# A REVISION OF THE RED-BROWN CABERINE GEOMETRIDS OF THE SOUTHEASTERN UNITED STATES (GEOMETRIDAE: CABERINI)

**Douglas C. Ferguson***

Systematic Entomology Laboratory, Agricultural Research Service, USDA, c/o National Museum of Natural History, MRC 168, Washington, DC 20560

**Abstract** - Seven species of the ennomine tribe Caberini in the southern United States are revised and assigned to four genera; namely, *Ilexia*, **n. gen.**, *Parilexia*, **n. gen.**, *Covellia*, **n. gen.**, and *Episemasia* Hulst, 1896. *Parilexia antilleata* and *Covellia procrastinata* are described as **new species**. Other taxonomic changes or actions include: three type species designations; referral of 20 previously proposed names for neotropical species to the new genera as **new combinations**; three instances of **new synonymy**; four instances of **revised status**, these being species removed from synonymy and reinstated as distinct species; and designation of three **lectotypes**. An identification key is provided for seven red-brown species of Caberini in the eastern United States; and the larvae of *Ilexia intractata* (Walker, [1863]) and *Episemasia solitaria* (Walker, 1861), both reared on American holly, *Ilex opaca* Aiton (Aquifoliaceae), are described for the first time.

**Key words:** Caribbean Geometridae, new taxa, larvae, host plants, American holly.

## INTRODUCTION

The purpose of this revision is to clarify the taxonomy of a group of red-brown ennomine Geometridae occurring in the southeastern U.S. and to reveal something of their relationships to others in the Neotropical Region. They proved to belong to four genera. The North American species of all but one, *Episemasia* Hulst, have been confused with or included in the neotropical genera *Thysanopyga* Herrich-Schäffer or *Oenoptila* Warren, to which they appear but distantly related. Three of the four genera are here described as new, along with two new species. Questions raised by the presence of unidentified species in Florida have gone unresolved for years because of our ignorance of the nearby West Indian fauna, and also because of a scarcity of material in good condition. Although nearly 200 light-trap specimens of *Parilexia* from Key Largo, Florida exist in collections, hardly one of these is good enough for description or illustration. I do illustrate several as better quality replacements are still unavailable. Some, such as *Parilexia nicetaria* (Guenée), *P. proditata* (Walker), and *Covellia procrastinata*, were not known from the U.S. before I began this study and are here reported for the first time.

The species treated are mainly northern outliers of larger neotropical groups of red-brown Ennominae, most of which remain unstudied. However, Krüger and Scoble (1992) revised *Thysanopyga* and *Perissopteryx* Warren; and Linda Pitkin, at The Natural History Museum, London, has been investigating others in connection with a study of the Ennominae of Costa Rica. Southeast Asian members of the group, some of which are remarkably similar to American counterparts, were treated by Holloway (1993).

The species that I listed as *Thysanopyga intractata* (Walker) in the North American check list (Ferguson, 1983), following Forbes (1948: 70), is the only U.S. representative of an otherwise neotropical genus, having at least five species in Central and South America. Of them, *Oenothalia montivaga* Schaus (= *Ilexia montivaga* (Schaus), **new combination**), from Guatemala and Costa Rica, is most closely related to *P. intractata*.

*Parilexia* is a neotropical group with many superficially similar but structurally diverse species. They are much in need of further revision. The three superficially similar species of *Parilexia* from Florida together comprise the "*Itame nicetaria*" of the McDunnough check list (1938: 161), and of Kimball (1965: 179). The *Itame gausaparia* of them and other authors is now *Ilexia intractata* (Walker). One can see indications of relationship in the genitalia of *Ilexia* and *Parilexia*; however, the genital characters of *Covellia* are quite distinct.

Between the genitalia of the *Ilexia*-*Parilexia* complex and *Covellia*, there is little to suggest any relationship whatsoever—nothing to show that they are related as members of the same tribe, except perhaps the absence of the gnathos and presence of a spine at or near the distal end of the valve as seen in *Ilexia* and *Covellia*. Otherwise, if *Covellia* is related to anything that I know, it would have to be *Episemasia*, a North American genus whose male genitalia show certain similarities. *Episemasia* is included in the present paper.

*Aterpnodes geminipuncta* Warren, from Costa Rica (type species of *Aterpnodes* Warren) presented somewhat of a problem because it has some features close to those of *Parilexia*. However, it also has some conspicuous differences, and I hope that I am justified in keeping it distinct. This is further discussed under the genus *Parilexia*.

*Apodrepanulatrix liberaria* (Walker), another red-brown species assigned to the Caberini and associated with *Ceanothus americanus* Linneaus (Rhamnaceae) from Ontario to the mountains of northern Georgia, is not treated here because it is not southeastern in the same sense, and it was already covered by Rindge (1949: 290). *Semaeopus caecaria* (Hübner), a neotropical species of Sterrhinae of which I collected several on Big Pine Key, Florida in 1976, resembles members of this complex, but it has fasciculate antennae, a strangely modified hindleg in the male, and a conspicuous white fillet on the head between the bases of the antennae in both sexes. The larger, pinkish rusty-brown, Arizona species long known as *Pterospoda opuscularia* (Hulst) may be a caberine and is one of the many that feed on Rhamnaceae. However, the taxonomy of the southwestern species of *Pterospoda* Dyar is so muddled that this one at present happens to be without either a generic or specific name.

*Deceased, 4 November 2002

## ABBREVIATIONS FOR INSTITUTIONS

The following are abbreviations used for museums where material was examined, borrowed, or types deposited. USNM: United States National Museum of Natural History, Washington, DC; BMNH: The Natural History Museum, London; MCZ: Museum of Comparative Zoology, Harvard University, Cambridge, Massachusetts; AMNH: American Museum of Natural History, New York; MGCL: McGuire Center for Lepidoptera and Biodiversity, Florida Museum of Natural History, University of Florida, Gainesville, FL.

## MATERIALS AND METHODS

This study is based on 785 adult specimens, mostly in the USNM, BMNH, and AMNH, including all relevant types, and 97 slide preparations of genitalia and wings. The genitalia were prepared in the usual way but mostly double stained with Chlorozol Black in water and then with a water and alcohol soluble grade of Eosin-Y in 95% isopropyl alcohol. Dissection was in 10–15% ethanol, followed by 95% isopropyl alcohol as a hardening and dehydration agent, clove oil as a clearing agent, and xylene as a mutually miscible solvent between clove oil and Canada balsam. Types were borrowed and dissected to establish the identity of species when necessary. Three broods of larvae were reared from eggs.

Before deciding to propose as new the genera *Ilexia*, *Parilexia*, and *Covellia*, I checked the type species of those neotropical genera most likely to be related to them; namely *Aterpnodes*, *Isochromodes*, *Lobopola*, *Mimomma*, *Mimosema*, *Oenoptila*, and *Oenothalia*, all of Warren, and *Pachydia* Guenée, *Perissopteryx* Warren, *Spilocraspeda* Warren, *Spododes* Warren, and *Thysanopyga* Herrich-Schäffer. This failed to reveal any generic names applicable to the five unplaced species occurring in the United States.

## CLASSIFICATION

The tribal classification of these red-brown ennomines is poorly understood and based mainly on superficial resemblances and perhaps on concepts more imagined than real. Forbes (1948: 22, 69) provided a useful description of the tribe Caberini, in part repeated and modified by McGuffin (1981: 23), although the characters that they emphasized do not stand up well when more genera are examined. I do not doubt that many genera assigned to the Caberini belong together, but anatomical features that would unite all of them are nebulous. Similar views on the unsatisfactory nature of the current classification were indicated by Krüger and Scoble (1992: 84) and Holloway (1993: 98). Temperate-zone species assigned to the Caberini are diverse, and among them the red-brown coloring is not especially prevalent. In tropical and subtropical regions, however, it is more so, in Asia and Africa as well as in the Neotropics. The genera treated here appear to be part of that far-flung assemblage, and they represent two groups—the *Ilexia*-*Parilexia* group and the *Episemasia*-*Covellia* group.

In the last check list (Ferguson, 1983: 93), I mistakenly included the genus *Stergamataea* Hulst of western North America in the Caberini. On the basis of larval chaetotaxy and other characters it may belong in the tribe Boarmiini.

## EARLY STAGES

Among the genera treated, larvae are known only for *Ilexia* and *Episemasia*, and they are here described for the first time under the respective species. In both cases the foodplant was American holly, *Ilex opaca* Aiton (Aquifoliaceae), a native evergreen tree valued as an ornamental, and on which the plain green larvae of *I. intractata* (Walker) occasionally become so numerous as to attract attention as pests. I reared a brood of *I. intractata* from eggs and was then able to recognize the leaf damage and find additional larvae on the native holly in Maryland. It has also been found on American holly in Virginia (submitted to me for determination), and Massachusetts (M. Mello, pers. comm.). The larva of *Episemasia solitaria* (Walker) is more colorful, being ornamented with markings of black, white, and yellow. The only other reported host record for a member of this group in the broad sense is a single rearing of *Thysanopyga carfinia* (Druce) from a larva on *Gouania polygama* (Jacq.) Urban (Rhamnaceae) in Chiapas, Mexico (J.E. Rawlins in Krüger & Scoble, 1992: 94) and another *Thysanopyga* species on the same host (J.E. Rawlins in Holloway, 1993: 99). Members of the Rhamnaceae are hosts for most North American Caberini, including *Erastria* Hübner, *Sericosema* Warren, and the complex surrounding *Drepanulatrix* Gummpenberg, but not *Cabera* Treitschke.

## KEY TO ADULTS OF RED-BROWN CABERINI OF THE EASTERN U.S.

1. Male antenna bipectinate; forewing in both sexes with one to three transverse lines, usually irregular, diffuse, sometimes indistinct; palpi directed forward, more or less straight, not curved toward each other at tips .....2
- Male antenna not bipectinate, appearing simple or nearly so; forewing in both sexes with two regular transverse lines that may be nearly straight and well defined, but sometimes finely dentate or sinuous, appearing as a series of dark dots, or absent; palpi often not straight but somewhat curved or bowed toward each other .....5

2. Antennal shaft with 2–3 thin, white, longitudinal lines; S Florida and Neotropics ..... ***Parilexia***, 4
- Antennal shaft without longitudinal white lines; E or SE United States to Texas .....3

3. Wing length 12–15 mm; associated with evergreen hollies; Massachusetts to Florida, Gulf Coast, E Texas ..... .....***Ilexia intractata***
- Wing length 15–20 mm; associated with *Ceanothus*; S Ontario and Great Lakes to N Georgia. Not treated herein (See Rindge, 1949: 290) .....***Apodrepanulatrix liberaria***

4. Male with large, unusual, backwardly directed hair pencil on forefemur (often largely concealed within a sheath formed of broad, curled, spatulate scales on adjacent thorax;

female with two thin, longitudinal white lines on shaft of antenna .....***Parilexia proditata***

- Male without such a hair pencil; females with three thin, longitudinal white lines on shaft of antenna, although ventral one may be indistinct .....***Parilexia nicetaria*** and ***P. antilleata*** (These two species reliably distinguished only by genitalia)

5. Male without white dorsal abdominal markings; wing length 14 mm or less; widespread in SE United States, including E Texas .....***Episemasia***, 6
- Male frequently with dorsal white spot or bar on abdominal segment 7; wing length 13–16 mm, Miami-Dade Co., Florida, Cuba, Bahamas .....***Covellia procrastinata***

6. Forewing without regular, well-defined, thin, pale postmedial line, which may instead be represented by series of disconnected dark dots; widespread in SE United States W to Texas .....***Episemasia solitaria***
- Forewing with regular, well-defined, thin, pale postmedial line that is never represented by series of dark dots; Texas only .....***Episemasia cervinaria***

## ***Ilexia*** Ferguson, **new genus**
(Figs. 1–3, 22, 31)

**Type species.** *Anisodes intractata* Walker, "1862" [1863]: 1,576, by present designation.

**Diagnosis.** A group of small to medium-sized, reddish-brown caberine geometrids of the Neotropics and southeastern United States, superficially resembling and much confused with those of other more or less related genera, such as *Parilexia*, and various neotropical groups of similarly colored moths that are much in need of revision. Forms of the southeastern *Episemasia solitaria* may also resemble *Ilexia intractata*, and both feed on holly (*Ilex* species). However, *Ilexia* differs conspicuously in male genitalia, venation, and other structures. The ocellus is obsolescent or absent in *Ilexia*, small but present in *Parilexia*, and well developed in the neotropical *Thysanopyga*.

**Further Description.** Male antenna broadly bipectinate, abruptly narrowing before last seven segments, which are simple; heavily ciliate ventrally, scaled in usual way dorsally but with unscaled branches; female antenna simple, very slender, sparsely ciliate; antenna of both sexes without pattern of white scales characteristic of *Parilexia*. Ocellus absent. Chaetosema small, with six or seven bristles. Tongue well developed, two-thirds to three-fourths length of antenna. Foretibia short, its length about equal to that of labial palpus in male, one and one-half times length of labial palpus in female, with epiphysis reaching end of tibia in both sexes; tibial and femoral hair pencils absent; hindtibia slightly swollen in male, unswollen in female, with both pairs of spurs.

Venation in costal area of forewing with veins well spaced, uncrowded; $R_1$ branching from radial stem before fork of Rs and M and forming a long, closed cell between R and Sc as in many other Geometridae. *Ilexia* differs from *Parilexia* in the widely spaced veins and the origin of $R_1$, the latter arising much farther out in *Parilexia*. It differs from *Parilexia* also in that $M_1$ and $M_3$ are more visibly drawn toward each other by crossveins forming end of discal cell, and crossvein meets $M_3$ about twice as far from juncture of $M_3$ and $CuA_1$ as it does in *Parilexia* (both wings). Venation differs from that of *Covellia* most conspicuously by the absence of accessory cells in forewing.

Moths reddish brown, fore- and hindwings colored alike; lines often indistinct, although diffuse dusky-brown antemedial, medial and postmedial lines may be present, the latter often pale-dotted and subparallel to outer margin or bulging outwardly at a point near middle (both wings); small, dark discal spots present; no fovea. Abdomen above same color as wings, without markings. Included neotropical species generally in same size range as *I. intractata*; wing length: 12–15 mm.

