

MEMOIRS
OF THE
AMERICAN MUSEUM OF NATURAL HISTORY

NEW SERIES, VOLUME III, PART I

ILLUSTRATIONS OF THE NORTH AMERICAN SPECIES
OF THE GENUS *CATOCALA*

By WM. BARNES, M.D. AND J. McDUNNOUGH, Ph.D.

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PART I.—ILLUSTRATIONS OF THE NORTH AMERICAN SPECIES OF THE GENUS
CATOCALA BY WM. BEUTENMÜLLER, WITH ADDITIONAL PLATES AND TEXT

BY WM. BARNES, M.D. AND J. McDUNNOUGH, PH.D.

PLATES I TO XXII

AT the time of Mr. Wm. Beutenmüller's withdrawal from his curatorship in The American Museum of Natural History he left in the hands of the authorities a partially completed monograph of the North American species of the genus *Catocala*. Knowing that we had ourselves been doing some slight work on this group, the Director forwarded the entire material to us with the request that we look it over and decide whether or not it could be put into fit shape for publication.

The material as received by us consisted of ten plates of excellent water-color drawings of the various species and two plates containing colored figures of the larvæ, all drawn by the accomplished hand of Mrs. Beutenmüller; besides this, there was an almost complete series of slides of the male clasping organs, of the legs, and of the palpi, together with rough outline sketches of the same. The manuscript itself proved to be very incomplete, in so far as any idea of a monographic revision was concerned; it consisted of a fairly complete bibliography, a fresh description of each species drawn up by Mr. Beutenmüller with excerpts from various authors relating to the larval stages, and, finally, a few general remarks concerning habitat and the location of type specimens.

Realizing the impossibility of our undertaking the immense amount of work involved in order to bring this manuscript up to a true monographic standard and yet being unwilling to deprive the entomological world of such excellent colored plates, it was suggested that they be published as 'Illustrations' and that we prepare a more or less explanatory text to the same. The present paper is the outcome of this compromise.

In commencing the work, our first concern was to endeavor to study the early stages of as many species as possible. As a result of breeding experiments carried on during several seasons, we have not only been able to verify and amplify some of the older larval descriptions but also to add materially to our knowledge of the whole group. Our notes on the early stages of a number of species have quite recently been published as a Museum Bulletin.¹ These notes are of necessity rather brief but, owing to the kindness of Dr. Stephen A. Forbes, State Entomologist for Illinois, who placed his artist, Mr. S. Fred Prince, at our disposal, we have been enabled to present five additional plates of larvæ, enlarged larval segments, and heads, drawn and colored from living specimens under our supervision, and these, we trust, will serve to amplify our own rather meagre descriptions.

¹ 1918. Bull. Amer. Mus. Nat. Hist., XXXVIII, pp. 147-177.

A comparative study of the ova, larvæ, male clasping organs, and tibiæ has convinced us that an excellent system of grouping may be evolved, based upon these four features and calculated to show the true affinities of the species far better than a system based on color alone. In the following pages we have attempted such an arrangement but it is of necessity more or less tentative, as our knowledge of the ova and larvæ of many species is still very deficient.

With regard to the male genitalia, we have found the claspers of great value for general grouping purposes but less so for specific separations. Apparently there is considerable local variation of these organs within each species and our studies have not been extended sufficiently to enable us to grasp any one feature which could be used in separating allied species. In this connection we would warn students from considering the figures of claspers herewith presented as anything more than rather rough sketches. We have carefully compared these sketches with the slides and eliminated many of the graver errors of the original drawings so that, for general purposes of grouping, they possess considerable value but, for the minute detail necessary in distinguishing closely related species, they cannot be recommended.

With the exception of two species, *nubilis* Hübner and *clonympha* Hübner, which are distinctly non-catocaline in all points, we have refrained from subdividing the genus. We believe, however, that sooner or later this must be done, as even our own more or less superficial studies have convinced us of the divergent points of origin of several of the groups. Such subdivision, however, may safely be left until the early stages of all the species are known; in this paper we have confined ourselves to indicating at the head of each group any generic term which might, if necessary, be available. We have further refrained from publishing a complete bibliography of each species; the more important revisions of our North American species will be found listed under the generic heading at the commencement of the paper; under each specific head we have given the original reference of the species as well as of each of its synonyms, varieties, forms, or aberrations, together with any important reference concerning the identity of the species or relating to its early stages. In our brief notes we have dealt with points of nomenclature, means of distinguishing closely related species, and geographical distribution.

In conclusion, we would express the hope that students and collectors interested in this group may make a special effort to advance our knowledge of those species the early stages of which are unknown. We shall always be very glad to give any assistance in our power in the shape of breeding hints or methods of obtaining ova and also to receive material with which to carry on our own breeding experiments.

Catocala SCHRANK

SCHRANK, 1802, Fauna Boica, II, 2, p. 158. GROTE, 1872, Trans. Amer. Ent. Soc., IV, pp. 1-20. HULST, 1880, Bull. Brooklyn Ent. Soc., III, pp. 2-13; 1884, Bull. Brooklyn Ent. Soc., VII, pp. 14-56. HAMPSON, 1913, Cat. Lep. Phal. Brit. Mus., XII, pp. 1-209.

SECTION I

Mormonia HÜBNER, 1823, Verz. bek. Schmett., p. 276 (type, *epione* Drury).

Catabapta HULST, 1884, Bull. Brooklyn Ent. Soc., VII, p. 49 (type, *antinympa* Hübner).

All tibiæ spined; tarsi with a fourth irregular row of spines.

Hulst (*loc. cit.*, p. 49) first made use, for the purpose of classification, of the fact that a considerable number of species possess spined fore tibiæ; he created the genus *Catabapta* (type, *antinympa* Hübner, fixed by Hampson, 1913, *loc. cit.*, p. 11) for this group and is followed in this by Hampson (*loc. cit.*, pp. 11-42). Unfortunately, both authors have overlooked the fact that *epione* Hübner, the type of the genus *Mormonia*, also has spined fore tibiæ, though at times the spining is considerably reduced, and *Mormonia* Hübner will therefore take precedence over *Catabapta* Hulst as used by Hulst and Hampson. It may possibly be necessary, however, to still further subdivide the group and, in this latter case, *Mormonia* will be used for the *epione* group, which consists of but two species as far as we know, and *Catabapta* for the *Myrica*-feeding section.

A very constant feature of the whole section and one that has been overlooked by students up to the present, but to which our attention was directed by Dr. W. T. M. Forbes while on a recent visit, is the fact that all the tarsi, besides the normal three rows of ventral spines, have a distinct fourth row of similar spines, rather irregularly placed and considerably more dorsal. Outside of the section this feature is only found in two species, viz., *illecta* Walker and *aholibah* Strecker.

This section contains all the walnut-feeders, the *Myrica*-feeders, and a single, rather aberrant, *Gleditschia*-feeder. Our further grouping is based on a study of the egg, the larva, and the male genitalia, which apparently present very excellent and constant classificatory features. As, unfortunately, the early stages of several species are entirely unknown and those of others quite incompletely so, our system must be considered as more or less tentative and will, doubtless, be considerably modified when the early stages have been adequately studied. Our studies, however, have convinced us that a separation on the color of the secondaries alone is entirely faulty — one based on the larval food-plants, even, would be considerably more accurate — and that the black-winged forms are of comparatively recent origin and have developed from various orange and yellow forms by a spreading of the black areas until all traces of color on the upper side of the secondaries have been eliminated.

GROUP I

Egg rather more than hemispherical, ribbed. Larva without lateral filaments, but with a slight dorsal transverse wart on the fifth abdominal segment. Male claspers strongly asymmetrical, the left clasper and the left harpe being quite abnormal in shape and differing markedly from those of any other member of the section.

This group contains but a single species, the *Gleditschia*-feeder, *innubens* Guenée.

Catocala innubens Guenée

Plate VII, figs. 9–11; Pl. X, fig. 35 (larval head); Pl. XI, fig. 10 (larva); Pl. XVIII, figs. 1 and 2 (claspers).

Catocala innubens GUENÉE, 1852, Hist. Nat. Ins. Sp. Gen., VII, p. 98. FRENCH, 1888, Can. Ent., XX, p. 170 (larva). BARNES AND McDUNNOUGH, 1918, Bull. Amer. Mus. Nat. Hist., XXXVIII, p. 147.

Catocala scintillans GROTE AND ROBINSON, 1866, Proc. Ent. Soc. Phil., VI, p. 28, Pl. III, fig. 6.

Catocala innubens var. *flavidalis* GROTE, 1874, Trans. Amer. Ent. Soc., V, p. 95.

Catocala innubens var. *hinda* FRENCH, 1881, Papilio, I, p. 111.

This species is too well known to need further comment on our part. The form described as *hinda* by French is merely the normal female, as figured on plate VII, figure 10, and the name should be dropped. *Scintillans* Grote and Robinson (figure 11) is a well-marked form which is quite worthy of a name. *Flavidalis* Grote is presumably a rare color-sport with yellow instead of orange secondaries; it is a mere aberration of which we have never seen specimens. Beutenmüller (1903, Bull. Amer. Mus. Nat. Hist., XIX, p. 508) states, on the authority of Mr. Chas. Dury, that it is artificially produced by heat.

The species occurs throughout practically the entire eastern half of the United States and is very common in the Mississippi and Ohio valleys; northward, it extends into Ontario and Wisconsin but we have no records of its occurrence in the Canadian Northwest.

GROUP II

Egg hemispherical, ribbed. Larva smooth, without either dorsal warts or lateral filaments. Male claspers strongly asymmetrical.

The single species, *piatrix* Grote, has generally been associated with *neogama* and *subnata*, but it differs so markedly in egg, larva, and genitalia from other members of the section that we have no alternative to placing it in a group by itself. The non-specialized egg and larva would point to a rather primitive form.

Catocala piatrix Grote

Plate VI, figs. 2 and 3; Pl. X, fig. 27 (larval head); Pl. XI, fig. 6; Pl. XIII, fig. 5 (larva); Pl. XV, fig. 8 (larval head); Pl. XVIII, figs. 3 and 4 (claspers); Pl. XXI, figs. 23–25 (tibiae).

Catocala piatrix GROTE, 1864, Proc. Ent. Soc. Phil., III, pp. 88 and 532, Pl. III, fig. 3. BEUTENMÜLLER, 1902, Bull. Amer. Mus. Nat. Hist., XVI, p. 389, Pl. LII, fig. 13 (larva). BARNES AND McDUNNOUGH, 1918, Bull. Amer. Mus. Nat. Hist., XXXVIII, p. 148.

Catocala dionysa HY. EDWARDS, 1885, Papilio, IV, Jan., p. 124.

This species is subject to very little variation in the imago; the females are somewhat more contrastingly marked

than the males but the difference is slight. In Arizona we meet with a much paler geographical race which has been named *dionyza* by Hy. Edwards and is well represented on plate VI, figure 3.

Apparently the larvæ are rather variable in coloration, especially on the head segments. The figure given of the head on plate X, figure 27 is one drawn by Mrs. Beutenmüller from the larva described in Bull. Amer. Mus. Nat. Hist., XVI, p. 389, and figured in this work on plate XI, figure 6; on plate XV, figure 8 we depict the head as we have commonly found it. Rowley (1909, Ent. News, XX, p. 133) records several varieties of larvæ found in the vicinity of Louisiana, Missouri, but further breeding will be necessary to decide whether such considerable variability exists or whether possibly two species are involved. Personally, among numerous specimens bred from the egg, we have found only slight color variations present and figure 5 of plate XIII accurately represents the larva as we know it; we are rather skeptical as to the specific unity of the two larvæ figured on plate XI, figure 6 and plate XIII, figure 5.

The species is rather more extended in its range than *innubens*, occurring in practically all the states east of the Mississippi River and being very common in the Mississippi and Ohio valleys; it extends westward through Texas into Arizona and southward into Mexico. Beutenmüller, in his manuscript, records it from "Canada west to British Columbia" but this needs verification; neither Winn, in his List of Quebec Lepidoptera, nor Wolley Dod, in his Alberta List, mention the species, although it is quite frequently met with in southern Ontario.

GROUP III

(*Mormonia* Hübner)

Egg rather more than hemispherical. Larvæ cylindrical, without either dorsal warts or lateral filaments; hickory-feeders. Male claspers somewhat asymmetrical, the left valve being more highly chitinized in the dorsal area than the right one, which is obliquely angled one-third from apex forming a slight blunt hook.

We have placed the two species *epione* and *consors* in this group on account of the great similarity in the male genitalia; the maculation of the primaries would also point to a close association of the two species. Both species have the spining of the fore tibiæ much reduced, and single specimens possibly occur in which spines are entirely lacking, but normally these are quite readily distinguishable.

Catocala consors (Abbot and Smith)

Plate VII, fig. 7; Pl. X, fig. 31 (larval head); Pl. XII, fig. 16 (larva); Pl. XVIII, figs. 7 and 8 (claspers).

Phalæna consors ABBOT AND SMITH, 1797, Nat. Hist. Lep. Georgia, II, p. 177, Pl. LXXXIX.

Catocala consors BEUTENMÜLLER, 1902, Bull. Amer. Mus. Nat. Hist., XVI, p. 391, Pl. III, fig. 18 (larva).

The characteristic purplish hue of the primaries with prominent single black cross-lines, combined with the very irregular nature of the postmedian orange band of secondaries, will readily distinguish this species from the other yellow winged forms.

The larva figured on plate XII, figure 16 is the original of Beutenmüller's description in Bull. Amer. Mus. Nat. Hist., XVI, p. 391. We received a single larva from Vinton, Iowa, found on a young hickory bush; it agreed excellently with this description and figure but, unfortunately, it died before pupation. We have no doubt that hickory is the true food-plant and that Abbot's record of False Indigo (*Baptisia*) and Hulst's (Bull. Brooklyn Ent. Soc., VII, p. 40) of Myrtle (*Myrica*) are erroneous.

The species is rather rare but is quite wide-spread throughout the Southern States and the Mississippi and Ohio valleys; it extends as far north as the states of New York and New Jersey on the East Coast and Iowa in the Middle West. Snow (1875, Trans. Kan. Acad. Sci., IV, p. 51) records it from the vicinity of Lawrence, Kansas.

Catocala epione (Drury)

Plate I, fig. 16; Pl. XIII, fig. 3 (larva); Pl. XV, fig. 7 (larval head); Pl. XVI, fig. 1 (segment); Pl. XVIII, figs. 5 and 6 (claspers).

Phalæna (Noctua) epione DRURY, 1770, Ill. Exot. Ent., I, 47, Pl. XXIII, fig. 2; and 1773, App., II.

Catocala epione DODGE, 1901, Can. Ent., XXXIII, p. 225 (larva). BARNES AND McDUNNOUGH, 1918, Bull. Amer. Mus. Nat. Hist., XXXVIII, p. 149.

Fresh specimens are considerably blacker on the primaries than the specimen figured on plate I, figure 16. The characteristic black cross-lines, in course much as we find in *consors*, readily separate it from the other black-winged species. It appears early in the season and extends over practically the same territory as *innubens*.

Wormsbacher (1912, Zeitsch. für wiss. Ins. Biol., VIII, p. 257) records oak as the food-plant of the larva but we imagine this is erroneous; larvæ bred by us from the egg refused all food-plants but hickory.

GROUP IV

(*Catabapta* Hulst)

Egg unknown. Larva without dorsal warts or lateral filaments. Male claspers either symmetrical or only slightly asymmetrical; apex of claspers rather pointed and projecting well beyond the less highly chitinized ventral area.

This group comprises the *Myrica*-feeders, as far as the early stages are known. We have included *cælebs* in the group on account of its similarity to *badia* in general appearance, a resemblance which is further borne out by the male genitalia. In *muliercula* the male genitalia are practically symmetrical, while the other three species show a slight asymmetry, the dorsal area of the left clasper being more strongly chitinized than the corresponding area of the right clasper; the harpes are very broad at the base. Detailed information concerning the early stages of all the species of this group is greatly to be desired.

Catocala muliercula Guenée

Plate VII, fig. 24; Pl. XII, fig. 13 (larva); Pl. XVIII, figs. 9-10 (claspers).

Catocala muliercula GUENÉE, 1852, Hist. Nat. Spec. Gen. Lep., VII, p. 97; Pl. II, fig. 15. BEUTENMÜLLER, 1902, Bull. Amer. Mus. Nat. Hist., XVI, p. 390.

Catabapta muliercula var. *peramans* HULST, 1884, Bull. Brooklyn Ent. Soc., VII, p. 50.

The deep brown color of the primaries is characteristic; the form described by Hulst as *peramans* is an aberration with the yellow areas of secondaries greatly reduced so that the wings are almost black.

The larva is quite unknown to us and we have been unable to verify the correctness of the figure given on plate XII, figure 13. In his manuscript Beutenmüller has noted that the larvæ are variable and that from several hundred which he collected and supposed to be *muliercula* both this species and *badia* were bred; he was unable to find satisfactory characters to separate the two species.

The species is more or less confined to the Atlantic Coast States where the food-plant abounds. French records it from Illinois (1881, Synop. Catocalæ Ill., p. 8) but we personally do not know of its occurrence in this state. We have a few specimens before us labelled Houston, Texas, but cannot vouch for the correctness of the label. Further information regarding distribution and early stages is much to be desired.

Catocala antinympha (Hübner)

Plate VII, fig. 15; Pl. XII, fig. 14 (larva); Pl. XVIII, figs. 11 and 12 (claspers).

Phalæna (*Noctua*) *paranympha* DRURY (*nec* Linnæus), 1770, Ill. Exot. Ent., I, p. 49, Pl. xxiii, fig. 6; and 1773, App., II.

Ephesia antinympha HÜBNER, 1825, Verz. bek. Schmett., p. 278.

Catocala affinis WESTWOOD, 1837, Drury, Exot. Ent., New Ed., I, p. 44, Pl. xxiii, fig. 6.

Catocala melanympha GUENÉE, 1852, Hist. Nat. Spec. Gen. Lep., VII, p. 98.

Catocala antinympha BEUTENMÜLLER, 1902, Bull. Amer. Mus. Nat. Hist., XVI, p. 392, Pl. LII, fig. 19 (larva).

The secondaries in the figure (Pl. VII, fig. 15) are paler than is usually found. The small size and blackish velvety color of the primaries render the species easily recognizable.

The larva is unknown to us except from prepared material which corresponds as far as we can tell with the figure given (Pl. XII, fig. 14).

The species is distinctly more northern in its range than *muliercula* occurring from Ontario and Quebec south through the New England States to Maryland. It has been recorded from Pennsylvania (Engel, 1908, Ann. Carn. Mus., V, p. 59) and Beutenmüller's manuscript mentions Wisconsin, but we have no definite data regarding its presence in this latter state.

Catocala cœlebs Grote

Plate VII, fig. 8; Pl. XVIII, figs. 13 and 14 (claspers).

Catocala cœlebs, GROTE, 1874, Trans. Amer. Ent. Soc., V, p. 96.

This species may be distinguished from *badia*, with which it has been at times confused, by the pale gray color of the median area of the primaries and the brown basal and postmedian shading.

Nothing is known of the early stages or food-plant of the larva.

It is a northern species and generally rather rare, although in certain districts of Maine it is apparently quite common. It occurs in Ontario and Nova Scotia and probably will be found in Quebec, although not mentioned by Winn in his List of Quebec Lepidoptera; it extends southward through New Hampshire to the Adirondack Mountains of New York.

Catocala badia Grote and Robinson

Plate VII, fig. 16; Pl. X, fig. 32 (larval head); Pl. XII, figs. 2-6 (larva); Pl. XVIII, figs. 15 and 16 (claspers).

Catocala badia GROTE AND ROBINSON, 1866, Proc. Ent. Soc. Phil., VI, p. 22, Pl. IV, fig. 1. BEUTENMÜLLER, 1902, Bull. Amer. Mus. Nat. Hist., XVI, p. 391, Pl. LII, fig. 17.

Catocala badia var. *phæbe* HY. EDWARDS, 1885, Papilio, IV, Jan., p. 125.

This species is rather distinctive on account of the general indefiniteness of the maculation of the primaries, which are more or less suffused basad of the t. p. line with purplish brown. The figure (Pl. VII, fig. 16) shows the maculation rather more distinct than usual and apparently represents a transition to the form *phæbe* Hy. Edwards, which was described from New Hampshire specimens and in which the t. p. line (normally straight) is sharply angled outwardly opposite the cell. Whether *phæbe* will prove to be a good geographical race or merely an aberration must remain undecided until more material is forthcoming.

The larva is unknown to us. Beutenmüller figures several varieties (Pl. XII, figs. 2-6) but, as already stated, has confused the larvæ of this species with those of *muliercula* and careful breeding will be necessary to clear up the matter.

The species is common in the southern New England States and the northern Atlantic States.

GROUP V

Egg flat, disk-shaped, with slightly elevated rim. Larva without dorsal elevations or lateral filaments. Male claspers somewhat asymmetrical, the left clasper being more heavily chitinized dorsally and blunter at the apex than the right one; both apices project well beyond the thinly chitinized ventral area of the clasper.

This group includes a number of species in which the male genitalia are so similar as to be practically useless as a means of specific separation, especially as considerable variation is shown in individuals of the same species. The flat egg, of a highly specialized nature, is very characteristic. As a rule, there are five larval molts but there may occur as many as seven, as is the case with *habilis*. The larvæ, as far as is known, are all hickory- or walnut-feeders. The species *serena*, *denussa*, *agrippina*, and *sappho* are only tentatively placed here, as nothing is known of their early stages. There is a marked tendency in the group for the females of the species to develop a basal dash on the primaries, notably the case in *habilis* and *angusi* where they are seldom without it.

Catocala habilis Grote

Plate VII, fig. 5; Pl. X, fig. 24 (larval head); Pl. XII, fig. 1 (larva); Pl. XVIII, figs. 17 and 18 (claspers).

Catocala habilis GROTE, 1872, Trans. Amer. Ent. Soc., IV, p. 11. BEUTENMÜLLER, 1902, Bull. Amer. Mus. Nat. Hist., XVI, p. 389, Pl. LII, fig. 14 (larva, as *serena*). ROWLEY, 1909, Ent. News, XX, p. 134 (larva). BARNES AND McDUNNOUGH, 1918, Bull. Amer. Mus. Nat. Hist., XXXVIII, p. 150.

Catocala habilis var. *basalis* GROTE, 1876, Can. Ent., VIII, p. 230.

The ashen-gray primaries with clean cut maculation, together with the small size, separate the species from the

other orange-banded species. The variety *basalis* Grote is merely the normal female form with a black dash at the base of the wing; occasional female specimens, however, occur without this dash so that the name may be retained if desired.

The full-grown larva has been described several times, Beutenmüller having erroneously recorded it in his paper on *Catocala* larvæ as *serena*. We would call particular attention to the abnormal number of larval stages (seven) as recorded by us in our recent larval descriptions.

The species ranges from Ontario and Quebec southward to Virginia and westward to the Mississippi Valley and Kansas. There is no reason why it should not occur in the Gulf States but we have no records from this region.

***Catocala denussa* Ehrman**

Plate VIII, fig. 25.

Catocala denussa EHRMAN, 1893, Jour. N. Y. Ent. Soc., I, p. 152. BEUTENMÜLLER, 1913, Insec. Ins. Menst., I, p. 97.

The only specimen known is the type male in the Ehrman Collection, captured in Allegheny County, Pennsylvania. Beutenmüller, who has examined the type, states that all the tibiæ are spined and he is inclined to regard it as a good species rather than as an aberration of *habilis*; we leave it so for the present.

***Catocala serena* Edwards**

Plate VII, fig. 6; Pl. XVIII, figs. 19 and 20 (claspers).

Catocala serena EDWARDS, 1864, Proc. Ent. Soc. Phil., II, p. 510.

This species is only tentatively placed here as nothing is known of its early stages. The t. p. line is much less excurved beyond the cell than in *habilis* and the color of the primaries is duskier.

It occurs sparingly throughout the Mississippi and Ohio valleys, extending eastward into New York and Massachusetts and northward into southern Ontario.

***Catocala robinsoni* Grote**

Plate II, figs. 9 and 10; Pl. XVIII, figs. 21 and 22 (claspers).

Catocala robinsonii GROTE, 1872, Trans. Amer. Ent. Soc., IV, p. 20. BARNES AND McDUNNOUGH, 1918, Bull. Amer. Mus. Nat. Hist., XXXVIII, p. 151.

Catocala robinsoni var. *curvata* FRENCH, 1881, Papilio, I, p. 218.

Catocala robinsonii var. *missouriensis* SCHWARZ, 1915, Ent. News, XXVI, p. 289, Pl. x, fig. 1.

Typical *robinsoni* has the primaries paler and more evenly gray than any other of the species with black secondaries and white fringes. The form *curvata* French (Pl. II, fig. 10) was described from a single female with a black basal dash and a curved blackish mark from the center of the costa across the reniform to the apex of the wing; the basal dash is probably merely a female characteristic which is only occasionally found in this species; we possess a single female of the type form with this dash and others without this dash but with the apical dark curved mark of the *curvata* form; we have seen no *curvata* males with the basal dash. The form *missouriensis* Schwarz is unknown to us but from the figure would seem to be an extreme form of *curvata* with the black dash much broadened and extending obliquely from base to just below apex of wing; it is worthy of note that three of the four type specimens are said to be males. Both *curvata* and *missouriensis* were described from material from the Middle West (Illinois and Missouri) and we have seen no specimens of these forms in eastern material, which in general is more evenly gray and less strongly marked than western specimens. The egg and larva are very similar to those of *habilis*. A detailed account of the earlier larval stages is still needed, our own notes dealing merely with the mature larva and having been drawn up from an inflated specimen.

The species is fairly common in late August and September throughout southern Ontario and the Eastern States, extending (as is usual with all the hickory-feeders) through the Mississippi and Ohio valleys. The most southerly record we know of is that of Alabama for one of the types of *missouriensis* but we should not be surprised to find that the species occurs in Texas and other Gulf States.

Catocala judith Strecker

Plate I, fig. 15; Pl. X, fig. 28 (larval head); Pl. XI, fig. 15 (larva); Pl. XVIII, figs. 23 and 24 (claspers).

Catocala judith STRECKER, 1874, Lep. Rhop. Het., Nov., p. 95, Pl. XI, fig. 5. BEUTENMÜLLER, 1902, Bull. Amer. Mus. Nat. Hist., XVI, p. 390, Pl. LII, fig. 15 (larva).

Catocala levettei GROTE, 1874, Trans. Amer. Ent. Soc., V, Dec., p. 95.

This is a small species in which the primaries are a pale even gray and the fringes of the secondaries are smoky-brown. The sexes are practically alike and we have never seen any females with a black basal dash.

The larva is unknown to us. Figure 15 on plate XI is presumably from the original of Beutenmüller's description in Bull. Amer. Mus. Nat. Hist., XVI, p. 390; Dodge (1901, Can. Ent., XXXIII, p. 224) has also furnished a description of the mature larva. A detailed account of the egg and the early larval stages is a desideratum.

The species is wide-spread throughout the Eastern States and the valleys of the Ohio and Mississippi rivers, extending northward into Ontario and Quebec, where it is comparatively rare.

Catocala flebilis Grote

Plate II, fig. 12; Pl. XII, fig. 19 (larva); Pl. XVIII, figs. 33 and 34 (claspers).

Catocala flebilis GROTE, 1872, Trans. Amer. Ent. Soc., IV, p. 4. ROWLEY AND BERRY, 1912, Ent. News, XXIII, p. 209 (larva).

Catocala dejecta form *carolina* HOLLAND, 1903, Moth Book, p. 261, Pl. XXXII, fig. 5. BEUTENMÜLLER, 1905, Can. Ent., XXXVII, p. 292.

This species closely resembles a small *resecta* but generally has the reniform much more distinctly centered with brown; a prominent black shade from the base of wing to the outer margin just below the apex is always present, being evenly oblique and not irregularly broken as in *angusi* var. *lucetta*; on the under side of the primaries the white areas, which are quite prominent in *resecta*, are greatly obscured by blackish scaling. Holland, erroneously figuring *lucetta* (Pl. xxxi, fig. 11) as *flebilis*, has redescribed the true species as *carolina*, his figured specimen (Pl. xxxii, fig. 5) being a rather pale and poorly marked male.

The early stages are unknown to us but have been accurately described by Rowley and Berry. According to this description, the absence of the lateral filaments distinguishes the larva from that of *resecta* and proves the validity of the species.

Flebilis is nowhere very common but is wide-spread. It has practically the same range of territory as *judith* except that it does not extend so far northward, there being no records of its occurrence in Ontario and Quebec so far as we know.

Catocala angusi Grote

Plate II, figs. 13-16; Pl. XVIII, figs. 25 and 26 (claspers).

Catocala angusi GROTE, 1876, Can. Ent., VIII, p. 229; 1877, Bull. Buffalo Soc. Nat. Sci., III, p. 188, Pl. v, fig. 1. ROWLEY, 1909, Ent. News, XX, p. 135 (larva).

Catocala residua var. *lucetta* FRENCH, 1881, Synop. Catocalæ Illinois, p. 4.

Catocala flebilis HOLLAND (nec Grote), 1903, Moth Book, p. 262, Pl. xxxi, fig. 11.

Catocala angusi var. *edna* BEUTENMÜLLER, 1907, Bull. Amer. Mus. Nat. Hist., XXIII, p. 150.

The typical form of this species is that figured by Grote in Buffalo Bull., III, Pl. v, figs. 1 and 2 and in this work on plate II, figures 13 and 14; the female (Fig. 14) which has a black basal dash has been redescribed by Beutenmüller under the name *edna*. The form *lucetta* (Fig. 15) occurs in both sexes and is characterized by heavy black streaks at base of wing and beyond the cell; this form, as already noted, has been erroneously determined by Holland as *flebilis* Grote. The name *lucetta* is usually attributed to Hy. Edwards but should stand, according to the rules of nomenclature, as *lucetta* French, since French first diagnosed the form in his Synopsis of the Catocalæ of Illinois, the fact that it is attributed to "Hy. Edwards, MSS." not altering the case at all (*vide* Banks and Caudell, Entom. Code, p. 8, Rule 27). The specimen figured on plate II, figure 16, is recorded by Beutenmüller in his explanation of plates as an aberration of *angusi*; as we have not seen the original specimen which served for the figure nor any specimens at all similar, we refrain from comment.

Apart from Rowley's short note (Ent. News, XX, p. 135) stating that the mature larva is very similar to that of *habilis*, nothing is known of the life-history of the species.

