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## The Pyraustinae (Lepidoptera, Pyralidae s. l.) of the Galápagos Islands, Ecuador

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**Abstract:** The Pyralidae Pyraustinae of the Galápagos Islands are diagnosed and illustrated and their biology and distribution are discussed. Of the five species recorded, three are considered as new and described: *Neohelvibotys hoecki* sp. n., *Pyrausta galapagensis* sp. n., and *Pyrausta insolata* sp. n.

**Keywords:** *Achyra* - Crambidae - *Neohelvibotys* - *Pyrausta* - new species - host plants.

### INTRODUCTION

The Pyraustinae form the fourth most species-diverse subfamily of Pyralidae s. l.; it is sometimes included in family Crambidae (= Crambiformes of Munroe, 1995). Pyraustinae are distributed worldwide, and while the world fauna includes 190 genera and 1413 species (Regier *et al.*, 2012), the Neotropical region is represented by 447 species in 35 genera (Munroe, 1995; Nuss *et al.*, 2014), with *Pyrausta* being the largest genus with 121 species in the Neotropical region (Munroe, 1995). The Pyraustinae form a strongly supported sister-group relationship with the Spilomelinae (Regier *et al.*, 2012), with which they were commonly grouped in the past. Diagnostic characters for Pyraustinae are the weakly bilobed praecinctorium, atrophied spinula and venulae, male forewing with a subcostal retinaculum, male mesothoracic tibia with a hair pencil in a longitudinal groove, male tegumen with parallel ridges, male valva almost always with a basally directed clasper often accompanied by one or more basally or dorsally directed lobes and conspicuous setae or erect scales, and female bursa almost always with a rhomboidal or mouth-shaped, spinulose, transversely keeled signum (Munroe, 1976; Regier *et al.*, 2012).

The Galápagos fauna of Lepidoptera contains close to 350 species (Roque-Albelo & Landry, 2014) and the Pyralidae compose the largest component of the fauna, with some 83 species recorded. As with the world fauna, the Pyraustinae of the Galápagos occupy the same fourth rank in terms of species diversity amongst Pyralidae s. l., albeit with only five species, treated below.

### MATERIAL AND METHODS

The material investigated here is deposited in the American Museum of Natural History, New York, New York, USA (AMNH), Natural History Museum, London, UK (BMNH), California Academy of Sciences, San Francisco, California, USA (CAS), Charles Darwin Research Station, Santa Cruz Island, Galápagos, Ecuador (CDRS), Carnegie Museum of Natural History, Pittsburgh, Pennsylvania, USA (CMNH), where the John S. Garth material was deposited, Canadian National Collection of Insects, Ottawa, Ontario, Canada (CNC), Museum of Comparative Zoology, Harvard University, Cambridge, Massachusetts, USA (MCZ), and “Muséum d'histoire naturelle de Genève”, Geneva, Switzerland (MHNG). The terminology of the structure of the genitalia follows Munroe (1976), except for the use of ‘phallus’ as recommended by Kristensen (2003). The host plant nomenclature follows Jaramillo Díaz & Guézou (2013). 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.

The previously described species are given additional descriptions of the sex and parts that were not treated in the original descriptions or elsewhere. The material examined for these species is given in alphabetical order of islands and within each island as for the paratypes of the new species, i.e. in chronological order of date of capture.

The photographs of the moths were taken in the MHNG with a Nikon D-800 digital camera and a Nikon Micro-Nikkor 105 mm lens. The images were modified in Photoshop or Photoshop Elements. Photographs of the genitalia were taken with a Leica DFC425 camera mounted on a Leica M205C dissecting scope and the Leica Application Suite, version 3.7.0. These photos

were then fused into one with maximal depth of field using Zerene Stacker Trial version Build 201305212130, with option Align & Stack All (PMax).

## TAXONOMY

### *Achyra* Guenée, 1849

Widespread across all major zoogeographical regions *Achyra* includes 18 species (Nuss *et al.*, 2014), 10 of which occur in the Neotropics (Munroe, 1995). The larvae feed on a variety of low plants, including some crops (alfalfa, beans, clover, cotton, strawberries, etc.) (Munroe, 1976). The moths have a conical frons and the male genitalia a narrowly triangular uncus, a juxta made of two separate plates connected ventrally, a clasper with a narrow spinulose process directed ventrally at middle or base of sacculus, and the sacculus with a blunt process or one or more dorsally directed spines at very base and a hump-like process adorned with radiating, dorsally directed setae beyond the clasper (Munroe, 1976).

### *Achyra eneanalis* (Schaus, 1923)

Figs 1-3, 17a-b, 22

*Pyrausta eneanalis* Schaus, 1923: 45, 46, fig. 21. – Linsley & Usinger (1966: 162).

*Loxostege eneanalis* (Schaus). – Capps (1967: 56, 57, figs 53, 101, 160, 161).

*Achyra eneanalis* (Schaus). – Munroe (1976: 46). – Munroe (1995: 55). – Roque-Albelo & Landry (2014). – Nuss *et al.* (2014).

**Material examined:** 16 ♂ (4 dissected), 34 ♀ (4 dissected) from the Galápagos. – *Española*: Bahía Manzanillo; Punta Suarez. – *Fernandina*: Cabo Douglas, S 00° 18.269', W 91° 39.098'; SW side, 352 m elev[ation]., S 00° 20.503', W 91° 36.969'; Punta Espinosa. – *Floreana*: close to Loberia, 6 m elev., S 01° 17.002', W 90° 29.460'; close to Las Palmas, 154 m elev., S 01° 17.049', W 90° 28.305'; Punta Cormoran. – *Gardner near Española*: NW side. – *Genovesa*: Bahía Darwin. – *Isabela*: Alcedo, lado NE, low arid zone, bosque palo santo; Alcedo, lado NE, 200 m [elev.], camp arida alta; Alcedo, NE slope, 292 m elev., S 00° 23.829', W 91° 01.957'. – *Marchena*: [no specific locality]. – *Pinta*: Plaja Ibbeston [sic]; arid zone; ± 15 m elev. – *Pinzón*: Playa Escondida, 14 m elev., S 00° 35.928' W 90° 39.291'. – *Plaza Sur*: 18 m elev., S 00° 34.980', W 09.990'. – *Rábida*: Tourist trail. – *San*

*Cristóbal*: P[uer]to Baquarizo [sic]; near Loberia, sea level, S 00° 55.277', W 89° 36.909'; near Loberia, 14 m elev., S 00° 55.149', W 89° 36.897'. – *Santa Cruz*: low agriculture zone, S 00° 42.132', W 90° 19.156'; casa L. Roque-Albelo & V. Cruz, 137 m elev., S 00° 42.595', W 90° 19.196'; transition zone, recently cut road, S 00° 42.528', W 90° 18.849'. – *Santiago*: Cerro Inn; La Bomba, 6 m elev., S 00° 11.151', W 90° 42.052'. – *Seymour Norte*: 17 m elev., S 00° 23.935', W 90° 17.369'. Deposited in BMNH, CDRS, CNC, and MHNG.

**Diagnosis:** In the Galápagos, this medium-sized species (14–20 mm wingspan) is unlike any other pyraloid moth by virtue of its grey colour and slightly darker faint pattern (Figs 1-3) that is sometimes obliterated. One unidentified *Udea* Guenée species (*Spilomelinae*) in the Galápagos is similar in size and sometimes almost without apparent pattern on the forewing, but its colour is brown and the paler hindwing has a pair of dark brown dots at about 1/3 below costa and medially.

**Biology:** One specimen from Fernandina (v.1975, G. M. Wellington, BMNH) was reared on '*Cacabus miersii*' (*Solanaceae*). The name of this plant taxon is now *Exodeconus miersii* (Hook. f.) D'Arcy. Widespread and endemic in the Galápagos, it is recorded on more than 13 islands of the archipelago in the coastal zone to the arid lowlands (McMullen, 1999; Jaramillo Díaz & Guézou, 2014). Moths have been collected between February and May, mostly near sea level, but also up to 352 m in elevation.

**Distribution:** This species is a widespread endemic to the Galápagos Islands. The type locality is Conway Bay, Santa Cruz Island. Schaus (1923) also reports it from South Seymour Island, nowadays more widely known as Baltra, and Tower, now Genovesa. I have examined or collected specimens from Española, Fernandina, Floreana, Genovesa, Isabela, Marchena, Pinta, Pinzón, Plaza Sur, Rábida, San Cristóbal, Santa Cruz, Santiago, and Seymour Norte.

