BULLETIN OF THE

Southern California Academy of Sciences

LOS ANGELES, CALIFORNIA

Vol. XXVIII Jan. - April, 1929 Part 1

CONTENTS

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SIGNIFICANCE OF ABRADED AND WEATHERED MAMMALIAN REMAINS FROM RANCHO LA BREA

By Chester Stock

The dense accumulations of mammalian remains encountered in the Pleistocene asphalt deposits of Rancho La Brea furnish mute evidence of the unusual conditions of miring and trapping that prevailed at this locality during the active periods of the tar pools. The abundance of skull and skeletal materials and the excellent state of preservation of the specimens suggest rather strongly that in the process of entombment the struggles of a mired form frequently hastened its total immersion and disappearance from the surface.

Information derived from a study of the Rancho La Brea collection in the Los Angeles Museum clearly indicates that a rapid entombment of the mired hosts may not always have taken place. It seems safe to assume that in some instances the bodies of animals trapped in the tar were disturbed or dismembered and the skeletal elements scattered before actual deposition occurred. Moreover, it appears possible that osseous remains accumulated along or near the borders of the pools where the carcass of a mammal may have been subjected to the forces of the weather and to disturbance by other creatures before entering the asphalt record. An inference may be drawn therefore that members of the carnivore group were often attracted to the traps not only by the sense of sight but by the sense of smell as well, significant perhaps in accounting for the noticeable prevalence of such forms as the dire wolves *(Ænocyon)*.

It is intended in the present paper to direct attention to two types of evidence on which these assumptions are based.

Abrasions

Skeletal elements are present in the collection which exhibit surface effects clearly due to attrition by organic forms, presumably carnivores and rodents. This abrasion is occasionally quite striking, as for example in a tibia of the large lion, *Felis atrox,* shown in Figure 1. In this specimen, exhumed at a depth of approximately 10 feet, in Pit 13 of the Los Angeles Museum excavations, at least two types of tooth-marking are to be noted:

(1) Relatively large abrasions in which chips of bone several centimeters in length have been flaked off or broken away. Apparently in some cases the bite has been strong enough to expose the marrow cavity.

PLATE 1

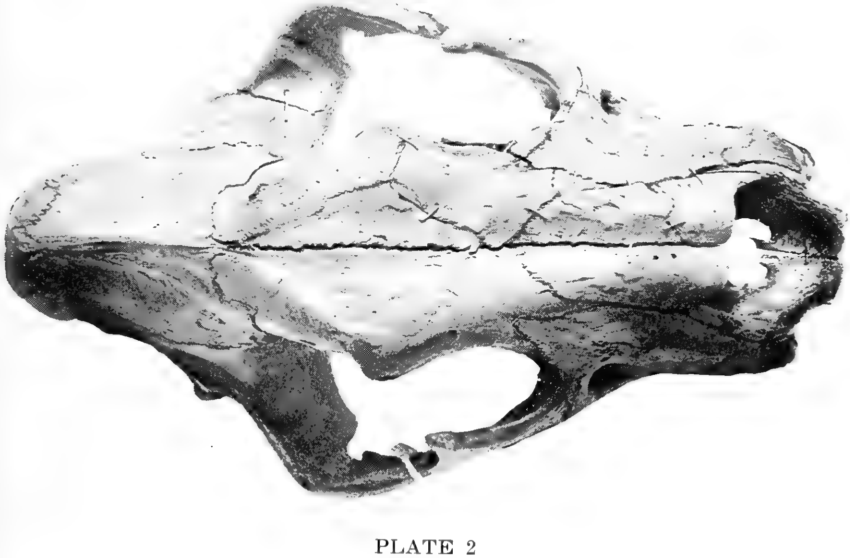

PLATE 2

(2) Small abrasions usually in the form of grooves, approximately a millimeter in width, and sometimes parallel. An individual groove frequently exhibits on closer inspection minute transverse ridges representing stages in the production of the groove by the chisel-like edge of the incisor teeth of rodents.

Occasionally the two types of markings are superimposed. Small tooth abrasions may be found on the margins of an area from which a flake has been broken, or a large abrasion may be traversed by a groove. It is apparent also that the mammals intent upon breaking or gnawing a particular bone found a convenient grasp along the more pronounced borders, for the latter are often scarred.

The markings referred to are obviously not the result of attrition of skeletal elements due to movement of this material in the petroliferous mass, but were made by mammals prior to the entombment of the specimen. Skeletal remains exhibiting these features may have furnished a source of food coveted particularly by the dire wolves with their strong jaws and teeth and by the smaller gnawing forms.

Weathering

The exposure of mammalian materials for any length of time at the surface of a tar pool or in its immediate vicinity ought to be indicated not only by the markings left by other mammals, but also by the type of preservation of the compact bony tissue of the skull and skeletal elements. The osseous remains occurring at Rancho La Brea usually retain their smooth external surfaces except where these have been modified for ligament or tendon attachment. In some instances, however, the material exhibits quite strikingly the effects of weathering, the specimens although thoroughly penetrated and stained by the oil possess a surface appearance so closely similar to that of weathered skeletal remains found lying on the plains at the present time as to fully justify the recognition of similar causes. An example may suffice.

No. 574, Figure 2, represents a skull of the large lion, *Felis atrox*, exhumed in Pit 3 of the Los Angeles Museum excavations at a depth of 9 feet. This specimen shows particularly well the effects of weathering on the ventral and lateral sides. Here the surface of the bones forming the hard palate and face are considerably roughened and scaled, the preservation of this portion of the skull being noticeably different from that of the bones forming the dorsal side of the face and brain-case. The latter retain in large measure their smooth surface. The teeth apparently have also suffered from exposure, the canines particularly exhibiting a shattered appearance. While the incisors and the cheek-teeth of one side are somewhat damaged, the skull and dentition do not give the impression that the material was transported for any great distance.

It appears reasonable to assume from the nature of the preservation that the skull lay with palate exposed either on the surface of the tar or on the sand or soil adjacent to a tar pool. Furthermore, sufficient time apparently elapsed after the death of the animal and before entombment of its hard parts to permit decomposition or destruction of the soft structures and a weathering of the skull.

Conclusion

In the process of entombment of the osseous remains at Rancho La Brea the agencies assuring a record of the mammals of the region were undoubtedly on occasion very active. The large fauna found at this locality and the striking representation of certain members of the Carnivora lend substance to the belief that the tar traps were extremely efficient during their active periods. Furthermore, the lure presented by them explains in a convincing way the preponderance of predatory forms in the fossil assemblage. Among the latter the dire wolves are unquestionably the most prevailing type and their occurrence suggests, along with other evidence, that they were attracted to the scene by the moving drama of the traps but were not remiss in their desires to batten on a carcass. Here also occurred rodents who, unlike the mouse of the story, were content at times to feed on the stark remains of a kill.

LEGENDS FOR TEXT FIGURES

PLATE 1

Felis atrox Leidy. Posterior and lateral views of tibia showing markings made by teeth of mammals. Los Angeles Museum Collection, Rancho La Brea Pleistocene, California.

PLATE 2

Felis atrox Leidy. Ventral and dorsal views of skull. Note the weathered appearance of the palate and the absence of this type of preservation on the dorsal side. Los Angeles Museum Collection, Rancho La Brea Pleistocene, California.

PENTSTEMON DUBIUM n. sp.

DR. A. DAVIDSON

Plant 3-4 dm. high, glabrous throughout; leaves sessile, oblanceolate below, lanceolate above, 25 mm. long, 7 mm. wide, finely serrate; sepals green; flower magenta colored, 2 cm. long, 6-7 mm. wide, tube slightly dilated above, 3 mm. wide; lower lobes 4 mm. long, 3mm. wide rounded at the apex; paler, with dark blue linear stripes running their whole length; upper lobes of similar diameter but shorter; pistil blue, entire sterile filament bearded at tip and along one side for 3 mm. with yellowish hairs; stamens horseshoe shaped, split their whole length.

Type No. 3659. Found on the fire-break over Mt. Lowe, Los Angeles in fair abundance amid specimens of *P. centranthifolius* and *P. Grinnelli* and suspected to be a hybrid between these 2 species. Specimens are under the observation in cultivation by Mr. Robert Kessler, the discoverer.

The Egg of GLAUCOPSYCHE LYGDAMUS AUSTRALIS Grinnell

By JOHN ADAMS COMSTOCK

Through the courtesy of Commander Dammers of Riverside, we have received a specimen of the egg of "The Southern Blue," *Glaucopsyche lygdamus australis,* a drawing of which is here presented. See plate 5, page 11.

This egg presents the appearance that is common to most members of the genus. In form it is echinoid, with a depressed micropyle, the surface covered with raised white reticulations disposed irregularly, and bearing raised white papillae at their points of junction.

These reticulations, or walls, enclose a series of irregular cells the ground color of which is a light green: the floors minutely pitted. These cells become smaller in the region of the micropyle. The example noted is about the same size as the egg of *Phaedrotes piasus* which we have previously figured.

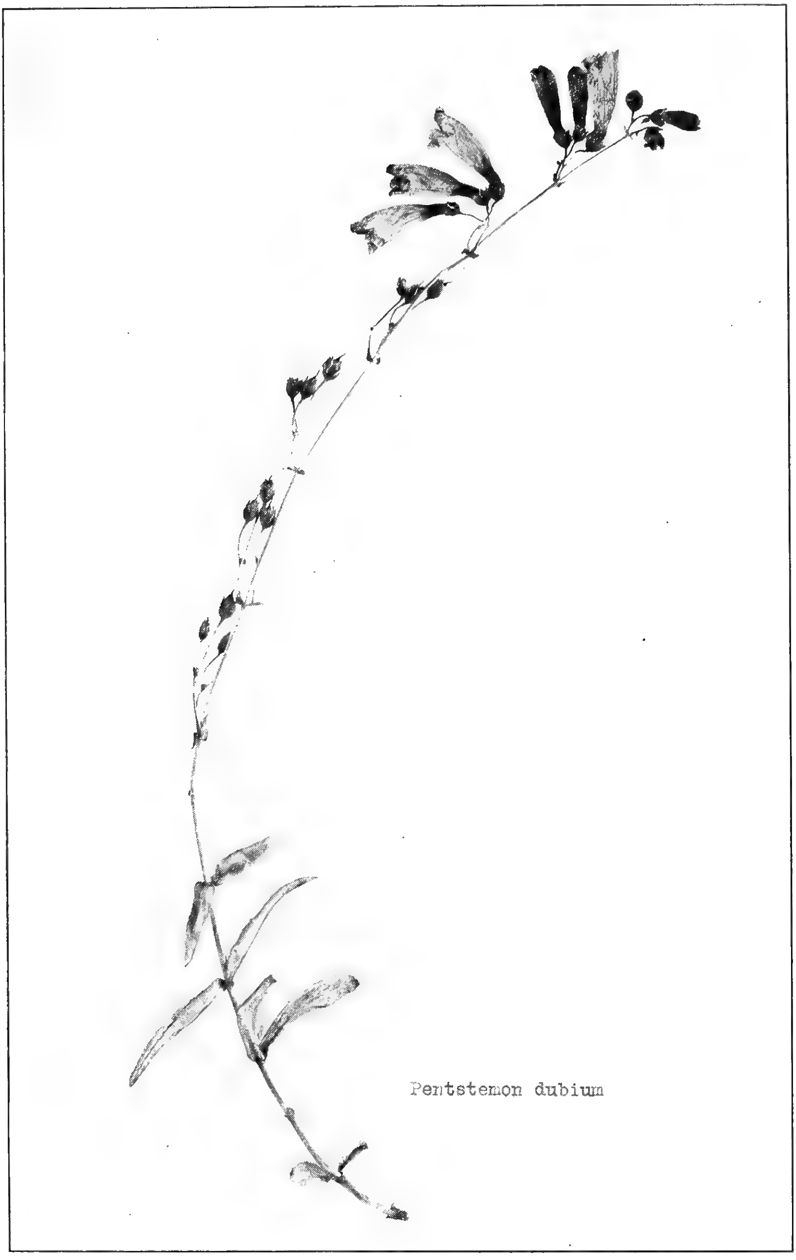

PLATE 3

THE CAUSES OF CHANGE IN COLOR

Patterns of Butterfly Aberrations

By Wilhelm Schrader, Los Angeles, Calif.

During a short period of summer certain species of butterflies taken on the wing are observed which show occasional variations in color that are in the nature of aberrations.

In one of my former articles (Bulletin So. Calif. Acad. of Sciences, Vol. XXVII, Part 2) I have dealt with this phenomena as regards *Pyrameis cardui*. In this paper it is proposed to apply the same type of investigation to a nearly related species, *Pyrameis carye*. The latter species can be easily distinguished from *cardui* by the squared tip of the fore-wing, although in other respects the two species bear a close resemblance. *Carye* is limited in range to the west coast of the Americas, and in the United States does not fly east of the Rocky Mountains.

The larval food plants in California are similar for both species, but *carye* seems to prefer species of *Malva*. The caterpillar of this species is smaller than *cardui,* and has somewhat different habits. The species is also less prolific, and does not show the tendency occasionally observed in *cardui,* to migrate. Incidentally I have made many attempts to hybridize the two species, without success.

Aberrations of *carye* are most frequently observed in this locality in June, but when there has been a warm winter season without late frosts, they are then seen more plentifully in May.

My observations tend to establish that these "sports" are the result of the first generation, which have carried through the cooler period, and at a critical period of the pupal stage have experienced high temperatures for a short space of time.

In a state of nature, caterpillars usually choose a site for pupating, which is in the shade during the mid-day period. Occasionally however they may be subjected to the intense noonday sun, and this may account for the rather rare appearance of aberrant forms in mid-summer.

It has been observed that these aberrant forms are less wary than the normal insects, probably due to their lessened vitality, and they seem incapable of reproduction.

Under experimental conditions I have produced these aberrations in the darkened incubator, as well as in exposure to sunlight. The best results have been obtained by taking chrysalids from a normal temperature, and exposing them for a short time to 118° Fahrenheit, afterwards allowing the temperature to gradually return to normal. It is observed that the aberrant forms emerge from one to two days later than do the normal, which seems to establish the fact that the vital processes are inhibited, possibly at a time when the pigment is being deposited.

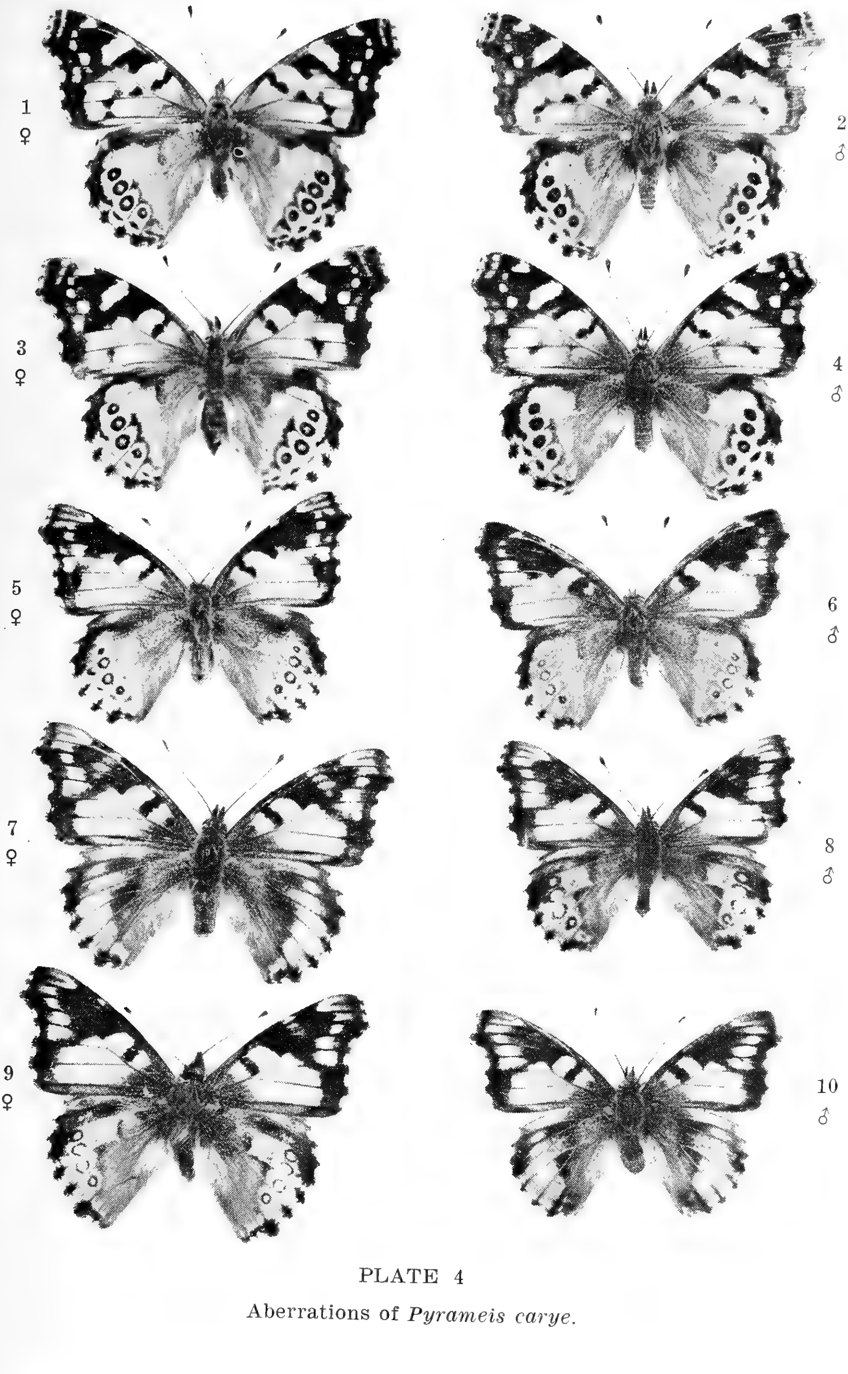

PLATE 4

Aberrations of *Pyrameis carye.*

The percentage of aberrations in these experiments is very small, but is never-the-less, much higher than when an equal number are raised under normal conditions.

Some species of butterfly pupæ, when exposed to high temperatures, develop the light colored pigments at the expense of the darker shades. With other species, the reverse is the rule. It is always noted however that on the last day before emergence, the light colors are developed first, and the dark colors last.

I have experimented with feeding larvæ on the blossoms only of their food plants in order to determine if this had any noticeable effect on the final pigment of the adult insect. Occasionally a difference is noted in the larval color, but no change is apparent in the imago.

In Plate 4 of this Bulletin it will be noted on figures 1, and 2 that the black band which crosses the forewing diagonally is reduced in size when compared with the normal insect.

Examples such as this are frequently observed in nature, but are not usually noticed by the inexperienced collector. This phase represents the first tendency towards aberration in response to an increased temperature in the later pupal stage.

In figures 3 and 4 the same black band has almost disappeared, and in figures 5 and 6 it is completely obsolescent, and in addition the large red spot near the apex and close to the costa of forewing has been obliterated. In addition, the ocelli on the secondaries have begun to change from blue to white. Figures 7, 8 and 9 show a further increase in the white centres of the ocelli, while in figure 10 we have the extreme form in which the ocelli are completely white without an outer black margin. This extreme aberration is very rare.

The ten examples shown in our plate represent the total of aberrant forms produced experimentally in over a thousand larvæ that were bred, and subjected to temperature changes. A considerable number were killed as a result of the application of heat in the pupal state.

Several other species of butterflies are subject to aberration in response to similar thermal changes, and some of these will be further discussed in a later issue of this "Bulletin." Incidentally, it may be noted that Mr. Jean Gunder of Pasadena has the finest and most complete collection of aberrant butterflies that has thus far come to our notice.

The methods which I have used in breeding and experimenting on butterflies are not matters of secrecy. On the contrary I have attempted to explain them in detail, so that younger students may be encouraged to experiment along similar lines and thus increase our knowledge of these interesting natural phenomena. The specimens produced in my series of experiments will be donated to the Los Angeles Museum and placed on display as an additional means toward furthering this interest.

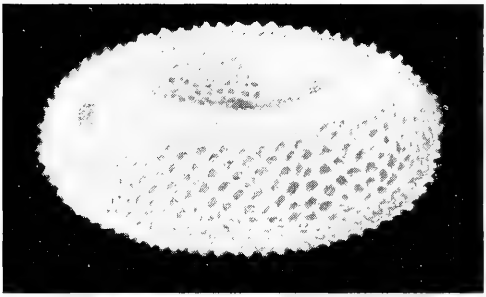

PLATE 5

Egg of *Glaucopsyche lygdamus australis* Grinnell, greatly magnified.

PROCEEDINGS OF THE SOUTHERN CALIFORNIA ACADEMY OF SCIENCES

Regular meeting of the Archeological Section of the Academy of Sciences was held in the Auditorium of the Library, November 20, 1928 at 8 P. M. Prof. C. S. Knopf of the University of Southern California gave the address of the evening on "Excursions in Ancient Civilizations." The talk was illustrated by slides depicting noted excavations past and present, by which we today gain our knowledge of life at the dawn of history. Prof. Knopf dealt in his usual clear way with the methods of the archeologists who no longer seek only museum material, but study and list every shovel-full of excavated dirt, resulting in a more intimate knowledge of life 5,000 years ago, than we have of conditions in comparatively recent times. The lecture was further illustrated by specimens of Babylonian clay tablets from the speaker's collection, which were translated to the audience. Prof. Knopf finished by a blackboard demonstration of the development of writing from the earliest characters showing the development of our own alphabet from the Chaldean, Phoenician, and Greek to the Roman which we now use.

A special meeting of the Academy was held December 14th, 1928 at 8 P. M. in the Library. This was a memorial meeting in recognition of the great work of the late Roald Amundsen, and was a joint service with the University of California at Los Angeles. Lieut. Comm. J. D. Murray, aide for aviation on the staff of Admiral Pratt, U. S. N., spoke on that phase of our great marine force which deals not with arts of destruction but of peace and the advancement of science and knowledge. He recounted the names of men of the navy who have led expeditions to uncharted lands and seas, and into the untrod polar regions. It was new viewpoint to those who have looked upon our navy as a war measure, rather than as an organization of peaceful progress, of conquers not of nations, but of the unknown.

Dr. Mars Baumgardt followed by a beautiful tribute to the life work of the great Norwegian, giving many personal bits from his active career in the polar lands. Dr. Baumgardt then gave a showing of two reels of motion picture film of the flight of the "Norge" with Amundsen and other polar veterans.

Regular meeting of the Academy was held in the library on December 18th, 1928 at 8 P. M. Mr. M. P. Skinner, formerly Park Naturalist of the Yellowstone, spoke on "Grizzlies." The work of the Park in the care of wild life was described, and numbers of slides of Elk and deer life and habits were shown. Many interesting and amusing facts about the life of the Bear family, particularly the "grizzly," were given.

The Archeological section's regular meeting was held in the library January 15th, 1929 at 8 P. M. The Chairman of the Section Dr. R. H. Swift spoke on the outstanding achievements in Archeology during the year of 1928 just past, and reviewed the work of this new Academy Section and its steady growth since its first meeting, March, 1928.

Dr. H. D. Bailey of Pasadena gave a talk on the "Navajos," beautifully illustrated by slides made by the speaker while living with the tribes where "whites" seldom are welcome. Many strange customs of these primitive people were touched upon, including a description at length of the Medicine Man's ceremonial attempt to cure disease.

Regular meeting of the Academy was held in the Auditorium of the L. A. Public Library, February 19th at 8 P. M. Dr. R. H. Swift spoke on "The Meaning of the X-Ray," demonstrating its actual usage by means of a "bed-side unit," by which the bones of the speaker's hand were made visible on a fluroscopic screen. The story of the discovery, with tribute to the late Dr. Roentgen, whose vigilant, trained scientific eye noting the flurescence of a screen in his laboratory in 1895, discovered what has been termed the greatest single discovery of the century. The explanation of the men of science as to the cause of the penetration of so-called solid matter by the rays, followed. The speaker then illustrated the great use to mankind in industry, investigations into the structure of matter, and its great value in diagnosis, by means of stereoptican slides of cases on file in his laboratories.

Regular meeting of Archeological Section of the Academy was held in the library, March 19th at 8 P. M. Mr. Charles Amsden of the Southwest Museum spoke on "The Indians of Southern California." The lecture was illustrated by slides depicting the arts and crafts of the California Indians of whom misleading accounts by the Spanish would have us believe to be of the lowest grade of development. The speaker divided these people into three types,—shore, hill and desert dwellers, and showed the influence of habitation on the archeological remains. Examples of great artistic beauty were noted in basketry, pottery and stone, shell and bone carving.

Dr. R. H. Swift, *Secretary.*

REPORT OF THE LORQUIN ENTOMOLOGICAL SOCIETY—MAY, 1929

The Eighth Annual Butterfly Show was held in the Los Angeles Museum at Exposition Park from March 22 to April 26, 1929. The exhibition consisted of twenty standard show cases of native and exotic Lepidoptera, Coleoptera, and representatives from other orders of the Insecta, in addition to the Dr. J. A. Comstock collection of 3,000 specimens which were mounted in wall cases. The total number of insects has been estimated at between 13,000 and 15,000.

Important features in connection with the exhibit were the smaller displays of butterflies in the public libraries, the full pages of Rotogravure in the Los Angeles Times and Long Beach Press-Telegram, special days at the Show for the nature clubs, school classes, and boy scouts, a story writing contest for the children, and special lectures by Dr. Comstock and Dr. Muchmore of the museum staff. An illustrated article will appear in the Pan-Pacific Entomologist.

The prize ribbons, in memory of Lockhart Muchmore, were awarded in the following manner:

No. 1—Highest Award for New Species........to Mr. J. D. Gunder

No. 2—Gold Award for Western Collection ....to Mr. J. S. Garth

No. 3—Silver Award for Western Collection to Mr. F. W. Friday

No. 4—Honorary Award for Western Collection to Mr. Lloyd Martin.

No. 5—Exotic Award ....to Mr. E. O. Murmann

No. 6—Commercial Award ....to Mr. Hal Newcomb

JOHN S. GARTH, *Secretary.*

BULLETIN of the SOUTHERN CALIFORNIA
ACADEMY of SCIENCES

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Care of Los Angeles Museum, Exposition Park,

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Publications of the
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The Academy has published to date the following:

PROCEEDINGS. 1896 to 1899. Six numbers—Vol. 1, Nos. 1 to 6.
MISCELLANEOUS BULLETINS issued under the imprint of the Agricultural Experiment Station—1897 to 1907. Ten numbers.

All issues of the above are now out of print.

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Bulletin of the
Southern California Academy of Sciences

Began issue with Vol. I, No. 1, January, 1902. Issued ten numbers in 1902, nine numbers in 1903, 1904, 1905; three numbers in 1906. Issued two numbers annually from 1907 to 1919, both inclusive (except 1908—one issue only). Issued four numbers (January, May, July and October) in 1920.

The 1921 issues are: Vol. XX, No. 1, April; Vol. XX, No. 2, August; Vol. XX, No. 3, December.

The 1922 issues are: Vol. XXI, No. 1, March; Vol. XXI, No. 2, September.

The 1923 issues are: Vol. XXII, No. 1, March; No. 2, July.

The 1924 issues are: Vol. XXIII, No. 1, January-February; No. 2, March-April; No. 3, May-June; No. 4, July-August; No. 5, September-October; No. 6, November-December.

The 1925 issues are: Vol. XXIV, No. 1, January-April; No. 2, May-August; No. 3, September-December.

The 1926 issues are: Vol. XXV, No. 1, January-April; No. 2, May-August. No. 3, September-December.

All of the above are now out of print, with the exception of the following, which may be secured from the Secretary of the Academy at the appended prices:

Vol.	3,	No.	7.	October	1904	$ .25
"	4,	"	5.	May	1905	.25
"	6,	"	2.	July,	1907	.25
"	7,	"	1.	January,	1908	.75
"	9,	"	1.	January,	1910	1.00
"	9,	"	2.	July	1910	.75
"	10,	"	2.	July,	1911	.75
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"	17,	"	2.	July,	1918	.75
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"	19,	"	4.	October,	1920	.25
"	21,	"	1.	March,	1922	.25
"	21,	"	2.	October,	1922	.25
"	22,	"	2.	July,	1923	.25
"	23,	"	1.	January,	1924	.25
"	23,	"	2.	March,	1924	.25
"	23,	"	3.	May,	1924	.25
"	23,	"	4.	July,	1924	.25
"	23,	"	5.	September,	1924	.25
"	23,	"	6.	November,	1924	.25
"	24,	"	1.	January,	1925	.25
"	24,	"	2.	May,	1925	.25
"	24,	"	3.	September,	1925	.25
"	25,	"	1.	January,	1926	.50
"	25,	"	2.	May,	1926	.25
"	25,	"	3.	September,	1926	.25
"	26,	"	1.	January,	1927	.25
"	26,	"	2.	April,	1927	.25
"	26,	"	3.	September,	1927	.25
"	27,	"	1.	January,	1928	.25
"	27,	"	2.	May,	1928	.25
"	27,	"	3.	September,	1928	.25

The Academy is desirous of completing its files in certain issues and will appreciate the donation of all numbers by members who have no further use for back issues. Address all communications concerning the above to:

DR. JOHN A. COMSTOCK
Southern California Academy of Sciences, Care of Los Angeles Museum, Exposition Park, Los Angeles, California

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Vol. XXVIII May-August, 1929 Part 2

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Los Angeles Museum, Exposition Park
Los Angeles, Cal.

DESCRIPTION OF TWO NEW LAND SHELLS FROM SOUTHERN CALIFORNIA

By G. Willett

Micrarionta reedi new species. Shell large for the group, whorls convex, sutures distinct; last whorl strongly descending behind peristome. Umbilicus wide and deep, contained about six times in diameter of shell. Aperture strongly oblique; peristome thickened, expanded, encroaching somewhat on the umbilicus. Embryonic whorls covered with irregular, elongate papillae, some of which have their long axes parallel to the suture and others at various angles to it. Later whorls smooth, except for lines of growth. Color of living specimens light brown, encircled at the shoulder by a very dark brown (almost black) band, about one millimeter wide, with indefinitely defined lighter zones above and below.

Type: No. 1019 Collection Los Angeles Museum. Paratypes in collections of S. S. Berry, Fred M. Reed and the writer. The type and 24 additional specimens were collected by the writer under rocks in Palm Canyon, Borrego Valley, San Diego County, California, April 28, 1929. Many other dead and faded specimens were seen scattered along the bottom of the canyon.

	Max. Diam. mm.	Min. Diam. mm.	Alt. mm.	Diam. Umbil. mm.	Number of Whorls
Type	21.7	18.3	12.3	3.6	5
Paratype (dead shell)	23.5	19.6	13.4	3.9	5¼

Remarks: This is the largest of the known California *Eremariontas,* with the exception of *E. wolcottiana* Bartsch, from which it is distinguishable at sight by its open umbilicus and more depressed form. The irregular arrangement of the papillae on the nuclear whorls is also different from any other species known to the writer.

The credit for the discovery of this handsome and strongly marked species belongs to Mr. Fred M. Reed, of Riverside, California, in whose honor it is named. The type locality was visited by the writer after Mr. Reed had sent to the Los Angeles Museum two dead specimens taken by him April 4, 1929.

Micrarionta ora new species. Shell depressed, whorls convex, sutures distinct; last whorl strongly descending behind peristome. Umbilicus wide and deep, contained about five and one-half times in diameter of shell. Aperture strongly oblique; peristome somewhat thickened, rounded, encroaching slightly on the umbilicus. Nepionic stage covered with irregularly shaped papillae, some of which are more or less rounded and others oblong, the axes of the elongated papillae being almost at right angles to the suture. At the beginning of the neanic stage, which embraces about one and one-fourth turns, the papillae become more elongated and regular, being in alternate rows, with their axes parallel to the suture. In the type specimen these papillae are regular and distinct and show little indication of fusion, as in *M. harperi* Bryant. On the subsequent whorls the papillae are much smaller, more rounded and more widely scattered, and are apparently absent on the last third of the last whorl. Base free from papillae, excepting in the aperture and in the umbilicus. Color of shell white or ivory yellow, passing into brownish on spire; a narrow brown band about .6 mm. wide encircling the shoulder.

Type: No. 1018 Collection Los Angeles Museum. Paratypes in collection of the writer. The type and eleven additional specimens were collected by the writer in rock slides near the north end of Fish Mountains, Imperial County, California, about three miles from the settlement of San Felipe, March 31, 1929. Three additional specimens, apparently referable to this form, were taken at Yaqui Wells, San Diego County, about ten miles from the type locality, April 28, 1929.

	Max. Diam. mm.	Min. Diam. mm.	Alt. mm.	Diam. Umbil. mm.	Number of Whorls
Type	18.4	15.4	10.9	3.4	5
Paratype	16.9	14.2	9.5	2.9	4¾
Spec. from Yaqui Wells	18.1	15.4	10.8	3.0	4⅞

REMARKS: It is entirely possible that, when the ranges bordering the southwestern portion of the Colorado Desert are thoroughly worked, this form may prove to be only subspecifically distinct from the shell now known as *M. orcutti* Bartsch. It may even be found that *orcutti* and *ora* are both subspecies of *M. harperi* Bryant. The material at hand at this time, however, shows *M. ora* to differ strongly from typical *orcutti* in much smaller umbilicus, and from *harperi* in much lighter papillation and in lack of same on base of shell and on the last third of the last whorl. Furthermore, if recorded specimens of *orcutti* and *harperi* are adult shells, *ora* is considerably larger than either of them.

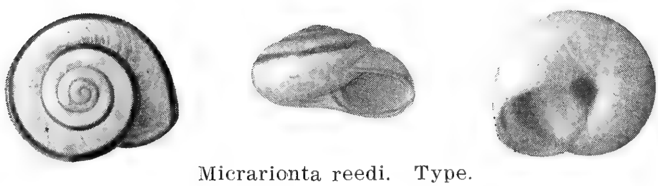
Recent descriptions of species of this group of *Micrariontas* have almost invariably placed great importance upon the differences in the scheme of papillation of the nuclear whorls. In fact, the reader of these descriptions would receive the impression that there was little variation in this regard within the species, and that such variations might be regarded as specific characters. A study of the nuclear characters of *M. ora* would seem to point to the conclusion that the importance of differences of papillation may have been over-emphasized, possibly due largely to scanty material. The arrangement of papillae described in the type of *M. ora* seems to be the usual one in the species, but there is considerable variation in the type series. In some specimens the papillae merge into slender lines, some of which lines run diagonally to the suture and others parallel with it. In others some of the papillae merge in such a way as to form more or less rectangular, shallow pits.

The writer names this species in honor of his wife, Mrs. Ora Willett, who assisted in collecting the type series and who, for several years past, has rendered valuable aid in the field.

Los Angeles Museum.
June 15, 1929.

NOTE: As this article goes to press we are in receipt of the Nautilus for October, 1929, in which S. Stillman Berry has given the name *Micrarionta boregoensis* to the shell described above as *Micrarionta reedi*. Dr. Berry's description having priority, *reedi* becomes *nomen nudum*. The receipt of this publication at this late date makes it impossible to withdraw the above description.

Micrarionta ora. Type.



Micrarionta reedi. Type.

PLATE 6.

ADDITIONAL EXPERIMENTS WITH PYRAMEIS CARYE (LEPID.)

By Wilhelm Schrader

Every experienced lepidopterist knows that localities in which there are extreme variations in temperatures tend to produce seasonal forms of certain species of butterflies. In my breeding experiments I find that the same thermic factor is operative in the production of aberrant forms: for example—butterfly larvae which have been raised in a cool environment, and after pupation are subjected to very hot temperature, produce the greatest percentage of aberrations.

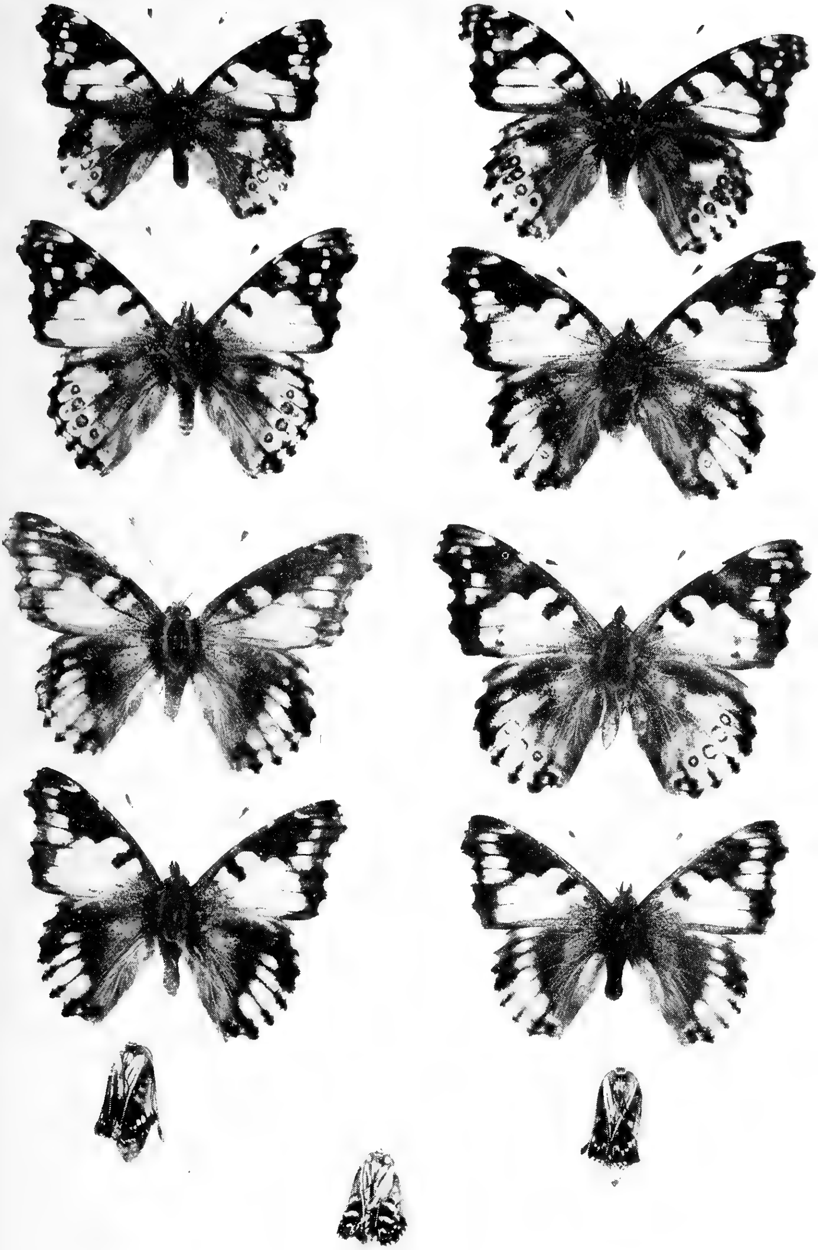
This explains the occurrence of these forms in nature during the early part of the warm season.

The past winter, and rainy season, was unusual for its long duration, and for two sharp periods of frost, that were widely separated in occurrence. For this reason I was anxious to collect a large number of the larvae of *Pyrameis carye* in order to determine the influence of the unusual weather conditions on the resultant hatch. Accordingly I collected, between November, 1928, and April, 1929, nearly three thousand caterpillars of this species. Unfortunately nearly all of these succumbed to the wilt disease, but a few aberrant forms resulted. This lot of caterpillars was exposed to the early cold spell of December 1928, followed by the milder, frostless period of January and February, 1929. I also captured, on April 8th, an unusually dark aberration of *P. carye* (see plate 7, fig. 1).

Following the heavy frost of March 11th, 1929, I again collected a large number of caterpillars, and succeeded in carrying more than a thousand through to the pupal stage. These pupae were subjected to 118° Fahrenheit for a short space of time. The resultant percentage of aberrations was higher than in any of my former breeding experiments. The degree of aberration (with increase of the black pigmentation) was also much more pronounced. Note the examples on plate 7, figures 2 to 8.

It has been my experience that all aberrations are lacking in the vitality which characterizes normal forms. Consequently there are many that were unable to free themselves from the pupal case. Note figures 9 and 10 of plate 7, in which the undeveloped wing clearly shows the dark pigmentation of the aberrant form. Compare this with the normal (but undeveloped) example in figure 11.

It will be interesting for other entomologists to carry on similar experiments with other species of lepidoptera, in seasons of long continued cold, or sudden thermal changes, in order that we may understand more thoroughly the influences responsible for pigmental variation.



2

4

6

8

10

11

Aberrations of Pyrameis Carye

PLATE 7.

STUDIES IN PACIFIC COAST LEPIDOPTERA

(Continued)

DR. JOHN A. COMSTOCK

Associate Director, Los Angeles Museum

Through the generous co-operation of Commander C. M. Dammers, and family, of Riverside, we are enabled to record a number of additional notes on the life histories of California lepidoptera.

PHYCIODES PHAON Edw. Larva.

The larva, as here described, is probably in its last instar.

Head: ground color, ivory, with large blackish-brown spots disposed as shown in our illustration, Plate 8. Two of these spots are reniform, near the top of the head, one each side of the median line. External to these is a large elongate spot, and inferior to this on the side of the head is another smaller ovate one, on which the true ocelli occur. The latter are jet black. A number of brownish-black hairs are scattered over the head.

Body: ground color, olivaceous. A fine mid-dorsal dark brown line is present, and lateral thereto occurs an area of olive-brown mottling, edged externally with a light olive stripe. Latero-inferiorly to this is a dark brown stripe, extending from the second cervical to the anal segments, but lighter and more irregular on the posterior end. Inferior to this stripe is a lighter mottled band extending along the line of the spiracles (stigmata). Below this is a light cream colored band, running along the entire length of the body, and edged along its lower margin by brownish-black. All of the body below this area is a dark olivaceous.

The body is covered with numerous branching spines, arranged in rows. The mid-dorsal row is smaller, and is obsolete on the first three cervical and last caudal segments. The row next lateral to this rests on a light colored band, and is complete. A second row external to this rests on the lower edge of a dark band. Latero-inferiorly to this is still another row of smaller spines, placed in line below the spiracles, and obsolete on the first and second dorsal, and anal segments. There are also two (paired) small spines at the base of each of the prolegs, and a single spine on each of the remaining segments in line with these.

All of the spines are light colored (or colorless) on the trunks, with slightly darkened tips. The hairs protruding from these spines are, for the most part, dark brownish-black, with slightly lighter bases.

Legs, and prolegs, dark olivaceous.

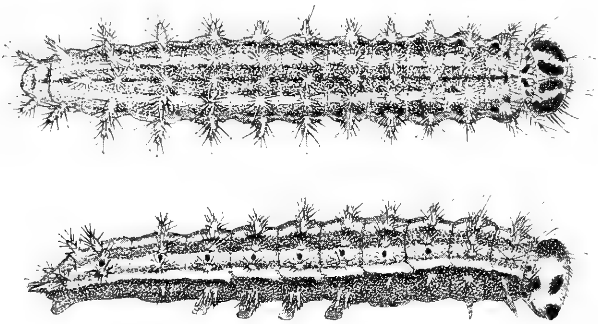
Larval foodplant, *Lippia nodiflora* and *L. lanceolata* (Mat grass).

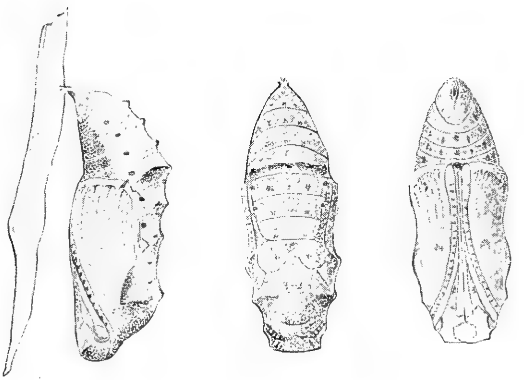
Pupa. 10.5 mm. long by 3.5 wide at greatest dimension. Color, light cream, with an overlay or reticulation of light brown. Spiracles, dark brown. The dorsal tubercles are whitish, tipped with brown. Our illustration, plate 8, accurately depicts the form.

The larvae were collected near Blythe, Calif., by Master Charles H. Dammers.

a.

b.





c. d. e.

Larva and Pupa of Phyciodes Phaon

a. Larva, dorsal view. b. Larva, lateral view. c. Pupa, lateral view. d. Pupa, dorsal view. e. Pupa, ventral view. All figures enlarged.

PLATE 8.

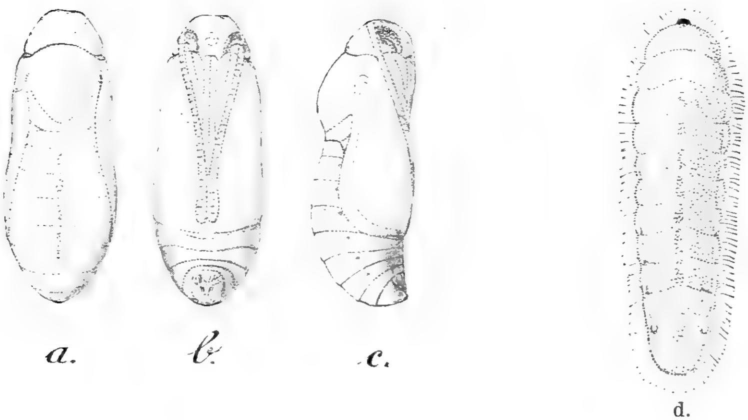
Plebejus melissa Edw.

In "Papilio," Vol. 4, Page 91, Mr. W. H. Edwards describes the larva of the above named species, and speaks particularly of the pair of retractile tubes, with which it is enabled to attract ants. We are reproducing a figure of this larva, plate 9, probably in the third instar. It was taken by Mr. Dammers on *Glycyrrhiza lepidota,* a foodplant not heretofore mentioned for the species, and was raised to maturity on wistaria.

The female of this species spends a lot of time in a pretense of laying—walking up and down the plant, and even on the ground at its base, before ovipositing. Though she seems very particular about choosing a site, the eggs may finally be laid on any portion of the plant, or even on dead leaves, sticks, or pebbles in proximity to it.

The pupa of *L. melissa* is similar to others of the genus (see plate 9).

The color is, at first, a uniform pea green, but changes somewhat before emergence. The wing cases take on a straw color, and the eye cases become black. Length, average 7.5 mm. Greatest width through abdomen, 3 mm. The pupa emerged in 9 days.



Plebejus melissa

a. Pupa, dorsal view. b. Pupa, ventral view. c. Pupa, lateral view. d. Larva, dorsal view. All figures enlarged.

PLATE 9.

PHOLISORA ALPHEUS Edw.

Egg. Color, ivory: the depressions shading to a brown, and the tips of the nodules a dirty white. Size, approximately .75 mm. broad. Height the same as breadth.

There are approximately eight ridges radiating from the microphyle, and bearing a number of nodules. These are most pronounced on the upper portion of the egg, and grow progressively smaller toward the base. From each nodule, a number of ridges or walls radiate, in an irregular stellate pattern. See Plate 10, figure a.

Larva. Last instar.

Head: dull brownish-black, covered profusely with a wavy yellowish pile.

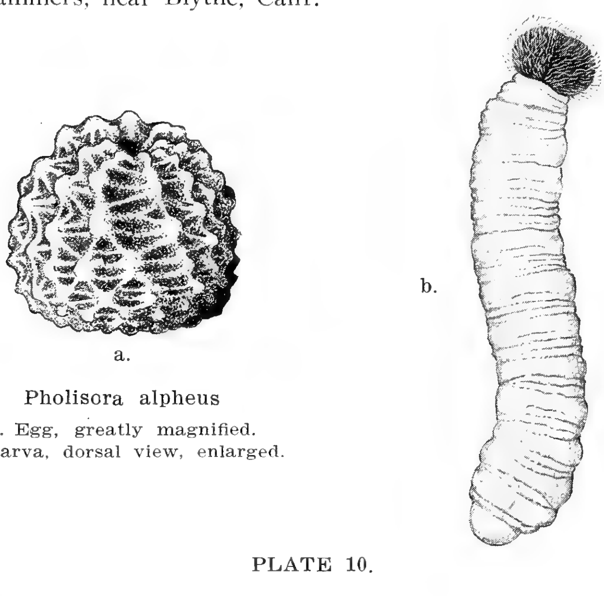
Body: dull green, profusely covered with small whitish nodules, and bare of ornamentation. The shape and form is accurately depicted in figure b of Plate 10.

The caterpillar rolls a leaf into a protective tent. Foodplant, *Atriplex* (Fog-weed). The species on which eggs were gathered was *Atriplex expansa.*

Pupa. Length, 11 mm. Color, light straw, with a "bloom" of powdery white, the abdominal segments slightly darker. Numerous hairs cover the head region, disposed as shown in the illustration. Plate 11. These are also scattered over the dorsum, and abdominal segments, but are absent on the ventrum, and wing cases.

The caterpillar pupates in its protective "tent."

The eggs of this species were collected by Master Charles H. Dammers, near Blythe, Calif.



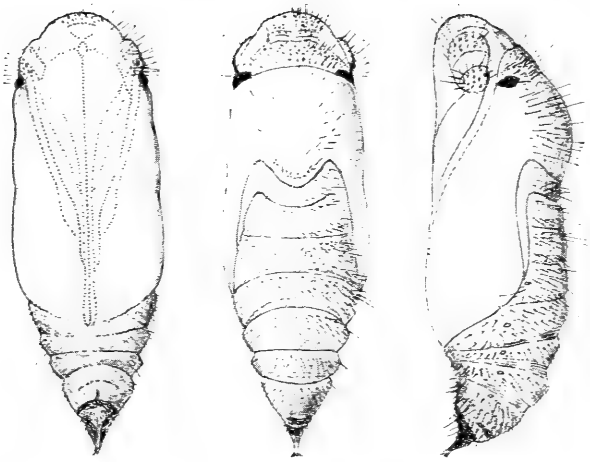
a.

b.

Pholisora alpheus

a. Egg, greatly magnified.
b. Larva, dorsal view, enlarged.

PLATE 10.



Pupa of Pholisora alpheus
a. Ventral view. b. Dorsal view. c. Lateral view.
All figures enlarged.

PLATE 11.

URBANUS SCRIPTURA Bdv.

Comm. Dammers reports the "probable" foodplant as *Sida hederacea* (Alkali Mallow).

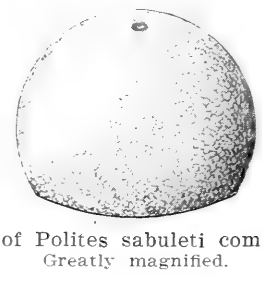
POLITES SABULETI COMSTOCKI Gund.

Egg. Color: delicate green. Surface finely granular, covered with an irregular reticulation of slightly raised walls, enclosing hexagonal areas, the floors of which are flat. Micropyle only slightly depressed, and of a darker shade of green.

Size: width at greatest dimension, 1 mm. About two-thirds as high as it is broad. See Plate 12.

Foodplant: Bermuda grass.

Comm. Dammers describes the young larva as "typical skipper, green, with jet black head."



Egg of Polites sabuleti comstocki
Greatly magnified.

PLATE 12.

OCHLODES SYLVANOIDES Bdv.

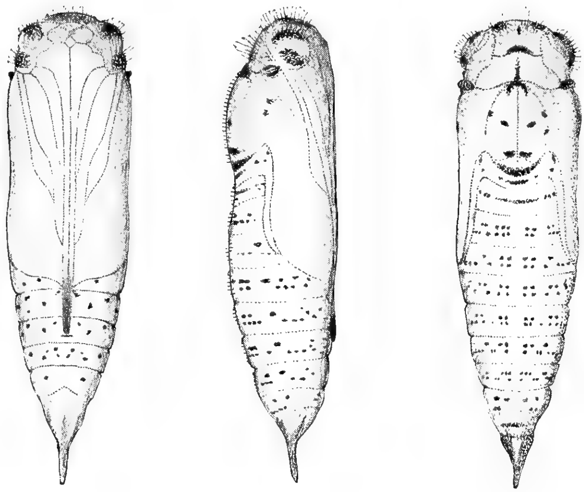
A larva of this species was found, resting on wild parsnip, whence it had probably crawled from some nearby grasses in preparation for pupation. The specimen was collected in Devil's Canyon on June 25, 1929 by Master Dammers, and pupated Aug. 2nd, without further feeding.

Larva: buff yellow, with a black head. Fed to maturity and pupated in six weeks.

Pupa. Length 15.5 mm. Greatest width through thorax, 4 mm. Ground color, cream, with a whitish "bloom" over most of the surfaces. The anterior portions are shaded with brown. Eye cases, reddish-brown, shading to a deep blackish-brown in two areas. Pile, where present, a dirty cream. Abdominal portions lighter in color.

The spots and markings, and general shape of the chrysalis are shown in Plate 13.

The pupa emerged in six days.



a. b. c.

Pupa of Ochlodes sylvanoides

a. Ventral surface. b. Lateral surface. c. Dorsal surface.
All figures enlarged.

PLATE 13.

Copaeodes aurantiaca Hew.

Egg. Color, cream. Texture, smooth and glistening; microphyle not depressed, and indistinguishable from the surrounding surface. The shape is that of a flattened hemisphere. See Plate 14, figure d.

Collected at Blythe, Calif., deposited on Bermuda grass July 30, 1929. Emerged Aug. 2nd.

Larva. First instar.

Cylinderical, tapering posteriorly.

Head conoidal, with two points projecting superiorly, the face crossed by two vertical bands of pink, beginning on the horns, and running infero-laterally, with a large purplish area on the cheeks. The top of head bears a V shaped mark, with the base toward the neck and the arms of the V extending onto the horns.

Body: green with bands of darker green running longitudinally. There is a delicate light mid-dorsal stripe, obsolescent caudally, bordered by two heavy green bands, coalescing on the last three segments and terminating in a pinkish-red band, which extends out onto the horn-like projection of the caudal segment. Two dark green bands occur on the lateral surface. Abdomen and legs, light green.

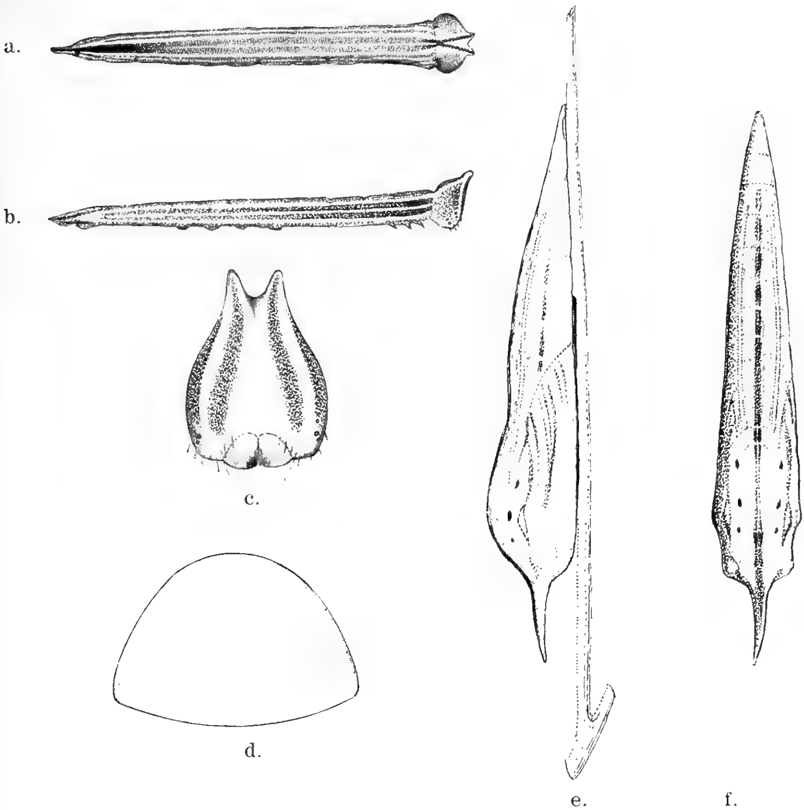
The larva is illustrated on Plate 14, figures a, b, and c.

In the later instars the head is proportionately smaller, and the dorsal bands are a heavy purple shade.
The larva pupated Aug. 24th.

Pupa. Length 19 mm. Color, light straw.

The body is cylindrical, with a sharp elongate "beak" extending anteriorly from the head, somewhat similar to that of the pupa of *Lerodea eufala.* Edw. There is a dark brown interrupted mid-dorsal line, with three paired spots of the same color on the dorsum of the thorax. A few irregular gray-brown lines occur on the wing cases.

Abdomen: elongate and tapering. Lateral to the mid-dorsal line there is a narrow white longitudinal line, and lateral to this a still narrower white line, edged above and below with pink. A narrow lateral brown line occurs immediately above the stigmata, which is, however, obsolescent on the anal segments. Below the stigmata is a faint suggestion of a yellow line. The tips of the labial cases are dark brown and extend posteriorly onto the abdomen. The pupa is suspended by a delicate girdle. See figures e and f on Plate 14.



Copaeodes aurantiaca

a. Larva, dorsal view. b. Larva, lateral view, enlarged.
c. Head of Larva greatly magnified. d. Egg, greatly magnified.
e. and f. Pupa, lateral and dorsal views, enlarged.

PLATE 14.

LERODEA EUFALA Edw.

The early stages of this species have been described by Karl Coolidge, in "Entomological News," Vol. 33, p. 305, but no illustration has been given. We are presenting, through Comm. Dammers' courtesy, a picture of the larva and pupa. See Plate 15.

Lerodea eufala
a. Larva, enlarged. b. Pupa, enlarged.
PLATE 15.

ATALOPETES CAMPESTRIS Bdv.

Egg. .9 mm. broad by half as high. Color: delicate greenish white. Texture: minutely granular, but free of reticulations. The shape is hemispherical, with a slightly depressed microphyle of a darker shade. Laid on Bermuda grass. See figure a, Plate 16.

Larva. Length 14 mm.

Head: glistening black, free of hairs, except for a few colorless bristles about the mouth parts. The true ocelli are black, and have a small straw colored patch anterior to them.

Body: color, dark olive green, profusely covered with minute black nodules, surrounded with dark green bases, each nodule bearing a microscopic black single hair. A dark greenish-brown mid-dorsal line runs the entire length of body, except for a short space anteriorly and caudally, where it becomes gradually obsolescent. The first cervical segment bears a black transverse line or collar, which occupies the posterior two-thirds of the segment. A very faint suggestion of a light sub-stigmatal line occurs.

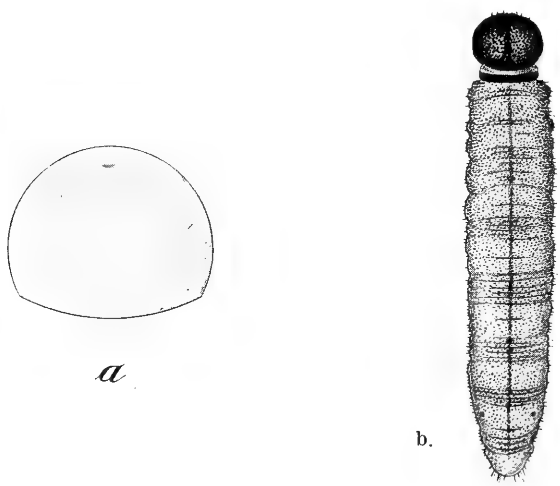
True legs, black. Prolegs, olive green. Spiracles, small, dark brown—the posterior one being fully twice the size of the others. The illustration, Plate 16, fig. b., accurately depicts the form.

The larva has the curious habit of climbing the terminal point of a blade of Bermuda grass, biting this off, and carrying it down to a point near the base of the plant, where it is incorporated into its protective "tent."

Pupa. Length, 19.5 mm. long by 6 mm. wide at greatest dimension through abdominal region; color, blackish brown, darker on wing cases, thorax and head. A prominent white ovate nodule in scapular region.

Thorax strongly arched on the dorsum, and bearing microscopic pile. On the abdomen there occurs a series of faint blackish spots on a brown surface, disposed as shown in the accompanying drawing. This maculation is partly obscured by the yellowish pile, which covers the entire abdominal region. A white flakey powdering covers a considerable portion of the chrysalis, particularly those areas bearing pile. This has had to be removed in order to reproduce the structural characteristics of the pupa. Our illustration gives the form and texture of this interesting chrysalis with sufficient accuracy to obviate the necessity of further description. See plate 17.

The duration of time from the laying of the egg to pupation was 15 days.



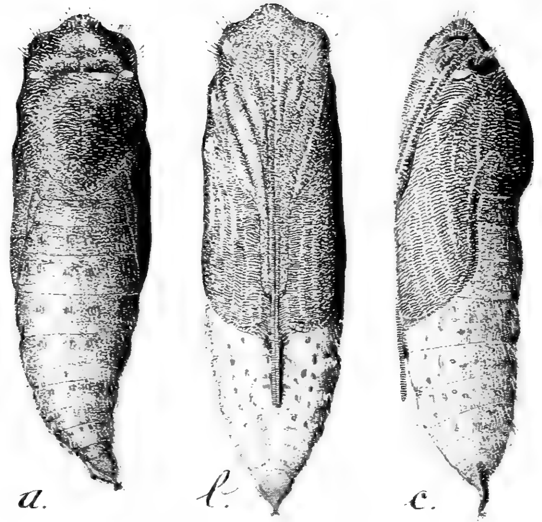
a

b.

Atalopetes campestris

a. Egg, greatly magnified. b. Larva, last instar, enlarged.

PLATE 16



Pupa of Atalcpetes campestris, enlarged
a. Dorsal view. b. Ventral view. c. Lateral view.

PLATE 17.

A NEW SPECIES OR FORM OF ANTHOCHARIS FROM CALIFORNIA

By John Adams Comstock
Los Angeles Museum

From Commander C. M. Dammers, of Riverside, we have received a unique example of an *Anthocharid* which differs markedly from anything thus far recorded. The specimen was taken March 8, 1929 in Whitewater Canyon, Riverside County, California. It bears a superficial resemblance to *A. lanceolata australis* Grin. but the orange tips of the primaries immediately separate it from that species. In some respects it suggests *A. reakirtii* Edw., particularly in the maculation of the underside of primaries. It may ultimately prove to be a hybrid between these two very distinct species, but further collecting in this little known district, and breeding experimentation will have to be relied on to determine this point. The specimen is a ♂, and has been placed on loan in the Los Angeles Museum collection by its discoverer, for whom we take pleasure in naming it.

Anthocharis dammersi n. sp.

Expanse 37 mm.

Primaries. Upper surface. White in the proximal 2/3 with a slight greyish dusting at the base. Outer margin heavily dentated with black, the apex with a wider black dentate margin. A wide black triangular band begins at the inner angle, and fades out as it approaches the outer edge of the cell. A heavy black ovate spot at outer end of cell. Outer third of wing beyond discal spot, a rich orange, where not obscured with black. Fringes, black, with white points at outer ends of nervules. Inferior surface: pure white except for a distinct black discal spot, an area of light orange discal thereto, and a few scattered dark scales along the costal margin and in the aprical area. Fringes as on superior surface but with the black scales somewhat reduced.

Secondaries: Superior surface; white, except for a heavy grey-black shading in the basal area, a few scattered black scales on the costal margin, and black points at the ends of the nervules. Inferior surface: Ground color, white; richly overlaid with marbling of grey green. The inner two-thirds of wing more heavily marbled than the outer third. Nervules delicately striped with light yellow. Fringes as on upper surface. Illustrated on Plate 18.

Upper surface Under surface

Anthocharis dammersi sp. nov.

PLATE 18.

IN MEMORIAM: HERBERT J. GOUDGE

Herbert J. Goudge, Fellow and member of the directorate of the Southern California Academy of Sciences, died at the Lutheran Hospital, Los Angeles, May 16th, 1929. The victim of a serious abdominal disorder, Mr. Goudge had undergone two surgical operations.

Born in London, England, in 1863, the lad was educated in his home schools and afterwards graduated from an English university. He migrated to the United States in early manhood, and settled in California in 1894. He was admitted to the bar in Ventura County, and after practicing his profession there two years, came to Los Angeles in 1896. He took up practice here, and as a side issue, held the secretaryship of a building and loan association. Mr. Goudge was married in 1896 to Miss Nellie Agnes Tighe, of Los Angeles, and to this union were born three children,—Agnes, George Philip and Mildred Goudge.

Early in his practice here Mr. Goudge asserted himself as an attorney of ability and high character. He was appointed assistant City Attorney, and held that position five years, after which he returned to private practice and acquired a large and influential clientage. Mr. Goudge's strongest claim to distinction in the annals of Los Angeles will lie in the beneficient work he accomplished as mediator in the long-drawn controversy between the city and the Edison Electric company. Three major issues were settled through the efforts of Mr. Goudge. In the harbor steam plant controversy the Edison company had set aside a Long Beach plant for the Power department, under contract that the city should not engage in the generation of electricity by steam power during the life of the contract. By this arrangement the city was saved the investment of several millions of dollars for a plant and heavy operating expenses. In the face of this the Power department projected the erection of a large steam plant at Los Angeles Harbor. The department was unable to proceed, however, by reason of technical obstruction and injunction suits. The second dispute, in which the city filed numerous tax claims against the company, was settled when the Edison company paid the Water and Power department $311,000. The third misunderstanding involved the distribution of energy in this field, and on this the city capitulated. All parties to the arbitration on Aug. 22, 1928, signed a statement in which credit was given Attorney

Goudge as a "friendly intermediary and not as an attorney or representative of either side." So Mr. Goudge will go down in history as a master compromiser,—one who accomplished a great good for his city and won the plaudits of both contestants.

Besides his long-time membership in the Academy of Sciences, Mr. Goudge was a member of the Masonic order, the California Club, the City Club, the San Gabriel Country Club and other social organizations. He was president-elect of the City Club, and would have been installed April 1st but for his sickness.

W. A. Spalding.

Herbert J. Goudge

PROCEEDINGS OF THE SOUTHERN CALIFORNIA ACADEMY OF SCIENCES

Regular monthly meeting was held in the Auditorium of the Los Angeles Public Library, April 16th at 8:00 P. M. A beautifully illustrated lecture on "The Grand Canyon" was delivered by Dr. F. H. Maude. The speaker had spent many weeks in the study of the geology of this stupendious work of Nature. Being of a rare artistic temperament as well as scientific, Dr. Maude's slides were most unusual, giving some conception to those who have not been fortunate to have visited this wonderland, of the inspiring beauty of the Canyon.

On May 6th the annual meeting of the Academy was held in the Banquet Hall of the Los Angeles City Club. The President, Mr. G. W. Parsons presided. Reports of the President, Treasurer, Secretary, and Editor of The Bulletin were presented. Following the banquet Mr. B. R. Baumgardt delivered a lecture on "The Poetry of Life." This was one of the most beautifully presented messages we have had from our Past President Baumgardt. He cleverly drew from the inspirations of the world's greatest thinkers translating them into our lives. The speaker has a mode of delivery of such a theme beyond compare.

Regular monthly meeting was held May 21st at the Public Library at 8:00 P. M. An instructive illustrated talk on "The Saline Deposits of Death Valley" was given by Major Julian Boyd, a well known Geologist and Engineer. The speaker dealt with the history, formations and mineral wealth of this most desolate area so close to home, yet seemingly not of the Earth. He showed that much has been written greatly exaggerating the dangers of the spot. The speaker depicted great untouched mineral deposits yet to be developed in the area.

Regular monthly meeting was held in the Public Library June 18th. A talk illustrated by gorgeously colored lantern slides on the "California Wild Flowers, and the Preservation of Our Landscapes," by our wild flower authority, Mr. Theodore Payne. It was a most eloquent plea for the State's most cherished asset, and a delight to our Nature lovers.

Meeting of Board of Directors of the Southern California Academy of Sciences was held June 5, 1929, at noon, in the office of the Secretary, 1151 W. 6th St., Los Angeles, Calif.

There were present the following:—Mr. G. W. Parsons, Chairman, Dr. A. Davidson, Dr. F. A. Carpenter, Dr. J. A. Comstock, Dr. T. C. Low, Mr. T. Payne, Mr. W. A. Spalding, and Dr. R. H. Swift.

The purpose of the meeting being the election of officers, votes were regularly cast electing Dr. Ford A. Carpenter, President; Mr. Theodore Payne, First Vice-President; Mr. Wm. A. Spalding, Treasurer; and Dr. R. H. Swift, Secretary.

Taking the chair, Dr. Carpenter informed the Board of the untimely death of Mr. Herbert J. Goudge. Mr. Spalding being asked to write a suitable memorial to this man who had rendered such service to the Academy.

There being a vacancy caused by the passing of Mr. Goudge, it was regularly moved, seconded and carried, electing Commander R. Frank Gross to fill this place.

There being no further business to come before the meeting, the Board adjourned at 12:35.

DR. R. H. SWIFT, *Secretary.*

The work of the Southern California Academy of Sciences is carried on entirely through the generosity of private citizens, who are sufficiently interested in the advancement of education and cultural endeavor to donate funds or make bequests to the Academy. As a guide, in the matter of bequests, for those who plan to further this program, the following forms are suggested:

Form of Legacy

To be used when it is desired to leave the Academy any personal property, such as money, stocks, bonds, works of art, or other objects of value.

I give and bequeath unto "Southern California Academy of Sciences," of the City of Los Angeles, the sum of.................................... Dollars: To have and possess the same unto the said "Southern California Academy of Sciences," its successors and assigns, to the uses, dispositions and benefits thereof forever.

Form of Devise

To be used when it is desired to leave real estate to the Academy.

I give and devise to "Southern California Academy of Sciences" of the City of Los Angeles, (.. here describe the property or ground rent...), together with the appurtenances, in fee simple, and all policies of insurance covering said premises, whether fire, title or otherwise, free from all taxes: To have and to hold the same unto the said "Southern California Academy of Sciences," its successors or assigns forever.

BULLETIN of the SOUTHERN CALIFORNIA
ACADEMY of SCIENCES

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Bulletin of the
Southern California Academy of Sciences

Began issue with Vol. I, No. 1, January, 1902. Issued ten numbers in 1902, nine numbers in 1903, 1904, 1905; three numbers in 1906. Issued two numbers annually from 1907 to 1919, both inclusive (except 1908—one issue only). Issued four numbers (January, May, July and October) in 1920.

The 1921 issues are: Vol. XX, No. 1, April; Vol. XX, No. 2, August; Vol. XX, No. 3, December.

The 1922 issues are: Vol. XXI, No. 1, March; Vol. XXI, No. 2, September.

The 1923 issues are: Vol. XXII, No. 1, March; No. 2, July.

The 1924 issues are: Vol. XXIII, No. 1, January-February; No. 2, March-April; No. 3, May-June; No. 4, July-August; No. 5, September-October; No. 6, November-December.

The 1925 issues are: Vol. XXIV, No. 1, January-April; No. 2, May-August; No. 3, September-December.

The 1926 issues are: Vol. XXV, No. 1, January-April; No. 2, May-August. No. 3, September-December.

The 1927 issues are: Vol. XXVI, No. 1, January-April; No. 2, May-August; No. 3, September-December.

The 1928 issues are: Vol. XXVII, No. 1, January-April; No. 2, May-August; No. 3, September-December.

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"	23,	" 5.	September,	1924	.25
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BULLETIN OF THE
Southern California Academy of Sciences

LOS ANGELES, CALIFORNIA

Vol. XXVIII September - December, 1929 Part 3

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Issued February 15, 1930

Southern California Academy of Sciences

SHELL FISH HOOKS OF THE CHUMASH

Arthur Woodward, *Los Angeles Museum*

Briefly speaking the territory once occupied by the division of California Indians known as the Chumash, extended along the coast from a point midway between Malibu Creek and Topanga Canyon northward to Estero Bay. Three of the islands in the Santa Barbara Channel, San Miguel, Santa Rosa and Santa Cruz were apparently within Chumash territory and occupied by them. "Inland, in general they reached to the range that divides the direct ocean drainage from that of the great valley; except that in the west, their frontier was the watershed between the Salinas and Santa Maria and short coast streams; and in the east some of the small fragments had spilled into part of the most southerly drainage of the San Joaquin-Kern system. The Carrizo plains are doubtful as between Chumash and Salinans, and may not have contained any permanent villages.

Marine life along the Chumash shores is exceptionally rich, the climate far famed, and every condition favored the unusual concentration of population among a people living directly upon nature.[1]

During the months of September, October and part of November, the Los Angeles Museum was able to maintain a field party through the generosity of Dr. Charles Van Bergen of New York upon the old Chumash village site of Muwu on the lagoon situated on the east side of Pt. Magu.

