate; clypeus narrow, exposed through ventral facial emargination; oral opening small *Paraglenanthe* Wirth
(3 species, New World (Caribbean); Wirth, 1956)

Genus *Glenanthe* Haliday

Glenanthe Haliday, 1839:404 [as a subgenus of *Hydrellia* Robineau-Desvoidy; type species: *Glenanthe ripicola* Haliday, by monotypy].—Loew, 1860:16 [accorded generic status].—Sturtevant and Wheeler, 1954:249 [review of Nearctic species].—Wirth, 1965:737 [Nearctic catalog]; 1968:6 [Neotropical catalog].

DIAGNOSIS.—Minute to moderately small shore flies, length 0.8 to 2.0 mm.

Head: Wider than high; frons densely microtomentose, with mesofrons undifferentiated; ocellar seta greatly reduced or lacking; 1 pair of intrafrontal setae (slightly larger than other intrafrontal setulae) inserted in front of anterior ocellus; numerous intrafrontal setulae; pseudopostocellar setae reduced, usually about $\frac{1}{3}$ to $\frac{1}{2}$ length of intrafrontal seta; 1 reclinate fronto-orbital inserted posteriad of 2 proclinate setae present; both inner and outer vertical setae present; ocelli arranged to form equilateral triangle. Antenna generally within shallow facial groove; arista slightly longer than first 3 antennal segments, bearing numerous short hairs above and below, appearing brush-like; pedicel bearing short proclinate dorsal seta. Eye pyriform (the principal distinguishing character for the genus), densely setulose. Face in profile very shallowly arched to flat vertically, lacking any prominence, dorsal portion of face between antennal bases carinate, carina frequently moderately wide and flat; oral margin from anterior view only slightly wider than narrowest distance between eyes, ventral margin shallowly emarginate; facial setae in 2 vertical series, with median row larger and mesocline, and with lateral row laterocline and inserted next to parafacial; gena short, at most one-fourth eye height; labella narrow, shorter than mediproboscis; palpus pale, mostly yellowish.

Thorax: Chaetotaxy moderately well developed, arranged in setal tracks as follows: acrostichal setulae in 2 to several rows, variable depending on species; prescutellar acrostichal setae usually well developed, inserted wide apart, distance more than between either seta and posterior dorsocentral seta, length subequal to that of posterior dorsocentral seta; dorsocentral track terminated posteriorly with larger seta, otherwise

lacking large setae; intra-alar setulae irregularly seriated; 1 postpronotal seta; presutural supra-alar seta reduced or not evident; postsutural supra-alar seta lacking; 1 postalar seta; 2 scutellar setae and with sparse, scattered setulae on scutellar disc; 2 notopleural setae, insertion of posterior one elevated above anterior one; 2 anepisternal setae along posterior margin and with several setulae along dorsal and posterior margins; katepisternal seta well developed, conspicuous; katepisternum also bearing 3 to 6 smaller setae, sometimes with setae in a vertical row anteriad of larger seta. Wing: membrane very pale milky white to pale tan; veins behind costa dark, yellowish brown to brown; vein R_{2+3} extended well beyond level of crossvein dm-cu, 3rd costal section at least 3 times longer than 2nd section; alular marginal setulae short, length less than half alular height. Halter pale, whitish yellow to yellow. Legs: usually lacking distinctive setae or ornamentation.

Abdomen: Fifth tergite of male visible dorsally, as long as combined length of 3rd and 4th tergites; 5th sternite U-shaped, with arms elongate, forming pocket into which the long aedeagus and surstyli rest. Male terminalia as follows: epandrium short in lateral view, not extended beyond posterior margin of cerci, notched posterodorsally; surstylus usually distinct from epandrium, much longer than wide, sparsely setulose, with setae long in some species and weakly developed in others; aedeagus long and very narrow; basiphallus tubular; ejaculatory apodeme usually flattened laterally, spatulate distally; distiphallus a flap or more complicated process that folds back on the basiphallus; gonites apparently vestigial or lacking, possibly fused with hypandrium; aedeagal apodeme more or less triangular in lateral view; hypandrium well developed, a pocket into which the rest of the genitalia are folded, variously shaped.

DISCUSSION.—*Glenanthe* is closely related to the other genera of the tribe Lipochaetini, as is evident from the structures of the male terminalia, especially the elongate surstyli, tubular aedeagus that bears an apical flap, and the absence of gonites. The genus is distinguished from other tribal species and genera by the unique shape of the eye, which is pyriform. The latter character is a synapomorphy that also

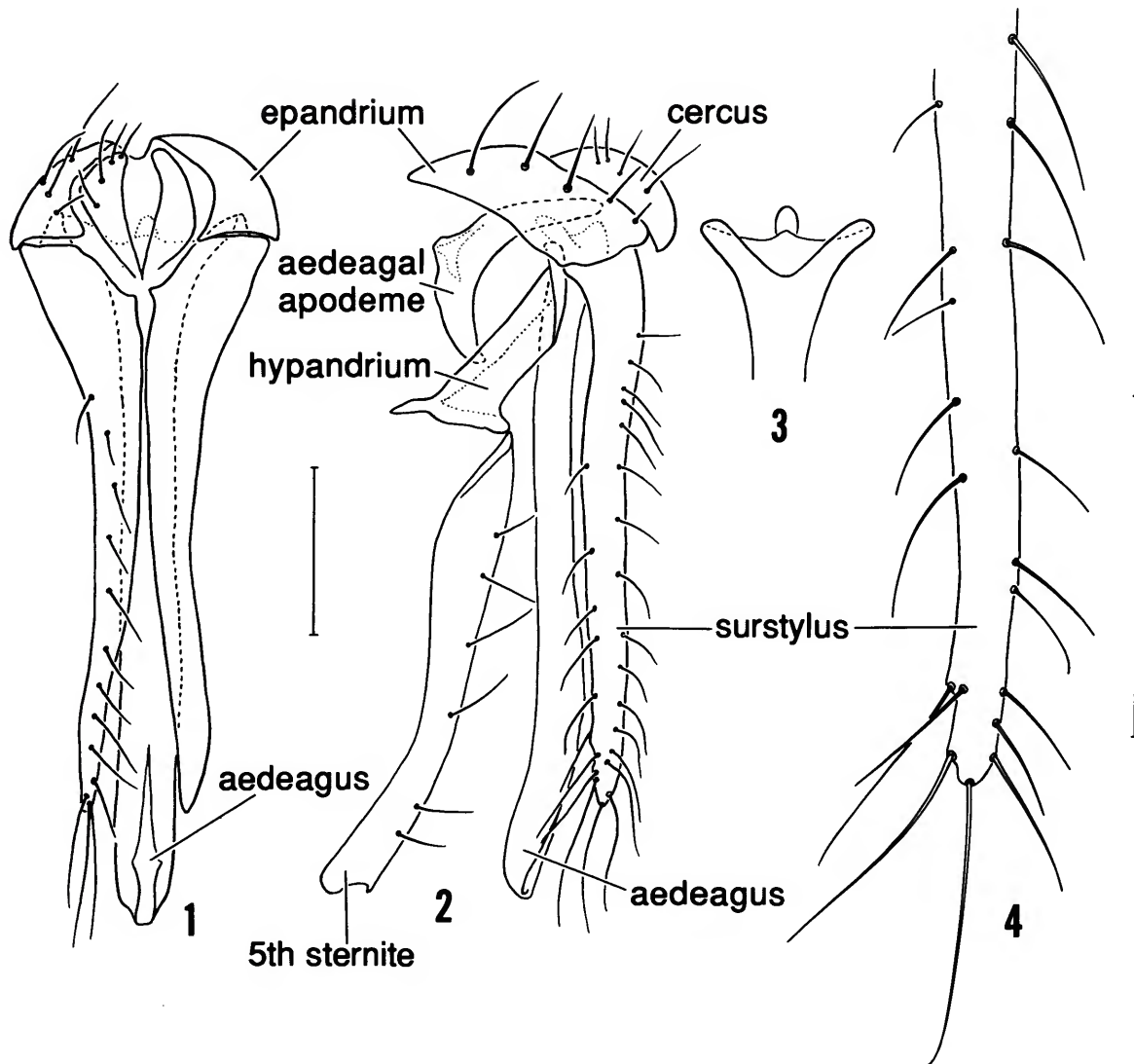
confirms the monophyly of the genus.

DISTRIBUTION.—This is the most widespread genus of the tribe Lipochaetini, with species occurring on most major continents within tropical and temperate zones. No species has

been described from the Afrotropics (Cogan, 1980; I have examined undescribed species from Nigeria and Zaire), however, and the Oriental (Cogan and Wirth, 1977) and Australasian/Oceanian regions are depauperate (Mathis, 1989, 1992).

Key to Species of *Glenanthe* from the New World

1. Wing with irregularly banded pattern of brown on a milky-white background . . . 2
 Wing uniformly hyaline, lightly infumate, or faintly milky white but lacking a pattern 3
2. Thorax brown to grayish brown except for 2 longitudinal, whitish gray stripes, dorsal stripe extended from postpronotum through notopleuron and onto alar area of mesonotum, ventral stripe extended across middle of anepisternum; color changes of wing abrupt, distinctly contrasted (Manitoba, Michigan, Ohio, and Ontario) 2. *G. interior* Chillcott
 Mesonotum, except notopleuron, and dorsal quarter of anepisternum tan to yellowish brown, otherwise thorax whitish gray and lacking distinct longitudinal stripes; color changes of wing gradual, blended (Texas) 1. *G. fascipennis* Sturtevant and Wheeler
3. Thorax with distinct gray stripe extended from postpronotum through notopleuron to alar region, contrasted with tan to golden tan coloration on either side; prominent prescutellar acrostichal setulae inserted far forward of posterior dorsocentral or postalar setae (Panama, Costa Rica, El Salvador) 6. *G. kobbe*, new species
 Thorax lacking stripe as described above; prescutellar acrostichal setulae inserted only slightly anterior of posterior dorsocentral or postalar setae 4
4. Abdomen sparsely microtomentose, subshiny, black, especially laterally and on 5th tergite. Thorax distinctly bicolored, mesonotum and dorsal third of anepisternum golden tan, thereafter ventrally gray to whitish gray. Antenna mostly to entirely yellowish orange (Dominica) 7. *G. bella*, new species
 Abdomen dull, microtomentose, gray to tan. Thorax not colored as above. Antenna mostly dark colored, at most flagellomere 1 partially yellowish orange 5
5. Palpus brown to blackish brown; antenna also dark colored 6
 Palpus usually wholly or partially yellowish, at least apex; flagellomere 1 variable, but frequently with some pale coloration 7
6. Fore basitarsomere of male normally developed, lacking distinct row of setae. Face whitish gray, contrasted with darker brown frons (widespread along the east coast of North America) 3. *G. litorea* Cresson
 Fore basitarsomere of male with closely set row of long setae on medialanterior near base. Face variable (Caribbean, Ecuador) 8. *G. ruetzleri*, new species
7. Mesonotum mostly silvery gray, only faintly light brown; frons mostly light brown 8
 Mesonotum mostly yellow or light brown to bronzish brown, mostly concolorous with frons 9
8. Surstylus in lateral view spatulate and with subapical, anterior surface evenly curved (Argentina, Curaçao) 9. *G. willinki* Lizarralde de Grosso
 Surstylus in lateral view more digitiform, and with a small, subapical, anterior nipple (Argentina) 10. *G. neotropica*, new species
9. Flagellomere 1 yellowish orange anteroventrally, dorsum faintly black; coloration of mesonotum and frons more light brown to bronzish; surstylus greatly elongate, over twice length of epandrium in lateral view (West Indies, Belize, and Panama) 4. *G. caribea*, new species
 Flagellomere 1 mostly blackish; coloration of mesonotum more yellowish or grayish light brown; surstylus short, about 1.5 times length of epandrium in lateral view (Nearctic, widespread) 5. *G. salina*, new species



FIGURES 1-4.—*Glenanthe fascipennis* (USA. Texas. Galveston: Galveston Island): 1, structures of the male terminalia (epandrium, cerci, surstyli, aedeagus), posterior aspect; 2, structures of the male terminalia (epandrium, cerci, surstyli, aedeagus, aedeagal apodeme, hypandrium, fifth sternite), lateral aspect; 3, base of aedeagus, posterior aspect; 4, apex of surstylus, lateral aspect. (Scale = 0.1 mm.)

1. *Glenanthe fascipennis* Sturtevant and Wheeler

FIGURES 1-5, 7

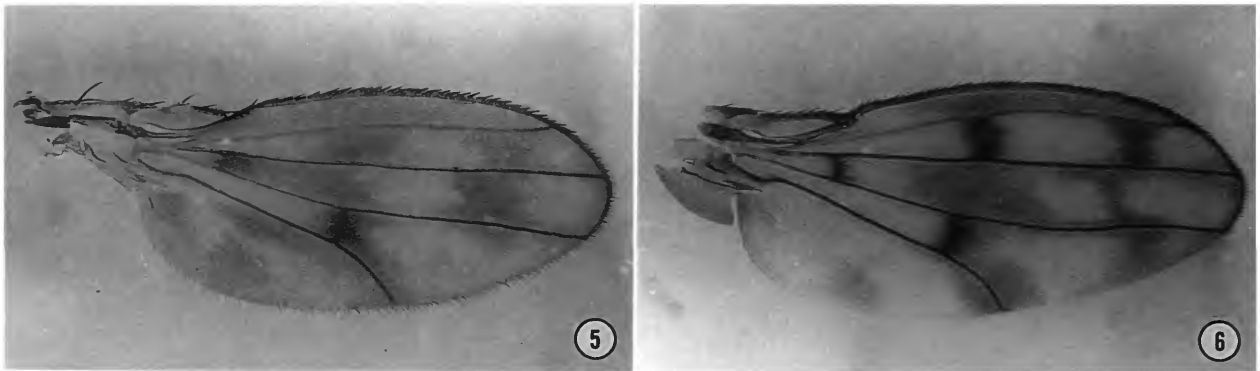
Glenanthe fascipennis Sturtevant and Wheeler, 1954:250.—Wirth, 1965:737 [Nearctic catalog].

DIAGNOSIS.—Wing patterned, with color changes gradual, blended; palpus pale, dull, yellow; antenna mostly pale, dull, yellow, flagellomere 1 with some blackish brown coloration dorsoapically; postpronotum, notopleuron, and alar area lacking a gray stripe; fore basitarsomere of male unadorned; and abdomen densely microtomentose, gray.

DESCRIPTION.—Small shore flies, length 1.1 to 1.4 mm; generally dull colored, light brown to gray, microtomentose.

Head: Face silvery white; frons tan, concolorous with mesonotum, fronto-orbits with anterior portion silvery white. Palpus and antenna usually dull yellowish except for blackish brown dorsoapical portion of flagellomere 1.

Thorax: Mesonotum, except notopleuron, and dorsal quarter of anepisternum tan to yellowish brown, otherwise thorax whitish gray to gray, lacking distinct longitudinal stripes. Wing (Figure 5) patterned, color with 3 irregular transverse bands or darkened areas subapically (apical one-fourth) and through



FIGURES 5, 6.—Wings: 5, *Glenanthe fascipennis*; 6, *G. interior*.

crossveins dm-cu and r-m, remainder of wing lacteous, color transitions gradual, blended; costal vein ratio 0.25; M vein ratio 0.5. Legs with femora and tibiae gray, tarsi pale yellow; fore basitarsomere unadorned.

