

LARVAL DESCRIPTIONS OF *RENIA HUTSONI*, *R. RIGIDA*, AND
R. MORTUALIS WITH A KEY TO LARVAE OF *RENIA*
(LEPIDOPTERA: NOCTUIDAE)

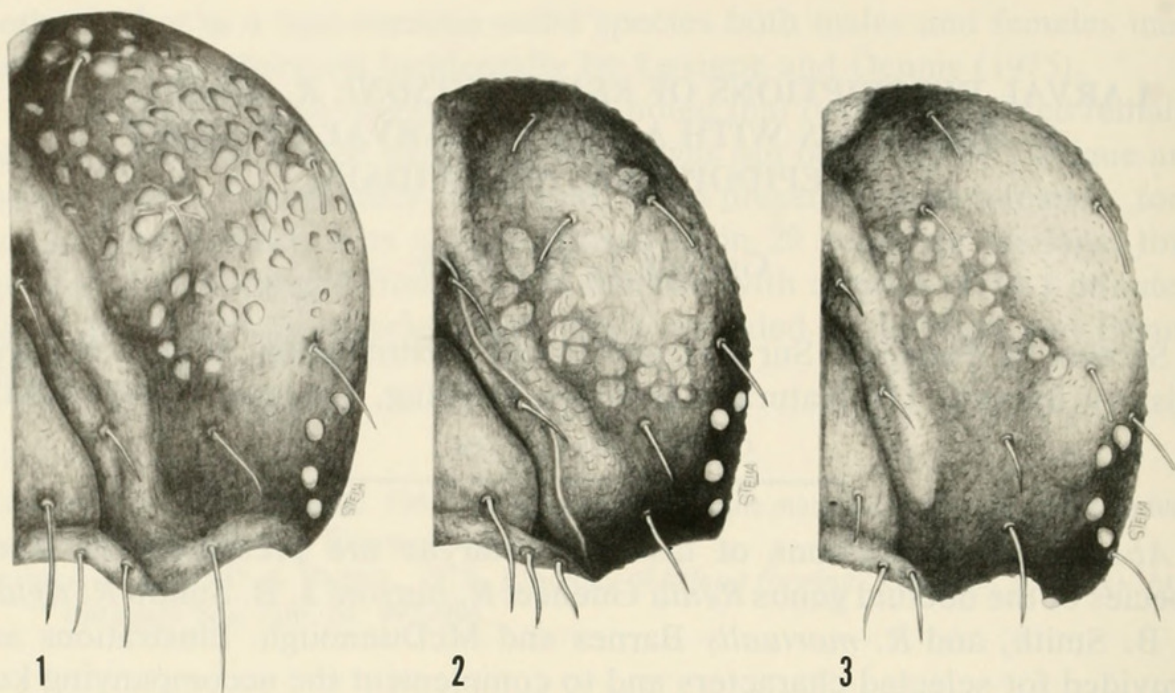
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Abstract.—Descriptions of last instar larvae are presented for three species of the noctuid genus *Renia* Guenée: *R. hutsoni* J. B. Smith, *R. rigida* J. B. Smith, and *R. mortualis* Barnes and McDunnough. Illustrations are provided for selected characters and to complement the accompanying key to all known *Renia* larvae.

Systematic and life history information on the larvae of species in the genus *Renia* Guenée (subfamily Herminiinae) is attributable to Dyar (1900), Crumb (1934, 1956), and Forbes (1954). Dyar described the egg, all larval instars, and, briefly, the pupa of *Renia sobrialis* (Walker) although the correct identity of the species that he reared is *R. larvalis* Grote. He stated that eggs from early June moths of *R. larvalis* produced moths of *R. sobrialis* in August, concluding that *R. larvalis* is a form of the latter. McDunnough (1938) and Forbes (1954) treated *R. larvalis* and *R. sobrialis* as distinct species. The second author maintained that the moths of *R. larvalis* exhibit seasonal variability (size and coloration) whereas *R. sobrialis* does not, but that the two species can be separated on the basis of antennal characteristics. Forbes additionally gave very brief larval descriptions and life history information for *R. larvalis* and *R. sobrialis* although he acknowledged uncertainty regarding the identity of the larva of the second species. Crumb (1934) provided a generic description of *Renia* based on larval characters, fairly extensive descriptions for the larvae of six species (*R. factiosalis* (Walker), *R. sobrialis*, *R. salusalis* (Walker), *R. fraternalis* J. B. Smith, *R. flavipunctalis* (Geyer), and *R. discoloralis* Guenée), a key for separating the species, and some life history data. Descriptions of the same six taxa and the key are repeated with slight modifications in Crumb's 1956 paper.

