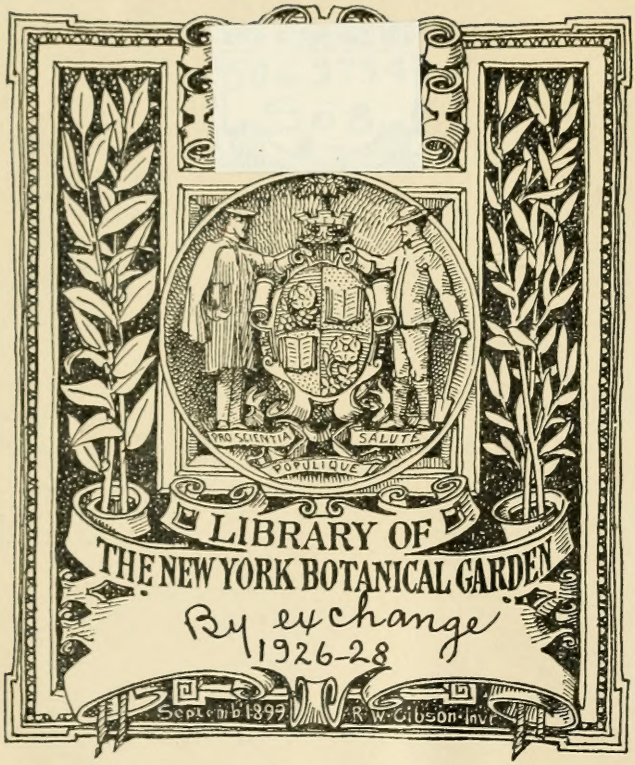
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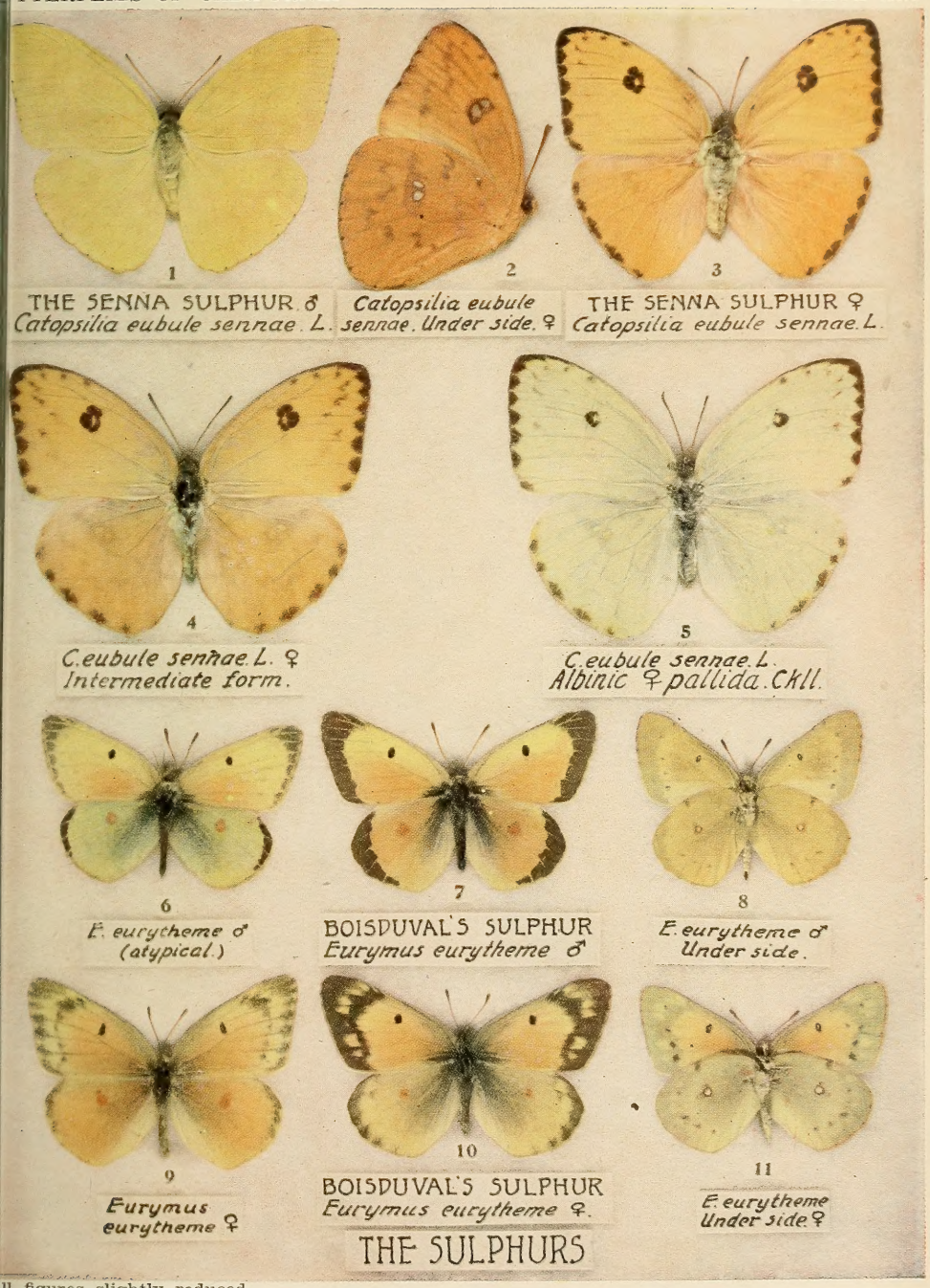

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CHECK LIST OF THE DIURNAL LEPIDOPTERA OF BOREAL AMERICA

WM. BARNES and F. H. BENJAMIN, Decatur, Illinois.

INTRODUCTION

Nine years have elapsed since the publication of any complete list of North American Diurnal Lepidoptera. In the meantime many new names have been published, and what is still more important, many radical changes in generic names and concepts have resulted from type fixations.

In the present list we adopt a method which we consider will tend toward the ultimate establishment of some degree of stability of nomenclature.

The generic names are accompanied by type designations. None of these are new fixations, but simply adopted by a strict course of following the International Rules of Zoological Nomenclature. Scudder, Ploetz, Butler, Godman and Salvin, Barnes and Lindsey, and Lindsey have been responsible for the fixation of the majority of genotypes not designated or indicated in the original descriptions. It is only justice to state that we have been greatly assisted by these fixations, and especially by the published and unpublished work of Dr. Lindsey. upon which we have drawn liberally. In one factor, however, we have deviated from most of the previous work, and that is in considering a specific name rather than a specific organism as the genotype. Too frequently have we found a specific name quoted as genotype when that name was not mentioned in the original description. Some cases involve names of typical rather than type species. Many cases involve the quotation of a specific name in place of a supposed synonym. Scudder's method of bracketing the supposed syononymic name eliminates, for the most part, what might otherwise be a real catastrophe, for frequently subsequent changes in the synonymy have removed names, and given them entirely different status. As long as a name is available we quote it. Where the specific name is unavailable under the Code, we have given it, and then quoted a name which we consider to be the oldest available one.

We have adopted the Hübner Tentamen, thus deviating from the Barnes and McDunnough Check List. The matter of the Tentamen is now under consideration by the International Commission, but pending a settlement of the question regarding its validity, we have deemed it best to use our own judgment. In the event the Tentamen is proven unavailable, many of the same names will be valid from dates 1806 et seq. because of the Sammlung exotischer Schmetterlinge. There will be a number of changes if the Tentamen is ultimately rejected, but not as many as our European friends who also reject the generic names of all of the Hübnerian works except the Verzeichniss bekannter Schmettlinge might expect. As practically all of the Tentamen names are quoted in the Verzeichniss in the plural, in a similar way to Linnaeus' use of *Papilio-Papiliones*, *Noctua-Noctuae*, *Bovis-Boves*, etc., a rejection of the Tentamen upon any other grounds than non-publication may only mean a somewhat later date for the same names.

We have postponed a list of the Heterocera mainly because of the Tentamen dispute. We feel that a list of Diurnals is now essential as even the latest revisional papers pay little attenton to the correct usage of the various generic names; quantities of specific

names until now in use are unavailable, being homonyms already sunk by Hübner, Godart, and Latreille; a great quantity of erroneous spellings and authorships can now be corrected; and a considerable number of names, many based upon freaks, have been proposed since the Barnes and McDunnough List, or were omitted therefrom.

We have stricken from the list a quantity of names having no place upon a check list, and these with our reasons will be found at the end of this paper.

In regard to authorship, we follow Article 21 of the Code rather than Opinion 78, which in this matter contradicts the definite article of the Code, and we list as author the first person to publish a name "in connection with" at least an indication of what the name represents. We do not consider that mere authorship alone amounts to a great deal, but upon authorship hinges specific types. In regard to these, Opinion 78 does more to confuse than to clarify the issue, as in its own text it more or less contradicts itself and shows no real agreement upon the part of the commissioners in regard to specimens which constitute the types of manuscript names subsequently published by other than the original author.

We have used a series of markings to indicate certain facts usually omitted from check lists, but which numerous friends assure us are of decided value.

* indicates that the organism does not occur, or is of decidedly doubtful occurrence, within the fauna we are considering.
‡ means an unavailable name, usually a homonym.

In the text we have as far as possible used the subdivisions *a*, *b*, *c*, etc., to denote geographical races which have often been listed, especially in Europe, as *var*. The term *form* we have applied to a variety which exists alongside the nimotypical form or which may be a seasonal one and we have confined the term *ab*. to so-called freak specimens or sports. In many instances, of course, our grouping is more or less tentative.

We follow the Code in bracketing authorship where the specific name has been originally placed under another generic name than the one here used. Personally we feel that there is little to be gained by these brackets. Aside from the genera *Papilio* and *Parnassius* the great bulk of the authorship stands in brackets. For the most part, only the rarest species and the names of some recently described minor forms and freaks escape. Even in such common and economic groups as the Cabbage Butterflies no author of even the most minor form has escaped a bracket. For the most part these brackets simply add two more symbols to be printed in connection with each name. The only real value we can assign to the brackets is a tendency toward uniformity throughout Zoology. We feel that it would be better that the Zoologist dealing with the few higher organisms drop the occasional bracket which they use than that the Entomologist should perpetually be required to bracket the authorship of the great majority of the important names.

We request that workers having knowledge of any name omitted from this List, or any generic changes, will notify us so that the errors may be corrected in a proposed catalogue upon which we are working.

Lastly we wish to acknowledge that our general text follows closely the precedent set by Augustus Radcliffe Grote whose work along similar lines in the Heterocera has been a constant inspiration to us, and has held before our eyes the hope that careful genotype fixations should ultimately result in a nomenclature which will not entirely change with every new paper.

Decatur, Illinois, February, 1926.

LIST OF DIURNAL LEPIDOPTERA

Superfamily **PAPILIONOIDEA**

PAPILIONIDÆ

Papilio L.

Type *Papilio machaon* L.

1 philenor *L.*
astinous Dru.
ab. wasmuthii *Weeks*
ab. obsoleta *Ehr.*
a acauda *Oberth.*
nezahualcoyotl Stkr.
corbis G. & S.
b hirsuta *Skin.*

*2 devilliers (*Godt.*)
villiersii Bdv. & Lec.

3 polydamas *L.*

4 ajax *L.*
‡*polyxenes* Fabr. (nec. Fabr.)
asterius Cram.
viridis Ckll.
semialba Ehr.
form curvifascia *Skin.*
form ampliata *Mén.*
asterioides Reak.
ab. alunata *Skin.* & *Aar.*
ab. ehrmanni *Ehr.*
ab. calverleyi *Grt.*
a americus *Koll.*
b stabilis *R.* & *J.*
c brevicauda *Saund.*
anticostiensis Stkr.

5 bairdii *Edw.*
utahensis Stkr.
form oregonia *Edw.*
form brucei *Edw.*
form hollandii *Edw.*

6 nitra *Edw.*

7 zelicaon *Luc.*
zolicaon Bdv.
californica Mén.
coloro Wright
ab. impunctata *Fischer*
ab. formosa *Fischer*
ab. melanotænia *Fischer*

8 indra *Reak.*
a pergamus *Hy. Edw.*

*9 machaon *L.*
a aliaska *Scud.*
joannisi Verity

*10 thoas *L.*
a autocles *R.* & *J.*
b nealces *R.* & *J.*

11 cresphontes *Cram.*
oxilus (Hbn.)
ab. maxwelli *Franck*

12 ornythion *Bdv.*

*13 aristodemus *Esp.*
cresphontinus Martyn
daphnis Gray
a ponceana *Schs.*

14 glaucus *L.*
form turnus *L.*
‡*ajax* L. (partim.)
‡*antilochus* L. (spec. fict.)
alcidamas Cram.
ab. ♂ fletcheri *Kemp*
a canadensis *R.* & *J.*
arcticus Skin.
b australis *Mayn.*

15 rutulus *Luc.*
ab. hospitonina *LeCerf*
a arizonensis *Edw.*
b ammoni *Behrens*

16 multicaudata *Kirby*
‡*daunus* Bdv. (nec Cram.)

17 eurymedon *Luc.*
lewisii Kirby
form albanus *F.* & *F.*
ab. cocklei *Gunder*

18 pilumnus *Bdv.*

19 troilus *L.*
ab. radiatus *Stkr.*
a ilioneus *A.* & *S.*
texanus Ehr.

20 palamedes *Dru.*
chalcas Fabr.

21 marcellus *Cram.*
‡*ajax* L. (partim.)
walshii Edw.
ab. abbotii *Edw.*
form floridensis *Holl.*
form telamonides *F.* & *F.*
form æst. lecontei *R.* & *J.*

22 celadon *Luc.*

Parnassius Latr.

Type *Papilio apollo* L.

23 eversmanni *Mén.*

wosnesenskii Mén.
a thor *Hy. Edw.*

*24 nomion *Fisch.*
a nominulus *Staud.*

25 clodius *Men.*
castus Bryk
a claudianus *Stich.*
pseudogallatinus Bryk
ab. baldus Ehr.
kallias Ehr.
ab. altaurus *Dyar*
b menetriesii *Hy. Edw.*
ab. immaculata *Skin.*
c baldur *Edw.*
lusca Stich.
ab. lorquini *Oberth.*
ab. binigrimaculella *Gunder*
d gallatinus *Stich.*

26 smintheus *Dbldy. & Hew.*
rocky Stich.
ab. nanus *Neum.*
mendica Stich.
minor Verity
verity Ehr.
ab. mariæ *Bryk*
ab. ninusculus *Bryk*
ab. ocellata *Bryk*
ab. quincunx *Bryk*
form alt. hermodur *Hy. Edw.*
pholus Ehr.
fermata Bryk
melanophorus Bryk
catullius Fruhs.
ab. nigerrima *Verity*
nigricans Bryk (partim.)
a apricatus *Stich.*
b magnus *Wright*
pseudocorybas Verity
minor Stich.
xanthus Ehr.
c sayii *Edw.*
montanus Ehr.
utahensis Roths.
aristion Fruhs.
sordellus Fruhs.
d behrii *Edw.*
astriotes Fruhs.
ab. niger *Wright*

ASCIIDÆ

Neophasia Behr

Type *Pieris menapia* F. & F.

27 menapia (*F. & F.*)
tau (Scud.)
ninonia (Bdv.)
♀ *suffusa* (Stretch)
ab. nigracosta *Comst.*

28 terlootii *Behr*
epyaxa Stkr.
ab. princetonia *Poling*

Appias Hbn.

Type *Papilio zelmira* Cram.

*29 ilaire (*Godt.*)
mysia (Godt.)
margarita (Hbn.)
molpodia (Hbn.)
poeyi Butl.
a neumoegenii (*Skin.*)
hollandi Roeber

Ascia Scop.

Type *Papilio monuste* L.

*30 amaryllis (*Fabr.*)
a josepha (*G. & S.*)

31 monuste (*L.*)
feronia (Steph.)
cleomes (Bdv. & Lec.)
form ♀ phileta (*Fabr.*)

32 beckerii (*Edw.*)

33 sisymbrii (*Bdv.*)
ab. ♀ flava (*Edw.*)
flavitincta (Comst.)

34 occidentalis (*Reak.*)
a calyce (*Edw.*)
b nelsoni (*Edw.*)

35 protodice (*Bdv. & Lec.*)
gen. vern. vernalis (*Edw.*)

36 napi (*L.*)
arctica (Verity)
a pseudobryoniæ (*Verity*)
b hulda (*Edw.*)
c borealis (*Grt.*)
d frigida (*Scud.*)
pseudoleracea (Verity)
gen. æst. acadica (*Edw.*)
e gen. vern. oleracea (*Harr.*)
hyemalis (Edw.)
gen. æst. cruciferarum (*Bdv.*)
casta (Kirby)
æstiva (Edw.)

f gen. vern. venosa (*Scud.*)
nasturtii (Bdv.)
microstriata (Comst.)
ab. ♀ flava (*Edw.*)
gen. æst. castoria (*Reak.*)
iberidis (Bdv.)
ab. resedæ (*Bdv.*)
flava (Edw.)
ab. cottlei (*Gunder*)
h gen. vern. marginalis (*Scud.*)
gen. æst. pallida (*Scud.*)
i pseudonapi (*B. & McD.*)
gen. æst. pallidissima (*B. & McD.*)
k virginiensis (*Edw.*)

37 ochsenheimeri (*Staud.*)

38 rapæ (*L.*)
metra (Steph.)
immaculata (Fologne)
‡*immaculata* (Ckll.) (nec Fologne)
‡*immaculata* (Skin. & Aar.) (nec Fologne, Ckll.)
gen. æst. yreka (*Reak.*)
æstivus (Verity)
ab. ♂ novangliæ (*Scud.*)

Nathalis Bdv.

Type *Nathalis iole* Bdv.

39 iole *Bdv.*
irene Fitch
luteolus Reak.

Euchloë Hbn.

Type *Papilio belia* Esp.

40 creusa (*Dbldy. & Hew.*)
elsa Beut.
pumilio Strd.
a hyantis (*Edw.*)
pseudoausonides Verity
b orientalides *Verity*
c lotta *Beut.*
belioides Verity

41 ausonides (*Bdv.*)
ab. semiflava *Comst.*
ab. flavidalis *Comst.*
a coloradensis (*Hy. Edw.*)
montana Verity

Zegris Rmb.

Type *Papilio eupheme* Esp.

42 olympia (*Edw.*)
a rosa (*Edw.*)

Anthocharis Bdv.

Type *Papilio genutia* Fabr.

43 lanceolata *Bdv.*
edwardsii Behr
a australis (*Grin.*)

44 midea (*Hbn.*)
‡*genutia* (Fabr.) (nec Cram.)
lherminieri (Godt.)
a flavida *Skin.*

45 cethura *F. & F.*
cooperii Behr
angelina Bdv.
a morrisoni *Edw.*
b deserti *Wright*

46 pima *Edw.*
a caliente *Wright*

47 sara *Bdv.*
mollis Wright
gen. vern. reakirtii *Edw.*
ab. wrighti *Comst.*
ab. sternitzkyi *Gunder*
a flora *Wright*
b julia *Edw.*
thoosa (Scud.)
c stella *Edw.*
d browningi *Skin.*

Catopsilia Hbn.

Type *Papilio crocale* Cram.

48 sennæ (*L.*)
form eubule (*L.*)
marcellina (Cram.)
form ♀ yamana (*Reak.*)
form ♀ pallida (*Ckll.*)

49 philea (*Joh.*)
aricye (Cram.)
melanippe (Cram.)

*50 argante (*Fabr.*)
cipris (Cram.)
larra (Fabr.)
cnidia (Godt.)

51 agarithe (*Bdv.*)
a maxima *Neum.*
‡*floridensis* Roeber (nec Neum.)

52 statira (*Cram.*)
a floridensis *Neum.*

53 bracteolata (*Butl.*)
‡*cipris* (Fabr.) (nec Cram.)

Amynthia Swains.

Type *Papilio mærula* Fabr.

54 clorinde (*Godt.*)
godarti (Perty)
swainsonia (Swains.)

Kricogonia Reak.

Type *Colias lyside* Godt.

55 lyside (*Godt.*)
lanice Lint. (♂, partim.)
form ♂ terissa (*Luc.*)
form ♀ unicolor *G. & S.*
xanthophila Roeber
form ♀ fantasia *Butl.*
lanice Lint. (♀, partim.)

Zerene Hbn.

Type *Papilio cæsonia* Stoll

56 eurydice (*Bdv.*)
‡wosnesenskii (Mén.)
♀*lorquini* (Bdv.)
♀*helena* (Reak.)
ab. fanniæ *Gunder*
gen. æst. amorphæ (*Hy. Edw.*)
a bernardino (*Edw.*)
ab. newcombi *Gunder*

57 cæsonia (*Stoll*)
‡*carolíniana* (Petiver) (pre-L.)
gen. auctum. rosa (*M'Neill*)
form rosea (*Roeber*)

Eurymus Swains.

Type *Papilio hyale* D. & S.

58 meadii (*Edw.*)
a elis (*Stkr.*)

59 hecla (*Lef.*)
a glacialis (*McLach.*)
chrysothemoides (Verity)
b hela (*Stkr.*)
c pallida (*Skin.*)

60 boothii (*Curt.*)
form chione (*Curt.*)

61 eurytheme (*Bdv.*)
ariadne (Edw.)
keewaydin (Edw.)
intermedia (Ckll.)
ab. ♀ alba (*Stkr.*)
ab. fumosa (*Stkr.*)
form amphidusa (*Bdv.*)
californiana (Mén.)
ab. flava (*Stkr.*)
unicitrina Gunder
ab. ♀ alba (*Stkr.*)
pallida (Ckll.)
form eriphyle (*Edw.*)
hagenii (Edw.)
gen. vern. autumnalis (*Ckll.*)
gen. vern. kootenai (*Cockle*)

62 philodice (*Godt.*)
‡*europome* (Haw.) (nec Esp.)
ab. nig (*Stkr.*)
nigridice Scud.
melanic (Skin.)
nigrina (Stkr.)
ab. miscidice *Scud.*
nigrofasciata (Reiff)
ab. hybrida (*Stkr.*)
luteitincta (Wolc.)
ab. virida (*Stkr.*)
ab. inversata (*Nakahara*)
ab. rothkei (*Reiff*)
form ♀ plicaduta (*Nakahara*)
form ♀ alba (*Stkr.*)
pallidice Scud.
albinic (Skin.)
ab. suffusa (*Ckll.*)
nigrofasciata (Reiff)
gen. vern. anthyale (*Hbn.*)

63 occidentalis (*Scud.*)
a chrysomelas (*Hy. Edw.*)
b barbara (*Hy. Edw.*)

64 harfordii (*Hy. Edw.*)
ab. weaveræ *Gunder*

65 interior (*Scud.*)
a laurentina *Scud.*

66 christina (*Edw.*)
ab. ♀ pallida (*Ckll.*)
form astræa (*Edw.*)
form gigantea (*Stkr.*)
pelidneides (Staud.)

67 alexandra (*Edw.*)
ab. ♀ alba (*Stkr.*)
pallida (Ckll.)
a edwardsii (*Edw.*)
b emilia (*Edw.*)

68 scudderii (*Reak.*)
ab. flavotincta (*Ckll.*)

69 pelidne (*Bdv. & Lec.*)
a labradorensis (*Scud.*)
ab. ♂ mira (*Verity*)
ab. ♀ moeschleri (*Gr. Grsh.*)
b skinneri (*Barnes*)
c minisni (*Bean*)

70 palæno (*L.*)
philomene (Hbn.)
lapponica (Staud.)
‡*werdandi* (H.-S.) (nec Zett.)
a chippewa (*Kirby*)
‡*helena* (Edw.) (nec H.-S.)

71 nastes (*Bdv.*)
a rossii (*Gn.*)
b streckeri (*Gr.-Grsh.*)
ab. obscurata (*Verity*)
c moina (*Stkr.*)
cocandicides (Verity)

72 behrii (*Edw.*)
♀*canescens* Comst.

Eurema Hbn.

Type *Papilio* ‡*delia* Cram. (*Eurema demoditas* Hbn.)

73 gundlachia (*Poey*)

74 proterpia (*Fabr.*)

75 mexicana (*Bdv.*)
♀*damaris* (F. & F.)
depuiseti (Bdv.)
ab. biedermanni *Ehr.*

76 boisduvaliana (*F. & F.*)
ingrata (R. Feld.)

77 nicippe (*Cram.*)
ab. flava (*Stkr.*)

78 westwoodii (*Bdv.*)
‡*dina* Gey. (nec Poey)

79 lisa (*Bdv. & Lec.*)
euterpe (Mén.)
form clappii (*Mayn.*)
form ♀ alba (*Stkr.*)

80 linda (*Edw.*)

81 demoditas *Hbn.*
‡*delia* (Cram.) (nec *D. & S.*)
daira (Godt.)

82 jucunda (*Bdv. & Lec.*)
ebriola (Poey)
**ab.* ♀ albina (*Poey*)

83 blakei (*Mayn.*)

Dismorphia Hbn.

Type *Papilio laia* Cram.

*84 melite (*Joh.*)

DANAIDÆ

Danaus L.

Type *Papilio plexippus* L.

85 menippe (*Hbn.*)
‡*plexippus* Auct. (L. partim.)
‡*archippus* (Fabr.) (nec Cram.)
?*megalippe* (Hbn.)
pulchra (Stkr.)
ab. fumosus (*Hlst.*)

86 berenice (*Cram.*)
a strigosa (*Bates*)
ab. kerri *Comst.*

Lycorea Dbldy.

Type *Lycorea atergatis* Dbldy. & Hew.

87 cleobæa (*Godt.*)
form atergatis *Dbldy. & Hew.*

Mechanitis Fabr.

Type *Papilio polymnia* L.
‡*Nereis* Hbn.

Type *Papilio polymnia* L.

*88 lycidice *Bates*
**a* isthmia *Bates*
californica Reak.

Dircenna Dbldy.

Type *Dircenna iambe* Dbldy. & Hew.

89 klugii (*Gey.*)

Dynothea Reak.

Type *Papilio lycaste* Fabr.

*90 lycaste (*Fabr.*)
**a* negreta *Reak*

SATYRIDÆ

Enodia Hbn.

Type *Oreas andromacha* Hbn.

91 portlandia (*Fabr.*)
a andromacha (*Hbn.*)

92 creola (*Skin.*)

Neonympha Hbn.

Type *Oreas helicta* Hbn.

93 gemma *Hbn.*
?*cornelius* (Fabr.)

94 henshawi (*Edw.*)

95 areolatus (*A. & S.*)
‡*phocion* (Fabr.) (nec Fabr.)
helicta (Hbn.)
a septentrionalis *Davis*
?*helicta* (Hbn.) (partim.)

Megisto Hbn.

Type *Papilio* ‡*eurytus* Fabr. (=*Papilio cymela* Cram.)

96 mitchellii (*French*)

*97 hermes (*Fabr.*)
canthe (Hbn.)
form sosybius (*Fabr.*)

98 cymela (*Cram.*)
‡*eurytus* (Fabr.) (nec L.)
viola (Mayn.)

99 rubricata (*Edw.*)

Paramecera Butl.

Type *Neonympha xicaque* Reak.

100 xicaque (*Reak.*)
epinephele (F. & F.)

Satyrodes Scud.

Type *Papilio eurydice* Joh.

‡*Argus* Scop.

Type *Papilio eurydice* Joh.

101 eurydice (*Joh.*)
canthus (L.)
canthus (Godt.)
transmontana (Gosse)
boisduvalii (Harr.)
a fumosus *Leuss.*

Coenonympha Hbn.

Type *Papilio geticus* Esp.

102 california *West. & Hew.*
ceres Butl.
form galactinus (*Bdv.*)
ab. pulla *Hy. Edw.*
a eryngii *Hy. Edw.*
gen. vern. siskiyouensis *Comst.*

103 kodiak *Edw.*
a yukonensis *Holl.*

104 inornata *Edw.*

105 ampelos *Edw.*
a elko *Edw.*

106 ochracea *Edw.*
brenda Edw.

*107 pamphilus (*L.*)
pamphiloides Reak.

108 haydenii (*Edw.*)

Neominois Scud.

Type *Satyrus ridingsii* Edw.

109 ridingsii (*Edw.*)
stretchii (Edw.)
a dionysus *Scud.*
ashtaroth (Stkr.)

Cercyonis Scud.

(Speyer ms.)

Type *Papilio alope* Fabr.

110 pegala (*Fabr.*)

111 alope (*Fabr.*)
a maritima (*Edw.*)
b texana (*Edw.*)
c nephele (*Kirby*)
d olympus (*Edw.*)
ino Hall
e boopis (*Behr*)
ariane (Bdv.) (partim.)
form baroni (*Edw.*)
form incana (*Edw.*)

112 ariane (*Bdv.*) (partim.)
gabbii (Edw.)
form ♀ stephensi (*Wright*)
a wheeleri (*Edw.*)
hoffmani (Stkr.)

113 meadii (*Edw.*)

114 behrii (*Grinnell*)

115 sthenele (*Bdv.*)

116 silvestris (*Edw.*)
okius (Oberth.)
a paulus (*Edw.*)

117 oetus (*Bdv.*)
charon (Edw.)
a phocus (*Edw.*)

Oeneis Hbn.

Type *Papilio norna* Thun.

118 macounii (*Edw.*)

119 nevadensis (*F. & F.*)
gigas Butl.
californica (Bdv.)
form iduna (*Edw.*)

120 chryxus (*Dbldy. & Hew.*)
a calais (*Scud.*)
b ivallda (*Mead*)

121 jutta (*Hbn.*)
balder (Guér.)
a alaskensis *Holl.*

122 uhleri (*Reak.*)
a varuna (*Edw.*)

123 nahanni *Dyar*

124 daura (*Stkr.*)
a alberta *E. & E.*
b oslari (*Skin.*)

125 norna (*Thun.*)
a caryi *Dyar*

126 cairnesi *Gibson*

127 taygete *Gey.*
bootes (Bdv.)