Abdomen: Coloration gray, some specimens with posterior margin of tergites pale, yellowish. Male terminalia (Figures 1-4): surstylus (Figures 1, 2, 4) long, length nearly 3 times

length of epandrium, gradually tapered, irregularly pointed apically, bearing long setulae posteriorly and anteriorly along most of length; aedeagus (Figure 2) long, extended anteriorly to level of anterior margin of 4th tergite, base of aedeagus (Figure 3) from posterior view bifurcate, each arm extended dorsolaterally, anterior margin between lateral arms with shallow point at attachment of aedeagal apodeme; aedeagal apodeme (Figure 2)

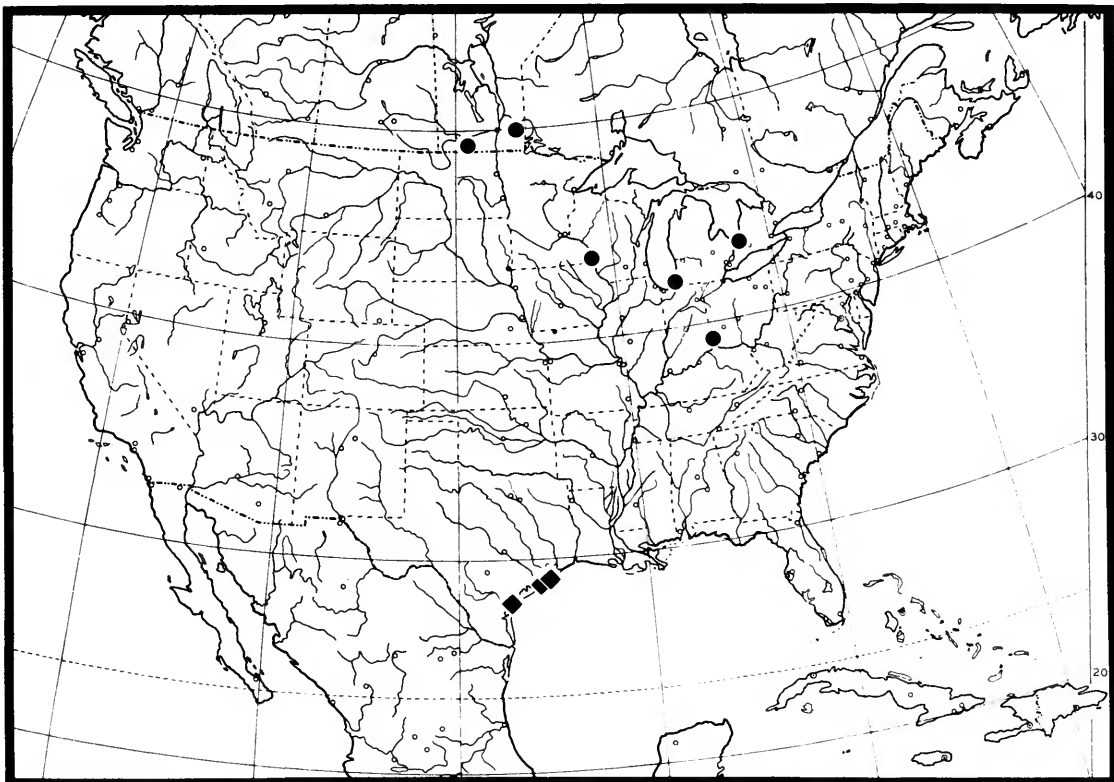


FIGURE 7.—Distribution map for *Glenanthe fascipennis* (diamonds) and *G. interior* (dots).

L-shaped in lateral view, with a lateral flange near outer angle; hypandrium deeply U or V-shaped, extended arms not flared greatly at attachment with epandrium.

TYPE MATERIAL.—The holotype male is labeled “Galveston, Tex[as]. Apr. 11[,] 1952 M.R. Wheeler [date handwritten]/HOLOTYPE Glenanthe fascipennis Stvt & Whlr [pink label]/6689 TYPE [red label; number handwritten]/ANSP [pale yellow label].” The holotype is double mounted (glued to a paper point), is in good condition, and is deposited in the ANSP (6689).

OTHER SPECIMENS EXAMINED.—UNITED STATES. *Texas*: Aransas Co., Salt Creek, 5 Jun 1953, M.R. Wheeler (1♂; UTA). Brazoria Co., Freeport, 3 Sep 1951, M.R. Wheeler (1♀; UTA). Galveston Co., Galveston Island (29°10'N, 95°05'W), 6 Apr–13 Sep 1953, 1993, D. and W.N. Mathis, M.R. Wheeler (14♂, 22♀; USNM, UTA; 4♂ and 7♀ are paratypes).

DISTRIBUTION (Figure 7).—Nearctic. United States (TX).

NATURAL HISTORY.—D. Mathis and I collected this species on the beach at Galveston, Texas. We found most specimens at a small, vegetated pool that was shaded during most daylight hours by a highway bypass ramp.

REMARKS.—Although this species is only known from the type locality and two other sites along the Gulf Coast of Texas, I suspect that its distribution is more widespread and that we are dealing with sampling error.

The patterned wing, similar to that of *G. interior*, indicates a sister-group relationship with the latter.

2. *Glenanthe interior* Chillcott

FIGURES 6–11

Glenanthe interior Chillcott, 1964:811.—Regensburg, 1978:93–94 [locality record].

DIAGNOSIS.—Wing patterned, with color changes abrupt, distinctly contrasted; palpus grayish yellow; antenna mostly dark, black, flagellomere 1 blackish brown, yellowish orange basomedially; postpronotum, notopleuron, and alar area with a gray stripe; anepisternum with a gray stripe; fore basitarsomere of male unadorned; and abdomen densely microtomentose, gray, with dark brown spots at base of setulae, especially on 5th tergite.

DESCRIPTION.—Small shore flies, length 1.6 to 1.9 mm; generally dull and light colored, golden tan to brown dorsally, more gray colored laterally, microtomentose.

Head: Frons golden tan, anterior margin silvery gray. Antenna mostly dark, scape and pedicel black; flagellomere 1 mostly black but with basomedial surface yellowish orange. Face whitish gray; parafacial at level of antennal bases with golden brown spot. Palpus whitish yellow.

Thorax: Generally grayish tan to grayish brown with golden hues except for 2 longitudinal, whitish gray stripes; dorsal stripe extended from postpronotum through ventral portion of notopleuron and onto alar area of mesonotum; ventral stripe extended across middle of anepisternum. Wing (Figure 6) with irregularly banded pattern of brown on a

milky-white background, color changes abrupt, distinctly contrasted; pattern as follows: 2nd costal section largely darkened, irregular band subapically, at level of crossvein dm-cu, and at level of crossvein r-m; bearing a spurious crossvein at level of crossvein dm-cu between veins R₂₊₃ and R₄₊₅; costal vein ratio 0.2; M vein ratio 0.48. Femora and tibiae grayish brown to gray with some yellow coloration at articulations; tarsi yellow; fore basitarsomere unadorned.

Abdomen: Coloration mostly gray, small brown spot at base of setulae, especially on 5th tergite. Male terminalia (Figures 8–11): Epandrium comparatively short, notched dorsally; surstylus elongate, length about 2.5 times epandrial length, tapered irregularly to apex, bearing moderately long setulae, especially on apical 3rd; aedeagus (Figure 9) long, extended anteriorly to level of anterior margin of 3rd tergite, base of aedeagus (Figure 10) from posterior view bifurcate, each arm extended dorsolaterally, anterior margin between lateral arms with shallow point at attachment of aedeagal apodeme; aedeagal apodeme (Figure 9) L-shaped in lateral view, with a lateral flange near outer angle; hypandrium deeply U- or V-shaped, extended arms not flared greatly at attachment with epandrium.

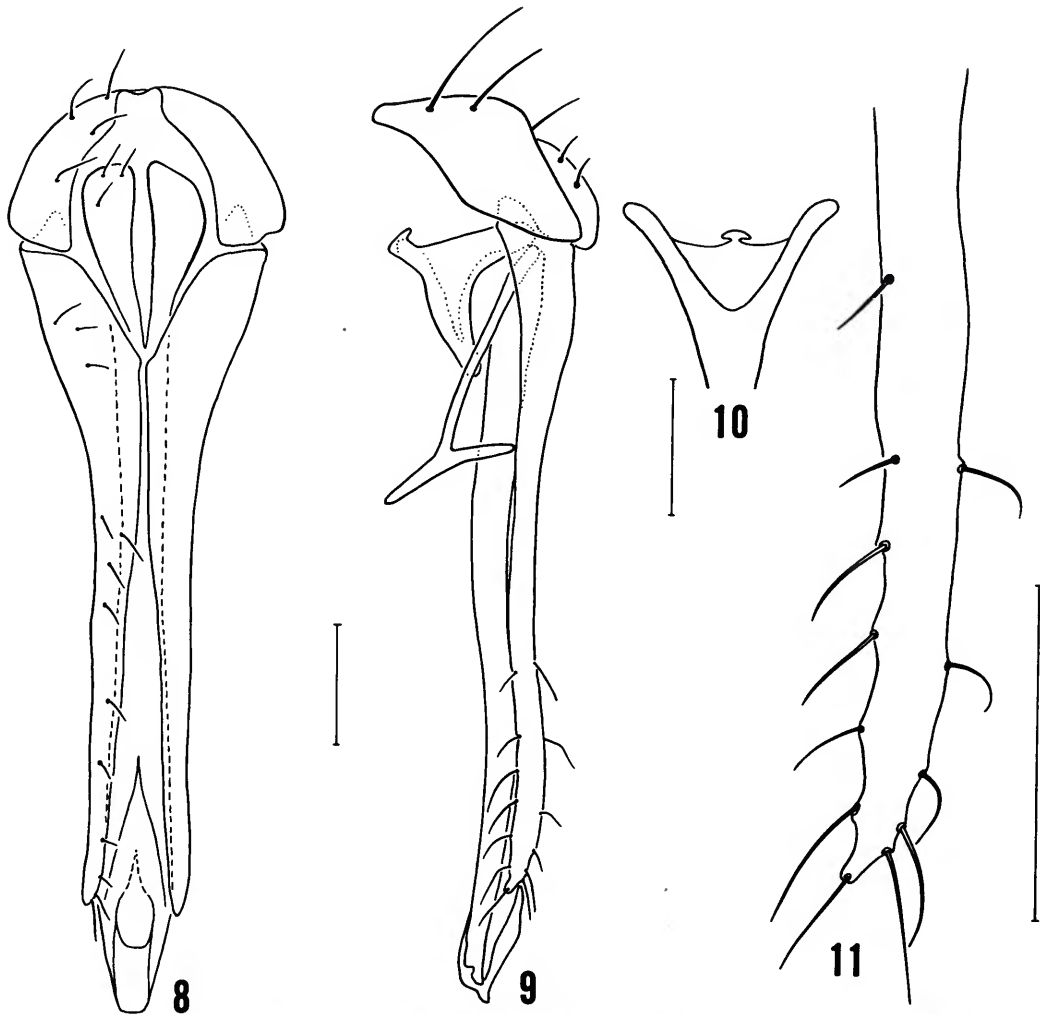
TYPE MATERIAL.—The holotype male is labeled “Bald Head Hills[,] 13 mi[les]. N. Glenboro[,] Man[itoba]. 21-VI-1958 [day and month handwritten] J.F. McAlpine/Ex. Petalostemon sp./Sand Dunes/HOLOTYPE CNC No. 8228 Glenanthe interior Chill. [handwritten except “HOLOTYPE” and “CNC No.”; red].” The holotype is glued to the side of a pin, is in good condition, and is deposited in the CNC (8228).

OTHER SPECIMENS EXAMINED.—CANADA. *Manitoba*: Bald Head Hills, Glenboro (13 mi N, = 20.8 km), 21 Jun–12 Jul 1958, J.G. Chillcott, R.L. Hurley (1♂, ♀; CNC). *Whitemont*, 10 Jul 1958, J.G. Chillcott (1♀; CNC). *Ontario*: Pinery Provincial Park, Grand Bend, 13 Jun–15 Jul 1980, 1982, K.N. Barber (2♂, 2♀; CNC, WSU).

UNITED STATES. Michigan: Warren Dunes State Park, 11 Jun 1983, K.N. Barber (3♂, 1♀; CNC, WSU). *Minnesota*: Houston Co., Mississippi Bluff (1–2 mi N State Line, = 1.6–32 km), 28 May 1949, M.E. Warters (1♂; UMSP). *Ohio*: Butler Co., Four Mile Creek (algal covered seep, 4 km N route 732), 17–18 May 1979, B. Steinly (4♂, 2♀; USNM); Hueston Woods State Park, 2 Jul 1975, J. Regensburg (1♀; DLD).

DISTRIBUTION (Figure 7).—Nearctic. Canada (MB, ON). United States (MI, MN, OH).

NATURAL HISTORY.—This species is frequently associated with sand dunes, perhaps indirectly. The type locality is an active sand dune in a spruce-covered area that was once the shore of the Pleistocene Lake Agassiz. The type series was swept from prairie clover (*Petalostemon* sp.) that was growing on the sand dunes. The sites at Pinery Provincial Park (Ontario) and Warren Dunes State Park (Ohio) were also dune habitats in part. Regensburg (1978) discovered this species at a seepage area below Acton Lake dam in the Hueston Woods State Park, Butler County, Ohio. The seepage was part of a stable sedge meadow.



FIGURES 8-11.—*Glenanthe interior* (USA. Ohio. Butler: 4-Mile Creek): 8, structures of the male terminalia (epandrium, cerci, surstyli, aedeagus), posterior aspect; 9, structures of the male terminalia (epandrium, cerci, surstyli, aedeagus, aedeagal apodeme, hypandrium, fifth sternite), lateral aspect; 10, base of aedeagus, posterior aspect; 11, apex of surstylus, lateral aspect. (Scale = 0.1 mm.)

REMARKS.—This is the most distinctive species of *Glenanthe* from the New World, with its patterned wing, light coloration, and brown spots at the base of the abdominal setulae. Its patterned wing, somewhat similar to that of *G. fascipennis*, indicates a sister-group relationship with the latter species.

