

## The Tortricidae (Lepidoptera) of the Galapagos Islands, Ecuador

Jozef RAZOWSKI<sup>1</sup>, Bernard LANDRY<sup>2</sup> & Lazaro ROQUE-ALBELO<sup>3</sup>

<sup>1</sup> Institute of Systematics and Experimental Zoology, PAS, Slawkowska 17, 31-016 Krakow, Poland. Email: razowski@isez.pan.krakow.pl

<sup>2</sup> Muséum d'histoire naturelle, C.P. 6434, 1211 Genève 6, Switzerland. Email: bernard.landry@ville-ge.ch

<sup>3</sup> Charles Darwin Research Station, A.P. 17-01-3891, Quito, Ecuador. Email: lazaro@fcdarwin.org.ec

### The Tortricidae (Lepidoptera) of the Galapagos Islands, Ecuador.

Sixteen species of Tortricidae are recorded as being established on the Galapagos Archipelago, including nine that are described as new by Razowski & Landry and presumed to be endemic (*Hedya brunneograpt*, *Eccopsis galapagana*, *E. floreana*, *Megalota johni*, *Episimus alcedanus*, *Epinotia microscyphos*, *Proteoteras atromacula*, *Coniostola isabelae*, and *Dichrorampha galapagana*). Two other endemic tortricids have been described from the Galapagos by Meyrick (*Platynota colobota* and *Crociosema synneuota*). The other five species are either native or recently introduced by humans (*Bactra philoherda* Diakonoff, *Endothenia eidolon* Razowski & Pelz, *Episimus transferranus* (Walker), *Epinotia lantana* (Busck), *Strepsicrates smithiana* Walsingham). Four additional species are reported to have been intercepted by the Galapagos quarantine system (*Anopinella* sp., *Lasiothyris* sp., *Transtillaspis* sp., and *Epinotia cosmoptila* (Meyrick)), but they are apparently not established in the Galapagos. *Hedya*, *Eccopsis*, *Proteoteras*, and *Coniostola* are recorded for the first time from South America. *Olethreutes olorina* Walsingham is transferred to *Hedya* Hübner.

**Keywords:** Sparganothini - Bactrini - Olethreutini - Eucosmini - Grapholitini - new species - endemics - introduced species - new combination.

### INTRODUCTION

As part of a continuing program to survey the Lepidoptera of the Galapagos Islands, initiated by the second author (BL) in 1989, this is the 25<sup>th</sup> contribution towards a complete taxonomic assessment of the microlepidopteran fauna of the Archipelago (see for example Landry & Gielis, 1992; Landry, 2001, 2002, 2006; Landry & Roque-Albelo, 2004).

The first report on Galapagos Tortricidae was by Schaus (1923), who recorded *Strepsicrates smithiana* Walsingham and *Crociosema plebejana* Zeller (then not yet

recognized as a separate species) along with three unidentified species of *Epinotia*, at least one of which did not belong to that genus. Then Meyrick (1926) described *Crocidosema synneurota* and *Platynota colobota*, without recording other species. These three taxa were simply listed by Linsley & Usinger (1966), and Linsley (1977) did not add any new records. In their papers on introduced insects in the Galapagos, Peck *et al.* (1998) and Causton *et al.* (2006) mentioned *C. plebejana* and *S. smithiana*, as well as *Bactra philoherda* Diakonoff and *Episimus transferranus* (Walker). Perry & de Vries (2003) recorded *C. plebejana* as widespread in the Galapagos and feeding on *Acacia* sp. (Fabaceae).

Tortricidae larvae usually feed in hiding, either in tied leaf shelters or inside plant tissue; several species are polyphagous. In the Galapagos one or more host plants are known for only three species, and the host plants of two more widespread species are known from elsewhere.

In addition to the species treated below, four others along with *Epinotia lantana* (Busck) were reared from larvae intercepted with various goods by the quarantine system of the Galapagos Islands (SICGAL). They were identified by BL and JR as follows: *Anopinella* sp. (Euliini), *Lasiothyris* sp. (Cochylini), *Transtillaspis* sp. (Euliini, reared from apples), and *Epinotia cosmoptila* (Meyrick, 1917) (Eucosmini), the last of which representing a new record for the western part of the South American continent. We do not believe that these four are established on the Galapagos. However, the unique female illustrated as Fig. 34 (wingspan: 24 mm), collected on Isabela, Volcan Darwin, 630 m in elevation (MHNG [ENTO] No. 3094) represents an unknown species that is probably established on the archipelago; it is not described here owing to the paucity of material.

Among the 28 families of Lepidoptera recorded from the Galapagos, the Tortricidae and Geometridae occupy the fourth rank in terms of species numbers, behind the Noctuidae, Pyralidae, and Gelechiidae. They are followed by the Sphingidae and Pterophoridae, which have 15 species each.

## MATERIAL AND METHODS

The responsibilities of the authors in this project were as follows. The first author (JR) made most taxonomic decisions and specimen identifications, and prepared all new species descriptions and most diagnoses. BL collected most of the specimens during five expeditions to the Galapagos Islands in 1989, 1992, 2002, 2004, and 2005. He mounted and labeled them, made some genitalia preparations and identifications, shaped the final text, listed the paratypes, and prepared the illustrations. LR arranged and participated in the last three expeditions of BL. He has also collected since 1994, mounted, and prepared about 190 specimens, reared some specimens, obtained additional material from the Galapagos Quarantine System (SICGAL), and provided Galapagos National Park authorizations for the export of specimens and their deposition in Geneva and Krakow.

The manner of giving the label data of the holotypes and paratypes is presented in Landry (2006) as are the methods used for specimen collecting. Most dissections and genitalia slides were made in Krakow by W. Zajda. The host plant nomenclature follows Lawesson *et al.* (1987). We also studied older material from the Natural

History Museum, London, UK (BMNH) and a few specimens collected in 2006 by P. Schmitz and deposited in the Muséum d'histoire naturelle, Geneva (MHNG).

The following additional abbreviations are used: CDRS for Charles Darwin Research Station, Santa Cruz Islands, Galapagos, Ecuador; CNC for Canadian National Collection of Insects, Ottawa, Canada; USNM for National Museum of Natural History, Washington, USA; and ZMJU for Zoological Museum, Jagiellonian University, Krakow, Poland.

## SPECIES TREATMENTS

### Sparganothini

*Platynota colobota* Meyrick, 1926

Figs 1-4, 35, 36, 59

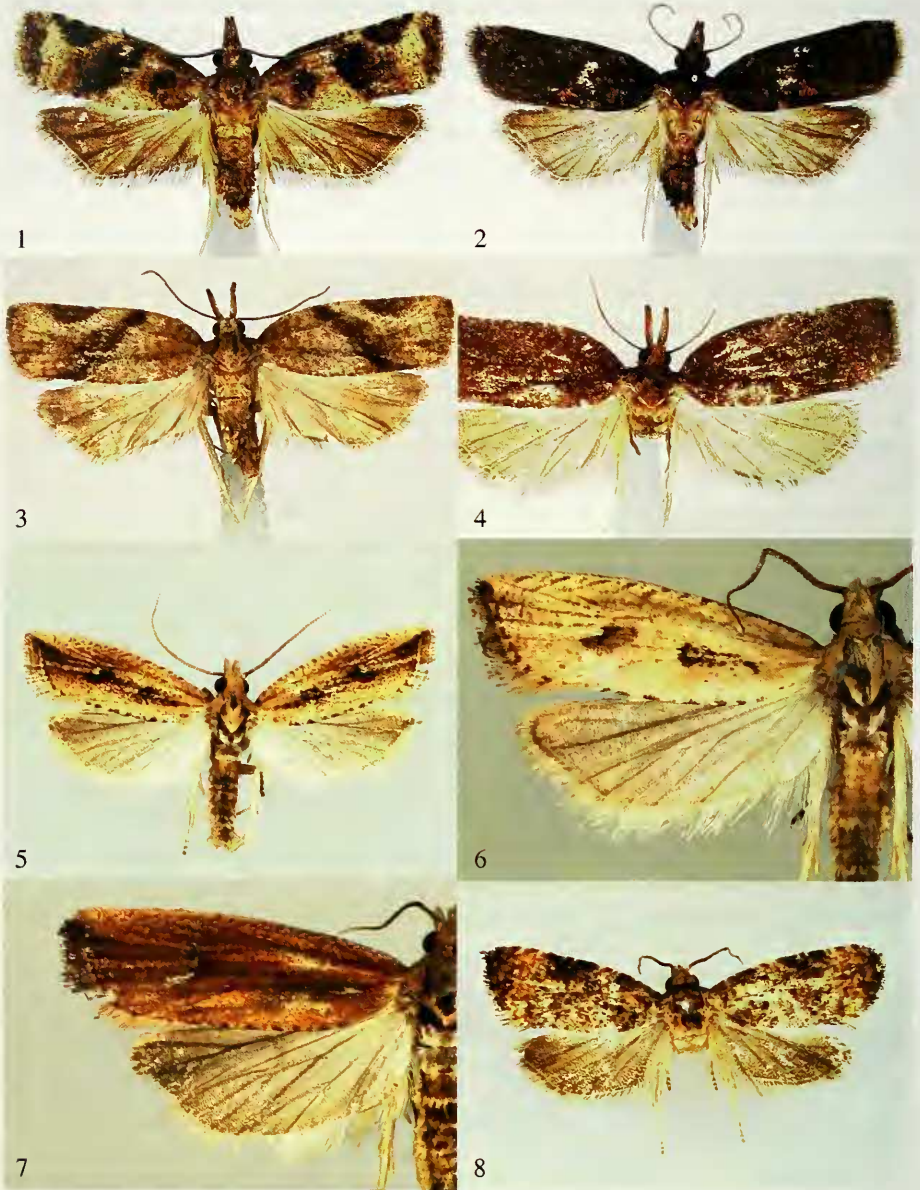
*Platynota colobota* Meyrick, 1926 – Linsley & Usinger (1966: 163).

MATERIAL EXAMINED: 96 ♂, 117 ♀. – *Floreana*: Las Cuevas; Finca Las Palmas, 300 m. – *Isabela, Volcan Alcedo*: 300 m; near pega-pega camp, 483 m; 570 m; 850 m; 900 m; 1100 m; East side, 700 m; North-east side. Guayabillos Camp, 700 and 900 m; cumbre, La Caseta, 1100 and 1200 m; *Isabela, Volcan Darwin*: base; 200 m; 300 m; 400 m; 630 m; 700 m; 900 m; 1000 m; 1240 m. *Isabela, Volcan Sierra Negra*: Puerto Villamil; 1 and 2 km W Puerto Villamil; 3, 8.5, 11, and ± 15 km N Puerto Villamil; pampa zone, 1000 m. – *Marchena*: no precise locality. – *Pinta*: ± 50 m; 200 m; 400 m; 421 m. – *Rabida*: Tourist trail. – *San Cristobal*: Puerto Baquerizo; 4 km SE Puerto Baquerizo; 1 km S El Progreso; SW El Progreso, 75 m; base of Cerro Pelado; pampa zone. – *Santa Cruz*: CDRS, Invertebrates laboratory, 11 m; CDRS, Barranco, 20 m; 4 and 5 km N Puerto Ayora, transition zone; casa L. Roque-Albelo & V. Cruz, 137 m; transition zone, recently cut road; Tortuga Reserve, W Santa Rosa; Finca S. Devine; Finca Vilema, 2 km W Bella Vista; near (NNW) Bella Vista, 223 m; Los Gemelos, 580 m; – *Santiago*: Bahía Espumilla; Cerro Inn; 200 m elevation; Aguacate, 520 m; Central, 700 m; Jaboncillo, ± 850 m; N side, 147 m. Deposited in BMNH, CDRS, CNC, MHNG, ZMJU.

DIAGNOSIS: This is a highly variable species (Figs 1-4). The colour ranges from pale to dark brown, and sometimes slightly reddish brown. The forewing pattern may be completely absent or consist of a darker costal spot postmedially and a more or less complete diagonal band from costa subbasally to dorsal margin medially. The wingspan ranges between 11-15 mm in males, and between 12-19 mm in females. The species can be separated easily from the other Galapagos Tortricidae by the long, porrect labial palpi reaching beyond eye by 2.75 largest eye diameter in females, and 1.75 in males. The species is similar in male genitalia to *Sparganothis subacida* Meyrick described from French Guiana (Clarke, 1958: 220), but in the latter the forewing seems to have only oblique and darker pattern elements subapically, and the male genitalia have the uncus shorter, the socii narrower, and the valvae wider at base than towards apex.

REMARKS: This species was described on the basis of a male collected on Albemarle [=Isabela] Island, Galapagos (Meyrick, 1926). It is believed to be endemic to the archipelago. The holotype, deposited in the BMNH (slide JFGC 9424) was examined by the second author (BL) and is illustrated by Clarke (1958: 178). So far the species has been found on the islands of Isabela, Marchena, Pinta, Rabida, San Cristobal, Santa Cruz, and Santiago from sea level to the volcanoes rims (e.g. Alcedo, Darwin, Sierra Negra) at 1000, 1240, and 1000 m respectively. Larvae were reared from leaves of *Psidium guajava* L. (Myrtaceae; vouchers in BMNH), *Pteridium*





FIGS 1-8

Adults of Galapagos Sparganothini and Bactrini. (1, 2) *Platynota colobota* males: (1) Santiago, 8.iv.1992, MHNG; (2) Isabela, 18.v.1992, MHNG. (3, 4) *P. colobota* females: (3) Pinta, 18.iii.1992, MHNG; (4) Isabela, 6.iv.2002, MHNG. (5-7) *Bactra philochearda*: (5) ♂, Santa Cruz, 4.v.2002, MHNG; (6) ♂, Santa Cruz, 1.iv.1992, MHNG; (7) ♀, San Cristobal, 25.ii.2005, MHNG. (8) *Endothenia eidolon*: ♀, San Cristobal, 18.ii.1989, CNC.



*aquilinum* (L.) Kuhn (Polypodiaceae; vouchers in CNC), *Chiococca alba* (L.) Hitch. (Rubiaceae; vouchers in CDRS), and *Clerodendrum molle* HBK. (Verbenaceae; vouchers in CDRS). The moths likely fly all year round; we have studied specimens collected from January to May and from September to December.

We examined 17 genitalia preparations made from specimens from all of the islands of occurrence except Marchena and Rabida, from which we have seen only one specimen each, and there is no significant variation, unlike the forewing pattern and colour.

## Bactrini

### *Bactra philoherda* Diakonoff, 1964

Figs 5-7, 37, 38, 60

*Bactra philoherda* Diakonoff, 1964: Peck *et al.* (1998: 227); Causton *et al.* (2006: 141).

MATERIAL EXAMINED: 37 ♂, 31 ♀. – *Floreana*: close to Loberia, 6 m. – *Isabela Volcan Alcedo*: higher arid zone, 200 m; NE side, pega-pega camp, 400 m; NE side, guayabillos camp, 700 m; NE side, cumbre, caseta Cayot, 1100 m. – *San Cristobal*: near Loberia, sea level; antiguo botadero, 4 km SE Puerto Baquerizo, 169 m; La Toma, ca. 5.6 km E El Progreso, 299 m; East side of El Junco, 654 m; shore of El Junco, 655 m. – *Santa Cruz*: Bahia Conway, 4 km N Puerto Ayora; Finca Vilema, 2 km W Bella Vista; NNW Bella Vista, 225 m; Los Gemelos; vic. Mirador, W Media Luna, ± 620 m; Media Luna, pampa zone. – *Santiago*: Bahia Espumilla; 200 m [above Bahia Espumilla]; Aguacate camp, 520 m; Central camp, 700 m; Jaboncillo camp, ± 850 m; NE side, close to Caseta, 686 m. Deposited in BMNH, CDRS, CNC, MHNG, ZMJU.

DIAGNOSIS: The Galapagos specimens vary in colour from pale beige to reddish brown (Figs 5-7). The pattern is usually inconspicuous and consists mainly in a median longitudinal line with a dark brown (and often white) spot at the end of the cell. The wingspan of the males is 10-17 mm, and that of the females 10-20 mm. Compared to other Galapagos species, *Bactra philoherda* can be separated by its relatively large size, the elongate and apically produced forewing, and the relative absence of forewing pattern. With regards to the other species of *Bactra*, Diakonoff (1964) mentions that this species is related to *B. boschmai* Diakonoff from Central West New Guinea and *B. limitata* Diakonoff from Java, but the 'clear differences' in the male genitalia are not mentioned specifically.