128 peartiæ (*Edw.*)

129 polixenes (*Fabr.*)
crambis (Frey.)
a subhyalina (*Curt.*)
b assimilis *Butl.*
c katahdin (*Newc.*)

130 melissa (*Fabr.*)
a ?oeno (*Bdv.*)
b semidea (*Say*)
eritiosa (Bdv.)
form nigra (*Edw.*)
c arctica *Gibson*

131 brucei (*Edw.*)
a yukonensis *Gibson*

132 simulans *Gibson*

133 beanii *E. & E.*

134 lucilla *B. & McD.*

Erebia Dalm.

Type *Papilio ligea* L.

135 discoidalis (*Kirby*)

136 fasciata *Butl.*

137 rossii (*Curt.*)

138 disa (*Thun.*)
a macinus *Dbldy. & Hew.*

139 vidleri *Elwes*

140 epipsodea *Butl.*
rhodia Edw.
a brucei *Elwes*
sineocellata Skin.
141 youngi *Holl.*
142 magdalena *Stkr.*
*143 tyndarus (*Esp.*)
a callias *Edw.*

144 sofia *Stkr.*
ethela Edw.
a alaskensis *Holl.*

Gyrocheilus Butl.
Type *Pronophila patrobas* Hew.
*145 patrobas (*Hew.*)
a tritonia *Edw.*

NYMPHALIDÆ

EUIDINÆ

Migonitis Hbn.
Type *Papilio erato* L.
146 charithonia (*L.*)

Colænis Hbn.
Type *Papilio julia* Fabr.
*147 julia (*Fabr.*)
alcionea (Cram.)
a delila (*Fabr.*)

Dione Hbn.
Type *Papilio juno* Cram.
*148 vanillæ (*L.*)
passifloræ (Fabr.)
a insularis (*Mayn.*)
ab. comstocki *Gunder*

NYMPHALINÆ

Euptoieta Dbldy.
Type *Papilio claudia* Cram.
149 claudia (*Cram.*)
daunius (Hbst.)
150 hegesia (*Cram.*)

Dryas Hbn.
Type *Papilio paphia* L.
151 idalia (*Dru.*)
ab. ashtaroth (*Fish.*)
‡*astarte* (Fish.) (nec Dbldy.)
infumata (Oberth.)
152 diana (*Cram.*)
153 nokomis (*Edw.*)
nitocris (Edw.)
nigrocærulea (W. P. & T. D. A. Ckll.)
a cærulescens (*Holl.*)
154 apacheana (*Skin.*)
ab. hermosa (*Comst.*)
155 leto (*Behr*)
ab. letis (*Wright*)
a charlottii (*Barnes*)
156 cybele (*Fabr.*)
daphnis (Cram.)
ab. baal (*Stkr.*)
ab. bartschi (*Reiff*)
a carpenterii (*Edw.*)
157 aphrodite (*Fabr.*)
‡*daphnis* (Martyn) (nec Cram.)
a alcestis (*Edw.*)
ab. suffusa (*Wolc.*)
b cypris (*Edw.*)
c columbia (*Hy. Edw.*)
158 lais (*Edw.*)
159 nausicaa (*Edw.*)
arizonensis (Elwes)
160 atlantis (*Edw.*)
ab. chemo (*Scud.*)
a nikias (*Ehr.*)
161 hesperis (*Edw.*)
162 electa (*Edw.*)
cornelia (Edw.)
163 chitone (*Edw.*)
164 bremnerii (*Edw.*)
a hippolyta (*Edw.*)
165 behrensii (*Edw.*)
166 zerene (*Bdv.*)
form conchyliatus (*Comst.*)
a monticola (*Behr*)
167 hydaspe (*Bdv.*)
ab. caliginosa (Comst.)
a purpurascens (*Hy. Edw.*)
ab. shastaensis (*Comst.*)
b rhodope (*Edw.*)
ab. sordida (*Wright*)
c sakuntala (*Skin.*)
168 cottlei (*Comst.*) (ab. ?)
169 irene (*Bdv.*)
viridicornis (*Comst.*)
170 nevadensis (*Edw.*)
a calgariana (*McD.*)
b semivirida (*McD.*)
c meadii (*Edw.*)
171 edwardsii (*Reak.*)
172 platina (*Skin.*)
173 halcyone (*Edw.*)
a picta (*McD.*)
174 snyderi (*Skin.*)
a californica (*Skin.*)
b gunderi (*Comst.*) (syn. præc. ?)
175 adiaste (*Behr*)
adiante (Bdv.)
a clemencei (*Comst.*) (syn. præc. ?)
b atossa (*Edw.*)
form tejonica (*Comst.*)
c semiramis (*Edw.*)
176 callippe (*Bdv.*)
comstocki (Gunder)

177 coronis (*Behr*)
liliana (Hy. Edw.)
ab. baroni (*Edw.*)
178 rupestris (*Behr*)
179 juba (*Bdv.*)
laura (Edw.)
a inornata (*Edw.*)
180 macaria (*Edw.*)
a laurina (*Wright*)
181 utahensis (*Skin.*)
182 montivaga (*Behr*)
egleis (Bdv.)
ab. mammothi (*Gunder*)
a malcombi (*Comst.*)
b tehachapina (*Comst.*)
c oweni (*Edw.*)
183 mormonia (*Bdv.*)
arge (Stkr.)
a erinna (*Edw.*)
ab. cunninghami (*Owen*)
184 bischoffii (*Edw.*)
a opis (*Edw.*)
b washingtonia (*B. & McD.*)
185 eurynome (*Edw.*)
a clio (*Edw.*)
artonis (Edw.)
‡*eris* (Igel) (nec Meigen)
b luski (*B. & McD.*)

Brenthis Hbn.

Type *Papilio hecate* D. & S.

186 myrina (*Cram.*)
myrissa (Godt.)
ab. nubes *Scud.*
ab. serratimarginata *Gunder*
a tollandensis *B. & Benj.*
*187 euphrosyne (*L.*)
a andersoni *Dyar*
?*morrisii* Reak.
*188 aphirape (*Hbn.*)
eunomia (Esp.)
tomyris (Hbst.)
a triclaris (*Hbn.*)
lais (Scud.)
b alticola *B. & McD.*
c dawsoni *B. & McD.*
189 kriemhild (*Stkr.*)
laurenti (Skin.)
190 helena (*Edw.*)
a ingens *B. & McD.*
191 montinus (*Scud.*)
192 chariclea (*Schneid.*)
**a* boisduvalii (*Dup.*)
oenone (Scud.) (ssp. dist.?)
b rainieri *B. & McD.*
c grandis *B. & McD.*
d arctica (*Zett.*)
e obscurata (*McLach.*)
gronlandica (Skin.)
f butleri (*Edw.*)
*193 pales (*D. & S.*)
a alaskensis *Holl.*
*194 freija (*Thun.*)
lapponica (Esp.)
freya (Godt.)
a tarquinius (*Curt.*)
195 natazhati *Gibson*
196 polaris (*Bdv.*)
a americana (*Strd.*)
*197 frigga (*Thun.*)
a saga (*Staud.*)
b sagata *B. & Benj.*
c improba (*Butl.*)
youngi Holl.
d alaskensis (*Lehm.*)
198 bellona (*Fabr.*)
‡*myrina* (Martyn) (nec Cram.)
ab. fasciata (*Ckll.*)
ab. kleenei *Watson*
199 epithore (*Edw.*)
ab. eldorado *Strd.*
ab. wawonæ *Gunder*
ab. obscuripennis *Gunder*
200 alberta (*Edw.*)
201 distincta *Gibson*
202 astarte (*Dbldy. & Hew.*)
victoria (Edw.)

Euphydryas Scud.

Type *Papilio phaëton* Dru.

203 phaëton (*Dru.*)
phaëtæna (Hbn.)
phaetontea (Godt.)
phædon (H.-S.)
ab. superba (*Stkr.*)
ab. phaethusa (*Hlst.*)
ab. streckeri (*Ellsw.*)
204 chalcedona (*Dbldy. & Hew.*)
ab. fusimacula (*Barnes*)
grundeli (Cool.)
ab. lorquini (*Oberth.*)
ab. suprafusa *Comst.*
ab. supranigrella *Comst.*
ab. fusisecunda *Comst.*
ab. hemimelanica *Comst.*
ab. mariana (*Barnes*)
ab. omniluteofuscus *Gunder*
ab. hemiluteofuscus *Gunder*
a dwinellei (*Hy. Edw.*)
macglashanii (Rivers)
b olancha (*Wright*)
205 colon (*Edw.*)
ab. huellemanni *Comst.*
ab. nigrisupernipennis *Gunder*
206 cooperi (*Behr*)
207 perdiceas (*Edw.*)
208 baroni (*Edw.*)
edithana (Strd.)
ab. mirabilis (*Wright*)
209 quino (*Behr*)
augusta (Edw.)
ab. augustina (*Wright*)

210 rubicunda (*Hy. Edw.*)
ab. rubrosuffusa *Comst*
ab. foxi *Gunder*
ab. albiradiata *Gunder*
211 nubigena (*Behr*)
a colonia (*Wright*)
b beani (*Skin.*)
ab. blackmorei (*Gunder*)
212 editha (*Bdv.*)
ab. fieldi *Gunder*
213 taylori (*Edw.*)
ab. victoriæ *Gunder*
214 helvia (*Scud.*)
215 sierra (*Wright*)
ab. magdelenæ *Gunder*
ab. umbrobasana *Gunder*
216 wheeleri (*Hy. Edw.*)
217 hermosa (*Wright*)
218 bernadetta *Leuss.*
219 maria (*Skin.*)
220 magdalena (*B. & McD.*)
221 anicia (*Dbldy. & Hew.*)
eurytion (Mead)
brucei (Edw.)
ab. melanodisca (*Comst.*)
a capella (*Barnes*)
ab. rubrolimbata (*Comst.*)
ab. oslari *Gunder*
222 gillettii (*Barnes*)
glacialis (Skin.)

Lemonias Hbn.

Type *Papilio maturna* L.
223 sterope (*Edw.*)
224 neumoegeni (*Skin.*)
225 gabbii (*Behr*)
sonoræ (Bdv.)
ab. newcombi (*Comst.*)
ab. gunderi (*Comst.*)
ab. pasadenæ (*Gunder*)
a sabina (*Wright*)
226 malcolmi (*Comst.*)
227 acastus (*Edw.*)
ab. pearlæ (*Gunder*)
228 flavula (*B. & McD.*)
229 demœtas (*Skin.*)
230 palla (*Bdv.*)
calydon (Mead)
ab. wardi (*Oberth.*)
ab. blackmorei *Gunder*
form ♀ eremita (*Wright*)
ab. stygiana (*Comst.*)
a whitneyi (*Behr*)
230-1 hoffmanni (*Behr*)
helcita (Bdv.)
ab. abnorma (*Wright*)
a segregata (*B. & McD.*)
bridgei (Comst.)
231 harrisii (*Scud.*)
232 callina (*Bdv.*)
ulrica (Edw.)
imitata (Stkr.)
233 perse (*Edw.*)
234 dymas (*Edw.*)
larunda (Stkr.)
♂ *senrabii* (Barnes)
235 chara (*Edw.*)
ab. jacintoi (*Gunder*)
ab. nitela (*Comst.*)
236 leanira (*F. & F.*)
form leona (*Wright*)
form obsoleta (*Hy. Edw.*)
‡*obliterata* (Stkr.) (lapsus calami)
237 wrightii (*Edw.*)
ab. carolynæ (*Gunder*)
238 cyneas (*G. & S.*)
239 alma (*Stkr.*)
cerrita (Wright)
240 fulvia (*Edw.*)
ab. sinefascia (*Wms.*)
241 theona (*Mén.*)
a thekla (*Edw.*)
b bollii (*Edw.*)
242 definita (*Aaron*)
schausi (G. & S.)
ab. albiplaga (*Aaron*)
243 pola (*Bdv.*)
a arachne (*Edw.*)
ab. polingi (*Gunder*)
b monache (*Comst.*)
244 minuta (*Edw.*)
approximata (Stkr.)
a nympha (*Edw.*)

Phyciodes Hbn.

Type *Papilio cocyta* Cram.
245 ismeria (*Bdv. & Lec.*)
‡*gorgone* (Hbn.) (partim; ♂)
carlota (Reak.)
ab. nigra *Cary*
246 nycteis (*Dbldy. & Hew.*)
oenone (Scud.)
a drusius *Edw.*
247 hanhami *Fletch.*
248 vesta *Edw.*
hiemalis Edw.
form æstiva *Edw.*
249 gorgone (*Hbn.*) (partim.;♀)
phaon (Edw.)
æstiva Edw.
form hiemalis *Edw.*
250 thebais *G. & S.*
arida (Skin.)
251 tharos (*Dru.*)
morpheus (Fabr.)
tharossa (Godt.)
cocyta (Cram.)
selenis (Kirby)
pulchella (Bdv.)
ab. packardii (*Saund.*)
ab. reaghi *Reiff*
form vern. marcia (*Edw.*)
a pascoensis *Wright*
ab. nigrescens *Hall*

form ♀ herse *Hall*
252 batesii (*Reak.*)
253 campestris (*Behr*)
♂ *pratensis* (Behr)
254 camillus *Edw.*
emissa Edw.
ab. tristis *Ckll.*
ab. rohweri *Ckll.*
255 montana (*Behr*)
orsa (Bdv.)
256 orseis *Edw.*
257 picta *Edw.*
canace Edw.
ab. jemezensis *Brehme*
258 mylitta (*Edw.*)
collina (Behr)
epula (Bdv.)
a pallida (*Edw.*)
ab. mata (*Reak.*)
b barnesi *Skin.*

Anthanassa Scud.
Type *Eresia cincta* Edw.
259 frisia (*Poey*)
gyges (Hew.)
260 texana (*Edw.*)
smerdis (Hew.)
a seminole (*Skin.*)
261 tulcis (*Bates*)
genigueh (Reak.)
archesilea (R. Feld.)
punctata (Edw.)
*262 cincta (*Edw.*)

Chlosyne Butl.
Type *Papilio janais* Dru.
263 erodyle (*Bates*)
264 janais (*Dru.*)
*265 lacinia (*Gey.*)
a adjutrix *Scud.*
nigra (Ckll.) (partim.)
bicolor (Ckll.) (partim.)
rufa (Ckll.) (partim.)
b rufescens (*Edw.*)
c crocale (*Edw.*)
nigra (Ckll.) (partim.)
bicolor (Ckll.) (partim.)
rufa (Ckll.) (partim.)
d nigrescens (*Ckll.*)
266 californica (*Wright*)
ab. chinoi *Gunder*
267 endeis (*G. & S.*)

Microtia Bates
Type *Microtia elva* Bates
268 elva *Bates*

Mestra Hbn.
Type *Mestra hypermnestra* Hbn.
269 amymone (*Mén.*)
270 cana (*Erichs.*)
floridana (Stkr.)

Hypolimnas Hbn.
Type *Papilio pipleis* L.
271 misippus (*L.*)

Polygonia Hbn.
Type *Papilio c-aureum* L.
272 interrogationis (*Fabr.*)
umbrosa (Lint.)
crameri (Scud.)
form fabricii (*Edw.*)
273 comma (*Harris*)
harrisii (Edw.)
form dryas (*Edw.*)
274 satyrus (*Edw.*)
form chrysoptera (*Wright*)
a marsyas (*Edw.*)
275 faunus (*Edw.*)
virescens Scud.
a rusticus (*Edw.*)
♀*silvius* (Edw.)
276 hylas (*Edw.*)
277 zephyrus (*Edw.*)
thiodamas Scud.
278 silvius (*Edw.*)
279 gracilis (*G. & R.*)
280 oreas (*Edw.*)
a silenus (*Edw.*)
281 progne (*Cram.*)
c-argenteum (Kirby)
ab. martineæ *Coleman*
form l-argenteum *Scud.*

Hamadryas Hbn.
Type *Papilio io* L.
282 j-album (*Bdv. & Lec.*)
ab. aureomarginata (*Ckll.*)
a watsoni (*Hall*)
283 californica (*Bdv.*)
284 milberti (*Godt.*)
furcillata (Say)
form subpallida (*Ckll.*)
285 antiopa (*L.*)
pompadour (Poll.)
ab. grandis (*Ehr.*)
ab. obscura (*Ckll.*)
ab. hippolyta (*Lym.*)
ab. hygiæa (*Heydenr.*)
lintnerii (Fitch)
a hyperborea (*Seitz*)

Cynthia Fabr.
Type *Papilio cardui* L.
286 atalanta (*L.*)
admiralis (Retz)
ab. edwardsi (*Grin.*)
287 virginiensis (*Dru.*)
‡*belledonna* (Petiver) (pre-L.)
huntera (Fabr.)
iole (Cram.)
hunteri (Hbn.)
ab. fulvia (*Dodge*)
ab. ahwashtee (*Fox*)
ab. massachusettensis (*Gunder*)

288 cardui (*L.*)
‡*belledonna* (Petiver) (pre-L.)
carduelis (Seba)
ab. minor (*Ckll.*)
ab. elymi (*Ramb.*)
ab. ate (*Stkr.*)
289 carye (*Hbn.*)
charie (Blanch.)
ab. intermedia (*Grin.*)
ab. muelleri (*Letch.*)
ab. letcheri (*Grin.*)

Junonia Hbn.
Type *Papilio lavinia* Cram.
290 cœna *Hbn.*
ab. schraderi *Gunder*
ab. weidenhammeri *Polacek*
a nigrosuffusa *B. & McD.*
291 genoveva (*Cram.*)

Anartia Hbn.
Type *Papilio jatrophæ* Joh.
292 jatrophæ (*Joh.*)
a saturata *Staud.*
jamaicensis Moesch.
293 fatima (*Fabr.*)

Victorina Blanch.
Type *Papilio stelenes* L.
294 stelenes (*L.*)
sthenele (Hbn.)
a biplagiata *Fruhst.*
form pallida *Fruhst.*

Hypanartia Hbn.
Type *Hypanartia tecmesia* Hbn.
295 lethe (*Fabr.*)
demonica Hbn.

Eunica Hbn.
Type *Papilio monima* Cram.
296 monima (*Cram.*)
myrto (Godt.)
modesta Bates
297 tatila *H.-S.*
cærula G. & S.

Myscelia Dbldy.
Type *Papilio orsis* Dru.
298 ethusa (*Bdv.*)
cyanecula F. & F.
299 skinneri *Mengel*

Dynamine Hbn.
Type *Papilio mylitta* Cram.
300 dyonis *Gey.*

Diæthria Billb.
Type *Papilio clymena* (Cram.)
301 clymena (*Cram.*)

Ageronia Hbn.
Type *Papilio chloë* Stoll.
302 fornax *Hbn.*
303 feronia (*L.*)

Timetes Bdv.
Type *Timetes merops* Bdv.
304 coresia (*Godt.*)
zerynthia (Hbn.)
sylla (Perty)
305 chiron (Fabr.)
marius (Cram.)
chironias (Hbn.)

Athena Hbn.
Type *Papilio* ‡*thetys* Fabr. (=*Papilio petreus Cram.*)
306 petreus (*Cram.*)
‡*peleus* (Sulz) (nec L.)
‡*thetys* (Fabr.) (nec Rott.)
*307 pellenis (*Godt.*)

Basilarchia Scud.
Type *Callianira ephestiæna* Hbn.
‡*Callianira* Hbn.
Type *Callianira ephestiæna* Hbn.
308 arthemis (*Dru.*)
lamina (Fabr.)
ab. rufescens (*Ckll.*)
ab. arthechippus *Scud.*
a rubrofasciata *B. & McD.*
b proserpina (*Edw.*)
c astyanax (*Fabr.*)
ephestion (Stoll)
ursula (Fabr.)
ephestiæna (Hbn.)
ab. cerulea (*Ehr.*)
ab. rubidus (*Stkr.*)
form viridis (*Stkr.*)
form atlantis *Nakahara*
form inornata *Nakahara*
form albofasciata (*Newc.*)
ab. benjamini *Nakahara*
d. arizonensis (*Edw.*)
309 weidemeyrii (*Edw.*)
a nevadæ *B. & Benj.*
b sinefascia (*Edw.*)
form norm. angustifascia *B. & McD.*
310 lorquini (*Bdv.*)
ab. eavesii (*Hy. Edw.*)
ab. comstocki *Gunder*
a burrisonii (*Mayn.*)
311 archippus (*Cram.*)
disippe (Godt.)
ab. pseudodorippus (*Stkr.*)
ab. lanthanis *Cook & Wats.*
ab. advena (*Ellsw.*)
cayuga Nakahara

a floridensis (*Stkr.*)
eros (Edw.)
ab. halli *Wats. & Comst.*
form nig (*Stkr.*)
nigricans (Stkr.)
312 obsoleta (*Edw.*)
hulstii (Edw.)

Heterochroa Bdv.
Type *Heterochroa serpa* Bdv.
313 bredowii (*Gey.*)
eulalia (Dbldy. & Hew.)
a californica *Butl.*

Celtiphaga B. & L.
Type *Apatura celtis* Bdv. & Lec.
314 celtis (*Bdv. & Lec.*)
alb (Stkr.) (partim.)
ab. alb (*Stkr.*) (partim.)
ab. inornata (*Wolc.*)
a alicia (*Edw.*)
b antonia (*Edw.*)
c montis (*Edw.*)
315 leilia (*Edw.*)
cocles (Lint.)
316 clyton (*Bdv. & Lec.*)
ocellata (Edw.)
ab. nig (*Stkr.*)
form proserpina (*Scud.*)
a flora (*Edw.*)
b texana (*Skin.*)
c subpallida (*B. & McD.*)

Smyrna Hbn.
Type *Smyrna blomfildii* Hbn.
*317 karwinskii *Gey.*

Historis Hbn.
Type *Papilio odius* Fabr.
*318 odius (*Fabr.*)
orion (Fabr.)
danæ (Cram.)
*319 acheronta (*Fabr.*)
cadmus (Cram.)
pherecydes (Cram.)

Anæa Hbn.
Type Papilio troglodyta Fabr.
320 andria *Scud.*
ops (Druce)
321 portia (*Fabr.*)
322 aidea (*Guér.*)
morrisoni (Holl.)

LIBYTHEIDÆ

Libythea Fabr.
Type *Papilio celtis* Fuess.
323 bachmanii *Kirt.*
motya Bdv. & Lec. (partim.)
form larvata *Stkr.*

RIODINIDÆ

Apodemia F. & F.
Type *Lemonias mormo* F. & F.
324 mormo (*F. & F.*)
dumeti (Behr)
mormonia (Bdv.)
a virgulti (*Behr.*)
sonorensis F. & F.
cythera (Edw.)
b mejicanus (*Behr*)
duryi (Edw.)
c deserti *B. & McD.*
325 palmerii (*Edw.*)
form marginalis (*Skin.*)
a hepburni *G. & S.*
326 multiplaga *Schs.*
327 nais (*Edw.*)
328 phyciodoides *B. & Benj.*

Emesis Fabr.
Type *Hesperia ovidius* Fabr.
*329 zela *Butl.*
a ares (*Edw.*)
form cleis (*Edw.*)

Lasaia Bates
Type *Papilio meris* Cram.
330 narses *Staud.*

Caria Hbn.
Type *Caria colubris* Hbn.
*331 domitianus (*Fabr.*)
a ino *G. & S.*
melicerta Schs.

Lephelisca B. & L.
Type *Erycina virginiensis* Guér.
332 virginiensis (*Guér.*)
pumila (Bdv. & Lec.)
333 borealis (*G. & R.*)
334 nemesis (*Edw.*)
australis (Edw.)
guadeloupe (Stkr.)
335 perditalis (*B. & McD.*)

THECLINÆ

Eumæus Hbn.
Type *Rusticus minyas* Hbn.
336 atala (*Poey*)
337 minyas (*Hbn.*)
toxea (Godt.)

Habrodais Scud.
Type *Thecla grunus* Bdv.
338 grunus (*Bdv.*)

Atlides Hbn.
Type *Papilio halesus* Cram.
339 halesus (*Cram.*)
dolichos Hbn.
juanita (Scud.)

Hypaurotis Scud.
Type *Thecla chrysalus* Edw.
340 chrysalus (*Edw.*)
a citima (*Edw.*)

Strymon Hbn.
Type *Chrysophanus mopsus* Hbn.
*341 hugon (*Godt.*)
hugo (Dbldy. & Hew.)
342 jada (*Hew.*)
343 telea (*Hew.*)
344 critola (*Hew.*)
345 martialis (*H.-S.*)
346 acis (*Dru.*)
mars (Fabr.)
347 simæthis (*Dru.*)
sarita (Skin.)
‡*lycus* (Skin.) (lapsus calami)
348 pastor *Butl. & Druce*
349 cecrops (*Fabr.*)
poeas (Hbn.)
350 columella (*Fabr.*)
eurytulus (Hbn.)
istapa (Reak.)
salona (Hew.)
modesta (Mayn.)
ocellifera (Grt.)
351 laceyi (*B. & McD.*)
352 clytie (*Edw.*)
mævia (G. & S.)
353 azia (*Hew.*)
354 leda (*Edw.*)
a ines (*Edw.*)
355 avalona (*Wright*)
356 m-album (*Bdv. & Lec.*)
psyche (Bdv. & Lec.)
357 melinus *Hbn.*
hyperici (Bdv. & Lec.)
humuli (Harr.)
a pudica (*Hy. Edw.*)
b atrofasciata *McD.*
358 favonius (*A. & S.*)
359 autolycus (*Edw.*)
a ilavia (*Beut.*)
mirabelle (Barnes)
360 ontario (*Edw.*)
361 alcestis (*Edw.*)
362 oslari (*Dyar*)
363 titus (*Fabr.*)
mopsus (Hbn.)
a immaculosus *Comst.*
364 acadica (*Edw.*)
souhegon (Whit.)
ab. muskoka *Wats. & Comst.*
ab. swetti *Wats. & Comst.*
a coolinensis *Wats. & Comst.*
b montanensis *Wats. & Comst.*
365 californica (*Edw.*)
borus (Bdv.)
cygnus (Edw.)
366 dryope (*Edw.*)
367 sylvinus (*Bdv.*)
a itys (*Edw.*)
b putnami (*Hy. Edw.*)
c desertorum *Grin.*
368 edwardsii (*Saund.*)
‡*fabricii* (Kirby) (lapsus calami)
369 wittfeldii (*Edw.*)
370 calanus (*Hbn.*)
falacer (Godt.)
lorata (G. & R.)
inorata (G. & R.)
371 heathii (*Fletch.*)
372 liparops (*Bdv. & Lec.*)
a strigosa (*Harr.*)
373 auretorum (*Bdv.*)
tetra (Edw.)
tacita (Hy. Edw.)
a spadix (*Hy. Edw.*)
374 adenostomatis (*Hy. Edw.*)
375 sæpium (*Bdv.*)
form fulvescens (*Hy. Edw.*)
form chlorophora *Wats. & Comst.*
form provo *Wats. & Comst.*
376 chalcis (*Edw.*)

Mitoura Scud.
Type *Thecla smilacis* Bdv. & Lec.
377 spinetorum (*Hew.*)
ninus (Edw.)
cuyamaca Wright
378 johnsoni (*Skin*)
379 nelsoni (*Bdv.*)
ab. exoleta (*Hy. Edw.*)
a muiri (*Hy. Edw.*)
380 siva (*Edw.*)
rhodope (G. & S.)
a juniperaria *Comst.*
381 xami (*Reak.*)
blenina (Hew.)

382 gryneus (*Hbn.*)
‡*damon* (Cram.) (nec D. & S.)
damastus (Godt.)
auburniana (Harr.) (partim.)
form smilacis (*Bdv. & Lec.*)
auburniana (Harr.) (partim.)
patersonia (Brehme)
a castalis (*Edw.*)
discoidalis (Skin.)
form brehmei *B. & Benj.*
383 loki (*Skin.*)

Incisalia Scud.

Type *Licus niphon* Hbn.

384 augustinus (*West.*)
‡*augustus* (Kirby) (nec Fabr.)
crasioides Scud.
385 iroides (*Bdv.*)
ab. immaculata (*Cockle*)
386 irus (*Godt.*)
arsace (Bdv. & Lec.)
ab. balteata *Scud.*
387 hadros *Cook & Wats.*
388 henrici (*G. & R.*)
a solatus *Cook & Wats.*
389 mossii (*Hy. Edw.*)
390 polios *Cook & Wats.*
ab. davisi *Wats. & Comst.*
391 fotis (*Stkr.*)
392 eryphon (*Bdv.*)
393 niphon (*Hbn.*)

Callophrys Billb.

Type *Papilio rubi* L.

394 dumetorum (*Bdv.*)
viridis (Edw.)
a perplexa *B. & Benj.*
395 affinis (*Edw.*)
396 sheridani (*Edw.*)
a neoperplexa *B. & Benj.*
397 apama (*Edw.*)
a homoperplexa *B. & Benj.*

Erora Scud.

Type *Thecla læta* Edw.

398 læta (*Edw.*)
♀*clothilde* (Edw.)

Callipsyche Scud.

Type *Thecla behrii* Edw.

399 behrii (*Edw.*)
kali (Stkr.)
ab. nigroinita *Gunder*

Satyrium Scud.

Type *Lycaena fuliginosa* Edw.

400 fuliginosa (*Edw.*)
suasa (Bdv.)

Feniseca Grt.

Type *Hesperia tarquinius* Fabr.

401 tarquinius (*Fabr.*)
cratægi (Bdv. & Lec.)
porsenna (Scud.)
ab. suffusa *Dean*

LYCÆNINÆ

Tharsalea Scud.

