

NEOTROPICAL TINEIDAE, V: THE TINEIDAE OF COCOS ISLAND,
COSTA RICA (LEPIDOPTERA: TINEOIDEA)

DONALD R. DAVIS

Department of Entomology, National Museum of Natural History, Smithsonian Institution, Washington, D.C. 20560.

Abstract.—Five species representing four genera of Tineidae are reported to occur on Cocos Island, Costa Rica. All are fully illustrated. An additional species of *Opogona* is also present but not described because of inadequate material. Four species are proposed as new: *Erechthias hoguei*, *Lepyrotica acantha*, *Opogona dimorpha*, and *Protodarcia cocosensis*. Only one of these, *L. acantha* also from the Galápagos Islands, is known to occur elsewhere. A fifth species, *Erechthias flavistriata* (Wlsm.), is an immigrant that occurs widespread through the Pacific area from Cocos Island to Malaysia. Although the sample is relatively small, it nevertheless exemplifies the disharmonic nature of the fauna—the five species represent four tineid subfamilies. Origins of the Cocos tineid fauna appear complex, but the affinities for most of the species are aligned along a standard track from the Caribbean to the Galápagos.

Key Words: Lepidoptera, Tineidae, Cocos Island, Costa Rica, Galápagos, biogeography

Cocos is a small volcanic island rising 849 m in elevation approximately midway (5°32'57"N, 86°59'17"W) between Costa Rica and the Galápagos Islands. It is somewhat kidney-shaped in outline with a length of 5.6 km, a width of 5.4 km, and an area of 46.6 km² (Fournier 1966, Hogue and Miller 1981). Largely as the result of being bathed mostly by a warm Equatorial Countercurrent (Hertlein 1963), the island lies within a wet climatic zone and receives more than 60 cm of rain per year, with a moderate dry season from January to March. Consequently, unlike the other predominantly xeric oceanic islands near the west coasts of Central and northern South America that are surrounded by the colder, westward flowing Humboldt Current, Cocos Island possesses numerous streams and an extensive wet, tropical forest. Because of its strategic location, a knowledge of the insect fau-

na of Cocos Island is of biogeographical interest.

To supplement previous, inadequate sampling attempts, a terrestrial arthropod survey of Cocos Island was initiated by the late Charles Hogue in 1975, with a second trip conducted by Hogue and Scott Miller in 1978 (Hogue and Miller 1981). The tineid moths collected on those two expeditions form the basis of the present report along with smaller samples from other collectors. Because the total sampling effort for Microlepidoptera currently totals less than three weeks, our knowledge of this fauna remains very sketchy.

Five species representing four genera of Tineidae have been identified from material collected thus far. Although the sample is relatively small, it nevertheless exemplifies the disharmonic nature of the fauna—the four genera represent four tineid subfami-

lies. Four of the five species were previously undescribed. The fifth, *Erechthias flavistriata* (Wlsm.), is an immigrant that occurs widespread through the Pacific area from Cocos Island to Malaysia. This species had not been reported previously from the New World and, thus, may owe its presence on Cocos to human transport from Polynesia. Similarly, human assisted introduction of *Erechthias hoguei* is also suspected, although rafting in rotting vegetation from Polynesia along the predominantly eastward flowing Equatorial Countercurrent cannot be ruled out. The Erechthiinae occur widely throughout the Pacific and Indian Oceans (Robinson and Nielsen 1993) with no species known to be endemic to the Americas. Origins for the other Cocos Tineidae are most likely either Central America or even the Antilles (Rosen 1976). Some could have been carried to the island on prevailing winds that blow mostly from the northeast during January (Byers 1981). *Lepyrotica* and *Protodarcia* are almost exclusively Caribbean genera that do not occur in the Old World. Recent collecting in both North and South America indicate that both genera are more widespread through the Americas. One of the new species, *Lepyrotica acantha*, also occurs commonly through the Galápagos Archipelago. Most of the type series of this species were collected in the Galápagos by Bernard Landry in support of an insect survey by Stewart Peck (Peck 1991). No other tineid species from Cocos Island is represented in the ca. 20 species known from the Galápagos. The pantropical genus *Opogona* is represented on Cocos by one and possibly two species. Both superficially resemble species from Central and South America. Until the neotropical, and particularly the Pacific coastal tineid fauna has been better surveyed, it will not be possible to state whether or not most of the new Cocos Island species are endemic.

Although mainland dispersal to Cocos may be the most plausible explanation for most of the island's tineid fauna, such dis-

persal may have been influenced by vicarious events that originated in the eastern Pacific, as suggested by Brown et al. (1991). Both Cocos (2 m.y.a., Castillo et al. 1988) and the Galápagos (3 m.y.a., Christie et al. 1992) comprise relatively recent, isolated oceanic islands produced by a rather stable Galápagos hot spot that may have begun activity 100 m.y.a. (Duncan et al. 1984). The presence of eroded volcanic seamounts, particularly along the Carnegie Ridge, indicate previous islands that may have appeared throughout the entire history of hot-spot activity (Christie et al. 1992). As suggested by these authors and previously by Holden & Dietz (1972) and Rosen (1975), the existence of earlier islands further imply a much greater time frame for speciation events to occur as well as shorter distances for dispersal. Few conclusions can be drawn from what little information we have of the Tineidae of this region. Basically this study agrees with previous observations (e.g. Croizat 1958) that Cocos Island is biogeographically positioned on a standard track between the Galápagos and the Caribbean. We now know this tract to be correlated with the tectonic history of the region (Rosen 1976).