**Male genitalia** (Fig. 22). Distinct from those of related genera in several respects. Tegumen relatively small and vinculum large, thus valves articulated well toward uncus; juxta somewhat shield-shaped with long, deeply bisected posterior extension; transtilla delicate but complete; socii obsolete; uncus almost straight, tapering to a fine hook at tip; a large, dense, fanlike tuft of strap-like and spatulate scales, about as long as valve, arising near base of valve on each side; valve with single apical spine (which may be found in some related neotropical genera); aedeagus small and slender, with six or seven cornuti.

**Female genitalia** (Fig. 31). Generalized, with no special features. Corpus bursae with small, round, dentate signum; ductus seminalis enters far toward posterior end, almost at juncture of bursa copulatrix and ductus bursae.

**Early stages.** Only the type species is known to have been reared, and the larva is herein described.

**Distribution.** Middle Atlantic states to Florida and Texas; Costa Rica; Guatemala; Colombia; Peru; Bolivia.

**Included species.** The following species appear to be related to *I. intractata*, and I include them in the genus *Ilexia* (type localities given first, other locality records in parentheses):

***Ilexia anagogaria*** (Warren), **new combination**
*Petelia anagogaria* Warren, 1904: 122. "1 male from Santo Domingo, Carabaya, S.E. Peru, 6000 ft. May 1902, dry season (Ockenden)." [BMNH]. (Colombia: San Antonio, 1700 m, Cali; Bolivia: Cochabamba, Incachaca).

***Ilexia purpurea*** (Warren), **new combination**
*Petelia purpurea* Warren, 1904: 123. "1 female from Santo Domingo, Carabaya, S.E. Peru, 6000 ft. November 1901, wet season (Ockenden)." [BMNH]. (Colombia: San Antonio, 1700 and 1800 m, Cali; Bolivia: Incachaca, Cochabamba and Río Songo, 750 m; Costa Rica: Mt. Poas and Juan Viñas).

***Ilexia vinasaria*** (Schaus), **new combination**
*Petelia vinasaria* Schaus, 1911: 596. Costa Rica: Juan Viñas. [USNM].

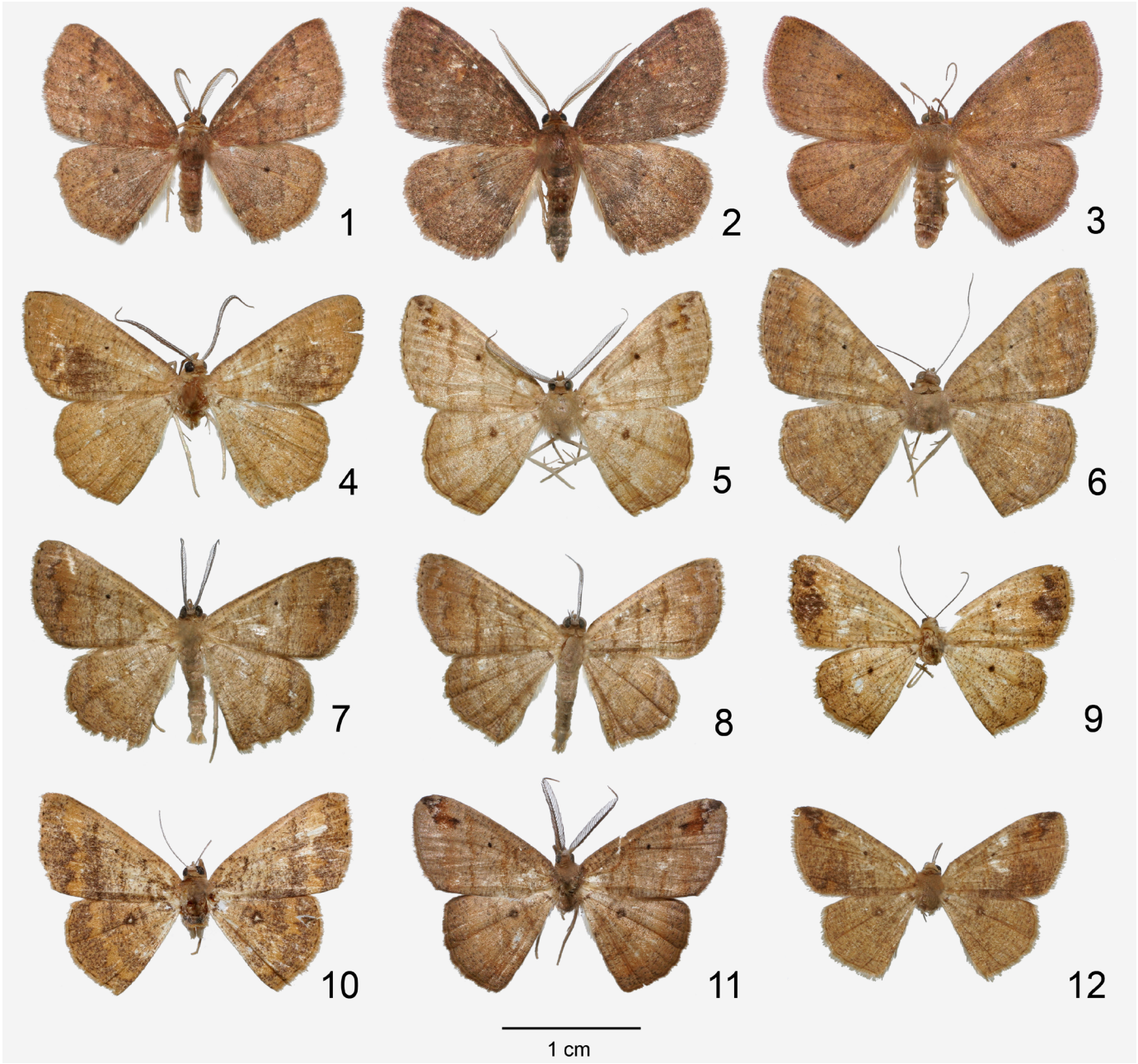
***Ilexia pallidula*** (Schaus), **new combination**
*Petelia pallidula* Schaus, 1911: 597. "Poas" [Costa Rica: Mount Poas]. [USNM]. (Costa Rica: Tuis; Guatemala: Volcán Sta. María).

***Ilexia montivaga*** (Schaus), **new combination**
*Oenothalia montivaga* Schaus, 1911: 598. "Poas" [Costa Rica: Mount Poas]. [USNM]. (Guatemala: Cayuga, Volcán Sta. María, and Chejal).

Of the above-listed species, *I. montivaga* is most closely related to *I. intractata*, and *I. purpurea* appears to be the least related. Other species not mentioned above that may belong in *Ilexia* are *Oenothalia maculosa* Dognin (1924: 17), from Río Songo, 750 m, Bolivia; *O. mediostrigata* Dognin (1913: 31), from Monte Tolima, 3200 m, Colombia "Cent. Cord.;" *O. heterograpta* Dognin, also from Monte Tolima (Type male, USNM), the original description of which I have not found; *O. subpallida* Dognin (1911: 180), from San Antonio, 1800 m, Cali, Colombia; *O. rufaria* Warren (1908: 95), from "Río Janeiro," Brasil; *O. inornata* Warren (1908: 108), from São Paulo, Brasil; and *O. picturata* Schaus (1911: 599), from Sixola River, Costa Rica.

## ***Ilexia intractata*** (Walker), **new combination**
(Figs. 1–3, 22, 31)

*Anisodes ? intractata* Walker, 1862 [1863]: 1,576
Type locality: East Florida [Probably St. Johns Bluff, Duval Co.]. [BMNH]
*Aspilates gausaparia* Grote, 1881: 41




**Figs. 1–12.** *Ilexia* and *Parilexia*: **1)** *I. intractata*, ♂, McClellanville, South Carolina, 24-III-1977, C. V. Covell, Jr [MGCL]; **2)** *I. intractata*, ♂, Atlanta, Fulton Co., Georgia, 15-III-2001, I. L. Finkelstein [MGCL]; **3)** *I. intractata*, ♀, Colesville, Montgomery Co., Maryland, 29-IX-1980, reared ex ovo on *Ilex opaca*, D. C. Ferguson [USNM]; **4)** *P. nicetaria*, ♂, "St. Dom." slide USNM 59066 [USNM]; **5)** *P. nicetaria*, ♂, Sierra Maestra, East. Cuba 1000ft., 16-VI-1930, Clorinda Querci, USNM slide 52614 [USNM]; **6)** *P. nicetaria*, ♀, Dominican Rep. vic. Jarabacoa, La Vega Prov., 27-VI-1981, C. V. Covell, Jr., USNM slide 59063 [USNM]; **7)** *P. proditata*, ♂, Key Largo Key, Monroe Co., Florida, 12-II-1978 Mrs. Spencer Kemp [USNM]; **8)** *P. proditata*, ♂, same data but, 30-VIII-1978 [USNM]; **9)** *P. proditata*, ♀, Santiago, Cuba, William Schaus Collection, USNM slide 59068 [USNM]; **10)** *P. antilleata*, Holotype ♀, data in text; **11)** *P. antilleata*, paratype ♂, Key Largo Key, Monroe Co., Florida, 7-I-1968, Mrs. Spencer Kemp, slide DCF 1669 [AMNH]; **12)** *P. antilleata*, paratype ♀, "Santiago de Cuba", June, William Schaus Collection, USNM slide 52154 [USNM]

Type locality: Wisconsin. [USNM]

*Petelia fulva* Warren, 1900: 204. I referred this previously overlooked name to the synonymy of "*Thysanopyga*" *intractata* (1983: 93) after seeing the holotype.

Type locality: Florida. [BMNH]

**Diagnosis.** A somewhat variegated, reddish-brown species, common in the Southeast but generally uncommon north of Maryland, occasionally a pest of American holly in Virginia and the Washington, D.C. area. It is the only reddish-brown geometrid of this size and color in the eastern United States north of Florida except the somewhat similar *Episemasia solitaria* (Walker); and the only geometrid in the United States with male genitalia resembling those illustrated, having a conspicuous, fanlike tuft of ribbon-like scales or hairs arising from the base of the sacculus on each side. *Ilexia intractata* is the *Itame gausaparia* of Kimball (1965: 173), McDunnough (1938: 161), and other authors. Following Forbes (1948: 70), it has been generally known as *Thysanopyga intractata*.

**Further description.** As this is the only species in the region, little need be added to supplement the generic description. *Ilexia intractata* varies considerably in size and markings. Some have three transverse dusky bands on the forewing and two on the hindwing (Fig. 1), and others are without such markings. The ill-defined, irregular postmedial line may include a series of pale spots on both wings, and the antemedial of the forewing often includes three pale spots. Especially well-marked individuals may show extensive patches of orange-brown ground coloring, especially in the median space surrounding the discal spots. Otherwise, the ground color is purplish brown, with fringes

concolorous. Underside paler with discal dots and postmedial lines sometimes showing distinctly. Length of forewing: males, 12.0–13.5 mm (n=120); females, 13.0–15.0 mm (n=49).

**Male genitalia** (Fig. 22). Tegumen smaller than vinculum, which is U-shaped; tegumen in form of inverted V, terminating in slender, tapered uncus with fine, downcurved, apical point; gnathos vestigial, delicate; socii absent. Valve differentiated into strap-like (but twisted), somewhat sclerotized, costal part and an inconspicuous, semimembranous ventral or saccular part, which extends proximally, much reduced, almost to saccus. Only strongly articulated part of valve is where sclerotized costal margin meets tegumen/vinculum juncture, which is nearer to uncus than to saccus. Costa of valve with small, single, inwardly directed spine at apex. Reduced saccular part of valve bears dense, fanlike tuft of long scales; and base of this membranous part of valve has thin, sclerotized edge that is parallel to that of opposite valve, forming straight mesial longitudinal pair of thin bars extending from near saccus to juxta. Juxta distinctive, somewhat shield shaped at one end but bifurcate at the other, with two long processes arising close to and beneath transtilla and almost reaching base of uncus; transtilla very slender but complete, bridging bases of valves. Membranous part of valve appears to be excavated to make space for the enormous scale tuft arising at its base. (n=8).

**Female genitalia** (Fig. 31). Simple, with bursa copulatrix consisting of membranous, bulbous corpus bursae, which bears simple, subcircular, stellate signum with only a few small points; and fairly stout ductus bursae of about same length. The apparent ductus bursae, which I think is really a narrowed part of corpus bursae, is longitudinally rugose and fairly rigid, but not conspicuously sclerotized. True ductus bursae short, marked off from corpus bursae by constriction and itself differentiated into two parts—a semimembranous third just beyond constriction and a lightly sclerotized two-thirds extending to very simple ostium. Virtually no sterigma. Ductus seminalis arises from left side of rugose part of bursa copulatrix just before above-mentioned constriction. (n=3).

**Early stages.** Mature larva plain, green, cylindrical or only slightly thickened in thoracic area, gradually tapering posteriorly; about same color as undersides of American holly leaves or only slightly darker, slightly more bluish; integument smooth but not shiny, somewhat folded or rugose ventrally and with thin, paler intersegmental folds dorsally; a faint, obsolescent, pale lateral line from A1 to A6 is the only marking on body except for small, dark-brown spiracles situated on this line; setae small, inconspicuous; prolegs concolorous with body; thoracic legs slightly paler, translucent. Head a slightly more yellowish shade of green, unmarked except for black stemmata arranged around a crescent-shaped whitish area; mouthparts pale brown. I noted that larvae could cling to leaves with a tenacity unusual for Geometridae. Length: 21–23 mm.

Pupa with integument thin, translucent, paler brown and not as deeply pitted compared to that of *Episemasia solitaria*, the only other member of the group whose early stages are known. Cremaster with usual two large hooks and three small ones on each side; tenth segment tapering abruptly to base of cremaster, which is in the form of a discrete process. Dorsal anterior margin of tenth segment, in transverse groove between ninth and tenth segments, crenulated, but more finely and evenly so than that of *E. solitaria*, and crenulate margin minutely and densely setose. Mesothoracic spiracle a forward-facing, transverse slit backed by a raised, flat, elongate, hood-like cover. Pupa easily distinguished from that of *E. solitaria* by all or any of these features.

