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REVISION OF THE NEARCTIC MOTH GENUS ABAGROTIS  
SMITH WITH DESCRIPTIONS OF NEW SPECIES  
(LEPIDOPTERA:NOCTUIDAE), PART 3

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**REVISION**  
**OF THE NEARCTIC MOTH GENUS ABAGROTIS SMITH**  
**WITH DESCRIPTIONS OF NEW SPECIES**  
(Lepidoptera: Noctuidae)

PART III: THE TRIGONA GROUP, WITH DISCUSSION OF PHENOTYPIC  
VARIATION; THE MIRABILIS GROUP, WITH THE DESCRIPTION OF FOUR  
NEW SPECIES; THE NEFASCIA GROUP, WITH THE SYNONYMY OF  
**ABAGROTIS FORBESI (BENJAMIN)**

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*A. trigona* Group

*Diagnosis* - Antennae of male with ventral part of flagellum basally fasciculate, apically becoming setose, of female setose-ciliate; palpi with second segment exterolaterally black; thorax with divided collar unicolorous, of ground color; primaries trigonate (as in figs. 162 through 166), may be broad or narrow, ground color variation from light tan to blackish, may be transversely banded (as in fig. 166); aedeagus of male genitalia possessing a single bulbed cornutis plus a spined sclerotized band; valves basally slightly swollen, hirsute, setae elongate; female genitalia with ductus bursae lightly sclerotized; bursa copulatrix lacking signae; greatest expanse of forewing 12 mm to 16 mm.

*Included species* - *A. trigona* (J. Smith).

*Distribution* - Western North America from the Pacific coast ranges eastward to at least the eastern edge of the Rocky Mountains, and from British Columbia, Canada, southward to southern California, Arizona, New Mexico and probably Nearctic Mexico.

*Variation* - The author examined the co-types of both *trigona* and *sambo* (J. Smith), and lectotypes were selected for each species. While the lectotype of *trigona* is light tan in coloration, the lectotype of *sambo* has much reddish irroration incorporated into the ground color. Until comparative biological studies are conducted and the results critically examined, it seems best to retain the various highly variable populations of *trigona* as non-nomenclatorial entities. The naming of additional species within the *trigona* group at present would only create future confusion.

There is ambiguity as to what is actually "*trigona*." This complexity in species composition may involve a Rassenkreis situation, as in a part of its range, but in another part of its range, *trigona* appears more constant phenotypically. The range of variation within the species is great, ranging from large, almost unicolorous, very light tan individuals (Great Basin influence) to small, very dark individuals (found in the Sierra Nevada Mountains and in the Coast Ranges). In part of the species population there is a high degree of sexual dichromatism.

A. *trigona* has been divided into four units, namely, A, B, C, D which represent populations quite different phenotypically. Unit A is composed of individuals in which the males are small (forewing expanse of 12 mm to 14 mm), very dark and with strongly trigonate wings, whereas the females of this unit are large in comparison to the males (forewing expanse of 14 mm to 16 mm), and light tan in coloration. Members of Unit A occur in the Coast Ranges of central and northern California, as well as in the Sierra Nevada Mountains, northward into British Columbia, Canada. Specimens of a population in the vicinity of Tecate Peak, San Diego County, California, also exhibit the characteristics of unit A, but in this case the males are much larger and somewhat lighter than in the typical males of unit A. For purposes of this discussion, the Tecate population is considered close to unit A, although it tends to blend into unit C, which will be elaborated on later.

Unit B consists of populations in which the males and females are of a more uniform size (forewing expanse of 14 mm to 16 mm), and there is no great sexual dichromatism. Another striking feature which characterizes this unit is the high percentage of banded specimens in a given population (see fig. 166). The definition used herein to define "banded" refers to any specimen of either sex in which either or both the basal-transverse anterior area and/or the subterminal area are conspicuously darkened in comparison to the ground color of the median area, and therefore, the dark areas appear to be broad bands.

Unit B is a fringe or marginal unit, being encountered on the eastern slope of the Sierra Nevada in California, as well as in the White Mountains in Mono County, and extending northward in areas of interdigitation between the Great Basin flora and our more mountainous flora found in the Pacific states, into British Columbia, Canada. Some interesting statistics to note are the percentage of banded specimens per total number of specimens studied from a given area. From Woodfords, Alpine County, California, a total of 97 specimens were examined, in which 36 out of 97 specimens, or 38.2 per cent were banded. Of these specimens, 22 out of 56, or 39.4 per cent of the males were banded, and 14 out of 41, or 34.2 per cent of the females were banded. Lacking knowledge of whether or not banding in these populations is in a state of equilibrium, or whether it is increasing or decreasing due to selective advantages or disadvantages, genetical elaborations can not be made at present. From Zephyr Cove, Douglas County, Nevada, a total of 81 specimens was examined, in which 37 out of 81 specimens, or 45.7 per

cent were banded. Of these specimens, 15 out of 34 males or 44.2 per cent were banded, whereas 22 out of 47 females, or 46.9 per cent were banded.

Of the four specimens examined from Bishop, Mono County, California, three specimens, or 75 per cent were banded. This figure has no other meaning than to imply the existence of banded *trigona*, or that unit B exists here, as one might expect. Six specimens from Topaz, Mono County, California yielded 50 per cent banded type. From Monitor Pass, in Mono County, California, 35 per cent of the specimens examined were banded, with 45.5 per cent being males. From near Bend, Deschutes County, Oregon, only 22.2 per cent of the specimens seen were banded. Of the specimens examined from British Columbia, 30.7 per cent were banded. From the preceding information, it seems apparent that banded specimens represent a considerable portion of the populations, with the central California populations exhibiting the highest percentage of banding. It can also be seen that the percentage banding is more or less equivalent between the sexes.

To contrast percentage banding, Johnsville, Plumas County, California was chosen, as banded specimens exist with the almost homogeneous unit A group. In the males, 5.56 per cent banded was observed, whereas 3.28 per cent banded females was observed, 285 specimens examined. Johnsville unlike the other aforementioned areas lacks, almost entirely, influence of the Great Basin region flora, whereas the areas other than Johnsville that exhibit a high percentage of banding in California are greatly influenced by Great Basin flora.

Unit C is more like the *trigona* as conceived by previous authors. It is closely related phenotypically to unit D. Members of unit C differ from those of unit D by being more red in coloration and by occurring at higher elevations in a situation where Great Basin flora is blended with Canadian and Hudsonian life zone plants such as quaking aspen (*Populus tremuloides* Michx.). Unit C exhibits no banding, and the sexes are of uniform size, with little variation in ground color of the primaries. The specimens representing this unit were collected at: 1) Cedar Pass, 6 miles west of Cedarville, Modoc County, California; 2) Lamoille Canyon, 25 miles south of Elko, Elko County, Nevada; and 3) Lassen Creek, Modoc County, California.

Unit D is the *trigona* as named in most collections, and the unit that most closely corresponds to the lectotype. It is characterized by sexes of a uniform size, with the ground color of the primaries of a "washed-out" tan to light brown. The members within each population exhibit homogeneity rather than radical color differences. This unit occurs throughout the Great Basin region in temperate North America in typical *Chrysothamnus* association in Nevada and Utah. It occurs from Mexico (where it probably links up with such populations as those found at Tecate Peak) northward through Arizona, New Mexico, Colorado, Utah, Nevada, Idaho, its eastern limit seeming to be the eastern slope of the Rocky Mountains.

*Abagrotis trigona* (J. Smith)  
(figs. 4, 47, 81, 121, 162-166)

- Rhynchagrotis trigona* J. Smith, 1893, Bull. U.S. Nat. Mus., No. 44, p. 53-54 ( *cupidissima*, Smith, Bull. U.S. Nat. Mus., No. 38, p. 24-25, in part, lectotype female, Arizona, collection J. B. Smith, genitalia on slide No. 1797, E. L. Todd (U.S.N.M.), Type No. 73, by present designation; Grote, 1895, Abhandl. Naturwissenschaftlichen Verein, Bremen 14(1):58; Dyar, 1903 (1902), Bull. U.S. Natl. Mus., No. 52, p. 129; J. Smith, 1908, Canad. Ent. 40(7):222; J. Smith, 1908, Canad. Ent. 40(8):287; Barnes and McDunnough, 1917, Check list of Lepidoptera Boreal Amer., p. 48.
- Triphaena trigona*, Hampson, 1903, Cat. Lepidoptera Phalaenidae Brit. Mus. 4:625, 640, pl. 77, fig. 17 (?).
- Lampra trigona*, Benjamin, 1921, Bull. So. California Acad. Sci. 20(3): 83, 86-90, pl. 1, fig. 5, pl. 5, fig. 37-38; Draudt, in Seitz, 1923, the Macrolepidoptera of the World 7:81, pl. 12(f), fig. 1 (nec. pl. 12e, fig. 6).
- Abagrotis trigona*, McDunnough, 1938, Mem. So. California Acad. Sci. 1:67; Llewellyn-Jones, 1951, Entomol. Soc. Brit. Columbia, Occasional Paper No. 1, p. 53.
- Rhynchagrotis sambo* J. Smith, 1908, Canad. Ent. 40(8):287-288, lectotype female, Kaslo, B.C., 29 July 1905 (Cockle), genitalia on slide No. 12,100 F. H. Rindge, type (AMNH), by present designation; Barnes and McDunnough, 1917, Check list Lepidoptera Boreal America, p. 48. New synonymy.
- Lampra sambo*, Benjamin, 1921, Bull. So. California Acad. Sci. 20(3): 87, 90, pl. 5, figs. 39, 40; Draudt, in Seitz, 1923, the Macrolepidoptera of the World 7:81.
- Abagrotis sambo*, McDunnough, Mem. So. California Acad. Sci. 1:67; Llewellyn-Jones, 1951, Entomol. Soc. Brit. Columbia, Occasional Paper No. 1, p. 53.
- Abagrotis trigona* var. *sambo*, Crumb. 1956, U.S.D.A., Tech. Bull. No 1135, pp. 114, 116.