REMARKS: This species was described from Dominica, but it occurs also in Angola, Brazil, Cuba, Jamaica, Panama, Peru, and the U.S.A. (Florida) (Diakonoff, 1964). The holotype in the USNM was not examined, but the well-illustrated description provides sufficient information for a confident identification. A paratype from Pompano, Florida, was reared from *Cyperus* sp. (Cyperaceae), but none of the Galapagos specimens have been reared. Peck *et al.* (1998) and Causton *et al.* (2006) reported the species from the islands of Santa Cruz and Santiago. We have examined Galapagos specimens collected on these two islands, but also on Floreana, Isabela, and San Cristobal. These were collected at light or with the net mostly in the highest (pampa) zone of these islands (up to 1100 m on Isabela, Alcedo), but also at sea level and intermediate elevations, between January and June.

### *Endothenia eidolon* Razowski & Pelz, 2002

Figs 8, 39, 61

MATERIAL EXAMINED: 4 ♂, 1 ♀. – *Isabela*: Volcan Alcedo, NE side, Guayabillos camp, 700 m; Volcan Sierra Negra, 11 km N Puerto Villamil. – *San Cristobal*: pampa zone. Deposited in CDRS, CNC, MHNG, ZMJU.

**DIAGNOSIS:** The five available specimens have a wingspan of 9 to 10 mm. None is in perfect condition and no differences in colour or pattern can be detected (Fig. 8). The species is very close to the Holarctic *E. hebesana* (Walker, 1863), but it has the uncus more rounded at apex laterally and the valva slightly wider towards apex. *Endothenia eidolon* can be separated from several other small, mostly dark brown Galapagos Tortricidae by the absence of forewing terminal spots and tornal speculum. However, the male genitalia (Fig. 39), especially the uncus and base of valva, are critical to examine for accurate determination, especially with regard to the externally similar *Megalota johni*, described below.

**REMARKS:** This species was described from the continent (Ecuador, Morona-Santiago Province) and is still the only one of the genus to occur in South America. The Galapagos specimens do not differ from the type. They have been collected so far only on Isabela and San Cristobal. The host plants are unknown. The female genitalia are described here for the first time: Sterigma subsquare, submembranous; vicinity of ostium bursae strongly sclerotized, forming posterior broadening; sclerite of antrum slender; signum moderate, typical of genus.

## Olethreutini

*Hedya brunneograpt* Razowski & Landry, sp. n.

Figs 9, 10, 41, 42, 62

**MATERIAL EXAMINED:** Holotype male: 'HOLOTYPUS' [small, rectangular, orange, printed]; 'ECU[ADOR]. GALAPAGOS, Alcedo | Isabela, North East side 200m | 14 IV 2002 U[ltra]V[iolet]L[ight] | L. Roque & B. Landry' [white, printed, except 'Alcedo']; '27. ♂ Geneve' [yellow, printed except for '♂']; 'HOLOTYPUS | Hedya | brunneograpt | Razowski & Landry' [red, handwritten]. Deposited in the CDRS.

Paratypes: 41 ♂, 30 ♀, 2 of undetermined sex from the Galapagos Islands, Ecuador: – *Espanola*: 1 ♂, 1 ♀, Las Tunas Trail, 100 m elev[evation]., 30.iv.1992, M[ercury]V[apour]L[amp] (B. Landry). – *Fernandina*: 1 ♂, 2 ♀ (one dissected, slide Zajda '26. ♀ Geneve', CDRS), North side, 1300 m, S 00° 21.862', W 091° 34.308', 15.i.2002 UVL (L. Roque, C. Causton); 1 ♀, SW side, GPS: 815 m elev., S 00° 21.270', W 091° 35.341', 11.ii.2005, UVL (B. Landry, P. Schmitz); 2 ♂, same data except: crater rim, 1341 m elev., S 00° 21.910', W 091° 34.034', 12.ii.2005; 1 ♂, same data except: 13.ii.2005; 1 ♀, Punta Espinosa, 12.v.1992, MVL (B. Landry). – *Floreana*: 1 ♀ (dissected, Slide MHNG [ENTO] 3081), Scalesias near Cerro Pajas, GPS: elev. 329 m, S 01° 17.743', W 90° 27.111', 12.iv.2004, UVL (P. Schmitz). – *Isabela*: 1 ♂, 3 km N S[an]to Tomas, Agr[iculture]. Zone, 8.iii.1989, MVL (B. Landry); 1 ♂, 1 ♀, Alcedo, NE slope, Los Guayabillos Camp, 892 m, 1.iv.2004 (B. Landry, P. Schmitz); 1 ♀, V[olcan]. Alcedo, North East side, 900 m, Guayabillos Camp, 16.iv.2002, UVL (L. Roque, B. Landry); 1 ♂, Alcedo, lado NE, 700 m, camp guayabillos, 16.iv.2002, UVL (B. Landry, L. Roque); 1 ♀, Alcedo, lado NE, cumbre, caseta Cayot, 17.iv.2002 (B. Landry, L. Roque); 2 ♀, V. Darwin, 300 m elev., 15.v.1992, MVL (B. Landry); 1 ♂, V. Darwin, 1240 m elev., 19.v.1992 (B. Landry); 1 ♂, V. Alcedo, 300 m elev., 10.x.1998, UVL (L. Roque); 2 ♂, V. Alcedo: 850 m, 12.x., and 1100 m, 13.x. – *Pinta*: 1 ♀, 400 m elev., 18.iii.1992, MVL (B. Landry). – *San Cristobal*: 2 ♀, pampa zone, 15.ii.1989, MVL (B. Landry); 1 ♂, La Toma, ca. 5.6 km E El Progreso, GPS: 299 m elev., S 00° 55.356', W 089° 31.089', 23.ii.2005, uvl (B. Landry); 2 ♂, El Junco, East side, GPS: 654 m elev., S 00° 53.734', W 089° 28.727', 25.ii.2005, UVL (B. Landry). – *Santa Cruz*: 4 ♂ (one dissected, Slide BL 1237, CNC), 3 ♀ (one dissected, Slide Zajda '4. Landry', CNC), Media Luna, Pampa zone, 21.i.1989, MVL (B. Landry); 1 ♀, 5 km N Puerto Ayora, 23.i.2003, outdoor [white] light (L. Roque); 1 ♀, Los Gemelos, 31.i.1989, MVL (B. Landry); 1 ♀, Tortuga Res[erve]., W S[an]ta Rosa, 6.ii.1989, MVL (B. Landry); 1 ♂, Media Luna, Pampa zone, 8.ii.1989, MVL (B. Landry); 1 ♀, Los Gemelos, 4.v.2002, UVL (B. Landry, L. Roque); 1 ♂, 1 ♀, Los Gemelos, 27.v.1992, MVL (B. Landry); 2 ♂ (one dissected, Slide Zajda '28. Geneve', CDRS), 2 unknown sex, 5 km N Puerto Ayora, Transition Zone, 17.ix.2001, UVL (L.

Roque); 3 ♂, 5 ♀, Media Luna, 580 m[e]t[er]s[s]o[br]e el[n]iv[er]s[us] del m[ar], Miconia pampa zone, S 00° 39' 28.7", W 090° 19' 37.8", in fluorescent light trap (L. Roque); 5 ♂, Los Gemelos, xii.2001, UVL (L. Roque). – *Santiago*: 2 ♂, 1 ♀, 200 m elev., 5.iv.1992, MVL (B. Landry); 2 ♂, Aguacate, 520 m elev., 6.iv.1992, MVL (B. Landry); 1 ♂, Aguacate, 7.iv.; 3 ♂, Aguacate, 12.iv.; 2 ♀, Central, 700 m elev., 9.iv.1992, MVL (B. Landry); 1 ♂, Central, 10.iv.1992. Deposited in BMNH, CDRS, CNC, MHNG, ZMJU.

**DIAGNOSIS:** Close to *Hedya olorina* (Walsingham, 1914), **comb. n.**, described from Tabasco, Mexico. *H. brunneograpt*a differs from *olorina* in the weakly convex sacculus, the smaller ventral lobe, and the lack of median and postmedian groups of setae. The female of *brunneograpt*a is characterized by unequally sized signa (the proximal is larger), whilst in *olorina* the signa are small and similar in size. From the other mostly brown Galapagos species of Tortricidae, *H. brunneograpt*a can be distinguished by the absence of a forewing speculum with black spots and by the presence of well-marked brown or rust-brown median and subterminal fasciae.

**DESCRIPTION:** Adult (Figs 9, 10). Wingspan 12 mm. Head ferruginous. Base of tegula brown, remaining parts of thorax brown, apex of tegula whitish grey. Costa of forewing slightly convex, termen weakly oblique, hardly convex. Ground colour glossy whitish with grey scaling; costal strigulae fine, concolorous; dorsum and base of wing suffused with grey, strigulated with brown. Markings rust brown: basal blotch reduced in dorsal half, consisting of a few costal and median spots; median fascia consisting of slenderer costal half and broader mediodorsal portion, usually not reaching dorsum; subterminal fascia parallel to dorsal part of median fascia; terminal fascia weak; cilia paler than markings. Hindwing cream brown, brown in distal portion; cilia concolorous with middle of wing, whiter in anal area.

**Variation:** Wingspan 11-14 mm. Ground colour of forewing more or less grey or white with more or less distinct suffusions or strigulation. Markings rust to brown. Some specimens with forewing ferruginous and rust brown, diffuse markings.

**Male genitalia** (Figs 41, 42): Uncus fairly well sclerotized, hairy, tapering to beyond middle, rounded terminally; socii short; base of tuba analis differentiated; valva slender with short basal cavity; sacculus gently convex; ventral incision of valva shallow, limited by posterior lobe; cucullus long; fold short, spiny; sacculus with median group of bristles.

**Female genitalia** (Fig. 62): Postostial sterigma with large lateral lobes and pair of prominences at posterior edge of ostium bursae; antrum broadening posteriorly; ductus bursae slender, well sclerotized from beyond middle; two funnel-like signa.

**ETYMOLOGY:** The species name is from *brunneus*, Latin for brown, and *grapt*a – *graptos*, Greek for painted, in reference to the forewing colour.

**REMARKS:** Currently known from eight islands of the Galapagos archipelago where it appears to be more common at highest elevations. The food plant is unknown. Specimens have been collected at light from January to May and in September, October, and December.

*Eccopsis galapagana* Razowski & Landry, sp. n.

Figs 11, 12, 43, 63

**MATERIAL EXAMINED:** Holotype male: 'HOLOTYPE' [small, rectangular, orange, printed]; 'ECU[ADOR]. GALAPAGOS | Santa Cruz, Barranco C[harles]D[arwin]R[esearch] S[itation] | 12 IX 2001 U[ltra]V[iolet]L[ight] | L. Roque' [white, printed]; '44. ♂ Geneve.'



[yellow, printed except for '♂']; 'HOLOTYPE | *Eccopsis* | galapagana | Razowski & Landry' [red, handwritten]. Deposited in the CDRS.

Paratypes: 9 ♂, 25 ♀ from the Galapagos Islands, Ecuador: – *Floreana*: 4 ♂ (2 dissected, Slides Zajda '23. ♂ Landry.', CDRS & MHNG ENTO 3622), 8 ♀ (2 dissected, Slides Zajda '20. ♀ Landry.', CDRS & MHNG ENTO 3623), zona arida, 300 m, Finca Las Palmas, 26.xii.1997, UVL-FL (L. Roque). – *Isabela*: 1 ♂, 3 ♀, Puerto Villamil, 2.iii.1989, M[ercury]V[apour]L[amp] (B. Landry); 2 ♂ (one dissected, Slide Zajda '30. ♂ Geneve.', CNC), 2 ♀, 1 km W Puerto Villamil, 3.iii.1989, MVL (B. Landry); 4 ♀, 2 km W Puerto Villamil, 5.iii.1989, MVL (B. Landry); 1 ♀, 8.5 km N Puerto Villamil, 11.iii.1989, MVL (B. Landry). – *San Cristobal*: 1 ♂, 2 ♀, P[uer]to Baquerizo, 17.ii.1989, MVL (B. Landry); 1 ♀, antiguo botadero, ca. 4 km SE Pto Baquerizo, GPS: 169 m elev[ation]., S 00° 54.800', W 089° 34.574', 22.ii.2005, UVL (B. Landry). – *Santa Cruz*: 1 ♀, C[hables]D[arwin]R[esearch]S[tation], arid zone, 3.ii.1989, MVL (B. Landry); 1 ♀, 2 km W Bella Vista, 27.ii.1989, MVL (B. Landry); 1 ♂, 2 ♀, same data as holotype. Deposited in BMNH, CDRS, CNC, MHNG, ZMJU.

DIAGNOSIS: Similar to *Eccopsis floreana* sp. n. but male with long, curved spine from the terminal part of the left sacculus and shorter and wider uncus with thick apical spines, and female with longer sclerite of antrum and basal position of ostium. From the other Galapagos species of Tortricidae the two *Eccopsis* species are most similar to *Bactra philocheerda* in colour, but the latter is generally larger and its markings, when present, are longitudinal along the middle of the forewing (Figs 5-7). Almost all *Eccopsis* are characterized by the presence of basal lobes on the valvae. In *E. wahlbergiana* Zeller, 1852, the type-species of the genus, the basal lobes are strongly reduced and the socii are more rigid than in the two Galapagos species. The apical concavity of the uncus, often well developed in African *Eccopsis*, is strongly reduced in the Galapagos species and the asymmetry of the valvae is stronger.

DESCRIPTION: Adult (Figs 11, 12). Wingspan 11 mm. Head and thorax pale brownish cream; labial palpus about twice longer than diameter of eye. Forewing mostly beige on basal half; mostly dark brown suffused with white-tipped scales in distal half; with light to dark chestnut brown scales below costa distally and below apex; darker brown along outer margin; main dark brown markings as oblique band before middle of costa and as blotch on dorsum medially; costal strigulae cream, divisions ochreous brown; cilia a mixture of dark brown and chestnut brown, beige-tipped scales, with longer whitish brown scales at termen. Hindwing mostly brown; whitish brown at base, with darker brown on venation; cilia pale greyish brown and white.

Variation: Wingspan 10.5-12 mm. Ground colour of forewing sometimes mostly ochreous cream, obscuring brown markings; sometimes (Fig. 12) with darker brown covering most of wing except basal 2/5 along costa and distal third.

Male genitalia (Fig. 43): Uncus slender with terminal hairs and spines; socius drooping, hairy; valvae asymmetrical, without basal lobes; right valva: sacculus uniformly convex, with marginal setae reaching end of neck of valva and group of spines at ventral angle of cucullus; cucullus elongate, angled ventro-caudally; fold short; left valva: sacculus longer, less convex than in right valva, with triangular termination armed with long, hooked spine and, more dorsal, group of shorter and longer spines; cucullus short, subtriangular with ventro-caudal angle; fold long; aedeagus large, curved, convex ventro-subterminally, membranous dorsally.

Female genitalia (Fig. 63): Postostial part of sterigma forming pair of large lobes connected with ostium area by means of weak sclerites; sclerite of antrum long; signum half-moon-shaped with four proximal processes.

ETYMOLOGY: The species name refers to the Galapagos Islands.

REMARKS: This probable Galapagos endemic has been found so far on four of the Galapagos islands between sea level and 300 m. The host plant is unknown. This is the first species of the genus to be recorded from outside of the Afrotropical region, where it is widely spread, including on islands such as Cape Verde, the Comoros, and Madagascar. The genus was revised by Aarvik (2004). The New World fauna of *Eccopsis* includes several more undescribed species (JR, unpublished).

*Eccopsis floreana* Razowski & Landry, sp. n.

Figs 13, 14, 44, 64

MATERIAL EXAMINED: Holotype male: 'HOLOTYPUS' [orange, printed]; 'ECU[ADOR]., GALAPAGOS | Española, Las Tunas | Trail, 100 m elev[ation]., 1 30.iv.1992, M[ercury]V[apour]L[amp] | leg. B. Landry' [white, printed]; 'MHNG ENTO | Prép. micr. | No 3090 ♂' [white, printed, except for 'MHNG' and number and ♂]; '29. ♂ Landry.' [white, printed, except for ♂]; 'Photograph | M. Kopec' [green, printed]; 'HOLOTYPUS | *Eccopsis | floreana* | Razowski & Landry' [red, hand-written]. Deposited in the MHNG.