**Remarks:** The original description did not take genitalia into account and the moth was illustrated in black and white. Capps (1967) added details to the external morphology description, described and illustrated the genitalia, and provided a black and white photograph of the moth. The male holotype deposited in the USNM (genitalia slide n° 107,347) was studied; the male genitalia of my specimens (Figs 17a-b) correspond perfectly although there is some apparent variation in

Figs 1-8. Adults of Galápagos Pyraustinae. (1-3) *Achyra eneanalis*. (1) ♀, Floreana, Punta Cormoran, 21.iv.1992, MHNG. (2) ♂, Isabela, Alcedo, lado NE, 200 m, camp arida alta, 18.iv.2002, MHNG. (3) ♀, Fernandina, SW side, 352 m elev., 10.ii.2005, MHNG. (4-6) *Neohelviobotys hoecki*. (4) ♂ holotype, CNC. (5) ♀ paratype, Santa Cruz, Tortuga Res., W Sta Rosa, 6.ii.1989, CNC. (6) ♂ paratype, Isabela, Alcedo, lado NE, 700 m, camp guayabillos, 16.iv.2002, MHNG. (7, 8) *Pyrausta panopealis*. (7) ♂, Santa Cruz, Los Gemelos, 4.v.2002, MHNG. (8) ♀, Isabela, 3 km N Sto Tomás, Agr. zone, 8.iii.1989, CNC.





the disposition and number of cornuti, but the vesica in its devaginated state was not investigated.

### *Neohelvitotys* Munroe, 1976

A New World genus containing eight species distributed from Maryland, USA, to Argentina (Munroe, 1976, 1995; Nuss *et al.*, 2014; Patterson *et al.*, 2014). It is recognized in the male genitalia by the narrowly triangular uncus, the absence of an oblique ridge sporting a row of dorsally directed, often scale-like setae medially on the valva, and a single clasper (Munroe, 1976). The immature stages are unknown.

### *Neohelvitotys hoecki* sp. n.

Figs 4-6, 18a-b, 23

**Material examined:** 32 ♂, 58 ♀.

Holotype: ♂, 'ECUADOR [sideways on left side] | GALÁPAGOS | S[an]ta Cruz, littoral | zone, Tortuga Bay | 29.I.1989, M[ercury]V[apour]L[ight] | B. Landry [leg.]'; 'HOLOTYPE | *Neohelvitotys* | hoecki | B. Landry'. Undissected. Deposited in the CNC.

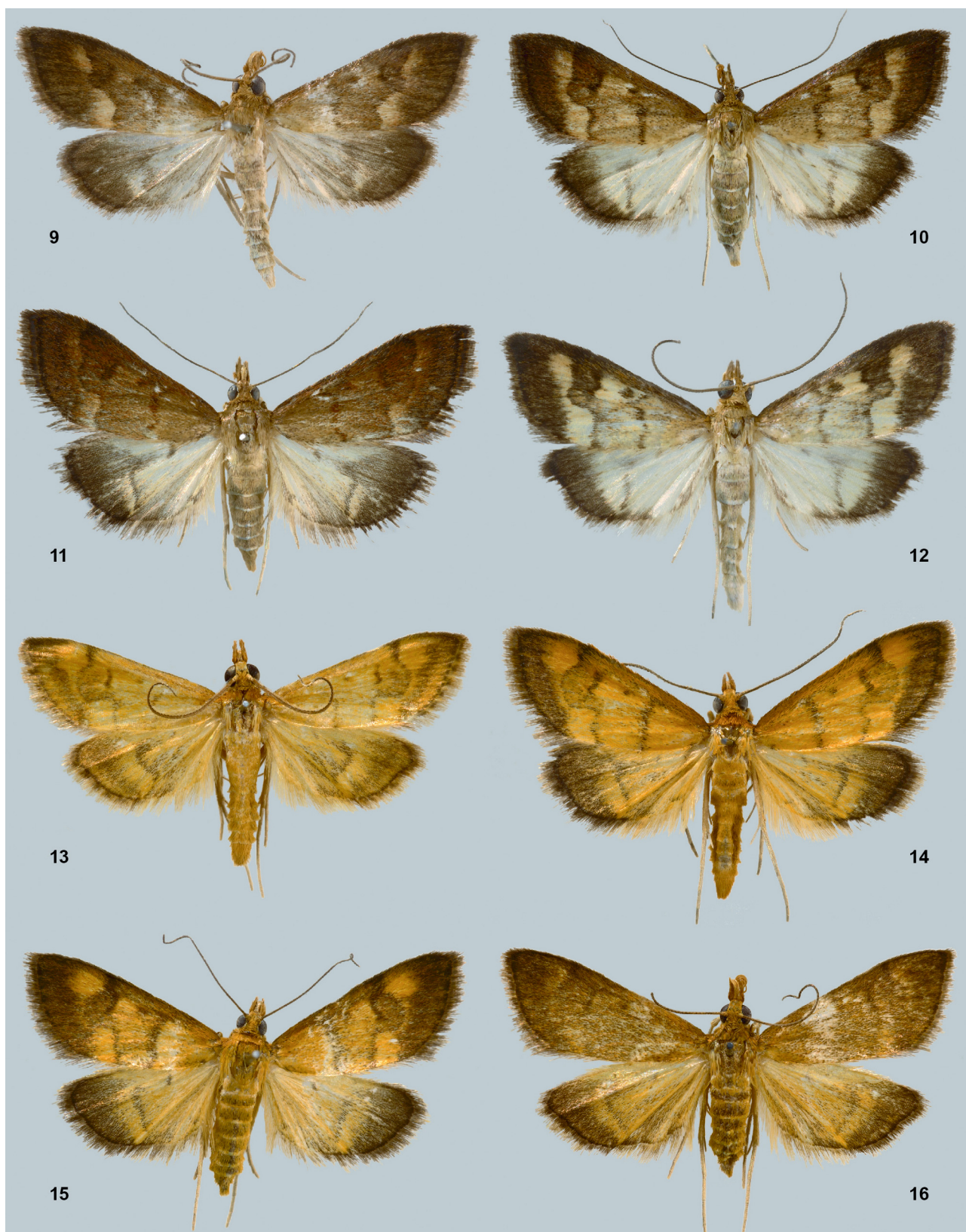
Paratypes: 31 ♂, 58 ♀ from the Galápagos Islands, Ecuador. – *Española*: 4 ♂, 13 ♀, Punta Suarez, 10-12. ii.[19]67, trap among *Lycium minimum*, *Prosopis doleis* and *Cryptocarpus pyriformis* (Gubarsbia) (I. L. Wiggins); 2 ♂ (one dissected, slide MCZ 913), 7 ♀, E side of peninsula at coast, N of summit, Alt. ± 2 m, 18.iv.[19]70 (R. Silberglied); 3 ♀, Bahía Manzanillo, 25.iv.1992, M[ercury]V[apour]L[ight] (B. Landry); 2 ♀, same data except 27.iv.1992; 1 ♀, Las Tunas Trail, 100 m elev[ation], 30.iv.1992, MVL (B. Landry); 1 ♀, Punta Suarez, 2.v.1992, MVL (B. Landry). – *Floreana*: 1 ♂, 1 ♀, Punta Cormoran, 21.iv.1992, MVL (B. Landry). – *Gardner near Española*: 2 ♀ (one dissected, slide MCZ 914), Gardner near Hood, NW Side, Alt[itude]. ± 10 m, 17.iv.[19]70 (R. Silberglied). – *Isabela*: 1 ♂, 11 km N Puerto Villamil, 9.iii.1989, MVL (B. Landry); 1 ♂, 1 ♀, 8.5 km N Puerto Villamil, 11.iii.1989, MVL (B. Landry); 1 ♂, Alcedo, lado NE, 700 m, camp guayabillos, 16.iv.2002, uvl (B. Landry, L. Roque); 1 ♀, Alcedo, lado NE, low arid zone, bosq[ue]. palo santo, 18.iv.2002, uvl (B. Landry, L. Roque); 1 ♀ (dissected, slide MHNG ENTO 8608), V[olcan]. Darwin, 300 m elev., 15.v.1992, MVL (B. Landry); 1 ♀, same data except 630 m elev., 16.v.1992; 1 ♂ (dissected, slide MHNG ENTO 8609), same data except 1000 m elev., 18.v.1992. – *Pinta*: 1 ♂ (dissected, slide MHNG ENTO 8611), Playa [sic] Ibbeston [sic], 13.iii.1992, MVL (B. Landry); 1 ♂, 1 ♀ (dissected, slide MHNG ENTO 6590), same data except 14.iii.1992; 1 ♀, same data except arid zone, 15.iii.1992; 1 ♀, Cabo Ibbeston, N 00°32.819', W 90°44.229', 8 m elev., 15.iii.2006, uvl (P. Schmitz, L. Roque); 1 ♀, 200 m elev., 16.iii.1992, MVL (B. Landry); 2 ♀, same data except 400 m elev., 17.iii.1992; 1 ♂, same data except