Published information indicates that *Renia* larvae characteristically feed on dead leaves of deciduous trees (Dyar, 1900; Crumb, 1934, 1956; Forbes, 1954) except that Forbes noted *R. larvalis* to feed on fresh and wilted leaves

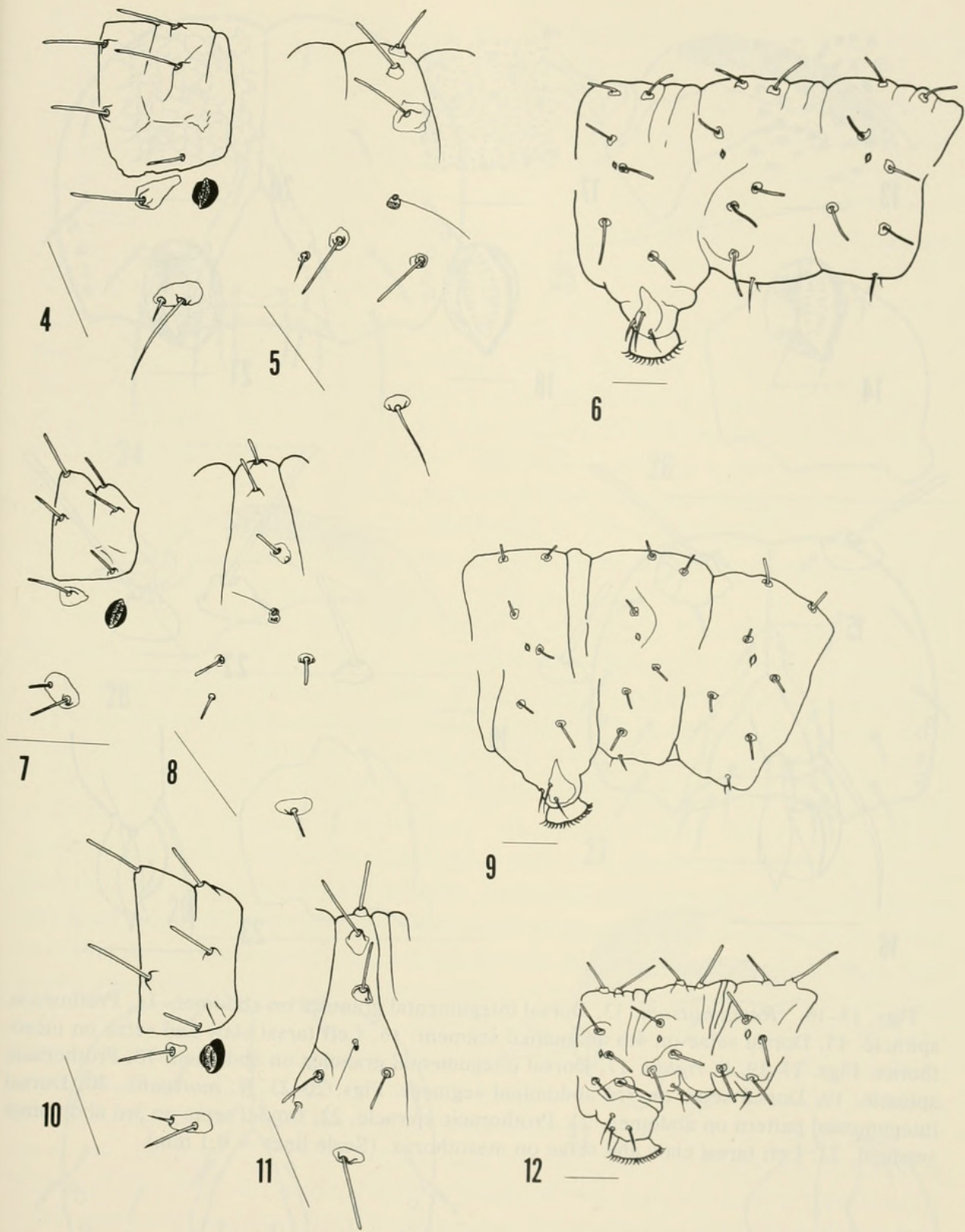


Figs. 1-3. Left half of head capsules showing color patterns and surface sculpturing: 1, *Renia hutsoni*. 2, *R. rigida*. 3, *R. mortualis*.