Hundreds of specimens were reclaimed from the site and a valuable collection of Chumash material was thus made available for study. Later, work was temporarily discontinued at Muwu and Dr. Van Bergen shifted his party northward to a village site near Avila, California, where a month was spent making a few test trenches with the view of obtaining more definite archeological evidence as to the inhabitants of that region. That portion of the coast line has always been included in Chumash territory. Undoubtedly the villages were occupied by the Chumash but there are other elements of culture entering into the area which offer a few problems. However, the purpose of the present paper is not to discuss the general aspect of the material culture of the Chumash as revealed in archeological excavations, but to depict the evolution of one of the most common and rather picturesque bits of fishing gear used by the Chumash dwelling along the shore, the

1. Kroeber, A. L. Handbook of the Indians of California, Washington, D. C., 1925, p. 551.

Islands and the immediate inland villages. This object is the peculiarly shaped shell fish hook which exists in one form or another from the southern limits of Chumash territory to the northern area.

A discussion of these hooks is given by Mr. Heye[2] and one of the quotations refers to the possible use of such items as ornaments. Of course, such a usage is not improbable but the author's personal opinion is, that the bulk of the hooks were not used as ornaments but as hooks for catching fish, *but* that ornaments were made patterned on the fish hook proper. One such ornament, decorated with incised lines and having two holes drilled in the shank and tip are in a private collection at Pismo Beach.

In the excavations at Muwu, one hundred and thirty-four hooks, fragments of hooks and portions of shell in the process of being fashioned into hooks, were found. Of this number, two fragments and one entire hook having barbs on the outer periphery near the point were discovered. In every case these hooks were found in the surface debris, none being deeper than twelve inches in the midden. Barbed hooks of this nature are not common although others in shell and bone have been found at various times. Heye does not mention any hooks of this type in his monograph already quoted but in a report by Rau[3] a bone hook rather similar to the shell hook illustrated in Plate 22 is pictured. He gives its point of origin as Santa Cruz Island, California and speaking of it says: "The shanks of the hooks (apparently there are several in the National Museum) are still covered with a coating of asphaltum evidently applied for securing the line. Contrary to the general rule, the barbs in these hooks are placed on the outer side."

As a rule the fishhooks are made of two kinds of shell, the common mussel and the haliotis or abalone. The abalone shell makes the sturdiest hook.

Comment has often been made to the effect that hooks of the peculiar circular shape made by the Chumash could not have been particularly effective. Various theories have been advanced as to the methods employed by the primitive fishermen whereby they might catch fish with these impractical appearing hooks. Mr. Heye states that his field man employed similar hooks of fresh haliotis shell successfully in catching rock bass.[4]

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2 Heye, Geo. G., Certain Artifacts from San Miguel Island, California, N. Y., 1921, pp. 133-137.

3 Rau, Charles, The Archeological Collection of the United States Museum in charge of the Smithsonian Institution, Washington, D. C., 1876, p. 64.

4 Heye, Geo. G., Certain Artifacts from San Miguel Island, California, p. 136.

That the aboriginal inhabitants of the southern California Coast line did make a decided success of fishing is well authenticated by the reports of the first Spanish exploring parties from Cabrillo's time down to Portola.

In a diary of Cabrillo's voyage the observer makes this entry concerning the Islander of the Channel group: "The Indians of the Islands are very poor. They are fishermen and they eat nothing except fish. They sleep on the ground. Their sole business and employment is fishing."[5]

When Portola's men were marching along that portion of the coast where the villages were thickest, many of the entries record the fact that the Indians, "made us a present of many fish."

Miguel Costanso, one of the diarists even mentioned the kinds of fish brought to the Spaniards.[6]

"They presented us with a quantity of fish, particularly the kind known as bonito (this was the season to catch it judging from the ease with which they took it.)"

And again: "The natives of this village immediately came to the camp, this we placed on the opposite side of the stream—bringing fresh fish roasted or grilled in barbecue for us to eat while their canoes, then out fishing, were returning with fresh fish. These canoes landed on the beach shortly afterwards and brought us an abundance of bonito and bass, which they gave us and offered in such quantity that we might have loaded the pack animals with fish if we had had the facilities to salt and prepare it. Moreover they gave us fish dried without salt (this they do not use in their victuals).[7]

The excavations at Muwu revealed a great quantity of fish bones scattered through the various refuse heaps, most of the skeletal remains were those of large sized fish and in many cases the vertebrae were found in place just as the ancients had discarded them after picking the flesh from the bones. Fish vertebrae were also found that had been fashioned into rings, some large, some small. This was done by drilling out the center of the vertebrae and leaving the resulting ring intact. Sometimes these vertebrae served as necklaces, one set of eighteen was found, all the rings being stained red from the ferruginous paint used apparently in great quantities by the villagers. Two species of sword fish were among the remains, likewise sheephead, and rays were among those most easily identified. At least forty per cent of the osteo-

5 Engelhardt, Z. Rev., Mission Santa Barbara, San Francisco, 1923, p. 5.
6 Diary of Miguel Costanso, Academy of Pacific Coast History, vol. 2, pp.33-35.
7. Ibid, p. 37.

logical material recovered from the midden was fish, fifty per cent marine mammals and a possible ten per cent land mammals and birds of various sorts. These estimates are based largely on the bulk of the material as finally sorted but the figures are not conclusive since the material is still being studied.

As we have noted, most of the shell fish hooks from the Channel region are usually nearly circular in shape. Now and then one encounters hooks that have a straight shank, or nearly so. Heye illustrates several of this type. In the Los Angeles Museum are a number of hooks obtained on San Nicolas Island. These are either circular or nearly so. In the specimens obtained at Muwu, not a single straight shanked specimen was discovered.

In Plate 20 is shown the largest and smallest hook found at Muwu. Both are actual size. The smallest is one-half inch in diameter and the larger specimen measures nearly one and one-half inches but unfortunately it is broken at the tip.

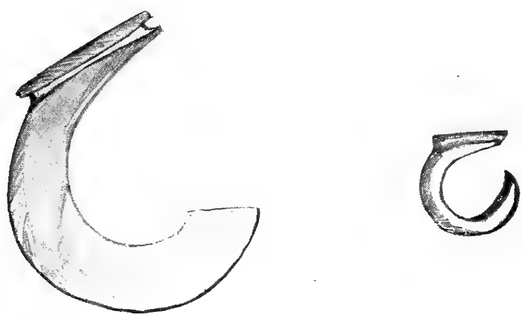


PLATE 20

In the excavations on a village site near Avila, California, but two specimens of shell fish hooks were recovered. One was perfect in every respect, the other was in the process of manufacture, the next to the last stage in fact. These hooks are depicted in Plate 21. The largest is seven-eights of an inch long.

PLATE 21

Both of these hooks were the straight shank type, and the largest was slightly notched in three or four places near the end of the shank, traces of tar still adhering to the shell showing where the cord had been attached. It would be interesting to see if the style of hooks changed in the northern end of the Chumash territory, but a great deal of further archeological work is necessary along the coast before even so trivial a problem can be settled.

At Muwu, several dozen, small, fat, plummet-shaped drills of chipped chert were recovered from the camp debris. The majority of these implements were dulled from long use, possibly the worn-out tools of the village artisans. Now and then a sharpened drill was found, several of them being in excellent condition. One of these drills was found on a house floor in conjunction with two partially drilled shell blanks and a perfect hook. Whereas in some areas the drill points were inserted in wooden shafts, for use with the bow drill, not a single one of the chert drills, from Muwu, showed any signs of ever having been hafted. In fact, when gripped tightly between the thumb and forefinger, they work very nicely, and fresh shell may be drilled quite easily, providing one keeps steadily at it.

PLATE 22

Enough blanks and finished hooks in the various stages of manufacture were found to furnish a complete series illustrating the evolution of the Chumash hook. This series is depicted in Plate

22. At the extreme left is shown the rough, pear-shaped piece of shell just as it was chipped from the shell by tapping it with a hammerstone. Next in the series is the blank with the rough edges ground down on a piece of sandstone. The third step shows the drill hole already begun. In the fourth the hole is drilled completely through the shell, and the shell has been further reduced and shaped along the edges. Step five illustrates the enlargement of the central hole. In the sixth stage, the outer rim near the fore part of the shank has been cut through, and the hook begins to assume definite shape. This is the next to the last stage. All that remains to make a finished product of the blank is the last final polishing touches inside and out and the addition of the groove by which the line was attached. The finished hook is depicted at the extreme right.

Above the row of hook blanks, and hooks is shown one of the small chert drills, somewhat blunt but still serviceable. Below is one of the barbed hooks of which so few have been found. It would be interesting to know the origin of these barbed specimens. Judging from their scarcity and position in the midden, i. e., on the surface, one would naturally suppose them to be a fairly late innovation, possibly patterned on some iron or copper hook made by the Spaniards. On the other hand the hooks may be a late indigenous development. The barbed hook in the photograph is made of mussel shell. Of the series of stages, the first, second, third, fourth, sixth and seventh are abalone, the fifth is mussel. None of the hooks found at Muwu had any traces of tar on them to indicate that that popular natural cement had been used to hold the fibre lines in place.

DEAFNESS AMONG ANCIENT CALIFORNIAN INDIANS

By Roy L. Moodie, Ph.D., Santa Monica, California
[With Two Figures]

We like to think of the North American aborigines as active, healthy dwellers of the plains, coasts and mountains, with perfect, unimpaired use of all their senses. Such, I believe, was the case with those active nomadic groups, like many of the Indians of the high plains, where continual activity and vigilence were needed to preserve life. The ineffectives would soon be eliminated in the struggle.

Sedentary life, or continued, undisturbed life, in one place, led to the development of physical troubles, which might rightly be called "diseases of slothfulness." There were, of course, other factors involved.

A recent examination of a small collection of about twenty-five skulls collected on San Nicolas Island and representing those Shoshoneans which became extinct there about a century ago, reveals an appalling incidence of deafness due to the presence of one or more, small or large aural *osteomata* in the outer one-third of the auditory meatus (See Plates 23 and 24). The exact

PLATE 23

The aural exostosis or osteoma of the right ear almost closes the meatus, recognized by the black crescent, at the point of the arrow. When the skin, thickened by the ceruminous glands, was present, the passage was completely blocked. The passage is closed in its middle one-third by hyperplastic bone, anyway, and the Indian was stone deaf, in both ears, and had been so for some years before death. He had suffered from a chronic, progressive deafness for most of his life, and these pictures show the almost complete closure of the passage.

Mas.—Right mastoid: Md.—Ramus of right mandible.

No. 830, Los Angeles Museum.

degree of incidence of this disease among the extinct San Nicolas Indians will be determined later when more abundant material is available. This short discussion is issued as a preliminary account of the subject of deafness in prehistoric times. Among the pre-Columbian Peruvians the aural exostoses were abundant, and frequently caused deafness by blocking the meatus. The entire subject of prehistoric deafness is receiving monographic treatment, and the memoir will appear later. The present account discusses only this one phase of deafness, for there were many causes of the condition.

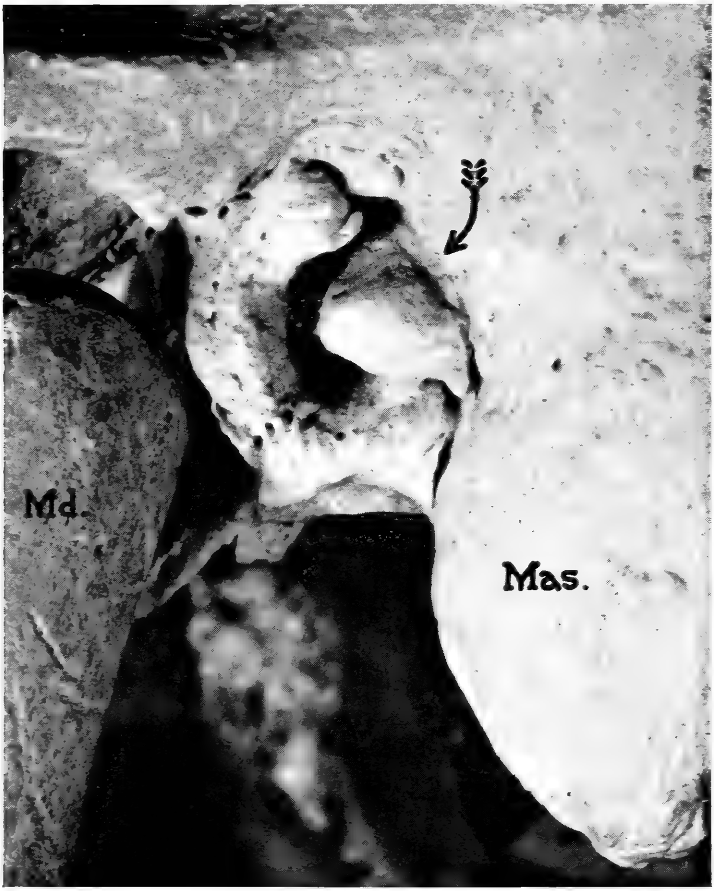


PLATE 24

The left ear of the same skull. It is not uncommon for the osteomata to occlude both ears.

Mas.—Left mastoid; Md.—Ramus of left mandible.

A single skull will be discussed here; No. 830, Los Angeles Museum, an adult, dolichocephalic male, collected in 1927 on San Nicolas Island, the fartherest seaward of the Channel Islands; a bit of wind-swept land, 8 miles long and about three wide, with an elevation of 890 feet.

On account of the intimate association of the diseases of the teeth and those of the ears, a careful examination of the dentition, upper and lower, was made. Some of the teeth were lost post-mortem. There is no caries, possibly on account of the extreme attrition which is of the fourth degree; the crowns of the teeth being nearly all worn away. The evidences of pyorrhea—the bane of aborigines everywhere—are excessive, the interdental processes being all eroded. The condyles are slightly worn. Secondary dentine is abundant and some of the teeth are polished. The left, lower, second molar exhibits a small apical abscess. A slight marginal arthritis is present on the occipital condyles, but otherwise the skull and jaw are healthy.

The auditory passages of both ears are closed by large osteomata (Figures 1 and 2), where the right and left ears are shown, enlarged. The tumor mass is solid and ivory-like. The external auditory meatus in its middle third, is further closed by the excessive hyperplasia of the walls. The exact relation of this form of deafness to *otosclerosis* is yet uncertain.

The nature and causes of these neoplasms in the meatus are unknown. They vary greatly in different skulls, and in different tribes. In one case, No. 494, Los Angeles Museum, we were able to account for a unilateral deafness, by the excessive use of his left teeth for mastication. But the causes vary, apparently, and we are still in the dark as to causes. Whatever the cause, such examples of chronic deafness are fairly common, more so among sedentary groups than among the more active.

The determination of such pathological conditions in *dry* skulls is difficult, for we have only the bony changes. I have shown examples of such deafness to practicing otologists, and they had seen nothing like the ones shown. The physician has a multitude of other things to consider, *in addition* to the bones, so it is no wonder that there is little literature on the subject. What few references there are will be given in my memoir, now nearing completion.

STUDIES IN PACIFIC COAST LEPIDOPTERA
(Continued)

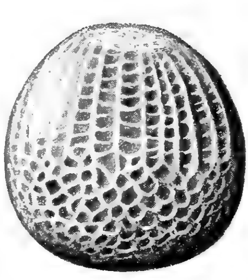
Dr. John A. Comstock
Associate Director, Los Angeles Museum

Melitaea chara Edw.

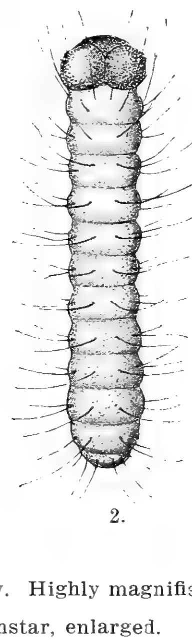
The usual desert rains of the fall of 1929 resulted in a luxuriant foliage of *Beloperone californica,* and a good hatching of *Melitaea chara* Edw. Eggs and larvae were collected near Cottonwood Springs on the lower Mojave Desert, in October. Commander Dammers was responsible for calling the occurrence of the flight in this locality to our attention.

EGG: Size .6 mm. broad by .7 mm. high. Color, light lemon yellow, changing just before emergence to a slightly darker shade. Micropyle flat or only slightly depressed.

The upper half of the egg bears some 20 to 30 longitudinal ridges, between which are numerous poorly defined transverse partitions. The lower half is covered with an irregular network of roughly hexagonal cells. Similar cells occur on the superior aspect, but are smaller. Base, rounding. See Plate 25, fig. 1.



1.



2.

PLATE 25

Fig. 1. Egg of *Melitaea chara* Edw. Highly magnified.

Fig. 2. Larva of *M. chara*, first instar, enlarged.

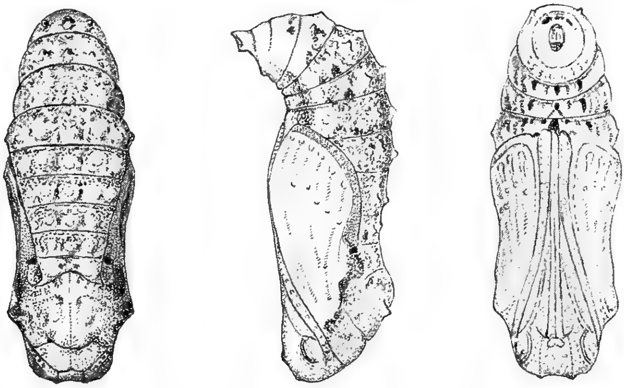
LARVA: FIRST INSTAR. Length 2 mm.: color light straw, the head slightly darker. Ocelli, straw color, with a large brownish black spot on the head, on which they are superimposed. Mouth parts, brownish. A few minute vibrissæ protrude from the surface of the head. Body: the first segment bears six long dark hairs which curve anteriorly over the head. Three rows of single hairs run longtitudinally on each side of the median line: the dorsal and dorso-lateral rows are black; the latero-inferior row is colorless, and is placed substigmatally. See Plate 25, fig. 2.

SECOND INSTAR: color, brownish green. All of the spines which are characteristic of the larvæ of this genus are now present. Head, brown with darker mottlings.

Body: A fine dark discontinuous median dorsal line is present, lateral to which is a brownish-green area, somewhat darker anteriorly. The spines over this entire area are yellowish-brown at their bases, with dark tips.

Lateral to this light area is a blackish-brown band with a row of dark colored spines superimposed thereon. Inferior to this is another light band (brownish-green) with a row of the lighter colored spines placed on it, at the base of which are minute rings of orange. Inferior to this is a light brown stigmatal band or area, sharply defined on its upper edge, and merging gradually into the lighter yellow-brown of the abdominal surface.

True legs, blackish-brown; prolegs yellow-brown.



a. b. c.

PLATE 26

Pupa of *Melitaea chara* Edw.

a. Dorsal surface. b. Lateral surface. c. Ventral surface.
All figures enlarged.

MATURE LARVA. The predominant color appears to be gray, thus giving a protective effect on the gray-green stems of *Beloperone.*

Head: black, profusely covered with grayish-white nodules, each one of which bears a black hair. A pear shaped whitish spot occurs in the median part of the lower anterior portion of face. There is a whitish bar immediately anterior to the ocelli, and another transverse whitish bar just above the mandibles. The hairs on this lower portion of the face are light, and do not arise from gray nodules. Ocelli, jet black.

Body: on the first thoracic segment at the juncture with head there is a narrow transverse orange band. The larva bears numerous branching spines arranged in rows characteristic of the genus. The median row extends from the fourth to tenth segment; each spine arises from an orange base, the orange spot having an outer circlet of white. The main trunk of each spine is colorless, and the branching subsidiary spines are black. This color scheme is more or less characteristic of all the spines, unless otherwise noted.

The row of spines next lateral to the above described median series, is complete on all segments. The next lateral row is placed just above the stigmata, and the amount of orange coloration at the base of each spine is greatly reduced or absent. A substigmatal row of spines is developed on a wide white band, each spine ringed with a narrow orange circlet at its base. These spines are lighter in color than those on the dorsum. Below this occurs another row of minute spines, those above the prolegs being paired, the remainder single.

The body color of the larva is gray, with black and white mottlings, and with orange patches at the base of certain spines as previously described. A narrow median black band is present and a narrow white band occurs in line with the stigmata. Substigmatally there is another wide white band, as previously mentioned.

Abdomen, mottled gray; prolegs, light gray-green; true legs, black; stigmata, black.

PUPA: length, 11 mm.: ground color, whitish gray, the wing cases and anterior thoracic portions lighter.

A series of nodules occurs over the dorsum, corresponding roughly to the dorsal spines of the larva. These are tipped with white, except for a few at the caudal end, which are speckled with brown. The abdominal segments, particularly on the dorsum, are irrorated and spotted with black. The pupa is illustrated on Plate 26.

The average duration of pupal life for those examples which did not overwinter, was seven days.

PHYCIODES campestris Behr.

Egg: color, delicate yellow-green. Size: .5 mm. broad by about .7 mm. high. Micropyle flat and granular. The upper half of egg is composed of longitudinal ridges, about 20 to 25 in number, with low transverse ridges running between them; lower half covered with irregular hexagonal cells, much as in the eggs of *Melitaeas*. Base, rounded.

The eggs are laid in a cluster. Oviposition was observed the 17th to 19th of October.

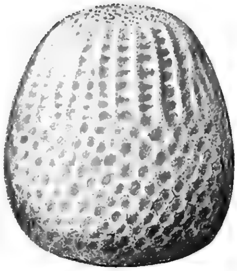


PLATE 27
Egg of
Phyciodes campestris,
highly magnified.

CHLOSYNE CALIFORNICA Wright.

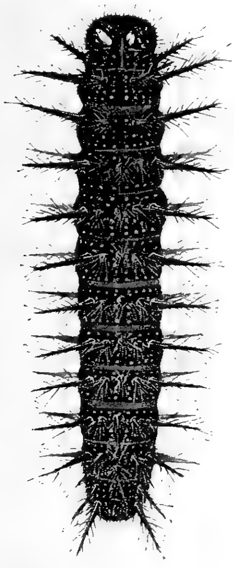


PLATE 28

LARVA

Length 3 mm. Probably in second instar. Head black: body, ground color, black. Some examples are heavily mottled with a dirty yellowish brown, others have the brown arranged in longitudinal lines. The characteristic spines, as later described in the mature larva, are all present, and are black. True legs, black. Prolegs, yellowish black.

The subsequent instars show little change except that the spines become longer, and develop a greater number of branches, and the black color becomes more conspicuous, tending to obscure the brown areas.

Mature larva, last instar, length 22mm.

Head; shiny black, covered with numerous black hairs, some of which arise from nodules.

Body; velvety black, with numerous creamy-white small punctate spots disposed somewhat irregularly but having a tendency to run transversely in rows. In the median line of the dorsum these spots are absent. The clear black space thus found is bordered by larger spots in an irregular longitudinal line.

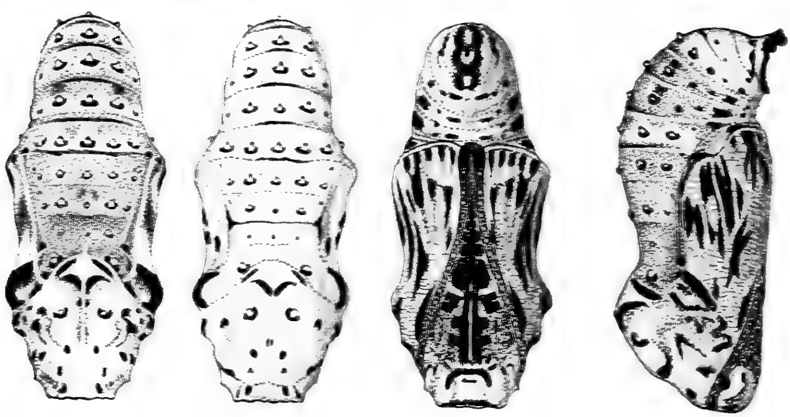
The body is covered by long branching spines arranged in rows, as shown on our figure. The median row is composed of nine spines, there being none present on the first three segments. The next lateral row is complete except on the first cervical and last caudal segments. The row next lateral to it is complete throughout with one large spine to each segment. Below the spiracles there is another similar row. Inferior to this is a row of rudimentary paired spines, with branching bristles of a lighter shade. The prolegs also bear a number of these light colored bristles. Spiracles, black. Abdomen, olive-black.

There is some variation in the color of larvae, particularly as regards the disposal of the small punctate spots, and their number and size. Some examples show in the last instar a considerable amount of gray arranged in transverse rows, and circlets of light yellow occur at the bases of the spines.

See Plate 28 for enlarged figure of mature larva.

Pupa. Length—average, 12 mm. Width at greatest dimension, 5 mm. Form, similar to that of Chl. lacinia and accurately pictured in Plate 29.

The ground color is a lustrous pearl, on which are superimposed numerous brownish and black spots. There are a series of nodules or papillae, corresponding roughly to the spines of the larvae. These are developed on a black base, and are orange, with minute black tips in some cases. There is a well developed mid-dorsal row of these papillae, and two lateral rows, the one most laterally placed being only partially developed.



a. b. c. d.

Pupae of *Chlosyne californica* Wright

Pupae of *Chlosyne Californica* Wright.

a. Dorsal aspect. b. Dorsal aspect of lighter colored example. c. Ventral aspect. d. Lateral aspect. All figures enlarged.

The chrysalis is entirely free of hair.

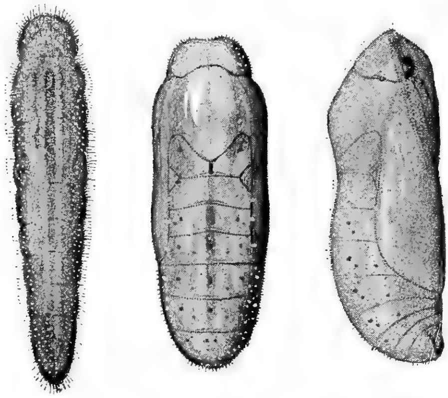
Pupal duration 5 days.

The range of variation in the color of this chrysalis is most remarkable, and runs from a lustrous white, without a particle of maculation, to examples that are practically a solid black.

HEODES HELLOIDES Bdv.

The early stages of this species have been described by Karl Coolidge and others, and the egg was illustrated in our "Butterflies of California."

An illustration is here shown of the mature larva, and pupa. (See Plate 29. The latter is less boldly marked than is usually the case with the species, judging from Coolidge's description of the chrysalis, but there is probably considerable variation here, as is the case with many of the Lycænidæ.)



a. b. c.

PLATE 29

Larva and pupae of *Heodes helloides*. Bdv. Enlarged. a. Larva, dorsal view. b. Pupa, dorsal view. c. Pupa, lateral view.

OCHLODES SYLVANOIDES Bdv.

Egg: color, cream; very similar in appearance to the egg of *O. agricola* (previously illustrated) except that the single example observed is slightly more depressed. Minute reticulations occur over the entire surface, as noted in the ovum of *agricola*.

OCHLODES NEMORUM Bdv.

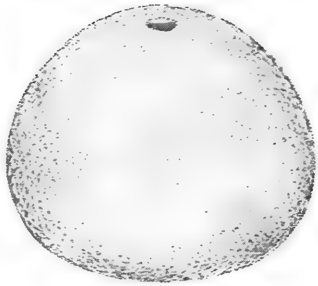


PLATE 30
Egg of *Ochlodes nemorum* Bdv. greatly magnified.

Egg: size, 1 mm. broad by the same high; color, gray-green. Micropyle small and deeply depressed. Base, rounding. The surface of the egg is covered with a network of fine reticulations, forming roughly hexagonal cells. The floors of these cells are flat and finely granular. Illustrated in Plate 30.

LERODEA EUFALA Edw.

The larva and pupa of this species were presented in the last issue of the "Bulletin." A drawing of the egg is here included (Plate 31) to which we append the following notes:

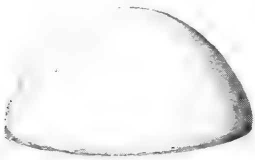


PLATE 31
Egg of *Lerodea enfala* Edw. Highly magnified.

EGG. Size: 1.1 mm. broad by .75 mm. high. Color: ivory, slightly suggesting a delicate yellow-green. Texture, smooth, with no visible micropyle.

This egg is hemispherical, with a flattened base. It was laid in captivity on Bermuda grass.

SABULODES CABERATA Gn.

Larva: last instar.

Color, yellowish white. Head, a flesh tint, with a few sparse short hairs. True eyes black. Mouth parts brownish.

There is a narrow median slate-colored band running the length of the dorsum, more clearly defined in the mid thoracic and caudal areas. Lateral to this is a narrow yellow band, edged outwardly with a black stripe. Lateral to the latter is a wide greyish area which bears two longitudinal bands of faint yellow, edged with fine black stripes, running longitudinally. All of these bands are less distinctly defined on the eighth and ninth segments.

A yellow stigmatal band is also present bearing the same black edging.

Abdomen, yellowish white; true legs of the same shade, except at their tips, which are tinged with brown. Prolegs yellowish white. Stigmata, bright orange yellow.

There is evidently wide variation in the color of different individuals. One example, of three observed, is a salmon color, with the bands more clearly defined. This specimen measured 1¼ inches, and was evidently in the next to last instar. The head of this specimen bore two black spots, one centrally placed on each side.

A few short hairs were present on these larvae, placed on the first dorsal segment, and along the lateral part of the body.

The caterpillar makes a protective covering by connecting two leaves along the edges. It remains dormant during the day and probably feeds at night. The chrysalis is also formed within this semi-cocoon.

The larva is illustrated on Plate 32.

Pupa.

Length, 20 mm.

Color, at first a slightly greenish, somewhat transparent white, later changing to a flesh tint.

Antennal cases a deep pinkish brown changing to a deeper brown before emergence.

The eye cases assume a greyish shade just prior to hatching. The shape and texture are shown on Plate 32.

Foodplant. In nature the larva may feed on a variety of plants. In captivity they were reared on Privet (*Ligustrum*).

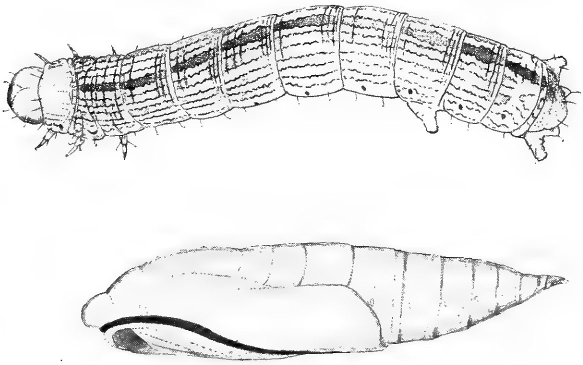


PLATE 32

Upper figure, larva of *Sabulodes* caberata Gn., dorsal view, slightly enlarged.

Lower figure, pupa of *S.* caberata, lateral view, enlarged.

TRICHOCLEA ANTICA Sm.

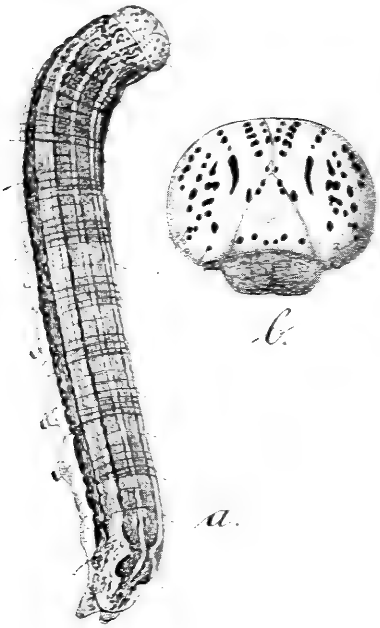


PLATE 33

a. Dorsal view of larva enlarged.
b. Head of Larva, anterior aspect, much enlarged.

Larva. Length when mature 20 mm.

Ground color, lemon yellow. Head slightly olivaceous, covered with numerous black spots, as shown in the accompanying cut. Mouth parts slightly darker.

Body with numerous black stripes and irrorations, running longitudinally, as shown in Plate 33. The arrangement of these stripes and of the yellow ground color gives the appearance of three well-defined narrow yellow bands on the dorsum, and a heavier black band on the lateral surface. Abdomen, light yellow. Legs, yellow with black dots. Prolegs, yellow with dark brownish tips. A few scanty colorless hairs occur on the head and body.

Foodplant: *Atriplex canescens.*

Nearly all of the butterfly larvæ and ova recorded in the foregoing paper, were brought to our attention by Commander C. M. Dammers of Riverside, Calif. We take this opportunity of again extending our thanks to him.

A COMMUNICATION

The following letter and its accompanying one are self-explanatory, and are of interest to Academy members, not only because of the remarkable context of the communication itself, but equally in the part which William H. Knight had in the development of our organization.—Ed.

Dear Sir:

My father, William H. Knight, was born in the State of New York, but crossed the Plains as a young man, and became a Pioneer of California. During his early years he was in the publishing business in San Francisco, but spent the latter part of his life in Los Angeles, where he served for a number of years as President of the Southern California Academy of Sciences. He was the founder and first President of the Astronomical Society of Los Angeles, and was active in other cultural organizations of that City. Father died three years ago in his ninety-first year.

When my son, Vernon, was born in 1907, father wrote him a letter which my son has prized very highly since he has been able to read and appreciate its splendid sentiments. This letter has never been offered for publication, but in view of the fact that a little daughter, who has been named Beryl, arrived on Saturday, Jan. 19, 1929, to brighten the home of Mr. and Mrs. Vernon Knight, it occurred to me that the publication of grandfather Knight's letter to his grandson might be appropriate at this joyful time.

I am therefore enclosing a copy of the letter, in case you care to publish it in your valued paper.

Very truly yours,

ALFRED KNIGHT.

Los Angeles, March 11, 1907.

Master Vernon Knight,
2206 Burnet Ave., Cincinnati, O.

My dear Grandson:

You have been ushered into the grandest Universe that the Divine Architect, with all his omniscience and omnipotence could conceive and devise, and if you become able intellectually to appropriate it, it will all be yours—its green hills, its sparkling streams, its cultivated fields, its primeval forests, its beautiful lakes, its sublime mountain heights, its heaving oceans, the blue dome resting over all; the miracle of daybreak, the gorgeous sunset, the roaring storm, the lightning flash; the majestic sun in his undeviating course, the star-gemmed canopy at night, the infinite host of shining worlds revealed by lens and camera; the mystery of the atom, of the ether, of the light ray, of all chemical forces; the unfathomable mystery of life, its beginning in the plant, its development in the worm, the insect, the fish, the bird, the quadruped, the anthropoid; the unfoldment of that spark of divinity the mind as manifested in thinking, reasoning, loving, planning, and achieving man; the bustling cities, the quiet country, the noisy factories, the solemn churches, the speeding railways, the dashing autocars; the charms of music, the treasures of art, the triumphs of architecture; the myriad tomes of history, biography, science, fiction; these are all yours, they are your playthings, your kindergarten blocks to bring into play your constructive faculty; with them you may build wisely and ingeniously, or with aimless and fruitless results.

What grand vistas of knowledge and of broadening horizons lie before you, and yet, in your wonderful journey through life, you will push those horizons further and further back, only to find that the borders of the great unknown are larger and larger as you advance.

It often happens that things, apparently of little moment, make or mar one's fortunes. It was a most happy thought on the part of your loving and sensible parents to endow you with a single, unhackneyed, and at the same time significant and historic name. One might search through biographical cyclopedias and not find any other which would so well fit the child, the date, the ear for euphony, or look so well on the printed page, as Vernon Knight. Handicapped by no meaningless initials, it will always appear in full, and thus confer upon the bearer a distinct individuality of his own—a great boon. It is a name not easily forgotten, but will impress itself on the mind and linger in the memory. A thousand congratulations on your felicitous name. May you ever be worthy of it and of the wise parents who bestowed it upon you.

Time, in its swift flight, bears one ruthlessly along through an eventful life, where are mingled sunshine and shadow, radiant hope and sad vicissitude, inspiring visions and stern realities, and as the end draws near how brief and ephemeral it all seems. So, though your unpracticed eyes cannot read these lines today, nor your untrained ears catch their import as your parents read them when the postman comes, the days and months and years will pass all too quickly when their full significance will sink into your heart and brain, and the rapid transitions from a smiling babe to a laughing child, a merry boy, an impetuous youth, an earnest student, a useful citizen, and a ripened manhood, will be but as the shifting scenes of a panorama.

Every man is the product of these forces—heredity, environment, and education. In your case the first could not be better; the second promises to be ideal; the third is dual and depends first, on numerous teachers—parents, instructors, associates, books, experience, the forces of nature; and second, on the pupil—his industry, ardor, choice of career, and assiduity in pursuing it.

Rewards? Do not look for them. The highest rewards are not those of gathered wealth, nor of fame achieved. That person who has the consciousness of having wrought well with the means at his command, is the best rewarded person in the community. Greed is insatiable, grasping ambition never satisfied. To serve your fellow man, individually and collectively, is the highest possible attainment to which you can aspire. At the same time the play of the intellectual faculties in the quest of scientific truth, and frequent excursions in the realms of general literature, are among the purest and most unfailing delights in which the soul can indulge.

And now, darling child, you have not only acquired the Universe, but you have inherited the ages, the development of a habitable planet from a rarified nebula, the lore, wisdom and experience of past generations, the gathered stores of wealth; and you also have, at the very outset of your career, all humanity, in every land and clime, working diligently in your behalf, collecting your food, weaving the fabrics for your clothes, preparing text books for your mental culture, erecting buildings of splendid architecture for your use and your aesthetic enjoyment, delving in mines, bridging streams, planting orchards, painting landscapes, composing symphonies, exploring unknown lands, searching out nature's hidden secrets, recording their travels, their scientific discoveries, their poetic images, their bright fancies, all these wonderful activities are going on for the welfare of little, as yet unconscious, Vernon Knight. No titled monarch in Europe, no scion of an American multi-millionaire, is so richly endowed as my fortunate little grandson. Deserve it and it will all be yours.

From your loving grandfather,

(Signed) Wm. H. Knight.

The work of the Southern California Academy of Sciences is carried on entirely through the generosity of private citizens, who are sufficiently interested in the advancement of education and cultural endeavor to donate funds or make bequests to the Academy. As a guide, in the matter of bequests, for those who plan to further this program, the following forms are suggested:

Form of Legacy

To be used when it is desired to leave the Academy any personal property, such as money, stocks, bonds, works of art, or other objects of value.

I give and bequeath unto "Southern California Academy of Sciences," of the City of Los Angeles, the sum of.. Dollars: To have and possess the same unto the said "Southern California Academy of Sciences," its successors and assigns, to the uses, dispositions and benefits thereof forever.

Form of Devise

To be used when it is desired to leave real estate to the Academy.

I give and devise to "Southern California Academy of Sciences" of the City of Los Angeles, (.. here describe the property or ground rent..), together with the appurtenances, in fee simple, and all policies of insurance covering said premises, whether fire, title or otherwise, free from all taxes: To have and to hold the same unto the said "Southern California Academy of Sciences," its successors or assigns forever.

BULLETIN of the SOUTHERN CALIFORNIA ACADEMY of SCIENCES

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■ ■

Bulletin of the

Southern California Academy of Sciences

Began issue with Vol. I, No. 1, January, 1902. Issued ten numbers in 1902, nine numbers in 1903, 1904, 1905; three numbers in 1906. Issued two numbers annually from 1907 to 1919, both inclusive (except 1908—one issue only). Issued four numbers (January, May, July and October) in 1920.

The 1921 issues are: Vol. XX, No. 1, April; Vol. XX, No. 2, August; Vol. XX, No. 3, December.

The 1922 issues are: Vol. XXI, No. 1, March; Vol. XXI, No. 2, September.

The 1923 issues are: Vol. XXII, No. 1, March; No. 2, July.

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Southern California Academy of Sciences, Care of Los Angeles Museum,
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Bulletin, Southern California Academy of Sciences

VOL. XXVIII, 1929

INDEX OF SUBJECTS

INDEX OF AUTHORS

New species indicated by bold face type.

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BULLETIN OF THE

Southern California Academy of Sciences

LOS ANGELES, CALIFORNIA

Vol. XXIX January-April, 1930 Part 1.

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Issued June 10, 1930

Southern California Academy of Sciences

OFFICE OF THE ACADEMY

Los Angeles Museum, Exposition Park
Los Angeles, Cal.

PLATE 1. Map of the Life Zones of Los Angeles County (Bogert).

AN ANNOTATED LIST OF THE AMPHIBIANS AND REPTILES OF LOS ANGELES COUNTY, CALIF.

Charles M. Bogert

The area included in the political limits of Los Angeles County may be briefly defined as consisting of six main topographical divisions: (1) Antelope Valley, the extreme Western arm of the Mojave Desert (Lower Sonoran); (2) The Liebre Mountains, (Upper Sonoran except the summit of Liebre Mountain which is Transition); (3) The San Gabriel Mountains (chiefly Upper Sonoran and Transition but includes Boreal on some of the higher mountain tops—maximum elevation 10,080 feet. Mount San Antonio; (4) San Fernando Valley (chiefly Lower Sonoran); (5) The Santa Monica Mountains (Upper Sonoran); and (6) The Los Angeles-San Gabriel Valley (Upper Sonoran along the coast but generally considered to be Lower Sonoran inland). Santa Catalina and San Clemente Islands off the coast are also parts of Los Angeles County and are mostly Upper Sonoran.

The following list of amphibians and reptiles of Los Angeles County is based upon my collecting and observing, except when otherwise noted, during and including the years 1923 to 1929. It is not believed that the list is complete although it does include a few species not previously recorded from the county. I have not visited San Clemente Island; therefore I am merely following previous records from there. However, three months were spent on Santa Catalina Island, so I have been able to verify previous records there in some instances. Admittedly more attention has been given to the reptiles than to the amphibians, in case of the latter, some of the information regarding the ranges of certain species in the county having been deduced from Slevin's recent work.*

It should be explained that the terms I have used here in describing the frequency of occurrence are purely relative with regard to each group, and pertain only to the occurrence of reptiles and amphibians in Los Angeles County. The range has been stated in general terms only when there seemed to be a sufficiently large number of locality records to justify such a statement, and in the case of rare forms individual records of finds have been mentioned.

* Occasional Papers Calif. Acad. of Sci. No. 16, 1928.

A. Newts and Salamanders

1. *Triturus torosus* (Eschscholtz)

Pacific Coast Newt. Quite common in most of the larger streams on the Pacific slopes of both the Santa Monica and San Gabriel Mountains. Does not seem to occur in any of the streams on the desert slope. A single specimen was found in a well near Santa Susana Pass.

2. *Batrachoseps attenuatus attenuatus* (Eschscholtz)

Slender Salamander. Exceedingly abundant under rocks, boards, or trash during the rainy season. During the dry months, however, the slender salamander is rarely found. It probably retires to some depth into the ground via earthworm passages. The occurrence of this salamander on the desert slope is doubtful although I did find one under a rock in Texas Canyon ten miles east of Saugus. It appears to be especially common in the vicinity of Pasadena and is also found on Santa Catalina Island.

3. *Batrachoseps attenuatus major* Camp

Garden Salamander. Known only from the vicinity of Sierra Madre. Two specimens were found under a log at the old San Gabriel Mission.

4. *Ensatina eschscholtzii* (Gray)

Red Salamander. Uncommon. During the Spring of 1924 I found four of these salamanders at Pine Flats in the San Gabriel Mountains. Two very immature specimens, equal in size, were found side by side beneath a log, and a few minutes later another overturned log revealed two more, also equal in size, and side by side, but nearly twice as large as the first pair. In 1927 I collected a large specimen beneath a rock in Millard's Canyon. Slevin* reports it from Topanga Canyon, Sierra Madre, Palmer's Canyon, and Los Angeles.

5. *Aneides lugubris lugubris* (Hallowell)

California Yellow-dotted Salamander. Somewhat uncommon but seems to be well distributed on the Pacific Slope. I found four small specimens in a shallow pool in the old Dawn Mine in Millard's Canyon. Has not been collected on the desert slope.

B. Frogs and Toads

1. *Scaphiopus hammondii* Baird

Western Spade-foot Toad. Has been taken at Sierra Madre and Los Angeles.

2. *Bufo boreas halophilus* Baird and Girard

California Toad. Common. Rather generally distributed throughout the county.

3. *Bufo cognatus californicus* Camp

Arroyo Toad. Has been reported from the Tujunga Wash near Sunland and doubtless will be recorded from many other of the dry washes.

4. *Hyla arenicolor* Cope

Sonoran Tree Toad. Rather common along the mountain streams of the county on both slopes.

5. *Hyla regilla* Baird and Girard

Pacific Tree Toad. Rather generally distributed throughout the country wherever there is water. Abundant on Santa Catalina Island, around even the smallest springs.

6. *Rana aurora draytonii* Baird and Girard

California Red-legged Frog. Occasional about pools and ponds in the foothills of the Pacific Slope.

7. *Rana boylii muscosa* Camp

Southern Yellow-legged Frog. More or less common in streams throughout the County.

C. Lizards

1. *Coleonyx variegatus* (Baird)

Banded Gecko. Rare. Through the courtesy of Mr. W. A. Rowe of San Fernando I have seen two specimens found in Powerhouse No. 2 of the Los Angeles Bureau of Power and Light in San Francisquito Canyon during May 1929.

2. *Dipsosaurus dorsalis dorsalis* (Baird and Girard)

Northern Crested Lizard. In May, 1928, I saw a specimen that had been collected on a ranch in the western end of San Fernando Valley.* Its occurrence in northeastern Antelope Valley is to be expected. It is a common form in the adjacent desert area of Kern County.

* Occasional Papers of California Academy of Sciences, No. 16, p. 62.

3. *Crotaphytus collaris* (Say)

Collared Lizard. Moderately common in rock piles and in the boulder-strewn gulches on the desert slopes of the San Gabriel Mountains, at least as far west as the Devil's Punchbowl and probably as far as Little Rock Creek. Rather frequent observations upon this Lizard were made in Mescal Gulch during the summer of 1927. In this locality their food consisted mostly of the larger winged insects—grasshoppers, wasps, beetles, etc., although an occasional *Uta stansburiana stejnegeri* or one of the smaller *Sceloporus* was included in the diet. The young did not appear until the latter part of August when they became about as numerous as the adults. A captive female collared lizard consumed a young lizard of the same species when the two were placed together in a small cage.

4. *Crotaphytus wislizenii* Baird and Girard

Leopard Lizard. Moderately common on the desert and desert slope. One of these lizards was observed in Mint Canyon on the Pacific slope. It is probable that a number of the desert forms range into Mint Canyon, as it together with Soledad Canyon forms a sort of natural pass connecting the desert with the Valley of the Santa Clara River.

5. *Sauromalus obesus* (Baird)

Chuck-walla. While I believe there is no previous published record of this lizard in this county I have found it to be locally common in at least two places: viz., Lovejoy Buttes and Peck's Butte, both in Antelope Valley in the northeastern section of the county Collecting at Lovejoy Buttes May 11 and 12, 1929, with the assistance of six boys, I secured fourteen chuck-wallas. A small crowbar and a bit of fishing line were used to extricate them from the cracks in the red granite of the buttes. Besides the fourteen collected, at least half again as many were observed in cracks where extrication seemed inadvisable, or impossible as was frequently the case. In three cases male and female found side by side in cracks were apparently mating. An average-sized female collected on this date contained six eggs.

The following incident may be of interest. In the early part of April, 1928, a large adult male chuck-walla was collected at Lovejoy Buttes. It had just come out of hibernation and was

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* Previously mentioned by L. M. Klauber—Copeia No. 170, page 16.

very thin. After about a month and a half of captivity it was liberated May 26, 1928, at a spot twenty feet from the crack in which it had originally been discovered. Then on May 11, 1929, nearly a year later, the identical specimen was re-collected when found between two rocks possibly twelve feet from the crack where it had been originally found. It was easily identified by means of a peculiar scar on its back. Also it was much thinner than any other of the fourteen Chuck-wallas collected on that week-end.

6. *Callisaurus ventralis gabbii* Cope

Desert Gridiron-tailed Lizard. Mr. L. M. Klauber, who very kindly examined six Los Angeles County specimens of this lizard for me, states that in his opinion they would come under the *c. v. gabbii* classification rather than under that of *c. v. ventralis,* although falling close to the border line. However, as Mr. Klauber added, it would require a larger series to permit really definite conclusions.

The gridiron-tailed lizard is a common form on the desert, ranging up into many of the desert gulches into the Upper Sonoran Zone. A female collected in Mescal Gulch in 1927 laid four eggs on July 7.

7. *Uta stansburiana hesperis* Richardson

California Brown-shouldered Lizard. Quite common from the ocean to the mountains. Usually amongst rocks.

8. *Uta stansburiana stejnegeri* (Schmidt)

Desert Brown-shouldered Lizard. Common on the desert and desert slopes at the lower altitudes.

9. *Sceloporus graciosus vandenburghianus* (Cope)

Southern Mountain Swift. Very common in the San Gabriel Mountains from an elevation of about five thousand feet to slightly over eight thousand feet (summit of Wright Mountain). No other lizard in the county extends its range so far into the Transition Zone as does this swift.

10. *Sceloporus magister* (Hallowell)

Desert Scaly Lizard. Moderately common on the desert among the Joshua trees (Yucca brevifolia). Perhaps more common amongst the rocks and about human habitations. Occasional in the desert gulches. I have observed it in Mint Canyon. Judging by captive specimens this species is omnivorous; insects, smaller lizards *(Callisaurus* and *Uta),* even earthworms, and occasionally flowers and berries were consumed. Unlike *Sceloporus orcutti* of some of the adjacent counties, *Sceloporus magister* is more curious than wary, and consequently it is easily captured by means of a noose.

11. *Sceloporus occidentalis biseriatus* Hallowell

Fence Lizard. Exceedingly common from the ocean to the desert foothills. About equally common with *Sceloporus graciosus vandenburghianus* in the San Gabriel Mountains at about five thousand feet elevation where *s. g. vandenburghianus* begins to replace it.

12. *Phrynosoma blainvillii blainvillii* (Gray)

Southern California Horned Lizard. Moderately common in the valleys, mesas, and foothills on both slopes as far north as the Devil's Punchbowl and the lower end of Mescal Gulch. Replaced on the desert by *Phrynosoma platyrhinos* and in the northwest corner of the county by *p. b. frontale* with which it intergrades.

13. *Phrynosoma blainvillii frontale* (Van Denburgh)

California Horned Lizard. Common in the valleys and canyons in the northwestern section of the county.

14. *Phrynosoma platyrhinos* Girard

Desert Horned Lizard. Common on the desert. I have collected this species and *Phrynosoma b. blainvillii* within three miles of each other near Little Rock, but the ranges of the two species seem never to overlap.

15. *Gerrhonotus scincicauda webbii* (Baird)

San Diegan Alligator Lizard. Quite common throughout the coastal area, and on the southern slope of the San Gabriel Mountains. Occasional on the desert slope, but not found, to my knowledge on the desert proper.

16. *Anniella pulchra* Gray

Silvery Footless Lizard. A subterranean species occasionally dug out by farmers or found beneath rocks. Most of the specimens I have seen have been from the Tujunga Wash (Tujunga and La Crescenta). It has been reported from Griffith Park. Specimens in the Los Angeles Museum are from Glendale, Gardena, and two miles south of Lankershim.

17. *Xantusia riversiana* Cope.

Island Night Lizard. San Clemente Island. How common this lizard is I do not know.

18. *Xantusia vigilis* Baird

Desert Night Lizard. Common on the desert and in the desert foothills under the decaying limbs of Joshua trees, in woodrat nests, under boards, and in cracks in rocks; but always in the vicinity of Joshua trees. It has been remarked that there were no Joshua trees within at least fifteen miles of the type locality, Fort Tejon, California. It is with interest that I noted a small clump of *Yucca brevifolia* in the Tejon Pass about six miles, by road, south of old Fort Tejon. It seems to me highly probable that this might have been the identical spot where the original specimens were collected or even quite possible that other Joshua trees might have existed even closer to Fort Tejon at one time.

19. *Cnemidophorus tessellatus tessellatus* (Say)

Desert Whiptail Lizard. Common on the desert and in the desert foothills. While this species is usually terrestrial, at the Devil's Punchbowl, I observed one three or four feet up in a manzanita bush apparently obtaining some food, just what I could not ascertain.

20. *Cnemidophorus tessellatus stejnegeri* (Van Denburgh)

San Diegan Whiptail Lizard. Moderately common in the foothills on the southern slopes of the San Gabriel Mountains and throughout most of the Santa Monica Mountains.

21. *Eumeces skiltonianus* (Baird and Girard)

Western Skink. Moderately common throughout the mountains and foothills. Occasional in the valleys and along the coast. I do not believe it has been recorded from the desert.

D. Snakes

1. *Siagondon humilis* (Baird and Girard)

Western Worm Snake. Mr. L. M. Klauber has kindly called my attention to a specimen in the Los Angeles Museum from "Near Chatsworth Park, Los Angeles County."

2. *Lichanura roseofusca* Cope

California Boa. Uncommon. I have collected it in Eaton Canyon, and I saw a specimen that was collected in San Gabriel Canyon. It has previously been recorded from both of these localities, which are on the Pacific Slope of the San Gabriel Mountains. I have had a number of reports of the presence of this species along the Mount Wilson Trail. It may occur on the desert slope inasmuch as I have collected a specimen two miles north of Victorville on the Mojave River, which is thirty miles to the east on the desert in San Bernardino County.

3. *Diadophus amabilis modestus* Blanchard

Ring-neck Snake. Moderately common throughout the county except on the desert and desert slope. During the months from February to May, 1929, I secured fourteen of these beautiful little snakes in my yard in Los Angeles by overturning rocks.

The largest specimen I have seen, one collected in the Arroyo Seco, Los Angeles, measured twenty-one inches. This large one devoured a thirteen inch specimen of the same species; however, their food in this section appears to consist largely of *Batrachoseps attenuatus attenuatus*. That a *Diadophus* ate a *Xantusia vigilis* while in captivity would indicate little, inasmuch as these two reptiles are probably never found in the same locality; but it was interesting to note that the *Xantusia* was killed by constriction previous to being eaten while the *Batrachoseps* are usually eaten without any preliminaries.

4. *Coluber constrictor mormon* (Baird and Girard)

Western Yellow-bellied Racer. Uncommon if not rare. Previously recorded from Bixby and Claremont and appears to be moderately common locally in the fields just south of Culver City. Kenneth Collins, who lives there, informs me that he has secured five or six during the spring of each year. He supplied me with a single specimen. This racer has been collected in Kern County at Tejon Pass and probably occurs in Los Angeles County at that point.

5. *Masticophis flagellum frenatus* (Stejneger)

Red Racer. More or less common on the desert (Antelope Valley) and in San Fernando Valley. Occasional in the vicinity of Los Angeles and Pasadena in the Los Angeles-San Gabriel Valley. A snake of the valleys and foothills; not found in the mountains. Inhabits open country usually.

6. *Masticophis lateralis* (Hallowell)

California Striped Racer. Common throughout the mountains and foothills of the county; usually in chaparral. Less common in the Transition Zone to an elevation of at least seven thousand feet (Blue Ridge).

7. *Salvadora grahamiae hexalapis* (Cope)

Western Patch-nosed Snake. Uncommon in the chaparral. I have collected it at Mt. Wilson, Barley Flats, and in Mint Canyon in the San Gabriel Mountains. (Mint Canyon is between the Liebre and San Gabriel Ranges.) It may occur in the Santa Monica Mountains but has not been collected there to date so far as I know.

8. *Arizona elegans occidentalis* (Blanchard)

Western Faded Snake. There is but one previous record of this snake from Los Angeles County; this was collected in Alhambra in the Los Angeles-San Gabriel Valley. I have collected it in the desert (Antelope Valley) between Neenach and Fairmont, at Lancaster, and at Little Rock. One was found on the Mint Canyon Highway at the junction of the Soledad Canyon Road about six miles northeast of Saugus in the foothills of the San Gabriel Mountains.

9. *Pituophis catenifer annectens* (Baird and Girard)

San Diegan Gopher Snake. Very common from the ocean to the desert's edge, and on the desert in the western end of Antelope Valley. This large snake ranges over the valleys and foothills up to an elevation of at least six thousand feet at Pine Flats. Occasional on Santa Catalina Island.

10. *Pituophis catenifer deserticola* Stejneger

Desert Gopher Snake. Three specimens were collected on the edge of the desert near Valyermo. They all appear to belong to this sub-species. Specimens collected at Harold were *P. c. annectens.*

11. *Lampropeltis californiae californiae* (Blainville)

California King Snake. Has been recorded from the extreme southeastern corner of this county at Claremont. I have not collected it.

12. *Lampropeltis getulus boylii* (Baird and Girard)

Boyle's King Snake. Moderately common throughout the county except in the higher mountains. I saw one on Santa Catalina Island.

13. *Lampropeltis multicincta* (Yarrow)

Coral King Snake. Moderately common in the canyons of both the Santa Monica and San Gabriel Mountains, occupying only the Upper Sonoran and Transition Zones. In captivity one fed readily upon *Eumeces skiltonianus.*

14. *Rhinocheilus lecontei* (Baird and Girard)

Long-nosed Snake. I have collected this snake in the vicinity of Lancaster, at Palmdale, at Harold in Antelope Valley and on the Mint Canyon Highway six miles southwest of Harold. All of these places are within the same twenty miles of highway on the desert and desert foothills. It has been previously recorded in Los Angeles County from the Los Angeles-San Gabriel Valley at Claremont and Belvedere.

15. *Hypsiglena ochrorhynchus* Cope

Spotted Night Snake. Rare. Specimens have been collected on the Mount Wilson Trail near Sierra Madre. In all probability it also occurs on the desert.

16. *Thamnophis sirtalis infernalis* (Blainville)

Pacific Garter Snake. Moderately common in the sloughs along the coast. An average-sized specimen collected in a slough on the outskirts of Los Angeles gave birth to thirteen young on July 2, 1928.

17. *Thamnophis ordinoides hammondii* (Kennicott)

California Garter Snake. Exceedingly common about ponds and streams throughout the entire county. The one thoroughly destructive snake of the county, apparently feeding mostly upon tadpoles, earthworms, toads, frogs and fish. One of these garter snakes found in a creek near Culver City gave birth to sixteen young on September 8, 1928.

18. *Tantilla eiseni* Stejneger

California Tantilla. One specimen recorded by Rüthling* from "near Los Angeles" he writes was collected by him "near Brandt Canyon and La Crescenta, between the two places." I know of no other Tantillas from Los Angeles County.

19. *Trimorphodon vandenburghi* Klauber

California Lyre Snake. Rare. Has been collected at Claremont in the Los Angeles-San Gabriel Valley and at San Gabriel Canyon near Azusa in the foothills of the San Gabriel Mountains.†

On July 1, 1929, I found a badly smashed specimen on the Mint Canyon Highway about four miles west of Acton. The Y-shaped mark on the upper surface of the head as well as the shape of the blotches on the body were sufficiently distinct on these mutilated remains to make identification practically certain for a locality record, although beyond that the specimen was of little value. A specimen in the collection of the Pasadena Junior College was "found under a rock near Sierra Madre" in May, 1929.

20. *Crotalus cerastes* Hallowell

Sidewinder. While there is no previous published record of this small species of rattlesnake in the area under consideration, it is probably one of the commonest if not the most common ophidian on the desert in the northeastern corner of the county. On May 12, 1929 I collected two at Lovejoy Springs. A friend of mine homesteading at Peck's Butte, about seven miles north of Lovejoy Springs, informs me that during the summer of 1928 he killed about fourteen sidewinders. There is a specimen in the Los Angeles Museum from "Antelope Valley, Los Angeles County."

21. *Crotalus ruber* (Cope)

Red Diamond Rattlesnake. But one specimen of this snake has been recorded from Los Angeles County.* It was collected at Whittier.

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* Copeia No. 15, February 20, 1915.

† Klauber, L. M., Trans. San Diego Society of Nat. History Vol. V, No. 11, pp. 183-194.

22. *Crotalus confluentus mitchellii* (Cope)

Bleached Rattlesnake. Recorded from near Fairmont in Antelope Valley.† Mr. Irving Kidd, County Ranger at Big Pines Park, who lived for some years near Lovejoy Springs, informs me that occasionally he saw this species around the buttes there. It appears to be uncommon.

23. *Crotalus scutulatus* Kennicott

Mojave Rattlesnake. On the desert only. Common in the west end of Antelope Valley but less common eastward. The food of this species appears to consist mostly, if not entirely, of Kangaroo rats. I have been most successful in collecting this rattlesnake at night and I have found it to be especially common in districts where the kangaroo rat is most abundant. One collected at ten o'clock one night near Neenach had one of the "rats" partly engulfed. Inasmuch as this snake's habitat is confined mostly to the open desert, refuge in day time must be sought in holes in the ground. I consider this to be the most vicious of our local rattlers.

24. *Crotalus confluentus oreganus* (Holbrook)

Pacific Rattlesnake. Common in the mountains and foothills and formerly was occasional in the Los Angeles-San Gabriel Valley. I collected a specimen on the summit of the divide between Mount Dawson and Mount San Antonio at an elevation of over nine thousand feet. Moderately common on Santa Catalina Island.

E. Tortoises and Turtles

1. *Gopherus agassizii* (Cooper)

Desert Tortoise. Common on the desert in the northeastern section of the county. An average-sized female collected at Lovejoy Springs on May 12 laid three eggs on June 28, 1929. The eggs probably were not fertile. None of them showed any signs of development.

2. *Clemmys marmorata* (Baird and Girard)

Pacific Mud Turtle. Common in the larger streams along the coast and in many of the marshes adjacent to the coast. Perhaps less common in some of the mountain streams. Does not seem to occur in any of the streams on the desert slope.

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* L. M. Klauber, Copeia No. 170, p. 21.
† Grinnell and Grinnell, Throop Institute Bulletin 35, 1907, pp. 59-60.

Species Which May Occur in Los Angeles County

The following reptiles have not been recorded from Los Angeles County but their occurrence here is probable:

1. *Uma notata* Baird

Ocellated Sand Lizard. To be expected on the desert in the sandy areas of the extreme northeastern portion of the county. It has been collected about forty miles eastward at Daggett in San Bernardino County.

2. *Sceloporus graciosus gracilis* (Baird and Girard)

Mountain Swift. Common in Lockwood Valley in the adjacent Kern County and almost certain to be collected in the mountains of the northwestern section of Los Angeles County.

3. *Charina bottae* (Blainville)

Rubber Snake. Has been collected in San Bernardino County twenty-five miles to the eastward. It may possibly be found in some of the more moist regions of the San Gabriel Mountains.

4. *Thamnophis ordinoides elegans* (Baird and Girard)

Mountain Garter Snake. Colonies of this garter snake have now been reported from both San Bernardino and San Diego Counties to the east and south respectively. Its occurrence in Los Angeles County is highly probable.

Acknowledgments

For assistance in the preparation of this list I am indebted to a number of persons. Sincere thanks are extended to Dr. F. N. Blanchard who kindly examined the ring-neck snakes, to Mr. H. R. Hill of the Los Angeles Museum, to Mr. Charles D. Perlee and especially to Mr. Harry C. James of the Trailfinders. Special recognition is due to Mr. L. M. Klauber, of the San Diego Zoological Society, who has courteously given much valuable assistance and whose advice and encouragement have largely made possible the completion of this list. What ever merit this paper may possess is due Mr. Klauber.

In the preparation of the Life Zone Map I have had advice and suggestions from Miss Elizabeth F. Burnell, Dr. Joseph Grinnell, Dr. Max W. de Laubenfels and Mr. Frank W. Peirson. To them my thanks are gratefully expressed.

Notes on MICRARIONTA RIXFORDI Pilsbry

By G. Willett

As the series used in the description of this species (Nautilus 33, p. 53) consisted of only three specimens, all of which were dead and faded, the results of a study of a much larger series, both living and dead, may be worthy of record.

During the past two years the writer has collected about a dozen mature specimens of *M. rixfordi* at, or very near, the type locality, which is given as "ten miles west of Twenty-nine Palms," and as many more in Forty-nine Palms Canyon, three or four miles from the type locality, in the same range of hills.

The type of *M. rixfordi,* according to Dr. Pilsbry, has a maximum diameter of 16.6 millimeters, umbilicus of 3.1 millimeters, and four and two-thirds whorls. The largest specimen in our series has four and seven-eighths whorls and a maximum diameter of 17.6 millimeters.

Twenty shells from the Eagle Mountains, about thirty-five miles southeasterly from the type locality of *rixfordi,* and the type locality of Dr. Berry's *Micrarionta aetotis* (Ann. and Mag. of Nat. Hist., ser. 10, vol. 1, p. 619), appear indistinguishable from *M. rixfordi,* as do, also, twenty-two specimens from the type locality of *M. depressispira* (l. c., p. 621).

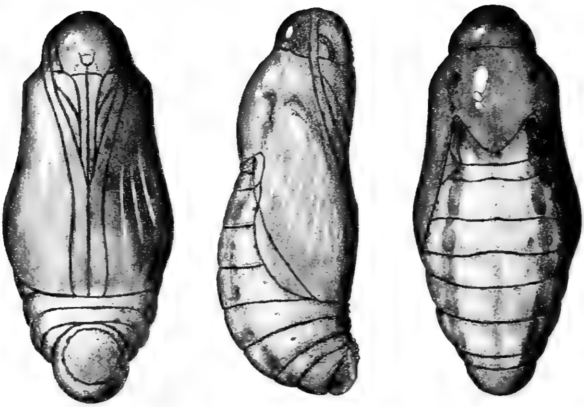
The high spire and compact coiling given as the differentiating characters of *aetotis,* are both variable features, extremes of which may be found throughout the series examined, regardless of locality.

The larger size and wider umbilicus claimed for *M. depressispira* are not apparent when a sufficient series of specimens is studied. Neither does the spire in our specimens average any more depressed than in our series of typical *rixfordi.* True, the type of *depressispira* is six-tenths of a millimeter larger than any other specimen yet examined. However, it has also an additional eighth of a whorl, which would indicate that the slightly larger size of this specimen is a result of natural growth. As to the wider umbilicus attributed to *depressispira,* our series does not show any such character. Furthermore, eliminating our series entirely and considering only the specimens used in the descriptions of *rixfordi* and *depressispira,* we find that the type of the latter, while possessing a third of a whorl more than the type of the former and one and one-fourth millimeters greater diameter, has an umbilicus only one-tenth of a millimeter greater. Also, the third specimen of *depressispira* cited by Dr. Berry, with a diameter only one-tenth of a millimeter less than the type of *rixfordi,* has an umbilicus four-tenths of a millimeter *smaller.*

The color of the shells seems identical throughout the series, when results of fading in dead specimens are considered. The general coloration of living specimens is dark horn-color, with band of mummy-brown, and a rather indefinite lighter zone on either side of the band.

After consideration of the above, the writer believes that both *Micrarionta aetotis* and *M. depressispira* should be considered synonyms of *Micrarionta rixfordi*, and that the range of the latter, as now known, is from a point ten miles west of Twenty-nine Palms, to, and including, the Eagle Mountains.

Los Angeles Museum.



a. b. c.

PLATE 2

Pupa of *Philotes sonorensis*, much enlarged.

a. Ventral aspect. b. Lateral aspect. c. Dorsal aspect.

THE LIFE HISTORY OF PHILOTES SONORENSIS FELDER

By Dr. John A. Comstock and Carl Coolidge

Philotes sonorensis, one of the daintiest of all North American lepidoptera, is a rather abundant species about Los Angeles. It has but one flight, a vernal one, in the sheltered canyons, such as San Antonio, emerging as early as the first week of February, but in the more exposed areas is usually not in full swing until April and may continue into May.

The food-plants are the various species of Sedum, popularly called "Hen and Chickens." The eggs are placed mainly on the undersurface of the leaves, but may also be deposited on the upper sides and even on the stalks. The larvae feed on the contents of the thick, juicy leaves, sometimes crawling entirely within, but usually several of the posterior segments are left protruding. The apical portion of the leaves seems to be the preferred part, and even the stalk may be riddled. In moulting, the larvae withdraw from the leaves and descend usually to the undersurface. Having both the interesting Lycaenid fluid sac and eversible tubes, they are attended by ants of a species as yet unidentified. They also suffer greatly from parasitization by a Tachinid fly.

The Egg.—Turban-shaped, round, sharply flattened at the base, evenly rounded on the sides and flattened at the top. The whole upper surface concave, with the micropyle in a deep, round, central depression, .05 mm. in diameter. The micropyle composed of a cluster of very minute but clearly defined round cells, about .005 mm. in diameter. Surface of egg ornamented with a raised lace work of cells, mostly subquadrate, but many are pentagonal and a few subtriangular, all becoming more elongate as the apex is approached and reached; on the sides these cells average .04 mm. in diameter and the cell walls are .01 mm. in thickness. At the angle of each cell a short rounded protuberance and the surfaces of the cells is covered with excessively fine punctae.

Color a delicate pale pea green, but this greenishness soon becomes lost and a solid chalky white is assumed. The raised net-work pure white. The micropyler area of a deeper green than ground color when first laid, and remaining so. Greatest diameter, .60 mm.; height, .34 mm.

First Instar.—Head dark chestnut brown, shining, .20 mm. in diameter; the ocellar field black. First thoracic segment pallid, with a bluish tinge.

Body subcylindric, finely granulated, and bearing series of rather high conical hair-projecting papillae, in the following order:

A suprastigmatal series of small fuscous papillae, two to a segment on either side, one anterior, the other a little above and before the middle. These project short colorless densely spiculiferous crooked clavate hairs, .037 mm. in height.

Three substigmatal papillae to a side. The hairs of the first series .038 mm. in length; those of the middle ones .12 mm.; the posteriors .04.

Two sets of laterodorsal papillae. The larger, situated centrally, send forth strongly recurved hairs, .18 mm. in length. The smaller, a little outside and slightly in back of the middle of segment, project hairs but .04 mm. in length. Both sets of hairs minutely spiculiferous and colorless.

A laterodorsal series of pale brown naked lenticles, two to a segment on either side, the outer the smaller; the inner measuring .015 mm., the smaller outer but .01 mm. On first thoracic a series of fuscous papillae that project colorless spiculiferous hairs over the head. Anal segment with a fringe of pale hairs, sharp, spiculiferous, varying in size, some as long as .16 mm. Spiracles circular, faintly black ringed, .01 mm. in diameter.

Color of body, at birth, pale lemon yellow, with a whitish sheen. Ventral surface pale greenish yellow; prolegs concolorous; legs pale brown, shining. Fluid sac present, but not the eversible tentacles of the following segment.

As the larva feeds the dorsal area becomes broadly but not distinctly outlined in greenish. In some examples broken roseate mediodorsal and laterodorsal stripes develop as the stage proceeds, but these are uneven and more or less obscure. Also, an infrastigmatal roseate stripe may develop, though weakly and inconspicuously.

Length, at birth and at rest, .90 mm.; in motion. Width at first thoracic, .30 mm.; at anal segment .14 mm.

Second Instar.—Head dark chestnut brown, shining, .40 mm. in diameter. First thoracic segment pallid, with a bluish tinge.

The body bearing numerous scattered small club-shaped colorless hairs, .06 mm. high, the stalks thick; most of these on the anterior parts of segments have the bent clubs facing posteriorly; those on the posterior parts facing anteriorly. The segments sharply defined. The infrastigmatal papillae, three to a segment, as in preceding stage; the anterior hairs .14 mm. in length, the middle .20 mm., the posteriors .18 mm. The laterodorsal tubercles .04 mm. high, with the hairs .20 mm. in length. First thoracic segment with a fringe of pallid hairs extending over the head, of varying sizes, but .16 mm. in length on the average. Spiracles round, .02 mm. in diameter, with a distinct, rather heavy, black ring.

Ground color of body a brown yellow, but this is mostly obscured by the longitudinal roseate stripes, not connected nor even, in fact, more like blotchings, but taken as a whole forming dorsal, mediodorsal, laterodorsal and infrastigmatal stripes. Or the ground color may be a solid rosaceous, without blotchings or stripes of any kind. Legs pale brown, subhyaline, darker at tips. Prolegs and ventral surface pale lemon yellow.

Length, 3.75 mm. Width at first thoracic, .90 mm.; at anal segment .86 mm.

Third Instar.—Head dark chestnut brown, shining, .62 mm. in diameter. First thoracic segment, as before, with a decided bluish tinge to its pallid coloration.

