Occasional Papers No. 17

Revision of the Nearctic Moth Genus ABAGROTIS Smith with Descriptions of New Species (Lepidoptera:Noctuidae), Part 5

John S. Buckett

BUREAU OF ENTOMOLOGY
DEPARTMENT OF AGRICULTURE
SACRAMENTO, CALIFORNIA

EDITORIAL BOARD

John S. Buckett, *Editor*

William R. Bauer Terry N. Seeno

BUREAU OF ENTOMOLOGY

Robert W. Harper, *Chief*

CALIFORNIA DEPARTMENT OF AGRICULTURE

1220 N STREET

SACRAMENTO, CALIFORNIA 95814

The OCCASIONAL PAPERS of the Bureau of Entomology will serve as a medium for papers dealing with Arthropod systematics by various individuals, primarily systematists associated with the California Department of Agriculture.

These papers will have no set publication date, but will be numbered consecutively and will appear as the respective articles are completed. As there will be no definite volumes, when approximately 300 pages are completed a TABLE OF CONTENTS will be provided to cover the issues totaling these pages.

Individual copies will be sent free of charge upon request and a regular mailing list will be maintained, including libraries and specialists. Manuscripts will be considered for publication in the order in which they are received, unless total cost of publication is prepaid. In the latter case publication will be immediate. Address all correspondence to the editor.

This issue mailed May 15, 1969

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

PART V: THE DUANCA AND PLACIDA GROUPS; CHECKLIST OF THE PRESENTLY KNOWN SPECIES WITHIN THE GENUS

JOHN S. BUCKETT
Systematic Entomologist
Bureau of Entomology

A. duanca Group

Diagnosis - Antennae of male with scape clothed in unicolorous spatulate scales; flagellum basoventrally ciliate, apically setose-ciliate, of female setose; palpi exterolaterally blackish; thorax with divided collar unicolorous, brown, blending with disc and tegulae, or contrasting, lighter than disc and tegulae; primaries with ground color brown to dark brown, ordinary crosslines strongly represented, or weakly so; aedeagus of male with vesical sac possessing a single cornutus plus a spined sclerotized band; valves terminally attenuated; ampulae well developed; uncus apically truncate; female genitalia with ductus bursae moderately sclerotized (as in figs. 143, 145); bursa copulatrix possessing a single signum; ovipositor lobes truncate, or somewhat pointed; greatest expanse of forewing 13 mm to 16 mm.

Included species - *A. duanca* (J. Smith); *reedi* Buckett, new species.

Distribution - Members of this group occur over the whole of western North America from the Pacific Coast ranges eastward into the Rocky Mountains and from British Columbia and Alberta, Canada, southward into Arizona, and New Mexico, and probably occur in Nearctic Mexico.

Key to species of the *duanca* group by superficial and genitalic characters.

1. Ground color of primaries blackish, if brown, then ordinary markings and cross lines obscure; collar contrasting with ground color in darker individuals, tan in coloration; in male, valves not greatly swollen basally (as in fig. 71); aedeagus with vesical cornutus bulbed; in female, posterior apophysis reduced in size; bursa copulatrix with signum large in comparison to size of bursa copulatrix (as in fig. 143). . . . . .*duanca* (J. Smith)

Ground color of primaries light brown to dark brown; ordinary cross lines usually distinct; ordinary markings distinct; collar not contrasting with ground color; in male, valves greatly swollen basally, apically finely attenuated (as in fig. 72); aedeagus with small, unbulbed vesical cornutus; in female, posterior apophysis elongate (as in fig. 145); bursa copulatrix with signa small in comparison to size of bursa copulatrix. . . . .*reedi* Buckett, n. sp.

Abagrotis duanca (J. Smith)

(figs. 21, 71, 111, 143, 224, 225)

Rhynchagrotis duanca J. Smith, 1908, Canad. Ent. 40(7):228, lectotype female, Stockton, Utah, October 2, 1904, J. B. Smith collection Rutgers, female genitalia on slide No. 12, 104 F. H. Rindge, by present designation; Barnes and McDunnough, 1917, Check list Lepidoptera Boreal Amer. p. 48.

Lampra duanca, Benjamin, 1921, Bull. So. California Acad. Sci. 20(3): 96, 99, pl. 2, fig. 11, pl. 6, fig. 49; Draudt, in Seitz, 1923, the Macrolepidoptera of the World 7:82.

Abagrotis duanca, 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. No. 1135, pp. 114, 118.

Diagnosis - Male: Ground color of primaries dark brown to black. Head with vertex clothed in rust, dark brown flattened hairs and elongate scales; frons clothed in light-tipped dark brown elongate scales and simple hairs; palpi with first segment clothed in tan elongate simple hairs ventrally; second segment basally clothed exterolaterally in black, apically light tan; third segment basally black, apically light tan; antennae with scape clothed ventrally in light tan, dorsally in dark brown; with dorsal row of black scales, ventrally ciliate, apically setose-ciliate. Thorax with divided collar rust color, porrect, intermingling of darker scales; lacking dorsal tufts; disc and tegulae of ground color; posteriorly with simple fuscous hairs; ventrally clothed in fuscous to fuscous-whitish simple hairs, underlain with white spatulate scales; legs with femora and tibiae clothed in blackish, but with third tibiae interolaterally clothed in white; tarsi black, each tarsomere apically white banded; primaries with ordinary cross lines indistinct, or distinct; when distinct, basal half line geminate, black, filled with irroration of light tan; basal, transverse anterior, median, subterminal areas all concolorous, uniform dark brown to black; transverse anterior line geminate, very irregular, black, filled as in basal half line; orbicular spot and reniform mark when present, outlined in ochreous, centrally filled with ground color; reniform mark medially constricted; transverse posterior line faintly geminate, ochreous, filled

with ground color; subterminal line represented by contrast between subterminal area, and ochreously irrorated terminal area; terminal line very faint, black, represented by lunules between veins; fringes of ground color; ventral surface dark fuscous, costal area lighter, transverse posterior line represented on costa as black dash; terminal line almost black, continuous; fringes as in dorsal surface; inner marginal area lighter than central portion of wing; secondaries dorsally fuscous; discal dot faint, blackish; veins outlined in darker color than ground color; fringes whitish; ventral surface fuscous, lighter than corresponding surface of primaries, irrorated with black; discal dot faint, black; exterior line a faint broad band; fringes as in dorsal surface. Abdomen dorsally clothed in light fuscous scales and hairs; ventrally clothed in light tan scales, hairs, irrorated with black. Greatest expanse of forewing 13 mm to 15 mm. Genitalia as in figs. 71, 111.

Female - Maculation generally more clearly defined, lighter than in male; ground color may have slight reddish cast; occasionally subterminal line commencing on costa as black wedge; collar tan to rust color; remainder as in male. Greatest expanse of forewing 14 mm to 16 mm. Genitalia as in fig. 143.

Material studied - 251 males, 185 females, May through October. CANADA. *Alberta:* Manyberries; Nelson. *British Columbia:* Kamloops; Lillooet. UNITED STATES. *Arizona:* Cochise. *California:* Alpine; Inyo; Kern; Lassen; Modoc; Mono; Nevada; Placer; Plumas; San Deigo; Siskiyou. *Colorado:* Garfield; Larimer; Routt. *Nevada:* Douglas; Elko; Esmeralda; Washoe. *Oregon:* Baker; Deschutes; Harney; Jefferson; Lake; Malheur; Sherman. *Utah:* Beaver; Box Elder; Carbon; Jaub; Tooele; Utah; Weber. *Washington:* Douglas; Yakima. *Wyoming:* Crook; Freemont.

Recognition characters - *A. duanca* is a fairly distinct species, but may be confused with both *A. reedi,* and males of *A. alampeta* . From the latter, it may be distinguished by: 1) the smaller size (compare figs. 182 and 224); 2) in the male genitalia by lacking modified apical portion of valves; and 3) vesical sac possessing a single bulbed cornutus and simple sclerotized band. *A. duanca* may be separated from *A. reedi* by: 1) primaries dorsally with ordinary cross lines obscure; 2) collar usually contrasting in color with disc and tegulae, lighter in coloration; 3) valves not greatly swollen basally (as in fig. 72); and 4) bulbed cornutus of vesical sac.

Immature stages - The larvae of *A. duanca* were reared by Crumb from Washington, and a description published by him in 1956. He cited sagebrush *(Artemesia)* as the exclusive food plant of this insect. Larvae were collected in April and May, and adults emerged in May and June. Mature larvae with general ground color rather dark, spiracles black, skin smooth; head 2.0 mm to 2.1 mm broad; body about 25 mm long, 3.4 mm broad medially; abdominal segments of nearly equal width throughout (*teste* Crumb, 1956).

Distribution - This species occurs from middle and eastern California eastward into Colorado, and from British Columbia and Alberta, Canada southward to, at least, the Mexican border, and probably occurs farther south into Nearctic Mexico. The distribution of this species seems to parallel that of sagebrush, its only known host plant. *A. duanca* occurs at medium to higher elevations (3,000 feet up to over 8,000 feet), and is not uncommon in late August and September.

Abagrotis reedi Buckett, new species
(figs. 22, 72, 112, 145, 226-227)

Lampra nefascia, Benjamin, 1921, Bull. So. California Acad. Sci. 20 (3):96, 97, 99-100, pl. 2, fig. 12, pl. 6, figs. 50, 51.
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. No. 1135, pp. 114, 119-120.

Holotype male - Ground color of primaries brown. Head with vertex clothed in admixture of dark brown-tipped, white-tipped dark brown spatulate hairs, apically with purple sheen; frons clothed in dark brown simple and spatulate hairs; palpi basally clothed exterolaterally in blackish spatulate scales, ventrally clothed in elongate light brown simple hairs; second segment as in basal segment, except apically with tan annulus; third segment stubby, black, apically tan-tipped; antennae with scape and pedicel clothed in brown scales and hairs, flagellar segments dorsally scaled, black, ventrally finely ciliate, apical portion setose. Thorax with divided collar of dark brown flattened and spatulate hairs, with purple sheen; tegulae and disc unicolorous, brown; posterior tufts tricolor, basally tan, preapically black, tan tipped apically; center clothed in admixture of dark brown hairs with femora exterolaterally clothed in dark brown, pinkish tan spatulate scales, ventrally clothed in elongate tricolor simple hairs, basally tan, preapically dark brown, apically white-tipped; tarsi blackish, each segment apically with tan annulus; primaries dorsally dark brown; basal half line geminate, dark brown, filled with ground color; inner marginal part of basal area continuous with transverse anterior area of ground color; transverse anterior line represented on costa by black dash, thence geminate, dark brown filled with ground color; inner marginal portion of basal area continuous with transverse anterior area; transverse anterior area of ground color; transverse anterior line represented on costa by black dash, thence geminate, dark brown filled with ground color, outcurved between veins; orbicular spot outlined in ochreous, centrally filled with brown; reniform mark erect, dark brown, a dark shade from inner marginal portion to inner margin; transverse posterior line colored

as in transverse anterior line, broken; subterminal line wavy, represented by contrast of dark brown subterminal area with shiny brown terminal area; terminal line represented by black lanceolate dashes on veins; fringes bicolor, basally ochreous, apically dark brown; ventral surface dark brown; transverse posterior line represented by black wedge costally; terminal area light brown; terminal line and fringes as in dorsal surface; secondaries dorsally deep smoky fuscous, veins outlined in black; fringes conspicuously tricolor, basally ochreous, medially brown, apically white-tipped; ventral surface dark brown, costal portion irrorated with admixture of tan and black scales; fringes as in dorsal surface. Abdomen dorsally clothed in shiny brown simple hairs and spatulate scales; apically of pink tinted brown simple hairs; ventrally clothed in tan and dark brown simple scales. Greatest expanse of forewing 16 mm. Genitalia as in figs. 72 and 112.

Female - As in male except ground color of primaries may be more reddish. Greatest expanse of forewing 14 mm. Genitalia as in fig. 145.

Types - Holotype male, Tecate Peak, San Diego County, California, 21 July 1963 (B.C. Reed), deposited in the Entomology Type Collection, University of California, Davis. Paratypes: 1 female (designated allotype), same data as holotype; 164 males, 323 females, same data as holotype. Paratypes deposited in the following institutions and collections: AMNH; B-B; CNC; Franclemont; Henne; LACM; OSDA; UCB; UCD. The following specimens were also studied: 274 males, 410 females, April through October. CANADA. *Alberta:* Manyberries. *British Columbia:* Duncan; Kaslo; Lillooet; Robson; Salmon Arm; Summerland. *Saskatchewan:* Cabri; Saskatoon. UNITED STATES. *Arizona:* Coconino; Gila; Graham; Mohave; Pima; Santa Cruz. *California:* Alpine; El Dorado; Lake; Los Angeles; Modoc; Mono; Plumas; Riverside; San Bernardino; Shasta; Siskiyou. *Colorado:* Garfield; La Plata; Logan. *Nevada:* Douglas; Washoe. *New Mexico:* Luna; McKinley; Sandoval. *Oregon:* Lane. *Utah:* Jaub; Utah. *Washington:* Okanogen; Stevens.

Variation - *A. reedi* exhibits little variation compared with many species within the genus. The most common ground color is dark brown, but the ground color varies from light brown to almost blackish. Maculation of the primaries is most often distinct, but specimens have been studied in which the maculation was hardly discernible, or wanting, save for the dark reniform mark. Quite often specimens will have a presubterminal shade, but this is not always [necessarily] pronounced. Over all, the males tend to be darker in ground color than the females. The male genitalia are quite constant, and are diagnostic in that the valves are apically attenuated. The female genitalia show only minor variation in the size of the ductus bursae.

Recognition characters - This species has in the past been confused with *duanca,* and true *nefascia.* From *duanca, reedi* may be distinguished by: 1) maculation prominent, particularly the ordinary

cross lines; 2) collar unicolorous with disc and tegulae, not lighter or contrasting; 3) in male genitalia, valves greatly swollen basally (as in fig. 72); and 4) cornutus of vesical sac small, simple, not bulbed. From true *nefascia, reedi* may be distinguished by: 1) roughened appearance of dorsal surface of primaries, maculation well represented; 2) lacking strong, contrasting costal representations of the transverse anterior and transverse posterior lines; 3) in the male genitalia, lacking preapical tooth of valves; and 4) vesical sac lacking sclerotized basal band.

Immature stages - Crumb (1956) reared this species, and discussed it under "*Abagrotis nefascia* (Sm.)" . . . from many larvae collected in eastern Washington" which were found to feed on willow, cottonwood, ocean spray *(Holodiscus),* and introduced box elder *(Acer negundo* L.*).* The larvae were collected in April and early May, and emerged in May and June. Mature larvae with general color usually some shade of brown, but varying occasionally to gray or blackish, skin smooth; head 2.3 mm to 2.5 mm broad; body about 30 mm long, 5 mm broad medially; abdominal segments of equal width throughout *(teste* Crumb, *op. cit.).*

Distribution - This species occurs over most of western North America, and is found from the coast ranges of central California, eastward into the Rocky Mountains, and from British Columbia, Saskatchewan and Alberta, Canada, southward to Arizona, New Mexico, and undoubtedly extends into Mexico. Judging by the apparent omnivorous habit of the larvae of this species, the range of *reedi* is probably much more extensive than presently represented.

A. placida Group

Diagnosis - Antennae of male with scape clothed in light colored spatulate scales; flagellum with dorsal portion clothed in spatulate scales, ventrally finely ciliate basally, medially, apically setose-ciliate, of female setose; palpi exterolaterally blackish for most part, second, third segments with tan apical annulus; thorax with divided collar concolorous with disc and tegulae, but may be light tipped apically; primaries with ground color tan to shades of red-brown, brown, olive tan, silvery brown, dark brown, or dark bluish-brown; ordinary cross lines weak or strong; male genitalia with valves not greatly swollen basally, possessing preapical tooth or not, uncus truncate, or bluntly pointed; aedeagus with vesical sac possessing a single cornutus, may possess additional spined sclerotized band or not; female genitalia with ductus bursae moderately to heavily sclerotized; bursa copulatrix possessing two signa or one large one; ovipositor lobes subtruncate; greatest expanse of forewing 12 mm to 16 mm.

Included species - *A. placida* (Grote), *dodi* McDunnough.

Distribution - Members of this group occur over the northern United States, and in adjacent Canada, southward into Arizona and from the coast ranges of California eastward into Colorado and Wyoming.

Key to species of the *placida* group by superficial and genitalic characters.

1. Primaries broad (as in figs., 228-236); ordinary cross lines weak or strong; terminal area contrasting with rest of wing; ground color of primaries variable, light tan to brick red, to most shades of brown, to dark bluish brown; male genitalia with valves modified apically, possessing preapical tooth (as in fig. 74); aedeagus with vesica possessing a single cornutus, lacking any additional band; female genitalia possessing two signa, one subequal to other; ductus bursae heavily sclerotized. . . . . .*placida* (Grote)

   Primaries narrow (as in fig. 237, 238); ordinary cross lines weak, or wanting except for transverse anterior and transverse posterior lines which are represented costally by strong black dash; subterminal line ochreous, contrasting between concolorous subterminal area and terminal area; primaries tan to dark brown; male genitalia with valves simple, no apical modification; aedeagus with vesica possessing bulbed cornutus plus spined sclerotized band; female genitalia possessing a single signum; ductus bursae moderately sclerotized (as in fig. 144). . . . . .*dodi* McDunnough

Abagrotis placida (Grote)

(figs. 24, 74, 115, 146, 228-236)

Agrotis placida Grote, 1876, Ann. Lyc. Natur. Hist., New York 11:305, type female, Lewis County, New York, July 26; 1878, Canad. Ent. 10(12):235; 1883, Proc. Amer. Phil. Soc. 21:144; Butler, 1889, Trans. Entomol. London 55:383 (=*Amathes velata,* Walker); Grote 1895, Abhandl. Naturwissenschaftlichen Verein, Bremen 14(1):58 (nec. p. 18, teste Benjamin, 1921).

Rhynchagrotis placida, J. Smith, 1890, Bull. U.S. Nat. Mus., No. 38, pp. 17, 21-22; 1893, Bull. U.S. Nat. Mus., No. 44, pp. 52-53; Dyar, 1903 (1902), Bull. U.S. Nat. Mus., No. 52:129; Holland, 1903, the Moth Book, p. 178, pl. 21, fig. 23; J. Smith, 1908, Canad. Ent. 40(7):222, 227; Barnes and McDunnough, 1917, Check list Lepidoptera Boreal Amer., p. 48.

Triphaena placida, Hampson, 1903, Cat. Lepidoptera Phalaenidae Brit. Mus. 4:624, 636, pl. 77, fig. 10.

Lampra placida, Benjamin, 1921, Bull. So. California Acad. Sci. 20(3): 84, 94-95, pl. 1, fig. 8, pl. 5, figs. 43, 44; Draudt, in Seitz, 1923, the Macrolepidoptera of the World 7:81, pl. 12(g), fig. 2.

Abagrotis placida, McDunnough, 1938, Mem. So. California Acad. Sci. 1:67; Llewellyn-Jones, 1951, Entomol. Soc. Brit. Columbia, Occasional Paper No. 1, p. 53.

Agrotis minimalis Grote, 1879, North Amer. Entomol. 1:45, lectotype male (nec. female), Idaho Springs, Colorado, 7,500 feet, August, 1879 (F.H. Snow), genitalia on slide No. 64F1025, J.S. Buckett, (K.U.), by present designation; 1881, Trans. Kansas Acad. Sci. 7:65; 1883, Proc. Amer. Phil. Soc. 21:144; 1895, Abhandl. Naturwissenschaftlichen Verein, Bremen, 14(1):58 (not p. 17, teste Benjamin).

Rhynchagrotis minimalis, J. Smith, 1890, Bull. U.S. Nat. Mus., No. 38, pp. 16, 17, 19; 1893, Proc. Amer. Phil. Soc. 21:144; Dyar, 1903 (1902), Bull. U.S. Nat. Mus., No. 52, p. 129; Holland, the Moth Book, p. 178; J. Smith, 1908, Canad. Ent. 40(7):221, 223; Barnes and McDunnough, Check list Lepidoptera Boreal Amer., p. 48.

Triphaena minimalis, Hampson, 1903, Cat. Lepidoptera Phalaenidae Brit. Mus. 4:625, 639, pl. 77, fig. 14.

Lampra placida ab. *minimalis,* Benjamin, 1921, Bull. So. California Acad. Sci. 20(3):94, 95-96, pl. 1, fig. 8b, pl. 5, fig. 45; Draudt, in Seitz, 1923, the Macrolepidoptera of the World 7:81, pl. 12(g), fig. 3.

Abagrotis placida form *minimalis,* McDunnough, Mem. So. California Acad. Sci. 1:67.

