THE GIANT BLASTOBASID MOTHS OF YUCCA (GELECHIOIDEA)

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Members of the family Blastobasidae are mostly small and uniformly drab moths which are characterized by bands of stout spines on the abdominal tergites. The forewings are often gray or brownish with one or more transverse bands of whitish. Species of subfamily Pigritinae are usually less than 12 mm in wingspread and have small or minute labial palpi, and often their forewings are yellowish or brownish, unicolorous or marked by a straight, transverse band. By contrast Blastobasinae are mostly larger, exceeding 12 mm in wingspread, with gray forewings, frequently showing a chevron-shaped pale marking. Their labial palpi are of the typical gelechioid form, elongate and strongly upcurved, reaching the crown or higher.

Taxonomic relationships within the family are only preliminarily known because no comprehensive assessment of genitalic characters has been attempted. The state of knowledge for the North American fauna is as poorly documented as that of any sizeable group of Microlepidoptera. The genera are based on wing venation and secondary male characters (Dietz, 1900, 1910; Forbes, 1923) and need to be readjusted by use of genital features. Preliminary steps in this direction were taken by McDunnough (1961), who based his decisions in proposing two new genera on too little material. About 100 species are described, but probably at least twice that many are represented in collections.

In 1974 I examined all types of Nearctic Blastobasidae at the National Museum of Natural History and Museum of Comparative Zoology (Harvard) (about 70% of the names) in order to develop a framework for biological studies of western species. Dissections of virtually none of the types have been made, and a number of Chambers or Dietz types are lost or are without abdomens, which will complicate matters for future students, as will Dietz's species concepts which were typological and imponderably fine-lined or heterogeneous from one time to another. In general it appears that considerable synonymy will be necessary among species of eastern North America, especially in the Pigritinae, while the western fauna remains largely undescribed, and the few species that have been named probably are valid.

Larvae of Blastobasinae are characterized by a well-developed sub-

mental pit; otherwise they resemble those of the scavenger group of Oecophoridae. Species for which habits have been studied feed in a wide variety of situations, mostly associated with detritus, often in nests of external feeding caterpillars or in galleries of insect borers. Rearing records include flower or seed heads of sumac (Forbes, 1923), Labiatae, Leguminosae, and Dipterocarpaceae (Fletcher, 1920, 1933); in acorns usually but not always following weevil borings (Craighead, 1950); a variety of conifer cones and foliage in association with various moth larvae (Fletcher, 1920; Lyons, 1957; Keen, 1958; Powell unpubl. data); in fallen fruit of *Ficus* (Fletcher, 1920), coffee (Busck & Oliviera, 1925), palm (Common, 1970) and apple mummies (Forbes, 1923); and in association with coccid colonies (Riley, 1887; Essig, 1916; Costa Lima, 1945; Fletcher, 1920; Forbes, 1931). However, in at least one example a species thought to be a predator was later proved to be a general feeder (Basinger, 1924). One species is said to be a gall maker (Costa Lima, 1945 after Brethes, 1917), a relationship that needs confirmation.

The general conclusion that one reaches is that larvae of most species are opportunists, with colonies basically established as scavengers, but individuals feeding in unaffected plant tissue when convenient or even acting in a predator role when a susceptible prey such as scale insects, beetle larvae (Lyons, 1957) or moth pupae (Keen, 1958) are encountered.

Apparently the biology of no member of the Pigritinae has been recorded. I reared *Pigritia arizonella* Dietz from root crowns of *Chrysothamnus* (Compositae) which were tunnelled by larvae of Eucosmini and Cochylidae (Hot Creek, Mono Co., Calif., VII–11–68, J. Powell no. 68G22). Although the feeding habits of *P. arizonella* were not observed, the record suggests that species of this subfamily also are scavengers, but feed on the ground or in subterranean situations. Thus their larvae have been overlooked because North American insect biologists have tended to ignore this ecological horizon.