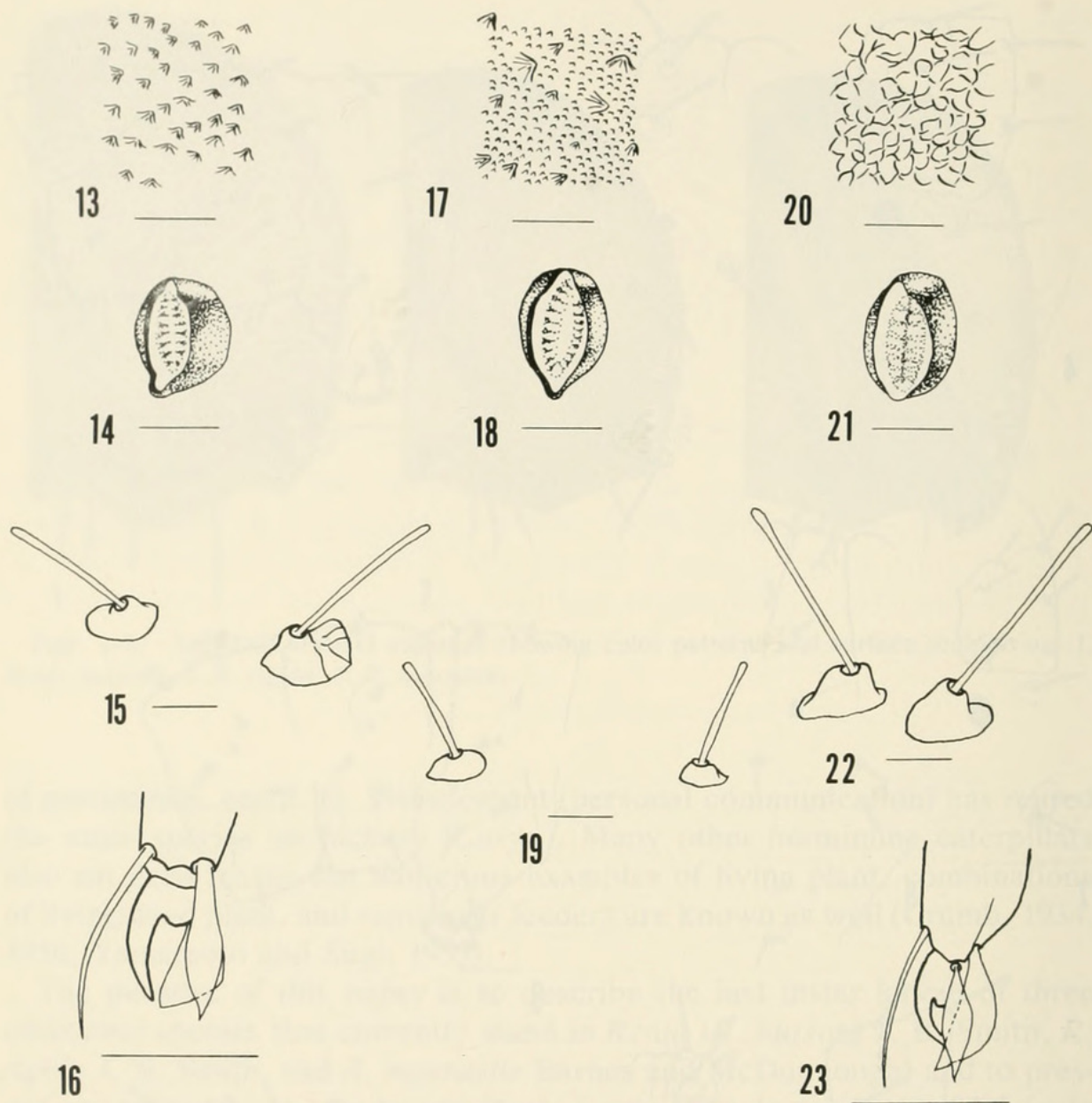
of persimmon, and J. G. Franclemont (personal communication) has reared the same species on hickory (*Carya*). Many other herminiine caterpillars also eat dead leaves but numerous examples of living plant, combinations of living/dead plant, and scavenger feeders are known as well (Crumb, 1934, 1956; Yamamoto and Sugi, 1955).

The purpose of this paper is to describe the last instar larvae of three additional species that currently stand in *Renia* (*R. hutsoni* J. B. Smith, *R. rigida* J. B. Smith, and *R. mortualis* Barnes and McDunnough) and to present an updated key to the known *Renia* larvae. The descriptions of *R. rigida* and *R. mortualis* are offered with some hesitancy because of the small number of reared specimens that were studied. However, because of little chance to secure additional adult-associated larvae of these species in the foreseeable future, the descriptions are presented in spite of the inherent limitations rather than not utilize the available material.

The three species were reared from eggs of female moths collected during a 1967 summer field study in the Chiricahua Mountains, Cochise County, Arizona. Specific collecting localities and dates are provided in the individual descriptions. The larvae were fed dead leaves of *Quercus* spp. that were misted with water daily. The mature larvae were preserved in 70% EtOH and deposited in the collection of John G. Franclemont. All accompanying illustrations were drawn to scale with the aid of a M5 Wild stereomicroscope and a grid system. The terminology follows that used previously (Godfrey, 1972).



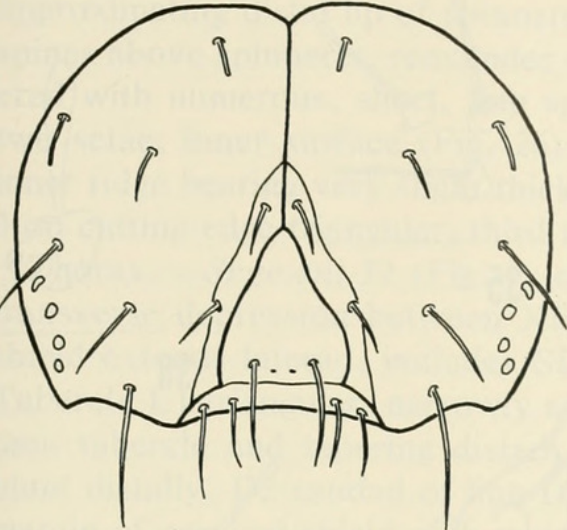
Figs. 4-6. *Renia hutsoni*. 4, Prothorax. 5, Metathorax. 6, Abdominal segments 6-8. Figs. 7-9. *R. rigida*. 7, Prothorax. 8, Mesothorax. 9, Abdominal segments 6-8. Figs. 10-12. *R. mortualis*. 10, Prothorax. 11, Metathorax. 12, Abdominal segments 6-8. (Lateral views; scale lines = 0.5 mm)