I reared this species twice in Maryland from eggs on *Ilex opaca*, and later found and reared larvae on the same host at Colesville, Montgomery Co., Maryland. Also, larvae found damaging the leaves of ornamental hollies in the Maryland-Virginia area were submitted to me for identification several times, and a few had been reared to adults to verify their identity. More recently the species was reared from larvae found on American holly in Massachusetts (M. Mello, pers. comm., 1997). This species would be expected to feed on other native evergreen hollies in the Southeast, such as yaupon, *Ilex vomitoria* Aiton, as it seems to become increasingly common where this shrub grows. Adults do not occur in a pattern of discrete broods but fly throughout the season from spring to late fall, even toward the northern limit of the range. Larvae may overwinter on the trees, exposed to freezing temperatures, as do those of *Hypagyrtis* Hübner, *Euchlaena* Hübner and doubtless many other geometrid genera. Progeny (10) from a female taken 17 Aug. 1980 emerged 25 Sept. 1980 to 31 Jan. 1981; and those (5) from a female taken 23 Aug. 1980 emerged 12–18 Oct. 1980, suggesting that the species may not have an obligate pupal diapause.

**Types and synonymy.** *Anisodes* ? *intractata* Walker was described from one female specimen, which is in the BMNH and still in good condition. It bears the following labels: "Type" (red circular label); "161" (yellow label); "U.S." (circular blue label); and my green genitalia slide label No. 1483. *Aspilates gausaparia* Grote was described from one male specimen from Wisconsin deposited in the USNM. The type locality of *A. gausaparia* is beyond the range of the food plant and thus questionable, but it might have been a vagrant. *Petelia fulva* Warren was described from a specimen from Florida deposited in the BMNH. I examined the types of all three names and first identified *P. fulva* as a synonym of this species in the check list (Ferguson 1983: 93), although "new synonymy" was not indicated.

The name "*intractata*" was correctly reinstated for this species by Forbes (1948: 70), with *A. gausaparia* as a junior synonym. Doubtless on the basis of too few specimens, he thought that northern specimens (*gausaparia*) were paler than southern ones (*intractata*), but no such differences exist. Paler specimens are simply weathered and faded. Also, Forbes referred this species to *Thysanopyga* (Herrich-Schäffer), a neotropical genus to which it does not belong.

**Distribution.** I examined 179 specimens from many localities in East Texas, Louisiana, Mississippi, Florida, Georgia, South Carolina, North Carolina, Kentucky, Virginia, Maryland, New Jersey, and eastern Massachusetts; and it is reported from Missouri (J.R. Heitzman, in litt. 1998). It is probably more widespread than these records indicate but would not be expected where evergreen hollies are absent. It occurs as far south as Miami-Dade County, Florida; as far west as Montgomery and Anderson counties, Texas; up the Mississippi drainage to Missouri and Kentucky; and up the East Coast to Greenport, Long Island, New York and eastern Massachusetts. Its occurrence as far north as Wisconsin (type of *A. gausaparia*) needs verification, as indicated above. North of Cape Hatteras it is mainly a Coastal Plain species but extends somewhat into the Piedmont as far north as Maryland. Its known distribution coincides closely with that of American holly.

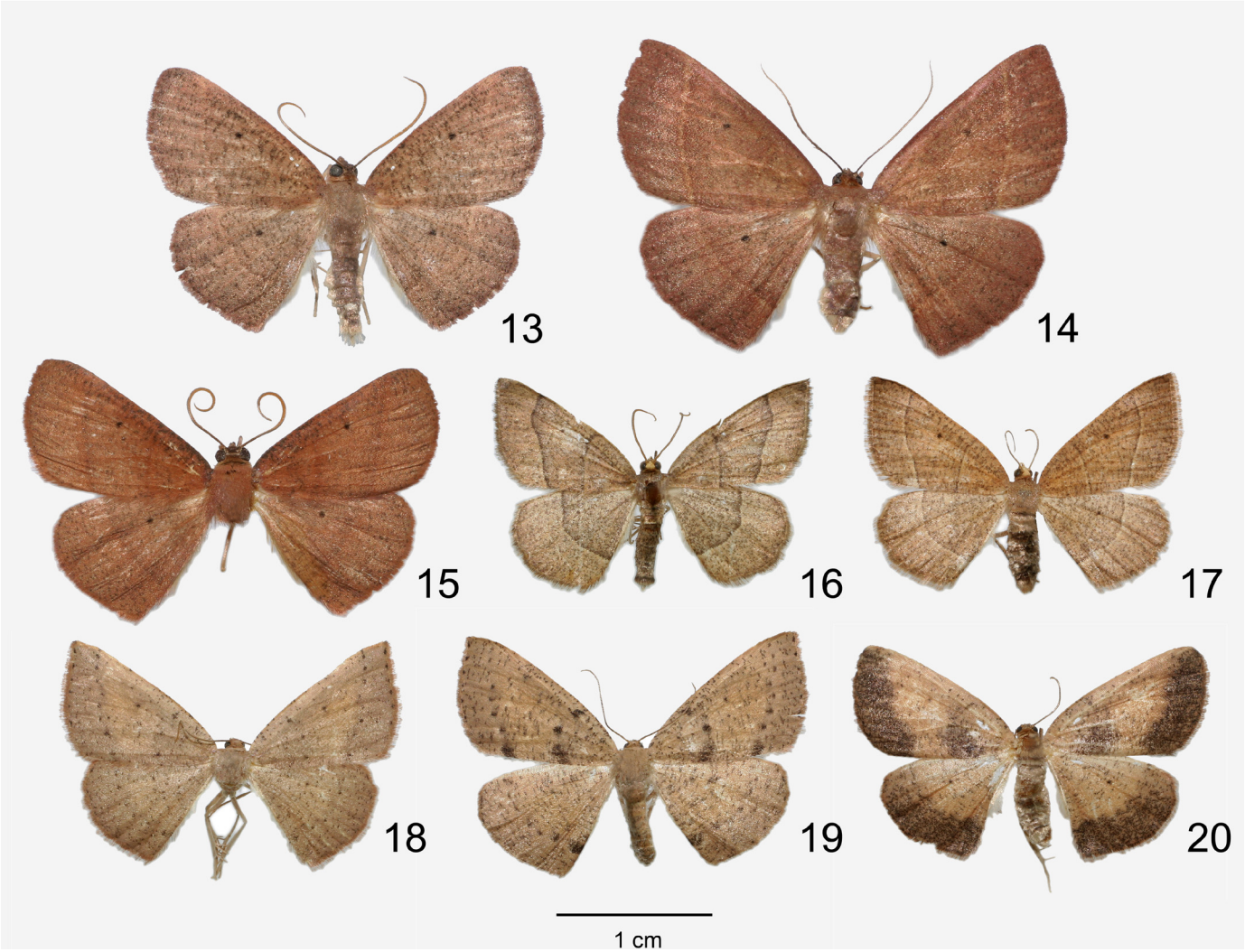
**Flight period.** Flies most of the year in the Deep South; February–November in Texas, South Carolina, Florida; collected every month of the year in Louisiana (V.A. Brou, in litt.); mainly 16 April–30 October in the coastal plain region of Maryland, where it is common, but occasionally taken as early as 14 March and as late as 31 December; 7 October at Greenport, Long Island (Roy Latham). Many came to my lights on 24 March at Frisco, Dare Co, on Cape Hatteras, North Carolina, where there are immense stands of *Ilex vomitoria*, another possible food plant.

## ***Parilexia*** Ferguson, **new genus**
(Figs. 4–12, 23–28, 32–35)

**Type species.** *Psamatodes nicetaria* Guenée, 1857: 107, by present designation.

**Diagnosis.** Reddish-brown moths, superficially similar to species of *Ilexia*, but with numerous differences in genitalia, venation, and other features. For example, male genitalia without large fanlike tufts of spatulate or ribbon-like scales, although coremata with long clumps of radiating hairs may be present; aedeagus usually with one very long and one short cornutus instead of several short ones; female with bursa copulatrix often complex and with point of attachment of ductus bursae highly variable, tending to be near the middle or toward the anterior end of the corpus bursae rather than in its usual position at or near the posterior end; venation with subcostal and radial veins more closely spaced and branching somewhat differently; antennal shaft with an unusual linear pattern of two or three thin lines of white scales, a feature not seen in related genera. Widespread in the Caribbean Region, Mexico, Central and South America; entering the United States only at the southern tip of Florida, where three species appear to be established, mainly on Key Largo. One of them, *P. proditata* (Wlk.), has also been taken on the mainland at Fuchs Hammock, near Homestead, Miami-Dade County. Florida records of "*Itame*" *nicetaria* (e.g., Kimball, 1965: 179, and earlier authors) almost certainly referred to a mixture of *P. proditata* and *P. antilleata*, not the true *P. nicetaria*, which is known to me from one authentic U.S. record, collected in 1996.

**Further description.** Male antenna broadly bipectinate, tapering abruptly before last 17–20 segments, which are simple; shaft ciliate ventrally; thin white longitudinal stripes of antennal shaft, characteristic of genus in both sexes, may extend onto antennal branches of male; female antenna simple, slender, finely ciliate; ocellus present, small; chaetosema small, with five or six bristles; tongue well developed, apparently about as long as antenna; foretibia variable, as long as labial palpus or longer, not necessarily longer in female but more slender, with epiphysis extending to or beyond apex; some species with very large hair pencil on foreleg, lying longitudinally on outer side of femur, directed backward (toward base of leg), and secured by a sort of retinaculum formed of very wide, glossy, curled scales; hindtibia unswollen in both sexes in species




**Figs. 13–20.** *Covellia* and *Episemasia*: **13)** *C. procrastinata*, Holotype ♂, data in text [USNM]; **14)** *C. procrastinata*, paratype ♀, Homestead, Florida 14-V-1978, C.V. Covell, Jr. [USNM]; **15)** *C. procrastinata*, paratype ♂, Santiago, Cuba, Wm. Schaus collection, USNM slide 52143 [USNM]; **16)** *E. cervinaria*, ♂, Harris Co. Texas, Bellaire, 7-V-1982 E. C. Knudson [MGCL]; **17)** *E. cervinaria*, ♀, Harris Co. Texas, Bellaire, 10-II-1982 E. C. Knudson [MGCL]; **18)** *E. solitaria* form "*solitaria*", ♀, Pensacola, Florida 7-IV-1962 Shirley Hills, T. S. Dickel genitalia vial 22-VI-2006 on same pin [MGCL]; **19)** *E. solitaria* form "*repugnata*", ♀, Manatee Springs State Park, Levy Co., Florida, 5-IV-1968 C. V. Covell, Jr. [MGCL]; **20)** *E. cervinaria*, form "*stabilata*", ♀, Gainesville, Florida, 19-III-1961, R. E. Woodruff [MGCL].

examined, with four spurs.

Venation in costal area of forewing more compressed than that of *Ilexia*; Sc and radial veins closely spaced; $R_1$ branching from radial stem well beyond fork of R and $M_1$, about opposite end of discal cell, and fused with Sc at point shortly thereafter, much as in *Ilexia*, but not fused with other veins (as it is in *Covellia*); $M_1$ and $M_3$ only slightly drawn toward each other at their juncture with crossvein at end of cell; this crossvein meeting $M_3$ at a point much closer to fork of $M_3$ and $CuA_1$ than in *Ilexia*, and a little closer than in *Covellia* (both wings). Venation differs from that of *Ilexia* most conspicuously in point of origin of $R_1$ and from that of *Covellia* in that same feature as well as absence of the two accessory cells of the forewing.

Moths reddish brown, about same size and shape as *Ilexia intractata*; fore- and hindwings mostly colored alike, with fine dusting of dark-brown scales on light-brown background; lines weak, diffuse, yellowish to reddish brown, straight or convex, consisting of antemedial, medial, and postmedial, although some or all of these lines may be obsolete; forewing may also have subterminal band and/or contrasting, dark, subapical markings or, more rarely, extensive dark shading; discal spots usually present, with white filling in some species; no fovea. Abdomen concolorous with wings, unmarked.

**Male genitalia.** Components with tendency to be slender, delicate; valve articulated more ventrally than that of *Ilexia* and tapering apically as in that genus, not expanded as in *Covellia*; juxta not usually well differentiated, but anellus lightly sclerotized and characteristically marked by series of parallel ridges, at least in species treated; transtilla delicately membranous or wanting; socius present but small; uncus simple, of uniform thickness almost to tip, evenly downcurved; no corema or tufts of specialized scales as conspicuous as those of *Ilexia intractata*, although smaller corema with long hairs usually arise from socket near base of valve; valve simple, flat, but with heavily sclerotized costa, sometimes narrowing both basally and apically to an almost fusiform shape; dentate costal process toward apex of valve present in some species but very reduced; aedeagus with intricately shaped vesica, bearing one to three cornuti, one of which may be of enormous size (equal to length of aedeagus and to twice length of valve in *P. proditata*).

**Female genitalia.** Ostium simple; ductus bursae joining bursa copulatrix somewhat before posterior end, but position of ductus seminalis highly variable; ductus seminalis may enter bursa anteriorly, posteriorly, or at any point between; corpus bursae variable in shape, commonly ovoid to fusiform and simple, but may be mesially constricted or bear pouches or extensions; surface of bursa may be striate or rugose; dentate signum often present.

**Early stages.** Unknown.

**Distribution.** Southern Florida; Caribbean Region; Mexico; Central America; northern South America.

**Included species.** The following is a list of species and their synonyms that I have investigated and assign to the genus *Parilexia*, including the three from Florida described and illustrated in this paper:

***Parilexia nicetaria*** (Guenée). **new combination**

*Psamatodes nicetaria* Guenée, 1857: 107. Haiti. (The synonymy of this species is further explained in the discussion of *Parilexia nicetaria*).

*Tephrina confiniaria* Walker, 1861: 959. Santo Domingo.

*Epione liboraria* Walker, "1862" [1863]: 1,495. Santo Domingo.

*Ephyra lucidiferata* Walker, "1862" [1863]: 1,574. Santo Domingo.

*Fidonia cyclata* Walker, "1862" [1863]: 1,669. Santo Domingo.

***Parilexia antilleata*** **n. sp.** Florida (type), Cuba, Jamaica, Venezuela. [USNM]

***Parilexia cercyon*** (Druce). **new combination, revised status**

*Pachydia cercyon* Druce, 1893: 137, pl 54, fig. 3. Presidio, Mexico. [BMNH]. Incorrectly synonymized to *P. nicetaria* by Schaus (1940: 320), but as the type has no abdomen, it may be impossible to identify this species. To me it has the appearance of a distinct species, and I reinstate it as such.