Type *Polyommatus arota* Bdv.

402 arota (*Bdv.*)
a nubila *Comst.*
403 virginiensis (*Edw.*)
404 hermes (*Edw.*)
del-sud (Wright)

Lycæna Fabr.

Type *Papilio phlæas* L.

405 gorgon (*Bdv.*)
406 dione (*Scud.*)
407 xanthoides (*Bdv.*)
form luctuosa (*Wats. & Comst.*)
408 editha (*Mead*)
409 thoé (*Guér.*)
410 mariposa (*Reak.*)
zeroe (Bdv.)
411 nivalis (*Bdv.*)
ianthe (Edw.)
412 helloides (*Bdv.*)
castro (Reak)
a florus (*Edw.*)
413 dorcas *Kirby*
414 epixanthe (*Bdv. & Lec.*)
a phædrus (*Hall*)
415 hypophlæas (*Bdv.*)
americana Harr.
ab. octomaculata (*Dean*)
ab. banksi (*Wats. & Comst.*)
ab. fulliolus (*Hlst.*)
ab. fasciata *Stkr.*
ab. obliterata (*Scud.*)
cæca (Reiff)
‡*obsoleta* (B. & McD.) (lapsus calami)
a arethusa (*Dod*)
b feildeni (*McLach.*)
416 cupreus (*Edw.*)
ab. maculinita (*Gunder*)
417 snowi (*Edw.*)

418 rubidus (*Behr*)
a sirius (*Edw.*)
419 heteronea *Bdv.*
ab. coloradensis (*Gunder*)
a clara *Hy. Edw.*

PLEBEJINÆ

Leptotes Scud.

Type *Lycæna theonus* Luc.

*420 theonus (*Luc.*)
a floridensis (*Morr.*)
striata (Edw.)
421 marina (*Reak.*)
ab. violacea *Gunder*

Brephidium Scud.

Type *Lycæna exilis* Bdv.

422 exilis (*Bdv.*)
fea (Edw.)
ab. coolidgei *Gunder*
423 isophthalma (*H.-S.*)
pseudofea (Morr.)

Hemiargus Hbn.

Type *Hemiargus antibubastus* Hbn.

424 catilina (*Fabr.*)
425 hanno (*Stoll*)
antibubastus Hbn.
‡*bubastus* Hbn. (nec Cram.)
filenus (Poey)
psuedoptiletes (Bdv. & Lec.)
philenus (Poey)
astenidas (Luc.)
(♂; partim.)
astenidia Beth.-Baker
426 gyas (*Edw.*)
astragala (Wright)
florencia (Clemence)
a zachæina (*Butl. & Druce*)
(♂; partim.)
427 cyna (*Edw.*)
mela (Stkr.)
428 isola (*Reak.*)
zachæina (Butl. & Druce)
(♀; partim.)
alce (Edw.)

Everes Hbn.

Type *Papilio* ‡*amyntas* D. & S.
(=*Papilio argiades* Pall.)

429 comyntas (*Godt.*)
sissona (Wright)
ab. watermani *Nakahara*
a herrii (*Grin.*)
430 amyntula (*Bdv.*)

Plebeius L.

Type *Papilio argus* L.

431 scudderii (*Edw.*)
a aster (*Edw.*)
b kodiak (*Edw.*)
c annetta (*Edw.*)
432 melissa (*Edw.*)
a lotis (*Lint.*)
433 anna (*Edw.*)
cajona (Reak.)
argyrotoxus (Behr)
philemon (Bdv.)
434 aquilo (*Bdv.*)
franklinii (Curt.)
a rustica (*Edw.*)
b podarce (*F. & F.*)
tehama (Reak.)
cilla (Behr)
nestos (Bdv.)
435 sæpiolus (*Bdv.*)
form rufescens (*Bdv.*)
form alt. æhaja (*Behr*)
a insulanus *Blackmore*
b hilda (*Grin.*)
436 amica (*Edw.*)
*437 optilete (*Knoch*)
a yukona (*Holl.*)
438 icarioides (*Bdv.*)
phileros (Bdv.)
fulla (Edw.)
?*mintha* (Edw.)
ab. dædalus (*Behr*)
ab. spinimaculata *Gunder*
a helios (*Edw.*)
b evius (*Bdv.*)
c ardea (*Edw.*)
d lycea (*Edw.*)
rapahoe (Reak.)
e pembina (*Edw.*)
f blackmorei *B. & McD.*
g montis *Blackmore*
439 maricopa (*Reak.*)
pardalis (Behr)
erymus (Bdv.)
440 pheres (*Bdv.*)
ab. orcus (*Edw.*)
441 shasta (*Edw.*)
zelmira (F. & F.)
calcas (Behr)
nivium (Bdv.)
a comstocki *Fox*
b minnehaha (*Scud.*)
442 acmon (*West. & Hew.*)
antægon (Bdv.)
a cottlei (*Grin.*)
ab. labecula *Wats. & Comst.*
443 lupini (*Bdv.*)

444 monticola (*Clemence*)
ab. malcolmi *Gunder*
ab. pallida *Gunder*

445 chlorina (*Skin.*)
form ♀ carolyna *Comst.*

446 emigdionis (*Grin.*)
melimona (Wright)

447 neurona (*Skin.*)

Philotes Scud.

Type *Lycæna regia* Bdv.

448 battoides (*Behr*)
a oregonensis *B. & McD.*
b bernardino *B. & McD.*
ab. baldyensis *Gunder*

449 glaucon (*Edw.*)
a intermedia *B. & McD.*
b centralis *B. & McD.*

450 enoptes (*Bdv.*)
a ancilla *B. & McD.*

451 rita (*B. & McD.*)
mohave Wats. & Comst.

452 spaldingi *B. & McD.*

453 speciosa (*Hy. Edw.*)

454 sonorensis (*F. & F.*)
regia (Bdv.)
ab. sonoralba *Wats. & Comst.*
form comstocki *Gunder*

Phædrotes Scud.

Type *Lycæna catalina* Reak.

455 piasus (*Bdv.*)
sagittigera (F. & F.)
viaca (Edw.)
‡*lorquini* (Behr) (nec. H.-S.)
a catalina (*Reak.*)
rhæa (Bdv.)
ab. gorgonioi *Gunder*
b daunia (*Edw.*)

Glaucopsyche Scud.

Type *Polyommatus lygdamus* Dbldy.

456 lygdamus (*Dbldy.*)
a couperi *Grt.*
♀*afra* (Edw.)
b oro (*Scud.*)
c behrii (*Edw.*)
d columbia (*Skin.*)
e australis *Grin.*

457 xerces (*Bdv.*)
form mertila (*Edw.*)
ab. huguenini *Gunder*
form ab. antiacis (Bdv.)
norm. polyphemus (*Bdv.*)

Lycænopsis F. & F.

Type *Lycaenopsis ananga* F. & F.

458 pseudargiolus (*Bdv. & Lec.*)
violacea (Edw.)
form ♂ nig (*Stkr.*)
nigra (Edw.)
form ♀ intermedia (*Stkr.*)
form lucia (*Kirby*)
ab. brunnea (*Tutt*)
ab. fumida (*Scud.*)
form marginata (*Edw.*)
ab. pseudora (*Scud.*)
ab. subtusjuncta (*Tutt*)
ab. inæqualis (*Tutt*)
gen. æst. neglecta (*Edw.*)
ab. obsoleta-lunulata (*Tutt*)
gen. æst. neglecta-major (*Tutt*)
a argentata (*Fletch.*)
b nigrescens (*Fletch.*)
form quesnelii (*Cockle*)
maculata-suffusa (Cockle)
c cinerea (*Edw.*)
gen. æst. arizonensis (*Edw.*)
d echo (*Edw.*)
ab. nunenmacheri (*Strd.*)
e gozora (*Bdv.*)

Superfamily HESPERIOIDEA

HESPERIIDÆ

PYRRHOPYGINÆ

Apyrrothrix Lind.

Type *Erycides araxes* Hew.

*459 araxes (*Hew.*)
cyrillus (Ploetz)
a arizonæ (*G. & S.*)

URBANINÆ

Phocides Hbn.

Type *Papilio palemon* Cram.

460 batabano (*Luc.*)
macinus (H.-S.)
okeechobee (Worth.)

461 lilea (*Reak.*)
albicilla (H.-S.)
socius (Butl. & Druce)
‡*cruentus* (Scud.) (nec Hbn.)
sanguinea (Scud.)
decolor (Mab.)
462 urania (*West. & Hew.*)
texana (Scud.)

Nascus Wats.
Type *Papilio phocus* Cram.
463 hesus (*West. & Hew.*)

Polygonus Hbn.
Type *Polygonus lividus* Hbn.
464 lividus *Hbn.*
‡*amyntas* (Fabr.) (nec Poda)
savigny (Latr.)
a arizonensis (*Skin.*)

Proteides Hbn.
Type *Papilio mercurius* Fabr.
465 mercurius (*Fabr.*)
‡*idas* (Cram.) (nec L.)

Epargyreus Hbn.
Type *Papilio tityrus* Fabr.
466 zestos (*Gey.*)
oberon (Worth.)
467 tityrus (*Fabr.*)
clarus (Cram.)
ab. obliteratus *Scud.*
468 exadeus (*Cram.*)

Goniurus Hbn.
Type *Papilio simplicius* Stoll
469 proteus (*L.*)
‡*fortis* (Skin. & Ramsd.) (lapsus calami)
ab. proteoides *Ploetz*
*470 dorantes (*Stoll*)
amisus (Hew.)
protillus (H.-S.)
a rauterbergi (*Skin.*)
471 simplicius (*Stoll*)
*472 eurycles (*Latr.*)

Chioides Lind.
Type *Eudamus albofasciatus* Hew.
473 albofasciatus (*Hew.*)
474 zilpa (*Butl.*)

Codatractus Lind.
Type *Heteropia imitatrix* Mab.
‡*Heteropia* Mab.
Type *Heteropia imitatrix* Mab.
475 alcæus (*Hew.*)
*476 melon (*G. & S.*)
a arizonensis (*Skin.*)

Telegonus Hbn.
Type *Papilio talus* Cram.
477 hahneli (*Staud.*)

Zestusa Lind.
Type *Plestia staudingeri* Mab.
‡*Plestia* Mab.
Type *Plestia staudingeri* Mab.
478 dorus (*Edw.*)

Achalarus Scud.
Type *Papilio* ‡*lycidas* A. & S.
(=*Proteides lyciades* Gey.)
479 lyciades (*Gey.*)
‡*lycidas* (A. & S.) (nec Cram.)
480 epigena (*Butl.*)
orestes (Edw.)
*481 albociliatus (*Mab.*)
482 coyote (*Skin.*)

Cecropterus H.-S.
Type *Cecrops zarex* Hbn.
‡*Cecrops* Hbn.
Type *Cecrops zarex* Hbn.
483 cellus (*Bdv. & Lec.*)
festus (Gey.)
ab. æreofuscus (*Gunder*)
484 pseudocellus (*Cool. & Clemence*)

Thorybes Scud.
Type *Papilio bathyllus* A. & S.
485 drusius (*Edw.*)
486 pylades (*Scud.*)
ab. immaculata (*Skin.*)
487 daunus (*Cram.*)
bathyllus (A. & S.)
488 mexicana (*H.-S.*)
ananius (Ploetz)
489 nevada *Scud.*
æmilea (Skin.)
490 confusis (*Bell*)

Cabares G. & S.
Type *Thanaos potrillo* Luc.
491 potrillo (*Luc.*)

Cogia Butl.
Type *Cogia hassan* Butl.
492 calchas (*H.-S.*)
terranea (Butl.)
493 outis (*Skin.*)
494 hippalus (*Edw.*)
gila (Ploetz)

Phœdinus G. & S.

Type *Eudamus caicus* H.-S.

495 mysie (*Dyar*)
496 caicus (*H.-S.*)
schaefferi (Ploetz)
moschus (Edw.)

Urbanus Hbn.

Type *Papilio malvæ* L.

497 centaureæ (*Ramb.*)
wyandot (Edw.)
498 ruralis (*Bdv.*)
cæspitalis (Bdv.)
vicaria (Edw.)
petreius (Edw.)
499 xanthus (*Edw.*)
macdunnoughi (Oberth.)
500 scriptura (*Bdv.*)
501 syrichtus (*Fabr.*)
form montivagus (*Reak.*)
fumosa (Rev.)
502 philetas (*Edw.*)
503 tessellata (*Scud.*)
communis (Grt.)
a occidentalis (*Skin.*)
504 domicella (*Erich.*)
nearchus (Edw.)
505 ericetorum (*Bdv.*)
alba (Edw.)
506 macaira (*Reak.*)
oceanus (Edw.)
locutia (Hew.)
a nivella (*Mab.*)
‡*nivea* (Scud.) (nec Cram.)
orbigera (Mab.)
507 laviana (*Hew.*)
pastor (R. Feld.)
leca (Butl.)

Antigonus Hbn.

Type *Urbanus erosus* Hbn.

508 nessus (*Edw.*)
notabilis (Stkr.)
509 pulverulenta (*R. Feld.*)
zampa (Edw.)

Pholisora Scud.

Type *Papilio catullus* Fabr.

510 alpheus (*Edw.*)
oricus Edw.
511 arizonensis (Mab. & Boul.)
(var. praec.?)
512 libya (*Scud.*)
a lena (*Edw.*)
513 catullus (*Fabr.*)
?*Therminier* (Latr.)
?*herminieri* (Morris)
514 mejicanus (*Reak.*)
515 ceos *Edw.*
516 hayhurstii (*Edw.*)
517 ascalaphus (*Staud.*)
*518 brennus (*G. & S.*)

Achlyodes Hbn.

Type *Papilio busirus* Cram.

519 thraso (*Hbn.*)
tamenund (Edw.)

Xenophanes G. & S.

Type *Papilio tryxus* Cram.

520 tryxus (*Cram.*)

Ephyriades Hbn.

Type *Papilio otreus* Cram.

521 brunnea (*H.-S.*)
?*electra* (Lint.)

Chiomara G. & S.

Type *Achlyodes mithrax* Moesch.

522 asychis (*Cram.*)

Erynnis Schr.

Type *Papilio tages* L.

523 icelus (*Scud. & Burg.*)
524 brizo (*Bdv. & Lec.*)
a somnus (*Lint.*)
525 burgessi (*Skin.*)
526 lacustra (*Wright*)
‡*callidus* (Grin.) ("♀" nec ♂; partim.)
527 gesta (*H.-S.*)
invisus (Butl. & Druce)
llano (Dodge)
528 persius (*Scud.*)
a afranius (*Lint.*)
b pernigra (*Grin.*)
c lucilius (*Scud. & Burg.*)
529 callidus (*Grin.*) (♂; partim.)
lilius (Dyar)
530 martialis (*Scud.*)
ab. ausonius (*Lint.*)
531 juvenalis (*Fabr.*)
juvenis (Hbn.)
costalis (West. & Hew.)
ennius (Scud. & Burg.)
?*plautus* (Scud. & Burg.)
532 propertius (*Scud. & Burg.*)
?*tibullus* (Scud. & Burg.)
a borealis (*Cary*)
533 horatius (*Scud. & Burg.*)
virgilius (Scud. & Burg.)
petronius (Lint.)
534 terentius (*Scud. & Burg.*)
ovidius (Scud. & Burg.)
nævius (Lint.)
535 pacuvius (*Lint.*)
536 scudderi (*Skin.*)
537 clitus (*Edw.*)
mæstus (G. & S.)
538 tristis (*Bdv.*)
form tatius (*Edw.*)
539 funeralis (*Scud. & Burg.*)

Timochares G. & S.
Type *Leucochitonea trifasciata* Hew.
540 ruptifasciatus (*Ploetz*)

Grais G. & S.
Type *Anastrus stigmaticus* Mab.
541 stigmaticus (*Mab.*)
fumosus (Ploetz)

HESPERIINÆ

Pamphilidia Lind.
Type *Papilio palæmon* Pall.
542 palæmon (*Pall.*)
mandan (Edw.)
mesapano (Scud.)
skada (Edw.)

Butleria Kirby
Type *Carterocephalus exornatus* C. Feld.
543 pirus (*Edw.*)
a semicæca (*Mab.* & *Boul.*)
544 microsticta *G.* & *S.*
545 polingii (*Barnes*)

Ancyloxypha C. Feld.
Type *Hesperia numitor* Fabr.
546 numitor (*Fabr.*)
puer (Hbn.)
marginatus (Harris)
form longleyi *French*
547 arene (*Edw.*)
myrtis (Edw.)
leporina (Ploetz)

Oarisma Scud.
Type *Hesperia powesheik* Parker
548 garita (*Reak.*)
hylax (Edw.)
549 edwardsii (*Barnes*)
550 powesheik (*Parker*)

Adopæa Billb.
Type *Papilio linea* D. & S.
551 lineola (*Ochs.*)

Copæodes Edw.
Type *Hesperia procris* Edw.
552 aurantiaca (*Hew.*)
waco (Edw.)
procris (Edw.) (♂; partim.)
macra (Ploetz)
candida Wright
553 minima (*Edw.*)
procris (Edw.) (♀; partim.)
rayata B. & McD.

Pseudocopæodes Skin. & Wms.
Type *Copæodes eunus* Edw.
554 eunus (*Edw.*)
wrightii (Edw.)

Chærephon G. & S.
Type *Pamphila citrus* Mab
555 rhesus (*Edw.*)
556 carus (*Edw.*)
557 simius (*Edw.*)

Choranthus Scud.
Type *Hesperia radians* Luc.
*558 radians (*Luc.*)
streckeri (Skin.)
559 haitensis *Skin.*

Hesperia Fabr.
Type *Papilio comma* L.
560 uncas *Edw.*
♀*ridingsii* Reak.
♀*axius* Ploetz
561 lasus (*Edw.*)
562 licinus (*Edw.*)
563 metea *Scud.*
564 morrisoni (*Edw.*)
565 columbia (*Scud.*)
california (Wright)
erynnioides (Dyar)
566 cabelus (*Edw.*)
567 harpalus (*Edw.*)
568 comma (*L.*)
a colorado (*Scud.*)
b manitoba (*Scud.*)
laurentina (Lym.)
c idaho (*Edw.*)
d assiniboia (*Lym.*)
e oregonia (*Edw.*)
569 juba (*Scud.*)
570 woodgatei (*Wms.*)
571 viridis (*Edw.*)
572 nevada (*Scud.*)
573 ruricola *Bdv.*
574 californica (*Mab.*)
575 attalus (*Edw.*)
a seminole (*Scud.*)
quaiapen (Scud.)
slossonæ (Skin.)
576 horus *Edw.*
577 leonardus *Harr.*
578 meskei (*Edw.*)
straton (Edw.)
579 ottoë *Edw.*
a pawnee *Dodge*
form ogallala (*Leuss.*)
b montana (*Skin.*)
580 sassacus *Harr.*
a manitoboides (*Fletch.*)
581 dacotæ (*Skin.*)

Hylephila Billb.

Type *Papilio phylæus* Dru.

582 phylæus (*Dru.*)
bucephalus (Steph.)
♀hala (Butl.)

Ochlodes Scud.

Type *Hesperia nemorum* Bdv.

583 sylvanoides (*Bdv.*) (♂; partim.)
pratincola (Bdv.) (♀; partim.)
francisca (Ploetz)
a napa (*Edw.*)

584 nemorum (*Bdv.*)
verus (Edw.)
a pratincola (*Bdv.*) (♂; partim.)

585 agricola (*Bdv.*)
yreka (Edw.)
milo (Edw.)

586 yuma (*Edw.*)
scudderi (Skin.)

587 snowi (*Edw.*)

Polites Scud.

Type *Hesperia peckius* Kirby

588 verna (*Edw.*)
pottawattomie (Worth.)

589 manataaqua (*Scud.*)
a rhena (*Edw.*)
alcina (Skin.)

590 themistocles (*Latr.*)
‡*taumas* (Fabr.) (err. typ.) (nec Hufn.)
‡*thaumas* (Fabr.) (nec Hufn.)
‡♀*phocion* (Fabr.) (nec Fabr.)
cernes (Bdv. & Lec.)
ahaton (Harr.)

591 baracoa (*Luc.*)
amadis (H.-S.)
myus (French)

592 sonora (*Scud.*)
siris (Edw.)
a utahensis (*Skin.*)

593 mystic (*Scud.*)
ab. weetamo (*Scud.*)
ab. nubs (*Scud.*)
a dacotah (*Edw.*)
pallida (Skin.)

594 mardon (*Edw.*)

595 coras (*Cram.*)
?*æsculapius* (Fabr.)
peckius (Kirby)
wamsutta (Harr.)

596 sabuleti (*Bdv.*)
genoa (Ploetz)
a tecumseh (*Grin.*)
chispa (Wright)
b comstocki *Gunder*
c chusca (*Edw.*)

597 draco (*Edw.*)

598 vibex (*Gey.*)
præceps (Scud.)
lumida (Moesch.)
golenia (Moesch.)
stigma (Skin.)
a brettus (*Bdv.*)
wingina (Scud.)
unna (Ploetz)
b brettoides (*Edw.*)

Atalopedes Scud.

Type *Hesperia huron* Edw.

599 campestris (*Bdv.*)
sylvanoides (Bdv.) (♀; partim.)
huron (Edw.)

Catia G. & S.

Type *Hesperia drury* Latr.

600 otho (*A. & S.*)
drury (Latr.)
pustula (Gey.)
a egeremet (*Scud.*)
ursa (Worth.)
cinna (Ploetz)

Problema Skin. & Wms.

Type *Pamphila byssus* Edw.

601 byssus (*Edw.*)
kumskaka (Scud.)

602 bulenta (*Bdv. & Lec.*)

Atrytone Scud.

Type *Hesperia iowa* Scud.

603 logan (*Edw.*)
♂ *delaware* (Edw.)
a lagus (*Edw.*)

604 arogos (*Bdv. & Lec.*)
iowa (Scud.)
mutius (Ploetz)

605 vestris (*Bdv.*)
metacomet (Harr.)
rurea (Edw.)
kiowa (Reak.)
osyka (Edw.)
osceola (Lint.)
ab. ♀ immaculatus (*Wms.*)

606 bimacula (*G. & R.*)
acanootus (Scud.)
illinois (Dodge)

607 arpa (*Bdv. & Lec.*)

608 palatka (*Edw.*)
floridensis (Ploetz)

609 dukesi *Lind.*

610 dion (*Edw.*)
a alabamæ *Lind.*
611 pontiac (*Edw.*)
♀*conspicua* (Edw.)
orono (Scud.)

Poanes Scud.
Type *Hesperia massasoit* Scud.
612 viator (*Edw.*)
613 massasoit (*Scud.*)
form suffusa (*Laur.*)
614 hobomok (*Harr.*)
ab. pallida *Wats.*
form ♀ pocahontas (*Scud.*)
quadaquina (Scud.)
ab. friedlei *Wats.*
615 zabulon (*Bdv. & Lec.*)
616 taxiles (*Edw.*)
617 melane (*Edw.*)
618 aaroni (*Skin.*)
a howardi (*Skin.*)
619 yehl (*Skin.*)

Phemiades Hbn.
Type *Papilio phineus* Cram.
620 jamaicensis *Schs.*

Atrytonopsis G. & S.
Type *Hesperia deva* Edw.
621 loammi (*Whitney*)
regulus (Edw.)
apostologica (Strd.)
622 hianna (*Scud.*)
grotei (Ploetz)
623 lunus (*Edw.*)
624 deva (*Edw.*)
625 vierecki (*Skin.*)
626 pittacus (*Edw.*)
627 python (*Edw.*)
a margarita (*Skin.*)
628 cestus (*Edw.*)
629 edwardsi *B. & McD.*
ab. polingi *Gunder*

Thespieus G. & S.
Type *Hesperia dalman* Latr.
630 macareus (*H.-S.*)

Amblyscirtes Scud.
Type *Hesperia vialis* Edw.
631 vialis (*Edw.*)
632 alternata (*G. & R.*)
eos (Edw.)
meridionalis Dyar
633 celia *Skin.*
634 nysa *Edw.*
similis (Stkr.)
635 ænus *Edw.*
636 cassus *Edw.*
637 comus (*Edw.*)
nilus Edw.
quinquemacula (Skin.)
638 textor (*Hbn.*)
oneko (Scud.)
wakulla (Edw.)
639 hegon (*Scud.*)
samoset (Scud.)
nemoris (Edw.)
640 nereus (*Edw.*)
641 nanno *Edw.*
642 oslari (*Skin.*)
643 bellus (*Edw.*)
644 phylace (*Edw.*)

Epiphyes Dyar
Type *Pamphila carolina* Skin.
645 carolina (*Skin.*)

Megistias G. & S.
Type *Hesperia tripunctata* Latr.
646 fusca (*G. & R.*)
647 neamathla (*Skin. & Wms.*)

Lerema Scud.
Type *Papilio accius* A. & S.
648 accius (*A. & S.*)
monoco (Scud.)
punctella (G. & R.)
nortonii (Edw.)

Lerodea Scud.
Type *Hesperia eufala* Edw.
649 arabus (*Edw.*)
650 eufala (*Edw.*)
floridæ (Mab.)
dispersus (Gundl.)
*651 tripunctus (*H.-S.*)

Oligoria Scud.
Type *Hesperia* ‡*maculata* Edw.
(=*Hesperia norus* Ploetz)
652 norus (*Ploetz*)
‡*maculata* (Edw.) (nec Brem. Grey)

Calpodes Hbn.
Type *Papilio ethlius* Cram.
653 ethlius (*Cram.*)
chemnis (Fabr.)
olynthus (Bdv. & Lec.)
654 coscinia (*H.-S.*)
?*ares* (C. Feld.)

Prenes Scud.
Type *Hesperia panoquin* Scud.
655 sylvicola (*H.-S.*)
656 panoquin (*Scud.*)
ophis (Edw.)
657 panoquinoides (*Skin.*)
658 errans (*Skin.*)
659 ocola (*Edw.*)
hecebolus Scud.
ortygia (Moesch.)
parilis (Mab.)

Megathymus Scud.

Type *Eudamus yuccæ* Bdv. & Lec.

660 yuccæ (*Bdv. & Lec.*)
 a coloradensis *Riley*
 b navajo *Skin.*

661 ursus *Poling*

662 cofaqui (*Stkr.*)

663 streckeri (*Skin.*) (♂; partim.)
 a texana *B. & McD.*
 streckeri (Skin.) (♂ & ♀; partim.)

664 smithi *Druce*

665 mariæ *B. & Benj.*

666 polingi *Skin.*

667 neumoegeni *Edw.*
 aryxna Dyar (partim.)

668 aryxna *Dyar* (partim.)

669 stephensi *Skin.*

Names Omitted from this List but Appearing on The Barnes & McDunnough Check List, or upon Recent Revisional Papers.

"*Amynthia mærula* Hbn." Apparently not a new name, but simply a misidentification by Geyer, instead of Hübner of *mærula* Fabr.

"*Eurymus palæno* Cram." Not a new name. Only an apparent misidentification of *palæno* L.

"*Eurymus pelidne menisme* Verity." Not a new name. Only an apparent misspelling of *minisni* Bean.

"*Megisto camerta* Cram." Presumably a distinct species not found in Boreal America.

"*Oeneis also* Moesch." Not a new name. Simply a presumably erroneous identification of *also* Bdv.

"*Euptoieta columbina* Godt." Not a new name. Simply a presumably erroneous identification of *columbina* Fabr.

"*Phyciodes pratensis* Scud." Not a new name. Simply a presumably erroneous identification and, in consequence, a mixed synonymy.

"*Polygonia c-argenteum* Scud." Not a new name. A presumably erroneous determination of *c-argenteum* Kirby.

"*Junonia orythia* A. & S." Not a new name. A presumably erroneous identification of *orithya* L., spelled *orythia*.

"*Victorina lavinia* Fabr." Apparently an Antillean form or subspecies not occurring in Boreal America, and differing from typical *steneles*.

"*Athena eleuchea* Hbn." Altho previously placed as a synonym of *pellenis*, the name apparently represents a misdetermination by Hübner, 1822-1825, Samml. exot. Schmett., II, pl. CCLXIII, for *eleuchea* Hbn., 1818, Zutr. exot. Schmett., f. 197.

"*Libythea carinenta* Cram." Presumably a purely Mexican species; *carinenta* Auct. falls to *larvata* Stkr.

"*Eumæus toxea* Gray." Apparently not a new name but simply a misdetermination of *toxea* Godt. This misdetermination was published by Guérin, 1829-1831, and not by Gray until 1832.

"*Eumæus toxana* Bdv." and "*godartii* Bdv." These names presumably refer to forms distinct from *minyas*, probably southern subspecies thereof, have not been actually recorded from Boreal America, and should be dropped from lists until so recorded.

"*Strymon lycus* Hbn." Evidently an error. Skinner puts the name in the synonymy of *simaethis* Dru. and is followed by Barnes & McDunnough, 1917, Check List, p. 13. Besides the generic term *Licus* of the Zutrage and *Lycus* of the Verzeichness, the only *lycus* we find in Hübner's works dealing with the American fauna is on pl. CL, ff. 1-2 of the Samml. exot. Schmett., "*Urbanus celebris Licus*," in the letter-press as "Urbani" "150. A. Celebres-Lycus." This is a large tropical *Castnia*, and is probably not intended for a new name, but simply *licus* Dru.

"*Strymon favonius* Bdv. & Lec." Not a new name. Simply a questionable determination of *favonius* A. & S., against the judgment of Boisduval but in deference to Leconte.

"*Strymon pan* Harr." Not a new name. Simply a mere listing by Harris of "pan Dru.?" under *Thecla*.

"*Heodes phlæas* Bdv. & Lec." Not a new name. The American species at that time considered the same as the European *phlæas* L.