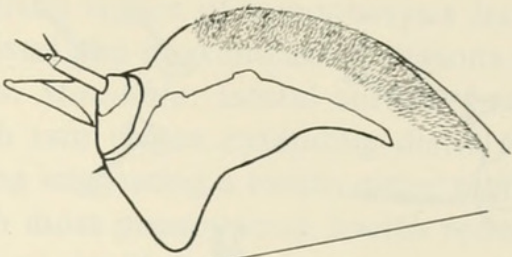
Figs. 13-16. *Renia hutsoni*. 13, Dorsal integumental granules on abdomen. 14, Prothoracic spiracle. 15, Dorsal setae on 4th abdominal segment. 16, Left tarsal claw and setae on mesothorax. Figs. 17-19. *R. rigida*. 17, Dorsal integumental granules on abdomen. 18, Prothoracic spiracle. 19, Dorsal setae on 3rd abdominal segment. Figs. 20-23. *R. mortualis*. 20, Dorsal integumental pattern on abdomen. 21, Prothoracic spiracle. 22, Dorsal setae on 3rd abdominal segment. 23, Left tarsal claw and setae on mesothorax. (Scale lines = 0.1 mm)

Renia hutsoni Smith

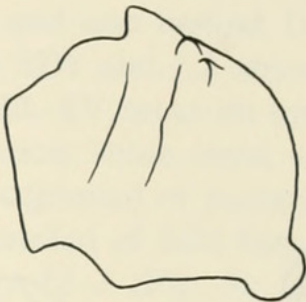
General.—Head width 1.40–1.54 mm. Total head and body length 14.58–17.42 mm. Metathoracic coxae widely separated. Prolegs present on Ab3–6, 10; size slightly increasing caudad on Ab3–6. Crochets homoideous, uniordinal. Integument of head and body granulated. Head (Fig. 1) with small convex granules giving beaded texture above antennal socket and



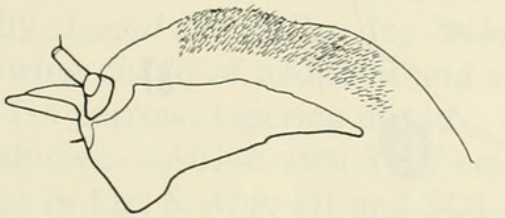
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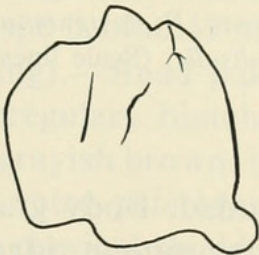
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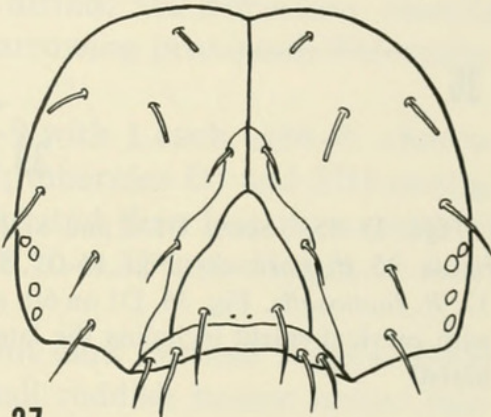
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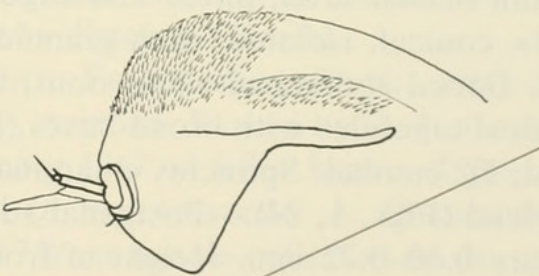
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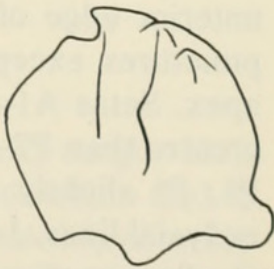
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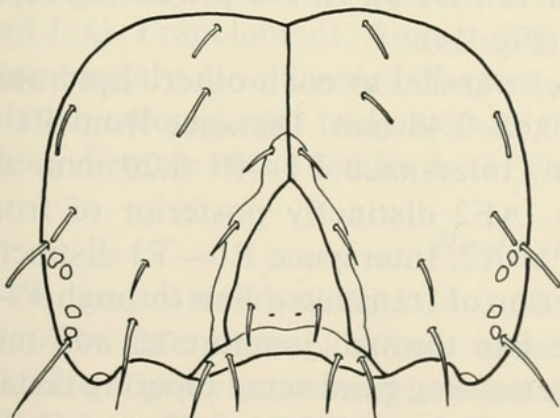
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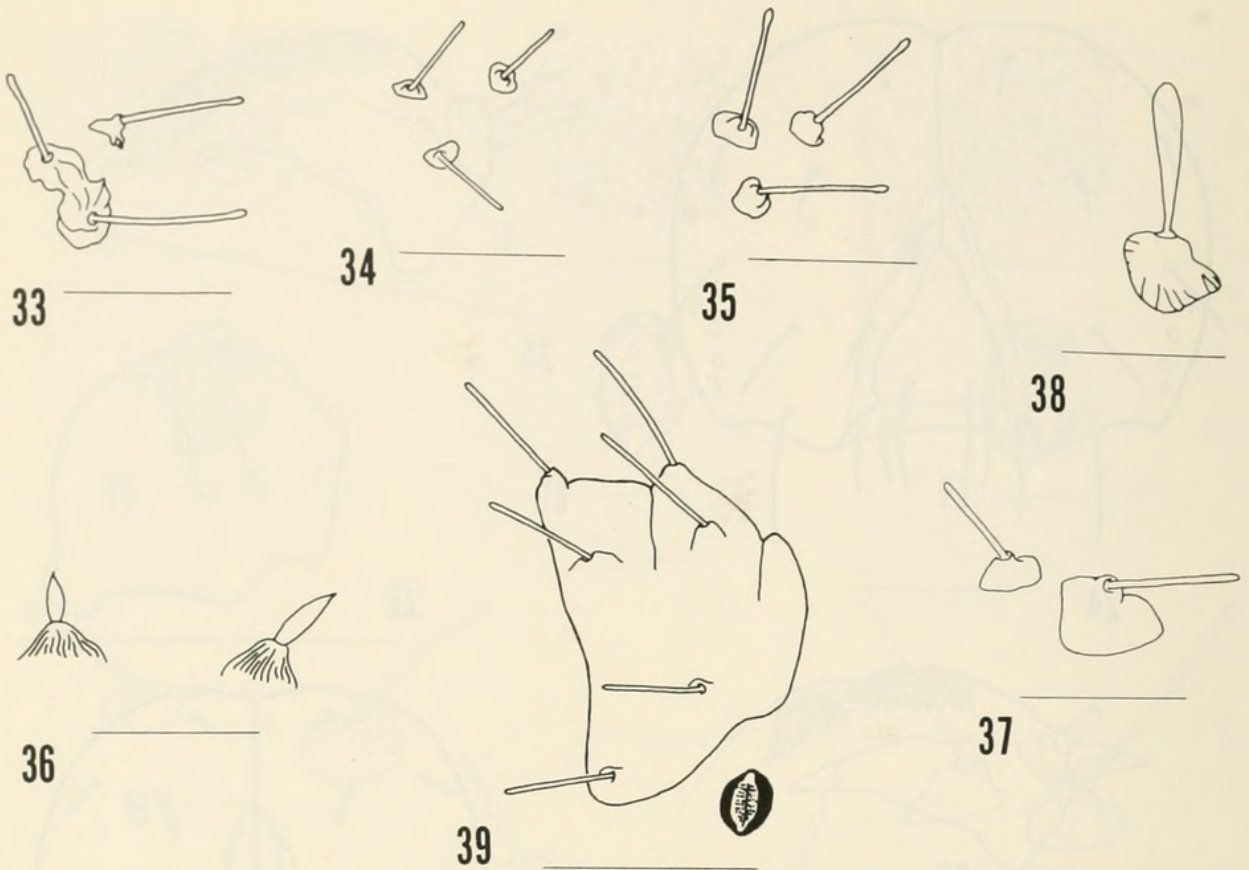