In some situations species of *Holcocera* are general scavengers which exploit various habitats. For example, at Dune Lakes, San Luis Obispo County, California, I reared one species from bacterial cankers on *Salix*, abandoned nests of Lepidoptera on *Baccharis* and occupied ones on *Eriogonum*, and from sporophores of Polyporaceae used by ciid beetles. In general, however, data are too preliminary to permit conclusions about habitat specificity because the taxonomy is incomplete and because there are few rearing records relative to the number of species for which adults are known.

Holcocera gigantella was described from Colorado by Chambers (1876), who found the adults perched and mating on leaves of yucca. The biology of this species appears to be exceptional in that a specific habitat is used and prior insect colonies may not be a necessity. Widely disjunct populations showing varying degrees of differentiation have been discovered in association with Agavaceae. Larvae feed in *Yucca* inflorescences after the pods are developing and in flowers of *Agave*.

Some information on the biology of *H. gigantella* has been given elsewhere (Powell & Mackie, 1966). During a study of the moths associated with *Yucca whipplei* larvae were found in large numbers in old pods and in green fruit prior to seed maturation. At one seaside locality in southern California there appeared to be continuous generations. Pupae that produced adults within a few days were collected in February, March, July, and October.

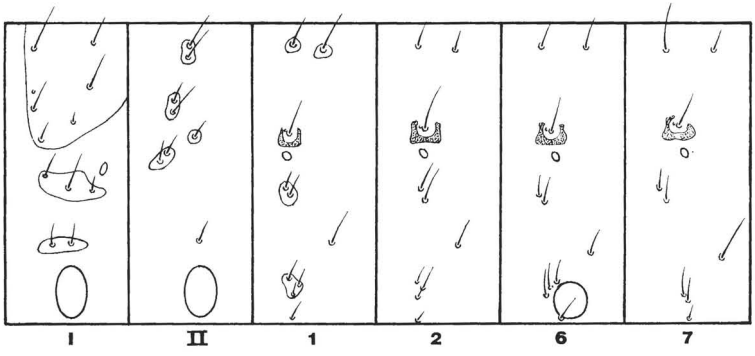
A second species, described below, occurs sympatrically with *H. gigantella* in southern Arizona in association with *Yucca schottii*. Although the new species lives in the same habitat and also is one of the largest Nearctic blastobasids, the two may not be phylogenetically closely related. Markedly different morphological characteristics, especially in female genitalia, are exhibited by the two. The present clarification of the status of these blastobasids provides background information for the *Y. schottii* study as well as a name for the second species.

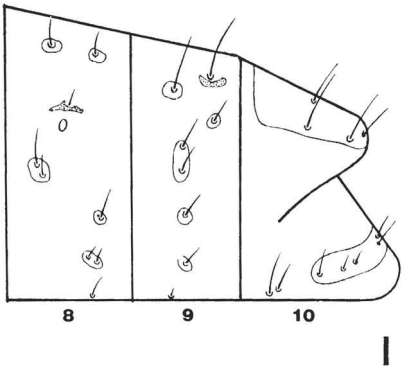
Holcocera gigantella (Chambers)

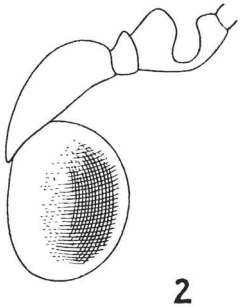
Blastobasis gigantella Chambers, 1876, Can. Ent. 8: 219.
Holcocera gigantella; Dyar, 1903, Bull. U.S. Natl. Mus. 52: 529; Dietz, 1910, Trans. Amer. Ent. Soc. 36: 29 (taxonomy); Powell & Mackie, 1966, U. Calif. Publ. Ent. 42: 41 (biology).

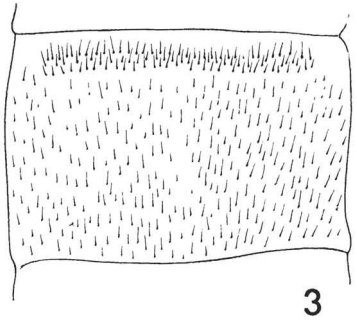
This is the largest Nearctic blastobasid. The forewings are gray with variable, longitudinal blackish markings.