***Parilexia cermala*** (Druce). **new combination**

*Pachydia cermala* Druce, 1893: 137, pl. 54, figs. 4, 5. Mexico, Guatemala, Costa Rica, Panama; no holotype or lectotype has been designated. [BMNH]

***Parilexia maresa*** Schaus. **new combination**

*Thysanopyga maresa* Schaus, 1901: 246. Brasil: São Paulo. [USNM]

***Parilexia nigristicta*** Warren. **new combination**

*Thysanopyga nigristicta* Warren, 1897: 477. Costa Rica. [BMNH]

***Parilexia oraea*** (Druce). **new combination**

*Pachydia oraea* Druce, 1893: 136, pl. 54, figs. 1, 2. Guatemala. [BMNH]

***Parilexia oroanda*** (Druce). **new combination, revised status**

*Pachydia oroanda* Druce, 1893: 137, pl. 54, figs. 6, 7. Mexico, Guatemala; no holotype or lectotype has been designated. A syntype that I dissected (DCF slide #1584) is from San Isidro. [BMNH]. Incorrectly synonymized to *P. nicetaria* by Schaus (1940: 320).

***Parilexia fulvifascia*** (Warren), **new combination, revised status**

*Thysanopyga fulvifascia* Warren, 1904: 124. Ecuador: Bulim. [BMNH]. Incorrectly synonymized to *P. nicetaria* by Schaus (1940: 320).

***Parilexia proditata*** (Walker), **new combination, revised status**

*Ephyra proditata* Walker, 1861: 633. Dominican Republic (type), Florida. [BMNH]. Incorrectly synonymized to *P. nicetaria* by Hulst, 1894: 305.

***Parilexia ochropurpurea*** (Herrich-Schäffer), **new combination**

*Cabira ochropurpurea* Herrich-Schäffer, 1855: 65, 81, fig. 317. Venezuela (type), Cayenne, Surinam, Brasil. I assign this species to *Parilexia* with some hesitation because the greatly elongated, distally bifid valve seems aberrant, as does the lengthened tegumen. The points of articulation between the tegumen and vinculum are abnormally ventrad (nearer end of vinculum), a likely consequence of the long tegumen. The moth is similar in size and appearance to *Ilexia intractata* and has a few features in common with that genus. The valve has the same kind of sharp, recurved, apical spine as in *Ilexia*, and the juxta and its paired appendages also match those of *Ilexia*, although, again, elongated. The tympanic bulla and its sclerites differ noticeably in the two genera, and those of *P. ochropurpurea* are clearly of the *Parilexia* type. In the forewing of *P. ochropurpurea*, $M_1$ separates from Rs before the fork of $R_1$ and Rs, as in *Parilexia*, not *Ilexia*. Lastly, the markings of the antennal shaft in both sexes of *P. ochropurpurea*—two longitudinal white stripes, one on each side of the shaft (flagellomere)—are a useful key feature for species of *Parilexia* and absent in *Ilexia*. The female genitalia show nothing distinctive.

*Parilexia* includes other neotropical species that I have not identified. It is possible that in the future the genus may be subdivided into those with the peculiar large foreleg hair pencil and those without, in which case the name *Parilexia* would apply to those species that lack this character, such as *P. nicetaria* and *P. antilleata*. This taxonomic change might also be supported by the genitalia, which are significantly different in both sexes of *P. proditata*.

**Remarks.** I was concerned that the type species of *Aterpnodes* Warren, *A. geminipuncta* Warren, 1900, might be congeneric with *Parilexia* because of its somewhat similar appearance and similar female genitalia (male not examined; USNM specimens are all females). However, *A. geminipuncta* has the apex of the forewing produced, making it almost falcate; the antennae more roughly scaled and lacking the thin longitudinal white lines of *Parilexia* species; the third segment of the female labial palpus relatively long compared to that of *Parilexia* species, in which it is very short; and somewhat different venation. The fork of Rs and $M_1$ is just distad of the branching of $R_1$ from Rs in *Aterpnodes*, well before the fork of $R_1$ and Rs in *Parilexia*.

### ***Parilexia nicetaria*** (Guenée), **new combination**

(Figs. 4–6, 23, 32, 33)

*Psamatodes nicetaria* Guenée, 1857: 107
Type locality: Haiti. [BMNH].
*Tephrina confiniaria* Walker, 1861: 959
Type locality: "St. Domingo" [= Dominican Republic]. [BMNH]. Referred to the synonymy of *P. nicetaria* by Hulst (1894: 305) and by Schaus (1940: 320).
*Epione liboraria* Walker, "1862"[1863]: 1,495.
Type locality: "St. Domingo" [= Dominican Republic]. [BMNH]. Referred to the synonymy of *P. nicetaria* by Hulst (1894: 305).
*Ephyra lucidiferata* Walker, "1862" [1863]: 1,574.
Type locality: "St. Domingo" [=Dominican Republic]. [BMNH]. Referred to the synonymy of *P. nicetaria* by Hulst (1894: 305) and by Schaus (1940: 320).
*Fidonia cyclata* Walker, "1862" [1863]: 1,669.
Type locality: "St. Domingo" [= Dominican Republic]. [BMNH]. Referred to the synonymy of *P. nicetaria* by Hulst (1894: 305).

**Diagnosis.** Reddish-brown moths of the Caribbean Region southward at least to Venezuela, similar in size and color to *Ilexia intractata*, other species of *Parilexia*, and to *Episemasia solitaria*. Wing pattern and color as in *P. antilleata* and *P. proditata*, and both sexes have three linear white stripes on the antennal shaft like *P. antilleata* (*P. proditata* has two) (although this character may be difficult to see). Male genitalia most like those of *P. antilleata*, but with vesica (not counting extended diverticulum) plus large terminal cornutus shorter than those of *P. antilleata*, about equal to length of valve (clearly exceeding length of valve in *P. antilleata*); and *P. nicetaria* lacks enormously elongated cornutus of *P. proditata*. Female genitalia of *P. nicetaria* distinctive in having ductus

seminalis joined to side of the corpus bursae, near middle and just anterior to nipple-like signum or slightly to one side. In *P. antilleata* it is at extreme anterior end of corpus bursae, and in *P. proditata* it is far posterior at end of large subapical diverticulum.

**Further description.** Superficial aspect almost exactly like that of *P. antilleata* or *P. proditata* except for white antennal stripes and absence of curious forefemoral hair pencil of *P. proditata* males as further discussed in generic description. Whether antennal shaft has two or three white stripes may not be easily seen if scales are worn off or discolored. Description of wing markings and colors of *P. nicetaria* would read almost exactly like those for *P. antilleata* or *P. proditata* and would not be helpful. Even their ranges of variation are essentially similar, except that *P. nicetaria* is most variable, having a form on Hispaniola with large, diffuse, dark patch in middle of the forewing that seems not to occur in other species. Wing length: males, 12–14 mm (n=7); females, 12–15 mm (n=11).

**Male genitalia** (Fig. 23). Valve with costal angle well out toward apex: distance between angle and apex less than length of uncus (equal or greater in *P. antilleata*). Costal sclerite about as long as combined lengths of tegumen and vinculum (shorter in *P. antilleata*). Pointed cornutus at tip of main section of vesica relatively small, shorter than diverticulum bearing smaller, squarish cornutus. Main cornutus of *P. antilleata* as long as corresponding diverticulum, and of *P. proditata* as long as aedeagus. (n=5).

**Female genitalia** (Figs. 32, 33). Simple in overall form, with long, slender ductus bursae and elongate-ovoid, longitudinally ribbed or rugose bursa copulatrix. Ostium in V-shaped mesial depression of anterior margin of 8th sternum; postostial plate sclerotized, slightly elongate, posteriorly truncated, delicately ribbed. Narrow "neck" of bursa that leads to ductus bursae about half sclerotized and longitudinally ribbed. Signum sclerotized, elevated, nipple-like, with short, vestigial, stellate processes radiating from base, situated just posterad of middle of corpus bursae; signum encircled by chitinous ring that may be complete or fragmentary; bursa wall may have another sclerotized patch almost opposite signum, in which rugose pattern tends to run transversely (not always present). Position of very slender, inconspicuous ductus seminalis on side of corpus bursae just anterad of or offset slightly to one side of signum and within path of sclerotized ring very different from that of other two species of *Parilexia* described here. (n=7).

**Early stages.** Unknown

**Types and synonymy.** *Psamatodes nicetaria* was described from one male and one female in the BMNH from Haiti, and I here designate as **lectotype** the female, which bears my green slide label #1509. *Tephrina confiniaria* was based on seven syntypes from "St. Domingo," "Mr. Tweedie's collection," from which I designate as **lectotype** a female in the BMNH with my slide label #1504. *Epione liboraria* was described from one female in the BMNH from "St. Domingo" (Tweedie collection), now bearing my slide label #1503. *Ephyra lucidiferata* was described from one male in the BMNH from "St. Domingo"(Tweedie collection), now bearing my slide label #1502. *Fidonia cyclata* was described from one male in the BMNH from "St. Domingo" (Tweedie collection) (my slide label #1499). Like all junior synonyms of *P. nicetaria* listed here, *F. cyclata* was previously referred to the synonymy, in this case by Hulst (1894: 305).

**Distribution.** The following specimens were examined and confirmed by dissection. **Florida:** Key Largo Hammocks State Botanical Site, Monroe County, 15 Jan. 1996, T.S. Dickel. Cuba: Sierra Maestra, E. Cuba, 1,000 ft., 16 June 1930, Clorinda Querci. **Haiti:** Types of *P. nicetaria* (locality and collector not known). **Dominican Republic:** "St. Domingo" [Santo Domingo] (probably referred to what we now know as the Dominican Republic, not necessarily the city of Santo Domingo), type material of all junior synonyms of *P. nicetaria* Guenée as listed above and some others not included (about 12 specimens); Vicinity Jarabacoa, La Vega Prov., 27 June 1981, C.V. Covell, Jr. (3); 12 km Constanza, 6 June 1969. **Venezuela:** Aroa.

All previous literature records for *P. nicetaria* except the original description must be disregarded because of the impossibility of positive identifications without reference to the genitalia. It was only through chance that Hulst (1894) and Schaus (1940) correctly referred the above synonyms to *P. nicetaria*. Schaus incorrectly included four other names that are removed from his synonymy in this paper.

## ***Parilexia proditata*** (Walker), **new combination**
(Figs. 7–9, 24, 25, 34)

*Ephyra proditata* Walker, 1861: 633

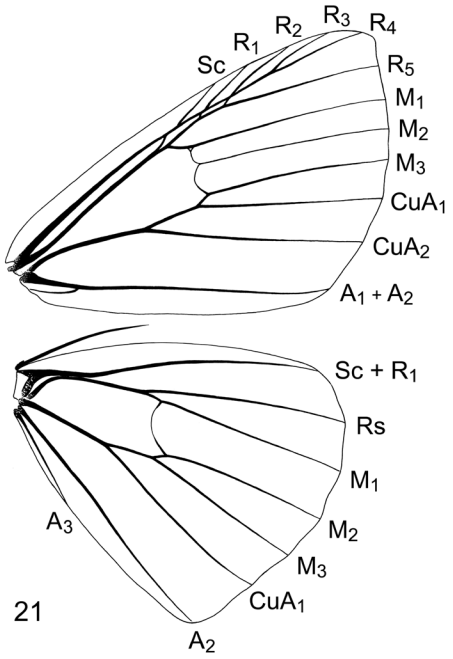



**Fig. 21.** Venation of *Covellia procrastinata*, slide USNM 53,953.

**Type locality.** Santo Domingo, Dominican Republic. [BMNH]

**Diagnosis.** Cannot be distinguished easily from *P. nicetaria*, *P. antilleata*, or most other species in this genus by general appearance, but both sexes readily identified by their distinctive genitalia (see descriptions below). Male has large, peculiar, backwardly directed hair pencil arising on forefemur that is unique to this species among Geometridae of the United States although it does occur in other neotropical members of *Parilexia*. Also, note differences in female antennal markings, described below. I saw this species only from Dominican Republic, Cuba, and southern Florida.

**Further Description.** Superficially almost indistinguishable from other species of *Parilexia* occurring in Cuba and Florida except for presence in male of large, conspicuous hair tuft or hair pencil on foreleg in addition to usual small tuft that covers epiphysis. Large hair pencil arises close to distal end of femur and is directed posteriorly, most often closely parallel to femur, and may be tightly wrapped and held in place by small specialized group of wide, stiff, curled, pale, glossy scales. First tarsal segment of male foreleg clearly much longer than tibia, only slightly longer in female. Females of *P. proditata* so similar to those of related species that I found only one subtle difference to distinguish them. Female antenna of *P. proditata* with two longitudinal white stripes on shaft (a weak third, subventral stripe present in other species is lacking). *Parilexia antilleata* and *P. nicetaria* have all three stripes.

Wings like those of related species but generally with less variegated pattern, without light or dark contrasts, dark markings toward apex of forewing, or bright patches of orange brown; discal spots white filled, but small and inconspicuous. Wing of female as in male and without reliable distinguishing features. Length of forewing: males, 11–13 mm (n=87); females, 11–13 mm (n=15).

**Male genitalia** (Fig. 24, 25). Characterized especially by disproportionately large aedeagus nearly twice as long as rest of genitalia and containing one extremely long, straight cornutus equal in length to aedeagus. (n=6).

**Female genitalia** (Fig. 34). Also distinctive, with unusual thumb-like extension anteriorly, possibly to accommodate end of greatly elongated cornutus, and with wide, spiculate band partly encircling elongated, ribbed, partly sclerotized corpus bursae. No signum, unless spiculate band is derivation of signum. Unlike that of *P. antilleata*, ductus seminalis adjoins bursa in normal posterior position at end of posterior extension or lobe. Ostium simple; sterigma undeveloped. (n=6).

**Types.** Described from one female in the BMNH from Santo Domingo. The abdomen had been glued on, which leaves some doubt as to the identity of this species. My identification is based on the assumption that the abdomen is the correct one. Such other characters as can be seen appear to fit this species.