Diagnosis - Male: Ground color of primaries various shades of brown, tan, red-brown, deep purplish gray. Head with vertex and frons clothed in light tipped ashy gray simple and flattened hairs; palpi with second segment exterolaterally clothed in blackish spatulate scales, tan tipped apically; third segment tan; antennae with scape clothed in brownish spatulate scales; flagellum dorsally clothed basally with light tan colored scales for first six to ten segments, then clothed in black scales; ventrally finely ciliate, becoming setose-ciliate medially and apically. Thorax with divided collar of ground color; posteriorly clothed in simple elongate silken hairs; ventrally clothed in light tipped simple hairs of ground color; tibiae clothed exterolaterally in fuscous spatulate scales, rose-colored simple hairs; tarsi weakly banded; primaries dorsally with cross lines hardly discernible, or strong; when strong, basal half line geminate, black, centrally filled with ground color, or color lighter than ground color; transverse anterior area lighter than ground color, concolorous with basal portion of median area; transverse anterior line outwardly oblique, geminate, black, outermost line being the most prominent, filled with lighter color than ground color; median area with median shade, occasionally forming hemispherical shade (as in fig. 232); orbicular spot and reniform mark large, dark, outlined in lighter color than ground color; outward portion of median shade dark, concolorous with subterminal area, giving banded effect in some specimens (as in fig. 236); transverse posterior line

finely geminate, both lines faint, most prominent feature being lighter colored centrally filled portion; subterminal line represented by contrast between subterminal area and lighter terminal area; terminal line represented by lunules on veins; fringes fuscous, white-tipped apically; ventral surface light fuscous, pink tinted costally, lighter inner marginally; transverse posterior line represented costally as black dash; secondaries dorsally light fuscous; discal lunule dark brown; veins outlined in fuscous; dark shade just preceding fringes; fringes tricolor, basally ochreous, medially fuscous, apically white-tipped; ventral surface as in dorsal surface except costally pink tinted; exterior line present costally as faint black band. Abdomen both dorsally and ventrally clothed in fuscous simple hairs and spatulate scales; apical hairs tinted with rose. Greatest expanse of forewing 12 mm to 16 mm. Genitalia as in figs. 74, 115.

Female - Similar to male except general ground color with a greater percentage of brown and reddish-brown; antennae setose; median shade not as prominent; ordinary cross lines may be almost entirely wanting; greatest expanse of forewing 14 mm to 16 mm. Genitalia as in fig. 146.

Material studied - 399 males, 342 females, July through September. CANADA. *Alberta:* Baniff; Calgary; Lethbridge; Manyberries; Nordegg; Sunnydale. *British Columbia:* Creston; Kamloops; Kaslo; Lac la Hache; Lower Post; Salmon Arm; Vancouver. *Manitoba:* Brandon; Cartwright; Onah; Wabowden. *Northwest Territories:* Fort Smith. *Ontario:* Hymers; Jeraldton. *Saskatchewan:* Earl Grey; Lost Mountain Lake; Saskatoon; Swift Current. UNITED STATES. *Arizona:* Coconino. *California:* Alpine; Los Angeles; Modoc; Mono; Nevada; Placer; Plumas; San Bernardino; Tulare. *Colorado:* Garfield; Larimer; Ouray; Pitkin; Routt. *Idaho:* Shoshone; Blaine. *Nebraska:* Scotts Bluff. *Nevada:* Elko; Washoe; White Pine. *New Mexico:* McKinley; San Migual. *New York:* Westchester. *Oregon:* Baker; Deschutes; Lake. *Utah:* Carbon; Emery; Jaub; Uintah; Utah. *Wyoming:* Fremont; Park.

Variation - This species is extremely variable, both in color and in maculation. The variation in color has already been elaborated upon, but one should note that the gray form of *placida* occurs primarily in the central and eastern United States whereas the brown to reddish-brown form is more western in distribution. In some specimens before the author, the maculation is almost entirely obscured, only a faint trace on the reniform mark being present.

In the male variation in the length of the aedeagus occurs, but other features of the genitalia are stable.

Recognition characters - *A. placida* may be confused with *dodi, turbulenta,* and in some instances *crumbi*. From *dodi, placida* may be distinguished by: 1) subterminal line of primaries jagged, not ochreous in coloration; 2) terminal area light, contrasting with remainder of wing, which is darker for most part (except in banded specimens); 3) broader primaries (as in figs. 228-236); 4) in male genitalia aedeagus

with unbulbed cornutus; 5) valves with preapical tooth; 6) lacking spined sclerotized vesical band; and 7) female genitalia possessing two cornuti.

From *turbulenta, placida* may be distinguished by: 1) light fuscous secondaries; 2) maculation more prominent; 3) valves of male genitalia narrow basally; 4) five and six of preceding; 5) female genitalia with bursa copulatrix possessing two signa; and 6) ductus bursae heavily sclerotized. It is less often that one will confuse *placida* with *crumbi,* however. *A. placida* may be distinguished from *crumbi* by: 1) smaller size generally; 2) terminal area not as silvery; 3) secondaries light fuscous; 4) median shade present; 5) aedeagus possessing only single cornutus; 6) possessing preapical tooth of valves; and 7) female genitalia heavily sclerotized.

Immature stages - Crumb (1932) described the larva of this species, and called it "The Red Cutworm." He lists the following as larval food plants: "Buds and younger growth of apple, cottonwood, *Crataegus,* grape, greasewood *(Sarcobatus vermiculatus)* and poplar." Mature larvae with general ground color faintly brownish gray, spiracles yellowish white with black rims, skin smooth; head 2.2 mm broad; body about 20 mm long, 4 mm broad medially; abdominal segments slightly broadened posteriorly (*teste* Crumb, 1932).

Distribution - This species has a great north-south range, extending from Fort Smith, Northwest Territories, Canada, southward into Arizona, and from the coast ranges on the west into Nebraska and through Canada into Ontario and into New York (see distribution map, fig. 24). Judging by the omnivorous habits of the larvae of this species, it is not all too surprising to expect it to occur in most areas of the Nearctic north and west.

Abagrotis dodi McDunnough

(figs. 23, 73, 113, 114, 144, 237, 238)

Abagrotis dodi McDunnough, 1927, Canad. Ent. 59(8):198, 199, fig. 2, holotype male, Head of Pine Creek, Calgary, Alberta, Canada, July 10, 1896 (F.H. Wolley-Dod), Type No. 2557 (C.N.C.); 1938, Mem. So. California Acad. Sci. 1:67.

Diagnosis - *Male:* Ground color of primaries rich tan to brown; ochreous subterminal line distinctive. Head with frons clothed in tan flattened hairs; vertex clothed in bicolor flattened hairs, basally white, apically dark brown; palpi exterolaterally blackish, second segment apically light tan, third segment as in apical portion of second segment; antennae dorsally clothed in black, ventrally finely ciliate, setose-ciliate apically. Thorax with divided collar dark brown, white-

tipped flattened hairs apically; tegulae of ground color, composed of spatulate scales; disc of ground color, composed of flattened hairs; ventrally clothed in whitish pubescence; femora clothed in light tan with pinkish hue dorsally; ventrally of long white hairs; tibiae clothed in light tan scales laterally and dorsally, also elongate light tan simple hairs dorsally; tarsi dark, suggestion of white apical annulus per segment; primaries with basal line hardly discernible, wanting in some specimens, represented by black dash costally; basal and transverse anterior areas of ground color; transverse anterior line represented costally by black wedge, remainder of line basally lighter than ground color, apically dark brown; median area of ground color; dark median shade present; orbicular spot outlined in ochreous, centrally filled with dark brown; reniform mark broad, constricted only slightly medially, colored as in orbicular spot; transverse posterior line commencing as black wedge on costa directly costally of reniform mark, thence toward apex of wing (as in figs. 237, 238) and abruptly turned toward inner margin, lighter than ground color; subterminal area of ground color; subterminal line ochreous, outstanding on most specimens; terminal area of ground color, or considerably darker; terminal line represented by lunules between veins; fringes of ground color, or considerably darker; ventral surface irrorated with rose-ochreous band costally; transverse posterior line represented in band as dark brown dash; inner marginal area light tan; remainder of wing dark brown; secondaries dorsally fuscous; discal dot darker than ground color; fringes lighter than remainder of wing; ventral surface with costal area irrorated in rose scalation; exterior line represented in dark brown; fringes fuscous. Abdomen concolorous with thorax, of ground color; terminal hairs tinted with rose; ventral surface lighter than dorsal surface. Greatest expanse of forewing 14 mm to 15 mm. Genitalia as in figs. 73, 113, 114.

Female - As in male except forewing color more variable, may be washed out, or heavily suffused with dark brown. Greatest expanse of forewing 13 mm to 15 mm. Genitalia as in fig. 144.

Material studied - 25 males, 13 females, July through September. CANADA. *Alberta:* Calgary; Manyberries. *British Columbia:* Lytton; Radium Hot Springs; Summerland. UNITED STATES. *California:* Modoc. *Nevada:* Elko. *Utah:* Carbon; Utah. *Wyoming:* Carbon; Teton.

Recognition characters - *A. dodi* is a species which has caused much confusion in the past in that it is rare, and also it is easily confused with *placida.* Because of its rarity, one was never able to examine enough specimens to be able to distinguish it from the multivariational *placida.* Collections frequently possess *dodi,* represented by a single specimen, which all too often is included with *placida. A. dodi* is a fairly constant species, exhibiting little variation, but yet by maculation one will find it difficult to separate some specimens of *dodi* from certain specimens of *placida.*

A. dodi can be separated from *placida* by: 1) subterminal line of primaries smooth, not jagged, ochreous in coloration (as in figs. 237, 238); 2) terminal area nearly same color as remainder of wing surface, not contrasting; 3) narrow, elongate primaries (compare figs. 237, 238); 4) valves lacking preapical tooth; 5) aedeagus with vesica possessing bulbed cornutus plus spined sclerotized band (as in figs. 113, 114); and 6) female genitalia with a single signum;

Distribution - This species is thus far poorly represented in collections, and therefore an accurate description of its range is presently speculative. When information is available concerning the larval food preferences perhaps one will better be able to account for the disjunct collection records available at the present time.

A. dodi occurs in areas of Great Basin influence, extending from Modoc County, California, eastward into Utah and Wyoming, and from British Columbia and Alberta, Canada southward into southern Utah.

Bibliography

Barnes, Wm., and J. H. McDunnough, 1912. Contrib. to the Natur. Hist. of the Lepidoptera of North Amer. 1(4):1-58, including 27 plates.

———, 1912b. Contrib. to the Natur. Hist. of the Lepidoptera of North Amer. 1(5):1-44, plus 5 plates.

———, 1917. Check list of the Lepidoptera of Boreal Amer. Herald Press, Decatur, Illinois. IX plus 392 pp.

Benjamin, F. H., 1921. A study of the Noctuid moths of the genera *Lampra* Hubner and *Cryptocala,* gen. nov. Bull. Southern California Acad. Sci. 20(3):71-154, including 8 plates.

Blackmore, E. H., 1922. Entomol. section, Rep. of the Provincial Mus. of Natur. Hist. for the year 1921. Vol. 12(Geo.5):17-45 plus 4 plates.

———, 1925. A new noctuid from British Columbia. Canad. Ent. 57(8):205.

———, 1928 (1927). Check-list of the Macrolepidoptera of British Columbia. Charles F. Banfield Press, Victoria. 47 pp.

Butler, A. G., 1889. Synonymic notes on the moths of the earlier genera of Noctuites. Trans. Entomol. Soc. London, pp. 375-387.

Crumb, S. E., 1932. The more important climbing cutworms. Bull. Brooklyn Entomol. Soc. 27(2):73-100, including 2 plates.

———, 1956. The larvae of the Phalaenidae. U.S. Government Press, Washington, D. C., Tech. Bull. No. 1135, 356 pp.

Draudt, M., (in Seitz, A.A.), 1923. The Macrolepidoptera of the World. Vol. 7:1-412 plus 96 plates. Stuttgart.

Dyar, H. G., 1903 (1902). A list of North American Lepidoptera and key to the literature of this order of insects. Bull. U.S. Nat. Mus. No. 52, xix 723 pp.

———, 1904. New Noctuidae from British Columbia. Canad. Ent. 57(8):205.

Ferguson, D. C., 1954. The Lepidoptera of Nova Scotia. Proc. Nova Scotian Inst. Sci. 23(3):161-375.

Forbes, Wm. T. M., 1954. Lepidoptera of New York and neighboring states (Noctuidae). Mem. 239, Cornell Univ. Agr. Exp. Sta.

Franclemont, J. G., 1955. A new species of *Abagrotis*. Bull. Brooklyn Entomol. Soc. 50(2):44-46.

———, 1967. Two new species of Noctuids. Proc. Entomol. Soc. Wash. 69(2):97-102, plus 8 figs.

Grote, A. R., 1874. New western Noctuidae. Trans. Kansas. Acad. Sci. 7:61-66.
———, 1875. On the moths collected by Prof. Snow in New Mexico. Trans. Kansas Acad. Sci. 8:45-57.
———, 1864. Descriptions of North American Lepidoptera No. 5 Proc. Entomol. Soc. Philadelphia 3:521-542 plus 6 plates, 2 of which are in color.
———, 1874. Notes on Noctuidae. Canad. Ent. 6(1):13-16.
———, 1874b. Preliminary catalogue of the Noctuidae of California, part 2. Canad. Ent. 6(11):214-217.
———, 1876. On Noctuidae from the Pacific Coast of North America. Bull. Buffalo Soc. Nat. Sci. 3:77-87, plus 1 plate.
———, 1876b. Descriptions of new Noctuidae with remarks on the variation of larval forms in the group. Ann. Lyceum Natur. Hist. New York 11:300-306.
———, 1878. New North American Lepidoptera with notes on a few little known. Canad. Ent. 10(12):231-238.
———, 1878b. Descriptions of Noctuidae, chiefly from California. Bull. U.S. Geol. Surv. Terr. 4:169-187.
———, 1879. New western Noctuidae. North American Entomol. 1: 38-39.
———, 1881. New Noctuidae, with list of the species *Perigrapha*. Canad. Ent. 13(6):131-134.
———, 1883. The moths of New Mexico. Ann. and Magazine of Natur. Hist. pp. 49-58.
———, 1883b. Notes on new species in Mr. Neumoegen's collection. Papilio 3(4):73-80.
———, 1891. The male genitalia and the subdivisions of *Agrotis*. Canad. Ent. 23(7):147-152.
———, 1895. List of North American Euterotidae, Ptildontae, Thyatiridae, Apatelidae and Agrotidae. Abhandl. Naturwissenschaftlichen Vereins, Bremen 14(1):44-128.

Hampson, G. F., 1903. Cat. of the Noctuidae in the collection of the Brit. Mus. Vol. 4, 689 plus xx pp. plus 20 plates.
Holland, W. J., 1903. The moth Book. xxiv plus 479 pp. plus 48 colored plates. Doubleday, Page & Co., New York.
Llewellyn-Jones, J. R. J., 1951. An annotated Checklist of the Macrolepidoptera of British Columbia. Entomol. Soc. Brit. Columbia, Occasional Paper No. 1, viii plus 148 pp.
Kimball, C. P., 1965. The Arthropoda of Florida (Lepidoptera), Printed by Florida Dept. Agr., Gainesville, Florida, v plus 363 pp. plus 26 plates, including 6 in color.

Knutson, H., 1944. Minnesota Phalaenidae. Tech. Bull. 165, Pub. Univ. Minnesota Agr. Exp. Sta., 128 pp.
Lugger, O., 1896. List of owlet-moths taken on sugar at St. Anthony Parl. First Ann. Report, Minnesota State Entomol. pp. 142-147.

McDunnough, J. H., 1927. Notes on certain agrotid genera and species. Canad. Ent. 59(3):64-66.

———, 1927b. The Lepidoptera of the Seton Lake Region, British Columbia. Canad. Ent. 59:193-199.

———, 1928. A generic revision of North American agrotid moths. Bull. Canadian Natl. Mus. No. 55, Biol. Ser., No. 16:1-78.

———, 1938. Check list of the Lepidoptera of Canada and the United States of America. Mem. So. California Acad. Sci. 1:1-272.

———, 1946. New North American Phalaenidae with notes. Canad. Ent. 78:28-35.

———, 1949. Notes on Phalaenidae. Amer. Mus. Novitates No. 1394:1-14.

Prentice, R. M., *et. al.,* 1962. Forest Lepidoptera of Canada. Forest Entomol. and Pathol. Branch, Canada Dept. Forestry, 2:77-281.

Rindge, F. H., 1955. The type material in the J. B. Smith and G. D. Hulst collections of Lepidoptera in the American Museum of Natural History. Bull. Amer. Mus. Natur. Hist. 106(2):95-172.

Schaus, Wm., 1894. New species of Noctuidae from Tropical America. Trans. Amer. Entomol. Soc. 21:223-244.

Smith, J. B., 1890. Contribution toward a monograph of the insects of the lepidopterous family Noctuidae of temperate North America. Revision of the species of the genus *Agrotis*. Bull. U.S. Nat. Mus. No. 38:1-237.

———, 1893. A catalogue, bibliographical and synonymical, of the species of moths of the lepidopterous superfamily Noctuidae, found in Boreal America. Bull. U.S. Nat. Mus. No. 44, 1-424 pp.

———, 1894. Descriptions of new genera and species of Noctuidae. Trans. Amer. Entomol. Soc. 21:39-88 plus 6 plates.

———, 1903. New Noctuids for 1903, No. 2, with notes on *Mamestra* and *Scotogramma*. J. New York Entomol. Soc. 11(1):1-23.

———, 1908. Notes on the species of *Rhynchagrotis* J. Smith, with descriptions of new species. Canad. Ent. 40(7):221-228.

———, 1908b. Notes on the species of *Rhynchagrotis* J. Smith, with descriptions of new species (continued from p. 228). Canad. Ent. 40(8):286-288.

Strand, Embrik, 1916. Neu aberrationen der Noctuiden. . .subfamilien Agrotinae und Cuculliinae. Archiv für Naturgeschichte 81(A-12): 142-149.

CHECKLIST OF THE SPECIES OF *ABAGROTIS* SMITH

In this list, only the species considered valid today are listed.

I *ERRATICA* GROUP

erratica erratica (Smith), 1890
erratica ornata Smith, 1903
kirkwoodi Buckett, n. sp.
alcandola (Smith), 1908
    tristis (Barnes and McDunnough), 1912

II *VITTIFRONS* GROUP

vittifrons (Grote), 1864
totonaca (Schaus), 1894
bimarginalis (Grote), 1883

III *TRIGONA* GROUP

trigona (J. Smith), 1893
    sambo (J. Smith), 1908

IV *MIRABILIS* GROUP

mirabilis (Grote), 1879
rubricundis Buckett, n. sp.
striata Buckett, n. sp.
glenni Buckett, n. sp.
hennei Buckett, n. sp.

V *NEFASCIA* GROUP

nefascia (Smith), 1908
    forbesi (Benj), 1921
alampeta Franclemont, 1967
denticulata McDunnough, 1946
barnesi (Benjamin), 1921
    nevadensis (Benj), 1921
baueri McDunnough, 1949

VI *ALTERNATA* GROUP

alternata (Grote), 1864
alternatella (Strand), 1916
uniformis (Strand), 1916
turbulenta McDunnough, 1927
crumbi crumbi Franclemont, 1955
crumbi benjamini Franclemont, 1955
variata (Grote), 1876
varix (Grote), 1876
orbis (Grote), 1876
orbitis (Strand), 1916
scopeops (Dyar), 1904
tecatensis Buckett, n. sp.

VII *DISCOIDALIS* GROUP

discoidalis (Grote), 1876
pulchrata (Blackmore), 1925

VIII *APPOSITA* GROUP

apposita (Grote), 1878
nanalis (Grote), 1881
mantalini (Smith), 1894

IX *DUANCA* GROUP

duanca (Smith), 1908
reedi Buckett, n. sp.

