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BIOLOGICAL AND TAXONOMIC NOTES ON TWO CALIFORNIA SPECIES OF PROTEOTERAS

(Lepidoptera: Tortricidae)

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The genus *Proteoteras* includes eight described species in North America, six of which are restricted to Canada and the northeastern United States. Only one, the widespread *P. aesculana* Riley, has been listed in California (Heinrich, 1923). The larvae of the several species for which biological information is available are borers and gall-makers in the seeds and twigs of maples, box-elder, and horse chestnut (Heinrich, 1923; MacKay, 1959; Peterson, 1958; Schaffner, 1950).

PROTEOTERAS ARIZONAE Kearfott

Proteoteras arizonae Kearfott, 1907, Trans. Amer. Ent. Soc., 33:48.

The type locality of this species is Prescott, Arizona, and there were cotypes from Colorado. Heinrich (1923) figured the male genitalia of a specimen from Mesilla, New Mexico, and described a closely related species, *P. obnigrana*, from New Hampshire which is distinguished by wing color and minor genitalic differences, primarily in the shape of the valvae. Recently collected California specimens of this complex have the genitalia form of *obnigrana* but otherwise match the description and worn lectotype male of *arizonae* in the American Museum of Natural History. The olivaceous tinge of the forewing, characteristic of *obnigrana*, is not represented in any western specimens I have seen. A series in the U.S. National Museum from Eureka, Utah compares well with the type of *arizonae* and has genitalic characters (slide No. 8, C.H., 18 Oct., '24) of California specimens. It seems apparent that Heinrich's figure (fig. 300) does not represent *P. arizonae* well; and if, as Heinrich stated, "the differences (between fig. 300 and *P. obnigrana*, fig. 305) are more than could be looked for in one species," the southern New Mexico specimen may represent an undescribed species.

The California specimens of *P. arizonae* are very similar genitally to *P. obnigrana* but appear to differ by the more well developed "shoulders" of the tegumen and by having larger lateral

spines of the valva. The number of these spines may vary from three to five on the same specimen, or one or more may be greatly reduced, but the size of the well developed three may be diagnostic.

California material examined.—Sonoma Co.: Santa Rosa, 1 ♂ VIII-1-38 (E. C. Johnston). Contra Costa Co.: Walnut Creek, 1 ♀ VI-15-61, 1 ♂ VIII-8-61, at lights (J. Powell). San Mateo Co.: Redwood City, 1 ♂ VI-23-59, r. f. *Acer negundo californicum*, emgd. VII-13-59, 2 ♂ same data except VI-30-59, emgd. VII-24, 30-59 (JAP-59F2) (A. E. Pritchard).

Biology.—Specimens collected as larvae in San Mateo County during June 1959 were reared from *Acer negundo californicum*. Host plants have not been recorded in other areas. The larvae tunnel into the terminal twigs but apparently do not cause any gall-like swelling as does *P. willingana* (Kearfott) on boxelder (Peterson, 1958). Feeding begins at what appears to be the base of the current season's growth, ultimately causing all the twig and leaves beyond this point to die. Working downward, larvae burrow out all contents of the hard, green stems; fully developed larval chambers measured 25 to 35 mm. in length and usually tapered somewhat downward. Apparently most of the frass is ejected from the shelter, as only a few particles were found at the lower end of mature tunnels. A small amount also adheres to webbing which closes the entrance area and is visible from the exterior.

Pupation probably normally takes place within the shelter, since two pupae were found *in situ*, one of which had pupated prior to having been collected. However, in the laboratory two individuals left the stems and pupated between folds of the paper at the bottom of the container; and the larva of *P. willingana* leaves the feeding chamber and drops to the leaf duff to pupate according to Peterson (1958). Prior to pupation *P. arizonae* spins several fine silken partitions at varying intervals along the length of the burrow. The cocoon consists of a fine silk structure or lining of the apical area of the chamber, the pupal head being adjacent to the exit spot.

The flight records suggest two generations during a season in the San Francisco Bay area.

About one-half the larvae from the Redwood City rearing lot (JAP-59F2) were parasitized by the Ichneumonid, *Apistephialtes nucicola* (Cushman)¹. A male and four females were reared, emerging July 7 to 13. Townes and Townes (1960) record this

¹Determined by G. S. Walley, Entomology Research Institute, Ottawa.

species as a parasite of various larvae in galls and nuts. The *A. nucicola* larvae matured when the host larvae had reached the penultimate instar, judging from the remains of the host caterpillars. Pupation of the Ichneumonid occurred in the twig, either head-downward or head-upward.