**Distribution.** Specimens examined were from Key Largo (Mrs. S. Kemp), Long Key, Monroe Co., and Fuch's Hammock, near Homestead, Miami-Dade Co. (T. Dickel), Florida; from Santiago, Cuba (W. Schaus); "Santo Domingo" (Dominican Republic) (type), and from vicinity of Jarabacoa, La Vega Prov. (C.V. Covell, Jr.), and Las Terrenas, Samana Prov., Dominican Republic (C.V. Covell, Jr.).

**Flight period.** Specimens seen from Florida for every month except March and June; mostly in the periods July–August and October–December; elsewhere in June. About 100 specimens examined.

**Remarks.** Other species from Costa Rica and Surinam have the same unusual foreleg hair pencils in the males, and these species cannot be distinguished reliably from *P. proditata* by external appearance. However, the genitalia show that they belong to several unidentified species, all of them different from *P. proditata* and probably in part undescribed.

Most of the material seen is from Key Largo, Florida. Mrs. Spencer Kemp, who lived in the village of Key Largo, ran a light trap in that vicinity in the 1960's and 1970's and collected many specimens of the two commoner *Parilexia* species, mostly *P. proditata*. This material was acquired by the late Charles P. Kimball, who kindly made it available to me, although almost every specimen is in poor condition.

## ***Parilexia antilleata***, Ferguson, **n. sp.**
(Figs. 10–12, 27, 28, 35)

**Diagnosis.** Similar in general appearance to *P. proditata*, *P. nicetaria*, and most other members of the genus, although with tendency to be more variable than *P. proditata*. For example, with or without white-filled discal spot on hindwing, well-defined purplish-brown transverse lines, orange or light rust-colored transverse bands just beyond transverse lines, and dark-brown to blackish preapical markings on forewings. Males lack large, backwardly directed hair pencil on foreleg characteristic of *P. proditata*, but females may need to be dissected for positive identification. Note, however, that *P. antilleata* (like *P. nicetaria*) has three thin, longitudinal white stripes on the female antenna; *P. proditata* has only two (ventral stripe apparently lacking). Known from Key Largo, Florida, and from Cuba and Jamaica.

**Further Description.** Eyes large; frons narrow, flat; palpus (both sexes) with short third segment and appearing truncated, hardly exceeding frons in male, slightly longer and narrower in female; legs normal, with small foretibial hair pencil in male but not the large one that is so distinctive in *P. proditata*; male foretibia nearly as long as first tarsal segment but hardly more than half length of femur. Head, body, and appendages light brown, without significant markings except generic character of thin, longitudinal white lines on antennal shaft of both sexes. Female of *P. antilleata* with three such lines, female of *P. proditata* with only two. This subtle character may be seen only with suitable magnification, and third line (ventral one) may be fragmentary.

Wings predominantly reddish brown, either uniformly so and almost without markings or, more commonly, variegated in one or more ways, as follows: slightly waved, purplish-brown, transverse lines, three on forewing and two on hindwing; wide, diffuse, ochreous orange transverse band just distad of postmedials on both wings, sometimes with infusion of same color in median space; small, round, dark discal spots normally present, but that of hindwing variable in size and often white filled; dark preapical patches present on forewing in about 20% of specimens examined (Fig. 11). *Parilexia proditata* may have similar markings, but apparently never the well-developed ochreous orange bands, less frequently the white-filled discal spots, and very rarely the dark preapical patches. Underside paler, with reduced markings and usually dusky outer border on both wings, as found in other members of genus. Fringes concolorous with wings, unmarked. Wing length: males, 10.5–13.0 mm (n=10); females, 11.0–12.0 mm. (n=12).

**Male genitalia.** (Figs. 27, 28). Larger than those of *P. proditata*, with valve nearly twice as long, but with longest cornutus of aedeagus much shorter; aedeagus (not counting everted vesica) slightly less than half length of valve in *P. antilleata*, nearly twice length of valve in *P. proditata*; *P. antilleata* with three shorter but still substantial cornuti. *Parilexia proditata* differs from others in having one exceptionally long cornutus equal to length of relatively long aedeagus or at least twice length of valve. Anellus often distinctively pleated or corrugated, similar to that of *P. nicetaria* (n=6).

**Female genitalia**. (Fig. 35). Relatively conventional in most respects, with simple ostium; slender ductus bursae about half length of corpus bursae and longitudinally rugose or striate at juncture with corpus bursae; corpus bursae with large, unevenly sclerotized patch on left side, which incorporates rounded signum at its ventral margin. Ductus bursae unusual in being connected at anterior extremity of corpus bursae (n=9).

**Early stages.** Unknown.

**Types.** Holotype female, Key Largo, Monroe Co., Florida, 13 April 1966, C.V. Covell, Jr., USNM Genitalia Slide No. 53034. Paratypes (15): 1 male, same locality and collector, 7 April 1967; 3 males, same locality, 7 January 1968 (USNM Slide 53033, DCF 1669), 5 February 1973, 31 July 1967, Mrs. Spencer Kemp (USNM slide 59067); 4 females, same locality, 5 January 1968 (USNM Slide 52135), 21 August 1973 (USNM Slide 53934), 21 September 1972 (USNM Slide 52146), and 30 September 1973 (USNM Slide 53930), Mrs. Spencer Kemp; 1 male, Long Key St. Rec. Area, Monroe Co., Florida, 15 Jan. 1996, T.S. Dickel; 3 males, Santiago, Cuba, June, Coll. Wm. Schaus, USNM Slides 52153, 52616, 52617; 2 females, same data but taken in June (USNM Slides 52154, 57384) and October; 1 female, Sierra Maestra, E. Cuba, 1000 ft., 16 January 1930, O. Querci, USNM Slide 59062. All specimens in USN and AMNH.

**Distribution.** In addition to Cuba and Florida, I have seen this species from Jamaica, verified by two dissected specimens in the USNM (USNM Slides #55754 and #55755); and from Aroa, Venezuela (slide HWC # 2006, USNM).

**Remarks.** I have seen additional specimens from Key Largo, Florida, with essentially the same data, but too poor to include in the type series.

## ***Covellia*** Ferguson, **n. gen.**
(Figs. 13–15, 26, 36)

**Type species.** *Covellia procrastinata*, **n. sp.**, by present designation.

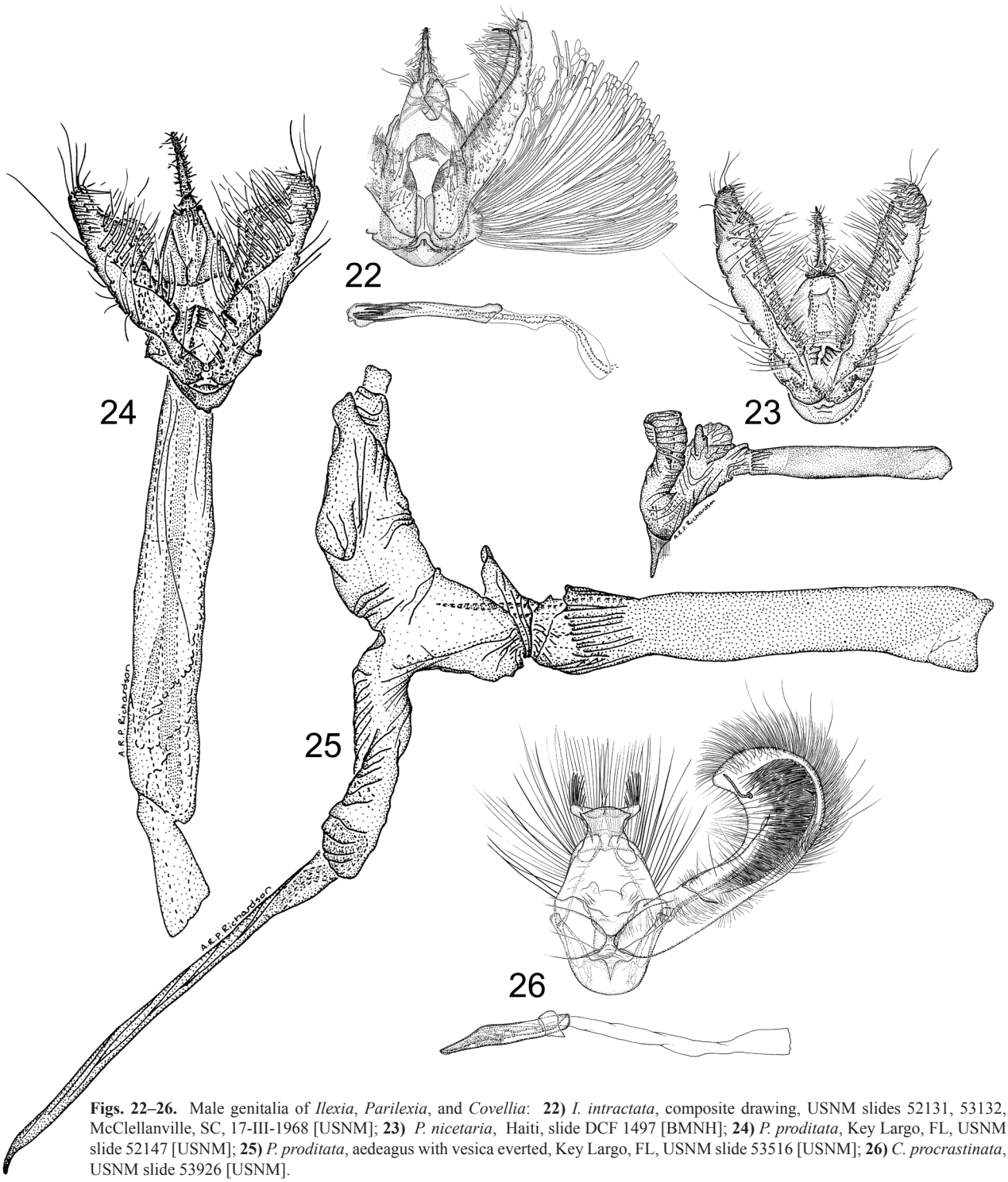
**Diagnosis.** Medium-sized, red-brown species of Caribbean distribution, larger than species of *Ilexia* or *Parilexia*, with the male antennae simple, not bipectinate; without white stripes on the antennal shaft in either sex; with two accessory cells in the forewing; with male abdomen usually marked with a distinctive white dorsal spot or transverse bar (sometimes pale brown or black) on segment seven; and with very characteristic genitalia in both sexes (Figs. 26, 36).

**Further Description.** Male antenna laminate, ciliate, not bipectinate, and with scales plain brown, lacking the longitudinal lines of white scales as seen in *Parilexia*; female antenna filiform, slender, finely ciliate, also without pattern of white scales; palpus quite short, slightly surpassing front, with third segment decumbent, and with the end of each palpus bending toward the other beyond proboscis but not touching; tongue well developed; ocellus present but minute, usually concealed by scales; chaetosema small, with 4–6 bristles. Foretibia nearly twice as long as labial palpus in female, subequal in male, 3/4 to equal length of first tarsal segment, with epiphysis reaching end of tibia. Legs closely scaled, without conspicuous hair-like scales and without hair pencils; hindtibia not enlarged and with all spurs.

Venation (Fig. 21) in costal area of forewing with veins close but easily differentiated, differing from that if *Ilexia* and *Parilexia* by presence of two accessory cells in subcostal area on radial stem, beyond branching points of $R_1$ and $R_2$. Vein $R_1$ branches from Rs just before fork of Rs and $M_1$, as in *Ilexia*. Fork of $M_3$ and CuA about as in *Ilexia*, about twice as far basad as that of *Parilexia*. Venation differs most obviously from that of the other genera described here in presence of two accessory cells in the forewing. *Episemasia solitaria* has one accessory cell in forewing, and *E. cervinaria* has none.

Fore- and hindwings colored alike; solidly reddish brown or irrorated with dark gray-brown to reddish scales on yellowish-brown to orange background; antemedial and postmedial lines present, dark or light, thin, regular, sharply defined, often nearly straight; hindwing with postmedial line only. Some specimens of some species with diffuse patches of lighter or darker coloring, but wings more often quite uniformly colored, with or without lines, and with faint, dark discal spots. Underside considerably paler, yellowish brown, almost unmarked. Forewing without a fovea. Body concolorous with wings, and of males characteristically marked with contrasting white or pale-brown (rarely black) dorsal spot on segment seven.

**Male genitalia.** Valve long, spatulate, widening and curving dorsad distally, with a ventral fringe of many bristle-like hairs inclined in one direction across most of inner face, and a strong, slender spine arising subapically just behind costa. This spine has a socketed base and is therefore assumed to be a modified seta. Other small, sharp spines (usually two) arise near ventral margin in distal half of valve, from base of fringe of bristles already mentioned. Costa of valve, near middle, may have row of about 16 long, sharp, erect spines, but they are lacking in type species. Uncus variable, either bilobed (*C. procrastinata* and *C. venusta*), or consisting of long, slender, linear shaft with somewhat bulbous base (*C. nigrilineata*). Derivation of strange, variable uncus unclear; it could have been derived from a highly modified gnathos. No




**Figs. 22–26.** Male genitalia of *Ilexia*, *Parilexia*, and *Covellia*: **22)** *I. intractata*, composite drawing, USNM slides 52131, 53132, McClellanville, SC, 17-III-1968 [USNM]; **23)** *P. nicetaria*, Haiti, slide DCF 1497 [BMNH]; **24)** *P. proditata*, Key Largo, FL, USNM slide 52147 [USNM]; **25)** *P. proditata*, aedeagus with vesica everted, Key Largo, FL, USNM slide 53516 [USNM]; **26)** *C. procrastinata*, USNM slide 53926 [USNM].

apparent gnathos or socii. Juxta modified as deep, concave, cuplike structure. Aedeagus simple, without cornuti. Male genitalia of *rubra* aberrant, with much asymmetry, although derivation of most components from parts that may be seen in other species of *Covellia* is fairly obvious.

**Female genitalia.** Bursa copulatrix pear shaped, without signum; posterior half in part longitudinally ribbed. Unusually thick, strong ductus seminalis arising near juncture with ductus bursae and leading to large, tough, well-formed bursa seminalis that is easily dissected, stained, and mounted intact as an integral part of the preparation. Bursa seminalis may have ribbed or finely reticulate surface and resemble a second, half-size bursa copulatrix. When the genitalia are well prepared, stained, and slide mounted, the two matching bursae are a distinctive feature of this genus. Ductus bursae stout, tough but membranous, or elongate and sclerotized. Sterigma undeveloped or showing as thinly sclerotized zone of integument around ostium, which usually opens in middle of the seventh sternum. *Covellia venusta* differs from others in having the elongated, rigidly sclerotized ductus bursae reaching posterior margin of seventh sternum.