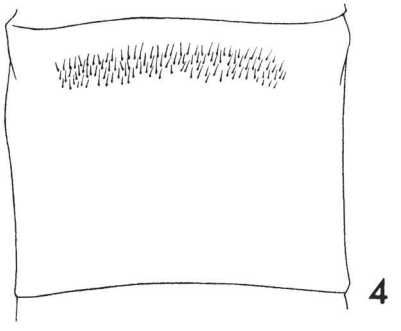
Male. Length of forewing 11.1–14.7 mm. *Head*: Labial palpus moderately elongate, strongly upcurved, exceeding crown; II segment length 1.1–1.3 times eye diameter; III = 0.65–0.70 as long as II; smooth scaled, whitish with scattered dark gray scales. Antennal scape elongate, length 0.9 eye diameter, broadened distally; 2nd segment short, broad, notched dorsally; 3rd segment claw-shaped, greatly broadened basally with a deep, rounded dorsal notch distally (Fig. 2); setae of shaft elongate, length greater than diameter of 4th and succeeding segments. Scaling of front and crown appressed, whitish to grayish. *Thorax*: Dorsal scaling white to gray; underside whitish, legs grayish exteriorly, hind tibia with enlarged, white dorsal fringe. *Forewing*: Narrow, length 4.5–4.9 times width. Ground color whitish to gray, usually with obscure to well-defined longitudinal, blackish lines along the veins, at least on distal half. In the typical form the lines are well-defined from base to apex, distinctly contrasting with the whitish ground and forming a short bar in middle of cell above fold and a transverse line or paired spot at end of cell; more often the markings obscured on basal half, with lines and spots of distal half strongly contrasted on a pale to dark gray ground; rarely with additional infuscation broadening the lines into spots that tend to form











Figs. 1–3. *Holcocera gigantella* (Chambers): 1, setal patterns on thoracic segments I–II, abdominal segments 1, 2, 6–10; 2, outline of antennal segments 1–3, eye, dorsolateral aspect; 3, setation of second abdominal tergite. Fig. 4. *H. paradoxa* Powell, setation of second abdominal tergite (posterior margin at top).

transverse bands at middle and in distal third of wing. Fringe pale gray, without extensions of the longitudinal markings. Underside dark gray, in pale forms with suggestion of whitish lines between veins in terminal area. *Hindwing*: Costal margin moderately excavate on distal third; width at end of cell about equal to forewing. Veins M_3 + Cu_1 stalked a varying distance, M_2 free, connate at base of M_3 + Cu_1 or from their stem. Base of anal margin and 3A with elongate, whitish ochreous hair tufts. Upperside scaling whitish and roughened on basal third, becoming pale gray and smooth distally; fringe paler, whitish. Underside similar, darker. *Abdomen*: Tergite 1–2 with a dense row of spines posteriorly and scattered smaller spines over whole surface (Fig. 3), 3–7 with compact, narrow posterior spine row only. Scaling shining whitish gray, obscuring the spine rows in fresh specimens. Genitalia as in Fig. 5 (drawn from lectotype, JAP prep. no. 4008, 9 preparations examined); transverse band of gnathos broad, with posterior notch; valva with a basal, triangular-shaped flap; costal process and free portion of sacculus relatively elongate, ca. 0.3 the total length of valva; sclerotized band of aedeagus forming a narrow ring at base.

Female. Length of forewing 11.7–14.7 mm. Essentially as described for male, differing as follows: labial palpus more elongate, II segment length 1.4–1.5 times eye diameter, III = 0.80–0.85 as long as II. Second and 3rd antennal segments unmodified; antennal ciliation short, less than 0.5 segment diameter. Forewing pattern variable, tending to be darker than male in any given population; forewing broader, length 4.3–4.6 times width. Genitalia as in Fig. 7 (drawn from paralectotype, JAP prep. no. 4009, 6 preparations examined); base of ductus bursae unmodified, without spiculae or scobination, gradually enlarged and abruptly turned before entering corpus bursae; signum broad, with a deep median crease, smooth surfaced.