The species occurs throughout the same territory as *flebilis* but is rather more commonly met with.

Catocala obscura Strecker

Plate II, fig. 17; Pl. XVIII, figs. 27 and 28.

Catocala obscura STRECKER, 1873, Lep. Rhop. Het., May, p. 19, Pl. III, fig. 4. KELLCOTT, 1886, Ent. Amer., II, p. 45 (larva). DODGE, 1904, Can. Ent., XXXVI, p. 115 (larva). ROWLEY, 1909, Ent. News, XX, p. 134 (larva).
Catocala simulatilis GROTE, 1873, Trans. Amer. Ent. Soc., V, Sept., p. 94. STRECKER, 1874, Lep. Rhop. Het., p. 106.

This species is, as the name implies, very obscure in the maculation of the primaries; it is generally distinguished from *residua* by the white fringes of the secondaries, which in the latter species are dusky. There is, however, some doubt in our minds as to whether this feature is of specific value, as the series before us tends to show intergrades. Careful breeding from authoritatively identified specimens will be necessary to settle the point. Holland's figure of *obscura* (Pl. xxxi, fig. 14) should be referred to *residua*. Three descriptions (as cited above) exist of the mature larva and, while they all agree in stating that neither filaments nor dorsal hump are present, they vary considerably in other respects. Messrs. Dodge, in their article, give points of distinction between the larvæ of *obscura* and *residua*, claiming that the former has a black acuminate dash extending from the mouth two-thirds of the way to the top of the head, while the latter has merely a small ill-defined blotch at the corners of the mouth; the pattern on the dorsum is also noted as different. These differences, if constant, would constitute specific distinctness.

We have made several slides of the genitalia of this species and of *residua*, besides having before us those slides which served as the originals of Beutenmüller's figures, but have been unable to decide by these means anything definite regarding the status of the two so-called species. The male claspers of a specimen of *obscura* from Massachusetts agreed exactly with Beutenmüller's figure, while those of a specimen from Quincy, Illinois, which we should not hesitate a moment in calling *obscura*, approached very closely to his figure of *residua*. On the other hand, eastern specimens of *residua* from New Jersey and Pennsylvania showed more resemblance in the genitalia to the figure of *obscura* than to that of *residua*. The formation of the apical portion of the claspers in this group is apparently not entirely constant. As we have remarked above, careful breeding from known females will be necessary to decide the point as to whether the names represent distinct species; for the present we treat them as such.

The species extends over the same general region as does the preceding species; it has been recorded from as far north as Ottawa, Ontario (Gibson, 1911, Rep. Ent. Soc. Ont. for 1910, p. 111).

Catocala residua Grote

Plate II, fig. 18; Pl. XIII, fig. 2 (larva); Pl. XV, fig. 2 (larval head); Pl. XV, fig. 29 and Pl. XVII, fig. 3 (segments);
Pl. XVIII, figs. 29 and 30 (claspers).

Catocala residua GROTE, 1874, Proc. Boston Soc. Nat. Hist., XVI, p. 242. DODGE, 1901, Can. Ent., XXXIII, p. 225 (larva, as *obscura*).
BARNES AND McDUNNOUGH, 1918, Bull. Amer. Mus. Nat. Hist., XXXVIII, p. 152.

Fresh specimens show more of a blackish tinge on the primaries than does figure 18 of plate II; Holland's figure under *obscura* (Pl. xxxi, fig. 14) gives a good idea of the species. As already noted under the preceding species, the fringes of the secondaries are dusky with a small whitish area near apex; specimens before us from Middle Western States (Illinois and Arkansas) show considerable whitish suffusion throughout the whole fringes, although the primaries with their distinct and contrasted maculation (notably the white s. t. line) point to an association with *residua* rather than *obscura*. As is the case with the preceding species, further breeding experiments are much to be desired to establish the range of variation.

The species occurs throughout the same territory as does *obscura*.

Catocala sappho Strecker

Plate I, fig. 14; Pl. XVIII, figs. 31 and 32 (claspers).

Catocala sappho STRECKER, 1874, Lep. Rhop. Het., p. 95, Pl. XI, fig. 4.

This is one of the rarest of the black-winged *Catocala* and is at once recognized by the large amount of whitish suffusion on the primaries. Nothing is known of the life-history. The species was described from a single specimen from Texas and has been recorded from Virginia, South Carolina, Florida, and various states of the Ohio and Mississippi valleys. It is probably as wide-spread as the majority of the hickory-feeders, although seldom captured.

Catocala agrippina Strecker

Plate I, figs. 1-6; Pl. XVIII, figs. 35 and 36 (claspers).

Catocala agrippina STRECKER, 1874, Lep. Rhop. Het., p. 95, Pl. XI, figs. 1-3.*Catocala subviridis* HARVEY, 1877, Can. Ent., IX, p. 193.*Catocala barnesi* FRENCH, 1900, Can. Ent., XXXII, p. 190. BEUTENMÜLLER, 1903, Bull. Amer. Mus. Nat. Hist., XIX, p. 508.

Figure 1 on plate I represents the males which are rather constant in color; the females are much more contrastingly marked and more variable, several of the more marked forms being represented by figures 2, 3, and 5; figure 4 represents a rare aberration, specimens of which, according to Beutenmüller's manuscript, are contained in the National Museum at Washington and in the Strecker Collection in the Field Museum at Chicago. The form *subviridis* Harvey, of which *barnesi* French is a synonym, is characterized by the greenish suffusion over the primaries; a female from our own collection is depicted in figure 6. Holland's figure under this name (Pl. xxxi, fig. 4) is incorrect and should be referred to *agrippina*; the maculation points to it being a female but the body looks like that of a male.

Nothing is known of the early stages or food-plant. The species is distinctly a southern one, being fairly common in Texas and the Gulf States and extending up the Mississippi Valley to the neighborhood of St. Louis, Missouri. It has also been recorded as rare from New Jersey (Smith, 1910, Cat. Ins. N. J., p. 478), Pittsburg, Pennsylvania (Ehrman, 1895, Ent. News, V, p. 212), and Ohio (Dury, 1877, Can. Ent., IX, p. 178).

GROUP VI

Egg (as far as known) flat, disk-shaped, with slight raised rim. Larva with lateral filaments, usually without a dorsal prominence on the fifth abdominal segment. Male claspers more or less asymmetrical.

When more is known of the early stages it may become necessary to subdivide the group; concerning the early stages of *dejecta*, *nebulosa*, *subnata*, and *euphemia*, nothing is known, and these species are only tentatively included here; the early stages of several other species are more or less incomplete, so that a definite arrangement is impossible. The known larvæ are all hickory- or walnut-feeders.

Concerning the species with black hind wings, we doubt if they have all sprung from the same parent form; *resecta* seems, both in the larva and in the genitalia, to be closely associated with *residua* and *flebilis*, but may be separated by the presence of the lateral filaments in the larva; the other species show considerably more asymmetry in the genitalia than the above species, the apex of the left clasper being rather broad and prominently extended beyond the thinly chitinated area, while in the right clasper it is quite sharply pointed and scarcely projecting.

In the yellow-winged species the same discrepancies occur; *palæogama* larva has a distinct wart-like ridge on the dorsal portion of the fifth abdominal segment, but the species approaches close to *lachrymosa* in the form of the male genitalia; *neogama* has a larva approaching more the normal form but rather rougher in appearance; concerning the larvæ of the other species nothing is known.

Catocala resecta Grote

Plate II, figs. 11, 19, and 20; Pl. XII, fig. 20; Pl. XIII, fig. 1 (larva); Pl. XV, fig. 3 (larval head); Pl. XV, fig. 31, and Pl. XVII, fig. 6 (segments); Pl. XVIII, figs. 37 and 38 (claspers).

Catocala resecta GROTE, 1872, Trans. Amer. Ent. Soc., IV, p. 4. FRENCH, 1894, Can. Ent., XXVI, p. 97 (larva). BARNES AND McDUNNOUGH, 1918, Bull. Am. Mus. Nat. Hist., XXXVIII, p. 153.

Catabapta luctuosa HULST, 1884, Bull. Brooklyn Ent. Soc., VII, p. 53.

This common species is very similar in general type of maculation to *flebilis* and *vidua*, being in size intermediate between the two; the reniform is generally more filled with brown than in *vidua* and the rather prominent black shade through the submedian median fold of this latter species is lacking, a feature that is not very well brought out in the illustration (Pl. II, fig. 11) but is better seen in Holland's figures (Pl. XXI, figs. 5 and 8). The form *luctuosa* (Figs. 19 and 20) is characterized by the purplish-brown ground-color of the primaries. The species is quite constant in maculation and shows no sexual differences. The larva, which is quite distinct from that of *vidua*, is closely approached by that of *residua*, differing in the presence of lateral filaments.

The species extends throughout practically the whole of the eastern half of the United States, ranging northward into Ontario and Quebec.

Catocala dejecta Strecker

Plate II, fig. 8; Pl. XVIII, figs. 39 and 40 (claspers).

Catocala dejecta STRECKER, 1880, Bull. Brooklyn Ent. Soc., II, p. 97.

This species is not common. It is allied to *resecta* and *vidua* but has more pointed wings and a rather prominent white costal patch before the reniform, the remainder of the wing in the male being unicolorous gray; the female (Fig. 8) is rather more contrasted in maculation, with a short, black, basal dash. The early stages are unknown. The species appears to have the usual range of the hickory-feeders, being reported from various states of the Ohio and Mississippi valleys and from the Atlantic Coast States from New Hampshire to Virginia.

Catocala insolabilis Guenée

Plate I, figs. 7 and 8; Pl. X, fig. 23 (larval head); Pl. XII, fig. 11 (larva); Pl. XIX, figs. 1 and 2 (claspers).

Catocala insolabilis GUENÉE, 1852, Hist. Nat. Spec. Gen. Lep., VII, p. 94. BEUTENMÜLLER, 1903, Bull. Amer. Mus. Nat. Hist., XIX, p. 509 (larva).

This species is easily recognized by the dark shading along inner margin of primaries and by the practical lack of the white median band on the under side of both wings.

The only knowledge of the early stages that we have is Beutenmüller's note on the mature larva, figure 11 of plate XII presumably being based on the original of this description.

The species is wide-spread over the same general area common to all the hickory-feeders.

Catocala vidua (Abbot and Smith)

Plate I, fig. 17; Pl. XIII, fig. 6 (larva); Pl. XV, fig. 1 (larval head); Pl. XV, fig. 32, and Pl. XVII, fig. 12 (segments); Pl. XIX, figs. 3 and 4 (claspers).

Phalaena vidua ABBOT AND SMITH, 1797, Nat. Hist. Lep. Ga., II, p. 181, Pl. xci.

Catocala vidua BARNES AND McDUNNOUGH, 1918, Bull. Amer. Mus. Nat. Hist., XXXVIII, p. 155.

Catocala desperata GUENÉE, 1852, Hist. Nat. Spec. Gen. Lep., VII, p. 95. FRENCH, 1888, Can. Ent., XX, p. 28 (larva).

This species is one of the largest of the black-winged forms; its points of distinction from allied species have already been pointed out. The figure of the larva given by Abbot on his plate xci is certainly not that of *vidua* but is probably that of *ilia*, the fact that it is stated to be an oak-feeder being a further proof in favor of this association.

Vidua, as already noted by us, is one of the few species in which the larva has seven stages, probably due to the small size of the egg and the large size of the moth.

The species is rather common and wide-spread throughout the eastern half of the United States and extends into southern Ontario.

Catocala mæstosa (Hulst)

Plate I, fig. 20; Pl. X, fig. 25 (larval head); Pl. XI, fig. 7 (larva); Pl. XIX, figs. 5 and 6 (claspers).

Catocala vidua GUENÉE (*nec* Abbot and Smith), Hist. Nat. Spec. Gen. Lep., VII, p. 94.

Catocala viduata GUENÉE, 1852, Hist. Nat. Spec. Gen. Lep., VII, p. 400. BEUTENMÜLLER, 1902, Bull. Amer. Mus. Nat. Hist., XVI, p. 385, Pl. LII, fig. 6 (larva).

Catabapta mæstosa HULST, 1884, Bull. Brooklyn Ent. Soc., VII, p. 53.

Catocala guenei GROTE, 1887, Can. Ent., XIX, p. 115.

Catocala moderna GROTE, 1900, Can. Ent., XXXII, p. 191.

Hulst's action in bestowing the name of *mæstosa* on this species was correct according to the rules of nomenclature and the species must stand under this name. *Viduata* Guenée, which has been used for the species, was merely a slight change of the name *vidua* in order to avoid conflicting with other noctuid species of similar name, as can be clearly seen from Guenée's remarks on page 399 of the seventh volume of his work; it was not, as claimed by some, a recognition of error in the identification of Abbot's species and the proposal of a new name for an undescribed species. As names based on misidentifications have no validity and as *viduata* was clearly based on a misidentification of Abbot's species *vidua*, the name cannot stand.

The species is readily separable from *vidua* by its larger size and the lack of dark shading above inner margin of primaries; *moderna* Grote is said to be based on an undersized specimen of this species and the name not worthy of being retained.

Beutenmüller's description of the mature larva is the only notice of the early stages known to us; the figure (Pl. XI, fig. 7) is that of an immature specimen, data unknown.

The range of the species is practically the same as that of *vidua* but it is generally rare in the Northern States, being apparently commonest in Texas and the Gulf States.

Catocala lacrymosa Guenée

Plate II, figs. 1-7; Pl. XIX, figs. 7 and 8 (claspers).

Catocala lacrymosa GUENÉE, 1852, Hist. Nat. Spec. Gen. Lep., VII, p. 93. ROWLEY AND BERRY, 1915, Can. Ent., XLVII, p. 338 (larva). BARNES AND McDUNNOUGH, 1918, Bull. Amer. Mus. Nat. Hist., XXXVIII, p. 155.

Catocala ulalume STRECKER, 1878, Lep. Rhop. Het., Mar., p. 132.

Catocala lacrymosa var. *paulina* HY. EDWARDS, 1880, Bull. Brooklyn Ent. Soc., III, p. 54.

Catocala lacrymosa var. *evelina* FRENCH, 1881, Papilio, I, p. 110.

Catocala lacrymosa var. *zelica* FRENCH, 1881, Papilio, I, p. 111.

Catocala lacrymosa var. *emilia* HY. EDWARDS, 1881, Papilio, I, p. 117.

Catocala lacrymosa form *albomarginata* CASSINO, 1917, The Lepidopterist, I, p. 104.

This species is a very variable one. The typical form may be known by the rather contrasted appearance of the maculation of the primaries with prominent white lunules on the inner margin marking the t. a. and t. p. lines; the female (Pl. II, fig. 7) is more contrastingly marked than the male (Fig. 1). The primaries tend to become more or less suffused with deep brown, which has given occasion for several names; in *zelica* French (Fig. 2) the brown area is confined to the base and the inner side of the s. t. line, producing a form corresponding to the form *phalanga* of *palæogama*; in *evelina* French — *emilia* Hy. Edwards — (Fig. 3) the brown suffuses the outer and inner margins, leaving the costal half of the median area gray; and in *paulina* Hy. Edwards (Figs. 4 and 5) the whole wing with the exception of the outer and inner margins is brown. *Ulalume* Strecker is a form the status of which is rather doubtful; figure 6 is taken from a cotype male in the Hulst Collection at Rutgers College, New Brunswick, New Jersey, and represents a duller, more evenly colored specimen than the typical male *lacrymosa*; the types came from the vicinity of San Antonio, Texas, and, until more material from this region is available, no definite conclusions can be reached. The mature larva is unknown, our own breeding experiments being successful only as far as the fourth larval stage, at which the larva is about half grown.

The species is common in the Mississippi Valley (Arkansas and Missouri) and extends over the same territory as the other species of the group.

***Catocala palæogama* Guenée**

Pl. VI, figs. 18-20; Pl. XI, fig. 11, Pl. XIII, fig. 4 (larva); Pl. XV, fig. 6 (larval head); Pl. XV, fig. 30, and Pl. XVII, fig. 5 (segments); Pl. XIX, figs. 17 and 18 (claspers).

Catocala palæogama GUENÉE, 1852, Hist. Nat. Spec. Gen. Lep., VII, p. 97. FRENCH, 1888, Can. Ent., XX, p. 108 (larva). BEUTENMÜLLER, 1902, Bull. Amer. Mus. Nat. Hist., XVI, p. 388, Pl. LII, fig. 12 (larva).

Catocala phalanga GROTE, 1864, Proc. Ent. Soc. Phil., III, p. 6, Pl. III, fig. 1.

Catocala paleogama var. *annida* FAGER, 1882, Can. Ent., XIV, p. 120.

This common species is very similar to the preceding in its range of variation; as in *lacrymosa*, the females are more contrastingly marked than the males (Pl. VI, fig. 18) and we have much the same tendency to brown suffusion exhibited, the forms *phalanga* Grote (Fig. 19) and *annida* Fager (Fig. 20) corresponding to *zelica* and *evelina* respectively.

The larval stages have been fully described by Prof. French and our own breeding experiments have verified his results. There are six larval stages with five molts. As the figure given by Beutenmüller (Pl. XI, fig. 11) is not entirely satisfactory, we have refigured the larva on plate XIII, figure 4.

The geographical distribution of this species corresponds with that of *lacrymosa* but it is much commoner in the Northern States and in Ontario.

***Catocala nebulosa* Edwards**

Plate VI, fig. 17; Pl. XIX, figs. 9 and 10 (claspers).

Catocala nebulosa EDWARDS, 1864, Proc. Ent. Soc. Phil., II, p. 510. ROWLEY, 1912, Ent. News, XXIII, p. 209 (larva).

Catocala ponderosa GROTE AND ROBINSON, 1866, Proc. Ent. Soc. Phil., VI, p. 23, Pl. IV, fig. 2.

This species is readily recognizable from the figure; the dark basal area is very characteristic.

Apart from Rowley's note on the young larvæ and the statement that they refused to eat a number of the ordinary food-plants offered them on hatching, nothing is known of the early stages.

The species is rare but wide-spread; it has been reported from as far north as Hamilton, Ontario (Johnston, 1901, Rep. Ent. Soc. Ont. for 1900, p. 40) and extends from the Mississippi and Ohio valleys into the Eastern States.

***Catocala subnata* Grote**

Plate VI, figs. 15 and 16; Pl. XIX, figs. 13 and 14 (claspers).

Catocala subnata GROTE, 1864, Proc. Ent. Soc. Phil., III, p. 326, Pl. IV, fig. 5.

Apart from the paler secondaries with broader yellow postmedian band, this species may be distinguished from *neogama* by the paler gray color of the primaries with a tendency to develop a rather prominent white costal patch before the reniform. The males (Pl. VI, fig. 16) never show the black basal dash commonly (although not always) found in *neogama* males; the females are more contrastingly marked than the males and possess a basal dash but this is much narrower than in *neogama* females and is clean cut, without any of the dark shades above it so frequently seen in *neogama*.

The early stages are unknown but the larva is probably a hickory-feeder.

The species has been reported from Ontario (as far north as Ottawa) and Quebec and has a similar range to that of the preceding species. It is nowhere very common.

***Catocala neogama* (Abbot and Smith)**

PLATE VI, figs. 10-12; Pl. X, fig. 29 (larval head); Pl. XI, figs. 8 and 9 (larva); Pl. XIX, figs. 11 and 12 (claspers).

Phalæna neogama ABBOT AND SMITH, 1797, Nat. Hist. Lep. Ins. Georgia, II, p. 175, Pl. lxxxviii. DODGE, 1901, Can. Ent., XXXIII, p. 299 (larva). BEUTENMÜLLER, 1902, Bull. Amer. Mus. Nat. Hist., XVI, p. 385, Pl. LII, fig. 5 (larva). BARNES AND McDUNNOUGH, 1918, Bull. Amer. Mus. Nat. Hist., XXXVIII, p. 156.

Catocala communis GROTE, 1872, Trans. Amer. Ent. Soc., IV, p. 9.

Catocala snowiana GROTE, 1876, Check List North Amer. Noc., II, p. 41; 1882, Papilio, II, p. 8.

We have already noted the points of distinction between this and the preceding species. Figure 10 of plate VI represents a very pale male with only traces of the basal black streak; we have specimens before us that lack this streak entirely.

but have seen none that are any paler in color than the specimen figured; the average male is several shades darker, generally with a much better defined black basal dash. Figure 11 represents an extremely dark female; the females are always more contrastingly marked than the males and possess a prominent black basal dash; there is more or less brownish suffusion over the primaries, generally, however, less marked than in the figure.

Grote, under the impression that Texan specimens collected by Belfrage approached more closely to *neogama* as figured by Abbot and Smith than did the northern form (*vide* Check List, 1876, part 2, p. 41), proposed for this latter the name *communis*. Abbot's figure is rather crude in coloration and we imagine that too great stress cannot be laid on the exact color of secondaries. We have specimens from Vicksburg, Mississippi, a locality much closer to Abbot's type locality than is the Texan locality, and these cannot be distinguished from the more northern form; we imagine, therefore, that *communis* is correctly treated as a synonym of *neogama*.

Regarding the Texan form mentioned by Grote, we have a good series from San Antonio, Tiger Hill, and Black Jack Springs, Texas, before us and they certainly show the distinctive features mentioned by Grote. They would appear to be intermediate between *neogama* and *euphemia*, being a more even gray in both sexes with reduced brown shading, especially in the female, and with very clean cut maculation; all the males before us possess the black basal streak and the two sexes show much greater similarity in the markings of the primaries than is found in typical *neogama*. The secondaries are paler orange with a rather broader postmedian band than is usual in the typical form. The male of this form might easily be confused with *subnata* if it were not for the basal streak on primaries. As the form seems to represent a distinct geographical race, we propose for it the name *loretta*, our types being 4 males and 3 females from the above mentioned localities in the Barnes Collection.

Figure 12 of plate VI is that of the type female of *snowiana* Grote. As stated by the author himself, it is an aberration but the name was later extended (Papilio II, p. 8) to apply to a presumable race from Kansas which showed darker primaries and broader black bands on secondaries. We do not know how constant these points of distinction may be as we have no material from Kansas before us; several bred specimens, however, from Vinton, Iowa, in the collection seem to carry out this idea fairly well, so that the name may be used for a trans-Mississippi racial form. The adult larva, which was quite recognizably figured by Abbot has been described several times; the full life-history is still a desideratum as our own breeding experiments failed to carry the larva beyond the fourth stage. In its rather rough, rugged appearance the larva bears a certain similarity to that of *ilia*.

The species is quite common and wide-spread, extending throughout the eastern half of the United States and northward into Ontario and Quebec.

Catocala euphemia Beutenmüller

Plate VIII, fig. 26; Pl. XIX, figs. 15 and 16 (claspers).

Catocala euphemia BEUTENMÜLLER, 1907, Bull. Amer. Mus. Nat. Hist., XXIII, p. 938.

Euphemia may be merely a southwestern race of *neogama* but, as there is some slight difference shown in the male claspers, we treat it as a species until the larval history is known. The even dark gray color of the primaries separates it from typical *neogama*.

The types of this species were four males from the Huachuca Mountains, Arizona, and from Texas. It would be well to limit the name to the Arizona type, as it is possible that the Texan specimens belong to our new form, *loretta*.

SECTION II

Catocala SCHRANK, 1802, Fauna Boica, II, 2, p. 158 (type, *C. fraxini* Linnæus).

Lamprosia HÜBNER, 1820, Samml. Exot. Schmett., II (type, *amatrix* Hübner).

Astiotes HÜBNER, 1825, Verzeichniss, p. 277 (type, *dilecta* Borkh.).

Andrewsia GROTE, 1882, New Check List, p. 41 (type, *messalina* Guenée).

Fore tibiae unspined; tarsi without the extra row of spines.

As we have already mentioned, there are two exceptions to the latter clause: both *aholibah* and *illecta* show a fourth row of tarsal spines; the former is decidedly aberrant in other respects, and probably, with two European species, forms

a group of good generic value; *illecta*, however, is apparently merely a connecting link between the previous section and this one, all its closest relatives being normal with respect to the tarsal spinulation. Hampson (1913, Cat. Lep. Phal. Brit. Mus., XII) unsuccessfully attempts to subdivide the group on the spining of the hind tibiae, his genus *Mormonia* containing species with spines both above and between the spurs, while *Catocala* is restricted to species with only a few spines between the spurs and *Ephesia* contains those species with non-spined hind tibiae. We have already shown, however, that *Mormonia* has been incorrectly applied, as the type, *epione*, belongs in the preceding section. We have found the spinulation very variable; some few species apparently have the hind tibiae always well spined for nearly the full length (*illecta*); others, again, show a small group of spines near the base of the tibiae and several spines between the spurs but in the same species each or even both of these groups may be entirely wanting. As an example of the variability and as a proof of the fallacy of such a method of subdivision, we might note that *delilah* Strecker is placed by Hampson in *Mormonia* while its Arizona race, *desdemona* Hy. Edwards, is relegated to the genus *Ephesia*, which is characterized by entire lack of spining of hind tibiae. In the genus *Catocala*, as restricted by Hampson, the same feature may be noted; in several species, notably of the *babayaga* group, the few spines normally found between the spurs may be entirely lacking in some specimens, while Hampson himself notes that in certain species included in *Ephesia* single spines occur between the spurs (*violenta*).

GROUP VII

(*Astiotes* Hübner)

Egg large, hemispherical, minutely granulate but not ribbed. Larva with lateral filaments and transverse prominence on fifth abdominal segment. Male claspers symmetrical. A fourth row of tarsal spines present.

The single North American species, *aholibah* Strecker, belonging to this group is closely related to the European species *sponsa* and *dilecta*. The male genitalia are entirely distinct from those of any other species and this, combined with the peculiar non-ribbed egg and the presence of a fourth row of tarsal spines, offers points of distinction which are probably of generic value. The larvæ are oak-feeders.

Catocala aholibah Strecker

Plate III, figs. 1 and 2; Pl. XIV, fig. 6 (larva); Pl. XV, fig. 9 (larval head); Pl. XV, fig. 38, and Pl. XVI, fig. 13 (segments); Pl. XIX, figs. 19 and 20 (claspers).

Catocala aholibah STRECKER, 1874, Lep. Rhop. Het., p. 72, Pl. IX, fig. 5. BARNES AND McDUNNOUGH, 1913, Psyche, XX, p. 191 (larva). *Catocala aholibah* var. *coloradensis* BEUTENMÜLLER, 1903, Bull. Amer. Mus. Nat. Hist., XIX, p. 507.

This well-known species is distinctly western in its range. It extends from Colorado, west of the divide, through Utah into New Mexico and Arizona and is common along the Pacific Coast from Vancouver Island, B. C., to southern California, occurring all through the Sierras at moderate elevations.

The form *coloradensis* Beutenmüller, the type of which is before us, is based on large pale-colored females such as the specimen figured on plate III, figure 2. This form is, however, by no means constant in Colorado and forms no geographical race; in our series bred from ova from Truckee, California, and Provo, Utah, about one-quarter of the specimens might be referred to *coloradensis*, the remainder being as dark as, or darker than, typical specimens.

GROUP VIII

Egg large, heavily ribbed; almost hemispherical. Larva rough and protuberant in appearance but without an actual wart on the fifth abdominal segment; lateral fringes present but short. Male claspers slightly asymmetrical; apices of claspers pointed but not projecting beyond the less chitinous ventral area; harpes spoon-shaped.

The two species, *ilia* and *zoe*, included in this group are apparently, in the larval stages, a further development of the *neogama* type; they are readily distinguished in all three stages from other North American species but are intimately related one to the other. Both are oak-feeders.

Catocala ilia (Cramer)

Plate VI, figs. 4-7; Pl. X, fig. 26 (larval head); Pl. XII, fig. 9 (larva); Pl. XIX, figs. 23 and 24 (claspers).

- Noctua ilia* CRAMER, 1775, Pap. Exot., I, p. 53, Pl. xxxiii, figs. B and C. FRENCH, 1884, Can. Ent., XVI, p. 12 (larva). BEUTENMÜLLER, 1907, Bull. Amer. Mus. Nat. Hist., XXIII, p. 149.
Catocala uxor GUENÉE, 1852, (nec Hübner, 1802) Hist. Nat. Spec. Gen. Lep., VII, p. 92.
Catocala ilia var. *obsoleta* WORTHINGTON, 1883, Papilio, III, p. 40.
Catocala ilia var. *umbrosa* WORTHINGTON, 1883, Papilio, III, p. 41.
Catocala ilia var. *decorata* WORTHINGTON, 1883, Papilio, III, p. 41.
Catocala ilia var. *confusa* WORTHINGTON, 1883, Papilio, III, p. 41.
Catocala ilia var. *conspicua* WORTHINGTON, 1883, Papilio, III, p. 40. BEUTENMÜLLER, 1907, Bull. Amer. Mus. Nat. Hist., XXIII, p. 150.
Catocala ilia var. *duplicata* WORTHINGTON, 1883, Papilio, III, p. 40.
Catocala ilia var. *albomacula* BUTLER, 1892, Entomol., XXV, p. 284.
Catocala ilia var. *normani* BARTSCH, 1916, The Lepidopterist I, p. 3, Pl. I.

This common species is very variable in the coloration of the reniform and the surrounding area and Worthington has given names to almost all the forms which occur, his types now being in the Barnes Collection. The typical form, according to Cramer's figure, has the reniform dark but ringed with white, the subreniform white, and the ordinary cross-lines partially marked with white much as in *decorata* Worthington. Holland's figure (Pl. xxxiv, fig. 7), under the name *osculata* Hulst, is fairly typical of *ilia*. The most conspicuous form is that with the solid white reniform (Pl. VI, fig. 7), which for a long while has gone under the name *uxor* Guenée but, as this name is preoccupied by *uxor* Hübner, the name *conspicua* Worthington must be used. Figure 4 is taken from a small Newfoundland specimen and represents the dark unicolorous form *umbrosa* Worthington; figure 5, with the subreniform better defined, is *confusa* Worthington; and figure 6 is close to *duplicata* Worthington, which typically has the subreniform, as well as the reniform, entirely white; *obsoleta* Worthington is similar to the typical form but without the white subreniform; *normani* Bartsch is suffused with brown in the median area.

The larva has been described several times; the description of the early stages by Prof. French is very accurate and is confirmed by our own observations; Rowley records (1909, Ent. News, XX, pp. 128 and 129) five larval molts, but this is erroneous; there are only four. The larval figure given by Beutenmüller (Pl. XII, fig. 9) is poor, as the larva is represented with altogether too smooth an appearance; in reality it is quite rough, each segment showing dorsal and lateral protuberances somewhat similar to those found in *neogama* larvæ but more pronounced; it is practically identical with the larva of *zoe* which Mr. Prince has excellently reproduced on plate XIV, figure 5.