18.iii.1992. – *Pinzón*: 1 ♂, playa [sic] Escondida, u[ltra] v[iolet][light], 20.iv.2002 (B. Landry, L. Roque). – *San Cristóbal*: 2 ♂ (one dissected, slide BL 1801), 2 km SW P[uer]to Baquarizo [sic], 11.ii.1989, MVL (B. Landry); 1 ♂, 4 km SE Pto Baquarizo [sic], 12.ii.1989, MVL (B. Landry); 1 ♂, 1 km S El Progreso, 14.ii.1989, MVL (B. Landry); 1 ♂, pampa zone, 15.ii.1989, MVL (B. Landry); 1 ♂, Pto Baquarizo [sic], 17.ii.1989, MVL (B. Landry); 1 ♂, 1 ♀, base of Cerro Pelado, 22.ii.1989, MVL (B. Landry); 1 ♀ (dissected, slide MHNG ENTO 6589), near Loberia, GPS: elev. 14 m, S 00°55.149', W 89°36.897', 16.iii.2004, uvl (B. Landry, P. Schmitz); 1 ♀, Chatham Island, 18.iv.[19]32 (M. Willows Jr) (Templeton Crocker Exped[ition].); 1 ♀, Puerto Baquerizo Moreno, Wreck Bay, v.1975 (T. J. deVries, B.M. 1976–58); 1 ♀, Sappho Cove, Chath[am] Island]. – *Santa Cruz*: 1 ♂, Los Gemelos, 31.i.1989, MVL (B. Landry); 4 ♀, C[hables] D[arwin]R[esearch]S[tation], arid zone, 3.ii.1989, MVL (B. Landry); 2 ♂, 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 ♂, Conway Bay, 15.ii.[19]33; 1 ♂, Media Luna, pampa zone, 26.ii.1989, MVL (B. Landry); 1 ♂, 2 km W Bella Vista, 27.ii.1989, MVL (B. Landry); 1 ♀, casa L. Roque-Albelo & V. Cruz, GPS: 137 m elev., S 00°42.595', W 090°19.196', uvl, 27.ii.2005 (B. Landry); 2 ♂ (one dissected, MHNG ENTO 8610), E[stacion].C[ientifica].C[hables].D[arwin]., 4.iii.1992, MVL (B. Landry); 1 ♀ (dissected, slide BL 1792), Finca S[teve]. Devine, 17.iii.1989, MVL (B. Landry); 1 ♀, Bahía Conway, 14.iv.1992, MVL (B. Landry); 1 ♀, CDRS, Barranco, 20 m elev., 30.iv.2002, uvl (B. Landry); 1 ♂, Horneman Farm, 200 m, 28.vi.1965 (J. DeRoy); 1 ♀ (dissected, BM Pyr. Slide n° 21187), Indefatigable [Island], xii.1968 (B.M. 1969–17, Ref No. L. 44). Deposited in AMNH, BMNH, CAS, CDRS, CMNH, CNC, MCZ, and MHNG.

**Diagnosis:** In the Galápagos this species is most similar to *Loxomorpha cambogialis* (Guenée), which is also often yellow and roughly the same size, but differs externally by the conical frons and the hindwing pattern without the extra dot submedially. In details of the male genitalia this species resembles most closely *Loxostege subcuprea* (Dognin, 1906), stated by Munroe (1995) to be misplaced in this genus. However, the wings of this species are orange, without pattern except for the fuscous costa and apical margin of the forewing and most of the fringes of the hindwing (see Capps, 1967: 43, figs 61, 174).

**Etymology:** I take great satisfaction in naming this species in honour of Dr Hendrik Hoeck, former director of the Charles Darwin Station (1978-1980), founding member and president for 17 years, until 2014, of the Swiss Friends of the Galápagos Organization, for his exceptional dedicated work and devotion to the preservation of the fauna and flora of the Galápagos archipelago.





Figs 9-16. Adults of Galápagos Pyraustinae. (9-12) *Pyrausta galapagensis*. (9) ♂ holotype, CNC. (10) ♀ paratype, Santa Cruz, NNW Bella Vista, 225 m elev., 18.ii.2005, MHNG. (11) ♀ paratype, Isabela, NE slope Alcedo, 483 m elev., 31.iii.2004, MHNG. (12) ♂ paratype, same data as Fig. 10, MHNG. (13-16) *Pyrausta insolata*. (13) ♂ holotype, MHNG. (14) ♂ paratype, Isabela, NE slope Alcedo, 869 m elev., 2.iv.2004, MHNG. (15) ♀ paratype, Isabela, 3 km N Sto Tomás, Agr. zone, 8.iii.1989, CNC. (16) ♀ paratype, Pinta, 400 m elev., 17.iii.1992, MHNG.

**Description:** *MALE* (n=32): Head with frons projecting, conical, pale burnt orange, with white scales dorsally along margin of eye and around ocellus; antennae filiform, with flagellomeres slightly thickened, with ciliation dense, as long as 1/3 width of flagellomeres, dorsal scaling light golden, with white ventrally on scape; maxillary palpus burnt orange; labial palpus burnt orange dorsally and on whole of third segment, white ventrally on first and second segments; haustellum white. Thorax dorsally burnt orange at collar, progressively paler, yellowish gold, to yellowish white. Foreleg coxa, femur and tibia pale golden, tarsomeres paler, almost white; tibia slightly swollen, with greyish brown hair pencil from medial slit; outer spur about half as long as inner spur. Midleg pale golden, as on tarsomeres of foreleg, white laterally on tibia. Hindleg as midleg, but less evidently white on tibia laterally. Forewing length: 7.5-9.0 mm (holotype 7.5 mm); forewing colour (Figs 4, 6) burnt orange as band along costa, otherwise yellowish gold with rest of pattern made of slightly darker convex subbasal line from slightly before 1/3 costa to almost middle of inner margin, postmedian line from 3/4 costa, convex to cubital sector, bent straight toward base for short distance, then bent at right angle and ending almost straight into inner margin, also with short dash at apex of cell connecting with costal band, and terminal shading; fringe with shorter scales concolorous with terminal area of wing, longer scales slightly paler. Hindwing pale yellowish gold, with slightly darker postmedian band nearly from costa to the first anal vein, also with terminal shading; fringe as on forewing. Abdomen dorsally pale golden, with white row at apex of most segments; ventrally paler, almost white.

*Male genitalia* (n=6) (Figs 18a-b). Uncus elongate, about as long as tegumen dorsally, flattened, slightly concave, gently narrowing from base to narrowly rounded apex, with medium-sized setation dorsolaterally from 1/4 except along narrow midline; setae longer near middle and changing into thin spines, shortening toward apex. Subscaphium lightly sclerotized. Tegumen dorsally with more thickly sclerotized, H-shaped (with median bar postmedially situated) teguminal ridges projecting apically on each side of uncus base over connections with dorsolateral arms of uncus; laterally with ventral margin more thickly sclerotized, forming mediumly-rounded apical projection on each side. Valva with dorsal margin subbasally humped, after connection with transtilla, then straight; with medially bare, more thickly sclerotized band along costa narrowing to 2/3, with a few long setae and scales laterally; ventral margin straight to 1/10, then angled and shortly straight again, then only slightly projecting to broadly rounded apex, with few long setae especially toward base; clasper with ventral process simple, claw-like, at 1/3 length of valva, accompanied by short, more or less narrowly rounded basal lobe pointing toward costa of valva and set with short to long setae;

sacculus a low, broadly-rounded hump set with short setae. Transtilla thin, unsclerotized medially. Diaphragma ventrad from transtilla with patch of about 60 short setae on each side; with one separate seta closer to middle on each side at level of base of setose patches. Juxta short, slightly wider than long, with broadly rounded basal margin, laterally extending into short, thin projections, with apical margin broadly concave. Vinculum narrow, with short saccus. Phallus straight, slightly longer than tegumen + uncus, more thickly sclerotized on left side on basal half, with narrow sclerotized band from middle on left side running in diagonal dorsally toward apex, enlarging to 2 X wider, twisting sheath subapically and ventrally, ending in long, narrow hook curving upward laterally on right side and reaching dorsal margin of shaft; ventrally at apex with short, down-curved rounded 'lip'; coecum penis short, rounded; vesica with elongate (about 1/4 length of shaft) band of 35-40 thick and short cornuti, and smaller, more rounded patch of more or less conspicuous smaller cornuti situated slightly more basad in invaginated condition; ductus ejaculatorius forming about 12 coils.