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30

Figs. 24–26. *Renia hutsoni*. 24, Chaetotaxy of head (frontal). 25, Hypopharyngeal complex. 26, Mandible. Figs. 27–29. *R. rigida*. 27, Chaetotaxy of head (frontal). 28, Hypopharyngeal complex. 29, Mandible. Figs. 30–32. *R. mortualis*. 30, Chaetotaxy of head (frontal). 31, Hypopharyngeal complex. 32, Mandible. (Scale lines = 0.5 mm)



Figs. 33–35. Setae D1–2 and SD1 on 9th abdominal segment. 33, *Renia hutsoni*. 34, *R. rigida*. 35, *R. mortualis*. Figs. 36–37. Setae D1–2 on 7th abdominal segment. 36, *R. discoloralis*. 37, *R. factiosalis*. Fig. 38. D1 on 6th abdominal segment, *R. flavipunctalis*. Fig. 39. Prothorax with cervical shield including the lateral seta, *R. salialis*. (Scale lines = 0.5 mm except as noted)

within ocellar area, pitted and rugose caudad. Body granules (Fig. 13) at $100\times$ conical, isolated, each granule bearing minute ridges converging distad. Dorsal abdominal setae stout, blunt distally, inserted in conspicuous, conical tubercles with broad bases (Fig. 15); D1 on Ab1–8 projecting cephalad, D2 caudad. Spiracles emarginate (Fig. 14).

Head (Figs. 1, 24).—Postgenal sutures parallel to each other. Epicranial suture 0.60–0.72 mm. Height of frons 0.42–0.48 mm. Distance from F1 to anterior edge of clypeus 0.18–0.22 mm. Interspace F1—F1 0.20 mm. All punctures except Fa's not discernible. AF2 distinctly posterior of frons apex. Setae A1–3 forming obtuse angle at A2. Interspace P1—P1 distinctly greater than P2—P2. L distinctly posterior of transverse line through P1—P1. P1 slightly posterior of transverse line through juncture of adfrontal ecdysial lines. L and P2 blunt distally, remaining head setae tapering distad. Ocellar spacing: Oc1—Oc2 0.03–0.04 mm, Oc2—Oc3 0.04–0.07 mm, Oc3—Oc4 0.02–0.03 mm.