"*Antigonus denuba* Ploetz." The original description gives Aburi, West Africa, as the habitat.

"*Epargyreus socus* Hbn." Probably represents a distinct species or race not found in Boreal America.

"*Phædinus epigona* H.-S." Placed on lists because of Godman & Salvin's description and figure of the supposed type, but this so-called type in no way fitting the original diagnosis.

"*Hesperia morrissoni* Ploetz." Obviously not a new name, but a mere misspelling of *morrisoni* Edw.

"*Hylephila augias* Hbn." Apparently not a new name but a presumably erroneous determination of *augias* L.

"*Polites cernes* Harr." Not a new name, but a presumably erroneous identification of *cernes* Bdv.

"*Polites vetulina* Ploetz." The description by Ploetz, 1883, Ent. Zeit., XLIV, 58, appears to be drawn from Herrich-Schaeffer, or a specimen identified as a Herrich-Schaeffer species, and not a new name. This species is not listed by Kirby, nor do we find it in Herrich-Schaeffer, Aussereurop. Schmett. Ploetz may have spelt the name incorrectly, or may have resurrected a previously overlooked Herrich-Schaeffer name. In either event there seems little to be gained by listing it as a synonym of *verna*, as Ploetz states "Vaterland?".

"*Catia ætna* Scud." Not a new name. Presumably a misidentification of *ætna* Bdv.

"*Atrytone vitellius* A. & S." Not a new name. Presumably a misidentification of *vitellius* Fabr.

"*Amblyscirtes elissa* G. & S." Record founded upon identification by Skinner who subsequently rescinds the statement.

"*Prenes nero* Fabr." According to Skinner and Williams the occasional Florida visitor is *sylvicola* which is probably a distinct species altho usually sunk as a synonym. True *nero* presumably has not been recorded from Boreal America.

"*Megathymus drucei* Skin." This name does not occur in the Check List but is credited to our fauna by Skinner & Williams, 1924, Trans. Am. Ent. Soc., L, 208, on the strength of a statement by Schwarz, 1897, Proc. Ent. Soc. Wash., IV, 209, that Morrison's material came from near Fort Grant in the Graham Mts., Ariz. This refers to Coleoptera. At least some of Morrison's Lepidoptera appear to have been collected in the Huachuca Mts., and it is not unlikely that Morrison did get into Mexico. Altho hundreds of *Megathymus* have been received from Arizona, none seem like the figure of *drucei*. The reason for the placement of this unique "Sonora, Mex." specimen as of United States origin is too doubtful to serve as a basis for listing the species.

BUTTERFLIES OF CALIFORNIA

(Continued)

DR. JOHN A. COMSTOCK

GENUS EURYMUS. Swains

The Sulphurs

Boisduval's Sulphur is a polymorphic species occurring in various forms, some of which are seasonal or altitudinal, and others albinic. The typical insect, (*E. eurytheme eurytheme* Boisd.) is the spring form, emerging from overwintering chrysalids. This is illustrated on plate 13, figures 6 to 11. It is smaller than the summer form, and bears less of the orange suffusion. An albinic or white aberrant female is not uncommon, and is illustrated on plate 14, figures 1 and 2. This has been named *alba* by Strecker. A dark and much suffused aberration of Boisduval's Sulphur has been described by the same author as *fumosa*, but we have not as yet seen Californian examples.

The **Flavid Sulphur,** (*E. eurytheme amphidusa* Bdv.) is the summer brood of this same species. It is a handsome insect, as reference to figures 4, 5 and 6 of plate 14 will testify. No other member of the order is so aptly called "flying butter" or "butterfly." In another sense than that of its color, it deserves this title, for the sulphurs are voracious destroyers of clover and alfalfa, which, if allowed to grow and be translated, via the dairy route, into milk, would eventually result in butter. Each one of these yellow beauties represents, therefore, just so much butter that has taken wing from the profits of the farmer.

The flavid sulphur has, like the spring form, an aberrant white female (alba. Stkr.) which we have illustrated on plate 14, figure 3. In higher altitudes this species tends to lose its orange color, and we have as a result the **Yellow Sulphur** (*E. eurytheme eriphyle* Edw.) which is pictured on plate 14, figures 7, 8 and 9. This, however, represents the summer high altitude brood, of which **Cockerell's Sulphur** is the early spring representative. It is unfortunate that Cockerell called this *autumnalis* because it usually results from overwintering chrysalids. Occasionally a late arrival may feel the effects of early frost and give a typical *autumnalis*, which probably accounts for the author giving it an autumnal designation. This form is illustrated on plate 14, figures 10, 11 and 12. We have never seen a white female of **Cockerell's Sulphur.**

There is hardly a month of the year in which we may not see some one of the forms of this butterfly on the wing in our lowland rural districts. It fairly swarms at certain seasons, during years that are favorable to its multiplication, and is at times a menace to the agriculturist. The yellow forms must be sought in our mountain meadows, and high plateaus, preferably in farming districts.

In addition to the common foodplants noted above, the larvae have been observed on rattleweed (*Astragalus*), sweet clover (*Melilotus*) and deerweed (*Lotus*).

STUDIES IN PACIFIC COAST LEPIDOPTERA

(Continued)

DR. JOHN ADAMS COMSTOCK

THIRTEEN NEW SPECIES OR ABERRATIONS OF CALIFORNIA BUTTERFLIES

The members of the *chalcedona* group of *Euphydryas* are subject to a wide range of variation and aberration. Most of our California collectors possess one or more of these peculiar forms, and inquiries are numerous concerning their cause and designation.

Some of these have received names, and others are in danger of being described without much thought for the direction in which the variation runs or the extent to which this variation is carried, unless some effort is made to reduce the matter to systematic order.

The direction in which this group varies is—

1. A tendency toward complete obscuring of primaries, or secondaries, or both,=complete or hemi-melanism.

2. A tendency toward accentuation or fusion of the yellow spots into elongate bands, on primaries, or secondaries, or both,= complete or hemi-fusion.

3. A tendency toward the lightening of the yellow spots, and the elimination of the red, or its reduction to a brownish shade on primaries, or secondaries, or both,=complete or hemi-albinism.

It is obvious that great confusion will arise if an attempt is made to name aberrant forms that are intermediate in the extent or degree of this variation,—in fact there is serious doubt as to the advisability of applying names to any aberrant forms whatsoever. Since, however, authorities continue to include such aberrations in their lists, it seems advisable to confine such naming within reasonable limits, and relegate to the synonymy all aberrant forms that do not carrry a given tendency to its ultimate degree of expression.

In the group under consideration we have two names that are generally accepted,—i. e. *E. chalcedona* ab. *mariana* Barnes, representing complete melanism, and *E. chalcedona* ab. *fusimacula* Barnes, representing complete fusion of yellow maculations. In addition Mr. Jean Gunder has proposed two names to cover partial or complete albinism, (*hemiluteofuscus* and *omniluteofuscus*).

In this paper we shall leave out of consideration the albinic tendency, and confine our analysis to the melanic and fused types.

The confusing element with which we have to deal here is that the tendency toward these aberrant patterns may occur in the primaries only, or be confined to the secondaries, and be in combination with the normal maculation on those wings which are not involved,—or there may be a fusion on one pair and an obscuration of the other.

We thus have a long list of possible combinations. The scheme of these possible variants is expressed in the following diagram,—and I have appended the names which I propose as new, in this formula.

Primaries. Secondaries.	Normal Normal	= chalcedona chalcedona Dbldy. & Hew.
	Fused Fused	=ab. **fusimacula** Barnes.
	Melanic Melanic	=ab. **mariana** Barnes.
	Fused Normal	=ab. nov. **suprafusa.**
	Melanic Normal	=ab. nov. **supranigrella.**
	Fused Melanic	=ab. nov. **hemimelanica.**
	Normal Fused	=ab. nov. **fusisecunda.**
	Normal Melanic	= ab. (none yet observed.)
	Melanic Fused	= ab. (none yet observed.)

The color plates of these new aberrations were published and distributed some time ago. They serve far better to describe the types than could a lengthy technical analysis. In order to designate type, locality, collector, and repository of type, etc., the following brief notes are appended.

Euphydryas chalcedona ab. **suprafusa** aberr. nov.

♀ Superior surface illustrated on Plate 32, figure 9.

Inferior surface normal except for the elongation and fusion of the yellow spots in the limbal area of primaries, which is more complete at the costo-apical end, and becomes less marked toward the posterior margin.

Holotype ♀. Los Angeles, Calif., April 10, 1924. In the collection of the Southwest Museum.

Allotype ♂. Tehachapi, Kern Co., Calif., June 27, 1922. Collection of Jean Gunder, Pasadena.

Paratype ♂. Diamond Canyon, Alameda Co., Calif., May 30, 1916. In the collection of Jean Gunder, Pasadena, Calif.

Euphydryas chalcedona ab. **supranigrella** aberr. nov.

Superior surface illustrated on Plate 32, figure 8.

Inferior surface, primaries devoid of all yellow spots. The brick-red shade is complete over the entire wing except for a delicate striping of black on the nervules and a small amount of black scaling irregularly distributed over the apical area. Secondaries normal.

Holotype ♂ Mt. Wilson, Calif., June 22, 1920. In the collection of the Southwest Museum.

Allotype ♀ Camp Baldy, San Gabriel Mountains, Calif., June 23, 1919. In the collection of Jean Gunder.

Euphydryas chalcedona ab. **hemimelanica** aberr. nov.

Illustrated on Plate 32, superior surface of holotype ♂ figure 11, inferior surface of allotype ♀ figure 10.

The colored figures serve as sufficient description.

Holotype, Sulphur Mountain Springs, Ventura County, Calif., July 4, 1920. In the collection of Mr. Jean Gunder.

Allotype, Los Angeles, Calif., April 1, 1919. In the collection of Mr. Jean Gunder.

Euphydryas chalcedona ab. **fusisecunda** aberr. nov.

Superior surface illustrated on Plate 32, figure 12.

The inferior surface is characterized by a partial fusion of the two bands of yellow spots on the secondaries. Probably this fusion would be more complete in specimens showing the ideal pattern to fit into the scheme which we have outlined. The primaries are normal.

Type. ♀ Mt. Wilson, Calif., June 22, 1920. In the collection of the Southwest Museum.

While collecting in the Lake Tahoe region, where *Euphydryas sierra* abounds, we were fortunate in capturing a remarkable example of an aberrant form of this species which is worthy of designation. We published a figure of this some months ago, so that the detailed description seems hardly necessary at this time. It is named *umbrobasana*, and is shown as figure 5 of our color Plate 35. The distinguishing feature of the superior aspect is the heavy suffusion of the basal areas, particularly of the secondaries, with black,—and the tendency toward suffusion and extension of the yellow maculation in the limbal area.

The inferior surface is not figured, and is therefore dealt with in greater detail.

Primaries, fringes and marginal area as in the normal form. The submarginal double rows of yellow spots are blended into a single wide band, separated into oblongate spots by narrow black nervules, and becoming obsolescent toward the lower third of wing. Four blurred yellow dashes occur lateral to the cell. The black lines crossing the cell are blurred and suffused with black.

The secondaries are very striking in appearance, due to the fact that the submarginal row of yellow crescents and the extra-discal row of yellow spots have extended toward each other and fused, thus eliminating the usual interposed red and black-margined area, and forming a continuous wide yellow band extending almost across the wing. A few red scales slightly invade this at the costal and anal edges, which is all that remains of the normal central red row of spots. The nervules, however, are narrowly defined in black.

The basal area is a clear field of red, except for one small black circle at outer end of each cell, pupillated in yellow.

Holotype ♂ Lake Tahoe region, July, 1922.

This name was mentioned, after I had distributed my colored plates, by Mr. Jean Gunder (Entomological News, July, 1925, Vol. XXXVI) where he states that "*umbrobasana*, as its name indicates, is a more melanic aberration of *sierra*, and several degrees opposite to *magdelenae*."

We have received from Mr. Jean Gunder a number of aberrant examples of *Euphydryas colon* which were captured by our good friend Otto Huellemann of Wallace, Idaho, for whom I name this interesting variant.

Euphydryas colon ab. **huellemanni** aberr. nov.

Superior surface, ground color black. Marginal row of red spots on primaries and secondaries practically suppressed. Submarginal rows of yellow spots on primaries present but slightly blurred. Extra-discal area occupied by three long yellow dashes, which are powdered laterally by a few red scales. Basal area solid black. The double row of yellow spots normally occurring on secondaries are obsolescent except for a few minute points. The basal half of secondaries, a rich black.

Inferior surface, much as in normal *colon* except for a partial, (or in one case a complete) suppression of the yellow spots in the basal area of secondaries, and their replacement with black. There is also a tendency toward extension and blurring of the yellow maculations.

♀ Much as in male, although our allotype shows some tendency toward the retention of the marginal row of red spots on the superior surface. Further description seems unnecessary in view of our publication of colored figures some months ago.

Holotype ♂ Wallace, Idaho, June 12, 1921. Illustrated on Plate 33, figure 5.

Allotype ♀ Wallace, Idaho, June 15, 1919. Illustrated on Plate 33, figure 4.

Paratype No. 1 ♂ Wallace, Idaho, June 14, 1925.

Paratype No. 2 ♀ Wallace, Idaho, July 4, 1925.

All collected by Mr. Otto Huellemann, and in the collection of Mr. Jean Gunder of Pasadena, Calif.

Euphydryas rubicunda ab. **rubrosuffusa** aberr. nov.

Superior surface illustrated on plate 34, figure 15.

The inferior surface differs from the typical insect only in the partial suppression of the black lines on the secondaries. These are entirely absent in the area between the submarginal crescents and the extra discal row of yellow spots, and this area is wider than normal. It is a field of clear brick red, except for a delicate dentate stripe of yellow running through it at about the centre.

Type. ♀ Mammoth, Mono Co., Calif., July 28, 1921. Loaned from the collection of Mr. George Malcolm.

The females of *Melitaea palla* show a tendency toward the production of a dark form, one phase of which was named *eremita* by W. G. Wright. The example which he chose for his type does not, however, represent the extreme to which this melanism (if such it is) may be carried. On our color plate 36, figure 19, we picture an example which is probably the ultimate extent to which this "darkening" is carried. We have called this—

Melitaea palla ab. **stygiana** aberr. nov.

The superior surface is so accurately pictured on our plate as to render a description superfluous. The inferior surface shows little variation from that of usual maculation of *eremita*, and our figure 18 on this same plate may serve to illustrate this.

Type. ♀ Willow Ranch, Modoc County, Calif., June 9, 1924.

Paratype No. 1. ♀ Fairfax, Marin Co., Calif., June 30, 1918.

Paratype No. 2. ♀ Carrville, Trinity Co., Calif., June 13, 1913.

Paratype No. 3. ♀ Walker, Siskiyou Co., Calif., June 3, 1920.

Paratypes Nos. 4 to 7. ♀♀ Willow Ranch, Modoc Co., Calif., May 30 to June 8, 1924.

Type and paratypes in the collection of Mr. Jean Gunder, Pasadena, Calif.

A remarkable aberration of *Melitaea gabbii* is illustrated on Plate 36, figure 6, which demonstrates the same tendency in this species that we have noted in the case of *palla* with its dimorphic females *eremita* and *stygiana*. We propose for this the name—

Melitaea gabbii ab. **gunderi** aberr. nov.

The illustration pictures accurately the superior surface of this butterfly. It will be noted that it compares to *stygiana* in the *palla* series, although it is probably of much rarer occurrence.

On the inferior surface we have the usual lustrous white spots, with the remaining portions of the wing heavily suffused with black scales. These have entirely replaced the normal orange-yellow areas and spots of the secondaries, and on the primaries have caused a darkening of the entire wing and a blurring, but not an entire eradication of the maculations.

Type. ♀ San Fernando, Calif., April 6, 1919. In the collection of the Southwest Museum.

Named for Mr. Jean Gunder.

Melitaea gabbii ab. **newcombi** aberr. nov.

Superior surface accurately pictured on our Plate 36, figure 5. This corresponds to *eremita* in the *palla* series.

The inferior surface is practically that of normal *gabbii* except that there is a tendency toward an increase of the black scales and their invasion of the orange areas. This is more marked on the primaries.

Type. ♀ Pasadena, Calif., April 7, 1917. In the collection of the Southwest Museum. Named for our friend Mr. Hal Newcomb.

Melitaea malcolmi sp. nov.

This is illustrated on our color plate 36, figures 10, 11 and 12, with sufficient accuracy to render a lengthy description unnecessary. It will be noted that it differs from *gabbii* in having a uniform ground color of a duller shade, with a heavier powdering of black in the basal area. The ground color of the female is of a considerably lighter shade than the male. On the inferior surface, the lustrous spots of secondaries are less pearly than those of *gabbii* but more so than in *palla.*

Holotype ♂ (Figure 10 of Plate 36). Near Mammoth Camp, Mono County, Calif., July 27, 1921.

Allotype ♀ (Figure 12 of Plate 36). Same locality and date.

Paratype No. 1. ♂ (Figure 11 of Plate 36.) Same locality and date.

All collected by Mr. George Malcolm, for whom I take pleasure in naming the species.

This is very close to *Melitaea flavula* B. & McD. and may prove to be a local race of this species.

Our color plate 37, figure 13, depicts an interesting aberrant of *Melitaea chara* which we have called—

Melitaea chara ab. **nitela** aberr. nov., which is characterized by a lustrous white ground color on the underside of secondaries, crossed in the limbal area by a band of connected quadrate yellow spots, with fine black margins. Four small squares also occur in the basal area, two of which are in relation to the cell.,—and a few irregular yellow spots are grouped close to the basal junction of the wing.

The under side of primaries is more uniformly yellow than in typical specimens, on account of the suppression of most of the black lines.

The superior surface differs from typical chara in the reduction of black lines throughout the discal area of both pairs of wings, and a lessened amount of black scaling throughout, which gives the suggestion of a lighter form.

Type. ♂ Near Palm Springs, Coachella Valley, Calif., April 5, 1921. In the collection of the Southwest Museum.

Tharsalea arota r. nubila race nov.

♂ Superior surface; primaries; differs from typical *arota* in the darker shading, which is of a brownish coppery hue with no suggestion of the violet over-tint characteristic of both *arota* and *virginiensis*, and in the greater width and clearer definition of the dark margin.

Secondaries of the same shade and with equally wide dark margins, which are continued along the costal edge and into the basal area. The tails average slightly shorter, and there is an almost complete eradication of the orange stripe and submarginal lunules in this area, except for a slight suggestion on the tail itself.

Fringes brown, except toward the anal angle where they become gray to whitish.

Inferior surface; practically as in typical *arota* except for the almost complete suppression of the red line in centre of tail and the red submarginal lunules connecting with it, which are a constant feature of both *arota* and *virginiensis*.

♀ Superior surface; primaries; much darker than in the typical insect, and with a reduction of the orange maculations to about half the area of the corresponding markings in *arota*. There are no orange scalings near the posterior angle of wing, which makes the wide dark marginal area (nearly ⅛ inch in width) continuous from apex to posterior angle. No orange scaling occurs posterior to the submedian vein.

Secondaries; clear dark brown, except for four or five narrow orange lunules, beginning at the anal angle,—a line of orange extended onto the tail, and three small orange patches lateral and inferior to the cell.

Inferior surface; much as in male, except for a slight suffusion of orange medial to the submarginal white lunules of primaries, shading to yellow in the limbal area.

Thorax and abdomen as in *arota*.

We have examined *arota* from central and northern California, and compared Oberthur's figure of the type. A series of *virginiensis* from Virginia City, Nevada, have also been used in this comparison. *Nubila* shows much greater divergence from the typical insect than does *virginiensis*.

Types. Holotype ♂ Griffith Park, Los Angeles, California, July 2, 1922. Allotype ♀ same locality and date. The holotype and allotype figured on our Plate 51, figures 2 and 3. Paratypes, 21 ♂♂ 20 ♀♀ all from the above locality, June 7 to July 15, 1922. In the collection of the Southwest Museum. Paratypes will be placed in the Barnes collection, in the National Museum, and in the Canadian National collection at Ottawa, and in the collection of Jean Gunder, Pasadena.

We take this to be a dark southern race of *arota*, but it is more deserving of rank as a distinct species than is *virginiensis*.

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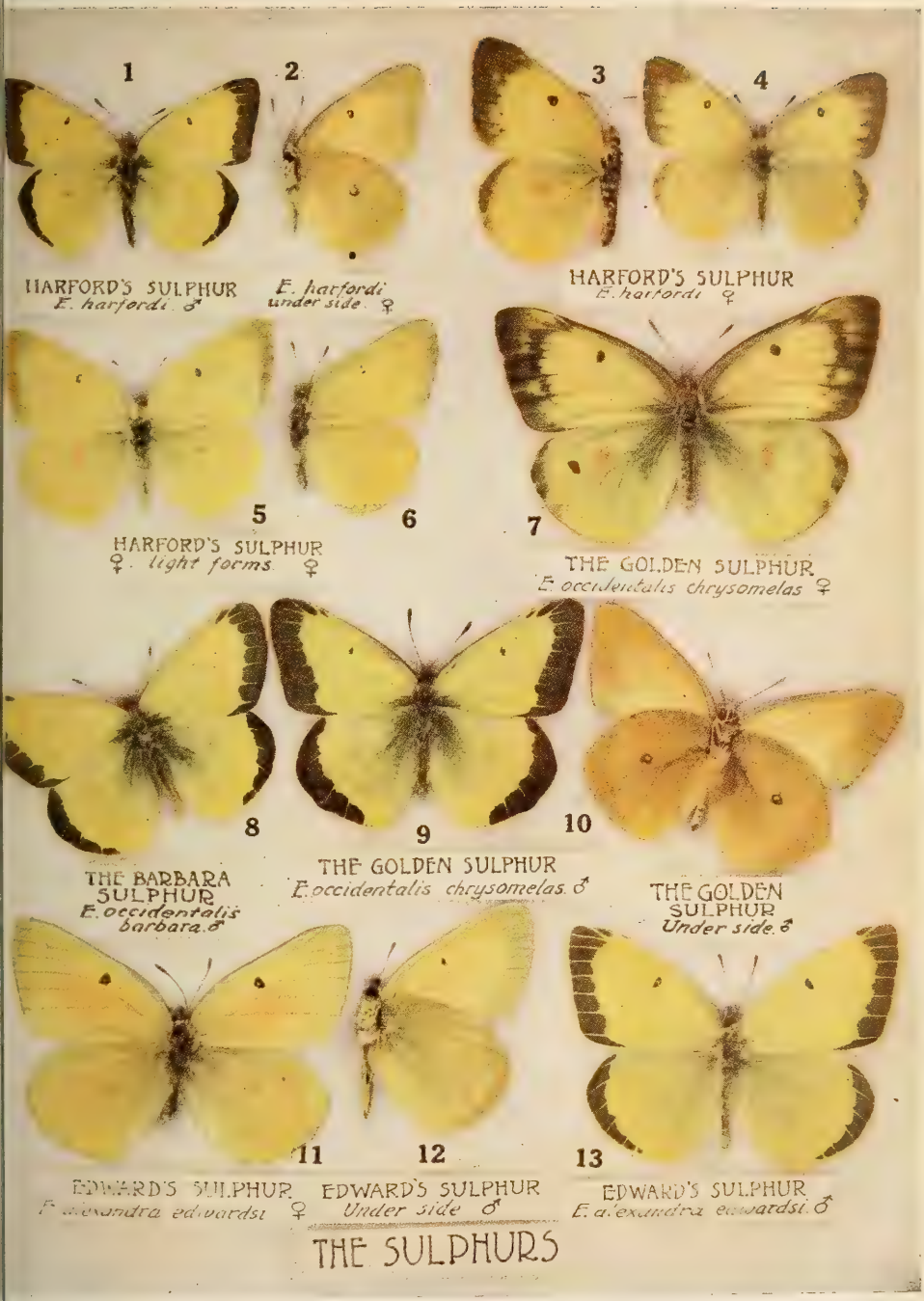


figures slightly reduced.

figures slightly reduced.

BOTANICAL SURVEY OF SOUTHERN CALIFORNIA IN RELATION TO THE STUDY OF ALLERGIC DISEASES.

— By —

GEORGE PINESS, M.D., HYMAN MILLER, M.D., H. E. McMINN, M.A.

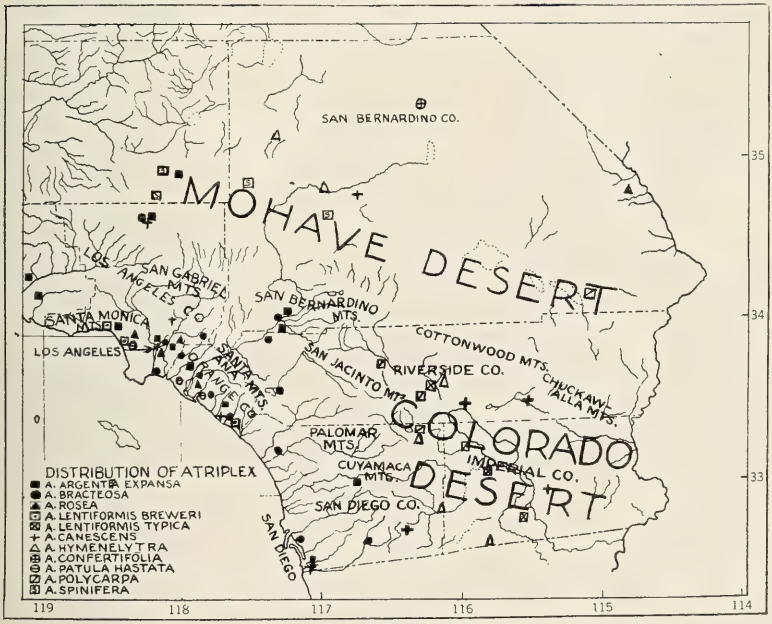
Los Angeles, California.

With the establishment of the etiologic relationship between plant pollens and the allergic diseases, such as asthma and hay-fever, the necessity for careful study of regional botany by the worker in this branch of medicine was soon realized. Thus it is that Scheppegrell, Hall, Sefridge, Watson and Kibler, Phillips, Mullin, Bernton, Stier, Templeton, Duke and Durham, and Kahn have published reports of botanical surveys of the particular regions in which they were interested and from which their patients were drawn.

That a botanical survey must be considered an essential requisite for the intelligent treatment of asthma and hay-fever is evident from the following considerations.

1. The identification of the plants which are wind-pollinated, in a particular district, is necessary in order to ascertain the proper correlation between skin reactions and the pollens with which the patient may come into contact.

2. The checking of the dates of pollination is necessary so that the date of initiation of treatment may be properly gauged.



MAP 1.

3. Information as to the relative abundance, size (Fig. 1.), duration and the yearly variation of the pollinating seasons, is necessary in order that those of relatively little importance may not be given too great weight in judging with which pollens one should treat. However, the final criteria for determining the species which cause hay-fever and asthma are the skin reactions obtained by testing with an extract prepared from the pollens together with the success obtained from such treatments.

It was with a view to obtaining information such as that outlined above that the present survey of southern California was undertaken. The survey consists of data collected within the last eight years while on extensive pollen collecting and special survey trips; from the herbaria of Pomona College at Claremont, California and the University of California at Berkeley; and a herbarium of about 175 species of wind-pollinated plants which has been prepared in the course of the work. These data include observations on the geographic and ecologic distribution, time of pollinating, abundance, size and character of the pollen, and other biological factors pertinent to the flora under consideration.

Since the geographic range, the nature of the soil, topography, and climate of a region determine the number and variety of species of plants within it, a brief summary of these factors is herein included.

By southern California (Map I) reference is made to that portion of the State lying south of the Tehachapi Mountains. This region includes the counties of Santa Barbara, Ventura, Los Angeles, Orange, San Diego, Imperial, Riverside, and San Bernardino. It lies between 32° 35′ and 35° north latitude and between the 114th and 119th meridian west. Its western boundary is the Pacific Ocean; its southern, Lower California; its eastern, the Colorado River, which separates it from Arizona; and its northern, a series of crossing mountain ranges extending from the Sierra Nevada to the Coast Ranges.

The topography of the region is very irregular, broken by many mountain ranges and separated by narrow passes or valleys of various sizes. The eastern part of the region is comprised of the arid desert wastes east of the San Bernardino and San Jacinto mountains. They consist for the most part of the Mojave and Colorado Deserts, separated by the Cottonwood and Chuckawalla Mountains. The western portion of the region is made up of the San Rafael, Santa Inez, Santa Monica, Santa Ana, Palomar, Cuyamaca, San Gabriel, San Jacinto, and San Bernardino Mountains and the intervening valleys. These, in a general way, extend parallel to the coast line. The coastal ranges arise from sea level or valley bottoms to altitudes reaching 4,000 feet. Some of the mountains of the central ranges reach altitudes of over 10,000 feet.

Many of the valleys of the western or coastal side of the mountains and foothills are very fertile and when water is abundant support a luxuriant vegetation. Several, however, are interspersed with low alkaline flats, gravelly mesas, and washes. The valleys on the eastern slopes are usually much drier and the flora, for the most part, is of the desert type. The coastal region, in several places consists of extensive alkaline marshes which support a saline type of vegetation.

