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A NEW *HOLCOCERA* CLEMENS FROM GUATEMALA AND REDESCRIPTION OF *H. ICERYAEELLA* (RILEY) FROM THE UNITED STATES (LEPIDOPTERA: COLEOPHORIDAE: BLASTOBASINAE: HOLCOCERINI): TWO CONGENERS WITH INCIDENTAL PREFERENCE FOR AVOCADO

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Abstract.—Two species of *Holcocera* Clemens (Lepidoptera: Coleophoridae: Blastobasinae: Holcocerini) are known to feed on *Persea americana* Mill. (Lauraceae), but their frequency of infestation appears low. One species, ***Holcocera plagatola*, n. sp.**, from Guatemala, is described herein. *Holcocera iceryaeella* (Riley) is known only from California and has been recorded on many different host plants; it is also known to be a predator of immature Hemiptera and scale insects. Photographs of the imagos of both *Holcocera* species are included, in addition to illustrations of the male and female genitalia. We comment on host preferences for both species.

Key Words: avocado, fruit, *Histura*, horticulture, Neotropics, opportunist, *Persea*, predator, *Stenoma catenifer*, taxonomy

Holcocera is represented by about 70 species worldwide (Adamski 1996; Adamski 2002a, b); its center of diversity is in the New World tropics. The genus is characterized by having the ventrolateral margins of the gnathos fused with the tegumen, having an aedeagus with a multisetose anellus, and having the apex of the proximal flange of the valva rounded or pointed. Although many undescribed *Holcocera* are represented in major institutional and private collections, many additional species undoubtedly will be available for study through future efforts of collectors, especially in tropical regions worldwide.

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Several host relationships are known for the genus. For example, larvae of *Holcocera gigantella* Chambers and *H. paradoxa* Powell feed on seeds and pods of *Yucca* spp. (Liliaceae) (Chambers 1876, Powell and Mackie 1966, Powell 1976); *H. chalcofrontella* Clemens feed on the seeds of *Rhus* sp. (Anacardiaceae) (Dietz 1910); *H. panurgella* Heinrich feed on the seeds of pine (Pinaceae) (Heinrich 1920); *H. immaculella* (McDunnough) on seeds of spruce (Pinaceae) (Prentice 1965, Kinzer 1976); and several undescribed species (Adamski and Brown 1989) are associated with plants within the Fagaceae, Rosaceae, Solanaceae, Salicaceae, and Polyporaceae (a fungus). In addition, several species of *Holcocera* are opportunists and/or predators, feeding

on scales and aphids, while some species are either gall inducers or secondarily associated with galls (Powell 1976, 1980; Powell et al. 1999).

During this study on pests of Hass avocado, *Persea americana* Miller (Lauraceae), in Guatemala, several species of Lepidoptera were collected from fruits. Among these was a new *Holcocera* (Coleophoridae: Blastobasinae: Holcocerini) whose larvae were observed feeding within the pulp of fruits picked from a commercial orchard that was treated monthly with one of two broad-spectrum insecticides, malathion or endosulfan. Another species of *Holcocera* from California, *H. iceryaeella* (Riley), also is known to feed on avocado as well as on several other phytophagous hosts, including immature Homoptera and scale insects. The purpose of this study is: 1) to make known to science a new species of *Holcocera* from Guatemala, 2) document that an allied species of *Holcocera* is known also to feed on avocado, and 3) characterize the feeding preferences for both species from known hosts.

Materials and Methods

Moths were reared from Hass avocados picked from commercial trees in Guatemala, i.e., these fruits were not from the ground. Fruit came from trees that showed visual signs of feeding damage characterized by the presence of frass at entrances of larval tunnels on the surface of the fruit. We examined 6,740 avocados from two of 22 collecting sites for Lepidoptera and reared only two specimens of *Holcocera*. Host data for *Holcocera iceryaeella* are from specimens reared by Jerry Powell (rearing #'s within brackets) and/or reliable literature references (within parentheses).