Mouthparts.—*Hypopharyngeal complex* (Fig. 25): spinneret tapering distad; stipular seta distinctly shorter than Lps1, shorter than Lp1; tip of Lp2

approximating distal lip of spinneret; distal region of hypopharynx lacking spines above spinneret, remainder of distal and proximolateral regions covered with numerous, short, thin spines. *Mandible*: lateral surface bearing two setae; inner surface (Fig. 26) with two ridges extending distad, first inner ridge bearing very slight thickening suggesting a tooth; outer teeth 1–3 on cutting edge triangular, third tooth most pronounced, fourth reduced.

Thorax.—*Segment T1* (Fig. 4): cervical shield distinctly sclerotized with transverse depression between XD and D tubercles and one behind D's; shield extends laterad, includes SD2 tubercle. Setae SD1 and L2 absent. Tubercle L1 triangular, narrowly separated from shield. SV setae on common tubercle and tapering distad, remaining prothoracic setae stout and blunt distally. D2 caudad of line D1—XD2. Spiracle cephalad of posterior margin of cervical shield with major axis extending caudad of SD2 but intercepting posterior portion of SV tubercle. *Segments T2–3* (Fig. 5): SD1 thin, hairlike; L2, SV and V tapering distad; remaining setae stout, blunt distally. *Tarsal setae* (Fig. 16): Ts1 tapering distad; Ts2 lanceolate, sharply narrowing distad of midpoint and slightly narrowing proximad; Ts3 spatulate; Ts4 narrow, tapering distad.

Abdomen.—Ab1–6 with 3 SV setae, Ab7–9 with 1 each. Ab6–8: chaetotaxy as in Fig. 6. Ab9: D1 and SD1 subequal; tubercles D1 and SD1 contiguous to narrowly separated (Fig. 33), if separated then less than width of either tubercle. Length of D1,2's on Ab6–7 0.20–0.32 mm. Height of Asp7 0.09–0.10 mm, Asp8 0.14–0.15 mm.

Coloration (living).—Head pale brown with dark coronal stripes. Body grayish brown, irregularly blotched with small reddish brown areas; middorsal area dark, grayish brown; tips of tubercles dark brown to black, bases yellowish brown; setae pale brown. Cervical shield dark brown. Width of middorsal line on cervical shield about $\frac{1}{4}$ distance D1—D1.

Material examined.—*Seven specimens*: East Turkey Creek, 6400 feet, Chiricahua Mountains, Cochise County, Arizona. Reared by G. L. Godfrey and J. G. Franclemont, August–September 1967 on fallen leaves of *Quercus* spp. (mainly *Q. arizonica* Sargent and *Q. hypoleucoides* A. Camus) from whitish colored eggs laid on 30 July 1967 from female collected on the same night. Female identified by J. G. Franclemont.

Renia rigida Smith

General.—Head width 1.24–1.30 mm. Total head and body length 13.7–14.5 mm. Metathoracic coxae widely separated. Prolegs present on Ab3–6, 10; size slightly increasing caudad on Ab3–6. Crochets homoideous, unior-dinal. Integument of head and body granulated. Head (Fig. 2) with homogeneous, small, closely spaced, convex granules creating finely beaded texture. Body granules (Fig. 17) at 100 \times vary in size, isolated, conical; largest granules bearing minute ridges converging distad. Dorsal abdominal setae

(Fig. 19) stout to slightly swollen medially, blunt distally, inserted in small tubercles; D1 on Ab1–8 projecting cephalad, D2 caudad. Spiracles emarginate (Fig. 18).

Head (Figs. 2, 27).—Postgenal sutures nearly parallel to each other. Epicranial suture 0.56–0.62 mm. Height of frons 0.38–0.42 mm. Distance from F1 to anterior edge of clypeus 0.14 mm. Interspace F1—F1 0.12–0.16 mm. All punctures except Fa's not discernible. AF2 distinctly posterior of frons apex. Setae A1–3 forming obtuse angle at A2. Interspace P1—P1 distinctly greater than P2—P2. L slightly posterior of transverse line through P1—P1; L and P1 posterior of transverse line through juncture of adfrontal ecdysial lines. L and P1–2 blunt distally, remaining setae tapering distad. Ocellar spacing Oc1—Oc2 0.02 mm, Oc2—Oc3 0.04–0.05 mm, Oc3—Oc4 0.02–0.03 mm.

Mouthparts.—*Hypopharyngeal complex* (Fig. 28): spinneret tapering distad; stipular seta shorter than Lps1, subequal to Lp1; distal region lacking spines above spinneret, remainder of distal and proximolateral regions covered with numerous, short, thin spines. *Mandible*: lateral surface bearing two setae; inner surface (Fig. 29) with two inner ridges extending distad, first inner ridge bearing slight thickening suggesting a tooth; outer teeth 1–3 triangular, third tooth most pronounced, fourth much reduced.

