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A new species of *Acleris* Hübner, [1825] from high elevations of Costa Rica (Lepidoptera: Tortricidae, Tortricini)

J. W. Brown & K. Nishida

Abstract

Acleris nishidai Brown, sp. n., is described and illustrated from the central cordillera of Costa Rica. The new species is assigned to *Acleris* Hübner, [1825] on the basis of the similarity of the male genitalia with other described species of the genus. The female genitalia are relatively modified and lack the pronounced lateral lobes of the sterigma characteristic of most *Acleris*. The new species has been reared from native and cultivated *Rubus* spp. (Rosaceae) at 3000 m elevation.

KEY WORDS: Lepidoptera, Tortricidae, Tortricini, *Acleris*, new species, Costa Rica.

Una nueva especie de *Acleris* Hübner, [1825] de las zonas altas de Costa Rica (Lepidoptera: Tortricidae, Tortricini)

Resumen

Se describe e ilustra a *Acleris nishidai* Brown, sp. n., de la cordillera central de Costa Rica. La nueva especie se asigna a *Acleris* Hübner, [1825] sobre la base de las similitudes de la genitalia del macho con otras especies del género. La genitalia femenina está relativamente modificada y carece de lóbulos laterales pronunciados del sterigma característica de la mayoría de los *Acleris*. La nueva especie ha sido criada con *Rubus* spp. (Rosaceae), tanto nativo como cultivado y sobre los 3.000 m de altura.

PALABRAS CLAVE: Lepidoptera, Tortricidae, Tortricini, *Acleris*, nueva especies, Costa Rica.

Introduction

The tortricid tribe Tortricini is remarkably diverse in the temperate regions of the world (POWELL, 1983, RAZOWSKI, 1984, 2002) but is represented by exceedingly few species in the tropics. In the New World south of the Mexican border, only 15 species are recorded: 10 members of the Neotropical-African genus *Apotoforma* Busck, 1934 (RAZOWSKI, 1993, RAZOWSKI & BECKER, 2003) and 5 of the Holarctic genus *Acleris* Hübner [1825] (POWELL *et al.*, 1995, RAZOWSKI & BECKER, 2003). Hence, we were somewhat surprised to find of a new species of *Acleris* during systematic studies on Costa Rican Tortricidae accumulated during field work associated with the NSF-funded Arthropods of La Selva project and graduate work by the second author on gall-inducing Lepidoptera. We take this opportunity to describe this new species and document its larval host plant. Field and laboratory studies on the life history of the species were conducted by the second author, systematic studies by the first.

Abbreviations for depositories are as follows: INBio = Instituto Nacional de Biodiversidad, Santo Domingo de Heredia, Costa Rica; USNM = National Museum of Natural History, Smithsonian Institution, Washington, DC. Other abbreviations used in the descriptions and specimens examined are

as follows: P.N. = Parque Nacional; Est. = Estación; and ca. = circa (approximately). Dissection methods follow that presented in BROWN & POWELL (1991, 2000). Images of adults and genitalia were captured using a Microptics© digital camera system and enhanced using Adobe Photoshop© and Illustrator© software. Terminology for wing venation and structures of the genitalia follows RAZOWSKI (1984).

Larvae were discovered in the field at several high elevation (2100-3100 m) sites in Cartago and San Jose provinces. Field-collected larvae were placed in plastic bags along with the host plant and transported to the laboratory at the University of Costa Rica, San José. Owing to the extreme difference in temperature between the field sites and the laboratory, larvae were kept in a refrigerator 16 hrs/day at 8° C and removed at night for 8 hrs, when they remained at ambient temperature (23° C).

Systematics

Members of the tortricid tribes Polyorthini and Tortricini, which belong to Chlidanotinae and Tortricinae, respectively, are characterized superficially by marked polymorphism in forewing pattern and the presence of small patches of raised scales on the forewing (e. g., HORAK, 1999, BROWN & ADAMSKI, 2004). The male genitalia of the two tribes are easily distinguished: those of Polyorthini typically possess a deep longitudinal invagination between the inner and outer surface of the valva in which a highly modified hairpencil from the eighth segment resides (e. g., TUCK, 1981, HORAK, 1999, BROWN & ADAMSKI, 2004); those of Tortricini typically lack an uncus and possess an usual process distally from the valva called a brachiola (e. g., RAZOWSKI, 1966, HORAK, 1999). Hence, while members of the tribes are superficially similar, they are phylogenetically quite distant, i.e., placed in different subfamilies (HORAK, 1999). On the basis of its considerable forewing polymorphism, raised scale patches, and a brachiola in the male genitalia, the new species described below is unequivocally assigned to Tortricini. It is assigned to *Acleris* on the basis of the strong similarity of the male genitalia to other species of that genus.