Gross morphological observations of the adult specimens and measurements of the wings were made using a dissecting microscope (reflected light) with a calibrated micrometer. Genitalia were dissected as described by Clarke (1941), except mercurochrome and chlorazol black were used as stains. The Methuen Handbook of Colour (Kornerup and Wanscher 1978) was used as a color standard for the description of the adult color pattern. Type specimens from this study are deposited in The National Museum of Natural History, Smithsonian Institution, Washington, D.C. (USNM), and The Entomological Research Museum, University of California at Riverside (UCR). Authorship of the new species is attributed to Adamski.

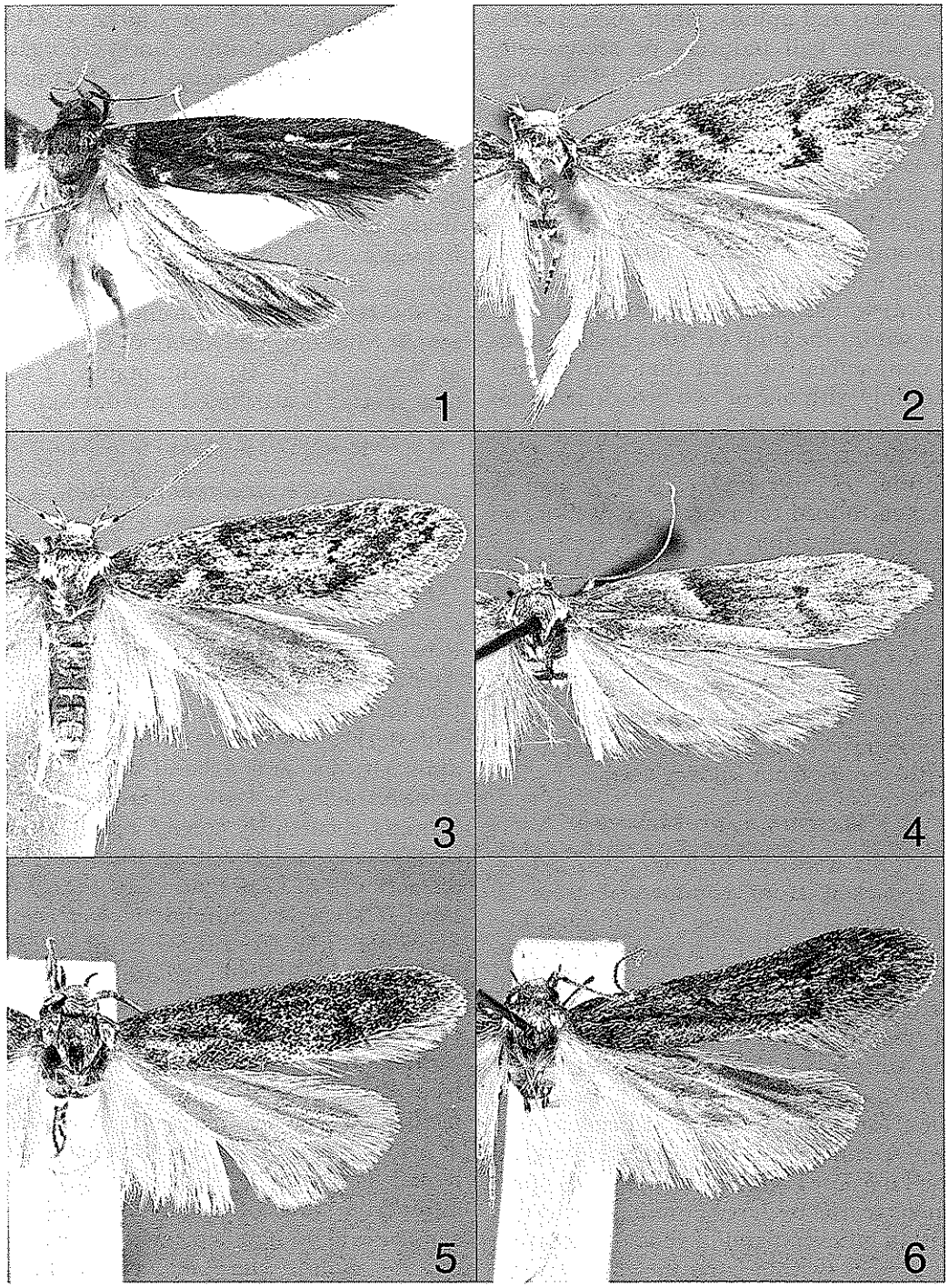
Results and Discussion

Holcocera plagatola Adamski, new species

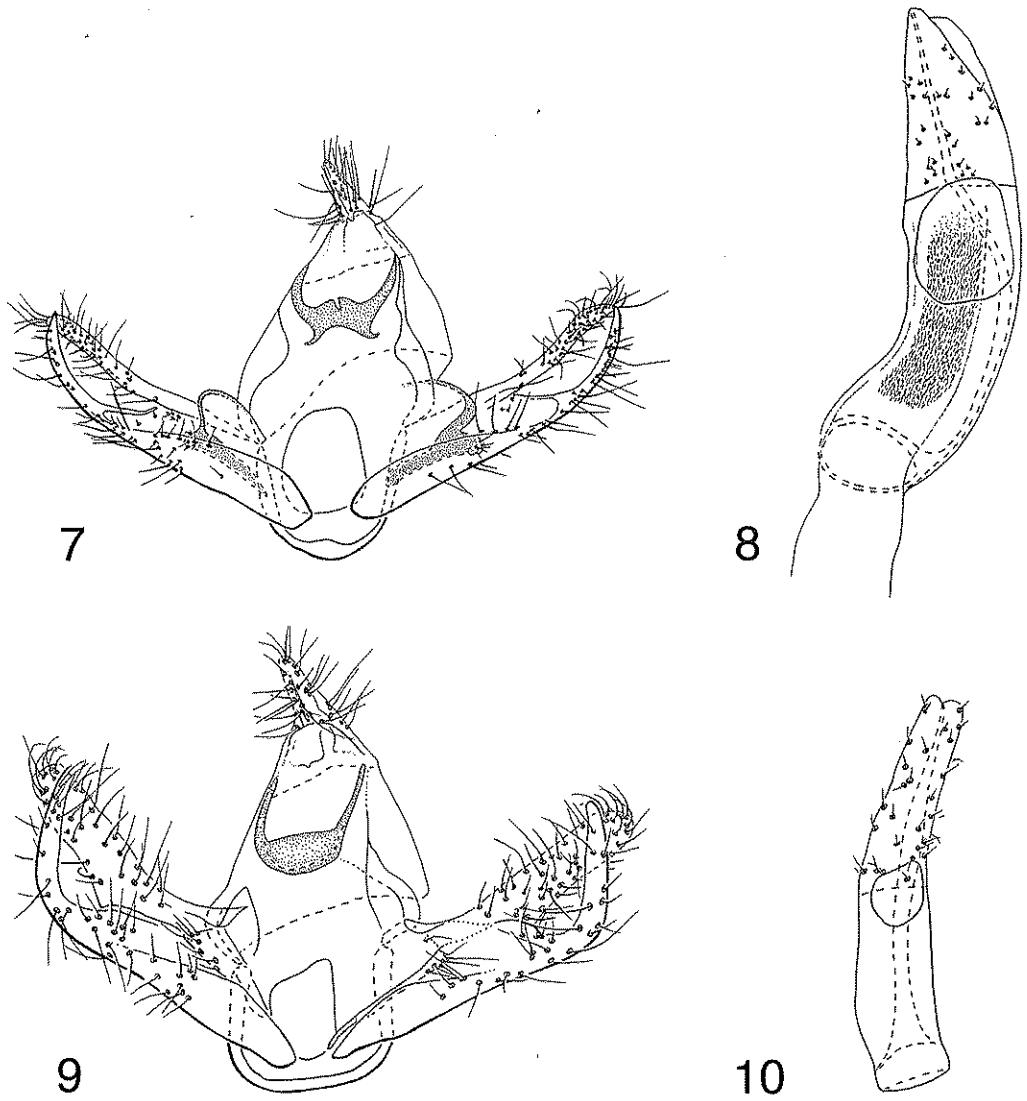
(Figs. 1, 7–8, 11)