Thorax.—*Segment T1* (Fig. 7): cervical shield distinctly sclerotized, deep transverse depression divides shield into anterior and posterior halves; shield extends laterad, includes SD2 tubercle. Setae SDL and L2 absent. Setae thick, blunt tips. Tubercle L1 triangular, free from cervical shield. Setae SV1–2 on common tubercle. D2 caudad of line D1—XD2. Spiracle cephalad of posterior margin of cervical shield with major axis passing caudad of SD2 and SV1–2. *Segments T2–3* (Fig. 8): D1–2, SD2, L1–3 and SV1 thick, blunt distally; SD1 thin, hairlike. *Tarsal setae*: Ts1 thick, tapering distad; Ts2 lanceolate, narrowing distad and proximad; Ts3 spatulate; Ts4 tapering distad.

Abdomen.—Ab1–6 with 3 SV setae, Ab7–9 with 1 each. Ab6–8: chaetotaxy as in Fig. 9. Ab9: seta SD1 subequal to D1; tubercles D1 and SD1 distinctly separated by twice width of either tubercle (Fig. 34). Length of D1,2's on Ab6–7 0.16–0.18 mm. Height of Asp7 0.10–0.12 mm; Asp8 0.16–0.18 mm.

Coloration (preserved material).—Head brown with faintly visible dark brown reticulate pattern and coronal stripes. Body sordid, cervical shield dark brown with pale middorsal line nearly as wide as distance D1—D1. Tubercles dark brown, distinct. Largest granules dark brown. Spiracles brown, peritremes dark brown. Thoracic legs, lateral shields of prolegs and anal shield dark brown.

Material examined.—*Two specimens*: East Turkey Creek, 6400 feet, Chiricahua Mountains, Cochise County, Arizona. Reared August–September

1967 on fallen leaves of *Quercus* spp. by G. L. Godfrey from eggs laid by female collected 13 August 1967. Female identified by J. G. Franclemont.

Renia mortualis Barnes and McDunnough

General.—Head width 1.28 mm. Total head and body length 9.8 mm (recently moulted). Metathoracic coxae widely separated. Prolegs present on Ab3–6, 10; size slightly increasing caudad on Ab3–6. Crochets homoideous, uniordinal. Integument of head granulated. Head granules homogeneous, small, convex, closely spaced, creating beaded texture (Fig. 3). Integument of body finely rugose or reticulate at 100 \times (Fig. 20). Dorsal abdominal setae stout, blunt and slightly swollen distally, inserted in large, conical tubercles (Fig. 22); D1 on Ab1–8 projecting cephalad, D2 caudad. Spiracles emarginate (Fig. 21).

Head (Figs. 3, 30).—Postgenal sutures nearly parallel to each other. Epicranial suture 0.40 mm. Distance from F1 to anterior edge of clypeus 0.16 mm. Interspace F1—F1 0.22 mm. All punctures except Fa's not discernible. AF2 distinctly posterior of frons apex. Setae A1–3 forming obtuse angle at A2. Interspace P1—P1 subequal to P2—P2. L on or slightly anterior of transverse line through P1—P1; L and P1 posterior of transverse line through juncture of adfrontal ecdysial lines. A3, O2, and P1–2 blunt distally, remaining head setae tapering distad. *Ocellar spacing*: Oc1—Oc2 0.03 mm, Oc2—Oc3 0.05 mm, Oc3—Oc4 0.02 mm.

Mouthparts.—*Hypopharyngeal complex* (Fig. 31): spinneret tapering distad; stipular seta shorter than Lps1, subequal to Lp1, slightly longer than Lps2, shorter than Lp2; distal region without spines above spinneret, remainder of distal region and proximolateral region covered with numerous, short, thin spines. *Mandible*: lateral surface bearing two setae; inner surface (Fig. 32) characterized by two ridges extending distad toward tips of outer teeth 2 and 3, first inner ridge bearing slight tooth; outer teeth 1–3 on cutting edge triangular, third tooth most pronounced, fourth reduced.

Thorax.—*Segment T1* (Fig. 10): cervical shield distinctly sclerotized, transverse depression divides shield into anterior and posterior sectors; shield extends laterad, includes SD2 tubercle. Setae SD1 and L2 absent. L1 tubercle triangular, free from cervical shield. SV1–2 on common tubercle and tapering distad, remaining prothoracic setae stout, blunt distally. D2 caudad of line formed by D1—XD2. Spiracle cephalad of posterior margin of cervical shield with major axis passing caudad of SD2 and SV1–2. *Segments T2–3* (Fig. 11): D1–2, SD2, L1–3, SV1 stout, blunt; SD1 thin, hairlike. *Tarsal setae* (Fig. 23): Ts1 thick, tapering distad; Ts2 lanceolate, narrowing distad and proximad; Ts3 spatulate; Ts4 narrow, tapering distad.

Abdomen:—Ab1–6 with 3 SV setae, Ab7–9 with 1 each. Ab6–8: chaetotaxy as in Fig. 12. Ab9: SD1 and D1 subequal; tubercles D1 and SD1 sep-

arated by width of either tubercle. Length of D1,2's on Ab6-7 0.14-0.17 mm. Height of Asp7 0.08 mm; Asp8 0.17 mm.

Coloration (preserved material).—Head yellowish brown with brown reticulation and coronal stripes. Body sordid with fine rugosity creating shadowy or darkening effect. Cervical shield brown with distinct, pale middorsal line with width of about $\frac{1}{2}$ D1—D1. Tubercles and cervical shield concolorous but integument encircling each tubercle distinctly paler. Setae pale. Spiracles and peritremes brown. Thoracic legs and lateral shields of prolegs but slightly paler than cervical shield.