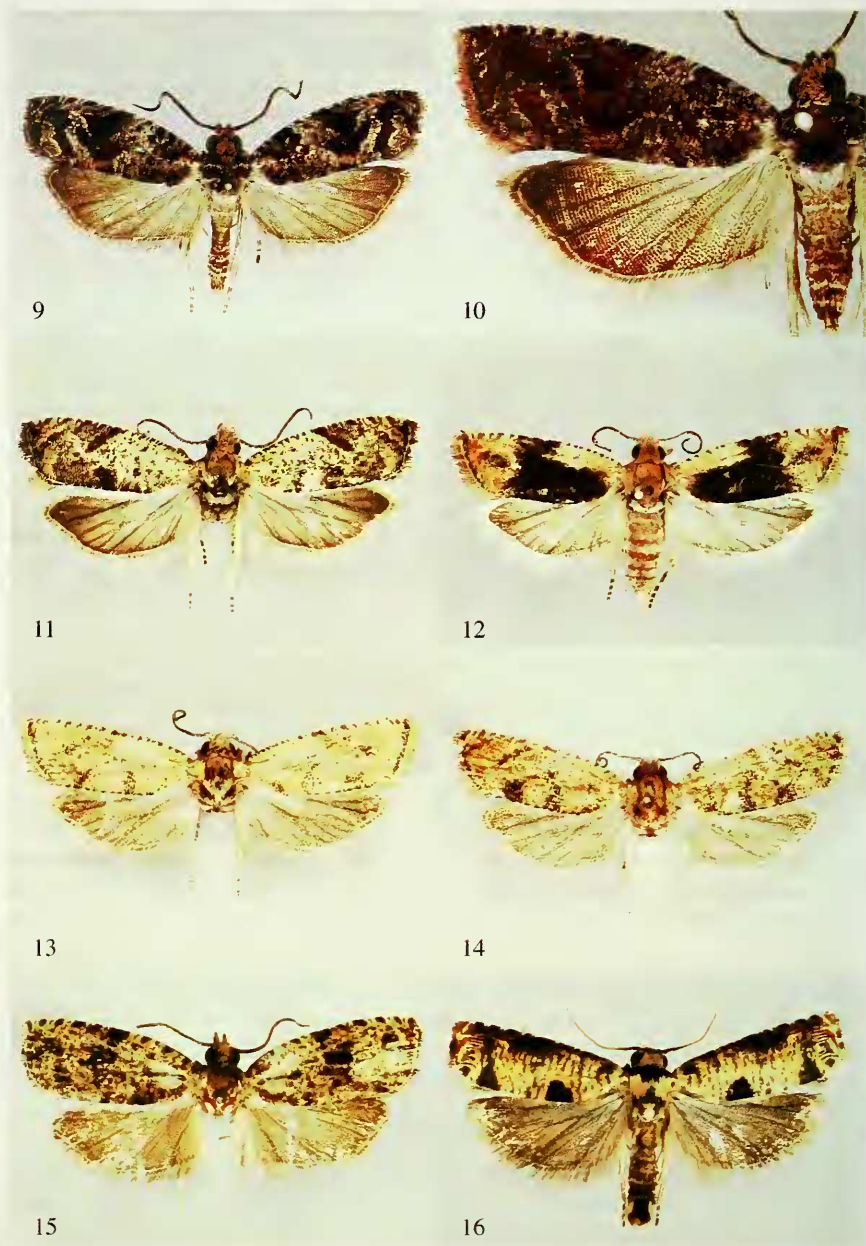
Paratypes: 8 ♂, 17 ♀ from the Galapagos Islands, Ecuador: – *Espanola*: 1 ♀ (dissected, Slide MHNG [ENTO] 3092), same data as holotype; 7 ♀, Bahia Manzanillo, 25.iv.1992, M[ercury]V[apour]L[amp] (B. Landry); 1 ♂, 2 ♀ (one dissected, Slide MHNG [ENTO] 3091), idem except 29.iv.1992. – *Floreana*: 1 ♀, Punta Cormoran, 21.iv.1992, MVL (B. Landry); 1 ♂, Las Cuevas, 23.iv.1992, MVL (B. Landry). – *Pinta*: 1 ♀, Plaja Ibbetson, 14.iii.1992, MVL (B. Landry); 1 ♂, 1 ♀, arid zone, 15.iii.1992, MVL (B. Landry); 1 ♂, 1 ♀, Cabo Ibbetson, N 00° 32.819', W 90° 44.229', 8 m elevation], 15.iii.2006, U[ltra]V[iolet]L[ight] (P. Schmitz, L. Roque); 1 ♀, 200 m elev., 16.iii.1992, MVL (B. Landry); 2 ♂, ± 50 m elev., 20.iii.1992, MVL (B. Landry); 1 ♂ (dissected, Slide MHNG [ENTO] 3093), ± 15 m elev., 21.iii.1992, MVL (B. Landry). – *Santa Cruz*: 1 ♀, littoral zone, Tortuga Bay, 29.i.1989, MVL (B. Landry); 1 ♂ (dissected, Slide Zajda '19 ♂ GALAPAGOS', CNC), 1 ♀ (dissected, Slide Zajda '20 ♀ GALAPAGOS', CNC), C[h]arles[D]arwin[R]esearch[S]tation, arid zone, 3.ii.1989, MVL (B. Landry). Deposited in BMNH, CDRS, CNC, MHNG, ZMJU.

DIAGNOSIS: Closely related to *E. galapagana* but the male can be distinguished by the large triangular lobe on the middle part of the valva, the lack of a long spine from the terminal part of the left sacculus, and the longer and narrower uncus without strong spines apically. The female has a shorter sclerite in the antrum and the ostium is more apically positioned, just beyond the middle of the sternite.

DESCRIPTION: Adult (Figs 13, 14). Wingspan 10 mm. Head and thorax pale ochreous cream; labial palpus 1.2 times diameter of eye, darker. Forewing uniformly broad throughout; pale ochreous cream with indistinct darker suffusions and trace of costal portion of median fascia; tornal area finely strigulated with brown, a line from dorsum and termen concolorous; dots along costa and dorsum fine, brown; cilia as ground colour. Hindwing white at base, pale brown towards termen; cilia pale brown and white.

*Variation*: Wingspan 8-10 mm. In some paratypes ground colour of forewing brownish cream to brownish orange; strigulation more or less distinct; markings brown or grey-brown in form of two or three transverse lines; median fascia complete or interrupted, or only tornal blotch present.

*Male genitalia* (Fig. 44): Uncus long, slender, expanding terminad; socius slender, slightly expanding terminally; valvae asymmetric, with long neck and short cucullus; right valva with small, elongate median lobe and group of shorter bristles, and rather short cucullus; left valva with larger lobe, stronger bristles and shorter cucullus; aedeagus fairly short, bent.



FIGS 9-16

Adults of Galapagos Olethreutini. (9, 10) *Hedyia brunneograpta* paratypes: (9) ♂, Isabela, 8.iii.1989, CNC; (10) ♀, San Cristobal, 15.ii.1989, CNC. (11, 12) *Eccopsis galapagana*: (11) Holotype; (12) ♀ paratype, Isabela, 11.iii.1989, CNC. (13, 14) *E. floreana*: (13) Holotype; (14) ♀ paratype, Española, 29.iv.1992, MHNG. (15) *Megalota johni*, holotype. (16) *Episimus transferranus*: ♂, Santa Cruz, 7.iv.2004, MHNG.



*Female genitalia* (Fig. 64): Lobes of postostial sterigma weak, submembranous; cup-shaped part of sterigma distinct; sclerite of antrum occupying posterior 1/3 of ductus bursae; signum with several processes.

ETYMOLOGY: The species epithet refers to one of the islands of occurrence, Floreana.

REMARKS: This *Eccopsis* species is probably endemic to the Galapagos, where it has been collected at light on four islands, mostly at sea level, but also up to 200 m in elevation, between January to April. The host plant is unknown.

*Megalota johni* Razowski & Landry, sp. n.

Figs 15, 40

MATERIAL EXAMINED: Holotype male: 'ECU[ADOR]. GALAPAGOS | Isabela. V[olcan]. Alcedo | 850 m elev., 12 x 1998 | U[ltra]V[iolet]L[ight]. leg. L. Roque' [white, printed]; 'HOLOTYPE | *Megalota | johni* | Razowski & Landry' [red, hand-written]; Photograph [sic] | M. Kopec' [green, printed]; '42. ♂ Geneve.' [yellow, printed except for ♂]. Deposited in the CDRS.

DIAGNOSIS: Related to *M. delphinosema* (Walsingham, 1913) but distinguished by the much smaller dorsobasal processes of the valvae. In *M. delphinosema* the valvae are longer and slenderer than in this species and the aedeagus shorter and distinctly bent in the middle. Among the Galapagos Tortricidae *Megalota johni* is similar to *Endothenia eidolon* in ground colour and absence of forewing speculum. It can be separated from that species by the distinct male genitalia, notably the very broad uncus and the more complex features of the valvae.

DESCRIPTION: Adult (Fig. 15). Wingspan 13.5 mm. Head and thorax dark brown and brownish cream, and base of tegula dark brown; labial palpus about 2 times diameter of eye, brownish cream basally, browner posteriorly. Ground colour of forewing dirty cream sprinkled and strigulated with brown; costal divisions brown; markings paler (worn) consisting of incomplete median fascia and weak subterminal and terminal fasciae; basal blotch reduced to series of spots; cilia (worn) concolorous with ground colour, with some brown divisions. Hindwing white on costa, brown elsewhere, slightly darker at apex; cilia concolorous with middle of wing.

*Male genitalia* (Fig. 40): Uncus very broad, slightly concave apically; dorso-basal lobe of valva large, provided with both short and long spines and bristles; group of bristles dorsally to terminal part of sacculus; with group of long setae just beyond middle of sacculus; aedeagus slender; cornuti absent.

Female unknown.

ETYMOLOGY: The species is named after Dr. John W. Brown who kindly compared our specimens with the Neotropical species of *Megalota*.

REMARKS: Known from a single male, this species is probably native given that Volcan Alcedo has never been inhabited by humans except when Galapagos Park wardens or scientists spend time in temporary camp sites or at the hut (caseta Linda Cayot) built on the crater rim. The area also has been visited by tourists on day-time outings in the past.

*Episimus transferranus* (Walker, 1863)

Figs 16, 45, 46, 65

*Episimus transferranus* (Walker, 1863): Peck *et al.* (1998: 227); Causton *et al.* (2006: 141).

MATERIAL EXAMINED: 8 ♂, 9 ♀. – *Floreana*: Finca Las Palmas, 300 m. – *Isabela*, 3 km Sto Tomas, agricultural zone. – *San Cristobal*: La Toma, ca. 5.6 km E El Progreso, 299 m; SW

El Progreso, 75 m. – *Santa Cruz*: CDRS, Barranco; NNW Bella Vista, 223 m; Finca Vilema, 2 km W Bella Vista; transition zone, recently cut road. Deposited in CDRS, CNC, MHNG, ZMJU.

**DIAGNOSIS:** The deep dark brown spot before the middle of the forewing dorsal margin (Fig. 16) readily distinguishes this species from all of the other Galapagos Tortricidae. In the presence of the same kind of spot on the forewing dorsal margin this species is most similar to *E. augmentanus* (Zeller, 1877) from Cuba and south Florida, but in *E. transferranus* the vertex is dark fuscous, as opposed to orange-buff (Heppner, 1994), the cucullus is longer and slenderer, and the sclerite of the antrum is longer.

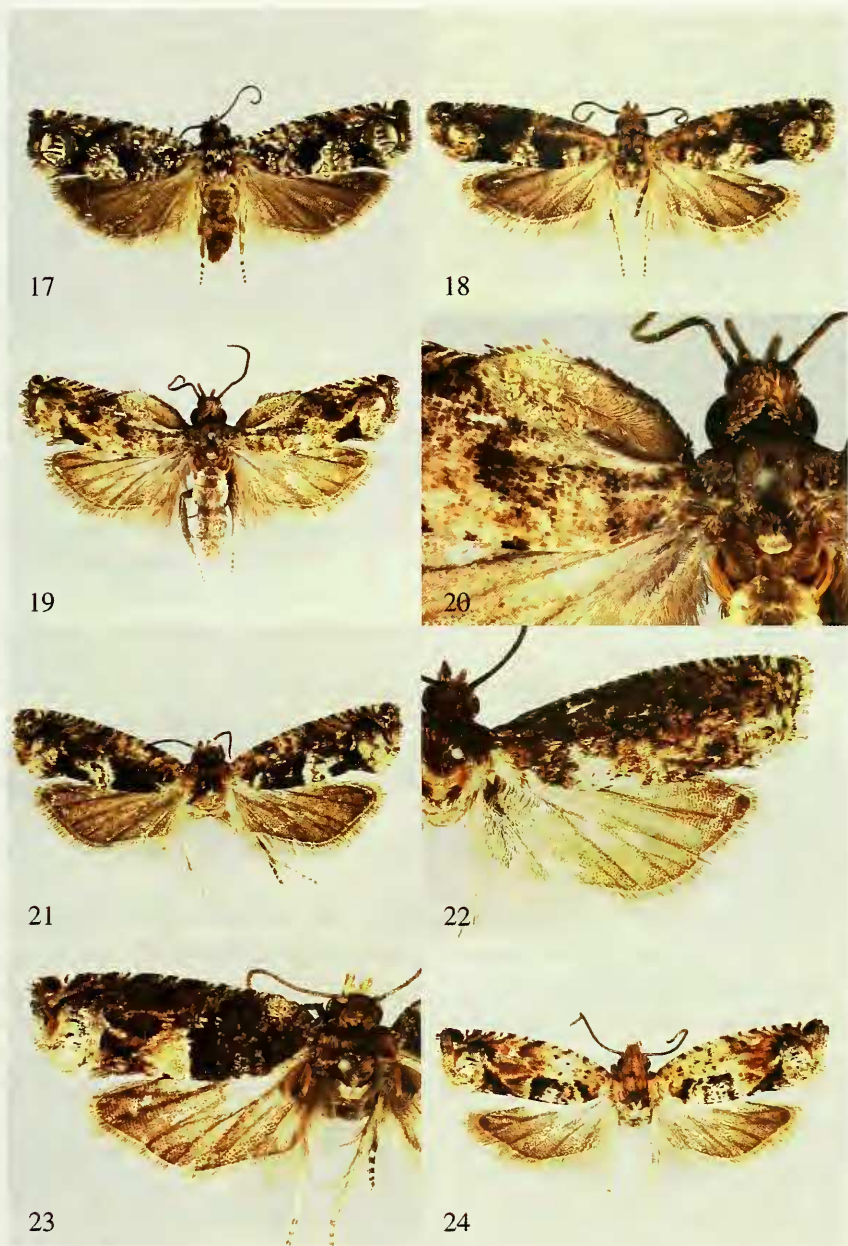
**REMARKS:** Described from Brazil (Amazonas), *Episimus transferranus* has a circum-Caribbean distribution, from the Southern USA (Florida and Texas) to Venezuela, south to Brazil (Heppner, 1994). It was reported from the Galapagos island of Isabela by Peck *et al.* (1998) and by Causton *et al.* (2006), and we add Floreana, San Cristobal, and Santa Cruz to this distribution. Most of the Galapagos specimens were collected at light, between December and May, between 75 and 330 m in elevation. One specimen was reared on Floreana by LR from *Spondias purpurea* L. (Anacardiaceae; vouchers in CDRS), which was recorded also as a host plant for this species in Robinson *et al.* (2007). Other known host plants are also in the Anacardiaceae (Heppner, 1994; Robinson *et al.*, 2007).

*Episimus alcedanus* Razowski & Landry, sp. n.

Figs 17, 47, 66

**MATERIAL EXAMINED:** Holotype male: 'ECU[ADOR], GALAPAGOS | Isabela, V[olcan]. Darwin | 300 m elev[ation], 15.v.1992 | M[ercury]V[apour]L[amp], leg[it]. B. Landry' [white, printed]; 'HOLOTYPE | Episimus | alcedanus | Razowsky & Landry' [red, hand-written]. Deposited in the MHNG.