The species ranges over the whole eastern half of the United States, extending from Texas and Florida northward to Newfoundland, Quebec, Ontario, and Minnesota. It is one of the earliest species on the wing; we personally have taken the imago in Florida in late April and in Illinois it is generally abundant in June and July.

Catocala zoe Behr

Plate VI, figs. 8 and 9; Pl. XIV, fig. 5 (larva); Pl. XV, fig. 10 (larval head); Pl. XV, fig. 42, and Pl. XVI, fig. 10 (segments).

- Catocala zoe* BEHR, 1870, Trans. Amer. Ent. Soc., III, p. 24. BARNES AND McDUNNOUGH, 1913, Psyche, XX, p. 189 (larva).
Catocala ilia var. *osculata* HULST, 1884, Bull. Brooklyn Ent. Soc., VII, p. 43.
Catocala reiffi CASSINO, 1917, The Lepidopterist, I, p. 62, Pl. IV.

This species has generally been treated as the western race of *ilia* but we see no reason for not considering it a good species. It is distinguished by its paler-colored secondaries, which are salmon-colored or orange, and the grayer tone of the primaries, which lack the velvety tinge of *ilia* and have a smaller reniform and more evenly dentate t. p. line; we have seen none of the variability in coloration of the reniform and surrounding areas so commonly met with in *ilia*. Hulst applied the name *osculata* to a form with yellow secondaries; Holland's figure under this name should be referred to *ilia*, as already noted. *Reiffi*, recently described as a new species by Mr. S. Cassino, seems, as far as can be judged from the figure, to be merely a small form of *zoe*; the author places it next to *zoe* but neglects to state any point of maculation whereby it may be separated from this species.

The larva is extremely close to that of *ilia*, so close as to render it optional whether *zoe* be treated as a race of *ilia* or as a good species.

The range of *zoe* is from Colorado, west of the divide, southward into Arizona and westward into California; in the north it is recorded from Cartwright, Manitoba (1917, Can. Ent. XLIX, p. 89) and Henry Edwards mentions it from

Vancouver Island (1875, Pac. Coast Lep. No. 14, p. 8) but this record needs verification; it is not included in the List of the British Columbia Entomological Society. The type locality is Searsville, California, a place we have been unable to find on the map but probably in either Napa or Marin Counties, to judge by Hy. Edwards' remarks in the article above cited.

GROUP IX

Egg small, hemispherical, faintly ribbed. Larva smooth, without a wart on the fifth abdominal segment; lateral filaments present but obsolescent. Male claspers almost symmetrical, with apex rather blunt.

The nearest relative of the single North American species, *cerogama*, included in this group is apparently *lara* from Siberia and Japan. The larva is quite primitive in its type of maculation and is almost without filaments; the peculiar enlargement of tubercles II on the eighth abdominal segment to form short dorsal horns is quite characteristic and tends to remind one of the larvæ of *palæogama* and *aholibah*. The male claspers are almost symmetrical but the left clasper shows a peculiar raised bunch of tooth-like prominences near the base of the harpe. The food-plant of the larva is *Tilia*.

Catocala cerogama Guenée

Plate VI, fig. 1; Pl. XIX, figs. 21 and 22 (claspers).

Catocala cerogama GUENÉE, 1852, Hist. Nat. Spec. Gen. Lep., VII, p. 96. ROWLEY AND BERRY, 1909, Ent. News, XX, p. 17 (ovum); 1910, Ent. News, XXI, p. 105 (larva).

Catocala cerogama var. *bunker*i GROTE, 1876, Can. Ent., VIII, p. 230.

Catocala cerogama var. *aurella* FISCHER, 1885, Can. Ent., XVII, p. 133.

Catocala cerogama var. *eliza* FISCHER, 1885, Can. Ent., XVII, p. 134.

The maculation of the secondaries easily distinguishes this species from the other yellow-winged ones. Several aberrational forms have received names. *Bunker*i Grote is characterized as having "the band on secondaries extremely narrow and the yellow basal shade entirely lost. On the fore wings the median space is deeply brown tinted." *Aurella*, to judge by the description, is a form with a bright yellow and clearly defined basal area on secondaries and *eliza* has prominent white shading on the costa before the reniform, at the apex of the wing, and on the inner margin below the subreniform. We have been unable to give a figure of the larva, the only material before us being a very poorly inflated specimen.

The species is distinctly northern in its distribution; it is common in Ontario and Quebec, extending south through the New England States to Virginia and west through the Ohio Valley to Missouri; in the northern portion it ranges westward into Manitoba (1917, Can. Ent., XLIX, p. 89).

GROUP X

(*Catocala* Schrank)

Egg hemispherical, ribbed, the ribs branching irregularly below apex. Larva with lateral filaments and a transverse wart on the fifth abdominal segment. Male claspers somewhat asymmetrical, apex of left clasper being pointed and extending well beyond the thinly chitinized ventral area.

We have included, for the sake of convenience, *relicta* and *marmorata* in this group. In the former species the claspers are practically symmetrical, the apices rounded, and the harpe is narrowly triangular, but both egg and larva show great affinity to those of the other members of the group; in *marmorata* the claspers and their armature point to quite a distinct form but nothing is known of the early stages, so we place the species provisionally in this group. The larvæ, as far as is known, are willow- and poplar-feeders and have normally four molts, *relicta* varying in having five.

This group is the most extensive in the genus, including a large number of our western forms which are apparently of quite recent origin and still in a rather unstable condition, as is shown by the great tendency to form local races and the variability in the color and maculation of the primaries, often making it extremely difficult to place single specimens correctly. The similarity of the male genitalia and their tendency to slight variation within the species render these useless as a means of specific differentiation and give further proof of the recent origin of the group.

***Catocala relictata* Walker**

Plate I, figs. 9-13; Pl. XIII, fig. 14 (larva); Pl. XV, fig. 5 (larval head); Pl. XVI, fig. 14, and Pl. XVII, fig. 10 (segments); Pl. XIX, figs. 25 and 26 (claspers).

Catocala relictata WALKER, 1857, Cat. Lep. Het. Brit. Mus., XIII, p. 1192. CLARK, 1888, Can. Ent., XX, p. 17 (larva). BEUTENMÜLLER, 1903, Bull. Amer. Mus. Nat. Hist., XIX, p. 505. ROWLEY AND BERRY, 1910, Ent. News, XXI, p. 109 (larva).

Catocala relictata var. *bianca* HY. EDWARDS, 1880, Bull. Brooklyn Ent. Soc., III, p. 54.

Catocala relictata var. *phrynia* HY. EDWARDS, 1880, Bull. Brooklyn Ent. Soc., III, p. 54.

Catocala elda BEHRENS, 1887, Can. Ent., XIX, p. 199.

Catocala relictata var. *clara* BEUTENMÜLLER, 1903, Bull. Amer. Mus. Nat. Hist., XIX, p. 506.

The typical form of this species is the dark one figured on plate I, figures 9 and 13; the form which for a long time was erroneously considered to be typical has been named *clara* by Beutenmüller (Fig. 11); *bianca* Hy. Edwards is a synonym of the typical form; and *phrynia* Hy. Edwards (Fig. 10) is the form with even gray primaries. *Elda* Behrens (Fig. 12) was described as a good species from Portland, Oregon, but is at the best a mere geographical race found on the Pacific Coast from British Columbia to Oregon; it is distinguished by its very dark primaries (darker than *phrynia*) and narrow-banded secondaries, the band usually showing traces of violet shading; it is apparently best defined on Vancouver Island, B. C., for specimens before us from the interior of Washington State can scarcely be separated from *phrynia*.

The species is a near ally of the European *fraxini* Linnæus and the relationship is clearly shown in the larvæ, which are extremely close. Clark, in his otherwise excellent account of the larval stages, has omitted one of the molts; this is rectified by Rowley and Berry, our own breeding experiments verifying their statement that there are five molts.

In the northern woods of Manitoba, Ontario, and Quebec the species is quite common and extends through the New England States into New York, New Jersey, and Pennsylvania. In the Middle West it occurs in the border states but has not been reported south of northern Illinois and Iowa. Snow records it from Idaho Springs, Colorado, and we have a single specimen before us of the form *clara* from Provo, Utah. In the southern portion of its area of distribution it is scattered and rare, being distinctly a northern species. The race *elda*, as already noted, occurs in the northern Pacific States.

***Catocala marmorata* Edwards**

Plate III, fig. 19; Pl. XIX, figs. 27 and 28 (claspers).

Catocala marmorata EDWARDS, 1864, Proc. Ent. Soc. Phil., II, p. 508. STRECKER, 1874, Lep. Rhop. Het., 73, Pl. IX, fig. 6.

The original description states that Yreka, Siskiyou County, California, is the type locality of this striking species but we imagine this to be an error. Strecker's figure is drawn from the type specimen, which at that time was in the collection of the Academy of Sciences, Philadelphia; at the present time it is misplaced or lost, Edwards having probably never troubled to place a type label on the specimen, as is the case with so many of his diurnal species. Fortunately, Strecker's figure leaves no doubt as to the identity.

The species is wide-spread but everywhere rare and nothing is known of its early stages. It extends along the Atlantic Coast from Vermont to North Carolina and westward through the Ohio Valley to Missouri; it has also been recorded from southern Ontario and Wisconsin.

***Catocala parta* Guenée**

Plate III, fig. 14; Pl. X, fig. 34 (larval head); Pl. XI, fig. 4 (larva); Pl. XIII, fig. 10 (larva); Pl. XX, figs. 1 and 2 (claspers).

Catocala parta GUENÉE, 1852, Hist. Nat. Spec. Gen. Lep., VII, p. 84, Pl. XVI, fig. 1. BEUTENMÜLLER, 1902, Bull. Amer. Mus. Nat. Hist., XVI, p. 387, Pl. LI, fig. 9 (larva). BARNES AND McDUNNOUGH, 1918, Bull. Amer. Mus. Nat. Hist., XXXVIII, p. 157.

Catocala parta var. *perplexa* STRECKER, 1873, Lep. Rhop. Het., p. 38, Pl. V, fig. 11.

Catocala parta var. *petulans* HULST, 1884, Bull. Brooklyn Ent. Soc., VII, p. 43.

This species is fairly constant in maculation and may be known by its pale gray primaries and salmon-colored secondaries. *Perplexa* Strecker is a form with rather darker ground-color of primaries and an oblique white area from costa to subreniform; *petulans* Hulst was based on a specimen with yellowish secondaries.

Besides Beutenmüller's figure of the larva on plate XI, figure 4, a figure which is rather more characteristic will be found on plate XIII, figure 10, drawn from material collected around Decatur, Illinois.

The species is distinctly a northern one. It is common through Manitoba, Ontario, and Quebec, and the eastern half of the United States with the exception of the Gulf States and the southern Atlantic ones. It has been reported from Colorado and we have a few specimens from the vicinity of Provo, Utah, where it appears to be rare.

Catocala luciana Strecker

Plate VII, figs. 21-23; Pl. XX, figs. 3 and 4 (claspers).

Catocala luciana STRECKER, 1874, Lep. Rhop. Het., p. 99. Hy. EDWARDS, 1875, Pacific Coast Lep., 14, p. 5. ROWLEY, 1913, Ent. News, XXIV, p. 197 (larva). BARNES AND McDUNNOUGH, 1918, Bull. Amer. Mus. Nat. Hist., XXXVIII, p. 158.

Catocala nebraskæ DODGE, 1875, Can. Ent., VII, p. 2.

Catocala nebraskæ var. *somnus* DODGE, 1881, Can. Ent., XIII, p. 40.

The excellent figures of this species should render it easily identifiable. The form with dark blackish primaries (Fig. 23) has been named *somnus* by Dodge; it occurs along with the type form.

The larva is very similar to that of *briseis* and *verecunda*; we have noted the main points of distinction in our article on the life-history. Our breeding was, unfortunately, done too late to permit of a figure being included in these present plates.

The species is a native of the prairies, occurring in the states west of the Mississippi as far as the foot-hills of the Rocky Mountains. It has been reported as rare in southern Manitoba (Gibson, 1910, Rep. Ent. Soc. Ont. for 1909, p. 118) and is fairly common in the vicinity of Minneapolis, Minnesota, from which locality our breeding material came. We have no records of its occurrence south of Kansas.

The name *luciana* has generally been ascribed to Hy. Edwards but, unfortunately, the rules of nomenclature demand that this species along with *mariana*, *hippolyta*, *cleopatra*, and *perdita* (all described in the same paper) be credited to Strecker who drew up descriptions, using Hy. Edwards' manuscript names, and published them prior to the appearance of Hy. Edwards' descriptions in No. 14 of his Pacific Coast Lepidoptera. This procedure is somewhat of an injustice to Hy. Edwards and throws no very creditable light on Strecker's methods, but we imagine that "Time, the great healer," whom Mr. Strecker was so fond of invoking, has already smoothed over any ill-feeling that might have arisen in this connection.

Catocala verecunda Hulst

Plate VIII, figs. 1-5, 8, 9, and 11; Pl. XIII, fig. 11 (larva); Pl. XV, fig. 15 (larval head); Pl. XVI, fig. 21, and Pl. XVII, fig. 7 (segments); Pl. XX, figs. 5 and 6 (claspers).

Catocala verecunda HULST, 1884, Bull. Brooklyn Ent. Soc., VII, p. 45. BARNES AND McDUNNOUGH, 1913, Psyche, XX, p. 199 (larva, as *faustina*).

Catocala diantha BEUTENMÜLLER, 1907, Bull. Amer. Mus. Nat. Hist., XXIII, p. 937. BARNES AND McDUNNOUGH, 1913, Psyche, XX, p. 200.

Verecunda is very closely allied to *luciana* Hy. Edwards, and its form *diantha* (Pl. VIII, fig. 9) would correspond to the dark form, *somnus*, of *luciana*. The best point of distinction between the two species, which occur together in eastern Colorado, seems to be found in the color of the secondaries, which in *luciana* show a marked salmon tinge much as in *parta* while in *verecunda* the color inclines toward pink, in some cases, especially in bred specimens, being bright carmine.

Typical *verecunda*, of which figure 1 of plate VIII is the best representation, has the cross-lines showing very prominently on a gray background; the female (Fig. 2) is rather more contrastingly marked; figures 3 and 4 are listed by Beutenmüller under this name and we presume are slight varietal forms of this species; figure 5 was unnamed in the text but would appear to us, as far as can be judged from a mere figure, to be best referred here. *Diantha* is well represented by figure 9; Beutenmüller has also listed figure 8 under this name, but the figure looks to us rather doubtful and might possibly refer to a *hermia* form. Figure 11, listed as a variety of *faustina*, we imagine better placed under *diantha*; it is a peculiar suffused form of rather mossy appearance, with distinct ruddy shades following the t. p. line; the original of the figure is before us from Denver, Colorado, and we also have a single specimen from Provo, Utah.

In 1913, as a result of breeding, we ventured the assertion that *verecunda* was merely a variety of *faustina*; as a result of further breeding experiments in 1914, in which each batch of ova from known females was kept separate, we have come to the conclusion that this was a mistake and that we have in *verecunda* a valid species with *diantha* as a dark variety. Ova of both *verecunda* and *diantha* hatch from one to two weeks earlier than those of *faustina* and the period of hatching is not very extended, occupying scarcely more than a week, while in *faustina* ova from a single female may hatch singly and in small numbers for a period of more than a month. We were uniformly successful in bringing larvæ of *verecunda* and *diantha* to pupation, but failed notably with *faustina* and its forms, although using the same food-plant. Most larvæ died before reaching the third stage, but we were finally successful in bringing a few larvæ to maturity; these proved to be distinct in the later stages from those of *verecunda*, although closely related.

The species is distinctly a Rocky Mountain form. The type series came from Montana and the species is common throughout Colorado and Utah, west of the divide; it has also been taken in the canyons near Denver and in this region is found together with *luciana*, with which it is liable to be confused. Southward it extends into New Mexico and Arizona and in the north it has been recorded from Cartwright, Manitoba (1917, Can. Ent., XLIX, p. 90).

Catocala irene Behr

Plate IV, figs. 9-13; Pl. XIII, fig. 13 (larva); Pl. XV, fig. 21 (larval head); Pl. XVI, figs. 6 and 18 (segments); Pl. XX, figs. 7 and 8 (claspers).

Catocala irene BEHR, 1870, Trans. Amer. Ent. Soc., III, p. 24. HY. EDWARDS, 1875, Pacific Coast Lep., XIV, p. 5. BARNES AND McDUNNOUGH, 1913, Psyche, XX, p. 202 (larva).

Catocala irene var. *virgilia* HY. EDWARDS, 1880, Bull. Brooklyn Ent. Soc., III, p. 56.

Catocala irene var. *volumnia* HY. EDWARDS, 1880, Bull. Brooklyn Ent. Soc., III, p. 56.

Catocala irene var. *valeria* HY. EDWARDS, 1880, Bull. Brooklyn Ent. Soc., III, p. 56.

According to Hy. Edwards, who had opportunities of examining the type specimen (since destroyed) the typical form is the one with rather even brown primaries, such as is figured on plate IV, figures 9 and 10; a specimen of this form, marked "true to type," exists in the Hy. Edwards' Collection in The American Museum of Natural History, New York. The form *virgilia* (Fig. 11), which occurs along with the type form, is strongly suffused with black-brown on the primaries and the rarer form *volumnia* (Fig. 12) is much paler, with white shades preceding and following the reniform and defining outwardly the t. p. line. Figure 13 depicts a very brilliant female specimen from Los Angeles; we have other similar ones before us from San Diego County and it is possible that these may be closer to the typical form, described from Fort Tejon, San Bernardino County, California, than those identified as such by Henry Edwards, whose material came largely from Mendocino County, California, a much more northern locality. Specimens frequently occur with a diffuse dark basal streak, at times extending almost the entire length of the submedian fold.

The form *valeria* Hy. Edwards (Fig. 10) represents a good geographical race occurring in the western Rocky Mountain region from Utah to Arizona; it is characterized by the pale even brown color of the primaries and the narrow black median band of secondaries.

The larva of the more typical Californian forms has never been bred and, until this is done, knowledge concerning the relationship between the forms remains unsatisfactory; in the case of *volumnia*, we may be dealing with a race or even a good species. Our own larval notes were drawn up from material of the race *valeria* from Provo, Utah.

The species extends through California from Mendocino County to San Diego County. It probably will be found at considerable altitudes in the Sierras, as we have specimens before us of a rather paler, smaller form from the vicinity of Truckee. Beutenmüller records the variety *volumnia* from Cartwright, Manitoba, but this needs verification; as already stated, the race *valeria* is found in the Rocky Mountains of Utah and Arizona.

Catocala allusa Hulst

Plate V, fig. 15; Pl. XX, figs. 9 and 10 (claspers).

Catocala allusa HULST, 1884, Bull. Brooklyn Ent. Soc., VII, p. 45. BEUTENMÜLLER, 1907, Bull. Amer. Mus. Nat. Hist., XXIII, p. 147. *Catocala frenchii* POLING, 1901, Can. Ent., XXXIII, p. 125.

The figure given (Pl. V, fig. 15) is not very satisfactory; the specimen figured is smaller than usual and shows none

of the pale lilac-gray coloration of primaries which is characteristic of this species; ordinarily, the t. a. line is even more dentate than in the figure, the tooth above the inner margin being very prominent; the black dash in median area below the subreniform is not constant.

Figure 14 of plate V is listed by Beutenmüller as a dark form of *californica* from Cartwright, Manitoba. We have seen nothing from this locality which agrees with this figure; it is certainly not *californica* as we have identified it but might possibly be referred tentatively to *allusa*. Even so, the locality is strange and leaves some doubt in our mind as to the authenticity of the label.

Of the early stages of this species nothing is known and until they have been worked out the relationships with other allied forms will not be fully known.

The range of the species is from Vancouver Island, British Columbia, southward through Washington and Oregon and down the Sierras into central California. We took the species at moderate elevation in Siskiyou County and have several specimens before us from the vicinity of Truckee. The record of Colorado given by Beutenmüller from specimens in the Doll Collection needs verification; our own experience of the labelling of the noctuids in this collection is that it is not at all accurate.

Catocala faustina Strecker

Plate V, figs. 16-20; Pl. XX, figs. 11 and 12 (claspers).

Catocala faustina STRECKER, 1873, Lep. Rhop. Het., p. 21, Pl. III, fig. 8. BARNES AND McDUNNOUGH, 1918, Bull. Amer. Mus. Nat. Hist., XXXVIII, p. 160.

Catocala faustina var. *zillah* STRECKER, 1878, Lep. Rhop. Het., March, p. 129.

Catocala faustina var. *carlota* BEUTENMÜLLER, 1897, Bull. Amer. Mus. Nat. Hist., IX, p. 212, fig. 1.

Catocala faustina var. *lydia* BEUTENMÜLLER, 1907, Bull. Amer. Mus. Nat. Hist., XXIII, p. 939.

Catocala cærulea BEUTENMÜLLER, 1907, Bull. Amer. Mus. Nat. Hist., XXIII, p. 939.

This species shows great variability in the coloration and maculation of the primaries and probably tends to form local races. The typical form is fairly well represented on plate V, figure 16, although the color of primaries is possibly rather too deep, the ground tint being usually of a pale blue-gray or a light ochreous gray; Holland's figure (Pl. XXXIII, fig. 3) well represents this latter form. *Zillah* Strecker was described as a form in which considerable pinkish suffusion is intermingled with the gray of the primaries; the author neglected to state that his type also showed a blackish streak running through the submedian fold and we believe it would be well to restrict the name to such forms, as the amount of pink is very variable and occurs in specimens with and without this basal streak. Figure 17 represents the form well; it occurs together with the typical one. A form with heavy black suffusion over the greater part of the primaries has been called *lydia* by Beutenmüller and the type is figured on figure 18; this also occurs together with typical *faustina* but not so commonly as *zillah*. *Cærulea* Beutenmüller of which figure 19 is a representation of the type, is probably a race found in Oregon and extending into southern British Columbia; it was described as a good species and differs from *faustina* in the deep blue-gray color of the primaries; we have been unable to match it with any of our material. *Carlota* Beutenmüller (Fig. 20) is apparently a mere aberrational female, possibly not even of *faustina*; it was described from a single female from Lake Tahoe, California, and no other specimens are known; we have specimens from Utah which approach it but are not nearly so extreme.

The species has been generally confused with *verecunda* but is somewhat smaller and narrower winged; specimens with considerable ruddy suffusion are easily identified, since *verecunda* shows practically none of this coloration. We would call attention to the peculiar scale formation found in the reniform and beyond the t. p. line, the scales being placed so as to give an appearance of distinct minute vertical ribbing; this is generally quite well marked in *faustina* but scarcely at all noticeable in *verecunda* forms and has served very satisfactorily in many instances to separate *faustina* from its allies. The same scaling is found in *briseis* and its races, which, however, are not so liable to be confused with *faustina*.

The larval history, especially the last two stages, clearly proves that *faustina* is specifically distinct. We regret that we are unable to give a figure of the mature larva, but our efforts to breed the species were successful only after the plates had been completed; we have noted the main points of distinction in our article on the life-history.

The species is typically a Rocky Mountain form, occurring west of the divide and being particularly common in Utah; records from the East are most certainly erroneous and based on misidentifications. In the Sierras we find the species common in the Lake Tahoe region, the specimens being rather smaller than Utah ones; it probably extends along

the eastern slopes of these mountains into Oregon, where we meet with the presumable race *cærulea* which has also been reported (Gibson, 1911, Rep. Ent. Soc. Ont. for 1910, p. 111) from Penticton, British Columbia. Concerning its range in the northern Rocky Mountain States we have no data, although there seems to be no reason why it should not occur here. Beutenmüller's manuscript records it from Montana and Wyoming.

Catocala cleopatra Strecker

Plate V, figs. 12 and 13; Pl. XX, figs. 17 and 18 (claspers).

Catocala cleopatra STRECKER, 1874, Lep. Rhop. Het., p. 99. HY. EDWARDS, 1875, Pacific Coast Lep., XIV, p. 2.
Catocala perditia STRECKER, 1874, Lep. Rhop. Het., p. 100. HY. EDWARDS, 1875, Pacific Coast Lep., XIV, p. 4.

The species has been generally listed as a variety of *californica* but, as our conception of this latter species is different from the usual one, we treat *cleopatra* as a good species until it can be bred and its relationships determined. We credit the species to Strecker for reasons already stated under *luciana*; there is, however, no type of *cleopatra* in the Strecker Collection nor did he mention it in his list of types. The specimen from the same locality which served Hy. Edwards for his description and which presumably may be considered a metatype exists in the American Museum at New York and a photograph of it lies before us. The type of *perditia* is in the Strecker Collection in Chicago and of this also we have a photograph. From a comparison of these photographs and a personal knowledge of the specimens we cannot see that *perditia* is anything but a slightly better marked form of *cleopatra* with rather more white shading before the reniform; the worn nature of the *perditia* type gives it a rather different appearance, which has erroneously led to its being referred as a variety of *faustina*. *Cleopatra* is well represented on plate V, figure 12 and *perditia* by figure 13; in our opinion, the latter name is scarcely worth retaining; the primaries have a certain olivaceous mossy appearance which is quite lacking in all species except *francisca* and show the same peculiar scale formation around the reniform as is found in *faustina*. Holland's figure (Pl. xxxv, fig. 14) is certainly not *cleopatra*; it looks to us more like *hermia* than anything else; his figure 13 on same plate (as *stretchi*) looks closer to true *cleopatra* but might be a *briseis* form; without a knowledge of the actual specimen it is impossible to tell. Nothing is known of the early stages.

The two forms of this species were described from specimens from Contra Costa County and San Mateo County, California. We have a fine series before us from Alameda County and others from the vicinity of San Francisco. As far as we know, the true species is confined to the territory around San Francisco Bay and other records must be regarded with great doubt until more is known of the species.

Catocala californica Edwards

Plate V, fig. 1; Pl. XIII, fig. 9 (larva); Pl. XV, fig. 14 (larval head); Pl. XVI, fig. 19, and Pl. XVII, fig. 1 (segments); Pl. XX, figs. 13 and 14 (claspers).

Catocala californica EDWARDS, 1864, Proc. Ent. Soc. Phil., II, p. 509. BARNES AND McDUNNOUGH, 1913, Psyche, XX, p. 200 (larva).
Catocala mariana STRECKER (*nec* Rambur), 1874, Lep. Rhop. Het., p. 99. HY. EDWARDS, 1875, Pacific Coast Lep., XIV, p. 3.
Catocala edwardsi KUSNEZOV, 1903, Rev. Russe Ent., III, p. 76.
Catocala eldoradensis BEUTENMÜLLER, 1907, Bull. Amer. Mus. Nat. Hist., XXIII, p. 148.

This species has probably caused more confusion in regard to its identity than any other species of North American *Catocala*. Edwards' description from a specimen from Yreka, California, is very inadequate and might apply equally well to half a dozen Californian forms. Strecker, who had an opportunity of examining the type specimen (at that time in the Collection of the Academy of Natural Sciences, Philadelphia), figured on plate XI, figure 13 of his Lep. Rhop. Het. a specimen collected by T. L. Mead in Colorado under the name of *californica*; we have seen this specimen in his collection and it bears the following label "*Catocala californica* Edwards, Idaho Springs, Colorado: original of figure in Lep. Rhop. Het. (one of original types)." Strecker's coloration of his figure is seen to be much too light when compared with the original, which has quite dark primaries and is without doubt a specimen of *hermia* Hy. Edwards. Strecker's statement on the label that this was one of the original types cannot, of course, be accepted in view of the wide divergence of localities, unless we presuppose a wrong labelling of specimens for which there is apparently no ground. In view, however, of Strecker's excellent eye for species we believe we must expect the true *californica* to be so close to *hermia* as to render Strecker's misidentification easily possible.

The original type of *californica* cannot now be found at Philadelphia. Strecker claims (Lep. Rhop. Het. Suppl., III, p. 35) to have it in his collection but a careful search on our part through his *Catocala* series has failed to produce it. On a recent visit to Pittsburg, we discovered among the noctuids of the Mead Collection, now in the Carnegie Museum Collection, a specimen labelled "Yreka, Calif." which proved to be what has generally been known as *mariana* Edwards. As *mariana* certainly possesses a great resemblance to *hermia*, especially in its lighter forms, and as the locality is the same as that of the type, we believe that this specimen may have been one of the type lot, especially when we take into consideration that Mead was the son-in-law of W. H. Edwards and probably the collector of the original type. We propose, therefore, to consider this specimen as typifying the true *californica* and list *mariana* as a synonym. Our own collecting experiences in the Shasta region (which is only slightly south of Yreka) would point to this identification being correct or at least not improbable, for among the *Catocalas* collected we found that *mariana* was vastly predominant, the only other species which might come into consideration being *allusa* Hulst, which was decidedly rare.

Regarding *mariana*, it has already been twice pointed out that the name is preoccupied in the genus by *mariana* Rambur; the names *edwardsi* Kusnezov and *eldoradensis* Beutenmüller, proposed to supercede it, will both fall into the synonymy. Beutenmüller is, however, incorrect in stating (1907, Bull. Amer. Mus. Nat. Hist., XXIII, p. 148) that the specimen from which Strecker's description of *mariana* was drawn up was a different species from that specimen which served as a type to Hy. Edwards a year later. We have examined both specimens and have photographs of them before us; they are simply light and dark forms of the same species, Strecker's specimen being more white-shaded before the reniform and approaching more closely to *hermia* in general appearance than does Hy. Edwards' type specimen, which agrees better with the figure on plate V, figure 1. We have bred both forms from ova laid by a single female from Truckee, California, and the long series from various localities before us show each to be about equally common.

The larva is very similar to that of *briseis*; apart from a rather deeper brown ground-color, there is nothing whereby it might be distinguished.

The species extends from Vancouver Island and the British Columbian mainland southward through the Cascades and the Sierras to central California and appears to be one of the commonest species throughout this territory.

***Catocala francisca* Hy. Edwards**

Plate XX, figs. 19 and 20 (claspers).

Catocala mariana var. *francisca* HY. EDWARDS, 1880, Bull. Brooklyn Ent. Soc., III, p. 57.

Beutenmüller has given no figure of this species, which may be merely a form or race of the preceding. The types were collected in Humboldt County, California; we have a few specimens which agree with these types but bear no further label than "California." We doubtfully refer here a single specimen from the Yosemite Valley and another one from the vicinity of San Francisco. These specimens appear to be larger and more robust than *californica* and show a peculiar greenish tinge over the rather unicolorous dark primaries. Until further specimens are available and the life-history can be worked out, we prefer to treat this as a good species.