The climate of southern California, although usually considered as rather uniform, is in fact quite diversified. As a general rule relatively scant rainfall and high temperature are characteristic, these features becoming more and more pronounced toward the central and eastern sections of the regions which are not reached by the

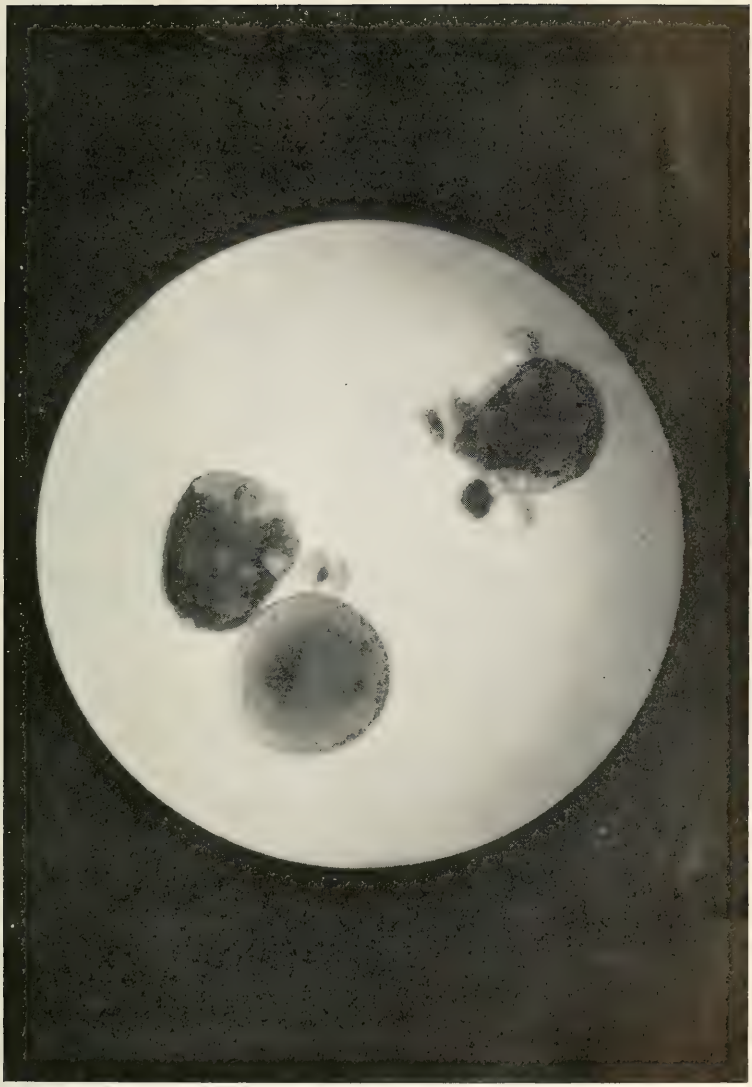


Fig. 1. Microphotograph of the pollen of corn (Zea mays) 125 microns in diameter and Bermuda Grass (Capriola dactylon) 25 microns in diameter emphasizing the non-importance of the former and the importance of the latter in the etiology of hay-fever by wind-blown pollens.

Fig. 2. Johnson Grass (Holcus halepensis)

cooling effect of the ocean breezes. Since the mountain ranges lie parallel to the coast line, their axis therefore, extend generally at right angles to the direction of the prevailing storm winds. As a result it is on these ranges, mainly during the winter and spring months, that the greatest rainfall in this region occurs. The average annual rainfall for the coastal and mountain regions ranges from ten (San Diego) to thirty inches (Cuyamaca), while some of the desert slopes and flats receive as little as two inches annually. During the summer and fall there is almost perpetual sunshine and during these seasons there is very little chance that rains will clear the atmosphere of the wind-blown pollens as is so frequently the case in the districts east of the Rocky Mountains.

There is also a great range in temperature. One may stand in Los Angeles or Pasadena in January, with the thermometer registering 60° F., and witness a terrific snowstorm on the mountains. Stations on the deserts, during July and August, register as high as 118° F.

In a region like the one herein limited, where topography is so varied and the climate likewise diverse, it is not surprising that there are about 350 species of native or naturalized plants in this district that may be considered as wind-pollinated. For the sake of convenience as well as from a practical viewpoint the species have been grouped under three divisions, these agreeing to some extent with the season of flowering. The first of these is comprised of spring pol-

Fig. 3. Carelessweed (Amaranthus palmeri)

linated trees and shrubs; the second of the grasses, sedges, and rushes; and the third of weeds. In the first group there are 63 native species comprised of Pines (11), Incense Cedar (1), Big Cone Spruce (1), Fir (1), Junipers (2), Cypress (1), Ephedras (4), Willows (9), Poplars (2), *Oaks* (13), *Alder* (1), *Walnuts* (2), *Sycamore* (1), Maples (3), Chinquapin (1) (summer), Ashes (4), Silk-tassel-bushes (4), Wax Myrtle (1), and Hackberry (1). The italicized species may be factors during their pollinating periods in the spring and early summer but the other species, either on account of their rarity, local distribution, distance from settled localities or from failure to produce skin reactions, are not considered as factors in this region. Various introduced species of trees are grown as ornamental and street trees and may be an occasional cause of hay-fever during the early spring.

The second group is made up of about 120 species of grasses and 50 species of sedges and rushes. None of the species of rushes (Juncus) and only two of sedges have given positive skin reactions, and members of these botanical groups have therefore not been included in this survey.

The 120 species of grasses represent 53 genera but many of the species are of such local and scattered distribution, or yield so little pollen, that they cannot, from a botanical viewpoint, be considered as important factors in causing hay-fever. The most important

Fig. 4. Allscale (Atriplex polycarpa)

grasses, based upon abundance, general distribution and amount of pollen produced are Bermuda Grass (Capriola), Brome Grasses (Bromus), Johnson Grass (Holcus) Fig. 2, Ray or Rye Grasses (Lolium), Melic Grass (Melica), Blue-grass (Poa), Canary Grasses (Phalaris), Stipa Grasses (Stipa), Wild Rye-grasses (Elymus), Koeler's Grass (Koeleria), Wild Oats (Avena), Barnyard Grass (Echinochloa) Red Top (Agrostis), and Fescue (Festuca).

The third group contains some of the most important hay-fever plants. This is due to the abundance of plants, their wide distribution, amount of light pollen produced, and long duration of their pollinating periods. Several of the weeds begin pollinating in spring and early summer and continue until late fall. About 96 species are included in this group, the most important ones being the Amaranths (Amaranthus) Fig. 3, Chenopods (Chenopodium), Franserias (including the False Ragweeds), Western Ragweed (Ambrosia psilostachya), Scale-bushes (Atriplex) Fig. 4, Russian Thistle (Salsola kali), Cockleburs (Xanthium), and Sagebrush (including the Sageworts-Artemisia) Fig. 5. The Mugwort (Artemisia vulgaris and sub-species), is perhaps the most frequent cause of the fall type of hay-fever. It is very common in low ground and hills of the entire central and western parts of the region. It pollinates profusely from July to the middle of September, often continuing until late October in some places. The pollen is very light and small, measuring 28 microns long, and

Fig. 5. Mugwort (Artemisia vulgaris)

19 microns wide. The genus Atriplex is another group which contains species of wide range (Map 1) producing abundant light pollen and must be considered a very important factor in the summer and fall type of hay-fever.

The accompanying chart shows the relative abundance, distribution, and pollinating periods of the most important hay-fever plants of southern California.

SUMMARY:

The very diversified topography including shorelines, inland alkaline valleys, deserts, mountains, fertile fields, and waste places render possible the existence of over 350 species of wind-pollinating plants in southern California.

Many of these species, on account of their restricted local distribution, distance from centers of population, amount and character of pollen, and abundance of plants are not important factors in causing hay-fever and asthma. All species, however, must be taken into consideration when studying individual cases.

Statistical studies of the results of treatment with the supposedly offending pollens show sufficient clinical results to warrant their inclusion amongst the therapeutic agents in hay-fever and asthma.

The data obtained in the survey as outlined above and tabulated in the Chart furnish the information necessary for their intelligent application to the clinical study of patients who give skin reactions to light, wind-blown pollens.

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THE MOST IMPORTANT HAY-FEVER PLANTS OF SOUTHERN CALIFORNIA

NAME

Names in Bold Face type are plants of most importance based upon range of distribution (see counties), abundance and amount of pollen and ease of shedding pollen.

* Most important hay-fever plants based upon skin reactions.

POLLINATING PERIODS

Each figure "1" represents one week. Bold Face figures represent time of greatest pollination.

DISTRIBUTION BY COUNTIES AND CITIES

Numbers indicate relative importance (scale 1-10 within a group, as III Grasses) based upon abundance of plants, proximity to centers of habitation and amount of free pollen.

GROUP I. TREES

Scientific Name	Common Name	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Los Angeles (Los Angeles, Pasadena, Long Beach, Pomona)	Orange (Fullerton, Anaheim, Santa Ana, Huntington Beach)	San Diego (San Diego, Escondido, La Jolla)	Imperial (Imperial, Brawley, Holtville, El Centro, Calexico)	Riverside (Riverside, Elsinore, San Jacinto)	San Bernardino (San Bernardino, Redlands)
Acer macrophyllum	Big-leaf Maple	....	....	111.	111.	....	....	....	....	....	....	....	3	1	1	..	1	1
Acer negundo	Box-Elder	....	.111	11..	....	....	....	....	....	....	....	....	Street	Street	..	..	1	1
Alnus rhombifolia	White Alder	..11	1111	11..	....	....	....	....	....	....	....	....	2	..	1	..	2	2
(Betula alba)	White Birch (Cultivated)	....	....	1111	1111	....	....	....	....	....	....	....	1	..	..	..	..	..
Castanopsis sempervirens	Bush Chinquapin (Shrub)	....	....	....	....	....	...1	1111	1...	....	....	....	1	..	1	..	2	2
(Celtis occidentalis)	Hackberry (Cultivated)	....	....	.111	11..	....	....	....	....	....	....	....	Street	..	..	..	..	..
*Juglans californica	California Black Walnut	....	....	..11	1111	111.	....	....	....	....	....	....	1	1	-	..	1	1
(Juglans regia)	**English Walnut** (Cultivated)	....	....	....	....	....	....	....	....	....	....	....	10	9	3	..	4	4
*Platanus racemosa	Western Sycamore	....	....	..11	1111	1...	....	....	....	....	....	....	5	5	1	..	1	1
*Populus fremontii	Fremont Cottonwood	....	..11	1111	....	....	....	....	....	....	....	....	1	1	..	1	..	-
***Quercus agrifolia**	**Coast Live Oak**	....	....	1111	1...	....	....	....	....	....	....	....	10	10	5	..	..	-
Quercus chrysolepis	Maul Oak	....	....	....	..11	1111	1...	....	....	....	....	....	6	4	4	..	3	4
Quercus dumosa	Scrub Oak (Shrub)	....	....	....	1111	11..	....	....	....	....	....	....	5	3	5	-	3	4
Quercus kelloggii	Black Oak	....	....	.111	1111	11..	....	....	....	....	....	....	3	..	1	..	3	3
Quercus wislizenii	Interior Live Oak	....	....	....	..11	1111	....	....	....	....	....	....	1	1	2	..	2	2

GROUP II. GRASSES

Scientific Name	Common Name	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Los Angeles Los Angeles Pasadena Long Beach Pomona	Orange Fullerton Anaheim Santa Ana Hunting-ton Beach	San Diego San Diego Escon-dido La Jolla	Imperial Imperial Brawley Holtville El Centro Calexico	Riverside Riverside Elsinore San Jacinto	San Bernardino San Bernardino Redlands
Achyrodes aureum	Golden Top	....	....	....	...1	1111	1...	....	....	....	....	....	1	1	1	..	1	1
*Agrostis palustrus	Red Top	....	....	....	....	...1	1111	1111	1111	....	....	....	1	1	1	..	1	1
Agrostis verticellata	Water Bent-grass	....	....	....	....	..11	1111	1111	....	....	....	....	1	1	1	..	1	1
Avena barbata	Barbed Oats	....	....	....	1111	11..	....	....	....	....	....	....	4	4	5	..	4	4
*Avena fatua	Wild Oats	....	....	....	1111	1111	1...	....	....	....	....	....	7	7	5	..	6	6
*Bromus carinatus	California Brome-grass	....	....	....	1111	1111	....	....	....	....	....	....	4	4	4	..	2	2
*Bromus hordeaceus	Soft Cheat	....	....	...1	1111	111.	....	....	....	....	....	....	3	3	3	..	2	2
Bromus marginatus	Large Mountain Brome-grass	....	....	....	.111	1111	1...	....	....	....	....	....	3	2	2	..	1	1
Bromus laevipes	Woodland Brome-grass	....	....	....	...1	1111	1111	....	....	....	....	....	4	4	2	..	1	1
Bromus rigidus	Broncho Grass	....	....	....	.111	1111	11..	....	....	....	....	....	7	7	6	1	5	5
Bromus rubens	Fox-tail Brome-grass	....	...1	1111	1111	11..	....	....	....	....	....	....	5	5	4	1	4	4
*Capriola dactylon	Bermuda Grass	....	....	....	.111	1111	1111	1111	1111	1111	1111	1...	10	10	9	10	9	9
*Dactylis glomerata	Orchard Grass	....	....	..11	1111	1111	1111	1111	1111	1111	1...	....	1	1	1	..	1	1
*Distichlis spicata	Salt Grass	....	....	....	..11	1111	1111	1111	1111	....	....	....	5	5	6	3	3	4
Echinochloa crus-galli	Barnyard Grass	....	....	....	....	....	1111	1111	1111	1111	1...	....	2	2	2	2	2	2
*Elymus condensatus	Giant Rye-grass	....	....	....	....	..11	1111	1111	11..	....	....	....	4	3	3	..	4	4
*Elymus glaucus	Western Rye-grass	....	....	....	..11	1111	11..	....	....	....	....	....	1	1	1	..	2	2
*Elymus triticoides	Alkali Rye-grass	....	....	....	....	1111	1111	111.	....	....	....	....	5	3	3	..	3	3
Festuca myuros	Rattail Fescue	....	....	...1	1111	1111	....	....	....	....	....	....	1	1	1	..	1	1
*Festuca otoflora	Fescue	....	....	....	1111	1111	11..	....	....	....	....	....	2	2	2	..	2	2
Holcus halapensis	Johnson Grass	....	....	....	....	...1	1111	1111	1111	1...	....	....	6	6	5	1	4	3
(Holcus halapensis sudanensis)	Sudan Grass (Cultivated)	....	....	....	....	....	1111	1111	1111	....	....	....	1	1	1	2	1	1
Koeleria cristata	Koeler's Grass	....	....	....	.111	1111	1111	....	....	....	....	....	4	4	3	..	2	2
*Lolium multiflorum	Italian Ray-grass	....	....	....	....	1111	1111	1111	....	....	....	....	4	4	3	..	3	3
*Lolium perenne	English Ray-grass	....	....	....	....	1111	1111	1111	1111	1111	11..	....	6	6	6	..	5	5
*Melica imperfecta	Melic Grass	....	....	1111	1111	111.	....	....	....	....	....	....	1	1	1	..	1	..
Notholcus lanatus	Velvet Grass	....	....	....	....	....	1111	1111	1111	111.	....	....	1	1	1	..	1	1
Phalaris lemmoni	Lemmon's Canary-grass	....	....	....	.111	1111	1...	....	....	....	....	....	2	2	2	..	1	1
*Phalaris minor	Mediterranean Canary-grass	....	....	..11	1111	1111	....	....	....	....	....	....	6	6	5	..	4	4
Phalaris paradoxa	Gnawed Canary grass	....	....	....	.111	1111	1...	....	....	....	....	....	1	1	1	..	..	..
*Poa annua	Annual Blue-grass	....	....	...1	1111	1111	1...	....	....	....	....	....	4	3	2	..	1	1
*Poa pratensis	Kentucky Blue-grass	....	....	....	...1	1111	1111	1111	1111	....	....	....	5	5	3	..	2	2
Polypogon monspeliensis	Annual Beard-grass	....	....	....	..11	1111	1111	1111	1...	....	....	....	1	1	1	1	1	1
Sitanion jubatum	Big Squirrel-tail	....	....	....	....	.111	1111	....	....	....	....	....	3	2	1	..	1	1
Stipa lepida	Small-flowered Stipa	....	....	...1	1111	1111	1...	....	....	....	....	....	2	2	2	..	1	1
Stipa pulchra	Nodding Stipa																	

GROUP III. WEEDS

Scientific Name	Common Name	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Angeles Los Angeles Pasadena Long Beach Pomona	Orange Fullerton Anaheim Santa Ana Hunting-ton Beach	Diego San Diego Escon-dido La Jolla	Imperial Imperial Brawley Holtville El Centro Calexico	Riverside Riverside Elsinore San Jacinto	Bernardino San Bernardino Redlands
*Amaranthus palmeri	Careless Weed	....	....	....	....	.111	1111	111.	....	....	....	....	..	..	..	10	..	..
*Amaranthus retroflexus	Rough Pigweed	....	....	....	...1	1111	1111	1111	1111	1111	1111	....	5	5	5	1	5	5
*Ambrosia psilostachya	Western Ragweed	....	....	....	....	....	...1	1111	1111	1111	....	....	6	6	6	..	4	4
*Artemisia californica	Coastal Sagebrush	....	....	....	....	....	..	....	..11	1111	11..	....	8	7	4	..	3	3
*Artemisia dracunculus	Dragon Sagewort	....	....	....	....	....	...1	1111	1111	1111	11..	....	2	2	2	..	3	2
*Artemisia tridentata and varieties	Sagebrush	....	....	....	....	....	....	....	...1	1111	1111	1...	1	..	1	..	1	1
Artemisia vulgaris and varieties	Mugwort	....	....	....	....	....	....	1111	1111	1111	1111	1...	10	9	8	1	8	8
*Atriplex argentea expansa	Silverscale	....	....	....	....	....	1111	1111	1...	....	....	....	5	2	2	..	1	1
*Atriplex bracteosa	Bractscale	....	....	....	....	...1	1111	1111	111.	....	....	....	6	4	3	..	1	1
Atriplex canescens	Wingscale	....	....	....	....	...1	1111	1111	1111	1...	....	....	1	1	2	1	1	1
Atriplex hymenelytra	Hollyscale	....	.111	1111	111.	....	....	....	....	....	....	....	..	..	1	1	1	1
*Atriplex lentiformis breweri	Lenscale	....	....	....	....	....	..11	1111	1111	1111	....	....	1	1	1	..	..	..
Atriplex lentiformis typica	Lenscale												..	..	..	5	1	1
Atriplex patula hastata	Spearscale	....	....	....	....	....	....	....	...1	1111	1111	....	2	2	1	..	..	..
*Atriplex polycarpa	Allscale	....	....	....	....	....	...1	1111	1111	1...	....	....	..	..	1	4	1	1
Atriplex rosea	Redscale Red Orache	....	....	....	....	....	...1	1111	1111	11..	....	....	6	3	2	..	1	1
Chenopodium album	Lambs Quarters	....	....	....	....	..11	1111	1111	1111	1111	1111	1...	6	5	6	1	4	4
Chenopodium ambrosoides	Mexican Tea	....	....	....	....	...1	1111	1111	1111	1111	111.	....	5	5	5	..	2	2
Chenopodium murale	Nettle-leaf Goosefoot		1	1111	1111	....	....	.111	1111	1111	....	....	7	6	6	..	5	5
Franseria bipinnatifida		....	....	....	....	1111	1111	1111	1111	1111	....	....	2	2	1	..	..	..
Franseria tenuifolia		....	....	....	....	....	....	....	....	1111	1111	1...	2	..	..	..	1	1
*Plantago lanceolata	English Plantain	....	....	....	..11	1111	1111	1111	1111	....	....	....	2	2	2	..	2	2
Rumex acetosella	Sheep Sorrel	....	....	....	1111	1111	1111	1111	1111	1...	....	....	3	3	3	..	3	3
*Salicornia ambigua	Pickleweed	....	....	....	....	....	1111	1111	1111	1111	1...	....	1	1	1	..	..	..
*Salsola kali var. tenuifolia	Russian Thistle	....	....	....	....	....	..11	1111	1111	1...	....	....	8	1	6	..	5	5
Suaeda californica	Sea Blite	....	....	....	....	..11	1111	1111	1111	1111	1...	....	1	1	1	..	..	..
Suaeda depressa erecta	Alkali Blite	....	....	....	....	....	....	...1	1111	1111	1111	....	1	1	1	..	1	1
Suaeda suffrutescens	Ink Bush	1111	1111	....	....	1111	1111	1111	1111	1111	....	....	..	.	1	4	..	..
Urtica gracilis var holosericea	Creek Nettle	....	....	....	....	....	....	1111	1111	111.	....	....	4	4	4	..	3	3
*Xanthium canadense	Cocklebur	....	....	....	....	1111	1111	1111	1111	1111	111.	....	6	6	4	..	4	3
Xanthium spinosum	Spiny Clotbur	....	....	....	....	....	1111	1111	1111	1111	1111	....	1	1	1	..	1	1

CEREUS MUNZII sp. nov.

S. B. PARISH

Stems oblong, 10-20 cm. long, growing in compact cushion-like clumps of 10-60; ribs 10-20, rather low, tuberculately irregular; spines in clusters of 10-16 subulate, unequal, the 1-4 centrals 2.5-5 cm. long, the others slenderer, 2-3 cm. long, all whitish, becoming ashy-gray; flowers campanulate, 3-4 cm. broad, cerese pink, the ovary and short tube bearing clusters of short, unequal, slender, white spines, their axils containing short, crisped white wool, as do those of the other spines; fruit rose-red, obovoid, 2.5 cm. high, crowned by the withered floral segments and densely covered with clusters of about 10 white, acicular spines, about 1 cm. long, readily deciduous, the white pulp containing numerous small rugose seeds, edible.

Growing on dry, stony slopes at the lower edge of the pine belt, at 1,400-2,000 m. altitude in the San Bernardino and the San Jacinto Mountains to northern Lower California. Type in the herbarium of the University of California, collected 2 miles below Kenworthy, Thomas Valley, Riverside County, alt. 1,400 m., May 21, 1922, Munz & Johnston 5570. Other collections are: Eastern end of Big Bear Valley, San Bernardino Mountains, alt. 2,000 m. June 13, 1922, P. A. Munz 5759; about 47 miles southeast of Tecate, Lower California, alt. 1,400 m. Munz 9612.

Of the subgenus Echinocereus and near *C. mojavensis* Engelm., from which it is distinguished chiefly by the color of the flowers, without intergrades. It occupies a distinct altitudinal and geographic range, the two species approaching one another on the east side of the San Bernardino Mountains, whence *C. mojavensis* extends to southern Nevada, and *C. munzii* in the opposite direction to Lower California.

STUDIES IN PACIFIC COAST LEPIDOPTERA

(Continued)

Dr. John Adams Comstock

A NEW ABERRANT BUTTERFLY FROM SOUTHERN CALIFORNIA.

In our series of **Glaucopsyche lygdamus behrii,** southern race **australis,** we find three specimens in which the line of spots on the secondaries has entirely disappeared. For this aberration we propose the name—

Glaucopsyche lygdamus behrii
race australis, ab. **sinepunctata** aberr. nov.

This corresponds, on the superior surface, to Grinnell's type of **australis** (comparison having been made with the type specimen which has been kindly loaned to us by Mr. Jean Gunder, for illustrating on our color plate 56.) The principal difference lies in the complete obliteration of the line of spots crossing the inner part of the limbal area on under side of secondaries, and also the entire absence of spots in the basal area. The wing is therefore immaculate except for a slight suggestion of a white line or dash near the outer edge of cell. There is a slight reduction of the spots crossing the under side of primaries.

The type is figured on our plate 56, to be subsequently published.

Type ♂ Mint Canyon, Los Angeles County, Calif., May 1st, 1921.

Paratype No. 1. ♂ Same locality, April 1920.

Paratype No. 2. ♂ Same locality, and date.

Type, and paratype No. 2, in the collection of the Southwest Museum. Paratype No. 1 to be deposited in the Barnes collection, Decatur, Ill.

NEW MOLLUSCAN SPECIES FROM THE CALIFORNIAN PLIOCENE

BY CARLTON M. CARSON

Stanford University

The types and paratypes of the forms described in this paper are in the Leland Stanford Junior University type collection.

The writer wishes to acknowledge his indebtedness to Dr. James Perrin Smith for his assistance and suggestions, to Mrs. Ida S. Oldroyd for help in identifying the living forms and to Mr. Leo G. Hertlein for his aid in the preparation of this paper.

The names of the species described in this paper have been used by the writer in a discussion of the Pliocene faunal zones of Southern California in a paper which was published in the Pan-Amer. Geol. Vol. 43, May 1925. The undescribed species listed there are all described in the present paper.

Descriptions of New Species

Cancellaria elodiae, n. sp.

Plate 1. Fig. 1.

Shell thick, ventricose, spire low, about five rapidly enlarging whorls, body chamber large, suture distinct but not channeled; body whorl sculptured with about twenty-four spiral ridges with wider interspaces; intercalaries rare; fine axial riblets present on upper three whorls but almost obsolete on the body chamber; inside of outer lip showing fine riblets, aperture semilunar, canal short, straight, open; pillar straight with two narrow but high plaits with narrow interspace, external siphonal fasciole present but not prominent. Height of type 64 mm., diameter of type 37 mm., apical angle 70°.

Type No. 109 in L. S. J. U. collection.

Fernando Formation, lower Pliocene of Fugler's Point, Santa Barbara Co., Calif. Collected by J. O. Lewis.

This species resembles *C. perrini* Carson but differs from it in having less prominent axial ribbing, no nodes, no shoulder, and slightly less prominent external siphonal fasciole. This species also resembles *C. palmeri* Carson but differs in being smaller, in having a more oval aperture, and in having a lower spire.

This species is associated with Janira, *Ostrea veatchii*, *Alectrion moranianus*, *Miopleionia oregonensis*, *Cryptoconus carpenterianus*, *Cardium meekanum* and *Paphia staleyi*.

Conus beali n. sp.

Plate 1. Fig. 2.

Shell medium thick, whorls five or more and slightly convex on the table, distinctly tabulate, spire high; body whorl slightly contracted below; sculpture consisting of faint, small, spirally revolving ridges at base of body whorl, becoming obsolete above. Height of type 64 mm., diameter of type 32 mm.

Type No. 115 in L. S. J. U. collection.

Fernando Formation, lower Pliocene of the Puente Hills, Orange Co., Calif. Locality N. W. ¼ Sec. 25, R. 2S 11W. of San Bernardino Meridian. R. N. Ferguson, collector.

In the Fernando beds of the Puente Hills are also found the following species:—*Astrea breaensis*, *Conus californica*. *Trochita radians*. *Chione elsmerensis*, *Chione fernandoensis*. *Panope generosa*. *Solen sicarius*. *Thracia trapezoides* and leaves and wood fragments referred to *Salix* and *Quercus* cf. *agrifolia*.

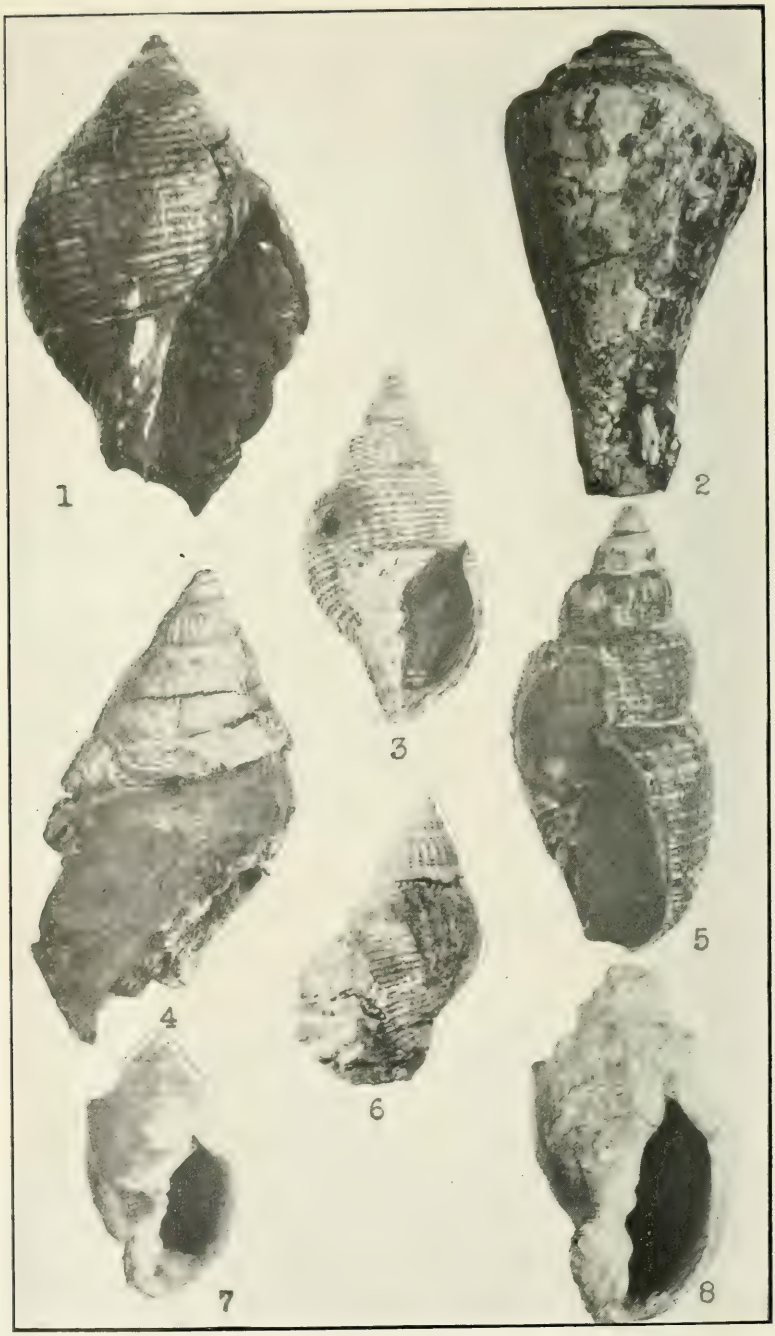

PLATE 1.

Cancellaria fugieri Arnold

Plate 1. Fig. 3.