Paratypes: 9 ♂, 30 ♀ from the Galapagos Islands, Ecuador. – *Fernandina*: 1 ♀, North Side, 300 m, S 00° 20.541', W 091° 36.815', 12.i.2002, U[ltra]V[iolet]L[ight] (L. Roque, C. Causton); 1 ♂, SW side, GPS: 352 m elev., S 00° 20.503', W 091° 36.969', 10.ii.2005, UVL (B. Landry, P. Schmitz); 1 ♂, 1 ♀, Zona de vegetacion, #98: 74, 19.vi.1998, B[lack]L[ight]-F[luorescent]L[ight]. (L. Roque, C. Causton); 1 ♀, Vegetation Zone, S 00° 17' 2.5", W 091° 31' 13.3", LR #98: 74, 19.vi.1998, BL Trap (L. Roque, C. Causton). – *Genovesa*: 1 ♀, Bahia Darwin, 26.iii.1992, M[ercury]V[apour]L[amp] (B. Landry). – *Isabela*: 1 ♂ (dissected, Slide Zajda '18. ♂ Landry', CDRS), V[olcan]. Darwin, 200 m, No. 99. 16, 11.ii.1999, UVL (L. Roque); 1 ♀, V. Darwin, campamento base, #2000-04, 1.iii.2000, BL-W[white]L[ight] Trap (L. Roque); 1 ♀, Volcan Darwin, 200 m [eters]s[obre el]n[jivel del]m[ar], #2000-05, 2.iii.2000, UVL-WLTrap (L. Roque); 1 ♀, Puerto Villamil, 2.iii.1989, MVL (B. Landry); 1 ♀, Volcan Darwin, 400 msnm, #2000-07, 3.iii.2000, UVL-WLTrap (L. Roque); 1 ♂, 5 km W Puerto Villamil, 5.iii.1989, MVL (B. Landry); 2 ♀, Volcan Darwin, 900 msnm, #2000-010, 6.iii.2000, UVL-WLTrap (L. Roque); 1 ♂ (dissected, Slide Baixeras 20262, CNC), 11 km N Puerto Villamil, 9.iii.1989, MVL (B. Landry); 1 ♀, 8.5 km N Puerto Villamil, 11.iii.1989, MVL (B. Landry); 1 ♂ (dissected, Slide MHNG [ENTO] 3063), 1 ♀ (dissected, Slide MHNG [ENTO] 3064), NE slope Alcedo, near shore, GPS: 9 m elev., S 090° 23.619', W 90° 59.715', 29.iii.2004, UVL (B. Landry, P. Schmitz); 1 ♀, Alcedo, lado NE, low arid zone, bosq[ue]. palo santo, 18.iv.2002, UVL (B. Landry, L. Roque); 2 ♀, Tagus Cove, 13.v.1992, MVL (B. Landry); 2 ♀, same data as holotype; 1 ♂, V. Darwin, 630 m elev., 16.v.1992, MVL (B. Landry); 1 ♀, idem except 17.v.1992; 1 ♂ (dissected, Slide MHNG [ENTO] 3065), V. Darwin, 1240 m elev., 19.v.1992, MVL (B. Landry); 1 ♀, near Tagus Cove, 100 m elev., 21.v.1992, MVL (B. Landry); 1 ♀, ± 15 km N Puerto Villamil, 25.v.1992, MVL (B. Landry). – *Marchena*: 1 ♀, 12.iii.1992, MVL (B. Landry); 2 ♀, 23.iii.1992, MVL (B. Landry); 2 ♂, 1 ♀ (dissected, Slide Zajda '50. ♀ Geneve', CDRS), Playa Negra, N 00° 18.089', W 090° 30.452', 7.iv.2002, UVL (L. Roque). – *Pinta*: 2 ♂, Playa Ibbetson, 13.iii.1992, MVL (B. Landry); 1 ♂, idem except 14.iii.1992; 1 ♀, arid zone, 15.iii.1992, MVL (B. Landry); 1 ♂, 3 ♀, ± 50 m elev., 20.iii.1992, MVL (B. Landry);



FIGS 17-24

Adults of Galapagos Olethreutini and Eucosmini. (17) *Episimus alcedanus*: ♀ paratype, Isabela, 15.v.1992, MHNG. (18-20) *Epinotia lantana*: (18) ♀, Pinta, 17.iii.1992, MHNG; (19, 20) ♂, Isabela, 25.v.1992, MHNG. (21, 22) *E. microscyphos* paratypes: (21) ♀, Fernandina, 15.i.2002, CDRS; (22) ♂, Santa Cruz, 21.i.1989, CNC. (23, 24) *Crocidosema synneurota*: (23) ♂, Santa Cruz, 17.iii.1989, CNC; (24) ♀, San Cristobal, 14.ii.1989, CNC.



1 ♀, ± 15 m elev., 21.iii.1992, MVL (B. Landry). – *Rabida*: 1 ♀, Tourist trail, 3.iv.1992, MVL (B. Landry). – *Santiago*: 1 ♀, Bahía Espumilla, 4.iv.1992, MVL (B. Landry); 1 ♀, La Bomba, GPS: 6 m elev., S 00° 11.151', W 090° 42.052', 1.iii.2005, UVL (P. Schmitz). Deposited in BMNH, CDRS, CNC, MHNG, ZMJU.

**DIAGNOSIS:** Closest to *E. prudens* (Meyrick, 1917) from Peru, but with dark brown forewing markings, broad cucullus, and more distal posterior lobe of sacculus. Female genitalia somewhat similar to those of *E. guiana* (Busck, 1913), but differing in the larger signa. Among Galapagos Tortricidae this species is most similar in ground colour and markings (with a forewing speculum) to *Coniostola isabelae*, *Crocidosema synneurota*, and *Dichrorampha galapagana*. *Episimus alcedanus* differs from all these in having the most contrasted black speculum spots in the form of four dashes, with the most terminal one reaching the margin at termen.

**DESCRIPTION:** Adult (Fig. 17). Wingspan 14 mm. Head and thorax greyish white with grey-black markings. Ground colour of forewing whitish cream suffused with grey, slightly mixed ochreous beyond middle subcostally; strigulation dark grey and blackish grey, in part diffuse. Costal strigulae and part of ocellus white, divisions black. Markings grey-black consisting of dorsopostbasal blotch extending towards middle of wing and almost connecting with costal half of median fascia; remaining markings paler; cilia black except for basal half at median portion of termen and at tornus. Hindwing greyish brown, paler towards base. In female base of wing only slightly paler than the median part.

**Variation:** Wingspan 12–16 mm. The appearance of the moths may be more or less dark brown with markings varying slightly in shape and contrast.

**Male genitalia** (Fig. 47): Uncus slender; socius broad, rounded; valva fairly broad; cucullus broad, convex ventrocaudally; sacculus convex in basal half, with moderate posterior lobe.

**Female genitalia** (Fig. 66): Sterigma almost subsquare; sclerite of antrum shorter than signum; signum large.

**ETYMOLOGY:** The specific epithet refers to the name of one of the collecting localities, Volcan Alcedo, on the island of Isabela, which peaks at 1125 m.

**REMARKS:** This species has not been collected on the older Galapagos Islands of Floreana, San Cristobal, Espanola, and Santa Cruz, the latter being the best collected of the archipelago. *Utetheisa devriesi* Hayes (Lepidoptera; Arctiidae) has a similar distribution pattern. These two species probably evolved on one of the younger islands and extended their distribution from there, successfully colonizing other islands where the host plants and habitats were suitable. The host plant is unknown. The moths come to light and have been collected from the sea shore to the pampa zone, such as on the rim of Volcan Darwin, at 1240 m, between January and June.

## Eucosmini

*Epinotia lantana* (Busck, 1910)

Figs 18–20, 49, 50, 67, 74

**MATERIAL EXAMINED:** 1 ♂, 7 ♀. – *Baltra*: intercepted by the Galapagos Quarantine System (SICGAL) with *Pelargonium graveolens* l'Hér. ex Aiton (Geraniaceae). – *Isabela*: Volcan Alcedo, 900 m; Volcan Darwin, 300 and 1300 m; Volcan Sierra Negra, 1000 m. – *Pinta*: 400 m. Deposited in CDRS, CNC, MHNG, and ZMJU.

DIAGNOSIS: Related to *E. microscyphos*, described below, but the male is distinguished easily by the large forewing costal fold and the pair of long, orange hairbrushes arising from the thorax apicolaterally and inserted into pockets of modified scales at the base of the abdomen dorsally (Figs 20, 74). In *E. microscyphos* (Fig. 22), the forewing costa is only slightly modified, there are no hairbrushes arising from the thorax apicolaterally and no modifications of the abdominal tergites I-III, but there are modified black scales at the base of the hindwing and apex of the thorax laterally. The male genitalia of *E. lantana* have a smaller but wider and apically blunt uncus (Fig. 49) and the costa of the valva has a sharp bend before midlength and its sacculus is much more pronounced than in *E. microscyphos* (Fig. 48). The female genitalia (Fig. 67) can be separated from those of *E. microscyphos* (Fig. 68) by the position of the ostium at the apical edge of the shallowly concave sternite VII, compared to an ostium situated near the middle of a deeply concave sternite VII, the narrow sclerotized ring around the ostium compared to a larger cup-shaped structure, and the wide paired lamella post-vaginalis with a small, elongate median plate entering into the ostium compared to a simple, narrow, transverse crescent-shaped plate at the edge of sternite VII. *Crocidosema longipalpata* (Möschler, 1890), described from Puerto Rico, also has a large forewing costal fold and orange brushes on the thorax apicolaterally. *Crocidosema lantana* has a simple sacculus while that of *longipalpata* has a subtriangular fold and the sterigma of *lantana* is broadly rounded while that of *longipalpata* is deeply incised in the middle posteriorly.

REMARKS: This is a Mexican species introduced to the Hawaiian Islands in 1902 for the control of *Lantana camara* L. (Verbenaceae) (Busck, 1910), and redescribed from Australia and Sri Lanka (see Brown, 2005 for synonymy). The lantana flower cluster moth or lantana tortricid moth is known to feed in pods of *Bignonia chrysantha* Jacq. (Bignoniaceae); in flower head, on berries and as a borer in tender twigs of *Lantana camara*; in stems of litchi (*Litchi chinensis* Sonnerat, Sapindaceae); and in terminal twigs of *Tecoma stans* (L.) Juss. ex Kunth in H.B.K. (Bignoniaceae) (Zimmerman, 1978; Robinson *et al.*, 2007). The Galapagos endemic *Lantana peduncularis* Andersson should be surveyed as a possible host of this species. Except for the female intercepted in quarantine, all Galapagos specimens were collected at light and the first Galapagos record is from 12 March 1989 on Sierra Negra, Isabela Island.

*Epinotia microscyphos* Razowski & Landry, sp. n.

Figs 21, 22, 48, 68

MATERIAL EXAMINED: Holotype female: 'HOLOTYPUS' [orange, printed]; 'ECU[ADOR]. GALAPAGOS | Fernandina, North side 1300m | S 00 21.862' W 091 34.308' | 15 I 2002 U[ltra]V[iolet]L[ight] | L. Roque & C. Causton' [white, printed]; 'Photograph [sic] | M. Kopec' [green, printed]; '24. ♀ Geneve' [yellow, printed except for ♀]; 'HOLOTYPE | *Epinotia* | *microscyphos* | Razowski & Landry' [red, hand-written]. Deposited in the CDRS.

Paratypes: 4 ♂, 6 ♀ from the Galapagos Islands, Ecuador. – *Fernandina*: 2 ♀ (one dissected, Slide Zajda '25. ♀ Geneve', CDRS), same data as holotype; 1 ♂ (dissected, Slide MH-NG ENTO 3620), vegetation zone, S 00° 17' 2.5", W 091° 31' 13.3", LR # 98-74, 19.vi.1998, B[lack]L[ight] Trap (L. Roque & C. Causton). – *Isabela*: 1 ♂ (dissected, Slide Zajda '40. ♂ Geneve', CDRS), Volcan Darwin, 700 m [eters]s[obre el]n[ivel del]m[ar], LR #2000 – 09, 4.iii.2000, U[ltra]V[iolet]-W[hite]L[ight] Trap (L. Roque); 1 ♀, V[olcan]. Darwin, 630 m elev[ation]., 16.v.1992, M[ercury]V[apour]L[ight] (B. Landry); 1 ♂, idem except 17.v.1992; 1 ♀, V. Darwin, 1240 m elev., 19.v.1992, MVL (B. Landry); 1 ♀, V. Alcedo, 1100 m elev.,

13.x.1998, UVL (L. Roque). – *Santa Cruz*: 1 ♂ (dissected, Slide Baixeras 20266, CNC), Media Luna, Pampa Zone, 21.i.1989, MVL (B. Landry); 1 ♀, Los Gemelos, 27.v.19992, MVL (B. Landry). Deposited in CDRS, CNC, MHNG, and ZMJU.

**DIAGNOSIS:** Closely related to *E. callida* (Meyrick, 1917) from Peru but distinguished chiefly by the longer uncus. From the Argentinean *E. cosmoptila* (Meyrick, 1917) it differs in the longer, slender cucullus and the much larger basal part of the valva, the longer cup-shaped part of the sterigma, and the presence of long bristles at the distal edge of the sterigma. Also related to *E. lantana* (see Diagnosis above).

**DESCRIPTION:** Adult (Figs 21, 22). Wingspan 14 mm. Head and proximal part of thorax greyish brown, posterior part of thorax greyish cream; labial palpus about twice as long as diameter of eye, greyish cream medially, cream terminally and along edges. Ground colour of forewing brownish cream suffused with grey-brown, in costal area and near termen scaled with yellowish brown; costal strigulae cream; divisions brownish grey; dorsal patch cream with grey-brown lines; strigulation and lines black; speculum concolorous with dorsal patch, scaled with brown-grey inside, with indistinct spots; cilia cream with greyish brown. Hindwing brown-grey; cilia paler.

**Variation:** Wingspan 12.5–14 mm. Ground colour of forewing pale brownish grey to grey with ochreous suffusions, dorsum occasionally blackish brown entirely or to dorsal patch; strigulation grey or blackish brown; speculum in a few specimens white with black inner spots; black lines more or less distinct, especially that limiting costal edge of speculum. Two specimens distinctly suffused with blackish grey.

**Male genitalia** (Fig. 48): Uncus long, uniformly broad; socii long, curved; basal half of valva broad, incision short; cucullus semi-oval, convex ventrocaudally, with small proximal lobe; aedeagus nearly as long as costa of valva.

**Female genitalia** (Fig. 68): Papillae anales slender; apophyses slender, long; posterior part of sterigma weakly sclerotized, cup-shaped part short; antrum membranous; ductus bursae partly sclerotized in two longitudinal, striated plates; corpus bursae with small digitate projection near connection with ductus bursae, mostly scobinated except for proximal end, with pair of laterally compressed signa of medium length and slightly curved.

**ETYMOLOGY:** From the Greek *micros*, meaning small, and *scyphos*, meaning a cup, in reference to the cup-shaped part of the sterigma.

**REMARKS:** This species seems to be restricted to higher elevation habitats of the Galapagos. The few available specimens were attracted to light in January, March, May, June, and October, on the islands of Fernandina, Isabela, and Santa Cruz. The host plant is unknown. The species should be looked for on Santiago, of which the highlands are now free of feral goats and pigs, but it may be absent on the older islands of San Cristobal and Floreana although they seem sufficiently high in elevation to harbor suitable habitats.

*Crocidosema synneurota* Meyrick, 1926, status revised      Figs 23–26, 52–54, 69, 70

*Crocidosema synneurota* Meyrick, 1926: 276.