***Catocala hermia* Hy. Edwards**

Plate V, figs. 2 and 11; Pl. XX, figs. 15 and 16 (claspers).

Catocala hermia HY. EDWARDS, 1880, Bull. Brooklyn Ent. Soc., II, p. 93.

Catocala hermia form *vesta* BARNES AND McDUNNOUGH, 1918, The Lepidopterist, II, pp. 9-11.

Figure 11 of plate V is only doubtfully referred here; Beutenmüller lists it as *californica* but we have already referred to his misidentification of this species. Figure 2 represents the dark form, which is typical; the form with even blue-gray primaries we have named *vesta*.

Dyar's description of the larva from Placer County, California, (Proc. Ent. Soc. Wash. IV, p. 327) should probably be referred to *californica*. Our own knowledge of the larva is that it is so close to that of *briseis* as scarcely to be separable; the imagines, however, are quite distinct and can be separated easily by the nature of the scaling around the reniform and beyond the t. p. line, which in *hermia* shows scarcely a trace of vertical ribbing.

The species is found in the central Rocky Mountain States; we possess it from western Colorado (Glenwood Springs) and Utah; and Snow records it from Idaho Springs, Colorado, and Las Vegas, New Mexico. More intensive collecting will probably disclose a wider range than the above mentioned states.

Catocala briseis Edwards

Plate III, figs. 5, 6, and 8; Pl. XIII, fig. 7 (larva); Pl. XV, fig. 17 (larval head); Pl. XVI, fig. 17, and Pl. XVII, fig. 4 (segments); Pl. XX, figs. 21 and 22 (claspers).

Catocala briseis EDWARDS, 1864, Proc. Ent. Soc. Phil. II, p. 508; STRECKER, 1872, Lep. Rhop. Het., p. 20, Pl. III, fig. 7. BARNES AND McDUNNOUGH, 1918, Bull. Amer. Mus. Nat. Hist., XXXVIII, p. 162.

Catocala briseis var. *albida* BEUTENMÜLLER, 1907, Bull. Amer. Mus. Nat. Hist., XXIII, p. 936.

Catocala minerva CASSINO, 1917, The Lepidopterist, I, p. 63, Pl. IV.

This well-known species is not liable to be confused in its typical form with any other of its allies. This form is shown on plate III, figure 5; the broad band following the t. p. line and showing the distinct vertical ribbing to which we have several times alluded is quite characteristic. In Manitoba the species tends to paler forms culminating in *albida* Beutenmüller, the type of which is figured on plate III, figure 8; figure 6 is a transitional form, probably also from Manitoba, which is fairly common. In Utah the species is very large and occurs in two forms, a dark one very similar to the typical form and a paler, rather even gray one which has been described as a new species by S. Cassino under the name *minerva* but which we think without doubt should be referred to *briseis*.

The larva is closely allied to those of *verecunda*, *californica*, *hermia*, *luciana*, and *faustina*, and possibly to a few other species of which the early stages are unknown (*allusa* and *cleopatra*).

The species is entirely northern in its distribution and occurs through Canada from Newfoundland to British Columbia; it extends southward through the New England States to New York and New Jersey. Ehrman records it as rare in the vicinity of Pittsburg, Pennsylvania (1892, Ent. News, III, p. 169) but Engel omits it in his List of Lepidoptera of Western Pennsylvania so that apparently the species has disappeared from this neighborhood. Westcott records it from Cook County, Illinois (1876, Can. Ent., VIII, p. 16) and it is found in Michigan, Wisconsin, and the border states farther west. In the Rocky Mountain region, our only records are from the vicinity of Provo, Utah, but it probably occurs in the neighboring states; we also have the species from eastern Washington where it tends to forms similar to those found in Manitoba.

Catocala grotiana Bailey

Plate III, fig. 7; Pl. XIV, fig. 4 (larva); Pl. XV fig. 4 (larval head); Pl. XVI, fig. 15, and Pl. XVII, fig. 2 (segments); Pl. XX, figs. 23 and 24 (claspers).

Catocala grotiana BAILEY, 1879, North Amer. Ent., I, p. 21. BARNES AND McDUNNOUGH, 1918, Bull. Amer. Mus. Nat. Hist., XXXVIII, p. 163.

Superficially, this species resembles *briseis* but may be distinguished by its larger size, the broad, white s. t. band and the fact that the t. p. line rarely has a strong inward bend above the inner margin.

The larva, when mature, is totally different from that of *briseis*, thus amply establishing the validity of the species. It would appear to be most closely related to the *pura* group.

The species is rather rare in the central Rocky Mountain States beyond the divide. We have specimens from Glenwood Springs, Colorado, and the vicinity of Provo, Utah. Snow (Trans. Kan. Acad. Sci., VIII, p. 38) reports it from Las Vegas, New Mexico, and Beutenmüller's manuscript records "Huachuca Mts., Arizona." The record from the Kaslo district of British Columbia given by Dyar (1904, Proc. U. S. Nat. Mus., XXVII, p. 878) needs verification; it is probably based on a form of *briseis*.

Catocala meskei Grote

Plate IV, fig. 8; Pl. XX, figs. 25 and 26 (claspers).

Catocala meskei GROTE, 1873, Can. Ent., V, p. 161. BUNKER, 1883, Can. Ent., XV, p. 100 (larva).

Catocala rosalinda HY. EDWARDS, 1880, Bull. Brooklyn Ent. Soc., III, p. 55.

This species is often confused with *unijuga*; it is, however, paler in the color of the primaries, with a tendency to show

the dark streak through the submedian fold found in *faustina*. The area beyond the t. p. line shows a very distinct vertical ribbing and the secondaries tend toward salmon color, in this respect resembling *parta*.

Apart from Bunker's short note on the larva, nothing is known of the life-history.

The species is wide-spread but apparently nowhere very common. It is found throughout the New England States, extending south into northern New York and westward through Quebec and Ontario into Manitoba, where it is rare (1917, Can. Ent., XLIX, p. 90); farther south, in Iowa, South Dakota, and Nebraska, it is commoner, specimens before us from the last named state being very dark in appearance. We have a single specimen from Denver, Colorado, which we are inclined to refer here.

Catocala unijuga Walker

Plate I, fig. 19; Pl. IV, figs. 6 and 7; Pl. VIII, fig. 23; Pl. XIII fig. 8 (larva); Pl. XV, fig. 16 (larval head); Pl. XVI, fig. 20, and Pl. XVII, fig. 8 (segments); Pl. XX, figs. 27 and 28 (claspers).

Catocala unijuga WALKER, 1857, Cat. Lep. Brit. Mus., XIII, p. 1194. KELLCOTT, 1881, Can. Ent., XIII, p. 38. BARNES AND McDUNNOUGH, 1918, Bull. Amer. Mus. Nat. Hist., XXXVIII, p. 164.

Catocala beaniana GROTE, 1878, Can. Ent., X, p. 195; 1883, Ill. Ess. Noct. North Amer., 67, Pl. iv, fig. 42.

Catocala lucilla WORTHINGTON, 1883, Papilio, III, p. 39.

Catocala unijuga var. *fletcheri* BEUTENMÜLLER, 1903, Bull. Amer. Mus. Nat. Hist., XIX, p. 509.

Catocala unijuga var. *agatha* BEUTENMÜLLER, 1907, Bull. Amer. Mus. Nat. Hist., XXIII, p. 936.

Catocala helena CASSINO (*nec* Eversmann), 1917, The Lepidopterist, I, p. 61, Pl. iv.

Catocala patricia CASSINO, 1917, The Lepidopterist, I, p. 104.

This species is larger than *briseis* and entirely lacks the brown band following the t. p. line; the whitish area before the reniform and the practical lack of the vertical ribbing are characteristic. Plate IV, figure 6, represents the typical form. A dark, suffused form has been named *agatha* by Beutenmüller and figure 7 is that of the unique type specimen; we have a somewhat similar specimen from Cartwright, Manitoba, and two others with almost unicolorous blackish primaries from the vicinity of Provo, Utah. On plate VIII, figure 23, is figured a specimen which Beutenmüller has labelled *beaniana* Grote. We have never been able satisfactorily to place this form; several years ago we saw the unique type from northern Illinois in the British Museum and noted that it was a worn specimen but seemed to be *unijuga* with the basal area shaded with blackish; this agrees with Beutenmüller's figure, but, until more and fresher specimens come to hand, we regard the position as doubtful. An aberration in which the red of the hind wings has become suffused with black is *fletcheri* Beutenmüller, the type being figured on plate I, figure 19. We cannot separate *lucilla* Worthington, of which the type series is in the Barnes Collection, from *unijuga*, in spite of Worthington's attempt to point out distinctions.

Patricia Cassino (*helena* Cassino *nec* Eversman) has recently been described as a good species from Vineyard, Utah, but, as far as we can judge by the half-tone figure, is merely another form of *unijuga*, possibly representing a Rocky Mountain race.

The distinctive features of the larva, as compared with *briseis* and its allies, have already been pointed out by us in our account of the life-history.

The species is very common throughout Canada, extending from Quebec and Ontario westward through Manitoba into the Northwest Provinces (Saskatchewan and Alberta). In the United States its area of distribution is rather more extended towards the south than that of the preceding species, as it has been reported from Pennsylvania and various states north of the Ohio River and also from the vicinity of St. Louis, Missouri (1914, Ent. News, XXV, p. 59). In the Rocky Mountain region it has been rarely taken, the only specimens known to us being the two aforementioned ones from Provo, Utah, in the Barnes Collection and the female type of *patricia* Cassino.

Catocala semirelictica Grote

Plate IV, fig. 2; Pl. XIV, fig. 9 (larva); Pl. XV, fig. 19 (larval head); Pl. XVI, fig. 16, and Pl. XVII, fig. 9 (segments).

Catocala semirelictica GROTE, 1874, 6th Ann. Rep. Peab. Acad. Sci., p. 35. BARNES AND McDUNNOUGH, 1918, Bull. Amer. Mus. Nat. Hist., XXXVIII, p. 166.

In the type, which we have examined, and in the majority of the specimens before us there is a distinct broad dark shade from the base of the wing along the submedian fold to near the anal angle; as in *pura*, however, certain specimens lack this dash and are more suffused with gray, making them difficult to separate from *unijuga* and still more so from

certain forms of *pura*. Generally speaking, the more unicolorous forms are distinguished from *unijuga* by the greater prominence of the black costal spot enclosing the reniform.

It is probable that this species is the eastern representative of the Rocky Mountain *pura*; the larvæ are very similar, although there are sufficient small differences present to make it advisable to regard the two forms as specifically distinct.

As the species has not generally been recognized, the range of distribution has not been thoroughly worked out. We have a single specimen labelled "Maine"; Winn records it in his Quebec List and we have a good series from northern Ontario. It has been listed from Manitoba (1913, Rep. Ent. Soc. Ont., XXXVI, p. 121) but such specimens may possibly belong to *pura*.

***Catocala pura* Hulst**

Plate IV, fig. 1; Pl. XI, fig. 14, Pl. XIV, fig. 3 (larva); Pl. XV, fig. 13 (larval head); Pl. XV, fig. 35, and Pl. XVI, fig. 5 (segments); Pl. XX, figs. 29 and 30 (claspers).

Catocala pura HULST, 1880, Bull. Brooklyn Ent. Soc., II, p. 96. BARNES AND McDUNNOUGH, 1913, Psyche, XX, p. 196 (larva).
Catocala pura var. *nigra* EASTMAN, 1916, The Lepidopterist, I, p. 2.

This species is very variable in the maculation of the primaries; the typical form is that figured on plate IV, figure 1; specimens are frequently found with the black basal dash extended through the entire submedian fold; other specimens show a maculation very similar to that of *semirelictæ* (Fig. 2), culminating in the form *nigra* Eastman in which the primaries are strongly suffused with black, with the t. a. and t. p. lines edged broadly with white. This latter form is very easily confused with *hermia* but can generally be separated by the fact that the thorax shows distinct black lines on the patagia in the *pura* forms, while in *hermia* forms it is almost unicolorous gray.

The species is common throughout Colorado and Utah, extending southward into New Mexico (Las Vegas and Fort Wingate) and Arizona (White Mountains). It has been reported from Cartwright, Manitoba (1908, Rep. Ent. Soc. Ont., XXXVIII, p. 122) but this needs further confirmation; among the *Catocalas* sent us for identification from the Heath Collection there were no specimens of *pura*; Dod (1916, Rep. Ent. Soc. Ont., XLVI, p. 202) records the species from Alberta, mentioning that it is probably synonymous with *semirelictæ* Grote; we have seen no specimens from this region but in view of the close similarity of the two species it will be interesting to determine by breeding to which form the larvæ belong.

***Catocala nevadensis* Beutenmüller**

Plate V, figs. 3 and 4; Pl. XX, figs. 31 and 32 (claspers).

Catocala nevadensis BEUTENMÜLLER, 1907, Bull. Amer. Mus. Nat. Hist., XXIII, p. 935. BARNES AND McDUNNOUGH, 1918, Bull. Amer. Mus. Nat. Hist., XXXVIII, p. 167.
Catocala nevadensis var. *montana* BEUTENMÜLLER, 1907, Bull. Amer. Mus. Nat. Hist., XXIII, p. 935.

This species is very closely related to *pura* and probably is merely the western race of this species. Its range of variation is similar to that of *pura*, as may be seen by the illustrations (Pl. V, figs. 3 and 4), specimens often occurring of a still more even gray color than that of the form *montana* (Fig. 4).

The larva is very similar to that of *pura* but the few specimens we succeeded in bringing to maturity were not quite identical. We regret we are unable to give a figure of the larva, as our experiments were successful too late to permit of a colored drawing being made.

As far as we know, the species extends from central California through the Sierras and Cascade Mountains to British Columbia, the species listed as *augusta* in the 1906 British Columbian List being probably this form. Further details as to its distribution, especially notes as to what form is found in the northern Rocky Mountain States, is greatly to be desired.

***Catocala julietta* French**

Catocala julietta FRENCH, 1916, Can. Ent., XLVIII, p. 72.

We know nothing of this recently described species; we have repeatedly endeavored to obtain either a photograph or a drawing of it but regret to state that our letters to Prof. French on the subject have been entirely ignored. The author places it near *junctura* (*walshi*) on the strength of the gray tone of the primaries and of the color of the secondaries,

but we doubt this association as the species appears to possess a prominent black streak through the submedian fold and we have never seen any specimen in the *junctura* group with this characteristic. Regarding this feature, French's phraseology is peculiar, as he states "a heavy shade below submedian vein, continued outside the reniform to subcostal vein, reminding one of the markings of *C. pura*." We are in doubt as to just what is meant by the terms "submedian" and "subcostal" as used here; with the ordinary interpretation of these terms the phrase becomes meaningless. The species was described from a single male captured near Carbondale, Illinois.

***Catocala texanæ* French**

Plate V, fig. 10; Pl. XX, figs. 33 and 34 (claspers).

Catocala texanæ FRENCH, 1902, Can. Ent., XXXIV, p. 98.

With this species, we reach a group of closely allied forms which may be termed the *junctura* group. They are still very imperfectly understood, as nothing is as yet known concerning the life-histories. Their distribution is decidedly southern. The present species is the largest of the group and is confined, as far as we know, to central Texas (Black Jack Springs). It may be merely a race of the following species, rather larger and with a dull mossy green appearance to the primaries.

***Catocala junctura* Walker**

Plate VIII, figs. 6 and 7; Pl. XX, figs. 35 and 36 (claspers).

Catocala junctura WALKER, 1857, Cat. Lep. Het. Brit. Mus., XIII, p. 1196.

Catocala walshii EDWARDS, 1864, Proc. Ent. Soc. Phil., II, p. 509.

The typical form is that figured on plate VIII, figure 6. What Beutenmüller calls a 'variety' of this species is shown in figure 7 but we personally have never seen so contrasted a specimen, although certain females before us tend in this direction.

The species is fairly common in southern Illinois, Missouri, and Arkansas and extends westward through Kansas to the Colorado foot-hills (Denver). It probably will also be found in various states east of the Mississippi. Worthington's record from northern Illinois (Papilio, III, p. 40) is doubtful and needs verification; he may have misidentified the species. Snow's record from Las Vegas, New Mexico, should probably be transferred to *arizonæ* Grote.

***Catocala arizonæ* Grote**

Plate IV, fig. 20; Pl. V, figs. 6-9; Pl. XX, figs. 37 and 38 (claspers); Pl. XXI, figs. 31 and 32 (tibiae).

Catocala arizonæ GROTE, 1873, Can. Ent., V, p. 163. BEUTENMÜLLER, 1903, Bull. Amer. Mus. Nat. Hist., XIX, p. 506.

Catocala babayaga STRECKER, 1884, Papilio, IV, p. 73.

The typical form of the species (Pl. V, fig. 6) is rather more clearly marked than *junctura* but specimens occur which are very difficult to separate from this species. The form with pinkish suffusion on the primaries is *babayaga* Strecker and is well depicted in figures 8 and 9.

Figure 20 on plate IV was listed by Beutenmüller as *jessica* Hy. Edwards; it was taken from a specimen in our collection labelled "New Mexico, Snow" and we believe is merely a dwarf specimen of this species approaching *junctura* in the confused maculation of primaries.

As far as is known, the species is confined to Arizona and the adjoining areas of New Mexico. Until its life-history is known, it is impossible to determine whether it is specifically distinct from *junctura* and *texanæ*.

***Catocala jessica* Hy. Edwards**

Plate VIII, fig. 12.

Catocala jessica HY. EDWARDS, 1877, Pacific Coast Lep., No. 23, p. 1.

We have carefully examined the type of this species from Havilah, Kern County, California, and believe that it is a dwarfed specimen of what is probably a mere race of *arizonæ*; we have matched it exactly with a small series in our

collection from the San Bernardino Mountains; the normal size is that of *arizonæ*. As nothing is known of the life-history, we leave it for the present as a species. It is only known from southern California.

***Catocala electilis* Walker**

Plate VIII, fig. 24; Pl. XXI, figs. 1 and 2 (claspers).

Catocala electilis WALKER, 1857, Cat. Lep. Het. Brit. Mus., XIII, p. 1209. DRUCE, 1880, Biol. Cent. Am. Lep. Het., I, p. 360, Pl. xxxi, fig. 8. BEUTENMÜLLER, 1897, Bull. Amer. Mus. Nat. Hist., IX, p. 211.
Catocala cassandra HY. EDWARDS, 1875, Pacific Coast Lep., XIV, p. 7.

The species has been generally confused with *junctura* and *arizonæ* but the excellent figure given should render it easily recognizable. Both *electilis* and *cassandra* are based on Mexican material but the species extends into southern Arizona; Beutenmüller records it from the Tonto Basin and we have a single specimen from the Huachuca Mountains which we are inclined to refer here.

***Catocala hippolyta* Strecker**

Plate IV, fig. 3; Pl. XXI, figs. 5 and 6 (claspers).

Catocala hippolyta STRECKER, 1874, Lep. Rhop. Het., p. 99. HY. EDWARDS, 1875, Pacific Coast Lep., XIV, p. 4.

A very distinct species with its pale gray primaries and narrow black band on secondaries.

The early stages are unknown.

The species is only known from the Coast Range of California extending from Sonoma County to Los Angeles County.

***Catocala stretchii* Behr**

Plate IV, figs. 4, 5, 14, 15, 18, and 19; Pl. XXI, figs. 7 and 8 (claspers).

Catocala stretchii BEHR, 1870, Trans. Amer. Ent. Soc., III, p. 24. FRENCH, 1892, Can. Ent., XXIV, p. 229 (larva).
Catocala portia HY. EDWARDS, 1880, Bull. Brooklyn Ent. Soc., II, p. 94.
Catocala stretchii var. *sierræ* BEUTENMÜLLER, 1897, Bull. Amer. Mus. Nat. Hist., IX, p. 212.

We have been obliged to differ from Mr. Beutenmüller in our conception of this species, the manuscript before us having placed *sierræ* as a variety of *aspasia* and made *portia* a good variety of *stretchii*.

Stretchii was described from Virginia City, Nevada; *portia*, from Lake Tahoe, California, and *sierræ*, from the same locality; all three type localities being, therefore, practically identical. The type of *stretchii* being lost, there only remains a specimen in the Hy. Edwards collection marked "true to type"; this, however, is from Havilah, Kern County, in southern California, a locality vastly removed from the type locality of *stretchii*. We have carefully examined this specimen, as well as the type of *portia*, comparing them with a long and variable series of what we consider *stretchii* from Truckee, California. We can match very closely the "true to type" specimen with specimens from Truckee (Pl. IV, figs. 14 and 15), but further material from the same general locality as this Havilah specimen (San Bernardino County) shows distinctly that the southern form (Pl. IV, fig. 4) is decidedly more heavily marked, as a general rule, and more variegated than the Sierra Nevada form. As regards *portia*, the type is worn and faded but is apparently only a specimen showing rather less maculation on primaries than usual; there is nothing in our opinion to warrant the retention of the name which, in view of the facts that we can match the "true to type" and the "type" specimens with specimens in our Truckee series and that the type localities are practically identical, should sink as a synonym of *stretchii*. In our series of the form *sierræ* Beutenmüller (Fig. 18) there are specimens which can scarcely be distinguished from *sara* French. In all probability the Rocky Mountain species which at present goes under the name of *aspasia*, with *sara* as a variety, will prove to be merely a race of *stretchii*. Figure 5 of plate IV is listed by Beutenmüller as a variety of *stretchii* and figure 19 as a pink form of *portia*; we leave them doubtfully under this species as, without a knowledge of the specimens and their locality, absolute identification is impossible.

The larval description given by French probably applies to the southern form, as the ova came from Colton, San Bernardino County, and certainly points to a close relationship between *stretchii* and *aspasia* when compared with our own description of the larva of this latter species.

The species extends through the Sierra Nevada Mountains southward to the San Bernardino Mountains. Records of this species from Colorado should be transferred, we believe, to *aspasia*.

Catocala aspasia Strecker

Plate IV, figs. 16 and 17; Pl. V, fig. 5; Pl. XIV, fig. 7 (larva); Pl. XV, fig. 12 (larval head); Pl. XV, fig. 37, and Pl. XVI, fig. 9 (segments); Pl. XXI, figs. 3 and 4 (claspers).

Catocala aspasia STRECKER, 1874, Lep. Rhop. Het., p. 94. BEUTENMÜLLER, 1903, Bull. Amer. Mus. Nat. Hist., XIX, p. 505. BARNES AND McDUNNOUGH, 1913, Psyche, XX, p. 198 (larva).

Catocala augusta HY. EDWARDS, 1875, Pacific Coast Lepid., XV, p. 1.

Catocala sara FRENCH, 1883, Can. Ent., XV, p. 163.

It is impossible to determine authentically the species Strecker described as *aspasia*; his original description is useless for purposes of identification, the species being compared in a general way with *amatrrix*; the type locality is given as Lower California, which may merely mean southern California or, if correct, would then refer to the Mexican peninsula. In his list of types Strecker lists three specimens from California as the types of *aspasia*, but these specimens do not exist in the Strecker Collection; under *aspasia* are seven specimens labelled "Manitou, Colo." and a single specimen, nowise different, merely labelled *aspasia*; none of these, therefore, can be considered as the original types, concerning the whereabouts of which we are entirely ignorant.

We apply the name to the species represented by these Colorado specimens, following Beutenmüller; the typical form would then be that figured on plate V, figure 5, the variation in the color of primaries ranging from pale gray and ochreous to pinkish. A form found in San Diego County, California, and adjacent counties, which may possibly be a good species or a race of *stretchi* or even the true *aspasia*, has been named *augusta* by Hy. Edwards; it is characterized by heavy maculation, the specimens before us, however, showing less black suffusion on the primaries than in Beutenmüller's figure (Pl. IV, fig. 16). *Sara* French (Fig. 17), of which a cotype still exists in the Strecker Collection, is a form of *aspasia* with strong blackish suffusion on the primaries, at times covering a greater portion of the wing; it corresponds to the form *sierræ* of *stretchi* and is generally rather rare.

The species appears to be common in the central Rocky Mountain States, occurring late in the season; it extends into Arizona and New Mexico. It has been recorded (Can. Ent., XXXII, p. 95) from Cartwright, Manitoba, where it is very rare. The record of *augusta* from Kaslo, British Columbia, (Dyar, Proc. U. S. Nat. Mus. XXVII, p. 878) is doubtful; it may refer to *nevadensis* Beutenmüller and needs verification; *augusta*, as far as we know, is strictly limited to southern California.

GROUP XI

(*Lamprosia* Hübner)

Egg hemispherical, ribbed, the secondary branches arising very regularly from the equatorial zone of the egg. Larva with lateral filaments and a transverse dorsal wart on the fifth abdominal segment. Male claspers symmetrical, the apex being rounded.

The peculiar ribbing on the egg and the symmetrical nature of the male claspers easily separate this group from the preceding. The larvæ are willow-feeders and normally have five molts, although *concumbens* with four shows affinity to the preceding group.

Catocala cara Guenée

Plate III, figs. 9 and 10; Pl. X, fig. 38 (larval head); Pl. XI, figs. 1 and 2 (larva); Pl. XXI, fig. 9 (clasper).

Catocala cara GUENÉE, 1852, Hist. Nat. Spec. Gen. Lep., VII, p. 87. FRENCH, 1882, Papilio, II, p. 167 (larva).

Catocala cara var. *carissima* HULST, 1880, Bull. Brooklyn Ent. Soc., II, p. 97.

Catocala cara var. *silvia* HY. EDWARDS, 1880, Bull. Brooklyn Ent. Soc., III, p. 57.

This well-known species needs no further comment on our part.

The species extends over the whole eastern half of the United States reaching northward into southern Ontario and Maine, where it is rarely met with; it has also been recorded from South Dakota (Ent. News, VIII, p. 28). In the southern portion of its range (Texas to Florida) it forms the race *carissima* Hulst (*silvia* Hy. Edwards), characterized by the large size and yellowish costal blotches.

Catocala concumbens Walker

Plate III, fig. 15; Pl. XI, fig. 5 (larva); Pl. XXI, fig. 11 (clasper).

Catocala concumbens WALKER, 1857, Cat. Lep. Het. Brit. Mus., XIII, p. 1198. BARNES AND McDUNNOUGH, 1918, Bull. Amer. Mus. Nat. Hist., XXXVIII, p. 168.

Catocala concumbens var. *diana* HY. EDWARDS, 1880, Bull. Brooklyn Ent. Soc., III, p. 57.

Catocala concumbens ab. *hillii* GROTE, 1883, Papilio, III, p. 43.

The figure gives an excellent idea of this species; *diana* is an aberration with pink suffusion on the abdomen dorsally and *hillii* a color form in which the secondaries are yellow; this latter variety may have been produced artificially, although its occurrence is possible.

This common species is much more northern in its range than *cara*, its southern boundary being, roughly speaking, the Ohio Valley region; in the north it extends through Quebec and Ontario into Manitoba and has been reported by Mr. Arthur Gibson from as far north as Fort Selkirk, Yukon Territory. We know of no authentic records from the Rocky Mountain region or the Pacific Coast.

Catocala amatrix (Hübner)

Plate III, figs. 11-13; Pl. X, fig. 36 (larval head); Pl. XI, fig. 3 (larva); Pl. XXI, fig. 10 (clasper).

Lamprosia amatrix HÜBNER, 1818?, Samml. Eur. Schmett., Fig. 487; 1820, Samml. Exot. Schmett., II.

Catocala amatrix FRENCH, 1884, Papilio, IV, p. 8 (larva).

Catocala nurus WALKER, 1857, Cat. Lep. Het. Brit. Mus., XIII, p. 1195.

Catocala selecta WALKER, 1857, Cat. Lep. Het. Brit. Mus., XIII, p. 1197.

Catocala editha EDWARDS, 1874, Trans. Amer. Ent. Soc., V, p. 112.

The typical form, as far as can be judged by Hübner's figure, is the one with dark streaks from the base to below the apex of the wing, as represented in plate III, figure 11; *nurus* Walker is a synonym. The pale form without dark shades has been named *selecta* by Walker and is figured on plate III, figure 12. Both forms are equally common.

The Rocky Mountain form, to judge by five specimens before us, has the primaries much paler in color than in the eastern and southern specimens and apparently represents a good geographical race to which we imagine the name *editha* must be applied, the type of this species being from Arizona. The form of *editha* corresponding to *selecta* Walker has been named *pallida* Poling and the type from Denver, Colorado, is before us, but this name, although included in Smith's Check List, has not to our knowledge ever been published; the form is figured on plate III, figure 13.

The species is common and wide-spread, occurring throughout practically the whole of the United States, east of the Rocky Mountains, and extending north into Quebec, Ontario, and South Dakota. In the Rocky Mountains of Colorado and Arizona the race *editha* seems rare; we have a few specimens from the vicinity of Denver.

GROUP XII

Male claspers more rounded apically and less asymmetrical than in Group X. Early stages practically unknown.

Of the species included in this group, the life-history of only *desdemona* is known to us; we are, therefore, unable to define the group definitely and we place them provisionally together on account of general similarity of maculation in the adults, combined with close resemblance in the male claspers. The larvæ will probably all feed on oak, as is the case with *desdemona*.

Catocala delilah Strecker

Plate VI, figs. 13 and 14; Pl. XIV, fig. 2 (larva); Pl. XV, fig. 18 (larval head); Pl. XV, fig. 28, and Pl. XVI, fig. 2 (segments); Pl. XXI, figs. 12 and 13 (claspers).

Catocala delilah STRECKER, 1874, Lep. Rhop. Het., Nov., p. 96, Pl. XI, fig. 7.

Catocala adoptiva GROTE, 1874, Trans. Amer. Ent. Soc., V, Dec., p. 96.

Catocala calphurnia HY. EDWARDS, 1880, Bull. Brooklyn Ent. Soc., III, p. 59. BEUTENMÜLLER, 1907, Bull. Amer. Mus. Nat. Hist., XXIII, p. 149.

Catocala desdemona HY. EDWARDS, 1882, Papilio, II, p. 15. BARNES AND McDUNNOUGH, 1913, Psyche, XX, p. 195 (larva).