**Early stages.** Unknown.

**Distribution.** Southern Florida; islands of the Greater and Lesser Antilles, as follows: the Bahamas, Cuba, Hispaniola, Puerto Rico, Jamaica, St. Lucia, Dominica.

**Included species.** I have examined the type material of the following and include them in *Covellia*. Type locality given first, followed by collection where types deposited; then other

recorded localities, if any, in parentheses:

***Covellia leucopygaria*** (Walker), **new combination**

*Pyrinia leucopygaria* Walker, 1866: 1543. Dominica [BMNH]

***Covellia nigrilineata*** (Warren), **new combination**

*Anagoge* ? *nigrilineata* Warren, 1895: 129. Jamaica [BMNH]

*Oenoptila nigrilineata* ab. *reversa* Warren, 1897: 476. Jamaica [BMNH]

***Covellia rubra*** (Warren), **new combination**

*Oenoptila rubra* Warren, 1897: 476. Jamaica [BMNH] Cuba

***Covellia venusta*** (Warren), **new combination**

*Oenoptila venusta* Warren, 1900: 204. Dominica [BMNH]. (Puerto Rico, St. Lucia, Dominica).

*Certima rufula* Warren, 1907: 300. Dominica [BMNH]. **new synonymy**

*Periclina triatrapata* Dyar, 1914: 425. Dominica [USNM]. **new synonymy**

*Periclina transmigrata* Dyar, 1914: 426. Dominica [USNM]. **new synonymy**.

***Covellia procrastinata*** Ferguson, **n. sp.** Florida [USNM]. (Bahamas, Cuba).

**Remarks.** *Covellia* is named for Charles V. Covell, Jr. (Curator of Lepidoptera, The McGuire Center for Lepidoptera and Biodiversity, Florida Museum of Natural History), a long-time friend and colleague, who collected and kindly made available most of the type series. This new species was discovered on a Florida field trip made by Dr. Covell, a few of his students, and some other lepidopterists. I was an invited participant, which explains why we were collecting moths in the same place at the same time. Dr. Covell had also collected one earlier specimen, the paratype from Everglades National Park. Although I have spent many weeks collecting in Florida, including the Keys and Homestead area, as have many others, I am not aware of any specimens other than the types. The presence of only one specimen in the fairly extensive Cuban holdings of the USNM seems to suggest that it is also rare in Cuba.

Only after investigation of the type species of all neotropical genera that seemed as though they might be related did I conclude that this genus was without a name.

### ***Covellia procrastinata*** Ferguson, **n. sp.**
(Figs. 13–15, 26, 36)

**Diagnosis.** Compared to others of the genus, a somewhat smaller, almost uniformly colored brown species of Florida and Cuba, showing relatively little variation. Moths resemble and could be confused with small, dull, gray-brown specimens of *C. venusta* and *C. rubra* but with clearly different genitalia in both sexes. The color, non-pectinate antenna, and dorsal pale spot or bar on the seventh abdominal segment distinguish males from those of all other Geometridae in the continental United States.

**Further Description.** Externally visible structures and markings generally as given for genus. Sexes nearly alike. Wings dull reddish brown with pinkish or purplish tint when fresh; apparently never marked with bright-orange or red shades as is common in other members of genus. Wings more or less irrorated with darker brown scales; forewing with antemedial line very faint, convex, lighter or darker than ground; postmedial line similar, more distinct, yellowish, edged with slightly darker scales on inner side, parallel to outer margin; discal spots of both wings small, black; fringe concolorous. Undersurfaces paler, pinkish, unicolorous but darkening slightly toward outer margins, marked only by small, black, discal spots. Wing length: holotype, 13 mm; other males, 13–15 mm (n=14); females, 14–16 mm (n=8). Specimens from the Bahamas (n=4) are noticeably smaller than Floridian ones, toward the 13 mm end of the size range.

**Male genitalia** (Fig. 26). Very distinctive, symmetrical; tegumen and vinculum strong but small relative to oversized valves; tegumen with long peripheral setae. Uncus broad, shallowly bifid, bearing setose knob on each side with setae large, straight, bristle-like. Juxta cuplike, deep, rounded. Valve long, widening distally, and toward extremity recurved in direction of uncus; bearing single socketed spine that arises from inner face near costa and toward apex, this spine bent near base. Inner face of distal half of valve with dense, bristle-like or spine-like setae arising from near periphery of outer margin and inclined inwardly (actually dorsad) across most of valval width; much of distal margin heavily but more finely setose, the setae persistent, not deciduous. Inner face of valve also bearing long, slender, linear, delicate process, widened, truncated, finely setose distally; this arises one-third of way out from base and toward ventral margin of valve, and it is inclined dorsally as for spine-like setae farther out. Aedeagus appearing stout dorsoventrally, flattened in profile, containing strong, wrinkled vesica but without cornuti. (n=3).

**Female genitalia** (Fig. 36). Ostium opening in a very wide, shallow fold, central part of which is sclerotized. Ductus bursae with brown, sclerotized band or ring encircling middle. Bursa copulatrix pear shaped, lightly striated or ribbed posteriorly. Relatively stout ductus bursae leading to large, membranous bursa seminalis. (n=2).

**Early stages.** Unknown.

**Types.** Holotype male, Homestead, Miami-Dade Co., Florida, 17 May 1978, D.C. Ferguson. Paratypes, 14 males, 11 females, as follows: 4 males, 2 females, same locality and collector, 14, 15, 16 May 1978. 9 males, 4 females, same locality (some labeled Camp Owaissa Bauer) (USNM slide 53944), 14, 15, 17 May 1978, C.V. Covell, Jr. (USNM slide 53926). 1 female, Royal Palm Hammock, E[verglades] N[ational] P[ark], Dade Co., Florida, 5 April 1967, C.V. Covell, Jr. 4 females, Freeport, Grand Bahama Island, 20–27 June, 1987, W.E. Steiner, M.J. and R. Molineaux (USNM slide 59033, slide DM 1497). 1 male, Santiago, Cuba [no date], Wm. Schaus collection, USNM slide 52143. Holotype and 23 paratypes deposited in the USNM; 2 paratypes deposited in MGCL. All those collected in 1978 are from Camp Owaissa Bauer, a Miami-Dade Co. recreational facility at Homestead that had a very rich hardwood hammock at that time.

**Distribution.** Seen only from Dade County, Florida, Grand Bahama Island, and from Cuba. All known localities are listed for types (26 specimens examined). The Cuban and Bahamian specimens were verified by genitalia slides.

**Remarks.** The species name is an oblique reference to the long period during which the red-brown Caberini of this country remained uninvestigated and unrevised, and especially to my own procrastination in delaying the description of this species for 19 years after it was recognized as new.

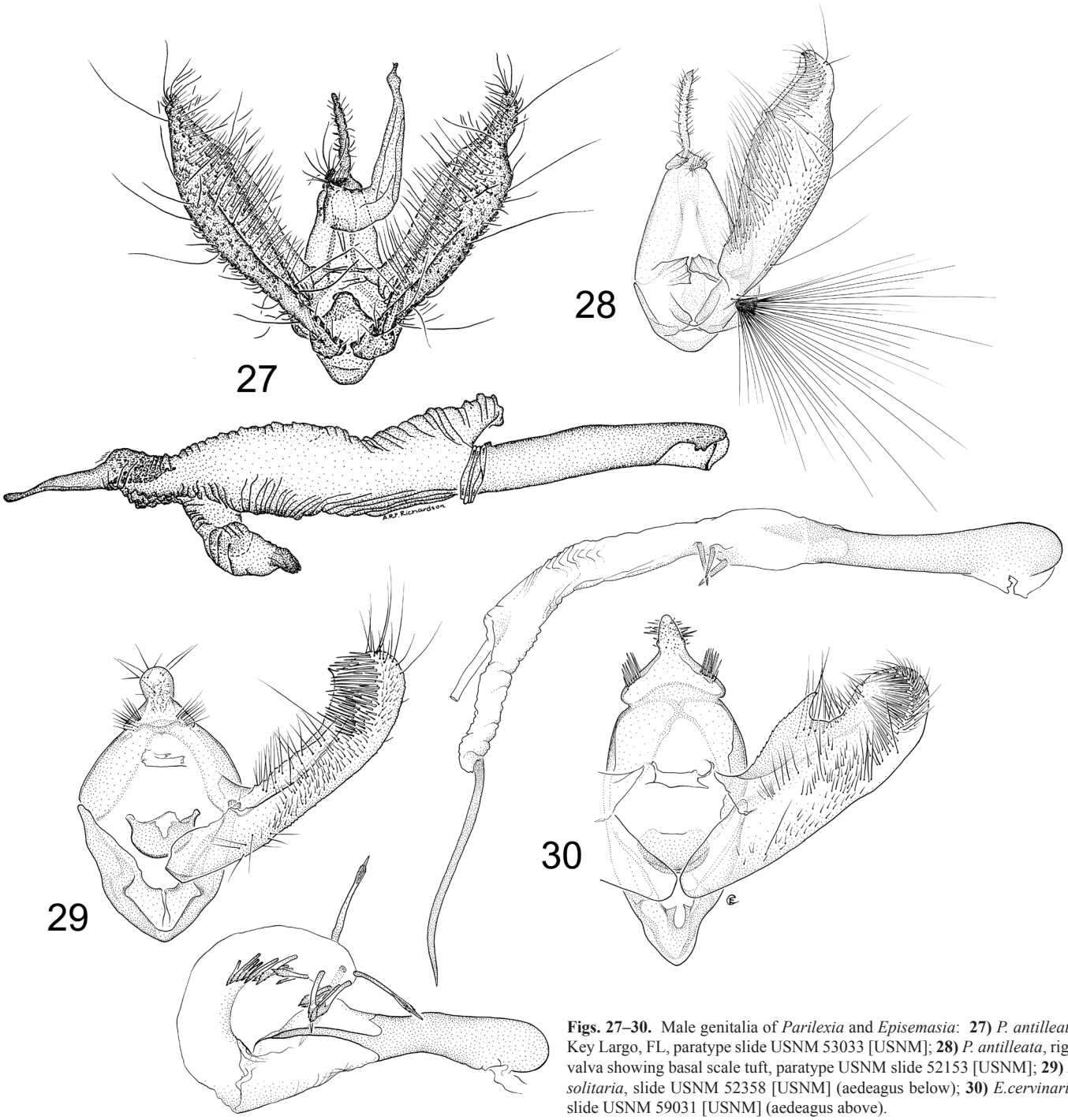
### ***Episemasia*** Hulst
(Figs. 16–20, 29, 30, 37, 38)

*Episemasia* Hulst, 1896: 323, 328

**Type species.** *Caberodes cervinaria* Packard, 1873: 81, by original designation.

**Diagnosis.** Red-brown to gray-brown species of the southeastern United States and Texas, similar in size to *Ilexia intractata* or smaller, with simple male antennae, and without white markings on antennae or body. Wings variable; transverse lines may be indicated by series of dark spots, faint dusky lines, or solid, regular pale lines, and ground color may be variegated by areas of blackish or purplish-gray shading. Fresh specimens have a violaceous tint in the wing coloring that is lacking in *I. intractata*. Similarities of appearance and structure suggest that *Episemasia* and *Covellia* might be sister groups, with components of the genitalia of *Episemasia* reduced or simplified. The genus includes only the two species treated, and they are not very closely related.

**Further Description.** Male antenna appearing simple but actually laminate, ciliate (not bipectinate); female antenna simple, slender, ciliate; neither sex with any longitudinal white lines on antennal shaft; palpus as in *Covellia*, but third segment more porrect than decumbent; palpi tending to turn inward toward each other beyond proboscis as in *Covellia*; proboscis well developed; minute ocellus present in type species but not in *E. solitaria*;




**Figs. 27–30.** Male genitalia of *Parilexia* and *Episemasia*: **27)** *P. antilleata*, Key Largo, FL, paratype slide USNM 53033 [USNM]; **28)** *P. antilleata*, right valva showing basal scale tuft, paratype USNM slide 52153 [USNM]; **29)** *E. solitaria*, slide USNM 52358 [USNM] (aedeagus below); **30)** *E.cervinaria*, slide USNM 59031 [USNM] (aedeagus above).

chaetosema minute, with 5–6 short bristles. Legs as in *Covellia*, without scale tufts or hair pencils. Venation of forewing with $R_1$ branching from Rs before $M_1$ as in *Ilexia* and *Covellia*. The first of the two accessory cells as seen in *Covellia* present in *solitaria* but not in *E. cervinaria*. Moths highly variable but basically of same red-brown color and with much the same pattern of lines on both wings as species of related genera, although with tendency toward a more faded or washed out appearance. Wing length: males, 12–14 mm (n=51); females, 11.5–14.0 mm (n=81).

**Male genitalia** (Figs. 29, 30). Characterized by elongated valves somewhat like those of *Covellia* but simplified; without complex accessory processes or highly derived setae. Uncus simple, short, stubby or flattened, with specialized setae in two clumps occupying outer corners of base in a way that suggests that they might be derived from socii. Aedeagus with long slender vesica and distinctive quill-like cornuti.

**Female genitalia** (Figs. 37, 38). Distinctive mainly because of bursa copulatrix, which, for most of its length, is comprised of a sclerotized, somewhat flattened and twisted tube, terminating in a very small, rounded, membranous or thick, wrinkled and rubbery corpus bursae, without signa.