*FEMALE* (n=58) (Fig. 5): Antenna thinner and less densely ciliate than male's. Forewing length: 7.0-9.0 mm. *Female genitalia* (n=5) (Fig. 23). Papillae anales narrow, curved (apically projecting dorsally and ventrally), abundantly setose on whole surface, with laterobasal sclerotized narrow band about twice as wide ventrally, not connecting either dorsally or ventrally; posterior apophyses thin, pointed, with short basal projection ventrally, about 2/3 length of papillae anales. Segment VIII of medium length, 4-5 X length of sclerotized band of papillae anales at level of apophyses, ventrally reducing in width, forming elongate triangle, not connected medially, with 6-8 short setae on each side dorsally; anterior apophyses about 1.6 X length of posterior apophyses, with short, narrowly triangular ventral projection at 1/4th of length from base. Lamella postvaginalis covered with spinules except along narrow midline, forming wide triangle across width of segment with cephalad margin slightly bent posterad; laterally and anteriorly from subbasal ventral projections of anterior apophyses with sclerotized band of medium width spinulose posteriorly. Antrum funnel-shaped, lightly sclerotized laterally, with sclerotized ridges extending into ductus bursae. Basal section of ductus bursae of medium girth, dorsally sporting flat, accessory sac about 1.5 X as long as width of ductus at its level, with sclerotized ridges ending at more heavily sclerotized, dorsally open collar of about 1/8 length of corpus bursae; subsequent section of corpus bursae a more or less triangular and thickly sclerotized widening which connects with ductus seminalis; final section of ductus bursae made of 6 coils of medium girth. Corpus bursae circular, not very large, apically (at bottom) with more or less thickly sclerotized small to medium-sized rounded signum with scobinations.



**Biology:** Unknown except for the nocturnal habits of the moths, which are attracted to light, and the diversity of habitats in which they fly, from sea level to 1000 m in elevation.

**Distribution:** Galápagos islands of Española, Floreana, Gardner near Española, Isabela, Pinta, Pinzón, San Cristóbal, and Santa Cruz.

**Remarks:** The species keys out as a member of *Neohelvibotys* in Munroe (1976). However, the key provided by Munroe mostly uses genitalia characters of the males, and this species does not entirely agree with the diagnosis (no formal description was given) of the genus with respect to the female genitalia. According to the diagnosis, the ostial chamber is large and the ductus seminalis does not form a broad arch with the ductus bursae as in *Achyra* and *Hahncappsia*. Also, the species of *Neohelvibotys* illustrated by Capps (1967) and Munroe (1976) have a small appendix bursae, absent in *N. hoecki*, while this species has an appendix (accessory sac) of the ductus seminalis, absent in the other species. Possibly this species is aberrant in female genitalia characters, when compared with the type species [*N. neohelvialis* (Capps)] and the other *Neohelvibotys* species for which the female genitalia are known, or the genera are yet improperly defined and need a phylogenetic analysis. I have checked all described species of *Achyra* Guenée, *Hahncappsia* Munroe, *Helvibotys* Munroe, *Neohelvibotys* Munroe, and species stated to be misplaced in *Loxostege* Hübner recorded from the Neotropical region by Munroe (1995) to make sure that this species was not already described. The dissected male and female MCZ paratypes from Española were dissected by Eugene G. Munroe in October 1983. The labels on the slide preparation of these specimens identify them as *Neohelvibotys* in Munroe's hand-writing.

### *Pyrausta* Schrank, 1802

A widely distributed genus comprising 284 species (Nuss *et al.*, 2014). The larvae web and often roll leaves, shoots, and flowers head of a variety of herbaceous plants, but most of the species were reared from Lamiaceae (Munroe, 1976). Three species occur in the Galápagos. The moths are generally small and slender and the valva of the male genitalia usually bears a single basally directed or recurved setose or scaled clasper (Munroe, 1976).

### *Pyrausta panopealis* (Walker, 1859)

Figs 7, 8, 19a-b, 24

*Rhodaria panopealis* Walker, 1859: 318.

*Pyrausta panopealis* Walker. – Munroe (1976: 111, 112, not illustrated). – Munroe (1983: 71) – Robinson *et al.* (1994: 179, pl. 29 fig. 19). – Shaffer *et al.* (1996: 189). – Peck *et al.* (1998: 227). – Munroe (1995: 57). – Heppner (2003: 275). – Causton *et al.* (2006: 141). – Roque-Albelo & Landry (2012). – Nuss *et al.* (2014). – Patterson *et al.* (2014).

**Material examined:** 14 ♂ (4 dissected), 16 ♀ (3 dissected). – *Isabela*: 3 km N S[an]to Tomás, Agriculture zone; 11 km N P[uer]to Villamil; NE slope Alcedo, near shore, GPS: elev[ation]. 9 m, S 00°23.619', W 90° 59.715'; NE slope Alcedo, GPS: elev. 292 m, S 00° 23.829', W 91° 01.957'; Alcedo, lado NE, camp arida alta, 200 m [elev.]; V[olcan]. Darwin, 300 m elev. – *Santa Cruz*: 4 km N Puerto Ayora; casa L. Roque-Albelo & V. Cruz, GPS: 137 m elev., S 00° 42.595', W 90° 19.196'; transition zone, recently cut road, GPS: S 00° 42.528', W 90° 18.849', [reared] from *Hyptis sidaefolia* leaves; low agriculture zone, GPS: 00° 42.132', W 90° 19.156'; Finca Vilema, 2 km W Bella Vista; Los Gemelos. – *Santiago*: N side, GPS: 437 m elev., S 00° 13.316', W 90° 43.808'; Cerro Inn; Bahía

### Key to the Galápagos species of *Pyrausta* Schrank

- 1 Forewing with orange spots or mostly orange; if forewing pattern obscured, then hindwing paler base with orange scaling; male genitalia with uncus of medium girth, with or without long setae along ventral margin of valva at base; female genitalia with colliculum of ductus bursae followed by distinctly enlarged section ..... 2
- 1' Forewing usually with mellow yellow markings; if forewing pattern obscured or with orange scaling, then hindwing paler base light yellow (Figs 9-12); male genitalia with narrow uncus and very long setae along ventral margin of valva at base; female genitalia with colliculum of ductus bursae followed by almost equally narrow section ..... *P. galapagensis* sp. n.
- 2 Forewing darker colour violet, with subapical orange marking extending along costa to apex; orange markings usually forming 4 spots, the median two sometimes converging into one; forewing base orange instead of darker violet, before postbasal line (Figs 7, 8); male genitalia with clasper distinctly spoon shaped; corpus bursae of female genitalia with appendix bursae ..... *P. panopealis* (Walker)
- 2' Forewing darker colour dark brown, with subapical orange marking not extending to apex along costa; orange more extensive, especially medially and at base, sometimes with dark brown reduced to lines (postbasal, postmedian, and subapical) and dash at end of cell, except in less common specimens with forewing entirely dark (Figs 13-16); male genitalia with clasper a simple, short, triangular sheet; corpus bursae of female genitalia without appendix bursae ..... *P. insolata* sp. n.



Espumilla; 200 m elev.; Aguacate, 520 m elev.; Central, 700 m elev.; Jaboncillo,  $\pm$  850 m elev. Deposited in CDRS, CNC, MHNG.

**Diagnosis:** In the Galápagos this small species can only be confused with *Pyrausta insolata* sp. n., but the key above will separate specimens of these two. Outside of Galápagos the species is most similar to *Pyrausta phoenicealis* (Hübner), but on average smaller (6–7 mm in forewing length), with wings lighter, more thinly scaled, the forewing with dark areas redder and light areas yellower, the hindwing lighter and not as red as the forewing, with the pale areas weakly contrasting and without a fulvous patch at base, the fringes with the basal parts yellow or with a few reddish scales and distal parts whitish, etc. (Munroe, 1976). The female hindwing is generally darker than that of the male because the lighter orange markings are smaller than those of the male.

**Biology:** *Hyptis capitata* Jacquin (Lamiaceae) was reported as a host plant in Puerto Rico (Munroe, 1976) and *Dicerandra frutescens* Shinnery and *Hyptis capitata* Jacquin (Lamiaceae) in Florida (Heppner, 2003). I have reared specimens from *Hyptis sidaefolia* (L'Hér.) Briq. (Lamiaceae) leaves on Santa Cruz Island. The moths are attracted to light and have been collected between the coastal zone and up to 850 m in elevation.

**Distribution:** Described from China, this species is widespread in the tropics of the world (Munroe, 1976). In the Galápagos I have collected specimens on the islands of Isabela, Santa Cruz, and Santiago. One specimen in the CDRS with a label stating '41' was associated with catalogue data stating '*Pyrausta phoenicealis*, Santa Cruz, Fernandina, Isabela, Santiago, Transition to humid zones, Feb[ruary], June, July, Dec[ember].'

**Remarks:** For the full synonymy pertaining to this taxon see Munroe (1976, or 1995). I confirm that the holotype deposited in the BMNH is a female. *Pyrausta panopealis* has been confused and synonymized with *Pyrausta phoenicealis* (Hübner, 1818) in some publications prior to Munroe (1976), who removed it from synonymy based on small differences (see Diagnosis). Later as well (see for example Guillermet, 2009, and Vári *et al.*, 2002), the species has been reported as *P. phoenicealis*, with *P. panopealis* in synonymy, although Munroe (1976) stated that *P. phoenicealis* 'seems to be confined to the southeastern part of the United States [of America]' and its type locality is Florida. I have decided to follow Munroe (1976, 1983, 1995) in considering that *P. panopealis* and *P. phoenicealis* are different taxa as he made the only available comparative study of the group and because there are DNA CO1 barcode unpublished data that seem to support the separation of the two species (J.-F. Landry, pers. comm.). The host

plant record of *Hyptis capitata* Jacquin (Lamiaceae) by Munroe (1976) is based on Schaus (1940) who reported the species as *P. phoenicealis* from Puerto Rico.