Body thickly studded with short clavate white hairs, spiculiferous, of varying sizes, some .08 mm. long, others but .04 mm.; these hairs .02 mm. in width apically, and they arise from minute brown-black stellate tubercles, .018 mm. in height and diameter. There are also many straight spiculiferous hairs, sharp apically, .20 mm. in length, arising from minute black tubercles. First hairs of substigmatal series .20 mm. in length; the middle ones .36 mm.; the posteriors .30 mm. First thoracic segment, with a fringe of spiculiferous colorless hairs extending over the head, some as long as .35 mm. A fringe on anal segment, the hairs projecting posteriorly, with some as long as .40 mm. Spiracles .04 mm. in diameter, with a distinct, heavy black ring.

Color now almost solidly rosaceous, the usual type of oblique lateral markings indicated with whitish blotchings. Or the ground color may be a pale yellowish white, with more or less raseaceous. A roseate dorsal line, heavier in coloration than the ground color, not prominent, and fading out on the posterior segments. Legs pale brown, subhyaline, darker at tips. Prolegs and ventral surface rather light greenish yellow.

Length, 5. mm. Width at first thoracic, 1.30 mm.; at anal segment, 1. mm.

Fourth Instar.—Head dark chestnut brown, shining, 1. mm. in diameter. First thoracic segment pallid and blue tinged.

Body, as before, minutely studded with conical brownish rayed tubercles, .02 mm. in height and diameter, giving rise to stout spiculiferous colorless hairs; some of these are but .04 mm. in height, stout and clavate; another type averages .08 mm. in length, nearly straight. Laterally, there are higher tubercles with much longer hairs, some being .26 mm.

The rosaceous coloration of the previous instar may be repeated, deepest on the thoracic segments, or the body may be pale yellow-white, though this is mostly obscured by the crenate lateral bands of the usual Lycaenid type. A deep red dorsal band, wider and more prominent anteriorly. In another phase the color is greenish-gray, the dorsal line red, but not wide nor prominent, disappearing on the last several posterior segments, and the usual crenate dashes only weakly indicated in pale red. Two other phases are entirely lacking in rosaceous; in one the ground color is greenish-yellow, the oblique lateral dashes blue-white, the dorsal line prominent dark blue, fading out on the posterior segments; in the other the larva is almost solidly a sordid pale yellow.

The eversible tubes and sac present. Spiracles .08 mm. in diameter, round, conspicuous, with a heavy black ring. Legs pale brown, shining, darker at tips. Prolegs pale yellow brown.

Length 9. mm. Width at first thoracic 1.80 mm.; at anal segment 1.60 mm.

Fifth Instar.—Head minute, obovoid, dark chestnut brown, shining, situated at the end of a long greenish-yellow conical neck, which is retractile, both head and neck being covered by the first thoracic segment. Diameter of head 1.20 mm.; the few sparse hairs that adorn it are colorless, sharp, spiculiferous.

Body onisciform, stout, well ridged, the dorsum elevated into a rounded ridge that slopes posteriorly. Flattened ventrally. The segmental incisures deep, the sides rather deeply and evenly excavated, and in the middle of each segment, from four to nine inclusive, a vertical narrow depression. Anal segment with the sides narrow, somewhat incurved and terminating roundly. Last several segments flattened, presenting a subspatulate appearance when viewed dorsally.

As before, the body is thickly studded with minute brown stellate tubercles, 5-6-7 rayed, from the center of each of which arises a concolored spine, not of uniform length. These conical tubercles arrayed in fairly regular rows. Fringes of hairs of first thoracic and anal segment just a little longer than in preceding instar.

Colorational phases of last instar practically repeated, though the predominant type is the rosaceous one, with the dorsal stripe much deeper but disappearing posteriorly. Laterally, to the spiracles, three series of crenulate pale whitish stripes, fairly regular, branches from the third encircling the stigmata. A less obvious similar substigmatal series. Ventral surface greenish opaque, prolegs green, legs brown. Tubes and sac prominent. Spiracles also prominent, round, .12 mm. in diameter, with a heavy black ring.

Length 14. mm. Width at first thoracic 4. mm.; at anal segment 3. mm.

Pupa—Of the usual Lycaenid type, rather plump and stout. Coloration, on the wing cases, thorax and cephalic areas olive green, the latter region slightly tinged with russet. Wood brown on the abdominal area. Surface of body minutely broken up with an irregular tracery of scarcely raised pale brown lines, about .02 mm. in width, and between these lines the surface is minutely punctate. Spiracles longish oval. A few scattered short spines, the longest but .05 mm. in length, terminating in a bunch of bristles; these only on the prothorax. Elsewhere, some scattered simple hairs, stout and clavate, but .07 mm. long. Length 8.5 mm. Greatest breadth 3.75 mm.

Pupation takes place in debris about, or at the base of the food-plant.

We are indebted to Theodore Childs, Jr., of Riverside, for the privilege of examining and making drawings of pupae that were reared by him from eggs taken near Azusa, Calif.

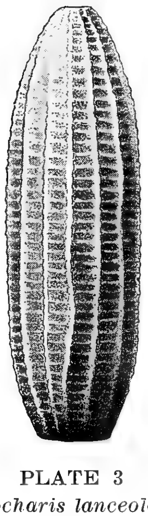


PLATE 3
Egg of *Anthocharis lanceolata australis*,
much enlarged.

STUDIES IN PACIFIC COAST LEPIDOPTERA
(Continued)

DR. JOHN A. COMSTOCK
Associate Director, Los Angeles Museum

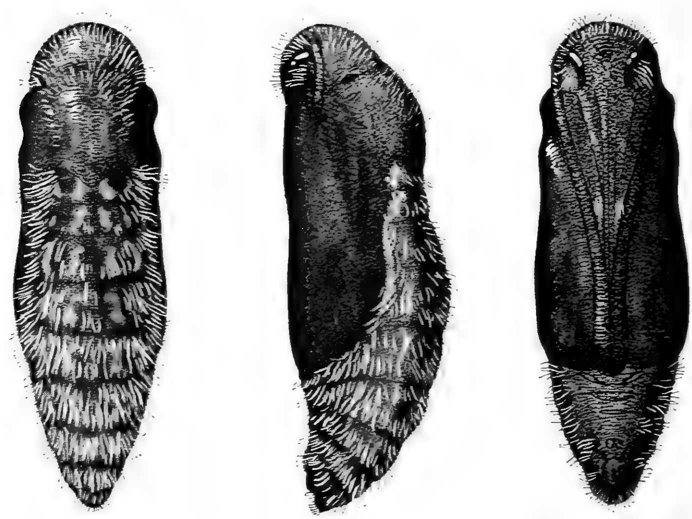
ANTHOCHARIS LANCEOLATA AUSTRALIS Grin.

Larva and pupae of this species were illustrated in our "Butterflies of California," and the young larva and ovum were described by Karl Coolidge in the "Canadian Entomologist," Vol. XLII, Sept., 1910. We illustrate the egg of *australis* in Plate 3. This single example measured 1.25 mm. high by .40 mm. broad.

APODEMIA MORMO VIRGULTI Behr.

The early stages of this butterfly were briefly described in the author's "Butterflies of California," and figures of the egg and larva were illustrated. The pupa has not been previously figured, to our knowledge, and a drawing is therefore included of this phase of the metamorphosis of this insect, through the courtesy of Comm. C. M. Dammers.

The specimen from which our figure was drawn pupated March 15th of this year, and emerged April 3rd. See Plate 4.



a. b. c.

PLATE 4

Pupa of *Apodemia mormo*, enlarged.
a. Dorsal view. b. Lateral view. c. Ventral view.

Plebejus emigdionis Grin.

A colony of this rare species is established in the Mojave River bottom lands, near Victorville, Calif., where a number of eggs were collected on April 20th of this year. The females were ovipositing on a species of *Atriplex*.

EGG: A flat echinoid. Color: gray-green exactly simulating the leaf of the food plant. Size: .75 mm. broad by about .25 mm. high.

Micropyle small and deeply depressed, with the surrounding surface in one example slightly raised. Three others do not show this character of micropylar ridge. The surface is covered with a fine reticulation of raised walls, enclosing deep pits of irregular triangular or quadrate shape. The walls or partitions show a slight tendency to develop tubercules at their points of juncture, but this character is much less pronounced than in many other Lycaenid eggs, and does not show on superficial examination. See Plate 5.

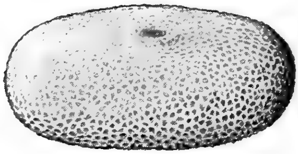


PLATE 5

Egg of *Plebejus emigdionis*, greatly magnified.

Philotes speciosa Hy Edw.

This species was plentiful this year at a point on the Mojave Desert, thirty miles north-east of Mojave, on the Randsburg road. Oviposition was occurring on April 19th, the plant of choice being *Oxytheca perfoliata* T. & G.

EGG: A robust echinoid. Color: Cream. Size: .5 mm. in diameter by .25 mm. high. Micropyle only slightly depressed.

The surface of the egg is covered by irregular ridges which show a slight tendency to radiate from the micropyle. These ridges are irregular in height and width, and bear numerous connecting and diverging arms which divide the surface of the egg into numerous shallow pits or depressions of varying sizes and depths. There are no tubercles or protuberances at the junctures of the ridges. The floor of the micropyle is flat, and of a slightly darker shade than the main body of the egg, and the ridges in this area are constricted to narrow low walls of a uniform height, enclosing a series of irregular shallow cells, the centre ones being the smallest. Plate 6 correctly illustrates the egg.

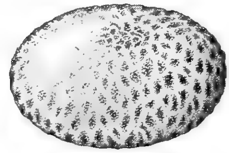
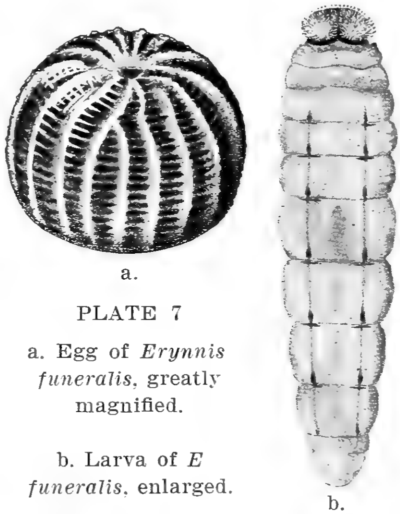


PLATE 6

Egg of *Philotes speciosa*, greatly magnified.

ERYNNIS FUNERALIS Scud. & Burg.

The metamorphosis of this insect has been recorded in detail by Karl Coolidge, in the "Journal of the N. Y. Entomological Society," Vol. 31, p. 175. No illustrations are available, and we are therefore reproducing in Plates 7 and 8 drawings of the egg, larva, and pupa. The examples from which these drawings were made were collected, as ova, on *Hosackia,* by Comm. C. M. Dammers, and were reared by him. One point which he has noted, and which is not mentioned in "Butterflies of California" is that, in the last larval instar, the caterpillar has two large orange-brown spots on the upper side of the head, (one on each side).



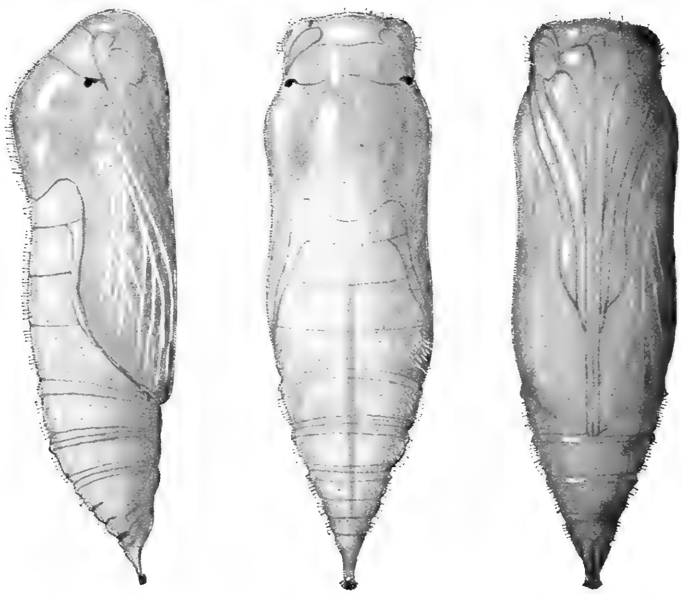
a.

b.

PLATE 7

a. Egg of *Erynnis funeralis*, greatly magnified.

b. Larva of *E funeralis*, enlarged.



a. b. c.

PLATE 8

Pupa of *Erynnis funeralis*, enlarged.

a. Lateral aspect. b. Dorsal aspect. c. Ventral aspect.

AUTOGRAPHA CALIFORNICA Speyer.

The larva of this species is illustrated by Essig in his "Injurious and Beneficial Insects of California," page 161 of the first edition.

I have seen no notes or drawings with reference to the pupa.

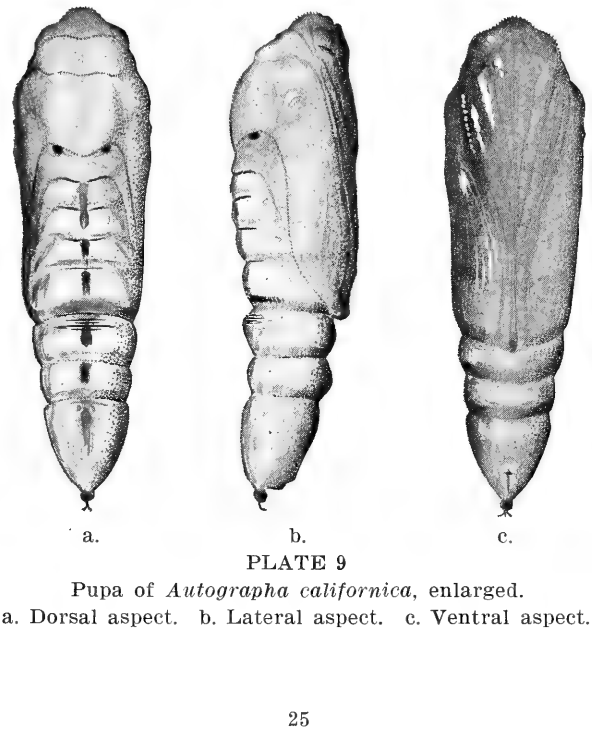
A caterpillar of this species was taken on *Viguiera deltoidea,* which constitutes a new food-plant record for it. Incidentally this is the plant on which *Chlosyne californica* Wright feeds, a fact which should have been noted in our paper dealing with that species in the last issue of the "Bulletin."

Pupa: Length, 15.5 mm. Greatest width 4 mm. Color, green, the thoracic portions of a bright shade, the abdomen lighter. There is a discontinuous dark green median line along the dorsum of the abdomen. Two small reddish-brown dots occur close to the scapular region, as shown in the illustration, Plate 9.

The first four abdominal segments bear a number of fine brick-red lines at the segmental junctures, on the dorsum. The fifth juncture has a brownish-red area on its anterior border, and four narrow raised ridges of the same color on its posterior border.

The posterior half of the wing cases are semi-transparent and the abdominal segmental lines are dimly discernible through them.

Stigmata, cream color. Cremaster and anal tip, brown.



a. b. c.

PLATE 9

Pupa of *Autographa californica*, enlarged.

a. Dorsal aspect. b. Lateral aspect. c. Ventral aspect.

Gloveria arizonensis Pack.

On March 25th, 1929, Commander and Mrs. Dammers found 119 caterpillars hibernating in a hole, on a rocky slope of Whitwater Canyon, Cochella Valley, California. The hole was about as large as a man's head, with an aperture of about 1½ inches. Below the opening there was an accumulation of frass, which gave a clue as to the presence of the larvae within. No vegetation was present in the immediate vicinity.

The larvae were taken to Riverside, and it was noted that, at about 8 o'clock of each evening they became very active. They were offered a great variety of plants, but nothing was found suited to their tastes. Com. Dammers therefore returned them to their native cave, and by observation noted that, in the evening, they all marched to a native juniper which was located some ten feet from their diurnal retreat. Feeding occupied about 15 minutes, after which they returned to their cave.

Subsequently a number of colonies of the same larvae were found on other junipers, and these were not observed to leave the trees during the day, but confined their feeding to the evening hours.

With careful breeding, and mating in captivity, Commander Dammers secured a fine series of *Gloveria arizonensis*. From specimens and data furnished by him, the following notes were compiled. An introduced cypress (Guadeloupe cypress) was substituted for *Juniperus californica* Carr, with equally good results. In handling the caterpillars it was discovered that the bristles produced a mild dermatitis.

Egg: Oval. Color, ivory. Surface apparently smooth, but under high magnification it is seen to be finely pitted. In shape, color and texture this ovum could be compared to a miniature ostrich egg. Size: 1.75 mm. wide by 2.5 mm. long. The eggs are deposited in clusters, on the terminal limbs of the Juniper, and oviposition occurs in August.

Larva: first instar.

Head black, except for a few orange markings about the mouth parts. First thoracic segment, black, with a diagonally placed olivaceous mark on each side of the median line, and a few minute olivaceous spots. There is a wide median light band running transversely along the dorsum, except where it is obscured by black on the caudal, and third thoracic segments. Lateral to this is a broken and irregular black band, at the outer edges of which are a series of orange spots which give the appearance of an orange line. These spots are lacking on the first thoracic, and last two or three caudal segments.

Latero-inferior to the orange spots is a wider black line, or series of spots, which is considerably broken or irregular on its lower edge. Below this is an olivaceous or creamy area. Abdomen heavily suffused with black.

True legs black, tipped with brownish-orange. Prolegs orange, shading to olivaceaus at the base. The caterpillar is covered with a series of long white hairs, arising from rows of nodules. A row of these nodules occurs on each side of the median line at the edge of the light median band. Another row runs substigmatally, with paired nodules above the four prolegs. Three additional nodules occur on each side of the thoracic segments.

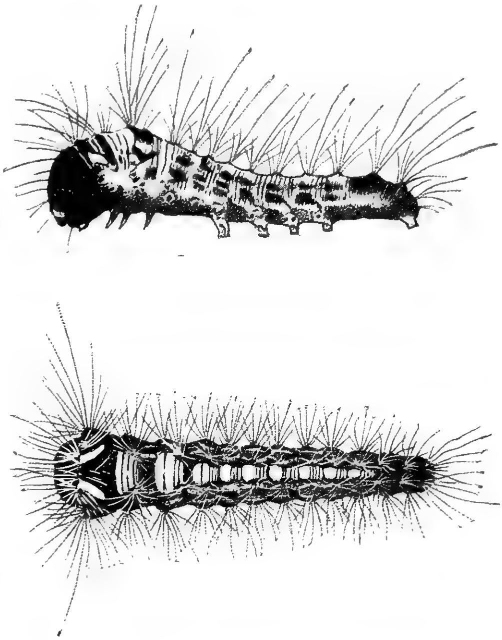


PLATE 10

Larva of *Gloveria arizonensis*, first instar, enlarged.

There is considerable variation in color and pigmentation, some examples showing a light creamy ground color instead of an olivaceous, with all the black areas much reduced. See Plate 10.

MATURE LARVA.

Length: 62. mm.

Ground color, sooty black. A dark gray area occurs in the mid-dorsal region, from which arises tufts of grayish-white hair, giving the appearance of a light mid-dorsal band. Lateral thereto is an area from which arises reddish-brown hair, suggesting a red-brown lateral band, but the color is in the pile only. On each segment in this area there occur a few small light spots, one or two to a segment. The reddish pile in this area does not take a continuous course antero-posteriorly, but is arranged in diagonal patches on each segment, which follow a course across the segment, beginning at a higher point and extending posteriorly to a lower one, thus giving a diagonally striped segmental appearance.

Latero-inferior to this is an area in which the pile is of the lighter grayish-white color.

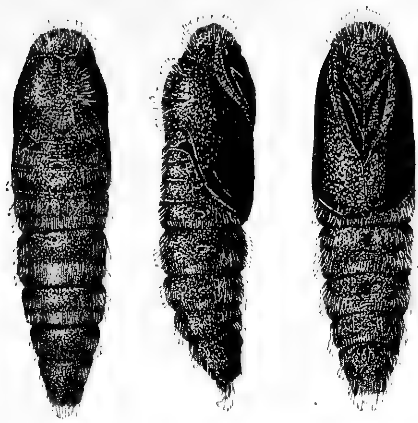
Spiracles, elongate, yellowish-gray. Abdomen, greenish gray.

Head: much the color of body, with a lighter colored inverted Y separating the anatomical divisions: covered with long hair. True ocelli, black. Pupation occurs in early August, and the imagos emerge in from 10 to 15 days: See Plate 11.

PLATE 11
Larva of *Gloveria arizonensis*, slightly enlarged.

Pupa: Length, 38. to 40. mm. Greatest width 12. mm. Color: brownish-black to black. Surface strongly pitted. The anterior end is profusely covered with wavy yellow pile. The highest point of the thorax on the dorsal surface bears scattered hairs of the same character, and each segment of the abdomen is thickly covered with similar pile on all surfaces. No pile is present on the wing cases or mouth parts. The shape is accurately pictured in Plate 12.

A loosely woven semi-transparent cocoon is spun before pupation.



a. b. c.

PLATE 12
Pupa of *Gloveria arizonensis*
slightly enlarged.
a. Dorsal aspect. b. Lateral aspect.
c. Ventral aspect.

PERO PEPLARIOIDES Hlst.

Of all the protectively colored caterpillars found in California, the larva of *Pero peplarioides* is, in our estimation, the most perfectly adapted, in form, color, and habit, to its environment.

The following notes and illustrations may therefore be of special interest to students who are interested in examples of adaptation.

EGG. Oval: dark grayish-brown. Texture, smooth or slightly granular. Size: 1. mm. long by .6 mm. wide.

LARVA. First instar. Thread-like, exceedingly active in their characteristic "looping" movements. Color: olive-green, the head and anal segments brownish. Shape, cylindrical. A few short sparse hairs are scattered over the body.

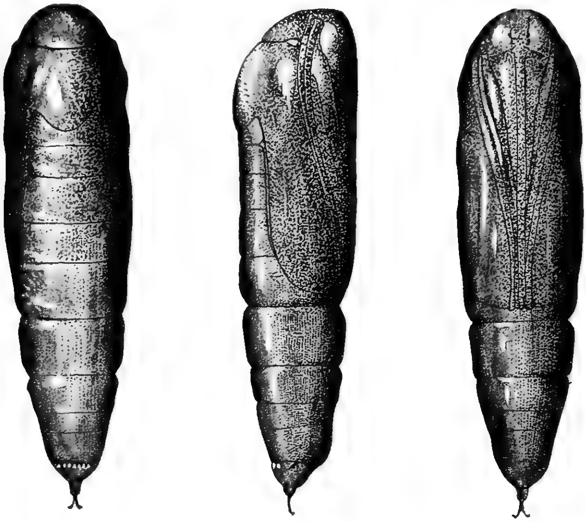
MATURE LARVA: wood-brown, mottled in exact simulation of a twig. Head, flat on anterior surface. Each segment bears a few short bristles: those of the anal region being somewhat shorter and more numerous. All prolegs except the fourth, and anal pair suppressed. The caterpillar remains in a rigid position, its body held almost at right angle to the twig on which its rests. Feeding probably occurs only at night. Plates 13 and 14 illustrate this phase.

PLATE 13
Young larva of *Pero peplarioides* on twig, at left, compared with natural twigs, at right.

PLATE 14. Larva of *Pero peplarioides* on twig, enlarged.

PUPA: blackish-brown, the surfaces deeply pitted, and free of pile. Terminal segment reduced to a small button and bearing cremaster formed in two small recurved hooks. The segment anterior to this has, on its dorsal surface, close to its anterior juncture, a row of small tubercles. Further description seems unnecessary in view of the accompanying illustration, Plate 15.

The larva were fed to maturity on Privet, but this is probably not their chosen food-plant.



a. b. c.

PLATE 15

Pupa of *Pero peplarioides*, enlarged.

a. Dorsal aspect. b. Lateral aspect. c. Ventral aspect.

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Southern California Academy of Sciences

LOS ANGELES, CALIFORNIA

Vol. XXIX May-August, 1930 Part 2

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LOS ANGELES, CALIFORNIA.


GUIDE MAP
FOR
BUTTERFLY COLLECTING
IN
LOS ANGELES COUNTY
CALIFORNIA
SHOWING THE BETTER KNOWN COLLECTING LOCALITIES
WHICH ARE INDICATED BY BLACK ARROWS
SEE INDEX AT SIDE OF MAP
COMPILED BY
J. D. GUNDER, PASADENA, CALIFORNIA
1930
SCALE IN MILES
AREA OF LOS ANGELES COUNTY 4,009 SQ. MILES
ROAD MAP REPRODUCED BY PERMISSION OF THE
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LOS ANGELES, CALIFORNIA
MOJAVE
DESERT
ANGELES
SAN GABRIEL MOUNTAINS
LANCASTER
PALMDALE
LITTLEROCK
ACTON
SAUGUS
NEWHALL
SAN FERNANDO
Chatsworth
Tujunga
BURBANK
GLENDALE
PASADENA
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MANHATTAN BEACH
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LONG BEACH
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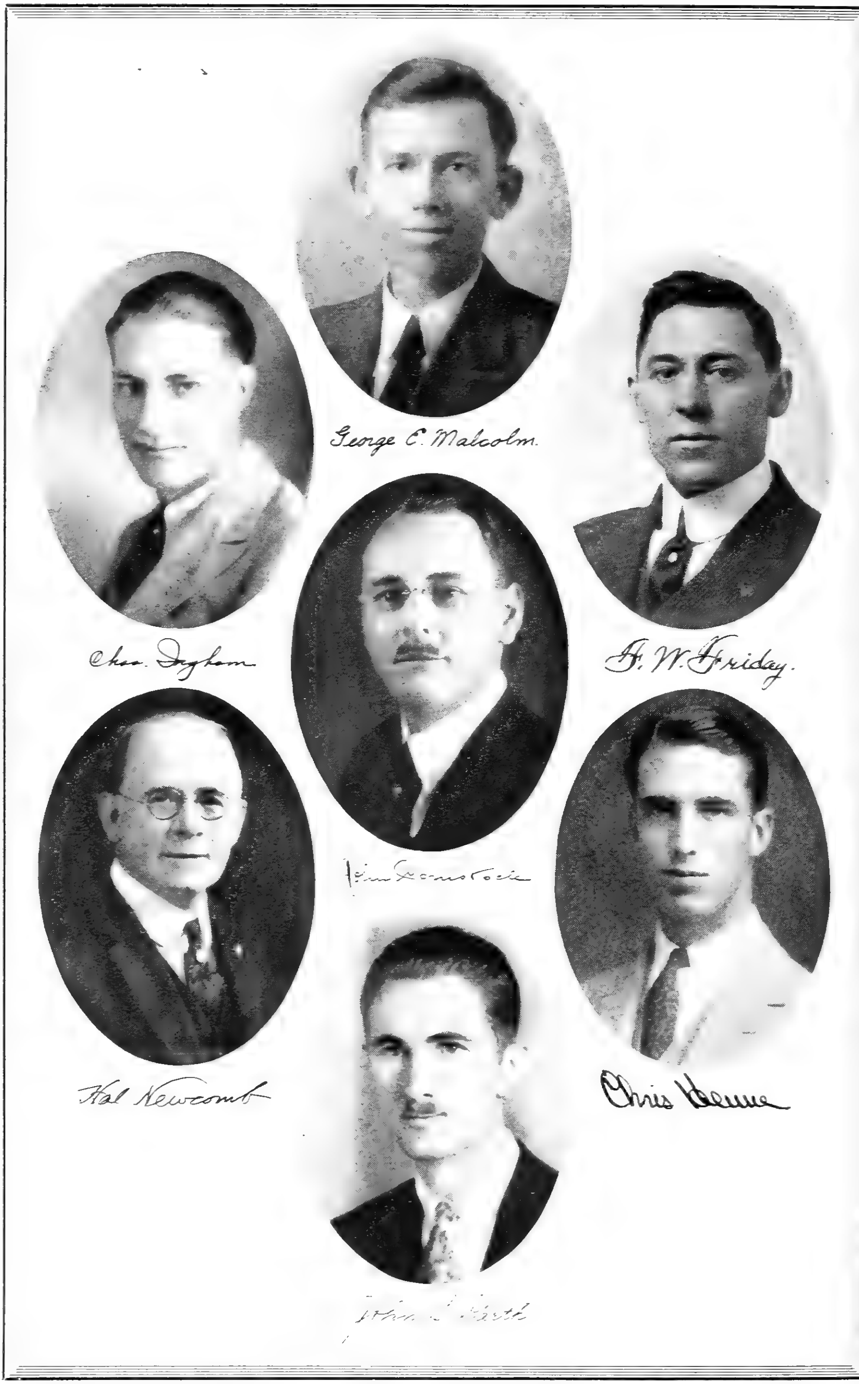

PLATE 17.
Representative Los Angeles County Lepidopterists of this Era.

BUTTERFLIES OF LOS ANGELES COUNTY, CALIFORNIA

Being an annotated check list giving details of where to go, when to go and what to collect.

By J. D. Gunder, Pasadena, Calif.

(eight plates)

Entomologists will be interested to know that Los Angeles County produces more kinds of butterflies than any other similar political division in the United States, of which we have record—a total of 178 named Rhopalocera, and the County is not considered an extra large one as western counties go. Neither has it been entirely "worked out," especially in the desert and mountain portions, and more new references will undoubtedly be added in the future. Perhaps the reason for this record number of butterflies is that its boundaries happen to include such a diversified faunal territory. There are the tide-water lands, plains, hilly districts, mountain areas up to 10,000 feet and the pure desert regions, all of which contribute their share towards variation. Los Angeles County is indeed an entomological paradise for the average collector and the majority of its species can be reached within parking distance of an automobile.

In making the following commentatorial list, I have been greatly assisted by a number of local specialists and it would be impossible to compile such an inventory of names without generous and helpful co-operation. I might add that Los Angeles holds, what I believe to be, another national record. There are more active collectors of lepidoptera listed in or near this city than near any other large metropolis in North America.

To Dr. John Comstock, author of the splendid book, "Butterflies of California," I am indebted for a list of food-plants, as he has been energetically studying lepidopterous life histories for several years. Mr. George Malcolm has probably the largest collection of California butterflies on this Coast and he has furnished many interesting records. "GM" continues to bring in something new each year and he is an old-resident collector whose enthusiasm has been continual. Mr. Chas. Ingham keeps a special schedule of all his collecting trips and his notes are therefore very reliable. During March, April and a part of May of each year, Mr. F. W. Friday makes excursions into the desert regions and his assemblage from these parts is unsurpassed. Messrs. John Garth, Chris. Henne and Hal Newcomb have also co-operated by abstractions from their entomological diaries.

In arranging the dates of capture and localities, I have tried to avoid repetition as much as possible and in most instances have given preference to the notes of others in place of my own. Local check lists, heretofore, have published only general distributional opinions and little information of definite character; however, it is going to be the object of this paper to let the average collector know, as nearly as is possible, just where to go, when to go and what the "other fellow" took before. In that respect this list will be of time-saving help and a new departure from most catalogues. Of course it is impossible to describe just which "fence corner" that "so-and-so" collected in, but if further elaboration seems necessary, this author will try to furnish it by personal reply from 310 Linda Vista Ave., Pasadena, Calif.

If any unusual butterflies or differently marked or colored specimens are caught, I would be glad to hear about them, in addition to any new names which should be added to this list.

Copies of this paper will be placed in the several public libraries in Los Angeles County.

Three butterflies (transition forms) are herein described as new.

Illustration references are noted as follows:

Comstock's: "Butterflies of California," by Dr. John Comstock.

Wright's: "Butterflies of the West Coast," by W. G. Wright.

Holland's: "The Butterfly Book," by Dr. W. J. Holland (old edition).

Superfamily *PAPILIONOIDEA*

Family **PAPILIONIDAE**

1. **Papilio philenor hirsuta** Skin. (*Ent. News*, 19, 149, 1908)
The Hairy Swallowtail, a race.

comstock's: pl. 2, ff. 4, 5.
wright's: pl. IV, ff. 31, b. c.

1 ♂, April 24, 1927, Hollywood, (Friday); 2 ♂, May 6, 1929, Chatsworth, (Gunder). Rarely found in this County, but plentifully by collectors around San Francisco. Food plant—*Aristolochia* (Dutchman's pipe vine).

2. **Papilio polydamas** L. (*Syst. Nat., Ed.* X, 460, 1758)
THE POLYDAMAS SWALLOWTAIL, a species.

COMSTOCK'S: pl. 1, f. 4.
HOLLAND'S: pl. XLI, f. 4.

1 ♀, Sept. 16, 1924, Santa Monica, (Clark). Not native to California and only occasional stray specimens get smuggled in from Mexico or Central America. Food plant—*Aristolochia,* probably.

3. **Papilio bairdii** Edw. (*Proc. Ent. Soc. Phila.,* 6, 200, 1866)
BAIRD'S SWALLOWTAIL, a species.

COMSTOCK'S: pl. 3, ff. 1, 2.
WRIGHT'S: pl. IV, ff. 30, f. (variations)
HOLLAND'S: pl. XL, f. 2.

1 ♂, May 12, 1905, Mt. Wilson, (Newcomb); 1 ♂, July 4, 1923, Mt. Baldy trail, (Gunder). Records of this butterfly in California are extremely rare, but if found, the examples sometimes look like those pictured in Wright's book. This species is not uncommon in Arizona and New Mexico. Food plant—*Artemisia.*

4. **Papilio zelicaon** Luc. (*Rev. Zool.,* (2), 4, 136, 1852)
THE ANISE SWALLOWTAIL, a species.

COMSTOCK'S: pl. 3, ff. 3, 4, 5.
WRIGHT'S: pl. 3, f. 24.
HOLLAND'S: pl. XXVIII, f. 1.

1 ♂, June 15, 1930, Griffith Park, (Henne); 1 ♂, June 26, 1927, Dark Canyon in San Gabriel Mts., (Malcolm); 6 ♂ and 6 ♀, Oct. 1, 1928, Hollywood, (Friday); 1 ♂, May 10, 1929, Mt. Wilson, (Ingham). Occasional here and there, but can be secured in numbers by breeding. Food plants—*Carum, Fœniculum, Daucus, Eulopus,* etc. (Anise, parsley, etc.).

5. **Papilio indra pergamus** Hy. Edw. (*Proc. Calif. Acad. Sci.,* 5, 423, 1874)
EDWARDS' SWALLOWTAIL, a race.

COMSTOCK'S: pl. 2, ff. 1, 2, 3.
WRIGHT'S: pl. IV, ff. 28, b.

1 ♂, May 11, 1913, San Gabriel Mts., (Haskins); 9 ♂, 3 ♀, June 3, 1928, Mt. Lowe, (Malcolm); 1 ♀, June 23, 1918, Altadena, (Malcolm); 1 ♂, May 10, 1929, Mt. Wilson, (Ingham). Rarest Papilio in California and generally collected back of Arrowhead Springs. Food plant—*Umbellales.*

6. **Papilio rutulus** Luc. (*Rev. Zool.*, (2), 4, 158, March, 1852)

WESTERN TIGER SWALLOWTAIL, a species.

COMSTOCK'S: pl. 4, ff. 6, 7, 8.
WRIGHT'S: pl. 3, f. 19.
HOLLAND'S: pl. XLV, f. 1.

5 ♂, 3 ♀, April 3, 1927, Dalton Canyon, (Friday); 1 ♂, May 25, 1919, Griffith Park, (Ingham); 1 ♂, 1 ♀, June 5, 1921, San Dimas Canyon, (Malcolm). Very plentiful everywhere, especially in canyons during spring and summer. Food plant—Willow, poplar, alder, hops and sycamore.

7. **Papilio eurymedon** Luc. (*Rev. Zool.*, (2), 4, 140, 1852)

THE PALE SWALLOWTAIL, a species.

COMSTOCK'S: pl. 4, ff. 3, 4, 5.
WRIGHT'S: pl. 3, f. 17.
HOLLAND'S: pl. XLIV, f. 5.

2 ♂, March 31, 1918, Arroyo Seco, (Newcomb); 4 ♂, June 3, 1928, Mt. Lowe, (Malcolm); 3 ♂, 1 ♀, April 3, 1927, Dalton Canyon, (Friday); 1 ♂, June 15, 1919, Griffith Park, (Ingham); 1 ♀, July 20, 1929, Pasadena, (Henne); 6 ♂ ♀, August 17, 1925, Arroyo Seco, (Garth). Good females seem hard to get, but males are common. Food plant—*Rhamnus*.

Family **ASCIIDAE**

8. **Ascia beckerii** Edw. (*Butt. N. Am.*, 1, p. 28, pl. 1, ff. 4-7, 1871)

BECKER'S WHITE, a species.

COMSTOCK'S: pl. 7, ff. 5, 8, 10.
WRIGHT'S: pl. 5, ff. 34, a, b, c.
HOLLAND'S: pl. XXXIV, ff. 8, 9.

1 ♂, June 14, 1918, 1 ♀, May 26, 1918, 2 ♀, June 16, 1918, 1 ♂, November 29, 1919, Bouquet Canyon, (Malcolm); 5 ♂, 3 ♀, March 17, 1928, Little Rock, (Friday); 1 ♂, April 6, 1930, Little Rock, (Ingham); 22 ♂ ♀, June 11, 1925, Mint Canyon near Saugus, (Garth). Found in canyons leading into the desert and also on the desert, but not on coastal plains. Food plant—*Isomeris arborea*.

9. **Ascia sisymbrii** Bdv. (*Ann. Soc. Ent. Fr.*, (2), 10, 284, 1852)

THE CALIFORNIA WHITE, a species.

COMSTOCK'S: pl. 7, ff. 11, 12, 13.
WRIGHT'S: pl. 5, ff. 35, a, b, c.
HOLLAND'S: pl. XXXIV, f. 12.

10 ♂, 6 ♀, March 17, 1928, Little Rock, (Friday); 4 ♂, April 6, 1930, Little Rock, (Ingham); 2 ♂, 4 ♀, April 6, 1930, Vincent, (Malcolm); one, April 8, 1924 and one Nov. 11, 1927, Saugus, (Comstock). To be looked for on the desert's edge and canyons leading into the desert regions. Food plant—*Cruciferæ*.

10. **Ascia sisymbrii flava** Edw. (*Butt. N. Am.*, 2, p. 67, pl. XV, f. 5, 1884)

THE FLAVID WHITE, a form.

COMSTOCK'S: pl. 7, f. 9.
WRIGHT'S: pl. 5, ff. 36, b. bb.

One, Nov. 11, 1927, Saugus, (Comstock); 1 ♀, April 19, 1930, Little Rock, (Gunder). Sometimes yellow or yellow tinted specimens of *sisymbrii* are found. These have been called form *flava*. They are mostly females, rarely males. Food plant—*Cruciferæ*.

11. **Ascia protodice** Bdv. and Lec. (*Lep. Am. Sept.*, p. 45, pl. XVII, ff. 1-3, 1833)

THE COMMON WHITE, a species.

COMSTOCK'S: pl. 7, ff. 14, 15, 16, 17; pl. 8, ff. 1, 2.
WRIGHT'S: pl. 5, f. 40.
HOLLAND'S: pl. XXIV, f. 10.

3 ♂, 2 ♀, July 8, 1929, Mt. Wilson, (Henne); 1 ♂, July 10, 1917, Arroyo Seco, (Malcolm); ♂ s, ♀ s, Eagle Rock Park, (Malcolm); 3 ♂, 1 ♀, March 17, 1928, Little Rock, (Friday); 2 ♂, 1 ♀, April 6, 1919, Elysian Park, (Ingham). Quite common everywhere. Food plant—*Cruciferæ*.

12. **Ascia protodice vernalis** Edw. (*Proc. Ent. Soc. Phila.*, 2, 501, 1864)

THE VERNAL WHITE, a form.

COMSTOCK'S: pl. 8, ff. 2, 3, 6.
WRIGHT'S: pl. 5, f. 4.
HOLLAND'S: pl. XXXIV, f. 18.

6 ♂, March 8, 1919, W. York Valley, (Malcolm); 1 ♀, Oct. 7, 1916, Eagle Rock Park, (Malcolm); 2 ♂, 1 ♀, April 6, 1919, Elysian Park, (Ingham). In Eastern America this is considered a spring form of the species. Comstock's text and plates show the difference. Food plant—*Cruciferæ.*

13. **Ascia rapae** L. (*Syst. Nat. Ed.,* p. 468, 1758)
The Cabbage Butterfly, a species.

comstock's: pl. 9, ff. 11, 13, 15.
wright's: pl. 6, ff. 48, b, bb, c, cc.
holland's: pl. XXXV, f. 3.

♂ s, ♀ s, July 9, 1917, Los Angeles, (Malcolm); 6 ♂, 1 ♀, October, 1929, Tujunga Canyon, (Henne); ♂ s, ♀ s, Feb. 13, 1921, Arroyo Seco, (Gunder). Common everywhere and at any time when the sun shines. Food plant — Cabbage and many Cruciferous plants.

14. **Ascia rapæ immaculata** Skinner. (*Can. Ent.,* 21, 128, 1889)
The Spotless Cabbage Butterfly, a transition form.

1 ♂, March 17, 1917, York Valley, (Malcolm); 1 ♂, Jan. 6, 1908, Los Angeles, (Schrader). Few collectors bother to collect the species, *rapæ,* therefore this transition form is indeed rare and few collectors have it. Typical examples are white and without spots. Popular butterfly books fail to illustrate it. I believe the form is more common in Northwestern America and B. C., Canada. Food plant—Cabbage, etc., as listed above.

15. **Ascia rapæ yreka** Reak. (*Proc. Acad. Nat. Sci. Phila.,* 238, 1866)
The Darker Cabbage Butterfly, a form.

1 ♂, June 13, 1920, Griffith Park, (Ingham). When a long series of *rapæ* are examined, it is noticed that the under sides of some may have a darker sprinkling of dusty green-black color; these may be designated form *yreka,* though the separation is hardly worth while. In the eastern states, these specimens may constitute a seasonal variation, but they do not in Southern California. Food plant—same as parent species.

16. **Nathalis iole** Bdv. (*Spec. Gen.,* 1, 589, 1836)
The Dwarf Yellow, a species.

comstock's: pl. 10, ff. 1, 2, 3.
wright's: pl. 7, ff. 52, b.
holland's: pl. XXXII, ff. 21, 22.

3 ♂, 1 ♀, April 29, 1927, Summit Mint Canyon, (Friday); 1 ♂, June 5, 1921, San Dimas Canyon, (Malcolm); one seen flying in down-town Los Angeles in summer of 1924, (Comstock). Picked up here and there in the mountains and foothills, but not in quantity in any one locality. Food plant—Fetid marigold, sneezeweed, filaree, etc.

17. **Euchlœ creusa lotta** Beut. (*Bull. Am. Mus. Nat. Hist.*, 10, 243, ill., 1898)

THE SOUTHERN MARBLE, a race.

COMSTOCK'S: pl. 10, ff. 7, 8.

125 ♂, 10 ♀, March 17, 1928, Little Rock, (Friday); 20 ♂, 10 ♀, April 6, 1930, Little Rock, (Ingham); 31 ♂, 7 ♀, April 14, 1927, 3 miles north of Palmdale, (Garth); 9 ♂ ♀, April 17, 1921, Big Rock Creek, (Malcolm); 1 ♂, April 22, 1928, Swartout Valley, (Comstock). A desert butterfly, common enough only in the spring when the desert is green. Food plant—evidently unknown.

18. **Anthocharis lanceolata australis** Grin. (*Can. Ent.*, 40, 72, 1908)

GRINNELL'S MARBLE, a race.

COMSTOCK'S: pl. 10, ff. 12, 16.
WRIGHT'S: pl. VII, ff. 53, b. (as lanceolata)

20 ♂ ♀ s, April 22, 1926, Millard's Canyon, (Comstock); 10 ♂ ♀, April, Big Rock Canyon, (Malcolm); 1 ♂, 5 ♀, Feb. 27, 1926, Fish Canyon, (Garth); 1 ♂, 2 ♀, April 6, 1929, below Little Rock Dam, (Friday); 1 ♂, Feb. 13, 1924, Mt. Wilson, (Ingham). About March 15th, a mile below Oakwild in the Arroyo Seco Canyon from Pasadena is where I have usually taken a series each year by standing where the canyon narrows and netting them as they fly by. Food plant—Mustards.

19. **Anthocharis cethura** F. & F. (*Reise Nov. Lep.*, 182, pl. XXV, ff. 1-2, 1865)

FELDER'S ORANGE TIP, a species.

COMSTOCK'S: pl. 10, ff. 19, 20.
WRIGHT'S: pl. VII, ff. 58, a, aa, b, bb, c.
HOLLAND'S: pl. XXXII, ff. 26, 27.

75 ♂, 30 ♀, March 17, 1928, Little Rock, (Friday); 20 ♂, 10 ♀, April 6, 1930, Little Rock, (Ingham); 13 ♂, 3 ♀, April 6, 1930, Vincent, (Malcolm); 1 ♂, April 19, 1930, Little Rock, (Malcolm). A desert species, very uncommon before Mr. Friday's location was recorded. Food plant—*Arabis*.

20. **Anthocharis cethura deserti** Wri. (*Butt. West Coast,* 106, 1905)

DESERT ORANGE TIP, a form.

COMSTOCK'S: pl. 11, f. 3, only.
WRIGHT'S: pl. VII, ff. 60b, bb, c, only.

10 ♀, March 17, 1928, Little Rock, (Friday); 9 ♀, April 6, 1930, Little Rock, (Ingham); 1 ♀, April 6, 1930, Little Rock, (Malcolm). True *deserti* is without color or a very faint cream color instead of the orange shade. Males of this shade are rare. Food plant—same as parent species; *Arabis*.

21. **Anthocharis cethura caliente** Wri. (*Butt. West Coast* 112, 1905)

TINTED DESERT ORANGE TIP, a form.

COMSTOCK'S: pl. 11, f. 2.
WRIGHT'S: pl. VIII, f. 70.

6 ♂ ♀, March 17, 1928, Little Rock, (Friday); ♂ ♀s, March 19, 1926, Mint Canyon, (Comstock); 3 ♀, April 6, 1930, Little Rock, (Ingham). Sometimes yellow shaded examples are found with the species, these were named *caliente* by Mr. Wright. They are of no direct relation to *pima*, an Arizona species. Food plant —*Arabis*.

22. **Anthocharis sara** Bdv. (*Ann. Soc. Ent. Fr.,* (2), 10, 285, 1852)

THE SARA ORANGE TIP, a species.

COMSTOCK'S: pl. 11, ff. 7, 8, 9.
WRIGHT'S: pl. VIII, ff. 66, a, b, c.
HOLLAND'S: pl. XXXII, ff. 28, 29.

6 ♂, March 16, 1919, Hollywood Hills, (Malcolm); 5 ♂ ♀, April 17, 1921, Big Rock Creek, (Malcolm); 8 ♂, 5 ♀, May 30, 1917, Chatsworth, (Friday); 1 ♂, March 28, 1930, Arcadia, (Ingham); 1 ♂, May 22, 1930, Tujunga Canyon, (Henne). Mr. Pearson reported this species as abundant near mouth of Santa Monica Canyon in 1922 about March 15th. Food plant—Mustards.

23. **Anthocharis sara reakirtii** Edw. (*Trans. Am. Ent. Soc.,* 2, 369, 1869)

REAKIRT'S ORANGE TIP, a race.

COMSTOCK'S: pl. 11, ff. 10, 11, 12, 17.
WRIGHT'S: pl. VIII, ff. 6 ♀, a, aa, b, c, only.
HOLLAND'S: pl. XXXII, f. 31.

26 ♂, 10 ♀, March 20, 1927, Dalton Canyon, (Friday); 41 ♂, 10 ♀, March 30, 1919, Elysian Park, (Ingham); 8 ♂, 8 ♀, Feb. 27, 1926, San Gabriel Canyon, (Garth). Quite common in March in the foothill canyons. Food plant—Mustards.

24. **Anthocharis sara reakirtii stella** Edw. (*Can. Ent.*, 11, 87, 1879)

THE STELLAR ORANGE TIP, a form.

COMSTOCK'S: pl. 11, ff. 13, 15.
WRIGHT'S: pl. VIII, f. 65b and 62bb, only.

1 ♀, March 22, 1918, Millard's Canyon, (Malcolm); 1 ♀, March 20, 1927, Dalton Canyon, (Friday); 1 ♀, March 15, 1921, Elysian Park, (Ingham); 1 ♀, May 1, 1929, Tujunga Canyon, (Henne); 3 ♂ ♀, March 21, 1921, (Comstock). A rare yellow form of the female and an extremely scarce form in the male. My only yellow males are from San Francisco. Food plant—As above, the Mustards.

25. **Catopsilia sennæ eubule** L. (*Syst. Nat., Ed.* 10, p. 470, 1758)

THE SULPHUR BUTTERFLY, a race.

COMSTOCK'S: pl. 13, ff. 1, 2, 3, 4.
WRIGHT'S: pl. IX, ff. 71, b, c.
HOLLAND'S: pl. XXXIII, ff. 2, 3, true eubule?

2 ♂, July 1, 1919, 1 ♀, Jan. 12, 1918, Los Angeles, (Malcolm); 2 ♂, April 20th and Oct. 10, 1929, (Friday); 3 ♂, Aug. 17, 1929, Los Angeles (Ingham); 5 ♂ ♀ s, Dec. 1917, and April 1926, Los Angeles, (Comstock). Eastern United States specimens are darker marked beneath as a rule, but on the Pacific Coast they are rarely heavily pigmented which would seem to portend a western race. Not common in L. A., except where the plant food is long established. Plant food—*Cassia.*

26. **Catopsilia sennæ eubule pallida** Ckll. (*The Entomologist*, 5, 1889)

THE PALLID SULPHUR, a female form.

COMSTOCK'S: pl. 13, f. 5.

1 ♀, Sept. 12, 1920, Westlake Park, (Ingham); 2 ♀, Aug. 6, 1921, ex-larva, Griffith Park, (Gunder). Upon occasions white females are caught though they are rare. Food plant—*Cassia.*

27. **Zerene eurydice** Bdv. (*Ann. Soc. Ent. Fr.*, 3rd *Ser. Bull.*, 32, 1855)

THE CALIFORNIA DOG HEAD, a species.

COMSTOCK'S: pl. 12, ff. 1, 5.
WRIGHT'S: pl. IX, ff. 72, a, b, c.
HOLLAND'S: pl. XXXVI, ff. 1, 2.

1 ♀, Feb. 28, 1927, San Gabriel Canyon, (Friday); 1 ♀, March 17, 1918, Millard's Canyon, (Malcolm); 1 ♀, July 4, 1923, Bouquet Canyon, (Malcolm); 6 ♂, 2 ♀, July 8, 1929, Mt. Wilson, (Henne); 2 ♂, July 20, 1919, Griffith Park, (Ingham). This beautiful butterfly is sometimes called the Flying Pansy. If a quantity is wanted, collect around July 1st at the Santa Ana Control on the road above Redlands in the San Bernardino Mts. Food plant—*Amorpha californica.*

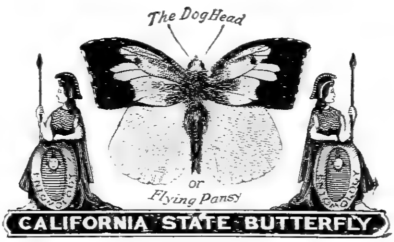

PLATE 18
Zerene eurydice is the State Butterfly of California

28. **Zerene eurydice bernardino** Edw. (*Butt. No. Am.*, 3, 71, pl. VII, 1887)

THE MARGINED DOG HEAD, a male form.

COMSTOCK'S: pl. 12, ff. 2, 3, 5.
WRIGHT'S: pl. IX, ff. 73, a, b, c.

1 ♂, March 29, 1918, Switzer's Camp, (Malcolm); 1 ♂, June 8, 1919, Griffith Park, (Ingham); 1 ♂, June 16, 1916, Monrovia Canyon, (Malcolm); 1 ♂, July 8, 1929, Mt. Wilson, (Henne). The width of the black margin of the upper side of the secondaries varies from a mere line to ¼ of a inch. Food plant—*Amorpha californica.*

29. **Zerene eurydice masumbrosus** Gun. (*Pan.-Pac., IV*, 3, p. 100, Jan. 1928)

THE CLOUDED DOG HEAD, a female form.

COMSTOCK'S: pl. 12, ff. 6, 7, (as *amorphae*).
WRIGHT'S: pl. IX, ff. 74, b, bb, (as *amorphae*).

2 ♀, July 14, 1919, Eagle Rock Park and York Valley, (Malcolm); 1 ♀, July 19, 1925, Griffith Park, (Ingham). A rare female form of the species which is best explained by an examination of the illustrations. Food plant—same as the parent species.

30. Zerene eurydice lineainita Gun. (*Pan-Pac., IV,* 3, p. 101, Jan. 1928)

THE STREAKED DOG HEAD, a male form.

ILLUSTRATED IN THE ORIGINAL DESCRIPTION

1 ♂, July 20, 1925, Griffith Park, (Ingham). A male form only, in which there are black streaks on the upper side of the veins of the secondaries. Food plant—same as the parent species, *Amorpha californica.*

31. Zerene eurydice fanniæ Gun. (*Ent. News,* 35, 158, pl. 11, f. k, 1924)

FANNIE'S DOG HEAD, a transition form.

COMSTOCK'S: pl. 12, f. 8.

2 ♂, July 4, 1927, Mt. Wilson, (Gunder). See Comstock's illustration of the type. Food plant—naturally the same as for the species.

32. Zerene cæsonia Stoll. (*Cramer's Pap. Exot., Suppl.,* p. 176, pl. XLI, f. 2, 1790)

THE SOUTHERN DOG HEAD, a species.

COMSTOCK'S: pl. 12, ff. 11, 12, 13.
WRIGHT'S: pl. IX, ff. 75, a, b.
HOLLAND'S: pl. XXXVI, ff. 3, 4.

2 ♂, 3 ♀, Oct. 27, 1929, Little Rock, below Dam, (Friday); 1 ♂, July 1, 1920, Griffith Park, (Ingham). A rare capture in this county, but fairly plentiful in Imperial Valley. Food plant—*Amorpha* and Clovers.

33. Eurymus eurytheme Bdv. (*Ann. Soc. Ent. Fr.,* 12, 286, 1852)

BOISDUVAL'S SULPHUR, a species.

COMSTOCK'S: pl. 13, ff. 7, 8, 9, 10, 11.
WRIGHT'S: pl. 10, ff. 78, a, b, c.
HOLLAND'S: pl. XXXIII, f. 5.

2 ♂, 2 ♀, March 28, 1926, Chatsworth, (Friday); ♂ ♀ s, May 6, 1929, San Fernando, (Henne); ♂ ♀ s, March 8, 1928, San Gabriel Canyon, (Friday). Can be collected by the thousands around alfalfa fields practically every month of the year. Food plant—Clovers, *Astragalus,* etc.

34. **Eurymus eurytheme alba** Stkr. (*Strecker's Catalogue,* 83, 1876)

Boisduval's White Sulphur, a female form.

comstock's: pl. 14, ff. 1, 2, 3.
wright's: pl. X, ff. 87d, e.
holland's: pl. XLVIII, f. 18.

♀ s, June 6, 1920, Bouquet Canyon, (Malcolm); ♀ s, April 4, 1920, Griffith Park, (Ingham). Nearly every 10th female is an albino. Food plant—As above.

35. **Eurymus eurytheme ariadne** Edw. (*Trans. Am. Ent. Soc.,* 3, 12, 1870)

The Spring Sulphur, a seasonal form.

comstock's: pl. 13, f. 6.
wright's: pl. X, ff. 77, a. aa, b, c, d, e, well illustrated.
holland's: pl. XXVI, ff. 7, 8.

1 ♂, Feb. 26, 1920, Azusa, (Malcolm); 1 ♀, March 9, 1919, Glendale, (Malcolm). This spring brood of *eurytheme* is the most interesting seasonal variation which the Southern California butterflies can show. Food plant—same.

36. **Eurymus amphidusa** Bdv. (*Ann. Soc. Ent. Fr.,* 12, 286, 1852)

The Flavid Sulphur, a species on the Pacific Coast.

comstock's: pl. 14, ff. 4, 5, 6.
wright's: pl. X, ff. 76, a, b.
holland's: pl. XXXVI, f. 9.

1 ♀, May 30, 1920, Griffith Park, (Ingham); ♂ ♀ s, Aug. 12, 1923, Collin's Ranch, Voltaire, (Gunder). My observations show that *amphidusa* flies with *eurytheme* and in locations where *eurytheme* does not occur as far as I know; hence this butterfly is either a species or a race in most western districts. Food plant—clovers, etc.

37. **Eurymus amphidusa alba** Stkr. (*Synonymical Catalogue,* 83, 1878)

THE WHITE FLAVID SULPHUR, a female form.

WRIGHT'S: pl. X, ff. 76bb, c.

1 ♀, May 30, 1920, Griffith Park, (Ingham). Commonly found with the species. Food plant—same as for the species.

38. **Eurymus harfordii** Hy. Edw. (*Pac. Coast Lepid.,* 24, 9, 1877)

HARFORD'S SULPHUR, a species.

COMSTOCK'S: pl. 15, ff. 1, 2, 3, 4, 5, 6.
WRIGHT'S: pl. X, ff. 84, a, b, bb, c.

10 ♂, 8 ♀, May 30, 1928, Big Tujunga Canyon, (Friday); ♂ ♀ s, June 3, 1923, Bouquet Canyon, (Comstock); 4 ♂, April 6, 1919, Bouquet Canyon, (Malcolm); 1 ♂, June 23, 1917, Griffith Park, (Ingham). Will collectors please be on the lookout for white females of this species and report same to this author? Food plant—Rattle weed or *Astragalus.*

39. **Eurema mexicana** Bdv. (*Spec. Gen.,* 1, 655, pl. XIX, f. 1, 1836)

THE MEXICAN YELLOW, a species.

COMSTOCK'S: pl. 16, ff. 5, 6, 7.
WRIGHT'S: pl. XII, ff. 98, a.
HOLLAND'S: pl. XXXVII, ff. 7, 8.

1 ♂, June 21, 1904, Arroyo Seco, Pasadena, (Grinnell); recorded as taken in L. A. by C. W. Herr. This species is rare in this county, but sometimes taken on the Colorado desert and in Imperial Valley. Food plant—*Cassia.*

40. **Eurema nicippe** Cram. (*Pap, Exot.,* 3, 31, pl. CCX, ff. C-D, 1782)

THE NICIPPE YELLOW, a species.

COMSTOCK'S: pl. 16, ff. 8, 9, 10.
WRIGHT'S: pl. XII, ff. 97, b.
HOLLAND'S: pl. XXVII, f. 3.

12 ♂ ♀ s, Aug. 4, 1912, Los Angeles, (Haskins); 5 ♂, 2 ♀, Oct. 1, 1928, Hollywood, (Friday); 3 ♂, 1 ♀, Feb. 23, 1930, San Gabriel Canyon, (Friday). Common. Food plant—*Cassia,* etc. The below newly described tr. f. has not as yet been found in Los Angeles county.

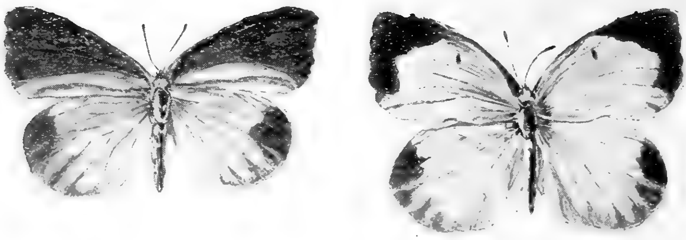

PLATE 19
Left figure shows the new tr. f. *dammersi* Gun. and the right, a typical ♀ *nicippe*, both actual size.

EUREMA NICIPPE Cram., tr. f. DAMMERSI new tr. f. *Under sides:* no color or maculation change. *Upper sides.* Primaries: black upwards over entire wing from center of interspace between submedian vein and median nervule No. 1, ridge of submedian vein outlined in black, therefore the only yellow color remaining on the wing is a streak on either side of the submedian vein. Secondaries: as in typical ♀ nicippe. Classification: transition form; melanifusism, with the primaries well developed undoubtedly. The wash-drawing accompanying this description is rather poor, but will serve to identify the characteristics. Holotype ♀, expanse 43mm., San Bernardino, California; bred by Mrs. A. Niece in 1928 and named after Mr. C. M. Dammers of Riverside, Calif., who first noticed this specimen and brought it to the attention of this author. Type in Gunder Coll.

Family **DANAIDÆ**

41. **Danaus menippe** Hbn. (*Verz. Bek. Schmett.,* p. 16, 1818) (?) 1816?)

THE MONARCH BUTTERFLY, a species.

COMSTOCK'S: pl. 17, ff. 1, 2.
WRIGHT'S: pl. XII, f. 100.
HOLLAND'S: pl. VII, f. 1.

♂ ♀, Jan. 2, 1912, Annandale, (Malcolm); 1 ♂, April 15, 1927, Mint Canyon, (Friday); 1 ♂, Sept. 30, 1923, (Ingham). Flies in all seasons and everywhere. Migrations occur in certain years. A long lived butterfly with strong, tough wings. Food plant—Milkweed.

42. **Danaus menippe americanus** Gun. (*Ent. News*, XXXVIII, p. 137, May, 1927)

THE AMERICAN MONARCH, a transition form.

COMSTOCK'S: pl. 17, f, 3, (as fumosus).

1 ♂, May 21, 1929, Chatsworth, (Friday). Only about 6 examples scattered around United States are known to date. Food plant—same as species—milkweed.

43. **Danaus berenice strigosa** Bates. (*Ent. Mo. Mag.*, 1, 32, 1864)

THE STRAITED QUEEN, a race.

COMSTOCK'S: pl. 17, ff. 4, 5.
WRIGHT'S: pl. XII, f. 102.
HOLLAND'S: pl. VII, f. 3.

12 ♂ ♀ s, Aug. 4, 1912, Los Angeles, (Haskins); 1 ♂, Sept. 1, 1919, York Valley, (Malcolm). Uncommon in this county, but plentiful at Palm Springs in Riverside county. Food plant—milkweed.

Family **SATYRIDÆ**

44. **Cœnonympha california** West & Hew. (*Gen. Diur. Lep.*, 2, 398, 1851)

THE CALIFORNIA RINGLET, a species.

COMSTOCK'S: pl. 18, ff. 4, 5, 6.
WRIGHT'S: pl. XXV, ff. 272, b.
HOLLAND'S: pl. XXV, f. 14?

10 ♂, 5 ♀, March 20, 1927, Dalton Canyon, (Friday); 10 ♂, 2 ♀, April 4, 1920, Griffith Park, (Ingham); ♂ ♀ s, Feb. 8, 1917, July 4, 1919, Oct. 7, 1917, Eagle Rock Park, (Malcolm). Food plant—grasses.

45. **Cœnonympha california galactinus** Bdv. (*Ann. Soc. Ent. Fr.*, (2), 10, 309, 1852)

BOISDUVAL'S RINGLET, a seasonal form.

COMSTOCK'S: pl. 18, ff. 1, 2, 3.
HOLLAND'S: pl. XXV, f. 9?

2 ♂, 6 ♀, April 28, 1918, Hollywood, (Malcolm); 3 ♂, 2 ♀, July 4, 1923, Bouquet Canyon, (Malcolm); 2 ♂, 1 ♀, June 24, 1930, Griffith Park, (Ingham). This is supposed to be the summer and

fall hatchings of the species and they are cream color and generally darker. Quite numerous in grassy areas. Food plant—grasses.

46. **Cercyonis silvestris** Edw. (*Proc. Acad. Nat. Sci.*, 162, 1861)

THE SYLVAN SATYR, a species.

COMSTOCK'S: pl. 20, ff. 1, 4, 5, 6, 7, 8.
WRIGHT'S: pl. XXIV, ff. 259, a, ?
HOLLAND'S: pl. XXVI, ff. 11-12 ?

7 ♂, 2 ♀, Pine Canyon, Lake Hughes, (Friday); 2 ♂, 1 ♀, July 20, 1919, Griffith Park, (Ingham); ♂ ♀ s, Aug. 19, 1926, Pasadena, (Comstock). Fairly common and the only Satyr butterfly in the county. Food plant—probably grasses.

Family **NYMPHALIDAE**

SUBFAMILY *EUIDINÆ*

47. **Dione vanillæ incarnata** Riley. (*The Entomologist*, 59, 243, 1926)

THE GULF FRITILLARY, a race.

COMSTOCK'S: pl. 22, ff. 1, 2, 3.
WRIGHT'S: pl., XII, ff. 104, a.
HOLLAND'S: pl. VIII, f. 7.

1 ♂, 1 ♀, March 30, 1919, Elysian Park, (Ingham); 6 ♂, 6 ♀, June 29, 1929, South Pasadena, (Henne). This species is so easy to raise that collectors do not bother to collect them on the wing, preferring bred examples for their collections. Food plant—the passion vine *(Passiflora.)*

48. **Dione vanillæ incarnata comstocki** Gun. (*Ent. News*, 36, 5, pl. 1, f. T, 1925)

THE BLACK STREAKED FRITILLARY, a transition form.

COMSTOCK'S: pl. 22, f. 5, an insignificant example.

The accompanying illustration shows various phases of this interesting butterfly in both sexes. The type is in the lower right hand corner. Many of these specimens were bred by Mr. Schrader of Los Angeles. Some are from Florida. One is from Chatsworth and caught by Mr. Joe Iverson. I have not attempted to show very slightly variant specimens, as Comstock has already illustrated one on his plate as indicated above. Food plant—same as the parent species.

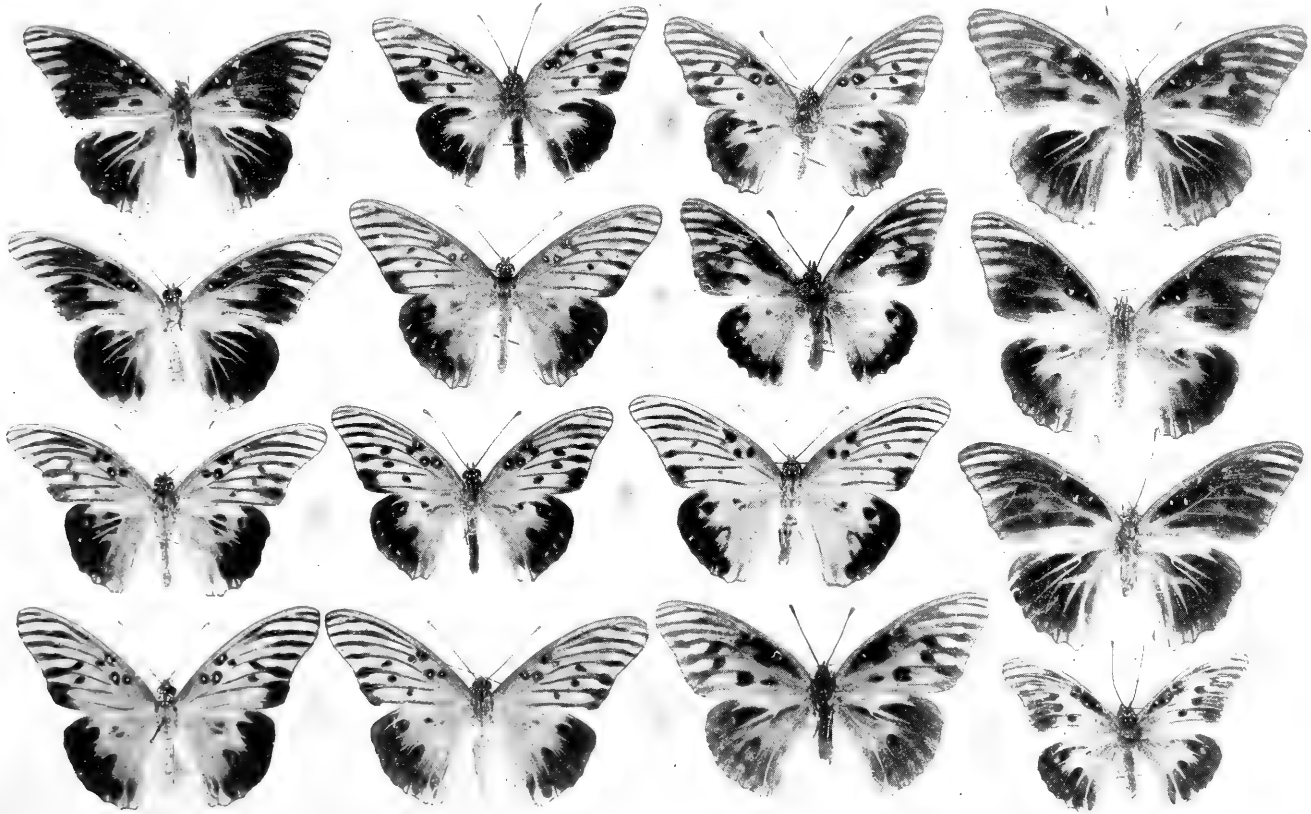

PLATE 20. Examples of *Dione vanillae incarnata comstocki* Gun. from the Gunder Collection. See notes in this List under No. 48.

49. **Dione vanillæ incarnata margineapertus** Gun. (*Can. Ent.*, *LX.*, 163, July 1928)

THE IMMACULATE FRITILLARY, a transition form.

ILLUSTRATION IN THE ORIGINAL DESCRIPTION.

As yet a rare transition form not found in many collections. These specimens lack maculation on the upper side in contrast to *comstocki* which has an over abundance of it. Some 12 examples in author's collection, all from Los Angeles County. Food plant —same as above noted.

50. **Dione vanillæ incarnata fumosus** Gun. (*Ent. News*, XXXVIII, 137, May 1927)

THE DARKER FRITILLARY, a transition form.

ILLUSTRATED IN THE ORIGINAL DESCRIPTION.

Some specimens, especially the females, are quite dark red, almost a brown. These are given the above name. The opposite to this in color sequence is a shading out to white. The white examples are called tr. f. *hewletti*, but none have been recorded from L. A. County thus far. Food plant—as above.

SUBFAMILY *NYMPHALINÆ*

51. **Euptoieta claudia** Cram. (*Pap. Exot.*, 1, 109, pl. LXIX, ff. E, F, 1779)

THE VARIEGATED FRITILLARY, a species.

COMSTOCK'S: pl. 22, ff. 4, 6, 10.
WRIGHT'S: pl. XII, f. 105.
HOLLAND'S: pl. VIII, f. 9.

This species has been noted for Southern California several times and even been observed in the streets of Los Angeles, but I have no positive records. Please report if found authentically. Food plant—Pansies and violets.

52. **Argynnis adiaste atossa** Edw. (*Butt. No. Am.*, 3, 125, 1890)

THE UNSILVERED FRITILLARY, a race.

COMSTOCK'S: pl. 28, ff. 4, 5.
HOLLAND'S: pl. XIII, f. 12.

500 ♂ ♀ s, June 11, 1922, across from Sandberg's on Ridge Route, (Comstock); 40 ♂ ♀ s, June 25, 1921, also Sandberg's, (New-

comb); 5 ♂, May 27, 1923, also Sandberg's, (Malcolm); 1 ♂, May 30, 1920, Bouquet Canyon, (Malcolm). This species is much demanded by eastern collectors. It is plentiful only at the above localities and near those dates. The imago frequents the flowers of the horse-chestnut. Food plant—violets.

53. Argynnis adiaste atossa tejonica Comst. (*Bull. So. Calif. Acad. Sci.*, 25, 68, 1925)

THE TEJON FRITILLARY, a transition form.

COMSTOCK'S: pl. 28, f. 6.

2 ♀, Aug. 12, 1923, Collin's Ranch, Voltair, (Gunder). It would be well to collect in August for *atossa* and look for the ones which are silvered beneath. Rare. Food plant—violets.

54. Argynnis semiramis Edw. (*Can. Ent.*, 18, 61, 1886)

THE SEMIRAMIS FRITILLARY, a species.

COMSTOCK'S: pl. 28, ff. 1, 2, 3.
WRIGHT'S: pl. XVI, ff. 136, b, c.
HOLLAND'S: pl. XIII, ff. 2, 3.

19 ♂, July 4, 1929, Blue Ridge, (Malcolm); 1 ♂, June 23, 1918, Mt. Lowe, (Malcolm). Most collectors secure their series of this species by going to Camp Idylwild in the San Jacinto Mts. or to the San Bernardino Mountains. Food plant—violets.

55. Argynnis comstocki Gun. (*Ent. News*, 36, 8, 1925)

COMSTOCK'S FRITILLARY, a species.

COMSTOCK'S: pl. 29, ff. 1, 2, 3 (as callippe).