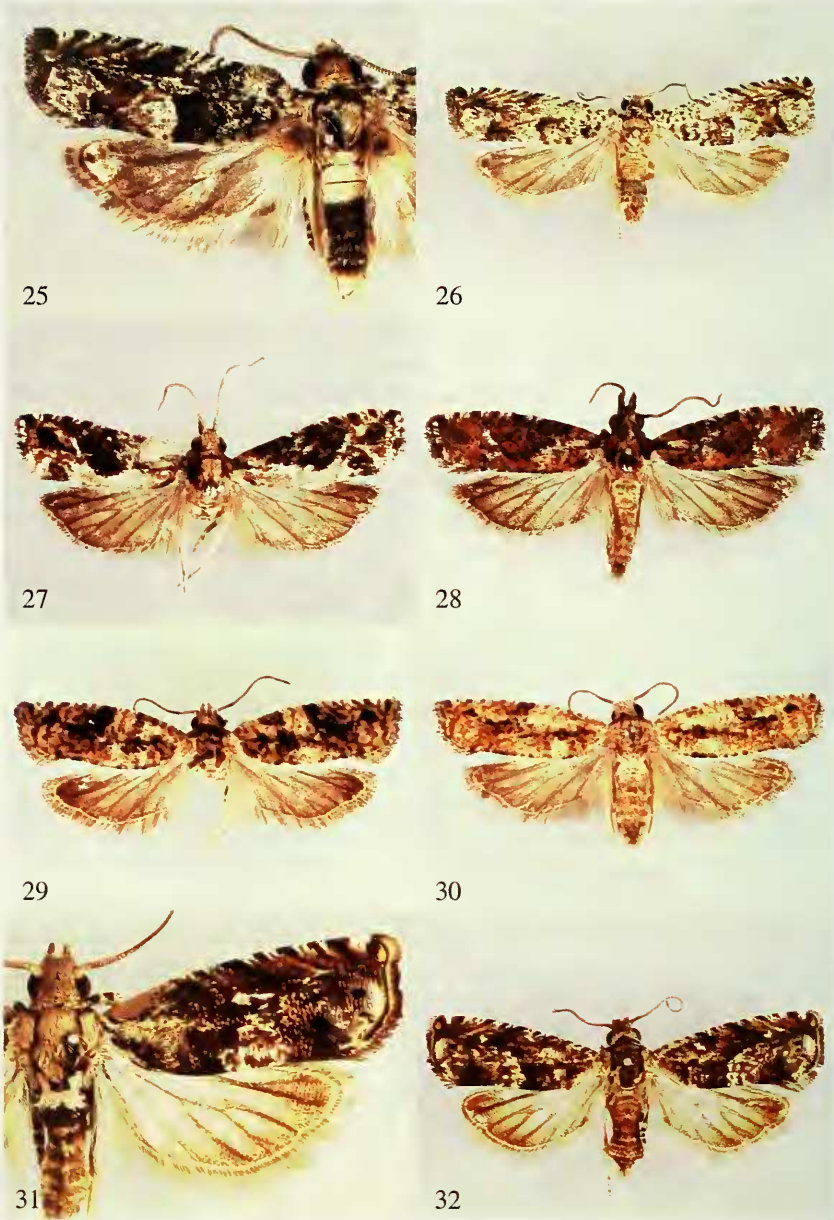
*Crocidosema plebejana* Zeller, 1847: Schaus (1923: 31); Linsley & Usinger (1966: 163); Linsley (1977: 37); Peck *et al.* (1998: 227); Perry & de Vries (2003: 144); Causton *et al.* (2006: 141). Misidentifications.



MATERIAL EXAMINED: 133 specimens of both sexes. – *Espanola*: Bahía Manzanillo; Punta Suarez; Las Tunas Trail, 100 m elevation. – *Fernandina*: North side, 1300 m; SW side, 352 & 1341 m elevation (crater rim). – *Floreana*: zona arida, Finca Las Palmas, 300 m; Punta Cormoran. – *Genovesa*: Bahía Darwin. – *Isabela, Volcan Alcedo*: zona arida baja; zona arida alta; 300 & 570 m elevation; pega-pega camp, 700 m; cumbre, 1200 m. – *Isabela, Volcan Darwin*: 300, 630, 900 & 1000 m elevation. – *Isabela, Volcan Sierra Negra*: Puerto Villamil; 8.5 km N Puerto Villamil; 3 km N Santo Tomas, Agriculture Zone. – *Marchena*: Playa Negra. – *Pinta*: Playa Ibbetson; ± 50, 200 & 400 m elevation. – *Pinzon*: Playa Escondida. – *Plaza Sur*: 18 m elevation. – *Rabida*: Tourist Trail. – *San Cristobal*: Puerto Baquerizo; 1 km S El Progreso; antiguo botadero, 4 km SE Puerto Baquerizo, 169 m; base of Cerro Pelado; La Toma, ca. 5.6 km E El Progreso, 299 m elevation. – *Santa Cruz*: Charles Darwin Research Station, Barranco; low agriculture zone; 5 km N Puerto Ayora, transition zone; Finca Steve Devine; Tortuga Reserve, W Santa Rosa; 2 km W Bella Vista; Los Gemelos, 580 m elevation; Media Luna, miconia - pampa zone, 580 m. – *Santa Fe*: Tourist Trail. – *Santiago*: Bahía Espumilla; La Bomba, 6 m elevation; 200 m elevation; North side, 437 m; Aguacate, 520 m; NE side, close to Caseta, 686 m; Central, 700 m; Cerro Inn. – *Seymour Norte*. Deposited in the BMNH, CDRS, CNC, MHNG, and ZMJU.

DIAGNOSIS: In habitus this is a highly variable species as shown in Figs 23-26. In some cases (not shown) there is a complete dark brown bar on the dorsum of the forewing from the base to the speculum. The abdomen of males varies from cream-coloured dorsally on the first two segments (Fig. 25) to completely dark brown, with intermediates. The wingspan varies from 9 to 14 mm. Strictly among Galapagos Tortricidae, the male of *C. synneurota* is easily recognized by the slightly modified scale patch subbasally on the forewing costa and by the large patch of elongate, grey-brown and cream-coloured scales at the base of the hindwing's cubital stem along with a smaller set of shorter slender scales at the base of the anal sector. The females may be brushed or dissected to unravel the distinctive projections at the base of sternite VII laterally. In male genitalia (Figs 52-54) the shape of the valva varies slightly, as well as the number of large spines of the pollex, counting 1 to 3. In female genitalia (Figs 69, 70) there is variation in the extent and shape of the sclerotization of the base of sternite VII and in the shape of the antrum. This species differs from the Palaearctic *C. plebejana* in the longer, slender uncus postbasally slightly enlarged.

REMARKS: This species was described from Albemarle [Isabela] and Indefatigable [Santa Cruz] Islands, Galapagos. A male 'type' from Albemarle was identified and illustrated by Clarke (1958: 318, 319) and examined by BL in 2000. Another species of *Crocidosema*, *C. piladelpha* was described by Meyrick (1917) both from Ecuador and Peru, and Clarke (1958) selected the Peruvian specimen as the lectotype. Based on the illustrations provided in that publication an accurate assessment of these species is impossible because the unci of the specimens are insufficiently visible. Although both *C. synneurota* and *C. piladelpha* are presumed to be valid species, more specimens from the continent need to be examined to assess their variability and differences. *Crocidosema synneurota* was reported by Perry & de Vries (2003) (as *C. plebiana* [sic]) as feeding on *Acacia* sp. (Leguminosae). LR reared three specimens at the Charles Darwin Station on flowers of *Abutilon depauperatum* (Hook. f.) Andersson (Malvaceae). LR's collaborator Alejandro Miele reared a specimen on *Waltheria ovata* Cav. (Sterculiaceae) from Santa Fe. We have examined specimens from the islands of Fernandina, Floreana, Genovesa, Isabela, Marchena, Pinta, Pinzon, Plaza Sur, Rabida, San Cristobal, Santa Cruz, Santa Fe, Santiago, and Seymour Norte,



FIGS 25-32

Adults of Galapagos Eucosmini and Grapholitini. (25, 26) *Crociosema synneurota*: (25) ♂, Española, 29.iv.1992, MHNG; (26) ♀, Española, 2.v.1992, MHNG. (27, 28) *Strepsicrates smithiana*, males from Santa Cruz: 27. 31.i.1989, CNC; (28) 8.ii.1989, CNC. (29, 30) *Proteoteras atromacula*, female paratypes from Isabela: (29) 9.iii.1989, CNC; (30) 25.v.1992, MHNG. (31, 32) *Coniostola isabelae* paratypes from Isabela: (31) ♂, 15.v.1992, MHNG; (32) ♀, 21.v.1992, MHNG.

between sea level and the rim of high volcanoes (at 1341 m on Fernandina). Linsley & Usinger (1966: 163) mentioned it from Baltra under the name *C. plebiana* [sic]. Specimens have been collected at light in all months of the year except June, July, and August.

*Strepsicrates smithiana* Walsingham, 1892

Figs 27, 28, 51, 71

*Strepsicrates smithiana* Walsingham, 1892: Schaus (1923: 31); Linsley & Usinger (1966: 163); Peck *et al.* (1998: 227); Causton *et al.* (2006: 141).

MATERIAL EXAMINED: 62 ♂ and ♀. – *Isabela*: Alcedo, NE side, 900 m, guayabillos camp; Volcan Darwin, 900 m; Sierra Negra, 1 km W Puerto Villamil; Sierra Negra, ± 15 km N Puerto Villamil; pampa zone, 1000 m. – *San Cristobal*: Puerto Baquerizo; 2 km SW Puerto Baquerizo; 4 km SE Puerto Baquerizo; 1 km S El Progreso; base of Cerro Pelado; pampa zone. – *Santa Cruz*: 4 km N Puerto Ayora; Finca S. Devine; Tortuga Reserve, W of Santa Rosa; 2 km W of Bella Vista; Los Gemelos; Media Luna, Pampa zone. (BMNH, CDRS, CNC, MHNG, ZMJU).

DIAGNOSIS: The forewing colour is mostly a mixture of various shades of brown, grey, and white, but one specimen also has olive green. The markings are more or less conspicuous and mostly consist in a large, V-shaped median blotch not reaching dorsum, and two smaller spots near midline subterminally and on dorsum before termen. Paler scaling is present mostly on dorsum below the large blotch and between it and the two smaller spots. There is no distinct speculum, but there is a conspicuous patch of raised scales at  $\frac{1}{4}$ , dorsad of the fold. The male costal fold is strongly developed and hides fine, white hair-like scales (Fig. 27). The male antenna is modified with a notch involving flagellomeres 7-11. The wingspan is fairly constant, around 13 mm, but varies between 10 and 14 mm. The species is somewhat similar to the Australian *S. dilacerata* (Meyrick, 1928), but with almost uniformly broad valvae and a longer aedeagus. Among Galapagos Tortricidae, *Strepsicrates smithiana* is most similar to *Proteoteras atromacula* as mentioned below.

REMARKS: This species was described from St. Vincent, West Indies. It has been reported from British Guiana and from Florida and Georgia, USA, from where it was introduced to Hawaii for the control of firebush (*Morella faya* (Ait. Wilbur, Myricaceae). The larva also feeds on *Morella cerifera* (L.) Small (Myricaceae) and common guava (*Psidium guajava* L., Myrtaceae) (Zimmerman, 1978: 611-615). Fortunately, the invasive *Morella* species do not occur on the Galapagos, but two species of *Psidium* are present on the archipelago (McMullen, 1999; Lawesson *et al.*, 1987). Other Myrtaceae and Myricaceae host plants are listed for this species in Robinson *et al.* (2007). In the Galapagos, the host plants remain unknown. Ferguson *et al.* (1991) record the distribution as widespread in the West Indies and on the mainland from Central America to Massachusetts (USA). *Strepsicrates smithiana* is believed to have been introduced accidentally (maybe on guava) to the Galapagos where it was reported as early as 1923 from the island of Baltra (Schaus, 1923), but no new island records have been reported since. We have examined specimens from Isabela, San Cristobal, and Santa Cruz, all inhabited islands, although on Isabela one specimen each were found on Volcan Alcedo and Volcan Darwin, which have never been inhabited. Interestingly, the species was found commonly on Isabela, San Cristobal, and Santa Cruz in 1989 (55 specimens collected in two months by BL), but since then, only seven specimens have been collected during at least 200 nights of collecting in 1992, and



each year since 1994. Perhaps an external factor has affected this species as mentioned for the following species. The moths are attracted to light and were collected from January until May.

*Proteoteras atromacula* Razowski & Landry, sp. n.

Figs 29, 30, 55, 72

MATERIAL EXAMINED: Holotype male: 'HOLOTYPUS' [orange, printed]; 'ECUADOR | GALAPAGOS | 3 km N. S[an]to Tómas, Agr[iculture]. Zone | 8.iii.1989, M[ercury]V[apour]L[ight] | B. Landry' [white, printed]; 'Photograph [sic] | M. Kopec' [green, printed]; '15. ♂ Landry.' [white, printed except for ♂]; 'HOLOTYPUS | *Proteoteras | atromacula* | Razowski & Landry' [red, handwritten]. Deposited in the CNC.

Paratypes: 5 ♂, 13 ♀ from the Galapagos Islands, Ecuador and collected by B. Landry at M[ercury]V[apour]L[ight]. – *Isabela*: 1 ♀, 1 km W Puerto Villamil, 3.iii.1989; 2 ♀, 2 km W Puerto Villamil, 5.iii.1989; 3 ♂, 5 ♀ (one dissected, Slide Zajda '8 ♀ GALAPAGOS', CNC), same data as holotype; 1 ♂, 2 ♀ (one dissected, Slide MHNG ENTO 3621), 11 km N Puerto Villamil, 9.iii.1989; 1 ♂, idem except 13.iii.1989; 2 ♀ (one dissected, Slide MHNG [ENTO] 3083), ± 15 km N P[uer]to Villamil, 25.v.1992. – *Santiago*: 1 ♀, Aguacate, 520 m elev[ation], 6.iv.1992. Deposited in the BMNH, CDRS, CNC, MHNG, and ZMJU.

DIAGNOSIS: Related to the Nearctic *P. willingana* (Kearfott, 1904), but *atromacula* has a shorter cucullus, very large spines on the neck of the valva, and the transverse rib connecting the thorns of the subgenital sternite is deeply concave. Among Galapagos Tortricidae, this species is most similar to *Strepsicrates smithiana*, mentioned above, because of their narrow forewings and absence of distinct speculum. However, in contrast with *S. smithiana* the male of *P. atromacula* has no costal fold and its flagellum is not notched. Also in contrast to *S. smithiana*, which has one large patch of raised scales on the forewing, this species has several smaller patches of raised scales mostly on the dorsal half of the forewing. The two or three strong, curved spines on the ventral margin of the valvae medially (Fig 55) are a unique feature of the male genitalia of *P. atromacula*. Its female genitalia are most similar to those of *Epinotia*, *Crociosema*, and *Episimus alcedanus* in possessing a pair of large blade-like signa and a partly sclerotized ductus bursae. Details of the antrum area and sterigma must be examined to separate these taxa.

DESCRIPTION: Adult (Figs 29, 30). Wingspan 12 mm. Head brownish cream; labial palpus about 1.5 times diameter of eye, greyish cream; thorax grey-cream, tegula browner basally. Forewing weakly expanding terminally; termen concave beneath apex. Ground colour brownish cream; suffusions browner; costal divisions brown, strigulae dirty cream. Markings brown; basal blotch weak, consisting of some spots; median fascia black to middle, ill-defined towards dorsum, extending medially towards black subapical spot; with several small patches of raised scales mostly on dorsal half; cilia concolorous with wing. Hindwing greyish brown, paler basally; cilia pale brown.

*Variation*: Wingspan 11.5-14 mm. Ground colour of forewing brownish cream to brown; strigulation and/or suffusions pale brown. Markings brown or yellowish brown with dark brown or black marks; basal blotch usually weak, median fascia distinct or diffuse, often with black longitudinal line in middle; markings in posterior third of wing usually weakly developed. One unicolourous specimen.

*Male genitalia* (Fig. 55): Socii long, pointed, rather well sclerotized; valva broad basally, slender before cucullus, with 2 or 3 strong outer, ventral spines medially.

*Female genitalia* (Fig. 72): Apophyses thin, posterior slightly longer than anterior. Postostial part of sterigma long, weakly concave terminally; anterior part reaching mid-length of posterior part; colliculum membranous; sclerotized part of ductus bursae long; signa two strong blades.

ETYMOLOGY: The species name refers to the colouration of the forewing: *ater* = black, *macula* = spot.