***Pyrausta galapagensis* sp. n.**

Figs 9–12, 20a–b, 25

**Material examined:** 7 ♂, 15 ♀.

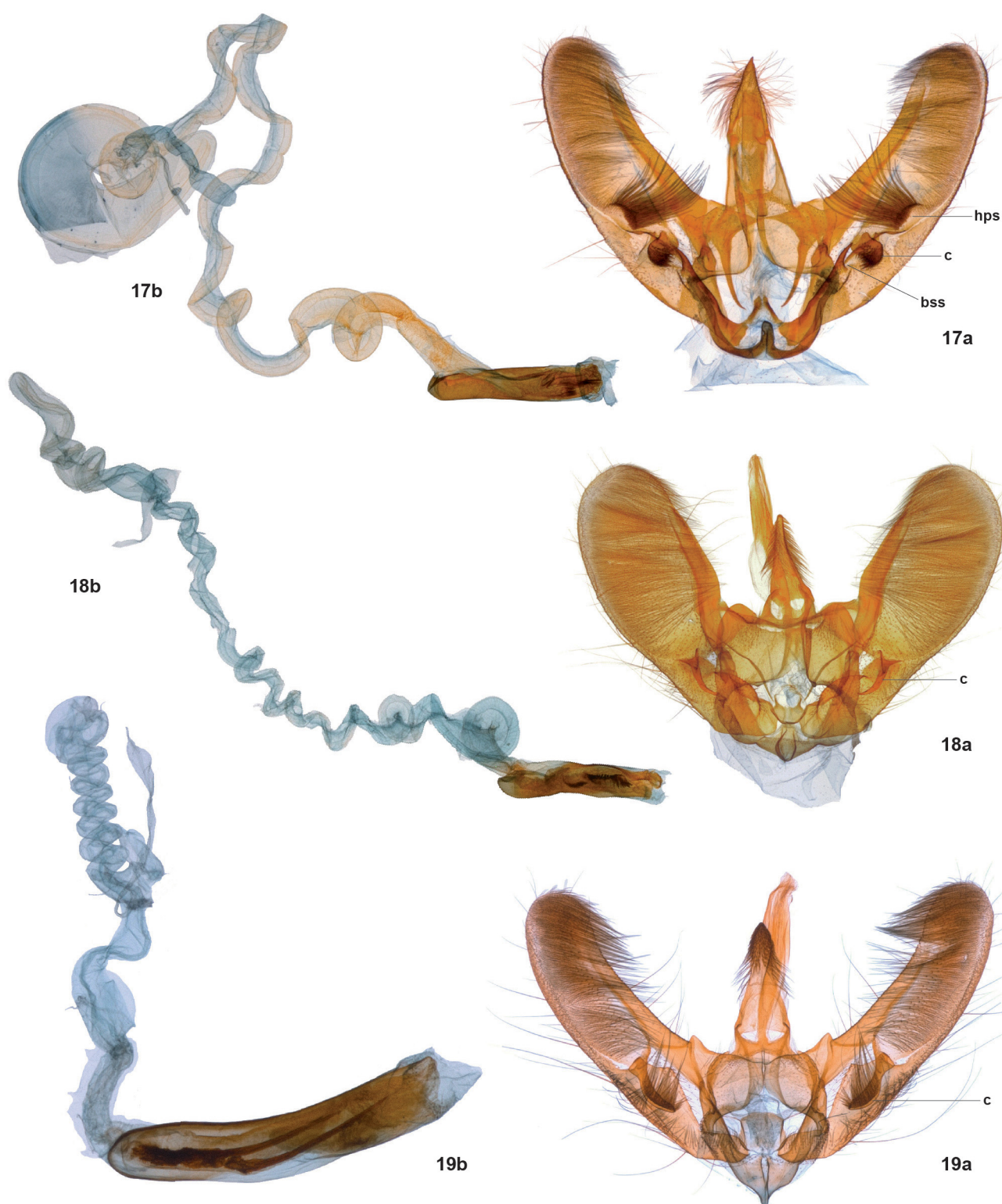
Holotype: ♂, 'ECUADOR [sideways on left side] | GALÁPAGOS | Isabela, 3 km N. | S[an]to Tomás, Agr[iculture] Zone | 8.III.1989, M[ercury]V[apour]L[ight] | B. Landry [leg.]'; 'HOLOTYPE | *Pyrausta* | galapagensis | B. Landry'. Undissected. Deposited in the CNC.

Paratypes: 6 ♂, 15 ♀ from the Galápagos Island, Ecuador. – *Floreana*: 1 ♂ (dissected, slide B.M. Pyralidae 21185), 1 ♀, Charles [Island], Asilo de la Paz, 360 m, i.1971, BM 1971–79, Ref. No. L-159. – *Isabela*: 1 ♂ (dissected, slide PYR 374), 1 ♀, same data as holotype; 1 ♀, NE slope Alcedo, near pega-pega camp, GPS: elev[ation]. 483 m, S 00°24.029', W 91°02.895', 31.iii.2004, u[ltra]v[iolet]l[ight] (B. Landry, P. Schmitz); 1 ♀ (slide MHNG ENTO 8622), NE slope Alcedo, ca. 400 m up (S) Los Guayabillos camp, GPS: elev. 892 m, S 00°24.029', W 91°04.765', 1.iv.2004, uvl (B. Landry, P. Schmitz); 1 ♂, 1 ♀, Alcedo, lado NE, 400 m, camp pega-pega, 15.iv.2002, uvl (B. Landry, L. Roque). – *Santa Cruz*: 2 ♀, Media Luna, pampa zone, 21.i.1989, M[ercury]V[apour]L[ight] (B. Landry); 1 ♀, casa L. Roque-Albelo & V. Cruz, GPS: 137 m elev., S 00°42.595', W 090°19.196', 17.ii.2005, day time (B. Landry); 2 ♂ (one dissected, slide MHNG ENTO 8620), 4 ♀ (one dissected, slide MHNG ENTO 8621), NNW Bella Vista, GPS: 225 m elev., S 00°41.293', W 090° 19.665', 18.ii.2005, uvl (B. Landry, P. Schmitz); 1 ♀, Los Gemelos, 4.v.2002, uvl (B. Landry, L. Roque); 1 ♂, 1 ♀, Indefatigable [Island], v.1970 (R. Perry & Tj. De Vries), B.M. 1970–371, Ref. No. L. 150; 1 ♀, same data except 'B.M. 1969–17'. Deposited in BMNH, CDRS, CNC, and MHNG.

**Diagnosis:** In forewing pattern and colour the paler specimens of this species are most similar to *P. deidamialis* (Druce), the lectotype of which is from Volcan Chiriqui, Panama. In male genitalia this new species differs from *P. deidamialis* in the distinctly narrower valvae and uncus, the spatulate clasper, and the three cornuti of the vesica. The female genitalia of *P. deidamialis* are unknown to me. In the Galápagos this species stands out from the other two *Pyrausta* species present, which have conspicuous orange scaling (see Key above).

**Etymology:** The name refers to the area of distribution, the Galápagos Archipelago.

**Description:** *MALE* (n=7): Head with frons slightly projecting, apically flat, burnt orange in middle, dark brown along the sides, with white band laterally from base of antennae to above frons and also ventral from



Figs 17-19. Male genitalia of Galápagos Pyraustinae, a and b always from same slide, but not to scale, a showing the genitalia without phallus and b, the phallus. (17) *Achyra eneanalis*: slide MHNG ENTO 8616, Fernandina. (18) *Neohelvibotys hoecki* paratype: slide MHNG ENTO 8610, Santa Cruz. (19) *Pyrausta panopealis*; slide CNC PYR 373, Santa Cruz. bss: basal spine of sacculus; c: clasper; hps: hump-like process of sacculus.