Diagnosis.—*Holcocera plagatola* is similar to two congeners from Costa Rica, *H. aclydis* Adamski and *H. bucinae* Adamski, by sharing a forewing pattern that includes surface of veins demarcated with dark-brown scales forming longitudinal streaks, and a basal area distally demarcated by 3–4 rows of arched scales, forming a narrowly convex band. These three species can be distinguished only by dissection and examination of the genitalia. The male genitalia of *Holcocera plagatola* differ from those of *H. aclydis* by having a rounded median lobe of the proximal flange and a less abruptly curved sclerite of the aedeagus. The male genitalia of *Holcocera plagatola* differ from those of *H. bucinae* by having the median lobe of the gnathos at least twice as wide and more deeply notched. The female genitalia of *Holcocera plagatola* differ from those of *H. aclydis* by having a more widely notched anterior margin of the eighth sternum and a more broadly rounded posterior margin of the seventh sternum. The female of *Holcocera bucinae* is unknown.

Description.—*Head:* Vertex and frontoclypeus grayish brown; scape and

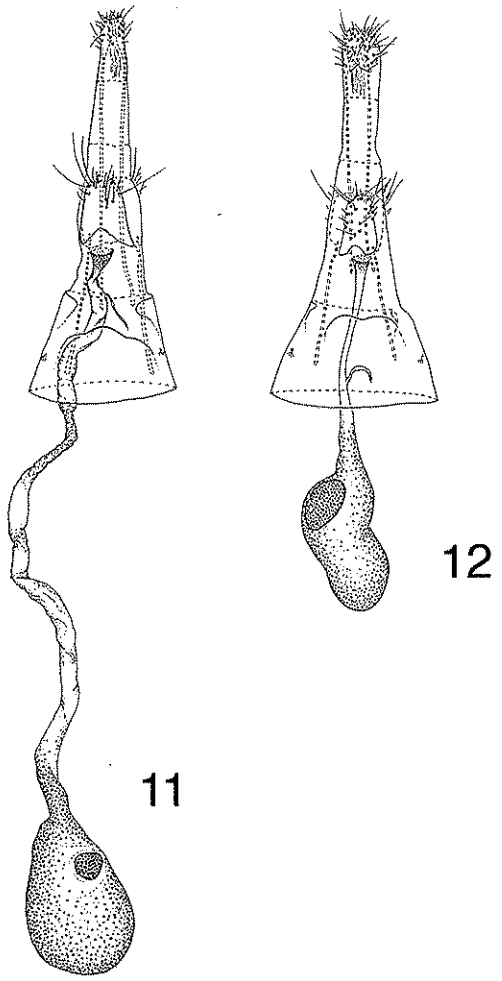


Figs. 1–6. Adults of *Holcocera* spp. 1, *H. plagatola*, paratype. 2–6, *H. iceryaeella*.



Figs. 7–10. Male genitalia of *Holcocera* spp. 7–8, *H. plagatola*. 7, Genital capsule. 8, Aedeagus–anellus complex. 9–10, *H. iceryaeella*. 9, Genital capsule. 10, Aedeagus–anellus complex.

flagellum of antenna grayish brown, pecten brown; first flagellomere in male widened laterally, at least twice the width of second flagellomere, forming a notch-like space; inner surface of first flagellomere with piliform sex scales; first flagellomere unmodified in female; outer and inner surfaces of labial palpus with segment-1 and distal 3/4 of segment-2 brown; distal 1/4 of segment-2 and segment-3 grayish brown; proboscis brown. *Thorax:* Tegula and mesonotum with basal 1/4 brown, distal 3/4 grayish brown. Legs brownish gray. Forewing (Fig. 1) length 9.5–9.7 mm (n = 2), grayish brown intermixed with few dark-brown scales; surface of veins demarcated with dark-brown scales, forming longitudinal streaks; basal area pale brown with a straight and narrow crossband of shiny, arched, dark-brown scales. Undersurface brown. Hindwing translucent brown basally, gradually darkening to apex. *Abdomen:* Terga 2–7