Lectotype. Male, by present designation; Colorado, in MCZ; bearing labels: "Chambers Color.," "Type 1551," "Blastobasis gigantella Col." (the last in Chambers' handwriting); and Genitalia 4008, JAP '75. There are two females and a specimen lacking metathorax and abdomen with the same data, in MCZ, and a specimen in poor condition with the Chambers determination label in NMNH. In the original description Chambers stated that he had met with the species only once, on the road to Monument Park, about 3 mi. N of Colorado Springs.

The type series is of the phenotype with whitish forewings marked by strongly contrasting dark longitudinal lines. Most specimens from certain California localities (San Luis Obispo Co., Santa Barbara Co., San Bernardino Mts., Mojave Desert) are similar, usually with more blackish markings. The material from San Diego County and Baja California is generally darker, most individuals having a uniform dark gray ground marked by diffuse longitudinal lines. A few southern California specimens and those from southern Arizona are intermediate, having a pale gray ground and with the dark markings more well-defined than in most San Diego examples and more extensive than in the typical form, tending to form transverse spots. The single specimen from Wyoming is similar to the types, which are the largest specimens. Those from California are moderately large, ranging up to 14.4 mm in forewing length; the short series from Arizona average smaller, ranging to 12.7 mm in the male and 13.4 mm in the female. Two males from Baja California reared from *Agave orcuttiana* flowers are the smallest (FW 11.1–11.7 mm), possibly a function of the food (flowers vs. pods) or rearing conditions, but they do not differ structurally.

Larva. The following diagnosis of the larval characteristics is based on a composite series of 20 last instar individuals from Cardiff, San Diego Co., California, collected in June 1963, and March and October 1967 (J. Powell nos. 63F13, 67C36 and 67K80).

Last instar larva: Length including head 13.0–23.8 mm (distended in KAAD preservative). *Head*: Width of head capsule (HC) 3.2–3.8 mm; deep amber to

orange brown dorsally with faint darker mottling; adfrontal plates narrow and irregularly bordered exteriorly. Setal arrangements as in *H. chalcofrontella* (Clemens) (MacKay, 1972). Submental pit well-defined, the submentum sclerotized laterally and posteriorly to the pit. *Body*: Thoracic shield and rings below SD_1 seta of Th3 to Ab7 dark amber, darker than the pinacula and anal shield, which vary in color independently, from yellowish to brown. Integument variably mottled with pale to dark purplish, forming on abdomen 3 broad, longitudinal bands, 2 in SD area and a weaker one in L enclosing spiracles; the intervening D and SD bands (latter enclosing SD_1 setae and their sclerotized crescents) usually unpigmented, but white in intensely colored individuals. Setal arrangements as in Fig. 1. Abdominal spiracles slightly oblong, tilted dorso-anteriorly, about 2× the size of most setal bases. Abdominal crotchets in a circle, 38–46 (usually 38–42), partially biordinal in an inconsistent pattern. Anal crotchets 27–35, partially biordinal to nearly triordinal. Anal fork absent.

Larvae collected in October were smaller (HC: 3.2–3.35 mm; length 13.0–16.7 mm) and were more deeply pigmented. Samples taken in March and June consisted of larger individuals (HC: 3.4–3.8 mm; length 16.0–23.8 mm) and contained no specimens with white longitudinal markings between the purplish bands.

In larval characters *H. gigantella* does not differ appreciably from the much smaller *H. chalcofrontella* as characterized by MacKay (1972) except in pigmentation and by the oval, relatively larger spiracles in *H. gigantella*.