Acleris nishidai Brown, sp. n. (Figs. 1-6)

Holotype ♂, Costa Rica, Cartago, Cerro de la Muerte, El Cañón, Génesis II Cloud Forest Reserve, 9° 42' 23.4" N, 84° 54' 35.9" W, 2385 m, 25-IV-2007, em: 4-VI-2007, reared from *Rubus* sp., K. Nishida (USNM).

Paratypes. COSTA RICA: Cartago: P. N. Tapantí, Macizo de las Muerte, Est. La Esperanza, 2600 m, X-2002, 1 ♀, R. Delgado (INBio). El Guarco, R. F. Río Macho, Macizo de la Muerte, Sector de la Esperanza, 2600 m, V-2002, 1 ♀, R. Delgado (INBio). Cerro de la Muerte, El Cañón, Génesis II Cloud Forest Reserve, 9° 42' 23.4" N, 84° 54' 35.9" W, 2385 m, 25-IV-2007, em: 4-VI-2007, 1 ♂, 1 ♀, reared from *Rubus* sp., K. Nishida (USNM). Heredia: Ojo de Agua, km 75, 30-VI-1967, 1 ♀, Flint & Ortiz (USNM). 6 km ENE Vara Blanca, 10° 11' N, 84° 07' W, 1950-2050 m, 21-II-2002, 1 ♀, 11-IV-2002, 1 ♀, malaise trap, INBio-OET-ALAS transect (INBio). San José: Cerro de la Muerte, Villa Mills, la Georgina, 3000 m, 18-VI-1999, 1 ♂, 2 ♀ ♀, 8-VIII-1999, 2 ♂ ♂, 7 ♀ ♀, 21-VI-1999, 1 ♀, r. f. *Rubus* sp., K. Nishida (USNM).

Diagnosis. The forewing of *A. nishidai* (Figs. 1-4) is similar to *A. emera* Razowski, 1993 (from Bolivia), known only from the holotype male, but it is larger and more colorful compared with the nearly uniform yellowish-beige forewing of *A. emera*. Most Holarctic species of *Acleris* have a variably developed semicircular patch of dark scales near the middle of the costa of the forewing that is lacking in *A. nishidai*. The male genitalia of *A. nishidai* are most similar to those of *A. emera*. The most conspicuous feature distinguishing those of *A. nishidai* from all congeners is the elongate, characteristically bent structure from the subscaphium (Fig. 5). The female genitalia of *A. nishidai* are quite dissimilar from those of other *Acleris* and can be distinguished by the absence of the lateral lobes of the anterior portion of the sterigma that characterize most species of the genus. The signum, usually

present as a stellate patch or linear band of stellate patches in the corpus bursae of most *Acleris*, is situated in the ductus bursae posterad of the junction with the corpus bursae in *A. nishidai*.