*Diagnosis - Male:* Ground color of primaries from tan to dark brown, banded or not. Head with vertex and frons clothed in tan or dark brown, white-tipped simple and flattened hairs; palpi with first segment clothed exterolaterally in black spatulate scales, ventrally clothed in tan elongate simple hairs; second segment exterolaterally almost entirely black, apically tan; third segment dark brown; antennae with scape ventrally clothed in tan, dorsally clothed in dark brown; flagellar segments clothed dorsally in black scales, ventrally carinaceous, fasciculate; eyes with anterior black patch one-half way between antennal pockets and

antennal bases. Thorax with divided collar light brown, irrorated with dark brown and whitish-tipped flattened hairs; tegulae dark brown, posterior scales white-tipped; ventrally clothed in light brown simple hairs; legs with femora clothed in tan scales, ventrally with very elongate whitish-brown simple hairs; tibiae with elongate brownish hairs exterolaterally; tarsi blackish, each tarsomere apically with tan annulus; primaries with normal cross lines faint; basal line wanting; transverse anterior line faint, darker than ground color; orbicular spot of ground color, solid black, or outlined in ochreous; reniform mark erect, rectangular, very slightly constricted medially; transverse posterior line geminate, represented by black dots on veins; subterminal area of ground color, darkening just prior to subterminal line; subterminal line ochreous; terminal line represented by lunules on veins; fringes fuscous; ventral surface with light costal band from base to just past transverse posterior line; transverse posterior line represented costally as black lunule, thence faint onto inner margin; veins from transverse posterior line to terminal line outlined in tan; inner margin irrorated with whitish scales; remainder of wing deep fuscous; secondaries deep fuscous, lightest basally; discal dot faint, darker than ground color; fringes bicolorous, basally ochreous, terminally whitish; ventral surface tan, irrorated with black, darkest preapically; discal dot black, prominent; exterior line broad, black, prominent; fringes fuscous. Greatest expanse of forewing 12 mm to 16 mm. Genitalia as in figures 47, 81.

*Female* - Ground color of primaries light tan, red brown, and occasionally sprinkled with brown; usually larger than male; ventral surface of secondaries costally irrorated with either rose-colored scales, or dark brown scales; exterior line present, or absent. Greatest expanse of forewing 15 mm to 17 mm. Genitalia as in fig. 121.

*Material studied* - 389 males, 543 females, March through October. CANADA. *British Columbia*: Ainsworth; Creston; Departure Bay; Duncan, Vancouver Island; Kaslo; Nelson; Quamachan, Vancouver Island; Robson; Seton Lake. UNITED STATES. *Arizona*: Coconino; Gila; Pima. *California*: Alpine; Kings; Inyo; Lake; Mariposa; Modoc; Mono; Nevada; Plumas; San Bernardino; San Diego; Shasta; Siskiyou; Toulumne; Yolo. *Colorado*: Chaffee; El Paso; Garfield; Jefferson; Larimer; Pitkin; Routt. *Idaho*: Blaine; Boise; Elmore. *Nevada*: Douglas; Elko; Nye; White Pine. *New Mexico*: McKinley; San Doval. *Oregon*: Douglas; Malheur. *Utah*: Cache; Carbon; San Juan; Sanpete; Tooele; Utah. *Washington*: Whitman.

*Recognition characters* - *A. trigona* is a distinctive species, despite its great phenotypical variation. This species is the only one with fasciculate antennae in the male in addition to trigonate primaries. It can be confused with species of the *erratica* group, principally with *erratica erratica*. However, *trigona* can be distinguished from members of the *erratica* group by: 1) possessing fasciculate antennae in the male rather than serrate, bipectinate antennae; 2) possessing ciliate, setose-ciliate antennae in the female; 3) aedeagus with vesical sac

lacking large cornutus so prominently exhibited in the *erratica* group (compare figs. 75, 76, 77, 81); and 4) ductus bursae in female genitalia not heavily sclerotized (as in fig. 121).

*Immature stages* - The larvae of this species were reared on willow (*Salix scouleriana* Barr.) by Crumb (1956) in Washington, who produced a larval description in 1956. Inasmuch as *S. scouleriana* only occurs in a portion of the distribution of *trigona* other host plant species are indicated. Crumb (1956) describes the mature larvae (in part) as follows: general ground color light brown, skin smooth; head 2.2 mm to 2.4 mm broad; body about 30 mm long, 4.5 mm broad medially; and abdominal segments of nearly equal width throughout.

Although Benjamin (1921) originally believed *sambo* to be a distinct species, Crumb (1956) stated "A very short time before his death Mr. Benjamin had determined a moth reared at Puyallup as '*Lampra trigona* var. *sambo*.'" The present study bears out Benjamin's later opinion that *sambo* is, at best, a "form."

#### *A. mirabilis* Group

*Diagnosis* - Antennae in both sexes finely ciliate; palpi exterolaterally blackish; thorax with divided collar; primaries may be tan, brick red, brown, dark brown, or black; orbicular spot and reniform mark cream colored to ochreous, usually highly contrasted with ground color (as in figs. 167 through 177); tarsal segments dark brown to black, possessing lighter colored apical annulus; ungues bifurcate, smallest furca occurring interolaterally; male genitalia with sacculus of equal width throughout; aedeagus with vesica possessing a single elongate cornutus only, or possessing a cornutus plus another sclerotized plate (as in figs. 82, 83, 85, 86); greatest expanse of forewing 12 mm to 19 mm.

*Included species* - *A. mirabilis* (Grote); *rubricundis* Buckett, n. sp.; *striata* Buckett, n. sp.; *glenni* Buckett, n. sp.; *hennei* Buckett, n. sp.

*Distribution* - Coast ranges of central western North America; Sierra Nevada Mountain range; Great Basin area; coniferous forests of western North America.

Key to species of the *A. mirabilis* group by superficial characters

1. Ground color of primaries brown to dark brown, may be striate, or not; black subbasal-transverse anterior dash (see figs. 172 through 177) present, or if absent, primaries appearing striate (as in fig. 171). . . . . 3
- Ground color of primaries either blackish or brownish, if brown, then subbasal-transverse anterior dash absent. . . . . 2

2. Ground color of primaries brick red to red-brown, ordinary cross lines wanting; cell may be blackish, or of ground color; orbicular spot present or absent. . . . . *rubricundis* Buckett, n. sp.  
 Ground color of primaries blackish to brown, ordinary cross lines often evident; cell black; orbicular spot present. *mirabilis* (Grote)
3. Ground color of primaries brown to dark brown, having appearance of being striated; subbasal-transverse anterior dash wanting, or indistinctly defined, weak; orbicular spot often diminutive; reniform mark small; terminal area only slightly lighter than subterminal area. . . . . *striata* Buckett, n. sp.  
 Ground color of primaries brown to dark brown, lacking striate appearance except for terminal area which may be striate; ordinary cross lines may be evident; subbasal-transverse anterior dash present, may be very prominent; reniform mark large, prominent; terminal area may be strongly contrasted with remainder of wing . . . . . 4
4. Primaries chocolate brown to light brown, with smooth appearance; ordinary cross lines wanting; subbasal-transverse anterior dash black, prominent (as in figs. 174, 175); greatest expanse of forewing 16 mm to 17 mm. . . . . *glenni* Buckett, n. sp.  
 Primaries dark brown, not appearing smooth, ordinary cross lines hardly discernible, or prominent; subbasal-transverse anterior dash generally not as strong as in preceding (as in fig. 176); subterminal area blackish, darker than other areas of wing; greatest expanse of forewing 12 mm to 15 mm. . *hennei* Buckett, n. sp.

*A. mirabilis* (Grote)

(figs. 7, 48, 82, 122, 167, 168)

*Agrotis mirabilis* Grote, 1879, North Amer. Entomol. 1:39, Type male, Idaho Springs, Colorado (KU); 1881, Kansas Acad. Sci. 7:62; 1895, Abhandl. Naturwissenschaftlichen Verein, Bremen, 14:18.