**Early stages.** Known only for *E. solitaria* and described under that species.

**Distribution.** Southeastern United States from North Carolina southward, including Gulf States to East Texas.

## ***Episemasia solitaria*** (Walker)
(Figs. 18–20, 29, 37)

*Ephyra solitaria* Walker, 1861: 631

Type locality: East Florida [probably St. John's Bluff, Duval Co.] (E. Doubleday). [BMNH]
*Ephyra stabilata* Walker, 1861: 632
Type locality: East Florida, as above. [BMNH]
*Anisodes* ? *repugnata* Walker, "1862" [1863]: 1,577
Type locality: East Florida, as above. [BMNH]
*Episemasia morbosa* Hulst, 1896: 328
Type locality: Florida. [AMNH]

**Diagnosis.** A common southeastern species from Cape Hatteras to Florida, rarely to coastal Maryland and perhaps southern New Jersey, and westward to Louisiana but evidently not overlapping with the rather dissimilar *E. cervinaria* in East Texas. Where *E. solitaria* occurs, it is the only red-brown geometrid in this size range with the following combination of features: non-pectinate, essentially simple (actually laminate) male antennae; no thin, discrete, longitudinal white lines on antennal shaft (although scales on shaft may be nearly all whitish in pale specimens); no whitish dorsal spots or other markings on male abdomen; no dark median line or band on forewing. This highly variable species includes forms with wide, dark, outer borders or dark spots where transverse lines meet inner margin (both wings), although most specimens are without such markings. Male genitalia with process of uncus wide, rounded, and vesica with about 18 quill-like cornuti. Female genitalia with bursa copulatrix sclerotized and longitudinally ribbed for more than half its length.

**Further Description.** Moths the size of *Ilexia intractata* or smaller, highly variable from deep reddish brown to pale tan or beige, usually with a dull reddish or pinkish tint. Three main color forms occur: (1) almost solidly reddish brown, with or without paler median space, marked only with very small discal spots and thin, faint, gray antemedial and postmedial lines or postmedial line only, which may be represented by series of small black points in some specimens (form "*solitaria*"— Fig. 18); (2) lighter, often pinkish tan or beige, with one to several larger blackish spots on the forewing antemedial and postmedial and one such spot on hindwing postmedial, concentrated at or toward inner margin (form "*repugnata*"— Fig. 19); (3) with wide, blackish or dark-gray outer border filling space between postmedial line and outer margin of both wings, and with a similarly colored inner medial (i.e., toward inner margin) patch on forewing (form "*stabilata*" — Fig. 20). Wing surfaces of many specimens of all forms more or less irrorated with dark scales. Fringes concolorous, unmarked. Undersurfaces similarly colored but paler, almost unicolorous, except that wide outer borders of form 3 are repeated, more weakly. Frons and palpi often colored like wings; body and legs paler. Wing length: males, 12–14 mm (n=51); females, 11.5–14.0 mm (n=81).

**Male genitalia** (Fig. 29). Tegumen and vinculum short and wide; uncus triangular basally but with apex expanding into a broad, rounded, flattened process; proximal outer corners of uncus base each with a clump of coarse setae suggesting those of socii; juxta broadly rounded ventrally, with dorsolateral corners produced; valve long, with costal and ventral margins subparallel for much of their length, and with sclerotized costa bearing sharp point near distal end. Shape of valve resembles that of *Covellia* species, but it is simplified, lacking processes and complex patterns of coarse setae. Aedeagus distinctive, with long, slender, distal extension and long, curled vesica bearing about 18 slender, quill-like cornuti that are barbed distally; three distal cornuti are longest. (n=2).

**Female genitalia** (Fig. 37). Eighth segment modified and collar-like, with its dorsal surface transversely striated; anterior apophyses much reduced. Ostium not clearly defined, and ductus bursae virtually wanting. Bursa copulatrix elongate, its posterior 2/3 sclerotized and boldly ribbed longitudinally; anterior third widened, rounded, membranous; no signum. (n=3).

**Early stages.** I reared this species from eggs obtained from a female collected at The Wedge Plantation, on the South Santee River, Charleston Co., South Carolina, on 25 April 1980. There was no information as to what the host might be, but the similarity of adult coloring between *E. solitaria* and *I. intractata* prompted me again to try holly, a guess that proved correct. They were reared so easily on the tough, seemingly unpalatable leaves of *Ilex opaca* that there can be little doubt that evergreen species of *Ilex* are the natural hosts. The species probably also feeds on other evergreen hollies, such as *Ilex vomitoria*, which is abundant in that region. The larvae matured and pupated promptly, and six adults emerged 22–25 June of the same year. The rest hibernated and 18 emerged 22 Mar.–14 Apr. 1981. The reared adults are more intensely red brown and larger than most caught ones.

Mature larva very different from plain, green, cylindrical larva of *Ilexia intractata*, and possibly aposematic, being ornamented with bands and stripes of black, white, and yellow. Body widest at segment A1, thence tapering both forward and backward. Head no more than half width of body at widest part; anal prolegs spread apart widely, well beyond width of body at its posterior end. If one considers black to be the ground color, the markings are as follows: thin, sinuous, longitudinal white lines consisting of pair of addorsals, then on each side a subdorsal, dorsolateral, spiracular (lateral), and ventrolateral stripe. A series of yellow segmental blotches lie astride the subdorsal and dorsolateral stripes, and in some larvae this yellow coloring may suffuse whole space between these stripes. Segment A1 largely blackish, preceded and followed by one or more diffuse, transverse dorsal bands of white or yellow, more definite in some larvae than others. Lateral sides of extended anal prolegs banded with black and yellow; other prolegs yellow; thoracic legs blackish. Head yellowish, boldly banded transversely with three bands of black—one at back of head, one in the middle (which ends before reaching sides of head), and one across front; labrum also with boldly contrasting black lower margin. Length at maturity: 20 mm.

Pupa with integument quite dark, opaque, conspicuously pitted. Cremaster with usual two large hooks and three small ones on each side. Tenth segment conical, so that cremaster is not constricted at its base and thus does not appear as a separate structure or process as in *I. intractata*. Dorsal anterior margin of tenth segment deeply and coarsely sinuous or crenulate and not setose. Mesothoracic spiracle a rounded pore facing anteriorly on the forward side of a relatively large, rounded hump (the callosity of McGuffin, 1981), unlike that of *I. intractata*, in which the mesothoracic spiracle is a forward-facing transverse slit backed by a raised, flat, hood-like cover.

**Types and synonymy.** *Ephyra solitaria* Walker is based on one female specimen in the BMNH that agrees with color form #1 under Further Description. It is labeled only "U.S." but the original description gives the type locality as East Florida for all three of the Walker names. It is in poor condition, without abdomen, but still easily recognized. *Anisodes* ? *repugnata* Walker (color form # 2) was described from two male syntypes (indicated to be females in the original description), one in better condition than the other, both in the BMNH. Although there is no question about the identity of either specimen, I here designate the better one as **lectotype**. It bears a circular Type label; the number 1019; a label which is a piece of paper cut from Walker's catalogue with the name *Anisodes* ? *repugnata*; a label saying PHOTOGRAPHED/B.M.; and my lectotype label. The poorer specimen has a circular bluish label that says "U.S.," which is lacking on the lectotype. *Ephyra stabilata* Walker (my color form # 3), the form with the wide dark border, was described from one female specimen in good condition (BMNH). *Episemasia morbosa* Hulst is based on one male from the Hulst collection in the AMNH. The name "*morbosa*" was generally used for this species in the American literature prior to Forbes's (1948) reinstatement of *E. solitaria*. Hulst (1894: 306) reported that *Macaria inaptata* Walker (1861: 886) is a variety of *E. solitaria*, but I identified the type of *M. inaptata* as the same species as *Itame varadaria* (Walker) (Ferguson 1973: 288).

**Distribution.** Florida, Georgia, Louisiana, South Carolina, North Carolina (Moore County), Maryland (Dorchester County); Lakehurst, New Jersey (June 1–10, Frdk. Lemmer, 1 female in USNM) (123 specimens examined). A specimen in the USNM labeled Lakehurst, N.J., June 1–10, Frdk. Lemmer, may have been mislabeled.

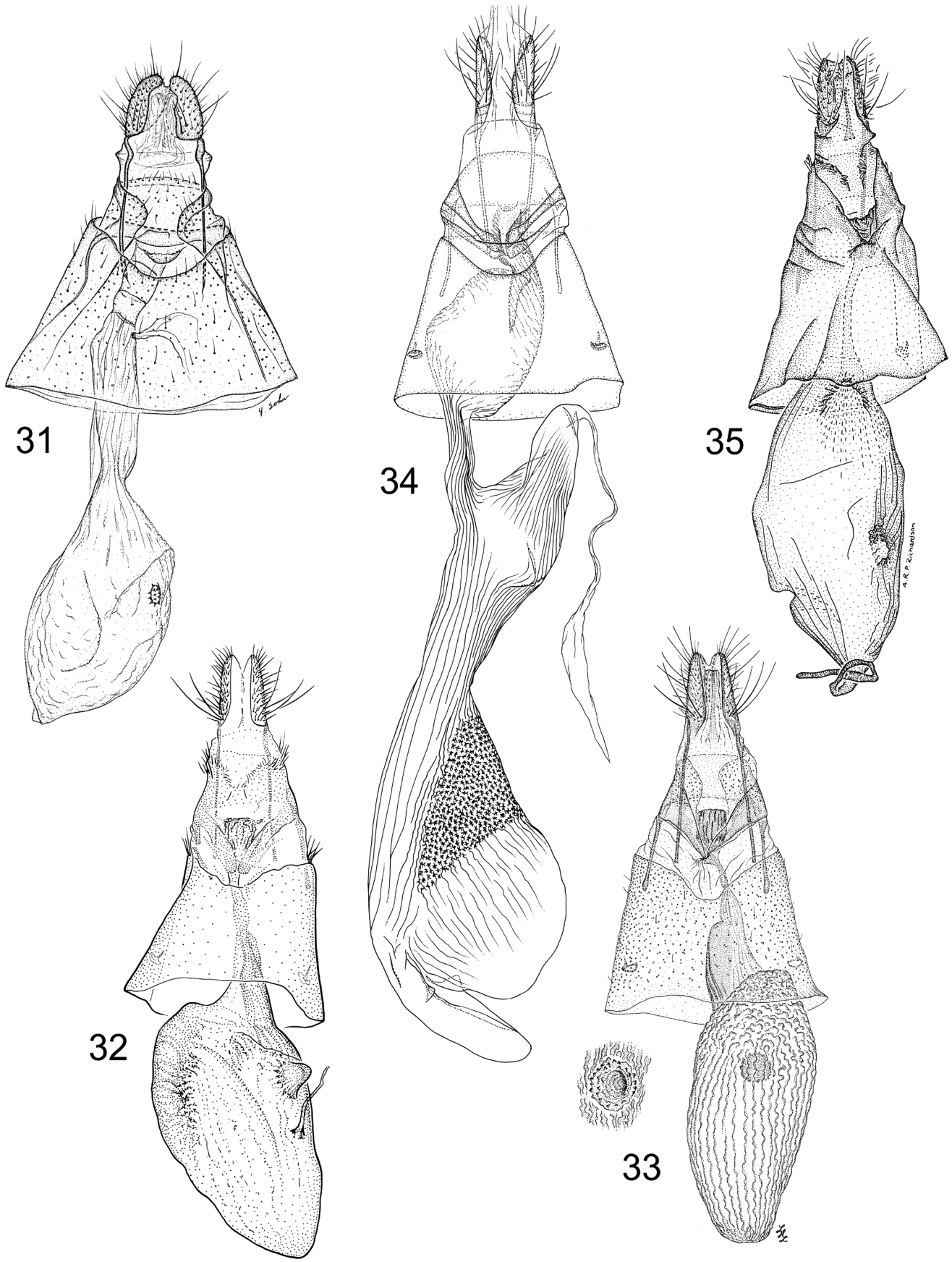
**Flight period.** March–June (March–April in Louisiana); 19 May in Maryland; one October record from coastal South Carolina.

## ***Episemasia cervinaria*** (Packard)
## (Figs. 16, 17, 30, 38)

*Caberodes cervinaria* Packard, 1873: 81

**Type locality.** "Texas, May 8 (Belfrage)." [MCZ]

**Diagnosis.** Adults of this species are so different from those of *E. solitaria* that one would not think them congeneric. However, similarities in the genitalia suggest that both belong in the genus *Episemasia*. The moths are similar in size to those of *E. solitaria* or slightly smaller, and uniformly reddish brown with regular, pale, transverse lines. They superficially resemble the brown spring forms of certain *Nemoria* species (Geometrinae), such as *N. bistriaria* Hübner, but do not have pectinate male antennae or pale dorsal abdominal markings, and they have no trace of green or rose-pink coloring on wings or body. In the male genitalia the process of the uncus is linear and tapered, not roundly expanded; the valve has a large, pointed process near middle of costa; and the vesica has 4–6 cornuti. The female has a distinct ostial funnel and rounded




**Figs. 31–35.** Female genitalia of *Ilexia* and *Parilexia*: **31)** *I. intractata*, holotype, slide DCF 1483 [BMNH]; **32)** *P. nicetaria*, La Vega Prov., Dominican Republic, slide USNM 59041 [USNM]; **33)** *P. nicetaria*, Haiti, lectotype slide DCF 1509 (with enlarged detail of signum) [BMNH]; **34)** *P. proditata*, slide USNM 53932 [USNM]; **35)** *P. antilleata*, holotype, slide USNM 53043 [USNM].

postostial plate not found in *E. solitaria*.

**Further Description.** Wings almost solidly reddish brown, varying to a more grayish brown, but otherwise little variation; moths nearly all alike, without the color forms of *E. solitaria*. Both wings with fine, uniform irroration of dark scales. Transverse lines thin, even, regular, light buff, very thinly edged with dark brown on proximal (inner) sides; forewing with postmedial band parallel to outer margin, and a convex antemedial band; hindwing with postmedial band only. Small dark discal spots on both wings. Fringes concolorous, or paler with delicate red-brown band through middle. Undersurfaces uniform, plain, not or hardly paler, irrorated, with transverse lines showing faintly in red brown to gray brown, and discal spots about as above. Differs somewhat from *E. solitaria* in having scales of the antenna, vertex, front, and palpus often contrastingly paler than reddish-brown body, being pale brown or buff. Wing length: males, 11–12 mm (n=23); females, 11–13 mm (n=13).

**Male genitalia** (Fig. 30). Unit comprised of tegumen and vinculum narrower than that of *E. solitaria*; uncus similar and with same kind of setal tufts at outer extremities of base, although process of uncus much more narrow, tapering distally to blunt point. Juxta subcircular, without processes at dorsolateral extremities. Valve similar in size to that of solitaria but wider, distally rounded, and with pointed process of costa much larger, arising more basad, near middle of costa, and directed obliquely outward. Aedeagus with long tubular vesica bearing one very long cornutus about four-fifths length of aedeagus, plus three to five short ones. (n=5).