Material examined. ARIZONA: Bog Springs, Madera Cyn., Santa Rita Mts., VII–10/26–64 (adults in flowers and reared from fruit of *Yucca schottii*; D. R. Davis); VII–30–73 (1 ♀ at light; Coville, Szerlip and Powell); 2 mi. SW Portal, Cochise Co., VII–25–72 (1 ♀ in flowers of *Y. schottii*; Powell). CALIFORNIA: short series, unknown locality in Los Angeles Co., VI–VII–1888 (reared from *Y. brevifolia*; Coquillett and Riley). Large series from various localities in association with *Y. whipplei*, as follows: Cardiff, San Diego Co. (reared from old and green fruit); 7 mi. E Morro Bay, S. L. O. Co., VI–23–65 (at light, Buckett); Mt. Lowe, VI–6–24 (Piazza) and 2 mi. NW Devil's Punchbowl, L. A. Co., V–1–68 (at light; Opler, Powell); Forest Home (reared; Dammers) and Mill Creek, San Bernardino Co., (reared; Keifer); 3 mi. N Refugio Beach, Santa Barbara Co., VI–21/28–65 (at light; Buckett and Powell). COLORADO: type series, cited above. WYOMING: 6 mi. NW Newcastle, Weston Co., VII–13–65 (1 ♀ at light; Hodges). MEXICO, BAJA CALIFORNIA NORTE: 2 mi. E El Rosario, III–26–73 (reared from flowers of *Agave orcuttiana*; Doyen and Powell); 5 mi. E El Rosario, III–18–72 (1 ♀ at light; Doyen and Powell).

In addition there is a series of specimens from Hidalgo, Mexico, which differ by having the forewing nearly immaculate white (Ruins of Tula, 7500′, VII–31–63, reared from yucca pods; D. R. Davis). Despite the differing phenotype and widely disjunct distribution, I did not find structural features to distinguish this population from *H. gigantella* (two genitalia preparations of each sex examined). The forewing in most individuals is nearly entirely pale grayish white, with only the two dark dots at the end of the cell which are characteristic of the genus. One female is slightly darker grayish, showing faint longitudinal grayish lines.

Two larvae from the intervening geographical region were examined. These were collected from fruit of *Yucca filifera* on the road to Salinas, 79 km NW of San Luis Potosi, 18 June 1963, by L. E. Caltagirone. They are distinguishable from *H. gigantella* as characterized above from California only in having the integumental purplish pigmentation restricted to more well-defined SD and L bands.

Holcocera paradoxa Powell, **new species**

A moderately large blastobasid having pale forewings with blackish longitudinal lines and two black dots at the end of the cell, and short antennal ciliation in the male.