Description. Adult. Head: Vertex rough scaled, gold-brown; frons smooth scaled, slightly paler than vertex; labial palpus gold-brown, weakly upcurved, ca. 1.5 times horizontal diameter of compound eye, second segment expanded by scales distally to about 3 times basal diameter; third segment short, barely exposed beyond scaling of second segment; maxillary palpus inconspicuous; proboscis ca. 1.2 times as long as labial palpus; antenna reaching to ca. middle of forewing costa, setae short in both sexes; ocellus present. Thorax: Dorsum smooth scaled, gold to pale yellow-orange; no posterior crest on metascutum; legs without modified sex scales in male. Forewing length 6.2-7.8 mm (smallest individuals reared); costa arched in basal 0.3, nearly straight in mesal 0.6; apex squarish, termen weakly convex; all veins present and separate; forewing length ca. 2.6 times width; discal cell ca. 0.6 length of forewing; chorda absent; M-stem absent; anal loop broad, ca. 0.3 length of 1A + 2A; costal fold absent in male; at least 5 small patches of raised scales in both sexes: three in mesal portion of wing near or in discal cell, one a basal 0.25, one in distal 0.25. Ground color variable from uniform pale rust-brown, with raised scales indicated by small dark brown specks, to somewhat two-toned with costal region red-brown and dorsum yellow-gold variegated with red-brown, or costal region gray to beige and dorsum orange with irregular blotches of red-brown; all forms with ill-defined, irregular, narrow transverse lines of faintly iridescent scales. Fringe pale reddish brown to pale rust. Hindwing with all veins present and separate; Sc + R to costa well before apex; Rs to costa before apex; M₁ to termen, with base widely separated from base of M₂; M₃ and CuA₁ connate at base, with base of M₂ very close to base of M₃ + CuA₁; CuP a trace at margin; ground color shiny white to pale gray-brown, with pale brown-gray mottling most dense in apical region. Fringe dirty white to pale brown. Male frenulum with one bristle, female with three. Abdomen: Gray brown; no modified scaling in male; no corothrogyne scaling in female.

Male genitalia in as fig. 5 (drawn from USNM slide 94,193; n = 2); tegumen ovoid, narrowed dorsally; subsacphium with elongate, rodlike process, bent ca. 100 subbasally and ca. 110 subapically, forming a squarish, C-shaped appendage; socius bulbous, rounded, with dense patch of hairs mesally, bare laterally; gnathos arms short, joined distally into broad plate, slightly curved dorsad in middle; transtilla a slender band, weakly expanded and arched dorsally at middle; valva mostly parallel-sided, broader basally, sacculus well defined, extending to end of valva, terminating in a densely spined, free lobe; brachiola rounded-triangular, situated immediately dorsad of termination of sacculus; costa of valva sclerotized; pulvinus absent. Aedeagus simple, phallobase slightly curved, remainder of aedeagus straight; vesica lacking cornuti.

Female genitalia as in fig. 6 (drawn from USNM slide 124,608; n = 6); papillae anales simple, mostly parallel-sided, weakly curved mesally at ventro-anterior end; sterigma bandlike, comprised of two lateral arms connected to edge of ostium bursae; antrum weakly sclerotized, with ovoid ostium; colliculum not defined; ductus bursae membranous, narrow in posterior 0.4, ca. 2 times as broad in anterior 0.6 beyond origin of ductus seminalis; small, rounded, angulate-stellate signum before junction with corpus bursae; junction of corpus bursae and ductus bursae moderately defined; corpus bursae irregularly ovoid, oblong, or foot-shaped (probably determined, in part, by the number of spermatophores); spiculae and signa absent.

Larva. Last instar 7-8 mm in length; head pale carmel, thorax and abdomen green. Chaetotaxy typical for the tribe.

Pupa (based on 3 exuviae) (Figs. 13-14). Length 6.0 mm; fusiform, typically tortricine, with tiny triangular cephalic projection, lacking conspicuous sculpturing. Rows of thorns on dorsum of segment 2 extremely reduced, barely visible; two rows of thorns on segments 3-7 in typical tortricoid fashion, well developed; segment 8 with single row of larger thorns. Cremaster extremely short, blunt, with large, slightly curved thorn at each lateral angle, each subtended by a fine, hook-tipped seta laterally, mesally, and ventrally, for a total of 6 setae.

Distribution and Biology. *Acleris nishidai* is known from 2300-3100 m elevation in the mountains of central Costa Rica. It has been reared on several occasions from larvae discovered in the field on

Rubus spp. (Rosaceae), both cultivated “mora” (blackberry) and native species (Figs. 7–12). Documented hosts include *Rubus eriocarpus* Liebm. at Génesis II Cloud Forest Preserve and Villa Mills, *Rubus vulcanicola* (Donn. Sm.) Rydb. at Villa Mills, and *Rubus praecipuus* L. H. Bailey at Génesis II Cloud Forest Preserve and El Empalme. Larvae fold, roll, and tie young leaves of the host, feeding on them and surrounding leaves; the larvae reside within or adjacent to the folded or rolled leaves. No frass was observed within the leaf folds, so larvae presumably eject their excrement. Larvae may be relatively abundant on cultivated blackberry, causing considerable damage; consequently, the species is considered a pest in the region. *Seticosta rubicola* Brown & Nishida, 2003 (Tortricidae: Euliini), which has a similar range in Costa Rica and also feeds on *Rubus*, is recorded from higher elevations in Guatemala as well (BROWN & NISHIDA, 2003), and it is possible that *A. nishidai* has a similar geographic distribution.