The typical form from Texas (Pl. VI, fig. 13) has considerable brown suffusion over the primaries; we have not seen a long enough series to determine whether or not this feature is constant. In Arizona and Utah we meet with a race,

desdemonia, which is generally paler in the coloration of both wings (Fig. 14) but which occasionally, in the female, shows a similar brown suffusion to that of the Texan form. We know nothing regarding *calphurnia* Hy. Edwards, described from a single specimen in the Bailey Collection ostensibly from Kansas; according to Beutenmüller, the species may be either European or an aberration of *delilah*; we leave it as the latter for the present. The larva of *desdemonia* has been bred by us; it remains to be seen if the larva of the type form shows any distinctive features.

The species is southern and southwestern in its distribution; it occurs in central Texas and apparently extends up the Mississippi Valley as far as southern Illinois, as French (Can. Ent., XVIII, p. 161) records the capture of two specimens in the vicinity of Carbondale. Snow records it as rare at Lawrence, Kansas (Trans. Kan. Acad. Sci., IV, p. 51). The race, *desdemonia*, as already stated, occurs in Arizona and Utah and probably will be found in New Mexico and adjoining states.

Catocala andromache Hy. Edwards

Plate IX, fig. 35; Pl. XXI, figs. 14 and 15 (claspers).

Catocala andromache Hy. Edwards, 1885, Ent. Amer., I, p. 50.

This small species resembles a miniature *desdemonia*. Nothing is known of the early stages. It is entirely confined to the arid regions of the Southwest, occurring fairly plentifully at considerable elevations in Arizona and southeastern California and presumably extending into Mexico.

Catocala frederici Grote

Plate VII, fig. 12; Pl. XXI, figs. 16 and 17 (claspers).

Catocala frederici GROTE, 1872, Trans. Amer. Ent. Soc., IV, p. 14.

This rare species is readily distinguishable from its allies by the pale gray color of the primaries.

It is found in central Texas and has been recorded by Snow from Kansas and northern New Mexico. This latter record needs verification; it may refer to *andromache*, which was undescribed at the time.

Catocala chelidonia Grote

Plate X, fig. 9; Pl. XXI, figs. 18 and 19 (claspers).

Catocala chelidonia GROTE, 1881, Papilio, I, p. 159; 1882, Ill. Ess. Noct. North Amer., p. 67, Pl. IV, fig. 41.

The dark blackish color of the primaries is quite characteristic of the species.

The early stages are unknown. Packard (5th Rep. Ent. Com., p. 175) records the food-plant of the larva as scrub oak, according to Mr. J. Doll.

The species has only been recorded from the mountain ranges of Arizona, where it may be taken in the daytime by beating the bushes and at night at the flowers of the mescal.

GROUP XIII

Egg hemispherical, vertically ribbed. Larva smooth, without dorsal warts or lateral filaments. Male claspers symmetrical.

The early stages of the species included in this group are too little known to allow of the grouping being anything but tentative. Considerable difference occurs between the ova of *illecta* and *abbreviatella*, the only two species whose egg stage has been noted. The larvæ are apparently of a rather primitive type and are feeders on various papilionaceous trees (*Gleditschia*, *Robinia*, etc.). The adult *illecta* differs from its allies in possessing four rows of spines on the tarsi and may eventually be found to belong in a section by itself.

Catocala illecta Walker

Plate VII, fig. 13; Pl. X, fig. 30 (larval head); Pl. XII, fig. 10 (larva); Pl. XXI, fig. 26 (tibia);
Pl. XXII, figs. 1 and 2 (claspers).

Catocala illecta WALKER, 1857, Cat. Lep. Het. Brit. Mus., XIII, p. 1205. FRENCH, 1892, Can. Ent., XXIV, p. 307 (larva). ROWLEY, Ent. News, XX, pp. 129-131 (larva). BARNES AND McDUNNOUGH, 1918, Bull. Amer. Mus. Nat. Hist., XXXVIII, p. 169.
Catocala magdalena STRECKER, 1874, Lep. Rhop. Het., p. 93, Pl. XI, fig. 9.

This species somewhat resembles a *concupens* with yellow secondaries, the pale gray-brown of the primaries being quite characteristic. The larvæ and its habits are well known and have been excellently noted by Rowley. The moth is seldom found on trees or at sugar, apparently concealing itself among low-growing bushes.

The species is fairly common in the central Plain States, extending south to Texas. It has been reported from southwestern Ontario (Moffat, Can. Ent., XXX, 140).

Catocala abbreviatella Grote

Plate X, fig. 18; Pl. XXII, fig. 3 (clasper).

Catocala abbreviatella GROTE, 1872, Trans. Amer. Ent. Soc., IV, p. 14. BARNES AND McDUNNOUGH, 1918, Bull. Amer. Mus. Nat. Hist., XXXVIII, p. 169.

The pale-centered reniform separates this species from *nuptialis*, in which this spot is prominently black. On the secondaries the terminal black band is broken near the anal angle, leaving a dark isolated spot.

The species is rarely met with and appears to inhabit a belt of territory in the central Plain States stretching from Texas in the south and following roughly the Mississippi Valley to southern Manitoba (1904, Rep. Ent. Soc. Ont., XXXIV, p. 94). Rowley reports a single specimen at Louisiana, Missouri (Ent. News, XXI, p. 453); French records it in his 'Catocala of Illinois'; and Dodge (Can. Ent., XXXIV, p. 117) mentions the capture of a few species each year in Missouri and eastern Nebraska.

Catocala nuptialis Walker

Plate X, fig. 19; Pl. XXII, fig. 4 (clasper).

Catocala nuptialis WALKER, 1857, Cat. Lep. Het. Brit. Mus., XIII, p. 1206.
Catocala myrrha STRECKER, 1874, Lep. Rhop. Het., p. 97, Pl. XI, fig. 12.

We have already noted the points of distinction between this species and the preceding.

It is commoner than *abbreviatella*, occurring through practically the same territory; Lintner's (1896, 11th Rep. Inj. Ins. New York, p. 266) record from New York, with food-plant of the larva given as apple, needs confirmation.

Catocala whitneyi Dodge

Plate X, figs. 16 and 17; Pl. XXII, fig. 5 (clasper).

Catocala whitneyi DODGE, 1874, Can. Ent., VI, p. 125. BEUTENMÜLLER, 1907, Bull. Amer. Mus. Nat. Hist., XXIII, p. 146.

This species occurs in two forms, as shown in the figures. It is easily recognized by the heavy black t. a. line and the broad reniform irregularly produced toward the base of wing.

It has only been reported from a few of the Plains States from Nebraska and Kansas northward to southern Manitoba but appears to be fairly plentiful locally.

Catocala amestris Strecker

Plate VIII, figs. 17 and 18; Pl. X, fig. 33 (larval head); Pl. XII, fig. 7 (larva); Pl. XXII, fig. 6 (clasper).

Catocala amestris STRECKER, 1874, Lep. Rhop. Het., Nov, p. 96, Pl. XI, fig. 6. BEUTENMÜLLER, 1903, Bull. Amer. Mus. Nat. Hist., XIX, p. 508 (larva).
Catocala anna GROTE, 1874, Trans. Amer. Ent. Soc., V, Dec., p. 96.
Catocala westcottii GROTE, 1878, Can. Ent., X, p. 195.

This species is rare. The form *westcottii* (Fig. 18) is said to differ from the type form (Fig. 17) in having the outer black margin of secondaries unbroken.

The type of the species came from Texas; we have a few specimens before us from this state, all of which show the unbroken band and would therefore fall under the term *westcotti* which was described from material from Illinois and Wisconsin. We have not examined these types and have no material from this region so cannot say if Beutenmüller's conception is correct or not; we presume that it is, as Grote himself regarded *westcotti* as a mere form of *amestris*. Apart from the type localities, we have a single specimen from Nebraska and Snow has recorded the species from Kansas; Beutenmüller secured the larvæ on *Robinia* in the Black Mountains, North Carolina, one of these specimens serving for the figure given on plate XII, figure 7. Apparently the species has a wide range throughout the Eastern States, although on account of its rarity it has seldom been recorded.

GROUP XIV

(*Andrewsia* Grote)

Early stages unknown. Male claspers slightly asymmetrical; apex of left clasper projecting slightly beyond the thinly chitinated ventral area.

Messalina, the only species in the group, has usually been placed close to *amica* on account of the lack of a median dark band on the secondaries; a study of the male claspers, however, shows that its affinities are rather with the *illecta* group than with *amica*; the early stages will probably shed light on the correct position. Hampson separates the genus *Andrewsia* on the dorsal tufting of the abdomen, which he states is lacking in *messalina*; we can, however, see no appreciable difference between this species and some of the smaller species of the *illecta* group. In fact, if a well-marked specimen of *messalina* and a pale specimen of *abbreviatella* be compared, it can readily be seen how a further reduction in the maculation of the primaries of the latter species and an elimination of the median band of the secondaries would produce *messalina*; we might even venture to predict that the larva of *messalina* will be without lateral filaments.

Catocala messalina Guenée

Plate X, fig. 20; Pl. XXII, figs. 34 and 35 (claspers).

Catocala messalina GUENÉE, 1852, Hist. Nat. Spec. Gen. Lep., VII, p. 107.

Catocala belfragiana HARVEY, 1875, Bull. Buffalo Soc. Nat. Sci., II, p. 281.

Catocala jocasta STRECKER, 1875, Lep. Rhop. Het., p. 107.

The illustration is ample to identify this striking and aberrant form. It is decidedly rare, apparently being most common in Texas; it occurs, however, in Kansas and a single specimen has been reported (Ent. News, X, p. 283) from Montgomery County, Virginia, so that its range will probably be similar to that of the preceding group of species.

GROUP XV

Early stages unknown. Male claspers symmetrical, rounded apically.

The two species included here, *gracilis* and *andromedæ (tristis)*, are apparently related, to judge by a comparison of the claspers, but a knowledge of the early stages will be necessary to definitely place the species.

Catocala gracilis Edwards

Plate IX, figs. 7-9; Pl. XXII, fig. 7 (clasper).

Catocala gracilis EDWARDS, 1864, Proc. Ent. Soc. Phil., II, p. 511.

Catocala similis GROTE (nec Edwards), 1872, Trans. Amer. Ent. Soc., IV, p. 17.

Catocala gracilis var. *sordida* GROTE, 1877, Can. Ent., IX, p. 170.

Catocala praeclara HOLLAND (nec GROTE AND ROBINSON), 1903, Moth Book, p. 269, Pl. xxxv, fig. 7.

This small species shows considerable variability in the coloration of the primaries. The typical form (Pl. IX, fig. 7) has a broad brownish streak along the inner margin; pale forms occur without this streak and again other specimens in which the whole wing is suffused with dark shades, this latter being the form *sordida* Grote. A study of the figures will

readily show the points of distinction from *similis* Edwards and *præclara* Grote and Robinson, with which species several authors have confused it.

The species is not rare along the Atlantic Coast; it has been reported from as far north as the vicinity of Ottawa, Ontario, (Gibson, Rep. Ent. Soc. Ont. for 1912, p. 121) and extends southward, according to Beutenmüller, into Florida; westward it ranges into Pennsylvania and Ohio and has been included by French in his synopsis of the Catocalæ of Illinois.

Catocala andromedæ (Guenée)

Plate I, fig. 18; Pl. XXII, fig. 8 (clasper).

Hypogramma andromedæ GUENÉE, 1852, Hist. Nat. Spec. Gen. Lep., VII, p. 36.

Catocala tristis EDWARDS, 1864, Proc. Ent. Soc. Phil., II, p. 511.

This species has been generally known as *tristis* Edwards but Sir Geo. Hampson has recently called our attention to the fact that Guenée's description of *andromedæ* (a name heretofore unplaced) fits this species very well; we concur with him in using Guenée's name, which has priority.

The similarity of this species with the preceding in general type of maculation of primaries as well as in structural characters leads us to believe that the two are correctly associated, although the early stages of both are unknown.

The range of the species is practically the same as that of *gracilis*, although it is distinctly rarer. It appears to extend farther down the Mississippi Valley than *gracilis*, as we have a single specimen in our collection labelled St. Louis, Missouri, and several specimens from Harris County, Texas; concerning the authenticity of these labels, however, we know nothing.

GROUP XVI

Egg hemispherical, prominently ribbed. Larva with lateral filaments and a dorsal wart on the fifth abdominal segment, which usually is very prominent, pointed backward, and conical. Male claspers symmetrical, apically strongly rounded.

The larvæ of all the species are not known but are probably all oak-feeders; in at least one species (*ophelia*) the dorsal wart is considerably reduced in size. The spining of the hind tibiæ is reduced to one or two spines between the spurs, which in some specimens are entirely absent.

Catocala herodias Strecker

Plate VIII, fig. 10.

Catocala herodias STRECKER, 1876, Lep. Rhop. Het., p. 121. BEUTENMÜLLER, 1903, Bull. Amer. Mus. Nat. Hist., XIX, p. 506; 1913, Insec. Ins. Menst., I, p. 97.

This rare species was for a long time only represented by the unique type specimen from Texas; of late years it has been bred from larvæ found on oak trees at Lakehurst, New Jersey, proving its validity to specific rank. Nothing, as far as we know, has, however, been published concerning the larva nor have collectors made any attempts to secure the full life-history of the species.

Apart from these two widely separated localities we know of no other authentic records for the species; judging, however, from the nature of the insect fauna of Lakehurst, we venture the prediction that the species will be found to occur generally in the pine barrens of the Southern States.

Catocala coccinata Grote

Plate III, figs. 16-18; Pl. XIV, fig. 1 (larva); Pl. XV, fig. 20 (larval head); Pl. XV, fig. 33, and Pl. XVII, fig. 11 (segments); Pl. XXII, fig. 9 (clasper).

Catocala coccinata GROTE, 1872, Trans. Amer. Ent. Soc., IV, p. 6. BARNES AND McDUNNOUGH, 1918, Bull. Amer. Mus. Nat. Hist., XXXVIII, p. 170.

Catocala coccinata var. *circè* STRECKER, 1876, Lep. Rhop. Het., p. 121.

Catocala sinuosa GROTE, 1879, Can. Ent., XI, p. 15.

Catocala coccinata var. *chiquita* BARTSCH, 1916, The Lepidopterist, I, p. 3.

The typical form of this species with rather even gray primaries is figured on plate III, figure 16; the type material

was from Pennsylvania. Strecker applied the name *circe* to specimens from Texas which were more suffused with brown and possessed a broad diffuse basal dash; we have not seen enough Texan material to judge as to the possibility of this being a geographical race; the name is generally applied to northern specimens which occur with the typical form and show the same characteristics (Fig. 17); such specimens are especially common among females. An aberration with the dorsal portion of the abdomen suffused with pink has been named *chiquita* by Bartsch. *Sinuosa* Grote (Fig. 18) is at least a good geographical race, if not a separate species; it is characterized by the narrow central black band on the secondaries and occurs in Florida and probably other Gulf States.

The species is wide-spread, extending in one form or another over the greater portion of the eastern half of the United States. In the north it is reported from Manitoba, Ontario, and Quebec.

Catocala verrilliana Grote

Plate VIII, figs. 15 and 16; Pl. X, figs. 14 and 15; Pl. XIV, fig. 10 (larva); Pl. XV, fig. 27 (larval head); Pl. XV, fig. 40, and Pl. XVI, fig. 7 (larval segments); Pl. XXII, fig. 10 (clasper).

Catocala verrilliana GROTE, 1875, Can. Ent., VII, p. 185. HARVEY, 1875, Bull. Buffalo Soc. Nat. Sci., III, p. 12.

Catocala verrilliana var. *votiva* HULST, 1884, Bull. Brooklyn Ent. Soc., VII, p. 41.

Catocala werneri BIEDERMAN, 1909, Ent. News, XX, p. 76. BARNES AND McDUNNOUGH, 1911, Ent. News, XXII, p. 180; 1912, Cont. Nat. Hist. North Amer. Lep., I, No. 4, p. 23, Pl. x, fig. 1.

Catocala beutenmuelleri BARNES AND McDUNNOUGH, 1910, Can. Ent., XLII, p. 251; 1912, Cont. Nat. Hist. North Amer. Lep., I, No. 4, pp. 23, Pl. x, fig. 6; 1913, Psyche, XX, p. 193 (larva).

This species is variable in the coloration of the primaries; the typical form from Texas has a distinct brownish tinge, even more apparent than in the figure (Pl. X, fig. 14); an aberration of this with yellow secondaries is *votiva* Hulst (Fig. 15). Holland's figure under this name (Pl. xxxiv, fig. 16) is incorrect and should be referred to *ophelia*. *Werneri* Biederman, of which the unique female type is before us, is seemingly either an aberration of this species or of *violenta* with a diffuse brown shade over a large portion of the wing; the size and color of the secondaries point to *verrilliana* while the dentate nature of the t. p. line above the fold is more as in *violenta*; the figure on plate VIII, figure 16 is not accurate, our own photograph giving a better idea of the maculation; until more material is available we place it with *verrilliana*. In Utah and on the Pacific Coast we meet with the race *beutenmuelleri* (Pl. VIII, fig. 15), characterized by the bluish gray tinge of the primaries and the less prominent dark basal dash. The larval history of this latter form has been described by us and the figures given are based on Utah material; we presume that when the larva of the typical form is known it will prove to be identical.

The species is quite common in the Southwestern States, the type form being recorded from Colorado, Texas, New Mexico, and Arizona; *beutenmuelleri* is typical in Utah but a very closely allied form, hardly worthy of varietal rank, is found along the Pacific Coast from southern California to Salem, Oregon.

Catocala violenta Hy. Edwards

Plate III, figs. 3 and 4; Pl. XXII, fig. 11.

Catocala violenta HY. EDWARDS, 1880, Bull. Brooklyn Ent. Soc., III, p. 58. BEUTENMÜLLER, 1903, Bull. Amer. Mus. Nat. Hist., XIX, p. 507; 1907, idem., XXIII, p. 147.

Catocala chiricahua POLING, 1901, Can. Ent., XXXIII, p. 127.

This species is larger than *verrilliana* and has more brilliantly colored secondaries, the orange tinge of *verrilliana* being replaced by bright carmine; the t. p. line is also considerably more dentate. The female (Pl. III, fig. 4), which is more contrastingly marked than the male, has been described by Poling as *chiricahua*, the type being in the Barnes Collection.

The early stages are unknown and the species has been recorded only from southern Colorado (type locality), New Mexico (Snow, Trans. Kan. Acad. Sci., VIII, p. 38), and Arizona; in this latter state it is fairly plentiful in the mountain canyons.

Catocala ophelia Hy. Edwards

Plate VIII, figs. 13 and 14; Pl. XIV, fig. 8 (larva); Pl. XV, fig. 26 (larval head); Pl. XV, fig. 34, and Pl. XVI, fig. 8 (segments); Pl. XXII, fig. 12 (claspers).

Catocala ophelia HY. EDWARDS, 1880, Bull. Brooklyn Ent. Soc., II, p. 95. BEUTENMÜLLER, 1907, Bull. Amer. Mus. Nat. Hist., XXIII, p. 939. BARNES AND McDUNNOUGH, 1913, Psyche, II, p. 194 (larva).

Catocala verrilliana HOLLAND (nec Grote), 1903, Moth Book, p. 265, Pl. XXXIV, fig. 16.

Catocala ophelia var. *dolli* BEUTENMÜLLER, 1907, Bull. Amer. Mus. Nat. Hist., XXIII, p. 940.

The conformation of the t. p. line separates this species from both *violenta* and *verrilliana*. A dark form with brown-shaded primaries has been named *dolli* by Beutenmüller, the type being figured on plate VIII, figure 14.

The larva is markedly distinct from that of *verrilliana*, as may be seen by a comparison of the figures, thus establishing the validity of the species.

The type of this species came from Mendocino County, California; we possess entirely similar specimens from Glenwood Springs, Colorado, and Provo, Utah, so that the range is apparently quite extended.

SECTION III

Eunetis HÜBNER, 1823, Zuträge Exot. Schmett., II, p. 26, fig. 347 (type, *ultronia* Hübner).

Corisce HÜBNER, 1825, Verzeichniss, p. 278 (type, *amica* Hübner).

Fore and hind tibiae unspined; mid-tibiae spined.

While individual specimens of the species included in the previous section may show unspined hind tibiae, an unspined condition of the hind tibiae is apparently the normal state of the species included in the present section; we have, at least, been unable to find spines on any of the numerous specimens examined. Hampson has used the generic term *Ephesia* Hübner for the section with unspined hind tibiae, relegating *Eunetis* Hübner (1825, Verz., p. 276) to the synonymy of *Catocala* Schrank with the type wrongly stated as *puerpera* Ochsenheimer, the first species listed under this heading in the 'Verzeichniss.' *Eunetis*, however, was first used before 1823 by Hübner in the 'Zuträge,' II, p. 26, figures 347 and 348, for the single species *ultronia*, the genus being thus monotypical with *ultronia* as type. In this connection we might note that *Ephesia* was first used by Hübner in the 'Zuträge' in connection with *elonympha* (Figs. 29 and 30) and later in the same work with *amica* (Figs. 57 and 58), whereas in the 'Verzeichniss' new genera are established for both of these species. As it is fairly well established that Hübner issued the plates of the 'Zuträge' a few at a time, it is probable that the plate with the figure of *Ephesia elonympha* (Pl. V) appeared prior to that containing the figure of *amica* (Plate x) and that therefore the type of the genus *Ephesia* must be taken to be *elonympha*, the genus being monotypical. In any case, the type, according to our view, would have to be selected from these two species since both plates of the 'Zuträge' appeared long before the portion of the 'Verzeichniss' containing the genus *Ephesia*.

GROUP XVII

(*Eunetis* Hübner)

Egg (as far as known) very flat at apex and base, circular, with faint lateral ribbing, covered with an albuminous cement and laid in rows in a crevice. Larva with lateral filaments and a dorsal wart on the fifth abdominal segment, which is usually long and pointed. Male claspers symmetrical, with a distinct chitinous dorsal rim which ends pointedly at the apex but does not exceed the thinly chitinized ventral area.

The early stages of several species included in this group are unknown and their position is, therefore, tentative. The position of *clintoni* is rather doubtful, as Dodge's short description of the egg would seem to show it to be similar to the flat egg of the walnut-feeders; the larva, however, shows the fleshy horn in some of its earlier stages; the apex of the male claspers is rather more rounded than is usual.

The larvæ, as far as is known, are all feeders on Rosaceæ.

Catocala miranda Hy. Edwards

Plate VIII, fig. 22; Pl. XXII, fig. 13 (clasper).

Catocala miranda Hy. Edwards, 1881, Papilio, I, p. 118. BEUTENMÜLLER, 1907, Bull. Amer. Mus. Nat. Hist., XXIII, p. 940.

This is a rare species which generally has been wrongly associated with *judith*, which it resembles somewhat in size, totally differing, however, in structural details. We only know the species from the type specimen in the American Museum and the slide of the genitalia made by Beutenmüller but believe it will prove to be correctly associated with the *ultronia* group. The species has been recorded only from Washington, D. C.

Catocala orba Kusnezov

Plate VIII, fig. 21; Pl. XXII, fig. 14 (clasper).

Catocala orba KUSNEZOV, 1903, Rev. Russe Ent., III, p. 166, figs. 1a and 1b. FRENCH, 1903, Can. Ent., XXXV, pp. 3, 43.

The species is very closely allied to *miranda* Hy. Edwards and may prove, when more material is available, to be merely a race of this species; it is larger, as far as can be judged by the few available specimens, but the maculation is very similar. The species is known only from Texas.

Catocala ultronia (Hübner)

Plate VII, figs. 17-20; Pl. X, fig. 22, and Pl. XV, fig. 11 (larval head); Pl. XII, figs. 15 and 17 (larva); Pl. XXII, fig. 15 (clasper).

Eunetis ultronia HÜBNER, 1823, Zutr. Exot. Schmett., p. 26, figs. 347 and 348.*Catocala ultronia* SAUNDERS, 1874, Can. Ent., VI, p. 147 (larva). BEUTENMÜLLER, 1907, Bull. Amer. Mus. Nat. Hist., XXIII, p. 147.

BARNES AND McDUNNOUGH, 1918, Bull. Amer. Mus. Nat. Hist., XXXVIII, p. 171.

Catocala ultronia var. *mopsa* Hy. Edwards, 1880, Bull. Brooklyn Ent. Soc., III, p. 58.*Catocala ultronia* var. *adriana* Hy. Edwards, 1880, Bull. Brooklyn Ent. Soc., III, p. 57.*Catocala ultronia* var. *celia* Hy. Edwards, 1880, Bull. Brooklyn Ent. Soc., III, p. 58.*Catocala ultronia* var. *lucinda* BEUTENMÜLLER, 1907, Bull. Amer. Mus. Nat. Hist., XXIII, p. 940.*Catocala ultronia* form *nigrescens* CASSINO, 1917, The Lepidopterist, I, p. 79, Pl. VI.

The typical form of this well-known species, as figured by Hübner, is that found on plate VII, figure 20; it has been redescribed by Hy. Edwards under the name *mopsa*. A paler form, for a long time considered to be the typical form, has been designated by Beutenmüller *lucinda* (Fig. 17); in this form the inner margin of primaries is broadly brown. A still paler form with more extended but less sharply defined dark shades is *adriana* Hy. Edwards (Fig. 19); there are all manner of intergrades between this and the preceding form. *Nigrescens* Cassino is an occasional aberration in which the entire primaries are suffused with black-brown. *Celia* Hy. Edwards (Fig. 18) is probably a good racial form, from Florida and the Southern States, in which the dark median band on the secondaries is much narrower; it shows the same range of variation in the coloration of the primaries as is found in the type form.

It is quite possible that some of the so-called forms have developed into well-defined geographical races in certain localities, notably in the North and South. From ova laid by several females received from northern Ontario, we bred a long series of specimens which, without exception, were of a form resembling a very bright and contrasted *lucinda*; ova from Iowa resulted in imagines of both the type form and typical *lucinda*; careful breeding from various eastern and southern localities is necessary to establish the status of the various forms.

The species is wide-spread, occurring over the whole eastern half of the United States and ranging northward into Quebec and Ontario. As we have the species from Hymers in northwestern Ontario, it is probable that it occurs also in Manitoba, although we have found no published record of this.

Catocala cratægi Saunders

Plate X, figs. 4 and 5; Pl. X, fig. 21 (larval head); Pl. XII, fig. 18 (larva); Pl. XXII, fig. 19 (clasper).

Catocala cratægi SAUNDERS, 1876, Can. Ent., VIII, p. 72.*Catocala pretiosa* LINTNER, 1876, Can. Ent., VIII, p. 121.

This species was based largely on a larval description; one of the types, however, is in the British Museum *ex Grote* Collection and is figured by Hampson (Cat. Lep. Phal., Pl. cc, fig. 16), this figure agreeing with that on our plate X, figure

5. *Pretiosa* Lintner seems to be a form of this species with less brown shading on the primaries along the inner margin. It should be borne in mind that the "*polygama* Guenée," referred to by Lintner, Saunders, and others of the older authors, is not the true species but probably what we have designated as *blandula* Hulst. The two species, *blandula* and *cratægi* with its variety *pretiosa*, have been constantly confused; the larvæ are, however, totally distinct as may be seen by a reference to our figure of *blandula* and Saunders' description of *cratægi* larva, which is stated to possess a long fleshy horn and is much the same as, if not identical with, that of *mira* Grote. We have no knowledge regarding the material which served for the figure of the larva given here by Beutenmüller. *Cratægi* is more contrastingly brown and white in the color of its primaries, and the t. a. and t. p. lines do not approach each other nearly so closely in the submedian fold as they do in *blandula*, where they at times actually touch.

Owing to the manner in which the species has been misidentified, it is difficult to arrive at the correct area of distribution of the true species. As far as we can tell, it ranges through Canada from Manitoba to Nova Scotia and is common in the New England and northern Atlantic Coast States. We have several specimens of what seems to be a slightly larger form of this species labelled "Tennessee" and "Florida" but have no knowledge of their origin. Records from the Middle West may refer to the following species.

Catocala mira Grote

Plate X, figs. 2 and 3; Pl. XIII, fig. 12 (larva); Pl. XV, fig. 22 (larval head); Pl. XV, fig. 36, and Pl. XVI, fig. 4 (segments); Pl. XXII, fig. 20 (clasper).

Catocala mira GROTE, 1876, Can. Ent., VIII, p. 230; 1882, Ill. Ess. Noct. North Amer., p. 70, Pl. IV, fig. 43. BARNES AND McDUNNOUGH, 1918, Bull. Amer. Mus. Nat. Hist., XXXVIII, p. 172.

Catocala polygama HOLLAND (*nec* Guenée), 1903, Moth Book, p. 268, Pl. XXXIV, fig. 13.

Fresh specimens of the typical *mira* from the Plains States have a distinct bluish gray cast to the primaries and differ further from *cratægi* in lacking the brown shades at base and along inner margin and the white shades in the median area; older specimens and those from more southern points have a tendency to become slightly brownish as in figures 2 and 3 of plate X. Holland's figure of *jacquetta* (Pl. xxxv, fig. 5), as well as that of *polygama*, should probably also be referred to this species.

As we have already stated, *mira* may prove to be merely a form of *cratægi* but, until the two can be bred side by side, we prefer to keep them separate.

The species inhabits the central Plains States, extending down the Mississippi Valley into Texas and eastward along the Ohio Valley into western Pennsylvania (Pittsburg and New Brighton) and the extreme western portion of New York (Jamestown).

Catocala grynea (Cramer)

Plate IX, fig. 16; Pl. X, fig. 10; Pl. X, fig. 37 (larval head); Pl. XII, fig. 8 (larva); Pl. XXII, fig. 21 (clasper).

Phalæna grynea CRAMER, 1779, Pap. Exot., III, Pl. ccviii, figs. F. and H.

Catocala polygama GUENÉE, 1852, Hist. Nat. Spec. Gen. Lep., VII, p. 105, Pl. xvi, fig. 2.

Catocala nuptula WALKER, 1857, Cat. Lep. Het. Brit. Mus., XIII, p. 1205.

Catocala grynea ab. *constans* HULST, 1884, Bull. Brooklyn Ent. Soc., VII, p. 36.

Catocala grynea BEUTENMÜLLER, 1902, Bull. Amer. Mus. Nat. Hist., XVI, p. 382.

This common species may be known by the dull olive-gray primaries with obsolescent maculation and a distinct ferruginous shade on inner margin beyond t. p. line. Guenée's figure of *polygama* is very poor but we do not see to what other species it can be referred; it is certainly not *blandula*. *Constans* Hulst (Pl. X, fig. 10) is an aberration with the secondaries largely suffused with black.

The full life-history has yet to be recorded; the mature larva is, however, well-known, the dorsal horn placing it in this group.