Figs. 11–12. Female genitalia of *Holcocera* spp. 11, *H. plagatola*. 12, *H. iceryaeella*.

with 3–4 irregular rows of spinelike setae in male; terga 2–6 with irregular rows of spinelike setae in female. *Male genitalia* (Figs. 7–8) with uncus wide basally, gradually narrowing to apex, pointed posteroventrally, ventrally keeled, setose; gnathos weakly fused with tegumen, with a deeply emarginate median lobe, produced posterolaterally into elongate, slightly curved arms and ventroanteriorly into very short recurved arms; vinculum narrow; valva deeply dissected distally, forming a digitate upper part and a broad lower part; upper part slightly membranous, setose; lower part with apical 1/3 produced into a broadly curved spinelike process; inner surface of ventral margin curled inwardly, partially overlying ventral portion of proximal flange; proximal flange with a large, setose median lobe, confluent with a broadly curved dorsal arm, extending dorsoposteriorly to point of articulation between tegumen and vinculum; juxta subrectangular, distally fused with a conical and setose anellus (= distal support of aedeagus); aedeagus abruptly curved basally; sclerite of aedeagus slightly coiled; portion of vesica microtrichiate. *Female genitalia* (Fig. 11) with ovipositor telescopic, with three membranous subdivisions; papillae anales elongate, setose; apophyses posteriores elongate, extending from base of papillae anales to slightly beyond posterior margin of seventh tergum; apophyses anteriores shorter, extending from posterolateral margin of eighth tergum to near posterior part of seventh segment; anterior margin of eighth sternum broadly emarginate near ostium; antrum spiculate; inception of ductus seminalis from a bulbous base slightly beyond posterior margin of seventh tergum; posterior margin of seventh sternum broadly rounded and anterior to straight posterior margin of seventh tergum; posterolateral arms of seventh tergum slightly curled around to venter; ductus bursae at least 3 times as long as corpus bursae, membranous, densely spiculate to near inception of corpus bursae; corpus bursae ovate, spiculate, bearing a spiculate, platelike signum.

Material examined.—*Holotype* ♂, "GUAT[EMALA]: Solola Pr[ovince], San Lucas Toliman, nr. Santiago Atitlan, 1585 m, 14°37′31″N, 91°8′43″W, ex. Avocado fruit, xii-2006-iii-2007, M. & C. Hoddle"; "♂ Genitalia slide by D. Adamski, USNM 83293" [green label]. Pupal exuvium is glued to a small paper card attached to pin. Deposited in USNM.

Paratype: 1 ♀, "GUAT[EMALA]: Sacatepequez or Escuintla or Solola Pr[ovince], various localities & dates reared from avocado fruit, xii-2006-iii-[20]07, M. Hoddle"; "Univ[ersity] of Calif[ornia] at Riverside, Ent[omological] Res[search] Museum, UCRCENT 160946"; "♀ Genitalia Slide by D. Adamski, No. 5777" [yellow label]. Pupal exuvium is glued to a small paper card attached to pin. Deposited in UCR.

Distribution.—Known only from Guatemala.

Host.—Avocado fruit, *Persea americana* Mill. (Lauraceae). Larvae were found feeding in the fruit pulp surrounding the seed and possibly the seed itself. An opening of a tunnel containing a larva was conspicuous owing to the presence of accumulated frass on the surface of the infested fruit.

Remarks.—Other species of Lepidoptera reared from avocados collected at the same sites as *Holcocera plagatola* were four Tortricidae, *Amorbia* sp. (Tortricinae: Sparganothini), *Netechma pyrrhodelta* (Meyrick) (Tortricinae: Euliini), *Cryptaspasma* sp. (Olethreutinae), an undescribed species of *Histuroides* (Chlidanotinae: Polyorthini); one gelechioid, *Stenoma catenifer* Walsingham (Elachistidae: Stenomatinae); and two species of Noctuidae, *Euxoa sorella* Schaus (Agrotini) and *Micrathetis triplex* Walker (Condicinae: Leuconyctini).

Etymology.—The species epithet, *plagatola*, is derived from the Latin, plagatus, meaning streaked, and refers to the dark streaks of the forewing pattern.