*Rhynchagrotis mirabilis*, J. Smith, 1890, Bull. U.S. Nat. Mus., No. 38:16, 17, 28; 1893, Bull. U.S. Nat. Mus., No. 44:54; Dyar, 1903 (1902), Bull. U.S. Nat. Mus., No. 52:129; J. Smith, 1908, Canad. Ent. 40(7):222, 226; Barnes and McDunnough, 1917, Check list Lepidoptera Boreal Amer., p. 48.

*Triphaena mirabilis*, Hampson, 1903, Cat. Lepidoptera Phalaenidae Brit. Mus. 4:624, 635, pl. 77, fig. 8.

*Lampra mirabilis*, Benjamin, 1921, Bull. So. California Acad. Sci. 20 (3):82, 91-92, pl. 1, fig. 6, pl. 5, fig. 41; Draudt, in Seitz, 1923, the Macrolepidoptera of the World, 7:81, pl. 12(f), fig. 7.

*Abagrotis mirabilis*, McDunnough, 1938, Mem. So. California Acad. Sci. 1:67.

*Diagnosis - Male:* Ground color of primaries nearly black. Head with vertex clothed in admixture of black, ochre, and white scales and hairs; frons smoothly rounded, clothed in admixture of black and white scales. hairs; palps basally clothed in light brown elongate simple hairs; second segment black except for terminal annulus of ochreous hairs; terminal segment black, white-tipped; antennal scape clothed in ochre elongate scales; flagellar segments finely ciliate to tip, dorsally with row of black scales. Thorax with divided collar of white-tipped or ochre tipped black elongate scales; dorsally with porrect anterior tuft of white-tipped ochreous flattened hairs; medially, with disc of ochreous flattened hairs; tegulae bicolorous, forming divided dorsal crests. interiorly coal black, remainder of tegulae of light-tipped, sooty black elongate scales; ventrally clothed in rose tinted charcoal scales and hairs; femoral segments of legs dorsally coal black; foretibiae dorsally of rose hairs; midtibiae dorsally of intermixed rose and black scales and hairs, end spurs distinctly black and white banded; hind tibiae dorsally with ridge of light brown hairs; medial and end spurs distinctly black and white banded; all tarsal segments black with white terminal annuli; primaries dorsally sooty black; basal line black, geminate, filled with white from costa to cubital vein, thence black to anal vein where it follows this vein to near transverse anterior line; transverse anterior area with very slight irroration of white scales; transverse anterior line geminate, black, centrally filled with white scales, jagged for its entire course; median area of ground color; cell black; orbicular spot minute, dull cream-yellow; reniform mark very large, conspicuous, colored as in orbicular spot, strikingly contrasting with ground color; transverse posterior line whitish, most pronounced at costa where it commences basally for a very short distance, thence outward around, and very close to reniform mark, where line becomes divided, thence on to inner margin directly below reniform mark, outer line may be represented by white dots on veins; subterminal area of ground color; subterminal line represented by contrast in dark subterminal area with lighter irrorated terminal area; terminal area may have black dashes on veins; terminal line of ground color; fringes fuscous brown; ventral surface of primaries with sooty brown ground color, medial portion with long hairs costally, subterminally irrorated with white; transverse posterior line represented on costa in black, thence wanting; subterminal area with veins outlined with black, thence wanting; subterminal area with veins outlined with black; secondaries fuscous, discal dot hardly discernible; veins outlined in sooty black; fringes white; ventral surface costally irrorated with rose, dark brown, white scales; remainder of wing dark brown; fringes as on dorsal surface. Abdomen dorsally fuscous; tinted with rose laterally; ventrally heavily irrorated with rose and white scales; posteriorly with rose hairs protruding beyond terminal portion. Greatest expanse of forewing 16 mm to 18 mm. Genitalia as in figs. 48, 82.

*Female*: As in male except ventral surface of abdomen possessing white semi-annuli intersegmentally. Greatest expanse of forewing 17 mm to 19 mm. Genitalia as in fig. 122.

*Material studied* - 42 males, 56 females, June through November. UNITED STATES. *Arizona*: Coconino. *California Counties*: Alpine; Colusa; Inyo; Lake; Mariposa; Modoc; Mono; Placer; Plumas; San Bernardino. *Colorado*: Garfield. *Idaho*: Blaine. *Nevada*: Douglas, Nye. *New Mexico*: Frijoles Canyon (Co.?); San Doval; San Miguel. *Oregon*: Deschutes. *Utah*: San Juan. *Washington*: Klickitat.

*Recognition characters* - *A. mirabilis* can readily be separated from other species in the *mirabilis* group by the following features: 1) blackish primaries; 2) lack of the subbasal-transverse anterior dash on the primaries; and 3) ordinary cross lines often evident and conspicuous. No other species of the group has these combination of characters. This species is most closely related to *rubricundis* Buckett, n. sp. from which it can be distinguished by the aforementioned characters.

In the past no one has been absolutely certain of the correct identity of this species. Cotypes were examined from different institutions which aided me in the proper identification of this entity. In collections many species were found to be included under this name.

*Distribution* - *A. mirabilis* ranges from the coast ranges near the Pacific, eastward through the central valley of California, through the Sierra Nevada Mountain range, and into the Great Basin region of North America. The majority of specimens available for study were collected in the Sierra Nevada Mountains of central California and of central western Nevada (Lake Tahoe region).

*A. rubricundis* Buckett, n. sp.  
(figs. 5, 49, 83, 123, 169, 170)

*Holotype male* - Ground color of primaries brick red. Head with vertex clothed in brick red flattened hairs, centrally clothed in ochreous flattened hairs; frons clothed in brick red simple and flattened hairs with a purple sheen; palpi with basal segment exterolaterally clothed in black spatulate scales, ventrally clothed in pinkish-white elongate simple hairs; second segment exterolaterally clothed in black spatulate scales, apically clothed in whitish scales, ventrally with subelongate rose colored simple hairs; third segment bicolor, basally dark brown, apically white; antennae with scape clothed in light flesh colored scales ventrally, dorsally of ground color. Thorax with collar basally black, white spatulate scales laterally, thence brick red, subapically black, apically brick red, some scales being white-tipped; anterior tuft of flattened hairs porrect, bicolor, basally of ground color, apically white-tipped; disc and posterior tufts clothed as in anterior tuft; tegulae unicolorous, of ground color, composed of spatulate scales; poster-

iorly with long whitish simple hairs; ventrally clothed in whitish and rose colored simple hairs; legs with femora clothed in black, white, and rose colored scales; tibiae clothed in black and white spatulate scales, plus elongate simple hairs posteriorly; hind tibiae, or meta tibiae, with irroration of rose colored scales; fore-tarsi black, apically each tarsomere possessing a white annulus; mid and hind tibiae interlaterally clothed in white, exterolaterally as in foretibiae; primaries with ordinary cross lines hardly discernible; orbicular spot hardly discernible, ochreous; cell black; reniform mark large, ochreous; subterminal line defined by contrast between subterminal area and terminal area; terminal area lighter than ground color; terminal line wanting; fringes fuscous; ventral surface with rose-colored costal band; terminal area rose-colored; remainder of wing fuscous; secondaries dorsally fuscous; discal dot dark brown, faint; veins outlined in dark brown; fringes white; ventral surface with costal area irrorated with rose; basal portion of wing lighter than apical portion; remainder of wing light fuscous; discal dot dark brown, faint; fringes as in dorsal surface. Abdomen concolorous with secondaries, terminally with rose-colored simple hairs; ventrally clothed in rose-colored scales and hairs. Greatest expanse of forewing 15 mm. Genitalia as in figures 49 and 83.

*Female* - Darker than in male; cell black; transverse anterior and transverse posterior lines represented on costa by black dash; remainder as in male. Greatest expanse of forewing 15 mm. Genitalia as in fig. 123.

*Types* - Holotype male, Johnsville, Plumas County, California, 10 August, 1963 (H. J. Pini), deposited in the Entomology Type Collection, University of California, Davis. Paratypes: 1 female (designated Allotype), same locality and collector as Holotype, 19 September, 1964; 5 males, 12 females, Johnsville, Plumas County, August-September; 1 female, Road to Spencer Lakes, 9 miles southwest Johnsville, Plumas County, California, 11 August 1961 (W. R. Bauer-J. S. Buckett); 1 male, 1 female, Calaveras Big Trees State Park, Calaveras County, California, 12 August 1949 (W. R. B.); 1 male, Kings Canyon National Park, Tulare County, California, 29 August, 1950 (W. R. B.); 1 male, Grants Pass, Josephine County, Oregon, 15 June 1963 (K. Goeden). Paratypes deposited in the following institutions and collections: AMNH; B-B; Franclemont collection; LACM; OSDA; USNM; UCD.

*Variation* - *A. rubricundis* exhibits little variation, the most variable aspects being the ground color of the primaries which varies from brick red to red-brown, and the variation in color of the cell from ground color to black.

*Recognition characters* - This species can be differentiated by the following: 1) ground color of primaries brick red to red brown; and 2) ordinary cross lines absent. It can be confused with old, brown specimens of *mirabilis* that are in poor condition.