The species is wide-spread and occurs throughout the eastern half of Canada and the United States, with the exception of the Gulf States and Texas.

Catocala praeclara Grote and Robinson

Plate IX, fig. 32; Pl. XXII, fig. 16 (clasper).

Catocala praeclara GROTE AND ROBINSON, 1866, Proc. Ent. Soc. Phil., VI, p. 25, Pl. iv, fig. 4.

This species possesses a peculiar, pale greenish, metallic sheen on the primaries which should readily distinguish it from its allies. Holland's figure (Pl. xxxv, fig. 7) is incorrect and should be referred to *gracilis* Edwards; it is the same species as his figure 8. The larval history has not been recorded. The species is fairly common in the northern Atlantic and New England States, extending into Nova Scotia (Rep. Ent. Soc. Ont. for 1908, p. 106); the records from Manitoba refer to the following species. Schroers' record (Ent. News, XXV, p. 59) from the vicinity of St. Louis, Missouri, if correct, would give a more extended range to the species than our material shows.

Catocala manitoba Beutenmüller

Plate IX, fig. 33; Pl. XXII, fig. 22 (clasper).

Catocala manitoba BEUTENMÜLLER, 1908, Ent. News, XIX, p. 54.

This is a duller and darker-colored form than *praeclara* and may possibly be merely a geographical race of this species. It is only known from Manitoba.

Catocala blandula Hulst

Plate X, fig. 1; Pl. XIV, fig. 12 (larva); Pl. XV, fig. 23 (larval head); Pl. XV, fig. 39, and Pl. XVI, fig. 3 (segments); Pl. XXII, fig. 17 (clasper).

Catocala blandula HULST, 1884, Bull. Brooklyn Ent. Soc., VII, p. 38. BARNES AND McDUNNOUGH, 1918, Bull. Amer. Mus. Nat. Hist., XXXVIII, p. 173.

This species is closely allied superficially to *C. crataegi* and more so to the variety *pretiosa*. It may be readily separated by the very oblique and almost even transverse anterior line, by the larger basal area, and by the very long inflection of the transverse posterior line in the submedian fold which almost touches or rests upon the transverse anterior line; when separated, it leaves the space between the two lines on the inner margin much narrower than in *C. crataegi*. The larvæ of the two species are entirely different, *blandula* being without the fleshy dorsal horn so characteristic of *crataegi*.

It is impossible to determine accurately the range of distribution of this species, as it has been confused with *crataegi* and *mira*. It occurs throughout Canada from Nova Scotia to northwestern Ontario (Hymers) and southern Manitoba (Cartwright) and extends southward through the New England States into the North Atlantic ones. Its range in the West is uncertain but it probably occurs at least in Michigan and Wisconsin and possibly in northern Illinois. We have a single specimen before us labelled "Kentucky."

Catocala alabamæ Grote

Plate IX fig. 17.

Catocala alabamæ GROTE, 1875, Proc. Acad. Nat. Sci. Phil., XXVI, p. 427. BEUTENMÜLLER, 1903, Bull. Amer. Mus. Nat. Hist., XIX, p. 508.

The dull coloration separates this species at the first glance from *praeclara*, from which it also differs in minor features of maculation, as may be seen by comparing the figures. Nothing is known of the early stages.

The species occurs in the Gulf States and central Texas (Springfield), extending up the Mississippi Valley to St. Louis, Missouri (Ent. News, XXV, 60). We have also a single specimen from Elmwood, Tennessee.

Catocala olivia Hy. Edwards

Plate IX, fig. 18; Pl. XXII, fig. 23 (clasper).

Catocala olivia HY. EDWARDS, 1880, Bull. Brooklyn Ent. Soc., II, p. 95. BEUTENMÜLLER, 1903, Bull. Amer. Mus. Nat. Hist., XIX, p. 508.

This is possibly a form of *alabamæ*, from which it differs by having a very large black patch on the inner margin of the fore wings. It is known only from Texas.

***Catocala titania* Dodge**

Plate VIII, fig. 19; Pl. IX, fig. 34.

Catocala titania DODGE, 1900, Ent. News, XI, p. 472. SCHWARZ, 1916, Ent. News, XXVII, p. 67.

This species may be merely a poorly marked form or race of *alabama*; the maculation is not well defined but there is nothing, as far as we can see, in the shape of the lines whereby the two might be separated. The single type (now in the Barnes Collection) is a rather undersized specimen, due probably to its having been bred; it is figured on plate IX, figure 34.

The only note we have on the life-history is that by Schwarz recording that the ova are laid in crevices of the bark of *Cratægus crus-galli*.

The species is known to occur only in Missouri and Illinois (Quincy).

***Catocala dulciola* Grote**

Plate IX, fig. 31; Pl. XXII, fig. 18 (clasper).

Catocala dulciola GROTE, 1881, Papilio, I, p. 5.

The rare species has quite a characteristic appearance with its pale median area, evenly rounded and prominent t. a. line, and brownish basal area with a short, heavy, black dash. It was first taken near Dayton, Ohio, and has since been reported from St. Louis, Missouri, and Quincy, Illinois. As far as our present knowledge goes, it is confined to the Ohio Valley region.

***Catocala clintoni* Grote**

Plate VII, fig. 14; Pl. XXII, fig. 24 (clasper).

Catocala clintonii GROTE, 1864, Proc. Ent. Soc. Phil., III, p. 89, Pl. III, fig. 4. DODGE, 1901, Can. Ent., XXXIII, p. 221 (larva).

This distinct species occurs generally throughout the United States east of the Rocky Mountains. Its being one of the earliest species on the wing possibly accounts for the fact that it is usually not very well represented in collections. It is also recorded from Vancouver, British Columbia, in the 1906 British Columbia Check List but the record needs verification. The life-history has been fully described by Dodge but, personally, we do not know the larva and have been unable to obtain material for figuring.

GROUP XVIII

Egg similar to that of Group XVII. Larva with lateral filaments and a small transverse dorsal wart on the fifth abdominal segment. Male claspers symmetrical, with long narrow and pointed apex.

The single species, *similis*, included here shows affinity to the preceding group in its early stages, but the male claspers are quite characteristic and much closer to those of *amica* than to any of the preceding group. The species is an oak-feeder.

***Catocala similis* Edwards**

Plate X, figs. 6-8; Pl. XIII, fig. 15 (larva); Pl. XV, fig. 43, and Pl. XVI, fig. 12 (segments); Pl. XXII, fig. 25 (clasper).

Phalæna amasia ABBOT AND SMITH, 1797, Nat. Hist. Lep. Ins. Georgia, II, Pl. xc (partim).*Catocala amasia* GUENÉE, 1852, Hist. Nat. Spec. Gen. Lep., VII, p. 103.*Catocala similis* EDWARDS, 1864, Proc. Ent. Soc. Phil., II, p. 511. BARNES AND McDUNNOUGH, 1918, Bull. Amer. Mus. Nat. Hist., XXXVIII, p. 175.*Catocala formula* GROTE AND ROBINSON, 1866, Proc. Ent. Soc. Phil., VI, p. 27, Pl. IV, fig. 5.*Catocala aholah* STRECKER, 1874, Lep. Rhop. Het., p. 96, Pl. XI, fig. 8.*Catocala formula* var. *isabella* HY. EDWARDS, 1880, Bull. Brooklyn Ent. Soc., III, p. 60.

This species may be readily separated into three forms, *similis*, *aholah*, and *isabella*. The type form is deep, almost slaty, gray, with a pale triangular apical patch; the figure (Pl. X, fig. 6) is too brown in tone. The variety *aholah* is paler, with a large black patch in the median space and a black subapical dash on the outer margin. Holland's figures

(Pl. xxxv, figs. 2 and 3) are just the reverse of this and the names should be interchanged. The variety *isabella* is allied to *aholah* but is grayer and lacks the black median patch and subapical dash.

The latter two names are based on Texan material and possibly represent forms of a good geographical race, peculiar to the Southern States.

The typical form is found in the New England and northern Atlantic States, extending northward into Ontario and Quebec. In the southern Atlantic and Gulf States it merges into *aholah*, which we have never seen from northern localities.

GROUP XIX

Egg (where known) similar to that of the preceding groups. Larva with filaments and a rather prominent dorsal wart. Male claspers asymmetrical, apices rounded.

The larvæ are oak-feeders, with the exception of *minuta* which feeds on *Gleditschia* and which possibly may form a group by itself as the male claspers show certain points of distinction. However, there is no doubt that considerable relationship exists between *minuta* and *micronympha* and we prefer to retain the species in one group for the present.

Catocala minuta Edwards

Plate IX, figs. 1-6; Pl. XI, figs. 12 and 13 (larva); Pl. XXII, figs. 30 and 31 (claspers).

Catocala minuta EDWARDS, 1864, Proc. Ent. Soc. Phil., II, p. 512. DODGE, 1901, Can. Ent., XXXIII, p. 222 (larva).

Catocala parvula EDWARDS, 1864, Proc. Ent. Soc. Phil., II, p. 512.

Catocala minuta var. *mellitula* HULST, 1884, Bull. Brooklyn Ent. Soc., VII, p. 35.

This is a small species with very variable fore wings. The type form is dark brown with a distinct, broad, white, subterminal line. The variety *parvula* (Pl. IX, fig. 2) is grayish or yellowish on the costal half and deep brown along the inner margin and on the outer margin to below the apex. The variety *mellitula* (Fig. 3) has the subbasal space and the whole of the median space yellow, the remaining parts being brown. There are numerous intergrading forms.

The species is wide-spread throughout the eastern half of the United States, probably occurring wherever *Gleditschia* grows; it is common in the central Plain States.

Catocala micronympha Guenée

Plate IX, figs. 22-30; Pl. XIV, fig. 11 (larva); Pl. XV, fig. 24 (larval head); Pl. XV, fig. 41, and Pl. XVI, fig. 11 (segments); Pl. XXII, figs. 26 and 27 (claspers).

Catocala micronympha GUENÉE, 1852, Hist. Nat. Spec. Gen. Lep., VII, p. 102. BEUTENMÜLLER, 1902, Bull. Amer. Mus. Nat. Hist., XVI, p. 382, Pl. LII, fig. 1 (larva). BARNES AND McDUNNOUGH, 1918, Bull. Amer. Mus. Nat. Hist., XXXVIII, p. 176.

Catocala fratercula GROTE AND ROBINSON, 1866, Proc. Ent. Soc. Phil., VI, p. 24, Pl. IV, fig. 3.

Catocala atarah STRECKER, 1874, Lep. Rhop. Het., p. 97, Pl. XI, figs. 10 and 11.

Catocala gisela MEYER, 1880, Bull. Brooklyn Ent. Soc., II, p. 96.

Catocala fratercula var. *jacquetta* HY. EDWARDS, 1880, Bull. Brooklyn Ent. Soc., III, p. 60.

Catocala timandra HY. EDWARDS, 1880, Bull. Brooklyn Ent. Soc., III, p. 60.

Catocala clintonii var. *helene* PILATE, 1882, Papilio, II, p. 31.

Catocala fratercula var. *hero* HY. EDWARDS, 1884, Papilio, IV, p. 125.

Catocala fratercula var. *ouwah* POLING, 1901, Can. Ent., XXXIII, p. 128.

This species shows extraordinary variability in the coloration of the primaries; when more is known about the species it may be found that there are several geographical races, but for the present we must treat them as mere forms or color phases. The typical form is that with chestnut-brown primaries (Pl. IX, fig. 22); it is apparently most typical in the South, all of our Floridan specimens being of this form. *Fratercula* Grote and Robinson is the pale olive-green form with the markings of varied intensity (Fig. 25); if necessary, this name may be applied to the northern Atlantic States form, the type material being from New York and Rhode Island; *helene*, *jacquetta*, and *timandra* all seem to have been applied to slight variants of this form and the names are scarcely worth retaining; it is possible, however, that *timandra*, based on Texan material, may prove to have racial characteristics when more material is available. Holland's figure under *jacquetta* (Pl. xxxv, fig. 5) is not typical; it is better referred to the type form. *Atarah* Strecker (as based on the male

specimen) is similar to the type form with the addition of a pale subreniform and a pale band beyond the t. a. line; it was described from Texan material; many specimens from this locality are heavily suffused with black-brown (Fig. 28) and others show, besides this, a black basal dash (Fig. 29); to such specimens the name *owwah* would apply. *Hero* Hy. Edwards (Figs. 23, 24, and 27), the type from Florida, is a form with prominent white shading in the median area, while *gisela* Meyer (Fig. 30) is a very striking form from the South (Georgia) with dark median area and white terminal band. Typical specimens of this latter form are rare but transitional forms with a prominent white s. t. line (Fig. 21) are more common.

The species has a wide range, occurring over the greater portion of the eastern half of the United States. In the New England States it has not been recorded north of Massachusetts nor have we it listed from Quebec; it has, however, been reported from Ontario (Rep. Ent. Soc. Ont. for 1885, p. 60).

Catocala cordelia Hy. Edwards

Plate IX, fig. 19; Pl. XXII, figs. 28 and 29 (claspers).

Phalaena amasia ABBOT AND SMITH (*nec* Esper), 1797, Nat. Hist. Ins. Georgia, II, p. 179, Pl. xc (partim).
Catocala cordelia HY. EDWARDS, 1880, Bull. Brooklyn Ent. Soc., III, p. 59. BEUTENMÜLLER, 1907, Bull. Amer. Mus. Nat. Hist., XXXIII, p. 146.

Smith, as distinctly stated in the text, based his diagnosis of *amasia* on the upper right-hand figure of plate xc and the name must be held to this species; the lower figure is that of *similis* Edwards. As, however, *amasia* Abbot and Smith is preoccupied by *amasia* Esper the next oldest name, *cordelia* Hy. Edwards, must be applied to this species. It is characterized by the broad, whitish, median area with paucity of maculation. We agree with Beutenmüller in correcting French's misidentification of this species (Can. Ent., XXXIV, p. 97) and referring his figures 2 and 3 to *amasia*, not his figure 1; French's copy of Abbot's figure is poor, the t. p. line being far too greatly accentuated.

The species occurs through the Atlantic Coast and Gulf States to Texas and has been reported from southern Illinois by French and from eastern Kansas by Snow (Trans. Kan. Acad. Sci., VII, p. 51).

Catocala connubialis Guenée

Plate IX, fig. 21.

Catocala connubialis GUENÉE, 1852, Hist. Nat. Spec. Gen. Lep., VII, p. 105.
Catocala amasia STRECKER (*nec* Abbot and Smith), 1874, Lep. Rhop. Het., p. 77, Pl. ix, fig. 12. HOLLAND, 1903, Moth Book, p. 268, Pl. xxxv, fig. 1.
Catocala sancta HÜLST, 1884, Bull. Brooklyn Ent. Soc., VII, p. 38.
Catocala amasia var. *virens* FRENCH, 1886, Can. Ent., XVIII, p. 162.

This possibly may prove to be merely a strongly marked form of *cordelia* Hy. Edwards; the two forms occur throughout the same territory and apparently together, to judge by French's remarks. A few specimens before us seem rather to intergrade with *cordelia*. Until the early stages of both forms are known, we prefer to treat them as separate species; we would note, however, that the male genitalia are absolutely identical. We hardly imagine that Guenée's note that the larva feeds on *Cephalanthus* will prove correct; it was based on a drawing by Abbot who frequently figured his larvæ on plants upon which it has since been proved they never feed; presumably the larva is an oak-feeder.

GROUP XX

(*Corisce* Hübner)

Egg unknown. Larva with short lateral filaments but without a dorsal wart. Male claspers symmetrical, with very pointed and rather serrate apices.

The egg will probably be similar to those of the preceding groups; the larvæ are oak-feeders. Hampson's separation of the genus *Corisce* on the ground that the abdominal tufting is absent is not very good; the abdomen is scarcely smoother in appearance than those of several of the smaller yellow-hind-winged species of the preceding groups.

Catocala amica (Hübner)

Plate VIII, fig. 20; Pl. IX, figs. 11–15; Pl. X, fig. 39 (larval head); Pl. XII, fig. 12 (larva); Pl. XXII, fig. 33 (clasper).

Ephesia amica HÜBNER, 1815, Zutr. Exot. Schmett., p. 14, Figs. 57 and 58.

Corisce amica HÜBNER, 1825, Verz. Bek. Schmett., p. 279.

Catocala amica BEUTENMÜLLER, 1902, Bull. Amer. Mus. Nat. Hist., XVI, p. 384, Pl. LII, fig. 3 (larva); idem., 1907, XXIII, p. 145.

ROWLEY AND BERRY, 1910, Ent. News, XXI, p. 448 (larva).

Catocala androphila GUENÉE, 1852, Hist. Nat. Spec. Gen. Lep., VII, p. 106.

Catocala lineella GROTE, 1872, Trans. Amer. Ent. Soc., IV, p. 18.

Catocala amica var. *nerissa* HY. EDWARDS, 1880, Bull. Brooklyn Ent. Soc., III, p. 61.

Catocala amica var. *suffusa* BEUTENMÜLLER, 1903, Bull. Amer. Mus. Nat. Hist., XIX, p. 508.

Catocala amica var. *androphila* BEUTENMÜLLER, 1907, Bull. Amer. Mus. Nat. Hist., XXIII, p. 146.

Catocala amica subsp. *novangliæ* REIFF, 1916, The Lepidopterist, I, p. 12, Pl. II, figs. 1 and 2.

Catocala amica form *melanotica* REIFF, 1916, The Lepidopterist, I, p. 15.

Catocala amica form *aurantiaca* REIFF, 1916, The Lepidopterist, I, p. 15. DYAR, 1917, The Lepidopterist, I, p. 31.

As Beutenmüller has pointed out, the typical form, according to Hübner's figure, has an olivaceous-gray tinge to the primaries, distinct maculation, but no curved dark apical shade; figure 11 of plate IX is closest to this conception but rather darker in ground color. *Androphila* Guenée was merely a name proposed to replace *amica* Hübner which Guenée considered preoccupied by *Hadena amica* Treitschke and, as such, has no status and cannot be used to designate any variety or form of *amica*, as proposed by Beutenmüller (Bull. Amer. Mus. Nat. Hist., XXIII, p. 146), but becomes an absolute synonym of this species, Hübner's name being perfectly valid. Grote, considering Guenée's description of *androphila* to be that of typical *amica* and applicable to a form with the dark, apical, curved mark (Fig. 14), redescribed the typical form (or a slightly darker variety of it) as *lineella*. He gave no definite localities and his type cannot be found but, according to the description, figure 11 would be quite typical.

Nerissa H. Edwards was applied to a form from Texas with deep blackish primaries, sparsely mottled with white; we have not seen the type but presume Beutenmüller's figure (Pl. VIII, fig. 20) is correct. We would note that the t. p. line is not nearly so dentate in this figure as in typical *amica* and have quite a number of specimens from Texas and Arkansas before us which show this peculiarity; others, however, from the same locality agree in this respect with *amica* so that the variation may be merely individual; the black spot at the anal angle of the secondaries is also very heavy in *nerissa*, as compared with the minute spot of *amica*; breeding is very necessary to determine the status of this form. Holland's figure of *nerissa* (Pl. XXXII, fig. 20) is best referred to typical *amica*; his figure 16 is a pale *amica* and his figure 19 cannot be *lineella* as it shows the curved apical mark; it is what Grote called *androphila* but apparently has no valid name.

Suffusa Beutenmüller (Fig. 15) was described from three specimens in the Barnes Collection from widely divergent localities (Florida, Texas, and Iowa). As it is possible that more than one race is involved in these types we would restrict the name to the female type from Harris County, Texas, which is figured in this paper but which is erroneously marked by Beutenmüller on the type label as a male.

Recently Reiff has described and figured a race from the New England States as *novangliæ*; this race is unknown to us. In the same paper he proposes the term *melanotica* for "suffused specimens of *amica* which are not *nerissa*," which he considers to be purely Texan; as, however, he has failed to note that *amica* was originally based on Georgian material and considers "Pennsylvania" material to be typical, it is quite impossible to determine to what form the name *melanotica* must be applied, especially as no mention is made of individual types or type localities. A still more poorly grounded name is his *aurantiaca*, which was originally a collective term for all specimens — no matter to what form they belonged — which showed a rather deeper yellow tone on the secondaries; this name was very properly limited by Dr. Dyar to the deeper colored specimens of the race *novangliæ*; even so, we believe the name to be quite superfluous.

The life-history of the species is incomplete and, until we know more concerning the larvæ of the various southern forms, it is impossible to list them correctly.

The species in one form or another extends throughout the eastern half of the United States, reaching northward into southern Ontario and Maine.

Catocala jair Strecker

Plate IX, figs. 10 and 20; Pl. XXII, fig. 32 (clasper).

Catocala jair STRECKER, 1897, Ent. News, VIII, p. 116.

This species is closely allied to *amica* but differs in the straighter and less dentate t. p. line and the broad brown-shaded

band following this line. We believe that specimens from Ohio which have been distributed as *jair* should be referred to *nerissa* Hy. Edwards, as figured on plate VIII, figure 20; they show the non-dentate t. p. line but lack entirely the brown subterminal shade which seems even more constant and characteristic than the shape of the t. p. line.

The type specimens (thirty in number) were taken in the Indian River region of Florida and since that time the species has remained almost unknown. Recently (Ent. News, XXI, p. 385), it has been reported from Lakehurst, New Jersey; if this identification be correct, collectors in this region should endeavor to secure ova and obtain the life-history. Beutenmüller (Ent. News, XXII, p. 140) records a dark form from Texas but this identification is very doubtful and probably should be referred to *nerissa*.

The following two species have been included by Mr. Beutenmüller in the genus *Catocala* but, in our opinion, must be removed and placed in separate genera. The life-history of one of these species, *nubilis*, has been shown by Mr. Rothke (1912, Entom. Rundschau, XXIX, pp. 67-76) to be distinctly non-catocaline; the egg is different, the larva is distinct, and there are two annual generations, the pupa hibernating, whereas in *Catocala* there is always only a single generation and the egg hibernates. This difference in the life cycle warrants a separation and this is further confirmed by the male claspers, which are totally distinct from anything found in the *Catocala* group, being very primitive in character and lacking the harpe.

Regarding the other species, *elonympha*, little is apparently known of the early stages, although we have Wasmuth's statement (1911, Ent. News, XXII, p. 139) that the egg is vastly different from the ordinary *Catocala* egg. Furthermore, it would appear from the records (Engel, Ann. Carn. Mus., 1908, p. 69) that this species also is double-brooded and probably has a life cycle similar to that of *nubilis*. The male claspers are also extraordinarily different and, besides being strongly asymmetrical, show a complicated armature which may best be understood by a reference to the figure.

For the above reasons, therefore, we have placed these two species in the genera *Euparthenos* and *Ephesia* respectively.

EUPARTHENOS GROTE

Euparthenos nubilis (Hübner)

Plate VII, figs. 1-4; Pl. XXI, fig. 20 (clasper).

Parthenos nubilis HÜBNER, 1822, Samml. Exot. Schmett., II, Pl. cccv.

Euparthenos nubilis GROTE, 1876, Ann. Lyc. Nat. Hist. New York, XI, p. 301. ROTHKE, 1912, Ent. Rundschau, XXIX, pp. 67-69 and 74-76 (larva).

Catocalirrhus nubilis ANDREWS, 1877, Can. Ent., IX, p. 20.

Catocala nubilis var. *fasciata* BEUTENMÜLLER, 1907, Bull. Amer. Mus. Nat. Hist., XXIII, p. 150.

Parthenos nubilis var. *apache* POLING, 1901, Can. Ent., XXXIII, p. 129.

Hübner's figure is based on a female specimen; in this sex the primaries are normally almost entirely suffused with black shades as in plate VII, figure 1. The male (Fig. 2) is much more shaded with white, and Beutenmüller's *fasciata* (Fig. 3) is based on a specimen of this sex with slightly more extended white shading than usual; as, however, the amount of white suffusion is quite variable, we see no reason for retaining the name. The race *apache* Poling (Fig. 4) from Arizona has the black banding on the secondaries much reduced.

The species extends from the southern New England States along the Atlantic Coast to North Carolina and westward through the Ohio Valley region to the Mississippi River. We have specimens from Vicksburg, Mississippi, so that its range will probably be found to be more extended than our present records indicate. It is recorded as rare in Kansas (Proc. Kan. Acad. Sci., IV, p. 50). In the North it is found in Wisconsin and Iowa and is quite common in southern Ontario.

EPHESIA HÜBNER***Ephesia elonympha* Hübner**

Plate X, figs. 11-13; Pl. XXI, figs. 21 and 22 (claspers).

Ephesia elonympha HÜBNER, 1815, Zutr. Exot. Schmett., I, p. 11, figs. 29 and 30.

Allotria elonympha HÜBNER, 1825, Verz. bek. Schmett., p. 280.

As we have already mentioned, we believe that the generic term *Ephesia* must be used for this species, Hübner's later usage of this generic name in the 'Verzeichniss' being invalidated by his earlier reference.

The species is quite variable in the amount of white suffusion on the primaries, figure 11 being fairly typical according to Hübner's figure.

Judging by the dates on our series of specimens, the species is double-brooded, occurring in early spring and again in July and August. Its range appears to be similar to that of the preceding species, with the exception that we have no records of its occurrence in Arizona.

PLATE I

PLATE I

- Fig. 1. *Catocala agrippina* Strecker, ♂.
- Fig. 2. *Catocala agrippina* Strecker, ♀.
- Fig. 3. *Catocala agrippina* Strecker, ♀.
- Fig. 4. *Catocala agrippina* Strecker. Aberration.
- Fig. 5. *Catocala agrippina* Strecker, ♀.
- Fig. 6. *Catocala agrippina* form *subviridis* Harvey.
- Fig. 7. *Catocala insolabilis* Guenée, ♂.
- Fig. 8. *Catocala insolabilis* Guenée, ♀.
- Fig. 9. *Catocala relictæ* Walker, ♂.
- Fig. 10. *Catocala relictæ* form *phrynia* Hy. Edwards.
- Fig. 11. *Catocala relictæ* form *clara* Beutenmüller.
- Fig. 12. *Catocala relictæ* variety *elda* Behrens.
- Fig. 13. *Catocala relictæ* Walker. Type.
- Fig. 14. *Catocala sappho* Strecker.
- Fig. 15. *Catocala judith* Strecker.
- Fig. 16. *Catocala epione* (Drury).
- Fig. 17. *Catocala vidua* (Abbot and Smith).
- Fig. 18. *Catocala andromedæ* (Guenée). *C. tristis* Edwards.
- Fig. 19. *Catocala unijuga* aberration *fletcheri* Beutenmüller. Type.
- Fig. 20. *Catocala mæstosa* (Hulst).



PLATE II

PLATE II

- Fig. 1. *Catocala lacrymosa* Guenée, ♂.
- Fig. 2. *Catocala lacrymosa* form *zelica* French.
- Fig. 3. *Catocala lacrymosa* form *evelina* French.
- Fig. 4. *Catocala lacrymosa* form *paulina* Hy. Edwards.
- Fig. 5. *Catocala lacrymosa* form *paulina* Hy. Edwards, ♂.
- Fig. 6. *Catocala lacrymosa* variety *ulalume* Strecker.
- Fig. 7. *Catocala lacrymosa* Guenée, ♀.
- Fig. 8. *Catocala dejecta* Strecker.
- Fig. 9. *Catocala robinsoni* Grote.
- Fig. 10. *Catocala robinsoni* form *curvata* French, ♀.
- Fig. 11. *Catocala relecta* Grote, ♂.
- Fig. 12. *Catocala flebilis* Grote, ♂.
- Fig. 13. *Catocala angusi* Grote, ♂.
- Fig. 14. *Catocala angusi* form *edna* Beutenmüller, ♀. Type.
- Fig. 15. *Catocala angusi* form *lucetta* Hy. Edwards.
- Fig. 16. *Catocala angusi* Grote. Aberration.
- Fig. 17. *Catocala obscura* Strecker, ♀.
- Fig. 18. *Catocala residua* Grote, ♂.
- Fig. 19. *Catocala relecta* form *luctuosa* Hulst, ♀.
- Fig. 20. *Catocala relecta* form *luctuosa* Hulst, ♂.