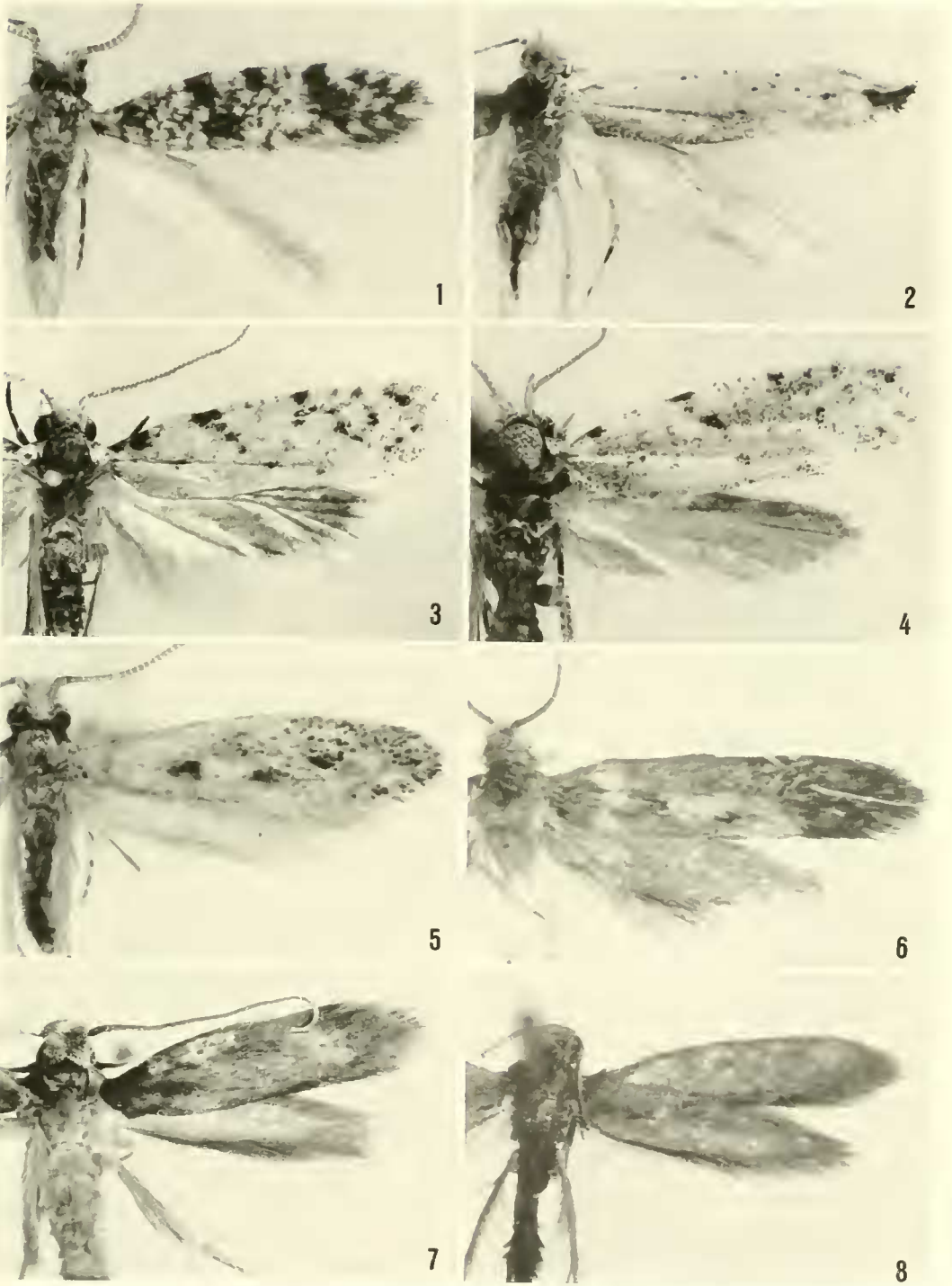
Protodarcia cocosensis,

NEW SPECIES

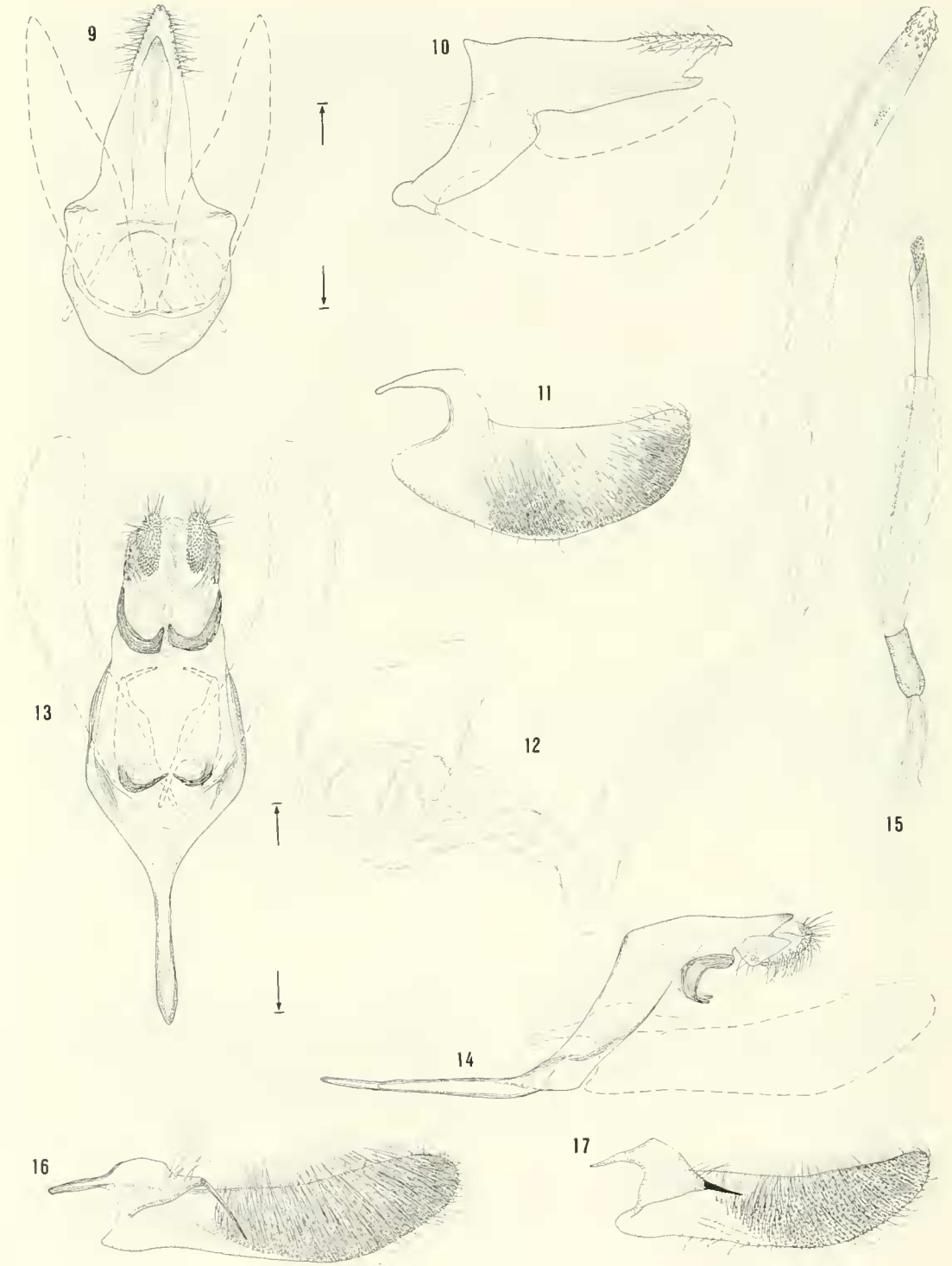
Figs. 1, 9–12, 34

Adult (Fig. 1).—Forewing length 3.1–3.7 mm.

Head: Rough, all scales piliform with acute apices; frons white to cream with brownish scales laterally along rim of eye and ventrally across base of frons. Vertex white to cream with brownish scales between antennal bases and on occiput. Antenna equal to forewing in length; scape cream, heavily suffused with fuscous; pecten consisting of 8–10 brownish bristles; flagellum with two annuli per segment; scales slender with basal annulus fuscous and apical one cream; annulation indistinct over distal fifth. Maxillary palpus 5-segmented, mostly cream, sometimes irrorated with



Figs. 1-8. Adults. 1, *Protodarcia cocosensis*, holotype ♂ (3.7 mm). 2, *Erechthias flavistriata*, ♂ (4.8 mm). 3, *Lepyrotica acantha*, holotype ♂, Galápagos Islands (6 mm). 4, *L. acantha*, paratype ♂, Cocos Island (5.5 mm). 5, *Erechthias hoguei*, holotype ♂ (3.6 mm). 6, *E. hoguei*, paratype ♂ (3 mm). 7, *Opogona dimorpha*, paratype ♀ (5 mm). 8, *O. dimorpha*, holotype ♂ (3.3 mm). Length of forewing in parentheses.



fuscous over basal segments. Labial palpus mostly fuscous laterally, white to cream mesally, with apex of segment III cream; a cluster of dark bristles arising from distal half of II.

Thorax: Pronotum mostly fuscous, lightly irrorated with pale buff to cream. Venter uniformly pale buff to cream. Forewing pale buff to cream, almost equally marked by numerous small to large patches of fuscous scales, resulting in an overall, variably spotted to barred pattern; fringe irregularly buff to cream. Hindwing uniformly white to cream. Foreleg without epiphysis, mostly dark fuscous dorsally and cream ventrally with tibia and tarsomeres tipped with cream. Midleg similarly marked but slightly paler with more buff on femur. Hindleg mostly cream to buff with faint indication of darker scales. Tibial spurs = 0-2-4.

Abdomen: Buff brown dorsally, slightly paler, more cream ventrally. Male with a pair of minute oval glands opening on pleura near anterior margin of A3; glands absent in female; A8 of male with a pair of short coremata; female without corethrogyne.

Male genitalia (Figs. 9-12): Vinculum a narrow ventral ring, not differentiated from tegumen; saccus absent. Tegumen and uncus fused, tapering to a simple, setose apex. Subscaphium present, slightly sclerotized caudally. Gnathos absent. Juxta a faintly sclerotized, hour glass-shaped median plate. Transtilla weakly developed. Valva simple, of relatively uniform width throughout, with bluntly rounded apex. Aedoeagus cylindrical, slightly less than length of valva, with numerous, small, apical spines; vesica elongate, ca. $3 \times$ the length of aedoeagus.