Material examined.—*One specimen*: East Turkey Creek, 6400 feet, Chiricahua Mountains, Cochise County, Arizona. Reared August–September 1967 on fallen leaves of *Quercus* spp. by G. L. Godfrey from cream-colored egg laid by female on 7 August 1967. Female identified by J. G. Franclemont.

DISCUSSION

Renia hutsoni, contrasting with *R. rigida* and *R. mortualis*, conforms the closest to the generic, larval description proposed by Crumb (1934). *R. mortualis* has three characters on the head capsule that deviate from Crumb's concept: the faint pigmented reticulation, the homogeneously rounded granules, and the subequality of interspace P1—P1 to P2—P2. Crumb specifically mentioned the absence of a reticulate color pattern, the presence of heterogeneous granules plus pits on the posterior (dorsal) aspect of the head, and that P1—P1 is greater than P2—P2. *R. rigida* has a definite reticulate color pattern and no posterior pits on the head, but P1—P1 is obviously greater than P2—P2. *R. hutsoni* has coronal stripes but no reticulate color pattern. However, coronal stripes usually are associated with such patterns (see Godfrey, 1972, for examples), and so *R. hutsoni*, to a degree, shares the same head color pattern with *R. rigida* and *R. mortualis*. The variation of *R. mortualis* and *R. rigida* indicates that the larval definition of *Renia* needs to be redefined as part of an overall review of the *Hermiinae*.

Renia larvalis is included in the following key. It has been treated as *R. sobrialis* in previous keys (Crumb 1934, 1956). However, that apparently was a perpetuated error because Dyar, who mistakenly considered *larvalis* to be a form of *sobrialis* (see introductory paragraph of this paper), identified the larval-associated moths that Crumb reared.

SPECIES KEY TO MATURE LARVAE OF *RENIA*

1. Interspace P1—P1 on head subequal to P2—P2 (Fig. 30)
 *mortualis* Barnes and McDunnough
- Interspace P1—P1 greater than P2—P2 (Figs. 24, 27) 2
2. Dorsal setae on Ab1-8 acutely pointed (Fig. 36)
 *discoloralis* Guenée

– Dorsal setae on Ab1–8 blunt or clavate (Figs. 37, 38) 3

3. Bases of tubercles D1 and SD1 separated on Ab9 (Figs. 34, 35) 4

– Bases of tubercles D1 and SD1 contiguous or slightly separated on Ab9 (Fig. 33) 6

4. Dorsum of body with heterogenous granules (Fig. 17) *rigida* J. B. Smith

– Dorsum of body finely reticulated (Fig. 20) or with homogenous granules 5

5. Tubercles D2 on Ab1–8 nearly truncate distally (Fig. 37) *factiosalis* (Walker)

– Tubercles D2 on Ab1–8 conical (Figs. 15, 19, 22) *larvalis* Grote

6. Setae D1 on Ab1–8 clavate, length subequal to width of corresponding tubercles (Fig. 38) *flavipunctalis* (Geyer)

– Setae D1 on Ab1–8 not clavate, length two times width of tubercles or greater (Fig. 15) 7

7. Prothoracic tubercle L1 included in lateral extension of cervical shield (Fig. 39) *salusalis* (Walker)

– Prothoracic tubercle L1 not included in lateral extension of cervical shield (Fig. 4) 8

8. Dorsum of body finely reticulated (Fig. 20) *fratenalis* J. B. Smith

– Dorsum of body with distinct granules (Fig. 13) .. *hutsoni* J. B. Smith

ACKNOWLEDGMENTS

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BOOK REVIEW

Ecological Methods with Particular Reference to the Study of Insect Populations. 1979. T. R. E. Southwood. Second Edition. Halsted Press, John Wiley and Sons, New York, 524 pp. Cost: \$25.00.

Here is a book that should be read and used by every field entomologist, ecologist, and environmentalist. It is a pleasure to read the clear, explicit, well-illustrated text. Chapters include descriptions of various practical quantitative and qualitative methods for field sampling or evaluation of populations, combined with lucid explanations of appropriate statistical methods to be used for analysis of the resulting data. Numerous examples are given, and the reader is frequently alerted to possible sources of bias that may distort population assessments. The survey of the literature is thorough, including references to many useful publications in journals not usually consulted by entomologists or ecologists. Chapters include: Sampling and measurement of dispersion; absolute population estimates using marking techniques; absolute population estimates by sampling a unit of habitat; relative methods of population measurement and the derivation of absolute estimates; estimates based on the products and effects of insects; observational and experimental methods for the estimation of natality, mortality, and dispersal; life-tables; systems analysis and modeling in ecology; diversity, species packing and habitat; and the estimation of productivity and energy budgets.

S. W. T. Batra, *Beneficial Insect Introduction Laboratory, IIBIII, Agric. Res., Sci. and Educ. Admin., USDA, Building 417, BARC-E, Beltsville, Maryland 20705.*



Godfrey, George L. 1980. "Larval Descriptions Of *Renia hutsoni*, *Renia rigida*, And *Renia mortualis* With A Key To Larvae Of *Renia* (Lepidoptera, Noctuidae)." *Proceedings of the Entomological Society of Washington* 82, 457–468.

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