*Distribution* - *A. rubricundis* is more restricted in distribution than is *mirabilis*, judging by its range from mountainous southern California northward into southern Oregon (see distribution map, fig. 5). As with

*mirabilis* the greatest numbers of this species have been taken in the central Sierra Nevada Mountains of California.

This is a rare species in collections, possibly due to its somewhat restricted, discontinuous distribution. With the exception of the single example from Oregon (collected in June), *rubicundis* flies during the same season as *mirabilis*.

*A. striata* Buckett, n. sp.

(figs. 8, 50, 84, 124, 171-173)

*Holotype male* - Ground color of primaries dark brown, striated. Head with frons clothed in dark brown scales, with a purple hue; vertex clothed in dark brown scales anteriorly and fawn brown scales posteriorly; palpi blackish exterolaterally; second segment ventrally with elongate rose colored flattened hairs, apically light tan; third segment of brown scales, apically lighter; antennae dorsally with a row of black scales, ventrally ciliate, apically setose-ciliate. Thorax with collar correct, black basally (covered by vestiture of vertex), thence dark brown, apically white-tipped; tegulae nearly black; posterior divided tuft colored as in anterior tuft; remainder of disc dark brown; ventrally clothed in rose, dark brown and black simple hairs; legs with femora predominantly black, exterolaterally irrorated with pinkish; tibiae posteriorly with elongate tan simple hairs; tarsi black, each tarsomere apically with rose-colored annulus; primaries dark brown, ordinary cross lines indistinct; basal dash black, elongate, indistinctly traversing wing to outer margin; cell black, a broad band from region of transverse anterior line to reniform mark, thinner from reniform mark to outer margin; basal, transverse anterior, and transverse posterior lines all represented on costa, geminate, black, centrally filled with ground color, thence indistinct; orbicular spot wanting; reniform mark small, ochreous, medially constricted; veins outlined in black, giving striate appearance; terminal area slightly lighter than ground color, lightest at wing apex; ventral surface with costal area tan from base to transverse posterior line; transverse posterior line represented costally in black, indistinctly traversing wing; central portion of wing dark brown; inner marginal area of light scales; veins outlined in black in terminal area; secondaries dark brown; discal dot wanting; veins faintly outlined in darker brown than ground color; fringes lighter than ground color; ventral surface brown, irrorated with whitish and rose colored scalation; exterior line discontinuous, faint, dark brown. Abdomen dorsally clothed in fuscous simple hairs and scales; pleurally and ventrally clothed in brown, white-tipped black scales, and rose-colored simple hairs; terminally clothed in rose-colored simple hairs. Greatest expanse of forewing 16 mm. Genitalia as in figures 50, 84.

*Female* - As in male except tegulae interodorsally black, remainder of ground color. Greatest expanse of forewing 15 mm. Genitalia as in fig. 124.

*Types* - Holotype male, Dalton Springs Camp, 5 miles west Monticello, San Juan County, Utah, 16 July 1963, elevation 8,500 ft. (F., P., and M. Rindge), type deposited in AMNH. Paratypes: 1 female (designated allotype) same locality and collectors as holotype, 15 July 1963; 1 female, Southwestern Research Station, Chiricahua Mountains, Cochise County, Arizona, 19 June 1958 (C. W. Kirkwood); 1 male, Kaibab Lake, Coconino County, Arizona, 10 July 1957 (D. Watson); 1 male, Williams, Coconino County, Arizona, 23 July 1963 (A. N. McFarland); 1 male, 1 female, Grand Quivira National Monument, Socorro County, New Mexico, 28 June 1958 (S. F. Wood); 1 male, Fort Wingate, McKinley County, New Mexico, 9 July; 1 male, 13 miles southwest Grantsville, Tooele County, Utah, 20 July 1958 (F. P. and S. Rindge); 1 male, 1 female, same locality and collectors as holotype, 14 July 1963; 1 female, Stockton, Tooele County, Utah, 17 July, 1907; 2 males Eureka, Jaub County, Utah, 24 July.

*Variation* - *A. striata* shows little variation with the exception of the presence or absence of the orbicular spot.

*Recognition characters* - This species is peculiar in that it possesses longitudinal black striations on the veins of the primaries (see figs. 171, 172, 173). *A. striata* is quite distinctive, but might be confused with *glenni*. The distinguishing characters of *striata* are: 1) striate appearance; 2) lack of the subbasal-transverse anterior dash; and 3) the weak contrast between the terminal area and the remainder of the wing.

*Distribution* - *A. striata* has a fairly wide distribution, but thus far very few specimens are known. It ranges from Utah south into Arizona and into New Mexico (see distribution map, fig. 8), and occurs in June, July and August. The majority of the specimens have been collected in late June and early to mid July. Of the specimens possessing elevation data, it appears that *striata* is a species of both the medium and higher elevations (up to 8,500 ft. in San Juan County, southeastern Utah.)

*A. glenni* Buckett, n. sp.

(figs. 6, 51, 85, 126, 174 and 175)

*Holotype male* - Ground color of primaries dark brown. Head with vertex and frons clothed in fuscous to dark brown simple and flattened hairs; antennae with scape surrounded by an annulus of light tan, pink tinted, scales; flagellum dorsally with row of dark brown scales, ventrally minutely ciliate, apically setose-ciliate; palpi light brown; first segment with simple, elongate white hairs ventrally; second segment extero-laterally with intermingled dark brown scales and rose colored

elongate simple hairs; terminally with light tan annulus; third segment bicolor, basally dark brown, apically light tan; thorax with divided collar basally black, thence dark brown, some scales terminally white-tipped; anterior and posterior tufts flesh color, weak; tegulae with inner margin black, remainder of ground color; white scales present at wing bases; disc flesh color; ventrally clothed in light brown, pink tinted hairs; legs with femora clothed in brown, pink tinted scales; tibiae clothed in dull maroon scales and hairs; tarsi black, with each tarsomere possessing an apical white annulus; primaries with basal line geminate, represented on costa in dark brown, ochreous filled; basal dash black, extended into median area just below and between orbicular spot and reniform mark; transverse anterior line costally as in basal line, below basal dash dark brown, very faint; cell black, broad to reniform mark, thence thin past reniform mark; orbicular spot ochreous, minute; reniform mark large, ochreous, slightly constricted medially; transverse posterior line costally as in basal line, thence hardly discernible, outwardly oblique around reniform mark; subterminal line represented by contrast between brown subterminal area and light olive terminal area; terminal line represented by dark brown lunules between veins; fringes fuscous; ventral surface with light band costally and terminally; transverse posterior line represented costally in black, thence wanting; remainder of wing fuscous; secondaries fuscous, veins outlined in darker brown than ground color; discal dot brown, faint; fringes white; ventral surface lighter than same surface of primaries, discal dot dark brown; costal area irrorated with rose colored scales, veins as in dorsal surface; fringes slightly darker than on dorsal surface. Abdomen dorsally concolorous with secondaries, terminal hairs pink tinted; ventral surface clothed in light tan scales, slight pink cast, lighter semi-annulus evident apically on segments 3 through 6. Greatest expanse of forewing 15 mm. Genitalia as in figs. 51, 85.

*Female* - As in male, but slightly lighter in coloration; collar irrorated with white scales; disc tan; venter of thorax and abdomen more pinkish rose than in male. Greatest expanse of forewing 16 mm. Genitalia as in fig. 126.

*Types* - Holotype male, 27 miles east Madeline, Lassen County, California, 15 August 1963 (J. Glenn), type deposited in the Entomology Type Collection, University of California, Davis. Paratypes: 1 female (designated allotype), same data as holotype; 23 males, 16 females, same data as holotype; (AMNH, B-B, Franclemont Coll., LACM, UCD, USNM).

*Distribution* - In addition to the type series, the following specimens were examined. 12 males, 22 females, UNITED STATES. *California Counties*: Alpine; Inyo; Modoc; Mono. *Colorado*: Nevada; Esmeralda; Washoe. *New Mexico*: Sandoval. *Oregon*: Crook, Deschutes; Jefferson; Klamath. *Utah*: Jaub; Tooele. CANADA. *British Columbia*: Toby Creek Road; Canal Flats.

As can be seen, *glenni* is of fairly wide distribution, and is found in regions with at least some influence of Great Basin flora, if even it is not confined to the Great Basin.

*Recognition characters* - *A. glenni* exists in a number of collections marauding under the name of *mirabilis*, and is in fact, more common in most collections than *mirabilis*. In this section of the group, *glenni* can be confused with both *striata* and *hennei*. From *striata*, *glenni* can be separated by: 1) the smooth appearance of the primaries, which are chocolate brown; and 2) a prominent subbasal-transverse anterior dash. *A. glenni* can be separated from *hennei* by: 1) lack of dark brown to black subterminal area; and 2) larger size.

I take great pleasure in naming this species in honor of the ardent collector and scholar, John Glenn, of Dixon, California who collected the type series.

*A. hennei* Buckett, n. sp.