3. *Glenanthe litorea* Cresson

FIGURES 12-16

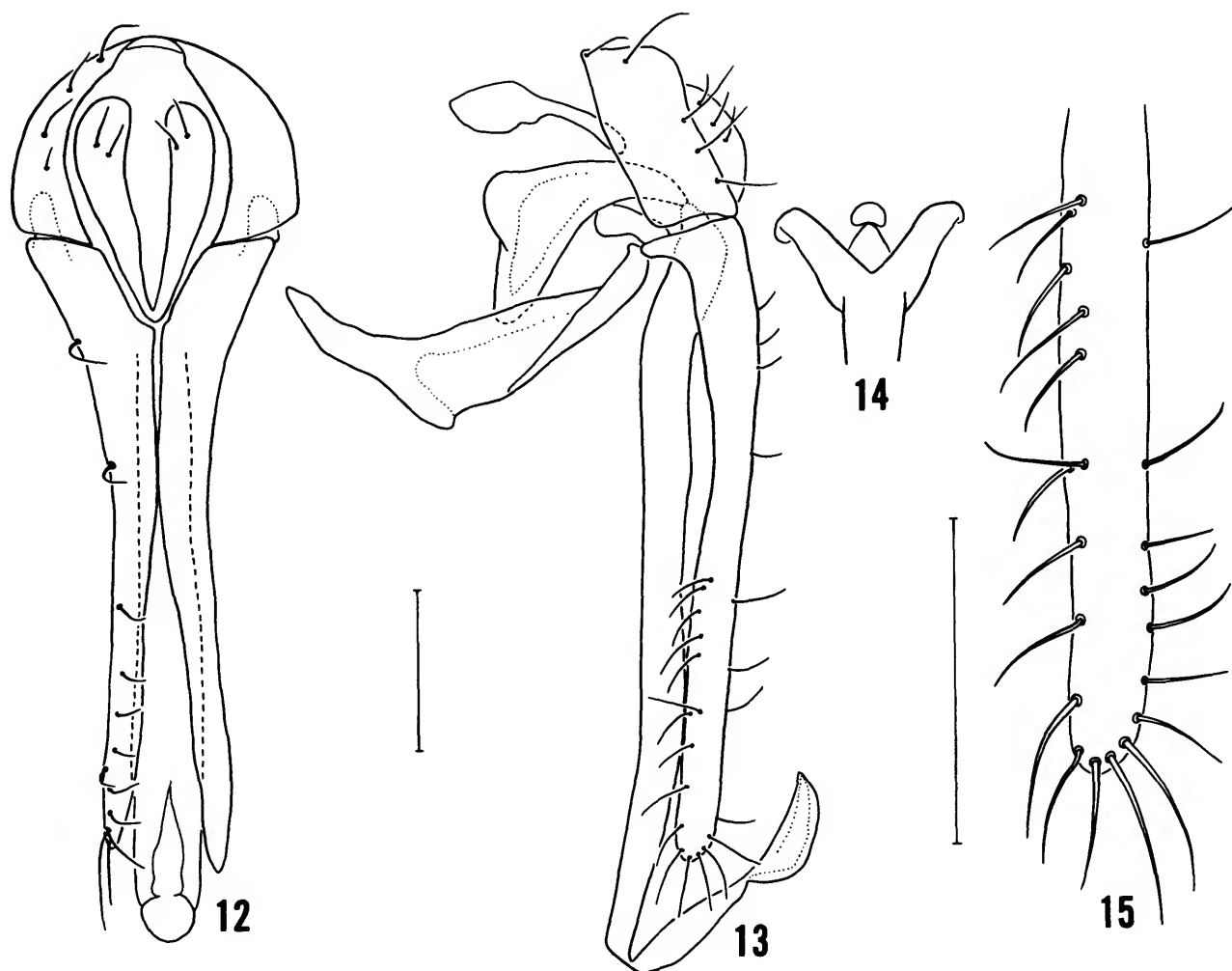
Glenanthe litorea Cresson, 1925:166; 1942:107 [review].—Sturtevant and Wheeler, 1954:249 [review].—Wirth, 1956:51 [Bahamas]; 1965:737 [Nearctic catalog]; 1968:6 [Neotropical catalog].

DIAGNOSIS.—Wing unpatterned; palpus blackish brown; antenna mostly dark, black; flagellomere 1 blackish brown; postpronotum, notopleuron, and alar area lacking a gray stripe; fore basitarsomere of male unadorned; abdomen densely microtomentose, gray.

DESCRIPTION.—Small shore flies, length 1.0 to 1.9 mm; generally dull colored, tan to silvery gray, microtomentose.

Head: Frons grayish brown to brown, concolorous with mesonotum, lateral margins sometimes lighter, grayer. Antenna and palpus dark, grayish black. Face mostly silvery gray to gray, carinate between antennal bases, some specimens with carinate portion tan to grayish brown.

Thorax: Mesonotum grayish brown to brown; lacking



FIGURES 12-15.—*Glenanthe litorea* (USA. New Jersey. Cape May: Wildwood): 12, structures of the male terminalia (epandrium, cerci, surstyli, aedeagus), posterior aspect; 13, structures of the male terminalia (epandrium, cerci, surstyli, aedeagus, aedeagal apodeme, hypandrium), lateral aspect; 14, base of aedeagus, posterior aspect; 15, apex of surstylus, lateral aspect. (Scale = 0.1 mm.)

stripes. Wing unpatterned; costal vein ratio 0.15; M vein ratio 0.5. Fore basitarsomere unadorned.

Abdomen: Tergites generally gray, unicolorous. 5th sternite U-shaped, arms of U elongate, forming pocket into which elongate aedeagus and surstyli lie. Male terminalia (Figures 12-15): Epandrium (Figure 12) well developed, inverted U-shaped, dorsum with notch; surstylus (Figures 12, 13) a long, digitiform, narrow, tubular process, length approximately 2.5 times longer than epandrium, parallel sided, apex broadly rounded, bearing numerous setulae, especially on apical third; aedeagus (Figure 13) long and very narrow, longer than surstylar length, apex with sclerotized and membranous flap folded back on itself, length about one-fourth to one-third length of aedeagus, base (Figure 14) bifurcate, V-shaped,

anterobasal margin projected at connection with aedeagal apodeme; aedeagal apodeme (Figure 13) more or less L-shaped in lateral view, with lateral flanges from outer angle; hypandrium (Figure 13) in lateral view narrowly triangular, with median, anteroventral projection.

TYPE MATERIAL.—The holotype male is labeled "Wildwood N[ew] J[ersey]/ET Cresson Jr IX 18 1920 [18 Sep 1920, date handwritten]/♂/1081/TYPE *Glenanthe LITOREA* E.T. Cresson, Jr. 6300 [deep purplish red label]/ANSP [pale yellow label]." The holotype is double mounted (glued to a paper point), is in poor condition (most of the thorax and abdomen are missing), and is deposited in the ANSP (6689). The allotype female bears the same locality and collecting data as the holotype. In the original publication, Cresson (1925:166) stated

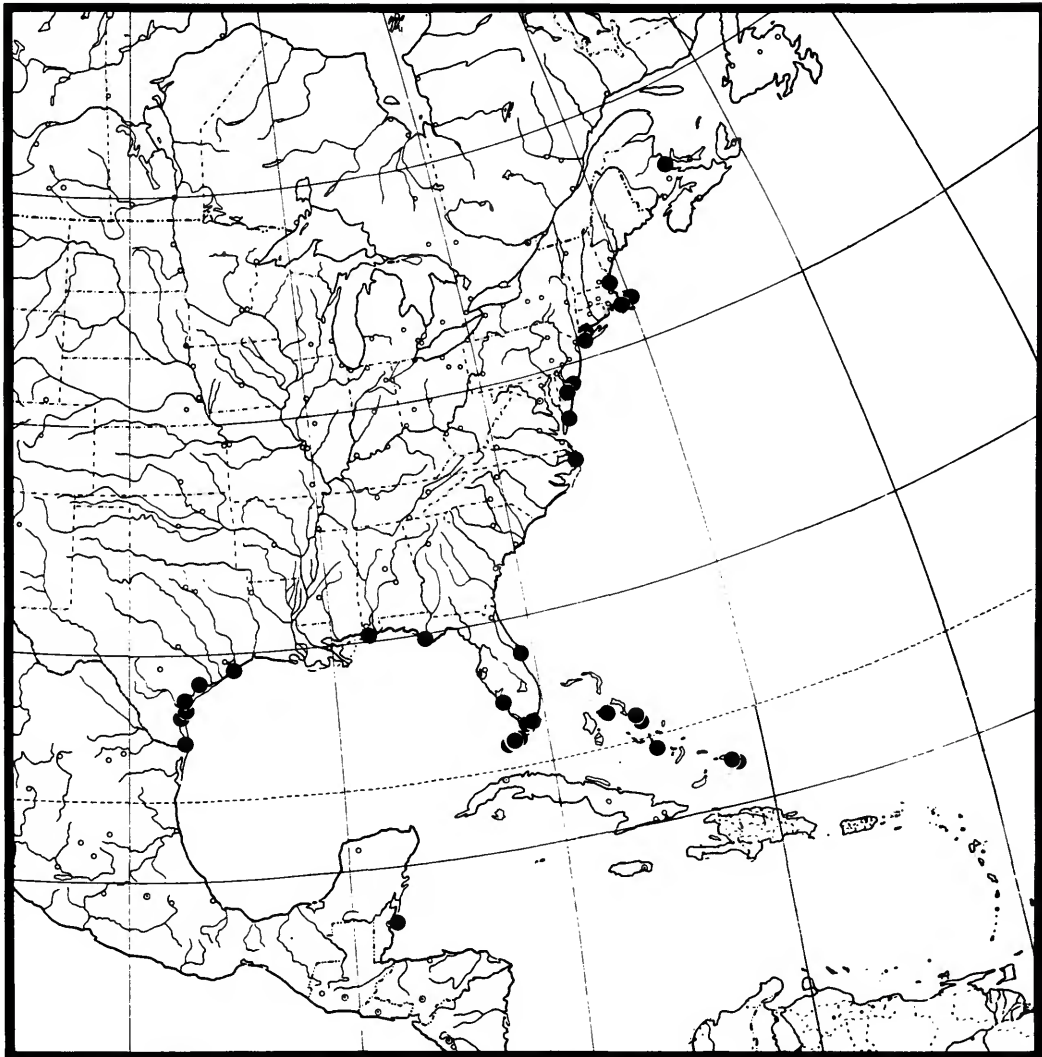


FIGURE 16.—Distribution map for *Glenanthe litorea*.

that he collected the type series “over [a] wet salt marsh.”

OTHER SPECIMENS EXAMINED.—**BAHAMAS.** *Cat Island*: Bennetts Harbour, 24 Mar 1953, L. Giovannoli, E.B. Hayden (1♂, 2♀; USNM). *Long Island*: Deadman’s Cay, 11 Mar 1953, E.B. Hayden (1♀; USNM). *Rose Island*: (4.8 km NE New Providence Island), 5 Apr 1953, E.B. Hayden (1♀; USNM). *Rum Cay*: (near Port Nelson), 16 Mar 1953, L. Giovannoli, E.B. Hayden (1♀; USNM). *Turks and Caicos Islands*: Grand Turk Island, 19 Feb 1953, E.B. Hayden, G.B. Rabb (2♂, 1♀; USNM). South Caicos Island, 11 Feb 1953, E.B. Hayden (4♂, 4♀; ANSP, USNM). West Caicos Island, 4 Feb 1953, L. Giovannoli, G.B. Rabb (1♂; USNM).

BELIZE. Belize District: Turneffe Islands: Blackbird Caye (17°19’N, 87°48’W), 27–30 Mar 1993, W.N. Mathis (6♂, 8♀;

USNM); Rope Walk Cay (17°13’N, 87°51’W), 31 Mar 1993, W.N. Mathis (9♂, 8♀; USNM).

CANADA. *New Brunswick*: Richibucto (on tidal flat), 12 Jul 1977, J.R. Vockeroth (3♀; CNC).

UNITED STATES. *Alabama*: Mobile Co., Coden (30°23’N, 88°14’W), 13 May–15 Oct 1924, 1993, D. and W.N. Mathis, A.H. Sturtevant (12♂, 2♀; USNM, UTA). *Connecticut*: New Haven Co., Milford, Anchor Beach, Woodmont section, 5 Aug 1978, B. Steinly (1♂; USNM). *Delaware*: Sussex Co., Rehoboth, 25 Jun 1939, A.L. Melander (1 ♀; ANSP). *Florida*: Brevard Co., Merritt Island, 26 Jun 1953, M.R. Wheeler (5♂, 5♀; USNM, UTA). Dade Co., Big Pine Key, 9 May 1967, B.V. Peterson (1♂; CNC); Homestead, 4 Apr 1952, J.R. Vockeroth (2♂; CNC); Key Largo, 5–6 Dec 1961, J.G. Chillcott, G.P.

Holland, E. Munroe (1♀; CNC). Gulf Co., St. Joseph State Park, 1–3 May 1970, W.W. Wirth (4♂, 1♀; USNM). Lee Co., Bonita Beach (seashore), 17 Apr 1970, W.W. Wirth (2♀; USNM); Ft. Myers (at black light), 16 Apr 1978 (1♂, 2♀; UMSP); Sanibel Island (Malaise trap, algal mat), 17 Apr–11 May 1973, 1989, D. and W.N. Mathis, W.W. Wirth (4♂, 9♀; USNM); Sanibel Island Causeway, 17 Apr 1989, D. and W.N. Mathis (1♂, 1♀; USNM). Monroe Co., Bahia Honda Key (seashore), 11 Apr 1970, W.W. Wirth (2♂, 6♀; USNM); Flamingo, 1–5 Dec 1961, J.G. Chillcott, G.P. Holland, E. Munroe (1♀; CNC); Stock Island, 26 Dec 1954, H.V. Weems, Jr. (1♀; USNM). *Massachusetts*: Barnstable Co., Eastham, 10 Sep 1987, J.R. Vockeroth (7♂, 7♀; CNC); East Sandwich (beach), 10 Aug 1978, B. Steinly (1♂; USNM); Falmouth Heights, 6 Aug 1918, A.H. Sturtevant (1♂, 2♀; USNM); North Falmouth, 1 Aug 1923, A.H. Sturtevant (1♂, 2♀; USNM, UTA); Woods Hole, Aug 1916, 1923, A.H. Sturtevant (2♂, 4♀; USNM, UTA). Dukes Co., Naushon Island, 16 Jul 1922, A.H. Sturtevant (1♀; USNM); Nonomesset Island, 28 Jul 1923, A.H. Sturtevant (3♂, 3♀; USNM); Pasque Island, 15 Aug 1952, A.H. Sturtevant (1♂; USNM). Essex Co., Gloucester, 20 Jun 1924, C.W. Johnson (1♂; ANSP). *New Jersey*: Cape May Co., Wildwood, 18 Sep 1920, E.T. Cresson, Jr. (14♂, 16♀; paratypes; ANSP, USNM, WSU). Monmouth Co., Waterwitch, 5 Jun 1937, A.L. Melander (1♀; USNM). Ocean Co., Tuckerton, 20 Aug 1975, M.J. Raupp (2♀; USNM). *New York*: Suffolk Co., Long Island, Cold Spring Harbor (1♂, 1♀; ANSP, USNM). Oak Bl, Jul (1♂; ANSP).

North Carolina: Dare Co., Nags Head, 15 May 1954, W.W. Wirth (2♂, 2♀; USNM). *Texas*: Aransas Co., Aransas Refuge, 22 Apr 1956, Jones, W.W. Wirth (15♂, 18♀; USNM); Padre Island (near Port Aransas), 23 Mar 1965, J.G. Chillcott (3♂, 6♀; CNC); Salt Creek, 5 Jun 1953, M.R. Wheeler (1♂; UTA). Cameron Co., Bayside (seashore), 25 Jan 1969, J. and J. Tenorio (2♀; USNM); Port Isabel, 23 Mar 1951, M.R. Wheeler (1♂, 3♀; UTA); San Benito, 23 Mar 1951, M.R. Wheeler (1♂, 1♀; UTA). Calhoun Co., Indianola, 28 Apr 1951, M.R. Wheeler (1♂, 4♀; UTA). Galveston Co., Galveston Island (29°10'N, 95°05'W), 11 Apr–14 May 1952, 1993, D. and W.N. Mathis, M.R. Wheeler (4♂, 4♀; USNM, UTA). Kleberg Co., Riviera Beach, 23 Mar–9 Jun 1936, 1951, R.H. Painter, M.R. Wheeler (2♂, 6♀; ANSP, USNM, UTA). San Patricio Co., Sinton, 23 Mar 1951, M.R. Wheeler (1♀; UTA). *Virginia*: Accomack Co., Assateague Island, 24 Jun–15 Aug 1967, 1969, G.C. Steyskal (9♂, 12♀; USNM).