REMARKS: Despite many collecting events, only three specimens of this species have been collected since 1989, when it was found commonly along the slope of Sierra Negra, on Isabela, from the littoral zone to about the middle of the Scalesia (or agriculture) zone (about 500 m). Maybe an external agent, such as a new predator or parasite, reduced its populations. The host plant is unknown. Specimens were attracted to light from March until May on Isabela and Santiago.

### Grapholitini

*Coniostola isabelae* Razowski & Landry, sp. n.

Figs 31, 32, 56, 73

MATERIAL EXAMINED: Holotype male: 'HOLOTYPUS' [orange, printed]; 'ECUADOR | GALAPAGOS | Isabela, 2 km W. | Puerto Villamil | 5.III.1989, M[ercury]V[apour]L[ight] | B. Landry' [white, printed]; 'Photograph [sic] | M. Kopec' [green, printed]; '7. ♂ Landry' [white, printed except for ♂]; 'HOLOTYPE | *Coniostola | isabelae* | Razowski & Landry' [red, handwritten]. Deposited in the CNC.

Paratypes: 24 ♂, 46 ♀, from the Galapagos Islands, Ecuador. – *Baltra*: 1 ♂, arid zone, 24.i.1989, M[ercury]V[apour]L[ight] (B. Landry). – *Espanola*: 2 ♂, 1 ♀, Las Tunas Trail, 100 m elev[ation], 30.iv.1992, MVL (B. Landry). – *Fernandina*: 2 ♀ (one dissected, Slide Zajda '38. ♀ Geneve', CDRS), North side, 300 m, S 00° 20.541', W 091° 36.815', 12.i.2002, U[ltra]V[iolet]L[ight] (L. Roque & C. Causton). – *Floreana*: 1 ♀ (dissected, Slide MHNG [ENTO] 3066), close to Las Palmas, GPS: elev. 154 m, S 01° 17.049', W 90° 28.305', 15.iv.2004, UVL (P. Schmitz); 1 ♂, 3 ♀, Las Cuevas, 23.iv.1992, MVL (B. Landry). – *Isabela*: 1 ♂ (dissected, Slide Zajda '39. ♂ Geneve', CDRS), 1 ♀ (dissected, Slide Zajda '22. ♀ Landry', CDRS), V[olcan] Darwin, 200 m, No. 99. 16, 11.ii.1999, UVL (L. Roque); 1 ♂ (dissected, Slide Zajda '33. ♂ Geneve', CDRS), V. Darwin, campamento base, LR #2000-03, 1.iii.2000, Malaise Trap (L. Roque); 2 ♀ (one dissected, Slide Zajda '34. ♀ Geneve', CDRS), idem except for LR #2000-04, B[lack]L[ight]-W[hite]L[ight] Trap; 1 ♀, Puerto Villamil, 2.iii.1989, MVL (B. Landry); 1 ♂, 2 ♀ (one dissected, Slide Baixeras 20269, CNC), 1 km W Puerto Villamil, 3.iii.1989, MVL (B. Landry); 2 ♀ (one dissected, Slide Zajda '36. ♀ Geneve', CDRS), Volcan Darwin, 400 m[eters]s[obre el]n[ivel del]m[ar], LR #2000-07, 3.iii.2000, UVL-WL Trap (L. Roque); 2 ♀, same data as holotype; 1 ♀, Volcan Darwin, 900 msnm, LR #2000-010, 6.iii.2000, UVL-WL Trap (L. Roque); 1 ♀, 3 km N S[an]to Tomas, Agr[iculture]. Zone, 8.iii.1989, MVL (B. Landry); 1 ♂, 8.5 km N Puerto Villamil, 11.iii.1989, MVL (B. Landry); 1 ♀, Alcedo, lado NE, playta, night on bushes, 13.iv.2002 (B. Landry); 1 ♀, Alcedo, North East side, 200 m, 14.iv.2002, UVL (L. Roque & B. Landry); 1 ♀, V. Alcedo, North East side, Guayabillos camp, 900 m, 16.iv.2002, UVL (L. Roque & B. Landry); 2 ♂, 1 ♀, Alcedo, lado NE, low arid zone, bosque palo santo, 18.iv.2002, UVL (L. Roque & B. Landry); 2 ♂, Tagus Cove, 13.v.1992, MVL (B. Landry); 1 ♂, 1 ♀, V. Darwin, 300 m elev., 15.v.1992, MVL (B. Landry); 1 ♀, n[ear] Tagus Cove, 100 m elev., 21.v.1992, MVL (B. Landry); 1 ♂, 1 ♀, z[ona de] transicion, bosque de pega pega, 570 msnm, S 00° 23' 54.9", W 91° 2' 49.0", 14.x.1999, dry Malaise (L. Roque). – *Marchena*: 1 ♀, 23.iii.1992, MVL (B. Landry); 1 ♂ (dissected, Slide Zajda '35. ♂ Geneve', CDRS), 1 ♀ (dissected, Slide Zajda '21. ♀ Geneve', CDRS), Playa Negra, N 00° 18.089', W 90° 30.452', 7.iv.2002, UVL (L. Roque). – *Pinzon*: 1 ♀, Playa Escondida, S 00° 35.928', W 90° 39.291', 14 m elev., 27.iii.2006, UVL (P. Schmitz); 3 ♂, 1 ♀, same locality, 20.iv.2002, UVL (B. Landry & L. Roque); 2 ♀ (one dissected, Slide Zajda '18. ♀ Geneve', CDRS), idem except (L. Roque & B. Landry). – *Santa Cruz*: 1 ♀, C[hables]D[arwin]R[esearch]S[tation], Arid zone, 17.i.1989,



FIGS 33, 34

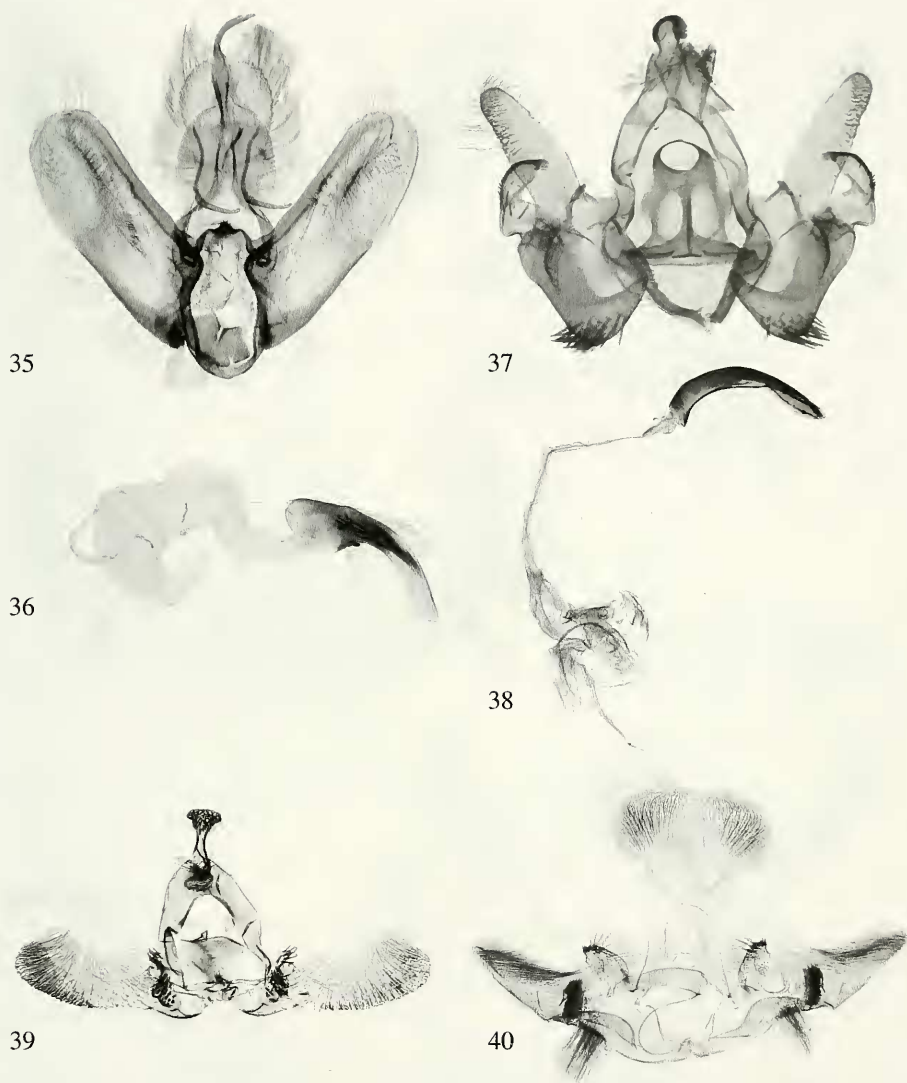
Adults of Galapagos Grapholitini and unknown Tortricidae. (33) *Dichrorampha galapagana*, holotype. (34) Unknown Tortricidae species, ♀, Isabela, 17.v.1992, MHNG.

MVL (B. Landry); 1 ♂, idem except 19.i.1989; 1 ♂, 2 ♀, idem except 3.ii.1989; 1 ♀, Tortuga Res[erve]., W S[an]ta Rosa, 6.ii.1989, MVL (B. Landry); 2 ♀, E[stacion].C[ientifica]. C[harles].D[arwin]., 4.iii.1992, MVL (B. Landry); 1 ♂, ECCD, El Barranco, 13.iii.2000, MVL Trap (L. Roque); 1 ♀, CDRS, wall of Invertebrates Lab, elev. 11 m, 19.iii.2004, UVL (B. Landry, P. Schmitz); 2 ♀ (one dissected, Slide MHNG ENTO 3610), ECCD, El Barranco, S 00° 44.291', W 90° 18.107', 22 m elev., 23.iii.2006, UVL (P. Schmitz); 2 ♀, Finca Vilema, 2 km W Bella Vista, 1.iv.1992, MVL (B. Landry); 1 ♂, Bahia Conway, 14.iv.1992, MVL (B. Landry); 1 ♀, CDRS, Barranco, 23.x.2001, UVL (L. Roque). – *Santiago*: 2 ♂, N side, GPS: 147 m elev., S 00° 12.186', W 90° 42.888', 2.iii.2005, UVL (P. Schmitz); 1 ♀, Bahia Espumilla, 4.iv.1992, MVL (B. Landry); 1 ♀, Central, 700 m elev., 9.iv.1992, MVL (B. Landry). Deposited in the BMNH, CDRS, CNC, MHNG, and ZMJU.

**DIAGNOSIS:** This is the only Neotropical species of the genus. The male is characterized by the broad valva and proximal part of the aedeagus, and the female, by the long, slender ductus bursae and the half-moon-shaped distal sclerite of the corpus bursae. From the other greyish brown species of Galapagos Tortricidae *Coniostola isabelae* can be separated by the small size and the speculum with two weak black spots dorsal to a bigger spot anterior to a small, oval white patch. In addition, the male has a distinctive patch of very small grey scales set close to each other at the base of the costa. The males of the other two described species of *Coniostola* have very similar genitalia, but their tegumen apparently is less broadly rounded apicodorsally and the aedeagus is less curved (Diakonoff, 1961, 1988). The male of *C. omistus* Diakonoff (1988), from Madagascar, has a long, narrow “streak of androconial scales” in the anal region, which is absent in the Galapagos species. The female of *C. omistus* is unknown, but that of *C. stereoma* (Meyrick, 1912), from India and the Seychelles, has a much narrower base of the ductus seminalis.

**DESCRIPTION:** Adult (Figs 31, 32). Wingspan 8.5 mm; head and thorax pale cream grey; labial palpus about 1.5 times diameter of eye. Ground colour of forewing grey suffused with cream at base, with yellowish brown along subcostal area; male with semi-oval patch of minute, grey scales on costa at base; distal half grey; speculum greyish cream distally with black inner spots and grey shades; anterior refractive line of speculum present; costal strigulae white, divisions dark greyish brown; dorsal patch



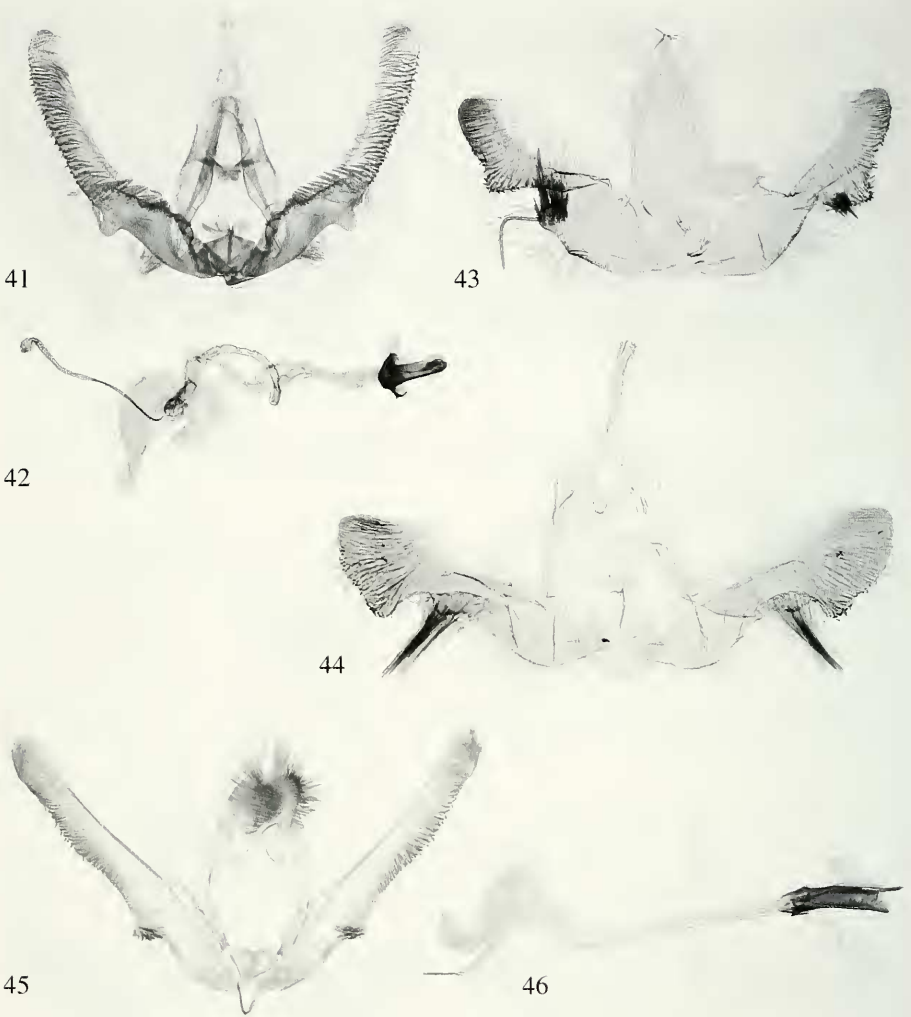


FIGS 35-40

Male genitalia of Galapagos Sparganothini, Bactrini, and Olethreutini. (35, 36) *Platynota colobota*: (35) Slide BL 1525, CNC; (36) Slide BL 1517, MHNG. (37, 38) *Bactra philoherda*, slide MHNG ENTO 3085. (39) *Endothenia eidolon*, slide W. Zajda No. 1 GALAP., CNC. (40) *Megalota johni*, holotype.

white suffused with grey, marked with dark grey lines; cilia grey. Hindwing whitish brown at base; veins and most of distal half brown; cilia grey-white.

*Variation*: Wingspan: 7-10 mm. Ground colour more or less dark, occasionally grey-brown or cream grey; suffusions grey to brown-grey; markings dark grey-brown consisting of basal blotch, median fascia often subdivided.

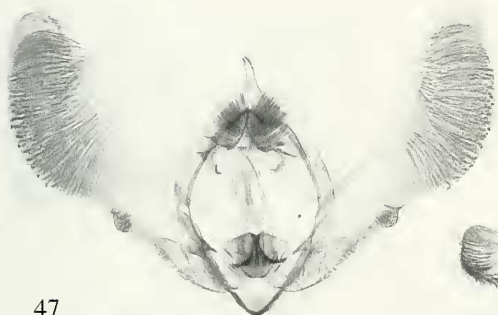


FIGS 41-46

Male genitalia of Galapagos Olethreutini. (41, 42) *Hedya bruneograpti*, paratype, slide BL 1237, CNC. (43) *Eccopsis galapagana*, paratype, slide W. Zajda No. 23 Landry, CDRS. (44) *E. floreana*, holotype. (45, 46) *Episimus transferranus*, slide MHNG ENTO 3082.