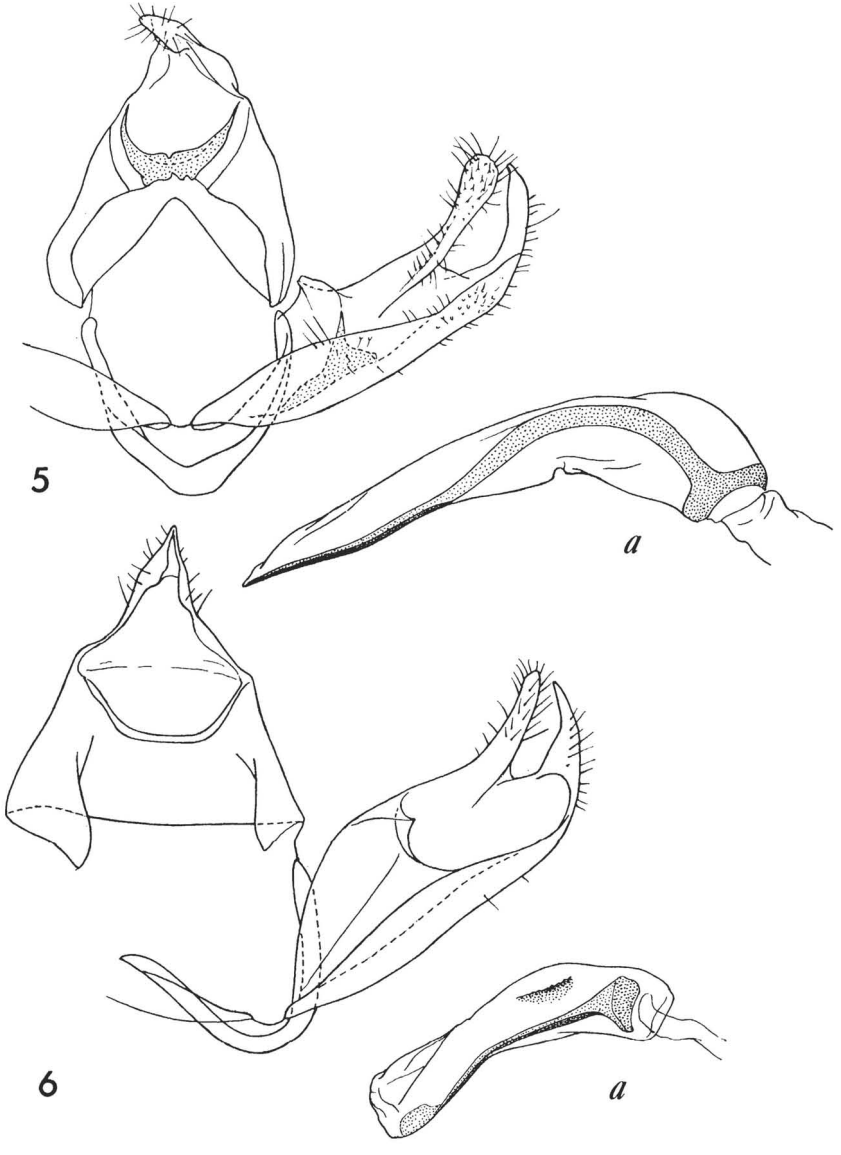
Male. Length of forewing 9.7 mm. *Head*: Labial palpus elongate, strongly curved, exceeding crown; II segment length 1.4 times eye diameter; III = 0.9 as long as II; smooth scaled, whitish with scattered dark scales. Antenna with scape elongate, subequal to eye diameter, broadened with elongate pecten on anterior margin, 2nd segment short, less than 0.25 length of 1st; 3rd claw-shaped, broadened basally with a deep notch on dorsal side distally; short ciliate, the setae less than 0.5 diameter of 4th segment. Scaling of front and crown whitish tan. *Thorax*: Dorsal scaling whitish tan with scattered brownish. Venter whitish tan; legs speckled with dark gray exteriorly; hind tibia with enlarged dorsal fringe. *Forewing*: Narrow, length 4.4 times width. Scaling whitish tan, dark gray between the veins, forming moderately distinct longitudinal lines, especially on costal half and beyond cell; a whitish blotch at end of cell enclosing two dark dots at upper and lower corners of cell. Fringe pale grayish. Underside dark gray to margins; fringe pale. *Hindwing*: Slightly narrower than forewing at end of cell; vein M_2 separate, nearly adjacent to connate base of M_3 and Cu_1. Dorsal scaling shining whitish gray. Fringe broad, whitish ochreous. Underside gray, fringe as above. *Abdomen*: Scale coloration not recorded. Dorsal spine bands narrow, compact, well-defined (about 3–4 spines wide) on segments 2–7 (Fig. 4); basal segment without spines. Genitalia as in Fig. 6 (drawn from holotype, JAP prep. no. 3874, one preparation examined); transverse connection of gnathos narrow without posterior notch; valva with costal process and free portion of sacculus relatively short, ca. 0.25 valva length; sclerotized median fold relatively elongate, 0.5 valva length; aedeagus with sclerotized band broad at base.

Female. Length of forewing 10.6 mm. Essentially as described for male, differing as follows: 2nd and 3rd segments of antenna not modified, antennal ciliation short. Forewing pattern more diffuse, the dark lines and spots less distinct. Hindwing with veins M_3 + Cu_1 stalked, the stem about 0.25 the length of Cu_1; M_2 connate with M_3 + Cu_1 stem. Abdomen with dorsal spine rows on segments 2–7. Genitalia as in Fig. 8 (drawn from allotype, JAP prep. no. 3847, one preparation examined); sterigma weakly sclerotized, scobinate; ductus bursae narrow throughout, rugose but not spiculate; signum a broad, concave plate, densely spurred interiorly.