West Indies. ANGUILLA: Prickly Pear Cay (east, north side, 18°16.17'N, 63°10.5'W), 30 Mar 1992, W.E. Steiner, J.M. Swearingen (1♀; USNM); Sandy Ground (18°12.2'N, 63°05.5'W), 24–30 Mar 1992, S.E. Steiner, J.M. Swearingen (64♂, 26♀; USNM). *DOMINICA*: Grande Savane, 20 Mar 1965, W.W. Wirth (14♂, 15♀; USNM). *JAMAICA*: Falmouth (bay shore), 1 Mar 1969, W.W. Wirth (7♂, 6♀; USNM). Milk River Bath (mangrove), 11 Mar 1970, T. Farr, W.W. Wirth

(6♂, 4♀; USNM). Point Henderson (bay shore), 24 Feb 1969, W.W. Wirth (1♂; USNM). Savanna La Mar (mangrove), 13 Mar 1970, W.W. Wirth (4♀; USNM).

DISTRIBUTION (Figure 16).—Coastal. Nearctic: North America. Canada (NB), United States (AL, CT, DE, FL, MA, NC, NJ, NY, TX, VA). Neotropical: Central America (Belize), West Indies (Anguilla, Dominica, Jamaica).

NATURAL HISTORY.—All records of this species are from seashores, sometimes associated with mangroves in more tropical zones.

REMARKS.—This is the most common and widespread species of the genus, and there is considerable variation in color, especially of the frons and mesonotum. The latter are usually concolorous and vary from light, grayish tan to brown. Usually the lateral margin of both structures are lighter, and frequently the fronto-orbits are concolorous with the face.

4. *Glenanthe caribea*, new species

FIGURES 17–26

DIAGNOSIS.—Wing unpatterned; palpus almost completely yellowish; antenna partially yellowish, flagellomere 1 yellowish orange anteroventrally; postpronotum, notopleuron, and alar area lacking a gray stripe; fore basitarsomere of male unadorned; and abdomen dull, densely microtomentose.

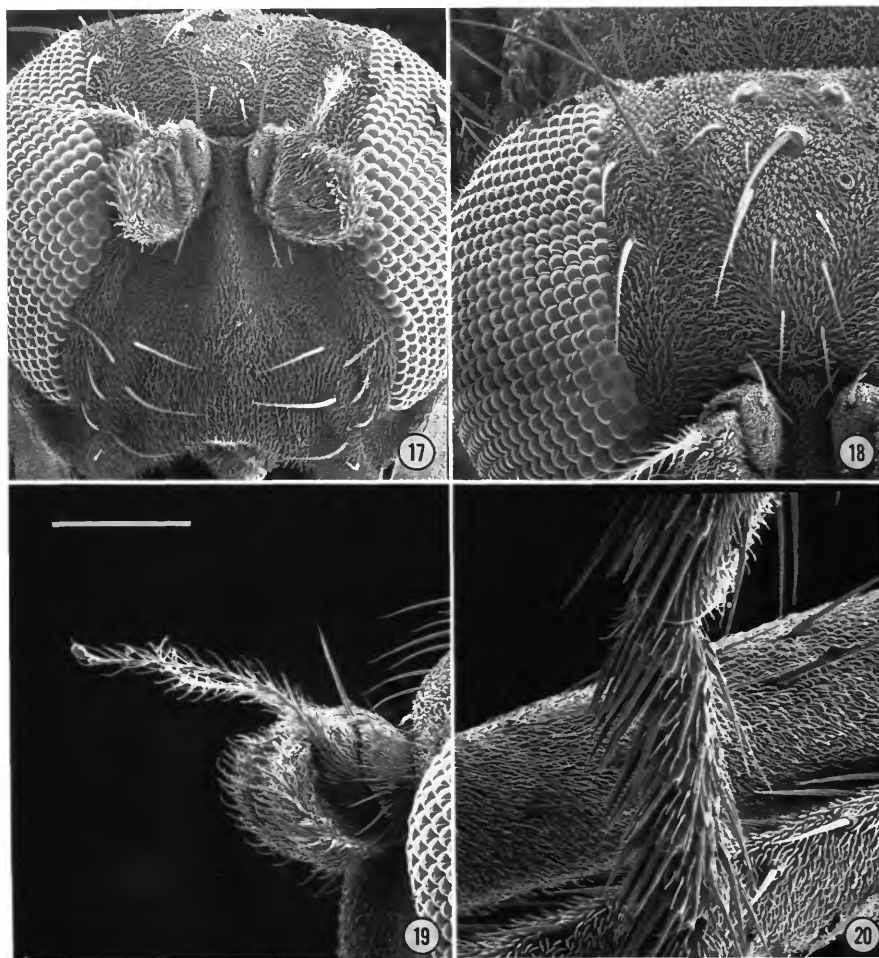
DESCRIPTION.—Small shore flies, length 1.0 to 1.3 mm; generally dull colored, tan colored dorsally, becoming grayer ventrally and laterally, microtomentose.

Head (Figure 17): Frons (Figure 18) golden tan, concolorous with mesonotum. Antenna (Figure 19) mostly yellow to yellowish gray; flagellomere 1 mostly yellow. Face silvery white, contrasted with golden tan frons; palpus almost entirely yellow to yellowish gray, some specimens with base slightly dark.

Thorax: Generally unicolorous, not distinctly bicolored, mesonotum light brown to bronzy, lacking a stripe through postpronotum and notopleuron regions. Prescutellar acrostichal setae inserted only slightly anterior of posterior dorsocentral or postalar setae. Fore basitarsomere of male (Figure 20) plain, lacking a comb of setulae. Wing uniformly hyaline, lacking a pattern of dark spots or bands; costal vein ratio 0.23; M vein ratio 0.34. Fore basitarsomere unadorned.

Abdomen: Dull, microtomentose, mostly gray. Male terminalia (Figures 21–24): Surstylus greatly elongate, over twice length of epandrium in lateral view (Figures 21, 22), gradually tapered to rounded apex; base of aedeagus in posterior view (Figure 23) with lateral projections rounded apically; hypandrium in lateral view (Figure 22) with anterior margin projected anteriorly, forming a foot-like structure.

TYPE MATERIAL.—The holotype male is labeled "BELIZE. Stann Creek District: Wee Wee Cay[,] 21 July 1989[,] Wayne



FIGURES 17–20.—Scanning electron micrographs of *Glenanthe caribea* (Belize. Stann Creek District: Wee Wee Cay; scale length in parenthesis; scale for all photographs = Figure 19): 17, head, anterior aspect (100 μ m); 18, frons, right side, anterodorsal aspect (75 μ m); 19, antenna, lateral aspect (75 μ m); 20, fore basitarsus, posteroventral aspect (38 μ m).

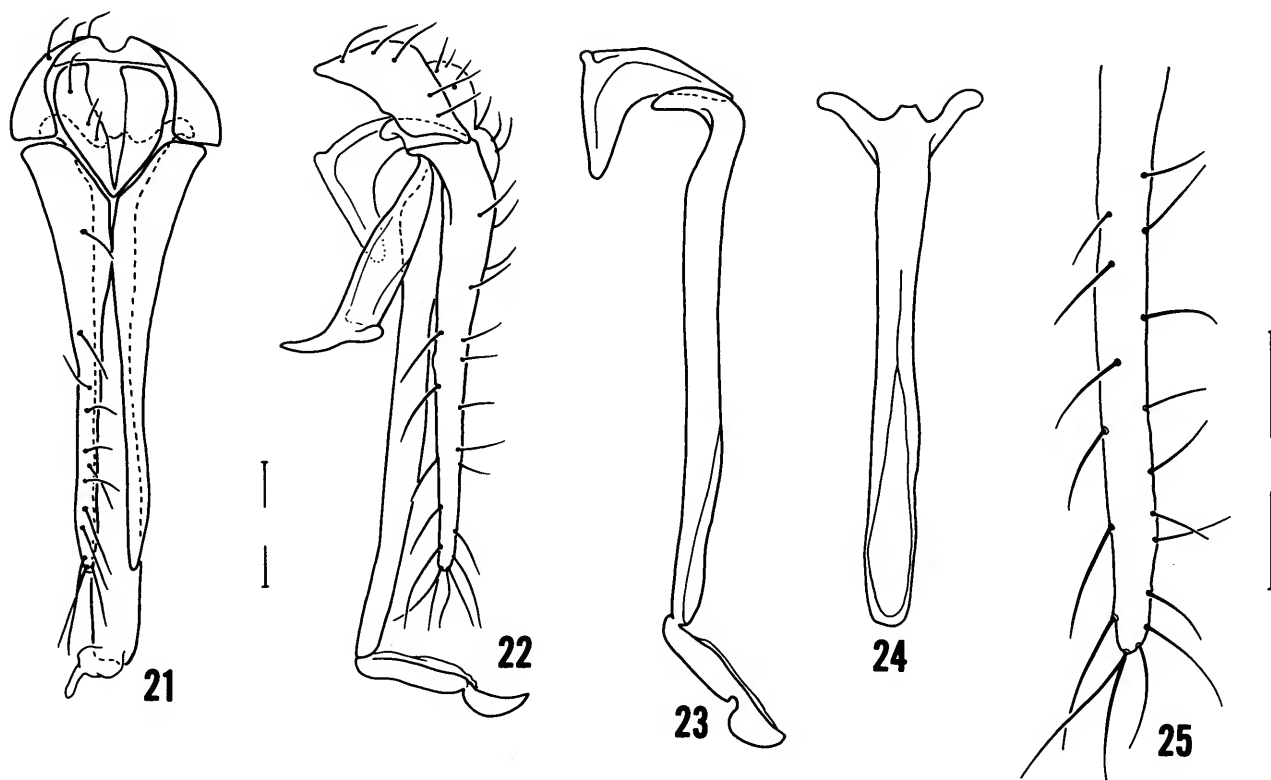
N. Mathis.” The allotype female and 21 paratypes (10 σ^7 , 11 f ; USNM) bear the same locality label data as the holotype. The holotype is double mounted (minute nadel in a block of plastic), is in excellent condition, and is deposited in the USNM. Other paratypes are as follows: **BELIZE**. Stann Creek District: Dangriga (12 km N), 28 Mar 1988, W.N. Mathis (1 σ^7 , 2 f ; USNM). **PANAMA**. Herrera: Chitré, 24 Oct 1952, F.S. Blanton (1 σ^7 , 9 f ; USNM). Playa Santa Clara, 2 Jul 1967, W.W. Wirth (2 σ^7 , 3 f ; USNM). **TRINIDAD**. Port of Spain, Jun 1953 (19 σ^7 , 20 f ; USNM). St. Andrew: Lower Manzanilla (12 km S, 10°24'N, 61°02'W), bridge over Nariva River, 20–27 Jun 1993, W.N. Mathis (15 σ^7 , 8 f ; USNM). **West Indies**. **DOMINICA**: Cabrits, 22 Mar 1989, W.N. Mathis (12 σ^7 , 5 f ; USNM); Layou River mouth, 8 Mar 1965, W.W. Wirth (1 σ^7 , 1 f ; USNM);

Grande Savane (pond margin), 20 Mar 1965, W.W. Wirth (1 σ^7 , 2 f ; USNM). **JAMAICA**: Savanna La Mar (mangroves, stream margin), 13 Mar 1970, W.W. Wirth (2 σ^7 , 4 f ; USNM). **ST. VINCENT**: St. Andrew: Buccament Bay, 25–28 Mar 1989, W.N. Mathis (1 σ^7 ; USNM).

DISTRIBUTION (Figure 26).—Probably circumcaribbean; Trinidad, West Indies (Dominica, Jamaica, St. Vincent), Belize, and Panama.

ETYMOLOGY.—The specific epithet, *caribea*, is a Latinized word referring to the Carib Indians after whom the Caribbean Sea was named. This species occurs on islands and continental areas directly associated with this sea.

NATURAL HISTORY.—This species has only been collected from maritime beaches and lagoons within the Caribbean.



FIGURES 21-25.—*Glenanthe caribea* (Belize, Stann Creek District: Wee Wee Cay): 21, structures of the male terminalia (epandrium, cerci, surstyli, aedeagus), posterior aspect; 22, structures of the male terminalia (epandrium, cerci, surstyli, aedeagus, aedeagal apodeme, hypandrium), lateral aspect; 23, aedeagus and aedeagal apodeme, lateral aspect; 24, base of aedeagus, posterior aspect; 25, apex of surstylus, lateral aspect. (Scale = 0.1 mm.)



FIGURE 26.—Distribution map for *Glenanthe caribea* (dots) and *G. kobbe* (diamonds).

5. *Glenanthe salina*, new species

FIGURES 27-29

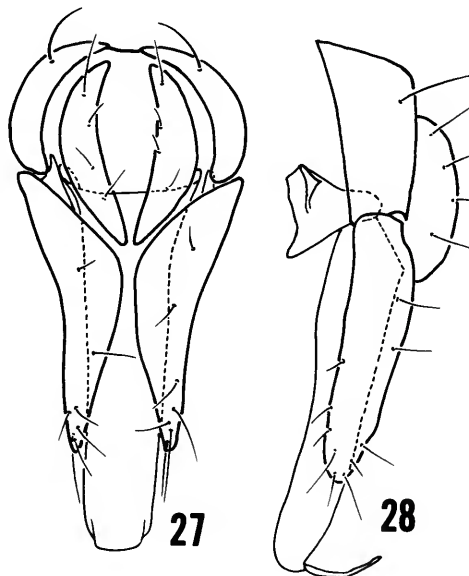
Glenanthe litorea of authors [misidentification in part].—Cresson, 1942:107 [review].—Sturtevant and Wheeler, 1954:249-250 [review].—Wirth, 1965:737 [Nearctic catalog].

DIAGNOSIS.—Wing unpatterned; antenna blackish brown to black; flagellomere 1 yellowish orange anteroventrally; palpus almost completely yellowish; postpronotum, notopleuron, and alar area lacking a gray stripe; fore basitarsomere of male unadorned; and abdomen dull, densely microtomentose.

DESCRIPTION.—Small shore flies, length 1.3 to 1.9 mm; generally dull colored, silvery to grayish tan, becoming grayer ventrally and laterally, microtomentose.

Head: Frons tan to golden tan, lateral margin silvery gray. Face silvery gray, carina sometimes slightly tinged with tan. Antenna mostly blackish brown; flagellomere 1 mostly blackish. Palpus grayish yellow to yellow.

Thorax: Mesonotum yellowish or grayish light brown; pleural areas whitish gray to gray, lacking a pleural stripe. Wing unpatterned; costal vein ratio 0.18; M vein ratio 0.4. **Legs** with femora and tibiae gray, densely microtomentose; tarsi pale, basal 1-3 tarsomeres yellowish orange to yellow, apical 1-3 tarsomeres brown; fore basitarsomere unadorned.



FIGURES 27, 28.—*Glenanthe salina* (USA, Nebraska, Lancaster: Lincoln): 27, structures of the male terminalia (epandrium, cerci, surstyli, aedeagus), posterior aspect; 28, structures of the male terminalia (epandrium, cerci, surstyli, aedeagus, aedeagal apodeme), lateral aspect. (Scale = 0.1 mm.)