*Male genitalia* (Fig. 56): Top of tegumen broad; socii membranous; valva broad with weak ventral incision; cucullus elongate-ovoid; aedeagus long, broad proximally, slender, bent beyond zone.

*Female genitalia* (Fig. 73): Sterigma submembranous except for median portion formed by two weak sclerites; ductus bursae long, slender, sclerotized in proximal half; antrum ill-defined; base of ductus seminalis broad, originating from distal portion of corpus bursae, protected by half-moon-shaped sclerite; signa two, horn like.



47



48



49



50

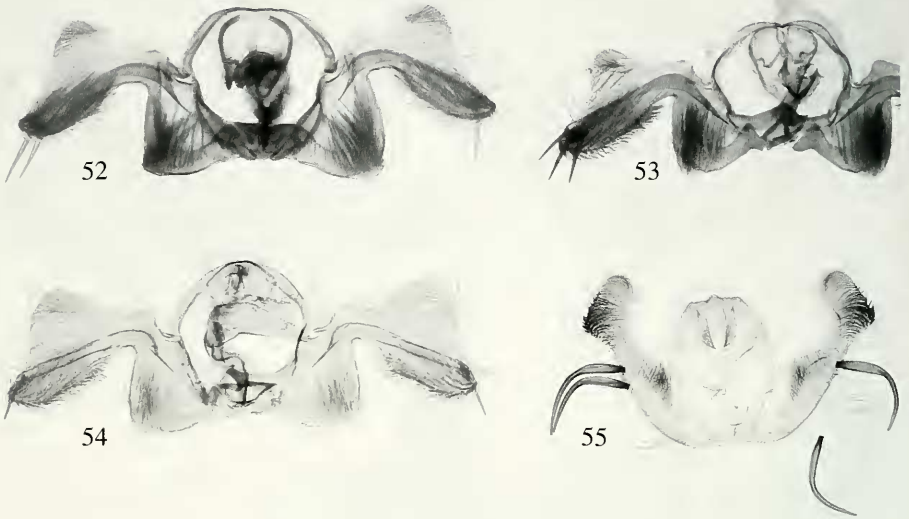


51

FIGS 47-51

Male genitalia of Galapagos Olethreutini and Eucosmini. (47) *Episimus alcedanus*, paratype, slide J. Baixeras No. 20262, CNC. (48) *Epinotia microscyphos*, paratype, slide J. Baixeras No. 20266, CNC. (49, 50) *E. lantana*, slide MHNG ENTO 3607. (51) *Strepsicrates smithiana*, slide W. Zajda No. 19 Geneve, CDRS.





Figs 52-55

Male genitalia of Galapagos Eucosmini. (52-54) *Crocidosema synneurota*: (52) Slide J. Baixeras No. 20267, CNC; (53) Slide MHNG ENTO 3070; (54) Slide MHNG ENTO 3072. (55) *Proteoteras atromacula*, holotype.

ETYMOLOGY: The species epithet refers to Isabela Island.

REMARKS: This rather commonly encountered species mostly inhabits lowlands, with the highest record at 570 m. The host plant is unknown. It has been collected mostly at light on nine islands, between January and May, and in October. Its two described congeners are known from Madagascar and the Oriental region (Brown, 2005).

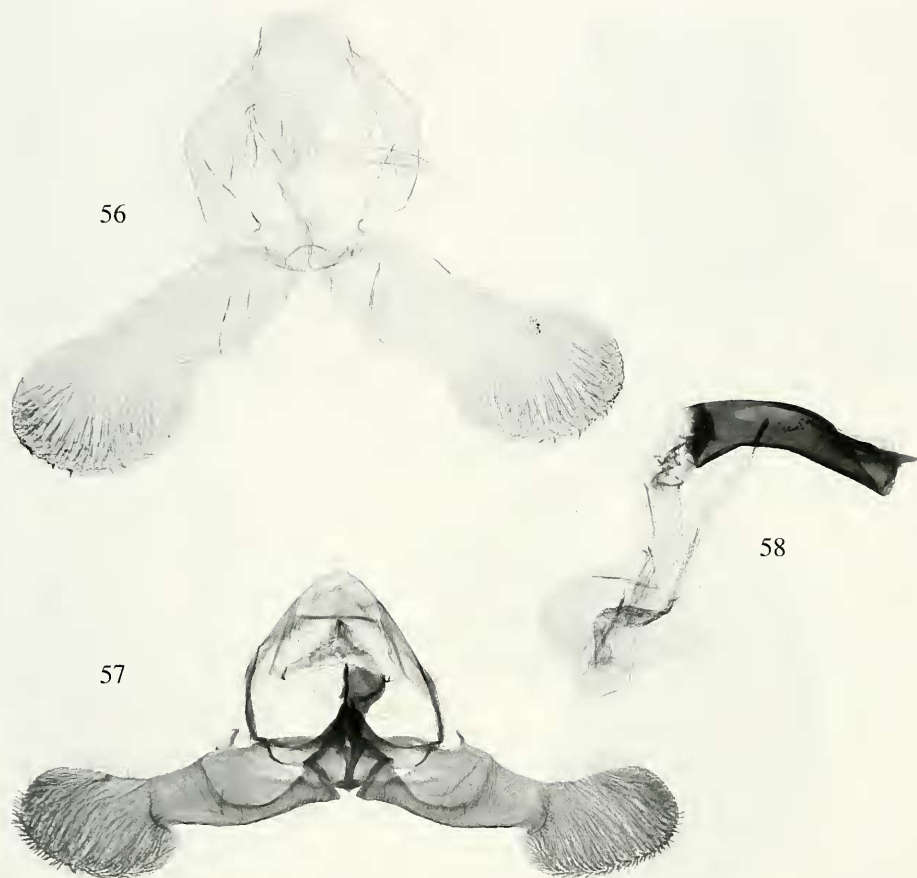
***Dichrorampha galapagana* Razowski & Landry, sp. n.**

Figs 33, 57, 58

MATERIAL EXAMINED: Holotype male: 'HOLOTYPUS' [orange, printed]; 'ECU.[ADOR] GALAPAGOS | Isabela, V[olcan]. Darwin | 300 m elev[ation]., 15.v.1992, M[ercury]V[apour] L[ight], leg[it]. B. Landry' [white, printed]; 'MHNG [ENTO] | Prép. micr. | No 3095 ♂' [white, printed except for 'MHNG, 3095', and '♂']; 'genitalia slide | BL 1239 ♂' [green, printed except for ♂]; 'Photograph [sic] | M. Kopec' [green, printed]; 'HOLOTYPUS | *Dichrorampha | galapagana* | Razowski & Landry' [red, handwritten]. Deposited in the MHNG.

Paratypes: 5 ♂ from the Galapagos Islands, Ecuador. – *Floreana*: 1 ♂ (dissected, MHNG [ENTO] 3077), Scalesias near Cerro Pajas, GPS: elev[ation]. 329 m, S 01° 17.743', W 90° 27.111', 12.iv.2004, U[ltra]V[iolet]L[ight] (P. Schmitz). – *Isabela*: 2 ♂, NE slope Alcedo, GPS: elev. 292 m, S 00° 23.829', W. 91° 01.957', 30.iii.2004, UVL (B. Landry, P. Schmitz); 1 ♂, same data as holotype; 1 ♂, V[olcan]. Alcedo, zona arida alta, 13.x.1999, UV-F[luorescent]L[ight] (L. Roque). Deposited in CDRS, MHNG, and ZMJU.

DIAGNOSIS: Related to *D. sarmentana* Zeller, 1877 from Colombia but differing in the strong dorsoterminal process and large terminal process of the aedeagus and the smaller ventral lobe of the cucullus. This species is easily separated from the other Galapagos Tortricidae by its dark grey-brown forewings with a pattern of slightly darker lines and 3-4 black terminal dots.



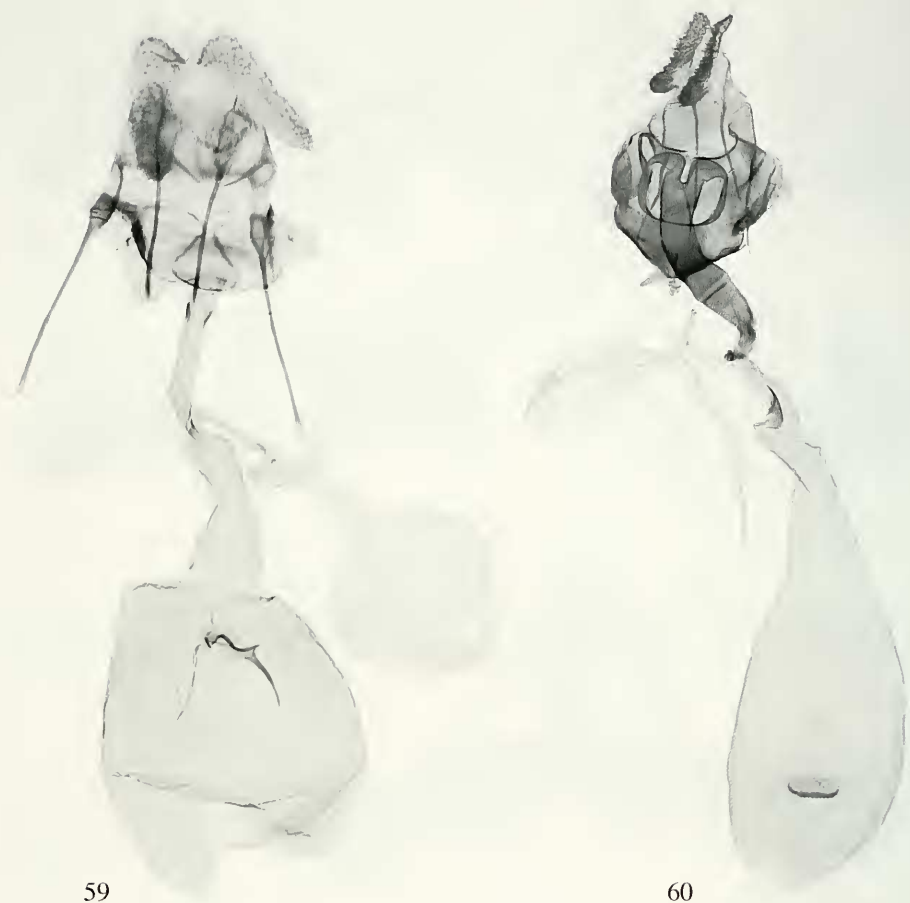
FIGS 56-58

Male genitalia of Galapagos Grapholitini. (56) *Coniostola isabelae*, paratype, slide W. Zajda No. 35 Geneve, CDRS. (57, 58) *Dichrorampha galapagana*, holotype.

**DESCRIPTION:** Adult (Fig. 33). Wingspan 13 mm. Head and thorax ash grey, median and posterior parts of tegula and median portion of thorax dark grey. Forewing ground colour grey suffused with ash grey basally; cream in distal part of costa and terminal third of wing; dorsal patch ash grey with grey lines; speculum tinged with cream followed by row of black terminal dots; without costal fold; cilia concolorous with suffusions, creamer basally. Hindwing brown; cilia greyish brown with darker short scales, especially toward apex.

**Variation:** Wingspan 11-13.5 mm. In some specimens forewing grey or olive grey with weak ash grey and whitish cream suffusions and small terminal part mixed with yellowish cream. There is also some variation in forewing breadth.

**Male genitalia** (Figs 57, 58): Tegumen with minute prominence dorsomedially; socii atrophied; neck of valva twice slenderer than base of valva, ventral incision



Figs 59, 60

Female genitalia of Galapagos Sparganothini and Bactrini. (59) *Platynota colobota*, slide BL 1518, CDRS. (60) *Bactra philochearda*, slide MHNG ENTO 3089.

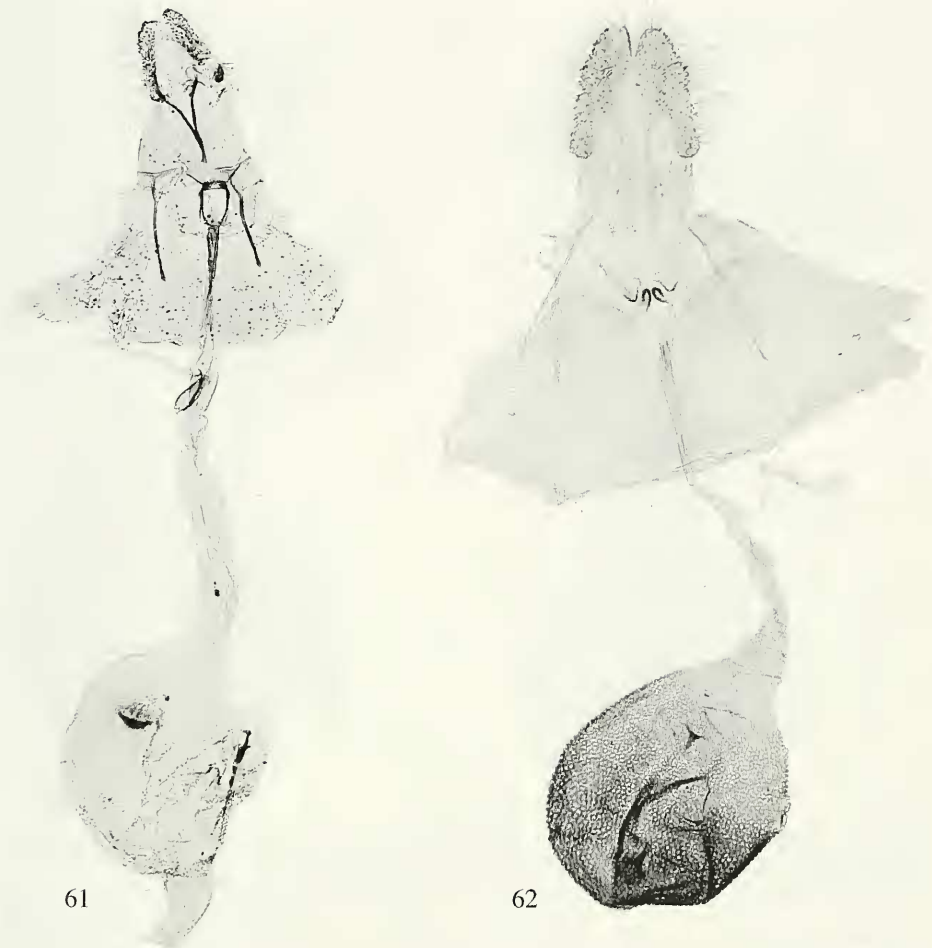
strong; cucullus oval, with broad ventral lobe; aedeagus short, uniformly broad, provided with simple or bifid dorsoterminal projection.

Female unknown.

ETYMOLOGY: Named after the Galapagos Islands.

REMARKS: This scarcely collected taxon probably has a wider distribution as it occurs on one of the oldest (Floreana) and one of the youngest (Isabela) islands of the archipelago. It is probably endemic, or at least native as it occurs in wild habitats on Isabela. The food plant is unknown.