Female genitalia (Fig. 34): Ovipositor elongate, telescoping; posterior apophysis

ca. $2 \times$ length of anterior pair. Ostium moderately broad, simple, continuing as a broad tube (antrum) ca. $\frac{2}{5}$ - $\frac{3}{5}$ the total length of ductus bursae before constricting to narrow tube. Corpus bursae abruptly enlarging into long elliptical sack exceeding total length of ductus bursae; ductus seminalis joining corpus near anterior end of ductus bursae; a single, curved, plate-like signum present extending half way around caudal end of corpus bursae.

Larva and pupa unknown.

Holotype.— δ ; Wafer Bay, Cocos Island, Costa Rica, 17-22 Apr 1975, C. L. Hogue (LACM).

Paratypes.—COSTA RICA: Cocos Island: Rio Génio: 5 δ , 17-22 Apr 1975, C. L. Hogue, slides DRD 3301, USNM 21172 (LACM, USNM). Wafer Bay: 21 δ , 1 \varnothing , 17-22 Apr 1975, C. L. Hogue, slides DRD 3312, USNM 22277 (LACM, USNM), 7 δ , 2 \varnothing , 24-27 Mar 1978, C. L. Hogue & S. Miller, slide USNM 31368 (LACM, USNM).

Distribution.—Known only from Cocos Island.

Etymology.—The specific name is derived from the name of the island, Cocos, added to the suffix *ensis* (inhabitant of).

Discussion.—The genus *Protodarcia* (type species: *bicolorella* Forbes) currently consists of four closely allied Caribbean species in addition to *P. cocosensis*. Not included is '*Protodarcia*' *argyrophaea* Forbes, which eventually will be assigned to a new genus. I am aware of three other undescribed species in this genus from the southern United States and southern Venezuela. *Protodarcia* shows the greatest affinities to *Eudarcia*, another member of the Meessiinae. It differs from *Eudarcia* in possessing more slender wings (forewing index (W/L) = 0.2 compared to 0.28 for *Eudarcia*) and different

Figs. 9-17. Male genitalia. 9, *Protodarcia cocosensis*, ventral view. 10, Lateral view. 11, Right valva, mesal view. 12, Aedoeagus. 13, *Lepyrotica acantha*, ventral view, Cocos Island. 14, Lateral view. 15, Aedoeagus. 16, Right valva, mesal view. 17, Right valva, mesal view, Galápagos Islands. All scales = 0.5 mm.

venation (M1 stalked to R5, A1+2 without anal fork). The male genitalia of *Protodarcia* differ in lacking all trace of a gnathos and in having the subscaphium partially sclerotized.