Shell medium thick, narrowly oval in outline, with six regularly enlarging convex whorls and two nuclear whorls, whorls prominently angulated above forming a narrow revolving table anterior to the suture; suture distinct, channeled, apex small and sharp; sculpture reticulate, strong, composed of twenty-three narrow, rounded, spirally revolving ridges with wider interspaces each carrying one thread-like intercalary and thirty-six longitudinal ridges which grow weaker toward the base of the last whorl, aperture ovate, canal short and open, pillar straight, carrying two rather wide oblique plaits, callus very thin, the sculpture showing thru; external siphonal fasciole very weak. Height of type 48 mm., diameter of type 23 mm., apical angle 53°.

Pleisiotype No. 105, L. S. J. U. collection.

Fernando Formation, lower Pliocene of Fugler's Point, Santa Barbara Co., Calif. Collected by J. O. Lewis.

This species is obviously closely related to the recent *C. crawfordiana* Dall to which it was assigned by Dr. R. Arnold, but differs in the following respects:—this species has twenty-three revolving ridges; *C. crawfordiana* has seventeen only; this species has thirty-six longitudinal ridges; *C. crawfordiana* has but twenty which are much higher, wider and heavier; the adult *C. crawfordiana* has two major and two minor plications which are anterior to the major plaits on the pillar; this species shows but the two major plaits, the external siphonal fasciole of *C. crawfordiana* is much more prominent than that of this species. This form is therefore, raised to full specific rank and Arnold's varietal name used in the specific sense.

The following species are also found in this zone: *Alectrion californicus, Miopleionia oregonensis, Cardium meekanum, Ostrea veatchii, Janira, Gyrineum lewisii, Cancellaria rapa, Searlesia portolaensis* and *Venericardia californica.*

Cancellaria hamlini n. sp.

Plate 1. Figs. 4 and 6.

Shell thick, ventricose, spire high and sharp, whorls five or more; suture distinct almost channeled; sculptured with about twenty-six square-topped, spiral ridges with narrow, rather closely spaced interspaces, often carrying an intercalarie, axial sculpture becomes obsolete at base of body whorl; aperture, canal, pillar, etc. concealed on type but aperture on other specimens is ovate. Height of type 36 mm., diameter of type 20 mm., apical angle 59°. Height of adult 67 mm., diameter of adult 35 mm., apical angle 60°.

Type No. 110, L. S. J. U. collection.

Fernando Formation, lower Pliocene of Elsmere Canyon, Los Angeles Co., Calif. Collected by C. M. Carson. Named in memory of Homer Hamlin, who named the Fernando Formation.

This species resembles *C. rapa* Nomland, but can be distinguished from it by its higher and sharper spire, more rounded whorl, more deeply indented suture, and by the greater size of the adult.

Astrodapsis fernandoensis, Arca canalis, Ostrea veatchii, Pecten ashleyi, Pecten hemphilli, Pecten oweni, Astrea undosa, Cancellaria rapa, Conus beali, Ficus nodiferus, Thyasira bisecta and *Panope generosa* are common associates of *Cancellaria hamlini.*

Cancellaria oldroydia n. sp.

Plate 1. Fig. 5.

Shell thin, with five or six regularly enlarging whorls, suture distinct, deeply channeled making a narrow revolving table on the top of the whorl, whorls flattened slightly laterally, apex missing;

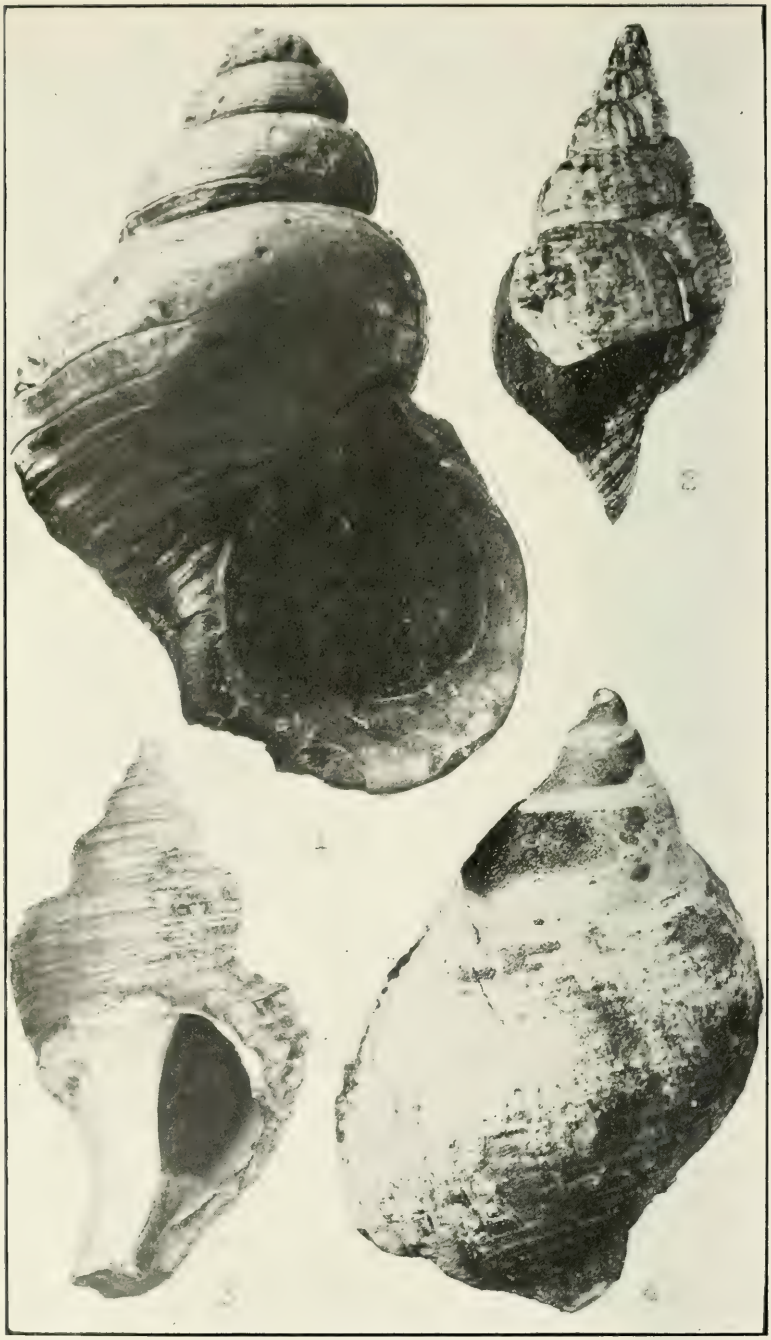

PLATE 2.

sculpture strong, composed of about eighteen spiral flat-topped ridges with wider interspaces which on the last whorl carry intercalaries; crossed by weaker axial riblets which become almost obsolete at the base; aperture ovate, outer lip slightly flaring at base, external siphonal fasciole broken. Height of type 60 mm., diameter 30 mm., apical angle 45°.

Type No. 104, L. S. J. U. collection.

Purisima Formation, lower Pliocene, collected near mouth of Purisima Creek, San Mateo Co., Calif.

This species obviously belongs to the group of the living *C. crawfordiana* Dall, but differs from it in its larger size, coarser sculpture, tabulated whorl, and much more prominent external siphonal fasciole. Named in honor of Mrs. Ida S. Oldroyd.

Associated with this species in the Purisima beds are the following:—*Cardium meekanum*, *Marcia oregonensis*, *Mya truncata*, *Pecten purisimaensis*, *Schizothoerus pajaroanus*, *Spisula albaria*, *Zirphea gabbi*, *Chrysodomus imperialis*, *Chrysodomus tabulatus*, *Alectrion moranianus*, *Dendraster interlineatus*, *Chione elsmerensis*, *Dosinia ponderosa*, *Pecten oweni* and *Dendraster ashleyi*.

Cancellaria fergusoni n. sp.

Plate 1. Figs. 7 and 8.

Shell rather thin, spire low, whorls three, the upper two or three whorls being missing, suture distinct, whorls shouldered, slightly tabulate, and strongly nodose at the angle of the shoulder; sculptured with about ten fine revolving ridges, interspaces wide, carrying three finer intercalaries, sculpture above the shoulder finer than below; axial ribs present but not prominent, and almost obsolete on body whorl, incremental lines distinct on body chamber; aperture ovate, inside of outer lip shows a slight tendency to have spiral ridges, pillar nearly straight carrying two, low, narrow, widely-spaced plaits, callus thin, external siphonal fasciole very prominent, canal short and open. Height of type 47 mm., diameter of type 25 mm., apical angle 76°.

Type No. 106, L. S. J. U. collection.

Upper Pliocene of Barlow's Ranch, Ventura Co., Calif. Collected by R. Arnold. Also from the Fernando lower Pliocene of Fugler's Point, Santa Barbara Co., Calif. Collected by J. O. Lewis.

This species resembles *C. sanctae-mariae* Carson but differs in being nodose, in being more sharply shouldered, and in having a more prominent external siphonal fasciole.

Cancellaria fergusoni is associated with the following forms in the upper Pliocene:—*Cancellaria tritonidea*, *Forreria belcheri*, *Drillia inermis*, *Dendraster excentricus*, *Macoma nasuta*, *Alectrion perpinguis*, *A. fossatus*, *Olivella biplicata*, *Pecten circularis*, *Saxidomus aratus*, *Terebra simplex*, *Turritella cooperi*, *Crepidula princeps*, and *Dentalium hexagonum*.

Gyrineum lewisii, n. sp.

Plate 2. Figs. 1 and 2.

Shell bucciniform, spire high, apex broken, five whorls present, suture deeply impressed, shoulder below suture narrow, whorls rounded; varices prominent; body whorl marked by about nine rounded grooves which at base of body chamber are found on top of wide, raised, rounded, ridges with narrow interspaces, longitudinal ribs lacking except on upper whorls; aperture oval, equal in height to between 1/3 and 1/2 the estimated height of shell if complete; outer lip slightly flaring at base, pillar straight, callus thick, canal missing but on other specimens, short, narrow and curved. Height of type 115 mm., diameter of type 65 mm., mouth opening height 50 mm., width 39 mm.

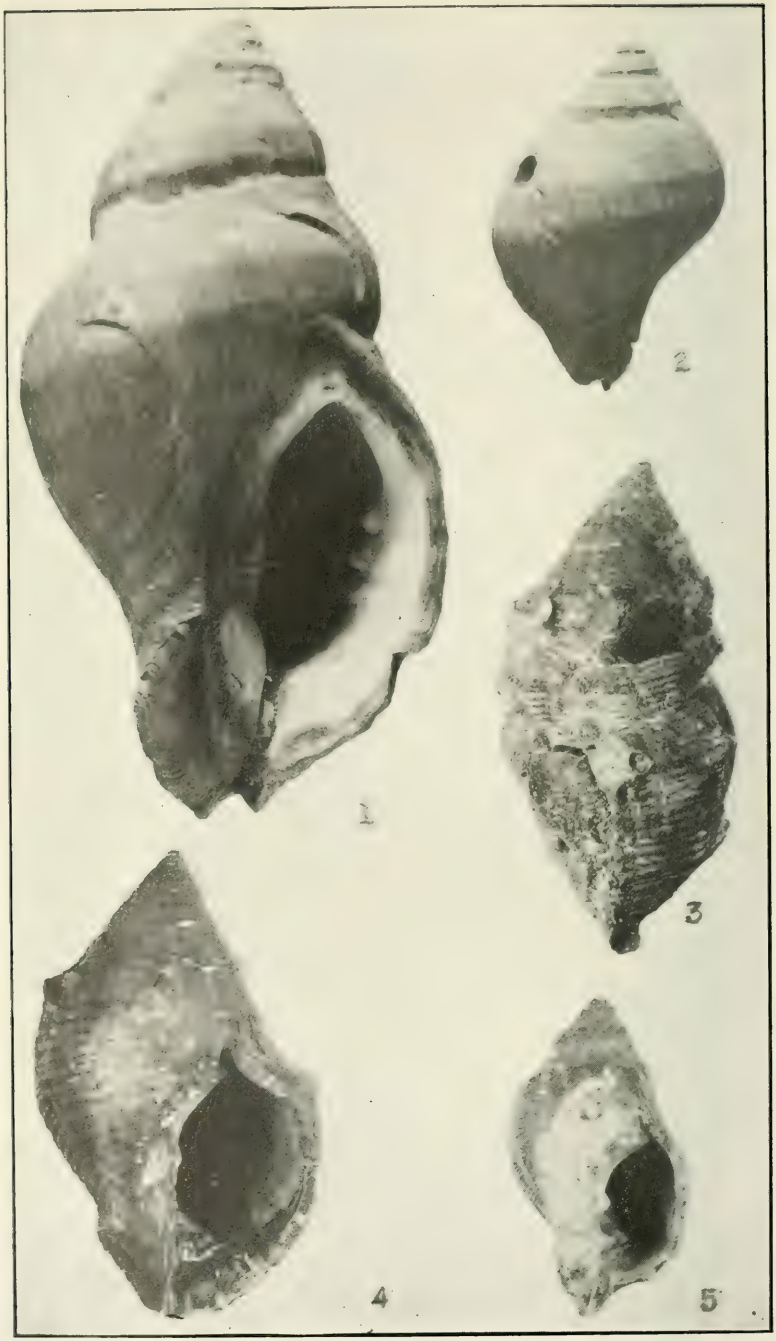

PLATE 3.

Type No. 114, L. S. J. U. collection.

From the Fernando, lower Pliocene of Fugler's Point, Santa Maria District, Santa Barbara Co., Calif. Collected by J. O. Lewis.

This species resembles *Gyrineum marshalli* Reagan but differs in its greater size, in having a narrow table anterior to the suture, in having many less and much coarser revolving lines, and in having a notch at the top of the aperture.

Following are some of the species occuring with this form:—*Dosinia ponderosa*, *Crepidula princeps*, *Cardium meekanum*, *Janira*, *Glycimeris coalingoensis*, *Ostera veatchii*, *Panomya ampla*, *Alectrion moranianus*, and *Miopleionia oregonensis*.

Chrysodomus hawleyi n. sp.

Plate 2. Fig. 3.

Shell thick, large, fusiform, spire high, whorls six in number, most of last whorl and upper one or two missing; suture distinct, appressed; whorl tabulate above, shoulder sloping; shell is ornamented with twelve or more strong, rounded, equally spaced, spiral ribs; interspace wide with one fairly strong spiral rib which in almost every case has a small thread-like rib on each side of it; aperture oval but contracted at base, outer lip smooth inside, inner lip smooth, incrusted; canal narrow, probably long and recurved. Height of type 75 mm., diameter of type 40 mm.

Type No. 113. L. S. J. U. collection.

From the upper Pliocene four miles west of Santa Barbara, Calif., collected by W. A. Hawley. Also from the upper Pliocene of San Pedro, Calif., collected by D. Arnold.

This species resembles *C. tabulatus* Broderip but differs in having very much heavier spiral sculpture, much thicker shell, probably two or three times as thick, in being lower spired, and in having the table on the whorl sloping outward instead of inward.

Some of the common associates follow:—*Tritonofusus rectirostris*, *Chrysodomus tabulatus*, *Cantharus fortis*, *Panope generosa*, *Pecten caurinus*, *Pecten bellus*, *Janira*, *Thracia trapezoidea*, *Turris smithi*, and *Turritella jewetti*.

Cancellaria palmeri n. sp.

Plate 2. Fig. 4.

Shell thick, ventricose, with five or six rapidly enlarging whorls, suture marked by a distinct line, slightly appressed, sculpture consisting of about twenty-two nearly square spiral ridges on the body whorl, between a few of which are intercalaries; axial riblets are apparently lacking but the growth lines are distinct; aperture ovate, slightly flaring at base, inner lip and pillar concealed. Height of type 85 mm., diameter of type 58 mm., apical angle 62°.

Type No. 107. L. S. J. U. collection.

Purisima Formation, lower Pliocene. Found in bluffs above beach east of hotel, Capitola, Santa Cruz Co., Calif. Collected by R. H. Palmer, for whom it is named.

This species resembles *C. rapa* Nomland, but differs from it in its much greater size and more ovate aperture.

The following forms are associated with this species in the Purisima beds:—*Marcia oregonensis*, *Panomya ampla*, *Spisula albaria*, *Chrysodomus liratus*, *Chrysodomus tabulatus*, *Alectrion moranianus*, *Natica clausa*, *Dendraster interlineatus*, *Arca canalis*, *Pecten etchegoini*, *Pecten oweni*, *Dendraster ashleyi* and *Dendraster perrini*.

Thais (Nucella) shumanensis n. sp.

Plate 3. Figs. 1 and 2.

Shell thick, spire high, whorls six, nucleus missing, suture distinct, appressed; whorls well rounded; sculpture nearly obsolete, consisting of faint, low, rounded, revolving ridges crossed by incremental lines, shell on the whole very smooth; aperture oval, outer lip slightly reflected, inside of outer lip carrying three teeth closely spaced with a fourth near the posterior end of the canal, pillar straight, callus moderately heavy, umbilicus false, external siphonal fasciole very heavy, canal short, deep, and recurved. Height of type 107 mm., diameter of type 50 mm., length of aperture 55 mm., diameter of aperature 31 mm.

Type No. 112. L. S. J. U. collection.

Fernando Formation lower Pliocene, ½ mile N. of Schuman in railroad cut, Santa Maria District, Santa Barbara Co., Calif. Collected by R. E. Collom.

This species resembles *Thais lamellosa* Gmelin, but differs from it in its much greater size. *Thais schumanensis* Carson is probably a predecessor of *Thais lamellosa* Gmelin.

Associated with this *Thais* at the Schuman locality are:—*Arca trilineata, Fusus sanctaecrusis, Glycimeris coalingensis, Ostrea veatchii, Pecten estrellanus?, Pecten healeyi, Pecten stearnsii, Trochita radians* and *Venericardia californica.*

Cancellaria newhallensis n. sp.

Plate 3. Fig. 3.

Shell thick, spire high, whorls five or more, body whorl large, suture distinct, last two whorls have a row of strong nodes just below the suture which give a tabulate appearance to the whorls; sculptured with about twenty-eight spiral ridges, interspace wide but occupied by a ridge almost as strong as the main ridges; the nodes are formed on the axial ribs which are not especially strong; aperture ovate, pillar nearly straight, carrying two strong, heavy plications, canal narrow, external siphonal fasciole fairly prominent. Height of type 66 mm., diameter of type 38 mm., apical angle 65°.

Type No. 108. L. S. J. U. collection.

Fernando Formation, lower Pliocene of Elsmere Canyon, Los Angeles Co., Calif., collected by C. M. Carson.

This species can be easily distinguished from *Cancellaria hamlini* Carson by the presence of the nodes on the two latest whorls.

With this species are found the following:—*Ficus pyriformis, Cypraea fernandoensis, Murex eldridgei, Astrea breaensis, Pecten oweni, Panope generosa, Thyasira bisecta, Arca grandis, Arca trilineata* and *Cancellaria rapa.*

Cancellaria perrini n. sp.

Plate 3. Fig. 4.

Shell thick, ventricose, whorls five and a nucleus, suture distinct forming a collar but not channeled; whorls full but not rounded except the last; apex small and sharp; sculpture consisting of about twenty-three spiral ridges, and heavy axial ribs which on the last whorl form a row of nodes, axial ribs become weaker below the nodes, spiral ridges somewhat rounded, interspaces narrow and carry intercalaries in but few cases; aperture ovate, canal short, straight, open; pillar straight with the usual pair of plaits, callus thin, external siphonal fasciole prominent. Height of type 62 mm., diameter of type 39 mm., apical angle 70°.

Type No. 102. L. S. J. U. collection.

Fernando Formation, lower Pliocene of Fugler's Point, Santa Barbara Co., Calif. Collected by J. O. Lewis. Also from the Fernando of Elsmere Canyon, Los Angeles County, Calif. Collected by C. M. Carson.

Named for Dr. James Perrin Smith. This species resembles *C. elodiae* Carson but differs from it in having much more prominent axial ribbing and a row of nodes on the last whorl.

This species is associated with *Arca trilineata, Pecten stearnsii, Pecten lawsoni, Alectrion moranianus Bathytoma carpenteriana, Glycimeris coalingensis*, and *Miopleionia oregonensis.*

The Elsmere Canyon specimens show some variation from the type specimen but it was not considered specific.

Cancellaria sanctae-mariae n. sp.

Plate 3. Fig. 5.

Shell moderately thin, spire high and sharp, five rapidly enlarging whorls, distinctly shouldered and slightly tabulate; suture distinct, appressed, sculptured with ten narrow, squarish, spiral ribs, interspaces wide and carrying three thread-like intercalaries, axial sculpture obsolete except on upper whorls, which are slightly nodose on the shoulder; aperture ovate, pillar straight carrying two high, narrow, widely spaced plaits, outer lip smooth within, canal short, open, straight, external siphonal fasciole almost lacking. Height of type 43 mm., diameter of type 23 mm., apical angle 62°.

Type No. 101. L. S. J. U. collection.

Fugler's Point, Santa Maria District, Santa Barbara Co., Calif. Fernando Formation, lower Pliocene. Collected by J. O. Lewis.

This species resembles *C. fergusoni* Carson but differs from it in being less sharply shouldered and much less nodose on the shoulder.

This species is found with the following:—*Pecten healeyi, Pecten hemphilli, Phacoides annulatus, Cancellaria rapa, Gyrineum lewisii, Alectrion moranianus, Ostrea veatchii, Paphia staleyi* and *Dendraster ashleyi*

Thais (Nucella) collomi n. sp.

Plate 4. Figs. 1 and 2.

Shell thick, solid, with six rapidly enlarging whorls; nucleus missing; suture distinct, whorls evenly rounded; sculpture consisting of about thirty small rounded revolving ridges with narrower interspaces, crossed by rather prominent growth lines which on crossing the revolving ridges flare outward from the shell giving a peculiar rough escalloped appearance to the surface of the shell; aperture anteriorly contracted; outer lip much thickened and slightly reflected with two teeth within; pillar long and concavely arcuate, moderately callous, and slightly flattened; canal short, deeply indented and somewhat recurved. Height of type 122 mm., diameter of type 80 mm., height of aperture 60 mm., diameter of aperture 35 mm.

Type No. 111. L. S. J. U. collection.

Fernando Formation lower Pliocene, ½ mile N. of Schuman in R. R. cut, Santa Maria District, Santa Barbara Co., Calif. Named for R. E. Collom, the collector.

At this same locality are found *Crepidula princeps, Cardium quadrigenarium* var. *fernandoensis, Chrysodomus* sp., *Pododesmus macroschisma, Natica lewisii, Olivella intorta, Panope generosa, Pecten ashleyi, Pecten coalingensis?, P. estrellanus?, P. hastatus*, and Barnacles.

Astrea breaensis n. sp.

Plate 4. Figs 3 and 4.

Shell small, conical, spire low, whorls about four; whorls sloping above, rounded on the sides and base, suture distinct, appressed; sculpture consisting of prominent rounded oblique ridges, about twenty

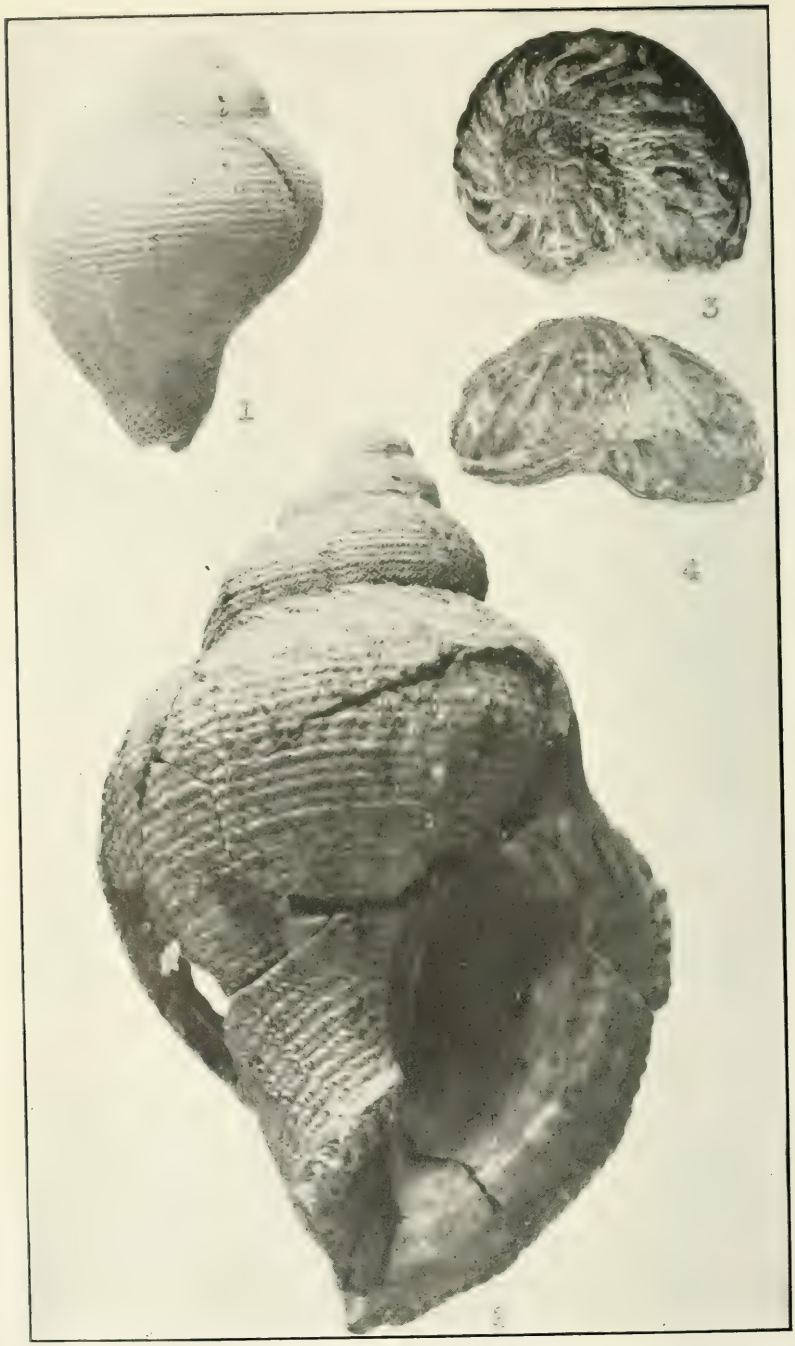

PLATE 4.

on body whorl, with narrow interspaces, extending from the side of the whorl to the suture above; base of body whorl marked by four heavy, rounded, spiral ridges with narower interspaces; aperture of moderate size, subcircular, outer lip simple, inner lip slightly thickened, umbilicus false. Height of type 22 mm., maximum diameter of type 41 mm., minimum diameter of type 35 mm.

Type No. 116. L. S. J. U. collection.

Fernando Formation, lower Pliocene, at mouth of Brea Canyon, Puente Hills, Orange Co., Calif. Collected by C. M. Carson.

At this same locality are also found leaves referred to *Salix* and *Quercus* cf. *agrifolia*, *Conus californica*, *Trochita radians*, *Chione fernandoensis*, *Panope generosa*, *Thracia undulata*, *Thracia trapezoides* and *Solen sicarius*.

EXPLANATION OF PLATE I.

Page

Fig. 1. *Cancellaria elodiae* n. sp. 50
Locality—Fugler's Point, Santa Maria District, Santa Barbara Co., Calif. Lower Pliocene, Natural size. True height of figured specimen 64 mm. L. S. J. U. collections.

Fig. 2 *Conus beali* n. sp. 50
Locality—Puente Hills, Orange Co., Calif. Lower Pliocene. Natural size. True height of figured specimen 64 mm. L. S. J. U. collections.

Fig. 3. *Cancellaria fugleri* Arnold 50
Locality—Fugler's Point, Santa Maria District, Santa Barbara Co., Calif. Lower Pliocene. Natural size. True height of figured specimen 48 mm. L. S. J. U. collections.

Fig. 4. *Cancellaria hamlini* n. sp. 50
Adult. Locality—Elsmere Canyon, Los Angeles Co., Calif. Lower Pliocene. Natural size. True height of figured specimen 67 mm. L. S. J. U. collections.

Fig. 5. *Cancellaria oldroydia* n. sp. 50
Locality—Near mouth of Purisima Creek, San Mateo Co., Calif. Lower Pliocene. Natural size. True height of figured specimen 60 mm. L. S. J. U. collections.

Fig. 6. *Cancellaria hamlini* n. sp. 50
Young. Locality—Elsmere Canyon, Los Angeles Co., Calif. Lower Pliocene. Natural size. True height of figured specimen 36 mm. L. S. J. U. collections.

Fig. 7. *Cancellaria fergusoni* n. sp. 50
Locality—Fugler's Point, Santa Maria District, Santa Barbara Co., Calif. Lower Pliocene. Natural size. True height of figured specimen 37 mm. L. S. J. U. collections.

Fig. 8. *Cancellaria fergusoni* n. sp. 50
Locality—Barlow's Ranch, Ventura Co., Calif. Upper Pliocene. Natural size. True height of figured specimen 47 mm. L. S. J. U. collections.

(Photographs by Crandall of Palo Alto)

EXPLANATION OF PLATE II.

Page

Fig. 1. *Gyrineum lewisii* n. sp. 52
Adult. Locality—Fugler's Point, Santa Maria District, Santa Barbara Co., Calif. Lower Pliocene. Natural size. True height of figured specimen 115 mm. L. S. J. U. collections.

Fig. 2. *Gyrineum lewisii* n. sp. 52
Young. Locality—Same as Fig. 1. Natural size. True height of figured specimen 63 mm. L. S. J. U. collections.