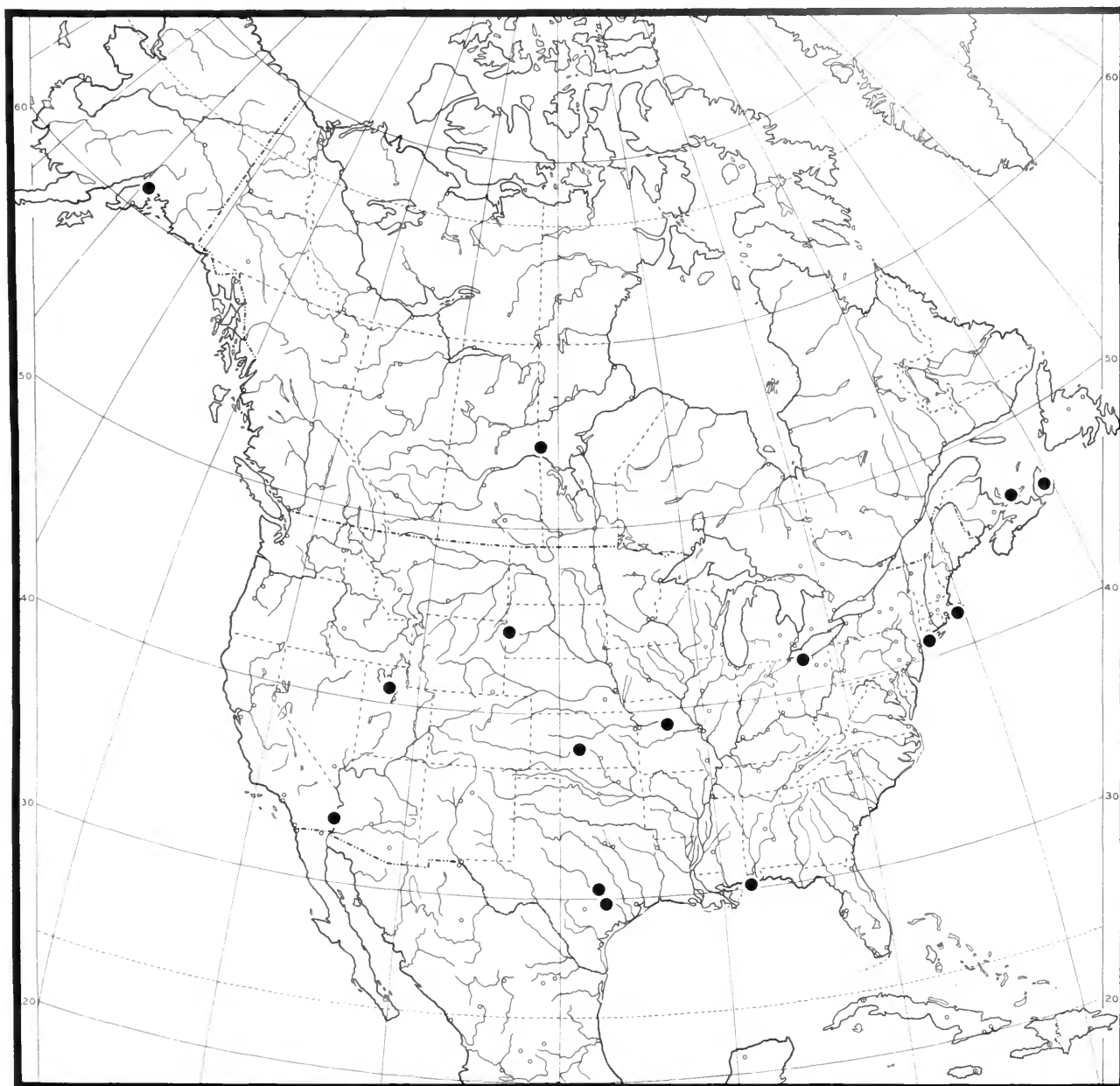


FIGURE 29.—Distribution map for *Glenanthe salina*.

Abdomen: Dorsum mostly gray, anterior tergites with some faint tan coloration, densely microtomentose. Male terminalia (Figures 27, 28): Epandrium comparatively short, with distinct, rounded notch dorsally; surstylus (Figures 27, 28) short, about 1.5 times length of epandrium in lateral view, ventral margin pointed, bearing moderately long setulae; aedeagus (Figures 27, 28) comparatively short, length about twice length of epandrium in lateral view; aedeagal apodeme

more or less triangular, anterodorsal angle with lateral flange.

TYPE MATERIAL.—The holotype male is labeled "Howard Co. M[iss]o[uri]. Boonslick Salt Spg.[.] 17 May 1969[.] W. W. Wirth." The allotype female and 17 other paratypes (7♂, 10♀; USNM) bear the same label data as the holotype. Other paratypes are as follows: NEBRASKA. Lincoln (salt lake), 19 Jun 1969, W.W. Wirth (13♂; USNM). The holotype is double mounted, is in good condition, and is deposited in the USNM.

OTHER SPECIMENS EXAMINED.—*CANADA. Manitoba:* The Pas, 31 Jul 1937, D.G. Denning (1♂; ANSP). *Nova Scotia:* Englishtown, 6 Jun 1936, T.N. Freeman (1♂; CNC). *Prince Edward Island:* Dalvay House National Park, 17 Aug 1940, G.S. Walley (1♀; CNC).

UNITED STATES. Alabama: Mobile Co., Coden, A.H. Sturtevant, 15 Oct 1924 (1♂; USNM). *Alaska:* Anchorage, 16 Jun 1921, J.M. Aldrich (4♂, 5♀; ANSP, USNM). *California:* Imperial Co., Palo Verde, W.W. Wirth (2♂, 10♀; USNM). *Kansas:* Stafford Co. (salt marsh), 29–30 Jun 1934, C.W. Sabrosky (1♂, 2♀; ANSP). *Massachusetts:* Barnstable Co., North Falmouth, 22 Jul 1922, A.H. Sturtevant (1♂; USNM); Woods Hole, 22 Jul–1 Aug 1922, 1923, A.H. Sturtevant (1♂, 2♀; USNM). *Missouri:* Boonsboro, 25 Apr–23 May 1954, D.L. Lindsley (4♂, 2♀; USNM). *New York:* Long Island, Cold Spring Harbor, 27 May 1923, A.H. Sturtevant (1♀; USNM); Towd Point (salt marsh), 24 May 1963, W.W. Wirth (2♀; USNM); South Beach, 25 Jun, A.L. Melander (1♀; USNM). *Ohio:* Lorain Co., Amherst, Beaver Creek, 18 Aug 1978, B. Steinly (5♂, 2♀; USNM). *South Dakota:* Lawrence Co., Spearfish (4.8 km S), 20 Jun 1968, W.N. Mathis (1♂; USNM). *Texas:* Gonzales Co., Gonzales, Guadalupe River, 22 Apr 1956, W.W. Wirth (1♂; USNM). Travis Co., Austin, 22 Sep–14 Oct 1951, M.R. Wheeler (1♂, 6♀; UTA). Austin (40 km NW), 22 Sep 1951, M.R. Wheeler (1♀; UTA). *Utah:* Salt Lake Co., causeway to Antelope Island, 21 Aug 1982, R.S. and V.L. Zack (1♀; WSU).

DISTRIBUTION (Figure 29).—Nearctic. Canada (MB, NS, PE). United States (AK, AL, CA, KS, MA, MO, NB, NY, OH, SD, TX, UT).

ETYMOLOGY.—The species epithet, *salina*, is of Latin derivation and alludes to the saline habitats where this species frequently occurs.

NATURAL HISTORY.—This species has been collected from maritime and inland salt marshes.

REMARKS.—This species was misidentified as *G. litorea* in the literature, although Cresson had attached a “var.” label to specimens from Stafford County, Kansas, indicating that he had noted differences in those specimens. The pale-colored palpus is the easiest reliable character for distinguishing between *G. litorea* and this species.

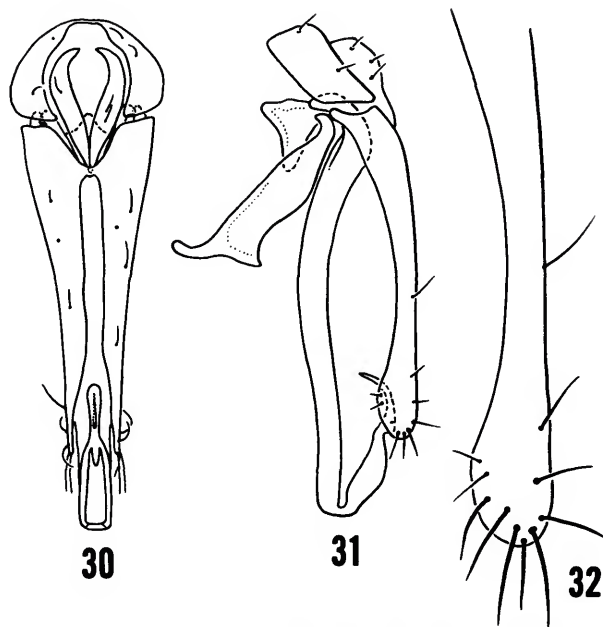
6. *Glenanthe kobbe*, new species

FIGURES 26, 30–32

DIAGNOSIS.—Wing unpatterned; palpus mostly whitish yellow, faintly darkened basally; antenna mostly yellowish; flagellomere 1 yellowish orange; postpronotum, notopleuron, and alar area lacking a gray stripe; fore basitarsomere of male unadorned; and abdomen moderately microtomentose, tan.

DESCRIPTION.—Small shore flies, length 1.25 to 1.5 mm; generally dull, densely microtomentose, light brown to gray.

Head: Frons golden, light brown, anteromedial margin sometimes silvery white. Antenna scape and pedicel mostly



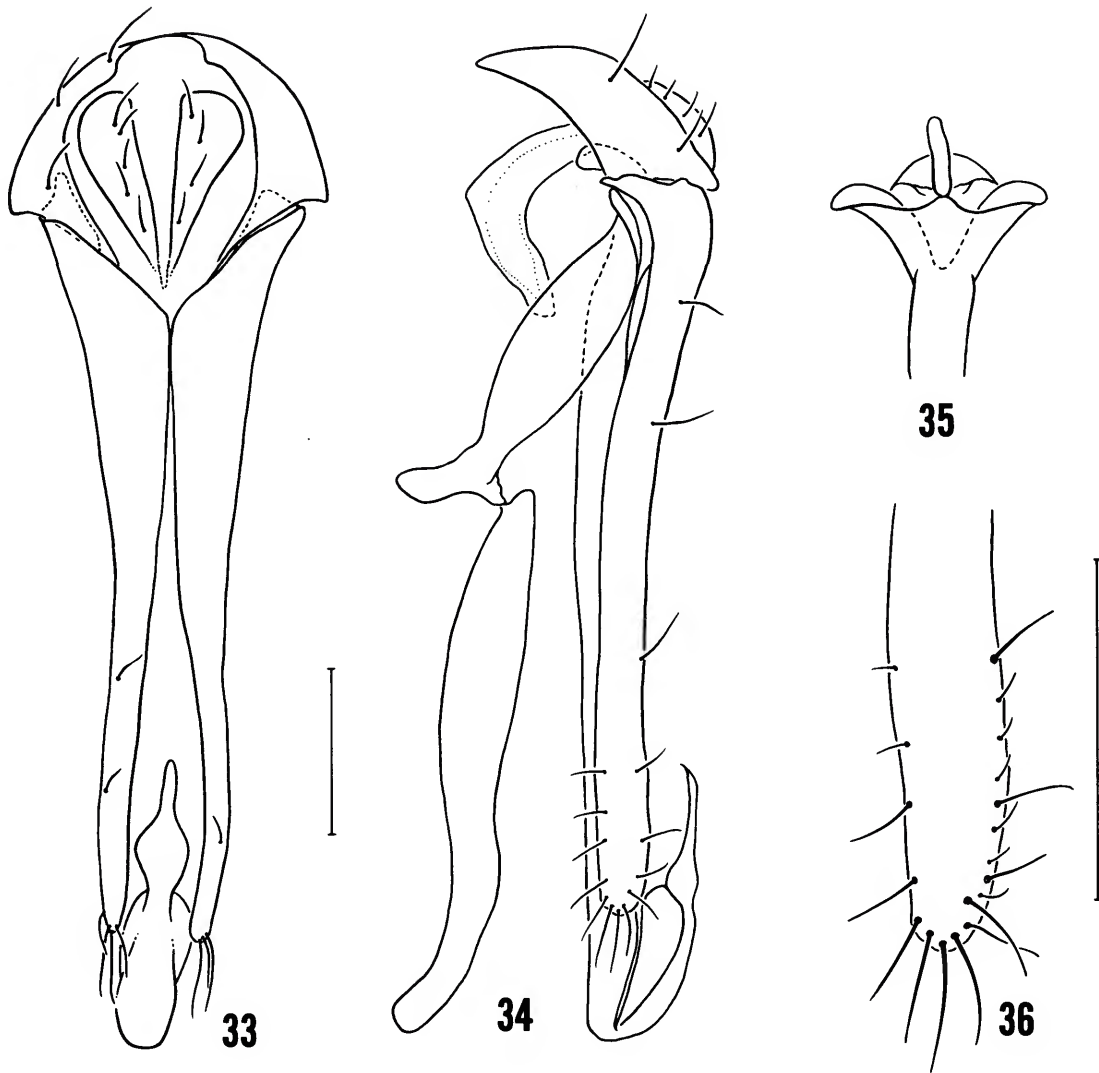
FIGURES 30–32.—*Glenanthe kobbe* (Panama Canal Zone: Kobbe Beach): 30, structures of the male terminalia (epandrium, cerci, surstyli, aedeagus), posterior aspect; 31, structures of the male terminalia (epandrium, cerci, surstyli, aedeagus, aedeagal apodeme, hypandrium), lateral aspect; 32, apex of surstylus, lateral aspect. (Scale = 0.1 mm.)

black; flagellomere 1 black dorsoapically, median surface basoventrally yellowish orange. Face silvery white. Palpus whitish yellow.

Thorax: Mesonotum uniformly tan; gray stripe extended from postpronotum through ventral portion of notopleuron to postsutural supra-alar area; dorsal portion of anepisternum concolorous with mesonotum. Prescutellar acrostichal setae prominent, inserted in front of transverse alignment of postalar setae, widely set apart, distance almost equal to that between basal scutellar setae. Wing unpatterned, faintly infumate, hyaline; costal vein ratio 0.19; M vein ratio 0.4. Fore basitarsomere unadorned.

Abdomen: Dorsal surface yellow tan to light brown, microtomentose, dull colored. Male terminalia (Figures 30–32): Epandrium short; surstylus (Figures 30, 31) elongate, length approximately 2.5 times that of epandrium in lateral view, distinctly spatulate apically, apex bearing numerous setulae; aedeagus tubular, slightly sinuous in lateral view; aedeagal apodeme subtriangular; hypandrium with anteromedian process, well sclerotized.

TYPE MATERIAL.—The holotype male is labeled “[Panama] Kobbe Beach[,] C[anal]. Z[one]. July 1967[,] W. W. Wirth ex mangrove.” The allotype female and 11 other paratypes (7♂, 4♀; USNM) bear the same label data as the holotype. A male paratype is from: Panama Canal Zone: Balboa, Feb 1958, M.R.