(figs. 6, 52, 86, 125, 176, 177)

*Holotype male* - Ground color of primaries dark brown. Head with frons and vertex clothed in black, dark brown, white-tipped flattened hairs, a purple sheen evident; palpi blackish; second segment apically with tan flattened hairs; antennae with scape extrolaterally clothed in tan, otherwise black; flagellar segments with dorsal row of black scales, ventrally finely ciliate, setose-ciliate apically. Thorax with collar basally black, medially dark brown, some scales white-tipped, with purple sheen; tegulae black inwardly, outwardly dark brown, posteriorly with white-tipped dark brown scales; disc with anterior tuft tricolor, basally flesh color, preapically black, apically white-tipped; posterior divided tufts colored as in anterior tuft; remainder of disc composed of light brown, white-tipped scales; ventral surface clothed in very thin light brown hairs; legs clothed in dark brown and black scales, irrorated with rose and white scales; tarsi black, each tarsomere with flesh colored white-tipped scales forming annulus apically; primaries dark brown, darker than in *glenni*; basal half line geminate, black, centrally filled with tan, from costal margin to basal dash; basal dash black, from base of wing into median area; lower portion of basal area light tan from basal dash to inner margin; transverse anterior line geminate, black, centrally filled with tan, represented on costa, then broken and reoccurring below basal dash where it forms an incurved "V", thence onto inner margin; median area of ground color; cell black, dash extending past subterminal line; orbicular spot diminutive, yellowish-white; claviform wanting; reniform mark small, constricted medially; subterminal line geminate costally, black, centrally filled with tan, from directly above reniform mark jutting outward, thence normally across wing, hardly discernible, light brown; subterminal space darker than ground color; subterminal line defined by contrast between dark subterminal area and tan terminal area; terminal area with veins out-

lined in black; terminal line represented by lunules between veins; fringes of ground color; ventral surface with light tan costal band from transverse anterior line to transverse posterior line; transverse posterior line represented by black dash on costa; terminal line black, continuous; fringes fuscous; remainder of wing dark brown; secondaries fuscous; discal dot hardly discernible; veins outlined in black; fringes and inner margin lighter colored than ground color; ventral surface with costal area thin, irrorated with black, suggestion of exterior line near costa; fringes as in dorsal surface; remainder of wing fuscous. Abdomen concolorous with secondaries, basally of simple hairs, flattened hairs, spatulate scales; terminally of simple hairs; ventral surface light tan; terminal simple hairs dark brown. Greatest expanse of forewing 14 mm. Genitalia as in figs. 52, 86.

*Female* - As in male except ground color slightly lighter; basal dash extended to subterminal line (=subbasal-transverse anterior dash.) Greatest expanse of forewing 14 mm. Genitalia as in fig. 125.

*Types* - Holotype male, Juniper Hills, Mojave Desert, Los Angeles County, California, 15 June 1964, elevation 3,500 ft. (C. Henne), type deposited in the Entomology Type Collection, University of California, Davis. Paratypes: 1 female (designated allotype) Pearblossom, Los Angeles County, California, 13 June 1964 (W. R. Bauer, J. S. Buckett, and M. R. Gardner); 3 males, 1 female, same data as preceding; 1 male, same locality and collector as holotype, 22 September 1962; 1 female, 9 miles southeast Pearblossom, Los Angeles County, 27 June 1957 (A. N. McFarland); 2 males, 2 miles south-southwest Valyermo, Los Angeles County, 11 June 1964 (W. R. B., J. S. B., M. R. G.); 1 female, Big Rock Creek, San Gabriel Mountains, Los Angeles County, 10 September 1964 (C. Henne); 2 males, Wrightwood, San Bernardino County, 13 June 1964 (W. R. B., J. S. B., M. R. G.); 1 male, Tecate Peak, San Diego County, California, 21 July 1963 (B. Reed).

*Distribution* - *A. hennei* is known only from the vicinity of Los Angeles and San Bernardino Counties south into San Diego County (see distribution map, fig. 6). Records indicate that *hennei* is double-brooded, as most specimens examined were collected in June and early July but two specimens were taken between the second and third week of September in Los Angeles County (collected by Chris Henne). To date *hennei* is believed to be very rare and is represented in few western collections.

*Recognition characters* - *A. hennei* can be distinguished from *glenni* and *striata* by the following features: 1) smaller size; and 2) dark subterminal area of the primaries. In addition, *glenni* has a smooth light brown to chocolate ground color, whereas *hennei* is brown to dark brown and lacks this smooth appearance. As the name implies, *striata* is striate and lacks the contrasting subterminal-terminal area. From personal communication with C. Henne, it is known that a foodplant for the larva of *hennei* is *Juniperus californica* Carr.

I take great pleasure in naming this species in honor of the ardent collector and naturalist, Christopher Henne of Pearblossom, California who made it possible to obtain the type series.

*A. nefascia* Group

*Diagnosis* - Antennae basally ciliate, apical portion setose-ciliate, setations moderate in length, not greatly exceeding length of flagellomere; palpi exterolaterally blackish; thorax with divided collar; primaries tan, brown, liver brown, red brown, blackish; aedeagus of male possessing a single cornutus, two cornuti, or a single cornutus plus a sclerotized basal vesical band (as in figs. 87, 88, 90, 91); ampulae large, prominent; uncus blunt, not sharply pointed; inner margin of sacculus serrated or simple; female genitalia with ovipositor lobes truncate; ductus bursae highly modified into huge rectangular structure, or simple; bursa copulatrix possessing one, or two signae; greatest expanse of forewing 15 mm to 19 mm.

*Included species* - *A. nefascia* (J. Smith); *barnesi* (Benjamin); *denticulata* McDunnough; *baueri* McDunnough; *alampeta* Franclemont.

*Distribution* - Western North America and eastward into New York, Indiana, and Michigan (see distribution maps, figs. 9 through 12).

Key to species of the *nefascia* group by distributional, superficial and genitalic characters.

1. Primaries tan to light brown, appearing irrorated with dark brown flecks; ordinary cross lines prominent; reniform mark unicolorous, dark brown; male genitalia with two vesical cornuti, one of which may be modified with 1, 2, or more lateral extensions (as in figs. 89, 92, 93, 94); aedeagus less than 0.5 mm at narrowest lateral width; juxta apically broadened, twice as wide as base; inner margin of sacculus simple, smooth. . . . . *denticulata* McDunnough  
 Primaries tan, brick red, brown, red brown, dark brown, not appearing irrorated with dark brown flecks; ordinary cross lines not prominent, sometimes wanting; reniform mark may be unicolorous, or inner marginal portion may be darker than costal portion; male genitalia with a single cornutus, may also be additional sclerotized basal vesical plate; aedeagus 0.5 mm or greater at narrowest lateral width; inner margin of sacculus serrate, or not; valves may possess preapical tooth (as in figs. 53, 54). . . . . 2
2. Primaries with reniform mark unicolorous, may be slightly darker than ground color, but not approaching black; subterminal line costally with dark wedge; male genitalia with valves possessing preapical tooth, or if not so, inner margin of sacculus not serrate; female genitalia lacking heavily sclerotized ductus bursae (as in figs. 127, 128). . . . . 3

- Primaries with reniform mark black, or appearing indistinctly bicolor, inner marginal portion darker than costal portion; male genitalia with inner margin of sacculus serrate; valves lacking preapical tooth; aedeagus with a single cornutus (as in figs. 95, 96, 97, 98) on vesica; female genitalia with ductus bursae heavily sclerotized (as in figs. 130, 131). . . . . 4
3. Ground color of primaries brown, or with slight red tinge, no sexual dichromism; transverse anterior and transverse posterior lines represented costally by thick black dashes, thence hardly discernible; male genitalia with prominent preapical tooth of valves; aedeagus with vesical plate basally; female genitalia with ductus bursae short (as in fig. 127); bursa copulatrix bilobed, possessing a single signa. . . . . *nefascia* (J. Smith)
- Sexual dichromism observed, ground color of primaries in males blackish-brown, in females tan to gray-brown; subterminal line costally represented as prominent black wedge, thence ochreous to inner margin; male genitalia with valves lacking preapical tooth; aedeagus with vesica lacking basal sclerotized plate; female genitalia with bursa copulatrix not bilobed; known thus far only from Arizona and New Mexico. . . . . *alampeta* Franclemont
4. Primaries olive brown, terminal area irrorated with light olive scales; greatest expanse of forewing  $\pm 16$  mm; male genitalia with vesical cornutus bulbed (as in fig. 98); aedeagus appearing short, robust, greatest length of uninflated aedeagus not exceeding 3.0 mm; female genitalia with ductus bursae possessing prominent lobe (as in fig. 131), not appearing rectangular; occurs in Coast Ranges and central California Sierra Nevada foothills. . . . .  
. . . . . *baueri* McDunnough
- Primaries light tan, rust brown, brown, dark brown; ordinary cross lines obscured; greatest expanse of forewing  $\pm 18$  mm; male genitalia with non-bulbed cornutus, in uninflated aedeagi vesical cornutus protrudes beyond apical end of aedeagus; greatest length of non-inflated aedeagus 3.0 mm or greater; female genitalia with huge rectangular ductus bursae (as in fig. 130); occurs in great interior valley of California and eastward into Great Plains and northward in the east. . . . . *barnesi* Benjamin

*Abagrotis nefascia* (J. Smith)

(figs. 12, 53, 54, 87, 88, 127, 178-181)

*Rhynchagrotis nefascia* J. Smith, 1908, *Canad. Ent.* 40(7):222, 227-228, lectotype male, Ft. Wingate, New Mexico, July 21, slide no. 12,106 F. H. Rindge (AMNH), by present designation; Barnes and McDunnough, 1917, *Check list Lepidoptera Boreal Amer.* p. 48 (spelled *negascia*).