Etymology. It gives me great pleasure to name this species after my friend and colleague Kenji Nishida, who is an indefatigable field worker with a penchant for discovering new species through his investigations of plant-insect associations.

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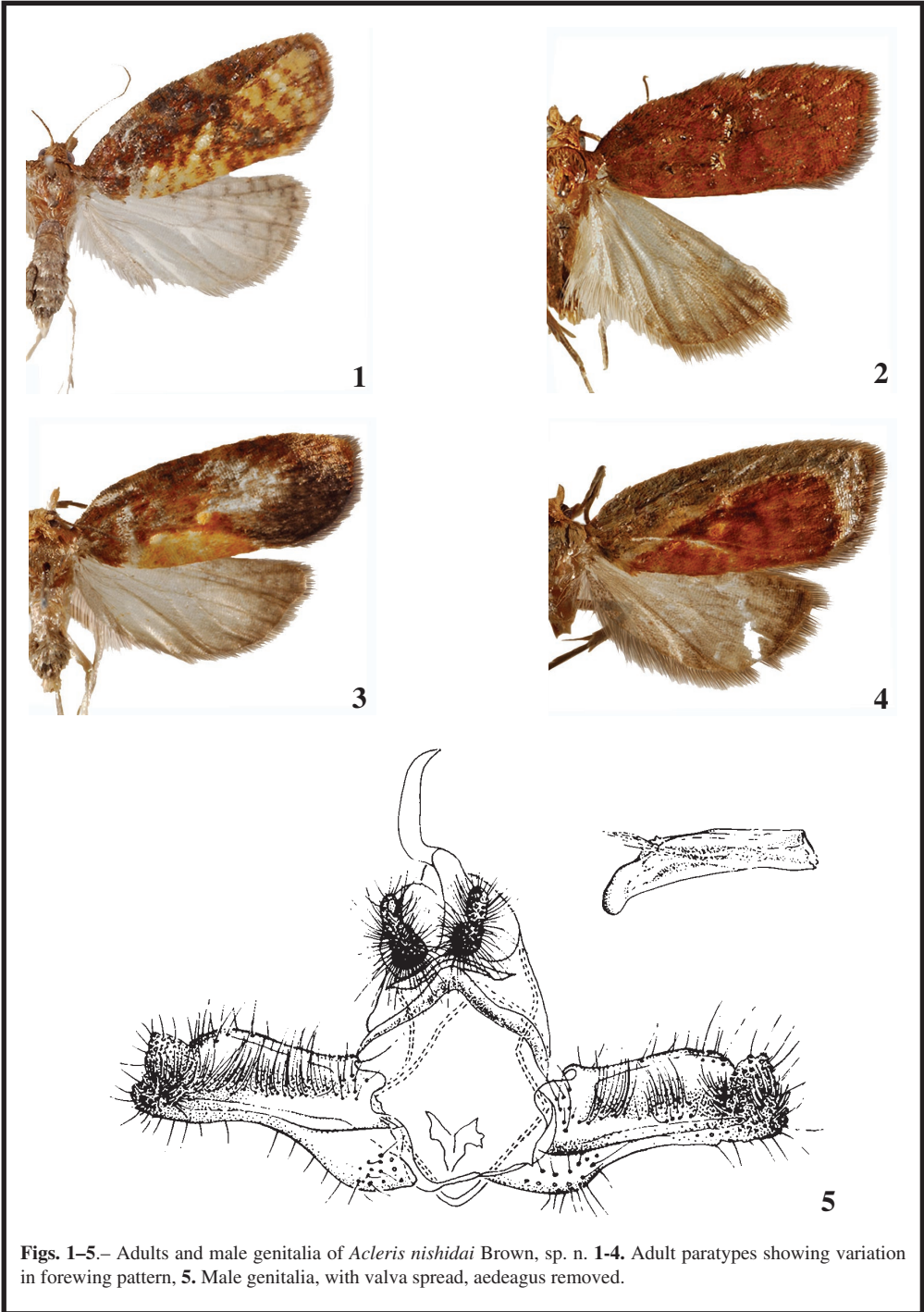
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Figs. 1–5.— Adults and male genitalia of *Acleris nishidai* Brown, sp. n. 1–4. Adult paratypes showing variation in forewing pattern, 5. Male genitalia, with valva spread, aedeagus removed.