The forewing pattern of *Protodarcia cocosensis* most resembles that of *P. plumella* (Wlsm.) from the Lesser Antilles. The latter can be easily distinguished from *P. cocosensis* by the presence of paired, spinose signa in the female holotype of *P. plumella*.

***Lepyrotica acantha*, NEW SPECIES**

Figs. 3, 4, 13–17, 35

Adult (Figs. 3, 4).—Forewing length: ♂, 4–7 mm; ♀, 4.5–8 mm.

Head: Rough, all scales piliform with acute apices, white, often with light to heavy suffusion of grayish fuscous over vertex and occiput. Antenna ca. 0.65 the length of forewing; scape with prominent dorsal tuft, white usually irrorated with fuscous; venter white; pecten consisting of 12–16 usually white, piliform scales; flagellum with a single annulus per segment; scales moderately broad, mostly white, strongly irrorated with fuscous along anterior surface of flagellum. Maxillary palpus 5-segmented, white with dark fuscous over dorsal surfaces of basal segments. Labial palpus mostly white, lateral surface of segments I–II dark fuscous and with 5–8 dark bristles.

Thorax: Pronotum white with most scales tipped with light golden brown to fuscous. Venter white. Forewing white lightly irrorated with fuscous tipped scales and small patches of pale golden brown and fuscous; largest patches of fuscous at base and basal third of costa, the latter often forming a short fascia slanted obliquely forward, as well as another shorter fascia sometimes present slightly beyond middle of costa slanted basally; a moderately large, median fuscous spot also present in unrubbed specimens near wing base; apex and termen variably marked with smaller fuscous spots; fringe white. Hindwing uniformly gray. Female with two frenular bristles, male with

one. Foreleg with epiphysis, mostly white ventrally with suffusion of gray, dark fuscous dorsally with apices of tibia and tarsomeres white. Midleg paler; tibia and first tarsomere with prominent dorsal bands of fuscous. Hindleg mostly white with grayish fuscous suffusion dorsally over basal tarsomeres. Tibial spurs = 0-2-4.

Abdomen: Pale buff to cream dorsally, white ventrally; without specialized scaling or glands other than typical tuberculate warts laterally on segments I and II.

Male genitalia (Figs. 13–17): Vinculum Y-shaped, with an elongate slender saccus ca. 0.6 the length of valva. Uncus consisting of a pair of widely separated, setigerous pads. Gnathos a pair of well developed, curved arms, weakly connected by a slender, U-shaped, median bridge. Juxta a slender, well sclerotized, transverse bridge connecting bases of valvae. Valva elongate, with rounded apex and densely setose mesal surface; sacculus a triangular basal lobe with a prominent, stout seta arising from apex. Aedeagus elongate, ca. 1.2 × length of valva, slender, slightly sinuate, indistinctly serrated along mid-dorsum, basal 1/2 more heavily sclerotized; cornuti absent.

Female genitalia (Fig. 35): Ovipositor elongate, telescoping; posterior apophysis ca. 1.4 × the length of anterior pair. Ostium relatively small, opening into a short, slightly sclerotized antrum that constricts and then immediately enlarges to form a slightly swollen, membranous ductus; walls of ductus bursae slightly rough due to circular ridges. Corpus bursae rather abruptly enlarged, elliptical to oval in outline; walls sometimes wrinkled, membranous except for small, elliptical sclerite at caudal end near opening of ductus.

Larva and pupa unknown.

Holotype.—♂; 4 km SE Pto. Baquarizo, Isla San Cristóbal, Galápagos, Costa Rica, 12 Feb 1989, B. Landry, MVL (mercury vapor lamp), (CNC).

Paratypes.—COSTA RICA: Cocos Island: Chatham Bay: 1 ♀, 8–10 Apr 1979, 2

♂, 9–11 Apr 1979, R. Silberglied, Malaise trap, at light, slides DRD 3297, 3298. Wafer Bay: 1 ♂, 1 ♀, 27 Mar 1978, C. L. Hogue & S. Miller, slide USNM 22278, 1 ♂, 17–22 Apr 1975, C. L. Hogue. ECUADOR: Galápagos Islands: Isla Española: Bahía Manzanillo: 1 ♂, 25 Apr 1992, B. Landry, MVL [mercury vapor lamp]. Punta Suarez: 1 ♂, 2 May 1992, B. Landry, MVL. Isla Floreana: Las Cueva: 1 ♀, 23 Apr 1992, B. Landry, MVL. Isla Isabela: 8.5 km N Pto. Villamil: 1 ♀, 11 Mar 1989, B. Landry, MVL. 3 km N Sto. Tomás, Agr. Zone: 1 ♀, 8 Mar 1989, B. Landry, MVL. V. Darwin, 630 m: 2 ♂, 1 ♀, 16 May 1992, B. Landry, MVL. Isla Pintada: 400 m: 1 ♀, 18 Mar 1992, B. Landry, MVL. Isla Rabida: Tourist Trail: 1 ♂, 3 Apr 1992, B. Landry, MVL. Isla San Cristóbal: 1 ♀, 4 km SE Pto. Baquarizo: 1 ♀, 12 Feb 1989, 1 ♂, 2 ♀, 20 Feb 1989, B. Landry, MVL. Pto. Baquarizo: 1 ♀, 17 Feb 1989, B. Landry, MVP. Isla Santa Cruz: CDRS (Charles Darwin Research Station), arid zone: 2 ♂, 17 Jan 1989, 4 ♂, 3 ♀, 19 Jan 1989, 1 ♂, 1 ♀, 3 Feb 1989, B. Landry, MVL, slides USNM 30841, 31361. ECCD [Charles Darwin Research Station]: 4 ♂, 1 ♀, 4–6 Mar 1992, B. Landry, WVL, UVL (ultra violet lamp). Finca S. Devine: 1 ♀, 17 Mar 1989, B. Landry, slide USNM 31198. Finca Vileme, 2 km W Bella Vista: 1 ♂, 1 ♀, 1 Apr 1992, B. Landry, MVL. 4 km N Puerto Ayora: 1 ♂, 1 ♀, 20 Jan 1989, B. Landry. Isla Santiago: Aquacate, 520 m: 2 ♂, 3 ♀, 12 Apr 1992, B. Landry, MVL. Isla Seymour Norte: 4 ♂, 29 Mar 1992, B. Landry, MVL. Paratypes deposited in BMNH, CNC, B. Landry, and USNM.