*Lampra nefascia*, Benjamin, 1921, Bull. So. California Acad. Sci. 20 (3):96, 97, 99-100, pl. 2, fig. 12, pl. 6, figs. 50, 51; Draudt, in Seitz, 1923, the Macrolepidoptera of the World 7:82; Blackmore, 1922, Rep. Provincial Mus. Natur. Hist. 12(5):21, pl. 3, fig. 4.

*Abagrotis nefascia*, McDunnough, 1938, Mem. So. California Acad. Sci. 1:67; Llewellyn-Jones, 1951, Entomol. Soc. Brit. Columbia, Occasional Paper No. 1, p. 54; Crumb, 1956, U.S.D.A., Tech. Bull. 1135, p. 119.

*Lampra forbesi* Benjamin, 1921, Bull. So. California Acad. Sci. 20(3): 96, 98, pl. 2, fig. 10, pl. 6, fig. 48, holotype male Stockton, Utah, September 19, 1907 (T. Spalding), slide No. 20-640 (USNM), NEW SYNONYMY.

*Diagnosis - Male:* Ground color of primaries brown, to dark brown. Head with vertex clothed in bicolor flattened hairs, basally light brown, apically dark brown; frons clothed in white-tipped brown flattened hairs; palpi with second segment exterolaterally of black spatulate scales, ventrally of elongate black flattened hairs, apically tan; third segment predominantly of ground color, apically tan; antennae with scape ventrally clothed in tan, dorsally clothed in brown; flagellar segments dorsally clothed in black scales, ventrally ciliate, apically setose-ciliate; compound eyes bordered in black laterally. Thorax dorsally with collar brown, preapically black, apically white-tipped; anterior tuft tricolor, basally tan, preapically dark brown, apically white-tipped; tegulae clothed in brown spatulate scales; disc of brown simple hairs plus flattened scales; posterior tuft colored as in anterior tuft; ventrally clothed in whitish fuscous simple hairs; legs with femora clothed in black and tan scales; tibiae clothed laterally in black and whitish elongate scales, posteriorly with elongate whitish hairs; tarsi fuscous, each tarsomere with tan apical annulus; primaries dorsally with ordinary cross lines indistinct or distinct; basal half line faint, geminate, black, filled with ground color; transverse anterior line sharply defined on costa by black wedge, thence faint, geminate, black, filled with ground color; orbicular spot outlined in light brown, centrally filled with darker color than ground color; reniform mark darker than orbicular spot, blackish, outlined in light brown; transverse posterior line represented by black wedge costally, this wedge being outlined in light brown, thence either wanting or represented by double row of black dots on veins; subterminal line represented by black wedge on costa, thence represented by contrast between subterminal area and lighter terminal area; terminal line represented by lunules between veins; fringes tricolor, basally fawn, medially whitish, apically fuscous; ventral surface costally with tan colored band from base to terminal line; transverse posterior line represented costally in black; inner margin whitish; fringes as in dorsal surface; remainder of wing fuscous; secondaries dorsally fuscous, lightest basally; discal dot faint, black; veins outlined in darker brown than ground color; fringes tricolor, basally ochreous, medially dark brown, apically white; ventral surface fuscous, irrorated with white, lightest

basally; costal area irrorated with rose; exterior line black, prominent; veins outlined in black; fringes as in dorsal surface. Abdomen dorsally of ground color, ventrally tan; terminally with elongate hairs of reddish brown and brown. Greatest expanse of forewing 15 mm to 16 mm. Genitalia as in figs. 53, 54, 87, 88.

*Female*: As in male but occasionally ground color with reddish cast; subterminal line basally bordered in dark brown; sometimes appearing banded. Greatest expanse of forewing 15 mm to 16 mm. Genitalia as in fig. 127.

*Material studied* - 99 males, 122 females, May through September. CANADA. *British Columbia*: Victoria. UNITED STATES. *Arizona*: Cochise; Coconino. *California*: Alpine; Calaveras; Colusa; Inyo; Kern; Lassen; Los Angeles; Merced; Modoc; Mono; Plumas; Riverside; Sacramento; San Bernardino; Shasta; Tulare; Ventura. *Nevada*: Clark; Douglas; Elko; Washoe. *New Mexico*: "Hot Springs." *Oregon*: Grant; Jefferson; Josephine; Klamath. *Utah*: Cache; Jaub; San Juan; Tooele; Utah. *Washington*: "Dry Falls"; Kittitas. *Wyoming*: Crook.

*Recognition characters* - *A. nefascia* is most closely related to *baueri* by maculation, but it may be distinguished by: 1) more elongate primaries (see figs. 178-181); 2) darker coloration; 3) possession of a preapical tooth of the valves; and 4) presence of a cornutus plus an additional sclerotized plate. From *barnesi*, *nefascia* can be distinguished by: 1) possession of a black costal wedge at start of both the transverse anterior and transverse posterior lines; 2) darker coloration; and 3) section 3 of above. The general color of *nefascia* is dark brown, but occasionally a specimen with distinct reddish tinge is observed.

*Immature stages* - The larvae vary in color, from dark gray to pale gray, and are about 30 mm in length and 5 mm broad medially (*teste* Crumb, 1956). Larvae were collected in April and May, and the adults emerged in "June and early July." The life cycle of *nefascia* in Washington would probably be one in which the eggs overwinter, hatch in April and May, pupate in ? , and emerge as adults in June-July. Judging by the emergence dates Crumb obtained, and comparing these data with records of adult specimens collected in the field, the larvae were probably reared under laboratory conditions, thus the adults emerged earlier than if the life cycle were allowed to proceed uninterrupted under natural conditions. The larval foodplant is Serviceberry (*Amelanchier* sp.).

*Distribution* - This species has a wide distribution, occurring in much of the western United States and northward into British Columbia (Canada) (see distribution map, fig. 12). This species occurs primarily in areas with a Great Basin influence, but it does occur in forested areas as well. Washington specimens were reared on Serviceberry, and as members of this plant genus (*Amelanchier*) are widely distributed there are members of this plant genus available to *nefascia* throughout its range.

*Abagrotis alampeta* Franclemont

(figs. 12, 58, 59, 90, 91, 128, 182, 183)

*Diagnosis - Male:* Ground color of primaries dark brown to blackish. Head with vertex clothed in bicolor flattened hairs, basally tan, apically black; frons clothed in white-tipped blackish flattened hairs; palpi with first segment ventrally clothed in admixture of tan, black flattened hairs, exterolaterally clothed in black spatulate scales; second segment exterolaterally black; apically tan; third segment bicolor, basally black, apically tan; antennae with scape ventrally clothed in tan, dorsally in black, flagellar segments dorsally scaled with black and tan, appearing banded, ventrally lengthily setose. Thorax with divided collar in dark brown, tan-tipped, elongate scales; anterior tuft bicolor, basally dark brown, apically white-tipped; tegulae composed of dark brown, black spatulate scales; disc clothed in bicolor simple hairs, basally dark brown, apically white-tipped; posteriorly clothed in fuscous elongate simple hairs; ventrally clothed in fuscous elongate simple hairs; legs with femora clothed in black and white scales, appearing checkered; tibiae exterolaterally clothed in black, posteriorly clothed in tan elongate simple hairs; tarsi predominantly black, each tarsomere possessing light colored annulus apically; primaries dorsally with faint light costal band; basal half line geminate, black, filled with ground color; transverse anterior area of ground color; transverse anterior line serrate, represented costally by black wedge, thence geminate, black, filled with ground color; median area of ground color; orbicular spot neatly defined in ochre, a faint black outline, centrally filled with ground color; reniform mark rectangular, darker centrally than orbicular spot, otherwise colored same, slightly constricted medially; transverse posterior line geminate, black, filled with lighter color than ground color; a row of black dots on veins paralleling transverse posterior line, between transverse posterior and subterminal lines; subterminal line costally black with broad black wedge inwardly directed, thence ochreous; veins faintly outlined, black, in transverse posterior and subterminal area; terminal line black, represented by lunules on veins; fringes fuscous; ventral surface lighter than dorsal surface; tan costal band present from base to subterminal line; transverse posterior line represented in black costally; inner margin lighter than center of wing; secondaries dorsally fuscous; discal dot dark, faint; veins outlined faintly in dark brown; fringes tri-color, basally ochreous, medially dark brown, apically whitish; ventral surface fuscous; costal area irrorated with rose and black scales; exterior line suggested costally; discal dot black; fringes as in dorsal surface. Abdomen dorsally of ground color, each segment apically with tan semi-annulus; terminally with elongate tan simple hairs; ventrally clothed in tan, terminally with rose hue. Greatest expanse of forewing 17 mm. Genitalia as in figs. 58, 59, 90, 91.