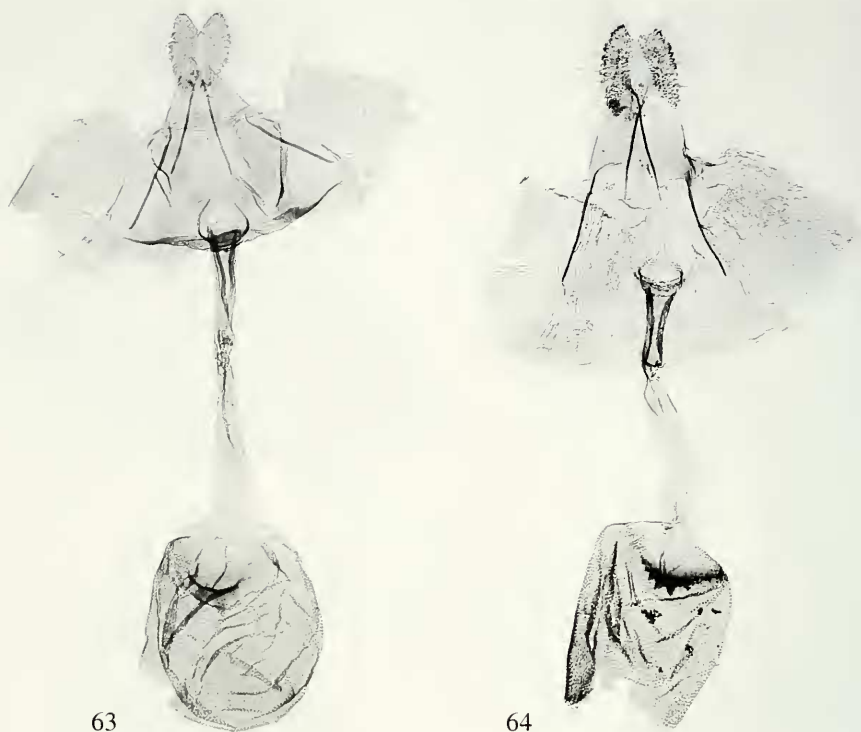
FIGS 61, 62

Female genitalia of Galapagos Bactrini and Olethreutini. (61) *Endothenia eidolon*, slide W. Zajda No. 6 Galapag., CNC. (62) *Hedyia brunneograptia*, paratype, slide W. Zajda No. 26 Geneve, CDRS.

## CONCLUSIONS

The generic composition of the Galapagos Tortricidae may be still incompletely known on the basis of the available material, but the taxa found so far revealed a few surprises.

First, there is a distinct disproportion between the species numbers of Tortricinae and Olethreutinae (Chlidanotinae have not been found in Galapagos at all). There is only one established member of Tortricinae Sparganothini, and three undetermined and apparently unestablished species of Tortricinae Euliini (*Anopinella* sp. and *Transtillaspis* sp.) and Cochylini (*Lasiothyris* sp.). This may depend on the vegetation. On the continent various types of forests dominate while in Galapagos the main plant



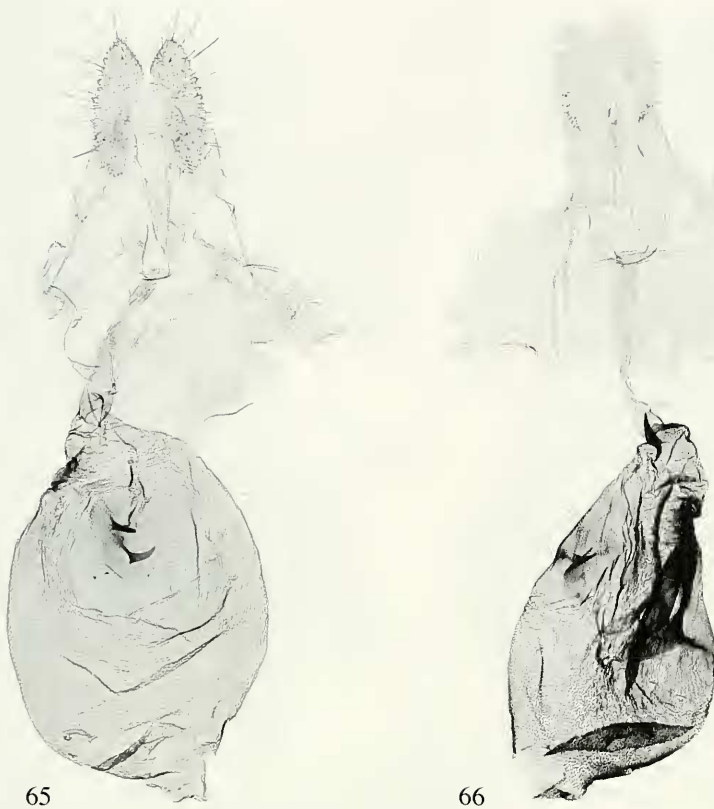
Figs 63, 64

Female genitalia of Galapagos Olethreutini. (63) *Eccopsis galapagana*, paratype, slide W. Zajda No. 20 Land., CDRS. (64) *E. floreana*, paratype, MHNG ENTO 3091.

formations on the low islands and the coastal areas are adapted to xeric conditions and include few low tree species and many Cactaceae. The open areas are more convenient to various groups of Olethreutinae, here represented by Bactrini (one species of *Bactra*, usually bound with wet biotopes, and one *Endothenia* of unprecised requirements); Olethreutini (6 species); Eucosmini (5 species); and Grapholitini (2 species). Our knowledge of the biology of the Tortricidae in the Neotropical region and in Galapagos is still poor. Thus any explanation for the paucity of Tortricinae on the Galapagos is at present impossible.

Second, the primarily Holarctic olethreutine genus *Endothenia* is now known to be more widely distributed in the Neotropics as its only South American species, *E. eidolon* Razowski & Pelz, 2002 is now found in the Galapagos.

Third, we describe the first species of *Megalota* Diakonoff, 1966 from the New World. The genus, described from the Oriental and Australian regions, then recorded from tropical Africa, is pantropical as mentioned by Horak (2006) based on a personal communication from J. W. Brown, who was the first to find *Megalota* in the Neotropics and is preparing a revision of the genus.



FIGS 65, 66

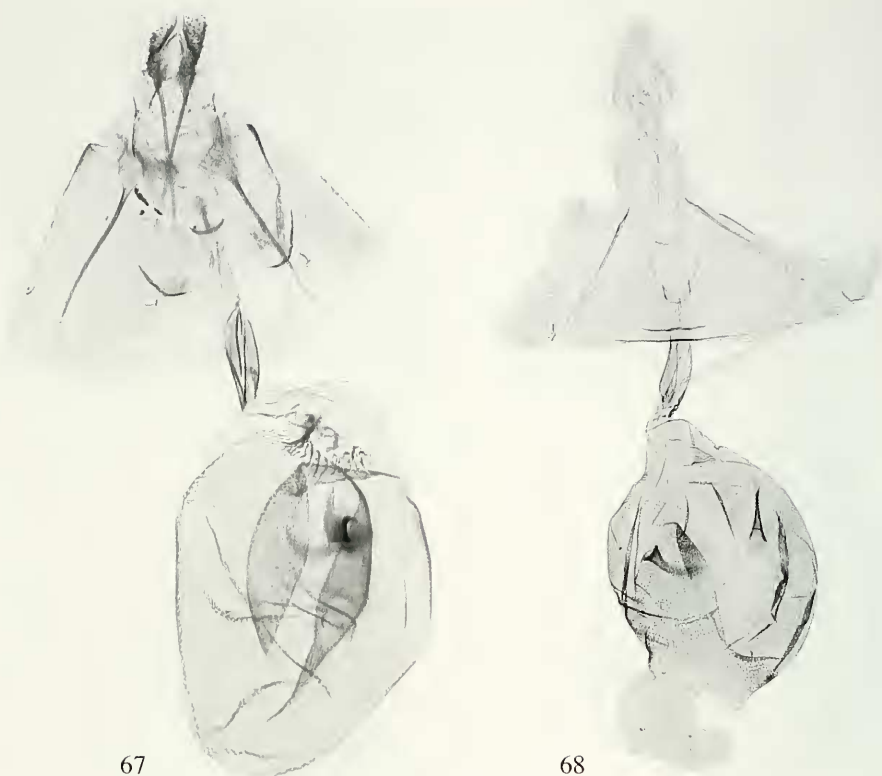
Female genitalia of Galapagos Olethreutini. (65) *Episimus transferranus*, slide MHNG ENTO 3080. (66) *E. alcedanus*, paratype, slide MHNG ENTO 3064.

Fourth, it was supposed that *Eccopsis* Zeller, 1852 was restricted to the Afrotropical region. However, its type-species, described from South Africa, was found also in Saudi Arabia (Diakonoff, 1983). Here we include in *Eccopsis* two Neotropical species (*galapagana*, *floreana*) based on characters of the genitalia despite some differences as mentioned under the Diagnosis of *E. galapagana* sp. n., above.

Fifth, regarding the cosmopolitan genus *Crocidosema* Zeller, 1847, many publications (cf. Clarke, 1958, 1963) suggest that it is represented in the Neotropics only by the Palearctic *C. plebejana* Zeller, 1847, its type species. The first author is of the opinion that there are some closely related species that show only slight differences to *plebejana* and that their synonymy (e.g. *C. piladelphina* Meyrick, 1917 and *C. synneurota* Meyrick, 1917) is incorrect.

Sixth, genus *Proteoteras* Riley, 1881 was until now known only from North America, where it is represented by eight species (Brown, 2005) of which the most southern representative is found in Florida, U.S.A. (*P. implicata* Heinrich, 1924). Thus, the new Galapagos species considerably extends the distribution of the genus.





FIGS 67, 68

Female genitalia of Galapagos Eucosmini. (67) *Epinotia lantana*, slide J. Baixeras No. 20268, CNC. (68) *E. microscyphos*, paratype, slide W. Zajda No. 25 Geneve, CDRS.

Finally, the Grapholitini genus *Coniostola* Diakonoff, 1961 known till now from one Madagascan and one Oriental species is also found in the Galapagos fauna.

Out of the 16 species of Tortricidae established on the Galapagos, 11 are believed to be endemic (or 68.75%). In total, including the introduced species, the endemism for all Galapagos microlepidoptera is 54%. For the Cosmopterigidae, Pterophoridae, and Pyralidae, the percentages of endemism are 78%, 53%, and 31.5% respectively. Thus, the percentage of endemism for the Galapagos Tortricidae is high. However, a better knowledge of the South American West Coast lepidopteran fauna will be necessary to obtain a more decisive picture of the true endemism of the Galapagos fauna, especially with regards to micro-moths.

### Check-list of the Galapagos Tortricidae

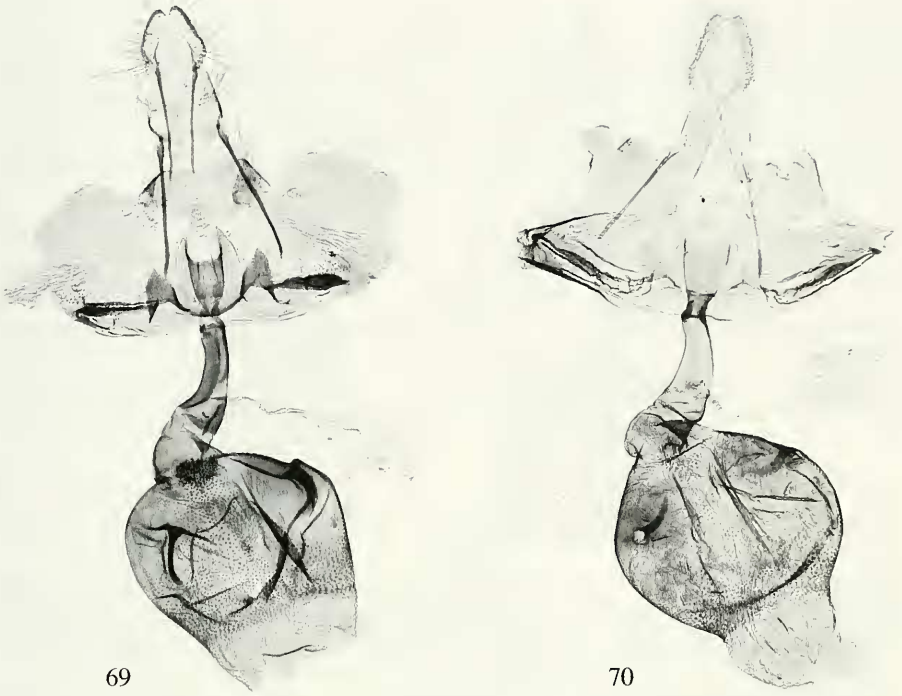
#### Sparganothini

*Platynota colobota* Meyrick, 1926

#### Bactrini

*Bactra philoherda* Diakonoff, 1964

*Endothenia eidolon* Razowski & Pelz, 2002



FIGS 69, 70

Female genitalia of Galapagos Eucosmini, *Crociosema synneurota*: (69) Slide MHNG ENTO 3068. (70) Slide MHNG ENTO 3073.

#### Olethreutini

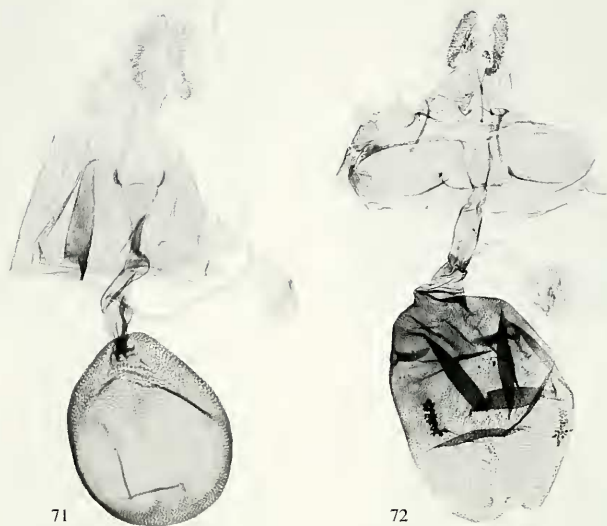
- Hedya brunneograpt* Razowski & Landry, sp. n.
- Eccopsis galapagana* Razowski & Landry, sp. n.
- Eccopsis floreana* Razowski & Landry, sp. n.
- Megalota johni* Razowski & Landry, sp. n.
- Episimus transferranus* (Walker, 1863)
- Episimus alcedanus* Razowski & Landry, sp. n.

#### Eucosmini

- Epinotia lantana* (Busck, 1910)
- Epinotia microscyphos* Razowski & Landry, sp. n.
- Crociosema synneurota* Meyrick, 1926
- Strepsicrates smithiana* Walsingham, 1892
- Proteoteras atromacula* Razowski & Landry, sp.n.

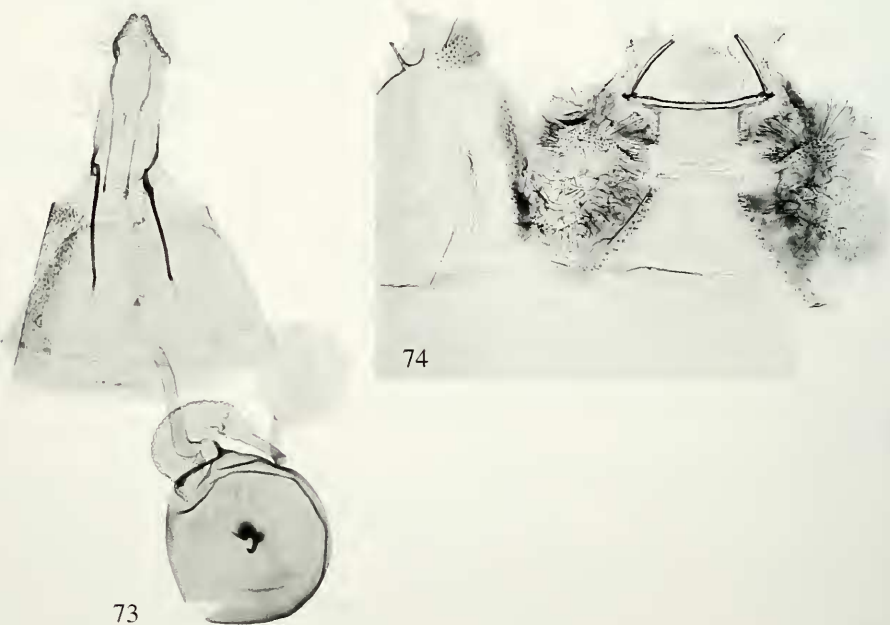
#### Grapholitini

- Coniostola isabelae* Razowski & Landry, sp. n.
- Dichrorampha galapagana* Razowski & Landry, sp. n.



FIGS 71, 72

Female genitalia of Galapagos Eucosmini. (71) *Strepsicrates smithiana*, slide J. Baixeras No. 20265, CNC. (72) *Proteoteras atromacula*, paratype, slide W. Zajda No. 8 Galapag., CNC.



FIGS 73, 74

(73) Female genitalia of *Coniostola isabelae* (Grapholitini), paratype, slide J. Baixeras No. 20269, CNC. (74) Base of abdomen of male *Epinotia lantana*, slide MHNG ENTO 3607.



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