The larva of *P. arizonae*, which has not previously been described, is most similar to that of *P. willingana* (Kft.) among the known species (MacKay, 1959). This relationship does not concur with that shown in the adults by the male sex scaling of the hindwing. The larva of *P. arizonae* may be characterized as follows (based on two specimens):

Ultimate instar.—Length about 14 mm. (distended in KAAD preservative). Essentially as described for *P. aesculana* Riley by MacKay, differing as follows. Head measurements variable, length: width of the two specimens, 1.01:1.28 mm. and 0.97:1.10 mm. Head dark yellow-brown, darker at posterior margin, ocellar and postgenal areas black. Ocellus V apparently slightly larger than III and IV. Spinneret rather stout, length about 4 to 4.5 times width. Thoracic shield pale yellow-brown, restricted posterolaterally, (as in *P. willingana*). Setal pinacula large and somewhat raised, but unpigmented, not differentiated from body color. Spinulation of integument minute, colorless, scarcely discernable at 54x magnification. Setal characters: L₁ on prothorax closer to L₂ than to L₃, located on a straight line between L₂ and L₃ or distinctly below it. D₁ on meso- and metathorax slightly posterodorsal to D₂. SV group on abdominal segments 1, 2, 7, 8, and 9, 3:3:2:2:1, 3:2:2:2:1, or 2:3:2:2:1. Setae V₁ on segment 9 only slightly farther apart than those on segment 8. Crochets primarily biordinal, about 38 abdominal, 23 to 27 anal. Anal fork absent.

The larva of *Proteoteras arizonae* thus may be differentiated from the other members of the genus described by MacKay (1959) as follows:

1. Anal fork present2
 Anal fork absent3
2. Setae D₁ of anal shield much shorter than setae SD₁; anal fork
 well developed, usually 3 to 5 teeth.....*aesculana* Riley
 Setae D₁ of anal shield as long as setae SD₁ or variable in
 length; anal fork minutetwo unidentified species on
 Acer platanoides
3. Setal pinacula brownish, large and distinct, especially on
 thorax*willingana* (Kearfott)
 Setal pinacula not differing from body color.....*arizonae* Kearfott

PROTEOTERAS AESCULANA Riley

Proteoteras aesculana Riley, 1881, Trans. St. Louis Acad. Sci., 4:321.

This widespread species was recorded from California by Heinrich (1923) without detailed data. It is commonly collected in the San Francisco Bay area, and the records suggest a multi-voltine life cycle. The rearing record given below involves silver maple, an introduced ornamental plant. A specimen in the U.S. National Museum from Corvallis, Oregon was reared from *Acer negundo*; and this host, as well as *Aesculus californicum* may be expected to be native foodplants in California.

California material examined.—Sonoma Co.: Santa Rosa, 1 ♂ V-12-36 (E. C. Johnston); Petaluma, 1 ♂ VI-26-37, 1 ♂ VIII-1-38 (E. C. Johnston). Napa Co.: Napa, 1 ♀ "Apr. 20" (Guedet). Contra Costa Co.: Richmond, 1 ♀ VI-15-59, 1 ♂ X-6-59 (C. D. MacNeill); El Cerrito, 1 ♀ IV-4-60, 2 ♀ VII-7, 19-60 (C. D. MacNeill), IX-27-60 (T. R. Haig); Walnut Creek, 1 ♂ VI-20-62 (J. Powell). Alameda Co.: Berkeley, 4 ♂, 1 ♀ III-10 to 17-59 (G. I. Stage), 1 ♀ III-9-59, 1 ♀ IV-1-59, 1 ♂ IX-25-59, 3 ♂, 2 ♀ III-4 to IV-7-60, 1 ♂ VII-20-60, 1 ♂ II-26-61, 1 ♂, 2 ♀ IV-3, 4-61, at light (J. Powell). San Mateo Co.: Belmont, 1 ♀ VI-30-59, r.f. *Acer dasycarpum* [= *saccharinum*] emgd. VII-27-59 (JAP-59F1) (A. E. Pritchard).

Biology.—Larvae collected at Belmont displayed a similar feeding behavior to that described for *P. arizonae*. However, the tunnels ranged up to 40-46 mm. in length. Pupation may normally occur outside the shelter, since a number of abandoned twig chambers were collected from the trees; and the one individual which was reared pupated on the bottom of the container.

A collection of young larvae (apparently 3rd and penultimate instars) was taken in mid July 1959 on *Acer negundo californicum* near Castro Valley, Alameda County, by A. E. Pritchard. These are presumed to be *P. aesculana*, although the smaller larvae lack the differentiated pinacula and the anal fork. In at least one case a small larva was found feeding in a tunnel obviously made by a mature larva. Such abandoned shelters, often with new plant tissue growing into the chambers, were common at the site; none contained pupal shells. The collection lends evidence to support the assumptions that more than one generation occur each season and that boxelder is a native host in California.

Two mature larvae taken in the Belmont lot (59F1) compare very well in structural details with the description of *P. aesculana* given by MacKay (1959). The head of the California examples is darker, being brown with darker, mottled areas laterally, and an

extensive black postgenal region. The thoracic shield is correspondingly darker, especially on one specimen; and it is considerably darker than the anal shield. Head measurements of the two individuals, length: width, were 0.90: 1.03 mm. and 0.94: 1.15 mm. Abdominal crotchets varied from 38-42.

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OBSERVATIONS ON THE VOLUNTARY DISPLAY OF COREMATA IN *ESTIGMENE ACREA*

(Lepidoptera: Arctiidae)

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The existence of coremata or "brush-organs" on the abdominal venter of many adults of Arctiidae and related families has repeatedly been demonstrated (Muller, 1874; Bethune-Baker, 1925; Chretien, 1926; Eltringham, 1934, 1935; Lane, 1957). Such organs have been noted in *Estigmene acrea* (Drury) (Morrison, 1874; Stretch, 1883; Weed, 1883; Berlese, 1909:541). The above records report results of hand manipulation of living captives or of artificial inflation of dissected organs of dead specimens; how-