Holcocera iceryaeella (Riley 1887) (Figs. 2–6, 9–10, 12)

Diagnosis.—*Holcocera iceryaeella* is similar in wing pattern to several undescribed *Asaphocrita* Meyrick (Blastobasinae: Holcocerini) from southwestern United States, but it can be distinguished from the latter by having a smaller notch or space between the first and second flagellomeres of the antenna in the male and a longer and more slender sclerite of the aedeagus, and by lacking a sclerite near the posterior end of the corpus bursae in the female.

Redescription.—*Head:* Scales on vertex and frontoclypeus narrow, brownish gray, tipped with pale brownish gray, or pale brownish gray; marginal scales of frontoclypeus together with pecten on scape of antenna entirely covering eye; scape brownish gray intermixed with white; flagellum pale gray, with more cilia in male; first flagellomere widened basally, forming a flattened lobe with a dense cluster of piliform sex scales on inner surface in male; outer surface of labial palpus brownish gray or pale brownish gray intermixed with white, and with white along apical margin; inner surface as above but paler; proboscis pale brownish gray. *Thorax:* Tegula and mesonotum brownish gray intermixed with pale brownish-gray scales or brownish gray on basal 1/3–1/2, pale brownish gray on 1/2–2/3. Foreleg brownish gray with pale brownish-gray scales and/or white scales along apical margin of tibia and tarsomeres; mid- and hindleg brownish gray intermixed with pale brownish-gray scales and/or white scales near middle of segments and along apical margin of tibia and tarsomeres (some specimens with hindleg paler than fore- and midlegs). Forewing (Figs. 2–6) length 9.8–14.1 mm (n = 102), brownish gray intermixed with pale-gray and few white scales or white intermixed with gray and pale-gray scales; basal area darker than or concolorous with adjacent area proximal to submedian fascia; submedian fascia incomplete; a narrow costal band and large midcell spot coalescent or separate, not extending to posterior margin; often with an oblique streak originating from costal margin of basal area extending to an area (behind costal

band) along posterior margin; two large spots near end of cell separate or coalescent with tornal spot, forming a single elongate marking, or posterior spot near end of cell coalescent with tornal spot forming and short streak posterior to single spot near end of cell; marginal spots separate, coalescent, or absent. Hindwing translucent on basal half, gradually darkening to margin. Undersurface brownish gray. Specimens with more white, gray, or pale gray ground color may have more prominent markings or tend to have pale or partially obliterated markings (Figs. 2–6). *Abdomen:* Three transverse, irregular rows of spinelike setae on posterior part of terga 2–7 in male, and 3 transverse, irregular rows of spinelike setae on posterior part of terga 2–6 in female. *Male genitalia* (Figs. 9–10) with uncus wide basally, gradually narrowing to apex, ventrally keeled, setose; gnathos weakly fused with tegumen, median lobe wide, entire, produced posterolaterally into straight, elongate arms; vinculum narrow; valva deeply dissected distally, forming a digitate upper part and a broad lower part; upper part slightly membranous, setose, nearly as wide as lower part; lower part with inner surface of ventral margin slightly curled inwardly; apical 1/3 produced into an abruptly curved spinelike process; proximal flange with a large, setose median lobe; juxta subquadrate, distally fused with an elongate and setose anellus; aedeagus slightly curved; sclerite of aedeagus slightly curved, forming a ring support at base. *Female genitalia* (Fig. 12) with ovipositor telescopic, with three membranous subdivisions; papillae anales elongate, setose pads; apophyses posteriores elongate, extending from base of papillae anales to slightly beyond ostium; apophyses anteriores shorter, extending from posterolateral margin of eighth tergum to near midlength of seventh segment; anterior margin of seventh sternum broadly emarginate near ostium; antrum microspiculate; posterior margin of seventh sternum slightly emarginate medially; posterolateral arms of seventh tergum slightly curled around to venter; ductus bursae about as long as corpus bursae, gradually widening and increasingly spiculate slightly anterior to seventh segment; inception of ductus seminalis anterior to seventh segment; corpus bursae slightly dilated on side of anterior end occupied by signum; signum large, platelike, spinulate, with a slightly sunken, transverse, median furrow.