20 ♂, 2 ♀, May 25, 1919, Griffith Park, (Ingham); 6 ♂, 9 ♀, June 5, 1930, Griffith Park, (Henne); ♂ ♀ s, May 30, 1920 Griffith Park, (Comstock). A short dirt road leads from the back of the City Nursery to the top of the hills in Griffith Park. By hunting near here at the proper time, many specimens may be taken. Food plant—violets.

56. Argynnis macaria Edw. (*Field & Forest*, 3, 86, 1877)

THE MACARIA FRITILLARY, a species.

COMSTOCK'S: pl. 30, ff. 6, 7, 8.
WRIGHT'S: pl. XV, ff. 133, a, b, c.
HOLLAND'S: pl. XIII, f. 9.

90 ♂, 35 ♀, May 30, 1920, Bouquet Canyon, (Malcolm); ♂ ♀ s, June 3, 1923, Bouquet Canyon, (Comstock); 125 ♂, 5 ♀, June

10, 1922, Bouquet Canyon, (Ingham); 20 ♂, 1 ♀, June 9, 1929, and 50 ♂, 10 ♀, June 19, 1929, Pine Canyon, Lake Hughes, (Friday). Easy to collect at the right time and right places. Food plant—violets.

57. **Argynnis macaria laurina** Wri. (*Butt. West Coast,* 138, 1906)

THE UNSILVERED MACARIA FRITILLARY, a transition form.

COMSTOCK'S: pl. 30, f. 9.
WRIGHT'S: pl. XV, f. 134.

1 ♂, June 10, 1922, Ridge Route, (Comstock); 1 ♂, June 19, 1929, Pine Canyon, (Friday); 2 ♂, 1 ♀, June 25, 1921, Bouquet Canyon, (Gunder). Food plant—violets.

58. **Euphydryas chalcedona** Dbldy. & Hew. (*Gen. Diur. Lep.,* 1, 180, (ill.), 1874)

THE CHALCEDONA CHECKERSPOT, a species.

COMSTOCK'S: pl. 32, ff. 1, 2, 3.
WRIGHT'S: pl. XVIII, ff. 154, b, c.
HOLLAND'S: pl. XVI, f. 2.

♂ ♀ s, July 16-17, 1929, Mt. Wilson, (Henne); 50 ♂, 25 ♀, May 8, 1927, Chatsworth, (Friday); 43 ♂, 2 ♀, June 10, 1921, Eagle Rock Park, (Malcolm); 5 ♂, 1 ♀, May 25, 1919, Griffith Park, (Ingham). The commonest checkerspot in California. Food plant—*Mimulus, Rosa, Diplacus, Scrophularia, Pentstemon,* etc.

59. **Euphydryas chalcedona fusimacula** Barnes. (*Can. Ent.,* 32, 42, 3, 1900)

THE FUSED CHECKERSPOT, a transition form.

COMSTOCK'S: pl. 32, ff. 4, 5, 6, 9, 11.

1 ♂, June 15, 1919, San Dimas Canyon, (Malcolm); 1 ♀, June 15, 1919, Griffith Park, (Ingham); 1 ♀, June 12, 1929, Mt. Wilson, (Henne). All transition forms are more or less rare, however this of *chalcedona* is represented more frequently than others in collections. Food plant—same as the species.

60. **Euphydryas chalcedona mariana** Barnes. (*Can. Ent.,* 32, 42, 3, 1900)

THE MARIAN CHECKERSPOT, a transition form.

COMSTOCK'S: pl. 32, ff. 7, 8, 10, 16.

1 ♂, June 19, 1927, Dark Canyon, (Malcolm); 1 ♀, June 17, 1928, Mt. Wilson, (Ingham). This dark transition form is rarer than the next above. Food plant—as above.

61. **Euphydryas editha** Bdv. (*Ann. Soc. Ent. Fr.*, (2), 10, 304, 1852)

THE EDITH CHECKERSPOT, a species.

COMSTOCK'S: pl. 34, ff. 4, 5, 6.
HOLLAND'S: pl. XVI, f. 8.

1 ♀, June 23, 1920, Mint Canyon, (Malcolm). There is no reason why this species should not be found in many parts of this county. Collectors usually secure their wants at Rancho Santa Fe in San Diego County, near the road 1 mile east of the hotel. I believe true *editha* is found only north of Tehachapi and that those south of L. A. County may be termed *Euphy. editha wrighti.* Food plant —*Plantago.*

62. **Euphydryas editha augusta** Edw. (*Can. Ent.*, 22, 21, 1890)

THE AUGUSTA CHECKERSPOT, a race.

COMSTOCK'S: pl. 34, ff. 7, 8.
WRIGHT'S: pl. XIX, ff. 169, b, c.
HOLLAND'S: pl. XVI, f. 4.

1 ♂, 1 ♀, April 17, 1921, Big Pine Creek, (Malcolm). When the higher San Gabriel Mts. are made accessible for spring collecting, this mountain race will be found more plentifully in the county. Food plant—probably *Plantago* of some kind. (?)

63. **Melitæa neumœgeni** Skin. (*Ent. News*, 6, 113, 1895)

NEUMOEGEN'S CHECKERSPOT, a species.

COMSTOCK'S: pl. 35, ff. 13, 14, 15.

2 ♂, March 17, 1928 and 1 ♂, April 6, 1930 and 5 ♂, 4 ♀, April 14, 1929, Little Rock, (Friday); 4 ♂, 2 ♀, April 17, 1927 and 2 ♂, 1 ♀, April 22, 1928, Little Rock, (Malcolm). Food plant—*Aster tortifolius.*

64. **Melitæa gabbii** Behr. (*Proc. Calif. Acad. Sci.*, 3, 89, 1863)

GABB'S CHECKERSPOT, a species

COMSTOCK'S: pl. 36, ff. 1, 2, 3.
WRIGHT'S: pl. XIX, ff. 174, b, c.
HOLLAND'S: pl. XVI, f. 15?

11 ♂, March 28, 1926, Chatsworth, (Malcolm); ♂ ♀s, April 6, 1916, San Fernando Valley, (Comstock); 50 ♂, 20 ♀, May 8, 1927, Chatsworth, (Friday); 1 ♂, May 22, 1929, Hills of Laguna Beach, (Henne); ♂ ♀s, June 25, 1919, Arroyo Seco, Pasadena, (Comstock). Wide-spread in range and gentle in flight. Food plant—*Corethrogyne filaginifolia.*

65. **Melitæa gabbii pasadenæ** Gun. (*Ent. News,* 35, 155, pl. 11, f. c, 1924)

PASADENA'S CHECKERSPOT, a transition form.

COMSTOCK'S: pl. 36, f. 4.

Gabbii is reddish-brown in color and this transition form differs in being a golden-yellow color instead. Type unique as yet. It was taken May 20, 1921, in Pasadena. Food plant—as above noted.

66. **Melitæa gabbii gunderi** Comst. (*Bull. So. Calif. Acad. Sci.,* 25, 33, 1926)

GUNDER'S CHECKERSPOT, a form.

COMSTOCK'S: pl. 36, f. 6.

1 ♂, April 6, 1919, San Fernando, (Comstock). Some specimens, mostly females, of *gabbii* are quite dark on the upper sides, so these were termed *gunderi* to differentiate them. Food plant—as above.

67. **Melitæa palla** Bdv. (*Ann. Soc. Ent. Fr.,* (2), 10, 305, 1852)

NORTHERN CHECKERSPOT, a species.

COMSTOCK'S: pl. 36, ff. 13, 14, 15.
WRIGHT'S: pl. XIX, ff. 176, b, c.
HOLLAND'S: pl. XVI, ff. 13, 14.

3 ♂, 1 ♀, May 30, 1922, Ridge Route, (Malcolm). Not commonly taken in this county, but plentiful in the meadows at low altitudes in the Sierras north of Kern County. Food plant—*Castilleia breviflora.*

68. **Melitæa palla eremita** Wri. (*Butt. West Coast,* 157, 1905)

THE EREMITA CHECKERSPOT, a form.

COMSTOCK'S: pl. 36, ff. 16, 17, 18, and 19 (as *stygiana*).
WRIGHT'S: pl. XIX, ff. 178, b, c, (all females).

1 ♀, May 27, 1915, Ridge Route, (Malcolm). These are simply darker colored forms of *palla* and most all are of the female sex. Food plant—as above.

69. **Melitæa wrightii** Edw. (*Can. Ent.,* 18, 64, 1886)
WRIGHT'S CHECKERSPOT, a species.

COMSTOCK'S: pl. 38, ff. 2, 3, 4.
WRIGHT'S: pl. XX, ff. 188, b, c.
HOLLAND'S: pl. XVII, ff. 9, 10.

20 ♂, 10 ♀, April 29, 1929 and 7 ♂, 8 ♀, May 1, 1929, Mint Canyon, (Friday); 55 ♂ ♀ s, May 6, 1920, Mint Canyon, (Malcolm); ♂ ♀, June 6, 1920, San Gabriel Mts., (Comstock). Food plant—*Castilleia.*

70. **Melitæa wrightii carolynæ** Gun. (*Ent. News,* 37, 3, pl. 1, f. 3, 1926)
CAROLYN'S CHECKERSPOT, a transition form.

ILLUSTRATED IN ORIGINAL DESCRIPTION.

1 ♂, May 5, 1925, Mint Canyon, (Comstock). A beautiful black and red transition form, quite different in design from the parent species. Food plant—as above.

71. MELITÆA WRIGHTII Edw., form PELONA new form. *Upper sides.* As in the typical ♀ *wrightii. Under sides.* Primaries: also as in typical examples. Secondaries: curved band through discal area of solid black and not having the usual row of white spots through the length of its center; also all of the black maculation thicker and more pronounced. This form corresponds exactly with form *leona* Wri. of *Melitœa leanira* F. & F. and shows the analogy of the two species. *Wrightii* is probably a race of *leanira* and will be so listed in future catalogues. *Leanira* is not found in Los Angeles County, nor does it extend south of Monterey, for example, and probably is restricted to its metropolis in the counties north of San Francisco. Holotype ♀, expanse 37mm.; May 1, 1921, Mint Canyon, (Comstock); type illustrated in "Butt. of Calif." pl. 38, f. 1, by Dr. J. A. Comstock and in his collection at the Los Angeles County Museum. Named after the Sierra Pelona Valley at the upper or east end of which is the summit of the Mint Canyon Highway where this butterfly was captured.

72. **Melitæa wrightii cerrita** Wri. (*Butt. West Coast,* 161, pl. XX, ff. 189, a, b. 1905)
THE CERRITA CHECKERSPOT, a local form.

COMSTOCK'S: pl. 38, ff. 6, 7.
WRIGHT'S: pl. XX, ff. 189, a, b.

♂ ♀, May 1, 1921, Mint Canyon, (Comstock); 2 ♀, May 6, 1920, Mint Canyon, (Malcolm); 3 ♂, 1 ♀, Mint Canyon, (Friday). In this county this loc. form should be found plentifully on the slopes of the ridges which reach out onto the desert north of the L. A. County Play-ground. Just east of there a few miles in San Bernardino County is where local collectors get their stock. An old road runs down from the Lone Pine Canyon road towards the desert and the town of Phelan. It is called Sheep Creek. On the semi-desert knobs, half way down is the location and as many as 100 *cerrita* in both sexes have been secured here in a day. This little colony of typical specimens makes *cerrita* a local form or practically a race with neither *wrightii* or *alma* present, except atypically. Between May 1 and May 15 is the best time. Food plant—*Castilleia.*

73. **Phyciodes campestris** Behr. (*Proc. Calif. Acad. Sci.,* 3, 86, 1863)

THE FIELD CRESCENT, a species.

COMSTOCK'S: pl. 39, ff. 4, 5, 6.

♂ ♂ s, June 15, 1925, Collins Ranch, Voltair, (Gunder). This species is supposed to occur much farther to the north, however, I cannot place them otherwise. More collecting will have to be done in this interesting part of L. A. County. Food plant—unknown.

74. **Phyciodes mylitta** Edw. (*Proc. Acad. Nat. Sci. Phila.,* 160, 1861)

THE MYLITTA CRESCENT, a species.

COMSTOCK'S: pl. 39, ff. 13, 14, 15.
WRIGHT'S: pl. XXI, ff. 204, b, c.
HOLLAND'S: pl. XVII, ff. 40, 41.

10 ♂, 6 ♀, May 30, 1927, Big Tujunga Canyon, (Friday); 7 ♂, 2 ♀, April 17, 1921, Big Dalton Canyon, (Ingham); 15 ♂ ♀ s, June 5, 1921, San Dimas Canyon, (Malcolm); ♂ ♀, June 25, 1919, Mt. Wilson, (Comstock). A wide spread flier in the canyons. Food plant—thistle.

75. PHYCIODES MYLITTA Edw., tr. f. COLLINSI new tr. f. Strangely enough this transition form resembles *Phyc. barnesi* Skin. from Colorado or rather shows mendelian traits towards that species. On the upper sides of both wings through the limbal and discal areas, there is a noticeable lack of usual spots and transverse maculation which allows the yellow-brown ground color to dominate. The black border edges at the outer

margins are as in typical *mylitta*. Beneath, the designs are unchanged, except in that they have a lighter or less heavy appearance. Classification: transition form; immaculism—probably well developed. Holotype ♂, expanse 38mm.; Aug. 12, 1923, Collin's Ranch, Voltair, Calif. Upper side illustrated in Comstock's "Butt. of Calif." pl. 39, f. 16. Type in author's coll. Named after Mr. Walter Collins of Los Angeles, a writer on personal and religious freedom.

76. **Polygonia satyrus** Edw. (*Trans. Am. Ent. Soc., 2,* 374, 1869)

THE SATYR BUTTERFLY, a species.

COMSTOCK'S: pl. 40, ff. 1, 2, 3, 4.
WRIGHT'S: pl. XXII, ff. 213, a.
HOLLAND'S: pl. XX, ff. 1, 2.

2 ♂, June 5, 1921, San Dimas Canyon, (Malcolm); ♂ ♀ s, June 16, 1908, Arroyo Seco, (Comstock); ♂ ♀ s, June 29, 1905, Mt. Wilson, (Grinnell); 1 ♂, May 25, 1919, Griffith Park, (Ingham). Found almost everywhere during the spring and summer in the shady portions of canyons. Food plant—nettle.

77. **Polygonia satyrus chrysoptera** Wri. (*Butt. West Coast,* 174, 1905)

THE GOLDEN ANGLE-WING, a form.

COMSTOCK'S: pl. 40, f. 9.
WRIGHT'S: pl. XXII, ff. 222, b.

1 ♂, June 21, 1918, Glendale, (Malcolm); 1 ♂, March 31, 1917, York Valley, (Malcolm); 1 ♀, June 9, 1918, Arroyo Seco, (Malcolm). A lighter colored form of the species. Food plant—nettle.

78. **Aglais californica** Bdv. (*Ann. Soc. Ent. Fr.,* (2), 10, 366, 1852)

THE CALIFORNIA TORTOISE, a species.

COMSTOCK'S: pl. 41, ff. 7, 8.
WRIGHT'S: pl. XXII, f. 225.
HOLLAND'S: pl. XX, f. 11.

21 ♂, 9 ♀, Feb. 13, 1921, Mt. Wilson, (Ingham); 15 ♂, 10 ♀, (ex. larva), May 25, 1927, Dalton's Canyon, (Friday); ♂ ♀ s, March, 1928, Millard's Canyon, (Malcolm); 1 ♀, June 3, 1928, Mt. Lowe, (Malcolm). Common certain years, other years scarce. One of the migratory butterflies. Food plant—*Ceanothus.*

79. **Aglais milberti** Godt. (*Encyclopedie Methodique, 9, 307,* 1819)

MILBERT'S TORTOISE, a species.

COMSTOCK'S: pl. 41, ff. 225.
WRIGHT'S: pl. XXII, f. 226.
HOLLAND'S: pl. XX, f. 10.

Bred from larva found in the Arroyo Seco near Pasadena, (Comstock). This butterfly seems rare in this county and local collectors have depended for their series upon summer trips into the Sierras. Food plant—nettle, willow, *Helianthus,* etc.

80. **Aglais milberti subpallida** Ckll. (*The Entomologist,* 185, 1889)

COCKERELL'S TORTOISE, a form.

COMSTOCK'S: pl. 41, f. 11.
WRIGHT'S: pl. XXII, f. 226a.

Several specimens bred from numerous larva found this year in the San Gabriel Mountains. (See Mr. Malcolm for dates and locations). In this form the white on the secondaries (upper side) is well developed and almost as wide as the red. Food plant—as above.

81. **Aglais antiopa** L. (*Syst. Nat. Ed. X,* p. 476, 1758)

THE MOURNING CLOAK, a species.

COMSTOCK'S: pl. 42, ff. 1, 2.
WRIGHT'S: pl. XXII, f. 223.
HOLLAND'S: pl. 1, f. 6.

♂ ♀ s, Feb. 1, 1919, Los Angeles, (Comstock); 1 ♂, Feb. 20 1929, San Gabriel Canyon, (Friday); 1 ♂, March 30, 1919, Elysian Park, (Ingham); 1 ♂, June 5, 1930, Griffith Park, (Henne). Flies everywhere and almost any time, but never in quantities. Food plant—willow, etc.

82. **Aglais antiopa hygiaea** Hydn. (*Verz. Europ. Schmett.,* pl. 7, 1851)

THE BROAD BORDERED MOURNING CLOAK, a transition form.

COMSTOCK'S: pl. 42, ff. 3, 4, 5.

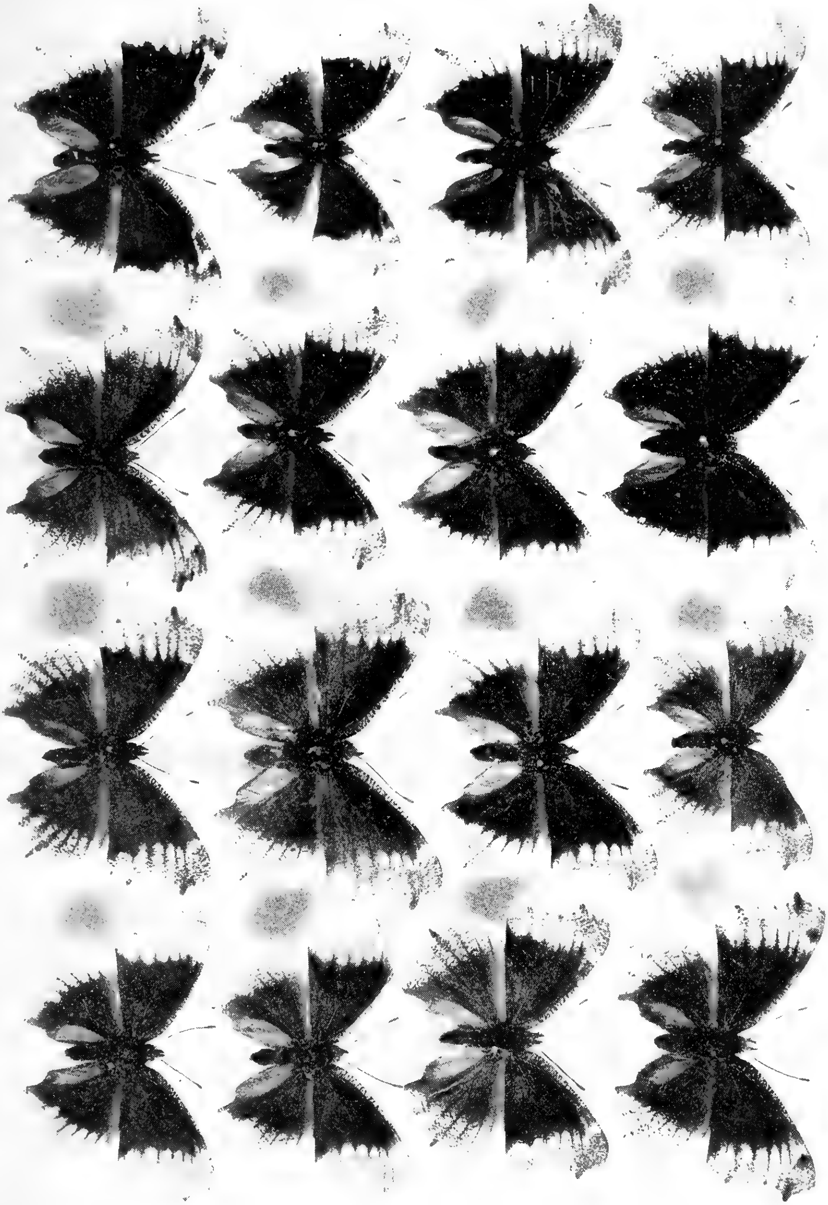

PLATE 21. Examples of *Aglais antiopa hygiaea* Hyden. from the Gunder Collection. See notes in this list under No. 82.

1 ♂, May 25, 1908, Los Angeles, (Grinnell); 1 ♀, Aug. 20, 1914, Pasadena, (Clemence). The plate accompanying this article shows a number of very well developed examples in which the yellow borders are quite wide and no blue spots present. Most of the specimens are from eastern United States and some are bred. A rare tr. f. considering the commonness of the species itself. Food plant—same as for parent species.

83. **Cynthia atalanta** L. (*Syst. Nat. Ed. X,* 478, 1758)

THE RED ADMIRAL, a species.

COMSTOCK'S: pl. 43, ff. 1, 2.
WRIGHT'S: pl. XXII, f. 227.
HOLLAND'S: pl. XLIII, f. 4.

1 ♂, March 16, 1919, Griffith Park, (Malcolm); 1 ♀, March 17, 1917, York Valley, (Malcolm); 1 ♂, April 28, 1920, Elysian Park, (Ingham); 1 ♀, Oct. 1, 1928, Hollywood, (Friday). Not so common, but netted from time to time anywhere. Food plant—nettle, hop, *Boehmeria.*

84. **Cynthia virginiensis** Dru. (*Ill. Exot. Ent.,* 1, pl. V, f. 1, 1770)

THE VIRGINIA LADY, a species.

COMSTOCK'S: pl. 43, ff. 3, 6.
WRIGHT'S: pl. XXII, f. 228.
HOLLAND'S: pl. 1, f. 2; pl. XXXIII, f. 6.

1 ♂, June 10, 1917, York Valley, (Malcolm); ♂ ♀ s, May, 1916, Monrovia, (Malcolm); 1 ♂, 1 ♀, April 24, 1921, Big Dalton Canyon, (Ingham). Food plant—Burdock, cudweed, mugwort, everlasting.

85. **Cynthia virginiensis edwardsi** Grin. (*Psyche,* 25, 113, pl. IV, f. 3, 1918)

THE "HIGH BRED" LADY, a hybrid.

COMSTOCK'S: pl. 43, ff. 4, 7.

1 ♂, July 30, 1914, Altadena, (Newcomb?). There is every reason to believe that the name *edwardsi* should be applied to hybrids between *atalanta* and *carye,* (see Ent. News, pl. VIII, Nov. 1927). The original Grinnell type and one other example is in this author's collection. Comstock illustrates both specimens. Food plant—same as parent species.

86. **Cynthia virginiensis fulvia** Dodge. (*Can. Ent.*, 32, 92, 1900)

DODGE'S LADY, a form.

COMSTOCK'S: pl. 42, f. 9.

1 ♀, May 1926, Los Angeles, (bred by Schrader). Simply a light colored form or light appearing because of less black maculation on upper side.

87. **Cynthia cardui** L. (*Syst. Nat., X,* 475, 1758)

THE PAINTED LADY, a species.

COMSTOCK'S: pl. 43, ff. 8, 9.
WRIGHT'S: pl. XXII, f. 229.
HOLLAND'S: pl. 1, f. 1.

Mar. 10, 1924, migration noticed in foothills, (Newcomb); specimens collected in Dec., Mar., Apr., and May by local collectors. Very common during spring and summer. Food plant—thistle, nettle, sunflower, mallow, burdock, etc.

88. **Cynthia cardui elymi** Ramb. (*Ann. Soc. Obs.*, 2, pl. V, ff. 1-2, p. 256, 1829)

THE SUFFUSED LADY, a transition form.

COMSTOCK'S: pl. 42, ff. 7, 8.

Almost every good sized collection has from one to several of these variations and the transition or design change runs from near typical to an example like the center one shown in the top row of my plate which is as far as the change of pattern goes. Some of the specimens on the plate were bred by Wm. Schrader and others are from different parts of the United States. One I caught in my garden in Pasadena. Food plant—same as parent species.

89. **Cynthia carye** Hbn. (*Samml. exot. Schmett.*, vol. 1, pl. 45, 1806)

THE WEST COAST LADY, a species.

COMSTOCK'S: pl. 44, ff. 1, 2.
WRIGHT'S: pl. XXII, f. 231.
HOLLAND'S: pl. XX, f. 12.

20 ♂, 15 ♀, April 15, 1928, Hollywood, (Friday); 2 ♂, March 14, 1920, Elysian Park, (Ingham); ♂ ♀s, June 24, 1923, York Valley, (Malcolm); ♂s, Sept. 1, 1917, Feb. 15, 1919, Eagle Rock, (Malcolm). Found only on the west coast in America and very plentiful. Food plant—mallow, nettle, privet, etc., etc.

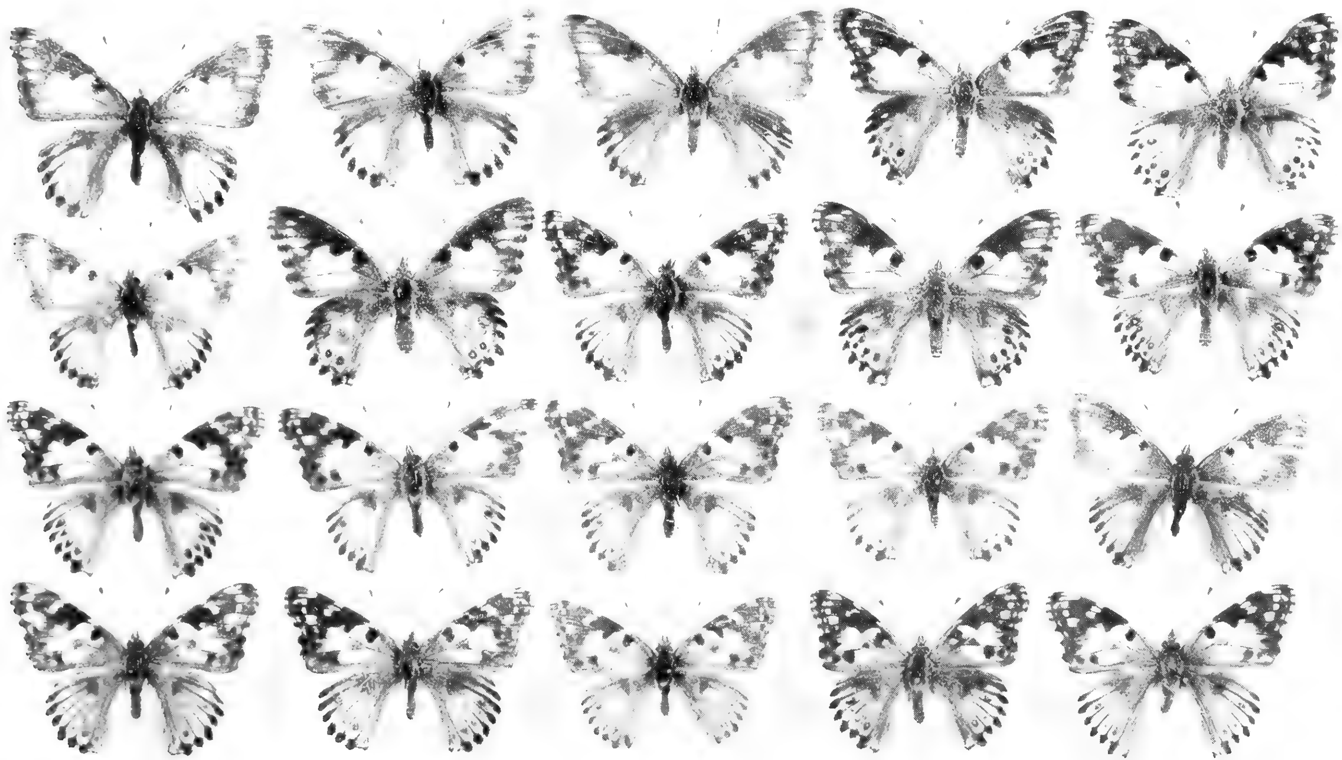

PLATE 22. Examples of *Cynthia cardui elymi* Ramb. from the Gunder Collection. See notes in this list under No. 88.

90. **Cynthia carye muelleri** Letcher. (*Ent. News,* 8, 38, pl. 3, 1898)

MUELLER'S LADY, a transition form.

COMSTOCK'S: pl. 44, ff. 4, 5, 6, 7, 8, (all muelleri).

Transition forms of *carye muelleri* are more plentifully represented in western collections than are similar forms of species *cardui.* Mr. Grinnell had several examples in his collection from Los Angeles as well as San Francisco and other parts of this coast. Several people have also bred this form. Mr. Wyckoff of Los Angeles once caught 2 examples in his garden on the same day and presented them to me. The plate accompanying this list shows numerous specimens all fairly well developed in transition. Food plant—same as for the parent species.

91. **Cynthia carye schraderi** Gun. (*Pan-Pac. Ent., VI,* 1, p. 9, July, 1929)

SCHRADER'S LADY, a transition form.

ILLUSTRATED IN ORIGINAL DESCRIPTION

If you find a transition form which looks like *muelleri,* but which is more darkly marked or black on the under side of the secondaries, then it is probably *schraderi.* Very rare and most of the known specimens have been raised by Mr. Schrader of Los Angeles. Food plant—as for the parent species.

92. **Junonia cœnia** Hbn. (*Samml. exot. Schmett.,* 2, pl. CCXLV, 1822-25? (1896))

THE BUCKEYE BUTTERFLY, a species.

COMSTOCK'S: pl. 44, ff. 9, 10.
WRIGHT'S: pl. XXIII, f. 234.
HOLLAND'S: pl. XX, f. 7.

1 ♂, Feb. 15, 1919, York Valley, (Malcolm); ♂s, March 11, 1929, Oct. 1, 1928, Hollywood, (Friday); 1 ♂, May 25, 1919, Griffith Park, (Ingham); 1 ♀, June 21, 1918, Glendale, (Malcolm). Picked up here and there, but not plentiful in any one location as a rule. Very common in eastern United States. Food plant—*Mimulus, Gerardia,* plantain, snapdragon, etc., etc.

93. **Junonia cœnia schraderi** Gun. (*Ent. News,* 36, 199, pl. V, f. 11, 1925)

SCHRADER'S BUCKEYE, a transition form.

COMSTOCK'S: pl. 43, f. 10.

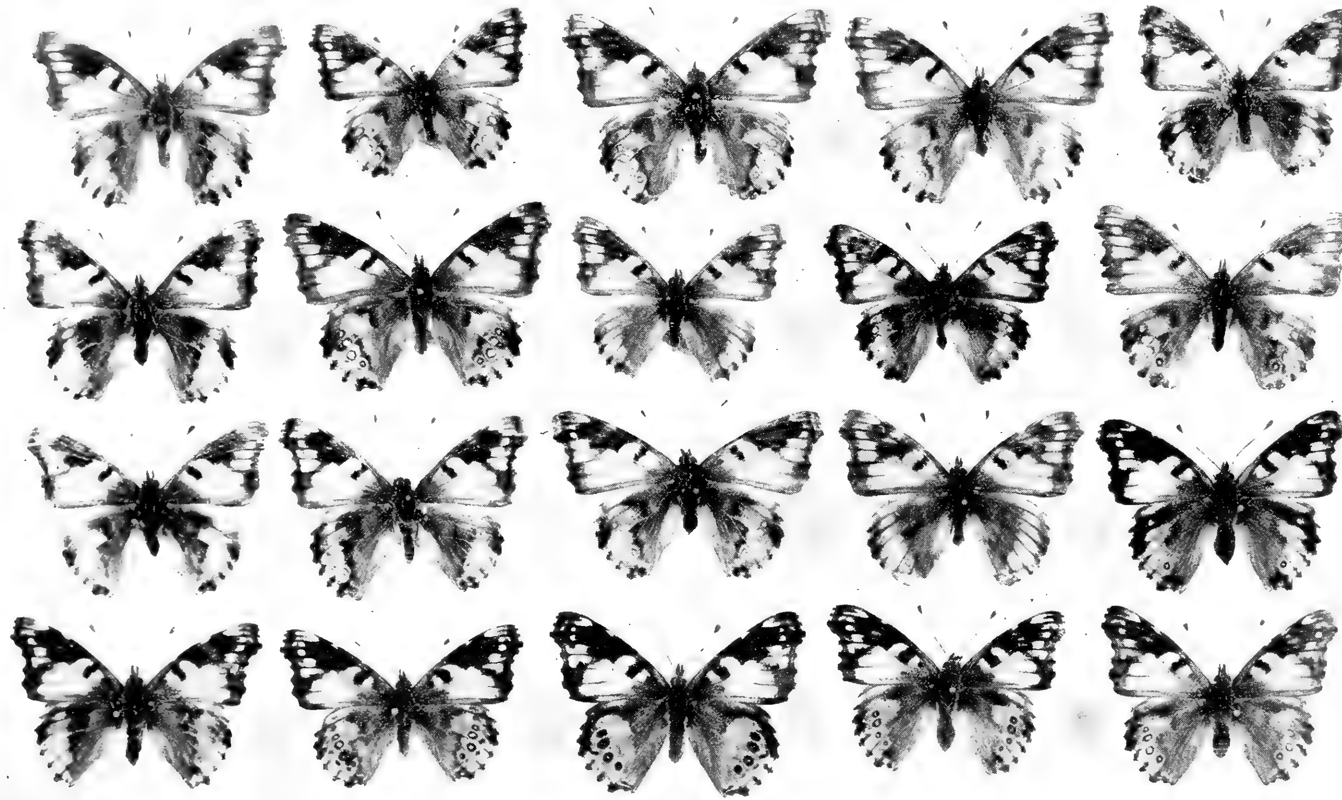

PLATE 23. Examples of *Cynthia carye muelleri* Letch. from the Gunder Collection. See notes in this list under No. 90.

1 ♀, May 17, 1910, Los Angeles, (Schrader). A rare butterfly which looks very darkly suffused on the upper side. Food plant—same as for the species.

94. **Junonia cœnia wilhelmi** Gun. (*Ent. News,* 38, p. 134, May, 1927)

One Eyed Buckeye, a transition form.

ILLUSTRATED IN ORIGINAL DESCRIPTION.

1 ♂, Sept. 15, 1910, 1 ♂, Oct. 15, 1913, Los Angeles, (Schrader). These specimens only have one spot or eye on the upper side of secondaries. Rare. Food plant—as above.

95. **Basilarchia lorquini** Bdv. (*Ann. Soc. Ent. Fr.,* (2), 10, 301, 1852)

Lorquin's Admiral, a species.

COMSTOCK'S: pl. 45, ff. 3, 4.
WRIGHT'S: pl. XXIII, f. 240.
HOLLAND'S: pl. XXII, f. 3.

5 ♂ ♀ s, April 8, 1916, Griffith Park, (Haskins); ♂ ♀ s, May 15, 1921, Bouquet Canyon, (Malcolm); 10 ♂, 6 ♀, June 9, 1927, Pine Canyon, (Friday); ♂ s, July 17, 1919, Arroyo Seco, (Friday). Numerous in the canyons. Food plant—willow, poplar, choke-cherry, etc.

96. **Basilarchia lorquini comstocki** Gun. (*Ent. News,* 36, 5, pl. 1, f. 3, 1925)

Black Suffused Admiral, a transition form.

COMSTOCK'S: pl. 46, f. 6.

1 ♀, July, 1928, Millard's Canyon, (Newcomb). The usual white row of spots through the center of the wings is shaded over with black in this transition form. Seemingly quite rare. Food plant—as for the species.

97. **Heterochroa bredowii californica** Butl. (*Proc. Zool. Soc. London,* 485, 1865)

The California Sister, a race.

COMSTOCK'S: pl. 46, ff. 4, 5.
WRIGHT'S: pl. XXIII, f. 243.
HOLLAND'S: pl. XXII, f. 21.

1 ♂, May 30, 1920, Bouquet Canyon, (Malcolm); 1 ♂, June 8, 1919, Griffith Park, (Ingham); 8 ♂, 5 ♀, June 9, 1927, Pine Canyon, (Friday); 2 ♂, Sept. 1, 1912, Mt. Wilson, (Haskins). A common butterfly and frequently flying in association with *Basilarchia lorquini* Bdv. Food plant—oak.

Family **LIBYTHEIDÆ**

98. **Libythea bachmanii** Kirt. (*Am. Jour. Sci.*, (2), 13, 336, 1852)

THE SNOUT BUTTERFLY, a species.

COMSTOCK'S: pl. 47, ff. 1, 2.
HOLLAND'S: pl. XXVIII, f. 1, 2.

25 ♂, 20 ♀, Oct. 27, 1930, Little Rock, near dam, (Friday). This butterfly was quite unique to collectors in Los Angeles until Mr. Friday happened upon a migration of them near Little Rock. How plentiful they will be in the future remains to be seen. In former years I have taken several near Palm Springs. Food plant—hackberry.

Family **RIODINIDÆ**

99. **Apodemia mormo virgulti** Behr. (*Proc. Calif. Acad. Sci.*, 3, 178, 1865)

BEHR'S METAL MARK, a race.

COMSTOCK'S: pl. 47, ff. 6, 7.
WRIGHT'S: pl. XXVII, ff. 296, b, c.
HOLLAND'S: pl. XXVIII, f. 6.

10 ♂, 5 ♀, March 17, 1928, Little Rock, (Friday); 1 ♂, 2 ♀, April 2, 1917, Highland Park, (Malcolm); 20 ♂, 10 ♀, April 20, 1927, Mint Canyon, (Friday); ♂ s, April 22, 1920, Griffith Park, (Ingham). I have always been able to secure hundreds of this butterfly in Mint Canyon in April or May, towards the desert end of the highway, anywhere along the road. In one sweep of the net one year Mr. Newcomb counted 75 captured. Food plant—*Eriogonum.*

100. **Apodemia palmerii marginalis** Skin. (*Ent. News,* 31, 175, 1920)

THE MARGINED METAL MARK, a race.

COMSTOCK'S: pl. 47, ff. 9, 10, 11.

1 ♂, May 17, 1925, near Harold, (Gunder); ♂ ♀ s, May 2, 1925, Lancaster, (Gunder). Most collectors get this little Metal Mark below Palm Springs on the Colorado Desert where they are quite plentiful around alfalfa fields. Food plant—*Beloperone californica*?

101. **Lephelisca nemesis** Edw. (*Trans. Am. Ent. Soc.*, 3, 212, 1871)

THE DUSKY METAL MARK, a species.

COMSTOCK'S: pl. 47, ff. 18, 19.
WRIGHT'S: pl. XXVII, ff. 302, b (not australis)
HOLLAND'S: pl. XXVIII, f. 14.

2 ♂, 1 ♀, Oct. 20, 1918, Santa Monica, (Malcolm); 1 ♂, Aug. 6, 1900, Arroyo Seco in Pasadena, (Grinnell). Most specimens of this species in my collection are from near Brawley in Imperial Valley dated 4/5/25 and some from Lower Santa Ana Canyon dated 6/19/29. Not so rare in proper localities. Food plant—*Bebbea juncea.*

Family **LYCÆNIDÆ**

SUBFAMILY *THECLINÆ*

102. **Habrodais grunus** Bdv. (*Ann. Soc. Ent. Fr.*, (10), 289, 1852)

BOISDUVAL'S HAIR STREAK, a species.

COMSTOCK'S: pl. 47, ff. 20, 22.
WRIGHT'S: pl. XXXVII, ff. 314, a.
HOLLAND'S: pl. XXIX, f. 12.

15 ♂, 8 ♀, June 9, 1927, Pine Canyon above Lake Hughes, (Friday); 15 ♂ ♀ s, Dark Canyon, (Malcolm); 28 ♂ ♀ s, August 14, 1911, Mt. Wilson, (Haskins). Plentiful in places where there are small live oaks. Must be freshly emerged to secure non-rubbed specimens, as they seem to scuff their wings easily. Food plant—oaks.

103. **Atlides halesus** Cram. (*Pap. Exot.*, 2, 3, pl. XCVIII, ff. B-C, 1779).

THE GREAT PURPLE HAIR STREAK, a species.

COMSTOCK'S: pl. 48, ff. 1, 2, 3.
WRIGHT'S: pl. XXVII, f. 306.
HOLLAND'S: pl. XXIX, f. 9.

1 ♂, March 20, 1921, Mint Canyon, (Malcolm); 1 ♂, June, 1916. Newhall Tunnel, (Malcolm); 9 ♂, Aug. 17-18, 1925, Arroyo Seco, (Garth); ♂ ♀s, Sept. 17, 1918, San Antonio Canyon, (Comstock). Considered a very fortunate capture if taken anywhere. Never seen in quantity in any one place. Food plant—mistletoe.

104. **Hypaurotis chrysalus** Edw. (*Trans. Am. Ent. Soc.,* 4, 344, 1873)

THE COLORADO HAIR STREAK, a species.

COMSTOCK'S: pl. 48, ff. 4, 5, 6.
WRIGHT'S: pl. XXVII, f. 304.
HOLLAND'S: pl. XXIX, f. 11.

June, Castaic Ranch at Newhall, (Shooter); Noted by Rivers, but very doubtful. Has not been recorded for 20 years as found in Los Angeles County or for that matter in California. I think this species should be stricken from records as occurring in this State. However, regardless of the old uncertain identifications there is always that possibility, so I include this name merely in the hope that a definite discovery may be made by modern collectors who know what they are taking. Food plant—probably oaks.

105. **Strymon avalona** Wright. (*Butt. West Coast,* p. 209, 1905)

THE AVALONA HAIR STREAK, a species.

COMSTOCK'S: pl. 48, ff. 14, 15, 16.
WRIGHT'S: pl. XXVIII, ff. 328, b, c.

♂ ♀s, July 20, 1912, Avalon, (Haskins); 22 ♂, 22 ♀, July 19, 1920, Avalon, (Gunder). By following the auto road leading to the Isthmus about 3 blocks back of the St. Catherine Hotel, you come to a saddle back or ridge, the east side of which overlooks the golf course. Near this place on the sides of the road I caught my series of these specimens. They undoubtedly occur many other places on the Island and are quite restricted to Catalina Island. Food plant—probably *Syrmatium*?

106. **Strymon melinus** Hbn. (*Zur. exot. Schmett.,* 1, 22, ff. 121-122, 1816)

THE COMMON HAIR STREAK, a species.

COMSTOCK'S: pl. 48, ff. 17, 18.
WRIGHT'S: pl. XXII, ff. 308, b.
HOLLAND'S: pl. XXXII, f. 20.

♂ ♀ s, June 24, 1919, Aug. 23, 1917, York Valley, (Malcolm); 1 ♂, Aug. 12, 1917, Hollywood, (Friday); 1 ♀, March 20, 1921, Elysian Park, (Ingham). Classed as a common butterfly and found almost everywhere and at any time, especially during the spring and summer. Food plant—mallow, *Sphœralcea, Polygonum, Humulus,* etc., etc.

107. **Strymon californica** Edw. (*Proc. Acad. Nat. Sci. Phila.,* 223, 1862)

THE CALIFORNIA HAIR STREAK, a species.

COMSTOCK'S: pl. 48, ff. 22, 23, 24, 25.
WRIGHT'S: pl. XXVII, ff. 309, a.

14 ♂, 7 ♀, June 3, 1928, Mt. Lowe, (Malcolm); 10 ♂, 3 ♀, June 9, 1927, Pine Canyon, (Friday); 1 ♀, July 25, 1927, Mt. Wilson, (Ingham). Plentiful in the late spring and summer. Food plant—probably oak.

108. **Strymon sylvinus** Bdv. (*Ann. Soc. Ent. Fr.,* (2), 10, 287, 1852)

THE SYLVAN HAIR STREAK, a species.

COMSTOCK'S: pl. 49, ff. 1, 2, 3.
WRIGHT'S: pl. XXVII, ff. 310, b, c.

2 ♀, June 23, 1918, Mt. Lowe, (Malcolm); 9 ♂, June 30, 1919, July 19, 1919, Arroyo Seco, (Malcolm); ♂ ♀, June 15, 1917, San Dimas Canyon, (Comstock); ♂ ♀, June 25, 1919, Verdugo Park, (Comstock); 24 ♂, 9 ♀, June 23, 1920, Griffith Park, (Ingham). Food plant—willow.

109. **Strymon sylvinus desertorum** Grin. (*Can. Ent.,* 49, 349, 1917)

THE DESERT HAIR STREAK, a race.

COMSTOCK'S: pl. 49, ff. 4, 5.

♂ ♀ s, June 16, 1925, Collins Ranch, Voltair, (Gunder). A doubtful race of *sylvinus* being lighter on the under sides and having the maculation lighter or less well defined. Somebody ought to collect these specimens at the type locality which is Oak Creek, Kern County. That place is on the road between Mojave and Tehachapi on the Southern slope of Mt. Tehachapi, not far from L. A. County. Mr. Grinnell found the original specimens June 29, 1905. Food plant—willow, (oak?).

110. Strymon auretorum spadix Hy. Edw. (*Papilio,* 1, 53, 1881)

THE NUT-BROWN HAIR STREAK, a race.

COMSTOCK'S: pl. 49, ff. 9, 10, 11.
WRIGHT'S: pl. XXVII, ff. 423, a.

1 ♀, June 9, 1927, Pine Canyon above Lake Hughes, (Friday); ♂s, June 15, 1920, Ridge Route, (Comstock); ♂ ♀, June 25, 1919, Mt. Wilson, (Comstock). Rare in most collections and not seen in long series. I secured my specimens at Warner Hot Springs. The butterflies love to feed on wild honeysuckle. Food plant—unknown.

111. Strymon adenostomatis Hy. Edw. (*Proc. Calif. Acad. Sci.,* 7, 144, 1877)

THE GREY HAIR STREAK, a species.

COMSTOCK'S: pl. 49, ff. 12, 13, 14, 15.
WRIGHT'S: pl. XXVII, ff. 324, b.
HOLLAND'S: pl. XXIX, f. 25.

♂ ♀s, April 12, 1920, Ridge Route, (Comstock); 1 ♂, June 20, 1920, Griffith Park, (Ingham); 2 ♂, June 24, 1919, Eagle Rock Park, (Malcolm); 5 ♂, 1 ♀, July 4, 1923, Bouquet Canyon, (Malcolm). Common in Bouquet Canyon near a place called Lincoln Crest towards the middle of June. Food plant—*Adenostoma*?

112. Strymon sæpium Bdv. (*Ann. Soc. Ent. Fr.,* (2), 19, 288, 1852)

THE HEDGE HAIR STREAK, a species.

COMSTOCK'S: pl. 49, ff. 16, 17, 18.
WRIGHT'S: pl. XXVI, ff. 316, ?, c ?
HOLLAND'S: pl. XXIX, ff. 36, 37, 33, 34.

52 ♂, 22 ♀, June 22, 1919, Griffith Park, (Ingham); 3 ♂, July 16, 1927, Mt. Wilson, (Henne); 5 ♂, June 28, 1919, Eagle Rock Park, (Malcolm); ♂ ♀s, June 8, 1919, Bouquet Canyon, (Comstock); 6 ♂, 4 ♀, June 9, 1927, Pine Canyon above Lake Hughes, (Friday). Food plant—unknown.

113. Mitoura spinetorum Hew. (*Ill. Diur. Lep. Lyc.,* p. 94, pl. XLV, ff. 198-199, 1867)

THE THICKET HAIR STREAK, a species.

COMSTOCK'S: pl. 49, ff. 24, 25, 26.
HOLLAND'S: pl. XXIX, f. 21.

1 ♂, June, Ridge Route, (Comstock); 1 ♀, May 17, 1925, near Acton, (Gunder). Always a very desirable butterfly and a rare catch. It is unusual to find anywhere in western America an example which has as straight lines on the under sides of the secondaries as is shown by fig. 25 in Comstock's book. Whether the type of spinetorum really had this distinction, I don't know. Some 40 examples in my collection fail in this regard, as all have wavy lines like his fig. 26. Food plant—unknown.

114. **Mitoura siva juniperaria** Comst. (*Bull. So. Calif. Acad. Sci.,* 24, 37, pl. 11, 1925)

THE JUNIPER HAIR STREAK, a race.

COMSTOCK'S: pl. 50, ff. 5, 6, 7.

2 ♂, 2 ♀, April 22, 1922, Little Rock, (Malcolm); 1 ♂, May 1, 1928, Mint Canyon, (Friday); 60 ♂ ♀, May 27, 1925, Mint Canyon, (Comstock). Typical *juniperaria* are found at the type locality which is in Mint Canyon just down from the summit towards the desert. Juniper trees extend for a mile or so down from this summit and by beating the branches or otherwise watching for specimens, many may be taken on one excursion. Food plant—juniper.

115. **Incisalia iroides** Bdv. (*Ann. Soc. Ent. Fr.,* (2), 10, 289, 1852)

THE WESTERN ELFIN, a species.

COMSTOCK'S: pl. 50, ff. 10, 11, 12.

WRIGHT'S: pl. XXVIII, ff. 330, b, c.

8 ♂, Feb. 21, 1925, San Gabriel Canyon, (Garth); ♂ ♀ s, March 5, 1927, San Gabriel Wash, (Friday); ♂ ♀ s, May 25, 1919, Griffith Park, (Ingham); 1 ♂, 2 ♀, June 23, 1927, Mt. Lowe, (Malcolm). Common little fellows which may be found in almost every canyon. Food plant—*Sedum.*

116. **Callophrys dumetorum perplexa** B. & Benj. (*Barnes Cont.,* 5, (2), 65, 1923)

THE PERPLEXING HAIR STREAK, a race

COMSTOCK'S: pl. 50, ff. 17, 18, 19.

4 ♂, 2 ♀, March 30, 1919, Elysian Park, (Ingham); 20 ♂ ♀, March 7, 1926, Altadena, (Comstock); 3 ♂, March 31, 1918, Santa Monica Canyon, (Malcolm); April 22, 1918, Big Rock Creek, (Friday). The species *dumetorum* is not found in Southern California, but is typically taken in San Francisco districts.

Both this race and the species occur with spots on the under sides or without spots. The point of distinction lies in the color and the size. *Perplexa* is moss-green and smaller, while *dumetorum* is verde-green and slightly larger. The females of both species and race vary on the upper side as to shading of red-brown color. Food plant—*Eriogonum.*

117. **Callipsyche behrii** Edw. (*Tran. Sm. Ent. Soc.,* 3, 18, 1870)

Behr's Hair Streak, a species.

comstock's: pl. 50, ff. 22, 24.
wright's: pl. XXVIII, ff. 329, b, c.
holland's: pl. XXX, ff. 4, 5.

June, Ridge Route, (Comstock); also reported by one other collector as having been taken in this County. A rare catch this far south, as most local men get their series in the Sierras. Comstock makes note that it is found in the Purshia belt through the Tejon and San Gabriel Ranges. Food plant—*Purshia glandulosa.*

Subfamily *LYCÆNINÆ*

118. **Tharsalea arota nubila** Comst. (*Bull. So. Calif. Acad. Sci.,* 25, 34, 1926)

The Cloudy Copper, a race.

comstock's: pl. 51, ff. 2, 3, 5.

2 ♂, May 30, 1929, Griffith Park, (Ingham); 25 ♂ ♀, July 2, 1922, Griffith Park, (Comstock); 15 ♂, July 8, 1929, Mt. Wilson, (Henne). The type locality of this race is in Griffith Park near the Old Spanish Lime Kilns. This is along the road which passes the Golf Course. They fly around and settle on the medium sized bushes. Just how long the natural shrubbery in the Park will remain untouched remains to be seen. Food plant—*Ribes gracillimum.*

119. **Lycæna gorgon** Bdv. (*Ann. Soc. Ent. Fr.,* (2), 10, 292, 1852)

The Gorgon Copper, a species.

comstock's: pl. 51, ff. 12, 13, 14.
wright's: pl. XXVIII, ff. 343, b, c.
holland's: pl. XXVIII, ff. 35, 36.

20 ♂, 2 ♀, May 30, 1922, Ridge Route, (Malcolm); 1 ♂, May 19, 1927, Mint Canyon, (Friday); 1 ♀, June 9, 1927, Pine Canyon, (Friday); 2 ♂. June 10, 1923, Sandberg's, (Ingham). This species makes an interesting showing in collections and is never very common. Females vary as to light markings on their upper sides. Food plant—unknown.

120. **Lycæna xanthoides** Bdv. (*Ann. Soc. Ent. Fr.*, (2), 10, 292, 1852)

THE GREAT COPPER, a species.

COMSTOCK'S: pl. 51, ff. 15, 16, 17.
WRIGHT'S: pl. XXVIII, ff. 342, b, c.
HOLLAND'S: pl. XXVIII, ff. 29, 30.

1 ♂, 3 ♀, June 21, 1918, Glendale, (Malcolm); ♂ ♀ s, June 23, 1923, Bouquet Canyon, (Comstock); ♂ s, June 21, 1923, Ridge Route, (Comstock); 2 ♂, May 30, 1920, Griffith Park, (Ingham). Like the above, this is an interesting species in which there is considerable variation on the upper side of the wings of the females, some being quite dark while others show much lighter maculation. Food plant—unknown.

121. **Lycæna helloides** Bdv. (*Ann. Soc. Ent. Fr.*, (2), 10, 291, 1852)

THE PURPLE COPPER, a species.

COMSTOCK'S: pl. 52, ff. 10, 11, 12.
WRIGHT'S: pl. XXVIII, ff. 248, b, c.
HOLLAND'S: pl. XXVIII, ff. 33, 34.

♂ s, June 5, 1917, Arroyo Seco, (Malcolm); 1 ♀, Oct. 28, 1917, Glendale, (Malcolm); 1 ♂, May 1, 1921, Griffith Park, (Ingham). Common species and a late summer flier. Food plant—*Polygonum, Rumex, Oxytheca, Gayophytum.*

122. **Lycæna heteronea clara** Hy. Edw. (*Pac. Coast Lepid.*, 26, 1, 1877)

THE BRIGHT BLUE, a race.

COMSTOCK'S: pl. 52, ff. 24, 25.
HOLLAND'S: pl. XXX, f. 26.

♂ ♀ s, July 1, 1927, Ridge Route, (Comstock). The type locality for this beautiful and rare butterfly is above the old stone quarry on Mt. Tehachapi above the town of Tehachapi in Kern County. This is not far from Los Angeles. Food plant—*Eriogonum.*

123. **Leptotes marina** Reak. (*Proc. Acad. Nat. Sci. Phila.*, 67, 1868)
THE MARINE BLUE, a species.

COMSTOCK'S: pl. 53, ff. 1, 2, 3.
WRIGHT'S: pl. XXX, ff. 399, b, c.
HOLLAND'S: pl. XXX, f. 27, pl. XXXI, f. 32.

♂ ♀ s, July 14, 1918, Aug. 30, 1917, York Valley, (Malcolm); ♂ ♀ s, Aug. 12, 1927, Hollywood, (Friday); 1 ♂, June 20, 1920, Griffith Park, (Ingham). Found everywhere, even occasionally on the desert. Food plant—*Plumbago,* wisteria, alfalfa, sweet pea, etc.

124. **Brephidium exilis** Bdv. (*Ann. Soc. Ent. Fr.*, (2), 10, 294, 1852)
THE PIGMY BLUE, a species.

COMSTOCK'S: pl. 53, ff. 16, 17, 18.
WRIGHT'S: pl. XXXI, ff. 402 to 403c (not isophthalma)
HOLLAND'S: pl. XXXII, f. 5.

♂ ♀ s, July 12, 1918, Los Angeles, (Malcolm); ♂ ♀ s, May 30, 1927, Big Tujunga Canyon, (Friday); 21 ♂, 14 ♀, August 8, 1919, Los Angeles, (Ingham). This is the small butterfly used in jewelry designs. Common in Venice on the vacant lots where the foot-high vegetation grows. Food plant—*Atriplex, Chenopodium,* petunia, etc.

125. **Brephidium exilis coolidgei** Gun. (*Ent. News,* 36, 2, pl. 1, f. 4, 1925)
COOLIDGE'S BLUE, a transition form.

COMSTOCK'S: pl. 53, f. 8.

2 ♀, July 12th and Aug. 3, 1922, Los Angeles, (Coolidge). See Comstock's illustration for details of this butterfly. Food plant—same as for the species.

126. **Hemiargus gyas** Edw. (*Trans. Am. Ent. Soc.*, 3, 210, 1871)
EDWARD'S BLUE, a species.

COMSTOCK'S: pl. 53, ff. 10, 11, 12.
WRIGHT'S: pl. XXX, ff. 397, a, a, b; f. 401.

♂ ♀ s, July 5, 1926, Dalton Canyon, (Comstock). Should be more plentiful in this county. Comstock also reports seeing it in Glendale. Food plant—*Astragalus.*

127. Hemiargus isola Reak. (*Proc. Acad. Nat. Sci. Phila.,* 332, 1866)

Reakirt's Blue, a species.

comstock's: pl. 53, ff. 13, 14, 15.
wright's: pl. XXX, ff. 394, b, c.
holland's: pl. XXX, f. 33.

♂ ♀ s, Sept. 2, 1920, Camp Baldy, (Comstock); 2 ♂, June 22, 1920, Sierra Madre, (Ingham). Like the species above, this one is also overlooked because of its small size. Food plant—unknown as yet.

128. Everes amyntula Bdv. (*Ann. Soc. Ent. Fr.,* (2), 10, 294, 1852)

The Western Tailed Blue, a species.

comstock's: pl. 53, ff. 16, 17, 18.
wright's: pl. XXIX, ff. 385, b, c.
holland's: pl. XXXII, ff. 7, 8.

1 ♂, June 10, 1922, Mint Canyon, (Ingham); ♂ ♀ s, June 19, 1930, Long Beach, (Garth); ♂ ♀ s, Feb. 22, 1924, Santa Monica Palisades, (Gunder). Food plant—*Astragalus.*

129. Plebeius melissa lotis Lint. (*Trans. Am. Ent. Soc.,* 4, 346, 1873)

The Lotus Blue, a race.

comstock's: pl. 53, ff. 23, 24, 25.

♂ ♀ s, June 3, 1923, Bouquet Canyon, (Comstock); 2 ♂, 1 ♀, March 11, 1919, Bouquet Canyon, (Malcolm); 1 ♂, 2 ♀, May 30, 1922, Sandberg's (Malcolm); 7 ♂, 1 ♀, April 30, 1929, Bouquet Canyon, (Ingham). Food plant—*Astragalus-Lotus.*

130. Plebeius icarioides evius Bdv. (*Ann. Soc. Ent. Belg.,* 12, 49, 1869)

The Evis Blue, a race.

comstock's: pl. 54, ff. 13, 14, 15.

3 ♂, June 5, 1921, San Dimas Canyon, (Malcolm); 4 ♂, 3 ♀, May 11, 1919, Bouquet Canyon, (Malcolm); 64 ♂, 7 ♀, April

30, 1929, Bouquet Canyon, (Ingham); 60 ♂ ♀ s, May 27, 1925, Swartout Valley, (Comstock). Found in quantity in many places in the mountains. Food plant—lupines.

131. Plebeius acmon West. & Hew. (*Gen. Duir. Lepid.*, p. 494, pl. LXXVI, f. 2, 1852)

The Acmon Blue, a species

COMSTOCK'S: pl. 55, ff. 1, 2, 3.
WRIGHT'S: pl. XXIX, ff. 380, b.
HOLLAND'S: pl. XXXI, ff. 27, 28?

4 ♂, 4 ♀, May 25, 1929, Pasadena, (Henne); ♂ ♀ s, May 25, 1919, Griffith Park, (Ingham). A common blue about the gardens and canyons. Food plant — *Astragalus, Hosackia, Eriogonum, Lotus,* etc.

132. Plebeius acmon angelus Gun. (*Bull. Brooklyn Ent. Soc.*, XXIV, Dec. 1929)

The Black Streaked Blue, a transition form.

ILLUSTRATED IN ORIGINAL DESCRIPTION.

1 ♀, June 10, 1920, Los Angeles, (Gunder). In this butterfly the black spots on the under side of both wings tend to become elongated black pointed streaks. Food plant—as for the parent species.

133. Plebeius acmon cottlei Grin. (*Pomona Jr. Ent. and Zoo.*, 8, 83, 1916)

Cottle's Blue, a seasonal form.

COMSTOCK'S: pl. 55, ff. 4, 5, 6.

2 ♂, 1 ♀, Feb. 28, 1927, San Gabriel Canyon, (Friday); ♂ s, March 14, 1920, Azusa, (Malcolm); ♂ s, April 16-24, 1929, Tujunga Canyon, (Henne); 1 ♂, May 8, 1918, Pasadena, (Comstock). Generally taken in the early spring-time. The darkness of the under side is a good characteristic to go by. Food plant—as for the species.

134. Plebeius monticola Clem. (*Can. Ent.*, 41, 38, 1909)

Clemence's Blue, a species.

COMSTOCK'S: pl. 55, ff. 10, 11, 12.

21 ♂ ♀ s, March 30, 1922, Sandberg's, (Malcolm); 20 ♂, 4 ♀, April 30, 1929, Bouquet Canyon, (Ingham); ♂ ♀ s, June 9, 1927, Pine Canyon, (Friday); ♂ ♀ s, June 8, 1928, San Gabriel Mts., (Comstock). *Monticola* is a mountain butterfly while *acmon* is a plains species. Food plant—lupines, etc.

135. **Plebeius monticola malcolmi** Gun. (*Ent. News,* XXXVI, p. 195, July, 1925)

MALCOLM'S BLUE, a form

COMSTOCK'S: pl. 55, f. 14.

1 ♀, May 30, 1922, Ridge Route, (Malcolm). Has an unusual amount of red on the upper side of both wings. Rare. Food plant—as for the parent species.

136. **Plebeius emigdionis** Grin. (*Ent. News,* 16, 115, 1905)

SAN EMIGDIO BLUE, a species.

COMSTOCK'S: pl. 55, ff. 17, 18, 19.
WRIGHT'S: pl. XXIX, ff. 378b ♂ and 382b ♀.

2 ♀, April 23, 1923, Mint Canyon, (Ingham); 1 ♀, April 20, 1928, Lancaster, (Friday). Going east from Victorville in San Bernardino County on the main highway, you come to where the road crosses the river. Turn left immediately before crossing and park within a block of the bridge. Look for *emigdionis* here along the river bank, hovering over small bushes. I camped there May 14-16, 1922, with splendid results. Food plant—*Atriplex.*

137. **Plebeius neurona** Skin. (*Ent. News,* 13, 15, 1902)

THE VEINED BLUE, a species.

COMSTOCK'S: pl. 55, ff. 20, 22, 23. (f. 21 is a ♀ *chlorina*).

50 ♂ ♀ s, Aug. 17, 1903, Barley Flats, Mt. Lowe, (Newcomb); 6 ♂, 4 ♀, July 4, 1927, Blue Ridge, (Malcolm); ♂ ♀, June 20, 1918, Mt. Wilson, (Comstock); ♂ ♀, June 21, 1923, Ridge Route, (Comstock). I secured my series of this species about July 1st on Mt. Tehachapi above the stone quarry up from the town of Tehachapi. Look for the dwarf lupine around which they seem to fly. Food plant—probably *Eriogonum.*

138. **Philotes battoides bernardino** B. & Benj. (*Barnes Cont.,* 3, (2), 116, 1916)

THE SAN BERNARDINO BLUE, a race.

COMSTOCK'S: pl. 55, ff. 29, 30, 31.
ILLUSTRATED BY BARNES IN DESCRIPTION.

3 ♂, 3 ♀, June, Chatsworth, (Friday); ♂ ♀ s, June 19, 1919, Annandale, (Malcolm); 1 ♂, 5 ♀, Sept. 11, 1925, El Segundo Beach, (Newcomb); ♂ ♀ s, June 24, 1922, Griffith Park, (Ingham). A small blue found in numerous localities. Food plant—probably *Eriogonum.*

139. Philotes battoides bernardino baldyensis Gun. (*Ent. News,* 36, 3, ill., 1925)

THE MT. BALDY BLUE, a transition form.

COMSTOCK'S: pl. 55, f. 32.

1 ♀, July 5, 1924, near Camp Baldy, (Gunder). The spots on the under sides of the wing run together forming a dark area. Rare, but can be found if enough specimens are collected and each examined to see if they differ. Food plant—same as for parent species.

140. Philotes enoptes Bdv. (*Ann. Soc. Ent. Fr.,* (2) 10, 298, 1852.

THE DOTTED BLUE, a species.

COMSTOCK'S: pl. 56, ff. 1, 2, 3.

25 ♂, 10 ♀, May 30, 1927, Big Tujunga Canyon, (Friday); ♂ ♀ s, June 9, 1927, Pine Canyon, (Friday). See Comstock's figures to know these small blues. Food plant—unknown as yet.

141. Philotes rita B. & McD. (*Can. Ent.,* 48, 223, 1916)

THE DESERT BLUE, a species.

COMSTOCK'S: pl. 56, ff. 4, 5, 6.

♀ s, June 9, 1927, Pine Canyon, (Friday); 40 ♂ ♀ s, Apr. 12, 1921, Mojave Desert, (Gunder). Watson & Comstock named certain specimens *Philotes mohave* from this district which Barnes & Benjamin synonyms under *rita;* as the specimens look similar I conclude that this name might apply. More work needs to be done in this group however. Food plant—unknown.

142. Philotes speciosa Hy. Edw. (*Proc. Calif Acad. Sci.,* 7, 173, 1877)

THE SMALL BLUE, a species.

COMSTOCK'S: pl. 56, ff. 12, 13, 18.
HOLLAND'S: pl. XXXII, ff. 1, 2.

2 ♂, May 1, 1927. Mint Canyon, (Friday). Twenty-two miles out of Mojave on the road to Randsburg is where most collectors go to get this butterfly. They are to the left of the road at that point. It is necessary to be on the ground at exactly the right season for them however. Collecting is better in the morning before the wind comes up. Food plant—*Oxytheca.*

143. **Philotes sonorensis** F. & F. (*Reise Nov. Lep.* p. 281, ill., 1865)

THE SONORA BLUE, a species.

COMSTOCK'S: pl. 56, ff. 7, 8, 9.
WRIGHT'S: pl. XXIX, ff. 374, b, c.
HOLLAND'S: pl. XXXI, ff. 21, 22.

1 ♂, May 18, 1919, Mt. Lowe, (Malcolm); 49 ♂, 21 ♀, Mar. 2, 1921, mouth San Gabriel Canyon, (Malcolm); 2 ♂, Apr. 17, 1921, Big Dalton Canyon, (Ingham); 4 ♂, Apr. 15, 1928, summit of Mint Canyon, (Friday); 178 ♂ ♀ s, Apr. 20, 1922, Fish Canyon wash, (Comstock); ♂ ♀ s, Mar. 25, 1917, Millard's Canyon, (Newcomb); 44 ♂ ♀ s, Mar. 14, 1915, Malibu Road, Santa Monica, (Haskins). Three hundred feet out in the wash at the mouth of the San Gabriel Canyon opposite the Ranger's Station is where most of this species can be taken. The road out of Azusa to the conyon's mouth is the one to take. Also many specimens have been taken near the pumping station at the mouth of Fish Canyon. Food plant—*Sedum*.

144. **Philotes sonorensis sonoralba** Wat. & Comst. (*Bull. Am. Mus.*, 42, 456, 1920)

THE WHITE SPOTTED SONORA BLUE, a transition form.

COMSTOCK'S: pl. 56, f. 14.

1 ♂, Mar. 5, 1924, San Gabriel Wash, (Comstock). A rare *sonorensis* in which the red color is replaced by white or yellow. Food plant—as for the species.

145. **Philotes sonorensis comstocki** Gun. (*Ent. News*, 36, 6, ill., 1925.

THE CLOUDED SONORA BLUE, a form.

COMSTOCK'S: pl. 56, ff. 10, 11, 15.

1 ♂, Mar. 20, 1921, Mint Canyon, (Malcolm); 1 ♂ Feb. 25, 1930, mouth of Fish Canyon, (Ingham); 1 ♂ Mar. 9, 1930, mouth of San Gabriel Canyon, (Friday). I have a series of some 20 of each sex of this form of *sonorensis*. By patiently collecting the species each year several will turn up and they are very worth while. A careful examination of Comstock's plates will show what these examples look like. Food plant—same as for the species.

146. Phaedrotes piasus catalina Reak. (*Proc. Acad. Nat. Sci. Phila.,* 244, 1866)

THE CATALINE BLUE, a race.

COMSTOCK'S: pl. 56, ff. 20, 21, 22.
WRIGHT'S: pl. XXIX, ff. 373, b. c.
HOLLAND'S: pl. XXXI, ff. 19, 20, (as sagittigera)

22 ♂ ♀ s, Apr. 17, 1916, La Canada, (Haskins); 21 ♂, 2 ♀, Apr. 30, 1929, Bouquet Canyon, (Ingham); 130 ♂ ♀ s, Mar. 12, 1923, Glendale, (Comstock). I believe the Glendale locality for this butterfly has been built over or else wiped out, as an Adventist camp meeting has been held there now for several years. Food plant—lupine.

147. Glaucopsyche lygdamus behrii Edw. (*Proc. Acad. Nat. Sci., Phila.,* 224, 1862)

BEHR'S BLUE, a race.

COMSTOCK'S: pl. 56, ff. 24, 25.

2 ♂, 1 ♀, Mar. 17, 1926, San Gabriel Wash, (Gunder). While collecting *sonorensis* in the San Gabriel Canyon Wash, one is apt to meet a few of these butterflies. I have also taken them in other canyons. The even ground color and the clear-cut round spots on the under side serve to identify the race. Food plant—probably lupine, etc.

148. Glaucopsyche lygdamus australis Grin. (*Can. Ent.,* 49, 350, 1917)

THE SOUTHERN BLUE, a race.

COMSTOCK'S: pl. 56, ff. 26, 28, 29.
WRIGHT'S: pl. XXIX, ff. 367, b. c ?

8 ♂, 4 ♀, Apr. 16, 1929, Tujunga Canyon, (Henne); 24 ♂ ♀ s, Mar. 8, 1916, Las Tunas Canyon on Malibu Road, (Haskins); 6 ♂, Apr. 11, 1927, Mint Canyon, (Friday); 2 ♂, 1 ♀, Mar. 30, 1919, Elysian Park, (Ingham). A common butterfly in the springtime. Food plant—lupines, *Lotus,* etc., etc.

149. Glau. lygdamus australis sinepunctata Comst. (*Bull. So. Cal. Ac. Sci.,* 25, 48, 1926)

THE UNSPOTTED SOUTHERN BLUE, a transition form.

COMSTOCK'S: pl. 56, f. 27.

♂ s, May 1, 1927, Mint Canyon, (Comstock). This is a variation of the species which is immaculate or nearly so on the under side. Examples in both sexes occasionally lack most of their spots. Mr. W. S. Wright should include this name in his next list of San Diego County Butterflies as Mr. Frank Morand took several this year in March at Jacumba. Food plant—lupine, *Lotus,* etc.

150. **Lycænopsis pseudariolus echo** Edw. (*Proc. Ent., Soc. Phila.,* 2, 506, 1864)

THE ECHO BLUE, a race.

COMSTOCK'S: pl. 57, ff. 6, 7, 8.
WRIGHT'S: pl. XXX, ff. 390, b, c.

35 ♂, 15 ♀, Feb. 10, 1928, San Gabriel Canyon, (Friday); 2 ♂, Mar. 20, 1921, Mint Canyon, (Malcolm); 5 ♂, June 5, 1921, San Dimas Canyon, (Malcolm); 1 ♀, May 23, 1920, Griffith Park, (Ingham). Usually one of the first butterflies of the early spring. Should be included in the San Diego List from Jacumba in March by Mr. Morand. Food plant—dogwood, *Ceanothus, Actinomaris,* etc. etc.

Superfamily HESPERIOIDEA

Family **HESPERIIDÆ**

Subfamily *PYRGINÆ*

151. **Polygonus lividus arizonensis** Skin. (*Trans. Am. Ent. Soc. Phila.,* 2, 560, 1864)

SKINNER'S ARIZONA SKIPPER, a race.

COMSTOCK'S: pl. 57, ff. 10, 11.

1 ♂, Sept. 11, 1922, Collins Ranch, Voltair, (Gunder). An exceedingly rare catch in Southern California and this is the only specimen that I know of in local collections from this territory. Food plant—unknown.