Fig. 3. *Chrysodomus hawleyi* n. sp. 52
Locality—4 mi. west of Santa Barbara, Calif. Upper Pliocene. Natural size. True height of figured specimen 75 mm. L. S. J. U. collections.

Fig. 4. *Cancellaria palmeri* n. sp. 52
Locality—Bluffs east of hotel, Capitola, Santa Cruz Co., Calif. Lower Pliocene. Natural size. True height of figured specimen 85 mm. L. S. J. U. collections.
(Photographs by Crandall of Palo Alto)

EXPLANATION OF PLATE III.

Page

Fig. 1. *Thais* (*Nucella*) *schumanensis* n. sp. 54
Adult. Locality—½ mile north of Schuman in R. R. cut. Santa Maria District, Santa Barbara Co., Calif. Lower Pliocene. Natural size. True height of figured specimen 107 mm. L. S. J. U. collections.

Fig. 2. *Thais* (*Nucella*) *schumanensis* n. sp. 54
Young. Locality—same as Fig. 1. Natural size. True height of figured specimen 46 mm. L. S. J. U. collections.

Fig. 3. *Cancellaria newhallensis* n. sp. 54
Locality—Elsmere Canyon, Los Angeles Co., Calif. Lower Pliocene. Natural size. True height of figured specimen 66 mm. L. S. J. U. collections.

Fig. 4. *Cancellaria perrini* n. sp. 54
Locality—Fugler's Point, Santa Maria District, Santa Barbara Co., Calif. Lower Pliocene. Natural size. True height of figured specimen 62 mm. L. S. J. U. collections.

Fig. 5. *Cancellaria sanctae-mariae* n. sp. 54
Locality—Fugler's Point, Santa Maria District, Santa Barbara Co., Calif. Lower Pliocene. Natural size. True height of figured specimen 43 mm. L. S. J. U. collections.
(Photographs by Crandall of Palo Alto)

EXPLANATION OF PLATE IV.

Page

Fig. 1. *Thais* (*Nucella*) *collomi* n. sp. 58
Young. Locality—½ mile north of Schuman in R. R. cut. Santa Maria District, Santa Barbara Co., Calif. Lower Pliocene. Natural size. True height of figured specimen 57 mm. L. S. J. U. collections.

Fig. 2. *Thais* (*Nucella*) *collomi* n. sp. 58
Adult. Locality—same as Fig. 1. Natural size. True height of figured specimen 122 mm. L. S. J. U. collections.

Fig. 3. *Astrea breaensis* n. sp. 58
Locality—Mouth of Brea Canyon, Puente Hills. Orange Co., Calif. Lower Pliocene. Natural size. True height of figured specimen 22 mm. L. S. J. U. collections.

Fig. 4. *Astrea breaensis* n. sp. 58
Locality—same as Fig. 3. Natural size. True height of figured specimen 22 mm. L. S. J. U. collections.
(Photographs by Crandall of Palo Alto)

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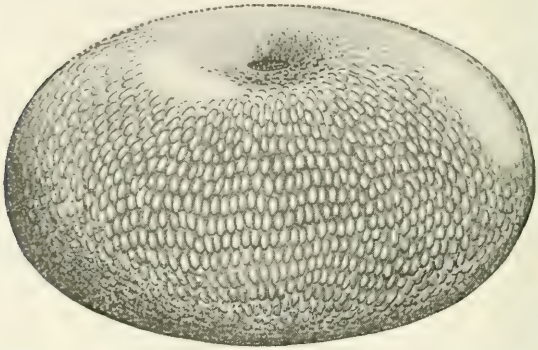


Egg of Parnassius smintheus, highly magnified.

FIGURE 6.

Larva of Parnassius smintheus, enlarged. After Edwards.

FIGURE 7.

BUTTERFLIES OF CALIFORNIA

(Continued)

Dr. John Adams Comstock

Genus **EURYMUS** Swains

THE SULPHURS

The Golden Sulphur (*Eurymus occidentalis chrysomelas* Hy. Edw.) is one of our rarer forms, limited in range to the northern counties, where it is occasionally encountered in the months of May, June and July. A southern race was separated by Henry Edwards, which is smaller and has narrow margins, and which was named for the type locality, Santa Barbara. This form, The **Barbara Sulphur** (*E. occidentalis barbara* Hy. Edw.) has been confused with **Harford's Sulphur** by the majority of California collectors, probably as a result of Wright's figures * which show specimens of *E. harfordi* as *barbara*. Our plate 15 pictures the Golden Sulphur, figures 7, 9 and 10, and the Barbara Sulphur, figure 8. The latter specimen is the one which was figured by Drs. Barnes and McDunnough in their Contributions, Volume 3, Plate VII, figure 9. It was loaned to us for this plate through the courtesy of Dr. William Barnes. Foodplant: probably various species of the *Fabaceae* (Bean family).

Harford's Sulphur (*E. harfordii* Hy. Edw.) is common in the mountains of Southern California, and is taken with increasing rarity as it approaches the northern limit of its range in Contra Costa and adjacent counties. It is a mid-summer species. The larvae have been reared on rattleweed (*Astragalus.*)

Illustrated on Plate 15, figures 1 to 4.

Egg of Eurymus harfordii, greatly magnified.

FIGURE 8.

Egg of Eurema nicippe, greatly magnified.

FIGURE 9.

Edward's Sulphur (*E. alexandra edwardsii* Edw.) is a western race of the **Alexandra Sulphur,** occuring in the Mono basin, and the high desert plateaus east of the Sierra Nevadas, and the desert lands to the north. It is comparatively rare.

The caterpillar probably feeds on such leguminous plants as *Astragalus, Thermopsis,* and other members of the bean family.

Illustrated on Plate 15, figures 11, 12 and 13.

Behr's Sulphur (*E. behrii* Edw.) was at one time considered our rarest species of the group on account of its restricted range, comparative isolation and short season. To secure it, one must scale our

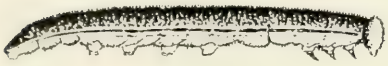
* Butterflies of the West Coast, Plate X, figure 85. W. G. Wright.

noble Sierras in mid-summer and seek the glacial flower-strewn meadows. In sunny days of late July it fairly swarms in favored localities above Yosemite. Mineral King seems to be about its southern limit.

The larvae feed on the dwarf billberry (*Vaccinium caespitosum*) and *Gentian newberryi*.

Illustrated on Plate 16, figures 1 to 3.

The females occur in two forms, a dull yellow and a whitish, both of which are heavily obscured with the characteristic green. To the latter form the author has given the name *canescens*. It is shown on figure 4 of Plate 16.



Larva of Eurymus harfordii, enlarged.

FIGURE 10.

Chrysalis of Eurymus harfordii, enlarged.

FIGURE 11.

Genus **EUREMA** Hbn.

The Mexican Yellow (*Eurema mexicana* Bdv.) is an occasional capture in the southern counties of the state. It is evidently double brooded, as records are available for the spring and fall months. More commonly it is reported from lowland desert areas, but an occasional specimen finds its way into the mountainous districts.

Little is known of its metamorphosis, but the larval food-plant is probably *Cassia*.

Illustrated. Plate 16. ♂ fig. 5; ♀ fig. 7; ♂ underside, fig. 6.

The Nicippe Yellow (*Eurema nicippe* Cram.) is our most abundant member of the genus in Southern California, due to the frequent use of introduced *Cassias* as ornamental garden shrubs. Santa Barbara is about the northern limit of its range. The species breeds continuously throughout the year, the first generation appearing in April or May, and the insect becoming increasingly plentiful as the season advances, until the first cold spell of our short winter puts it 'out of the running.'

Early stages. Egg: elongate, conical, tapering at both ends, and ribbed with low longitudinal lines. There are a few transverse striations at the upper end only. Color, yellow. The eggs are, as a rule, laid singly on the under surfaces of tender leaves, but occasionally one is deposited on the upper surface. (See Figure 9.)

Caterpillar: velvety-green, with a fine whitish-yellow stripe laterally placed.

Chrysalis. This is illustrated in our cut (figure 14) which renders a description unnecessary. The color is an olive-green, with occasionally a few russet spots.

Larval foodplants; *Cassia* and other Leguminosae.

Illustrated. Plate 16. ♂ fig. 8; ♀ fig. 10; ♂ underside, fig. 9; dwarf ♀ fig. 15.

Larva of Papilio eurymedon.

FIGURE 12.

Chrysalis of Papilio eurymedon, slightly enlarged.

FIGURE 13.

The Little Sulphur (*Eurema lisa* Bdv. & Lec.) synonym *euterpe* Men. has been listed for California by one of the early collectors, but later work over a period of many years has failed to substantiate the record. It is comparatively common in Southern Arizona, and there seems to be no reason why it should not become established in this state, in view of favorable climatic conditions and an abundance of foodplant. The larvae feed on *Cassia* and clover.

Early stages. These were figured by Boisduval, but a careful recording of each stage in the metamorphosis remains to be done.

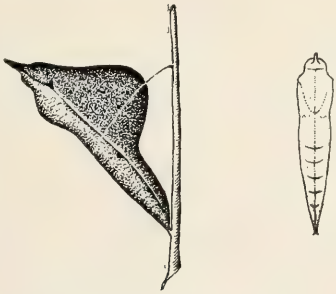
Illustrated. Plate 16. ♂ fig. 11; ♀ fig. 13; ♂ underside, fig. 12.

The Delia Sulphur (*Eurema demoditas* Hbn.) synonym *delia* Cram. is another species recorded for the state in the early days, and of which no confirmation has since been made. It is normally an inhabitant of the Gulf states. The early stages are probably similar to those of *lisa*.

Illustrated. Plate 16. ♀ fig. 14; ♂ underside, fig. 16.

Few illustrations of the early stages of California butterflies are available to nature students. This phase of the subject offers a fascinating field of research for the western lepidopterist. The complete metamorphoses of a large number of native species is entirely unknown, in spite of the ready availability of material for study. Collectors are urged to gather the eggs and caterpillars of every species that it is possible for them to secure, and to record their findings. The author will gladly cooperate in this work.

A number of drawings of butterfly eggs, caterpillars and chrysalids are published in this issue of the Bulletin, which will constitute the first of a series of such illustrations dealing with the known life histories of our native forms.



Chrysalis of Eurema nicippe, slightly enlarged.

FIGURE 14.

LONICERA AND SYMPHORICARPOS IN SOUTHERN CALIFORNIA

—— By ——

DAVID D. KECK

This paper has been prepared under the direction of Dr. Philip A. Munz of Pomona College, who, while at the Gray Herbarium of Harvard University, saw specimens and secured notes that have been of great use in the preparation of this work. To him and Dr. I. M. Johnston of the Gray Herbarium I am indebted for notes and suggestions. I wish also to express gratitude to Mr. F. W. Peirson of Pasadena, Dr. L. R. Abrams of Stanford University and Miss Alice Eastwood of the California Academy of Sciences for loans of herbarium material. In citation of specimens the following abbreviations are used:

Pomona College Herbarium (Po),
Stanford University Herbarium (St),
Peirson Herbarium (FP),
California Academy (CA),
Gray Herbarium (G).

I. LONICERA

Key to the Species*

A. Flowers sessile, in threes, arranged in terminal spikes or panicles, not enveloped in conspicuous foliaceous bracts; corolla distinctly irregular with one lobe well separated from the rest; filaments free for a distance at least equal to the length of the anthers.

B. Leaves all distinct, never connate; no parts glaucous; flowers in panicled, pubescent spikes; corolla 10-14 mm. long, pubescent outside, yellow.

C. Leaf blades linear-oblong to oblong, from 2.5 to 4 times as long as wide; corolla 8-10 mm. long; mountains of Santa Barbara Co. .....1a. *L. subspicata* var. *typica.*

CC. Leaf blades oblong-ovate to suborbicular, less than twice as long as wide; corolla 10-14 mm. long; Ventura Co. southward.

D. Leaves evidently whitish below, noticeably bicolored, not yellowish beneath, strongly pubescent, especially below; Ventura Co. to Lower California..... .....1b. *L. subspicata* var. *Johnstoni.*

DD. Leaves of yellowish cast beneath, not strongly bicolored, glabrate below; San Diego Co. to Lower California .....1c. *L. subspicata* var. *denudata.*

BB. Upper leaves connate, rarely all distinct; stems glaucous.

C. Inflorescence glabrous; corolla 10-14 mm. long, glabrous without, yellow; leaves never stipulate. 2. *L. interrupta.*

CC. Inflorescence glandular pubescent; corolla 12-18 mm. long, glandular pubescent without, purplish; all but lowest leaves usually with stipular appendages. ....3. *L. hispidula* var. *vacillans.*

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*The common cultivated honeysuckle, **L. japonica** Thunb. escapes occasionally and becomes naturalized, as in the San Bernardino Valley (Parish, Bull. S. Cal. Acad. 19. pt. 4:25. 1920).

AA. Flowers in peduncled axillary pairs, each pair enveloped in two conspicuous foliaceous bracts; corolla subregular, no distinct lip; filaments free for a distance less than the length of the anthers. .....4. *L. involucrata.*

Treatment of Species

1. Lonicera subspicata H. & A. Bot. Beechey Voy., 349. 1840.

A clambering shrub of the dry chaparral from 3 to 8 ft. high; woody trunks; bark thin, shredded, grayish; young twigs minutely puberulent, usually tinged purplish; leaves linear oblong to suborbicular, 1.5-3.5 cm. long, 0.5-2.5 cm. wide, obtuse, entire, pubescence more marked beneath, usually bicolored, no stipular appendages, coriaceous, all distinct; petioles 1-5 mm. long, pubescent; spikes of few flowered, compact whorls forming an open leafy panicle, spikes 2-12 cm. long; inflorescence pubescent; calyx lobes broadly lanceolate, ca. 1 mm. long, greenish, pubescent; corolla yellowish or cream color, funnel-formed, sometimes gibbous at the base, 8-14 mm. long, pubescent without; tube gradually expanding into throat, both hairy within, 4-7 mm. long; limb two lipped often recurved; lower lip elliptic oblong, ca. 5-7 mm. long, ca. 2 mm. wide; upper lip ca. 6 mm. long, 4 lobed, subregular, each lobe rounded deltoid, ca. 1.5 mm. long, ca. 1.5 mm. wide; stamens less than, equalling, or exceeding limb in length, filaments free for three-fourths of their length, pubescent at base, anthers ca. 3 mm. long, minutely puberulent to pubescent; pistil exserted, stigma depressed globose, ca. 1 mm. wide; berry 5-7 mm. long, 4-5 mm. wide; seeds several, ca. 4 mm. long, 2.5-3 mm. wide, concavo-convex bearing two more or less plainly marked grooves on each surface, light brown, shallowly pitted.

1a. Lonicera subspicata var. **typica** n. var.

Lonicera subspicata H. & A., Bot. Beechey Voy., 349. 1840. T. & G., Fl. N. Am. 2:8. 1841; of Rehder, Rep. Mo. Bot. Gard. 14:175. 1903 for Santa Barbara Co.; of Parish, Bull. So. Calif. Acad. 3:79. 1904 for Santa Barbara Co.; of Abrams, Bull. N. Y. Bot. Gard. 6:457. 1910 for Santa Barbara Co.; of Davidson & Moxley, Fl. So. Calif. 344. 1923 for Santa Barbara Co. *Caprifolium subspicatum* (H. & A.) K. Koch, Hort, Dendr. 294. 1853 and of Greene, Fl. Francisc. 348. 1892 for material from Santa Barbara Co. *Lonicera hispidula* var. *subspicata* of Gray, in Brew. & Wats., Bot. Calif. 1:280. 1876 and Synop. Fl. N. Am. 1, pt. 2:18. 1884 for material of Santa Barbara Co.

Leaf blades linear oblong to oblong, from 2.5 to 4 times as long as wide; corolla 8-10 mm. long.

This plant is known only from the mountains of Santa Barbara County. It occurs in dry situations in the chaparral at elevations below 3,000 ft. Material studied: Santa Barbara Co.: Santa Barbara, *Elmer* 3729 (CA, St), *Nuttall* (G); Mountain Drive, Santa Barbara, *Abrams* 4148 (St); Ellwood, *Eastwood in* 1908 (CA); Bartlett Canyon, Santa Barbara, *Rothrock* 124 (G); Painted Cave Ranch, mts. adjacent to Santa Barbara, *Eastwood* 65 (G); mountain road to Montecito, *Eastwood* 197 (G). "California" *Douglas* (G).

1b. Lonicera subspicata var. **Johnstoni** n. var.

Lonicera subspicata of Torrey, Bot. Mex. Bound. 71, pl. 29. 1859; of Rehder, Rep. Mo. Bot. Gard. 14:175. 1903 for material south and east of Santa Barbara Co.; of Coville, Con. U. S. Nat. Herb. 4:118. 1893; of Parish, Bull. So. Calif. Acad. 3:79. 1904 for material south and east of Santa Barbara Co.; of Abrams, Fl. L. A., 381. 1904 and 349. 1917 for material south and east of Santa Barbara Co.; of Davidson & Moxley, Fl. So. Calif. 344. 1923 for material south and east of Santa Barbara Co.; of Abrams, Bull. N. Y. Bot. Gard. 6:457. 1910 for material south and east of Santa Barbara Co.; of Johnston, Pl.

World 22:119. 1919; of Parish, Pl. World 20:255. 1917. *Lonicera sp.* of Parish, Bull. S. Calif. Acad. 13:12. 1914. *Caprifolium subspicatum* of Greene, Fl. Francisc., 348. 1892 for material south of Santa Barbara Co.; of Davidson, List Pls. L. A. Co., 7, 1892 and Cat. Pls. L. A. Co., 12. 1896; of McClatchie, Fl. Pasadena, 643. 1895. *Lonicera hispidula* var. *subspicata* of Gray, in Brew. & Wats., Bot. Calif. 1:280. 1876 and Synop. Fl. N. Am. 1, pt. 2:18. 1884 for material south of Santa Barbara Co., in part. Hall, Univ. Calif. Pub. Bot. 1:121. 1902.

Leaves evidently whitish below, noticeably bicolored, never yellowish beneath, strongly pubescent, especially below.

This variety occurs in all our mountains from Kern Co. to Lower California being supplanted for a short distance along the coast about San Diego by the following variety. Kern Co.: Vicinity of Fort Tejon, *Abrams and McGregor* 309 (St). Los Angeles Co.: Sepulveda Canyon, Santa Monica Mts., *Abrams* 2544 (St), and 367 (St); Eagle Rock Canyon, *Greata in* 1900 (St); Arroyo Sec, *Grinnell* 33 (St); Griffith Park, *Braunton* 471 (St); Mount Lowe, *Dudley* in 1900 (St); Pasadena, *Grant* 706a (St); Old Wilson Trail, *Grant* 2458 (St); Saw-Pit Canyon near Monrovia, *Dudley in* 1907 (St); near Monrovia, *Dudley in* 1907 (St); San Gabriel Wash, *Johnston* 980 (Po); Sunset Trail, *Johnston in* 1924 (Po); Live Oak Canyon, Claremont, *Crawford in* 1915 (Po). San Bernardino Co.: Cucamonga Canyon, *Johnston* (Po); San Bernardino, *Parish* 430 (St), in 1891 (St); Waterman's Canyon, *Shaw and Illingsworth* 9 (St). Orange Co.: Santa Ana, *Geis* 518 (St); Santa Ana Canyon, *Kendall in* 1923 (Po); Santiago Canyon, *Geis in* 1902 (St); Santiago Peak, *Munz* 7738 (Po). Riverside Co.: Poppet Flat, Idyllwild Road, *Munz* 8853 (Po); Temescal Canyon, near Lee Lake, *Johnston in* 1918 (Po); Glen Ivy Trail to Santiago Peak, *Munz* 7052 (Po); Hemet Valley to Vandeventer, *Munz* 4700 (Po); Temecula River, *Peirson* 217 (FP). San Diego Co.: Cameron's Ranch, Laguna, *Mearns and Schoenfeldt* 3713 (St); Doane Valley, Palomar Mt., *Munz* 8312 (Po); Laguna Mts. *Peirson* 4862 (FP), *Munz* 8353 (Po); Live Oak Springs, Laguna Mts., *McGregor* 78 (St); Trail to Monument Peak, Laguna Mts., *Randall in* 1918 (St); Julian, *McGregor in* 1918 (St); Witch Creek, *Alderson* 441 (St), *Abrams* 4915 (St); Mountain Spring, *Mearns* 3010 (St); Summit, *McGregor* 945 (St); Halfway between Descanso and Alpine, *Munz & Harwood* 7141 (Po); Jacumba, *Mearns* 3255 (St). Lower California: Nachoguero Valley, *Mearns and Schoenfeldt* 3431 (St).

These specimens were found to be intermediate between this variety and the following: San Diego Co.: Laguna Mts., *Munz* 8352 (Po); Julian, *Abrams* 3804 (St). The following approach *L. interrupta*: Cleghorn Canyon, San Bernardino Mts., *Abrams & McGregor* 704 (St) and Strawberry Valley, San Jacinto Mts., *Hall* 2529 (St).

This plant occasionally has a narrow leafed form, intermediate with *typica*: Saw-Pit Canyon near Monrovia, *Dudley in* 1907 (St).

1c. **Lonicera subspicata** var. **denudata** Rehder. Rep. Mo. Bot. Gard. 14:176. 1903.

Lonicera subspicata var. *denudata* in Parish, Bull. So. Calif. Acad. 3:79. 1904 and Abrams, Bull. N. Y. Bot. Gard. 6:458. 1910. *L. hispidula* var. *subspicata* of Gray, in Brew. & Wats., Bot. Calif. 1:280. 1876 and Synop. Fl. N. Am. 1, pt. 2:18. 1884 for material from coastal San Diego Co., in part. *L. denudata* of Davidson & Moxley, Fl. So. Calif. 344. 1923.

Leaves of yellowish cast beneath, not strongly bicolored, glabrate below.

A coastal form restricted to a small area near San Diego. Riverside Co.: Temecula Canyon, *Munz* 7128 (Po). San Diego Co.: Fall-

brook, *Parish in* 1891 (St); San Diego, *Spencer* 88 (Po), Street in 1917 (St), *Stokes in* 1895 (St).

2. Lonicera interrupta Benth., Pl. Hartweg., 313. 1849.

Lonicera interrupta Benth. Rehder, Rep. Mo. Bot. Gard. 14:176. 1903. Parish, Bull. S. Calif. Acad. 3:79. 1904. Abrams, Bull. N. Y. Bot. Gard. 6:458. 1910. Abrams, Fl. L. A., 349. 1917. Davidson & Moxley, Fl. So. Calif., 344. 1923. Parish, Pl. World 20:255. 1917. Johnston, Pl. World 22:119. 1919. *L. hispidula* var. *interrupta* (Benth) Gray, Proc. Am. Acad. 8:628. 1873. Gray, in Brew. & Wats., Bot. Calif. 1:280. 1876 and Synop. Fl. N. Am. 1, pt. 2:18. 1884. *Caprifolium interruptum* Greene, Fl. Fran., 347. 1892.

Intricate bushy shrub with branches twining or leaning on other vegetation; woody trunks; bark grayish, thin and fibrous; young stems glabrous, reddish and glaucous; leaves orbicular to elliptical, obtuse, retuse to mucronulate, entire, 1.5 to 3.5 cm. long, 1 to 3 cm. wide, glabrous or minutely puberulent, glaucous beneath, green above, usually without stipular appendages, coriaceous, usually the uppermost pair connate-perfoliate; petioles 1 to 4 mm. long, glaucous, glabrous or minutely puberulent; flowers in whorls in an interrupted spike; spikes 3 to 16 cm. long, forming an open panicle; inflorescence glabrous or nearly so; calyx tube ca. 0.5 mm. long, lobes deltoid, yellowish, glabrous; corolla yellowish, funnel shaped, somewhat gibbous at base, 10-14 mm. long, glabrous without; tube and throat hairy within, ca. 6-7 mm. long, tube gradually expanding into throat; limb two-lipped, lower lip elliptic-oblong, ca. 7 mm. long, ca. 1.5 mm. wide, upper lip ca. 6 mm. long, 4-lobed, each lobe rounded deltoid, ca. 1.5 mm. long, ca. 1.5 mm. wide; stamens pubescent throughout equaling limb in length, filaments free for 6-7 mm., anthers ca. 3 mm. long; pistil equaling limb in length, naked, stigma depressed globose, ca. 1 mm. wide; berry 5-7 mm. long, 4-5 mm. wide; seeds several, ca. 4 mm. long, ca. 3 mm. wide, ca. 1 mm. thick, concavo-convex, with two shallow grooves on each surface, gray green, shallowly pitted.

This mountain plant is found from the northern limits of our range as far south as the San Bernardino Mts. Specimens studied: Santa Barbara Co.: near Zaca Lake, *Eastwood* 544 (CA); La Cumbre Trail, Santa Ynez Mts., *Abrams* 4319 (St). Ventura Co.: Mt. Pinos, *Peirson* 4505 (FP); near White's on Sespe Creek, *Dudley and Lamb* 4804 (St); Alamo Mt., *Dudley and Lamb* 4655 (St); Red Reef Canyon, Topatopa Mts., *Abrams and McGregor* 136 (St). Los Angeles Co.: Liebre Mts., *Abrams and McGregor* 395 (St), 326 (St); Acton, *Hasse in* 1893 (St), *Elmer* 3694 (Po); Mint Canyon, *Peirson* 264 (FP), *Munz* 6793 (Po); Mt. Wilson Toll Road, *Peirson* 218 (FP); Rock Creek, San Gabriel Mts., *Peirson* 4504 (FP); Prairie Fk., San Gabriel River, *Johnston* 1713 (Po, St); Swartout Canyon, *Abrams and McGregor* 629 (St). San Bernardino Co.: Waterman's Canyon, *Parish* 5517 (St), *Shaw and Illingsworth* 226 (St); Seven Oaks, *Mr. and Mrs. S. Grout in* 1900 (Po).

3. Lonicera hispidula var. **vacillans** Gray, Proc. Am. Acad. 8:628. 1873.

Lonicera hispidula var. *vacillans* Gray in Brew. & Wats., Bot. Calif. 1:280. 1876. *L. hispidula* of Brandegee, Zoe 1:138. 1890; Mrs. Trask, Erythea 7:137. 1899. Probably *L. hispidula* var. *subspicata* of Brandegee, Zoe 1:114 and 138. 1890. *L. hispidula* var. *vacillans* of Brandegee, Zoe 1:138. 1890 and of Lyon, Bot. Gaz. 11:333. 1886. *L. catalinensis* Millsp., Field Mus. Pub. Bot. 5:252. 1923. *L. californica* T. & G., Fl. N. Am. 2:7. 1841; Davidson & Moxley, Fl. So. Calif., 344. 1923. *L. hispidula* var. *californica* (T. & G.) Rehder, Rep. Mo. Bot. Gard. 14:178. 1903; Abrams, Bull. N. Y. Bot. Gard. 6:457. 1910; Abrams, Fl. L. A., 349. 1917; Parish, Bull. S. Calif. Acad. Sci. 3:79. 1904. *Caprifolium californicum* (Gray) K. Koch, Hort. Dendr., 294, 1853. *C. hispidulum* var. *californicum* Greene. Fl. Fran. 347. 1892.

Climbing bushes bearing long drooping twigs; bark grayish; younger stems often purplish, usually glabrous, somewhat glaucous; leaves elliptic-oblong to ovate, obtuse, from rounded to cordate at the base, 3.5-8 cm. long, 2-4.5 cm. wide, usually glabrous above, puberulent beneath, glaucous below, green above, thin or coriaceous, several uppermost pairs connate-perfoliate, usually with conspicuous stipular appendages on all but lowest; petioles 3-5 mm. long on lower leaves, glaucous, glabrous; spikes forming loose leafy panicles of many-flowered whorls, 10-20 cm. long; internodes 1-1.5 cm. long; inflorescence usually glandular pubescent; calyx tube ca. 1 mm. long, lobes deltoid, reddish, glabrous or pubescent; corolla purplish, funnel shaped, 12-18 mm. long, usually glandular pubescent without; tube gradually expanding into throat, tube and throat hairy within, ca. 6-9 mm. long; limb two lipped, lower lip elliptic-oblong, ca. 7-10 mm. long, 2 mm. wide, upper lip 6-9 mm. long, four lobed, each lobe rounded and of varying length, 2-3 mm. long, 1.5-2 mm. wide; stamens nearly equaling limb in length, usually pubescent throughout, filaments free for ca. 5 mm., anthers 3-4 mm. long; pistil equaling limb in length, pubescent, stigma depressed globose, ca. 1 mm. wide; berry red, 7 mm. long, 6 mm. wide; seeds few, 4-5 mm. long, 3 mm. wide, ca. 2 mm. thick, brown, concavo-convex with two shallow grooves on each surface, shallowly pitted.

This plant, more common in the region to the north, occurs sparingly as far south as the San Jacinto Mts. and Catalina Island. The following specimens from our region have been studied: Santa Barbara Co.: Atascadero, *Abrams* 7654 (St). Los Angeles Co.: San Gabriel Mts., Sturdevants, *Peirson* 4502 (FP). Riverside Co.: San Jacinto Mts., south of Banning, *Munz* 8710 (Po). Santa Catalina Island, Avalon, *Grant* 3789 (St).

4. **Lonicera involucrata** Banks, Sprengel, Syst. Veg. 1:759. 1825.

Lonicera Ledebourii Esch. Mem. Acad. Sci. Petersb. 10:284. 1826; Esch., Cham. and Schlecht., Linnaea. Litt. Ber. 1828:149. Rehder, Rep. Mo. Bot. Gard. 14:100. 1903; Abrams, Bull. N. Y. Bot. Gard. 6: 459. 1910. *L. involucrata* Banks, Gray in Brew. and Wats., Bot. Calif. 1:280. 1876. *Distegia Ledebourii* Greene, Man. Bot. S. F. Bay, 164. 1894; Davidson and Moxley, Fl. So. Calif. 344. 1923. *Caprifolium Ledebourii* Kuntze, Rev. Gen. Pl. 1:274. 1891; Greene, Fl. Fran., 346. 1892.