Distribution.—Known only from Cocos Island and the Galápagos Archipelago.

Etymology.—The specific name is derived from the Greek *akanthos* (thorn, spine), in reference to the large spinose seta present at the base of the valva.

Discussion.—This species closely resembles the other described members of *Lepyrotica*, a neotropical genus of Tineinae currently represented by six species restrict-

ed to predominantly xeric habitats in the western Antilles. The largest, most atypical member of the genus is an undescribed species that I collected in a considerably wetter habitat on Cerro de la Neblina at 1850–2050 m in southern Venezuela.

The male genitalia of all members of *Lepyrotica* are similar in possessing paired, setose unculus lobes, a paired, slender, armlike gnathos, a long, rod-like saccus, and long slender valvae and aedoeagi. *Lepyrotica acantha* is the only species with a prominent, spiniform seta arising from the sacculus. The female genitalia of those species examined are similar in possessing a single, plate-like signum at the caudal end of the corpus bursae. The signum of the undescribed Venezuelan species is distinct in being minutely spinose. The males of some species of *Lepyrotica*, including the type of the genus, *scardamycetis* Meyr., also possess a large sternal scale pocket on A7. No such pocket exists in *L. acantha*.

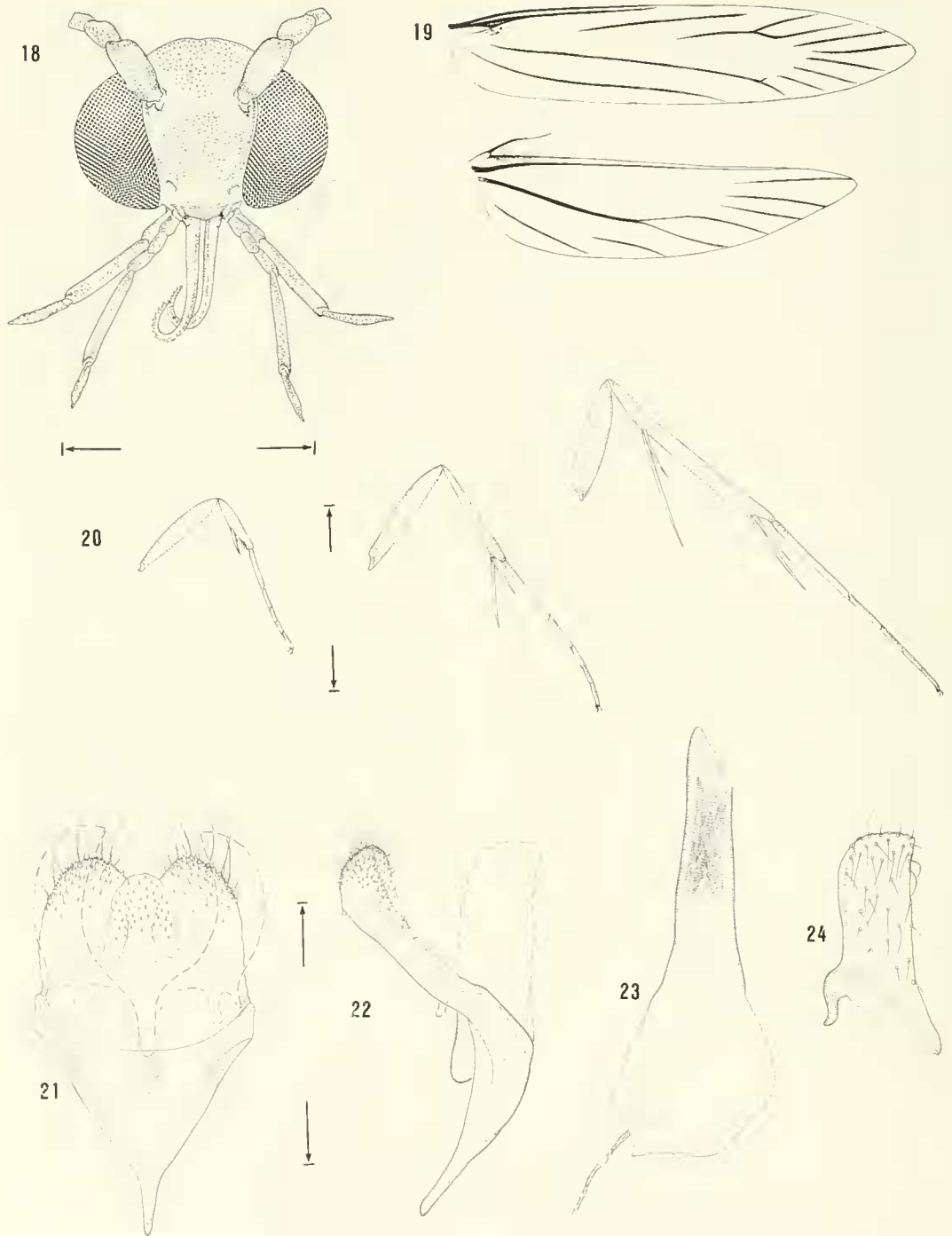
The Cocos Island population of *L. acantha* is believed to be conspecific with material collected more recently in the Galápagos Islands by Bernard Landry. The only differences noted between the two populations were that the apex of the valva was tapered more and the saccular spine was shorter and more porrect in the Galápagos males (Fig. 17).

Erechthias hoguei, NEW SPECIES

Figs. 5, 6, 18–24

Adult (Figs. 5, 6).—Forewing length, 3.2–3.7 mm.

Head (Fig. 18): Rough, scales piliform with acute to narrowly truncate apices; variable in color from white to brownish fuscous. Antenna 1.0–1.2 × length of forewing; scape cream to light brown, irrorated with dark brown scales dorsally; white ventrally; pecten consisting of 4–5 white to light brown bristles; flagellum with a single annulus of slender, uniformly cream to light brown scales per segment. Maxillary palpus 5-segmented, mostly white, suffused with



Figs. 18-24. *Erechthias hoguei*. 18, Head, anterior view (0.5 mm). 19, Wing venation. 20, Leg structure (1 mm). 21, Male genitalia, ventral view (0.2 mm). 22, Lateral view. 23, Aedeagus. 24, Right valva, mesal view. Scale lengths in parentheses.

light brown dorsally over basal segments. Labial palpus dark grayish brown dorsally and laterally, white mesally and ventrally, with 9–10 dark brown bristles arising mostly laterally from segment II.