X *PLACIDA* GROUP

placida (Grote), 1876
minimalis (Grote), 1879
dodi McDunnough, 1927

INDEX*

Abagrotis 1-18
Acer negundo 1-11
Acknowledgments 1-4
Adelphagrotis 1-15
Agrotis 1-15
alampeta 1-10; 3-22
alcandola 1-10; 2-10
Alnus spp. 1-11
alternata 1-10; 4-5
alternata group 4-3
Amathes 1-15
Amelanchier spp. 1-11
apposita 1-10; 4-23
apposita group 4-23
Artemisia spp. 1-11
aureum, Ribes 1-11
barnesi 1-10; 3-25
baueri 1-10; 3-28
benjamini 1-10; 4-11
Bibliography 5-15
bimarginalis 1-10; 2-15
Biology and Ecology 1-8
bruneicollis 1-17
californica, Juniperus 1-11
Caradrina 1-15
Carya sp. 1-11
Cerastis 1-15
Checklist of species 5-18
Crataegus sp. 1-11
crumbi 1-10; 4-9
crumbi benjamini 1-10; 4-11
crumbi crumbi 1-10; 4-9
denticulata 1-10; 3-24
Descriptions 1-7
discoidalis 1-10; 4-19
discoidalis group 4-18
Distribution 1-12
dodi 1-10; 5-12
duanca 1-10; 5-4
duanca group 5-3
erratica 1-10; 2-5
erratica erratica 1-10; 2-5
erratica group 2-3
erratica ornatus 1-10; 2-7
Eurois 1-15
Explanation of figures 5-22
Food Sources 1-9
Fragaria sp. 1-11
Fraxinus sp. 1-11
glenni 1-10; 3-14
Hemigraphiphora 1-17; 1-18
hennei 1-10; 3-16
Historical Review 1-15
Holodiscus sp. 1-11
Illustrations 1-7
Juglans sp. 1-11

* The first number preceding the hyphen refers to the *part* in which the subject may be found; whereas, the second number refers to the *page*. For example: *Abagrotis* 1-18 may be found in *Part* 1, *page* 18.

Juniperus california 1-11
kirkwoodi 1-10; 2-8
Lampra 1-4; 1-15
Lycophotia 1-15
Malus sp. 1-11
Matuta 1-15
Methods 1-5
mirabilis 1-10; 3-9
mirabilis group 3-8
nanalis 1-10; 4-25
Natural Enemies 1-10
nefascia 1-10; 3-19
nefascia group 3-18
negundo, Acer 1-11
Noctua 1-15
ornatus 1-10; 2-5
Periodicity and Activity 1-9
Phylogeny 1-8
placida 1-10; 5-9
placida group 5-8
Plates 5-28
Populus sp. 1-11
Preparation of Material 1-6
Protolampra 1-17; 1-18
Prunus spp. 1-11
pulchrata 1-10; 4-21
Quercus sp. 1-11
reedi 1-10; 5-6
Rhynchagrotis 1-3; 1-18
Ribes aureum 1-11
Ribes sp. 1-11
rubricundis 1-10; 3-11
Rubus sp. 1-11
Salix scouleriana 1-11
Salix sp. 1-11
Sarcobatus vermiculatus 1-11
scopeops 1-10; 4-15
scouleriana, Salix 1-11
Seasonal Occurrence 1-8
striata 1-10; 3-13
tecatensis 1-10; 4-16
Terminology 1-13
thapsus, Verbascum 1-11
totonaca 1-10; 2-14
trigona 1-10; 3-6
trigona group 3-3
Triphaena 1-3; 1-15
turbulenta 1-10; 4-7
variata 1-10; 4-12
Verbascum thapsus 1-11
vermiculatus, Sarcobatus 1-11
Vitis sp. 1-11
vittifrons 1-10; 2-12
vittifrons group 2-11

EXPLANATION OF FIGURES

In drawings of the genitalia of the female, the genital pore was dorsally oriented, facing the reader. The photographs are taken in the same scale and for this reason no size indications are given.

Figs. 1-24. Distribution maps of *Abagrotis* species.

Fig. 25. Generalized diagrammatic forewing of *Abagrotis* species.

Figs. 26-27. Wing venation of *A. erratica.* Fig. 26. Right forewing. Fig. 27. Right hindwing.

Figs. 28-30. Male antennal segments of *A. erratica.* Fig. 28. Apical or terminal portion of antenna. Fig. 29. Subapical portion of antenna depicting much less biserrate appearance than basal segments. Fig. 30.. Basal segments of antenna which depicts biserrate, fasciculate appearance.

Figs. 31-36. Hairs and scales which compare integumental vestiture. Fig. 31. Simple hair. Fig. 32. Elongate hair. Fig. 33. Flattened hair. Fig. 34. Simple scale. Fig. 35. Spatulate scale. Fig. 36. Flattened scale.

Fig. 37. Diagrammatic male genitalia with parts labeled as employed in this work.

Figs. 38-39. Aedeagi of male *Abagrotis* depicting types of cornuti.

Fig. 40. Diagrammatic female genitalia with parts labeled as employed in this work.

Figs. 41-74. Male genitalia minus the aedeagi. Fig. 41. *A. erratica erratica,* slide No. 63B19-4. Fig. 42. *A. alcandola,* slide No. "8". Fig. 43. *A. kirkwoodi,* slide No. 63B3-26. Fig. 44. *A. vittifrons,* slide No. 62D25-2. Fig. 45. *A. bimarginalis,* slide No. 62D25-1. Fig. 46. *A. totonaca,* TYPE No. 1799 (USNM). Fig. 47. *A. trigona,* (slide No. 62C14-6). Fig. 48. *A. mirabilis,* (slide No. 62A3-2). Fig. 49. *A. rubricundis,*(slide No. 65C6-21). Fig. 50. *A. striata,* (slide No. 62D17-2). Fig. 51. *A. glenni,* (slide No. 62A3-1). Fig. 52. *A. hennei,* (slide No. 65L28-1). Fig. 53. *A. nefascia,* (slide No. 62A11-9). Fig. 54. *A. nefascia,* (slide No. 12,106). Fig. 55. *A. denticulata,* (slide No. 62B4-32).

Fig. 56. *A. barnesi,* (slide No. 15). Fig. 57. *A. denticulata,* (type No. 19A). Fig. 58. *A. alampeta,* (slide No. 63K2-25). Fig. 59. *A. alampeta,* (slide No. 63K2-26). Fig. 60. *A. baueri,* (slide No. 63A31-37). Fig. 61. *A. alternata,* (slide No. 62D20-1). Fig. 62. *A. turbulenta,* (slide No. 63B18-2). Fig. 63. *A. crumbi,* (slide No. 47). Fig. 64. *A. variata,* (slide No. 63B8-21) (And Sprs.). Fig. 65. *A. scopeops,* (slide No. 45). Fig. 66. *A. tecatensis,* (slide No. 64H30-6). Fig. 67. *A. discoidalis,* (slide No. 62C5-2). Fig. 68. *A. pulchrata,* (slide No. 63A19-1). Fig. 69. *A. apposita,* (slide No. 63B6-34). Fig. 70. *A. nanalis,* (slide No. 63B20-2). Fig. 71. *A. duanca,* (slide No. 62B17-7). Fig. 72. *A. reedi,* (slide No. 2). Fig. 73. *A. dodi,* (type dodi A612; Calgary, Alta.). Fig. 74. *A. placida,* (slide No. 63B12-1).

Figs. 75-115. Aedeagi of male genitalia. Fig. 75. *A. erratica,* (slide No. 63B19-4). Fig. 76. *A. kirkwoodi,* (slide No. 63B3-26). Fig. 77. *A. alcandola,* (slide No. 8). Fig. 78. *A. vittifrons,* (slide No. 62D25-2 male). Fig. 79. *A. totonaca,* (type 1799). Fig. 80. *A. bimarginalis,* (slide No. 62D25-1 male). Fig. 81. *A. trigona,* (slide No. 62C14-6). Fig. 82. *A. mirabilis,* (slide No. 62A3-2). Fig. 83. *A. rubricundis,* (slide No. 65C6-21). Fig. 84. *A. striata,* (slide No. 62D17-2). Fig. 85. *A. glenni,* (slide No. 62A3-1). Fig. 84. *A. hennei,* (slide No. 65L28-1). Fig. 87. *A. nefascia,* (slide No. 62D11-1). Fig. 88. *A. nefascia,* (slide No. 12,106 lectotype). Fig. 89. *A. denticulata,* (slide No. 62C-20-1). Fig. 90. *A. alampeta,* (slide No. 63K2-26). Fig. 91. *A. alampeta,* (slide No. 63K2-25). Fig. 92. *A. denticulata,* (slide No. 62K8-2). Fig. 93. *A. denticulata,* (slide No. 62B4-32). Fig. 94. *A. denticulata,* (type 19A). Fig. 95. *A. barnesi,* (slide No. 24-723). Fig. 96. *A. barnesi,* (slide No. 62E25-1). Fig. 97. *A. barnesi,* (slide No 15). Fig. 98. *A. baueri,* (slide No. 63A31-3). Fig. 99. *A. alternata,* (slide No. 62D20-1). Fig. 100. *A. variata,* (slide No. 63K2-22). Fig. 101. *A. crumbi,* (slide No. 47). Fig. 102. *A. variata,* (slide No. 63B8-21). Fig. 103. *A. variata,* (slide No. 63K2-22). Fig. 104. *A. variata,* (slide No. 63B6-48). Fig. 105. *A. scopeops,* (slide No. 45). Fig. 106. *A. tecatensis,* slide No. 54H30-6). Fig. 107. *A. discoidalis,* (slide No. 62C5-2). Fig. 108. *A. pulchrata,* (slide No. 63A19-1). Fig. 109. *A. apposita,* (slide No. 63B6-34). Fig. 110. A. *nanalis,* (slide No. 63B20-2). Fig. 111. *A. duanca,* (slide No. 62E17-7). Fig. 112. *A. reedi,* (slide No. 62E11-1). Fig. 113. *A. dodi.* Fig. 114. *A. dodi.* Fig. 115. *A. placida,* (slide No. 63B18-1).

Figs. 116-146. Female genitalia. Fig. 116. *A. erratica,* (slide No. 63B18-4). Fig. 117. *A. kirkwoodi,* (slide No. 63B4-1). Fig. 118. *A. bimarginalis,* (slide No. 63A29-3). Fig. 119. *A. vittifrons,* (slide No. 63A31-1). Fig. 120. *A. alcandola,* (slide No. 65C29-4). Fig. 121. *A. trigona,* (slide No. 62C19-5). Fig. 122. *A. mirabilis,* (slide No. 65L28-4). Fig. 123. *A. rubricundis,* (slide No. 65C6-22). Fig. 124. *A. striata,* (slide No. 65L29-3). Fig. 125. *A. hennei,* (slide No. 65L27-2). Fig. 126. *A. glenni,* (slide No. 65L28-3). Fig. 127. *A. nefascia,* (slide No. 62C29-2). Fig. 128. *A. alampeta,* (slide No. 63K2-24). Fig. 129. *A.*

denticulata, (slide No. 62C21-4). Fig. 130. *A. barnesi,* (slide No. 63A-29-2). Fig. 131. *A. baueri,* (slide No. 62C28-1). Fig. 132. *A. alternata,* (slide No. 63E3-29). Fig. 133. *A. turbulenta,* (slide No. 64I12-2). Fig. 134. *A. crumbi,* (slide No. 62C28-4). Fig. 135. *A. crumbi,* (slide No. 63B6-40). Fig. 136. *A. scopeops,* (slide No. ? lectotype (8)). Fig. 137. *A. variata,* (slide No. 63B6-50). Fig. 138. *A. tecatensis,* (slide No. 64H30-7). Fig. 139. *A. discoidalis,* (slide No. 62B28-4). Fig. 140. *A. pulchrata,* (slide No. 63819-2). Fig. 141. *A. apposita,* (slide No. 63B6-36). Fig. 142. *A. nanalis,* (slide No. 63B20-3). Fig. 143. *A. duanca,* (slide No. 62E17-8). Fig. 144. *A. dodi,* (slide No. 64H30-3). Fig. 145. *A. reedi,* (slide No. 62D19-2). Fig. 146. *A. placida,* (slide No. 62C14-2).

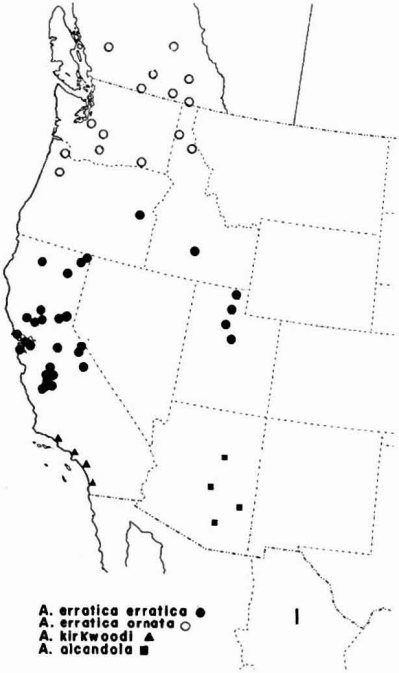
Figs. 147-238. Photographs of the adults of *Abagrotis* species. Fig. 147. Lectotype male, *A. erratica erratica* "Sierra Nev., Cal." USNM type No. 75. Fig. 148. Male, *A. erratica erratica,* Anderson Springs, Lake Co., California 8 September 1956 (W. R. Bauer - J. S. Buckett). Fig. 149. Female *A. erratica erratica,* Nevada Co., California, (Koebele Collection). Fig. 150. Male, *A. erratica ornata,* Salem, Oregon, 5 August 1957 (K. Goeden). Fig. 151. *A. erratica ornata,* Kaslo, British Columbia 29 July 1905 (Cockle Collection). Fig. 152. Holotype male, *A. kirkwoodi,* 2 mi. southeast Modjeska, Santa Ana Mts., Orange Co., California, 23 September 1962 (the Flemmings). Fig. 153. Allotype female, *A. kirkwoodi,* same data as in Fig. 152. Fig. 154. Holotype male, *A. tristis (=alcandola),* "Santa Catalina Mts., Arizona." Fig. 155. Male, *A. alcandola,* East Verde River, 7 mi north of Payson, Gila Co., Arizona, 11 September 1958 (A. S. Menke and L. A. Stange). Fig. 156. Female, *A. alcandola,* Todd's Lodge, Oak Creek Canyon, Arizona, 14 September 1941 (G. H. and J. L. Sperry). Fig. 157. Male, *A. vittifrons,* 5 mi. east of Bend, Oregon 11 August 1964 (K. Goeden). Fig. 158. Female, *A. vittifrons,* Monitor Pass, Alpine Co., California 25 September 1960 (W. E. Simonds). Fig. 159. Lectotype female, *A. bimarginalis,* "Near Hot Springs, Las Vegas, New Mexico, 7,000 feet, August '82, F. H. Snow, USNM type No. 33794." Fig. 160. Female, *A. bimarginalis,* Hart Prarie, 10 mi. north, northwest Flagstaff, Coconino Co., Arizona, 8,500 feet, 12 July 1961 (J. G. Franclemont). Fig. 161. Lectotype male, *A. totonaca,* "Jalapa, Mexico." "Collection Wm. Schaus," USNM type No. 10823. Fig. 162. Lectotype female, *A. trigona,* "Arizona," "Collection J. B. Smith" "USNM type No. 73. Fig. 163. Male, *A. trigona* Johnsville, Plumas Co., California 24 September 1962 (H. J. Pini). Fig. 164. Female, *A. trigona,* Lassen Creek, north of Davis Creek, Modoc Co., California, 8 August 1956 (W. R. B. and J. S. B.). Fig. 165. Female, *A. trigona,* Zephyr Cove, Douglas Co., Nevada, 3 September 1962 (B. Ellis). Fig. 166. Female, *A. trigona,* Woodfords, Alpine Co., California, 21 August 1963. Fig. 167. Male, *A. mirabilis,* Zephyr Cove, Douglas Co., Nevada, 1 September 1964 (B. Ellis). Fig. 168. Female, *A. mirabilis,* Anderson Springs, Lake Co., California 12 September 1948 (W. R. B.). Fig. 169. Holotype male, *A. rubricundis,* Johnsville, Plu-

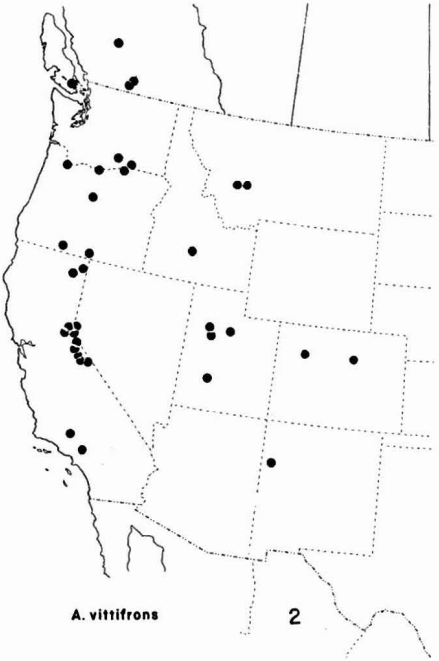
mas Co., California 18 August 1964 (H. J. P.). Fig. 170. Allotype female, *A. rubricundis,* Johnsville, Plumas Co., California 19 September 1964 (H. J. P.). Fig. 171. Holotype male, *A. striata,* Dalton Springs Camp 5 mi. west of Monticello, San Juan Co., Utah, 16 July 1963, 8,500 ft. (F., P. and R. Rindge). Fig. 172. Allotype female, *A. striata,* same locality and collectors as preceding, 15 July 1963. Fig. 173. Paratype female, *A. striata,* Gran Quivira Natl. Monument, Socorro Co., New Mexico (S. F. Wood). Fig. 174. Holotype male, *A. glenni,* 27 mi. E. Madeline, Lassen Co., California 15 August 1963 (J. Glenn). Fig. 175. Allotype female, *A. glenni,* same data as holotype. Fig. 176. Holotype male, *A. hennei,* Juniper Hills, Mojave Desert, Los Angeles Co., California 15 June 1964, 3,500 feet (C. Henne). Fig. 177. Allotype female, *A. hennei,* Pearblossom, Los Angeles Co., California 13 June 1964 (W. R. B., J. S. B., M. R. Gardner). Fig. 178. Holotype male, *A. forbesi (=nefascia),* "Stockton, Ut., IX-19-7, T. Spalding." Fig. 179. Same as preceding, left forewing in horizontal plane. Fig. 180. Male, *A. nefascia,* Woodfords, Alpine Co., California 5 July 1963. Fig. 181. Female, *A. nefascia,* Lamoille Canyon, Ruby Mts., 25 mi. south of Elko, Elko Co., Nevada, 1 August 1964 (W. R. B., J. S. B., M. R. G.). Fig. 182. Holotype male, *A. alampeta,* Madera Canyon, Santa Cruz Co., Arizona, Male, *A. alampeta,* Madera Canyon, Santa Cruz Co., Arizona, 7 July 1963, 4,880 feet (W. R. B., J. S. B.). Fig. 183. Female, same locality and collectors as preceding, 6 July 1963. Fig. 184. Female, *A. denticulata,* Tecate Peak, San Diego Co., California 21 July 1963 (B. C. Reed). Fig. 185. Male, *A. denticulata,* Anderson Springs, Lake Co., California 10 August 1947 (W. R. B.). Fig. 186. Holotype male, *A. barnesi,* "White Mts., Arizona" "Barnes Collection." Fig. 187. Cotype female, *A. barnesi* form *nevadensis,* "Esmeralda Co., Nevada" "Photograph Pl. 22, No. 10." Fig. 188. Female, *A. barnesi,* Kingsburg, Fresno Co., California, 15 May 1961 (J. C. Reyes). Fig. 189. Female, *A. barnesi,* Chowchilla, Merced Co., California 16 July 1961. Fig. 190. Male, *A. barnesi,* Merced Co., California 26 May 1961 (S. A. Campbell). Fig. 191. Topotype male, *A. baueri,* Anderson Springs, Lake Co., California 9 August 1947 (W. R. B.). Fig. 192. Homotype male, *A. baueri* (det. J. S. Buckett), same locality and collectors as preceding, 24 July 1948. Fig. 193. Male, *A. alternata,* Rabbit Ears Mts., 8,200 ft. 10 mi. southeast Steamboat Springs, Routt Co., Colorado, 28 July 1962 (J. S. B., G. M. Trenam). Fig. 194. Female, *A. alternata* Lethbridge, Alberta, Canada, 3 August 1931 (H. L. Seamans). Fig. 195. Female, *A. turbulenta,* Jamez Springs, New Mexico, 13 July 1926 (J. Woolgate). Fig. 196. Male, *A. turbulenta,* Williams, Coconino Co., Arizona 23 July 1957. Fig. 197. Female, *A. turbulenta,* 2 mi. southwest of Timpanogos Cave Natl. Monument, Utah, 5 August 1964 (W. R. B., J. S. B., M. R. G.). Fig. 198. Holotype male, *A. crumbi crumbi,* "White Swan, Wn., VI-T-39," "Collector S. E. Crumb." Fig. 199. Male, *A. crumbi crumbi,* Woodfords, Alpine Co., California 7 August 1962. Fig. 200. Female, *A. crumbi crumbi,* Jamez Springs, New Mexico, 16 July 1924 (J. Woolgate). Fig. 201. Female, *A. crumbi crumbi,* 8 mi. south