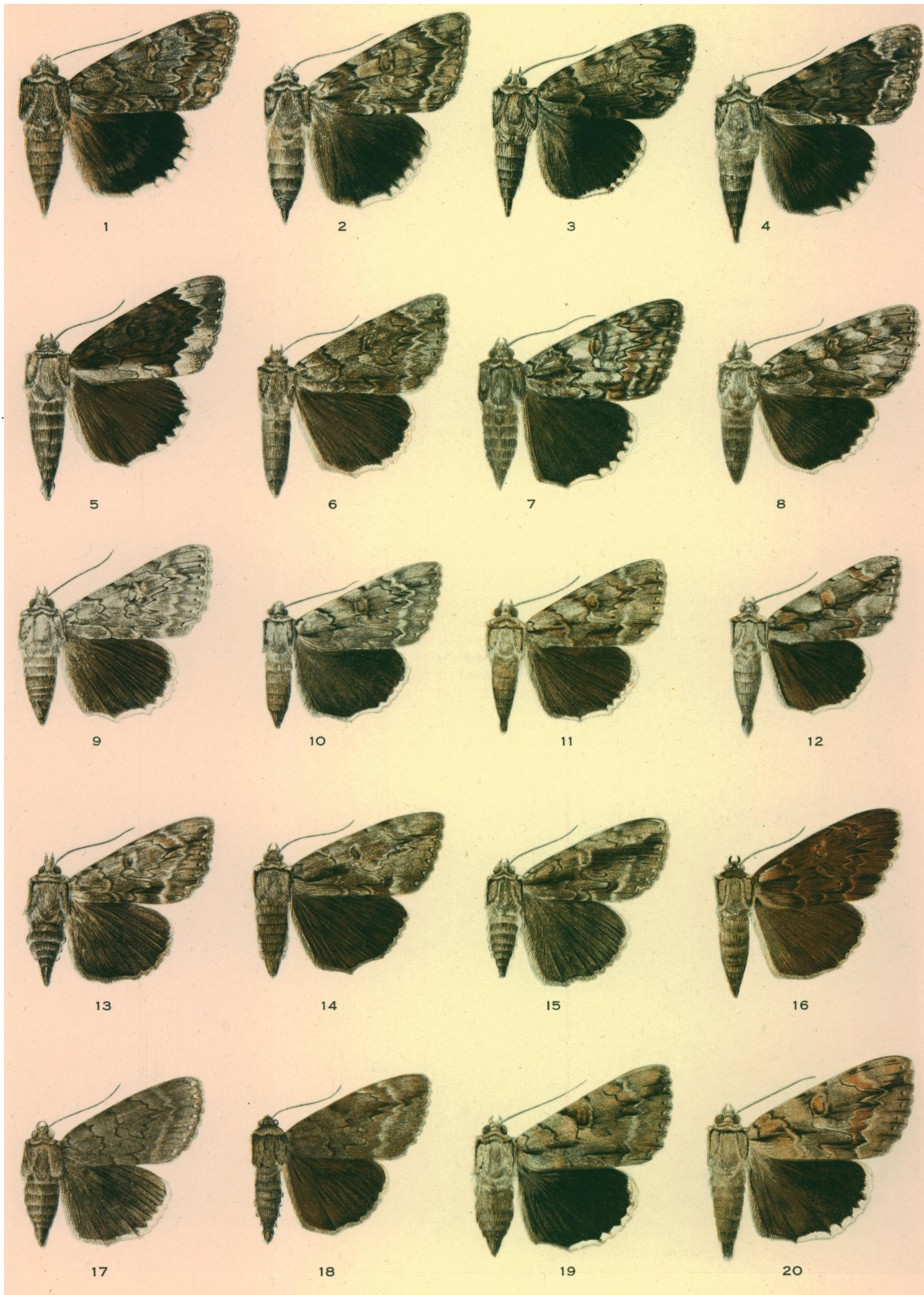


PLATE III

PLATE III

- Fig. 1. *Catocala aholibah* Strecker.
- Fig. 2. *Catocala aholibah* variety *coloradensis* Beutenmüller, ♀. Type.
- Fig. 3. *Catocala violenta* Hy. Edwards, ♂.
- Fig. 4. *Catocala violenta* Hy. Edwards, ♀.
- Fig. 5. *Catocala briseis* Edwards, ♂.
- Fig. 6. *Catocala briseis* Edwards, ♀. Pale form.
- Fig. 7. *Catocala grotiana* Bailey.
- Fig. 8. *Catocala briseis* variety *albida* Beutenmüller. Type.
- Fig. 9. *Catocala cara* Guenée.
- Fig. 10. *Catocala cara* variety *carissima* Hulst.
- Fig. 11. *Catocala amatrix* (Hübner).
- Fig. 12. *Catocala amatrix* form *selecta* Walker.
- Fig. 13. *Catocala amatrix* variety *pallida* Poling.
- Fig. 14. *Catocala parta* Guenée.
- Fig. 15. *Catocala concumbens* Walker, ♂.
- Fig. 16. *Catocala coccinata* Grote.
- Fig. 17. *Catocala coccinata* variety *circe* Strecker.
- Fig. 18. *Catocala coccinata* variety *sinuosa* Grote.
- Fig. 19. *Catocala marmorata* Edwards.



PLATE IV

PLATE IV

- Fig. 1. *Catocala pura* Hulst.
- Fig. 2. *Catocala semirelicta* Grote.
- Fig. 3. *Catocala hippolyta* Strecker.
- Fig. 4. *Catocala stretchi* Behr.
- Fig. 5. *Catocala stretchi* Behr. Variety.
- Fig. 6. *Catocala unijuga* Walker.
- Fig. 7. *Catocala unijuga* variety *agatha* Beutenmüller. Type.
- Fig. 8. *Catocala meskei* Grote.
- Fig. 9. *Catocala irene* Behr.
- Fig. 10. *Catocala irene* variety *valeria* Hy. Edwards.
- Fig. 11. *Catocala irene* form *virgilia* Hy. Edwards.
- Fig. 12. *Catocala irene* form *volumnia* Hy. Edwards. Typical.
- Fig. 13. *Catocala irene* form *volumnia* Hy. Edwards. Variety.
- Fig. 14. *Catocala stretchi* Behr.
- Fig. 15. *Catocala stretchi* Behr, ♂.
- Fig. 16. *Catocala aspasia* variety *augusta* Hy. Edwards.
- Fig. 17. *Catocala aspasia* variety *sara* French.
- Fig. 18. *Catocala stretchi* form *sierræ* Beutenmüller. Typical.
- Fig. 19. *Catocala stretchi* Hy. Edwards. Pink variety.
- Fig. 20. *Catocala arizonæ* Grote.



PLATE V

PLATE V

- Fig. 1. *Catocala californica* Edwards.
- Fig. 2. *Catocala hermia* Hy. Edwards.
- Fig. 3. *Catocala nevadensis* Beutenmüller. Type form.
- Fig. 4. *Catocala nevadensis* form *montana* Beutenmüller.
- Fig. 5. *Catocala aspasia* Strecker.
- Fig. 6. *Catocala arizonæ* Grote.
- Fig. 7. *Catocala arizonæ* form *babayaga* Strecker. Variety.
- Fig. 8. *Catocala arizonæ* form *babayaga* Strecker.
- Fig. 9. *Catocala arizonæ* form *babayaga* Strecker.
- Fig. 10. *Catocala texanæ* French.
- Fig. 11. *Catocala hermia* Hy. Edwards (?).
- Fig. 12. *Catocala cleopatra* Strecker.
- Fig. 13. *Catocala cleopatra* form *perdita* Strecker.
- Fig. 14. *Catocala allusa* Hulst (?).
- Fig. 15. *Catocala allusa* Hulst.
- Fig. 16. *Catocala faustina* Strecker.
- Fig. 17. *Catocala faustina* form *zillah* Strecker.
- Fig. 18. *Catocala faustina* form *lydia* Beutenmüller. Type.
- Fig. 19. *Catocala faustina* variety *cærulea* Beutenmüller. Type.
- Fig. 20. *Catocala faustina* aberration *carlota* Beutenmüller. Type.



PLATE VI

PLATE VI

- Fig. 1. *Catocala cerogama* Guenée.
- Fig. 2. *Catocala piatrix* Grote.
- Fig. 3. *Catocala piatrix* variety *dionyza* Hy. Edwards.
- Fig. 4. *Catocala ilia* form *umbrosa* Worthington.
- Fig. 5. *Catocala ilia* form *confusa* Worthington.
- Fig. 6. *Catocala ilia* (Cramer). Close to form *duplicata* Worthington.
- Fig. 7. *Catocala ilia* form *conspicua* Worthington.
- Fig. 8. *Catocala zoe* Behr. Variety.
- Fig. 9. *Catocala zoe* Behr. Type form.
- Fig. 10. *Catocala neogama* (Abbot and Smith), ♂.
- Fig. 11. *Catocala neogama* (Abbot and Smith), ♀. Dark form.
- Fig. 12. *Catocala neogama* aberration *snowiana* Grote. Type.
- Fig. 13. *Catocala delilah* Strecker.
- Fig. 14. *Catocala delilah* variety *desdemona* Hy. Edwards.
- Fig. 15. *Catocala subnata* Grote, ♀.
- Fig. 16. *Catocala subnata* Grote, ♂.
- Fig. 17. *Catocala nebulosa* Edwards.
- Fig. 18. *Catocala palæogama* Guenée.
- Fig. 19. *Catocala palæogama* form *phalangæ* Grote.
- Fig. 20. *Catocala palæogama* form *annida* Fager.



PLATE VII

PLATE VII

- Fig. 1. *Euparthenos nubilis* (Hübner), ♀.
- Fig. 2. *Euparthenos nubilis* (Hübner), ♂.
- Fig. 3. *Euparthenos nubilis* form *fasciata* Beutenmüller.
- Fig. 4. *Euparthenos nubilis* variety *apache* Poling.
- Fig. 5. *Catocala habilis* Grote.
- Fig. 6. *Catocala serena* Edwards.
- Fig. 7. *Catocala consors* (Abbot and Smith).
- Fig. 8. *Catocala caelebs* Grote.
- Fig. 9. *Catocala innubens* Guenée, ♂.
- Fig. 10. *Catocala innubens* Guenée ♀.
- Fig. 11. *Catocala innubens* form *scintillans* Grote.
- Fig. 12. *Catocala frederici* Grote.
- Fig. 13. *Catocala illecta* Walker.
- Fig. 14. *Catocala clintoni* Grote.
- Fig. 15. *Catocala antinympha* (Hübner).
- Fig. 16. *Catocala badia* Grote and Robinson.
- Fig. 17. *Catocala ultronia* form *lucinda* Beutenmüller.
- Fig. 18. *Catocala ultronia* form *celia* Hy. Edwards.
- Fig. 19. *Catocala ultronia* form *adriana* Hy. Edwards.
- Fig. 20. *Catocala ultronia* (Hübner). Type form.
- Fig. 21. *Catocala luciana* Strecker. Type form.
- Fig. 22. *Catocala luciana* Strecker. Variety.
- Fig. 23. *Catocala luciana* form *somnus* Dodge.
- Fig. 24. *Catocala muliercula* Guenée.



PLATE VIII

PLATE VIII

- Fig. 1. *Catocala verecunda* Hulst, ♂.
- Fig. 2. *Catocala verecunda* Hulst, ♀.
- Fig. 3. *Catocala verecunda* Hulst.
- Fig. 4. *Catocala verecunda* Hulst.
- Fig. 5. *Catocala verecunda* Hulst. Variety (?).
- Fig. 6. *Catocala junctura* Walker.
- Fig. 7. *Catocala junctura* Walker. Variety.
- Fig. 8. *Catocala verecunda* form *diantha* Beutenmüller. Variety (?).
- Fig. 9. *Catocala verecunda* form *diantha* Beutenmüller.
- Fig. 10. *Catocala herodias* Strecker.
- Fig. 11. *Catocala verecunda* Hulst. Variety.
- Fig. 12. *Catocala jessica* Hy. Edwards.
- Fig. 13. *Catocala ophelia* Hy. Edwards.
- Fig. 14. *Catocala ophelia* variety *dolli* Beutenmüller. Type.
- Fig. 15. *Catocala verrilliana* variety *beutenmuelleri* Barnes and McDunnough.
- Fig. 16. *Catocala verrilliana* aberration *verneri* Biederman.
- Fig. 17. *Catocala amestris* Strecker.
- Fig. 18. *Catocala amestris* variety *westcotti* Grote.
- Fig. 19. *Catocala titania* Dodge.
- Fig. 20. *Catocala amica* form *nerissa* Hy. Edwards.
- Fig. 21. *Catocala orba* Kusnezov.
- Fig. 22. *Catocala miranda* Hy. Edwards.
- Fig. 23. *Catocala unijuga* form *beaniana* Grote.
- Fig. 24. *Catocala electilis* Walker.
- Fig. 25. *Catocala denussa* Ehrmann. Type.
- Fig. 26. *Catocala euphemia* Beutenmüller.



PLATE IX

PLATE IX

- Fig. 1. *Catocala minuta* Edwards.
- Fig. 2. *Catocala minuta* form *parvula* Edwards.
- Fig. 3. *Catocala minuta* form *mellitula* Hulst.
- Fig. 4. *Catocala minuta* Edwards. Variety.
- Fig. 5. *Catocala minuta* Edwards. Variety.
- Fig. 6. *Catocala minuta* Edwards. Variety.
- Fig. 7. *Catocala gracilis* Edwards.
- Fig. 8. *Catocala gracilis* form *sordida* Grote.
- Fig. 9. *Catocala gracilis* form *sordida* Grote.
- Fig. 10. *Catocala jair* Strecker, ♂.
- Fig. 11. *Catocala amica* (Hübner). Type form.
- Fig. 12. *Catocala amica* (Hübner). Pale form.
- Fig. 13. *Catocala amica* (Hübner). Variety.
- Fig. 14. *Catocala amica* (Hübner). Variety.
- Fig. 15. *Catocala amica* form *suffusa* Beutenmüller. Type.
- Fig. 16. *Catocala grynea* (Cramer).
- Fig. 17. *Catocala alabamæ* Grote.
- Fig. 18. *Catocala olivia* Hy. Edwards.
- Fig. 19. *Catocala cordelia* Hy. Edwards. *P. amasia* Abbot and Smith.
- Fig. 20. *Catocala jair* Strecker, ♀.
- Fig. 21. *Catocala connubialis* Guenée. *C. sancta* Hulst.
- Fig. 22. *Catocala micronympha* Guenée.
- Fig. 23. *Catocala micronympha* form *hero* Hy. Edwards.
- Fig. 24. *Catocala micronympha* form *hero* Hy. Edwards.
- Fig. 25. *Catocala micronympha* form *jacquenetia* Hy. Edwards.
- Fig. 26. *Catocala micronympha* Guenée. Variety.
- Fig. 27. *Catocala micronympha* form *hero* Hy. Edwards.
- Fig. 28. *Catocala micronympha* Guenée. Variety.
- Fig. 29. *Catocala micronympha* form *ouwah* Poling. Type.
- Fig. 30. *Catocala micronympha* form *gisela* Meyer.
- Fig. 31. *Catocala dulciola* Grote.
- Fig. 32. *Catocala præclara* Grote and Robinson.
- Fig. 33. *Catocala manitoba* Beutenmüller.
- Fig. 34. *Catocala titania* Dodge. Type.
- Fig. 35. *Catocala andromache* Hy. Edwards.



PLATE X

PLATE X

- Fig. 1. *Catocala blandula* Hulst.
- Fig. 2. *Catocala mira* Grote. Variety.
- Fig. 3. *Catocala mira* Grote. Type form.
- Fig. 4. *Catocala cratægi* form *pretiosa* Lintner.
- Fig. 5. *Catocala cratægi* Saunders.
- Fig. 6. *Catocala similis* Edwards.
- Fig. 7. *Catocala similis* form *aholah* Strecker.
- Fig. 8. *Catocala similis* form *isabella* Hy. Edwards.
- Fig. 9. *Catocala chelidonia* Grote.
- Fig. 10. *Catocala grynea* aberration *constans* Hulst.
- Fig. 11. *Ephesia elonympha* Hübner.
- Fig. 12. *Ephesia elonympha* Hübner. Variety.
- Fig. 13. *Ephesia elonympha* Hübner. Variety.
- Fig. 14. *Catocala verrilliana* Grote.
- Fig. 15. *Catocala verrilliana* aberration *votiva* Hulst.
- Fig. 16. *Catocala whitneyi* Dodge.
- Fig. 17. *Catocala whitneyi* Dodge. Dark form.
- Fig. 18. *Catocala abbreviatella* Grote.
- Fig. 19. *Catocala nuptialis* Walker.
- Fig. 20. *Catocala messalina* Guenée.
- Fig. 21. Head of larva of *Catocala cratægi*.
- Fig. 22. Head of larva of *Catocala ultronia*.
- Fig. 23. Head of larva of *Catocala insolabilis*.
- Fig. 24. Head of larva of *Catocala habilis*.
- Fig. 25. Head of larva of *Catocala mæstosa*.
- Fig. 26. Head of larva of *Catocala ilia*.
- Fig. 27. Head of larva of *Catocala piatrix*.
- Fig. 28. Head of larva of *Catocala judith*.
- Fig. 29. Head of larva of *Catocala neogama*.
- Fig. 30. Head of larva of *Catocala illecta*.
- Fig. 31. Head of larva of *Catocala consors*.
- Fig. 32. Head of larva of *Catocala badia*.
- Fig. 33. Head of larva of *Catocala amestris*.
- Fig. 34. Head of larva of *Catocala parta*.
- Fig. 35. Head of larva of *Catocala innubens*.
- Fig. 36. Head of larva of *Catocala amatrix*.
- Fig. 37. Head of larva of *Catocala grynea*.
- Fig. 38. Head of larva of *Catocala cara*.
- Fig. 39. Head of larva of *Catocala amica*.



PLATE XI

PLATE XI

- Fig. 1. Larva of *Catocala cara*.
Fig. 2. Larva of *Catocala cara*. Immature.
Fig. 3. Larva of *Catocala amatrrix*.
Fig. 4. Larva of *Catocala parta*.
Fig. 5. Larva of *Catocala concumbens*. Lateral filaments omitted.
Fig. 6. Larva of *Catocala piatrix*. According to Beutenmüller.
Fig. 7. Larva of *Catocala maestosa*. Immature; lateral filaments omitted.
Fig. 8. Larva of *Catocala neogama*.
Fig. 9. Larva of *Catocala neogama*.
Fig. 10. Larva of *Catocala innubens*.
Fig. 11. Larva of *Catocala palæogama*. Poor figure.
Fig. 12. Larva of *Catocala minuta*. Dark form, natural size.
Fig. 13. Larva of *Catocala minuta*. Gray form, enlarged.
Fig. 14. Larva of *Catocala pura*. Color too white.
Fig. 15. Larva of *Catocala judith*.



PLATE XII

PLATE XII

- Fig. 1. Larva of *Catocala habilis*.
Fig. 2. Larva of *Catocala badia*.
Fig. 3. Larva of *Catocala badia*.
Fig. 4. Larva of *Catocala badia*.
Fig. 5. Larva of *Catocala badia*. Immature.
Fig. 6. Larva of *Catocala badia*. Immature.
Fig. 7. Larva of *Catocala amestris*.
Fig. 8. Larva of *Catocala grynea*.
Fig. 9. Larva of *Catocala ilia*. Poor figure.
Fig. 10. Larva of *Catocala illecta*.
Fig. 11. Larva of *Catocala insolabilis*.
Fig. 12. Larva of *Catocala amica*.
Fig. 13. Larva of *Catocala muliercula*.
Fig. 14. Larva of *Catocala antinympha*.
Fig. 15. Larva of *Catocala ultronia*. Paler than normal.
Fig. 16. Larva of *Catocala consors*.
Fig. 17. Larva of *Catocala ultronia*.
Fig. 18. Larva of *Catocala cratægi*.
Fig. 19. Larva of *Catocala flebilis*.
Fig. 20. Larva of *Catocala relecta*.



PLATE XIII

PLATE XIII

- Fig. 1. Larva of *Catocala resecta*.
Fig. 2. Larva of *Catocala residua*.
Fig. 3. Larva of *Catocala epione*.
Fig. 4. Larva of *Catocala palæogama*.
Fig. 5. Larva of *Catocala piatrix*.
Fig. 6. Larva of *Catocala vidua*.
Fig. 7. Larva of *Catocala briseis*.
Fig. 8. Larva of *Catocala unijuga*.
Fig. 9. Larva of *Catocala californica*.
Fig. 10. Larva of *Catocala parta*.
Fig. 11. Larva of *Catocala verecunda*.
Fig. 12. Larva of *Catocala mira*.
Fig. 13. Larva of *Catocala irene*.
Fig. 14. Larva of *Catocala relictæ*.
Fig. 15. Larva of *Catocala similis*.



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PLATE XIV

PLATE XIV

- Fig. 1. Larva of *Catocala coccinata*.
- Fig. 2. Larva of *Catocala delilah* variety *desdemona*.
- Fig. 3. Larva of *Catocala pura*.
- Fig. 4. Larva of *Catocala grotiana*.
- Fig. 5. Larva of *Catocala zoe*.
- Fig. 6. Larva of *Catocala aholibah*.
- Fig. 7. Larva of *Catocala aspasia*.
- Fig. 8. Larva of *Catocala ophelia*.
- Fig. 9. Larva of *Catocala semirelecta*.
- Fig. 10. Larva of *Catocala verrilliana* variety *beutenmuelleri*.
- Fig. 11. Larva of *Catocala micronympha*.
- Fig. 12. Larva of *Catocala blandula*.



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PLATE XV

PLATE XV

All figures $\times 5$

- Fig. 1. Head of larva of *Catocala vidua*.
- Fig. 2. Head of larva of *Catocala residua*.
- Fig. 3. Head of larva of *Catocala relecta*.
- Fig. 4. Head of larva of *Catocala grotiana*.
- Fig. 5. Head of larva of *Catocala relecta*.
- Fig. 6. Head of larva of *Catocala palæogama*.
- Fig. 7. Head of larva of *Catocala epione*.
- Fig. 8. Head of larva of *Catocala piatrix*.
- Fig. 9. Head of larva of *Catocala aholibah*.
- Fig. 10. Head of larva of *Catocala zoe*.
- Fig. 11. Head of larva of *Catocala ultronia*.
- Fig. 12. Head of larva of *Catocala aspasia*.
- Fig. 13. Head of larva of *Catocala pura*.
- Fig. 14. Head of larva of *Catocala californica*.
- Fig. 15. Head of larva of *Catocala verecunda*.
- Fig. 16. Head of larva of *Catocala unijuga*.
- Fig. 17. Head of larva of *Catocala briseis*.
- Fig. 18. Head of larva of *Catocala delilah* variety *desdemona*.
- Fig. 19. Head of larva of *Catocala semirelecta*.
- Fig. 20. Head of larva of *Catocala coccinata*.
- Fig. 21. Head of larva of *Catocala irene*.
- Fig. 22. Head of larva of *Catocala mira*.
- Fig. 23. Head of larva of *Catocala blandula*.
- Fig. 24. Head of larva of *Catocala micronympha*.
- Fig. 25. Head of larva of *Catocala similis*.
- Fig. 26. Head of larva of *Catocala ophelia*.
- Fig. 27. Head of larva of *Catocala verrilliana* variety *beutenmuelleri*.
- Fig. 28. Eighth abdominal segment of larva of *Catocala delilah* variety *desdemona*.
- Fig. 29. Eighth abdominal segment of larva of *Catocala residua*.
- Fig. 30. Eighth abdominal segment of larva of *Catocala palæogama*.
- Fig. 31. Eighth abdominal segment of larva of *Catocala relecta*.
- Fig. 32. Eighth abdominal segment of larva of *Catocala vidua*.
- Fig. 33. Eighth abdominal segment of larva of *Catocala coccinata*.
- Fig. 34. Eighth abdominal segment of larva of *Catocala ophelia*.
- Fig. 35. Eighth abdominal segment of larva of *Catocala pura*.
- Fig. 36. Eighth abdominal segment of larva of *Catocala mira*.
- Fig. 37. Eighth abdominal segment of larva of *Catocala aspasia*.
- Fig. 38. Eighth abdominal segment of larva of *Catocala aholibah*.
- Fig. 39. Eighth abdominal segment of larva of *Catocala blandula*.
- Fig. 40. Eighth abdominal segment of larva of *Catocala verrilliana* variety *beutenmuelleri*.
- Fig. 41. Eighth abdominal segment of larva of *Catocala micronympha*.
- Fig. 42. Eighth abdominal segment of larva of *Catocala zoe*.
- Fig. 43. Eighth abdominal segment of larva of *Catocala similis*.



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PLATE XVI

PLATE XVI

All figures $\times 5$

- Fig. 1. Fifth abdominal segment of larva of *Catocala epione*.
- Fig. 2. Fifth abdominal segment of larva of *Catocala delilah* variety *desdemona*.
- Fig. 3. Fifth abdominal segment of larva of *Catocala blandula*.
- Fig. 4. Fifth abdominal segment of larva of *Catocala mira*.
- Fig. 5. Fifth abdominal segment of larva of *Catocala pura*.
- Fig. 6. Fifth abdominal segment of larva of *Catocala irene*.
- Fig. 7. Fifth abdominal segment of larva of *Catocala verrilliana* variety *beutenmuelleri*.
- Fig. 8. Fifth abdominal segment of larva of *Catocala ophelia*.
- Fig. 9. Fifth abdominal segment of larva of *Catocala aspasia*.
- Fig. 10. Fifth abdominal segment of larva of *Catocala zoe*.
- Fig. 11. Fifth abdominal segment of larva of *Catocala micronympha*.
- Fig. 12. Fifth abdominal segment of larva of *Catocala similis*.
- Fig. 13. Fifth abdominal segment of larva of *Catocala aholibah*.
- Fig. 14. Eighth abdominal segment of larva of *Catocala relict*.
- Fig. 15. Eighth abdominal segment of larva of *Catocala grotiana*.
- Fig. 16. Eighth abdominal segment of larva of *Catocala semirelict*.
- Fig. 17. Eighth abdominal segment of larva of *Catocala briseis*.
- Fig. 18. Eighth abdominal segment of larva of *Catocala irene*.
- Fig. 19. Eighth abdominal segment of larva of *Catocala californica*.
- Fig. 20. Eighth abdominal segment of larva of *Catocala unijuga*.
- Fig. 21. Eighth abdominal segment of larva of *Catocala verecunda*.



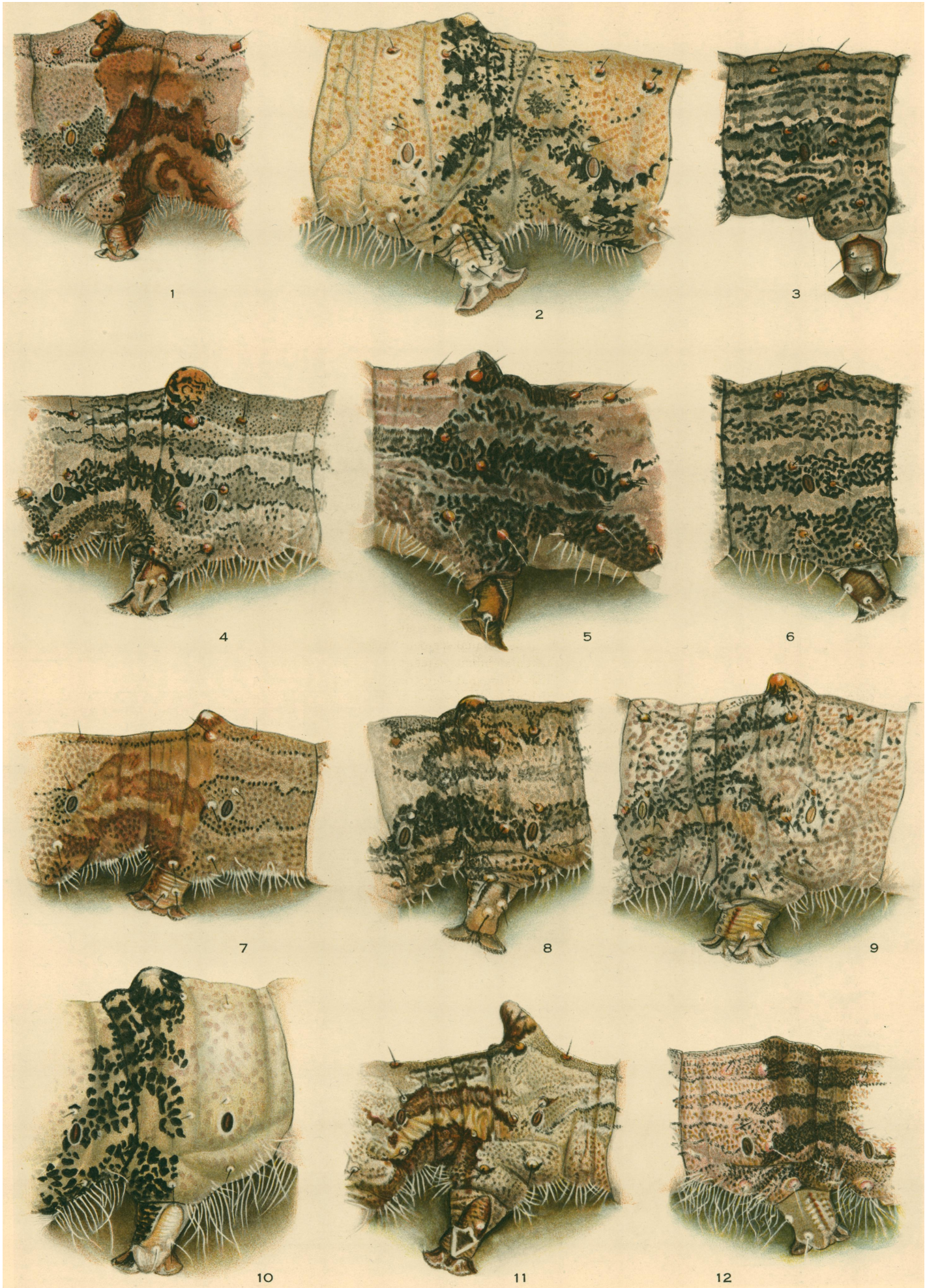
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PLATE XVII

PLATE XVII

All figures $\times 5$

- Fig. 1. Fifth abdominal segment of larva of *Catocala californica*.
- Fig. 2. Fifth abdominal segment of larva of *Catocala grotiana*.
- Fig. 3. Fifth abdominal segment of larva of *Catocala residua*.
- Fig. 4. Fifth abdominal segment of larva of *Catocala briseis*.
- Fig. 5. Fifth abdominal segment of larva of *Catocala palæogama*.
- Fig. 6. Fifth abdominal segment of larva of *Catocala relecta*.
- Fig. 7. Fifth abdominal segment of larva of *Catocala verecunda*.
- Fig. 8. Fifth abdominal segment of larva of *Catocala unijuga*.
- Fig. 9. Fifth abdominal segment of larva of *Catocala semirelecta*.
- Fig. 10. Fifth abdominal segment of larva of *Catocala relecta*.
- Fig. 11. Fifth abdominal segment of larva of *Catocala coccinata*.
- Fig. 12. Fifth abdominal segment of larva of *Catocala vidua*.



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PLATE XVIII

PLATE XVIII

- Fig. 1. Right clasper of *Catocala innubens*, enlarged.
- Fig. 2. Left clasper of *Catocala innubens*, enlarged.
- Fig. 3. Right clasper of *Catocala piatrix*, enlarged.
- Fig. 4. Left clasper of *Catocala piatrix*, enlarged.
- Fig. 5. Right clasper of *Catocala epione*, enlarged.
- Fig. 6. Left clasper of *Catocala epione*, enlarged.
- Fig. 7. Right clasper of *Catocala consors*, enlarged.
- Fig. 8. Left clasper of *Catocala consors*, enlarged.
- Fig. 9. Right clasper of *Catocala muliercula*, enlarged.
- Fig. 10. Left clasper of *Catocala muliercula*, enlarged.
- Fig. 11. Right clasper of *Catocala antinympha*, enlarged.
- Fig. 12. Left clasper of *Catocala antinympha*, enlarged.
- Fig. 13. Right clasper of *Catocala cælebs*, enlarged.
- Fig. 14. Left clasper of *Catocala cælebs*, enlarged.
- Fig. 15. Right clasper of *Catocala badia*, enlarged.
- Fig. 16. Left clasper of *Catocala badia*, enlarged.
- Fig. 17. Right clasper of *Catocala habilis*, enlarged.
- Fig. 18. Left clasper of *Catocala habilis*, enlarged.
- Fig. 19. Right clasper of *Catocala serena*, enlarged.
- Fig. 20. Left clasper of *Catocala serena*, enlarged.
- Fig. 21. Right clasper of *Catocala robinsoni*, enlarged.
- Fig. 22. Left clasper of *Catocala robinsoni*, enlarged.
- Fig. 23. Right clasper of *Catocala judith*, enlarged.
- Fig. 24. Left clasper of *Catocala judith*, enlarged.
- Fig. 25. Right clasper of *Catocala angusi*, enlarged.
- Fig. 26. Left clasper of *Catocala angusi*, enlarged.
- Fig. 27. Right clasper of *Catocala obscura*, enlarged.
- Fig. 28. Left clasper of *Catocala obscura*, enlarged.
- Fig. 29. Right clasper of *Catocala residua*, enlarged.
- Fig. 30. Left clasper of *Catocala residua*, enlarged.
- Fig. 31. Right clasper of *Catocala sappho*, enlarged.
- Fig. 32. Left clasper of *Catocala sappho*, enlarged.
- Fig. 33. Right clasper of *Catocala flebilis*, enlarged.
- Fig. 34. Left clasper of *Catocala flebilis*, enlarged.
- Fig. 35. Right clasper of *Catocala agrippina*, enlarged.
- Fig. 36. Left clasper of *Catocala agrippina*, enlarged.
- Fig. 37. Right clasper of *Catocala relecta*, enlarged.
- Fig. 38. Left clasper of *Catocala relecta*, enlarged.
- Fig. 39. Right clasper of *Catocala dejecta*, enlarged.
- Fig. 40. Left clasper of *Catocala dejecta*, enlarged.