152. **Epargyreus tityris** Fabr. (*Syst. Ent.,* p. 532, 1775)

THE SILVER SPOTTED SKIPPER, a species.

COMSTOCK'S: pl. 57, ff. 12, 13.
WRIGHT'S: pl. XXXII, f. 474.
HOLLAND'S: pl. XVIII, f. 5.

1 ♂, Apr. 25, 1927, Mint Canyon, (Friday); 1 ♂, Sept. 12, 1920, Westlake Park, (Ingham). More common in the San Bernardino Mts. at the Play Grounds above the Santa Ana Control Road. Food plant—wisteria, locust, wild bean, etc. etc.

153. **Thorybes mexicana** H.-S. (*Corr. Blatt. Zoo. M. V. G.*, 23, 188, 1869)

THE MEXICAN DUSKY WING, a species.

COMSTOCK'S: pl. 58, ff. 1, 2.

2 ♀, June 15, 1919, San Dimas Canyon, (Malcolm); 1 ♂, July 4, 1929, Blue Ridge, (Malcolm). According to Mr. E. L. Bell of Flushing, N. Y. who is our American expert on "skippers," there is a strong possibility that typical *mexicana* does not fly in California, but that we have *Thorybes diversus* Bell instead; therefore these of Los Angeles County records might properly be classified under that name. Food plant—unknown.

154. **Pyrgus tessellata occidentalis** Skin. (*Ent. News*, 17, 96, 1906)

THE WESTERN CHECKERED SKIPPER, a race.

COMSTOCK'S: pl. 58, ff. 12, 13.
WRIGHT'S: pl. XXXI, ff. 457, b, c.

♂ s, Mar. 9, 1919, Glendale, (Malcolm); ♂ ♀ s, May, 1927, Van Nuys, (Friday); ♂ ♀ s, May 14, 1919, Elysian Park, (Ingham); ♂ ♀ s, Aug. 27, 1917, York Valley, (Malcolm). Very plentiful everywhere; the females are a little heavier or darker marked. Food plant—mallow, etc.

155. **Pyr. tessellata occidentalis skinneri** Gun. (*Ent. News*, 38, Feb. 1927)

SKINNER'S SKIPPER, a transition form.

COMSTOCK'S: pl. 62, f. 7.

1 ♀, July 7, 1929, Los Angeles, (Gunder). Another specimen somewhat less developed is also in Mr. Friday's collection. Food plant—as for the typical species.

156. **Pyrgus ericetorum** Bdv. (*Ann. Soc. Ent. Fr.*, (2), 10, 313, 1852)

THE LARGE WHITE SKIPPER, a species.

COMSTOCK'S: pl. 58, ff. 14, 15, 16.
WRIGHT'S: pl. XXXI, ff. 456, b, c.

22 ♂, 4 ♀, June 9-23, 1927, Pine Canyon, (Friday); 2 ♂, Apr. 6, 1919, Bouquet Canyon, (Malcolm); ♂ s, Apr. 16, 1928, Swartout Valley, (Comstock); ♂ ♀ s, Aug. 13, 1929, Arroyo Seco, (Comstock). It seems difficult to secure many females of this species. Food plant—bush-mallows.

157. **Pholisora alpheus** Edw. (*Trans. Am. Ent. Soc.*, 5, 206, 1876)

THE ALPHEUS SOOTY WING, a species.

COMSTOCK'S: pl. 58, ff. 19, 20.
WRIGHT'S: pl. XXX, 407, b.
HOLLAND'S: pl. XLX, f. 2.

2 ♂, May 19, 1924, Lancaster, (Gunder). My series of this species was taken about Apr. 9-11, at Yuma. Also some at Brawley and some near Victorville. It is almost exclusively a desert butterfly and has been taken as far north as northern Nevada.

158. **Pholisora libya** Scud. (*Bull. U. S. Geol. & Geog. Surv.*, 4, 258, 1878)

THE MOHAVE SOOTY WING, a species.

COMSTOCK'S: pl. 58, ff. 22, 23, 24.
WRIGHT'S: pl. XXX, ff. 406, b, c.
HOLLAND'S: pl. XLVIII, f. 14.

♂ ♀ s, June 16, 1925, Collin's Ranch, Voltair, (Gunder). The majority of my specimens were collected in a small alfalfa field in the town of Indio, San Bernardino County, on Oct. 15, 1921; however I have specimens from northern Utah and Nevada. Some can always be netted on alfalfa at Olancha in Inyo County as well. Food plant—unknown.

159. **Pholisora catullus** Fabr. (*Ent. Syst.*, 3, (1), 348, 1793)

THE SOOTY WING, a species.

COMSTOCK'S: pl. 58, ff. 25, 26, 27.
WRIGHT'S: pl. XXX, ff. 403 (as 404), a.
HOLLAND'S: pl. XLV, f. 4.

1 ♂, Apr. 4, 1920, Griffith Park, (Ingham); ♂ s, Apr. 6, 1919, Bouquet Canyon, (Malcolm); ♂ s, Feb. 20, 1899, Pasadena, (Comstock); ♂ ♀ s, Apr. 22, 1928, Swartout Valley, (Comstock). A fairly common little jet-black skipper. Food plant—*Chenopodium, Amaranthus, Ambrosia, Monarda.*

160. **Erynnis lacustra** Wri. (*Butt. West Coast*, 253, 1905)

WRIGHT'S DUSKY WING, a species.

COMSTOCK'S: pl. 59, f. 1.
WRIGHT'S: pl. XXXII, ff. 480, a.

1 ♂, Apr. 22, 1928, Swartout Valley, (Comstock); ♂ s, June 7, 1903, Mt. Wilson, (Comstock). This is considered one of our rare western skippers. I believe it can be acquired in quantity in the Laguna Mountains in eastern San Diego County. Food plant—unknown.

161. Erynnis persius afranius Lint. (*30th. Rept. N. Y. St. C. N. H.*, 175, 1878)

THE AFRANIUS DUSKY WING, a race.

COMSTOCK'S: pl. 59, ff. 2, 3, 4.

♂ ♀ s, Mar. 1, 1925, San Gabriel Canyon, (Comstock). Not many helpful references seem available for these dark skippers because they are difficult to identify. Food plant—willow, poplar, clover.

162. Erynnis callidus Grin. (*Ent. News*, 15, 114, 1904)

THE ARTFULL DUSKY WING, a species ?

COMSTOCK'S: pl. 59, ff. 7, 8.

♂ ♀, June 6, 1903, Mt. Wilson, (Grinnell). Since Mr. Grinnell took the types, no one seems to have looked "on the summit in the hot sunshine around Ceonothus and scrub-oak" for this butterfly. The synonymy of this group of dark skippers is not so well worked up. Food plant—unknown.

163. Erynnis propertius Scud. & Burg. (*Proc. Bost. Soc. Nat. Hist.*, 13, 298, 1870)

THE PROPERTIUS DUSKY WING, a species.

COMSTOCK'S: pl. 59, ff. 12, 13, 14.
WRIGHT'S: pl. XXXII, f. 463.

♂ s, Apr. 17, 1921, Big Rock Creek, (Malcolm); ♂ ♀, Mar. 21, 1926, Millard's Canyon, (Comstock); ♂ ♀, June 1, 1921, San Gabriel Canyon, (Comstock). Fairly common. Food plant —unknown as yet.

164. Erynnis funeralis Scud. & Burg. (*Proc. Bost. Soc. Nat. Hist.*, 13, 293, 1870)

THE FUNEREAL DUSKY WING, a species.

COMSTOCK'S: pl. 59, ff. 16, 17, 18.
WRIGHT'S: pl. XXXII, f. 468.
HOLLAND'S: pl. XLVIII, f. 12.

10 ♂, 8 ♀, Feb. 28, 1917, San Gabriel Canyon wash, (Friday); ♂ s, Oct. 7, 1916, Eagle Rock, (Malcolm); 1 ♂, Apr. 13, 1919, Elysian Park, (Ingham); ♂ s, June 5, 1930, Griffith Park, (Henne). A common butterfly everywhere. Food plant—burr-clover, *Hosackia,* etc.

Subfamily *HESPERIINÆ*

165. Copæodes aurantiaca Hew. (*Desc. Hesp., 2,* 45, 1868)

HEWITSON'S SKIPPER, a species.

COMSTOCK'S: pl. 60, ff. 3, 4, 5.
WRIGHT'S: pl. XXX, ff. 411, b, c.
HOLLAND'S: pl. XLVIII, f. 9 (as procris).

1 ♂, May 19, 1924, Lancaster, (Gunder); ♂ ♀, June 16, 1925, Collin's Ranch, Voltair, (Gunder). I have also taken this little gold skipper at Indian Wells and Olancha in Inyo County; however they are more plentiful at Palm Springs and from there south through Imperial Valley. There are always some along the irrigation ditches in Imperial County. Food plant—salt grass.

166. Hesperia juba Scud. (*Peabody Acad. Sci.,* 4th Rep., *77,* 1872)

THE JUBA SKIPPER, a species.

COMSTOCK'S: pl. 60, ff. 16, 17, 18.

♀, June, 1916, York Valley, (Malcolm); ♂ ♀ s, June 12, 1922, Bouquet Canyon, (Gunder). In typical *juba* the dark maculation extends inward along the submedian vein on the upper sides of the primaries. This is not so well shown in Comstock's figures. Food plant—unknown.

167. Hesperia ruricola Bdv. (*Ann. Soc. Ent. Fr.,* (2, 10, 315, 1852)

THE RUSTIC SKIPPER, a species.

COMSTOCK'S: pl. 61, ff. 1, 2, 3.

3 ♂, May 13, 1928, Mint Canyon, (Friday); 4 ♂, 3 ♀, June 6, 1920, Bouquet Canyon, (Malcolm); ♂ ♀ s, June 21, 1923, Ridge Route, (Comstock). Fairly common. Food plant—unknown.

168. Hylephila phyleus Dru. (*Ill. Exot. Ent.*, 1, 25, pl. XIII, ff. 4-5, 1770)

THE FIERY SKIPPER, a species.

COMSTOCK'S: pl. 61, ff. 4, 5, 6.
WRIGHT'S: pl. XXXI, ff. 437, 438, males only.
HOLLAND'S: pl. XLVI, ff. 18, 19.

♂ ♀ s, June 24, 1919, July 14, 1918, Aug. 8, 1917, York Valley, (Malcolm). This butterfly can be netted both in the gardens and canyons. Food plant—grasses.

169. Ochlodes sylvanoides Bdv. (*Ann. Soc. Ent. Fr.*, (2), 10, 313, 1852)

THE WOODLAND SKIPPER, a species.

COMSTOCK'S: pl. 61, ff. 7, 8, 9.

♂ ♀ s, Aug. 28, 1922, Arroyo Seco, Pasadena, (Gunder); ♂ ♀ s, July 16, 1921, Mt. Wilson, (Gunder). Not a difficult skipper to secure in series. Food plant—grasses.

170. Ochlodes nemorum Bdv. (*Ann. Soc. Ent. Fr.*, (2), 10, 314, 1852)

THE FOREST SKIPPER, a species.

COMSTOCK'S: pl. 61, ff. 10, 11, 12.

8 ♂, 3 ♀, May 7, 1927, Chatsworth, (Friday); 8 ♂, June, 1927, Dark Canyon, (Malcolm); ♂ ♀ s, June 12, 1921, Griffith Park, (Comstock). The purple markings on the under sides of the secondaries of this species vary a great deal, some being quite dark and others fading into the background color. The examples which are very light, with hardly any design on the under sides, may be called form *pratincola* Bdv. See Comstock's pl. 61, f. 13. Food plant—grasses.

171. Ochlodes agricola Bdv. (*Ann. Soc. Ent. Fr.*, (2), 10, 314, 1852)

THE RURAL SKIPPER, a species.

COMSTOCK'S: pl. 61, ff. 14, 15, 19.

6 ♂ ♀, Aug. 14, 1911, Mt. Wilson, (Haskins); ♂ ♀ s, June 12, 1917, Griffith Park, (Comstock). As common as the preceding species. Look around the flowers in your garden. Food plant—probably grasses.

172. **Polites sabuleti** Bdv. (*Ann. Soc. Ent. Fr.,* (2), 10, 316, 1852)

THE SANDHILL SKIPPER, a species.

COMSTOCK'S: pl. 61, ff. 24, 25, 26.
WRIGHT'S: pl. XXXI, ff. 440, b, c.
HOLLAND'S: pl. XLVII, ff. 42, 43.

♂ s, Apr. 27, 1921, Big Rock Creek, (Malcolm); 2 ♂, 1 ♀, spring of 1916, York Valley, (Malcolm); ♂ ♀ s, May 27, 1925, San Gabriel Mts., (Comstock). Fairly common. Food plant—grasses.

173. **Atalopedes campestris** Bdv. (*Ann. Soc. Ent. Fr.,* (2), 10, 316, 1852)

THE FIELD SKIPPER, a species.

COMSTOCK'S: pl. 62, ff. 1, 2, 3.
WRIGHT'S: pl. XXXI, ff. 435, b, c, cc.
HOLLAND'S: pl. XLVI, ff. 4, 5(?) as huron.

♀, July, 1916, York Valley, (Malcolm); ♂ ♀ s, Apr. 12, 1920, Los Angeles, (Comstock); ♂ ♀ s, Aug. 11, 1920, Pasadena, (Comstock). Abundant. Food plant—grasses.

175. **Poanes melane** Edw. (*Trans. Am. Ent. Soc.,* 2, 312, 1869)

THE UMBER SKIPPER, a species.

COMSTOCK'S: pl. 62, ff. 8, 9.
WRIGHT'S: pl. XXXI, ff. 453, b, c.

2 ♂, 2 ♀, Apr. 20, 1928, Dalton Canyon, (Friday); 4 ♂, 2 ♀, Apr. 1, 1929, San Gabriel Canyon, (Friday); 1 ♂, Apr. 10, 1921, Los Angeles, (Comstock); 1 ♂, May 31, 1920, Griffith Park, (Comstock). Never seemingly abundant in one locality, but may be had, several at a time, each year. Food plant—unknown.

176. **Calpodes ethlius** Cram. (*Pap. Exot.,* 4, 212, pl. CCCXCII, ff. a-b, 1782)

THE BRAZILIAN SKIPPER, a species.

COMSTOCK'S: pl. 62, f. 24.
HOLLAND'S: pl. XLV, f. 3.

♂ ♀ s, Sept. 12, 1924, west of Huntington Park, L. A., (Schrader). Mr. Schrader found a patch of larva and bred these specimens, so it may be inferred that the species is becoming established in California. Food plant—canna.

177. **Prenes errans** Skin. (*Ent. News,* 3, 174, 1892)

THE WANDERING SKIPPER, a species.

COMSTOCK'S: pl. 62, ff. 18, 19, 21.

♂ ♀ s, Aug. 15, 1920, Santa Monica, (Comstock). Found along the sea coast. Food plant—a species of grass or sedge, occurring near the ocean.

Family **MEGATHYMIDÆ**

178. **Megathymus yuccæ navajo** Skin. (*Ent. News,* 22, 300, 1911)

THE NAVAJO SKIPPER, a race.

COMSTOCK'S: pl. 62, f. 25.

2 ♂, 2 ♀, Mar. 17, 1928, Little Rock, (Friday); 1 ♂, Apr. 22, 1928, Swartout Valley, (Comstock); 1 ♂, Apr. 16, 1927, east of Little Rock, (Garth). Most of the local men have caught this skipper in the first low range of hills south of Little Rock about 3 blocks west of the new school building. While looking for other spring butterflies, one may be lucky and see a specimen sitting on a yucca root. They are easily frightened and should be captured on the first swing. Food plant—yucca, undoubtedly.

Editor's Note: The above paper was issued as a separate, without authorization, prior to the publication of this issue of the "Bulletin." This will explain the correction of several typographical errors which occurred in the "separate," and will also fix the date of publication for Mr. Gunder's three new forms as of August 6th, 1930, rather than the slightly later date of issuance of this number of the "Bulletin." The pagination of this publication bears no relation to the unauthorized separate.

ON THE FLORA OF THE TEHACHAPI MOUNTAINS, CALIFORNIA*

H. L. BAUER
University of Southern California

The Tehachapi Mountains, a short low range, separate the Mohave Desert from the Upper San Joaquin Valley and connect the Sierra Nevadas with the Coast Ranges. The lowest passes are about 4,000 and the highest peaks about 8,000 feet in elevation. The San Joaquin Valley to the north stands about 500 and the Mohave to the south about 3,000 feet above sea level. This range is the only mountainous connection in California between the two great systems of mountains, except the connection formed by the Siskiyou Mountains in the extreme northern part of the state. It is likely, therefore, that the Tehachapis serve as a path of migration for the mountainous species and as a barrier to the migration of some of the desert species. So far as the writer has been able to ascertain no general systematic account of the flora of this region appears to have been published, its investigation apparently being limited to reports of incidental collecting.

The area investigated included not only the mountains but also contiguous portions of the desert at their bases. The vegetation may be classified into five distinct associations; viz. (1) desert, (2) woodland, (3) conifer forest, (4) grassland, and (5) chaparral. Completeness for the list of species is not claimed. Doubtless many species that do occur in the area were not encountered and some of these are probably of significance. However, on the assumption that the species actually found are a fair representation of the entire flora, some computations can be made that are of sufficient accuracy to be of interest.

The species collected† represent 69 families and 239 genera. Table 1 deals with several of the larger families.

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* The work reported in this paper is part of a more extensive investigation conducted under the direction of Dr. H. de Forest, Department of Botany, University of Southern California.

† Most of the specimens collected are in the herbarium of the University of Southern California, Los Angeles. Others are in the herbarium of the Kern County Junior College in Bakersfield, California.

TABLE 1. Number of genera and species in the larger families of the Tehachapis

FAMILY	GENERA	SPECIES
Compositae	54	81
Leguminosae	12	28
Gramineae	17	24
Polygonaceae	4	16
Liliaceae	8	14
Cruciferae	14	16
Chenopodiaceae	8	14
Onagraceae	7	11
Solanaceae	4	11
Labiatae	7	10
Polemoniaceae	3	9

This table shows that three families, out of a total of 69, contain one-third of all the species and also one-third of the genera. More than half of all the species is included in the 10 larger families. The *Compositae* alone comprise over 20 per cent of all the species. Twenty-nine families are represented by a single genus and of these twenty-two have but a single species.

TABLE 2. Genera containing the larger number of species

GENUS	NUMBER OF SPECIES
Eriogonum	10
Atriplex	7
Quercus	7
Astragalus	6
Pinus	5
Linanthus	5

These six genera constitute less than 10 per cent of the total number of species. Thus the species of the Tehachapis are scattered through many genera rather than concentrated in a few.

TABLE 3. Growth form and life habit of plants in the Tehachapi area

	PER CENT
Annuals	35
Herbaceous perennials	36
Woody plants, except trees	20
Trees	9

The abundance of annuals is one of the striking features of the Tehachapi flora. They constitute about half of the herbaceous plants and about one-third of all the species encountered. These annuals are, for the most part, to be found in the lower foothills and gentle slopes near them, and are definitely related to the climatic and soil conditions in these localities. Many of them are ephemeral only, growing and maturing their seed in a comparatively short time in the early spring.

Adventive species play a conspicuous part in the flora. They are most noticeable on the more fertile soils near the cultivated areas, chiefly as "weeds." In some places the adventives have greatly modified the character of the native vegetation, crowding it out and dominating it to a marked degree. A count shows that about 17 per cent of all the species found, regardless of the altitude or conditions of growth, are not indigenous to California. About 25 per cent of the plants listed as "new arrivals" are species that have been introduced into the state. This suggests the ease with which the foreign invaders migrate and the success with which they compete with the native forms.

A few of the species encountered are of such interest as to merit special comment. These include several new forms, the complete descriptions of which have not as yet been published, several species that are not listed in the manuals covering the region, and twenty-four species that are new arrivals in the Tehachapi area, or at least do not appear to have been previously reported from there. This is based on the ranges as given in Jepson, W. L. "Manual of the Flowering Plants of California," 1925.

Adenocaulon bicolor Hook.* A few specimens were found at an elevation of about 5,000 feet.

Atriplex rosea L. Growing near Tehachapi Pass.

Bassia hyssopifolia. Not listed in Jepson's Manual. An extremely common weed near cultivated portions of the area. Observed later growing abundantly in Los Angeles County. So far as the writer knows it has been reported in California only once before—from Merced County. According to Tietstrom's Flora of Utah and Nevada it is common around Fallen, Nevada.

* All plant names according to W. L. Jepson, "A Manual of the Flowering Plants of California," 1925.

Ceanothus diversifolius Kell. Not common.

Chaenactis fremontii Gray. Growing abundantly in the foothills near the station of Bena.

Centaurea solstitialis L. Collected near Tehachapi.

Cordylanthus mollis Gray var. viridis Jepson. A new variety. The flowers are borne in spikes 6 to 10 inches and have calyces of a bright green color. The species not known before outside of the salt marshes near San Francisco Bay and its arms. Found growing abundantly in places of high alkali concentration about 15 miles southeast of Bakersfield.

Dodecatheon hendersonii Gray. Not rare in the foothills.

Eastwoodia elegans Brandegee. Not listed in Jepson's Manual; published as a new species in Zoe, Vol. 4, pp. 397-8, 1893-4. Growing rather abundantly along the roadside through the foothills about 20 miles southeast of Bakersfield.

Erigeron linifolius Willd. A weed near cultivated areas.

Eriodictyon californicum Greene. Not uncommon at middle elevations.

Eriogonum virgatum Benth var. rubidum Jepson. A new variety. The flowers are of a deep red or crimson color. Growing abundantly on the grassy slopes at altitudes of from 3,000 to 5,000 feet.

Gayophytum diffusum T. & G. Collected on Breckenridge Mountain at an altitude of about 5,500 feet.

Layia douglasii H. & A. Found in the foothills.

Lessingia germanorum Cham. Collected in Antelope Valley.

Lycopus americanus Muhl. Collected along irrigation ditches south of Bakersfield.

Mentha spicata L. Common along ditch banks.

Mimulus kernensis Jepson. A new species. A low form with small yellow flowers. Found growing rather abundantly in a rather dry open space in the conifer forest on Breckenridge Mountain at an altitude of about 6,000 feet.

Mimulus tricolor Hartw. Collected at elevations of about 6,000 feet.

Pentstemon heterophyllus Lindl. var. azureus Jep. Collected on Breckenridge Mountain at an altitude of about 4,500.

Salix sessilifolia Nutt. var. leucodendroides Schn. Streamsides at lower elevations.

Solanum elaeagnifolium Cav. Collected in the town of Mohave and also near Bakersfield.

Suaeda suffrutescens Wats. A common weed in alkaline areas near Bakersfield.

Trifolium olivaceum Greene. Found near Caliente.

HORSFORDIA ALATA Gray

A New Record for U. S.

Dr. A. Davidson

This plant was discovered by Mrs. Ben L. Clarey of Coral Reef Ranch, Coachella, who supplies the following note.

"This was collected on Dec. 1, 1929. It was found growing in an isolated desert wash near the old water line of Salton Sea at a point where the wash opens out from a narrow rugged canyon. This canyon is about 12 miles southwest of Coachella near the approximate junction of the San Jacinto and Santa Rosa mountain ranges.

"Several groups of these plants were found growing up under and through the branches of Palo Verde trees, (*Cercidium torreyanum*). They ranged in height from one to eleven feet. Heavy rains during August and September had a marked effect upon these plants. In a section, characterized by the sparseness of the foliage of plant life it was most startling to come upon this luxuriant vegetation. Many of the leaves at this season were three to four inches in length. The whole effect was that of a small oasis of tropical undergrowth in the desert.

"When first seen the plants had apparently passed the peak of their blooming though some blossoms were seen as late as May. They seeded profusely throughout this period. There are probably seventy-five or more plants extending a distance of about three hundred feet down the wash."

Mr. Ivan Johnstone who identified the plant adds the following note:

"I have examined the specimen of *Malvaceae* which you mentioned in your letter of March 28th. This material is of uncommon interest and appears to represent the first evidence of the occurrence of *Horsfordia alata* (Wats.) Gray, not only in California, but in the United States. The species has been known heretofore from the middle sections of the peninsula of Lower California and from the northwestern portions of Sonora. Your discovery of it on the western side of the Colorado Desert is, accordingly, most surprising. Exploration made along the western side of the Colorado Desert has revealed from time to time various species known previously only from Sonora and Lower California; another case similar to yours is the occurrence of *Bursera microphylla*."

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SHELLS USED BY THE INDIANS IN THE VILLAGE OF MUWU

By Arthur Woodward

Scattered along the bays and headlands of the Southern California coast are numerous deposits of shell, fire blackened earth, stone, bone, and shell artifacts and animal bones, the only visible evidences of the once populous Indian villages that once stood upon such sites.

It is from such deposits that we draw forth by means of the trowel and whisk broom, the scattered bits of evidence which, when fitted together, present a fairly accurate cross section of the lives of the ancient inhabitants.

It would seem that wherever man has come in contact with the ocean he has left his traces in such shell heaps. They are not peculiar to California alone. Similar deposits are found from Maine to Tierra del Fuego and from Chile to Alaska. It is from the sea that man draws most easily his most plentiful supply of food stuffs. However, since lack of space prohibits a general discussion of such shell or kitchen middens, as they are frequently termed, we shall concentrate our attention on one site.

From September to the fore part of November, 1929, the Van Bergen-Los Angeles Museum Field Party excavated on the site of the ancient Chumash or Canaliño village of Muwu (spelled variously as Muwu, Mugu, Magu). This village site is situated on the eastern shore of a quiet, land-locked lagoon, just north of Pt. Magu, on the east side of the Roosevelt Highway, some fifty miles north of the city of Santa Monica and ten miles south of Oxnard.

The major portion of the village had a frontage of some three hundred yards and a depth of perhaps two hundred yards. In ancient times a few scattered dwellings may have been erected almost at the water's edge, but the bulk of the population lived on higher ground within the sheltering arms of the two projecting points of hills that jut out on the north-west and south-eastern sides of the village, forming as it were the tips of an irregular crescent. Here the round, half-orange shaped, thatched dwellings averaging nineteen to twenty one feet in diameter were ranged haphazardly without any seeming semblance of orientation.

Hundreds of feet of trenches, four feet in width and ranging from six inches to eight feet in depth, depending upon the thickness of the midden were driven through the heavy camp debris and thousands of bone, shell and stone artifacts were recovered therefrom.

In the September-December, 1929 issue of the Bulletin an account was given of the shell fish hooks used by the Chumash peoples.[1] In this paper we shall discuss the further uses of shells among the same Indians.

Primarily of course, shell fish of various species served as the main sources of the food supply of these coastal inhabitants. Naturally, the abundance or lack of certain species of shells in the vicinity of the villages indicates to the archaeologist the relative state of affairs in such villages. If the shells of the abalone, clam, mussel, etc., the larger food shells used, are found to predominate, the inference is that the villagers were comparatively well off, and when the bones of sea and land mammals are found in great quantities mingled with the shells, then indeed was that village fortunately situated. Such a village was Muwu.

The shell and bone deposit at Muwu was quite heavy. There were instances when the workmen trowelled through solid layers of cockle shells, unmixed with earth or other debris, evidently the remains of ancient feasts or a heavy catch prepared for future use.

An examination of the shells encountered and a classification of them has yielded an interesting fact. Of the eighteen species identified, fifteen were the most useful in one way or another. Of these fifteen varieties, eight were probably used primarily for food, the empty shells of some being used secondarily as ornaments, receptacles, etc., and of the remaining seven utilized, five had little value as food and were used primarily as ornaments. Eight of the main type shells were encountered only in land locked bays or quiet waters of open bays. Consequently it would appear that the inhabitants of Muwu did not have to range far from home for the bulk of their sustenance, and judging from the depth of the deposit in certain areas, this village had been inhabitated for a great period of time. Evidences of Spanish contact, small glass beads, copper spike, bits of blue and white Majolica, etc., were encountered at various places on the site, but all within the first two feet of the deposit. The remaining depth from two to six feet of closely packed shell and earth were free of such intrusive cultural traces.

As in all localities where shell fish are abundant, certain type shells are valued more highly than others for certain purposes.

The most useful shellfish found along the southern coast was the abalone. The Black Abalone is the most plentiful in this region and at Muwu the younger shells of this species were encountered quite frequently. On the average the shells found were about two years old, the smaller shells apparently being more in favor

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1. Woodward, Shell Fish Hooks of the Chumash, Bulletin of the Southern Calif. Academy of Sciences, Vol. XXVIII, Sept.-Dec. 1929, Pt. 3, pp. 41-46.

than the older, heavier ones. The smaller abalone shells, ranging from three to four and one half inches in width find favor with most tribes who use them, for example, the Zuni, Hopi and Navajo, who when offered a choice between a large, heavy, full grown abalone six to six and a half inches in width, and the smaller sizes, will almost invariably choose the lighter, smaller shells. The people at Muwu followed the usual Canaliño custom of using the shells as scoops and paint receptacles.

When the shells were used for such purposes, the apertures along the side were plugged with tar and often the lips of the shells used as scoops are worn, giving definite evidence of such usage.

Often these receptacles were used to hold hot tar or paint and when found, both substances are encrusted on the inner surfaces. In several instances the shells were almost filled with masses of hardened bitumen. A film of red paint frequently coats the nacreous basins of those shells which served as primitive palettes and there have been instances when abalone shells filled with dry paints were encountered in graves.[2]

The iridescent brilliance of the interior of the abalone made it a prime favorite with the Indians as a source of supply for the larger ornaments, inlay work and fish hooks.

Oddly enough however, it does not seem to have commanded a high trade value. Even today, although abalone shells are appreciated, it is the smaller, less gaudy shells that are most acceptable and more extensively used in the manufacture of ornaments by those tribes, mentioned in a foregoing paragraph. The appearance of abalone shell ornaments in prehistoric graves in the Southwest is quite rare when compared to the numerous examples of jewelery manufactured from other, plainer species of shell. I speak now of the interior regions where shells from the coast and the Gulf of California penetrated, including Arizona, Nevada, New Mexico, Utah and Colorado.

At Muwu, the types of abalone shell ornaments encountered were of the variety more or less common to the entire southern Canaliño group. Quantities of such ornaments in varying forms have been uncovered on the Channel Islands, San Miguel and San Nicolas, have yielded hundreds, perhaps thousands of such items.[3]

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2. Heye, Geo. G., Certain Artifacts from San Miguel Island, California, Museum of the American Indian, Heye Foundation, N. Y., 1921, Pl. LXXIV.
3. Ibid, pp. 117-137.

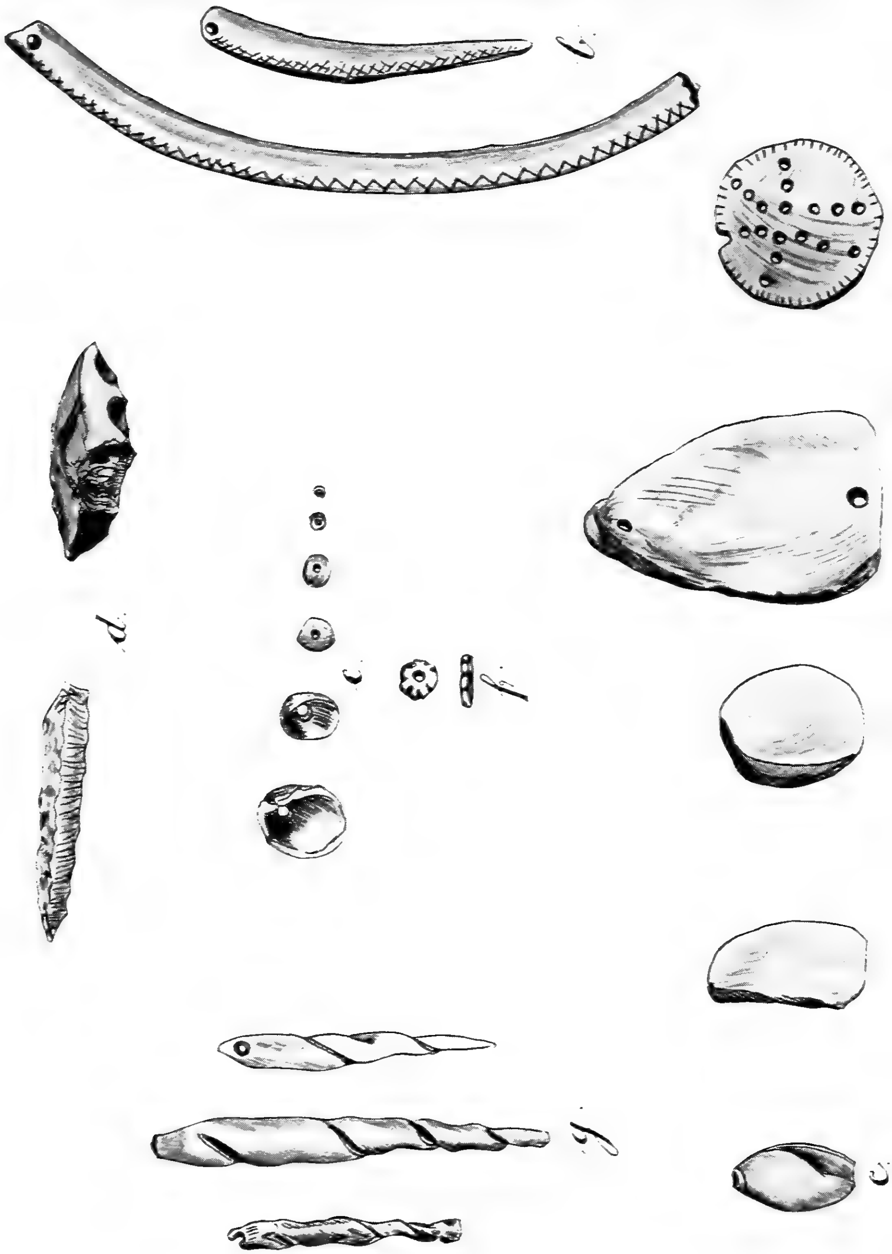

PLATE 24

Shell ornaments from the Indian village of Muwu.

Illustrations by Arthur Woodward.

These ornaments were manufactured from various portions of the abalone shell. The greater part of the pendants, earrings, beads, etc., were fashioned from thin sections of the body of the shell. The shells were apparently broken with hammerstones and the thin plates then rubbed down to the required shapes on smooth sandstone slabs, after which they were drilled and incised. Two examples of ornament blanks and two complete ornaments of this type are shown in Plate 24, Fig. A. Another form of ornament was fashioned from the heavy inner rim of the shell. Two long, curving pendants of this type are depicted in Plate 24, Fig. B. One edge of the pendant is decorated with a series of fine cross hatched lines. These lines have been filled with tar to make the ornamentation stand out in black relief against the shimmering background. There was a dearth of small beads fashioned from abalone at Muwu, and as a matter of fact, while the inlay work on stone and bone artifacts is generally of small worked fragments of abalone shell, small abalone beads are never encountered as frequently as those manufactured from the olivella, clam, etc.

In the fabrication of small beads the shell most commonly used was the *Olivella biplicata,* Plate 24, Fig. C, which is found in great profusion along the California beaches. This small shell has been in great demand among the Indians of the entire Southwest for many centuries.

It is used extensively among the Hopi and Zuni today. However, owing to the tediousness of gathering these shells and the low prices paid by dealers for them, shell collectors are not willing to gather the olivella in quantities. Consequently the Indians are finding it more difficult to obtain the light colored olivellas, which they prefer to purple or dark olivella and strands of good shell beads are increasingly hard to secure. Substitutions have been tried but none are as satisfactory as the familiar olivella.

In making olivella shell beads, the ancient Canaliño artisan apparently followed the same, or approximately the same process as that used by the modern Indian bead maker. At any rate, an examination of the olivella blanks, broken shells and rejects as well as partly finished and finished beads from a Zuni bead maker's collection and a comparison of this material with similar material recovered from Muwu reveals a striking similarity.

The first process in shell bead making is the removal of the outer lip of the olivella with a pair of nippers. In ancient times this was done either with a rock or a pair of wooden nippers, today it is done with steel pincers. By the time all of the useable sections of the shell are removed nothing is left but the small, hard, twisted columella, which being too small and too difficult to handle is thrown away. In a fire pit at Muwu the author found a double handfull of these discarded columellae, as clean as the day they had been broken. Among them was one, roughly shaped, drilled bead.

The second step is the drilling of the larger pieces. At Muwu this was apparently accomplished by the use of small stone drills of two main types; see Plate 24, Fig. D. The most common type drill was the short, chunky, plummet shaped tool, usually made of chert or quartz. The other was more slender, roughly triangular in shape and more neatly made. A third drill was also used, a thin, slender flake of chert usually retouched along the edge and point. The points of the majority of these drills found, show decided wear, but experiments conducted with them on fragments of fresh shell produced the same type drill holes seen in the shell ornaments found in the camp debris.

It is also possible that in ancient times, some of the very fine holes were made with small spindles of hard wood and some fine abrasive. Experiments conducted in modern times have shown that a hard wood spindle and dry sand will drill a small hole five inches in depth in catlinite within a period of three hours. In this case however, a pump drill was used.[4]

As a rule the primitive workman drilled about half way through his blank, then reversed the shell and drilled through from the opposite side. Sometimes the holes met exactly and again they did not. The reason for this procedure was, that when shell becomes hot, under pressure it is likely to crumble and break. Professional manufacturers of shell wampum in the New Jersey factories in the 18th and 19th centuries recognized this fact and either drilled the shell beads under water or kept water dropping around the steel drill points to keep the shell from breaking.[5]

The holes produced by the stone drills are funnel shaped, tapering as they approach the center. The sides of these holes show minute striations produced by the irregular projecting tips of chert on the sides of the drill.

As the drills became worn they needed retouching and each retouching process left them shorter and blunter until they finally lost their usefulness and were discarded. Each time a new drill point was inserted the bottom portion of the hole became smaller, the diameter varied accordingly and the striations were irregular. Beads of shell or stone, drilled with tubular drills of bone or cane and fine abrasive show clean cut, straight holes of one diameter, which when polished with usage appear, superficially at least, similar to steel drilled holes. However, even in such drill holes, close examination under a microscope reveals plainly the minute striations caused by the fine grains of the abrasive.

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4. Holmes, W. H., Bulletin 60, Pt. 1, Bureau of American Ethnology, pp. 356-357.
5. Westervelt, F. A., Wampum Industry in Bergen County, Papers and Proceedings, Number 12, 1916-1917, Bergen County Historical Society, pp. 20-38.

An interesting comparison in drill holes came to light in an examination of certain shells and ornaments extracted from the debris of Muwu. Two or three specimens of carpet shell cockles (*Paphia staminea*—Conrad) as well as fragments of these shells were found with neat, tapering drill holes at the apex of the hinge, drilled from the outside. The holes were in the same place an Indian would place them if he were drilling the shell for use as a pendant. However, a closer inspection of the drilling reveals the fact that the hole, while tapering and bearing a close resemblance to the stone drilled perforations in the ornaments, differed in two ways. The striations on the sides of the hole were a bit more regular and in some instances gave the appearance of being undercut, again, where the hole broke through on the under side the perforation was clean cut. The drilling tapered from one side only.

According to Mr. Howard Hill, field man in conchology at the Los Angeles Museum, such holes are made by certain univalves such as the Channeled Whelk (*Alectrion fossata*—Gould) and the Southern Moon Shell (*Polinices recluziana*—Deshayes). These cannibalistic shellfish fasten themselves on their less fortunate brethren, drill through the shells with their tongues and feed upon the bodies of the creatures inside.

Consequently, not all shells or fragments of shells found on Indian village sites showing drill holes can be attributed to Indian workmen. A careful examination of each drilled shell should be made by students of archaeology before classifying it as an artifact.

After the shell fragments were drilled they were probably strung upon cords of sinew or native fiber and the entire lot rubbed back and forth on some smooth, gritty stone slab, preferably fine grained sandstone. In this way all of the beads would be reduced in equal proportion to the same size. Large beads and pendants, allowing a purchase with the fingers were no doubt rubbed down individually. In fact an examination of almost any abalone pendant will serve to show the cross hatching of striations that have come from rubbing in various directions.

The olivella beads were made in an infinite number of sizes. Some were left in the rough in two or three sizes, similar to the first two of the series shown in Plate 24, Fig. E. Others were worked down to smaller beads varying from one quarter of an inch in diameter to tiny specimens one sixteenth of an inch in diameter. Approximate sizes of these beads are shown in the same series. The beads one sixteenth of an inch in diameter average about thirty four or five to the inch when strung.

One might think that the labor entailed in reducing the fragments to beads a quarter of an inch and less, would be sufficient to deter the artisan from incurring any more work in the manufacture of the ornaments but the fact remains that in several instances beads of this size have been found with the edges and peripheral margins of the upper surfaces cut with tiny incisions which in turn were filled with tar. The effect was that of a small flower. A top and side elevation of such a bead is shown in Plate 24, Fig. F.

A simple form of bead was manufactured from the *olivella* by simply grinding off the apex of the shell thus making an aperture through which a cord might be passed. This was a common and wide spread method of utilizing the entire olivella shell. Fanciful effects could be obtained even with such a simple bead.[6] The shell shown in Plate 24, Fig. C has been prepared to make such a bead.

Odd pendants were fashioned from the columellae of the Moon Shell and possibly other univalves having a columella of sufficient thickness. The outer lips of the shell were broken off and the columella trimmed to a neat, tapering spindle. The spiral grooves of the shaft were a natural ornamentation and this effect was heightened when the grooves were filled with tar. Perforations were made at the thick end as a rule. Plate 24, Fig. G shows three pendants of this type.

No specimens of bone inlaid with shell were found at Muwu although numerous examples have been recovered from the Channel Islands and other village sites on the mainland. As far as the author knows, none of the wooden bowls inlaid with shell, mentioned in the diaries of the early Spanish explorers from this section of the coast have been found although other wooden objects, tapering wands inlaid with shell and having rock crystal or stone blade inserts have been discovered in caves and are on exhibition in museums in New York and San Diego.

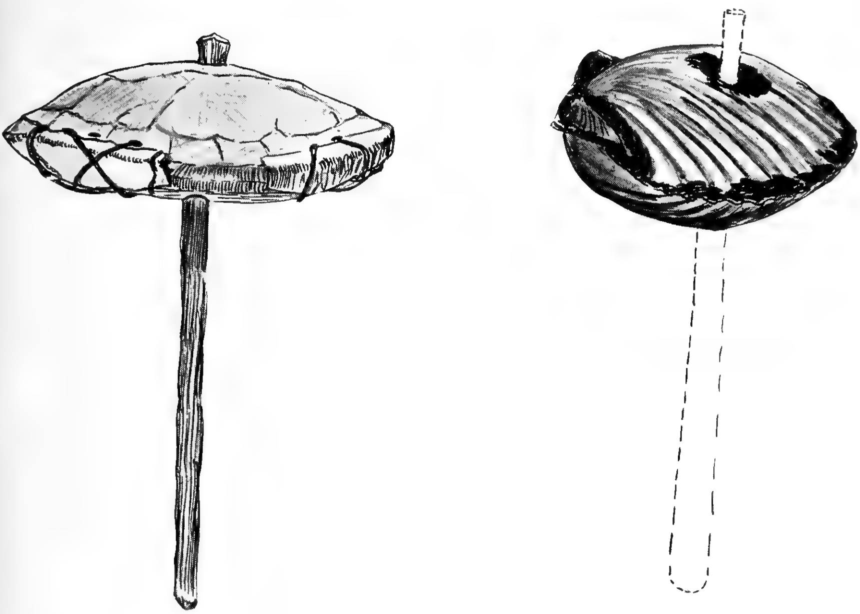
A rather unique pecten shell rattle composed of two halves of the Speckled Pecten (*Pecten circularis aeqisulcatus*—Carpenter) was found, minus the wooden or bone handle and half of another one.

The two shells were cemented together with bitumen, holes drilled in the sides to permit passage of the handle, which in turn was likewise cemented in place with tar. Small pebbles had been placed inside and although the handle was missing these tar stained stones were still in place when the rattle was found.

The method of mounting the rattle is strongly suggestive of the manner in which the Diegueño of San Diego County mounted

6. Orchard, W. C., Beads and Beadwork of the American Indians, Museum of the American Indian, Heye Foundation, N. Y., 1929, p. 23, Figs. 8-9.

the carapaces of small turtles in ancient days. A rattle of this type is depicted on Plate 25, Fig. A in conjunction with the pecten shell rattle found at Muwu (Fig. B). The dotted lines indicate reconstructed handle. The turtle shell rattle shown bears evidence of mending with white man's materials, tin and baling wire. This specimen is in the Museum of the American Indian, Heye Foundation, New York.



a, b.

PLATE 25

Rattles of the Coastal Indians of Southern California.

Fig. a. Diegueño rattle made of a turtle carapace.

Fig. b. Rattle from Muwu, showing use of two pecten shells.

Illustrations by Arthur Woodward.

The shells most frequently encountered in the midden at Muwu are given in the following list. It will be noted that the majority of the shell fish used for food came from the waters of the lagoon. Identification of the shells was made possible through the kind services of Mr. Howard Hill.

Black Abalone—*Haliotis cracherodii*—Leach, found on the rocks on the open beach. This is the most prevalent of the species found in Southern California.

Southern Moon Shell—*Polinices recluziana*—Deshayes, found in bays and lagoons.

Lewis' Moon Shell—*Polinices Lewisii*—Gould, Giant moon shell also found in bays and lagoons.

Carpet Shell Cockle—*Paphia staminea* — Conrad, enclosed bays. This was one of most common shells found at Muwu.

Washington Clam—*Saxidomus nuttallii*—Conr., open beaches, also in enclosed bays.

Butter Clam or Purple Clam—*Sanguinolaria nuttallii*—Conr., enclosed bays only.

Gaper Clam—*Schizothaerus nuttallii*—Conr., open or enclosed bays, not on open beach.

Razor Clam—*Tagelus californianus*—Conr., bays only, never on outer beaches.

Speckled Pecten—*Pecten circularis aequisulcatus*—Carpenter, found in bays.

Lurid Oyster—*Ostrea lurida*—Carpenter, enclosed bays.

Giant Key-hole Limpet—*Megathura crenulata*—Sowerby, rocks, on outer beaches.

Owl Limpet—*Lottia gigantea*—Gray, rocks on the outer beaches.

Blue-point Olive Shell—*Olivella biplicata*—Sowerby, outer beaches.

California Cowery—*Cypraea spadicea*—Swainson, outer beaches and rocks.

Channeled Whelk—*Alectrion fossata*—Gould, in bays and open sea.

Rock Purple—*Thais emarginata*—Deshayes, found on the rocks.

Coffee-bean Shell—*Trivia Californiana*—Gray, found on the rocks.

California Mussel—*Mytilus Californianus*—Conr., found on the rocks.

AN ANNOTATED LIST OF THE DIURNAL LEPIDOPTERA OF HUNTINGTON LAKE REGION, FRESNO COUNTY, CALIFORNIA

LLOYD M. MARTIN *and* CHARLES H. INGHAM
LOS ANGELES, CALIFORNIA

Huntington Lake is located in Fresno County, California, at an altitude of 6,950 feet. It lies in a heavily wooded valley, almost entirely surrounded by mountains of comparatively low elevation. At the nearest point, four miles north of the lake, is the Kaiser Ridge, of which the highest peak attains an elevation of 10,643 feet. The western continuation of this range is Kaiser Crest, and the highest mountain is Kaiser Peak, rising to a height of 10,300 feet. On Kaiser Peak and along Kaiser Crest the best collecting was found.

Collecting, with few exceptions, was limited to a radius of fourteen miles from Huntington Lake. In this area 3,382 specimens of butterflies were captured, and Mr. Martin's records show 83 species, races, and forms as having been taken. An estimate of the mileage covered on collecting trips alone, using Huntington Lake as a base, would run close to one thousand miles.

The following report is merely the result of thirteen weeks' collecting in this locality, from June 12 to August 30, 1930, and therefore should not be considered as a complete list, for there are undoubtedly many more species to be recorded for this area.

Order **LEPIDOPTERA.**
Suborder **RHOPALOCERA** (Butterflies).
Superfamily **PAPILIONIDEA.**
Family **PAPILIONIDÆ.**

PAPILIO L.

1. Papilio bairdii brucei Edw.

Date..............June 19—2 males, 3 females.
July 3—3 males, 1 female.
July 21—2 males, 2 females.

Locality........Kaiser Peak and Kaiser Crest.

Elevation......10,000 to 10,300 feet.

Remarks.......*Brucei* is a rapid flyer, and rarely settles on flowers. *Brucei* and *P. indra* were found in the same locality. 32 larvae were found August 9, feeding on wild parsley, and 27 died when brought to a lower altitude. The larvae are similar to those of *P. zelicaon* before the second moult. After the second and third moult, there is a marked resemblance to the larvae of *P. ajax*. These were found feeding in the day-time only. This larva is illustrated on Plate 26.

PLATE 26

Larva and pupa of
Papilio bairdii brucei Edw.

About natural size.

2. **Papilio indra** Reak.

Date..............June 17—17 males, 4 females.
June 21—12 males, 5 females.
June 24—25 males, 6 females.
June 27—23 males, 6 females.
June 30—19 males, 11 females.
July 3—28 males, 10 females.
July 7—13 males, 5 females.
July 11—16 males, 6 females.
July 13—34 males, 8 females.
July 21—11 males, 2 females.
July 24— 7 males.
July 27— 3 males.

Locality.........Kaiser Peak and Kaiser Crest.

Elevation......10,000 to 10,300 feet.

Remarks.......*Indra* is quite commonly found on this range of mountains, but they were not taken below 10,000 feet.

The males spend their time flying along the barren, rock-strewn summit in quest of the females. Wild parsley is the food-plant, and the females are taken when they are sunning themselves on the food-plant, or depositing their eggs. The parsley grows amongst the rocks, protected from the strong wind. When a male made several circles over a group of rocks, and then dropped down, it was certain that he had sighted a female.

The larvae were found August 4, under rocks near their food-plant. They feed at night between the hours of 9 P.M. and 5 A.M., and are easily seen with the aid of a flashlight. In color they resemble the larvae of *P. pergamus*, but they have a wider orange band, and the ground color is a more intense black. 231 larvae were taken, and only 14 pupated. The rest died when taken to a lower altitude. The chrysalid is similar to that of *P. pergamus*, but slightly larger. These were found attached to the under side of rocks.

3. **Papilio indra pergamus** Hy. Edw.

Date..............June 24—2 males.
June 30—3 males, 1 female.
July 7—3 males, 2 females.

Locality.........Kaiser Park.

Elevation......10,300 feet.

Remarks.......*Pergamus* was taken flying with *P. indra*. They are rarely taken as far north as Fresno County. The length of the tails was quite variable.

4. **Papilio rutulus** Luc.

Date..............June 17—3 males.
June 30—2 males, 1 female.
July 1—2 males, 2 females.

Locality.........Round Meadow.

Elevation......7,200 feet.

Remarks.......They are uncommon at this altitude.

5. **Papilio eurymedon** Luc.

Date..............June 12 to August 30.

Locality.........Near Huntington Lake.

Elevation......7,000 to 9,500 feet.

Remarks.......Commonly taken on snow-bush. Of the first brood, 38 males and 41 females were taken. The second brood emerged August 24, and 17 males and 21 females were taken in eight days' collecting. The larvae were found June 16, feeding on wild coffee.

6. **Papilio eurymedon albanus** F. & F.

Date..............July 9—2 males.
Aug. 11—1 female.

Locality.........Round Meadow.

Elevation......7,200 feet.

Remarks.......This dark form is uncommon.

PARNASSIUS Latr.

7. **Parnassius clodius** Men.

Date..............June 25—1 male.
July 14—3 males, 1 female.

Locality.........Upper Little Line Creek.

Elevation......8,500 feet.

Remarks.......Found flying around the rocks. Typical *clodius* was quite scarce.

8. **Parnassius clodius baldur** Edw.

Date..............July 1 to August 10.

Locality.........Upper Little Line Creek.

Elevation......7,000 to 8,500 feet.

Remarks........Pennyroyal was the favorite flower of *baldur* and *clodius*. 183 specimens were taken, of which 130 were males, and 53 were females.

Family **PIERIDÆ.**

NEOPHASIA Behr

9. **Neophasia menapia** F. & F.

Date................July 27 to August 30.

Locality.........Pine trees near Huntington Lake.

Elevation......7,000 to 8,000 feet.

Remarks........More commonly seen than netted, as they stay near the tops of the pines.

PIERIS Schrank

10. **Pieris sisymbrii** (Edw.)

Date................June 19— 2 males, 5 females.
June 28—14 males, 8 females.
July 7— 3 males, 2 females.
July 9— 1 male, 1 female.

Locality.........Upper Deer Creek.

Elevation......8,200 feet.

Remarks........Not very common.

11. **Pieris occidentalis** (Reak.)

Date................June 17—2 males.
July 7—4 males, 3 females.

Locality.........Near Allen's Saw Mill.

Elevation......7,200 feet.

Remarks........Uncommon at this altitude.

12. **Pieris protodice** (Bdv. & Lec.)

Date................July 14—1 male, 2 females.
July 19—2 males, 1 female.

Locality.........Near Cedar Crest.

Elevation......7,100 feet.

Remarks........More commonly found at a lower altitude.

EUCHLOE Hbn.

13. **Euchloe ausonides** (Bdv.)

Date..............July 14—2 males.
July 19—1 male, 1 female.
Locality........Home Creek.
Elevation......8,500 feet.
Remarks.......Very scarce.

ANTHOCHARIS Bdv.

14. **Anthocharis lanceolata australis** (Grin.)

Date..............June 12 to August 24.
Locality........Camp 60 (east end of Huntington Lake).
Elevation......7,000 to 8,000 feet.
Remarks.......Were attracted by flowers.

15. **Anthocharis sara** Bdv.

Date..............June 17—4 males, 3 females.
June 28—7 males, 3 females.
July 1—4 males, 1 female.
Locality........Mary's Meadow.
Elevation......7,800 feet.
Remarks.......Rather uncommon.

16. **Anthocharis sara reakirtii** Edw.

Date..............June 17—3 males, 2 females.
June 19—2 males, 1 female.
June 27—6 males, 5 females.
Locality........Mary's Meadow.
Elevation......7,800 feet.
Remarks.......Flying with *sara*.

17. **Anthocharis sara julia** Edw.

Date..............June 27—4 males, 1 female.
June 28—3 males, 1 female.
July 1—7 males, 4 females.
Locality.... ....Mary's Meadow.
Elevation......7,800 feet.
Remarks.......Taken with the above two species.

18. **Anthocharis sara stella** Edw.

Date..............July 1—1 female.
Locality.........Mary's Meadow.
Elevation......7,800 feet.
Remarks.......Very scarce.

EURYMUS Swains

19. **Eurymus eurytheme** (Bdv.)

Date..............June 28—1 female (Round Meadow).
July 7—2 males (Round Meadow).
July 17—3 males, 2 females (Kaiser Peak).
Elevation......Round Meadow, 7,200 feet.
Kaiser Peak, 10,300 feet.
Remarks.......Not very common.

20. **Eurymus eurytheme alba** (Stkr.)

Date..............July 5—2 females.
July 6—1 female.
Locality.........Upper Little Line Creek.
Elevation......7,800 feet.
Remarks.......Uncommon at this locality.

Family **DANAIDÆ.**

DANAUS L.

21. **Danaus menippe** (Hbn.)

Date..............June 12 to August 30.
Locality.........Found everywhere.
Elevation......7,000 to 10,300 feet.
Remarks.......Specimens taken on Kaiser Peak were badly worn.

Family **SATYRIDÆ.**

COENONYMPHA Hbn.

22. **Coenonympha california** West. & Hew.

Date..............June 14—3 males, 1 female.
June 23—4 males, 1 female.
Locality.........Lower end of Round Meadow.
Elevation......7,000 feet.
Remarks.......Frequenting low grasses.

CERCYONIS Scud.

23. Cercyonis alope boopis (Behr)

Date...............July 28—1 male.
Locality.........Near Cedar Crest.
Elevation.......7,000 feet.
Remarks........It was rather badly worn.

OENEIS Hbn.

24. Oeneis chryxus ivallda (Mead)

Date...............June 17 to July 26.
Locality.........Kaiser Crest and Kaiser Peak.
Elevation.......10,000 to 10,300 feet.
Remarks........Found flying around rocks at the high points. The first female was taken on July 7. 112 males and 28 females was the total catch.

Family NYMPHALIDÆ.

Subfamily NYMPHALINÆ.

ARGYNNIS Hbn.

25. Argynnis zerene (Bdv.)

Date...............June 23—1 female.
Locality.........Upper Little Line Creek.
Elevation.......7,800 feet.
Remarks........Typical *zerene* was quite scarce.

26. Argynnis hydaspe (Bdv.)

Date...............June 12— 1 male.
July 11— 7 males.
July 26— 9 males, 5 females.
July 28— 7 males, 4 females.
July 29—14 males, 8 females
Locality.........Crestmens, below Huntington Lake.
Elevation.......5,000 to 5,600 feet.
Remarks........Not very common.

27. **Argynnis hydaspe purpurascens** (Hy. Edw.)

Date..............July 26—1 male.
Locality........Kaiser Creek. (Old gold diggings.)
Elevation......5,300 feet.
Remarks.......The only one taken on this trip.

28. **Argynnis hydaspe viridicornis** (Comst.)

Date..............July 11—14 males, 1 female.
July 26— 9 males.
Locality........Kaiser Creek. (Old gold diggings.)
Elevation......5,000 to 5,300 feet.
Remarks.......Taken with *hydaspe.*

29. **Argynnis montivaga** (Behr)

Date..............July 2—4 males, 1 female.
July 13—1 male.
July 17—4 males, 2 females.
Locality........Kaiser Pass.
Elevation......9,300 feet.
Remarks.......Were found flying with *M. hoffmanni.*

30. **Argynnis montivaga oweni** (Edw.)*

Date..............July 11—2 males, 1 female.
July 21—4 males.
Locality........Near Huntington Lake Lodge.
Elevation......7,000 feet.
Remarks.......In company with *A. mormonia.*

31. **Argynnis mormonia** (Bdv.)

Date..............July 1 to July 31.
Locality........Meadows near Huntington Lake.
Elevation......7,200 to 9,000 feet.
Remarks.......228 males and 108 females were taken.

BRENTHIS Hbn.

32. **Brenthis epithore** (Edw.)

Date..............June 12 to July 18.
Locality........Meadows near Huntington Lake.
Elevation......7,000 to 9,000 feet.
Remarks.......219 males and 163 females were taken.

* Probably only a dark variant of *mormonia.*—Editor.

EUPHYDRYAS Scud.

33. **Euphydryas chalcedona** (Dbldy. & Hew.)

Date..............June 12—2 males, 4 females.
Locality.........Crestmens, below Huntington Lake.
Elevation......5,500 feet.
Remarks.......Not many of these taken, although they were rather common.

34. **Euphydryas colon** (Edw.)

Date..............July 17—1 male.
Locality.........Upper Little Line Creek.
Elevation......8,200 feet.
Remarks.......The species is not common in this area.

35. **Euphydryas rubicunda** (Hy. Edw.)

Date..............June 12 to July 22.
Locality.........Upper end of Round Meadow.
Elevation......7,800 feet.
Remarks.......Very local, as they were only taken in this meadow. 416 specimens taken—284 males and 132 females.

36. **Euphydryas rubicunda cottlei** Gunder

Date..............June 15—1 male.
Locality.........Upper end of Round Meadow.
Elevation......7,800 feet.
Remarks.......An exceedingly rare transition form.

37. **Euphydryas sierra** (Wright)

Date..............July 11—7 males, 2 females.
July 28—9 males, 3 females.
Locality.........Kaiser Creek.
Elevation......6,400 feet.
Remarks.......Were mistaken for *rubicunda* until a more thorough comparison was made.

MELITAEA Fabr.

38. **Melitaea palla** (Bdv.)

Date..............July 26—2 males.
Locality.........Near Nellie Lake.
Elevation......9,200 feet.
Remarks.......Are much lighter than *whitneyi*.

39. **Melitaea palla eremita** (Wright)

Date..............July 26—1 female.
Locality........Near Nellie Lake.
Elevation......9,200 feet.
Remarks.......Occur in same locality as *palla*.

40. **Melitaea palla whitneyi** (Behr)

Date..............June 12 to July 28.
Locality........Meadows near Huntington Lake.
Elevation......6,900 to 8,000 feet.
Remarks.......Are easily taken feeding on flowers. The total catch was 306 specimens—189 males and 117 females.

41. **Melitaea hoffmanni** (Behr)

Date..............June 28 to July 30.
Locality........Upper Little Line Creek to Kaiser Pass.
Elevation......8,500 to 9,000 feet.
Remarks.......Are fond of flowers, and are easily netted. 214 males and 186 females were taken.

PHYCIODES Hbn.

42. **Phyciodes campestris** (Behr)

Date..............June 12 to July 30.
Locality........Meadows near Huntington Lake.
Elevation......7,200 to 9,000 feet.
Remarks.......Total catch was 73 males and 34 females.

43. **Phyciodes montana** (Behr)

Date..............June 12 to July 30.
Locality........Meadows near Huntington Lake.
Elevation......7,200 to 9,600 feet.
Remarks.......The females were subject to much variation in size and depth of color.

44. **Phyciodes mylitta** (Edw.)

Date..............June 12 to July 30.
Locality........Meadows near Huntington Lake.
Elevation......7,200 to 9,000 feet.
Remarks.......51 males and 18 females were taken.

POLYGONIA Hbn.

45. **Polygonia satyrus** (Edw.)

Date...............July 12—4 males, 3 females.
Locality........McKinley Grove of Big Trees.
Elevation......6,000 feet.
Remarks.......Taken on thistles.

46. **Polygonia faunus rusticus** (Edw.)

Date...............July 12—7 males, 1 female.
July 13—4 males, 2 females.
Locality........Near Summit of Mt. Tom.
Elevation......9,400 feet.
Remarks.......Were drinking at moist spot near spring. Made several trips to this locality, but saw no more specimens.

47. **Polygonia zephyrus** (Edw.)

Date...............June 12 to August 31.
Locality........Meadows near Huntington Lake.
Elevation......7,000 to 9,200 feet.
Remarks.......Taken near willow and wild currant. 87 specimens were taken. Of these, 68 were males, and 19 females.

AGLAIS Dal.

48. **Aglais californica** (Bdv.)

Date...............June 12 to July 20.
Locality........Between Lakeshore and Cedar Crest.
Elevation......6,900 to 7,800 feet.
Remarks.......41 males and 11 females were taken.

49. **Aglais milberti** (Godt.)

Date...............July 21—2 males.
Locality........Kaiser Crest.
Elevation......10,000 to 10,300 feet.
Remarks.......Have rapid, erratic flight.

50. **Aglais milberti subpallida** (Ckll.)

Date...............June 26—1 female.
Locality........Kaiser Crest.
Elevation......10,000 feet.
Remarks.......This specimen was taken on a snow-drift.

51. **Aglais antiopa** (L.)

Date............... June 12 to August 30.
Locality......... Generally distributed.
Elevation...... 6,900 to 8,300 feet.
Remarks....... Many specimens were badly rubbed.

VANESSA Fabr.

52. **Vanessa atalanta** (L.)

Date............... June 17—4 males.
June 20—4 males, 1 female.
Locality......... Kaiser Peak.
Elevation...... 10,300 feet.
Remarks....... Taken at the highest point.

53. **Vanessa virginiensis** (Dru.)

Date............... June 17—7 males, 2 females.
Locality......... Kaiser Peak.
Elevation...... 10,300 feet.
Remarks....... Flying with *atalanta* and *cardui.*

54. **Vanessa cardui** (L.)

Date............... June 17—1 male.
Locality......... Kaiser Peak.
Elevation...... 10,300 feet.
Remarks....... Many more seen, but not taken.

55. **Vanessa carye** (Hbn.)

Date............... June 12 to August 30.
Locality......... Meadows near Huntington Lake.
Elevation...... 7,000 to 8,600 feet.
Remarks....... Occur quite commonly.

JUNONIA Hbn.

56. **Junonia coenia** (Hbn.)

Date............... July 8—4 males, 2 females.
Locality......... Meadows near Huntington Lake.
Elevation...... 7,000 to 8,200 feet.
Remarks....... Were commonly found in meadows.

BASILARCHIA Scud.

57. **Basilarchia lorquini** (Bdv.)

Date................June 14—4 males, 1 female.
Locality.........Meadows near Huntington Lake.
Elevation......7,000 to 8,600 feet.
Remarks........Many more observed.

58. **Basilarchia lorquini burrisoni** (Mayn.)

Date................June 27—2 males.
Locality.........Kaiser Peak.
Elevation......10,200 feet.
Remarks........Taken on rock pile within 100 feet of the summit of this barren peak.

HETEROCHROA Bdv.

59. **Heterochroa bredowi californica** Butl.

Date................June 12 to August 30.
Locality.........Meadows near Huntington Lake.
Elevation......7,000 to 8,500 feet.
Remarks........Quite common.

Family LYCAENIDÆ.

Subfamily THECLINÆ.

HABRODAIS Scud.

60. **Habrodais grunus** (Bdv.)

Date................July 11—4 males, 2 females.
Locality.........Kaiser Creek.
Elevation......5,200 feet.
Remarks........Were found near oaks.

INCISALIA Scud.

61. **Incisalia iroides** (Bdv.)

Date................June 12 to July 1.
Locality.........Round Meadow.
Elevation......7,400 feet.
Remarks........17 specimens were taken. These were flying with *I. eryphon.*

62. **Incisalia eryphon** (Bdv.)

Date..............June 12 to July 1.
Locality........Round Meadow and other meadows near Huntington Lake.
Elevation......7,000 to 8,600 feet.
Remarks.......28 males and 14 females were taken. Ground color of the females was subject to much variation.

CALLOPHRYS Billb.

63. **Callophrys dumetorum perplexa** B. & Benj.

Date..............June 17—4 males, 1 female.
June 21—2 males, 1 female.
Locality........Kaiser Crest.
Elevation......10,300 feet.
Remarks.......Rather uncommon.

Subfamily CHRYSOPHANINÆ.

HEODES Dal.

64. **Heodes nivalis** (Bdv.)

Date..............June 29 to July 21.
Locality........Upper Little Line Creek.
Elevation......8,200 feet.
Remarks.......Were very fond of flowers. 97 males and 34 females were taken.

Subfamily LYCAENINÆ.

PLEBEJUS L.

65. **Plebejus aquilo podarce** (F. & F.)

Date..............June 12 to July 1.
Locality........Meadows near Huntington Lake.
Elevation......7,000 to 8,200 feet.
Remarks.......78 males and 18 females were caught.

66. **Plebejus saepiolus** (Bdv.)

Date..............June 12 to July 30.
Locality........Meadows near Huntington Lake.
Elevation......7,000 to 8,200 feet.
Remarks.......313 specimens were taken. 216 were males and 97 were females.

67. **Plebejus saepiolus rufescens** (Bdv.)

Date..............June 16—3 females.
June 19—7 females.
Locality........Little Line Creek Meadow.
Elevation......7,200 feet.
Remarks.......Rather uncommon.

68. **Plebejus saepiolus hilda** (Grin.)

Date..............June 14 to July 30.
Locality........Meadows near Huntington Lake.
Elevation......7,000 to 8,200 feet.
Remarks.......124 males and 69 females were taken.

69. **Plebejus maricopa** (Reak.)

Date..............June 26—4 males, 2 females.
June 28—7 males, 1 female.
July 17—2 males.
Locality........Upper Little Line Creek.
Elevation......7,000 to 8,200 feet.
Remarks.......Were taken in a field of lupine.

70. **Plebejus shasta comstocki** Fox

Date..............June 28 to July 30.
Locality........Kaiser Crest.
Elevation...... 10,000 feet.
Remarks.......162 males and 16 females were taken. The larvae were found on a species of dwarf lupine.

71. **Plebejus acmon** (West. & Hew.)

Date..............July 11—4 males, 2 females.
Locality........Kaiser Creek.
Elevation......6,000 feet.
Remarks.......Not many taken, although they were very common.

72. **Plebejus lupini** (Bdv.)

Date..............June 17—4 males.
June 19—3 males, 1 female.
July 21—7 males, 4 females.
Locality........Nellie Lake.
Elevation......9,400 feet.
Remarks.......A few worn *shasta comstocki* were taken flying with *lupini*.

PHILOTES Scud.

73. **Philotes battoides** (Behr)

Date............... June 12 to July 18.
Locality......... Kaiser Crest.
Elevation...... 9,800 to 10,300 feet.
Remarks....... Quite common, as 168 males and 37 females were taken. On July 5th, *battoides* was taken during a snow-storm on Kaiser Peak. They were chasing the snow flakes to the ground from an elevation of about 12 feet.

74. **Philotes enoptes** (Bdv.)

Date............... June 28—5 males, 2 females.
July 5—7 males.
Locality......... Kaiser Crest.
Elevation...... 10,000 feet.
Remarks....... Flying with *battoides* and *shasta comstocki.*

Superfamily **HESPERIOIDEA.**

Family **HESPERIIDÆ.**

Subfamily **URBANINÆ.**

THORYBES Scud.

75. **Thorybes mexicana** (H.-S.) *

Date............... June 19—1 male, 1 female.
June 27—6 males, 2 females.
July 2—4 males.
Locality......... Upper Little Line Creek Meadow.
Elevation...... 7,200 feet.
Remarks....... Frequents the marsh grass.

76. **Thorybes nevada** Scud.

Date............... June 13— 4 males, 2 females.
June 24—17 males, 7 females.
Locality......... Upper Little Line Creek Meadow.
Elevation...... 7,200 feet.
Remarks....... Were found near moist spots, and also were taken on marsh grass.

* There is a possibility that this may prove to be *T. diversus* Bell.—Editor.

URBANUS Hbn.

77. **Urbanus ruralis** (Bdv.)

Date..............June 12 to July 1.
Locality........Little Line Creek Meadow.
Elevation......7,200 feet.
Remarks.......Found near damp spots.

78. **Urbanus ericetorum** (Bdv.)

Date..............July 11—14 males, 2 females.
July 28— 8 males, 1 female.
Locality........Kaiser Creek.
Elevation......5,500 feet.
Remarks.......Very rapid fliers.

Subfamily HESPERIINÆ.

HESPERIA Fabr.

79. **Hesperia nevada** (Scud.)

Date..............June 24—4 males, 1 female.
July 7—2 males, 1 female.
Locality........Near Kaiser Crest.
Elevation......8,400 feet.
Remarks.......Rather uncommon.

OCHLODES Scud.

80. **Ochlodes sylvanoides** (Bdv.)

Date..............June 12 to July 20.
Locality........Meadows near Huntington Lake.
Elevation......7,000 to 8,000 feet.
Remarks.......Were found near moist places.

POLITES Scud.

81. **Polites sonora** (Scud.)

Date..............July 1 to August 1.
Locality........Meadows near Huntington Lake.
Elevation......7,000 to 8,000 feet.
Remarks.......Were taken on flowers.

82. **Polites sabuleti** (Scud.)

Date............... June 18 to July 1.
Locality......... Marys Meadow.
Elevation...... 9,400 feet.
Remarks........ Are very fond of flying around the undergrowth.

ATALOPEDES Scud.

83. **Atalopedes campestris** (Bdv.)

Date............... June 20 to August 1.
Locality......... Kaiser Pass.
Elevation...... 9,300 feet.
Remarks........ Are fond of flowers, and are easily captured.

Collectors can reach this district from Fresno, either by stage, or by auto. Roads are well surfaced, although a bit steep in places. Accommodations may be secured at several hotels, located on the shores of Huntington Lake. Camping locations are fairly plentiful, but we would recommend Deer Creek as being the most accessible. Food may be purchased from the store nearby.

On the following page we are publishing a map of the Huntington Lake district, with a key attached which will enable collectors to locate all of the localities mentioned in this paper. See Plate 27, page 134.