Tonasket, Washington, 11 September 1960, 1,100 ft. (D. F. Hardwick). Fig. 202. Holotype male, *A. crumbi benjamini,* "Coll. A. C. Weeks," "Collection Brklyn Mus.", "Acc. 17,151." Fig. 203. Male, *A. variata,* Eldridge, Napa Co., California (Jacob Doll). Fig. 204. Male, *A. variata,* San Antonio Canyon, California, 1 July 1925 (T. Craig). Fig. 205. Female, *A. variata,* Provo, Utah, 7 August 1909 (Tom Spaulding). Fig. 206. Male, *A. variata,* 8-15 miles northeast of Whiteriver, Arizona, 8-11 July 1940 (W. Gertsch and Hook). Fig. 207. Male, *A. scopeops,* 3 mi. east of Monitor Pass in Mono Co.,California, 9 September 1964 (W. R. B., J. S. B., M. R. G.). Fig. 208. Male, *A. scopeops,* Seton Lake, British Columbia, 2 August 1933 (J. McDunnough). Fig. 209. Lectotype female, *A. scopeops,* "Kaslo, B. C.," "Collection Dr. H. G. Dyar," "27898" "USNM Type No. 7327." Fig. 210. Holotype female, *A. tecatensis,* Tecate Peak, San Diego Co., California 21 July 1962 (B. C. Reed). Fig. 211. Allotype male, *A. tecatensis,* same data as for holotype. Fig. 212. Paratype, *A. tecatensis,* same data as for holotype. Fig. 213. Female, *A. discoidalis,* Hot Springs, Owyhee Co., Idaho, 15 June 1962 (R. R. Snelling). Fig. 214. Male, *A. discoidalis,* Crooked Creek Research Station, White Mts., Mono Co., California, 19 June 1961, 10,150 ft. (J. S. Buckett). Fig. 215. Female, *A. discoidalis,* same locality as preceding, 6 July 1962 (P. Manis, D. Mathais). Fig. 216. Male, *A. pulchrata,* 5 mi. northwest Corvallis, Benton Co., Oregon, 26 August 1964 (D. L. Shumway). Fig. 217. Female, *A. pulchrata,* Grants Pass, Josephine Co., Oregon, 11 September 1964 (K. Goeden). Fig. 218. Male, *A. apposita,* Anderson Springs, Lake Co., California, 10 August 1947 (W. R. B.). Fig. 219. Female, *A. apposita,* Johnsville, Plumas Co., California, 27 August 1964 (H. J. P.). Fig. 220. Male, *A. apposita,* Anderson Springs, Lake Co., California 19 July 1947 (W. R. B.). Fig. 221. Lectotype male, *A. mantalini (=nanalis)* "36511," "Colo. Bruce," "Type No. 227 USNM." Fig. 222. Male, *A. nanalis,* 11 mi. northwest Helper, Carbon Co., Utah, 5 August 1964 (W. R. B., J. S. B., M. R. G.). Fig. 223. Female, *A. nanalis,* Convict Creek, Mono Co., California, 25 August 1963 (M. G. Tunzi). Fig. 224. Male, *A. duanca,* Rabbit Ears Mts., 10 mi. southeast Steamboat Springs, Routt Co., Colorado, 28 July 1962, 8,200 ft. (J. S. B., G. M. T.). Fig. 225. Female, *A. duanca,* Mt. Ingalls, Plumas Co., California, 12 July 1964 (W. R. B., J. S. B., M. R. G.). Fig. 226. Holotype male, *A. reedi,* Tecate Peak, San Diego Co., California, 21 July 1963 (B. C. Reed). Fig. 227. Allotype female, *A. reedi,* same data as holotype. Fig. 228. Lectotype male, *A. minimalis (=placida),* Idaho Springs, Colorado, 7,500 ft. August, 1879 (F. H. Snow) "Type specimen species discovered by F. H. Snow." Fig. 229. Female, *A. placida* (red form) 17 mi. west Roberts, Larimer Co., Colorado, 30 July 1962 (J. W. B., G. M. T.). Fig. 230. Female, *A. placida* (red form) Rabbit Ears Mts., 10 mi. southeast of Steamboat Springs, Routt Co., Colorado, 8,200 ft. 28 July 1962 (J. S. B., G. M. T.). Fig. 231. Male (gray form) *A. placida,* same data as preceding. Fig. 232. Female, (red form) *A. placida,* 4 mi. southeast Bend, Oregon, 11 August 1964 (K. Goe-

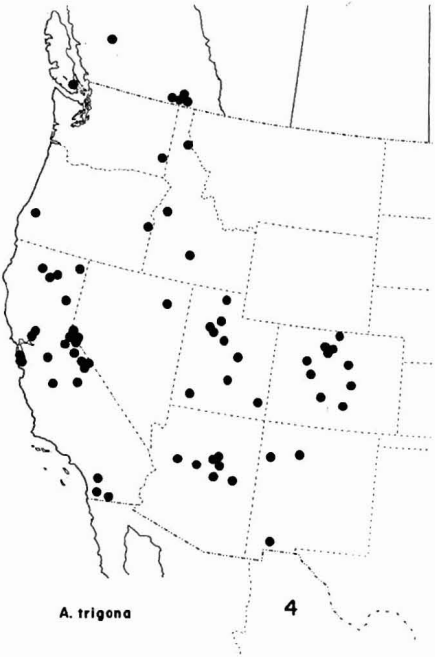
den). Fig. 233. Male, *A. placida* (gray form), same data as preceding. Fig. 234. Female, *A. placida* (red form), Kaslo, British Columbia, 16 August 1924. Fig. 235. Female, *A. placida* (red banded form), Dividend, Utah, 7 August (T. Spaulding). Fig. 236. Male, *A. placida* (gray, banded form), Woodfords, Alpine Co., California 5 July 1963. Fig. 237. Paratype male, *A. dodi,* Head of Pine Creek, Calgary, Alberta, 10 July 1926 (F. H. Wolley-Dod). Fig. 238. Male, *A. dodi,* Rabbit Ears Mts., 10 mi. southeast Steamboat Springs, Routt Co., Colorado, 8,200 ft., 28 July 1962 (J. S. B., G. M. T.).