FIGURES 33–36.—*Glenanthe bella* (Dominica (West Indies). Cabrits): 33, structures of the male terminalia (epandrium, cerci, surstyli, aedeagus), posterior aspect; 34, structures of the male terminalia (epandrium, cerci, surstyli, aedeagus, aedeagal apodeme, hypandrium, fifth sternite), lateral aspect; 35, base of aedeagus, posterior aspect; 36, apex of surstylus, lateral aspect. (Scale = 0.1 mm.)

Wheeler (UTA). The holotype is double mounted, is in good condition, and is deposited in the USNM.

OTHER SPECIMENS EXAMINED.—*COSTA RICA*. Punta Arenas: Playa Manuel Antonio (6 km SE Puerto Quepos; sandy mudflat around mangrove inlet), 30 Mar 1988, J.M. Hill, J.M. Mitchell, W.E. Steiner, J.M. Swearingen (1♂, 1♀; USNM).

EL SALVADOR. Acajutla (Pacific coast), Dec 1953, W.B. Heed (1 ♂; UTA).

DISTRIBUTION (Figure 26).—Neotropical: Costa Rica, El Salvador, Panama.

ETYMOLOGY.—This species is named after the type locality, Kobbe Beach, in the former Canal Zone of Panama.

7. *Glenanthe bella*, new species

FIGURES 33–37

DIAGNOSIS.—Wing unpatterned; palpus blackish brown; antenna mostly yellowish; flagellomere 1 yellowish orange; postpronotum, notopleuron, and alar area lacking a gray stripe; fore basitarsomere of male unadorned; and abdomen sparsely microtomentose, subshiny, black.

DESCRIPTION.—Small shore flies, length 1.1 to 1.6 mm; except for abdomen, generally microtomentose, dull, abdomen subshiny, black, sparsely microtomentose.

Head: Frons golden, light brown, concolorous with mes-

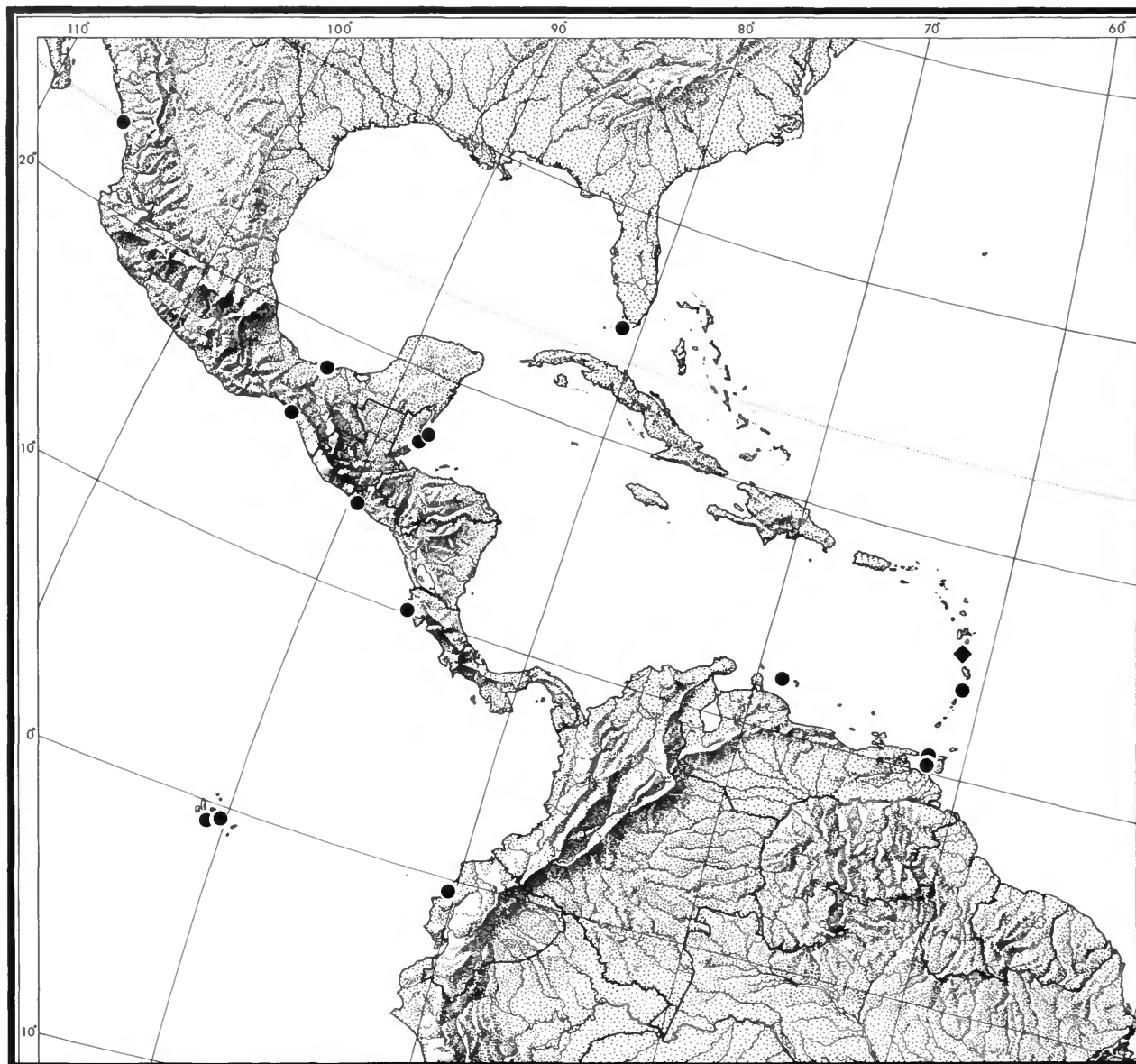


FIGURE 37.—Distribution map for *Glenanthe bella* (diamonds) and *G. ruetzleri* (dots).

onotum; face golden light brown dorsally, becoming darker brown ventrally with some grayish microtomentum. Antenna mostly to entirely yellowish orange; palpus blackish brown.

Thorax: Thorax distinctly bicolored, mesonotum and area ventrad to dorsal third of anepisternum golden light brown, thereafter gray to whitish gray, lacking a distinct gray stripe from postpronotum through notopleuron to alar region; prescutellar acrostichal setae inserted only slightly anterior of posterior dorsocentral or postalar setae. Wing uniformly hyaline, lightly infumate or faintly milky white; costal vein ratio 0.20; M vein ratio 0.36. Fore basitarsomere unadomed.

Abdomen: Abdomen sparsely microtomentose, subshiny, black, especially laterally and on 5th tergite. Male terminalia (Figures 33–36): surstylus (Figures 33, 34) long, extended to anterior margin or 3rd tergite, parallel sided, apex setulose, bluntly and evenly rounded; aedeagus long, slender, parallel sided, base (Figure 35) bifurcate, each basolateral process curved laterally, with shallow point at attachment with aedeagal apodeme, apical portion reflexed back, pedunculate, apex pointed; aedeagal apodeme with flange extended laterally near attachment with base of aedeagus; hypandrium deeply V-shaped.

TYPE MATERIAL.—The holotype male is labeled “W[est]. [Indies]. Dominica: Cabrits[,] 22 March 1989[,] W. N. Mathis.” The allotype female and 23 paratypes (16♂, 7♀; USNM) bear the same label data as the holotype. An addition female paratype (USNM) has the following label data: W.I. Dominica. Macoucheri, 14 Feb 1965 W.W. Wirth, sea shore. The holotype is double mounted (minute nadel in a block of plastic), is in excellent condition, and is deposited in the USNM.

DISTRIBUTION (Figure 37).—West Indies. Dominica.

ETYMOLOGY.—The species epithet, *bella*, is of Latin derivation and alludes to the attractive coloration of this species.

NATURAL HISTORY.—The specimens from the type locality were found along the margins of a brackish-water swamp that occurs at the eastern base of the Cabrits, a small peninsula between Prince Rupert Bay and Douglas Bay. There is a small path between the two bays that provides access to the swamp.

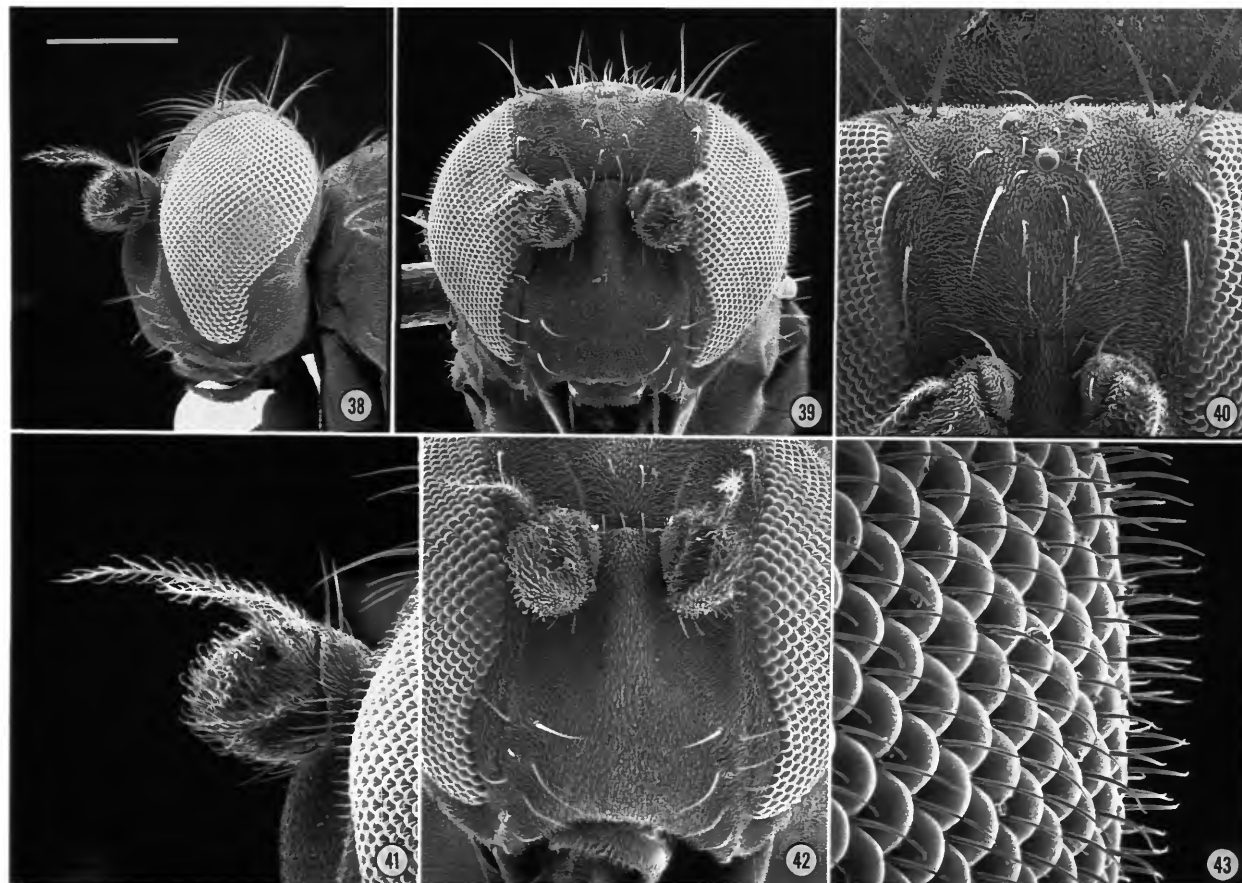
Where the mud substrate is exposed along the western margin of the swamp a blue-green alga formed a mat on much of the mud's surface, and sweeping slowly just above the algal mat resulted in the collection of several species of shore flies, including this species and its congener, *G. caribea*. I presume that this is the habitat where oviposition occurs, as several of the females that were caught had an egg protruding from their ovipositors.

REMARKS.—This is a very distinctive species of *Glenanthe*, and the features that characterize it also contribute to its attractive appearance and prompted selection of its name.

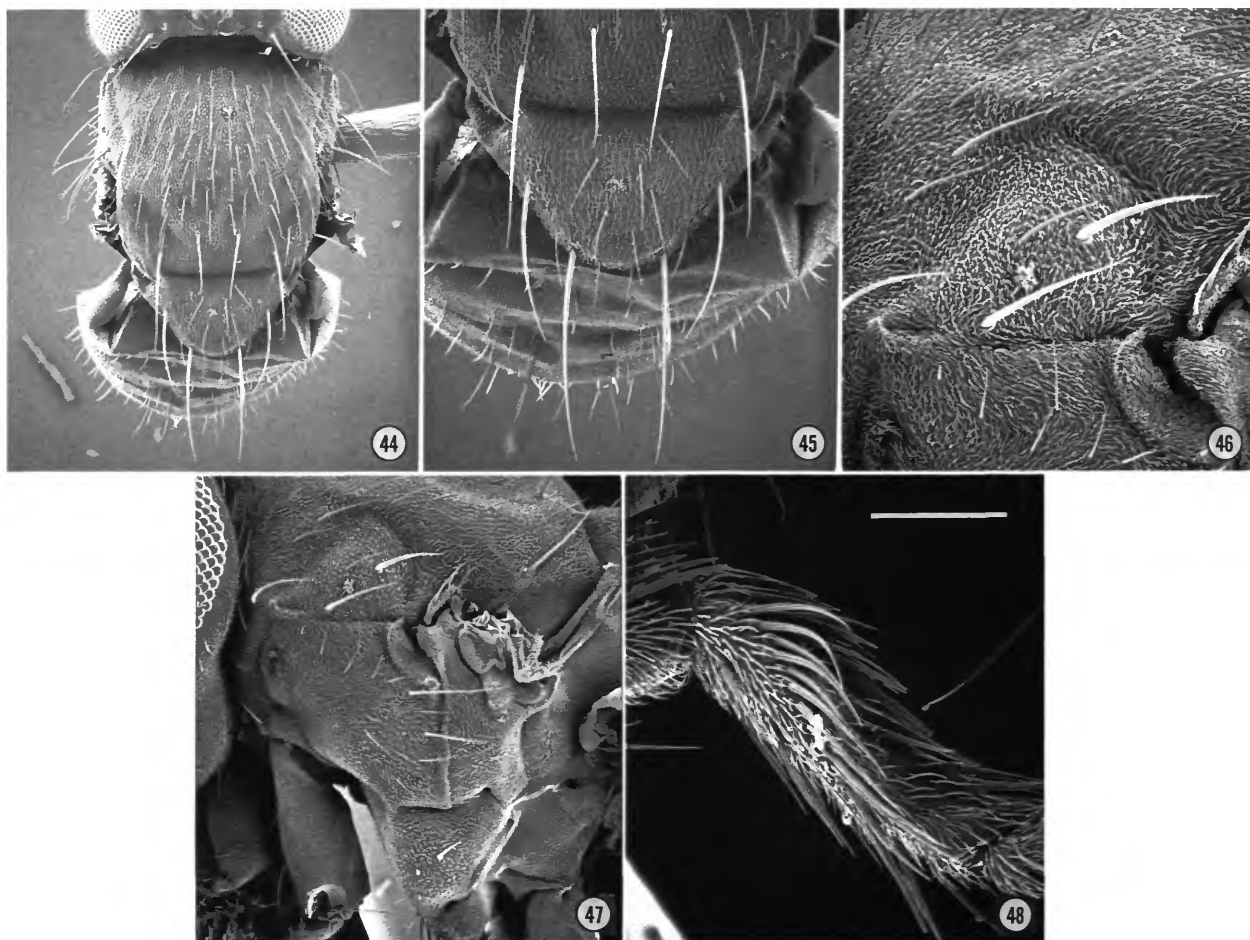
8. *Glenanthe ruetzleri*, new species

FIGURES 37-53

DIAGNOSIS.—Wing unpatterned; dark-colored palpus and antenna; lack of a gray stripe through the postpronotum,



FIGURES 38-43.—Scanning electron micrographs of *Glenanthe ruetzleri* (Belize. Stann Creek District: Twin Cays, Aanderaa Flats; scale length in parenthesis; scale for all photographs = Figure 38): 38, head, lateral aspect (200 μm); 39, same, anterior aspect (176 μm); 40, frons, anterodorsal aspect (107 μm); 41, antenna, lateral aspect (86 μm); 42, face, anterior aspect (120 μm); 43, left compound eye and interfacetal setulae, anterior aspect (20 μm).