compound eye; antennae filiform, with ciliation dense, as long as  $1/3$  width of flagellomeres, with one single longer (half as long as corresponding flagellomere) seta dorsally on about first 10 flagellomeres, scaling mostly greyish brown, with some white, dark brown and burnt orange on scape and pedicel; maxillary palpus burnt orange or dark brown with few burnt orange scales; labial palpus burnt orange, sometimes with dark brown, on most of second segment and all of third, satiny white ventrally on second segment and all of first; haustellum light yellow to light orange and sometimes greyish brown. Thorax dorsally at collar burnt orange, sometimes with longitudinal darker lines on scales, to lighter royal yellow, progressively becoming lighter toward apex, sometimes with brown scales, dirty white to light yellow on thoracic segment III. Foreleg coxa light greyish brown with few burnt orange and dirty white scales; femur burnt orange; tibia dark greyish brown with white laterally and some burnt orange; tarsomeres light greyish brown, with some white at base of first tarsomere, progressively becoming darker greyish brown. Midleg coxa satiny white; femur light gold, with burnt orange and dark brown at tip; tibia dorsally at base with dark brown and burnt orange, progressively becoming paler toward apex, laterally satiny white; tarsus light gold with greyish white on last two tarsomeres. Hindleg coxa white, otherwise leg entirely light gold. Forewing length: 6.0-7.0 mm (holotype 6.0 mm); forewing colour (Figs 9, 12) dark brown on costa and second half of wing, more or less speckled with burnt orange, base of wing more mellow to light yellow toward dorsum; dark brown markings as submedian line straight from dorsum to base of cell where one or two more or less distinct dark brown spots may be present, postmedian line from dorsum straight to middle of wing where it curves externally to sometimes reach broad terminal band, and short bar at end of cell; mellow yellow markings as pair of spots or complete line from dorsum, but not reaching costa, bordering postmedian dark line, and in cell and sometimes below until dorsum; fringe with shorter basal scales dark greyish brown and longer scales lighter greyish brown. Hindwing base light yellow, often with dark brown spot submedially in median sector and straight line from median sector to anal sector postmedially, followed by light yellow before broad apical dark brown band; fringe as on forewing. Abdomen dorsally mostly light greyish brown speckled with light yellow or orange and with white line at apices of segments II-VII, although last two segments mostly light gold; ventrally light gold with some light greyish brown on sternites V-VII.

*Male genitalia* (n=3) (Figs 20a-b). Uncus elongate, about 1.6 X length of tegumen dorsally, flattened, very slightly down-turned, narrowing from base to about  $2/5$ , then parallel-sided until slightly pointed apex, with medium-length setation laterally from about middle to  $3/4$ , with short, thick setae from beyond middle dorsal-

ly until apex. Subscaphium lightly sclerotized, shorter than uncus. Tegumen short, dorsally with more thickly sclerotized teguminal ridges diverging apically and basally, without distinct median bar connecting them, but rather with scale-less area slightly shorter than teguminal ridges; laterally with more thickly sclerotized ventral margin slightly concave, with scaled area between it and teguminal ridges rounded, more thickly scaled toward dorsoapical margin. Valva narrow, with dorsal margin slightly humped at connection with transtilla, then slightly concave; medially bare and thickly sclerotized band along costa narrowing to  $2/3$ , with some moderately long thin setae and scales on dorsal edge; ventral margin straight at base, subbasally angled, then straight until rounded apex; medially with few short thin scales at base; laterally, next to ventral margin, and along ventral margin with about 10 moderately long to very long setae between  $1/10$  to  $1/3$ ; clasper directed basomedially, shaped like racquetball racquet, with mostly short and thick, apically unmodified setae, but also a few longer ones mostly along apical and lateral margins; sclerotized plate before clasper medially forming broad, low triangle with short, narrow, rounded point set with about 10 short setae; sacculus unmodified. Transtilla thin, unsclerotized medially. Diaphragma ventrad from transtilla with patch of about 10 medium-length setae on each side. Juxta short, quadrangular, almost completely flat, with low depression medially, with apical margin projecting and medially with short v-shaped cut, with basal margin at each angle with short, rounded projection. Vinculum narrow with short saccus apically narrowly rounded. Phallus an almost straight tube, about 10% longer than tegumen + uncus, basal half thickly sclerotized only ventrally; coecum penis absent; vesica with three cornuti: longest half as long as phallus shaft, second  $3/5$  length of longest, third  $2/5$  length of longest; ductus ejaculatorius forming one coil distally.

*FEMALE* (n=15) (Figs 10, 11): Antenna thinner than that of the male. Forewing length: 6.5-7.5 mm.

*Female genitalia* (n=2) (Fig. 25). Papillae anales short, slightly convex, moderately setose, with short to moderately long setae mostly along basal (in one line) and apical margins; cuticle covered with spinules, with laterobasal sclerotized band narrow, wider at bases of apophyses, not connecting either ventrally or dorsally; posterior apophyses long and thin, without ventral projection at base, about 1.5 X width of papillae anales. Segment VIII short, 2 (ventrally) – 3 (dorsally) X length of sclerotized band of papillae anales at level of apophyses, ventrally not connected in middle, with few short to medium-length setae mostly along apical margin and dorsally, covered with spinules; anterior apophyses about 0.85X length of posterior apophyses, with dorsal, triangular enlargement at about  $1/4$ . Membrane unspecialized around ostium bursae. Ductus bursae with membranous and spinulose funnel-shaped antrum about  $1/5$  of total length, followed by shorter colliculum devoid of spinules, followed by



short membranous lateral extension and constriction abundantly adorned with thick spinules, followed by sclerotized and ridged wider section devoid of spinules and about 1/3 length of whole structure, with lateral rounded projection at base, followed by membranous, narrower, ridged and bent section devoid of spinules and slightly enlarging into corpus bursae. Ductus seminalis connecting between second sclerotized section of ductus bursae and next. Corpus bursae circular, with spinules either single or in rows of 2-6 except distad of signum; signum very large, shaped like closed pair of thick, stylized human lips, with two low crests directed internally on each side of middle along midline, which thus appears more thickly sclerotized, with perpendicular scale-like extensions from middle, and with thick, short spines directed internally; with accessory sac about half of size of corpus bursae, devoid of spinules.

**Biology:** Unknown except that moths are attracted to light and that the species seems to prefer habitats situated at medium (225 m) to high elevations, up to the pampa zone.

**Distribution:** Galápagos Islands of Floreana, Isabela, and Santa Cruz; probably endemic.

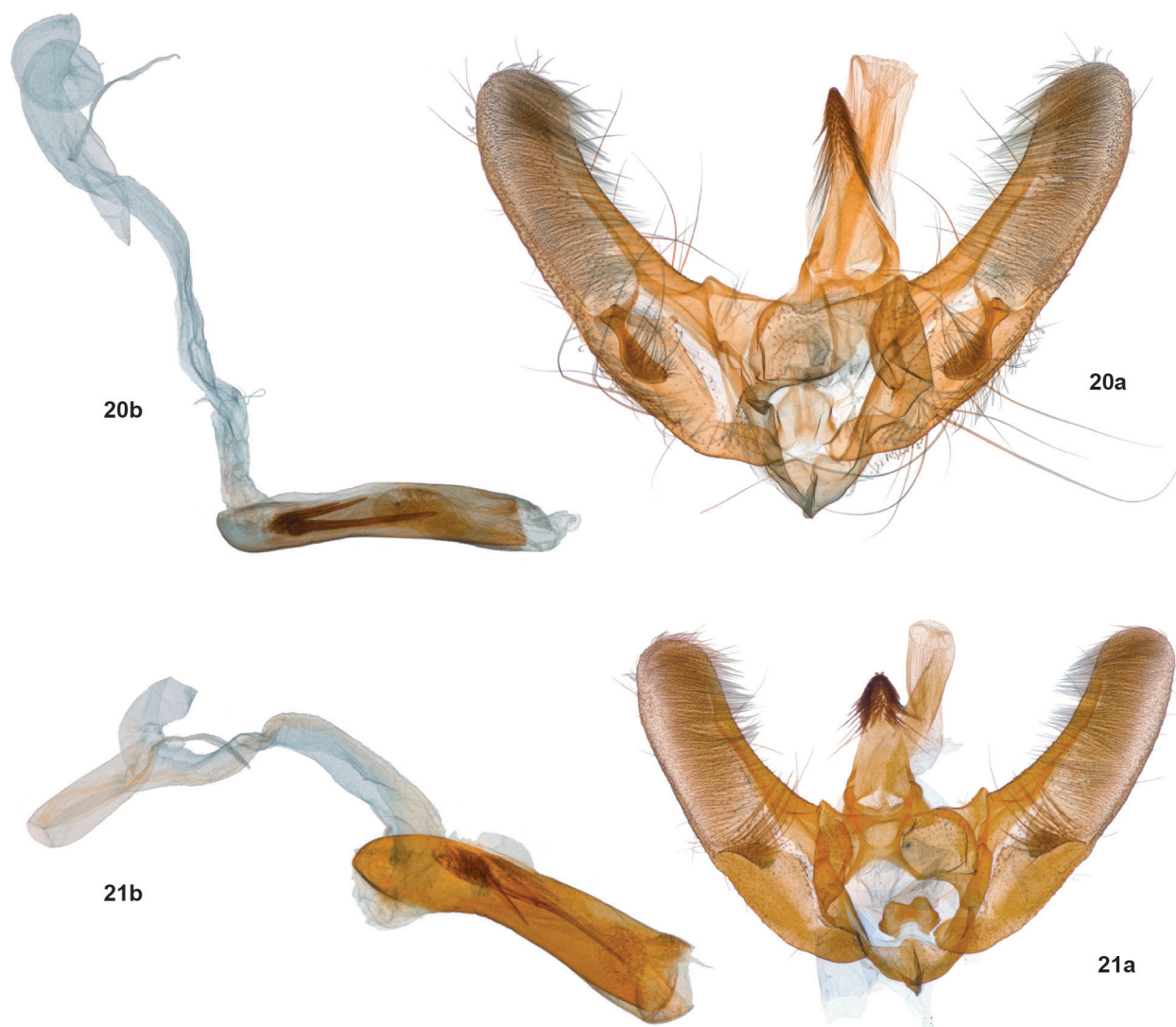
**Remarks:** The females are often darker than males. The colour definitions are partly from Wikipedia.