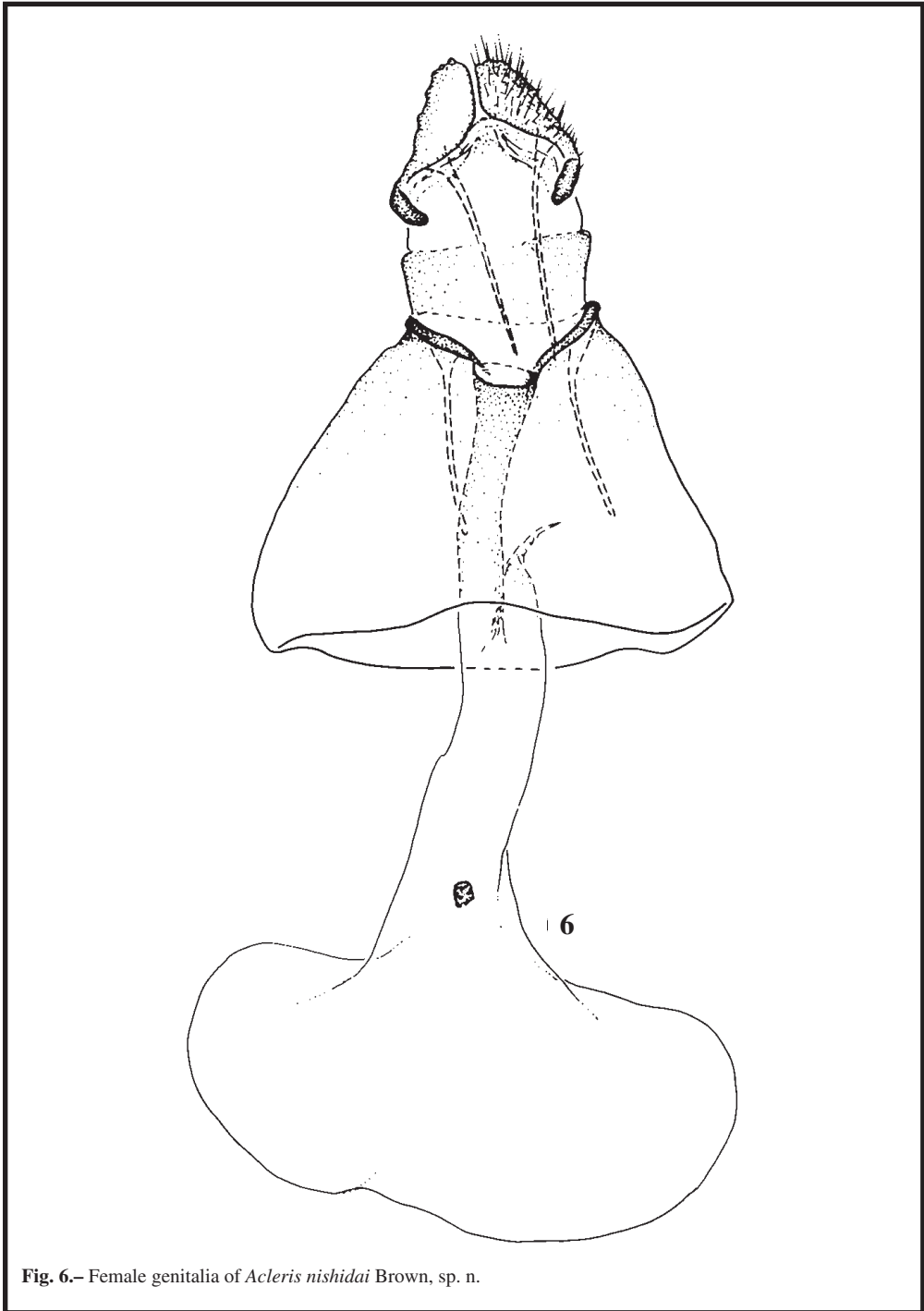
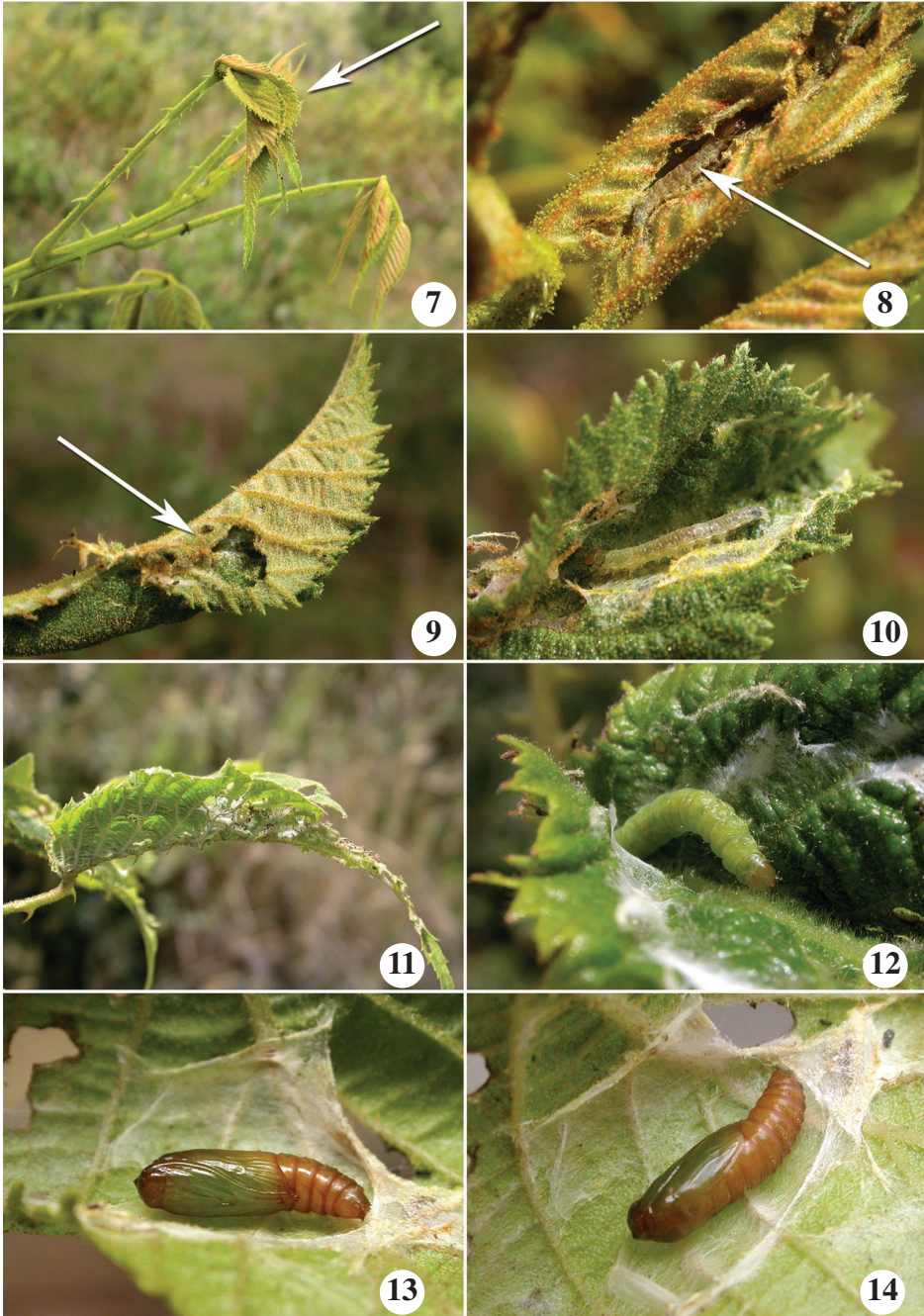


Fig. 6.– Female genitalia of *Acleris nishidai* Brown, sp. n.



Figs. 7–14.— Early stages of *Acleris nishidai* Brown, sp. n. 7–12. Larva feeding on *Rubus*. 13–14. Pupa.