PLATES


A. erratica erratica ●
A. erratica ornata ○
A. kirkwoodi ▲
A. alcandola ■
1

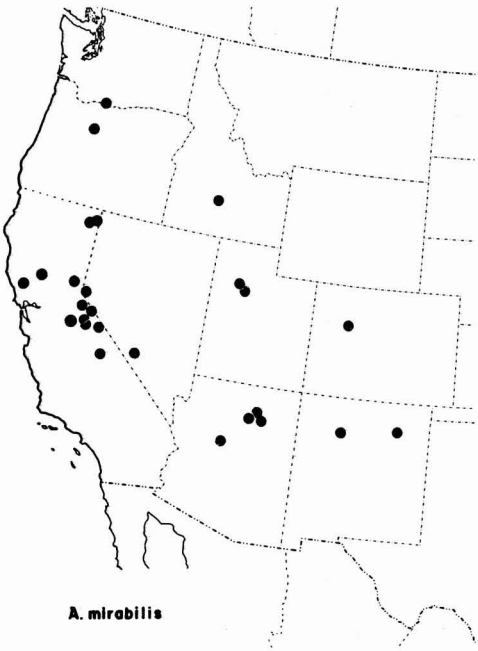

A. vittifrons
2

A. bimarginalis ●
A. totonaca ▲
3


A. trigona
4

5

6

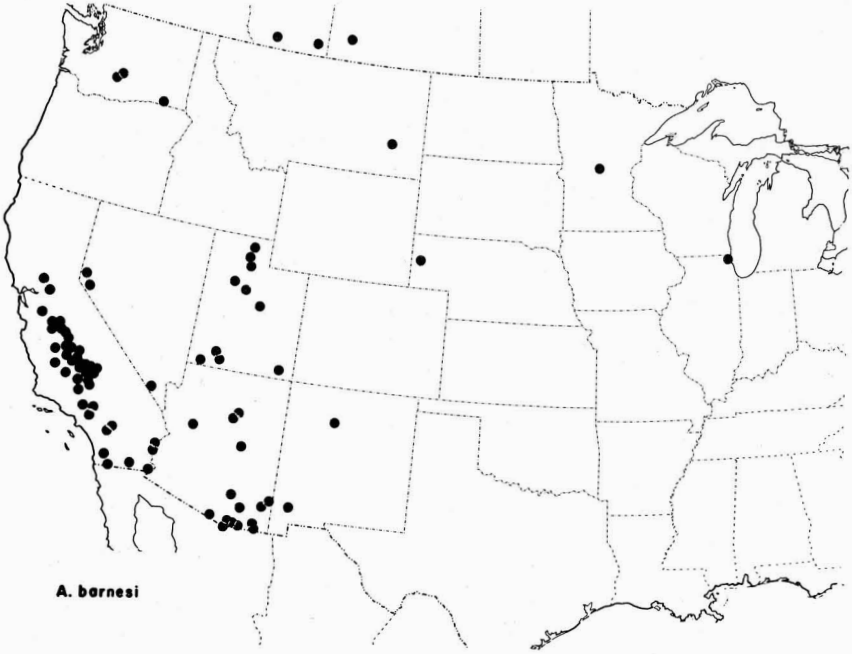


7

8

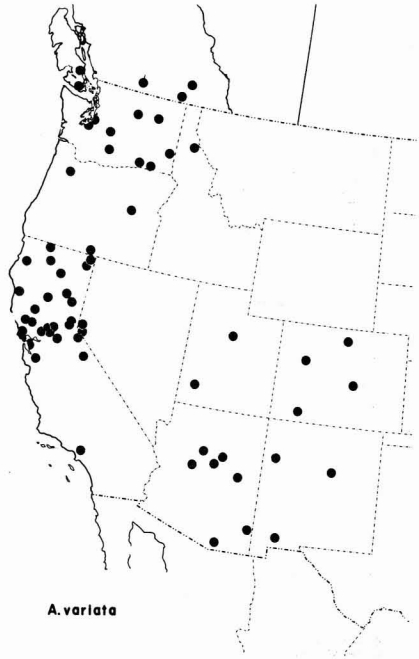
9

10

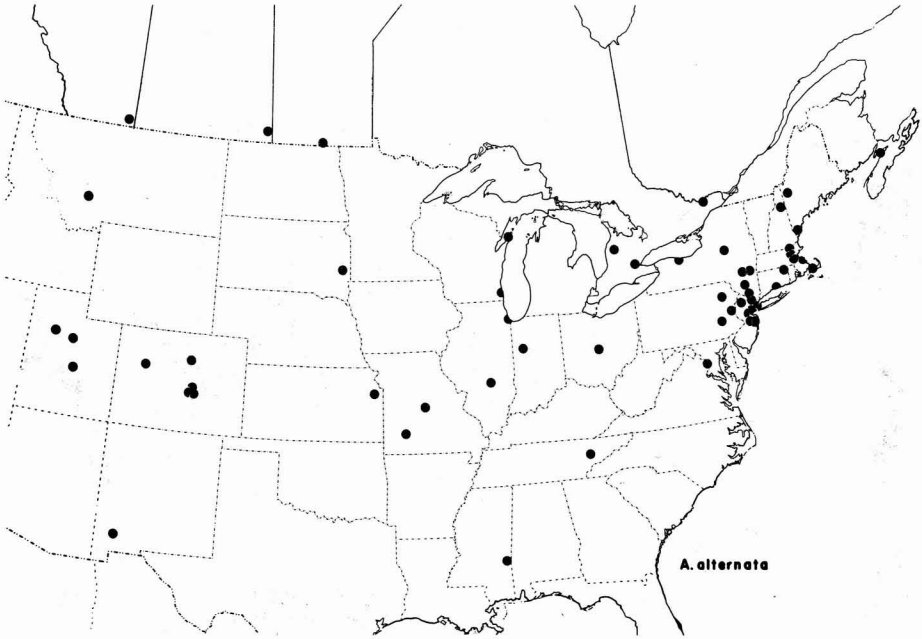


11

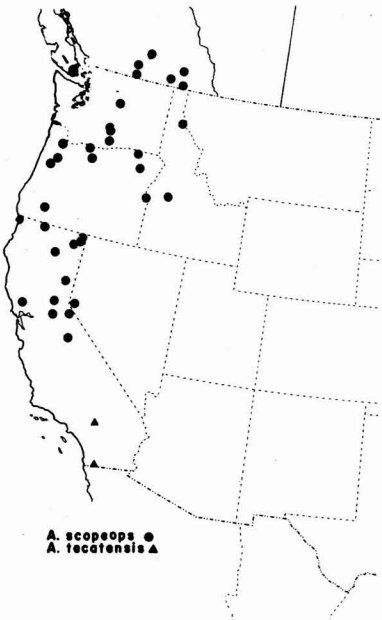
12



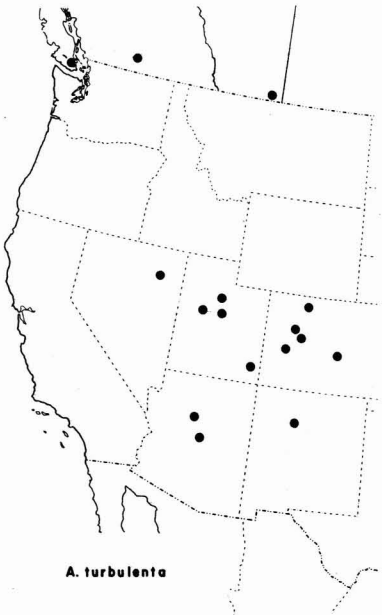
13



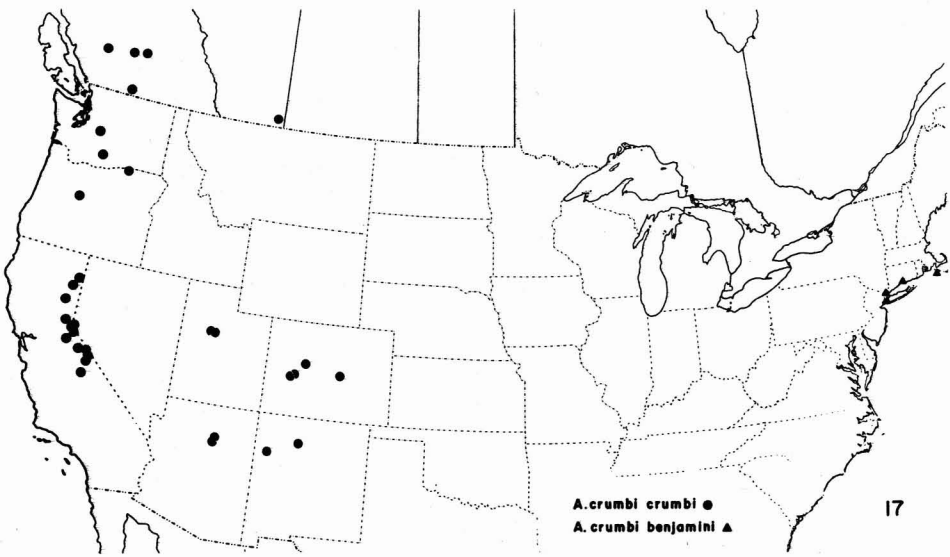
14


A. scopeops ●
A. tecatensis ▲

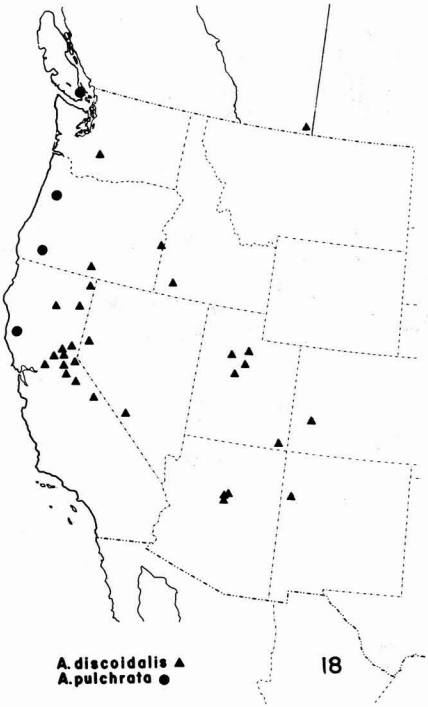
15

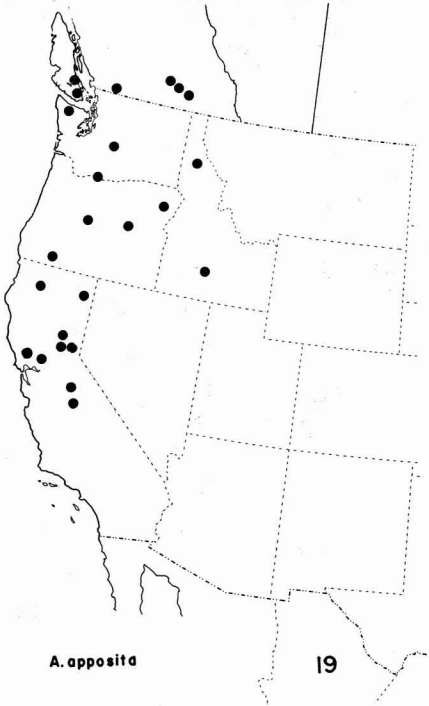

A. turbulenta

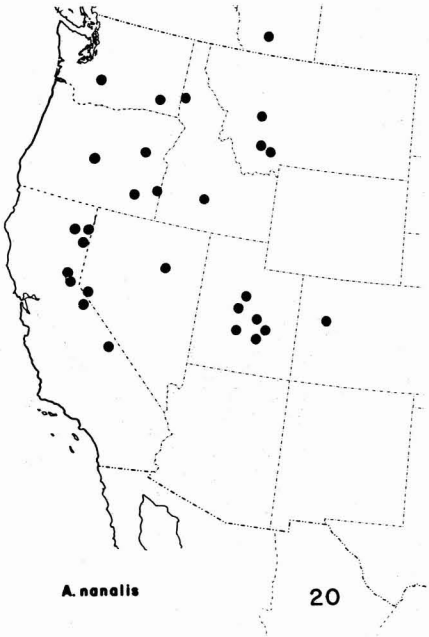
16

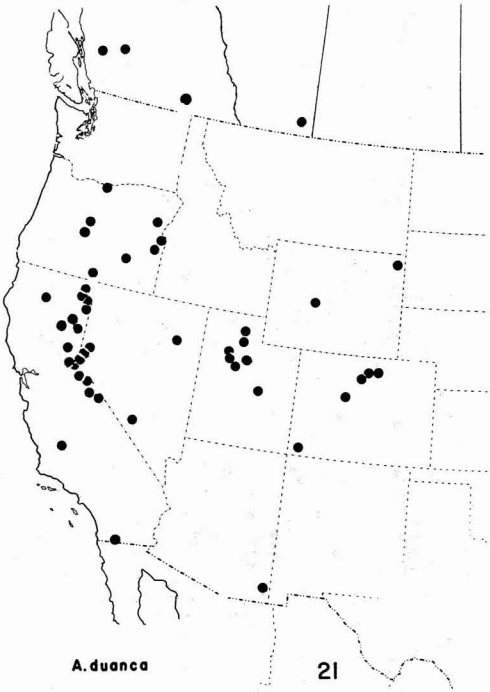

A.crumbi crumbi ●
A.crumbi benjamini ▲

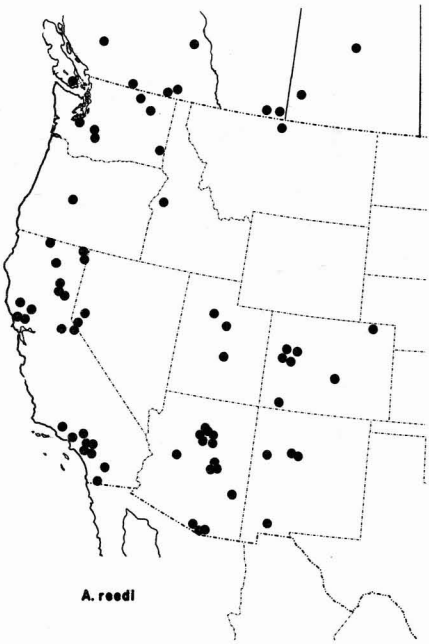
17


A. discoidalis ▲
A. pulchrata ●
18

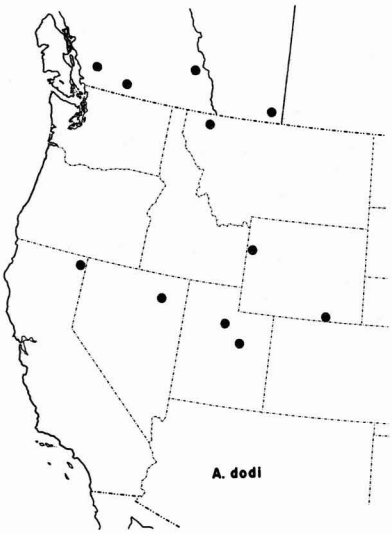

A. apposita
19


A. nanalis
20

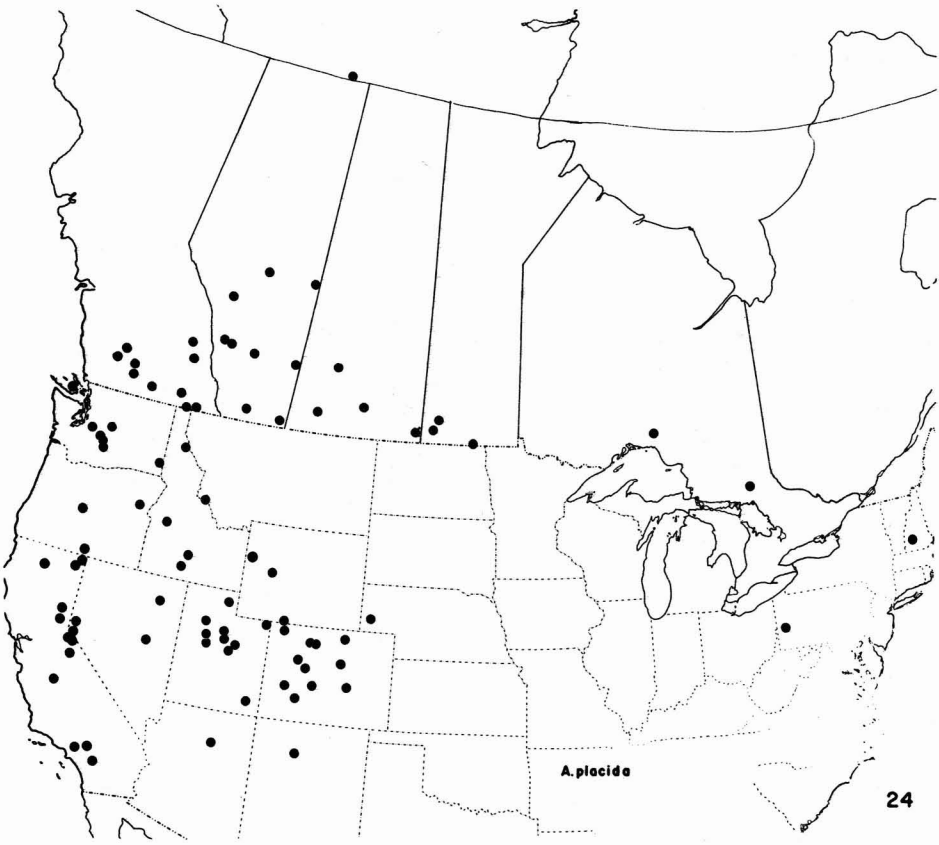

A. duanca
21



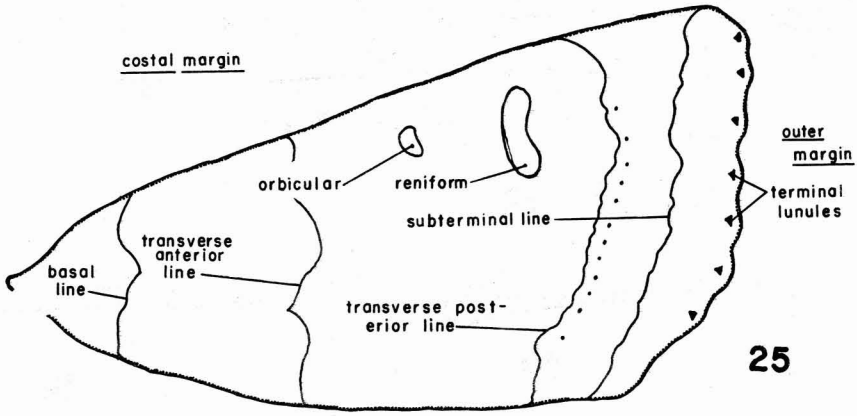
22



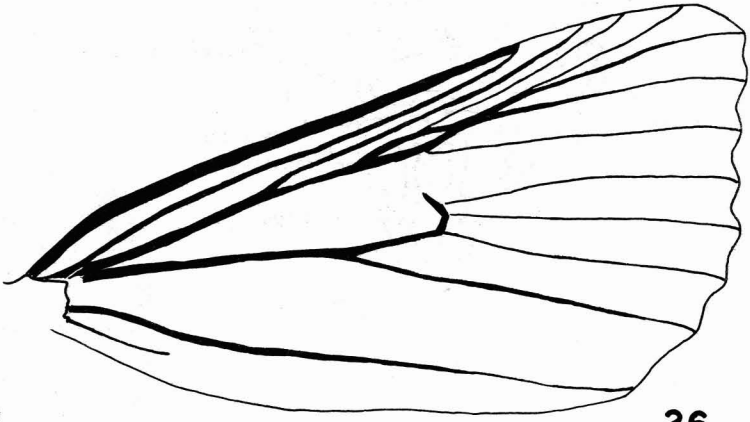
23

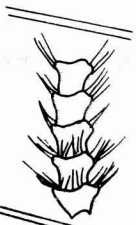


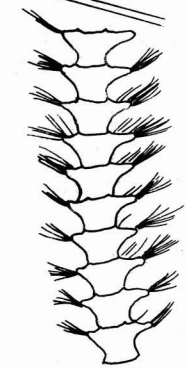
24

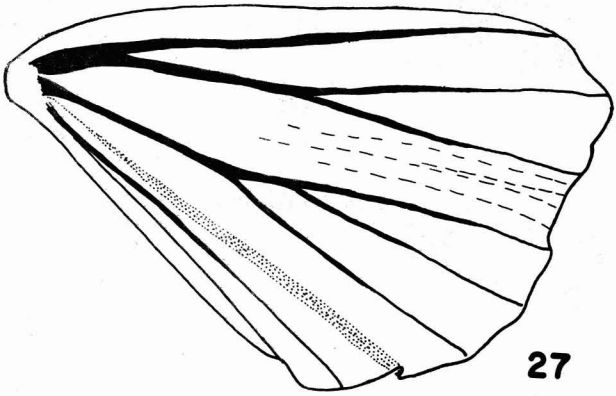

costal margin
outer margin
orbicular
reniform
terminal lunules
subterminal line
transverse anterior line
basal line
transverse posterior line
25
inner margin