Thorax: Pronotum buff with fuscous suffusion on tegulae to entirely fuscous. Venter white to cream. Forewing variable from cream irrorated with mostly scattered, light brown to fuscous scales to mostly pale fuscous with 2–3 white spots along cubital fold, especially evident in darker specimens; darker, fuscous scales concentrated between white cubital spots and at apex of discal cell; fringe cream with scattered fuscous scales to entirely fuscous. Foreleg with epiphysis (Fig. 20); fuscous dorsally with tibia and tarsomeres tipped with white; white to cream ventrally. Midleg paler dorsally with white to cream banding equal in width to fuscous banding in paler specimens, to mostly dark brown with faint cream tipped tarsomeres in darker specimens. Hindleg varying from uniformly cream to dark brown. Tibial spurs = 0-2-4.

Abdomen: Buff brown to fuscous dorsally; cream to pale brown ventrally. Male without coremata.

Male genitalia (Figs. 21–24): Vinculum V-shaped, with a short, slender saccus. Uncus broadly bilobed, indistinctly separated from tegumen. Gnathos absent. Subscaphium absent, with a light concentration of small spines midventrally. Valva simple, of uniform width; apex rounded dorsally, curving to relatively acute ventral angle; base of valvae fused to U-shaped juxta possessing a narrow, ventral pocket. Aedoeagus a simple cylinder ca. $1.3 \times$ the length of valva; a dense concentration of numerous, short cornuti clustered in distal half.

Female, larva, and pupa unknown.

Holotype.—♂: Wafer Bay, Cocos Island, Costa Rica, 17–22 Apr 1975, C. L. Hogue, slide 3921 (LACM).

Paratypes.—COSTA RICA: Cocos Island; Río Génio: 1 ♂, 17–22 Apr 1975, C. L. Hogue, slide 3300. Same data as holo-

type: 4 ♂, slides 3920, 3922, USNM 31194, 31381. Paratypes deposited in LACM and USNM.

Distribution.—Known only from Cocos Island.

Etymology.—The species is named in honor of Charles L. Hogue who collected the type series and most of the specimens included in this report.

Discussion.—The scale coloring observed in the small series available exhibited unusual variation. However, only one species is believed to be represented as attested by their similar male genitalia. The pouch-like juxta associates this species with *Erechthias*, a member of the subfamily Erchthiinae (Robinson and Nielsen 1993).

Erechthias flavistriata (Wlsm.)

Figs. 2, 25–28, 36

Ereumetis flavistriata Walsingham, 1907: 716.—Swezey, 1909: 9.

Erechthias flavistriata (Walsingham).—Meyrick, 1915: 233.—Robinson and Nielsen, 1993: 295.

Decadarchis flavistriata (Walsingham).—Veitch, 1923: 9.—Clarke, 1986: 365.

Decadarchis euophthalma Meyrick, 1924: 83.

Neodecadarchis flavistriata (Walsingham).—Zimmerman, 1978: 341.

This widespread species is an obvious introduction to the Cocos Island fauna. It was described originally from Hawaii where it is commonly referred to as the sugarcane bud moth. Zimmerman (1978) also reported it from the Marquesas, Rapa, Fiji Islands, New Hebrides, Kernadec Islands, Solomons, Indonesia, and Malaysia.

Swezey (1909) has provided the best synopsis of the larval biology. In addition to being a pest on live sugarcane and pineapple fruit, the larva also feeds on dead leaves of palms, bananas, pineapples, and *Pandanus*.

The adult is easily recognized by the digitate costal lobe and nearly truncate apex of the male valvae (Fig. 27) and by the rela-



tively large, circular signum of the female with its externally projecting, digitate lobe (Fig. 36). The forewings are typical of most of the species in this large, mostly Indo-Australian-Pacific genus in possessing sharply upturned apices (Fig. 2).

Material examined.—COCOS ISLAND: Wafer Bay: 3 ♂, 4 ♀, 17–22 Apr 1975, C. L. Hogue, slides SEM 79-47, USNM 31369, 31370 (LACM, USNM).

Ogogona dimorpha, NEW SPECIES

Figs. 7, 8, 29–33, 37

Adult (Figs. 7, 8).—Forewing length: ♂, 2.9–3.7 mm; ♀, 4.4–5.4 mm.

Head: Depressed, smoothly scaled; frons cream to buff; vertex and occiput lustrous dark grayish brown. Antenna 0.75 the length of forewing; scape smooth, same color as vertex dorsally, cream ventrally; flagellum of male uniformly dark grayish brown dorsally, generally pale buff to cream in female except for grayish brown first or second flagellomeres; one annulus per segment comprised of slender scales. Maxillary palpus 5-segmented, cream. Labial palpus strongly flattened, cream to buff, suffused with dark grayish brown dorsally, cream ventrally; 7–8 dark bristles arising dorsolaterally along segment II.

Thorax: Pronotum smooth, same color as vertex. Venter pale buff to cream. Forewing uniformly lustrous dark grayish brown similar to vertex and pronotum. Hindwing brownish orange in male with grayish brown fringe; pale grayish brown in female with slightly darker fringe. Frenulum consisting of a single stout bristle in male, a pair of weaker bristles in female. Foreleg dark grayish brown dorsally and pale buff ventrally, with dorsal apices of tarsomeres buff to

cream; epiphysis well developed. Midleg and hindleg slightly paler dorsally; tibial spurs = 0-2-4.

Abdomen: Grayish brown dorsally, buff to cream ventrally; coremata and corethropyne absent.

Male genitalia (Figs. 29–33): Vinculum broadly rounded, without saccus. Tegumen not differentiated from vinculum. Uncus very distinct, complex, with rather broad, setose, lateral lobes and a pair of more reduced, closely adjacent, inner lobes. Gnathos, juxta, and subscaphium absent. Valva slender, with a prominent, basal tuft of stout setae. Aedoeagus simple, tapering to an acute apex, with an elongate, coiled vesica ca. 6× the length of aedoeagus; cornuti absent.