HUNTINGTON LAKE REGION, FRESNO COUNTY, CALIFORNIA

Allen's Saw Mill	D5 to E5
Camp 60	D8
Cedar Crest	E6
Deer Creek	D7
Home Creek	E2 to E3
Huntington Lake Lodge	G3
Kaiser Creek	A5 to A6
Kaiser Crest	B2 to B6
Kaiser Pass	B11
Kaiser Peak	B6
Kaiser Ridge	B7 to B12
Lakeshore	E7
Mary's Meadow	D2
Meadows Near Huntington Lake	E3 to E4 and E5 to E6
Nellie Lake	C3
Round Meadow	E4 to E5
Upper Deer Creek	C7
Upper Line Creek	D4
Upper Little Line Creek	C6
Upper Little Line Creek Meadow	D5

Scale· 1 Section = 2 Sq. Miles

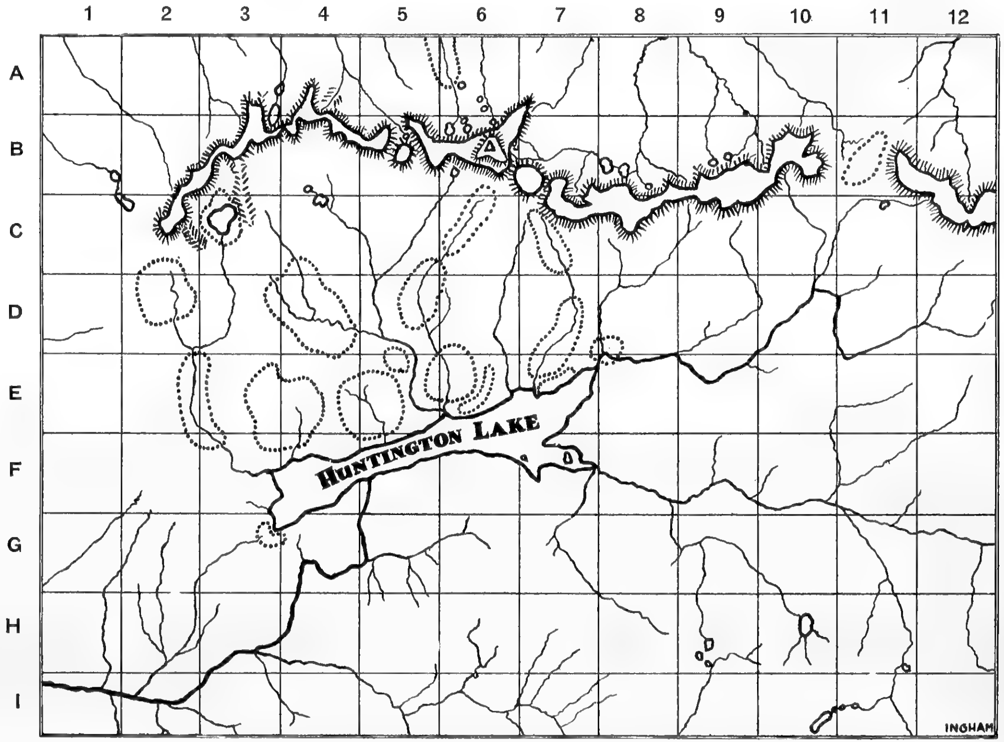


PLATE 27

STUDIES IN PACIFIC COAST LEPIDOPTERA

(CONTINUED)

Dr. John A. Comstock
Associate Director, Los Angeles Museum

Larva and Pupa of *Parnassius smintheus behrii* Edw.

The egg and larva of the parent species, *smintheus,* were figured and described in W. H. Edwards' "Butterflies of N. A.," first series, pl. 3 and were described by the same author in the Canadian Entomologist, Vol. II, p. 141. The life history is also given by Edwards in the Canadian Entom. Vol. 17, p. 161.

Of the Pacific Coast race *behrii* Edw. only a brief mention is made by T. L. Mead in Psyche, Vol. 2, p. 181.

Mr. John Garth secured a single larva of *behrii* in the Rock Creek Lakes region of the Sierras on July 6, 1930, which was placed in the care of Comm. C. M. Dammers, who bred it to maturity, and to whom we are indebted for the notes and drawings.

This larva was in its last instar, and pupated July 16th, the imago emerging Aug. 1, 1930.

The larva was offered violet, and Sedum, of two species, a large white form and also a small green species. Its plant of choice was the white Sedum.

Larva, last instar: ground color, velvet black, the lateral surfaces bearing tufts of short black hairs.

There are four longitudinal rows of orange spots as shown in the illustration, Plate 28. These spots vary considerably in size, the dorso-lateral line being obsolete on the anterior three segments. Head black. Legs and prolegs black.

The larva was covered with the whitish bloom of the *Sedum,* and this had to be removed before Comm. Dammers could make the drawing. Length of larva, 1 inch. Mature larvae may attain a greater length than this in a state of nature, judging from the fact that the resultant imago was considerably dwarfed.

Pupa: a uniform chocolate or reddish brown, except for darker spots and wavy lines on the abdomen and wing cases, as shown in the accompanying illustration, Plate 28, lower figure. The form is accurately given in Comm. Dammers' excellent drawing.

The larva chose the floor of the breeding case as a site for pupation, where it spun a very light semblance of a cocoon. Length of pupa, 9/16 inch.

PLATE 28

Larva and pupa of *Parnassius smintheus behrii* Edw.

Upper figure, larva, dorsal surface.
Middle figure, larva, lateral surface.
Lower figure, pupa, lateral surface.
All figures slightly enlarged.

Drawings by Comm. C. M. Dammers.

Egg, Larva and Pupa of *Phyciodes campestris* Behr.

The egg of this species was described and figured in the Bulletin So. Calif. Academy of Sciences, Vol. XXVIII, Part 3, 1929, p. 53. We are reprinting this figure in Plate 29 of this issue, along with the illustrations of larvae and pupae.

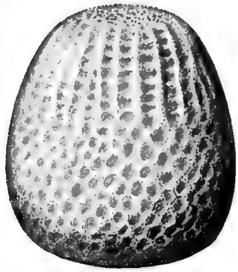


Fig. a.

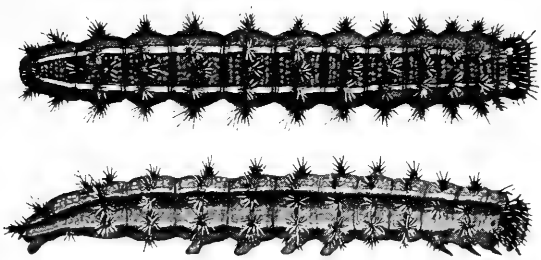


Fig. b.

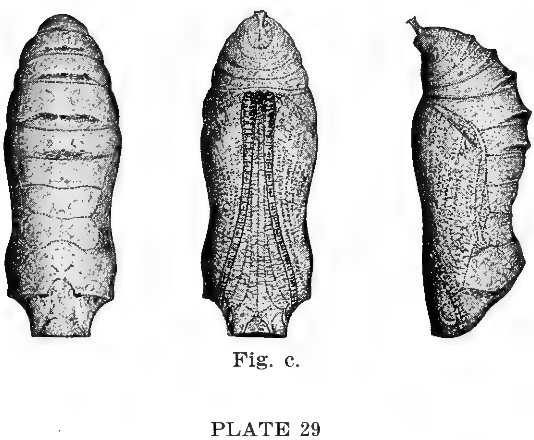


Fig. c.

PLATE 29

Metamorphosis of *Phyciodes campestris* Behr.

Fig. a. Egg, highly magnified.

Fig. b. Mature larva, dorsal and lateral aspects, enlarged.

Fig. c. Pupa, dorsal ventral and lateral aspects, enlarged.

Illustrations by Comstock.

Comm. C. M. Dammers carried this species through its complete metamorphosis, and we gratefully acknowledge his aid in furnishing the specimens from which our descriptions and figures were prepared.

MATURE LARVA. Length 15 mm.

Head, glistening black, with two points of highlight that appear as white dots on the superior surface; covered with short black or grayish hairs. Ocelli, black and protruding from surface. Mouth parts black.

Body cylindrical, covered with numerous branching spines as later specified.

There is a broad band of black, medially placed, which is profusely covered with greyish white punctate spots that give the area a greyish appearance. Lateral to this is a narrow greyish-white band running the length of the body, but somewhat broken up on the thoracic segments. Lateral to this is a wide black area, covered less profusely with the light punctate spots than is the dorsal band. This area ends inferiorly at the spiracles, and is gradually replaced by a mottled yellowish-brown band, which ends inferiorly in a narrow cream colored line.

Abdominal surface brown, with light punctate spots. Spiracles black. Legs black. Prolegs yellow-brown or straw, covered with concolorous hair.

The arrangement of the branching spines is characteristic for the genus, i. e.:

A mid-dorsal row of small black spines, absent on the 3 anterior and last caudal segments.

Next lateral to these is a row of larger spines, superimposed on the narrow greyish-white band. The main shafts of these spines are slightly lighter in color than those in adjacent rows.

There is a supra-stigmatal row of large, well defined black spines, and another row of equally well developed spines is placed infra-stigmatally. The shafts of the latter are concolorous with the yellowish-brown band on which they are superimposed.

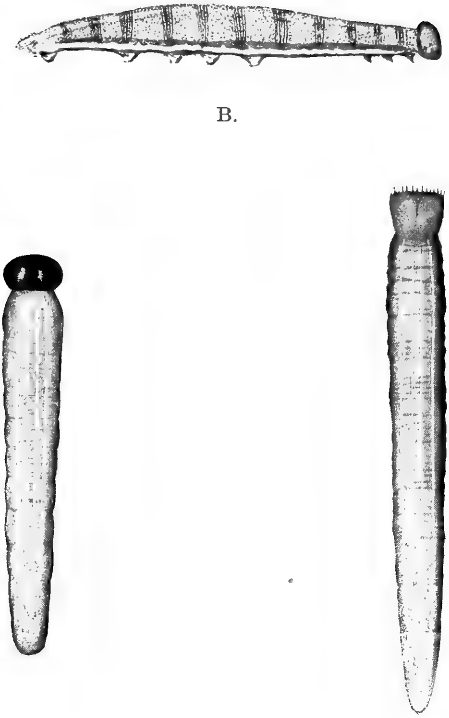
A row of small spines is placed infero-laterally and is incomplete on some of the segments. At the bases of the prolegs, the spines of this row are paired. The last mentioned row of spines is light yellow-brown in color.

Two examples under observation pupated on Sept. 26 and 28.

Larval foodplant, *Aster foliaceus* v. *hesperius*.

PUPA.

Length 10.5mm. Greatest width 3.75mm. Ground color, soft wood brown, penciled over with a network of darker brown lines and irrorations, as shown in the accompanying cut, Plate 29, Fig. C. The form is pictured with sufficient accuracy to render a lengthy description unnecessary.



B.

A. C.

PLATE 30

Larva of *Prenes errans* Skin.

Fig. A. First instar, dorsal aspect.
Fig. B. Sixth instar, lateral aspect.
Fig. C. Last instar, dorsal aspect.
All figures enlarged.

EGG, LARVA AND PUPA OF *Prenes errans* Skin.

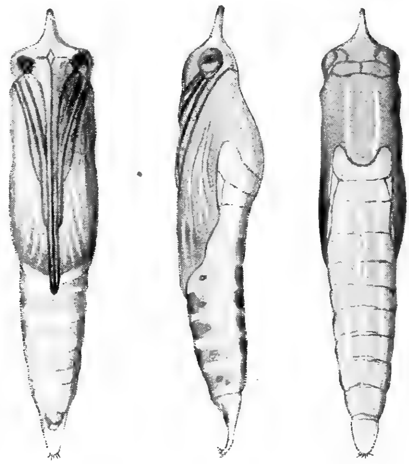
Commander Dammers, to whom I am indebted for the following notes, and for the specimens from which drawings were made, reports the egg of this species as being of the "typical hemispherical skipper type, white in color."

Eggs were laid on salt grass, Sept. 30, and hatched Oct. 8, 1929. The young larvae were later transferred, with difficulty, to Bermuda grass after the fourth instar. Eggs were secured at Cardiff, Calif., where the species was not uncommon.

First instar: larva smooth, semi-transparent, vivid green, with the head light brown, changing later to a blackish brown. Two fine longitudinal cream colored lines occur on each side of the mid-dorsal area. Tip of the terminal segment tinged with brown. Illustrated on Plate 30, Fig. A.

Second instar: little change from the first stage. The head assumes a darker shade and the body is a uniform yellowish green except on the longitudinal dorsal stripes, which are a yellowish-white. The larva measures about 5 mm. at the beginning of this instar.

There is very little subsequent change in color throughout the remaining instars until the sixth when a lateral stripe, yellowish-white in color, becomes noticeable and the head changes to a bright green. Comm. Dammers has made a drawing of this instar, shown on Plate 30, Fig. B.



A. B. C.

PLATE 31
Pupa of *Prenes errans* Skin.
A. Ventral aspect. B. Lateral aspect. C. Dorsal aspect.
All figures enlarged.

Seventh and last instar: length 27 mm. Body green, the two caudal segments of a lighter shade. The four dorsal longitudinal greenish white stripes are prominent, and are edged with fine gray borders. The lateral yellowish-white stripe is also prominent. A series of minute dark green punctae run transversely across the folds of the body, and are also present on the head, where they are mauve in color. The latter are more thickly grouped at the top and bottom of the lobes than elsewhere. There is also a scattering of minute hairs over the head area. Ocelli black. Abdomen and all legs a vivid blue green. The segmental junctures are slightly tinged with yellow.

This instar is illustrated on Plate 30, Fig. C.

The instars were passed on the following dates:

2nd	instar	begun	on	Oct.	17,	1929
3rd	"	"	"	Nov.	5,	"
4th	"	"	"	Nov.	22,	"
5th	"	"	"	Dec.	10,	"
6th	"	"	"	Dec.	22,	"
7th	"	"	"	Jan.	12,	1930

Pupated Feb. 11, 1930

While feeding on Bermuda grass the larva kept itself quite clean, but while on salt grass it was covered with dirt and debris normally adhering to that plant. In both situations it was admirably camouflaged.

Pupa: length 18 mm.; greatest width through thorax 3.75 mm.; color, translucent green, the antennal sheaths and thoracic dorsal area slightly darker. On the dorsum of the abdominal segments there is a persistence of the larval stripes, as whitish lines. Tip of labial sheaths brown as is also the tip of the snout. Cremaster colorless; spiracles white. Pupation occurred on the foodplant, a slight girdle, and the usual silk button for attachment of the cremaster being present. Illustrated on Plate 31, Figs. A, B, C.

A second example, collected at a later date, pupated Dec. 14, 1930.

The larva of this species is difficult to rear in captivity, many of the young caterpillars being drowned in the respired droplets that gather on the foodplant. Although continuously observed, the larvae were only once seen to move, when one was observed to devour an entire blade of grass within the space of a few minutes, after which it returned to its carefully camouflaged resting position. Apparently the species is a night feeder.

PLATYSAMIA GLOVERI Strecker.

I am unable to locate a published description of the metamorphosis of this species.

Edw. L. Graef, in the Bull. Brooklyn Ent. Soc. Vol 1, p. 75, 1878, describes the cocoon and pupa, comparing it with *cecropia*, but no details are given of the larvae. An illustration of the latter is shown on Plate 32. In form, it resembles the larva of *cecropia*, but the ground color is very different, being a rich velvety greenish-black in the mature stage.

The eggs are indistinguishable from those of *cecropia*. Specimens were received from Salt Lake City, Utah, and were raised to maturity on a species of willow.

PLATE 32

Mature larva of *Platysamia gloveri* Strecker.

PROCEEDINGS OF THE ACADEMY

May to November, 1930

May 19, 1930: Regular monthly meeting was held in the Los Angeles Library. Dr. John Munchow, who has spent a number of years in our Far Eastern possessions, presented "A Musical Travelogue," illustrated by lantern slides of Philippine dances and music. The speaker also demonstrated native airs on instruments used in those islands. His ability as a musician and interpreter added greatly to the lecture. Native music was also played by a three-piece string orchestra under the speaker's direction, bringing vividly to us the spirit of Malay.

June 17, 1930: Regular monthly meeting was held in the Los Angeles Library. Mr. Lal Chand Mirha, student, artist and messenger of his people, gave an illustrated talk on "India; Old and New." The speaker presented the case of modern misunderstood India, cradle of our race, in a new light, coming as he does with native understanding but with Western education.

September 8, 1930: Annual meeting and banquet of the Academy was held in the University Club. The President, Dr. Ford Carpenter, presided, calling upon the other officers for reports. Sr. Georgi, nationally known sculptor, presented the Academy with a life-sized bust of Dr. Ford Ashman Carpenter, our President. Formalities completed, the meeting was turned over to Past President B. R. Baumgardt who delivered a beautifully illustrated lecture on "Constantinople, The Golden Horn, and the Isles of Greece." By the speaker's unusual ability, those present were transported to old Stamboul, made to see the beauties of a city where the East and West meet; thence to the historic isles of the Aegean and the spirit of the "glory that was Greece." The members were further treated by the speaker to rare pictures of the start of the ill-fated Andre flight, the true outcome of this first polar flight having just come out of the frozen North.

October 11, 1930: Regular monthly meeting was held in the Los Angeles Library. Dr. R. H. Swift, Secretary of the Academy and Pathologist of the Bellevue Hospital, presented a talk on "Man and the Microbe." The speaker's plea was to replace in the mind of man the destroyers of men and spoilers of nations—the Alexanders, the Caesars and Napoleons, as heroes of history, by those toilers of science who have given us the civilization of today, those who have been conquerors in the war against disease, and whose efforts have given man life. A brief historical mention of the work of Leeuwenhoek, Lister, Pasteur, Roux, Koch, Ehrlich, Metchnikoff, and Noguchi was followed by a description of these minute forms of life and death. The speaker pointed out that the harmful organisms are but few, while great industries, and even life itself is dependent on the works of many of these strange little dwellers in the world of the microscope.

NOVEMBER 8, 1930: Regular monthly meeting was held in the Los Angeles Library. Mr. Harry K. Sargent gave another of his beautifully illustrated lectures on popular Astronomy in "Simple Facts About the Sun and Planets." The speaker showed some interesting pictures and data of the new planet, Pluto, as well as facts and figures on the proposed 200-inch telescope.

It is the desire of the Academy that the members avail themselves of these meetings and educational lectures which we, as an organization, have conducted for many years. Strange as it may seem, these meetings have been poorly attended by actual members of the Academy. Use your membership—and profit!

Regular monthly meetings are held the second Saturday of each month in the Auditorium of the Los Angeles Public Library.

DR. R. H. SWIFT, *Secretary.*

DR. JOHN A. HORNUNG

Zoologists will learn with regret of the death, on December 24, 1930, of Dr. John A. Hornung, member of the Academy, and Zoologist of the Los Angeles Museum.

As a mammalogist, ornithologist and osteological preparator, Dr. Hornung has been well known for many years to the older generation of specialists. The last five years of his life were devoted to entomology and his careful work as a preparator of Lepidoptera is evidenced by many thousands of butterflies and moths in the collection of the Los Angeles Museum.

Although Dr. Hornung had wide experience as a field collector in Africa, India, the East Indies, etc., he did not publish, but preferred to pass on, for the use of well known specialists, the results of his explorations and investigations. He was a recognized authority on bats, and his work in ornithology was acknowledged by a number of writers. The method he devised of mounting humming birds was considered by John Rowley, and so accredited, as the best technique known to taxidermy. His preparations of small mammal skeletons were unexcelled.

Dr. Hornung was born in Brandenburg, Germany, his father being professor of Sanskrit, Greek and Latin in the Ritter Academy, in which school the son received his early education. In his youth he became master of the three dead languages in which his father excelled, and in addition he spoke French, and English, along with his native tongue. He also had a working knowledge of a number of other languages.

His medical degree was secured in the University of Berlin. For a number of years he practiced as a physician and surgeon in San Francisco. He was also employed for a short period as chief chemist for the Oxnard Sugar Company, and at one time was pharmacist and manager of a drug store in Palo Alto.

After the earthquake and fire of 1906 in San Francisco, in which he and his wife lost all of their possessions, Dr. Hornung engaged in field collecting for a number of years.

Shortly after the organization of the Los Angeles Museum, he joined the scientific staff of that institution, and remained with it, working in various capacities, until his death.

The work of the Southern California Academy of Sciences is carried on entirely through the generosity of private citizens, who are sufficiently interested in the advancement of education and cultural endeavor to donate funds or make bequests to the Academy. As a guide, in the matter of bequests, for those who plan to further this program, the following forms are suggested:

Form of Legacy

To be used when it is desired to leave the Academy any personal property, such as money, stocks, bonds, works of art, or other objects of value.

I give and bequeath unto "Southern California Academy of Sciences," of the City of Los Angeles, the sum of.................................... Dollars: To have and possess the same unto the said "Southern California Academy of Sciences," its successors and assigns, to the uses, dispositions and benefits thereof forever.

Form of Devise

To be used when it is desired to leave real estate to the Academy.

I give and devise to "Southern California Academy of Sciences" of the City of Los Angeles, (.. here describe the property or ground rent..), together with the appurtenances, in fee simple, and all policies of insurance covering said premises, whether fire, title or otherwise, free from all taxes: To have and to hold the same unto the said "Southern California Academy of Sciences," its successors or assigns forever.

BULLETIN of the SOUTHERN CALIFORNIA
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Publications of the

Southern California Academy of Sciences

The Academy has published to date the following:

PROCEEDINGS. 1896 to 1899. Six numbers—Vol. 1, Nos. 1 to 6.
MISCELLANEOUS BULLETINS issued under the imprint of the Agricultural Experiment Station—1897 to 1907. **Ten numbers.**

All issues of the above are now out of print.

■ ■

Bulletin of the

Southern California Academy of Sciences

Began issue with Vol. I, No. 1, January, 1902. Issued ten numbers in 1902, nine numbers in 1903, 1904, 1905; three numbers in 1906. Issued two numbers annually from 1907 to 1919, both inclusive (except 1908—one issue only). Issued four numbers (January, May, July and October) in 1920.

The 1921 issues are: Vol. XX, No. 1, April; Vol. XX, No. 2, August; Vol. XX, No. 3, December.

The 1922 issues are: Vol. XXI, No. 1, March; Vol. XXI, No. 2, September.

The 1923 issues are: Vol. XXII, No. 1, March; No. 2, July.

The 1924 issues are: Vol. XXIII, No. 1, January-February; No. 2, March-April; No. 3, May-June; No. 4, July-August; No. 5, September-October; No. 6, November-December.

From 1925 to 1930, including volumes XXIV to XXIX, three numbers were published each year. These were issued as No. 1, January-April; No. 2, May-August; No. 3, September-December, for each volume.

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THE SACRED BEETLES OF EGYPT

By Dr. R. H. Swift

Some years ago my attention was called to the scant literature on the scarab, when I was called upon to aid in cataloging a large collection. The splendid works of Budge, Newberry, Petri and Ward, I found were but introductions into this field. As Numismatics have supplied the historian and archeologist with material to fill the too numerous blank periods in the story of people of the past, so may we find in these quaint little baubles, insight into the life of the people and the history of the kingdoms of the Nile.

No longer does the archeologist limit himself to the great museum specimens, but in sifting the refuse heaps he gathers his priceless facts from what a few generations ago was considered comparatively valueless remains.

One is surprised to note the number of educated people who think the scarab is a fossilized beetle; others who feel that all are modern imitations of antique gems. It is true that many good, but spurious, scarabs are sold at high prices to the unwary tourists and collectors, but there is a sixth sense which quickly aids the experienced student in differentiating between the true and false in most cases.

There has been marked difference of opinion among Egyptologists as to the true meaning of the scarab which is found so intimately associated with remains extending over a period of about two thousand years. The ancient writings shed but little direct light upon the matter. The widespread use of seals before the use of true locks, suggested an explanation and has been a commonly accepted answer to the question. To the ancient world seals were far more generally used than is commonly conceded. Doors, vessels, documents, boxes, etc., were thus guaranteed against trespass. The earliest inscriptions come to us on seals. The "Mer-kesti," or seal engraver, was of high position in ancient Egypt. Through the ancient world plain and cylinder seals were widespread in use. (Pl. III, 3 and 7).

From Crete and the Isles of the Aegean, was imported to Egypt, the little ivory button seal and scaraboid (Plate III, 3). Later the true scarab supplanted these, even in the lands of their origin (Pl. I. 1). The numerous references in books on magic speak of the scarab by the name of "khetem," or seal. Thus archeologists have rested in the thought that the multitude of scarabs excavated were primarily utilitarian as seals.

I feel that reaching back over the ages we may better grasp the true meaning by a consideration of the ancient Egyptian mind as gleaned from the numerous written evidences which we now possess.

The earliest religion was monotheistic, but later the very attributes of the great "One Being" came to be individualized into the numerous deities of the Egyptian Polytheism, probably from the inability of the untutored masses to grasp the esoteric and symbolic philosophy of the priestcraft.

The beetles common to the region of the Nile, Scarabaeus Sacer, s. aegyptiorum or Ateuchus sacer, called by the Egyptians "keper," slight variations of the name persisting in the German and Old English, were early of interest to the observant priesthood.

The habit of rolling the egg in dung until it becomes a great ball, later to incubate in the hot desert sun and bring forth young, "kheperā" came to mean "he who turns," or "rolls," the personified symbol of the Sun. Since the dung ball became covered with clay, later to bring forth the young, "kheperā" was the "Creator," "he who creates all out of clay." The Sun's evident part in all growth soon elevated Kheperā to a primal point in the personification of life-giving force until, as nearly as can be guessed from Egypt's confused chronology, about 3000 B. C. we find the beetle taking a place similar to the emblem of the Cross in Christianity. The use increased in importance until after the 10th dynasty it was universal. That it was early used obviously as seals, because of the convenient base, was only because of the extreme sacredness of the seal to the ancient mind. After the Middle Kingdom, the priestcraft further enhanced their amuletic use to a positive requisite for divine favor, with profit to the craft. Sun worship by the end of the 18th Dynasty attained a pre-eminence amounting to a true Monotheism.

It is probable that Copris, Hypselogenia, Artharsius and Gymnoplearus were probably used as beetle models, as well as s. Sacer, and colored realistically a bluish-green. Animal personifications of divine beings are common to all peoples, and found early amuletic use in Egypt (Pl. III, 4-6) and were thought to carry a perpetual prayer to the deity so symbolized.

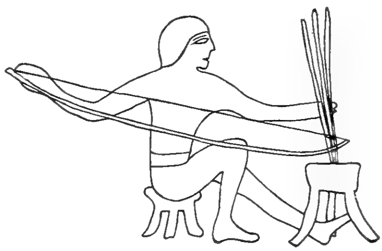


FIG. 1
"Bow-Drill" from Tomb of Rekhmara.

The shape of the scarab lent itself naturally to the bezel of ring, or mounting on a swivelled funda (Pl. III, 2). They were strung as a bead or pendant (Pl. III, 9). They may have been a "witness" sold to the pilgrims at shrines, such as that of the desert goddess Hathor (Pl. III, 11). Amenhotep III and his Queen used them for royal proclamations. They were used to perpetuate an event (Pl. IV, 10). There is documentary evidence that seals were used as a government guarantee of weight, a forecast of the use of coinage. Plato tells us that in Ethiopia, just south of Egypt, graven stones were used as money. The regulation sizes of the scarab would seem to lend support to this, and unquestionably they did in instances pass as barter, but no direct proof is to be cited. They were sewn on, and about, mummies, and worn as "Pectorals" on priestly vestments (Pl. III, 1 and 8). In the "Chapter of the Heart" in "The Book of the Dead," placing over the heart of the mummy of a green stone scarab is advised, green jasper, basalt or slate being thus common on large "heart scarabs" with passages from this writing.

The material used for the scarab was dependent upon the wealth of the purchaser. Metals such as gold, silver and bronze are known, but are rare. Turquoise, amethyst, (Pl. I, 7), beryl, serpentine, green jasper (Pl. I, 15), bloodstone, carnelion, hematite, quartz (Pl. I, 20), blue felspar, sard, obsidian, chalcedony, lapis lazuli (Pl. III, 5), and diorite scarabs are found. On these harder stones, inscriptions, if any, were often on a base of gold or electrum, and were forced upon the wealthy at great cost. Cheaper, soft material, such as steatite (Pl. I, 2), schist, and limestone, were for the poor. Ivory, amber, wood and resin were used. Manufactured materials for molding, such as glass, appearing in the 18th dynasty, colored cyanus, and faïence (Pl. I, 12), a soft porcelain-like material, were also common.

The scarab was shaped with obsidian, or tempered bronze implements, the inscriptions were cut intaglio in the base, and polished. Casting, or modeling, and firing were used in the manufactured faïence, clay, etc., and then dipped in vitreous glaze. The inscription was first drawn in ink on the softer materials, and cut. Herodotus (VII, 69) tells of the engraving by hard stones in Ethiopia. "Bow drills" (Fig. 1), of tempered bronze, with oil and water, were used to drive the hole. The commonly used natural steatite, a soapstone (magnesium silicate), was cut and hardened by glazing. This beautiful glazing tells us much of the age of the scarab. It varies from pale blue to deep violet, and light to dark green; rarely reds and yellows are found. These glazes fade, the greens change to soft brown shades, the blues to grays and white; yet in protected crevices we may see the original color, often increasing the beauty of these little voices from the past. Certain blues and greens were characteristic of the 12th dynasty, increasing in numbers of shades in the 13th, green in the 18th, a rather poor yellow-green in the 19th, a characteristic blue from the 20th, and a revival of the antique blue-green in the 26th dynasty, when they pass after the Persian conquest, save for a few short revivals.

Almost two millenniums of their universal use by the millions who lived in the Nile valley during this great interval makes the scarab the most common of Egyptian antiquities, yet this does not detract from our interest in them when considered from the intimate part played in the mind of the possessor in a land steeped in explicit faith in charms and the power of the graven image (Pl. IV, 11, 12 and 13). The sacred amuletic significance of the scarab spread to North Africa, Babylonia, Rhodes, Cyprus (Pl. I, 1), Crete (Pl. III, 3), Aegean Islands, and the Greek mainland, as well as Etruscan copies in Italy, in which even the hieroglyphics were crudely imitated. Many of the facts known of the kings from the 12th to the 18th dynasities are from the scarabs. Many of these Hyksos kings are known only thus, yet from some kings we have no scarabs.

The time of origin of their general use may be placed after the 11th dynasty, but evidence of workmanship places many as early as the 6th, though unsupported by absolute proof. There were none found in the early tombs of Beni Hasan, Abydos, Bêt Khalâf, Dendera, Hu or Nagada, though jars with marks of cylinder seals (Pl. III, 7) were numerous. This would indicate that prior to the 10th dynasty the scarab, as we know it, was not in general use.

Royal scarabs with names of early kings as Menes, Khufu, Khafrā, Menkaurā (Pl. II, 6). Unas (Pl. II, 17), Pepi and Merenrā appear along with the general revival of ancient lore after the expulsion of the Hyksos. The sudden burst into popularity may be dated from middle of 12th dynasty. In the Cairo Museum there are, however, a number of rough modeled small glazed specimens with well defined head, prothorax and elytra that are unquestionably much earlier. Egypt's early chronology is wholly problematical. Future generations may discover the right, but due to the fragmentary and conflicting lists of Manetho, Africanus, the Turin Papyrus, and the Abydos and Saccarah tables, authorities vary 3000 years as to the date of the time of Menes, founder of the Old Kingdom. Egypt had no era, and the available lists speak of the duration of reign of kings which often include joint reigns and contemporaneous dynasties. Wilkinson feels that twelve out of the thirty dynasties were ruling simultaneously. The German and French scholars think only a few did, hence the marked difference of the two schools. (See after description of Plate IV for what I consider a fair basic chronology.)

There are characteristic types of workmanship which aid in approximately dating the scarab. In the 12th dynasty we find an elongated conventional and true to nature style. The legs and elytra are not marked (Pl. I, 5). In the 13th we find a thicker base, with large rounded body (Pl. I, 7). With the Middle Kingdom we have a roughly cut style, often with palm or leg designs on wing cases, or crudely carved on base. The elytra are seldom marked (Pl. I, 19), except for notches, but the head and eyes are shown. At the close of the 17th dynasty either a narrow waisted, high prothorax (Pl. I, 11) or rather compact type prevails. Human-headed scarabs are often found in this period (Pl. I, 6). In the 18th dynasty the types of the late Middle Kingdom continue with variations in green steatite. Oval bases appear, and head, clypeus, and legs are carefully cut. Threading-holes are often seen (Pl. I, 10). In the 19th dynasty cast scarabs, with legs free from base, and (Pl. I, 14) elaborate backs, often small bodies with great spread legs, are popular. Hathor or human heads are again seen. From 20th to 26th dynasties difficulty is encountered in classification, but bulbous abdomens, with free cut legs, are common (Pl. I, 21). Archaistic styles are imitated, and the novice is apt to misjudge the age of these (Pl. I, 22). Then at the close of the 26th dynasty, after the Persian conquest, we see the sudden passing of the sarab, save as a purely funery piece revived in Ptolemaic times.

Difficulty is encountered in the exceptions to these period types. The nature of the inscription must be considered, as for example, in Plates I and II, scarab 4. Here the general type would indicate post-20th dynasty, while the utter supremacy of the Sun God expressed would tend to place it before the revolt, at the end of the 18th dynasty, against the Solar worship of Akhenaton and his family.

They continue in the last days of Minoan Greece, where they pass to the Dorians in the high-ledged imitations in sard.

It is from the reverse that we gain most in our study of the scarab. This phase may be divided as follows:

A. Inscribed in Hieroglyphs

1. Royal cartouches
2. Names of officials
3. Official titles only
4. Individual names
5. Names and symbols of deities
6. Wishes and mottoes
7. Historic records
8. Magic Formulae
9. Funery passages from "Book of Dead"

B. Figures

1. Human
2. Animals
3. Pictured Events
4. Flowers
5. Miscellaneous objects

C. Designs

1. Geometrical
2. Coil Patterns

D. Plain

1. Center Perforation
2. Side perforation

Class D-1, may have been inscribed gold or electrum bases, or were worn purely as a gem (Pl. III, 2, 8, and 9).

Class D-2, were to be sewn on vestments (Pl. IV, 1).

Class C-2, first appears under Usurtasen I, king of Upper Egypt in the 12th dynasty, as shown by the care and regularity evidenced before an art ceases to be a novelty (Pl. II, 18). As it is in full development when it appears on his monuments, and scarabs, we may look to the Sumerians for its origin. The Egyptian added the lily design and we find it thus even on Minoan walls. It is common to many early arts, notably Scandinavian, Celtic, and Danubian Bronze ages.

Class B. May have had more intimate meanings of local significance now unknown.

Class B-5. Are extremely obscure by their very nature (Pl. II, 4). Interpretation as well as translation is needed. Belief in similar amuletic power of the pictured form persists in China in modern times.

In Class A, we probe into the mind of Ancient Egypt. Her written language,—especially the hieroglyphics, were a guarded secret from all foreigners. It had a deep and sacred significance, an analogy may be found with the Chinese. Verbs, grammatical endings, determinatives, letters and even syllables are often omitted on the scarabs for want of room, artistry being the prime aim. *Class A-1*, royal names are enclosed in "Ren" or cartouch (Pl. II, 9). It is not to be thought that this was the royal personal seal, but was the sacred amuletic name of the deified Pharoah, nor is it to be said that the royal name was always contemporaneous with the ruler designated. The type alone will so date them. The cartouches of early kings are often repeated in the archaizing revival of the New Empire. Thothmes III is found over a great period (Pl. II, 3). Rameses II, the Great, is for reasons unknown seldom repeated (Pl. II, 8). Akhenaton, the Heretic, and his unpopular family, were never repeated. Thus these scarabs are useful in placing the period type. Nib-mat-rā found repeated in the 26th dynasty is not Akhenaton's father, Amenhotep III, but probably Amenhotep, son of Hapu. The name is often spelled phonetically, as Queen Tii (Pl. II, 9), the "throne name," as Men-Kheper-ra (Pl. II, 3), or a symbol, such as the rabbit of Unis (Pl. II, 17). In *Class A-5,* the deity's name is either spelled phonetically, as Ammon (or "Amn," vowels not being used) (Pl. II, 5), or as a symbol, as Hathor with uraei (Pl. II, 11), Anubis (Pl. II, 22), or even as in *Class B-2,* as animals sacred to the deity. The "ankh," "hes," "nefer" and other symbols are often used to mean the postmortem souls, i. e., the dead.

Different deities were considered supreme at various periods and places. I feel it is highly probable that we may often locate the city of manufacture of scarabs by the deity invoked (Pl. II, 21). Thus I have been able to check in a few of known origin. Phthah was looked upon as a supreme in Memphis, Num in Elephantine, Saback in Letopolis, Hathor at Mensa and Denderah, Neith at Tena, Anubis at Sep, Nishem at Aukof, Taurt at Patek, and Ammon at Thebes.

Class A-6, are human in their personal touch, where we may today reach back four thousand years and find a kinship in the aspirations of the dim and distant past. "May your name be doubled in a son" (Pl. II, 10), "Happy and Prosperous New Year" (Pl. II, 16), "May God give you safety and life everlasting," (Pl. II, 12),—the inconceivable gulf of milleniums fade and we understand—it is human!

In spite of the fact that we may cite numerous cases where the Egyptian did not live up to *our* standard of morals, the "Forty-Two Laws" found in the 125th chapter of the "Book of the Dead" show as high an ethical concept as is to be found in any writing.

In *Class A-7,* many fragments of real value are to be found. An example is seen in the large record scarab of "Ab Mutt, priest of the South, who was granted leave and departed to visit the Mighty Ones of the North, where he made an offering to Ammon, etc." (Pl. IV, 10).

Class B-3, includes some material worth study, as the war chariot of Unis sweeps the enemy aside (Pl. II, 17); or the story of the post-mortem soul's journey (Pl. II, 14); or hunting scenes.

I have had the opportunity to examine some fine collections telling the story of the mind of Egypt as do few materials available to the man of moderate means. A collection may be small, as is mine, but descriptive of the class. I wish to make acknowledgment to my friend and fellow-collector, Prof. Herschel Parker, for assistance in obtaining, translating, and interpreting my best specimens, as well as for the free use I have made of the works of the authorities mentioned at the start and throughout this paper.

Much may be hoped for from studious amateurs in this field of Egyptology. The purpose of the writer of this paper is three-fold: To call attention to the deep spiritual, rather than the commonly accepted utilitarian origin of the Scarab; to present a basis for classification; and last, but not least, to stimulate interest in these Sacred Beetles of Ancient Egypt.

PLATES I AND II.

Upper portions on Plate I, bases in same order on Plate II.

1. Red Jasper Scaraboid from Cyprus. Figure of an Ibex with inscription in Cypriote syllabary. c. 1800 B. C.
2. XVIII-th Dynasty, tan steatite Royal Scarab. "The majesty of the heart of King Thoserkra." (The Reed and Hornet name of Amonhotep I.)
3. Green Jasper Royal Scarab of Thothmes III, "Men-keper-rā," XVIII-th Dynasty.
4. Light Green glazed faïence of late XVIII-th Dynasty. "Utat" (Right eye of Rā), "Rahr" (Dog), "Betu" (Fish), "Set" (Animal of Death), "Nub" (Gold), and "Nehem" (Flowers); i.e., "The sacred eye of Rā watches over all things."
5. Yellow-green glazed steatite, of XII-th Dynasty. "Am Ra neb" (Amon Rā, the God).
6. Light-blue glazed limestone Scaraboid head of XVII-th Dynasty workmanship. "Men-kah-rā," (A Pharoah of the IV-th Dynasty).
7. XIII-th Dynasty, amethyst "Gem" Scarab.
8. Royal Scarab of XIX-th Dynasty in blue-green glazed faïence. "User-mat-ra," (Rameses II, the Great).
9. Royal Scarab from XVIII-th Dynasty in yellow-green glazed steatite, of the wife of Amenôphis III, (Trans.) "The Divine double of the Goddess of Truth, the pretty Queen Tii, embraced of the living Rā, (i.e., the King)."
10. XVIII-th Dynasty "Wish" Scarab of reddish-brown glazed steatite. (Trans.) "Thy name shall be perpetuated in a child (son)."
11. Yellow-green glazed steatite Scarab of XVII-th Dynasty with Hathor head and uraei.
12. XX-th Dynasty blue-green glazed faïence "Amuletic" Scarab. (Trans.) "May Rā provide you with safety and life." (See No. 14.)
13. XVII-th Dynasty yellow-green glazed steatite "Royal" Scarab of King Dedumes. "Nefer-ded-ra, Suten ded ankh." (Beautiful living ruler of Upper Egypt.)
14. Opal-white glazed steatite "Funery?" Scarab of XIX-th Dynasty style with pictured excerpt from 129th chapter of the "Book of the Dead," showing the soul's progress after death. Over all the Winged Disk of Rā. 1st line: Osiris and the "Lords of Truth" in the "Hall

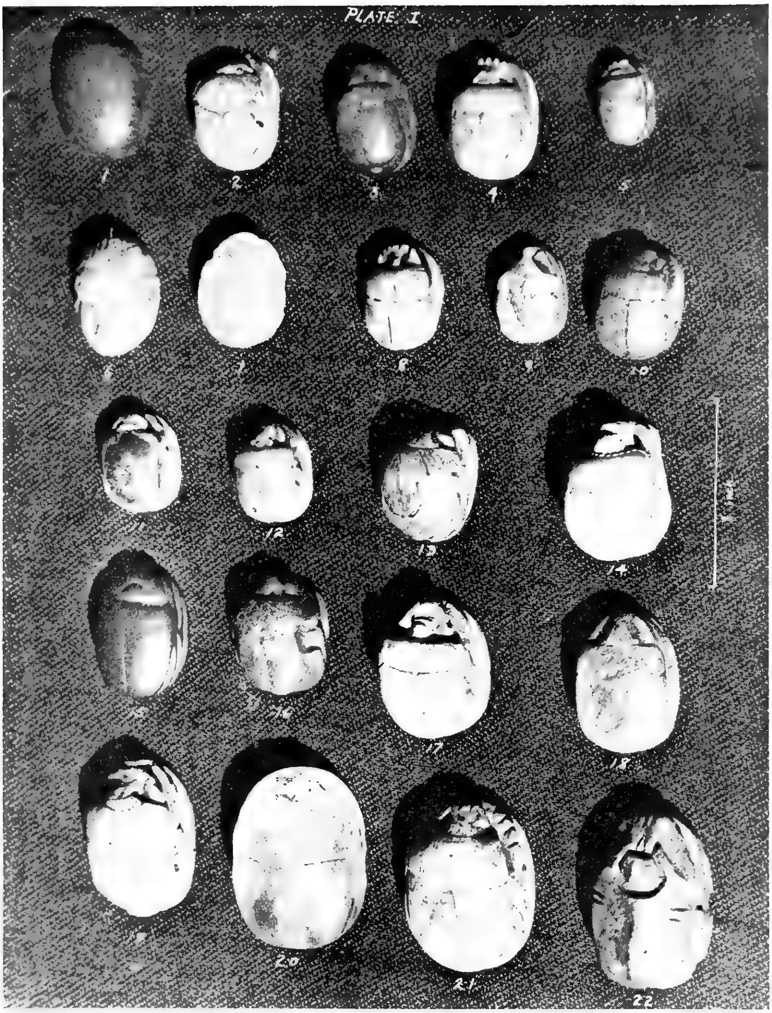


PLATE I.

of Truth," judges of the soul. 2nd line: Horus the Examiner, Thoth the Recorder, Mat the Goddess of Truth, and Anubis, the Director of the Weight, with the balance in which the soul's good deeds are weighed against the feather of Truth. 3rd line: The good deeds having been found sufficient the soul enters the "Boat of the Sun" in which the good Spirits are conducting it to Aahlu, the Place of Osiris.

15. Middle Kingdom, dark-green jasper Scarab, with boat.

16. XIX-th Dynasty, red colored limestone "Wish" Scarab. (Trans.) "May Isis give you a Happy New Year."

17. XIX-th Dynasty, ivory glazed steatite Scarab. War chariot of King Unis (V-th Dynasty) crushing enemy.

18. XII-th Dynasty "Royal" Scarab of green glazed steatite (?), with unusual double cartouch. "Ant neferu ankh hotep." (Steadfast in the living Beauties.)

19. XVII-th Dynasty, yellow steatite Royal Scarab of Intefoe, with traces of an old green glaze. (Reversed on Plate II.) "Nub Kheperu rā, nefer kheperu sutan bat." (Golden One of the Creations of Rā, Beautiful of Created Beings, King of Upper Egypt.)

20. XIII-th Dynasty, Rock-quartz "Gem" Scarab. "Tat xerp ankh" (To govern the emanation of life). (Reads thus in either direction.)

21. XXVI-th Dynasty, pale-green glazed steatite Scarab. "Sutem" (South), Crocodile (to govern), and Seth, or Set (Probably ref. to King Seti I), or a "Soul of Nekhen," ancient capitol of the Hawk-kings of the South (Hieraconpolis).

22. XXV-th Dynasty, sea-green glazed stone Scarab with horns of ram of Rā on back. On base Matt feather of Truth, and the Jackal-headed Anubis, "Weigher of Souls after death."

PLATE III.

1. Winged "Pectoral" Scarab of blue glazed faïence. c. XX-th Dynasty.
2. Gold ring with amethyst Scarab bezel. XV-th Dynasty (see Pl. IV, 2).
3. Animal Scaraboid ivory seal from Crete. c. 1500 B. C. (Hedge-hog, with two figures on base.)
4. Amethyst Scaraboid amulet. Frog of "rebirth."
5. Lapis lazuli Scaraboid seal. c. 3000 B. C.
6. Jasper Scaraboid seal of "Apis." c. 2000 B. C.
7. Glazed clay cylinder seal. c. 3500 B. C.
8. Blue glazed winged Scarab pendant. XX-th Dynasty.
9. Cut amethyst and gold bead necklace with rock crystal Scarab pendant. c. XIX-th Dynasty.
10. Large steatite "Historical" Scarab. Probably XVIII-th Dynasty.

PLATE IV

1. Reverse of "Pectoral," Plate III, 1. Showing placement of holes for sewing to vestments.

2. Bezel of ring in Plate III, 2, turned to side.

10. Inscribed base of "Historical" Scarab Plate III, 10. Free translation: "Ab-Mutt, Priest of the South, being granted leave, departed to visit the Great Kings of Lower Egypt (Mighty Ones of the North). In the Palace of the King he made an offering to Amen, and continued to the Sea, etc." (Trans. by Parker.)

11. Gray-green glazed amulet of the Goddess Taurt holding magic Sa symbol. To be worn by women for easy child-birth, etc. c. XXI-th Dynasty.

12. Bronze statuette of Osiris wearing Atif crown. C. XIX-th Dynasty.

13. Light-blue "Mummy" beads with Uzat, sacred eye of Horus Amulet. XIX-th Dynasty.

PLATE II.

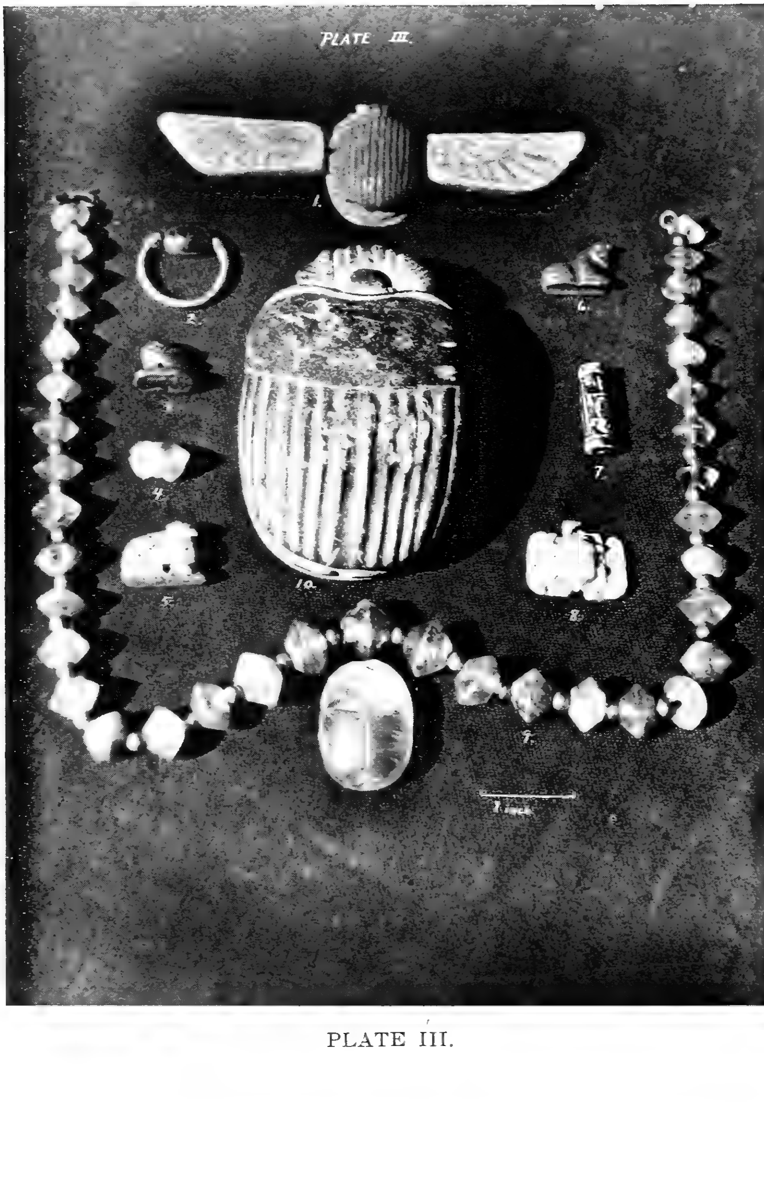


PLATE III.

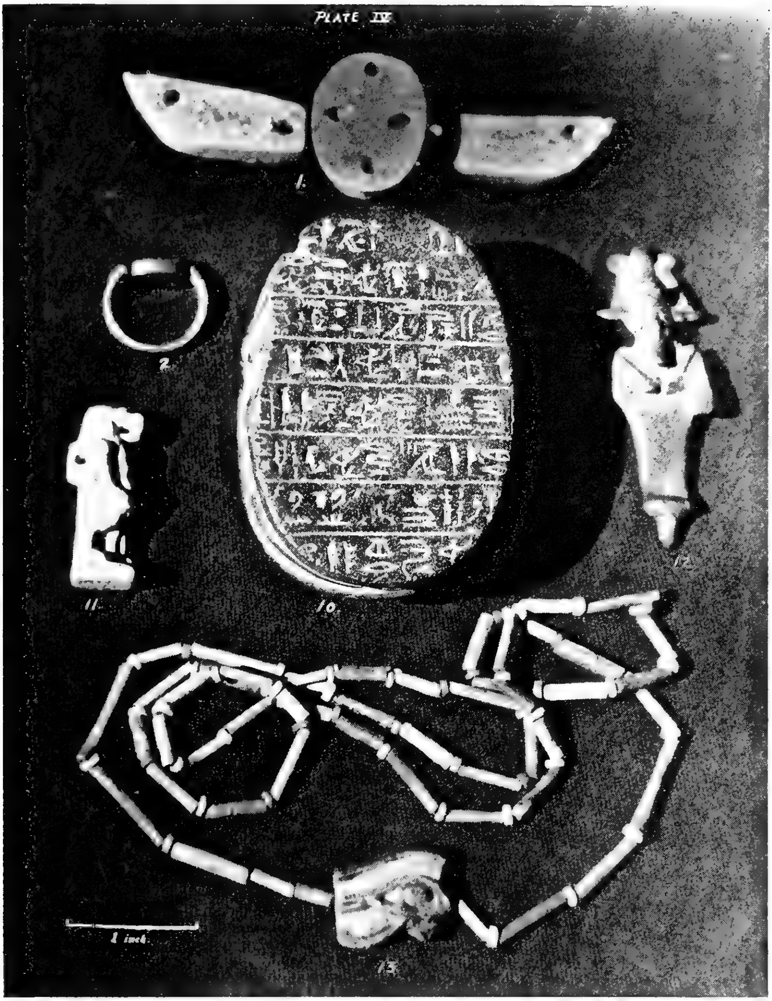


PLATE IV.

Approximate Dates of Dynastic Egypt

	OLD KINGDOM	
I and II	3500? to 2980? B.C.	Unification under Upper Egypt.
III to VI	2980? to 2475? B.C.	Pyramids built.
VII to X	2475? to 2160? B.C.	Internal Struggle. Scarabs appear.
	MIDDLE KINGDOM	
XI	2160? to 2000 B.C.	Reunification.
XII	2000 to 1788 B.C.	Development of Arts.
XIII to XVII	1788 to 1580 B.C.	Hyksos XV and XVI.
	NEW EMPIRE	
XVIII	1580 to 1350 B.C.	Greatest Expansion.
XIX	1350 to 1200 B.C.	On Defensive.
	DECADENCE	
XX	1200 to 1090 B.C.	Lower Egypt Independent.
XXI	1090 to 945 B.C.	Thebian Priest Kings.
XXII to XXIV	945 to 712 B.C.	Libian Rule.
XXV	721 to 655 B.C.	Ethiopian Rule. Assyrian Control.
	SAITE RENAISSANCE	
XXVI	663 to 525 B.C.	Greek Influence in Art.
	FOREIGN CONTROL	
XXVII	525 to 332 B.C.	Conquest by Persians. Scarabs pass.
	NATIVE REVOLTS	
XXVIII to XXX	460 to 346 B.C.	Native, Mendesian and Sabennytic.
	GREEKS	
	332 to 323 B.C.	Macedonian.
	323 to 30 B.C.	Ptolemies. To Roman Conquest.

STUDIES IN PACIFIC COAST LEPIDOPTERA
(Continued)

By John A. Comstock
Associate Director, Los Angeles Museum

Notes on the Metamorphosis of *Melitaea gabbii* Behr.

The early stages of this relatively common butterfly have long been a puzzle to California lepidopterists. During the spring of 1929 observations were made by Commander C. M. Dammers at Riverside, and independently, by his son Carlito Dammers, in the Ojai Valley, which made it possible for the author to secure a good supply of the larvæ.

The eggs are laid, as with many of the Melitaeas, en masse at the base of the plant. The young larvæ are gregarious, but separate as they approach maturity. The foodplant is *Corethrogyne filaginifolia* Nutt var *bernardina* Hall, in the region where our larvæ were gathered (Gavilan Hills near Riverside). Probably any form of Corethrogyne serves equally well in other portions of the specie's range. Mr. and Mrs. Oliver F. Young have also found it feeding on *Hazardia squarrosa* Greene.

Mature Larva:

Average length, 20 mm. Robust; ground color black.

A mid-dorsal row of short black branching spines is present, one spine to each segment except on the first three thoracic. There is a narrow velvety-black mid-dorsal line, edged outwardly at the base of each spine with orange-brown crescents. The body, lateral to this area, is black, covered with numerous small dirty white punctate spots. Two rows of branching black spines occupy this black area, their bases being encircled with poorly defined gray areolæ.

A narrow supra-stigmatal line is present, which is yellowish on the segmental junctures and orange-brown in the center of each segment. A similar line is placed infra-stigmatally, and the area between these two lines is of a lighter shade than the remainder of the body, due partly to the larger number of light punctate spots scattered over it. Another row of branching spines is present in this area, placed sub-stigmatally. The latter are of a lighter color than those previously described.

Below the last described row of spines, the body is black, with the usual covering of light punctate spots.

At the juncture of the prolegs with the body there occur a series of small horizontally paired branching spines, and the segment cephaled thereto contains similar spines. A single spine occurs in line with these on the 3rd thoracic segment and also on

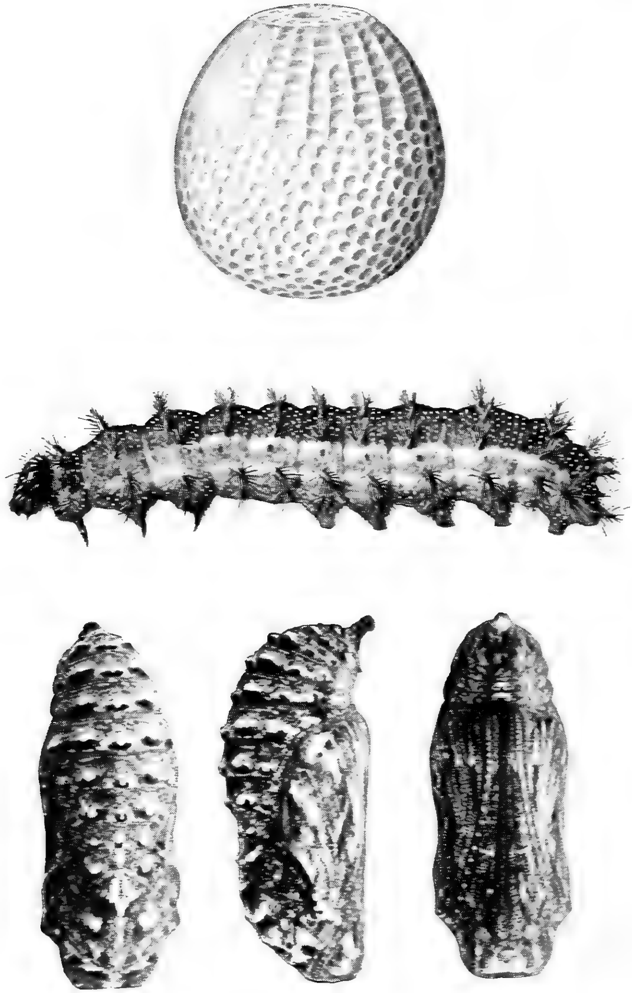


PLATE 5.

Early stages of *Melitaea gabbi* Behr.

Upper figure, egg, highly magnified.

Middle figure, larva, enlarged.

Lower figures, pupa, dorsal, ventral and lateral aspects, enlarged.

the 10th and caudal segments. The short single hairs arising from the main shafts of the spines vary on different rows, being a mixed brown and black on the upper series, and brown on the lower two rows. This gives the larva a rusty or coppery tone.

Head, black, covered with short black hair. Ocelli black. The first thoracic segment bears six small spiny tubercles, three on each side of the median line. True legs, black. Prolegs, black. Stigmata, oval, black centered, with whitish circlets. Abdomen, black. (See Plate 5.)

One larva of 8 mm., probably in its third instar was practically the same as the mature specimens, except for a lighter shade on the abdomen, and a light shade of yellow on the dorsal and lateral orange brown spots of the mature larva.

Larva of 3 mm., probably 2nd instar. This example shows an olivaceous ground color. There is a poorly defined dark mid-dorsal stripe, and another placed laterally which is bordered by two narrow light areas. Below this is a mottled area which is again bordered inferiorly by a lighter wide area.

The usual branching spines are present, the bodies of which are concolorous with the larval body, but the tips are darker. The mid-dorsal row is composed of very short spines bearing only one or two branches. The tubercles on the first thoracic segment bear each a long single hair which curves over toward the face.

Head, shining black, with a covering of short light-colored hairs. Ocelli black. True legs slightly darker than body, shading to almost black at the tips. Prolegs concolorous with body.

PUPA.

Length 11 mm.; greatest width, 4.5 mm. Ground color, ivory, nearly obscured by brownish and black blotchings and irrorations. The shape is recorded in Plate 5, lower figures.

A series of prominent tubercles occurs over the dorsum, arranged as follows:

One median dorsal row, suppressed over the thorax and first abdominal segment. (These are tipped with a light orange, and are heavily shaded anteriorly with black). Two rows on each side of the mid-dorsal area, tipped with ivory, (a few slightly shaded with light orange.)

The first lateral row of these tubercles is the most prominent, and is present over the thorax; the next is reduced to three or four, and is placed supra-stigmatally.

Stigmata, black on a lighter field.

In some specimens a broken and spotted orange line runs longitudinally immediately below the last described row of tubercles.

Cremaster black; the cremasteric hooks orange brown.

Further Notes on the Larva of Melitaea neumoegeni Skin.

In checking our original description of the mature larva of this species, the following additional points are worth noting.

The shafts of all spines are a glistening black, in contrast to the ground color of the body, which is a rich velvety black.

The bases of the mid-dorsal row of spines are encircled by narrow gray ringlets. The supra-stigmatal row of spines have lunate spots on their bases, which separate them from the spiracles. These are dull orange-brown.

The three joints of the prolegs vary in character. The proximal joint is a shiny black; the middle joint is a translucent gray with a narrow black line at its distal edge, and the terminal joint is gray at its base, shading to dull brown on the hooks.

This larva is illustrated on Plate 6.

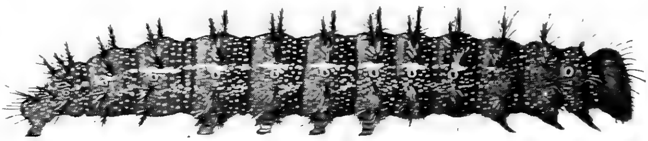


PLATE 6.
Larva of *Melitaea neumoegeni* Skin. Enlarged.

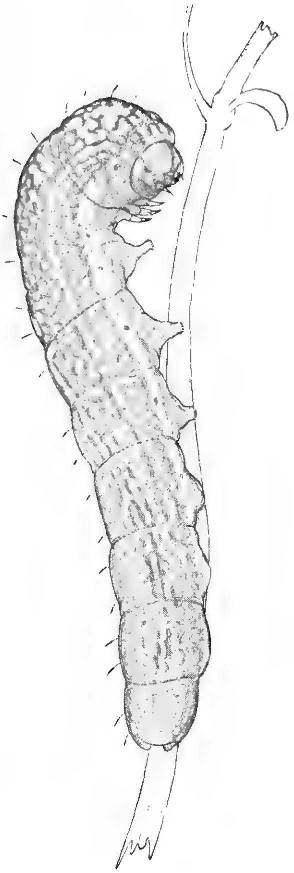
Notes on the Early Stages of Oxylos citrinellus G. & R.

During a collecting trip made in the vicinity of Indian Wells, Coachella Valley, Calif., in the fall of 1930, a number of greenish larvae were found on *Croton americanus*. These were nearly mature, and shortly went into pupation. The following notes were made with reference to the larva and pupa.

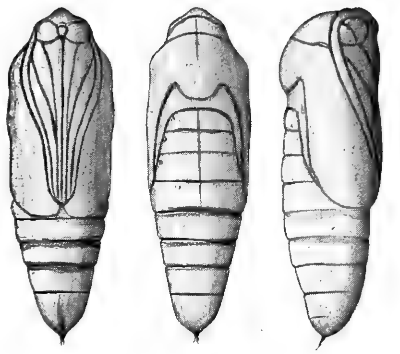
Mature larva. Length, 24 mm.

Ground color, apple green, overlaid by a reticulation of gray-green, composed of bars, dots and irregular figures, in a semi-geometric pattern, which is difficult to describe but is clearly shown in the accompanying illustration, Plate 7, fig. *a*.

A wide irregular whitish band runs longitudinally in the stigmatal area.



a.



b. c. d.

PLATE 7.

Larva and pupa of *Oxylos citrinellus* G. & R.

a. Larva, much enlarged.

b, c. d. Pupa, ventral, dorsal and lateral aspects, enlarged.

On high magnification the body is seen to be covered with minute papillae or spiculiferous projections which are colored differently in the several areas. Those which are placed over the green portions of the dorsum are black, while those over the gray-white reticulation and all of the lateral and abdominal areas below the stigmatal line are white.

Head, gray-green. True ocelli, black. Tips of mandibles and spinnaret, brownish-black.

True legs, gray-green, the terminal segments tipped with brown. Prolegs gray-green. Stigmata yellow.

A few single short hairs occur on various parts of the body, arising from circular whitish bases.

Foodplant: *Croton americanus.*

Pupa.

Length, 14 mm. Greatest width through thorax 4 mm.

Color, reddish-brown, the segmental lines slightly darker. Texture smooth.

The head faces ventrally, and the sheath for the mouth parts protrudes as a small button.

The dorsal thoracic portion is strongly arched and is restricted to the anterior ¼th of the chrysalis. Abdomen, gently tapering to a rounded anal segment, the cremaster protruding as a round nodule with four minute hooks, dorsally curved. The illustration, Plate 7, figs. *b, c, d,* render further description unnecessary.

A single imago emerged March 9, 1931.

NOTES ON THE LIFE HISTORY OF POANES MELANE EDW. (*Lepid*)

By John A. Comstock and Charles M. Dammers

Poanes melane is one of the common "Skippers" of Southern California, and in view of its relative abundance it seems strange that the metamorphosis of the species has not heretofore been recorded.

A number of eggs of this species were secured from confined females, on October 29th, 1930. They were laid indiscriminately on a variety of grasses, including Crab, Bermuda, and Brome, and the larvae raised to maturity on Bermuda grass. The young larvae emerged on November 3rd, making a period of five days in the ovum.

Egg. 1.2 mm. broad by .9 mm. high.

Hemispherical, with an apparently smooth surface, but on high magnification it shows a reticulation of low walls arranged in irregular hexagonal form, the cells thus defined having flat floors. See Plate 8, fig. *a*.

Larva, first instar.

Head black. The first thoracic segment has a black bar placed transversely across it. Body, dirty yellow-green, with darker lines running longitudinally, and a well defined dark mid-dorsal line.

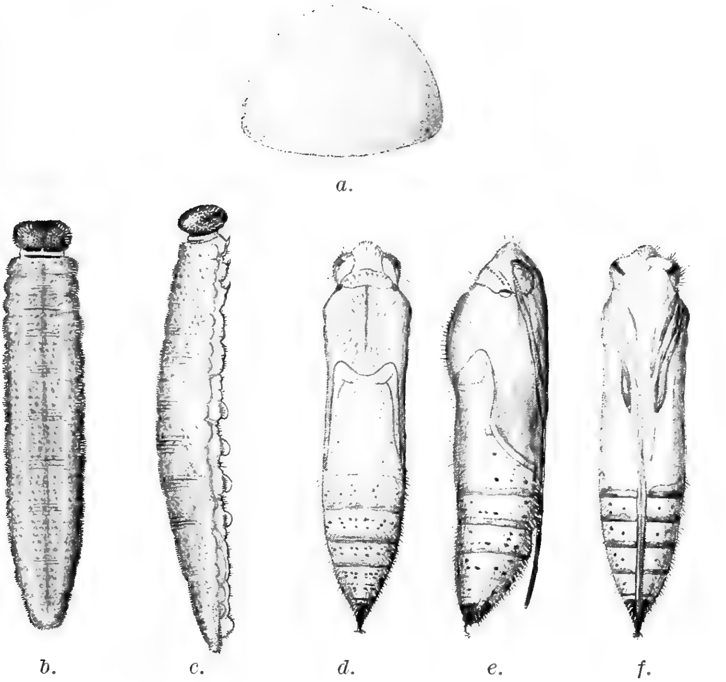


PLATE 8.
Early stages of *Poanes melane* Edw.

a. Egg, highly magnified.
b, c. Larva, dorsal and lateral aspects, enlarged.
d, e. f. Pupa, dorsal, lateral and ventral aspects, enlarged.

In each succeeding instar the head assumed a slightly lighter shade, and the black line on the first segment became reduced.

Mature larva.

Length, 32 mm.

Head, yellow brown, thickly covered with minute pits, the depths of which are shaded with a dark brown; the entire head clothed with a whitish pile.

Mouth parts, dark brown, as are also the inferior surfaces of the lobes. Ocelli resting on a dark brown base, the anterior 2 a glistening dark brown, the posterior 2 and inferior 1 a translucent white. Scutellum, white, edged anteriorly with black, and a narrow black transverse stripe separating the anterior 2/3 from the posterior 1/3, the latter evident only when the head is extended.

Body, dirty yellow-green, and mottled with black punctae of varying sizes, having some tendency toward arrangement in transverse rows.

There is a well defined blackish mid-dorsal line, and a very poorly defined dorso-lateral line, yellowish in color.

Stigmata, whitish yellow.

Abdominal surface, grayish-green. Legs, gray-green with brown tips. Prolegs concolorous with abdomen. There are two white stripes on the abdominal surface, placed transversely on the anterior edges of the 11th and 12th segments.

The entire body is profusely covered with short colorless pile.

The larva is illustrated in the resting attitude with the body less elongate than when crawling or feeding. See Plate 8, figs. *b, c*.

Pupation occurred from the 20th to the 25th of January, 1931.

Pupa.

Length 22 mm. Greatest width through thorax 5.4 mm.

The puparium was formed by uniting several strands of grass, with a loose inner lining of silk, through which were scattered numerous white flakes of silk.

The pupa is, at first, a light straw color, tinged with pink, later changing to a light grayish ochre.

Head prominent, with a decided anterior bulge of its central elements. Eye cases well rounded, and of a darker shade than the remainder of the head, particularly over the ocellar ribbon.

The tubercle of the first spiracle at the base of the pro- and meso-thoracic juncture is prominent, and slightly darker in color than its surroundings. The antennal sheaths are also darker than the adjacent parts.

Labial sheaths; prolonged over the abdomen and free at their tips, the posterior third being a dark brown.

Abdomen; cylindrical and gradually tapering. Numerous small black spots occur on the last several segments, as shown in the illustration on Plate 8, figs. *d, e, f*.

Cremaster, dark brown. Spiracles concolorous with ground color, and almost indistinguishable.

The head is covered with long yellowish-straw vibrissae, and a covering of shorter hairs occurs over the thorax and abdomen.

Specimens were reared to maturity on Bermuda grass. In a state of nature the species probably prefers native wild grasses.

The pupa figured in our illustration gave forth an imago on January 23, 1931. This may be a somewhat earlier date than usual, due to the sustained heat of the laboratory throughout the winter.

The remaining examples emerged between the 25th of January and the 15th of February, 1931.

The larva of *P. melane* spends most of its time in a loosely woven case formed of blades of grass, united with strands of silk, from which it ventures forth only at the time of feeding.

NOTES ON POLLEN-USER WASP, PSEUDOMASARIS EDWARDSII CRESSON

By Charles H. Hicks
Los Angeles, California

Much is yet to be learned in regard to the nesting habits and activities of our Masarid wasps in America, especially during the early stages of nest building and provisioning. Little is likewise known concerning the growth and development of the young larvæ. It was therefore considered good fortune when in May, 1929 a female was located near Arcadia, California with a nest barely begun. At the time found (May 5), it consisted of only the base of the first cell. Some notes were taken at the time. Later, the completed nest was secured for study. Certain facts obtained are given below. Some papers or earlier studies considering or referring to the biology of the wasps of the genus *Pseudomasaris* or related genera in America are those by Ashmead ('02), Baequaert ('29) ('29), Bradley ('22), Cockerell ('13), Davidson ('13), Hicks ('27) ('29), and Williams ('27).

A nest was found a little after noon, following much time spent earlier in the day in an unsuccessful attempt to locate the nests. Certain facts suggested that the wasps were confining their activities to a comparatively small area in flower visitation and possibly were doing likewise in nesting. Consequently, the immediate area was carefully scrutinized for nests. The rocks especially received attention, although it was already known that *P. edwardsii* sometimes attaches her cells to stems. In this way she has a similar habit to that of the larger species, *P. vespoides,* which avails herself of both plants and rocks. Which is preferred in either species cannot be emphatically stated, although the style of architecture is of necessity somewhat altered by the selection. Nests on stems are much more symmetrical and even approach a perfection which might be termed artistic.

At 12:37 p.m., a wasp was observed hovering near a bunch of Brome grass (*Bromus madritensis* L.*) and other plants, among which was *Phacelia* sp. After a brief pause in this fashion, it darted into the vegetation. Two minutes later it came out and flew away. Search at the place resulted in the finding of the nest. It consisted of the base of the first cell attached to a dead stem of some woody plant. The cell, at the time, was not more than 3 mm. long and its point of attachment was along the side of the stem.

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* Kindly determined by Dr. A. M. Johnson of the University of California at Los Angeles.

Time notes were taken on the activities of the nesting female, *P. edwardsii,* following the location of the nest. The records are for ten counts in each instance. It was found that the time away from the nest, during active work, varied from one minute to 3 minutes and 40 seconds, with an average of one minute and 59.3 seconds. The time at the cell varied from 55 seconds to 2 minutes and 43 seconds, with an average of one minute and 48.66 seconds. The counts were consecutive and fairly typical. Weather conditions may, however, modify materially the activity of the insect.

The time spent at the nest was used in constructing the cell; the time away from the nest was utilized in securing soil and possibly? in obtaining water to moisten it.

The soil was carried in the wasp's jaws. She consistently hovered, somewhat humming-bird fashion, before the plants holding her nest. In constructing the cell she seemed to work with her head inside the cell, building up the walls from below. Thus her fore legs were within, wings folded parallel, body pulsating rythmically. She worked fairly rapid, building more than three times the length of the cell first found, in the following two hours. During this time the sun was shining and the temperature high.

Thanks to the help of Ruth K. Hicks, the wasp's activity while away from the nest was observed and checked upon. Its source of building material was located 102 feet to the west. It consisted of a pile of mixed soils, dumped upon the surface of this desert-like region. *P. edwardsii* persistingly returned to a small ledge of a miniature slope, alighting at almost the identical spot each time. She thus resembled the Jug-builder, *Eumenes crucifero* Prov.* previously seen nesting along the Los Angeles River in her return to a given place for material.