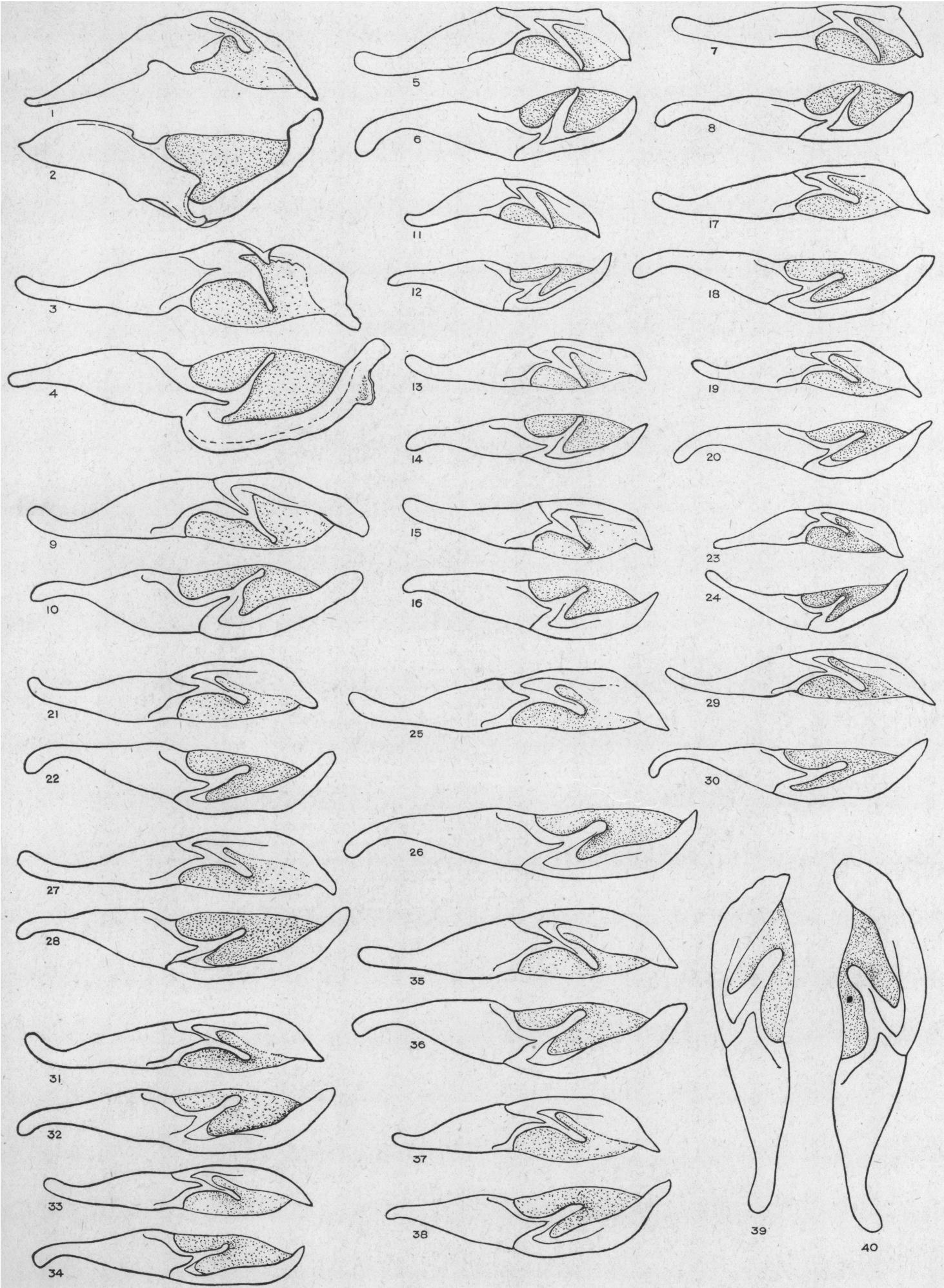


PLATE XIX

PLATE XIX

- Fig. 1. Right clasper of *Catocala insolabilis*, enlarged.
- Fig. 2. Left clasper of *Catocala insolabilis*, enlarged.
- Fig. 3. Right clasper of *Catocala vidua*, enlarged.
- Fig. 4. Left clasper of *Catocala vidua*, enlarged.
- Fig. 5. Right clasper of *Catocala mæstosa*, enlarged.
- Fig. 6. Left clasper of *Catocala mæstosa*, enlarged.
- Fig. 7. Right clasper of *Catocala lacrymosa*, enlarged.
- Fig. 8. Left clasper of *Catocala lacrymosa*, enlarged.
- Fig. 9. Right clasper of *Catocala nebulosa*, enlarged.
- Fig. 10. Left clasper of *Catocala nebulosa*, enlarged.
- Fig. 11. Right clasper of *Catocala neogama*, enlarged.
- Fig. 12. Left clasper of *Catocala neogama*, enlarged.
- Fig. 13. Right clasper of *Catocala subnata*, enlarged.
- Fig. 14. Left clasper of *Catocala subnata*, enlarged.
- Fig. 15. Right clasper of *Catocala euphemia*, enlarged.
- Fig. 16. Left clasper of *Catocala euphemia*, enlarged.
- Fig. 17. Right clasper of *Catocala palæogama*, enlarged.
- Fig. 18. Left clasper of *Catocala palæogama*, enlarged.
- Fig. 19. Right clasper of *Catocala aholibah*, enlarged.
- Fig. 20. Left clasper of *Catocala aholibah*, enlarged.
- Fig. 21. Right clasper of *Catocala cerogama*, enlarged.
- Fig. 22. Left clasper of *Catocala cerogama*, enlarged.
- Fig. 23. Right clasper of *Catocala ilia*, enlarged.
- Fig. 24. Left clasper of *Catocala ilia*, enlarged.
- Fig. 25. Right clasper of *Catocala relictæ*, enlarged.
- Fig. 26. Left clasper of *Catocala relictæ*, enlarged.
- Fig. 27. Right clasper of *Catocala marmorata*, enlarged.
- Fig. 28. Left clasper of *Catocala marmorata*, enlarged.

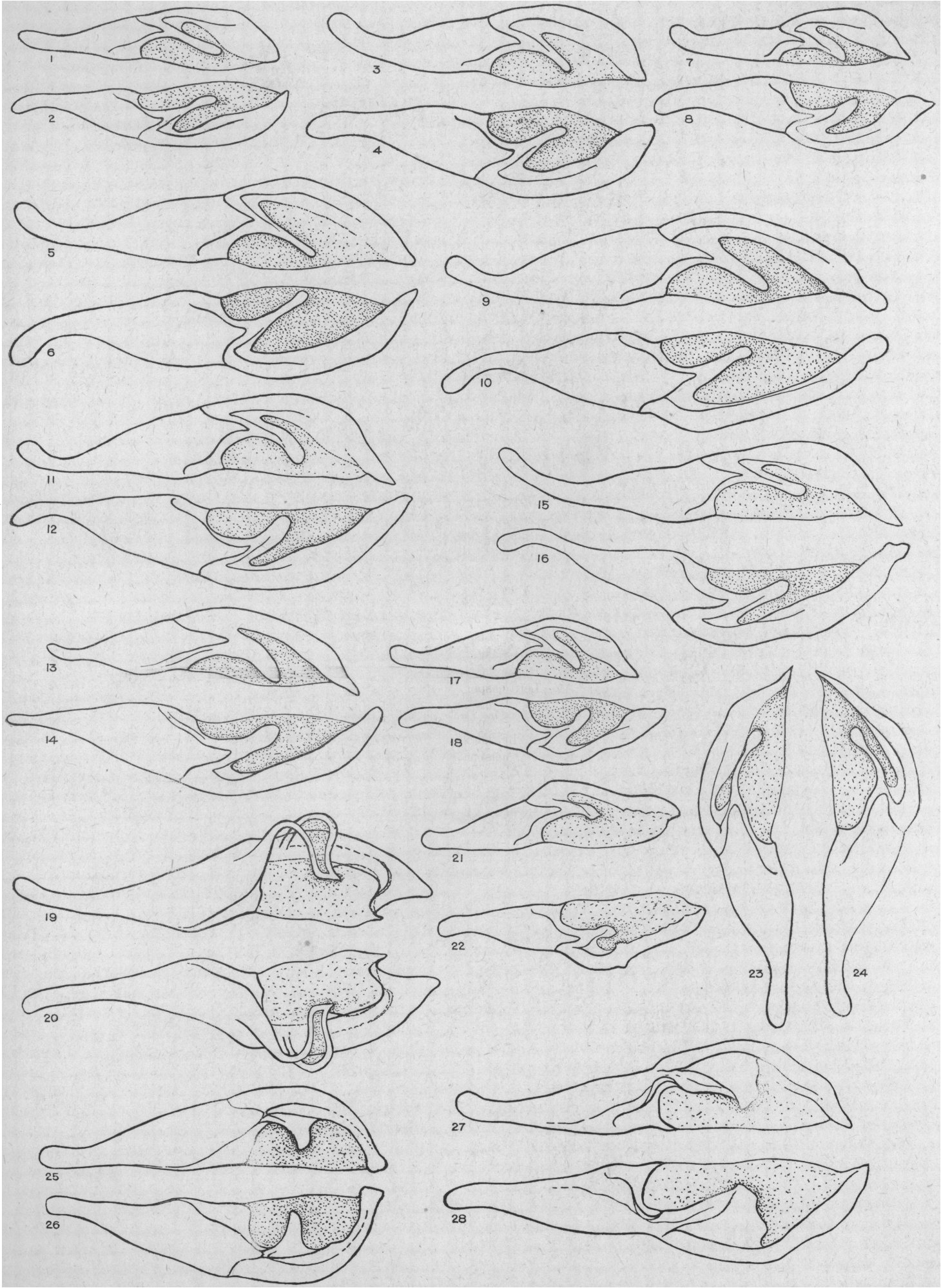


PLATE XX

PLATE XX

- Fig. 1. Right clasper of *Catocala parta*, enlarged.
- Fig. 2. Left clasper of *Catocala parta*, enlarged.
- Fig. 3. Right clasper of *Catocala luciana*, enlarged.
- Fig. 4. Left clasper of *Catocala luciana*, enlarged.
- Fig. 5. Right clasper of *Catocala verecunda*, enlarged.
- Fig. 6. Left clasper of *Catocala verecunda*, enlarged.
- Fig. 7. Right clasper of *Catocala irene*, enlarged.
- Fig. 8. Left clasper of *Catocala irene*, enlarged.
- Fig. 9. Right clasper of *Catocala allusa*, enlarged.
- Fig. 10. Left clasper of *Catocala allusa*, enlarged.
- Fig. 11. Right clasper of *Catocala faustina*, enlarged.
- Fig. 12. Left clasper of *Catocala faustina*, enlarged.
- Fig. 13. Right clasper of *Catocala californica*, enlarged.
- Fig. 14. Left clasper of *Catocala californica*, enlarged.
- Fig. 15. Right clasper of *Catocala hermia*, enlarged.
- Fig. 16. Left clasper of *Catocala hermia*, enlarged.
- Fig. 17. Right clasper of *Catocala cleopatra*, enlarged.
- Fig. 18. Left clasper of *Catocala cleopatra*, enlarged.
- Fig. 19. Right clasper of *Catocala francisca*, enlarged.
- Fig. 20. Left clasper of *Catocala francisca*, enlarged.
- Fig. 21. Right clasper of *Catocala briseis*, enlarged.
- Fig. 22. Left clasper of *Catocala briseis*, enlarged.
- Fig. 23. Right clasper of *Catocala grotiana*, enlarged.
- Fig. 24. Left clasper of *Catocala grotiana*, enlarged.
- Fig. 25. Right clasper of *Catocala meskei*, enlarged.
- Fig. 26. Left clasper of *Catocala meskei*, enlarged.
- Fig. 27. Right clasper of *Catocala unijuga*, enlarged.
- Fig. 28. Left clasper of *Catocala unijuga*, enlarged.
- Fig. 29. Right clasper of *Catocala pura*, enlarged.
- Fig. 30. Left clasper of *Catocala pura*, enlarged.
- Fig. 31. Right clasper of *Catocala nevadensis*, enlarged.
- Fig. 32. Left clasper of *Catocala nevadensis*, enlarged.
- Fig. 33. Right clasper of *Catocala texanæ*, enlarged.
- Fig. 34. Left clasper of *Catocala texanæ*, enlarged.
- Fig. 35. Right clasper of *Catocala junctura*, enlarged.
- Fig. 36. Left clasper of *Catocala junctura*, enlarged.
- Fig. 37. Right clasper of *Catocala arizonæ*, enlarged.
- Fig. 38. Left clasper of *Catocala arizonæ*, enlarged.

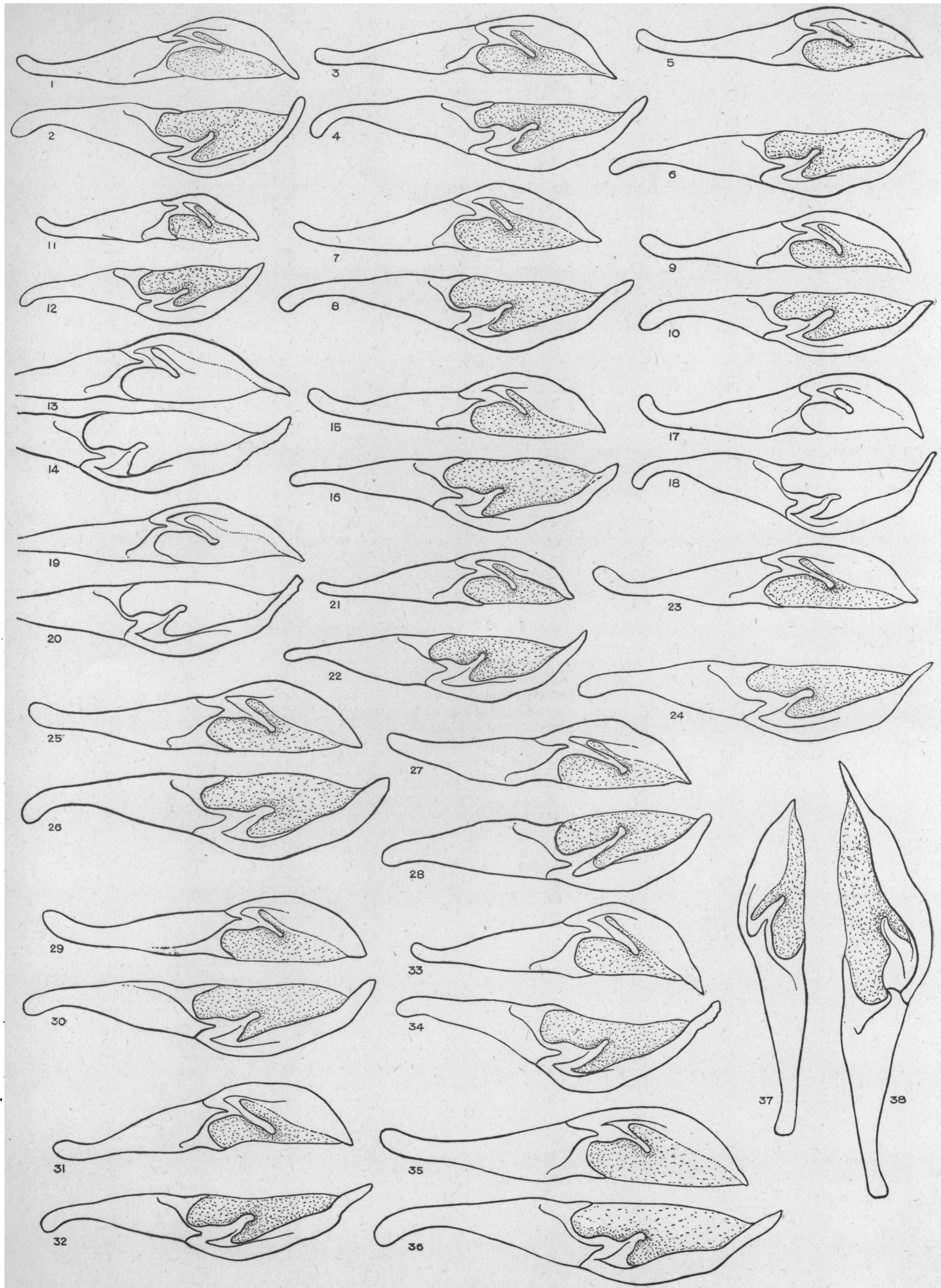


PLATE XXI

PLATE XXI

- Fig. 1. Right clasper of *Catocala electilis*, enlarged.
- Fig. 2. Left clasper of *Catocala electilis*, enlarged.
- Fig. 3. Right clasper of *Catocala aspasia*, enlarged.
- Fig. 4. Left clasper of *Catocala aspasia*, enlarged.
- Fig. 5. Right clasper of *Catocala hippolyta*, enlarged.
- Fig. 6. Left clasper of *Catocala hippolyta*, enlarged.
- Fig. 7. Right clasper of *Catocala stretchii*, enlarged.
- Fig. 8. Left clasper of *Catocala stretchii*, enlarged.
- Fig. 9. Right clasper of *Catocala cara*, enlarged.
- Fig. 10. Right clasper of *Catocala amatrix*, enlarged.
- Fig. 11. Right clasper of *Catocala concumbens*, enlarged.
- Fig. 12. Right clasper of *Catocala delilah*, enlarged.
- Fig. 13. Left clasper of *Catocala delilah*, enlarged.
- Fig. 14. Right clasper of *Catocala andromache*, enlarged.
- Fig. 15. Left clasper of *Catocala andromache*, enlarged.
- Fig. 16. Right clasper of *Catocala frederici*, enlarged.
- Fig. 17. Left clasper of *Catocala frederici*, enlarged.
- Fig. 18. Right clasper of *Catocala chelidonia*, enlarged.
- Fig. 19. Left clasper of *Catocala chelidonia*, enlarged.
- Fig. 20. Left clasper of *Euparthenos nubilis*, enlarged.
- Fig. 21. Right clasper of *Ephesia elonympha*, enlarged.
- Fig. 22. Left clasper of *Ephesia elonympha*, enlarged.
- Fig. 23. Fore tibia of *Catocala piatrix*.
- Fig. 24. Middle tibia of *Catocala piatrix*.
- Fig. 25. Hind tibia of *Catocala piatrix*.
- Fig. 26. Hind tibia of *Catocala illecta*.
- Fig. 27. Hind tibia of *Catocala cara*.
- Fig. 28. Hind tibia of *Catocala unijuga*.
- Fig. 29. Middle tibia of *Catocala delilah*.
- Fig. 30. Hind tibia of *Catocala delilah*.
- Fig. 31. Middle tibia of *Catocala arizonæ* form *babayaga*.
- Fig. 32. Hind tibia of *Catocala arizonæ* form *babayaga*.

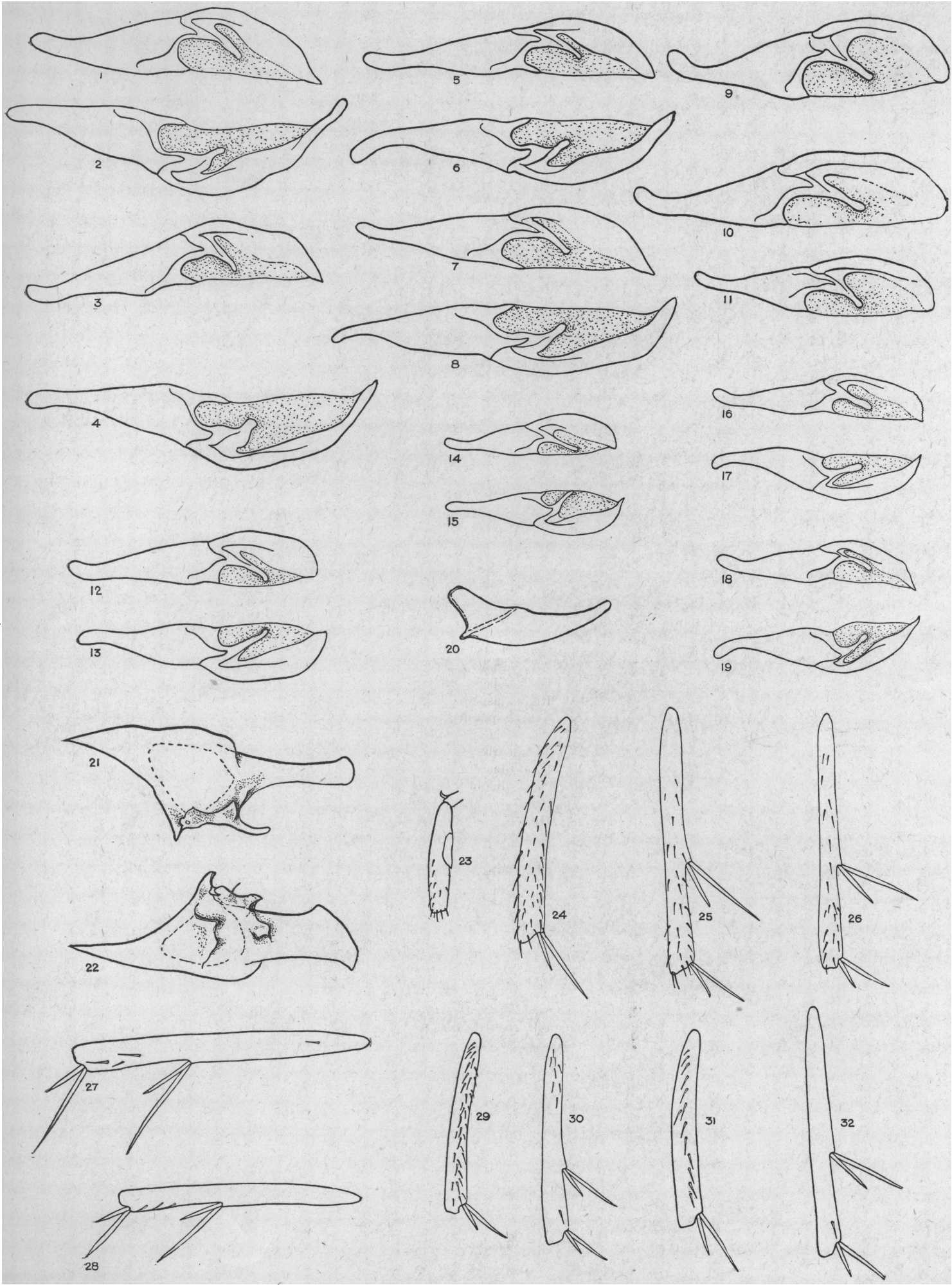
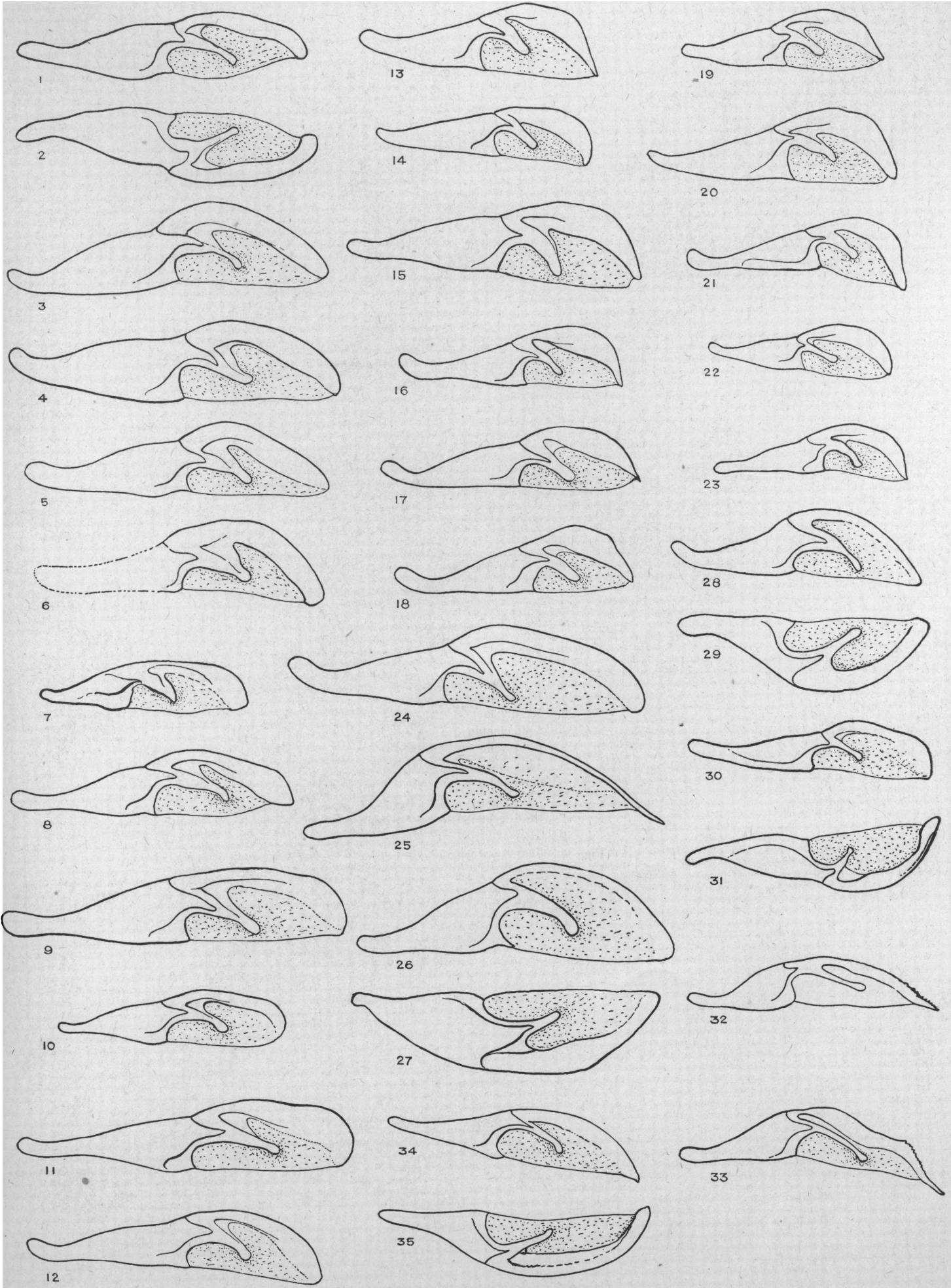


PLATE XXII

PLATE XXII

- Fig. 1. Right clasper of *Catocala illecta*, enlarged.
- Fig. 2. Left clasper of *Catocala illecta*, enlarged.
- Fig. 3. Right clasper of *Catocala abbreviatella*, enlarged.
- Fig. 4. Right clasper of *Catocala nuptialis*, enlarged.
- Fig. 5. Right clasper of *Catocala whitneyi*, enlarged.
- Fig. 6. Right clasper of *Catocala amestris*, enlarged.
- Fig. 7. Right clasper of *Catocala gracilis*, enlarged.
- Fig. 8. Right clasper of *Catocala andromedæ*, enlarged.
- Fig. 9. Right clasper of *Catocala coccinata*, enlarged.
- Fig. 10. Right clasper of *Catocala verrilliana*, enlarged.
- Fig. 11. Right clasper of *Catocala violenta*, enlarged.
- Fig. 12. Right clasper of *Catocala ophelia*, enlarged.
- Fig. 13. Right clasper of *Catocala miranda*, enlarged.
- Fig. 14. Right clasper of *Catocala orba*, enlarged.
- Fig. 15. Right clasper of *Catocala ultronia*, enlarged.
- Fig. 16. Right clasper of *Catocala præclara*, enlarged.
- Fig. 17. Right clasper of *Catocala blandula*, enlarged.
- Fig. 18. Right clasper of *Catocala dulciola*, enlarged.
- Fig. 19. Right clasper of *Catocala cratægi*, enlarged.
- Fig. 20. Right clasper of *Catocala mira*, enlarged.
- Fig. 21. Right clasper of *Catocala grynea*, enlarged.
- Fig. 22. Right clasper of *Catocala manitoba*, enlarged.
- Fig. 23. Right clasper of *Catocala olivia*, enlarged.
- Fig. 24. Right clasper of *Catocala clintoni*, enlarged.
- Fig. 25. Right clasper of *Catocala similis*, enlarged.
- Fig. 26. Right clasper of *Catocala micronympha*, enlarged.
- Fig. 27. Left clasper of *Catocala micronympha*, enlarged.
- Fig. 28. Right clasper of *Catocala cordelia*, enlarged.
- Fig. 29. Left clasper of *Catocala cordelia*, enlarged.
- Fig. 30. Right clasper of *Catocala minuta*, enlarged.
- Fig. 31. Left clasper of *Catocala minuta*, enlarged.
- Fig. 32. Right clasper of *Catocala jair*, enlarged.
- Fig. 33. Right clasper of *Catocala amica*, enlarged.
- Fig. 34. Right clasper of *Catocala messalina*, enlarged.
- Fig. 35. Left clasper of *Catocala messalina*, enlarged.



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part 1.

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THE AMERICAN MUSEUM JOURNAL

Volumes I-XVIII. The Journal is a popular record of the progress of The
American Museum of Natural History, issued monthly from October to May.

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GUIDE LEAFLETS. Numbers 1-48.

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