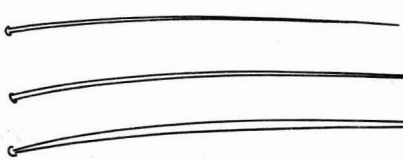
28


26


29


30

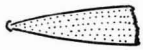

27



31

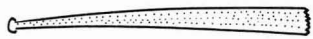
32

33

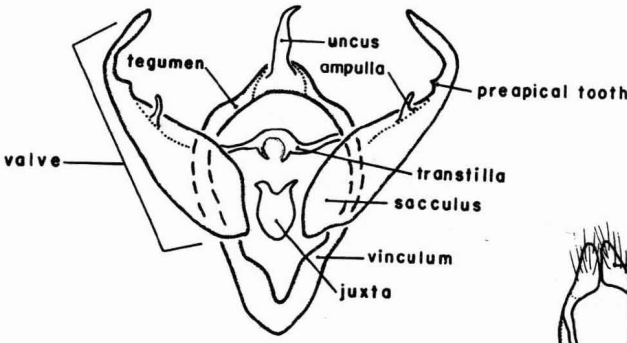


34

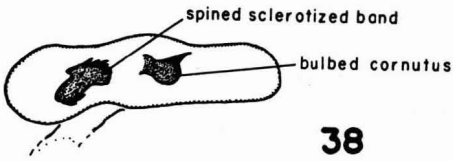
35



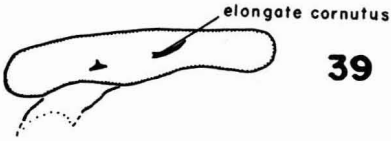
36



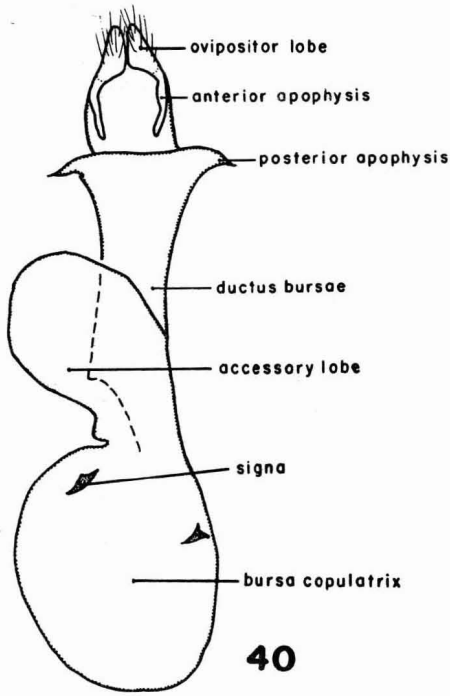
37



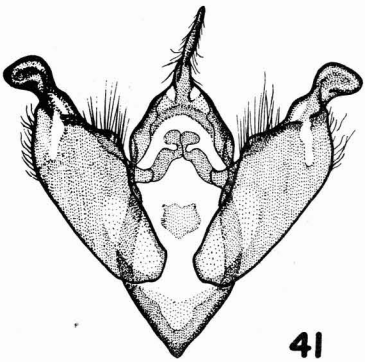
38



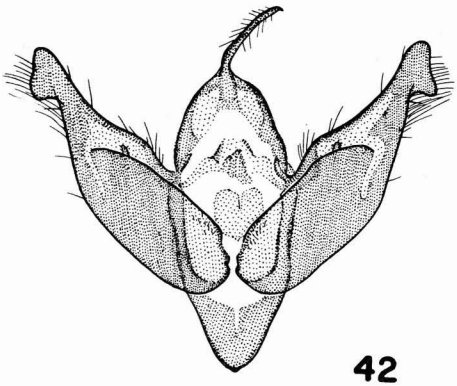
39



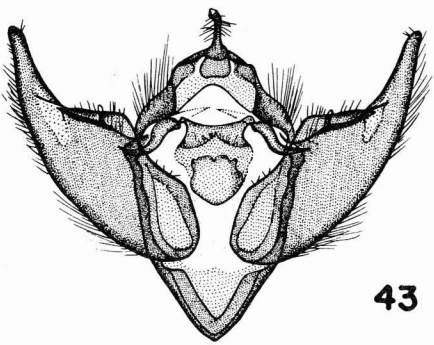
40



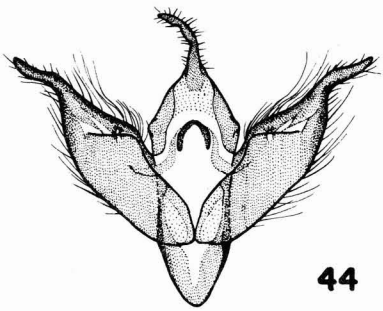
41



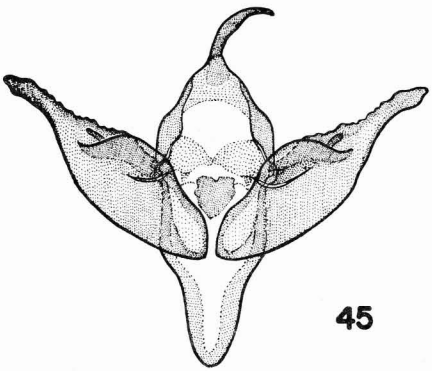
42



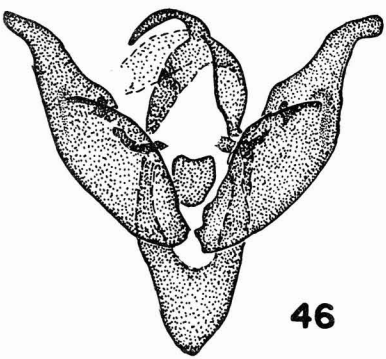
43



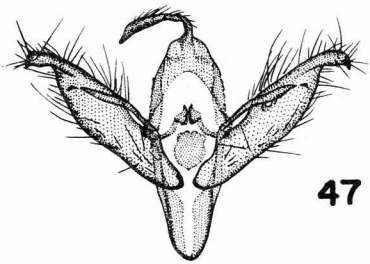
44



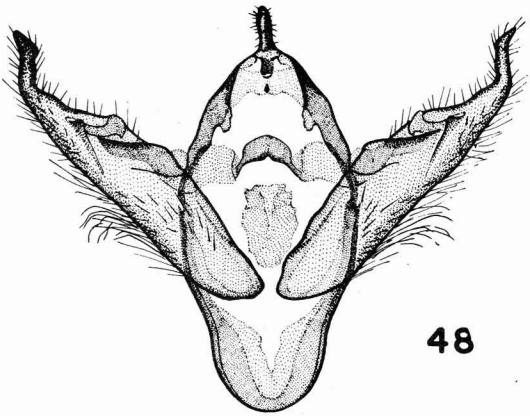
45



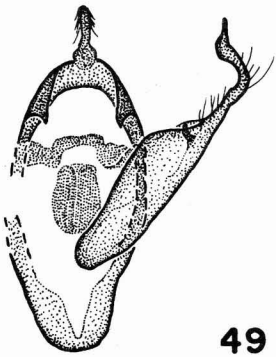
46



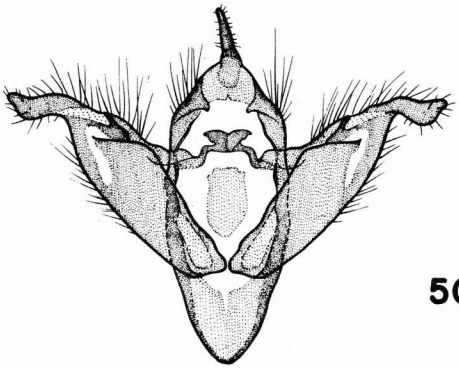
47



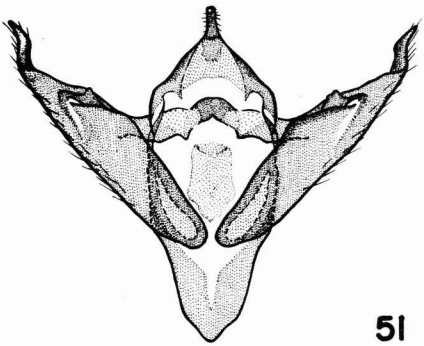
48



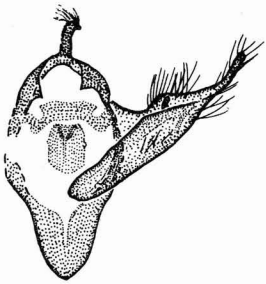
49



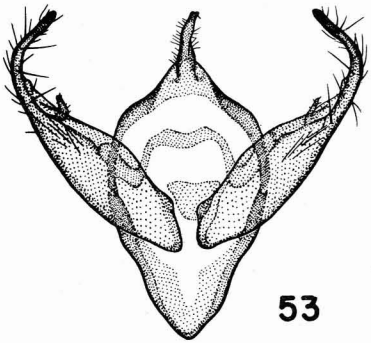
50



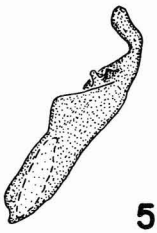
51



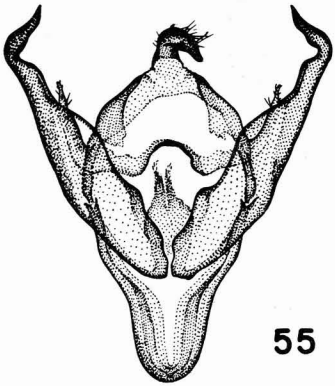
52



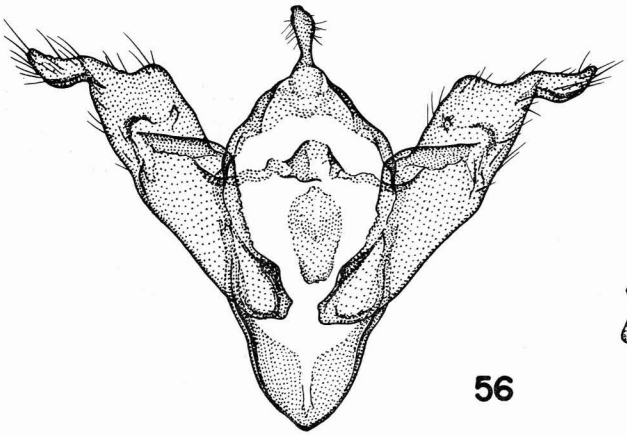
53



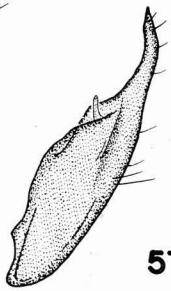
54



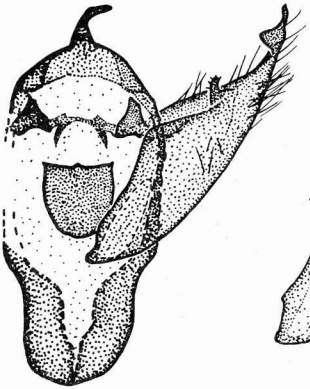
55



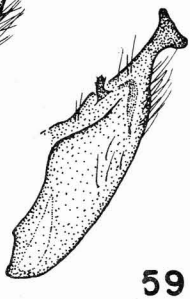
56



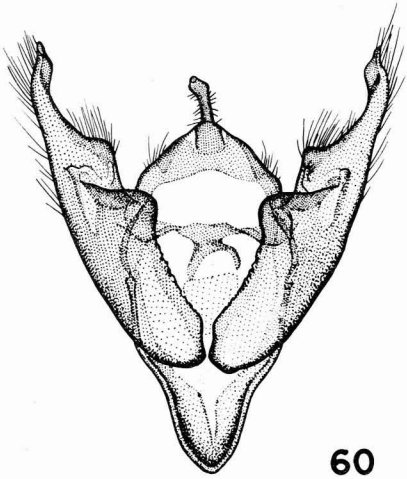
57



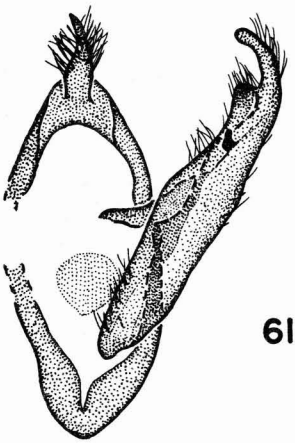
58



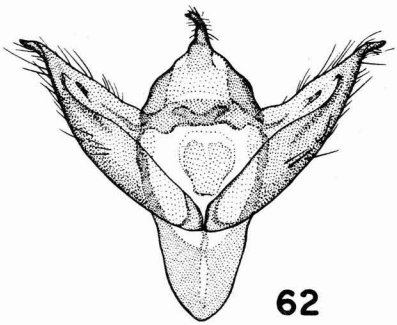
59



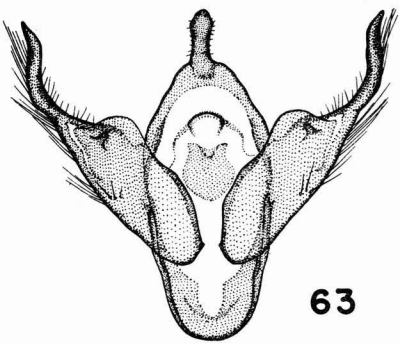
60



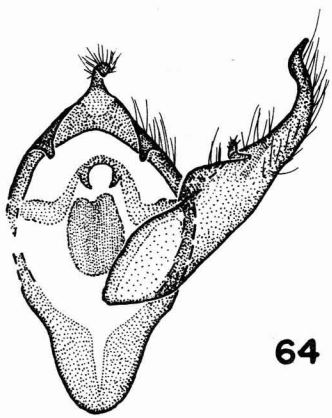
61



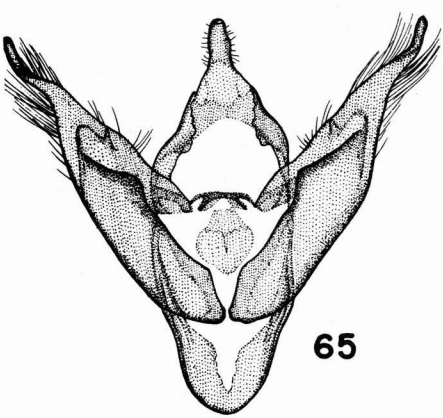
62



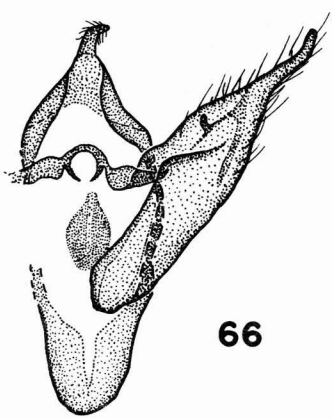
63



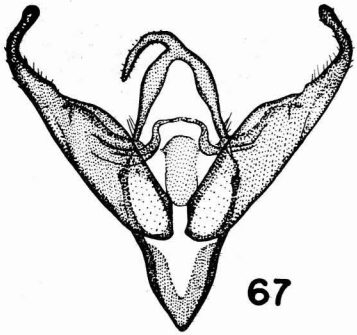
64

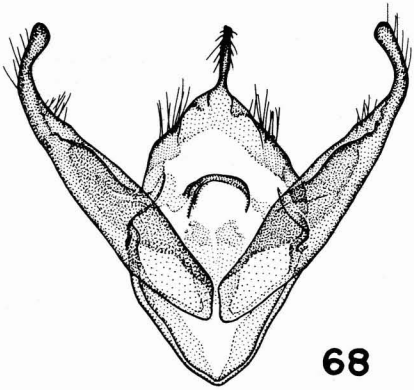


65

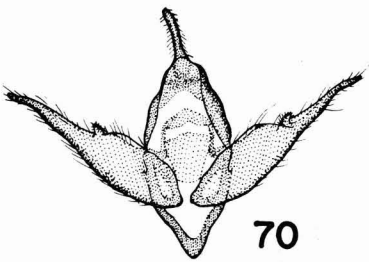


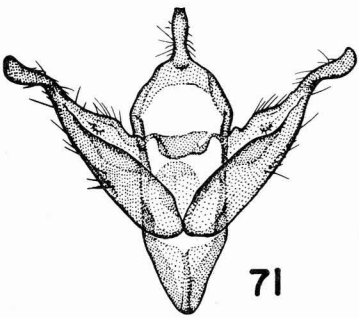
66

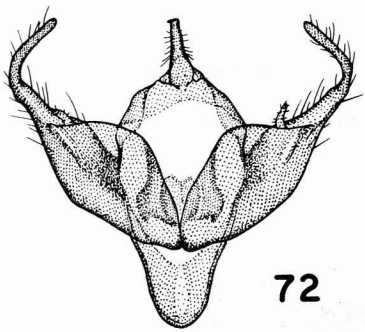

67

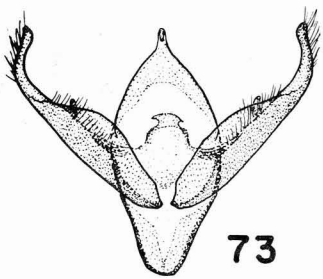

68

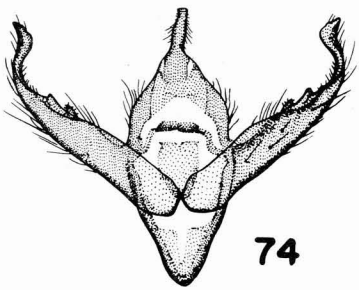
69


70


71

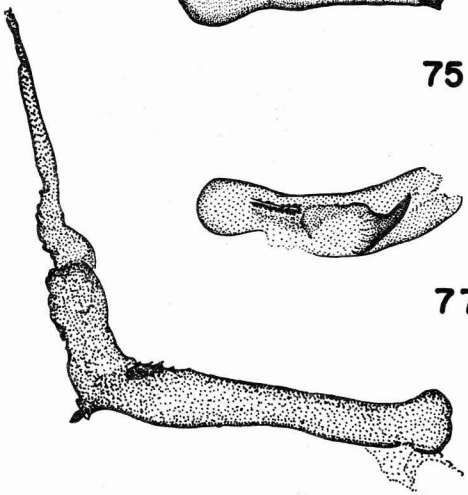

72


73


74

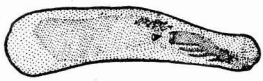
75

76

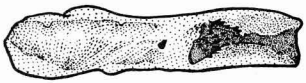


79

77



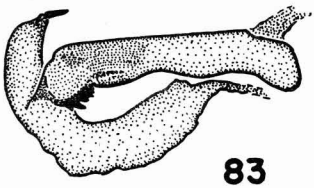
78



80

81

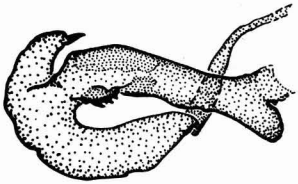
82



83

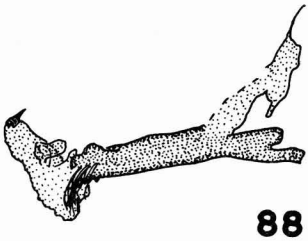
84

85



86

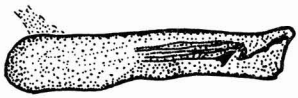
87



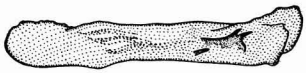
88

89

90



91

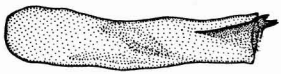


92

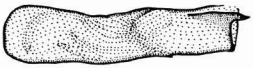
93

94

95



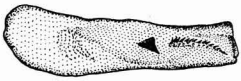
96



97

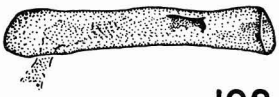
98

99

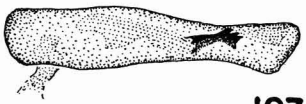


100

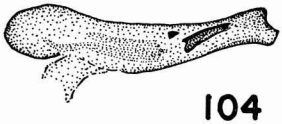
101



102

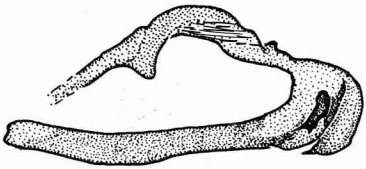


103



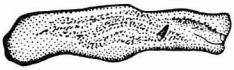
104

105



106

107



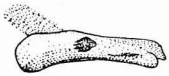
108

109

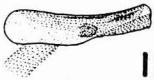
110

111

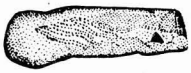