FIGURES 44–48.—Scanning electron micrographs of *Glenanthe ruetzleri* (Belize. Stann Creek District: Twin Cays, Aanderaa Flats; scale length in parenthesis; scale for all photographs = Figure 48): 44, mesonotum, dorsal aspect (250 μm); 45, scutellum, dorsal aspect (136 μm); 46, notopleuron, lateral aspect (75 μm); 47, thoracic pleural area, lateral aspect (150 μm); 48, fore basitarsus, posterior aspect (38 μm).

notopleuron, and alar region; unique comb of setulae on the fore basitarsomere of male; and microtomentose, dull-colored abdomen.

DESCRIPTION.—Small shore flies, length 1.3 to 1.8 mm; generally dull colored, grayish tan to brown dorsally, becoming grayer ventrally, microtomentose.

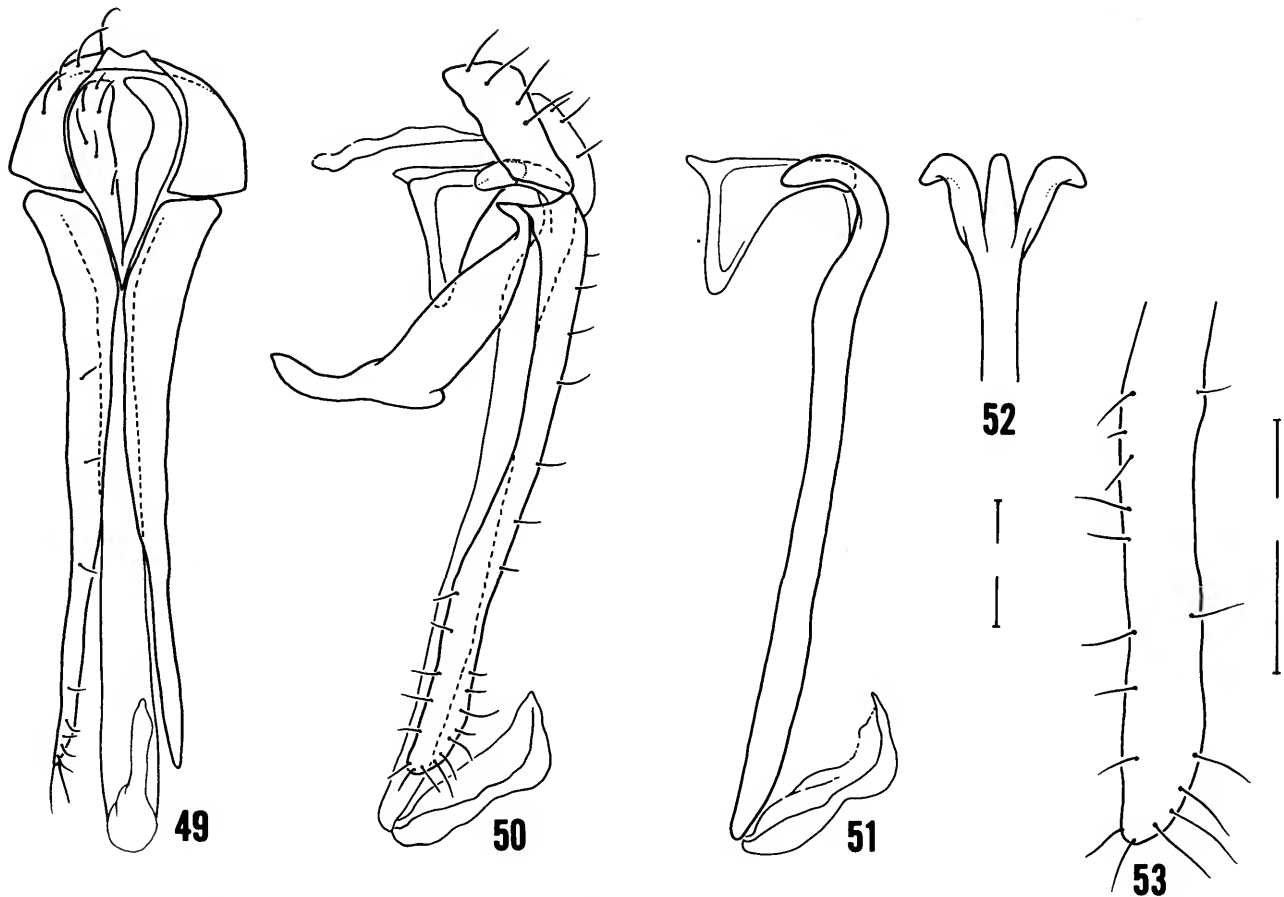
Head (Figures 38–43): Facial color variable, gray, especially ventrally, to yellowish or golden gray, especially dorsally, dorsal coloration concolorous with frons. Antenna black. Palpus brownish to grayish black.

Thorax (Figures 44–48): Thorax generally unicolorous, not distinctly bicolored, lacking gray stripe from postpronotum through notopleuron regions. Prescutellar acrostichal setae inserted only slightly anterior of posterior dorsocentral or postalar setae. Wing uniformly hyaline, lacking a pattern of

dark spots or bands; costal vein ratio 0.15; M vein ratio 0.45. Fore basitarsomere of male with a comb of setulae anteromedially (Figure 48).

Abdomen: Generally dull, microtomentose, gray. Male terminalia (Figures 49–53): Surstylus greatly elongate, over three times height of epandrium, in lateral view shallowly sinuous and with apex slightly enlarged (Figures 49, 53), spatulate; base of aedeagus in posterior view (Figure 52) with lateral projections distinctly curved laterally, hook like, and slightly pointed; hypandrium in lateral view (Figure 50) with anterior margin extended anteriorly as a long projection.

TYPE MATERIAL.—The holotype male is labeled “BELIZE. StannCreek Dist: Twin Cays, Aanderaa Flats, 7–19 November 1987[,] W.N. & D. Mathis.” The allotype female and 43 other paratypes (30 σ^7 , 13 Q ; USNM) bear the same locality label as



FIGURES 49-53.—*Glenanthe ruetzleri* (Belize, Stann Creek District: Twin Cays, Aanderaa Flats): 49, structures of the male terminalia (epandrium, cerci, surstyli, aedeagus), posterior aspect; 50, structures of the male terminalia (epandrium, cerci, surstyli, aedeagus, aedeagal apodeme, hypandrium), lateral aspect; 51, aedeagal apodeme, lateral aspect; 52, base of aedeagus, posterior aspect; 53, apex of surstylus, lateral aspect. (Scale = 0.1 mm.)

the holotype. Other paratypes are as follows: **BELIZE**. Stann Creek District: Carrie Bow Cay, Mar 1988, W.N. Mathis (1♂); Dangriga (12 km N), 28 Mar 1988, W.N. Mathis (1♂; USNM); Round Cay (near Coco Plum Cay), Mar 1988, W.N. Mathis (1♂); Stewart Cay, Mar 1988, W.N. Mathis (11♂, 3♀); Tobacco Range, Jul 1989, W.N. Mathis, H.B. Williams (2♀); Twin Cays (Aanderaa Flats, south end of East Island, north of Lair Channel, south end of West Island, West Bay, West Pond), Jan-Nov 1987, Mar 1988, Jul 1989, W.N. and D. Mathis, C. Feller, H.B. Williams (81♂, 59♀); Wee Wee Cay, Nov 1987, W.N. and D. Mathis (22♂, 20♀). Glover's Reef (Middle Cay, Southwest Cay), Jul 1989, W.N. Mathis, H.B. Williams (23♂, 1♀). Belize District: Turneffe Islands: Blackbird Caye (17°19'N, 87°48'W), Mar 1993, W.N. Mathis (5♂, 2♀). Soldier Cay (17°20'N, 87°47'W), Mar 1993, W.N. Mathis (1♀). Rope Walk Cay (17°13'N, 87°51'W), Mar 1993, W.N. Mathis (1♂). The holotype is double mounted (minuten in a block of plastic),

is in excellent condition, and is deposited in the USNM.

OTHER SPECIMENS EXAMINED.—**COSTA RICA**. *Guanacaste*: Playa Tamarindo (sandy mud flats around brackish lagoon), 28 Mar 1987, W.E. Steiner (55♂, 55♀; USNM).

CURAÇAO. Boca Santa Cruz, 14 Feb 1987, W.E. Steiner, J.M. Swearingen (6♂, 16♀; USNM).

ECUADOR. *Manabi Province*: Bahia, 10 Jan 1978, W.N. Mathis (23♂, 4♀; USNM). *Galápagos Islands*: Isabela. Puerto Villamil (Flamingo lagoon, high saline), 5-10 Mar 1989, B.J. Sinclair (21♂, 22♀; CNC, USNM). Santa Cruz. Academy Bay (arid zone, thorn scrub, 30 m), 14 Jul 1985, S.B. and J. Peck (3♂, 1♀; CNC); Caleta (1 km N, salt lagoon, littoral), Tortuga Negra, B.J. Sinclair (6♂, 4♀; CNC); Charles Darwin Research Station (littoral, white sand beach), 5 Feb 1989, BJS (2♀; CNC); Charles Darwin Research Station (2 km E, lagoon, sweeping sand banks, high saline), 26 Feb-30 Mar 1989, B.J. Sinclair (11♂, 12♀; CNC, USNM); Charles Darwin Research

Station (1 km E, lagoon, littoral), 30 Mar–7 Apr 1989, S.B. Peck, B.J. Sinclair (1♀; CNC). Santa Fe. (arid zone, cactus forest, 50 m), 4 Apr 1989, B.J. Sinclair (1♀; CNC).

EL SALVADOR. Acajutla (Pacific coast), Dec 1953, W.B. Heed (1♂, 1♀; USNM).

MEXICO. Chiapas: Boca de Cielo (17 km S Puerto Arista), 18 May 1985, A. Freidberg, W.N. Mathis (3♀; USNM). Sinaloa: Mazatlan (rocky beach), 26 Dec 1983, R.S. Zack (1♀; WSU). Tabasco: Paraiso (5 km E, beach), 6 May 1985, W.N. Mathis, A. Freidberg (17♂, 17♀; USNM).

TRINIDAD. St. George: Chacachacare Island (10°41'N, 61°46'W), saline pond margin, 29 Jun 1993, W.N. Mathis (9♂, 8♀; USNM). St. Patrick: Pitch Lake (10°14'N, 61°38'W), 24 Jun 1993, W.N. Mathis (1♂, 1♀; USNM).

UNITED STATES. Florida: Dade Co., Bahia Vaca Key, 26 Nov 1961, J.G. Chillcott (1♂, 1♀; CNC).

West Indies. ST. LUCIA. Black Bay, 26 Feb–1 Mar 1978, S.A. Marshall (4♂, 5♀; CNC).

DISTRIBUTION (Figure 37).—Nearctic: United States (FL). Neotropical: Belize, Costa Rica, Curaçao, Ecuador (mainland and Galápagos Islands), El Salvador, Mexico (CHI, SIN, TAB), Trinidad, and West Indies (St. Lucia).

ETYMOLOGY.—The species epithet, *ruetzleri*, is a patronym to honor Dr. Klaus Rützler (Department of Invertebrate Zoology, National Museum of Natural History, and director of the Caribbean Coral Reef Ecosystems project), who supported and graciously hosted much of our field work on the cays of the Belizean barrier reef.

NATURAL HISTORY.—The type series was collected on Wee Wee Cay (16°46'N, 88°08.5'W), which is an isolated patch reef about 6.5 km southwest of South Water Cay. The cay is situated within the barrier reef lagoon of the Belize Barrier Reef (Caribbean), and its shape is roughly triangular with sides 90–140 m long (Stoddart et al., 1982). The cay is not inhabited, although on occasion it has been used as a fishing station. The fringe of the cay is dense red mangrove (*Rhizophora mangle* L.), but the most dominant vegetation just inside the mangrove fringe is a large stand of buttonwood mangrove (*Conocarpus erectus* L.) and coconut palms (*Cocos nucifera* L.), and the southern third of the island is extensively covered by black mangrove (*Avicennia germinans* (L.)). The interior of the northern half of the cay has been cleared of vegetation and toward the northern end there is a large area (30 m in diameter) of moist substrate that is covered with a mat of blue-green algae. Specimens of *G. ruetzleri* were abundant on the mat and were easily collected by sweeping just above the matted algae. Other Ephydriidae collected from the algal mat included species of the tribe Discocerini (*Discocerina* and *Polytrichophora*) and *Paralimna*. The larvae of *G. ruetzleri* were probably breeding in the algae and moist substrate.

REMARKS.—On seashores of the Caribbean, this is the most widespread species, sometimes occurring abundantly. Although common, specimens need to be examined carefully, as two other species, *G. litorea* and *G. caribea*, are known to occur sympatrically.

9. *Glenanthe willinki* Lizarralde de Grosso

FIGURES 54–56

Glenanthe willinki Lizarralde de Grosso, 1977:125.

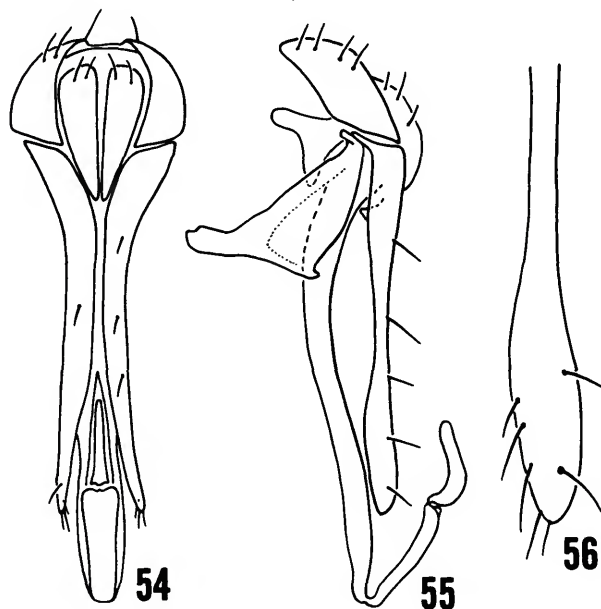
DIAGNOSIS.—Wing unpatterned; palpus mostly blackish brown, apex usually pale, grayish yellow; antenna mostly dark, black; flagellomere 1 blackish brown; postpronotum, notopleuron, and alar area lacking a gray stripe; fore basitarsomere of male unadorned; abdomen densely microtomentose, gray.

DESCRIPTION.—Small shore flies, length 1.3 to 1.8 mm; generally dull colored, brown to gray, microtomentose.