**Female genitalia** (Fig. 32). More slender and slightly longer overall compared to those of *E. solitaria* but basically similar. Ostium wide, with large and definitive ostial funnel, followed by a rounded, sclerotized postostial plate not present in *E. solitaria*. Eighth segment not forming a definite, collar-like ring and not transversely striated dorsally. Anterior apophyses very short as in *E. solitaria*. Ductus bursae not apparent and not shown in drawing. Ostial funnel forms continuous unit with long, tubular, sclerotized, posterior section of bursa copulatrix, which is a helix with one rotation; anterior part of bursa copulatrix, much as in *E. solitaria*, is a small, membranous, globular sac, without signum. (n=3).

**Early stages**. Unknown

**Types and synonymy**. Described from two females in the Packard collection collected by Belfrage in Texas. These should be in the Museum of Comparative Zoology, Harvard University. I have not seen them, and no lectotype has been designated. However, Packard's later treatment (1876: 532; pl. 6, fig. 16; pl. 12, fig. 34) leaves no doubt about the identity of this species. Much of Belfrage's material came from Bosque County, Texas. There are no synonyms.

**Distribution.** Seen only from the following counties in Texas: Anderson, Bastrop, Blanco, Bosque, Burnet, Dallas, and Jackson. It is also reported from Missouri (J.R. Heitzman, in litt. 1998). One large female in the USNM is labeled "Dayton O[hio] Pilate," possibly in error.

**Flight period.** 29 February–28 March; "Apr.;" 14 May–16 June, a time span that suggests more than one brood.

**Remarks.** This species is uncommon in collections. Nearly half of those examined are around 100 years old, and some have incomplete data. However, the late André Blanchard collected it in most of the above-named counties in the 1960's and 70's, and the USNM has examples taken at Irving, Dallas Co., Texas in 1984 and 1986 (from Russell A. Rahn). Specimens examined: 37.

## ACKNOWLEDGEMENTS

For supplying material or information during the long period during which this paper was in preparation, I am indebted to Vernon A. Brou of Abita Springs, Louisiana; Charles V. Covell, Jr. of Louisville, Kentucky; Terhune S. Dickel of Anthony, Marion County, Florida (formerly of Homestead); J. Richard Heitzman of Independence Missouri; Frederick H. Rindge of the American Museum of Natural History, New York; the late André Blanchard of Houston, Texas and the late Charles P. Kimball of Barnstable, Massachusetts and Sarasota, Florida. My correspondence with lepidopterists at the Natural History Museum, formerly the British Museum of Natural History (BMNH), London, concerning species and the loan of types in this complex, spans a period of years, beginning with D.S. Fletcher and continuing more recently with Linda Pitkin and Malcolm Scoble. I thank them all. The genitalia and wing drawings are by contract illustrators Ann R.P. Richardson and Susan Escher, Systematic Entomology Laboratory staff illustrator Linda Lawrence, and USNM entomology staff illustrator Young Sohn.

## REFERENCES CITED

**Dognin, P.**
1911. Hétérocères nouveaux de l'Amérique du Sud. *Mémoires de la Société Entomologique de Belgique,* 18:151–188.
1913. Ibidem, 22: 1–54.
1924. Hétérocères nouveaux de l'Amérique du Sud, fasc. 25: 34 pp. Imprimerie Oberthür, Rennes.

**Druce, H.**
1891–1900. *Lepidoptera-Heterocera. In:* F. D. Godman and O. Salvin, *Biologia Centrali-Americana; or, Contributions to the Knowledge of the Fauna and Flora of Mexico and Central America.* Zoology: Insecta. Vol. 2. Taylor & Francis, London. 622 pp.

**Dyar, H.G.**
1914. Lepidoptera of the Yale-Dominican Expedition of 1913. *Proceedings of the United States National Museum,* 47: 423–426.

**Ferguson, D.C.**
1973. The identity of *Macaria inaptata* Walker and *Itame varadaria* (Walker) (Geometridae). *Journal of the Lepidopterists' Society,* 27: 288–290.
1983. Geometridae (except Sterrhinae), pp. 88–107. *In*: Hodges, R.W., et al. (Eds.). *Check list of the Lepidoptera of America north of Mexico*. E.W. Classey Ltd. and The Wedge Entomological Research Foundation, London. xxiv + 284 pp.

**Forbes, W.T.M.**
1948. *The Lepidoptera of New York and neighboring states*, pt. 2. Cornell University Agricultural Experiment Station Memoir 274: 263 pp.

**Grote, A.R.**
1881. Descriptions of Geometridae, chiefly collected by Mr. Pilate. *Papilio,* 1:40–42.

**Guenée, A.**
1857. Uranides et Phalénites, pts. 1–2, being vols. 9–10 of Boisduval and Guenée, *Histoire Naturelle des Insectes, Spécies Général des Lépidoptères*. Collection des Suites à Buffon, Paris. 1099 pp.

**Herrich-Schäffer, G.A.W.**
1850–1858. *Sammlung neuer oder wenig bekannter aussereuropäischer Schmetterlinge*. Regensburg. 84 pp., 120 col. pls.

**Holloway, J.D.**
1993. *The Moths of Borneo, part 11, Geometridae, Ennominae*. The Malaysian Nature Society & Southdene Sdn. Bhd., Kuala Lumpur, Malaysia. 309 pp., 593 monochrome figs., 19 col. Pls.

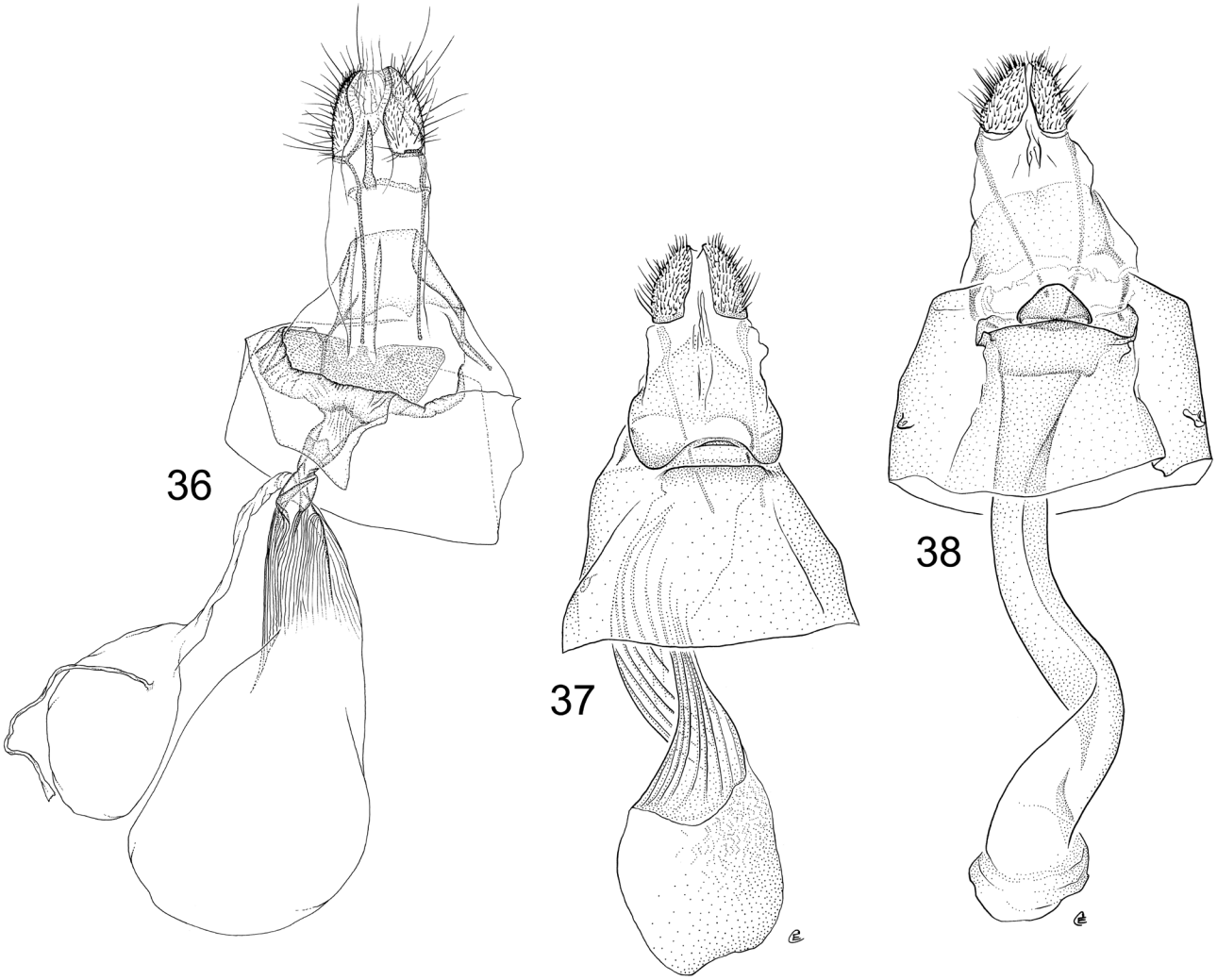
**Hulst, G.D.**
1894. Notes on types of North American Geometrina in European collections, I. *Entomological News* 5: 302–306.
1896. Classification of the Geometrina of North America. *Transactions of the American Entomological Society,* 23:245–386.

**Kimball, C.P.**
1965. The Lepidoptera of Florida, an annotated Checklist. *Arthropods of Florida and Neighboring Land Areas,* 1:i–v + 363.

**Krüger, M. and M.J. Scoble**
1992. Neotropical red-brown Ennominae in the genera *Thysanopyga* Herrich-Schäffer and *Perissopteryx* Warren (Lepidoptera: Geometridae). *Bulletin of the British Museum* (*Natural History*) Entomology, 61(2):77–148.

**McDunnough, J.H.**
1938. Check List of the Lepidoptera of Canada and the United States of America, pt. 1, macrolepidoptera. *Memoirs of the Southern California Academy of. Sciences,* 1: 272 pp.

**McGuffin, W.C.**
1981. Guide to the Geometridae of Canada 2, Subfamily Ennominae, part 3. *Memoirs of the Entomological Society of Canada,* 117. 153 pp., illus.




**Figs. 36–38.** Genitalia of *Covellia* and *Episemasia*: **36)** *C. procrastinata*, slide USNM 53944 [USNM]; **37)** *E. solitaria*, slide USNM 52356 [USNM]; **38)** *E. cervinaria*, slide 59032 [USNM].

**Packard, A.S.**

1873. 5th Annual Report of the Trustees of the Peabody Academy of Science: 81.

1876. A monograph of the geometrid moths or Phalaenidae of the United States. *In*: F.V. Hayden, *United States Geological Survey of the Territories*. Government Printing Office, Washington. 607 pp., 13 pls.

**Rindge, F. H.**

1949. A revision of the geometrid moths formerly assigned to *Drepanulatrix* (Lepidoptera). *Bulletin of the American Museum of Natural History,* 94(5):233–298.

**Schaus, W.**

1901. New species of Geometridae from Tropical America. *Transactions of the American Entomological Society,* 27:241–276.

1911. New species of Heterocera from Costa Rica. *Annals and Magazine of Natural History,* (8)8:577–602.

1940. Insects of Porto Rico and the Virgin Islands—moths of the families Geometridae and Pyralididae. *Scientific Survey of Porto Rico and the Virgin Islands*, vol. 12, pt. 3: 291–417. New York Academy of Sciences, New York.

**Walker, F.**

1861. *List of the Specimens of lepidopterous Insects in the Collection of the British Museum*, part 22:495–755. London.

1861. Ibidem, part 23: 756–1020.

"1862" [1863]. Ibidem, part 26: 1476–1796.

1866. Ibidem, part 35: 1535–2040.

**Warren, W.**

1895. New species and genera of Geometridae in the Tring Museum. *Novitates Zoologicae,* 2:82–159.

1897. New genera and species of Thyrididae, Epiplemidae and Geometridae from South and Central America and the West Indies in the Tring Museum. *Novitates Zoologicae,* 4:408–507.

1900. New genera and species of American Drepanulidae, Thyrididae, Epiplemidae, and Geometridae. *Novitates Zoologicae,* 7:117–225.

1904. New American Thyrididae, Uraniidae, and Geometridae. *Novitates Zoologicae,* 11:1–173.

1907. American Thyrididae, Uraniidae, and Geometridae in the Tring Museum. *Novitates Zoologicae,* 14:187–323.

1908. Descriptions of new species of South American geometrid moths. *Proceedings of the United States National Museum,* 34:91–110.

## Addendum

*The preceding article was essentially completed by the late Douglas C. Ferguson prior to his tragic death in November 2002. It lacked only preparation of photographs of the moths and composition of the artwork into plates. I had reviewed it in 1998, and Doug informed me that he still had to reconcile artwork done by three different Smithsonian staff artists as the work progressed beginning in the early 1980's. That seems to have been the main reason completion was delayed, and led to his use of the epithet "procrastinata" for the new species of the new genus Covellia. Dr. Alma Solis sent me Doug's unfinished short articles in 2004, and I have retained those involving Geometridae. Those on other families have been relayed to other interested colleagues. I later searched the Smithsonian collection where I found a drawer containing the specimens pertinent to this manuscript and borrowed them in order to complete the project. Some specimens bore small orange labels on them stating "photo," and they have been used in the plates presented here. However, I did not find labeled specimens for all species to be figured; so I had to select several additional specimens for illustration. Doug apparently had no photographs made of any of the included species.*

*Early in 2009 I enlisted the aid of Dr. Deborah Matthews Lott, who applied her excellent photographic and computer skills to the task of preparing the figures and legends to accompany the manuscript. She took the photos, scanned the genitalia drawings, and reconciled their relative sizes, and composed them all into plates. Together we have worked to get Doug's manuscript published posthumously, modifying as little as possible the manuscript as he left it.*

*I am deeply indebted to Deborah Matthews, without whose assistance the completion of this project would have been further delayed. Thanks are also due to Patricia Genitili-Poole of the Smithsonian Institution, who located and sent the needed genital preparations, and Dr. Ronald W. Hodges of Eugene, Oregon, who carefully reviewed the manuscript prior to its submission. We also thank Dr. M. Alma Solis for locating and sending me the materials that relate to this project.*

**Charles V. Covell Jr., Ph.D.**
McGuire Center for Lepidoptera and Biodiversity
Florida Museum of Natural History