*Female:* Dichromism exhibited, female not dark as in male, but rather tan to olive-tan; maculation appearing more obscured than in male. Greatest expanse of forewing 17 mm. Genitalia as in fig. 128.

*Material studied* - male, Madera Canyon, Santa Cruz County, Arizona, elevation 4,880 feet, 7 July 1963 (W. R. Bauer, J. S. Buckett); 1 female same locality and collectors as preceding, 6 July 1963; 14 males, 28 females, same data as preceding, Barfoot Mountain, 20 miles west Portal, Cochise County, Arizona, 10 July 1963 (W.R.B., J.S.B.); 7 males, 8 females, 21 miles northwest Portal, Cochise County, Arizona, 11 July 1963; 2 females, Turkey Flats, Chiricahua Mountains, Cochise County, Arizona (J. A. Busche); 1 female, Sunnyside, west side Huachuca Mountains, 9 July 1958 (L. M. Martin); 1 female, Huachuca Mts., 24 June 1936; 1 female, Garden Canyon, Huachuca Mts., Cochise Co., Arizona, July 10 (K. R. Coolidge); 1 female, Todd's Lodge, Oak Creek Canyon, Coconino Co., Arizona, 12 June 1946; 3 females, Pine Crest, Mt. Graham, Graham Co., Arizona, 28 June 1955 (W. A. Reese); 1 female, Christopher Creek, Mogollon Rim, Gila Co., Arizona, 19 June 1957 (L. M. Martin, et. al.); 1 male, 5 miles north Payson, Pima Co., Arizona, 5 September 1961 (J. S. Buckett); 1 male, Nogales, Santa Cruz Co., Arizona (A. Koebele); 1 male, 4.5 mi. south Placitas, Sandia Mts., Sandoval Co., New Mexico 16 May 1958 (A. N. McFarland).

*Variation* - This species exhibits little variation although the ground color of the primaries varies slightly. In this respect the females vary from tan to brown, but the males exhibit almost no variation in this respect.

*Recognition characters* - *A. alampeta* is most closely related superficially to *barnesi*, but not as closely to *barnesi* as are *baueri* and *denticulata*. The maculation of *alampeta* is quite distinctive in that: 1) the reniform mark is most often filled with ground color, or if filled with darker color than ground color, only slightly darker; 2) costally the transverse anterior and transverse posterior lines commence as a black wedge (much as in *nefascia*); 3) at costal commencement of subterminal line a black shading is present, the shading projecting basally. From *barnesi*, *alampeta* is best distinguished by the three factors mentioned above plus very distinctive genitalia (compare figs. 56, 57, 58, 59, 90, 91, 95-97). The ground color of *alampeta* varies from light tan in the female, to nearly black in the male.

*Distribution* - *A. alampeta* is thus far known from Arizona and New Mexico, and probably extends its range southward into Nearctic Mexico. It is collected at medium to high elevations (4,000 feet to 8,000 feet elevation), and has been collected flying at fairly cool temperatures at higher elevations (below 45°F). In this latter respect, *alampeta* occurs locally where no specimens of *barnesi* were seen, even though *barnesi* was collected in abundance at lower elevations at the same time.

*Abagrotis denticulata* McDunnough

(figs. 9, 55, 57, 89, 92, 93, 94, 129, 184, 185)

*Abagrotis denticulata* McDunnough, 1946, *Canad. Ent.* 78(2):31-32, holotype male, Petaluma, Sonoma County, California, June 20, 1938 (W. R. Bauer), Type No. 5646 (CNC).

*Diagnosis - Male:* Ground color of primaries tan to light brown with irrorated appearance. Head with vertex clothed in bicolor flattened hairs, basally tan, apically dark brown; frons clothed in unicolorous tan scales, flattened hairs; palpi basally tan; first segment extero-laterally black; second segment extero-laterally black, apically tan; third segment unicolorous, light brown; antennae with scape clothed in ground color; flagellar segments clothed in tan scalation, remainder clothed in black; ventrally ciliate, apically setose-ciliate; eyes bordered with black hairs laterally, these hairs extending toward wing base. Thorax with divided collar tan, irrorated with black scales; anterior tuft, if present, tricolor, basally tan, preapically black, apically white-tipped; tegulae, disc concolorous, composed of tan spatulate scales, irrorated with black; posterior tuft colored as in anterior tuft; ventral surface clothed in black-tipped concolorous, tan simple hairs; legs with femora, tibiae concolorous, tan, irrorated with black, tarsi dark, each tarsomere with tan apical annulus; primaries with maculation on dorsal surface faint, or prominent, surface light brown, irrorated with dark brown flecks; basal line geminate, dark brown, filled with ground color; basal area fuscous inner marginally; transverse anterior line irregular, dark brown, geminate, filled with ground color; orbicular spot outlined in ochre, centrally filled with fuscous; reniform mark rectangular, colored as in orbicular spot; transverse posterior line dark brown, geminate, filled with ground color; subterminal area slightly darker than median area, fuscous; subterminal line a dark brown wedge costally, thence ochreous to inner margin, shaded basally in brown; terminal area of ground color; terminal line represented by dark brown lunules on veins; fringes tricolor, basally ochreous, medially a thin white band, apically fuscous; ventral surface with thin light costal area; transverse posterior line represented costally as dark brown dash; thence faint to inner margin; terminal area irrorated with tan; inner margin whitish; remainder of surface fuscous; secondaries fuscous, lightest basally; discal dot large, dark brown; veins outlined in dark brown; fringes tricolor, basally ochreous, medially dark brown, apically white; ventral surface with costal area irrorated with flesh-colored dark brown scales; exterior line broad, dark brown costally, thence fading into fuscous on lower part of surface; fringes as in dorsal surface. Abdomen dorsally fuscous, each segment with tan semi-annulus; ventral surface clothed in tan scales, irrorated with black scales. Greatest expanse of forewing 16 mm to 18 mm. Genitalia as in figs. 55, 57, 89, 92, 93, 94.

*Female* - Maculation less defined than in male, more washed out in appearance; otherwise as in male. Greatest expanse of forewing 16 mm to 18 mm. Genitalia as in fig. 129.

*Material studied* - 71 males, 79 females, May through September. UNITED STATES. *California*: Amador; Contra Costa; El Dorado; Lake; Los Angeles; Orange; San Bernardino; San Francisco; Santa Cruz; Sonoma; Yolo.

*Variation* - *A. denticulata* exhibits a moderate amount of variation both superficially and genitally. Superficially, the primaries vary in color from tan to brown; genitally in the male, the vesical armature is quite variable (as in figs. 89, 92, 93, 94).

*Recognition characters* - This species can be confused quite easily with some specimens of *baueri*, but can be distinguished by: 1) possession of two cornuti on the vesica of the aedeagus; 2) juxta apically broadened, twice the width of base; and 3) larger size and irrorated appearance (see figs. 190, 191). It can be confused with *barnesi* quite easily, but it may be distinguished by features 1 and 2 of above, plus possession of a serrate inner margin of the sacculus.

*Distribution* - *A. denticulata* has been collected in the Coast Ranges of central and southern California (see distribution map, fig. 9). It has also been collected less frequently in the great interior valley of central California, and in the foothills of the Sierra Nevada Mountains. This species was originally described from Petaluma, Sonoma County in 1946, and few specimens have been collected there since. The majority of the specimens collected in the past few years have been collected in Lake County, California. This species is best collected by the methods outlined for collecting *baueri*. Nothing is known of the immature stages of this insect.

*Abagrotis barnesi* (Benjamin)

(figs. 11, 56, 95, 96, 97, 139, 186-190)

*Lampra barnesi* Benjamin, 1921, Bull. So. California Acad. Sci., 20(3): 96, 97, pl. 2, fig. 9, pl. 6, fig. 46, holotype male, White Mountains, Arizona, slide No. 24-723, right primary missing (USNM); Draudt, in Seitz, 1923, the Macrolepidoptera of the World 7:81-82; Crumb, 1932, Bull. Brooklyn Entomol. Soc. 27(2):78, 90, pl. 11, fig. H.

*Abagrotis barnesi*, McDunnough, 1938, Mem. So. California Acad. Sci. 1:67; 1946, Canad. Ent. 78(2):31; 1949, Amer. Mus. Novitates, No. 1894, p. 12; Crumb, 1956, U.S.D.A. Tech. Bull. 1134, pp. 114, 120-121.

*Noctua barnesi*, Forbes, 1954. Mem. Cornell Univ. Agr. Exp. Sta., No. 329, pp. 58, 69, 70, figs. 83, 90.

*Lampra barnesi* form *nevadensis* Benjamin, 1921, Bull. So. California Acad. Sci. 20(3):98; Barnes and McDunnough, 1912, Contrib. Lepidoptera North Amer., pl. 22, fig. 10; Draudt, in Seitz, 1923, *nevadensis* Benjamin (not Barnes and McDunnough), the Macrolepidoptera of the World 7:82.