Head: Frons mostly light tan, with anterior and lateral margins gray. Antenna black. Face silvery gray. Apex of palpus pale, yellowish, base grayish black.

Thorax: Mesonotum mostly silvery gray, only faintly light brown medially and toward posterior half; pleural areas light gray. Wing unpatterned; costal vein ratio 0.17; M vein ratio 0.4. Legs with femora and tibiae gray, densely microtomentose; tarsi yellow, apical 1–2 sometimes brown; fore tarsomere unadorned.

Abdomen: Dorsum mostly gray, with some faint tan coloration medially and toward base. Male terminalia (Figures 54–56) as follows: surstylus (Figures 54–56) in lateral view nearly 3 times length of epandrium, spatulate with margins more or less even, anterior surface lacking a subapical nipple; aedeagus with distiphallus as 2 articulated pieces, combined length slightly less than 0.5 that of basiphallus.



FIGURES 54–56.—*Glenanthe willinki* (Argentina. Buenos Aires: Bahia Blanca): 54, structures of the male terminalia (epandrium, cerci, surstyli, aedeagus), posterior aspect; 55, structures of the male terminalia (epandrium, cerci, surstyli, aedeagus, aedeagal apodeme, hypandrium), lateral aspect; 56, apex of surstylus, lateral aspect. (Scale = 0.1 mm.)

TYPE MATERIAL.—The holotype male is labeled “[Argentina. Buenos Aires Province] BAHIA BLANCA 11/70 [Nov 1970] col. GROSSO [black sub-border, handwritten]/GLENANTHE WILLINKIL. DE GROSSO [black sub-border, handwritten]/HOLOTIPO [red].” The holotype is double mounted (glued to a paper point), is in very poor condition (wings and some legs missing, front part of face broken, abdomen broken and in a microvial that is attached to the same pin), and is deposited in the insect collection at IML.

The allotype female is labeled “R[epublica]A[rgentina]. Pte Peron Colonia Benitez, 3-XI-949 [3 Nov 1949] Coll: M L Aczel/GLENANTHE WILLINKI L. DE GROSSO/ALOTIPO.” The allotype is double mounted (minute nadel in cork base), is in good condition, and is deposited in the insect collection at IML.

OTHER SPECIMENS EXAMINED.—CURAÇAO. Boca Santa. Cruz, 14 Feb 1987, W.E. Steiner and J.M. Swearingen (2♂, 3♀; USNM).

DISTRIBUTION.—This species is known only from Argentina and the Dutch island of Curaçao in the Caribbean.

NATURAL HISTORY.—The series from Curaçao was collected on a mud flat of approximately one hectare in size that was surrounded by mangrove (*Avicennia germinans*). The mud was partially dried but not cracked. At extreme high tides, it is likely that the flat is flooded with sea water, but otherwise the flat is isolated from the ocean by a road bed.

REMARKS.—The holotype is in very poor condition, and my identity of this species is mostly based on structures of the male terminalia. Although somewhat disjunct, probably reflecting sampling error, the specimens from Curaçao seem to be this species.

10. *Glenanthe neotropica*, new species

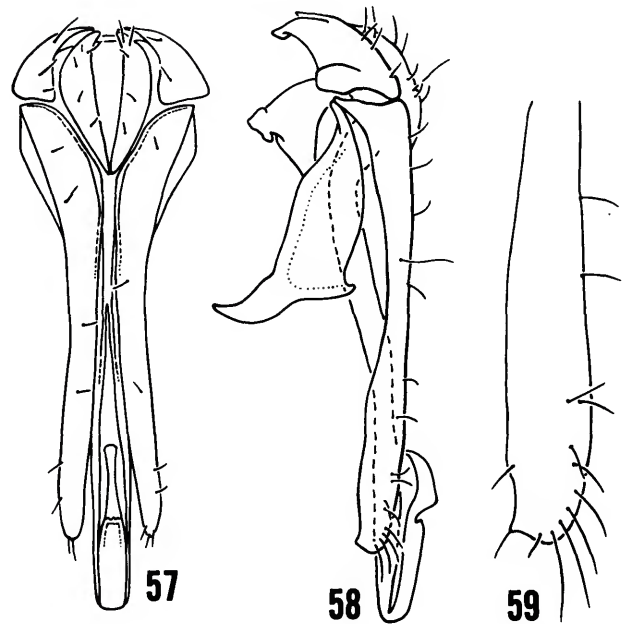
FIGURES 57-59

DIAGNOSIS.—Wing unpatterned; pale-colored palpus, mostly dark colored antenna; lack of a gray stripe through the postpronotum, notopleuron, and alar region; unadorned fore basitarsomere of male; and microtomentose, dull-colored abdomen.

DESCRIPTION.—Small shore flies, length 1.3 to 1.8 mm; generally dull colored, tan to gray, microtomentose.

Head: Frons with frontal vitta grayish tan, microtomentose; parafrons more yellowish tan, less densely microtomentose; fronto-orbits silvery gray to silvery white. Antenna mostly black, scape and pedicel black; flagellomere 1 black dorsoapically, median surface with basoventral portion yellowish orange. Face silvery gray to silvery white. Palpus whitish yellow to lightly grayish yellow.

Thorax: Mesonotum mostly tan to grayish tan, lateral margins mostly gray; pleural areas gray; lacking stripe. Wing unpatterned, hyaline; costal vein ratio 0.19; M vein ratio 0.41. Fore basitarsomere unadorned.



FIGURES 57-59.—*Glenanthe neotropica* (Argentina. Cordoba: Cordoba): 57, structures of the male terminalia (epandrium, cerci, surstyli), posterior aspect; 58, structures of the male terminalia (epandrium, cerci, surstyli), lateral aspect; 59, apex of surstylus, lateral aspect. (Scale = 0.1 mm.)

Abdomen: Male terminalia (Figures 57-59) as follows: Epandrium narrowed dorsally, with a rounded notch posteriorly; surstylus (Figures 57, 59) elongate, length about 2.5 times that of epandrium, with a small, subapical, anterior nipple; aedeagus tubular, parallel sided in lateral view; aedeagal apodeme (Figure 58) more or less L-shaped in lateral view, with angle bearing lateral flange; hypandrium (Figure 57) in lateral view shaped like a slipper with the toe extended anteriorly.

TYPE MATERIAL.—The holotype male is labeled “R[epublica de] ARGENTINA[,] CORDOBA[,] L.V. Mansilla[,] Salina - Ruta 60[,] 27. I. 1977 [27 Jan 1977][,] Col. M. L. de Grosso [handwritten].” The female allotype and five other paratypes (3♂, 2♀; IML, USNM) bear the same label data as the holotype. The holotype is double mounted (pin in a cork disk), is in good condition (left wing folded, some setae on head missing), and is deposited in the IML.

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

ETYMOLOGY.—The specific epithet, *neotropica*, is a Latinized word to recognize the geographic region where this species occurs.

REMARKS.—This species is very similar to *G. willinki* externally, and I can distinguish between the two species only by the shape of the surstylus, which in *G. neotropica* bears a small nipple on the anterior surface near the apex.

Literature Cited

- Becker, T.
1896. Dipterologische Studien, IV: Ephydriidae. *Berliner Entomologische Zeitschrift*, 41(2):91–276, 4 plates.
- Canzoneri, S., and L. Rampini
1992. Una nuova specie di *Glenanthe* dell'Iran (Diptera, Ephydriidae). *Bollettino del Museo Civico di Storia Naturale di Venezia*, 41(1990):231–233, 1 figure.
- Cheng, L., and R.A. Lewin
1974. Fluidisation as a Feeding Mechanism in Beach Flies. *Nature*, 250(5462):167–168.
- Chillcott, J.G.
1964. A New Species of *Glenanthe* Haliday (Diptera: Ephydriidae) from the North American Interior. *The Canadian Entomologist*, 96(5):811–812, 2 figures.
- Cogan, B.H.
1980. 71. Family Ephydriidae. In R.W. Crosskey, editor, *Catalogue of the Diptera of the Afrotropical Region*, pages 655–669. London: British Museum (Natural History).
- Cogan, B.H., and W.W. Wirth
1977. Family Ephydriidae. In M.D. Delfinado, and D.E. Hardy, editors, *A Catalogue of the Diptera of the Oriental Region, Suborder Cyclorrhapha (Excluding Division Aschiza)*, 3:321–339. Honolulu: University Press of Hawaii.
- Cresson, E.T., Jr.
1925. Descriptions of New Genera and Species of the Dipterous Family Ephydriidae, VII. *Entomological News*, 36:166.
1942. Synopses of North American Ephydriidae (Diptera), I: The Subfamily Psilopinae, with Descriptions of New Species. *Transactions of the American Entomological Society*, 68:101–128.
- Czerny, L.
1909. Cyclorrhapha Schizophora Holometopa. In L. Czerny and P.G. Strobl, Spanische Dipteren, III. *Verhandlungen der Kaiserlich-königlichen Zoologisch-botanischen Gesellschaft in Wien*, 59:247–290.
- Giordani Soika, A.G.
1981. Sulla presenza nelle lagune delle coste atlantiche dell'America Centro-Setentrionale della *Lipochaeta slossonae* Coq., dittero efidride di tipo paleosteppico-mediterraneo. *Bollettino del Museo Civico di Storia Naturale di Venezia*, 31:69–77, 2 figures, 4 plates.
- Griffiths, G.C.D.
1972. The Phylogenetic Classification of Diptera Cyclorrhapha, with Special Reference to the Structure of the Male Postabdomen. *Series Entomologica*, 8: 340 pages, 154 figures, 2 plates. The Hague: W. Junk.
- Haliday, A.H.
1839. Remarks on the Generic Distribution of the British Hydromyzidae (Diptera). *Annals of Natural History*, 3:217–224, 401–411.
- Hendel, F.
1934. Schwedisch-chinesische wissenschaftliche Expedition nach den nordwestlichen Provinzen Chinas, unter Leitung von Dr. Sven Hedin und Prof. Sü Ping-chang. Insekten gesammelt vom schwedischen Arzt der Expedition Dr. David Hummel 1927–1930, 13: Diptera, 5. Muscaria holometabola. *Arkiv för Zoologi*, 25A(21):1–18, 3 figures.
- Lizarralde de Grosso, M.
1977 ("1976"). *Glenanthe* Haliday, nuevo genero para Sudamerica con la descripcion de una nueva especie (Diptera-Ephydriidae). *Neotropica*, 22(68):125–128, 3 figures.
- Loew, H.
1860. Die Europäischen Ephydriidae und die bisher in Schlesien beobachteten Arten derselben. In *Neue Beiträge zur Kenntniss der Dipteren. Programm der Königlichen Realschule zu Meseritz*, 7: 46 pages.
- Mathis, W.N.
1977. Key to the Neotropical Genera of Parydrinae with a Revision of the Genus *Eleleides* Cresson (Diptera: Ephydriidae). *Proceedings of the Biological Society of Washington*, 90(3):553–565, 13 figures.
1984a. A Revision of the Genus *Asmeringa* Becker (Diptera: Ephydriidae). *Israel Journal of Entomology*, 17(1983):67–79, 21 figures.
1984b. A Revision of the Shore Fly Genus *Homalometopus* Becker (Diptera: Ephydriidae). *Proceedings of the Biological Society of Washington*, 97(2):251–262, 21 figures.
1986a. A Revision of the Subgenus *Eremotrichoma* Soika of the Shore Fly Genus *Allotrichoma* Becker (Diptera, Ephydriidae). *Israel Journal of Entomology*, 19:127–139, 6 figures.
1986b. Studies of Psilopinae (Diptera: Ephydriidae), I: A Revision of the Shore Fly Genus *Placopsidella* Kertész. *Smithsonian Contributions to Zoology*, 430: iv + 30 pages, 34 figures.
1989. 66. Family Ephydriidae. In N.L. Evenhuis, editor, *Catalog of the Diptera of the Australasian and Oceanian Regions*, pages 639–649. Honolulu and Leiden: E.J. Brill and B.P. Bishop Museum special publication 86.
1991. Classification of the Shore Flies (Diptera: Ephydriidae); Past, Present, and Future. In L. Weismann et al., editors, *Proceedings of the Second International Congress of Dipterology*, pages 209–208. The Hague and Bratislava: SPB Academic Publishing.
1992. The First Shore Fly of the Genus *Glenanthe* Haliday from the Australasian Region (Diptera: Ephydriidae). *Proceedings of the Entomological Society of Washington*, 94(1):78–82, 3 figures.
1993. Studies of Gymnomyzinae (Diptera: Ephydriidae), IV: A Revision of the Shore-fly Genus *Hecamede* Haliday. *Smithsonian Contributions to Zoology*, 541: iii + 46 pages, 64 figures, 1 table.
- Mathis, W.N., and T. Zatzwornicki
1990. Taxonomic Notes on Ephydriidae (Diptera). *Proceedings of the Biological Society of Washington*, 103(4):891–906, 13 figures.
- McAlpine, J.F.
1981. Morphology and Terminology—Adults. In J.F. McAlpine et al., editors, *Manual of Nearctic Diptera*, 1:9–63. Ottawa. [Volume 1 is Monograph 27 of Research Branch Agriculture Canada.]
- Munari, L.
1988. Il genere *Homalometopus* Becker: Considerazioni e ipotesi sulla sua biogeografia e filogenesi, con descrizione di una nuova specie della Sardegna (Diptera, Ephydriidae). *Società Veneziana di Scienze Naturali—Lavori*, 13:5–16, 3 figures.
- Papp, L.
1979. A Contribution to the Revision of the Palearctic Ephydriidae (Diptera). *Folia Entomologica Hungarica*, new series, 32(1):97–104.
- Regensburg, J.T.
1978. A New U.S. Record for *Glenanthe interior* Chillcott (Diptera: Ephydriidae). *Entomological News*, 89(2/3):93–94.
- Stoddart, D.R., F.R. Fosberg, and D.L. Spellman
1982. Cays of the Belize Barrier Reef and Lagoon. *Atoll Research Bulletin*, 256: 76 pages, 80 plates.

Sturtevant, A.H., and M.R. Wheeler

1954. Synopses of Nearctic Ephydriidae (Diptera). *Transactions of the American Entomological Society*, 79:151-257.

Williston, S.W.

1897. Diptera Brasiliana, Part IV. *Kansas University Quarterly*, series A, 6:1-12.

Wirth, W.W.

1956. The Ephydriidae (Diptera) of the Bahama Islands. *American Museum Novitates*, 1817: 20 pages, 21 figures.
1965. Family Ephydriidae. In A. Stone et al., editors, *A Catalog of Diptera of America North of Mexico*, pages 734-759. United States Department of Agriculture, Agricultural Research Service, Agriculture Handbook, 276:iv+1696 pages.

1968. 77, Family Ephydriidae. In N. Papavero, editor, *A Catalogue of the Diptera of the Americas South of the United States*, pages 1-43. São Paulo: Departamento de Zoologia, Secretaria da Agricultura.

Wood, D.M.

1991. Homology and Phylogenetic Implications of Male Genitalia in Diptera: The Ground Plan. In L. Weissmann et al., editors, *Proceedings of the Second International Congress of Dipterology*, pages 255-272. The Hague and Bratislava: SPB Academic Publishing.

Zatwarnicki, T.

1992. A New Classification of Ephydriidae Based on Phylogenetic Reconstruction (Diptera: Cyclorhapha). *Genus*, 3(2):65-119, 99 figures.

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