Before alighting, in accord with her habit at nest, flower, or soil, the wasp paused for a brief moment (10 seconds in one instance). In getting the load, the wasp usually remains in one position. She bites it loose with her jaws and apparently moistens it with a liquid from her mouth. Her fore legs help to form the ball, although they are not in use all the time. The complete pellet of soil is not large and she is able to fly with it in an almost straight line to the nest.

The mound of soil serving as building material for *P. edwardsii* was 3 feet high with a broad, irregular base and a general western slope. It contained much more clay and less sand than the surrounding region. This fact may have been a contributing cause for the repeated visits. Too, other specimens of *P. edward-*

* Determined by Grace Sandhouse.

sii used it and later in the season, I found *P. vespoides* also coming to it. This latter species obtained it in much the same way as did the smaller and former one.

The wasp was not observed obtaining water. In fact, the country in which she was nesting was very dry. This, however, did not leave out the possibility of a source at some yard, garden, hidden pool or stream. For these reasons many hours were spent in searching for a place and in following, insofar as possible, the insect. But she was never caught in the act. It still remains to be learned whether or not she moistens the soil with regurgitated water. The soil for the cell is not exceedingly moist; it could possibly be moistened from secretions from her mouth or from the nectar obtained from flowers.

By 4 p.m. the weather was cooler, the sky somewhat cloudy and a light wind blowing. The activity of the wasp was lessened and an half-hour later it had ceased completely. She had crept head first into the nearly, if not entirely finished cell. Since it was much cooler, later, the nest enveloped in shadows, etc., she had ceased work for the day. The cell was destined to hold her and somewhat protect her during the night.

Academic duties prevented a continued detailed study of her work and many interesting facts were doubtless thereby lost. A week later the nest was found complete. It consisted of a beautiful group of six cells, which presented a regularity in sharp contrast to the inconspicuous mass sometimes found plastered on rocks. For convenience, the cells were numbered consecutively. Number 1 was constructed first; 2 and 3 probably next; 4, 5, and 6 last, with the exact order of these not known.

The cells consisted of two nearly parallel rows of three each. These varied in length from 14 to 16 mm. The thickness of the nest (2 cells) was 10 mm; the width (3 cells) was 18 mm. The maximum length of the nest was also 18 mm. It is the habit of this species to deposit loads of soil between, above and below the cells. This tends to break their outlines and especially upon rocks, brings about a resemblance which may be protective. The added soil made the nest longer than that of the individual cells.

On the evening of May 14, cell number 2 was opened. It was found to contain a pollen mass of provisions and a small larva of *P. edwardsii.* The young insect measured more than 2 mm. in length. It was wider (1 mm.) across the posterior segments than at the head and anterior region. Somewhat curved about the base of the provisions, resting with its back downward, its head and belly to the food, the larva was found feeding. The egg membrane was at the end of the larva and partly between it and the food, at the posterior end. The larva at this early age, as well as when mature, was very light in color and rather delicate in structure.

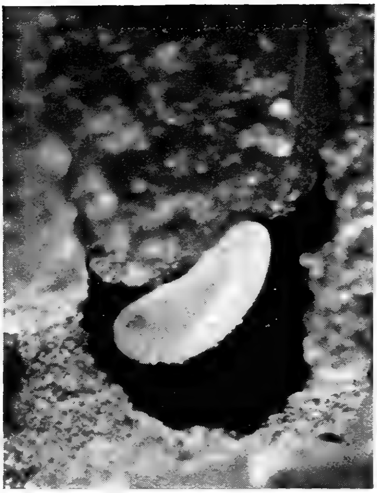

PLATE 9.

Egg of *P. edwardsii* shown curved about pollen mass at the base of the cell.

PLATE 10.

Newly hatched Larva of *P. edwardsii* feeding in place.

The pollen mass, practically complete, was 11 mm. long, nearly 4 wide and 3 mm. thick. The outer surface had the appearance of consisting of a series of layers (possibly representing pollen from separate collecting trips) which gave the mass a segmentation, the edges of which had scale-like projections. The mass of provisions, at the time, was plump and the outer part, of the consistency of light dough. This prevented it from running or flattening out of its own weight, althought not sufficient to prevent it giving upon pressure. The inner portion contained less dense food, more like honey.

The pollen and nectar, when first placed in the cell, is fairly liquid in nature as compared with the pollen mass of many days or months standing. In very old cells it is found hard, rough, shriveled and covered with minute papilla-like projections.

A free space of nearly 2 mm. remained above the upper, anterior end of the pollen provisions and between it and the plug to the cell. A short space likewise was found beneath it and the inner surface of the concave base.

The inner surface of the cell contained no film, coat or polish, although it was very smooth. The drying process of the food,

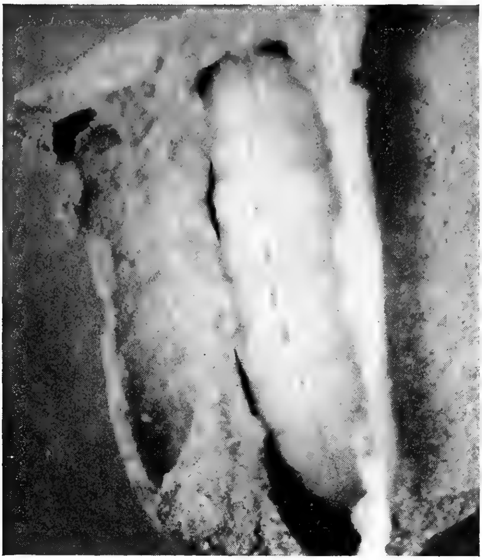

PLATE 11.

Full grown larva of *P. edwardsii.*
It remains dormant until spring.

when not normally devoured, must be slow for in mixing the soil for the walls the wasp may produce or utilize some hardening liquid. This substance may somewhat retain the moisture.

Cell number 3 contained an egg at the base of the pollen (see Plate 9). It was curved below and slightly upward about the pollen with its lesser angle toward the base. It measured about 3 mm. in length and was clear and light in color. Its position corresponded well with that of the newly hatched larva, the latter (see Plate 10) remaining and feeding in this place for some time after emerging.

The young in cell number 2 was observed casting its larval skin on the afternoon of May 17. It assisted this by wave-like contractions of its body from anterior to posterior end. The light, wrinkled skin was finally pushed to the posterior end where it appeared to remain until the next molt. In this it resembled the molting of certain Ceratina bee larvæ.

Cell number 1 was opened on June 5 and found to contain a mature larva (see Plate 11) which had apparently just finished feeding. The cell had been kept, during the period following its removal from the field, in the laboratory where it was cool. Its

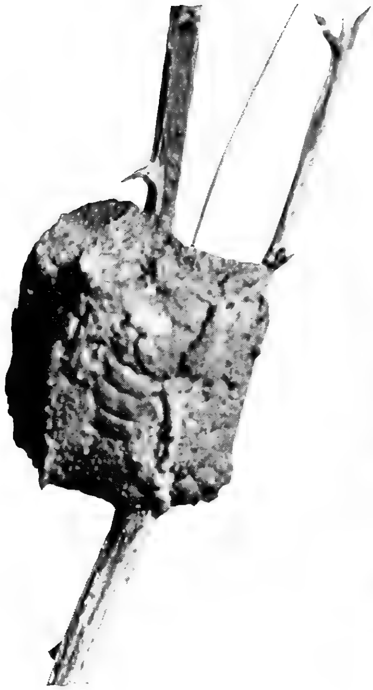

PLATE 12.
Nest of *P. edwardsii* on stem. Compare with figure to right.

PLATE 13.
Nest of *P. vespoides* on stem. One cell is incomplete. Note the characteristic cup-shaped depressions at end of finished cells.

development would doubtless have been hastened had it remained in the field in the nest exposed, at times, to the sun. The other cells contained nearly mature larvæ on this date. None were found to contain parasites. Possibly the location of the nest among the dense growth made the cells difficult for parasites to find.

These wasps, which have food-provisioning habits similar to that of some of the wild bees, are found fairly common in Los Angeles County. It is hoped that many more data may be obtained in regard to its nesting habits and biology. Other species likewise should be studied in order to see how nearly they agree in these somewhat peculiar wasp habits.

The writer is pleased to acknowledge his indebtedness and to express his thanks to Dr. John A. Comstock, for the drawing accompanying this article. Photographs had earlier been taken, over which the drawings were made. The photograph of the larger species, *P. vespoides,* has kindly been taken under the supervision of Dr. Comstock and is shown along with the drawings of *P. edwardsii* (see Plates 12 and 13) in order that the nests of the two may be compared.

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PROCEEDINGS OF THE ACADEMY

December, 1930, to March, 1931

December 13, 1930: Regular monthly meeting of the Academy was held in the Los Angeles Library. Dr. Mars F. Baumgardt, F. R. A. S., gave a beautifully illustrated lecture on what he chose to call "A Trip to the Moon." The speaker reviewed the facts gained by minute study of our satelite, and then in his inimitable popular manner led the members present on a hypothetical tour of the valleys of the Moon.

January 10, 1931: Regular monthly meeting was held in the Los Angeles Library. Dr. William A. Bryan, Director of the Los Angeles Museum, presented an illustrated lecture on the "Mystery of Easter Island" in which, as an introduction, he recounted the reasons leading up to a visit to the Island made by him in 1919 as well as setting forth the relation of this remote and seldom visited spot to other Pacific Islands and to the general theory of a submerged continental area in the mid-Pacific.

The limited land fauna and flora was shown to be almost entirely composed of widely distributed and well known plants and animals of comparatively recent introduction; none of them being sufficiently modified by isolation, etc., to be worthy of specific names. The marine fauna however was found to be distinctly Polynesian rather than American or continental in character.

The vanishing native people and their remarkable culture was dwelt upon at length and illustrated with an interesting series of original slides, showing the great stone images for which the Island is celebrated, the quarries from which they were taken and the native temples in which they were erected, all of which taken together with remarks made by the speaker on the geology and the life on and about this bit of distant land combined to form an interesting discussion of the scientific problems involved in a study of the unsolved mystery of Easter Island.

February 14, 1931: Regular meeting of the Academy held in the Los Angeles Library. The subject of the evening was "The Pueblo Indians of the Rio Grande." A talk was illustrated by artistically colored lantern slides and given by W. Allen Cushman, who has lived with and made a study of the arts, customs and life of these unappreciated and delightful children of Nature. The speaker was assisted in his portrayal of the music, songs and dances by Wo Peen who in costume gave the ceremonial airs of his people. Beautiful examples of the art and black pottery were shown.

March 14, 1931: Regular monthly meeting was held in the Los Angeles Library. Mr. A. C. Harwell gave an illustrated description of "Birds from Sierra to Sea." The illustration by realistic whistles of our California feathered life made the picture perfect. The plea to preserve our birds was echoed by all present.

The Academy hopes that its members will attend the programs held on the second Saturday of each month at 8:00 P. M., in the Auditorium of the Los Angeles Library.

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Dr. R. H. Swift, *Secretary.*

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REPORT OF LORQUIN ENTOMOLOGICAL SOCIETY

The spring meetings of the Lorquin Entomological Society have been of particular interest to those who are following the "Studies in Pacific Coast Lepidoptera" published regularly in this Bulletin. Through the peristent efforts of Mr. C. M. Dammers, and the occasional assistance of our younger Lorquinians, Dr. Comstock has been able to record the life histories of practically all those species of butterflies indigenous to the mountains and deserts of Southern California.

The breeding experiments by Mr. Dammers over a period of years upon *Euphydryas chalcedona* tend to prove that color variations are regulated by conditions of temperature and humidity, and that larval aestivation accounts for the scarcity of butterflies in periods of drought.

Exceptional catches of *Papilio pergamus,* rarest of the swallowtail butterflies in North America, were recorded during the second week in April. Mr. and Mrs. Sperry discovered the flight in upper San Gabriel Canyon.

Lloyd Martin and Chas. Ingham netted *Anthocharis pima* in abundance near Tucson, Arizona. Eggs and larvae procured by Mr. Ingham failed to survive the change to another food plant, except in the case of a single individual raised by Mr. Dammers.

The rare *Sphinx phaeton* has been taken by Dr. Comstock, Dr. Halbert, Miss Rudkin, and Mr. Dammers, who noted the plant food. Enough *phaeton* are in the possession of Mr. Dammers to supply the leading museums in America and Europe.

Mitoura loki has been reported from Jacumba, Warner's Hot Springs, Gavilan, Palm Springs, Morongo, Redlands, and Riverside.

Certificates of Honorary Membership were awarded to Mr. E. J. Oslar, Dr. E. P. VanDuzee, Mr. James Cottle, Dr. W. J. Holland, Dr. L. O. Howard, Dr. J. McDunnough, Dr. F. H. Benjamin, and Dr. Frank E. Blaisdell, Sr., for outstanding contributions to the science of Entomology.

Fifty-two members and friends were present at the opening of the Tenth Annual Butterfly Show in the Los Angeles Museum. The One Hundredth Meeting of the society was celebrated on February 27, 1931. A brief review of the history of our organization revealed that the Lorquin Natural History Club was organized by Fordyce Grinnell in August, 1913, and that Dr. J. A. Comstock has served the society for a longer continuous period than any other member.

Respectfully submitted,

JOHN S. GARTH, *Secretary Lorquin Society.*

BULLETIN of the SOUTHERN CALIFORNIA
ACADEMY of SCIENCES

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All issues of the above are now out of print.

■ ■

Bulletin of the
Southern California Academy of Sciences

Began issue with Vol. I, No. 1, January, 1902. Issued ten numbers in 1902, nine numbers in 1903, 1904, 1905; three numbers in 1906. Issued two numbers annually from 1907 to 1919, both inclusive (except 1908—one issue only). Issued four numbers (January, May, July and October) in 1920.

The 1921 issues are: Vol. XX, No. 1, April; Vol. XX, No. 2, August; Vol. XX, No. 3, December.

The 1922 issues are: Vol. XXI, No. 1, March; Vol. XXI, No. 2, September.

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"	26,	"	3.	September,	1927	.25
"	27,	"	1.	January,	1928	.25
"	27,	"	2.	May,	1928	.25
"	27,	"	3.	September,	1928	.25
"	28,	"	1.	January,	1929	.25
"	28,	"	2.	May,	1929	.25
"	28,	"	3.	September,	1929	.25
"	29,	"	1.	January,	1930	.25
"	29,	"	2.	May,	1930	.25
"	29,	"	3.	September,	1930	.25
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BULLETIN OF THE

Southern California Academy of Sciences

LOS ANGELES, CALIFORNIA

Nostra tuebimur ipsi

Vol. XXX May-August, 1931 Part 2.

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Issued Sept. 10, 1931

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PREHISTORIC PAINTINGS IN SANTA BARBARA

By Dr. R. H. Swift

In the mountains, six miles in a direct line to the northwest from the City of Santa Barbara, at an elevation of about 2,400 feet above the sea, is to be found one of the finest examples of prehistoric rock painting, or pictography, to be found in California. It was discovered, I am told, by Dr. W. J. Hoffman in 1884, but little study has been made of it.

The writer found these paintings in a shallow cave (Plate 14) in a thirty-foot gray sandstone rock mass near the Arroyo Burro. The cave opened due north and extended south about fifteen feet. Immediately within the entrance the cavern reaches its maximum width of some fifteen feet, at which place there is about an eight-foot ceiling, with the floor rising rapidly to rear. The western wall (Plate 15), and to a less degree the east wall (Plate 16), contains most of the paintings. There are evidences on the blank south, or back wall and ceiling, of there having been similar pictographs thereon which have been effaced by seepage and rock disintegration. The paintings primarily extend well up onto the ceiling in all cases.

The cave is high above the canyon bottom, but shows evidence of having been formed by river action. This could give a rough estimate of the age of the cavern but no light would be thus shed on the age of the paintings, for the cave as we now see it was probably so found by the primitive artists, on a high trail many centuries ago.

The paintings or pictographs, are vividly executed in usual Indian fashion, in blue, white and red mineral pigments. The encircled cross "Sun symbols" in many variations predominate; several are to be seen on the rock ledge over the entrance. The balance of the figures are scattered without order on the walls of the interior. There are tree, animal and human forms and design figures of uncertain meaning. The workmanship is not so elaborate as those on "La Piedra Pintada" in eastern San Luis Obispo County. The human forms were of the usual crude, stiff, conventional primitive types. A figure of man with feathered headdress and ceremonial garment of broad blue and white horizontal stripes was often repeated. Most of the figures are those commonly met with in the study of the designs of the basketry, pottery and bead-work of the Indians within historic times. Because of its seclusion from weathering, the whole is in a remarkable state of preservation, save for the work of the usual child-minded adults, who are always found present, ready and glad to ruin priceless monuments by carving their names and stupid comments, and who have wantonly mutilated some of these beautiful examples of prehistoric American art. Stricter laws alone can save us from such pests. The present owners, through whose kindness I was permitted to study the cave, have thoughtfully erected an iron gate to preserve this art for posterity.

No artifacts have been found in or about the cave, so as to approximately date the work or identify the artists. This can only be done by comparing with other, more or less, similar petroglyphs and rock paintings to be found in or near the lands of Shoshonian influence in California and to the east.

There is little reason to ascribe to this work the great antiquity which some of our American Archeologists seem prone in estimates of the prehistoric in America, to give it. Certainly

PLATE 14
Entrance to cavern

there is no foundation for the fanciful flights of the mystically inclined pseudo-scientific mentalities who break into print with romantic stories of transcendent civilizations existing milleniums ago in our land.

These paintings on rocks are fairly numerous in the lands of the Chumash, Gabrieleno, and southern Yokuts; notable examples are to be found from the great Painted Rock on Carriso Plains, south through Santa Barbara, to the Channel Islands. The fact that the Chumash of historic times ascribed great antiquity to the work is in all probability in line with the usual unreliability of their loose chronology. Cases are common where events which are known to have taken place but several generations before, are placed by the Indian in a long forgotten age.

Taking into consideration the action of the elements upon the work, one can say that a very fair estimate would place the age of all of this artistry within a period culminating about three centuries ago, and extending back some five hundred years from the present.

As to who were the artisans, we can but look for possibilities. The work is distinctly that of a good grade of Indian artistry. The symbols show no departure from the designs used by the Red Man of historic times.

The early Spanish records describe the Santa Barbara Chumash as being the most advanced of the California tribes. That a high degree of artistry lingered through the Mission Days, although rapidly declining, is seen in the basketry we now possess. It does not tax our imagination to picture the ancestors of the Chumash as the artists of these rock paintings. The early whites exaggerated, in most cases, the low culture of the Indian, even where a comparison of the mentalities of the two would in no way be flattering to the white.

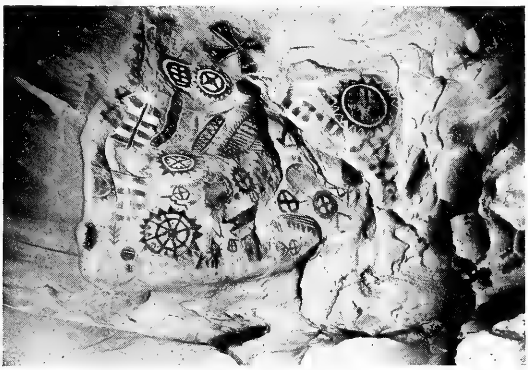


PLATE 15
Pictographs on west wall of cavern

What these pictographs were intended for can only be surmised. The report in Vol. IV, Bureau of American Ethnology, is inclined to think they were pictograms of a utilitarian nature describing articles of trade, etc. It is true that the cave is near a spring and an old established trail over the Santa Inez mountains, but the care and detail and the use of several colors on a single drawing, would suggest more than mere ideographs of comparatively recent times.

Within historical times the Luiseño maidens painted stones as a part of the Adolescence Rite. Such ceremonial practices might be the explanation, but this seems highly improbable.

The cave has the appearance of a ceremonial recess. It may have been the abode of a local "Shaman," and the crude symbols for his "Medicine Magic." Padre Boscana's unfinished account of early California Indians, "Chinigchinich," is unfortunately cut short while describing their mythology. He tells of a definite and complete astrological system where the sun passed through the twelve houses of the sky; " . . . The twelve palaces were marked by a circle called the Zodiac, but with signs which alluded to certain passages in the fable . . . "; and here breaks off this rare

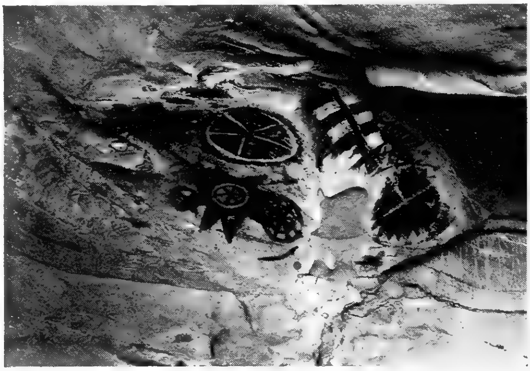


PLATE 16
Pictographs on east wall of cavern

old manuscript. It would, however, lead us to the thought of the possibility of many of these sun, tree, animal and human characters passing high over this vault from east to west, being made for the purpose suggested by Boscana,—Symbols of primitive striving to interpret the mysteries of Nature; Quien sabe?

PSEPHIS (*PETRICOLA*) *TELLIMYALIS* (*CPR.*) NOT THE YOUNG OF *PETRICOLA DENTICULATA* SBY.

By G. Willett

In most of the California shell collections are specimens of a small *Petricola* that is common at times along our southern California shores, particularly in the vicinity of Santa Monica. This is the species that Dr. Philip Carpenter named *Psephis tellimyalis* (B. A. Rep. Moll. W. N. Am., 1864, p. 641). Later Dr. W. H. Dall (Nautilus XIII, 1900, pp. 121-122) declared Carpenter's species to be the young of *Petricola denticulata* and it has been thus generally labelled.

A few months ago, while the writer was talking with Dr. W. O. Gregg, the well-known California conchologist, he mentioned having taken undoubted specimens of the young of *Petricola denticulata* and stated that they were very different from the shells that we had been considering the young of that species. A short time later Mr. Stanley Field informed the writer that he had taken similar specimens and was of the same opinion as Dr. Gregg. Through the courtesy of these two gentlemen, specimens of the young of *Petricola denticulata* were furnished for comparison, and, after a careful study, the conclusion was reached that the two forms compared were entirely distinct and that Carpenter's name *tellimyalis* must again be applied to the shell under discussion.

Petricola tellimyalis is readily distinguishable from the young of *P. denticulata* by its entirely different shape, *denticulata* being much more elongated and not at all triangular. These differences may be easily seen in the appended cut, Plate 17.

Los Angeles Museum, Los Angeles, California, April 2, 1931.

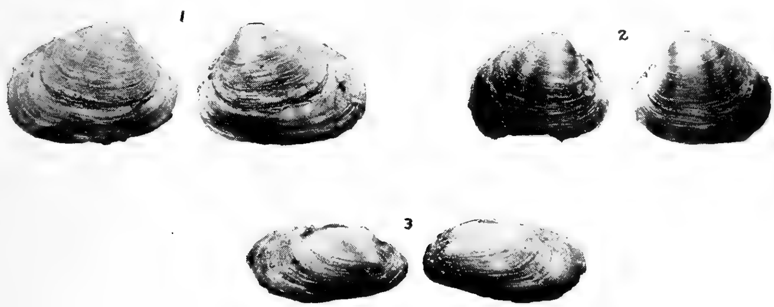


PLATE 17

Fig. 1. Petricola tellimyalis Cpr., light phase.
Fig. 2. Petricola tellimyalis Cpr., dark phase.
Fig. 3. Petricola denticulata Sby., young.

Figures twice natural size.

NOTES ON THE EARLY STAGES OF FOUR CALIFORNIA ARGYNNIDS (Lepid.)

By John A. Comstock and Charles M. Dammers

Several Fritillary larvae were brought to us by Mr. Randolph Matson, who had collected them in Bouquet Canyon on April 17th of this year. The following notes were made, and several specimens raised to maturity.

Argynnis macaria Edw.

Mature larva. Length, 30 mm. Body, velvety black, covered with branching spines. There is an inconspicuous double mid-dorsal line, dull gray in color, running the length of the body, but less clearly defined on the segmental junctures. Lateral to this is the first dorsal row of branching spines which are represented on all segments. The shafts of these spines are tinged with dull yellowish gray at their bases, and shade into black at the tips. The branching bristles arising from them are a glistening black.

There is an intensely black velvety area on the body, quadrate in shape, medial to each one of the spines above described. The next lateral row of spines, supra-stigmatally placed, is similar in coloring to that previously described, but a variation occurs on the first three thoracic segments. The spines in this area have been reduced to small nodules bearing a few simple black hairs, and in addition, two large spines are placed at a slightly lower level on the segmental junctures. The latter are a bright yellow on the main shaft, shading to a dull grayish-black at the tips. The bristles on these spines are black.

An area on the body immediately in front of each one of these spines is also an intense velvet black, except for the three thoracic segments.

A third row of branching spines is placed infra-stigmatally, extending from the 4th to the 11th segments. The shafts of these are yellow, with the tips only, shaded with gray-black, and the bristles jet black. A lateral gray line, composed of spots and irrorations occurs on the body, placed longitudinally, in line with the last described spines.

A row of small tubercles occurs inferior to the series of spines last mentioned, each one of which bears a number of simple black bristles.

The body of the larva is covered with short black glistening hairs, and is sprinkled with small grayish dots and blotches except over the quadrate velvety black spots which lie in relation to the upper two rows of spines.

Abdomen: dull black, and covered with numerous small gray spots. Short hairs or bristles occur on the abdominal surface.

True legs black. Prolegs black on the proximal segments, with a fringe of brown hair on their lower edges; translucent gray on the middle and terminal segments, with the pads black.

Head; dull black, covered with shiny black tubercles and bristles.

Ocelli, jet black.

Spirades, black centered, with narrow gray circlets.

One specimen was parasitized by a Tachinid fly—*Phorocera sp.*

The mature larva is illustrated on Plate 18, Fig. *a*.

Pupa. Length 20-22 mm. Greatest width through thorax, 8 mm. Ground color, dirty ivory, heavily overlaid with black markings as shown in the illustration, Plate 18, Figs. *b* and *c*.

Thorax and abdomen markedly arched. A row of low papillae occurs each side of the median dorsal area, extending from thorax to abdomen.

A few short, barely perceptible vibrissae are present on portions of the head, dorsum, and abdomen.

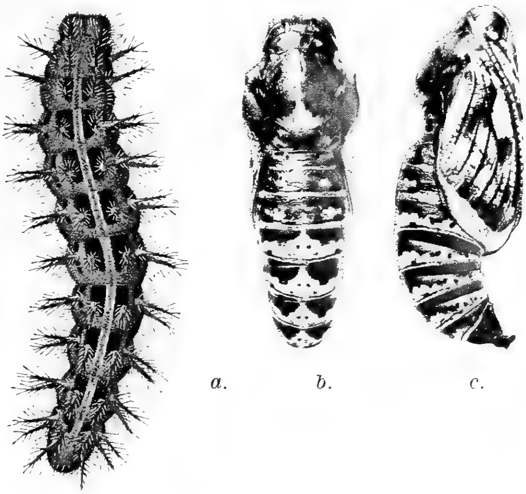


PLATE 18

a. Mature larva of *Argynnis macaria*, dorsal aspect.
b. Pupa, lateral aspect.
c. Pupa, dorsal aspect.

All figures slightly enlarged.

Mr. Matson collected a number of *A. macaria* larvae at Lebec, and placed them with us for observation. Included in the lot was one example which showed points of difference.

This was placed in a separate breeding compartment, and notes made during its development. The resulting imago proved to be the following species.

Argynnis atossa Edw.

Mature larva. Length, 35 mm. Same general structure and coloration as the larva or *A. macaria,* but with the following points of variance.

A dirty yellow patch occurs along the dorsum of the head, near its juncture with the first thoracic segment.

The supra-stigmatal row of spines are lighter on their shafts than are the corresponding spines of *macaria.* There is also a greater amount of mottled gray along the sides of the *atossa* larva, below the infra-stigmatal row of spines.

Pupa. Length, 20 mm. Very similar to that of *A. macaria,* the chief difference being in the lighter aspect of the wing covers, with a marked reduction of the black veining and mottling, a narrowing of the veins, and the formation of separate quadrate spots at their outer ends. This feature may be an individual variation of the particular specimen observed.

Argynnis callippe Bdv.

Egg. Size, .75 mm. broad by the same in height. Ovoid. Color when first laid, yellow, changing to a pinkish brown.

The surface is ridged vertically by about 20 ridges, extending from base to micropyle, several of which become confluent with their neighbors near the base and at the upper end. Horizontal ridges numerous and conspicuous.

This egg is much more ovoid than is the case with other members of the genus, and in the examples observed, does not show the usual tendency to become conoid.

The specimens from which this description was prepared, were submitted by Mr. Jean Gunder of Pasadena.

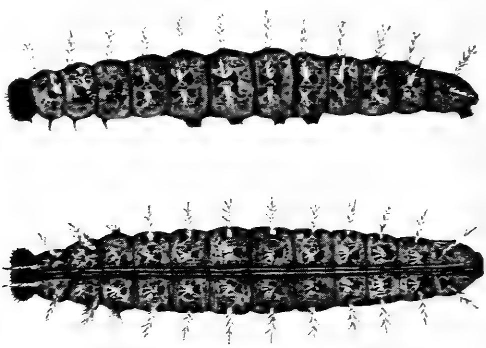


PLATE 19.
Larva of *Argynnis callippe.*
Upper figure, lateral view. Lower figure, dorsal view.
Both figures slightly enlarged.
Drawing by C. M. Dammers.

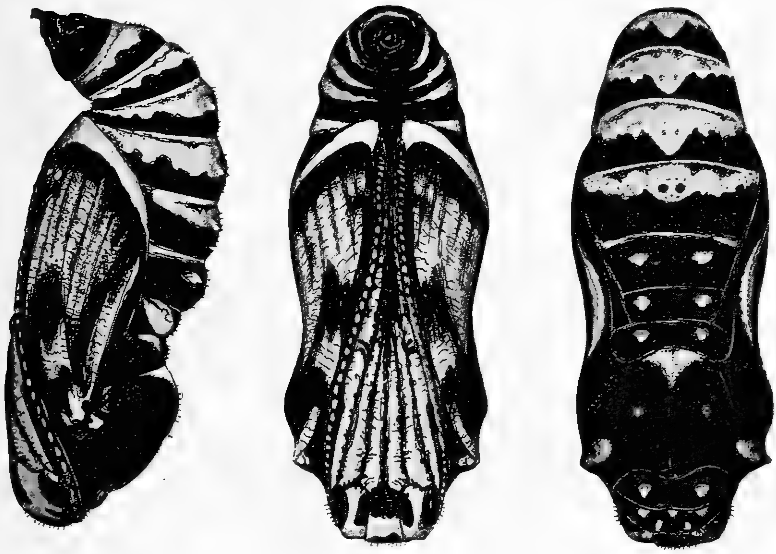
Mature larva. Ground color, light gray, overlaid with black blotchings, disposed as shown in the accompanying illustration, Plate 19. A double gray mid dorsal line is present.

The spines are disposed as in other members of the genus, but are somewhat more yellow in color than is the case with the two species above described. Otherwise the larvae are very similar.

Pupa: Length 22 mm. Ground color deep ivory brown having a purplish cast. The spots and markings are a deep black. Similar in shape to the pupa of *macaria,* but with heavier and more profuse black, as will be noted by referring to the illustration, Plate 20. The dark veins on the wing covers show a fusion at their outer ends into a broad black band.

The larva from which this description was drawn was secured in the Ojai Valley by Carlito H. Dammers, on April 12, 1930. It pupated April 22nd.

A number of observations have been made by the authors, and others, on the feeding habits of the larvae of this genus, during the past summer. It has been previously inferred that they were nocturnal. Investigation shows that at least a part of



a. *b.* *c.*

PLATE 20

Pupa of *Argynnis callippe*, showing (*a*) lateral, (*b*) ventral, and (*c*) dorsal aspects. All figures enlarged.

their feeding is carried on during the day. They do not, however, rest upon the food plant, but instead usually follow the practice of concealing themselves in nearby tufts of grass or other vegetation. When feeding time arrives they rush out to the nearest violet plant and proceed to devour an entire leaf, after which they retire to their retreat. Occasionally they may be found resting at the base of the plant.

In a state of nature they feed exclusively on violet leaves. They may however be raised on garden pansies.

ARGYNNIS SEMIRAMIS EDW.

To larvae were collected at the upper end of Devil's Cañon near San Bernardino, on April 16, 1931. They were then in their 2nd or 3rd instar. After feeding to maturity the following points were noted

Larva. Last instar. Similar to that of *A. callippe* except that all spines are black, with orange bristles, and the lower line of spines is orange with black tips and orange bristles.

Pupa. Practically indistinguishable from that of *A. callippe.*

One example emerged June 6, 1931.

Differentiation of the above described larva may be made on the following points:

Atossa. Yellowish patch on dorsum of head. More pronounced lateral mottled gray line.

Macaria. Black spines with black bristles.

Semiramis. Black spines with orange bristles.

Callippe. Orange spines with black bristles; the upper pairs with black tips. The spines on first segment only, a solid black.

Pupation of all four species above described occurs in the usual manner for the genus, the chrysalis hanging pendant from a silk button.

SOME NEW BUTTERFLIES (Lepid., Rhopalocera)

By J. D. Gunder, *Pasadena, Calif.*

Anthocharis sara Bdv., tr. f. **corcorani** new transition form.

The usual red or reddish-orange of the apical area of the primaries is here a light yellow. Classification: chromatism; red to yellow (as in *reakirtii sternitzkyi* Gun.)

Holotype ♀; expanse 46 mm. Griffith Park, Los Angeles, Calif. April 14, 1931. Type in Author's coll. Named after a local collector, Mr. J. A. Corcoran of Los Angeles. Note: *Reakirtii* Edw. should be given the status of a race in future check lists.

Anthocharis sara Bdv., race *julia* Edw., tr. f. **sulfuris** new transition form.

Red patch at apical area on primaries here becomes a bright yellow. Almost lack of or thin or broken black transverse bar under red patch on upper side primaries determines race *julia,* as compared to *sara, reakirtii,* etc. Classification: chromatism; red to yellow (as in *reakirtii sternitzkyi* Gun.).

Holotype ♂; expanse 38 mm. Kellogg, Idaho. June 1, 1931. Type in Author's coll.

Eurymus harfordii Hy. Edw., form ♀ **martini** new ♀ form.

The white female of *harfordii.* Primary apical and outer marginal black maculation areas as in Fig. 4, Pl. 15 of Comstock's "Butterflies of Calif."; however all female *harfordii* vary in the amount of marginal darkness. There is a slight yellowish tinge only at outer and inner margins on upper side secondaries and nearer apex along costal margin on upper side primaries; whether this is an attribute of the white female form remains to be seen.

Holotype ♀, expanse 46 mm. South side of Arrowhead Lake, San Bernardino Co., Calif. Sept. 2, 1931. Type in Author's coll. Named after Mr. Lloyd Martin of Roscoe, Calif.

Eurymus chippewa Kirby, form ♀ **kohlsaati** new ♀ form.

The yellow female of *chippewa* (probably of syn. *helena* Edw.) A strong yellow in contrast to the white or slightly yellowed white of the usual white females. Marginal black border designs, greenish of upper and under sides of secondaries and darker basal flares of upper side secondaries as usual.

Holotype ♀, expanse 45 mm. Mt. McKinley Nat. Park, Alaska. July 14, 1930. Taken by Mr. Frank Morand of Los Angeles and named after my good friend and expedition associate, Mr. John E. C. Kohlsaat of Carpenteria, Calif. Type in Author's coll.

Argynnis **dodgei** new species.

Argynnis irene Bdv. is well illustrated by Chas. Oberthur in "Etudes de Lepidopterologie Comparee," pl. CCLXII, fig. 2197. The figure shows a lightly marked ♀ example; light yellow-brown upper side and light chocolate-brown maculation under side. Comstock in "Butterflies of California," Pl. 26, Figs. 4, 5 and 6, also shows correctly this light *irene*. Boisduval's type then, must have come from the region around Truckee or north through Sierra or Plumas Counties of California. This summer Mr. F. W. Friday of Hollywood secured a good series in both sexes for me from the high Gold Lake region of Sierra County which are all constant and light as the original type. Now as *irene* proceeds northward and up the coast it becomes darker and as found on Mt. Shasta and the nearby Castle Lake region most of the examples are a purple-brown color on underside and darker shade on upper side, though an occasional light specimen can be found. At this point in that part of California they are not all truly dark. Getting north into Oregon and at Diamond Lake, in Douglas County, which is just north of Crater Lake, all the specimens are dark, having a reddish-brown upperside and a dark purplish-brown or reddish-brown under side, and they are constant in this respect, being of quite different appearance from the Boisduval type in the California Sierra mountains. To this race (species for the time being) I apply the name *dodgei*. They average larger in both sexes then *irene*. The maculation of the upper sides is heavier aside from the ground color being darker. On the under sides the characteristics of the prominent white spots remain; instead of the two fine lines found at the outer margin on the secondaries, as in *irene*, they here become practically a dark band. Like *irene*, *dodgei* is unsilvered. Mr. E. A. Dodge of Santa Cruz, Calif., first sent me several examples which were taken at Diamond Lake in 1930 by Mr. Strohbeen and this year Mr. Fred Lawrence secured long series in both sexes from the same locality.

Holotype ♂, expanse 53 mm., July 10, 1930; allotype ♀, expanse 57 mm., July 17, 1931. Diamond Lake, Douglas Co., Oregon. Types in Author's coll. Paratypes—10 ♂, and 3 ♀; same place and dates. One pair deposited in the Canadian Nat. Coll. at Ottawa and one pair in the Nat. Museum (Barnes Coll.) at Washington. Unfortunately Dr. Holland in his revised "Butterfly Book" places *luski* B. & McD. as a synonym of *irene* Bdv. and figures a *luski* for an *irene*; but they are quite different and belong in separate groups.

EUPHYDRYAS EDITHA Bdv., race **fridayi** new race.

A small alpine race very similar in color and pattern arrangement to race *monoensis* Gun. which is figured correctly for size and color in Holland's revised "Butterfly Book," Pl. LVII, Figs. 26 and 27. In size they average the same as *nubigena* Behr. whose type locality is Tuolumne Meadows, Yosemite Nat. Park, near by. (*nubigena* Behr. is not found in Colorado). The clear cut design of pattern and color is not lost by the smallness of the specimens which places them at once as near *monoensis*.

Holotype ♂, expanse 31 mm. Allotype ♀, expanse 33 mm. Near auto road on left between June and Silver Lakes, Mono Co., Calif. June 14, 1930. Some 60 pairs in type lot, all similar. Paratypes 3 ♂ and 3 ♀; one pair to Canadian Nat. Coll. at Ottawa and one pair to Nat. Museum (Barnes coll.) at Washington. Types in Author's coll. Named after that steady collector, Mr. F. W. Friday of Hollywood, Calif.

EUPHYDRYAS EDITHA Bdv., race **lawrencei** new race.

A small, dark alpine race similar in size and color to *beani* Skin. whose type locality is Bamff, Alb., Can. and in pattern arrangement to *nubigena* Behr. whose type locality is Tuolumne Meadows in Yosemite, Calif. Less white maculation than on upper side *nubigena* with black dominating. *Beani* is inclined to have a submarginal row of white spots on upper side secondaries while *lawrencei* is lacking in this respect. The dark red color also separates it from *nubigena*. In most of the series of the specimens of *lawrencei* the basal half on the upper side secondaries is exceedingly dark. The maculation of the under sides averages like *nubigena*, except for the dark red color. In the type lot of some 80 specimens there are some very small dark males; several averaging only 23 mm. These are probably the smallest *Euphydryas* on record. Females larger, but similar.

Holotype ♂, expanse 30 mm. Allotype ♀, expanse 32 mm. Near timber line on trail between Diamond Lake (Camp) and summit of Mt. Thielsen at about 9,000 feet, Douglas Co., Oregon. July 17-18, 1931. Types in Author's coll. Paratypes—10 ♂ and 10 ♀, same place and date. One pair sent to Canadian Nat. Coll. at Ottawa and one pair to Nat. Museum (Barnes coll.), Washington, D. C. Named after Mr. Fred Lawrence of Central Point, Oregon, whose collecting efforts in new regions is hereby rewarded.

Euphydryas editha Bdv., race *lawrencei* Gun., tr. f. **diamondensis** new transition form.

Having the white spots (and in this case some of the red also) suffused and elongated inwardly through their interspaces on both upper and under sides after the fashion of *chalcedona fusimacula* Barnes and others. As there is not much white spotting to be found on the upper sides of race *lawrencei,* this tendency is better shown on the under sides in well developed specimens. Classification: albifusism; a semi-final development.

Holotype ♂, expanse 30 mm. Timber line on Mt. Thielsen, Douglas Co., Oregon. July 17, 1930. One paratype male, primaries only showing albifusism; same location and date. Named after Diamond Lake at base of Mt. Thielsen. Types in Author's collection. Specimens taken by Mr. Fred Lawrence.

Euphydryas editha Bdv., race *lawrencei* Gun., tr. f. **thielsenensis** new transition form.

On the upper and under sides of the primaries, the inner half of the wings are solid black with only the two red cell spots showing. The basal areas of the secondaries are also considerably darkened on both surfaces. Classification: melanifusism; here only a semi-final development.

Holotype ♀, expanse 36 mm. Timber line on Mt. Thielsen, Douglas Co., Oregon. July 17, 1931. One female paratype with less melanifusism over same area with same date and locality. Types in Author's coll. Named after the mountain which is the type locality of the parental race. Taken by Mr. Fred Lawrence.

CRABRO GRACILISSIMUS PACKARD

Of this family of wasps this is the common species in the neighborhood of Los Angeles. Its nests may frequently be found in the stems of the elder and other pitch-bearing plants in almost any district and in fair abundance. The stems are usually tunnelled to a depth of 6 or 8 inches and compactly furnished with cells. These latter in mode of formation closely resemble those of *Ceratina dupla*. They are on an average 6 lines long and 2½ wide, each cell being separated from its neighbour by a partition of pith ⅛-inch in depth.

The wasp stores its nest with small flies, generally 8 to 10 in number, but in one instance as many as 26. The larva when mature spins a brown pyriform cocoon about 5 lines long, to the smaller anterior end of which is attached a variable clump of insect debris, too chitinous for even the larval digestion.

The mature insects appear early in the season, hatching out not later than the first of April and very frequently early in February.

Of parasites there are few and all of one species, *Diamorus zabriskii,* Cress. These attack the larvae after the cocoon has been spun. The ubiquitous *Pachyopthalmus trypoxylonis* Towns., may frequently be found attacking the flies stored for the larva's use.

A. Davidson.

PINUS MURICATA—Bishop Pine

This pine is rare in Southern California, being limited to a few scattered groves in San Luis Obispo County and near Monterey. South of that no record of its occurrence has been heretofore noted except in Lower California, near San Quentin and the Cedros Islands. Last season a grove of these were discovered by Theodore Payne near Lompoc, a few miles from the coast line.

Along with this he collected what seems typical specimens of *Quercus Wislizeni var. exima* Jepson.

In that same neighborhood were gathered specimens of *Arctostaphylos nummularia* Gray. Both these latter are new localities for this district.

Dr. A. Davidson.

REMARKS ON THE TAXONOMY OF THE CACTACEAE AND SOME NEW COMBINATIONS AND NAMES IN THAT FAMILY

F. R. Fosberg

Anyone at all familiar with the Cactaceae realizes that the taxonomy of this family is in a serious state of disorder. The present widespread interest in cacti makes the consideration of this important from two points of view. One is, of course, that there is an immediate need for correct and usable nomenclature. The longer an incorrect name is in use the harder it is to secure general acceptance of a change. Witness the list of "nomina conservanda" recognized by the International Congress of Botanists. The other reason is that with commercial cactus collecting going on so industriously there is a chance of some species becoming completely exterminated before they have been adequately studied. At least with increasing rarity of many species it will become exceedingly difficult to study them in their habitats, the only way to satisfactorily study this family.

The reasons for the inadequacy of the classification of cacti are several. In the first place there is a serious lack of herbarium material to work on. Cacti are very difficult to put up and are not too satisfactory after specimens are made, so most botanists ignore them.

Secondly the Cactaceae is very evidently a young family geologically. This is evidenced by the lack of fossil records. The only records of fossil cacti that are known to me are some collections of late Pleistocene (?) material from Shelter Cave, New Mexico, made by myself and not reported upon as yet. The extreme variability of the species and the localized distribution of groups of related species are also looked upon as indications of recency of origin. This recency of origin is probably the reason for the large amount of intergradation found in the cacti and other recent groups. What would ordinarily be considered species have formed, but without the dying out of the forms from which they were derived, or of the various stages through which they have evolved. This leaves great variable masses of individuals, none of which are separated by any very marked gaps or sets of differences. According to the species concepts of some taxonomists a group of this kind could be nothing but a single species. Others would make a species out of each little variation. Generic segregation is just as difficult.

The third cause of confusion is the fact that Britton and Rose, monographers of the group, are noted for their tendencies toward extreme splitting of both genera and species. Their work also shows evidence of carelessness or hastiness in many places. Repeatedly, in separation of genera or species, they will remark that there are differences in the fruit, flowers or armament, but will not indicate what these differences are, and it is usually not evident from their descriptions. Thus there is no way of being sure of what they had in mind. To a conservative botanist their treatment of both genera and species does not seem at all consistent, and in many cases is entirely unacceptable. If they had treated the genus Opuntia in the same manner as they did Cereus, Echino-cactus or Coryphantha their present subgenera would probably become subtribes with numerous genera under them. The reasons for not doing this evidently are the presence of intermediate forms. But if in one group the intergrades have to some extent died out and in another they have not there is, to me, no more evident reason for generic segregation in the first than in the second.

The argument may be advanced that inclusive genera do not show the relationships of the species within them. This is quite true, but there is no reason why the segregates may not be made subgenera which will show the relationships fully as well. This system would show the relationships of the groups of species as well as of the species themselves. It would also make the classification far more usable to workers in other branches of Botany. After all, taxonomy is not an end in itself, any more than is any other individual science.

The species concept put forth in Britton and Rose's monograph does not admit the existence of varieties or subspecies. If an entity exists it is treated as a species. If it is not considered distinct enough to be called a species it is ignored. This naturally leads to the retaining of many groups as species that would ordinarily be given varietal rank, for the simple reason that they could not well be discarded completely. It also leads to the discarding of some groups that might be well considered varieties.

The question of what characters are important in the classification of cacti brings up interesting problems. Reproductive parts are ordinarily considered far more reliable from a taxonomic point of view than vegetative parts. They are less likely to be influenced by ecologic conditions. Important genetic differences are usually indicated by differences in the reproductive parts as well as in the vegetative. In the cacti, however, there is little difference in floral structure throughout the family. Within the main groups there is so little difference that genera cannot sometimes be separated on the basis of floral structure. Between species there is sometimes no difference whatever in the flowers. Therefore the taxonomy has largely been based upon vegetative parts.

The lack of difference in the reproductive parts in the cacti must indicate one of two things. Either the reproductive parts are not as subject to mutation or genetic change as in other families, or the differences in vegetative parts are not so deep seated as they have been considered to be. There is no evidence that the former is true, although no real genetic work has been done on the cacti. For the latter possibility there is abundant evidence. An example of this is found in the common cholla of the Mojave and Colorado deserts, Opuntia echinocarpa Engelm. and Bigel. This species, wherever found usually possesses a short woody trunk and short, prominent rhombic tubercles. These are about the only vegetative characters that are constant. On some portions of the desert, such as the Barstow region in the Mojave and around Palm Springs in Coachella Valley the joints are so covered by long yellow spines as to be completely hidden. This seems to be the case where the desert is most arid. In San Gorgonio Pass and in the region around Hesperia the spines are very short and the plant has a distinct green color. This appears to be the case where there is a bit more rain. In Morongo Valley, between the two deserts there is a form which has a very pronounced glaucous epidermis and light gray spines which are of medium length. There is a larger water supply here than in the lower parts of the desert, because of the drainage from the mountains. The reproductive parts seem only to vary in color of perianth. This is ordinarily yellow, but is often tinged with brownish red. Color means very little in Opuntia blossoms. The gradation between these forms is very gradual and appears to be quite well correlated with the variation in environment. Instances of this kind are numerous and in some cases have led to the description of species. Britton and Rose point out (Cactaceae vol. I p. 44) that cultivation sometimes produces tremendous variation in Opuntia. In cacti variations in vegetative parts are much more conspicuous than in other plants, although there is no reason to believe that they are of any more importance. One does not describe shade forms, depauperate forms or other such environmental variants as species in other groups of plants. At least conservative botanists do not. If they did the value of the species concept would be destroyed and the term would have to be replaced in general use by another denoting a group of such "species."

The value of hybridization as a criterion is very doubtful. So little is known of the reasons for the sterility of hybrids that conclusions based upon it are weak. It seems that if it is a case of sets of characters not fitting together that this would be a tremendously variable cause, and that at times even remotely related things could hybridize successfully. It is evident that a large part of the variation in Opuntia is due to hybridization. This would seem true in such cases as the O. occidentalis-Covillei-Vaseyi group where the plants are growing side by side. However, these species are among the weakest recognized by Britton and Rose. If the type of characters used to separate these species were used consistently the number of species in this particular group in southern California would be nearer thirty than three. In this group Parish's treatment (Jepson's Manual p. 657) seems satisfactory except that O. Vaseyi is not sufficiently distinct to be called a species while O. littoralis seems to be quite a good species. It has been suggested to me by Dr. A. D. Houghton that the radioactive substances in the soil may have something to do with changing the genetic makeup of this group and other variable groups. While this seems a reasonable hypothesis, there is at present nothing to support it.

On a basis of consistency alone a great deal of Britton and Rose's work will have to be changed. This applies to consistency with their own work as well as with accepted work of competent botanists in other groups of plants. Neomammillaria Britt. & Rose and its relatives Phellosperma, Solisia and Dolichothele are good examples of this and will be discussed in the latter part of this paper. Their generic standings are based upon such insignificant characters that they seem scarcely to deserve subgeneric rank.

It seems to me that the presence of latex ducts plus brown seeds in some of the Neomammillarias would make just as strong a case of the establishment of a genus as the rugose surface and enlarged hilum of the seed in Phellosperma. This seems especially so since the only characters that effectually separate Solisia from Neomammillaria are a combination of latex ducts and black smooth seeds. The vegetative peculiarities of Solisia i.e. pectinate spines in long narrow areoles are no more important than the differences between many individual species of Neomammillaria.

As a starting point for the reorganization of this group I propose to unite the genera Phellosperma, Dolichothele and Solisia with Neomammillaria as subgenera, dividing the latter genus into two subgenera, Galactochylus and Hydrochylus, basing the latter upon the black seeds and lack of latex ducts in the species which I assign to it. The members of these groups are very widely variable in purely vegetative characters, but, although the presence of latex ducts is vegetative, it seems a thing that is more deep seated than most characteristics of outward form. It involves the presence or absence of a whole set of organs, not merely the slight alteration of a set already present as in a variation in armament. The development of latex ducts is quite variable in extent. Some species are very lactiferous throughout. Others are only so in the main body of the plant, not in the tubercles. In N. Rekoi Britt. & Rose the latex system is evidently not well developed. In N. Solisii Britt. & Rose it has not been found at all. However, since it has brown seeds and is the only one known with brown seeds that is not known to have a latex system, it is placed here. It will probably be found to have a vestigial latex system when it is histologically examined.

Most of the species with hooked central spines fall into the subgenus Hydrochylus. The exceptions to this are N. uncinnata (Zuec.) Britt. & Rose, N. hamata (Lehm.) Britt. & Rose, N. Rekoi Britt. & Rose and N. Solisii Britt. & Rose. The presence of hooked central spines does not seem a character of very much importance, however. It is found rather indiscriminately distributed through several of the higher groups of the Cactaceae. Mr. Stark of Rancho Santa Ana Botanic Gardens found a specimen of Neomammillaria (Hydrochylus) dioica (K. Brand.) Britt. & Rose at Jacumba, California, a species with strongly hooked spines, which had only the faintest suggestion of hooking on the ends of a very few spines. Otherwise they were perfectly straight.

The combination of brown seeds with a latex system and that of black seeds with a lack of a latex system seems to me a distinction sufficient to warrant calling the two entities subgenera on an equal rank with those given generic rank by Britton and Rose on the basis of characters of seemingly equal importance; i.e. Phellosperma on an enlarged corky hilum and large rugose seed, Dolichothele on an elongated perianth tube with stamens to the top of the throat, Solisia with pectinate spines, elongate areoles, latex and black seeds with a somewhat enlarged hilum.

The studies upon which these conclusions are based have been made upon living or herbarium material whenever possible, but in many cases such was unavailable. In these cases the excellent illustrations and the descriptions, which, although not always complete seem quite accurate, in Britton and Rose have served. Thanks are due the many gardeners and cactus fanciers whose collections I have been privileged to examine. In this connection I must especially mention Mr. Wright M. Pierce of Claremont, California, in whose garden I have done the greater part of my work and with whom I have spent many enjoyable days studying cacti in their native habitats. Thanks are also due Dr. Arthur D. Houghton of San Fernando, California, to whose encouragement and interest I owe the inspiration for this piece of work.

Key to the subgenera of Neomammillaria:

A Latex system present

B Seeds black with a broad basal hilum, spines pectinate - - - - - - - - - - - - *Solisia*

BB Seeds brown with small hilum, spines not pectinate - - - - - - - - - - - *Galactochylus*

AA Latex system absent

B Seeds with large corky base, rugose, black, with central spine hooked - - - *Phellosperma*

BB Seeds without large corky base, various, central spine hooked or not

C Flower tube elongated, funnel shaped, stamens growing on entire throat of tube - - - - - - - - *Dolichothele*

CC Flower tube short, campanulate, stamens only on basal portion of throat.

D Seeds brown - - - - *Galactochylus*

DD Seeds black - - - - - *Hydrochylus*

Galactochylus (Schumann) Fosberg n. subgen.

Eumammillaria Eng. used by Schumann is ignored because it obviously refers to Mammillaria Haw. which is invalid.

(Latin diagnosis: Spinae raro adunci; tubi laticorum manifesti aut inchoati, raro absenti; baccae raro squamosae; semini nigri.)

Plants cylindric to globose, depressed globose or turnip shaped; single, branched or cespitose; more or less lactiferous (except in N. Solisii); tuberculate, with tubercles arranged more or less in spiral rows, terete, angled or flattened, not grooved on upper surface; axils of tubercles usually pubescent, not glandular; spine areoles on tops of tubercles; radial spines always present, central spines usually present, sometimes different from radials, seldom hooked; flowers from axils of old tubercles, more or less campanulate, comparatively small, stamens numerous, born on basal portion of perianth tube, short, included, style short, stigma lobes linear; fruit clavate to cylindrical or even globose, variable, usually scaleless; seeds brown.

The type species of this subgenus is naturally that of the genus, N. mammillaris (L.) Britt. & Rose. The other species included here are N. nivosa (Link) Britt. & Rose, N. Gaumeri Britt. & Rose, N. petrophila (Brand.) Britt. & Rose, N. arida (Rose) Britt. & Rose, N. Brandegeei (Coulter) Britt. & Rose, N. gummifera (Engelm.) Britt. & Rose, N. MacDougalli (Rose) Britt. & Rose, N. Heyderi (Mühl) Britt. & Rose, N. hemisphaerica (Engelm.) Britt. & Rose, N. applanata (Engelm.) Britt. & Rose, N. phymatothele (Berg.) Britt. & Rose, N. magnimamma (Haworth) Britt. & Rose, N. macracantha (DC.) Britt. & Rose, N. Johnstonii Britt. & Rose, N. melanocentra (Poselg.) Britt. & Rose, N. Runyonii Britt. & Rose, N. Sartorii (Purpus) Britt. & Rose, N. seitziana (Mart.) Britt. & Rose, N. Ortegae Britt. & Rose, N. meiacantha (Engelm.) Britt. & Rose, N. Scrippsiana Britt. & Rose, N. gigantea (Hildmann) Britt. & Rose, N. peninsularis Britt. & Rose, N. flavovirens (Salm-Dyck) Britt. & Rose, N. sempervivi (DC.) Britt. & Rose, N. obscura (Hildmann) Britt. & Rose, N. crocidata (Lemaire) Britt. & Rose, N. polythele (Mart.) Britt. & Rose, N. carnea (Zuccarini) Britt. & Rose, N. Lloydii Britt. & Rose, N. Zuccariniana (Mart.) Britt. & Rose, N. formosa (Gal.) Britt. & Rose, N. compressa (DC.) Britt. & Rose, N. mystax (Mart.) Britt. & Rose, N. Petterssonii (Hildmann) Britt. & Rose, N. Eichlamii (Quehl) Britt. & Rose, N.

Karwinskiana (Mart.) Britt. & Rose, N. Praelii (?) Britt. & Rose, N. Standleyi Britt. & Rose, N. Evermanniana Britt. & Rose, N. Parkinsonii (Ehrenb.) Britt. & Rose, N. gemispina (Haworth) Britt. & Rose, N. Pyrrhocephala (Scheidw.) Britt. & Rose, N. Woburnensis (Scheer) Britt. & Rose, N. Collinsii Britt. & Rose, N. chinocephala (Purpus) Britt. & Rose, N. tenampensis Britt. & Rose, N. polygona (Salm-Dyck) Britt. & Rose, **N. echinops (Scheidweiler) Fosberg n. comb.,** N. confusa Britt. & Rose, N. villifera (Otto) Britt.& Rose, N. polyedra (Mart.) Britt.& Rose, N. Conzattii Britt. & Rose, N. napina (Purpus) Britt. & Rose, N. lanata Britt. & Rose, N. kewensis (Salm-Dyck) Britt. & Rose, N. subpolyedra (Salm-Dyck) Britt. & Rose, N. Galleottii (Scheidw.) Britt. & Rose, N. tetracantha (Salm-Dyck) Britt. & Rose, N. elegans (DC.) Britt. & Rose, N. pseudoperbella (Quehl) Britt. & Rose, N. dealbata (Dietrich) Britt. & Rose, N. Haageana (Pfeiff.) Britt. & Rose, N. perbella (Hildmann) Britt. & Rose, N. collina (Purpus) Britt. & Rose, N. donatii (Berge) Britt. & Rose, N. Mundtii (Schumann) Britt. & Rose, N. celsiana (Lemaire) Britt. & Rose, N. aureiceps (Lemaire) Britt. & Rose, N. yucatanensis Britt. & Rose, N. ruestii (Quehl) Britt. & Rose, N. Pringlei (Coulter) Britt. & Rose, N. cerralboa Britt. & Rose, N. phaeacantha (Lemaire) Britt. & Rose, N. Graessneriana (Bodeker) Britt. & Rose, N. spinosissima (Lemaire) Britt. & Rose, N. densispina (Coulter) Britt. & Rose, N. Nunezii Britt. & Rose, N. amoena (Hoppfer) Britt. & Rose, N. rhodantha (Link & Otto) Britt. & Rose, N. uncinata (Zuccarini) Britt. & Rose, N. hamata (Lehm.) Britt. & Rose, N. Rekoi Britt. & Rose, N. Solisii Britt. & Rose, N. Xanthina Britt. & Rose, **N. Zeyeriana (Ferd. Hge.) Fosberg n. comb.**

Some other species may belong here but they are so little known that it does not seem wise to include them.

Hydrochylus (Schumann) Fosberg n. subgen.

(Latin diagnosis: Spinae crebro aduncae; tubi laticorum semper absenti; baccae numquam squamosae; semini spadici.)

Differs from Galactochylus in having no evidences of a latex system, central spines often hooked, fruit never scaled, seeds black.

As a type species I will designate N. microcarpa (Engelm.) Britt. & Rose, as it is a familiar species and illustrates the subgeneric characters excellently. The following other species are included in this subgenus: N. plumosa (Weber) Britt. & Rose, N. prolifera (Miller) Britt. & Rose, N. multiceps (Salm-Dyck) Britt. & Rose, N. camptotricha (Dams) Britt. & Rose, N. eriacantha (Link and Otto) Britt. & Rose, N. Scheideana (Ehrenb.) Britt. & Rose, N. lasiacantha (Engelm.) Britt. & Rose, N. denudata (Engelm.) Britt. & Rose, N. lenta (K. Brand.) Britt. &

Rose, N. candida (Scheidweiler) Britt. & Rose, N. vetula (Mart.) Britt. & Rose, N. fertilis (Hildmann) Britt. & Rose, N. decipiens (Scheidweiler) Britt. & Rose, N. discolor (Haworth) Britt. & Rose, N. fragilis (Salm-Dyck) Britt. & Rose, N. elongata (DC.) Britt. & Rose, N. oliviae (Orcutt) Britt. & Rose, N. echinaria (DC.) Britt. & Rose, N. Pottsii (Scheer) Britt. & Rose, N. mazatlanensis (Schumann) Britt. & Rose, N. sphacelata (Marti.) Britt. & Rose, N. albicans Britt. & Rose, N. Slevinii Britt. & Rose, N. Palmeri (Coulter) Britt. & Rose, N. pygmaea Britt. & Rose, N. Wildii (Dietrich) Britt. & Rose, N. Seideliana (Quehl) Britt. & Rose, N. barbata (Engelm.) Britt. & Rose, N. mercadensis (Patoni) Britt. & Rose, N. Kunzeana (Bodeker & Quehl) Britt. & Rose, N. hissuta (Bodeker) Britt. & Rose, N. multihamata (Bodeker) Britt. & Rose, N. longicoma Britt. & Rose, N. bocasana (Poselger) Britt. & Rose, N. multiformis Britt. & Rose, N. Scheidweileriana (Otto) Britt. & Rose, N. Saffordii Britt. & Rose, N. Schelhasei (Pfeiffer) Britt. & Rose, N. glochidiata (Mart.) Britt. & Rose, N. trichacantha (Schumann) Britt. & Rose, N. Painteri (Rose) Britt. & Rose, N. Wrightii (Engelm.) Britt. & Rose, N. Wilcoxii (Toumey) Britt. & Rose, N. viridiflora Britt. & Rose, N. Mainae (K. Brand.) Britt. & Rose, N. Boedekeriana (Quehl) Britt. & Rose, N. Milleri Britt. & Rose, N. Sheldonii Britt. & Rose, N. armillata (K. Brand.) Britt. & Rose, N. fraileana Britt. & Rose, N. Swinglei Britt. & Rose, N. dioica (K. Brand.) Britt. & Rose, N. Goodridgei (Scheer) Britt. & Rose, N. zephyranthoides (Scheidweiler) Britt. & Rose, N. Carretii (Rebut) Britt. & Rose, N. jaliscana Britt. & Rose, N. bombycina (Quehl) Britt. & Rose, N. occidentalis Britt. & Rose, N. fasciculata (Engelm.) Britt. & Rose, N. Nelsonii Britt. & Rose, N. longiflora Britt. & Rose.

Several other species probably belong here but are too little known to be with certainty included.

Phellosperma (Britt. & Rose) Fosberg n. subgen. Hydrochylus

Vegetative characters very much like those of ~~Melanosperma~~, root enlarged and soft; flowers originating in axils of old tubercles, very large, tube elongate, slender; fruit bright scarlet, naked, clavate to cylindrical or globular; seeds large, dull black, rugose, with a conical corky base nearly as large as the body.

This subgenus contains the one species, **Neomammillaria tetrancista (Engelm.) Fosberg n. comb.**

Dolichothele (Schumann) Fosberg n. comb.

Vegetative characters much as in Melanosperma, plant soft, tubercles much elongate; flower funnel-shaped, perianth tube elongate and slender, stamens born on whole face of throat, forming a definite ring about the top of the throat, style slender, stigma lobes linear; fruit and seeds little known, fruit red, greenish or purplish, seeds brown or black.

The type species is **Neomammillaria longimamma (DC.) Fosberg n. comb.** The other species included here are **N. sphaerica (Dietrich) Fosberg n. comb., and N. uberiformis (Zuccarini) Fosberg n. comb.**

Solisia (Britt. & Rose) Fosberg n. subgen.

Similar to Galactochylus in its latex system and some other characters, but having broad appressed pectinate spines in long narrow areoles; axils of tubercles not pubescent; seeds black, smooth, dome shaped with a broad basal hilum.

The only species in this subgen. is **Neomammillaria pectinata (B. Stein) Fosberg n. comb.**

A study of Britton & Rose's genus Escobaria does not reveal differences sufficient to separate it from Coryphantha, or even to warrant its being made a subgenus. Britton & Rose suggest that this group is "like Coryphantha in having grooved flower bearing tubercles, but are otherwise different, especially in the flowers, fruit and seeds." What these differences are however, they do not point out. The flowers are small while those of most species of Coryphantha are large, but the structure seems essentially the same. There is no important difference in the fruit, except a difference in color and time of maturing. There is as much variation between the seeds of the species in each group as there is between the groups. Additional similarities between the two groups lie in the glands in the grooves and in the origin of the flowers at the base of the grooves of young tubercles at the top of the plant.

This will transfer the species which are recognized under Escobaria in Britton and Rose to Coryphantha. They are as follows: **C. tuberculosa (Engelm.) Fosberg n. comb., C. dasyacantha (Engelm.) Fosberg n. comb. C. chihuahuaensis (Britt. & Rose) Fosberg n. comb. C. Piercei Fosberg n. nom. C. Chaffeyi (Britt. & Rose) Fosberg n. comb. C. Sneedii (Britt. & Rose) Fosberg n. comb. C. bella (Britt. & Rose) Fosberg n. comb. C. Lloydii (Britt. & Rose) Fosberg n. comb. Coryphantha Piercei Fosberg n. nom.** is proposed to replace *Escobaria Runyonii Britt. & Rose*, which becomes a homonym when placed in Coryphantha. It is named for Wright M. Pierce, mentioned elsewhere herein.

Some of these probably do not deserve specific rank and doubtless will be reduced when the group is more intensively studied.

While collecting in southern New Mexico in the summer of 1930 I had ample opportunity to study Griffiths' Opuntia Wootonii which Britton and Rose have reduced to a synonym of O. Engelmannii. I studied it at Pyramid Peak, Dona Ana County, and at the base of the Organ Mountains. Both places are not far from the type locality. It seems to be a definite entity, although obviously close to O. Engelmannii. At Pyramid Peak the ranges of the two are close together and they preserve their identity pretty well.

The chief differences are as follows: O. Wootonii has yellow subulate central spines, a bright green epidermis and an oblong truncate fruit while O. Engelmannii has very heavy flat white central spines, a very glaucous epidermis and an obovoid fruit. O. Wootonii seems to grow chiefly on rocky slopes while O. Engelmannii grows on well-drained alluvium.

I propose to reinstate this Opuntia under the name **Opuntia Engelmannii Salm-Dyck var. Wootonii (Griffiths) Fosberg n. comb.**

Contribution from the Herbarium of the Los Angeles Museum No. 1, Aug. 27, 1931.

NOTES ON THE FLORA OF SANTA CRUZ ISLANDS, CALIFORNIA

By Ira W. Clokey

SOLANUM ARBORESCENS Sp. Nov.

Perennial. Stems unarmed, the lower woody portion 2-3 m. long, prostrate or resting on other shrubs, with abundant, gray, unbranched, spreading, somewhat glandular pubescence. Leaves much longer than the internodes, entire or slightly crenate, rarely lobed at base, thin, elliptic ovate, subcordate and usually unequilateral at base, acute at apex. Lower leaves 6-10 cm. long, 3-5 cm. wide, gradually decreasing in size upwards, sparingly pubescent; pubescence unbranched, somewhat viscid. Petioles 5-20 mm. long. Flowers from a few to 15 in an umbel. Peduncles shorter than the slender pedicles. Calyx pubescent, one-third the length of the corolla; teeth triangular. Corolla blue, 15 mm. long, with greenish glands at base. Mature fruit yellow, 8-10 mm. in diameter.

This species was found growing at Pelican Bay, Santa Cruz Island, California, on a north hillside in openings among Quercus dumosa, Nutt. and Photinia arbutifolia Lindl. The long woody stems separate this species from other North American species of the genus. In herbarium specimens, the unbranched, glandular pubescence, the leaves and the length of the petioles and peduncles separate it from S. umbelliferum Esch. My number 5047, deposited in my herbarium, is designated as the type.

Munz and Crow 11667 from Santa Rosa Island and 11854 from Santa Cruz Island belong here.

The last comprehensive list of the plants found on Santa Cruz Island was made by T. S. Brandegee, "Flora of the California Islands," Zoe vol. 1 no. 5, July 1890. Some other individual species or varieties have since been published. During the seasons of 1930 and 1931 the following were collected on Santa Cruz Island. No record of these from the island has heretofore been published.

Gymnogramme triangularis Kaulf. var. viscosa Eat.
Potamogeton pectinatus L.
Bromus hordeaceus L.
" rigidus Roth.
Festuca bromoides L.
" megalura Nutt.
Avena barbata Brot.
Gastridium ventricosum (Gouan) S. & T.
Carex abrupta Mack.
Calochortus albus (Benth.) Dougl. var. rubellus Greene.
Quercus dumosa Nutt. forma myrtifolia Trealese.
Anemopsis californica (Nutt.) Hook.
Rumex pulcher L.

Suaeda californica Wats.
Papaver californicum Gray.
Thysanocarpus lacinatus Nutt. var. emarginatus (Greene) Jepson.
Heuchera micrantha Dougl.
Lupinus arboreus Sims.
Medicago apiculata Willd.
Trifolium tridentatum Lindl.
Lotus grandiflorus (Benth) Greene.
" " " " var. mutabilis Ottley.
Astragalus migulensis Greene.
Lathyrus strictus Nutt. var. barbarae (White) Jepson.
Viola pedunculata T. & G.
Mentzelia micrantha T. & G.
Epilobium californicum Haus.
Oenothera hirta Link. var. jonesii Seville.
Sanicula arguta Greene.
Torolis nodosa (L.) Gaertn.
Bowlesia lobata R. & P.
Centaurium venustum (Gray) Rob.
Pectocarya linearis DC.
Amsinkia douglasiana A. DC.
Cryptantha clevelandii Greene var. florosa Johnston.
Marrubium vulgare L.
Solanum arborescens Clokey.
Hieracium grinellii Eastwood.
Eriophyllum staechadifolium Lag. var. artemisaefolium (Less.) Jepson.
Anthemis cotula L.
Cotula coronopifolia L.

E. L. Greene, Bulletin no. 7, California Academy of Science, 1887, reported Cheilanthes californica Mett. from Santa Cruz Island. T. S. Brandegee, "Flora of the California Islands," Zoe vol. 1, no. 5, July 1890, omitted this species. During 1930 and 1931 plants of this species were found near Pelican Bay and in Friar's Canon.

Two changes in nomenclature should be made:

Cotyledon greenei (Rose) comb. nov.
Ref. Dudleya greenei Rose.

Cotyledon candelabra (Rose) comb. nov.
Ref. Dudleya candelabrum Rose.

PROCEEDINGS OF THE ACADEMY

April to September, 1931

April 11th: Regular monthly meeting was held in the auditorium of the Library. C. Warren Temple spoke on "From the Nile to Nebo," illustrated with rare lantern slides from pictures taken by the speaker who has spent some years living with the Bedouin Arabs. The speaker, in a most instructive manner, portrayed the steps in a series of trips, over which he conducted several large parties, on the traditional journeys of the Children of Israel. An intimate insight into the simple minds of the dwellers of desert was given, showing how we should take care in literal interpretation of oriental tales and stories. Our speaker gained the confidence of many of the tribesmen, and with his mastery of the language, was able to make observations never before recorded.

May 9th: Regular meeting was held in the library auditorium with the subject of "The Conquest of Mt. McKinley," presented by the first man to reach the peak of the North American continent, Prof. Herschel C. Parker. Beautiful lantern slides were shown of peaks in Europe, and the Canadian Rockies, which the speaker had been first to climb, culminating in a detailed account of the failures, preparations and final achievement of what has been considered one of the most difficult ascents in mountaineering. The speaker contributed much to the geographical and geologic survey of this heretofore blank space on the map of our great territory in the arctic, Alaska.

June 8th: Annual Banquet and Meeting of the Academy was held in the University Club. At the conclusion of the regular business of the meeting, including the reading of the ballots cast for the Board of Directors, and the reports of the Officers, B. R. Baumgardt, F. R. A. S., gave an illustrated lecture on "Russia in Transition." The speaker reviewed the historical background of this vast nation, dwelling upon her contributions to the arts and sciences, to show that much is to be expected from the great experiment now being conducted by the Soviet government. The speaker by clear analysis showed that, while many changes will have to occur, yet Russia will work out her problem in the near future to the best interests of all.