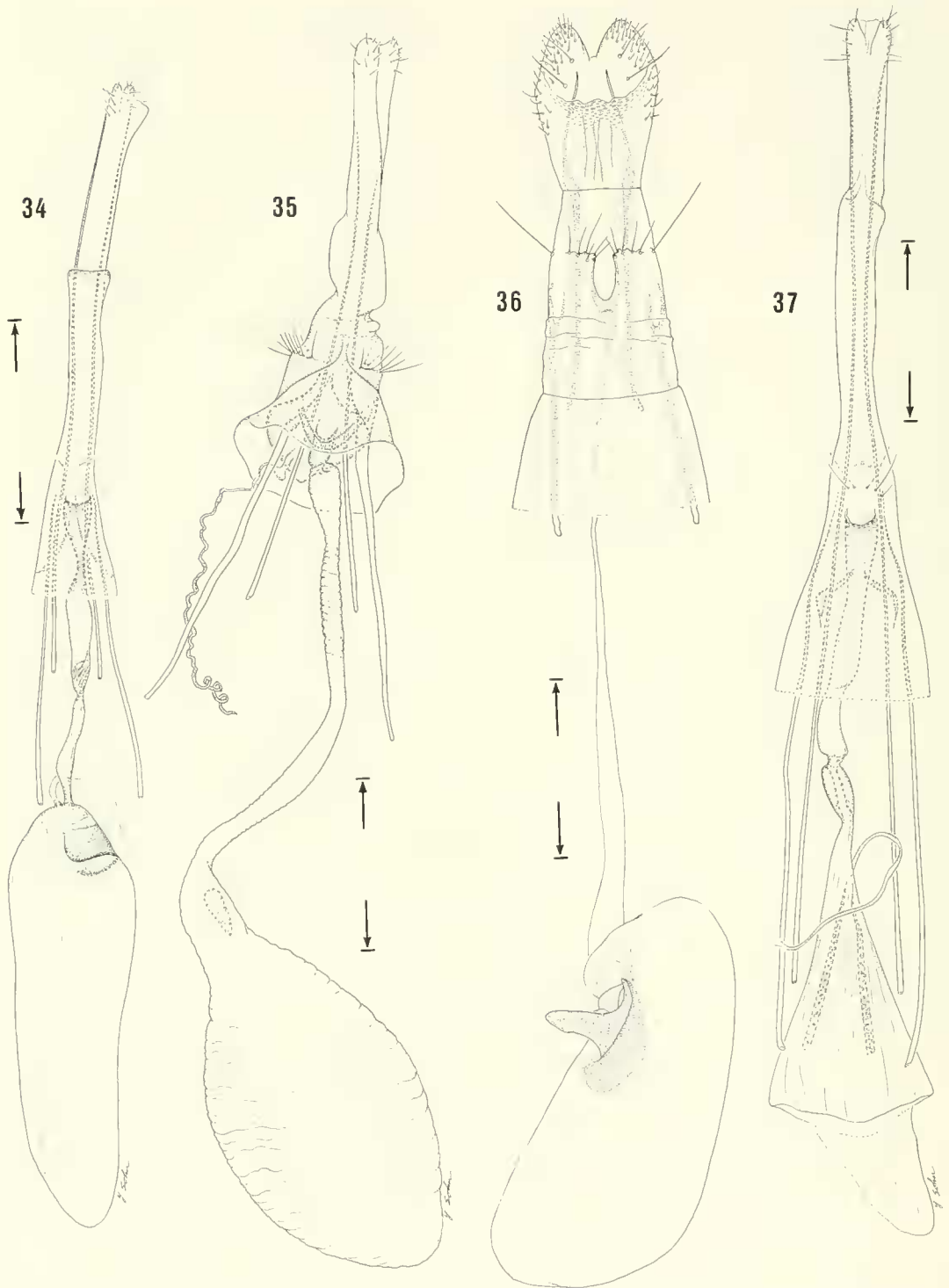
Female genitalia (Fig. 37): Ovipositor elongate, telescoping; posterior apophysis ca. 2× the length of anterior pair. Ostium moderately broad, simple, continuing internally as a moderately broad ductus bursae to a sphincter-like constriction immediately caudad of a slightly swollen, elliptical section of ductus with lightly sclerotized walls; immediately anterior to latter swelling corpus bursae begins to enlarge as a cone-like sack with fluted walls; anterior end of corpus contrastingly membranous; ductus seminalis joining corpus bursae at caudal end; signa consisting of a pair of elongate, serrated rods ca. 0.5 the length of corpus.

Larva and pupa unknown.

Holotype.—♂; Wafer Bay, Cocos Island, Costa Rica, 17–22 Apr 1975, C. L. Hogue (LACM).

Paratypes.—COSTA RICA: Cocos Island: Chatham Bay: 7 ♀, 22 Jan 1967, I. L. Wiggins (CAS); 6 ♀, 9–11 Apr 1979, R. Silberglied, malaise trap over stream, slide USNM 31195 (LACM, MCZ, USNM). Rio Génio: 3 ♂, 1 ♀, 17–22 Apr 1975, C. L. Hogue, slide

Figs. 25–33. Male genitalia. 25, *Erechthias flavistriata*, ventral view. 26, Lateral view. 27, Right valva, mesal view. 28, Aedoeagus. 29, *Ogogona dimorpha*, ventral view. 30, Lateral view. 31, Aedoeagus. 32, Ventral detail of uncus. 33, Right valva, mesal view. All scales = 0.5 mm except Fig. 32 which = 0.1 mm.



Figs. 34-37. Female genitalia. 34, *Protodarcia cocosensis*. 35, *Lepyrotica acantha*. 36, *Erechthias flavistriata*. 37, *Opogona dimorpha*. All scales = 0.5 mm.

USNM 31197 (LACM, USNM), Wafer Bay: 3 ♂, 17 ♀, 17–22 Apr 1975, C. L. Hogue, slide USNM 31196 (LACM, USNM); 1 ♂, 1 ♀, 27 Mar 1978, Hogue & Miller, malaise trap station 3, slide USNM 22279 (LACM, USNM).