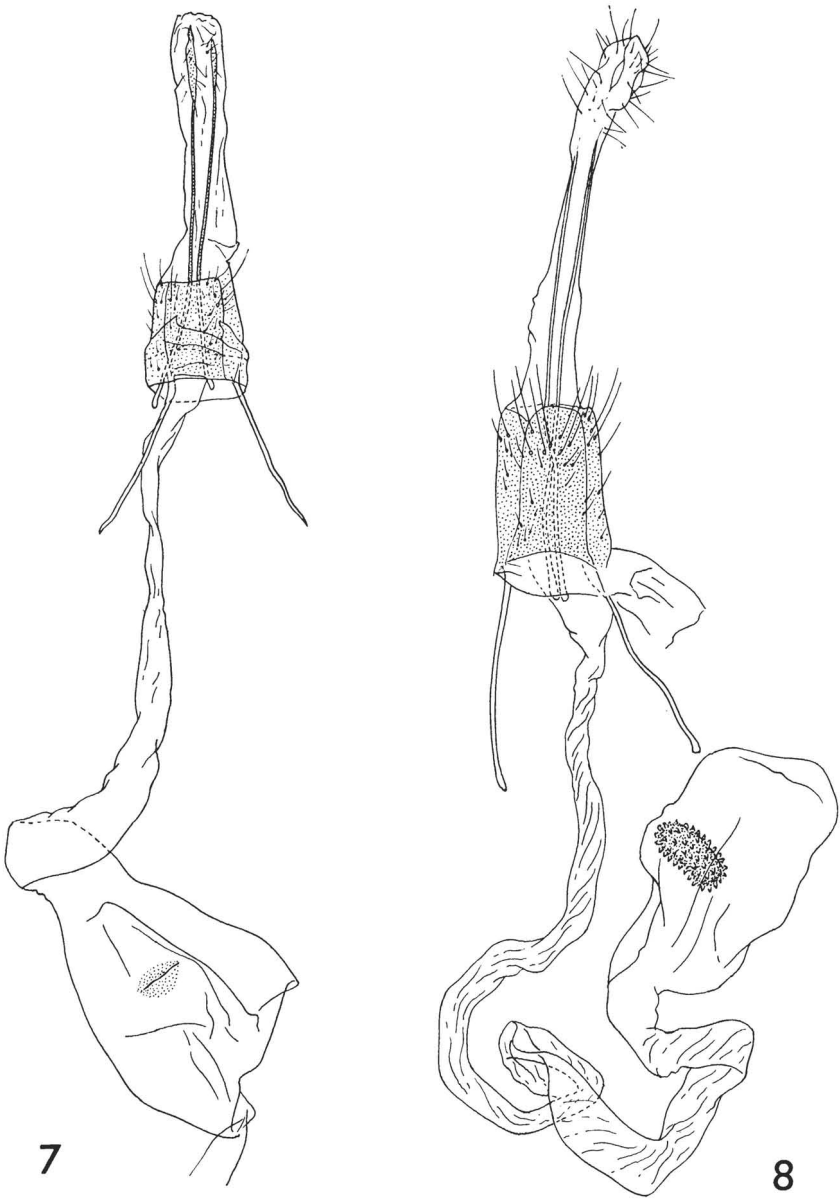
Holotype. Male, Arizona, Madera Canyon, Santa Rita Mountains, 6 June 1968, reared from remnants of 1967 pods *Yucca schottii*, emgd. 24 September 1968 (J. Powell no. 68F47). Allotype female, same locality, 3 October 1968, reared from 1968 pods *Y. schottii*, emgd. 3 June 1969 (J. Powell no. 68K15). Holotype placed at the California Academy of Sciences on indefinite loan from the Essig Museum of Entomology, University of California, Berkeley, which retains the allotype.

The peculiar wing venation in the hindwing of the male is outside the range of that shown in a long series of males of *H. gigantella*, which although somewhat variable, always have M_3 + Cu_1 at least short-stalked. The female venation in *H. paradoxa* is typical of *Holcocera* and *Holcocerina* as defined by McDunnough (1961), but the female genitalia in these two species possess a mixture of features of the two genera. The status of *Holcocerina* will have to be reassessed by comprehensive study of North American species. The new species is most similar to *H. gigantella* among Nearctic blastobasids for which salient features have been described. *H. paradoxa* differs by its smaller size, more elongate labial palpus, and short antennal ciliation in the male, and compact spine row on abdominal segment 2. In genitalia, *paradoxa* is distinguished by its narrow gnathos band and relatively short free parts on the valva and by the distinctive features in female genitalia: sterigma form, ductus form and surface texture, and the spurred signum.