September 19th: Regular monthly meeting after the summer recess was held in the auditorium of the library. Harry K. Sargent, well-known lecturer on popular astronomy, gave an illustrated talk on "Measuring the Universe." In simple terms the great strides made by the silent workers of the night in our large observatories were reviewed, showing man's means of reaching out into realms of space to distances which stagger the mind, and deal with worlds by the exactitude of modern science.

The Academy hopes that its members will attend the regular meetings held on the second Saturday of each month in the auditorium of the Los Angeles Public Library at 8:00 P. M. Speakers of ability, subjects of vital scientific value and a chance to know the members of our organization are the inducements promised to regular attendants of the meetings. Make your membership pay, and help place the Academy where it belongs!

DR. R. H. SWIFT, *Secretary.*

The work of the Southern California Academy of Sciences is carried on entirely through the generosity of private citizens, who are sufficiently interested in the advancement of education and cultural endeavor to donate funds or make bequests to the Academy. As a guide, in the matter of bequests, for those who plan to further this program, the following forms are suggested:

Form of Legacy

To be used when it is desired to leave the Academy any personal property, such as money, stocks, bonds, works of art, or other objects of value.

I give and bequeath unto "Southern California Academy of Sciences," of the City of Los Angeles, the sum of..................................... Dollars: To have and possess the same unto the said "Southern California Academy of Sciences," its successors and assigns, to the uses, dispositions and benefits thereof forever.

Form of Devise

To be used when it is desired to leave real estate to the Academy.

I give and devise to "Southern California Academy of Sciences" of the City of Los Angeles, (.. here describe the property or ground rent..), together with the appurtenances, in fee simple, and all policies of insurance covering said premises, whether fire, title or otherwise, free from all taxes: To have and to hold the same unto the said "Southern California Academy of Sciences," its successors or assigns forever.

BULLETIN of the SOUTHERN CALIFORNIA
ACADEMY of SCIENCES

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Publications of the
Southern California Academy of Sciences

The Academy has published to date the following:

PROCEEDINGS. 1896 to 1899. Six numbers—Vol. 1, Nos. 1 to 6.
MISCELLANEOUS BULLETINS issued under the imprint of the Agricultural Experiment Station—1897 to 1907. **Ten numbers.**

All issues of the above are now out of print.

■ ■

Bulletin of the
Southern California Academy of Sciences

Began issue with Vol. I, No. 1, January, 1902. Issued ten numbers in 1902, nine numbers in 1903, 1904, 1905; three numbers in 1906. Issued two numbers annually from 1907 to 1919, both inclusive (except 1908—one issue only). Issued four numbers (January, May, July and October) in 1920.

The 1921 issues are: Vol. XX, No. 1, April; Vol. XX, No. 2, August; Vol. XX, No. 3, December.

The 1922 issues are: Vol. XXI, No. 1, March; Vol. XXI, No. 2, September.

The 1923 issues are: Vol. XXII, No. 1, March; No. 2, July.

The 1924 issues are: Vol. XXIII, No. 1, January-February; No. 2, March-April; No. 3, May-June; No. 4, July-August; No. 5, September-October; No. 6, November-December.

From 1925 to 1930, including volumes XXIV to XXIX, three numbers were published each year. These were issued as No. 1, January-April; No. 2, May-August; No. 3, September-December, for each volume.

All of the issues listed on previous page are now out of print, with the exception of the following, which may be secured from the Secretary of the Academy at the appended prices:

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"	23,	" 4.	July,	1924	.25
"	23,	" 5.	September,	1924	.25
"	23,	" 6.	November,	1924	.25
"	24,	" 1.	January,	1925	.25
"	24,	" 2.	May,	1925	.25
"	24,	" 3.	September,	1925	.25
"	25,	" 1.	January,	1926	.50
"	25,	" 2.	May,	1926	.25
"	25,	" 3.	September,	1926	.25
"	26,	" 1.	January,	1927	.25
"	26,	" 2.	April,	1927	.25
"	26,	" 3.	September,	1927	.25
"	27,	" 1.	January,	1928	.25
"	27,	" 2.	May,	1928	.25
"	27,	" 3.	September,	1928	.25
"	28,	" 1.	January,	1929	.25
"	28,	" 2.	May,	1929	.25
"	28,	" 3.	September,	1929	.25
"	29,	" 1.	January,	1930	.25
"	29,	" 2.	May,	1930	.25
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BULLETIN OF THE

Southern California Academy of Sciences

LOS ANGELES, CALIFORNIA

Vol. XXX September-December, 1931 Part 3.

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Issued Feb. 10, 1932

Southern California Academy of Sciences

THE CACTI OF THE PYRAMID PEAK REGION, DONA ANA COUNTY, NEW MEXICO

By F. R. Fosberg

The vicinity of the Pyramid Peak Range in Dona Ana County, New Mexico, is a natural cactus garden which is surpassed in few places in the United States for variety and abundance of cacti and yucca-like plants. The writer took special notice of the cacti while collecting for the Los Angeles Museum in the Mesilla Valley region in July, August and September, 1930, and it seems quite worth while to record the results of these observations before that group of ruthless vandals known as commercial cactus collectors start their depredations in the region. There is a possibility that with attention called to this locality those interested in conservation in New Mexico may take steps to prevent its being despoiled. This is especially possible, since with the exception of a few unproductive mineral claims the land is publicly owned and absolutely useless for grazing, agriculture or mining, and could be set aside for the public enjoyment and study with little effort or expense.

Pyramid Peak (Bishop's Cap Peak) is a more or less isolated pyramidal mass of fossiliferous limestone, evidently of the Magdalena formation (Pennsylvanian), lying just southwest of the southern end of the Organ Mountains in southern New Mexico. About its base are several smaller ridges of the same formation, forming with it a small isolated range. It is on the east terrace of the broad valley of the Rio Grande about six miles east of the river. The plain on both sides of the river is approximately 1,300 meters above sea level, and the river has cut a very broad ravine through it to a depth of about 125 meters. Above the level of the east terrace of the valley Pyramid Peak arises a little over 300 meters, most of this in great ledges of limestone produced by strata of different hardness. At the base it is surrounded by alluvial fans of limestone debris from its own slopes. On the east and north it is rather closely approached by fans of porphyritic alluvium from the Organ Mountains.

The whole area under consideration is in the desert shrub formation. Although a more complete account of this will be given

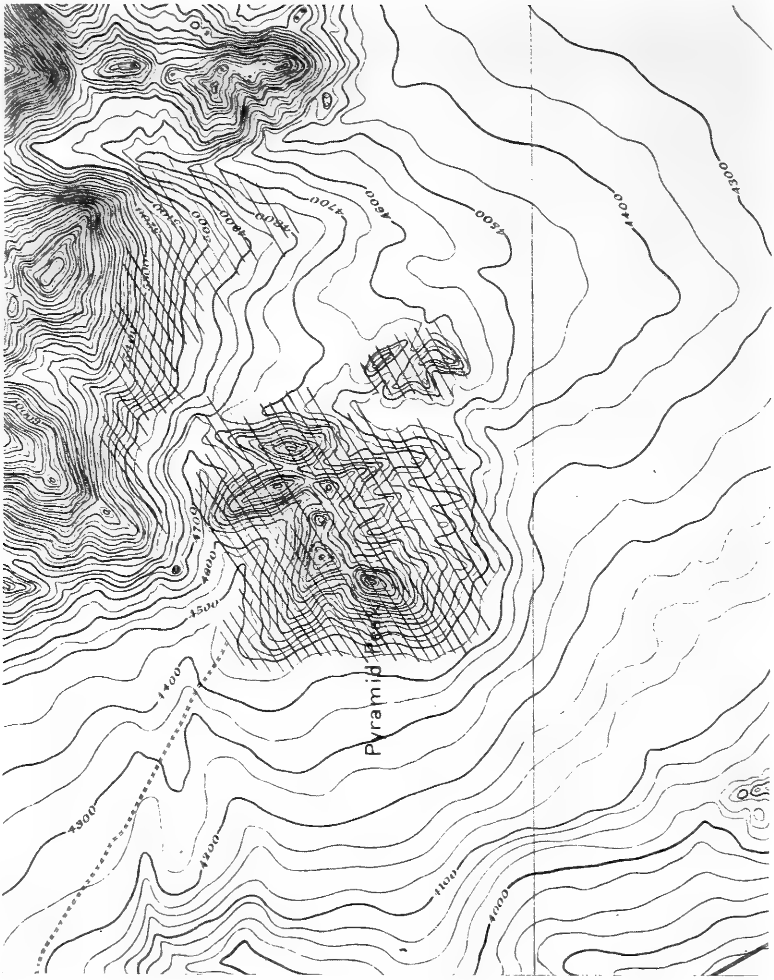

PLATE 21

Contour Map of the Pyramid Peak region.
Shaded areas indicate cactus-yucca association.

in a later paper, a brief sketch will be given here. On the limestone slopes of Pyramid Peak itself and on the uppermost parts of the alluvial fans surrounding it this takes the form of a yucca-cactus association. It is equivalent to the lechuguilla-sotol as accepted by Shantz, but the agave is of very minor importance. The chief constituents of this beside the cacti which are to be discussed in this paper are Dasylirion Wheeleri Wats. (sotol), Fouquieria splendens Engelm. (ocotilla), Yucca macrocarpa (Torr.) Engelm. (Spanish Dagger), Prosopis glandulosa Torr. (mesquite) and Larrea divaricata DC. (creosote bush).

On the alluvial fans about the base of this limestone peak is a Larrea association, the Larrea-Fluorensia of Clements, with Fluorensia in most places of very little importance. On the lower portion of the fan where the Larrea merges with the mesquite-grass [Hilaria mutica (tobosa grass)] of the surrounding plain Fluorensia cernua DC. and Acacia constricta Benth. become quite abundant. On the upper parts of the fans the only important shrub beside Larrea divaricata is Krameria glandulosa Rose and Painter.

On the porphyritic alluvial fan just across a small wash from this to the east the Larrea entirely disappears, giving way to a mesquite grassland with a few scattered shrubs and with a considerable growth of Yucca baccata Torr. This Yucca increases higher upon the fan and near the base of the Organ Mountains the mesquite grass gives way to a rather poor development of a yucca-cactus association somewhat similar to that on Pyramid Peak but with Yucca baccata and without any Larrea.

No definite reasons can be given for the abundance and luxuriant growth of cacti on Pyramid Peak. The limestone may have something to do with it, as limestone seems often to be associated with abundance of cacti in other localities. In fact, some of them will not thrive in gardens without lime in some form. Good drainage doubtless plays an important part in encouraging growth of cacti. They are seldom found where the drainage is not of the best. Opuntia macrocentra Engelm. comes nearest to being an exception to this of any species considered in this paper. The limestone ledges of the peak and the coarse alluvium of the upper portions of the fans afford very good drainage, although a hardpan several feet below the surface prevents too rapid drainage on the fans. The major rainy season in southern New Mexico is in July and August and the rain comes in the form of very violent showers, localized and of short duration. This condition causes a surface runoff even on the coarse alluvium around Pyramid Peak. On the rock ledges there is considerable runoff although there is also probably quite a lot of subterranean percolation as is usual in limestone.

Eighteen species of cactaceae were found in this area and are discussed below. Five others are also noted because they have been reported from neighboring localities or from similar situations elsewhere, and seem likely to be found in this region. Tortugas Mountain, a similar outlying range of limestone a few miles up the river at Mesilla Park was studied by Wooton and Standley and at that time had a remarkable cactus flora. It has since been stripped almost completely by the commercial collectors.

Opuntia leptocaulis DC. is widely distributed and rather abundant on the alluvial fans surrounding the Pyramid Peak Range, and gets up on the limestone slopes a little way in places. It seems to show little discrimination, growing on rocky slopes, the surface of the fan, as well as in the sandy gullies and washes. In the late summer the plants seemed in very poor condition. A few had proliferating fruits which seemed rather old. They probably flower during the fall or early winter.

Opuntia spinosior (Engelm.) Toumey has practically the same distribution as has O. leptocaulis. Its fruits seemed quite mature in August.

Opuntia arenaria Engelm. Britton and Rose speak of this tiny plant as very rare and report it only from the sandy bed of the Rio Grande. Around the Pyramid Peak Range it seems fairly abundant on the upper portions of the limestone alluvium. The soil is not at all sandy but rather fine and rich, though filled with rocks. One or two plants were collected with dry fruits. The blooming season is evidently sometime during the winter.

Opuntia macrocentra Engelm. is very widely distributed but not locally very abundant in this region. It grows from the top of the alluvial fans clear down to the edges of the adobe flats which are covered by Hilaria mutica (tobosa grass). This species seems to be the species most capable of standing poor drainage present in this region. It matured fruit in August, although not abundantly.

Opuntia phaeacantha Engelm. extends from the upper parts of the alluvial fans, where there are some plants that appear to be hybrids with O. macrocentra, to the top of Pyramid Peak. It is by far the most abundant and characteristic cactus of this region.

It forms large matlike thickets and is one of the dominant plants of the association. It also appears on the upper portions of the alluvial fans at the foot of the Organ Range, in alluvium which is porphyritic in nature. This species matured abundant fruit in August.

Opuntia Engelmannii Salm-Dyck is the large glaucous plant with heavy white spines which furnishes the Mexicans with their "tunas" or edible cactus fruits in this region. It grows in the gullies and washes at the base of the peak where the alluvium is rather coarse. Its abundant large purple fruits matured in August.

Opuntia Engelmannii Salm-Dyck, var. Wootonii (Griffiths) Fosberg was described from the Organ Mountains. It grows abundantly on the limestone ledges of the whole Pyramid Peak Range. It remains quite distinct from the species excepting a few plants at the base of the hill where their ranges touch. These are quite possibly hybrids. The variety scarcely extends onto the fan at all.

Echinocereus neo-mexicanus Standley occurs on the limestone ledges and uppermost portions of the alluvial fans, abundantly on the west slope, to some extent elsewhere. The type locality is not far from Pyramid Peak. It was neither in flower nor in fruit.

Echinocereus Rosei Woot. & Standl. is a segregate of E. polyacanthus Engelm. which with conservative treatment will probably be reduced to varietal rank. It is the most widely abundant Echinocereus in the region, being present on the alluvial fans from the flats to the base of the range and up a considerable distance on the limestone slopes. It is extremely variable, two plants seldom looking exactly alike in form, spines or color. It was not seen in flower or fruit.

Echinocereus Fendleri (Engelm.) Rümpl. This handsome plant does not occur in or near limestone at all, at least not in this region. It is quite abundant on the upper half of the alluvial fan at the foot of the Organ Mountains. It was neither in flower nor fruit.

Echinocereus stramineus (Engelm.) Rümpl. is one of the most beautiful members of the genus Echinocereus. Pyramid Peak is one of the few places where it is really abundant. It grows on the limestone ledges from the base almost to the summit. Its huge mounds of light green joints covered by long straw colored spines make it one of the most conspicuous features of the vegetation.

One plant was noticed in flower near the end of July, but this was evidently off-season, as some of the others matured fruit during the same period. The Mexicans prize the fruit of this cactus more than any other growing in the region. They call it "pitahaya." The plant evidently does not fruit abundantly.

Echinocereus chloranthus (Engelm.) Rümpl. and *Echinocereus viridiflorus Engelm.* are known to occur in the Organ Mountains and E. chloranthus on Tortugas Mountain (Wooton and Standley) and it is quite possible that some of what passed as E. neo-mexicanus in the Pyramid Peak region were really these species, although those examined seemed to correspond well to the description of E. neo-mexicanus in Britton and Rose.

Echinocactus Wislizeni Engelm. or "barrel cactus" is distributed in greater or less abundance over almost the entire region under discussion. One large specimen was even found on the adobe flats southwest of Pyramid Peak. It seemed most abundant on the limestone ledges and just at the top of the fans. August seemed to be the height of its blooming season. The flower color varied from pure yellow through orange, yellow with red midribs to vermillion.

Echinocactus uncinnatus Galeotti or *Brittonia uncinnata (Galeotti) Houghton* as it has been recently called, is rather widely distributed but nowhere abundant in this district. It is found occasionally on the alluvial fans both around Pyramid Peak and at the foot of the Organs. It also gets up on the limestone slopes to some extent. It was neither in flower nor fruit, but some plants that were cultivated in Los Angeles, brought from this region, flowered in early March.

Echinocactus horizonthalonius Lemaire is an extremely abundant species on the upper alluvial fans and lower limestone slopes. A few specimens were found on the lower portions of the fans, but none at the foot of the Organs. It flowered during August for the most part, but at the foot of the east slope of the Range the blossoming time was several weeks earlier. There is no apparent explanation of this. It was also seen in bloom near El Paso, Texas, in July.

Epithelantha micromeris (Engelm.) Weber is very inconspicuous and, although it has evidently not been taken west of the Sacramento Mountains may have escaped detection. Since it is known to commonly inhabit limestone mountains, it is here included as possibly occurring in this region.

Echinomastus dasyacanthus (Engelm.) Britt. & Rose was found rather rarely on the alluvial fans south of the Pyramid Peak Range and quite abundantly on the upper portions of the porphyritic alluvial fans at the base of the Organs. It was neither in fruit nor in flower, but specimens brought to Los Angeles flowered the first of March.

Coryphantha Muhlenphordtii (Poselger) Britt. & Rose was not found near Pyramid Peak, but one specimen was found in the alluvial hills west of the Rio Grande and several specimens have been found near Mesilla Park (Wooton & Standley). It very possibly may exist in very small numbers in the area under consideration. It was in fruit in August.

Coryphantha macromeris (Engelm.) Lemaire is one of the most widely distributed species in this locality. It is sparingly present over practically the whole area under discussion, even getting down on the clay flats in some places. It blossomed quite abundantly in August. Often its clumps are as much as two feet across and when covered with bright pink blossoms are very handsome.

Coryphantha tuberculosa (Engelm.) Fosberg is a little rock-lover usually found on the limestone ledges. It is very abundant almost to the top of the peak. It seems able to grow in any place where there is a crack of any kind where a seed could find lodgement. The plant when young is quite symmetrical but soon becomes very irregularly branched. It flowered abundantly from July to September and some fruits were almost mature by the middle of September.

Neomammillaria Heyderi (Mühl.) Britt. & Rose is not abundant in this region. It was only found three times, all on the upper part of the fan at the foot of the Organ Range. The blooming season is doubtless in the spring, as they bore immature fruits.

Neomammillari microcarpa (Engelm.) Britt. & Rose has not been found near Pyramid Peak, but further search might reveal it, since this is in its range and it has been found on Tortugas Mountain (Woot. & Standl.).

Contribution from the Herbarium of the Los Angeles Museum, No. 2, Aug. 27, 1931.

PLATE 22

Cutworm larva with egg of *Podalonia luctuosa* attached. X 2.

PLATE 23

Developing wasp larva feeding in situ. X 4.

THE HUNT AND CAPTURE OF THE PREY OF A DIGGER WASP

Charles H. Hicks, *Los Angeles, California*

The life history and habits of the digger wasp, *Podalonia luctuosa* (Smith)*, were until recently practically unknown. This is somewhat surprising in view of the fact that it is a species of wide geographical range and in some places found quite common. Fernald[2] states that "it is found practically everywhere in the Northern United States and the Southern Canadian territory. It is a northern species with southern extensions in mountainous districts."

This wasp is of distinct economic importance, using as prey large, mature, or nearly mature, cutworms. It would be difficult to measure the good it accomplishes in helping to keep in check the numbers of these pests. Thus, its study has an economic as well as purely scientific interest and value.

Newcomer[4] has recently published an excellent account of the life history of this species and certain of its habits. He has also given interesting notes concerning some dipterous inquilines. The present writer, from a study of the wasp extending over a period of seven years, both in California and Colorado, is pleased to substantiate his findings in the more important facts of its life history.

The wasp hunts for and digs its prey from the ground, stings it, malaxates it, carries it and suspends it on a plant or object a few inches from the ground, selects a nest site, digs a short tunnel and a cell at the end, transports the prey to it and into it, lays an egg on the side of the cutworm, fills the tunnel, conceals the location, and flies away.

Briefly, one may refer to her main activities in nesting in this way. But the capture of each cutworm, the particular nest site selected, the time of the year, the enemies of the wasp peculiar to the given geographical location—these, and many other factors, modify her activities in this seemingly simple and orderly sequence of events. Too, there are individual variations of habits which make further study of importance and of necessity, in order to better understand her place in nature.

The wasp comes forth and starts nesting as soon as the sun has sufficiently warmed the earth in the spring. This is before few other insects have emerged. There appears to be two generations a year if one considers the dates of capture, but in the springtime she is more conspicuous and abundant.

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* Specimens of this wasp have been sent from time to time, along with other material for identification, to able entomologists. The writer wishes to thank, in this connection, T. D. A. Cockerell, H. T. Fernald, S. A. Rohwer and Grace Sandhouse.

The adult females, which do all the work, measure some 12 to 20 mm. in length. The body is jet black with shining, violet-reflecting wings—a beautiful insect. Her great strength is manifested in the capture and in the carrying of prey, larger and much heavier than herself.

Although this wasp is somewhat timid and flies away readily, her habits may be closely observed if she be cautiously approached. If all movements are confined as much as possible to the time when she is out of sight or actively engaged in work and if the change is not too radical, she appears not to be aware of it. By these methods one is able to draw very near where but few of her movements escape notice. The importance of patience and the disastrous results of being in a hurry in the field has seldom been evidenced more convincingly than during the study of this species.

The search for and capture of the prey is usually the first task of the wasp in nesting. Observations made at Boulder, Colorado, early in the month of May, illustrate this phase of her activity. The capture of the prey is often one of the most difficult phases of the work of any wasp to be able to be observed. In the case of *P. luctuosa*, it is of more than usual interest since she has to find her prey beneath the surface and dig it out. The following shows her at work.

By 8:15 in the morning, many of the wasps were about. One, watched to the exclusion of the others, was soon found digging near the roots of a young, sweet clover plant. She dug very near to one spot for twenty minutes, at the end of which time she located a larva. During these twenty minutes she had dug mainly in one place, two or three inches in diameter.

The digging consisted of a careful search and a working over of the ground of this area. It could readily be distinguished from the more hasty, though more definite excavations for the storage of prey. In the digging for prey, *P. luctuosa* used her mandibles to loosen the soil and her fore legs to push it back. Large pieces of cinders and pebbles were grasped by her jaws and carried backward for a distance of from two to four inches away.

After toiling fifteen minutes near one spot, she moved four inches nearer the clover clump. She dug here but a short time, then changed, not to the original place but to one two inches from both it and the second. She began removing earth at once and I soon saw the soil moving, the wasp grasped something and a larva came wriggling to the surface. Luctuosa must have sensed that it was not deep below the surface, for at no time during the watch had she dug to a depth of more than one and one-half inches.

The larva, now in full view on the top of the soil, was left for a few moments while the wasp brushed herself or walked slowly about it. She then returned to it, grasped it just back of its head, twisted her abdomen towards it head on the ventral side. There she gave it a sting between its first pair of true legs. She then advanced progressively backward, moving the tip of her abdomen along the ventral side and appearing to feel with its tip before inserting the sting. The sting was inserted, not by a quick hard thrust but rather deliberately, after the period of testing. It seemed that her sting must have come very near to or have actually reached the respective ventral ganglia of the prey.

The wasp was seen to sting the larva seven different times, each time in a different segment on the ventral side. When she had finished, it rested limp and motionless. She then turned it over, grasped it in the normal position for carrying and walked with it two inches nearer the clover plant. There she began a period of malaxation. Held ventral side up, her jaws opened and closed in the region back of its head, or more definitely the neck, while her short tongue lapped the liquid issuing from its mouth. This process, termed malaxation by Fabre[1] and others, lasted four minutes.

It seems pertinent at this time to consider the meaning and significance of this act. Newcomer[4] likewise observed it in *P. luctuosa*. I shall quote him in full in regard to the habit. He says:

"Following the stinging, the wasp often spends some time squeezing or chewing the cutworm just back of the head with her mandibles. Fabre calls this "malaxation" (my French dictionary gives the verb "malaxer" as a druggists' term meaning "to work up"), and says that this munching of the worm is for the purpose of rendering insensible the brain, which can not easily be reached with the sting. The Peckhams also, have interpreted it to be for the purpose of further quieting the worm. It seemed to me that the squeezing was mostly on the first thoracic segment, and while that may affect the brain, it appeared also to be for the purpose of finding out whether the worm was sufficiently paralyzed, for I have seen a wasp sting a worm several times, 'malax' it, and then sting it again. The wasp also sometimes sucks up the liquid regurgitated from the worm's mouth after this treatment, but this habit is undoubtedly incidental. I am inclined to believe with the Peckhams that the instinct of paralyzing and 'malaxing' the worm does not extend beyond the immediate effect, that of putting the worm in a condition to be managed easily by the wasp."

Hingston[3] would seem to support this view also, for he says, in referring to *Sphex lobatus* (p. 101), that "this *Sphex* has the habit of malaxing her prey, that is biting into the neck, probably as an accessory to the sting."

Professor Wheeler,[6] however, gives quite a different interpretation to this act. He states (p. 50) that "Many solitary wasps, after stinging their prey, devour it in part or entirely, or chew, *i.e.*, malaxate, its neck and lap up the exuding juices. This behavior is essentially like that of a parasitoid, and in its more frequent, feebler manifestations may be regarded as vestigial feeding. The adult wasp is no longer as carnivorous as its ancestors, because she has come to rely to some extent on the energizing nectar of flowers, but this substance contains no proteins and is therefore an improper food for her growing larval young."

Several investigators share with Wheeler in this interpretation and line of reasoning. It is a line of deduction which would seem to me to be most nearly correct. It is true, however, that the digger wasp does sometimes pinch with its mandibles the body of the prey in an apparent testing of its responses and liveliness. When it does occur though, it has the earmarks of a different purpose than that evidenced at the time of malaxation.

The fluid from the mouth of the prey is not always tasteful. In fact, it is sometimes decidedly the opposite. Neither do all nesting wasps practice it at each capture. It is, however, a fairly frequent procedure and, when engaged in, is often of some duration. The wasp may return several times to feed from one larva. There is even some evidence to support the view that she may capture prey and use it solely for that purpose.

At the end of the four minutes our wasp spent in feeding from the prey, she abandoned it, walked away and began digging at another place. This spot was soon deserted and the wasp flew to and fed from some dandelions, wandered about, dug three more times and then flew fifteen feet away. She again started to dig at the base of another sweet clover plant. Here, she early gave the appearance of digging for a larva.

She had worked carefully over an area of some three square inches, when suddenly she grasped an object, the soil moved as it did in the previous encounter and out from it came a larva held onto by the wasp. This larva, as in the previous capture, was abandoned for a time while the wasp carelessly walked about, rested and brushed the dust from her body. But in the meantime, while *P. luctuosa* was giving no attention to her find, the larva started to move hurriedly away towards the shelter of the thick clover stalks.

When the wasp soon turned about to the place where she had left the larva, it had moved only two inches away. Although quite near her, she did not seem to see it and spent her time about the actual spot where it had been taken and later released. She continued thus to search for it for about five minutes, four minutes after the cutworm had crawled into the clump of stems to be seen no more. Although it had been in sight for over a minute after the wasp had returned for it, she appeared wholly unable, for one reason or another, to retake it.

At the end of six minutes she gave up the search and flew away, apparently searching anew for another. An observation of her subsequent activity, however, was cut short, due to the fact that she was soon lost to view.

It is interesting to question her actions. Why did she leave her first cutworm after malaxating it? Why did she not recapture the fleeing second catch? If she scents her prey beneath the soil, why should she not track it on the surface instead of losing it? These and many other questions arise which are often baffling to answer.

Another wasp was able to locate two cutworms in a rather short time. The first was taken from her in an attempt to rear it and learn the species of moth involved; the second, caught an half-hour later, was left to her disposal.

During the period between these captures the wasp looked many places for larvae. She would dig at various spots but usually only for a moment. It seems that she can usually determine whether or not a larva is beneath the surface. The question arises as to her reason for digging at all, even if only for a brief period in barren places, where she finds no prey. In answer, it may be reasoned that a faint scent is left which lingers for a time after the cutworm is gone.

When she is searching for a larva one can see that she follows a different method than she does when searching for a place to dig a nest in which to store one already taken. In the former case, she does not dig at one spot to any great depth but seems to carefully scour the ground but little below the surface. Too, she often snoops around stones, pulls away dead stems of plants, and looks beneath rubbish—all of which is not done while looking for a place to dig a nest. When the wasp finds a spot where she seems to suspect prey, she often works very excitedly for a time, even though she may not unearth a cutworm at that particular site.

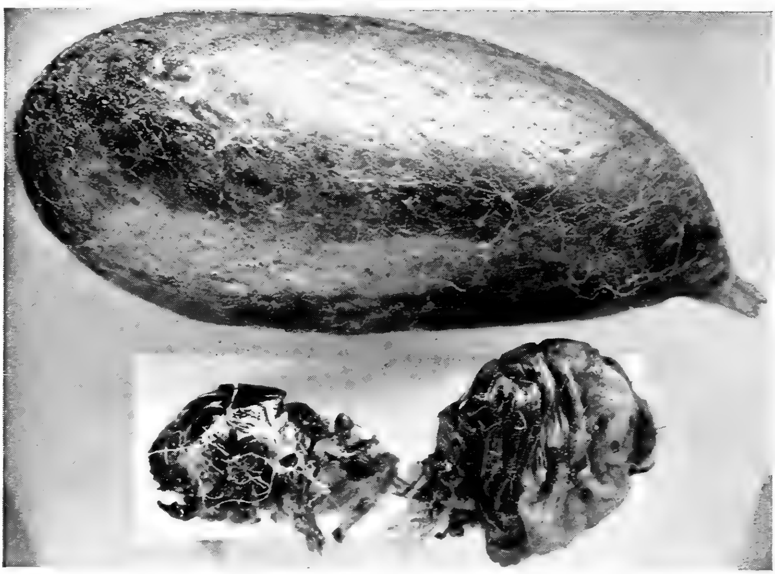

PLATE 24

Entire cocoon of *P. luctuosa* (above) and remainder of prey not eaten by the larva (below). X 5.

Luctuosa may begin digging in a given place but not stay long enough to secure her cutworm, even though one is present. This was seemingly evidenced by several observations, although there remains the rather improbable possibility that the larvae were not of the species desired and therefore rejected. The following record furnishes an example.

One wasp dug energetically at a spot for a short time and then left it for no apparent reason. I waited until there was no doubt of her failure to return, after which soil was removed at the very place where she had been digging. A large cutworm seemingly mature, was found there. The very small amount of soil covering the "worm" showed that she had approached very near to it and that, had she worked but a few seconds longer, this larva would have been exposed.

This same wasp soon dug in another place where loose soil covered some coarse cinders. She again dug rapidly after the fashion of securing prey but deserted this also. I dug it out and found a spider in a hole but two inches beneath the surface.

Even though this wasp errs from time to time in her hunting and captures she is, nevertheless, very successful for the most part. During the spring she could nearly always be found in con-

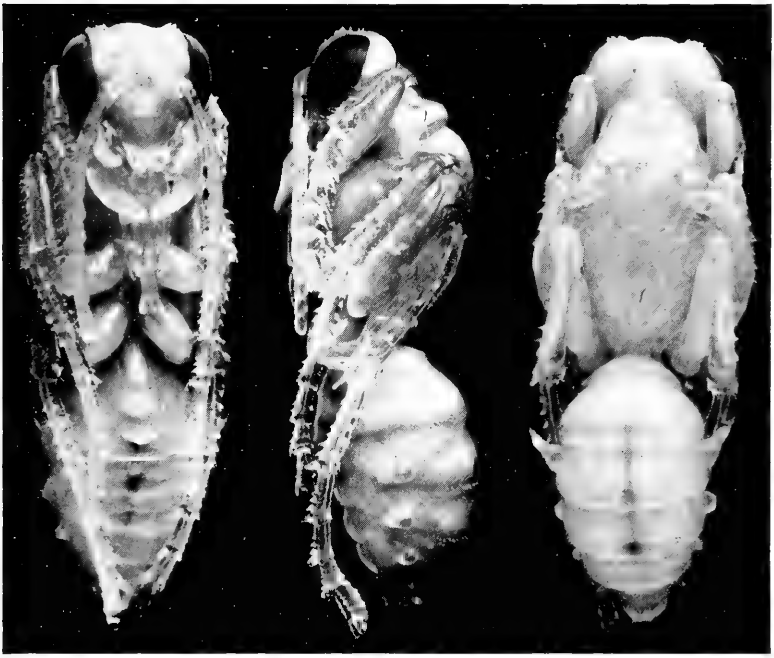

PLATE 25

Ventral, lateral and dorsal view of pupa of *P. luctuosa*. Female. Dark eyes indicate advanced stage in pupal development. X 4.

siderable numbers at Boulder, transporting her heavy booty to a destined cell. She is likewise not infrequently found at or near Los Angeles, engaged in a like activity.

The widespread distribution of this wasp, its abundance and activity in destroying cutworms, must be of considerable value to man and ought to commend itself to him. There is but little doubt in my mind that *P. luctuosa* could be increased in numbers under artificial conditions, liberated in the spring in areas threatened with inroads of cutworm pests, and crops protected. As it remains, this wasp is and long has been of service to mankind, during which time she has received little recognition or attention.

The writer is pleased to acknowledge the aid of Dr. John A. Comstock, under whose supervision the photographs have been taken. These photographs show the egg, larva, pupa and prey of the wasp. Later articles will present other facts concerning *P. luctuosa* (F. Smith).

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THE METAMORPHOSIS OF HETEROCHROA BREDOWII CALIFORNICA BUTL. (Lepid.)

By John A. Comstock and Charles M. Dammers

Egg. 1.75 mm. wide by 2 mm. high. Color, green, of the same shade as the upper surface of the *Quercus* leaf on which it was laid.

The surface is covered with hexagonal cells, as in the genus *Basilarchia,* arranged in regular rows, the walls of which are raised.

From the junctures of the cell walls a translucent green spine occurs, each one of which bears a swelling at about its center.

These swellings or nodules may result from the drying of a secretion, as it was noted at the time of laying that the egg was moist, and the swellings have the appearance of solidified droplets.

Described and drawn from a single example which an accommodating female deposited on an oak leaf a few inches from the senior author's nose, on June 1st, 1931. Collected near Atascadero, California. Emergence of the larva occurred on June 12th.

The egg is illustrated on Plate 26, fig. *a.*

Larva, First Instar.

Ground color of body olive green, flecked with numerous brownish-white and dark brown spots, which give it a dusty appearance.

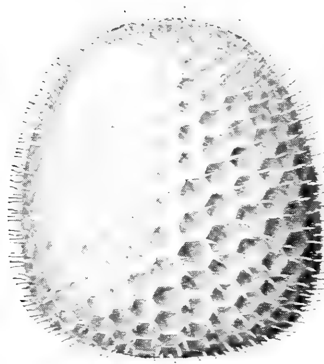
Head, brown, mottled with light brown and dark brown areas. Mouth parts dark brown. Ocelli small and jet black. A few minute yellowish hairs are present, scattered over the surface.

The head is large and well formed in comparison with other segments, probably as a provision for the heavy musculature of the mouth parts, in order that the very tough leaves of the live-oak may be masticated.

The point of juncture of the head with the first thoracic segment is marked by a narrow transverse black line.

Body. The first thoracic segment is thrown into a number of transverse folds over the dorsum, and bears a narrow brown transverse dash on each side of the median line. The second and third segments bear each two prominent tubercles, placed dorsolaterally. These are tipped with dark brown. See Plate 26, fig. *b.*

A similar pair of nodules occurs on the 5th segment, but the tubercles are slightly smaller, and are placed closer to the median line. Minute tubercles of similar character occur in line with the last described pair on the 7th and 10th segments. Finally a caudal pair of well defined tubercles is present.



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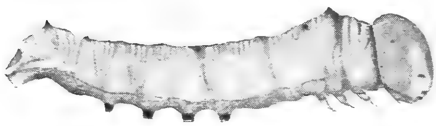

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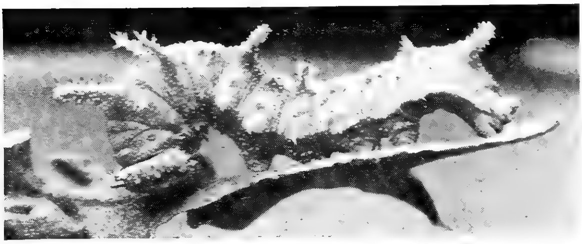

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PLATE 26

Egg and larva of *Heterochroa californica.*

a. Egg, highly magnified.

b. Larva, first instar, enlarged.

c. Adult larva in characteristic resting attitude, slightly enlarged.

The body is, at first, a mottled green, but gradually becomes darker and assumes a mottled brown shade as the first larval moult is neared.

True legs, olive green, slightly tinged with brown at their tips. Prolegs and anal prolegs heavily shaded with blackish-brown on their outer (lateral) aspects.

The larva cast its skin on June 21, the first larval instar thus being of 9 days duration.

Second Instar. Color, various shades of brown, ranging from a light ochre-brown to a blackish brown on certain of the projections.

Head, large and prominent, with a ground color of light yellow-brown; crossed by two bands of rich brown which converge superiorly. The head is studded with a large number of light ochre or ivory colored nodules, and a few long pointed black-tipped nodules are present.

Ocelli, jet black. Mouth parts, light brown, shading to darker on the edges. Antennae white at the base, shading to yellow-brown at the tips.

The body of the larva is minutely and profusely studded with yellow-brown nodules, which have a tendency to run generally in line with the transverse folds. Paired projections or horns arise on each of the 2nd, 3rd, 5th, 7th, 10th and anal segments, corresponding to the nodules previously noted in the first instar. Those of the 2nd segment project somewhat anteriorly, are most prominent, and are studded with short pointed spines, some of which are blackish-brown, while others are yellow with black tips.

The pair of projections which arise from the 3rd segment are shorter than those previously described and are lighter in color. The spines arising from them are yellow.

The projections on the 5th segment are darker than those last mentioned, and their subsidiary spines are brownish black. In length, they are intermediate between those of the 2nd and 3rd segments.

The anal horns or projections correspond in size to the last described pair, but they point in a posterior direction. The projections on the 7th and 10th segments are little more than tubercles.

The dorsal area, between the two lines of projections, is variegated, being a mottled dark brown on the 2nd and 3rd and the last two caudal segments, and a light yellow-brown from about the 4th to the 9th segments.

Along the side of the body there is a supra-stigmatal area of dark brown blotches, which give the appearance of a wide lateral broken dark line.

Abdomen, brown.

True legs, yellow-brown. Prolegs, mottled brown.

Stigmata concolorous with body.

The peculiar attitude sometimes assumed by this larva when at rest, becomes noticeable from the second instar on to maturity.

The larva cast its skin June 28, making the duration of this instar 8 days.

THIRD INSTAR. The larva is similar in appearance to the second instar, with the following exceptions:

The horns or projections are somewhat longer, and generally lighter in color, with the subsidiary spines which cover them a cream or yellow. There are also small stellate spines on each segment, in line with the larger projections, and a second line of spines of the same character occurs supra-stigmatally.

The profuse sprinkling of nodules over the entire body of the larva is more marked as it matures, and many of these nodules assume the proportions of simple spines.

Moulted June 2nd. Duration of instar, 4 days.

The laboratory conditions under which this single specimen was raised did not approximate those of nature, and some disturbance and variation in the rate of development of the various instars may have occurred.

FOURTH INSTAR. Very similar to third, with a slightly lighter cast to the general color scheme. The long spines are a uniform light brown, and the smaller subsidiary spines are yellow-brown. A few of the latter have black tips. This instar is illustrated on Plate 26, fig. *c*.

Moulted July 11th. Duration of instar, 9 days.

FINAL INSTAR. MATURE LARVA. Length, 39 mm. Breadth at 5th segment, 5 mm.

Color markedly different from previous instars, being deep green on the superior and lateral aspects and a deep chocolate on the abdomen.

Head. Pale brown with five bands of darker brown running perpendicularly, the outer pair forming an inverted V. A raised collar occurs at the postero-superior margin, which bears numerous yellow-brown spiny points, those at the lower edge being lighter in color, while the superior ones are longer and darker. A few of these points have black tips, and one pair, superiorly placed, gives the appearance of horn-like projections.

The face is covered with points and dots of a lemon color, and a few colorless short hairs are present.

The usual horns are present along the dorsum of the body, as described in the previous instars, and the subsidiary spines covering these are prominent, and are lemon-yellow in color, with black hairs at their tips.

The lateral (suprastigmatal) row of stellate spines is somewhat more prominent, and these spines are in evidence from the 2nd to caudal segments. The anterior pair are longer than the others. All are of a lemon-yellow shade.

The first segment bears a transverse pale brown bar.

The segmental creases are green, or greenish grey, with the over-hanging segmental lips a lemon yellow, and bearing numerous spiny points which project inwards and downwards.

True legs pale pink, with colorless points. Prolegs and anal proleg concolorous with abdomen, the claspers gray.

Spiracles, dark brown.

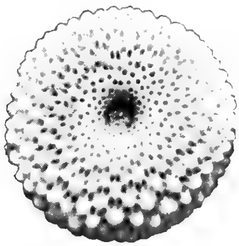
Pupation occurred July 25th, the larva suspending on the foodplant from a silk button.

Pupa. Length 23 mm. Color a pale straw, profusely marbled and striated with a darker straw or light brown. Three pairs of dark spots occur on the venter, between the antennal sheaths.

The lower edges of wing cases and several areas on the dorsum are heavily shot with gold.

A mid-dorsal hump occurs, somewhat as in the pupae of the Basilarchias, but proportionately less prominent and without a constricted neck.

Emergence of the imago occurred on Aug. 4, 1931, resulting in a fully developed male.



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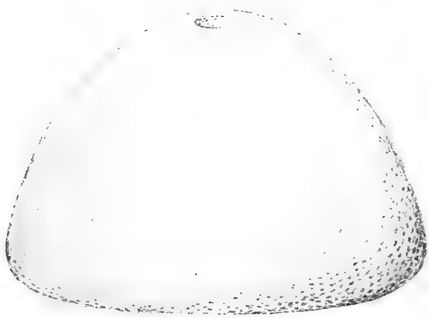

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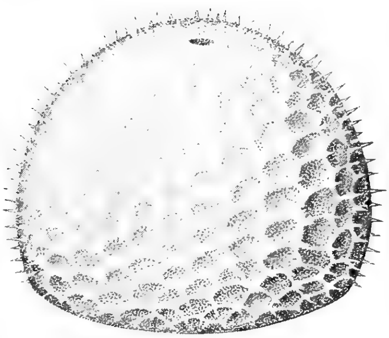

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PLATE 27

Fig. *a.* Egg of *Atlides halesus*, much enlarged.

Fig. *b.* Egg of *Pseudocopaeodes eunus*, much enlarged.

Fig. *c.* Egg of *Basilarchia lorquini*, much enlarged.

STUDIES IN PACIFIC COAST LEPIDOPTERA
(Continued)

By John A. Comstock
Associate Director, Los Angeles Museum

Egg of Atlides halesus. Cram.

Although the larva and pupa of this species has frequently been described and figured, I know of no reference in the literature to the egg.

Comm. C. M. Dammers has succeeded in inducing females to lay in captivity, and has reared a long series. The example from which this description and illustration was prepared was furnished by him.

Egg. Size .8 mm. broad x .37 high. Color, glistening white. Form, echinoid. The micropyle deeply depressed.

The surface is covered with raised papillae, which are arranged in more or less regular horizontal rows. Each papillus is joined to its neighbors by low narrow connecting walls, with the result that most of the papillae appear stellate. These nodular protrusions decrease in size as the micropylar area is approached.

An egg which was laid June 21, 1931 hatched on the 26th, making five days in the ovum.

See Plate 27, fig. *a*.

The egg of Pseudocopacodes cunus Edw.

Size 1.10 to 1.20 mm. broad by .75 to .90 mm. high, an unusually large egg for so small a butterfly. Color, cream. Form, sub-conoidal, the base flat; micropyle small and not very deeply depressed.

The surface is covered with a fine reticulation of slightly raised walls which mark off cells of an irregular pentagonal and hexagonal shape. The raised network is concolorous with the egg, and the cells thus defined have finely granulated floors.

The cells in the area of the micropyle are very much smaller than those covering the remaining egg surface.

This egg is illustrated on Plate 27, fig. *b*. The single example from which this description was prepared was furnished by Comm. C. M. Dammers.

The Egg of Basilarchia lorquini Bdv.

The metamorphosis of Lorquin's Admiral was recorded by Dr. H. G. Dyar in the "Canadian Entomologist," Vol. 23, p. 172, and a drawing of the pupa was given in "Butterflies of California," p. 143.

We are illustrating the egg on Plate 27, fig. *c*. The example from which our drawing was prepared was secured by Theodore Childs, Jr., of Riverside, California.

The egg and first larval instar of Melitaea gabbi Behr.

Some discussion was given concerning the metamorphosis of this species in Vol. XXX, Part 1, 1931 Bulletin Southern California Academy of Sciences, and an illustration of the egg, mature larva, and pupa was there shown.

Additional information concerning the egg and first larval instar is now available, and will aid in completing our knowledge of the life cycle of this interesting Nymphalid.

Egg: .5 mm. broad by .6 mm. high; color, light translucent green.

Form: of the usual Melitaea type, the upper third to half marked by longitudinal ridges, 18 to 20 in number, the depression between these ridges being crossed transversely by numerous secondary ridges which are poorly defined. The lower half or two-thirds of the egg is broken up into a series of cells or depressed pits, the raised walls of which form irregular hexagons.

Base, rounded. Top flattened, the central micropylar area slightly depressed and minutely pitted.

The eggs are usually laid on the under side of a leaf of *Corethrogyne filaginifolia,* close to the base of the plant, and are spread out in a single layer. One mass of eggs observed contained 95 examples, all of which were laid in a short space of time, on April 7, 1931. Emergence occurred April 14.

First larval instar.

Length of newly emerged larva, 1.5 mm.

Head, jet black, with a few short colorless hairs scattered over its surface.

Mouth parts and ocelli, concolorous with head.

Body, dirty yellow, the anal segment tipped with gray. A number of long simple hairs arise from the body, arranged in longitudinal rows. These arise from papillae which are concolorous with the body. There are five of these rows on each side of the median line, the dorsal set being longest. The three uppermost rows are black, the next lateral row is lighter, and the inferior row is colorless, and the hairs are shorter than are those of the other rows.

True legs gray. Prolegs concolorous with body.

Anthocharis sara reakirtii Edw. Notes on the Early Stages.

Eggs and larvae of this species were furnished by Mr. J. A. Legge, of the Lorquin Entomological Society, from which the following incomplete description was prepared.

Egg. Approximately 2 mm. tall. Color, at first a rich yellow, changing to a deep orange. Form: tall, cylindrical, tapering at both ends, and bearing 16 to 18 longitudinal ridges, with the interspaces crossed transversely by numerous fine striae or walls, the latter barely perceptible except under magnification. A female was observed to oviposit on Feb. 27, 1931, the plant of choice being *Thysanocarpus curvipes.*

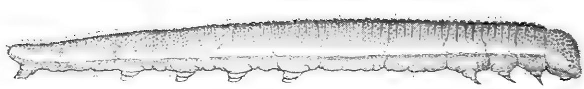
Illustrated on Plate 28, fig. *a*.

Larva of 5.25 mm: probably in the 2nd instar.

Head: brownish-black, with a black rim at juncture of first segment. No appendages are apparent on the head except under high magnification, which discloses a few short black vibrissae scattered over the surface.

Body: dirty olive-green, mottled, and bearing a few short dark single hairs arising from black papillae, the latter surrounded at their bases by circlets of whitish green. A light stigmatal line,

a.



b.

PLATE 28

Fig. *a*. Egg of *A. sara reakirtii*, much enlarged.

Fig. *b*. Larva of *A. sara reakirtii*, lateral view, enlarged.

whitish to light yellow, runs longtitudinally, and a narrow light mid-dorsal line is also present.

True legs, blackish-brown. Prolegs concolorous with body.

Stigmata slightly darker than the ground color.

MATURE LARVA.

Head: green, covered with numerous black punctae bearing short black bristles. The yellowish-white lateral line of the body extends for a short distance over the lobes. Ocelli, green centered, with black ringlets. Mouth parts, darker green, with black or dark brown edges to the mandibles, and a dark tip to the spinnaret.

Body: ground color green, the dorsal surface tinged with a dirty yellow and bearing numerous dark blotchings and punctae from some of which arise short black hairs. Across the center of each segment, transversely placed, are six black hairs (three each side of the median line) which are about three times the height of the more numerous short hairs. These long hairs arise from black papillae with whitish areolae at their bases.

A poorly defined mid-dorsal green line is present, formed by the lack of dark punctae in this region.

There is a wide lateral stigmatal line, yellowish-white in color and slightly more yellow along its upper edge, on which the stigmata show as green circlets with cream colored centers. This line is shaded inferiorly by a darker green area which gradually blends into the lighter translucent green of the abdominal surface.

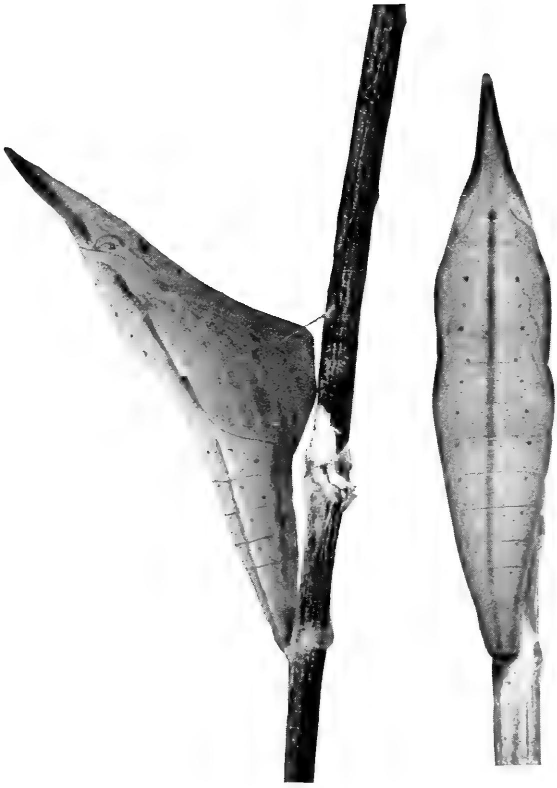
Legs and prolegs, green.

PUPA. Elongate and narrow, the head protruded into a long tapering snout which is not recurved as in *lanceolata*. Thorax gently protruding. Abdomen tapering regularly toward the caudal end.

Color, light wood brown, with darker brown spots and markings as shown on the illustration, Plate 29, figs. *a.* and *b*. The dorso-lateral edge is shaded with dark brown, and a dark mid-dorsal band is present. A line of dark points occurs on the dorsal surface, midway between the median line and the lateral edge. A supra-stimatal white line edges the dark dorso-lateral line, and gradually blends inferiorly with the wood-brown of the ventral surface.

The veins under the wing cases are indicated by barely perceptible light lines on a darker ground.

Head and palpal cases slightly darker than the color of the body.



a. *b.*

PLATE 29

Pupa of *Anth. sara reakirtii*, enlarged.

a. Lateral view. *b.* Dorsal view.

NEW RECORDS OF DIURNAL LEPIDOPTERA FOR CALIFORNIA

Eudamus simplicius (Stoll)

Mr. J. D. Gunder reports the capture of several specimens of *Eudamus simplicius* (Stoll) by Theo. W. Bower, at Fertilla, Riverside Co., Calif., on Oct. 20, 1922.

Junonia coenia f. nigrosuffusa B. & McD.

Dr. John A. Comstock and Comm. C. M. Dammers took several specimens of *Junonia coenia f. nigrosuffusa* at Blythe, Riverside Co., Calif., on Oct. 18, 1931.

Parnassius smintheus magnus Wright.

During the past summer, Lloyd Martin of Roscoe, Calif., and the writer took several specimens of *Parnassius smintheus magnus* at Castle Lake, Siskiyou County, thereby adding another known species to the California list.

On the afternoon of July 11, the writer netted two male specimens of *magnus* among the rocky outcroppings at the south end of the lake. The following day the first female was taken. The butterflies were feeding almost exclusively on *Monardella,* a species of mint, and when thus engaged were quite easily captured. When in the open, however, they were most elusive as they sported about the barren, rocky cliffs.

The following count of the writer's captures clearly indicates late emergence of the females as compared with the males. To further verify this, the males taken during the latter part of the month were in poor condition while the females showed evidence of having recently emerged.

July 11—	2 males	
" 12—	5 males	1 female
" 19—	15 males	3 females
" 22—	10 males	10 females
" 30—		6 females

At all times the males were more in evidence than the females, as the latter usually secrete themselves amongst the rocks waiting for the males to find them. Only by watching the patches of *Monardella* could one entertain hopes of capturing this elusive mistress, and then a quick, sure sweep of the net was imperative.

W. B. DAVIS

GNOSTIC INTAGLI

By Dr. R. H. Swift, *Archeological Section*

"I will give him a white stone, and in the stone a new name written, which no man knoweth saving he that receiveth it."—Rev. II, 17.

A certain historical background will be necessary to hold in mind if we are to understand the rise of Gnosticism in the First Century of our era, and its influence on early Christianity in the Roman World until the Sixth.

A common error is to speak of these sects as a mere heresy of the early Church. The whole complicated structure was due to fusing under one name, portions of at least four ancient and long established faiths made possible by the peculiar receptiveness of the mind of the period. Alexander's conquests in the East brought the Neo-Platonic Greek into direct contact with the ancient mystic religions of Asia. Notable among these was Talmud Judaism, which was based upon teachings of the Zendavesta learned while in captivity, along with the teachings of the Kabala and Book of Enoch. These differ from the Mosaic fundamental concept of the unity of the Godhead, supplanting it with the Persian Angelic Monarchy as direct rulers of all material creation.

From the Far East, sent by the zealous Indian king Asoka, came missionaries with a Brahminical type of Buddhism. Thus we find groups in Asia Minor and Syria blending these seemingly incompatable systems into one unit, and as the center of the philosophical world at this time was Alexandria, we find them here well organized in the second century B. C.

Nor was this all, for here in Egypt was revived and added to what already seemed to be an unwieldy concept, the esoteric symbology of the ancient Egyptian priestcraft, together with the new Christian faith in the First Century, or more exactly, those portions of early Christianity which satisfied their craving for occult mysteries.

This colossal cult continued until the late Sixth Century, when slowly degenerating into vulgar witchcraft and puerile logomachy, it was largely absorbed in Europe, by the simpler Catholicism, and in the East by the tide of Islam. Such a structure however could not pass completely with Man's innate love of things mystic, and we find it persisting in sheltered spots under the Arian Christian Goths in Europe, and under the more tolerant Saracen in the East. These embers we see fanned to flame in the Albigenes Manicheism and later in the Fifteenth Century revival of magic, astrology, and alchemy, and thriving among the Druses and Ansayreh on the slopes of Mt. Lebanon. Strange as it may seem, many of the fantastic creations of the Gnostic minds live today as basic principals in many of the more metaphysical occult cults.

It is difficult to state in a few words the fundamentals of these "jarring sects" of early "Christians." Most historians conveniently pass them with but a few words, and since their own manuscripts are secretive, it is from the glyptic art of these gems that we gain more intimate contact with their involved beliefs.

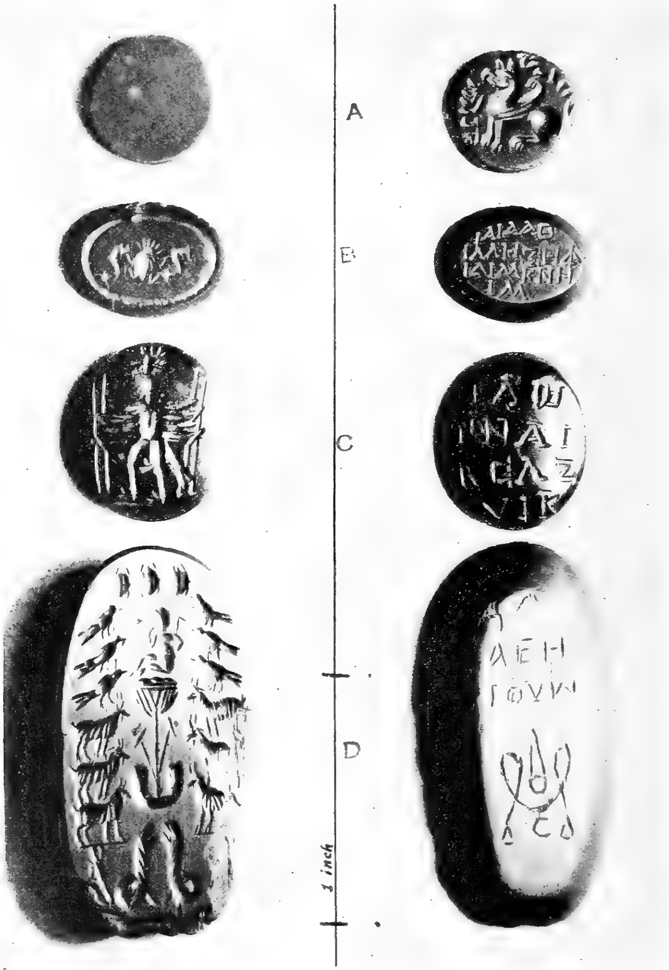
Common to most Gnostics was the belief that the Supreme Diety created the Spiritual World of Intelligences, Aeons and Angels. The Material World was created by Deniurges, a divine Emanation. They rejected the Old Testament, but accepted parts of the Gospels, rejecting the balance as being merely Apostolic interpolations. Thus they revised, elaborated and combined with complicated oriental symbolism the Biblical stories of the Fall of Man, and the birth, life and death of Christ. God evolved "Nous," or Mind, and sent him in the form of Jesus to save the world from corruption. His death on the cross was considered an illusion, death being beneath divine dignity to the oriental mind. Tenets of absorption into God, duality, trinity, asceticism and contemplation they adopted from India probably through the Essenes. The elaborate mystic symbolism came from the Persian Magi and the remnants of the Egyptian priestcraft.

With this rather lengthy preface, warranted by the scant literature on the Gnostics, I will present these unpublished gems, formerly from the Draper and Parker cabinets, now in my small collection.

A talisman was intended to both bring good fortune and to ward off evil, while an amuletum was for protection of the wearer only. Gnostic gems were usually intended to serve the purposes of an amulet and as credentials, and as such were intended to be carried in the zona or pouch, or worn about the neck, but not to be used as setting for rings as were the Persian charms. (Pl. 30, A.)

The early used semi-precious stones (Pl. 30, C) were soon replaced as gem materials by plasma, jasper (Pl. 30, B) and hematite (Pl. 30, D)., materials reputed by the ancient Chaldeans as having innate magic powers in themselves. Fine well cut gems of Gnostic type are usually found to be from the Fifteenth Century revival of mysticism. Gems of the Magi (Plate 30, A) or Isis amulets are often mistaken as Gnostic.

The true Gnostic intaglio expresses but the debased art of the late period of Alexandria. They were cut with a crude wheel, often with marked carelessness, showing the growing barbarism in the once supreme art of Greece.



Reverse *Obverse*

PLATE 30

A. Sassanian Mithric Gem of green Jadite. Griffin and Pehlevi inscription. Third to Seventh Century.

B. Jasper Ophite Gem. c. Second Century. (Described in text.)

C. Moss-Agate Gnostic Gem. c. First Century. (Described in text.)

D. Large Hematite Gnostic Gem. c. Late Second Century. (Described in text.)

(Photographs by Mr. W. W. Hook)

The real problem presents itself when we attempt to fully interpret the subjects carved on these amulets. This may seem strange as the objects are fairly well drawn and the legends are in legible Greek, save where the unskilled artizan was unable to make rounded letters well (Pl. 30, B). The true reason for the difficulty is twofold; First words were intentionally garbled: The "Masters" had no desire that their "cosmic truths" be learned by the world at large, their very merit was largely due to keeping this "gnosis" the exclusive possession of the chosen few. Even contemporaries, as Jerome, calls their legends "Tormenta verborum." The second reason for difficulty is that while the letters were in Greek, the language was usually Coptic, Syro-Chaldean, modified Greek, or Pehlevi, but never Latin. The many alleged Gnostic intagli with Hebrew characters are Caballistic and Rosicrucian stones of the Sixteenth Century. While many of the symbols and lore of Dynastic Egypt were used by the Gnostics, no evidence is to be found that they could use the hieroglyphics.

The following are gems typical of the class. Plate 21, D, is an oval flattened plaque of hematite, beveled on the obverse. Crudely cut intaglio are the "mystic seven Greek vowels." These were to express the "Seven Heavens," Sun, Moon and the known planets. These vowels were said to be the sounds uttered by each as it completed its passage through the Seven Houses of the Zodiac. The combined tone made "the music of the Spheres." The Vowels were also used to veil, from the profane, the ineffable name of the Creator, I A W, which is included in them. Certain words uttered only under specified conditions are common to most mystic orders and much power is identified with them.

Above the Vowels on this gem, but nearly effaced, is a A Ω I, possibly the hidden name of Horus I A Ω, or the name of the owner of the amulet, and used to complete a third line; three, five and seven being mystic powers.

A "Secret Mark" symbol is below the Vowels, consisting of two joined triangles, Zoroastrian symbols of the Trinity, Ormuzd, Ahrimanes and Mithra,—Light, Darkness and Truth. The triangle was the primal figure made by joining the three mystic points. In the center are the three Lights, the Sun governing the day; below the Moon governing the night, and the phallic sign of the Master.

On the reverse we have a well cut Abraxine subject, indicating an approximate date of the Mid-Second Century in Egypt. I am inclined to feel that the same engraver did not cut both sides, and would think the obverse cutting was much later, being of cruder workmanship and made by a different tool, but this is by no means certain.

In the center the child Harpokrates or Horus, the Sun God, his finger to his lips for secrecy, a scourge in his hand, Egyptian symbol of power, and seated on a lotus flower. The lotus was the Eastern emblem of creation from the ancient sacred Indian formula "Om mani padme, hum"; (Jewel of creation is in the lotus). About the God, grouped in triads, are scarabs, ancient symbols of Rā and Eternity, the extensive use of which had been but a memory in the valley of the Nile for over five hundred years (*); birds whose meaning I have been unable to trace; and the goats of Mendes. At the base of the lotus stem is a Moon sign, made by two phalli, below which are two scorpions and coiled asps of Isis.

The next gem is seen in Plate 30, B, and is of Second Century type. It suggests Ophite influence, one of the numerous Gnostic sects, by its dominant serpent lore. It is of jasper, one half dark-green and the other reddish-brown. The obverse is beveled. The Ophite serpent with its tail in its mouth surrounds a scarab, symbol of eternity, flanked on either side by a "Z," the heptad from the so called Pythagorian numerals. The serpent was symbolic of all knowledge to the Gnostics. It was said to have healing powers as well.

The legend is in square Greek but meaningless in Coptic, Greek, Syrian or Persian in its present arrangement, other than as names. Each sect had its own names for the various "Powers." The Genii of the constellations were named after the Jewish archangels. To call the name of a "Power" was thought to give control over it. Hippolytus tells us that if the Names of the "Great Ones" were not uttered with regularity the universe would not hold together. Some light on this intaglio may be cast by a passage from the great Gnostic work, possibly written by the school of Valentinian, the Pistis Sophia. "And the disk of the sun was a great dragon whose tail was in its mouth, who went up into the Seven Powers on the left hand, being drawn by the Four Powers, having the similitude of white horses." These four lines may contain the names of the Four Powers, as the balance is suggestive.

(*) See BULLETIN XXX, Part 1, pg. 1.

The last, and probably the earliest, is illustrated in Pl. 30, C. It is a dark moss-agate of ovoid shape. The letters are skillfully cut and use the unutterable name of the Creator, I A W, standing for the Hebrew YHWH, considered too sacred to write. These letters were also used for Mithra and Ormuzd. The whole legend, in poor Greek, seems intended to read, "IAW T'NAI ΒΑΣΙΛΩΣ ΝΙΚΑ" (And truly Jehova is the Lord Victorious). On the reverse we have the Hekate Triformis, Queen of Hell. The general material, workmanship and subject would lead me to place the date of this gem in the First Century.

By their very nature, the ultimate meaning of these relics of Gnostic glyptic art will be a closed book. The whole complicated system, only a glimpse of which could be given in this paper, was the most elaborate religion, if we can call it such, that knowledge-hungered Man has ever evolved, yet to me the most startling fact is that the fantastic beliefs and doctrines of these Gnostics are today prized as "pearls of Truth and learning." They are taken as fundamental facts and woven into the fabric of most of the occult cults and secret orders in this our Twentieth Century, by the millions who mistake the mental confusion of these abstract ancient "Masters" for profundity, prizing the ambiguous circumlocution the more for its very irrationality. So strong is Man's desire to solve the Riddle of the Universe.

PROCEEDINGS OF THE ACADEMY

October 1931 to January 1932

October 10th.

Regular monthly meeting of the Academy was held in the Auditorium of the Library. Arthur Woodward, Curator of History of the Los Angeles Museum spoke on "New Archeological Discoveries in the Gila Valley." He dealt mainly with the "Grewe" site, and the lecture, which was illustrated, brought out the following points:

During the year 1930-31 the Van Bergen-Los Angeles Museum Expedition was occupied in excavating an ancient Hohokam village site, located on privately owned property, one mile east of the Casa Grande National Monument, Gila Valley, Arizona.

This site was particularly interesting because, for the first time, stray scattered elements of a very early type culture, denoting an active physical contact of the ancient inhabitants of the Gila, with the richer, more colorful civilization of Old Mexico, were found in sites among the ruins of houses, trash mounds and burial areas.

The badly disintegrated remains of fifty habitations of two types, known as the *Jacal* or surface, brush, wattle-and-daub structure and a well defined pit-dwelling or semi-subterranean habitation, were found on the tract.

The entire area probed by the workmen was a plot thirty acres in extent.

Three cremation burial areas were uncovered and from the newly discovered pit, cremated burials, a wealth of shattered pottery vessels, carved shell jewelry, carved bone awls and stone paint palettes were recovered and added to the Museum collections.

Of these mortuary gifts to the dead, perhaps the most interesting items were the thin, beveled, sandstone discs which at one time had been the bases of mosaic mirrors, the reflecting surfaces of which had been composed of thin segments of iron pyrite crystals set in a cement with the natural, polished side of the crystals uppermost.

Such metallic mirrors were the product of skilled workmen in Mexico and Central America—this being the first time any quantity of such objects has been found north of Mexico.

The pottery objects were numerous and interesting. There were huge finely decorated storage jars, plates, plaques, flare-rimmed bowls, vessels fashioned to resemble mountain sheep, ladles and legged vessels. The latter vessels showed a decided Mexican influence and the supports on these ranged from one to seven in number.

All of the decoration was in red on a buff background.

The ancient Hohokam burned their dead and deposited the calcined bones in pits dug into the caliche, a concrete-like substratum underlying the valley floor in certain areas. In these pits were deposited the offerings, of stone, bone, shell and pottery.

Approximately nine tons of sherds, stones, etc., were removed to the Museum laboratory for study and reconstruction. Three type collections were deposited in Arizona, one in the State Museum, University of Arizona, Tucson; another at Gila Pueblo, Globe, Arizona; and one at Casa Grande National Monument. Collections of type pottery sherds were also distributed to various institutions through the generosity of Dr. Charles Van Bergen, sponsor of the expedition.

This work demonstrated the necessity of the exploration of small, obscure sites and a great deal of additional work is needed in all parts of the Southwest and in Mexico before an adequate idea of the cultures represented in the various regions may be obtained.

The Museum is contemplating further exploration in the region and so far the test work undertaken has revealed many interesting facts, yet the evidence is all too scanty and fragmentary to satisfy the archaeologists. A great deal yet remains to be done before the cultural threads of our Southwest are woven together into one harmonious entity.

November 14th.

Regular monthly meeting was held in the Library. The speaker of the evening was Dr. F. D. Blakeslee, well known lecturer and traveler, who spoke on "Archeological Finds in Cyprus and Malta." The lecture was illustrated by lantern slides depicting the recent work carried on by the German and American excavators in the islands. Unexpected civilizations were unearthed, dating many centuries before the dawn of the Greek. The speaker also touched on the picturesque life of the modern islanders.

December 12th.

Last regular meeting of the year was held in the Library. The Academy was fortunate in having as a speaker Oliver Perry Medsger, lecturer for the American Museum and Pennsylvania State University on Nature subjects, who spoke on "In the Haunts of John Burroughs, and Wild Life of the Eastern States." Many personal recollections, born of a warm friendship with the Dean of American Naturalists, were given. The lecture was illustrated by beautifully colored lantern slides from photographs made by the speaker. The animal and floral life, now too fast dwindling in numbers because of the inroads of civilization, was instructively covered.

January 9th.

Regular monthly meeting was held in the Library. The speaker was Arthur Woodward, curator of History of the Los Angeles Museum, and authority on the American Indian. His subject was "Trade with the Indians in the 19th Century." The lecture was illustrated by lantern slides. The speaker dealt with the early contact of the European traders with the Red-man of the Eastern section of our country for furs, the introduction of the use of wampum as money by the Dutch, and the French and English use of silver ornaments, made in Europe for the Indian traders. Examples of these were shown. The speaker also covered the subject of the native silver workmanship of the Southwestern tribes developed during the last forty years.

The Academy hopes that its members will attend the regular meetings held on the second Saturday of each month in the Auditorium of the Los Angeles Library at 8:00 P. M. Speakers of great ability, subjects of vital scientific interest and a chance to meet and to know your fellow members are the inducements promised to regular attendants of the meetings.

Dr. R. H. Swift, *Secretary*.

The work of the Southern California Academy of Sciences is carried on entirely through the generosity of private citizens, who are sufficiently interested in the advancement of education and cultural endeavor to donate funds or make bequests to the Academy. As a guide, in the matter of bequests, for those who plan to further this program, the following forms are suggested:

Form of Legacy

To be used when it is desired to leave the Academy any personal property, such as money, stocks, bonds, works of art, or other objects of value.

I give and bequeath unto "Southern California Academy of Sciences," of the City of Los Angeles, the sum of.. Dollars: To have and possess the same unto the said "Southern California Academy of Sciences," its successors and assigns, to the uses, dispositions and benefits thereof forever.

Form of Devise

To be used when it is desired to leave real estate to the Academy.

I give and devise to "Southern California Academy of Sciences" of the City of Los Angeles, (.. here describe the property or ground rent..), together with the appurtenances, in fee simple, and all policies of insurance covering said premises, whether fire, title or otherwise, free from all taxes: To have and to hold the same unto the said "Southern California Academy of Sciences," its successors or assigns forever.

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Began issue with Vol. I, No. 1, January, 1902. Issued ten numbers in 1902, nine numbers in 1903, 1904, 1905; three numbers in 1906. Issued two numbers annually from 1907 to 1919, both inclusive (except 1908—one issue only). Issued four numbers (January, May, July and October) in 1920.

The 1921 issues are: Vol. XX, No. 1, April; Vol. XX, No. 2, August; Vol. XX, No. 3, December.

The 1922 issues are: Vol. XXI, No. 1, March; Vol. XXI, No. 2, September.

The 1923 issues are: Vol. XXII, No. 1, March; No. 2, July.

The 1924 issues are: Vol. XXIII, No. 1, January-February; No. 2, March-April; No. 3, May-June; No. 4, July-August; No. 5, September-October; No. 6, November-December.

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"	24,	" 2.	May,	1925	.25
"	24,	" 3.	September,	1925	.25
"	25,	" 1.	January,	1926	.50
"	25,	" 2.	May,	1926	.25
"	25,	" 3.	September,	1926	.25
"	26,	" 1.	January,	1927	.25
"	26,	" 2.	April,	1927	.25
"	26,	" 3.	September,	1927	.25
"	27,	" 1.	January,	1928	.25
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"	29,	" 2.	May,	1930	.25
"	29,	" 3.	September,	1930	.25
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DR. JOHN A. COMSTOCK

Southern California Academy of Sciences, Care of Los Angeles Museum, Exposition Park, Los Angeles, California.

Bulletin, Southern California Academy of Sciences

VOL. XXX, 1931

INDEX OF SUBJECTS

INDEX OF AUTHORS

New species or forms indicated by bold face type.

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