Distribution.—Known only from Cocos Island.

Etymology.—The specific name is derived from the Greek *di* (two) and *morphe* (form), in reference to the obvious sexual dimorphism present in this species.

Discussion.—Collections indicate that this species and *Protodarcia cocosensis* are the most common tineids occurring on Cocos Island. At least one other, even smaller species of *Opogona* with mottled forewings has been collected on the island, but lack of adequate material does not permit its description. The genus is a large, mostly Old World tropical group that is not well represented in the Neotropics (Davis 1978, Robinson and Nielsen 1993). It is a member of the subfamily Hieroxestinae.

Among the more diagnostic features of *O. dimorpha* is the relatively pronounced sexual dimorphism present. The male is much smaller than the female and possesses brownish orange hindwings in contrast to the more somber, grayish hindwings of the female. The male genitalia also are diagnostic, particularly the uncus with its peculiar, quadrid apex (Fig. 32). The corpus bursae of the female is unusual in its cone-like shape, fluted walls, and paired rod-like signa (Fig. 37).

ACKNOWLEDGMENTS

I wish to thank Scott Miller and Charles Hogue (deceased 1992) and the Los Angeles County Museum for allowing me to study their material. Also most helpful were the fine series of specimens collected in the Galápagos Islands by Bernard Landry of Ottawa. A loan of essential type material was made possible by Aurelian Popescu-Gorj and Rusti Doru of the Musée d'Histoire Naturelle "Grigore Antipa," Bucharest. I also

wish to thank John Grehan of the University of Vermont for our brief but fruitful discussion on Cocos Island biogeography. I am indebted to Young Sohn and Vichai Malikul of the Department of Entomology, Smithsonian Institution, for the line drawings and to Victor Kranz of the Smithsonian Photographic Laboratory for photographic assistance.

LITERATURE CITED

- Brown, J. W., J. P. Donahue, and S. E. Miller. 1991. Two new species of Geometrid moths (Lepidoptera: Ennominae) from Cocos Island, Costa Rica. *Contributions in Science, Natural History Museum of Los Angeles County* 423: 11–18.
- Byers, G. W. 1981. The crane flies (Diptera: Tipulidae) of Cocos Island, Costa Rica, with descriptions of new species. *Contributions in Science, Natural History Museum of Los Angeles County* 335: 1–8.
- Castillo, P., R. Batiza, D. Vanko, E. Malavassi, J. Barquero, and E. Fernandez. 1988. Anomalously young volcanoes on old hot-spot traces: I. Geology and petrology of Cocos Island. *Geological Society of America, Bulletin* 100: 1400–1414.
- Clarke, J. F. G. 1986. Pyralidae and Microlepidoptera of the Marquesas Archipelago. *Smithsonian Contributions to Zoology* 416: i–iii, 1–485.
- Christie, D. M., R. A. Duncan, A. R. McBirney, M. A. Richards, W. M. White, K. S. Harpp, and C. G. Fox. 1992. Drowned islands downstream from the Galápagos hotspot imply extended speciation times. *Nature* 355: 246–248.
- Croizat, L. 1958. *Panbiogeography*. Vol. 1. Published by the author, Caracas.
- Davis, D. R. 1978. The North American moths of the genera *Phaeoses*, *Opogona*, and *Oinophila*, with a discussion of their supergeneric affinities (Lepidoptera: Tineidae). *Smithsonian Contributions to Zoology* 282: 1–39.
- Duncan, R. A. and R. B. Hargraves. 1984. Plate tectonic evolution of the Caribbean region in the mantle reference frame. *Geological Society of America, Memoir* 162: 81–93.
- Fournier, L. A. 1966. Botany of Cocos Island, Costa Rica, pp. 183–186. *In* Bowman, R. I., ed., *The Galápagos*. University of California Press, Berkeley.
- Hertlein, L. G. 1963. Contribution to the biogeography of Cocos Island, including a bibliography. *Proceedings of the California Academy of Sciences*, 4th ser. 32(8): 219–289.
- Hogue, C. L. and S. E. Miller. 1981. Entomofauna

- of Cocos Island, Costa Rica. Atoll Research Bulletin No. 250, pp. 1-29.
- Holden, J. C. and R. S. Dietz. 1972. Galapagos gorgon, NazCoPac triple junction and Caribbean Cocos ridges. *Nature* 235: 266-269.
- Meyrick, E. 1915. Revision of the New Zealand Tineina. *Transactions of the New Zealand Institute* 47: 205-244.
- . 1924. Exotic Microlepidoptera 3: 65-128.
- Peck, S. B. 1991. The Galápagos Archipelago, Ecuador: With an emphasis on terrestrial invertebrates, especially insects; and an outline for research, pp. 319-336. *In* Dudley, E. C., ed., *The Unity of Evolutionary Biology. Proceedings Fourth International Congress of Systematics and Evolutionary Biology*. Dioscorides Press, Portland, OR.
- Robinson, G. S. and E. S. Nielsen. 1993. Tineid genera of Australia. *Monographs on Australian Lepidoptera*, 2: i-xv, 1-344.
- Rosen, D. E. 1976. A vicariance model of Caribbean biogeography. *Systematic Zoology* 24: 431-464.
- Swezey, O. H. 1909. The Hawaiian sugar cane bud moth (*Ereunetis flavistriata*) with an account of some allied species and natural enemies. Hawaiian Sugar Planters' Association Experimental Station, *Entomology Bulletin* 6: 1-40, pls. 1-4.
- Veitch, R. 1923. The minor pests on sugar cane in Fiji. *Agricultural Report (Sydney)*, 7: 9, pl. 2, fig. 2.
- Walsingham, Lord (Thomas de Grey). 1907. Microlepidoptera. *In* Sharp, D., ed., *Fauna Hawaiiensis or the Zoology of the Sandwich (Hawaiian) Isles*, 1(5): 469-759, pls. 10-25. Cambridge University Press, Cambridge.
- Zimmerman, E. C. 1978. Microlepidoptera, Part 1. Monotrysis, Tineoidea, Gracillarioidea, Yponomeutoidea, and Alucitoidea. *Insects of Hawaii* 9(1): i-xviii, 1-881, pls. 1-8.