***Pyrausta insolata* sp. n.**

Figs 13-16, 21a-b, 26

**Material examined:** 26 ♂, 21 ♀.

Holotype: ♂, 'ECU[ADOR]., GALÁPAGOS | Pinta, 17.iii.1992 | 400 m elev[ation]., M[ercury]V[apour] L[ight] | leg[it]. B. Landry'; 'HOLOTYPE | Pyrausta |



Figs 20-21. Male genitalia of Galápagos *Pyrausta* species paratypes, a and b from same slide, but not to scale, a showing the genitalia without phallus and b, the phallus. (20) *P. galapagensis*: slide CNC PYR 374, Isabela. (21) *P. insolata*: slide MHNG ENTO 8628, Santiago.

insolata | B. Landry'. Undissected. Deposited in the MHNG.

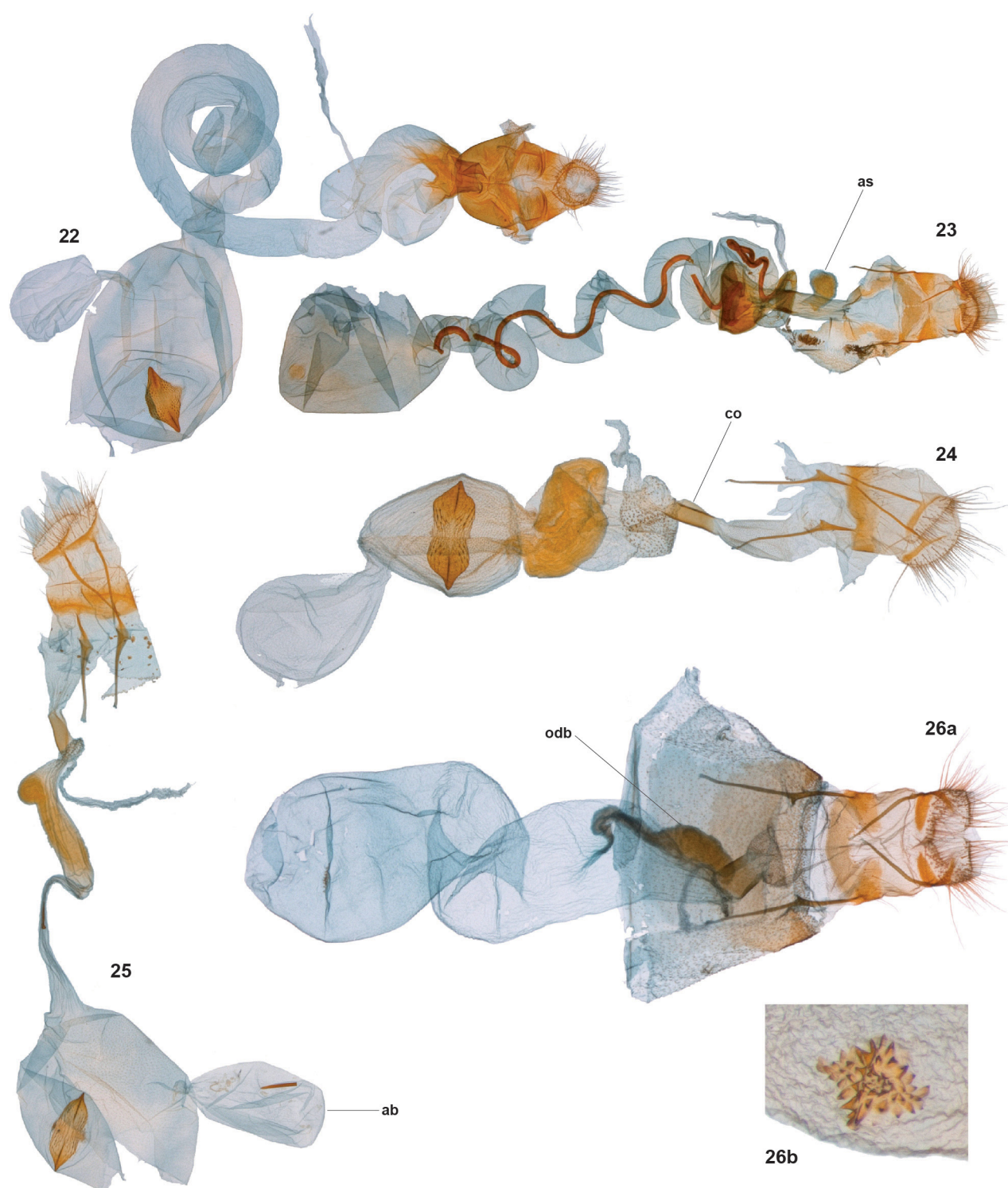
Paratypes: 25 ♂, 21 ♀ from the Galápagos Island, Ecuador. – *Fernandina*: 1 ♂ (dissected, slide MHNG ENTO 8631), SW side, GPS: 815 m elev[ation], S 00° 21.270', W 091° 35.341', 11.ii.2005, u[ltra]v[iolet][light] (B. Landry, P. Schmitz); 1 ♂, SW side, crater rim, GPS: 1341 m elev., S 00° 21.910', W 091° 34.034', 12.ii.2005, uvl (B. Landry, P. Schmitz); 1 ♂, same data except 13.ii.2005; 1 ♂, [no precise locality], iii.1970 (Perry & de Vries). – *Isabela*: 3 ♀ (one dissected, slide PYR 372), 3 km N S[an]to T[ó]mas, Agr[iculture]. Zone, 8.iii.1989, M[ercury]V[apour]L[ight] (B. Landry); 2 ♂ (one dissected, slide PYR 353), 1 ♀, 11 km N Puerto Villamil, 9.iii.1989, MVL (B. Landry); 3 ♂ (one dissected, slide MHNG ENTO 8632), 1 ♀, NE slope Alcedo, ca. 400 m up (S) Los Guayabillos camp, GPS: 892 m elev., S 00° 25.208', W 91° 04.765', 1.iv.2004, uvl (B. Landry, P. Schmitz); 1 ♂, 1 ♀, NE slope Alcedo, Los Guayabillos camp, GPS: 869 m elev., S 00° 24.976', W 91° 04.617', 2.iv.2004, uvl, 4h00-5h30 (B. Landry, P. Schmitz); 1 ♂, 1 ♀, Alcedo, lado NE [side], 400 m [elev.], camp pega-pega, 15.iv.2002, uvl (B. Landry, L. Roque); 1 ♂, 1 ♀, Alcedo, lado NE, 700 m [elev.], camp guayabillos, 16.iv.2002, uvl (B. Landry, L. Roque); 1 ♀, Alcedo, lado NE, 1100 m [elev.], cumbre [summit], caseta Cayot [cabin], 17.iv.2002, uvl (B. Landry, L. Roque); 3 ♀, V[olcan]. Darwin, 630 m elev., 17.v.1992, MVL (B. Landry); 1 ♂, ± 15 km N Pto Villamil, 25.v.1992, MVL (B. Landry); 2 ♂, Sierra Negra, Corazon Verde, xi-xii.1974 (T.J. De Vries, B.M. 1976–58). – *Pinta*: 1 ♂, 372 m elev., 16.iii.2006, N 00° 34.476', W 90° 45.102', uvl (P. Schmitz, L. Roque); 1 ♂, 1 ♀ (dissected, slide MHNG ENTO 8629), 200 m elev., 16.iii.1992, MVL (B. Landry); 2 ♂, 3 ♀, same data as holotype; 1 ♂, 400 m elev., 18.iii.1992, MVL (B. Landry); 2 ♂ (one dissected, slide BL 1248), 400-650 m elev., day (B. Landry). – *Santa Cruz*: 2 ♀, Tortuga Res[erve]. W S[an]ta Rosa, 6.ii.1989, MVL (B. Landry). – *Santiago*: 1 ♂, N side, GPS: 437 m elev., S 00° 13.316', W 90° 43.808', 3.iii.2005, uvl (P. Schmitz); 1 ♂ (dissected, slide MHNG ENTO 8628), 1 ♀ (dissected, slide MHNG ENTO 8630), NE side, close to caseta, GPS: 686 m elev., S 00° 14.177', W 90° 44.619', 6.iii.2005, uvl (P. Schmitz); 1 ♂, 1 ♀ (dissected, B.M. Pyralidae slide 21186), (James), vii.1970 (B.M. 1970-567, Ref. No. L 159); 1 ♀, (James), Bahia Bucanero, iv.1974 (B.M. 1975-7, Ref. No. L [blank]). Deposited in BMNH, CDRS, CNC, and MHNG.