*Diagnosis - Male:* Ground color of primaries tan to dark olive brown, occasionally with reddish cast. Head with vertex clothed in brown hairs and scales; frons clothed in tan elongate scales; palpi with first segment black exterolaterally, ventrally with elongate simple hairs; second segment exterolaterally with black scales, apically tan; third segment stubby, tan; antennae with scape clothed in light tan; flagellar segments dorsally clothed in black scales, ventrally clothed in light tan scales basally, thence ciliate, apically setose-ciliate; compound eyes with black patch posteriorly, extending to one-half distance to wing base. Thorax dorsally with divided collar porrect or not, tan in light colored specimens, irrorated with black in darker specimens; disc and tegulae concolorous tan to brown; posteriorly with elongate fuscous to whitish fuscous simple hairs; ventrally clothed in light tan elongate simple hairs; legs with femora clothed in tan scales and hairs; irrorated with dark brown scales; tibiae clothed in tan spatulate scales and simple hairs; tarsi dorsally clothed in black spatulate scales, tarsomeres with tan apical band, ventrally clothed in tan; primaries with ordinary cross lines faint, geminate, dark brown, filled with ground color; orbicular spot outlined in tan, centrally filled with ground color; reniform mark darker than ground color, outer line constricted medially, outlined in tan; subterminal line wavy, lighter than subterminal area and terminal area; terminal area irrorated heavily with tan; terminal line represented by black lunules between veins, outwardly a thin ochreous line; fringes fuscous; ventral surface with light costal band from base to apex; transverse anterior line represented on costa by black lunate dash; fringes represented by brown lunules between veins; fringes basally ochreous, terminally fuscous; inner margin irrorated with light tan scales; remainder of wing dark fuscous; secondaries dorsally fuscous; discal dot elongate, dark brown, faint; veins faintly outlined in darker color than ground color; fringes bicolored, basally fuscous, terminally white; ventral surface basally irrorated with tan scalation, preapically dark fuscous; discal lunule prominent, dark brown; exterior line present, dark brown costally, fading into fuscous preapical area; fringes ochreous. Abdomen dorsally clothed in fuscous, each segment with tan semi-annulus apically; ventrally clothed in tan scalation. Greatest expanse of forewing 16 mm to 18 mm. Genitalia as in figs. 56, 95-97.

*Material studied* - 364 males, 424 females, May through October. CANADA. *Alberta:* Lethbridge; Manyberries. *Saskatchewan:* Swift Current. UNITED STATES. *Arizona:* Cochise; Coconino; Gila; Pima; Santa Cruz. *California:* Fresno; Imperial; Inyo; Kern; Kings; Los Angeles; Madera; Merced; Riverside; Tulare. *Illinois:* Waukegan. *Nevada:* Clark.

*Variation* - The ground color of the primaries of *barnesi* may be light tan to dark brown, or they may have a rusty tinge. In rare instances they may be brick red, a feature not found in the other closely related species within the group.

*Recognition characters* - *A. barnesi* is closely related to *baueri*, *denticulata*, and to *alampeta*. Both *baueri* and *denticulata* are of somewhat restricted distribution in California, as is *alampeta* in Arizona and New Mexico, and *barnesi* occurs sympatrically with these three species. *A. barnesi* may be distinguished from *baueri* by: 1) larger size; 2) aedeagus of male exceeding 3.0 mm in length; and 3) cornutus on vesica not bulbed. There are few characters to separate *barnesi* from *baueri*, but with a large series the distinctive features can be observed. *A. barnesi* can be distinguished from *denticulata* by: 1) smoother appearance (see figs. 186-190); 2) by presence of a single cornutus on the vesica rather than two; and 3) inner margin of sacculus (inner face of valve) serrate. From *alampeta*, *barnesi* can be distinguished by: 1) lack of well defined wedge shaped subterminal line at costa of primaries; 2) lack of sclerotized plate in addition to cornutus; and 3) lack of preapical tooth of valve.

This species was represented in collections for years before it was finally described by Benjamin (1921). Even at the time of the original description, Benjamin had not solved the problem of what *barnesi* included. As a result, his type series contained two species, and the photograph of his "Mission San Jose" specimen "close to form *nevadensis*" represents yet another species. Curiously enough, the form *nevadensis* Benjamin was found to be conspecific with *barnesi* and therefore placed into synonymy by later workers (McDunnough, 1938). Dr. Franclemont first separated Benjamin's type series of *barnesi* into its component species.

*A. barnesi* is of agricultural interest in that it has been recorded as being ". . . an injurious climbing cutworm on apple and grape." (Forbes, 1954).

*Immature stages* - Apparently, Crumb (1932) was the first to describe the larval form of *barnesi*, and for general habitus stated "Ground color light gray, sometimes tinged faintly with brownish, overlaid dorsally, to and including the spiracles, with fuscous or black . . ." and "Head ground color pale gray with the submedian arcs and reticulation fuscous or ferruginous, the arcs tending to be reticulate or dilute anteriorly." *A. barnesi* is a general feeder, and has been recorded from peach, grape, apple, Currant, cherry, cottonwood, serviceberry, and introduced box elder.

*Distribution* - *A. barnesi* is a widely distributed species which is recorded from both eastern and western North America (see distribution map, fig. 11). It reaches its greatest concentration in Great Basin regions and in rolling hills of deciduous forests in the southern portion of its range. No data are available from Mexico, but it is almost certain to be within the range of *barnesi*. In California, *barnesi* is found in the

central valley southward to the Mexican border, thence eastward through the southern United States, and on to the Great Plains. In the eastern United States, it has been recorded as far north as Ithaca, New York (Forbes, 1954).

*Abagrotis baueri* McDunnough  
(figs. 10, 60, 98, 131, 191, 192)

*Abagrotis baueri* McDunnough, 1949, Amer. Mus. Novitates, No. 1394, p. 12, holotype male, Anderson Springs, Lake County, California, July 13, 1947 (W. R. Bauer), (AMNH); Benjamin, 1921 (= *Lampra*), Bull. So. California Acad. Sci. 20(3):149, pl. 6, fig. 47 (not *barnesi*).

*Diagnosis - Male:* Ground color of primaries light brown to olive. Head with vertex and frons clothed in unicolorous light brown, black-tipped flattened hairs, simple hairs present on frons also; palpi basally tan, second segment exterolaterally clothed in black scales, simple hairs, apically tan; third segment clothed in tan, black scales, apically tan; antennae with scape, basal four or five flagellomeres clothed in tan; dorsally with black scales from fifth or sixth flagellomere to apical part; ventrally ciliate, medially setose-ciliate, ciliations becoming longer apically; compound eyes laterally with dark brown simple hairs, extending toward wing base. Thorax with divided collar of ground color, white-tipped apically; tegulae composed of tan, few dark brown spatulate scales, simple hairs; disc of ground color; posteriorly with tan simple hairs; ventrally clothed in tan simple hairs; legs unicolorous, tan; primaries with ordinary cross lines faint, basal line obscured; transverse anterior line geminate, dark brown, filled with ground color, very straight in course; orbicular spot outlined faintly in dark brown, inwardly tan, centrally filled with ground color; reniform mark erect, dark brown, outlined in tan, very slightly constricted medially; transverse posterior line geminate, dark brown, smooth, filled with ground color; subterminal line inwardly dark brown, outwardly tan; terminal space irrorated with gray; terminal line represented by dark brown lunules on veins; fringes tricolor, basally ochreous, medially tan, apically dark brown; ventral surface lighter on costa and inner margin than on remainder of wing; transverse posterior line represented costally as dark dash; fringes as in dorsal surface; remainder of wing fuscous; secondaries dorsally fuscous; discal dot faint; veins outlined in dark brown; fringes tricolor, basally ochreous, medially dark brown, apically white-tipped; ventral surface fuscous, costally irrorated with flesh-color plus dark brown scales; exterior line prominent costally, thence blending with remainder of wing; discal lunule broad, dark brown; fringes as in dorsal surface; remainder of surface fuscous. Abdomen dorsally and ventrally of ground color. Greatest expanse of forewing 16 mm to 17 mm. Genitalia as in figs. 60, 98.

*Female:* As in male but may be darker in coloration. Genitalia as in fig. 131.

*Materials studied* - UNITED STATES. *California:* Colusa; Lake; Sacramento; Yolo.

*Recognition characters* - *A. baueri* is one of the smallest in the group, and its olive to olive-brown color plus its bicolorous dark brown to blackish reniform mark (at least inner marginally dark) will help to superficially distinguish it from its close sympatric relatives. Genitally *baueri* can be distinguished from both *barnesi* and *denticulata* by: 1) aedeagus never exceeding 3.0 mm in length; and 2) possession of a single, bulbed cornutus on the vesica of the aedeagus.

Nothing is known about the immature stages of *baueri*. Attempts to stimulate oviposition from females of this species failed. Methods of collecting *baueri* are of interest because this species is taken infrequently at incandescent lights. It has been collected primarily by sugaring, and by "flushing" specimens from litter. The fluorescent ultraviolet light, employed only recently, probably accounts for the greatest number of specimens in collections today, however.