Distribution.—Known only from California. It is found throughout most of the coastal counties and a narrow region from the San Francisco Bay area northeast to the central Sierra Nevada Mountains. *Holcocera iceryaeella* is known to occur in: Alameda, Butte, Contra Costa, El Dorado, Humboldt, Los Angeles, Marin, Mendocino, Monterey, Orange, Placer, Sacramento, San Diego, San Francisco, San Mateo, San Luis Obispo, Santa Barbara, and Sonoma counties.

Plant hosts.—Agavaceae: *Yucca whipplei* (Torr.) Trel. [pods]; Cupressaceae: *Juniper* sp. with *Epinotia* sp. (Tortricidae) [JAP Lot 63D22: Larva collected in foliage with larvae of *Argyrotaenia* sp. (Tortricidae)]; *Sequoia sempervirens* (D. Don.) Endl. [JAP Lot 74B7]: [larva found in foliage]; Fagaceae: *Quercus agrifolia* Nee [JAP Lot 68D51]: Twig samples, taken from upper part of tree, were infested with 3 spp. of tortricids and *Chionodes chrysopyla* (Keifer) (Gelechiidae)], [JAP Lot 68D71–75: larvae were collected by beating foliage]; *Q. lobata* Nee; Lauraceae: *Persea americana* Mill.; Leguminosae: roots of *Medicago arborea* L.; Moraceae: *Ficus* sp., dried fruits; Pinaceae: *Abies concolor* (Gordon & Glend.) Lindl. Ex Hildebr. [JAP Lot 79F31: Larvae feeding in bracts and axils of two new growth shoots]; *Pinus radiata* D. Don [JAP Lot 80C3.2: Pine branches with a large quantity of silk and remains

of staminate cones and foliage infested by *Chionodes nitor* Hodges, *Coleotechnites* sp. (Gelechiidae) and *Epinotia* sp. (Tortricidae)]; Polygonaceae: *Eriogonum parvifilium* Sm. [JAP Lot 74C10: Clumps of webbing in foilage infested by *Toripalpus trabalis* (Pyralidae), *Chionodes dammersi* (Keifer), and *Aroga paraplutella* (Busck), (Gelechiidae)]; Polyporaceae: *Polyporus hirsutus* (Wulfen) [a series of larvae collected from fungi on a willow stump (Powell, per. comm.)]; Rosaceae: *Heteromeles arbutifolia* M. Roem. [JAP Lot 79C3: A single larva was found in debris under an abandoned cocoon of *Sabulodes* sp. (Geometridae), in foliage infested by *Coleotechnites* sp. (Gelechiidae)]; *Prunus* fruit, trash of *Prunus dulcis* (Mill.) D.A. Webb; Rutaceae: *Citrus sinensis* (L.) Osbeck, (Basinger 1924, 1927a, b, 1928, 1936, 1938; Basinger and Boyce 1935; Ryan 1934; Swain and Buckner 1935; Woglum 1935a, b).

Animal hosts.—Diaspididae: *Lepidosaphes camelliae* Hoke; Margarididae: *Icerya purchasi* Maskell; *Lecanium persicae* (Fabr.) (Essig 1916, Riley 1887); *Planococcus citri* (Risso); Pseudococcidae: *Pseudococcus* sp.

Discussion

Holcocera iceryaeella appears to be an opportunist, able to feed on live or decaying plant tissue or as a predator on gregarious Hemiptera. Powell has reared this insect many times (J. Powell, per. comm.), and it appears that larvae of *H. iceryaeella* seem to feed in foliage infested by other insects, often moth larvae (J. Powell, per. comm.). In California, larvae of this moth have been observed feeding in the fruit pulp of avocados, and it became a serious pest of Valencia Oranges in the late 1920s and early 1930s in California (see above references by Basinger, Ryan, and Woglum). Similarly, avocado appears to be an incidental host for *Holcocera plagatola* in Guatemala. Although no other host is known for the latter species, it conceivably could be found to be an opportunistic organism like *H. iceryaeella*.

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