112



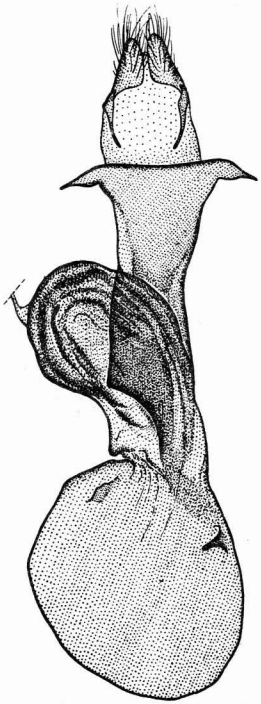
113



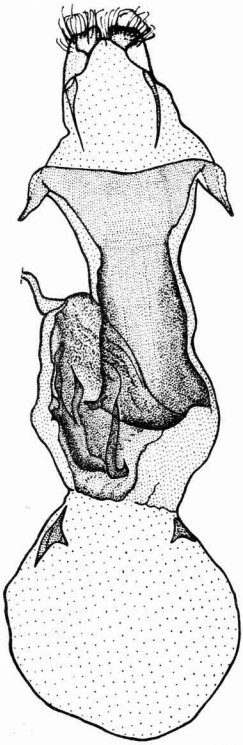
114



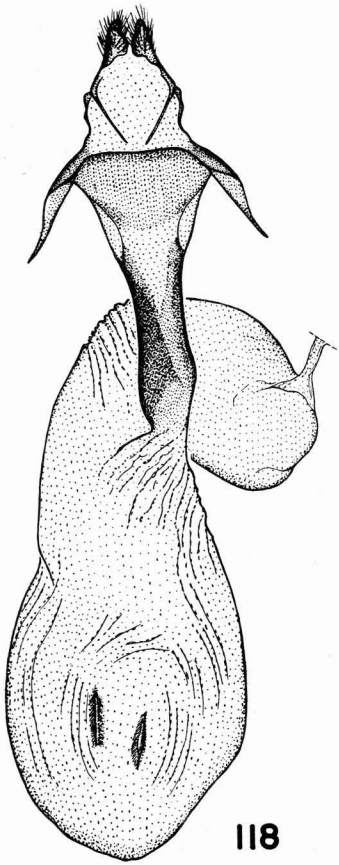
115



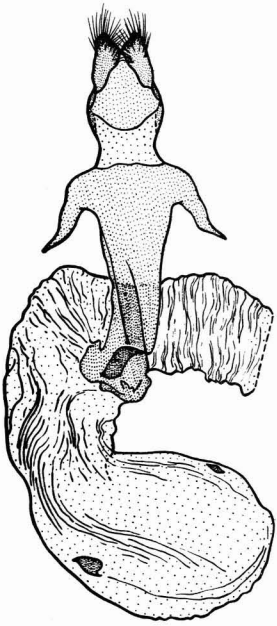
116



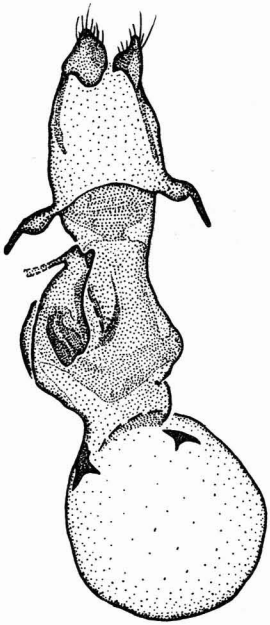
117



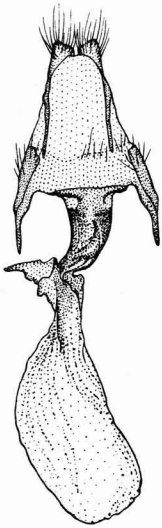
118



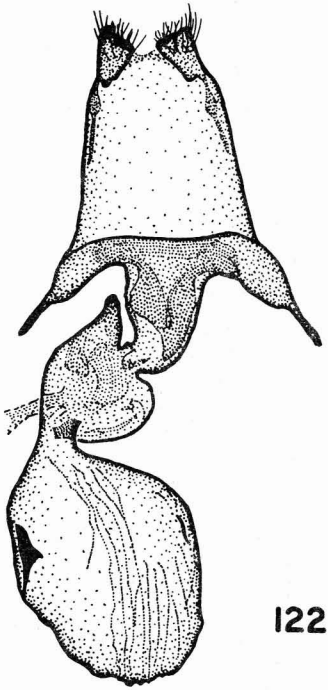
119



120

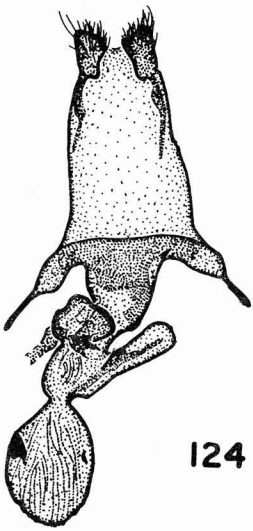


121

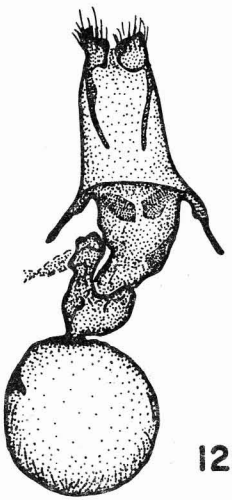


122

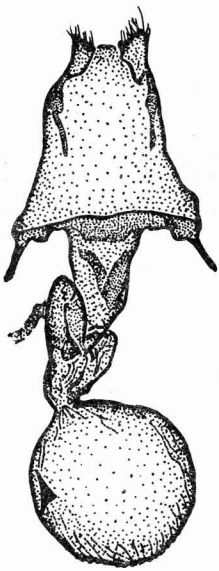
123



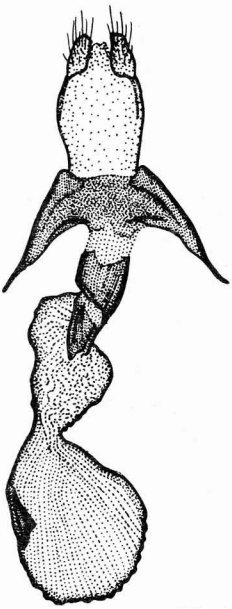
124



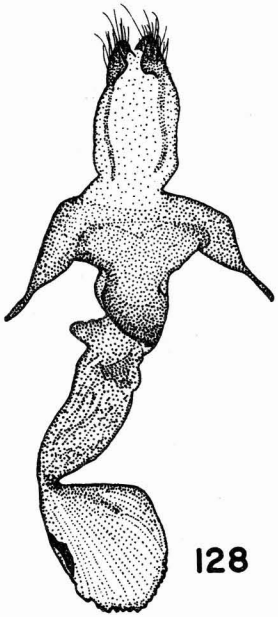
125



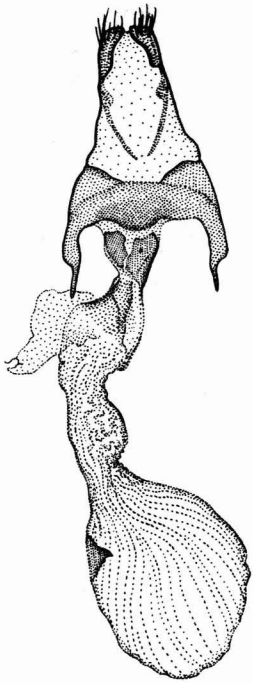
126



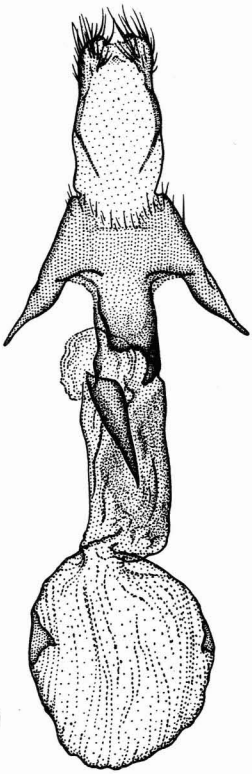
127



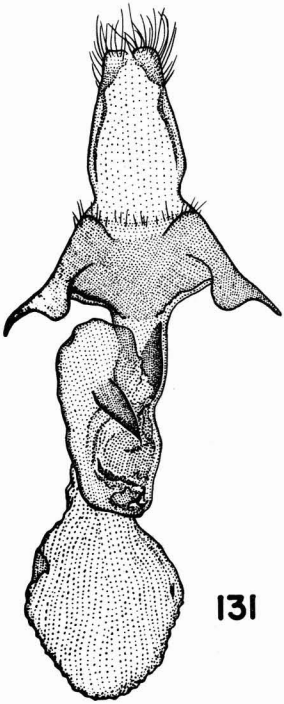
128



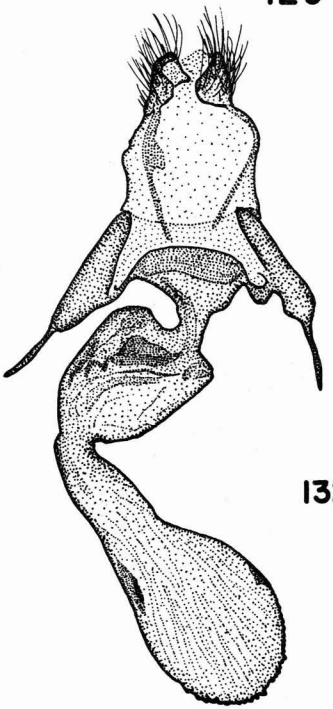
129



130

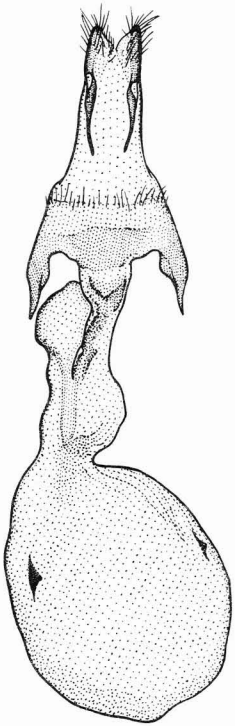


131

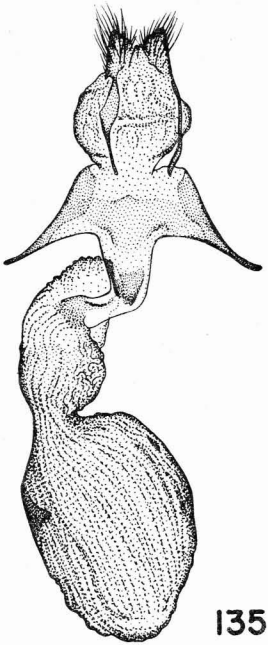


132

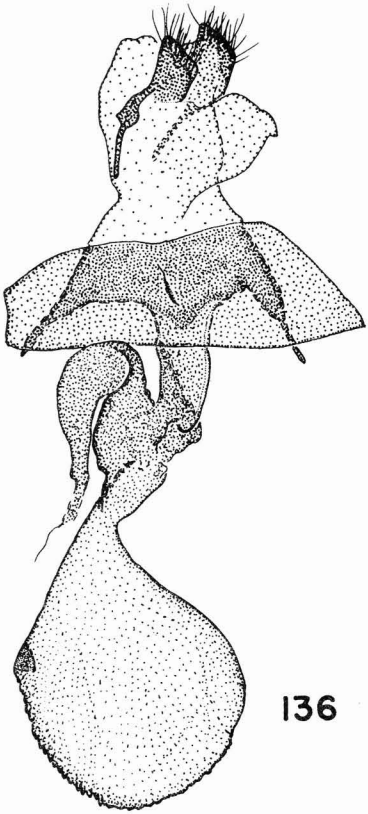
133



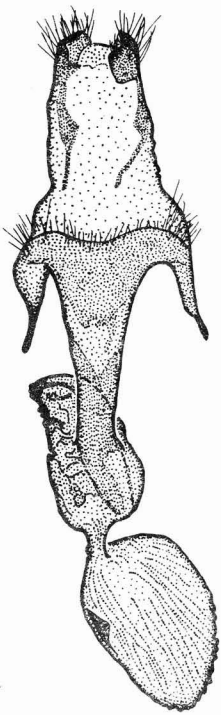
134



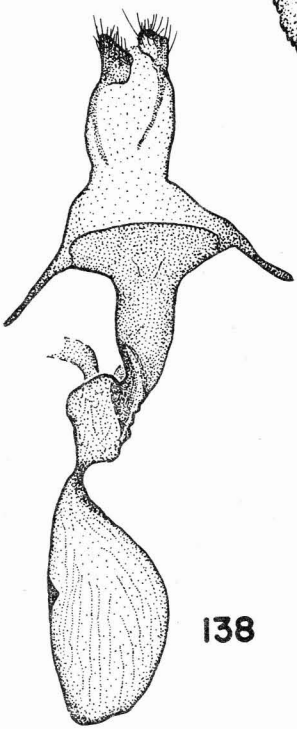
135



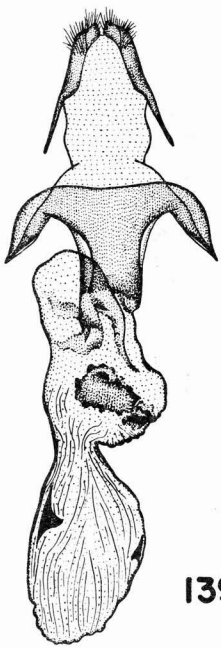
136



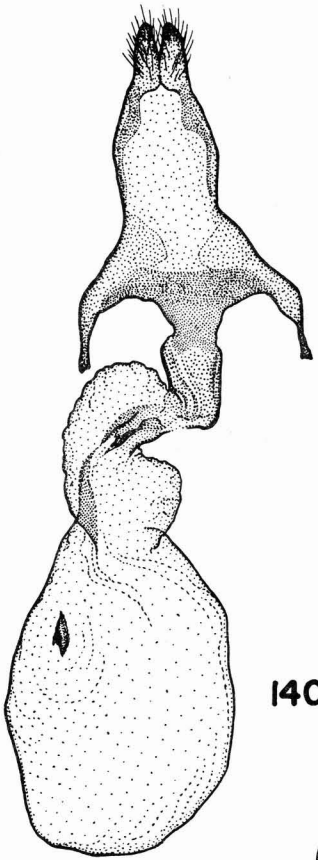
137



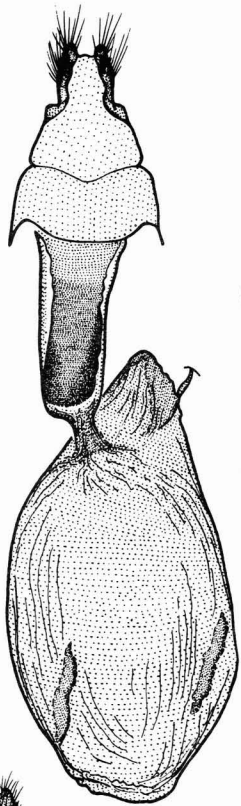
138



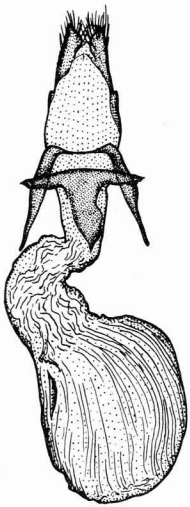
139



140

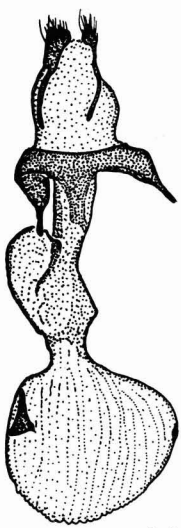


141

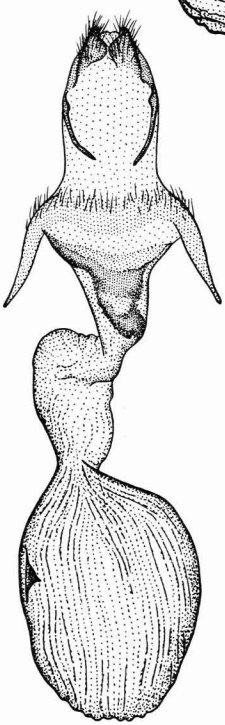


142

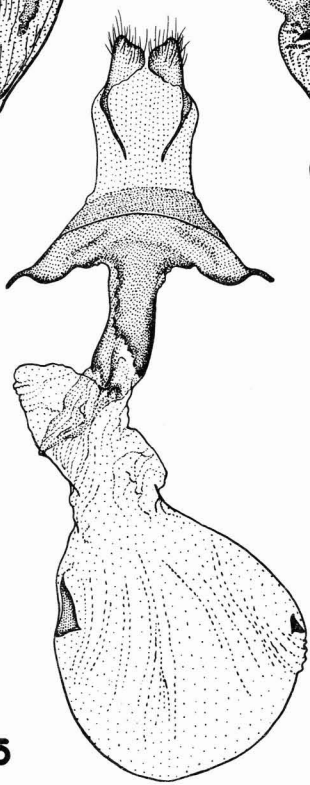
143



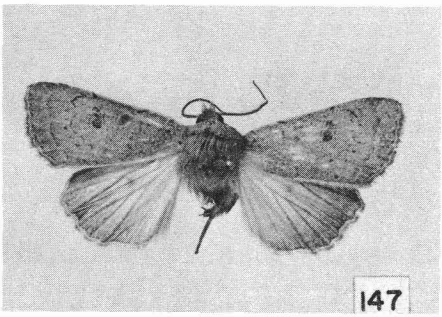
144

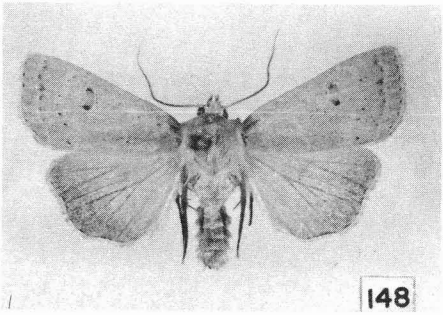


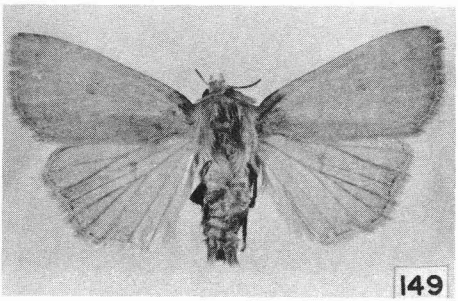
145

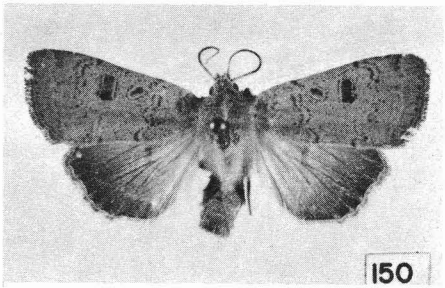


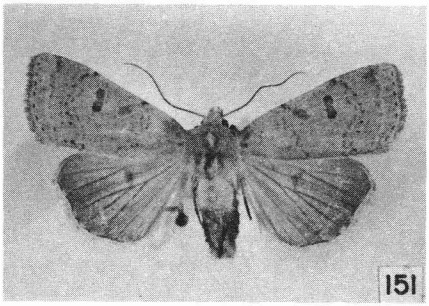
146

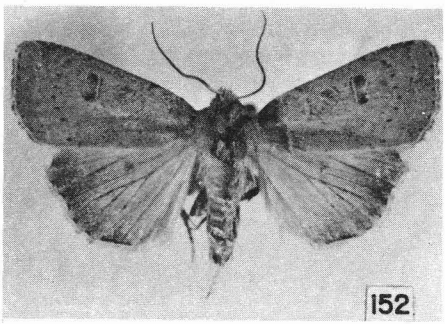

147

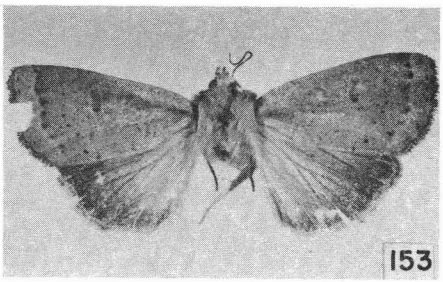

148

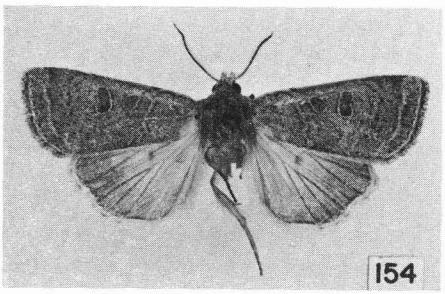

149

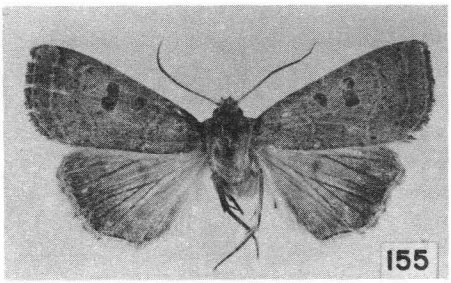

150

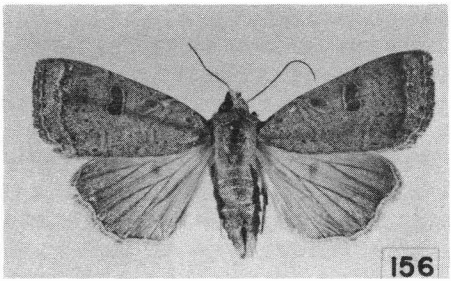

151

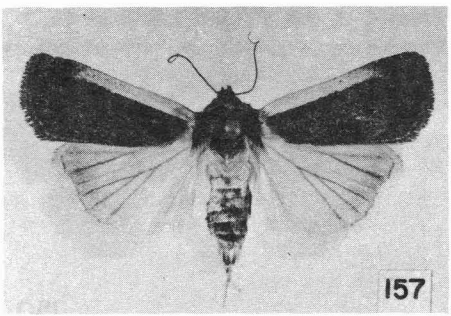

152

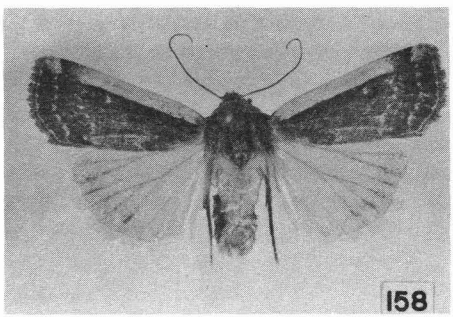

153

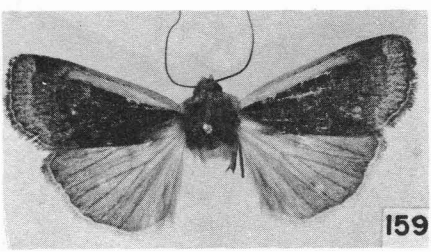

154

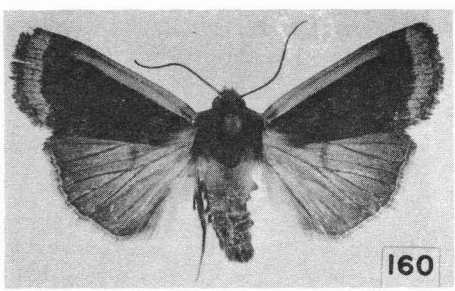

155

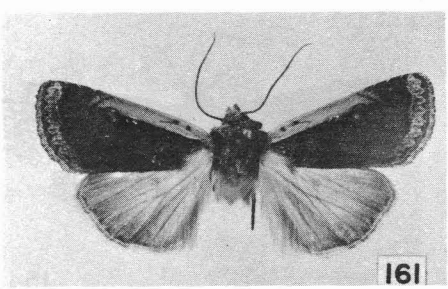

156

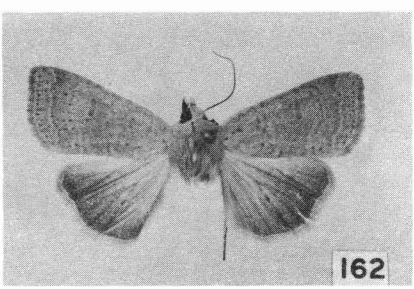

157

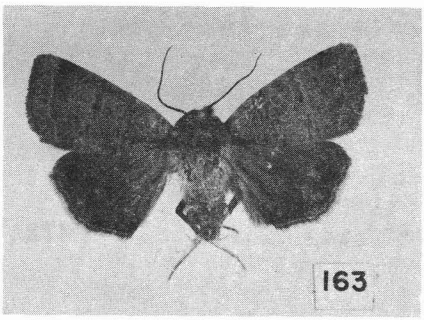

158

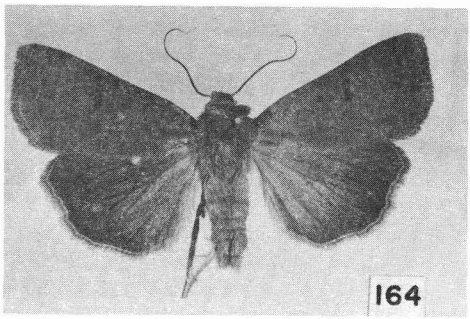

159

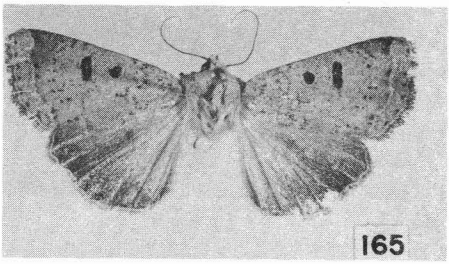

160

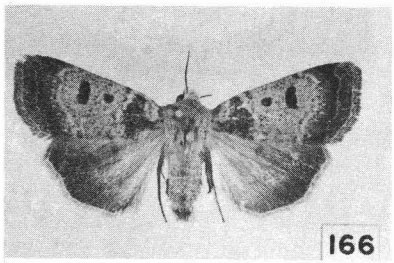

161

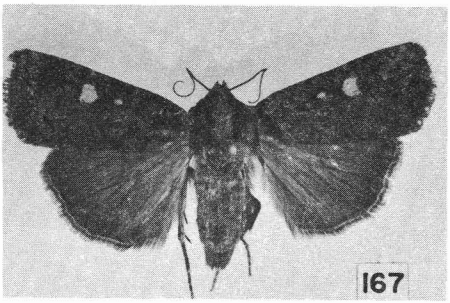

162

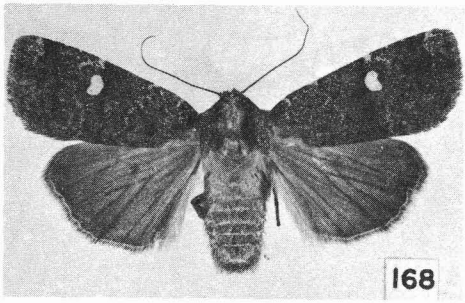

163

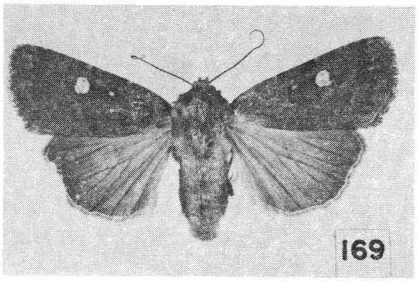

164

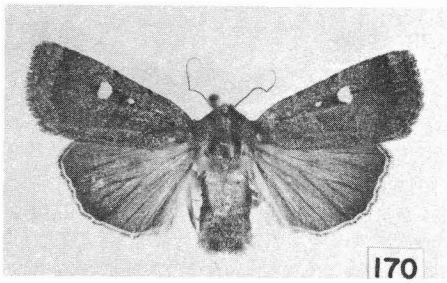

165

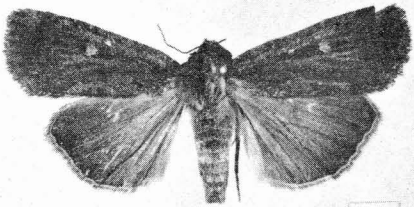

166

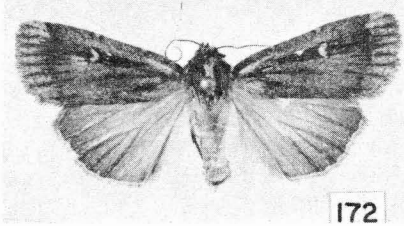

167

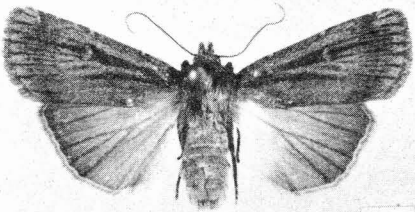

168

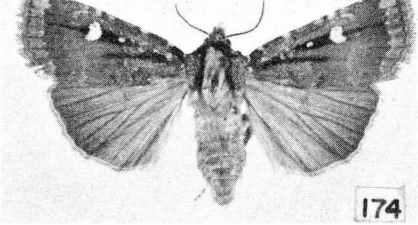

169

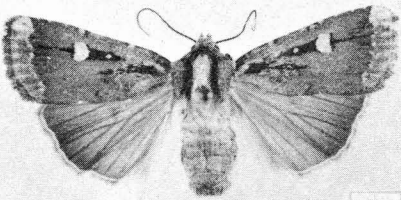

170

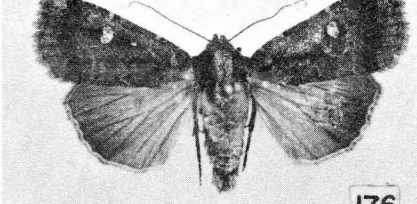

171

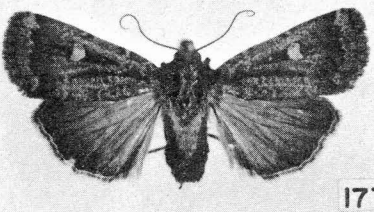

172

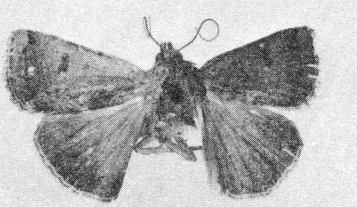

173