Preserved larvae believed to represent *H. paradoxa* were examined from the type locality (Oct. 1968, Sept. 1969, Aug. 1970), Pena Blanca Lake area, Santa Cruz Co., Ariz. (Sept. 1969) and Paradise Road, Chiricahua Mts., Ariz. (Aug. 1971). All were collected as eggs or larvae from green pods of *Yucca schottii*. These larvae



Figs. 5–6. *Holcocera*, male genitalia, ventral aspect, valvae spread, aedeagus (a) removed and shown in lateral aspect: 5, *H. gigantella* (Chambers), lectotype; 6, *H. paradoxa* Powell, holotype.



Figs. 7–8. *Holcocera*, female genitalia, ventral aspect: 7, *H. gigantella* (Chambers), paralectotype; 8, *H. paradoxa* Powell, allotype.

do not differ structurally from those of *H. gigantella*, as characterized above from California. However, Arizona specimens differ by lacking most of or all of the integumental pigmentation. The color and extent of sclerotization of the prothoracic shield and kappa group pinaculum is similar in the two geographic samples, but the extensive purplish markings that form longitudinal bands in *H. gigantella* are lacking or represented by only faint traces in *H. paradoxa*. The dark sclerotized crescents (SD_1) of the metathorax and abdominal segments 1–7 and the conspicuously brown pinacula in *H. gigantella* are unpigmented in *H. paradoxa*. The integumental pigment is darker in the penultimate and antepenultimate stadia in *H. gigantella*. These stages lack integumental markings in the Arizona populations, so instar differences between collections is not a factor in the two forms.

After adults were reared from small samples of pod material in 1968, larger collections were made in September 1969, but all larvae died, probably due to overheating during field transit. The larval habits of *H. paradoxa* are briefly described elsewhere (Powell, 1976).

ACKNOWLEDGMENTS

Field work during this study was supported in part by National Science Foundation Grant GB–6813X. J. T. Doyen (University of California, Berkeley), P. A. Opler (Office of Endangered Species, Washington, D.C.), and R. A. Mackie (Public Health Service, Guam) assisted with field collections. The illustrations were executed by Celeste Green.

Cooperation by J. F. Lawrence, Museum of Comparative Zoology, Harvard and R. W. Hodges, National Museum of Natural History, Washington, D.C. enabled study of specimens in those institutions.

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NOTES AND NEWS

Recent Letter

Dear Dr. Godfrey,

With reference to Mr. Manley's note on "The 'greasy' wing gene of *Utetheisa ornatrix* (Arctiidae)" (1975, J. Lepid. Soc. 29: 77), I do not think that any special significance should be attached to the 1:1 ratio in females *ex* various collections, except that it shows that the aberration is confined to the female, but whether sex-linked or sex-controlled can only be ascertained by breeding. It is most unusual for the proportion of an aberration to the type in museum collections to correspond with the proportion in nature; there is an inevitable bias in favour of the aberration. Also no inference as regards dominance can be drawn from such figures, as many morphs, genetically dominant, are far rarer than the recessive allelomorph in nature. A good example is f. *salaami* Suff. of *Papilio dardanus* Brown, which is far rarer than f. *hippocoon* F., to which it is dominant.

Dr. Sargent's experience with *Papaipema duovata* (1975, J. Lepid. Soc. 29: 9) appears to confirm the comment made by J. W. Tutt, the famous English entomologist, early in the century "that no species is rare if you know where to look for it."

An entomologist, working with light, both mercury vapour and incandescent, would be quite justified in concluding that the sphingid *Nephele peneus* Cr. did not occur in Mombasa. Its congeners *argentifera* Wlk., *bipartita* Btlr., *funebris* F. and *comma* Hpffr., all visit light freely, whilst *aequivalens* Wlk., *oenopion* Hbn. and *rosae* Btlr. occur more rarely, but during 20 years collecting I have known a single *peneus* to visit light. Yet it is quite common and an examination of its foodplant in the proper season will always provide large numbers of ova and larvae at all stages of growth.

D. G. SEVASTOPULO