**Diagnosis:** This species is most similar to *Pyrausta insignitalis* (Guenée), *P. onythesalis* (Walker) and *P. pseudonythesalis* Munroe, but it resembles the former more in habitus by virtue of the predominance of orange colouration. In male genitalia (see Munroe, 1976, pl. J fig. 6 for a photo of the male genitalia of *P. insignitalis*), the new species differs in the shorter and broader uncus, absence of a thin projection of the clasper, and sclerotized plate before clasper without dorsal

projection. In female genitalia the new species differs especially in the wide and singly coiled ductus bursae. In the Galápagos this species is most similar to the other two *Pyrausta* species recorded and the key presented above will separate the three.

**Etymology:** From Latin, meaning 'exposed to the sun'; in reference to the colour of the moths and the fact that the species being present on the equatorial Galápagos archipelago indeed receives a lot of sunshine.

**Description:** *MALE* (n=26): Head with frons slightly projecting, apically slightly rounded (not quite flat), orange except for few whitish yellow scales at base of antenna; antennae filiform with ciliation dense, as long as 2/3 width of flagellomeres, with one single longer (2/3 as long as corresponding flagellomere) seta dorsally on about first 10 flagellomeres, scaling orange on scape and pedicel, greyish brown to whitish grey on flagellum; maxillary palpus greyish orange; labial palpus orange, with paler whitish yellow scales ventrally on first segment and burnt orange dorsally on second segment and apically on third; haustellum light orange. Thorax dorsally orange to light burnt orange at collar and bases of patagia, sometimes with light brown, orange in middle and slightly lighter orange on thoracic segment III. Foreleg coxa light golden to light orange; femur as coxa, with orange at tip; tibia greyish brown with light golden laterally and at tip; tarsomeres light golden and greyish brown dorsally. Midleg coxa whitish golden; femur light golden with orange at tip; tibia orange dorsally with light greyish brown at base and dorsally on spurs, light golden elsewhere; tarsomeres light golden with light greyish brown at base of first tarsomere. Hindleg light golden with light orange on tibia dorsally and light greyish brown on tarsomeres dorsally. Forewing length: 6.0-7.0 mm (holotype 7.0 mm); forewing colour (Figs 13, 14) mostly orange, with dark brown on costa as fine line, complete submedian slightly convex line, sometimes one small spot at base of cell, one distinct straight bar at end of cell usually associated with more or less intense suffusion between bar and terminally bulging section of postmedian line, small triangle on costa at postmedian line, straight subterminal line often with small indentations at CuA<sub>1</sub> and M<sub>1</sub>, often fused with terminal brownish black spots at apices of veins to form wider terminal band, sometimes whole wing with heavier suffusion and broad costal band (Figs 15, 16); fringe with basal scales forming pale orange and greyish brown spots alternately or mostly dark greyish brown in darker specimens, longer scales pale greyish brown. Hindwing orange with dark brown markings as small spot in cell, postmedian line, subterminal band often fused with terminal band, and suffusion usually between CuP and 2A up to middle of wing; fringe similar to that of forewing. Abdomen dorsally uniformly orange or with greyish brown on segments I-V in darker



Figs 22-26. Female genitalia of Galápagos Pyraustinae. (22) *Achyra eneanalis*: slide MHNG ENTO 8617, Fernandina. (23) *Neohelvibotys hoecki* paratype: slide BL 1792, Santa Cruz, CNC. (24) *Pyrausta panopealis*: slide MHNG ENTO 8624, Santiago. (25) *P. galapagensis* paratype: slide MHNG ENTO 8621, Santa Cruz. (26) *P. insolata*: a- slide CNC PYR 372, Isabela; b- signum, slide BM Pyralidae n° 21186, Santiago. ab: appendix bursae; as: accessory sac; co: colliculum; odb: outgrowth of ductus bursae.



specimens, ventrally light golden, with light orange on distal segment in darker specimens.

**Male genitalia** (n=5) (Figs 21a-b). Uncus stout, about 1.6 X length of tegumen dorsally, flattened and straight in lateral view, with dorsal margin apically down-turned, with lateral margins gently converging to mediumly rounded apex, with 1-2 long setae dorsolaterally near middle, apical third covered with medium-length to short thickened setae decreasing in size towards apex. Subscaphium with narrow, lightly sclerotized ventral margin reaching apex of uncus. Tegumen short, dorsally with more thickly sclerotized teguminal ridges diverging apically and basally, H-shaped, with more thickly sclerotized horizontal bar present, forming basal margin, with scale-less area between teguminal ridges 3/5 length of latter; laterally with more thickly sclerotized ventral margin slightly concave, with scaled area between it and teguminal ridges square, more thickly scaled toward dorsoapical margin. Valva of medium width, with dorsal margin slightly humped at connection with transtilla, then slightly concave; medially bare and thickly sclerotized band along costa narrowing to 1/3 of length of valva, then parallel-sided until ending at 3/4 length of valva, with some moderately long thin setae and scales on dorsal edge; ventral margin not distinctly straight at base, subbasally broadly rounded, then straight to mid-length and slightly convex to rounded apex; medially with few short thin scales at base; laterally, next to ventral margin, and all along ventral margin with short to long setae; clasper a simple, short, triangular sheet with dorsal margin produced and rounded, medially covered with short to long thickened setae decreasing in length toward apex; sclerotized plate before clasper broadly rounded, not projected dorsally beyond dorsal angle of clasper, adorned with 8-10 moderately long setae; sacculus unmodified. Transtilla thin, unsclerotized medially. Diaphragma ventrad from transtilla with patch of about 6-10 medium-length setae on each side. Juxta short, shaped like inverted human pelvis. Vinculum narrow, with short, laterally compressed saccus with blunt apical margin. Phallus a slightly curved, short tube about 20% longer than tegumen + uncus, basal 1/3 thickly sclerotized only ventrally; coecum penis short, rounded; vesica with a long, thin, curved cornutus about 3/5 length of phallus, one thicker, stiletto-like cornutus about half as long, and about 5 additional thin cornuti also about half as long; ductus ejaculatorius forming one coil.

**FEMALE** (n=21) (Figs 15, 16): Antenna thinner than that of the male. Wings usually with more dark brown scaling than those of males, sometimes with dark brown and also sometimes burnt orange scaling completely obscuring orange areas. Forewing length: 6.0-7.0 mm.

**Female genitalia** (n=3) (Fig. 26). Papillae anales short, slightly convex, abundantly setose, with short to moderately long setae, the latter mostly along basal margin; cuticle covered with spinules, with laterobasal sclerotized band narrow, wider near bases of posterior

apophyses, not connecting either ventrally or dorsally; posterior apophyses short, slightly thicker at base, about as long as width of papillae anales. Segment VIII short, with sclerotized section a narrow band of nearly equal length ventrally and dorsally, 2 X length of sclerotized band of papillae anales at level of apophyses, ventrally not connected in middle, with few medium-length setae mostly along apical margin laterally and dorsally, covered with spinules; anterior apophyses almost 2 X length of posterior apophyses, with dorsal, triangular enlargement at about 2/5. Membrane unspecialized around ostium bursae, covered with spinules. Ductus bursae with short, membranous and spinulose funnel-shaped antrum, followed by equally short sclerotized incomplete (open dorsally) colliculum devoid of spinules, followed by enlarging membranous section forming one twist, 4 X as long as first two sections, almost 4 X as wide as colliculum, adorned with elongate sclerotized and wrinkled outgrowth decreasing in size from base to middle, lightly spinulose. Ductus seminalis connecting between second, sclerotized section of ductus bursae and next. Corpus bursae short, circular, not much wider than ductus bursae, about half as long as ductus bursae, lightly spinulose; signum a small, square plate with short spines projecting inside, with or without depression in middle; without accessory sac.

**Biology:** Unknown except that moths are attracted to light and that the species seems to prefer habitats situated at mid to high elevations (200-1341 m), up to the top of the islands in two cases.

**Distribution:** Galápagos islands of Fernandina, Isabela, Pinta, Santa Cruz and Santiago; presumably endemic.

**Remarks:** The vesica of two dissected males had no cornuti while another had seemingly lost only the 5 shorter and thinner cornuti.

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