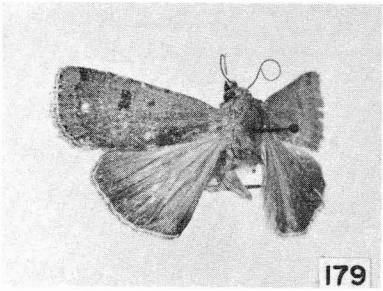

174

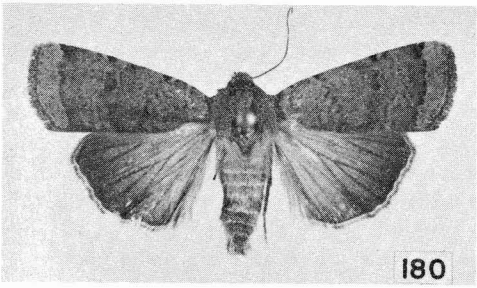

175

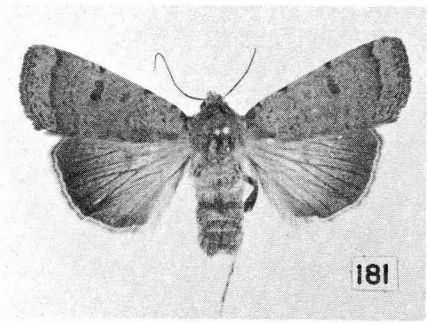

176

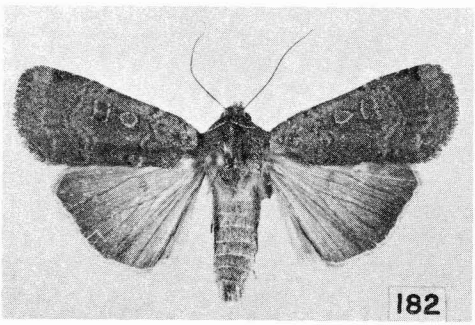

177

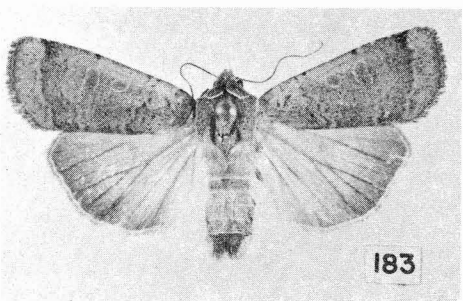

178

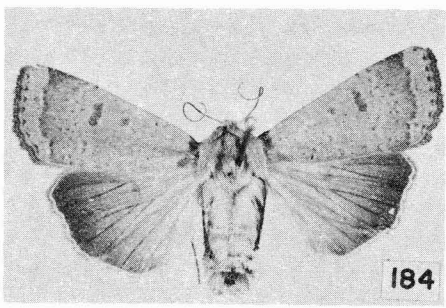

179

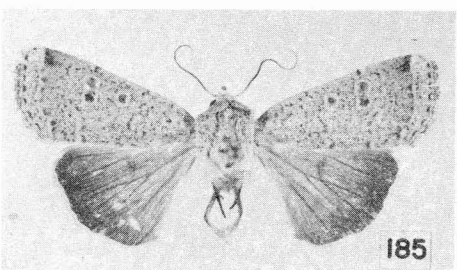

180

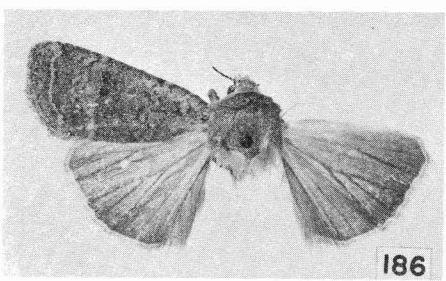

181

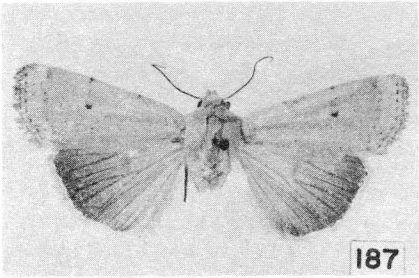

182

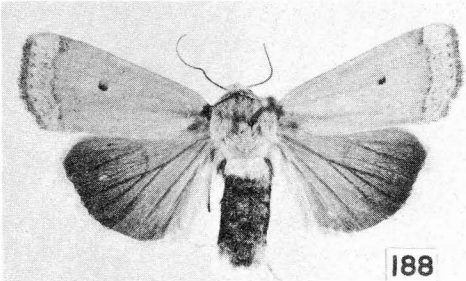

183

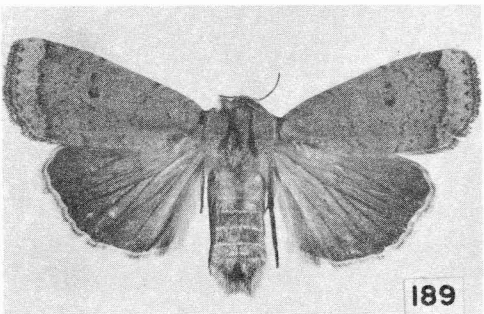

184

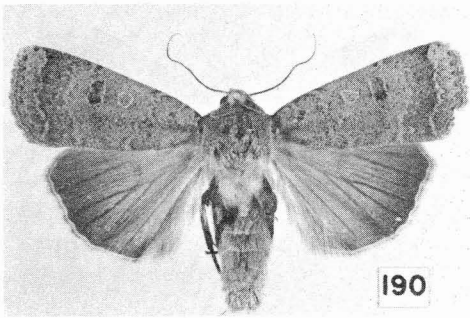

185

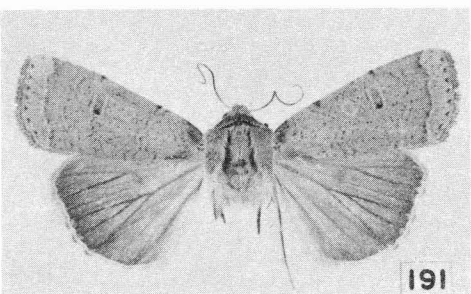

186

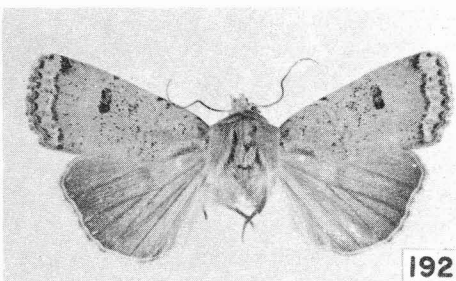

187

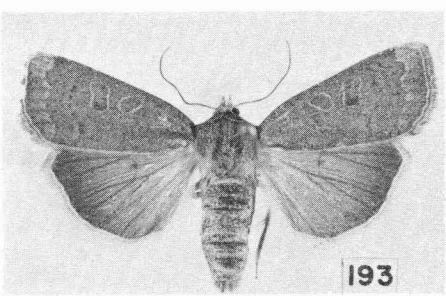

188

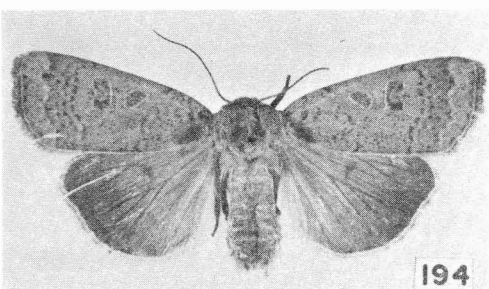

189

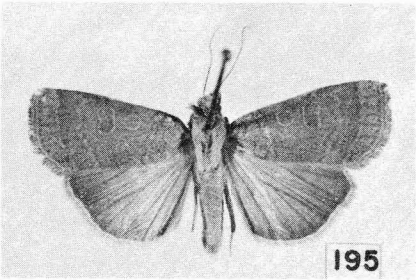

190

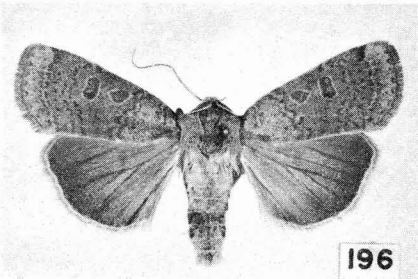

191

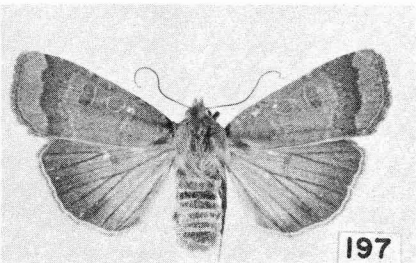

192

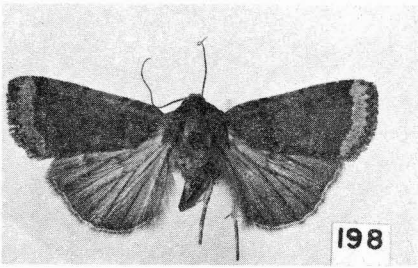

193

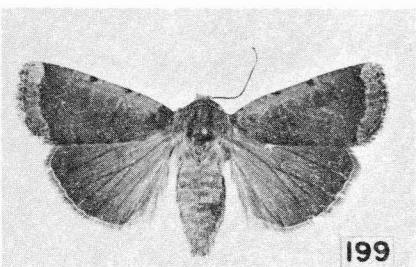

194

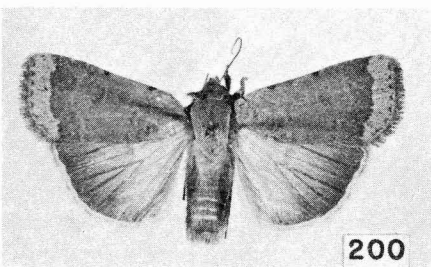

195

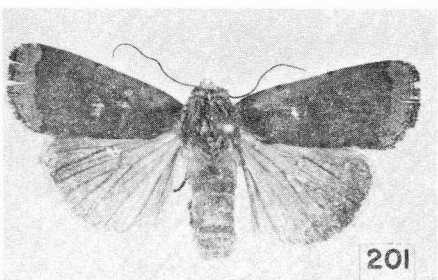

196

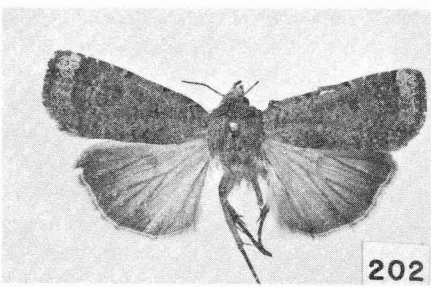

197

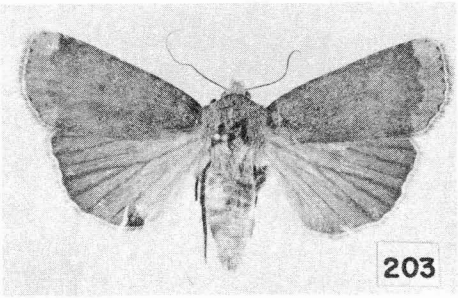

198

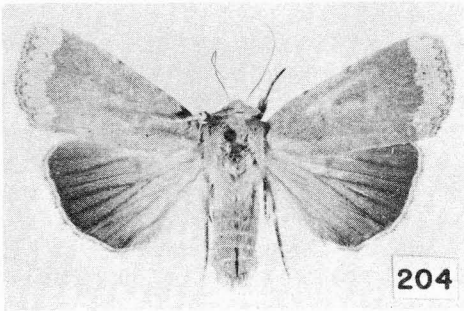

199

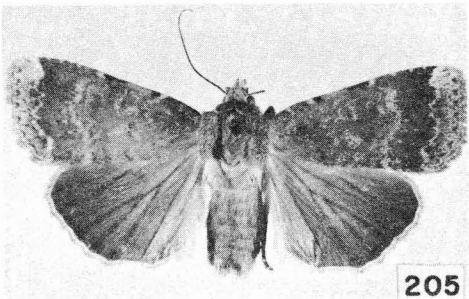

200

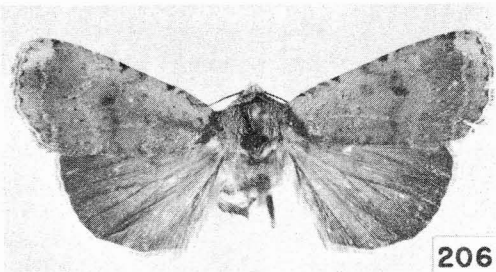

201

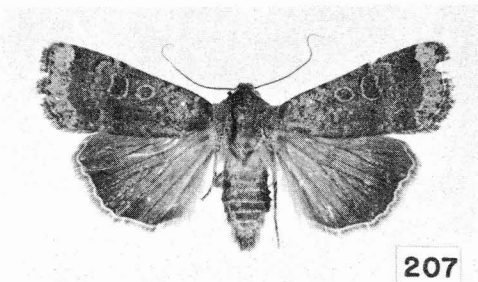

202

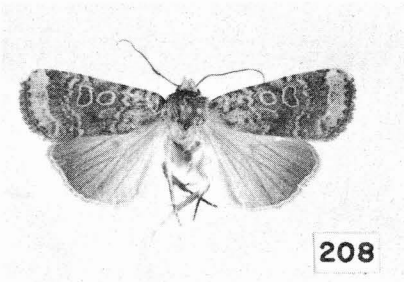

203

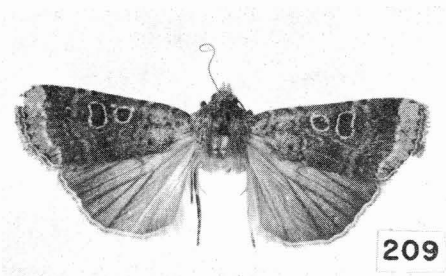

204

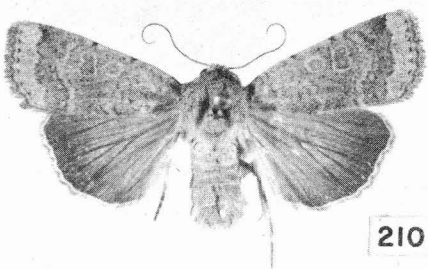

205

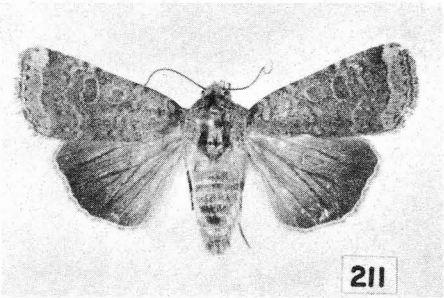

206

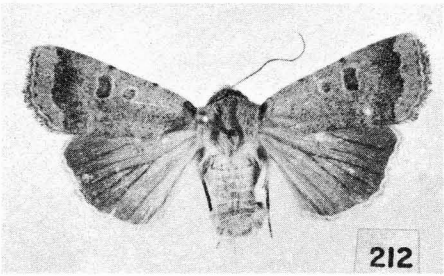

207

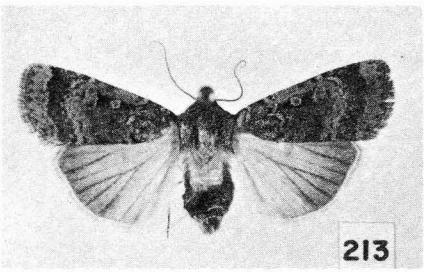

208

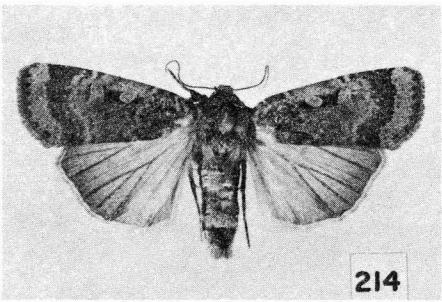

209

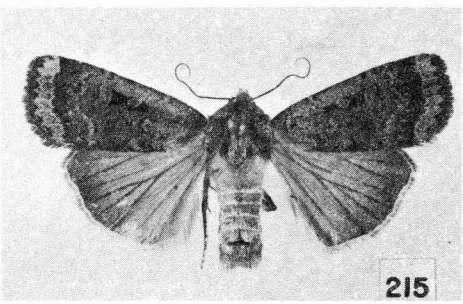

210

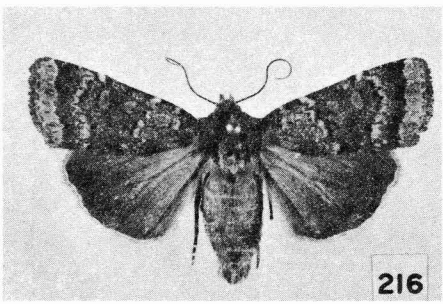

211

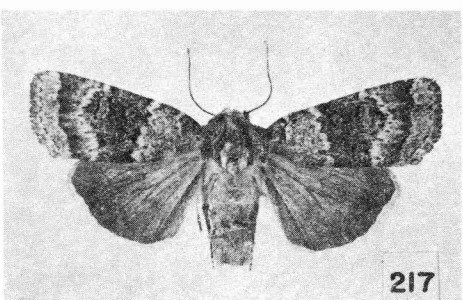

212

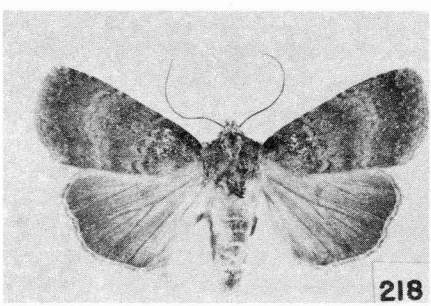

213

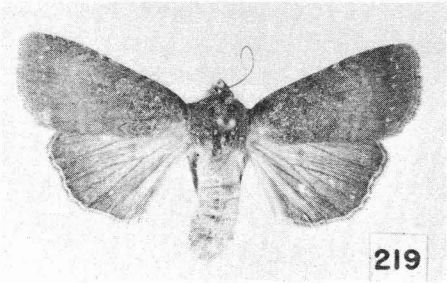

214

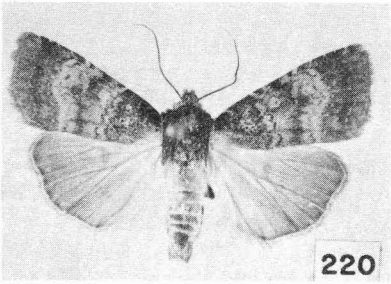

215

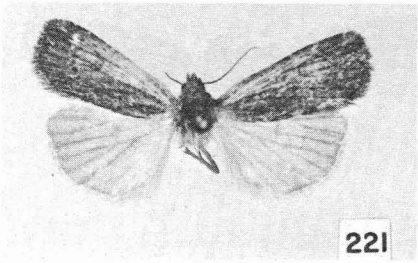

216

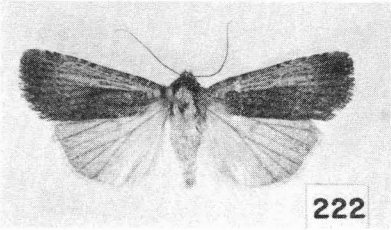

217

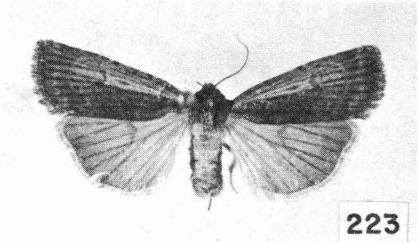

218

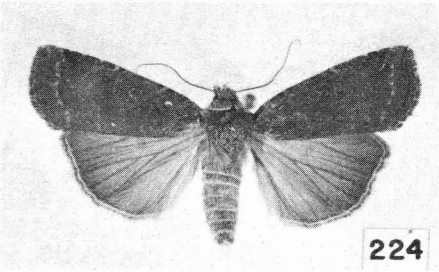

219

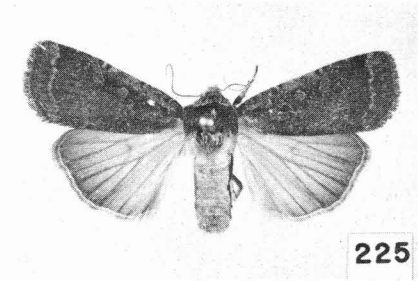

220

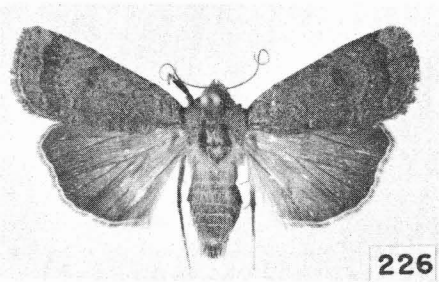

221

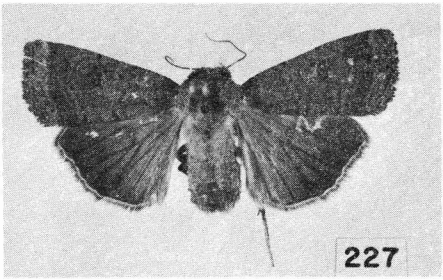

222

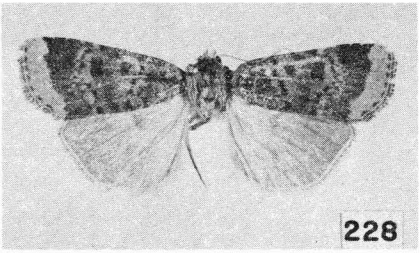

223

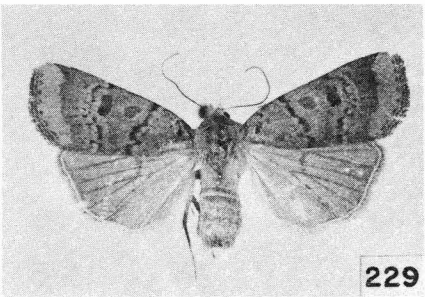

224

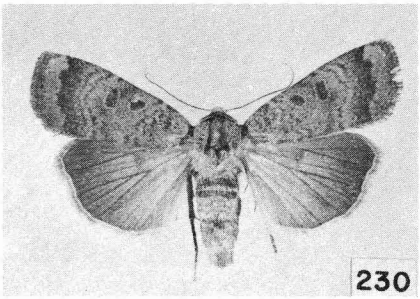

225

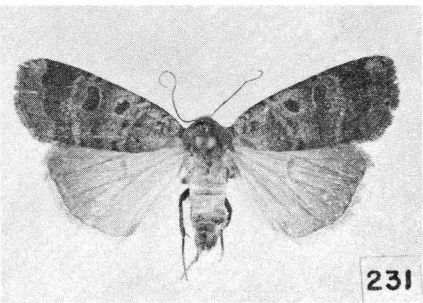

226

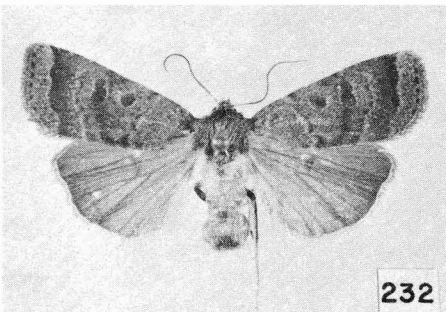

227

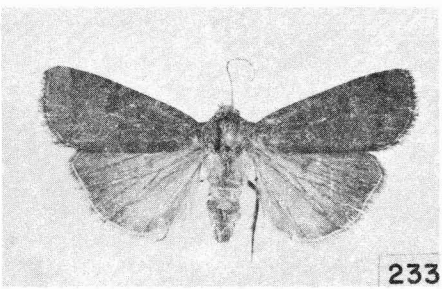

228

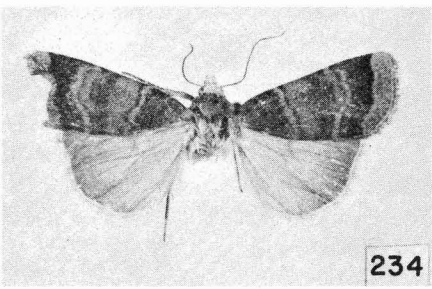

229

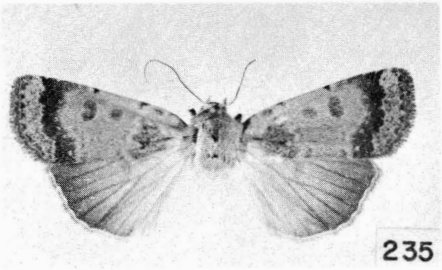

230

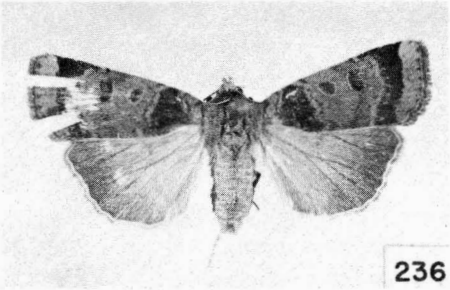

231

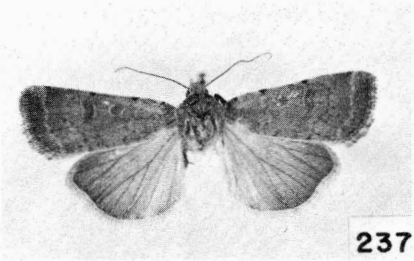

232

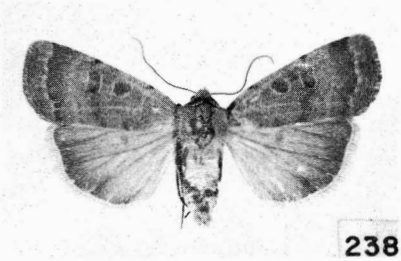

233


234









Purchased by U.S. Department of Agriculture for Official Use