Spreading shrub with rather slender stems, 6-10 ft. high, ultimate branches often dependent on adjacent vegetation; bark on branches grayish brown, thin and fibrous, on leafy twigs ridged; youngest shoots glandular pubescent; leaves oblanceolate to oval, obtuse or acute, rounded or tapering at the base, 2.5-6.5 cm. long, 1.5-3 cm. wide, nearly glabrous above, pubescent beneath, not glaucous, thin, all distinct; no stipular appendages; petioles 3-5 mm. long, glandular pubescent; flowers borne in pairs subtended by large leafy bracts which become reddish with age, on a single axillary peduncle; two peduncles borne at a node, very glandular toward flowers, somewhat pubescent; corolla saccate at base, covered with hairs tipped with reddish glands without, tubular, yellow within and yellow without tinged with scarlet, 12-16 mm. long; throat not distinct from tube, naked or pubescent for half the distance within; limb subregular, lobes rounded, ca. 1 mm. long, 1.5 mm. wide; stamens almost or quite equaling top of throat, naked throughout, filaments adnate from near the anthers or from halfway down, anthers 2 mm. long; pistil ca. equal with limb, style more or less hairy, stigma globose, ca. 1 mm. wide; berries black, 8-10 mm. in diameter; seeds 3-4 mm. long, 2-3 mm. wide, 1 mm. thick, shallowly pitted, more or less wrinkled.

This plant occurs as far south as Santa Barbara Co., Abrams l. c., but the most southern material studied was San Luis Obispo Co.: Santa Lucia Mts., *Munz* 9247 (Po). Dr. Munz while at the Gray Herbarium studied the following specimens: Santa Barbara, *Nuttall*, (G); Santa Ynez Mts., *Mrs. Elwood Cooper*, *June* 1879 (G).

II. SYMPHORICARPOS

Key to the Species

A. Corolla 12-15 mm. long, tube narrow and over 10 mm. long; anthers versatile, scarcely if at all free; style bearded; restricted to the desert ranges. .....1. *S. longiflorus.*

AA. Corolla not over 10 mm. long, tube scarcely distinguishable or not over 2 mm. long; anthers free; style naked; coastal.

B. Corolla 5-10 mm. long, lobes ca. one-fourth entire length of corolla; leaves grayish green; branches declined, often rooting; found above 5,000 feet alt.....2. *S. Parishii.*

BB. Corolla 4-6 mm. long, lobes extending nearly to the middle: leaves bright green; branches erect or spreading, never rooting; found below 5,000 feet alt.....3. *S. albus* var. *mollis.*

Treatment of Species

1. Symphoricarpos longiflorus Gray, Jour. Linn. Soc. 14:12. 1875.

Symphoricarpos longiflorus Gray in Synop. Fl. 1, pt. 2:14, 1884. Coville, Contr. U. S. Nat. Herb. 4:117. 1893. Brandg., Zoe 5:149. 1903.

Low, spreading shrub, branches somewhat declining, from 5-10 dms. long; bark grayish, thin and fibrous, younger twigs glabrate and glaucous; leaves lanceolate to elliptical, acute or obtuse, narrowed at the base, entire, 1-1.5 cm. long, 0.3-0.5 cm. wide, minutely pubescent, glaucous, grayish, thick; stipules absent; petioles 1-3 mm. long, glabrate; flowers solitary in axils of terminal leaves, very fragrant; calyx campanulate, naked, 5-lobed, each lobe deltoid, green, ca. 1 mm. long; corolla salverform, 12-15 mm. long, pink, glabrous without and within; tube 11-13 mm. long; throat scarcely distinguishable; lobes 5, subregular, oblong, ca. 2 mm. long, ca, 1 mm. wide; stamens ca. equalling tube, anthers versatile, ca. 2 mm. long, filaments scarcely if at all free; pistil 5 mm. long, style bearing few long hairs, stigma depressed globose, appearing two or three lobed, 0.5 mm. wide.

In Southern California proper known from a single station: Providence Mts., San Bernardino Co., where it grows in the Upper Sonoran Zone at about 5,000 ft. altitude. *Munz, Johnston and Harwood* 4388 (Po, FP). To the north it is known from several collections in the Death Valley and surrounding regions: (Coville l. c.); Chloride Cliff, Death Valley, *Jaeger* 130 (Po).

2. Symphoricarpos Parishii Rydb., Bull. Torrey Club 26:545. 1899.

Symphoricarpos Parishii Rydb. Abrams, Bull. N. Y. Bot. Gard. 6: 457. 1910. Hall, Univ. Calif. Pub. Bot. 1:122. 1902. Parish, Pl. World 20:255. 1917. Johnston, Pl. World 22:118. 1919. Davidson & Moxley, Fl. So. Calif., 343. 1923. Probably *S. oreophilus* of Davidson, Cat. Pls. L. A. Co., 12. 1896. Parish, Zoe 4:163. 1893.

A low, spreading shrub, branches declined, sometimes rooting at the end, 5-10 dm. long; bark on young twigs reddish, thin, shredded, glabrate; leaves elliptical to oval, acute or obtuse, entire or toothed, 1-2.5 cm. long, 0.5 to 1.3 cm. wide, (*Munz*, Laguna Mts. 5 cm. long, 2.5 cm. wide) pubescent or glabrate, bicolored, gray green, thick; stiples absent; petioles 1-3 mm. long, pubescent or glabrate; flowers axillary in 1- to few-flowered terminal clusters; calyx campanulate, naked or glabrate, with 5 irregular lobes, scarious margined, green, ca. 1 mm. long; corolla campanulate to tubular funnelform, 5-10 mm. long, pink, glabrous without, throat hairy within; tube scarcely distinguishable or 1-2 mm. long; throat 4-7 mm. long; limb 1-3 mm. long, with 5 subregular lobes, oblong, 1-3 mm. long, 1-2.5 mm. wide, rounded; stamens included in the limb, naked, filaments free about 1-2 mm., anthers 1.2 mm. long; pistil ca. 4 mm. long, naked, stigma depressed globose, ca. 0.8 mm.

wide; fruit a drupe, nutless usually 1-3, elliptical, pointed at both ends, flattened, striate.

This species, found only above the Upper Sonoran Life Zone, is frequent in all of our higher mountains in dry open situations. The following specimens have been studied: Tulare Co.: Bonita Meadow, *Hall & Babcock* 5190 (St). Kern Co.: Canyon above Castac Lake, *Dudley & Lamb* 4472 (St, Po); Frazier Mt., *Dudley & Lamb* 4472a (St). Ventura Co.: Goodenough Meadow, *Dudley & Lamb* 4740 (St, Po); Topatopa Mts., *Abrams & McGregor* 106 (St). Los Angeles Co.: Blue Ridge, San Gabriel Mts., *Peirson in* 1922 (St); Big Pines, *Peirson* 4506 (FP); along stream north of Waterman, *Peirson* 2439 (FP); west spur of Baldy, *Johnston* 1727 (Po, St), *Munz* 1686 (Po, St); Swartout Canyon, *Abrams & McGregor* 638 (St). San Bernardino Co.: Coldwater Fork of Lytle Creek, *Johnston* 1389 (St, Po); head of South Fork of Lytle Creek, *Johnston* 1472 (Po, St); Cienega Seca Creek, *Munz* 6290 (Po); Bluff Lake, *Peirson* 1200 (FP), *Benten in* 1908 (St); Bear Valley, *Parish* 10940 (St), 2093 (St), *Abrams* 2081 (St); Foxesee Creek, *Peirson* 2264 (FP); Seven Oaks, *Mr. & Mrs. S. Grout in* 1902 (Po); Dry Lake Canyon, *Abrams & McGregor* 787 (St), Riverside Co.: Tamarack Valley, *Hall* 2485 (St); Tahquitz Valley, *Grinnell in* 1908 (St, Po), *Munz* 6016 (Po); Toro Peak, *Munz* 5879 (Po). Orange Co.: Santiago Peak, *Munz* 7751 (Po), *Munz & Keck* 7071 (Po). San Diego Co.: Laguna Mts., *Munz* 8400 (Po).

The retention of *Parishii* as a species is a question of doubtful procedure. *S. Parishii* runs into Sierran material of *S. oreophilus* and into material to the east, but it seems unwise to make any nomenclatural changes, without making a more thorough study of the relationships of the *S. oreophilus* and *S. rotundifolius* group.

3. Symphoricarpos albus (L) Blake var. mollis (Nutt.) n. comb.

Symphoricarpos mollis Nutt. in T. & G. Fl. N. Am., 2:4. 1841. Gray, in Brew. & Wats., Bot. Calif. 1:279. 1876. Gray, Synop. Fl. 1, pt. 2:14. 1884. Lyon, Bot. Gaz. 11:333. 1886. Brandegee, Zoe 1:137. 1890. McClatchie. Fl. Pasadena, 643. 1895. Davidson, List Pls. L. A. Co., 7. 1892 and Cat. Pls. L. A. Co., 12. 1896. Abrams, Fl. L. A., 381. 1904 and 349. 1917. Abrams, Bull. N. Y. Bot. Gard. 6:456. 1910. Moxley, Lorquinia 1:3. 1916. Parish, Pl. World 20: 255. 1917. Davidson & Moxley, Fl. So. Calif., 343. 1923. Millspaugh & Nuttall, Field Mus. Pub. Bot. 5:251, 1923. *S. racemosus* of Gray, Bot. Calif., l. c. for S. Calif. material and of Gray, Synop. Fl. l. c. for S. Calif. plants. Davidson, List of Pls. L. A. Co. 7. 1892. Davidson & Moxley, Fl. S. Calif. 344. 1923. *S. ciliatus* Nutt. in T. & G., Fl. N. Am., 2:4. 1841.

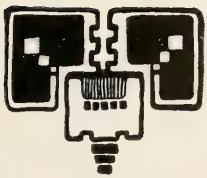
Low, erect, diffusely branched shrub, 3-6 (9) dm. high; bark grayish, thin and fibrous, younger stems brown or reddish, minutely pubescent; leaves elliptical to orbicular, obtuse, from obtuse to rounded at the base, entire or lobed or toothed, 1-4 cm. long, .75-3. cm. wide, velvety pubescent above, more so beneath giving whitish cast to under surface, thin; stipules absent; petioles 1-4 mm. long, pubescent; inflorescence a crowded spike of several flowers, 8-3 cm. long, softly pubescent; calyx tube adnate to ovary, lobes subregular, acutely deltoid, fringed with hairs, green, ca. 0.5 mm. long; corolla a deep pinkish, open campanulate, glabrous without, 4-6 mm. long, lobed nearly to the middle, tube not differentiated from throat, throat bearing long white hairs within, lobes five, regular, oblong lanceloate, ca. 3.5 mm. long, ca. 2 mm. wide; stamens nearly equaling limb, naked, filaments free less than half their length, anther ca. 0.8 mm. long; pistil 3-4 mm. long, naked, stigma depressed globose, ca. 1 mm. wide; fruit a white berry, ca. 5 mm. in diameter; seeds several, hard, 3-4 mm. long, ca. 2 mm. wide, convex or flattened, smooth.

This variety is found in our region from Santa Barbara Co. south and east to the Mexican border. Its habitat is the coastal valleys

though it ascends the canyons to about 5,000 feet altitude. The following specimens were studied: Santa Barbara Co.: South side of Gaviota Pass, *Munz* 9299 (Po); Shepard's, *Abrams in* 1908 (St); La Cumbre Trail, Santa Inez Mts., *Abrams* 4309 (St). Los Angeles Co.: Summit, Santa Susanna Mts., *Moxley & Grinnell* 498 (St); Topango Canyon, Santa Monica Mts., *Munz & Harwood* 3988 (Po, St); Sepulveda Canyon, Santa Monica Mts., *Barber* 74 (Po), *Abrams* 347 (St), 2552 (St); Santa Monica Mts., *Abrams* 1308 (St); Pasadena, *McClatchie in* 1893 (St); Little Santa Anita Canyon, *Grant in* 1902 (St); Mt. Wilson Trail, *Grant in* 1900 (St), 1260 (St); Monrovia Canyon, *Peirson* 440 (FP); Wilson's Peak, *Brown in* 1894 (Po); Evey Canyon, *Johnston* 2127 (Po, St); Hills south of Pomona, *Johnston* 2002 (Po, St); Pomona, *Munz* 2270 (Po). San Bernardino Co.: Devil's Canyon, *Parish* 11340 (Po); North fork Deep Creek, *Johnston* 2866 (Po); Waterman's Canyon, *Parish* 2215 (St); San Bernardino Mt. *S. B. & W. F. Parish* 481 (St). San Diego Co.: Laguna, *Munz* 2173 (Po), 2685 (Po), *Mearns & Schoenfeldt* 3555 (St); Witch Creek, *Abrams* 4912 (St); Smith Mt., *Parish in* 1897 (St); Buckman Spring, *Stokes in* 1895 (St), *Cleveland in* 1884 (St); Spencer Valley near Julian, *Abrams* 3785 (St); 8 mi. north of Descanso, *Munz & Harwood* 7174 (Po); near Summit, Pine Hills, *Spencer* 336 (Po). Santa Catalina Island, Avalon, *Grant* (St), Eagle Nest, *Grant & Wheeler* 6155 (St).

The only differences that I can find either in the specimens studied or in the literature between *S. albus* and *S. mollis* is a greater pubescence in the foliage and a less pubescence in the throat of the corolla in the southern material (*mollis*). For this reason I cannot consider *mollis* as a distinct species. This situation is somewhat in agreement with Fernald's observation (Rhodora 7:167. 1905) that "much of the northwestern material which is passing as *S. mollis*, Nutt., seems inseparable from *S. racemosus*." (*S. albus*). Blake pointed out (Rhodora 16:117-119. 1914) that *S. albus* is an earlier name for the material that has commonly gone as *S. racemosus*.

At the upper limits of its altitudinal range *S. mollis* offers some puzzling intergradations with *Parishii*. For example *Munz* 9815 from shaded slopes of Middle Peak, Cuyamaca Mts., 5,500 feet alt., bent over and rooted at the tips as *Parishii* so often does.



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ll figures slightly reduced

INBREEDING OF JUNONIA COENIA (LEPID.) THROUGH THIRTY-FIVE SUCCESSIVE GENERATIONS

—— By ——

WILHELM SCHRADER, Los Angeles, Cal.

Every nature lover marvels over the wonderful coloring and marking of our thousands of different species of butterflies. My interest in these beautiful insects was aroused as a small boy, and now, at three score years, this interest deepens, the longer I am able to carry on experiments.

It is obvious that the many thousands of different patterns evidenced in butterflies were not produced at one time, but are the result of a series of gradual changes. It is a fascinating pursuit to endeavor to determine the factors that are operative in their production, and to produce by experimental means in a short space of time, changes that, in a state of nature are the result of many centuries.

This I have accomplished in a measure, as a result of intensive breeding, with a variety of artificially produced environments.

Experimentation in this field was begun in 1906, in a small sunny room, and with very little time at my disposal. The results of this earlier work were published in various scientific journals. The terrible world war, and consequent business depression, had its effect in inhibiting many scientific activities, and it is only at this time that matters have shaped themselves for a further recording of work carried on since my last published notes.

A brief summary of former experimentation will first be given, but before introducing this I wish to thank Dr. John Comstock, the president of the Southern California Academy of Sciences, for his aid and encouragement in this work. As the result of these experiments is of educational value, I will present all of the original specimens described and illustrated on the two accompanying plates, to one of the local museums, for permanent exhibition.

There seems to have been some misunderstanding by some of my former readers, as to the meaning of the term inbreeding, and an explanation is here in order.

Live-stock specialists follow three distinct methods of breeding, namely, inbreeding, line-breeding and crossing. The terms are self-explanatory.

Inbreeding has been demonstrated to be the best method of rapidly fixing a new point in color or marking.

This is carried on in the following way; a gravid female of the usual type is captured in the open, and imprisoned in a wire cage over a potted plant that is known to be the proper food of the species. This is placed in a sunny spot, and the female proceeds to oviposit. The butterflies finally resulting from these eggs are my first generation. These are mated, (brother with sister, to use the common vernacular.) Successive generations are paired in the same way, care being taken to select examples that show the special points it is desired to preserve.

I have tried line-breeding, by mating two males of the same species, captured in separate localities, with two females captured in a like manner. The progeny of these two matings were kept separate,—one designated line A, the other line B.

Males of line A were mated with females of line B, and vice versa. Each successive generation was mated in the same manner.

This form of breeding was found to be productive of little result, and was much more difficult to carry on. One drawback re-

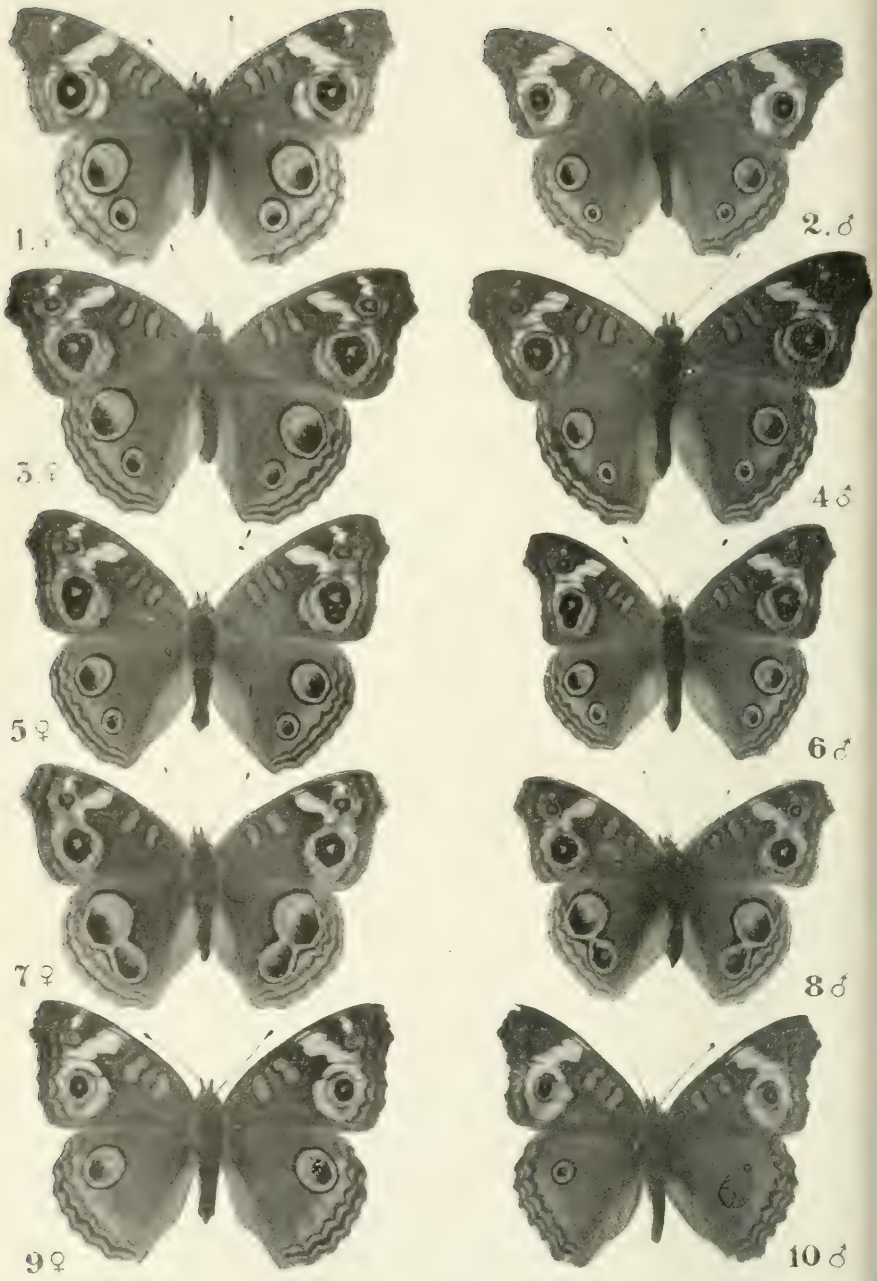


PLATE 1.

sulted from the fact that butterflies live on the average only five days. The two lines would often come to maturity at different times and could not therefore be bred.

The crossing of butterflies of different species has not met with success, largely because of the fact that the genital organs are of quite different types in each species. This does not hold to the same extent for certain groups of large moths, which are more primitive in structure. Prof. Stanfuss, of Zurich, Switzerland, and other experimentors, have met with some success in the latter group. My own work has not included cross-breeding, but has been carried on by intensive inbreeding under varying environments, such as high or low temperatures, increased moisture, or low humidity, exclusion or increase of light, etc.

This has resulted in demonstrating that these environmental combinations have striking results, in combination with selective inbreeding, in changing the colors and markings of butterflies.

Much light has thus been shed on the origin of various changes which make for the production of new species. It can hardly be expected however, even with the application of great patience, that radical changes can be produced in the short span of one life time, when compared with the great amount of time in which nature has operated.

Every collector of Lepidoptera knows that many butterflies produce seasonal forms, the spring generation frequently being quite different from that produced in the summer. There are also many "sports" arising in a state of nature, which frequently vary in a marked degree from the usual insect.

Many of these latter variations arise, so far as my experiments seem to demonstrate, through exposure to heat, from excess of sunlight, at a critical time in the development of the chrysalids. Aberrations of this sort are usually too weak, however, to reproduce themselves.

Junonia coenia has proven the ideal species with which to work. It is longer lived than the average species, the males remaining active about seven days, and the females, when gravid, about two weeks. They become quite tame in captivity, and are easy to handle.

The experiments were begun in a moist air incubator, with a temperature of 80 to 90 deg. Fahr. A complete cycle, from egg to butterfly was carried through in the short span of one month.

This rate could not be maintained however, on account of the development of contagious diseases. The food plant was cultivated in pots to insure its succulency. From 50 to 100 out of each generation were retained, a task that was most difficult on account of the rapid consumption of the plants. When large enough to be easily removed, the young larva were transferred to cut stems of garden grown plants, which had to be renewed daily. The wire cages had to be cleaned every day, to offset the possibility of wilt disease attacking the caterpillars. Various parasites had to be guarded against, and the ants controlled.

Very moist air will, in most butterflies, produce a darker ground color, or an enlargement of dark spots. In Junonia, this change is barely perceptible in the first few generations. A few of the females develop enlarged ocelli on the fore-wings.

These are selected, and paired with males of the same inbred generation. Each successive brood shows an increase in the number of females with enlarged spots on the primaries, and eventually the largest ocellus shows a tendency to develop an appendix. In the course of eight or ten generations a few males will appear with the same changes evident. These. when paired with "sisters" will produce still more startling results, as will be noted on plate 1, No. 3 ♀, a specimen with dark ground color, and black appendices on the ocelli

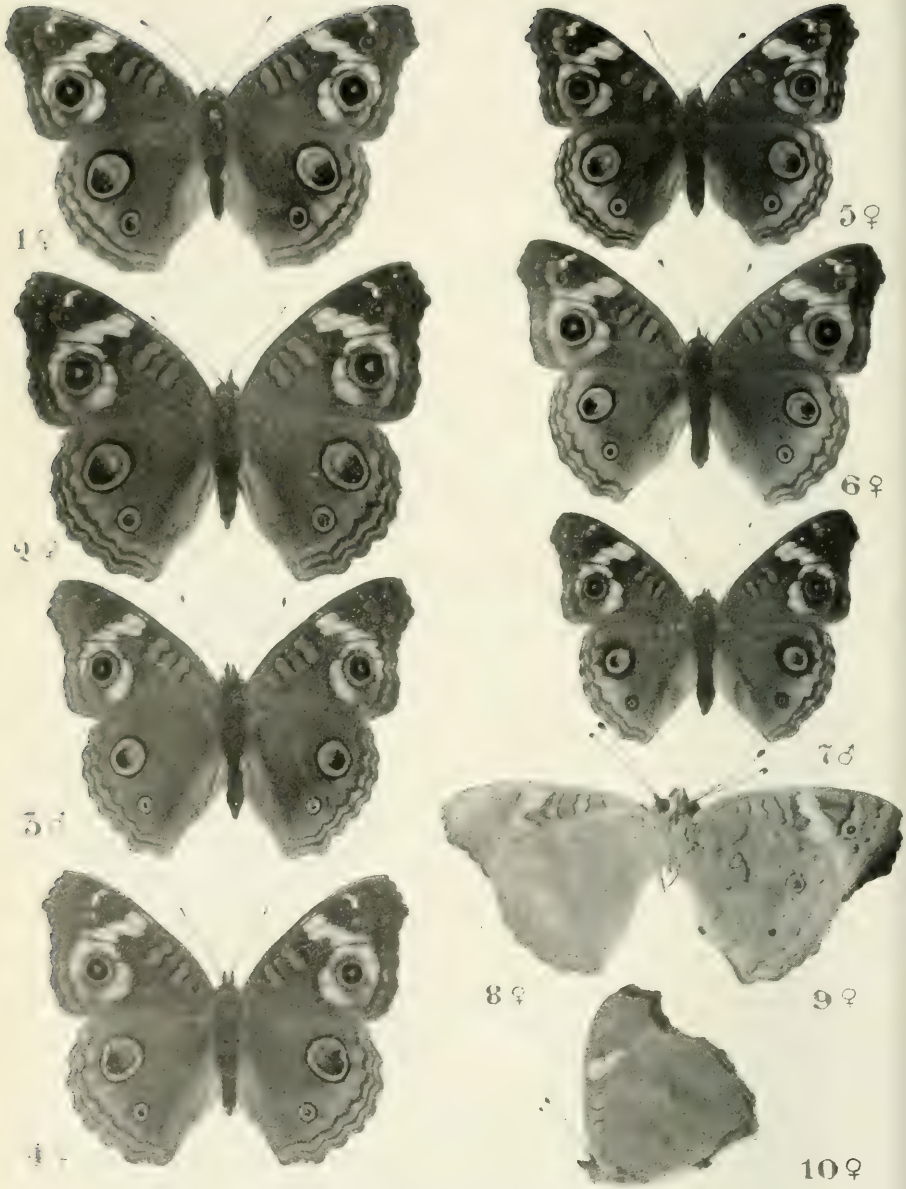


PLATE 2.

of forewings,—and also in specimen No. 4 ♂ of the same plate. Both these specimens are of the tenth generation. It will be noted that these specimens are of unusually large size, contrary to the accepted belief that continued inbreeding causes degeneration. I have succeeded in maintaining the customary size of this species through thirty-five generations.

After the tenth generation occasional females arise in which a light center appears in the aforementioned appendix.

The best of these were selected and paired. In the 25th generation, females were produced with double ocelli, (see plate 1 No. 5 ♀) and males appeared with very large appendices on the ocelli of the forewings. (plate 1, No. 6 ♂.)

In the females a double white spot will be noted near the outer margin in the apex of the forewings. This is the sex mark of the females of Junonia.

Cool Air Experiments

Making a selection of young caterpillars, from the line bred continuously in 80 to 90 deg. I placed these in a specially constructed cool room. The temperature was first regulated to about 70 deg. to stimulate better growth and not make too rapid a change. Following this the temperature was reduced to an average of 50 deg. Each time that the caterpillars were given new food, which was about twice a week, they were placed in 70 deg. temperature for a short time only, to give them a good start in feeding. The chrysalids were maintained uninterruptedly in the cooler temperature. It was found that the life cycle, in these reduced temperatures, was prolonged to about three months, and in cool weather, even longer.

All of the examples which were transferred from warm to cool air as caterpillars, produced striking changes in one generation.

This was evidenced in the enlargement, and frequently, confluence of the ocelli of the secondaries. Note Plate 1, figs. 7 ♀ and 8 ♂. The experiment was frequently repeated, and always with the same results. Protracted continued cool air inbreeding could not be continuously carried on however, as the effect of lower temperatures seemed to destroy the reproductive faculties.

It was also found that chrysalids taken from a line bred continuously in warm air, and transferred to the cool air chamber, would, when hatched, show very little change. This seems to establish the fact that the influences responsible for the change are operative on the caterpillars.

Dry Air Experiments

Plate 1, No. 9 ♀, and No. 10 ♂ are the result of subjection to dry air. It will be noted that all ocelli are greatly reduced, and the smaller ocelli of the hind wings are obsolete.

These results were procured with the use of a 75 watt bulb, in a specially constructed glass incubator. The procedure is difficult, on account of the drying effect on the food plant. This marked change in the size, and obsolescence of ocelli appears even in the first generation, but only from caterpillars descended from butterflies that were raised for many generations in moist air.

I have twice raised six generations in dry air, but the start was made with eggs collected from the outside. In each instance there was only a small amount of reduction in size of the ocelli.

Selective Color Experiments

On July 5th, 1911, in Los Angeles, I captured a fertile female of Junonia, which to all appearances was of the normal form, except that it was of a large size. (See Plate 2, No. 1 ♀.)

From this example a number of eggs were obtained, which were hatched and the caterpillars reared in a temperature of 80 to 90 deg. All of the progeny were of much increased size, as will be noted from Plate 2, Nos. 2 ♀ and 3 ♂. The ground color of these specimens was also darker, and the two orange colored spots of the forewings near the costal margin were increased in size. Another marked feature was the presence of a purplish irridescence near the costal margin of the primaries and around the aforementioned spots.

I was partcularly interested in this irridescence, (which is evanescent, and fades with time) and desired to improve it by selective inbreeding. Experience had demonstrated that a new color development was first evidenced in the females, and only after a considerable amount of selective breeding became apparent in the males.

In the third generation I obtained about 50 per cent of females with this purplish hue. In subsequent generations a few males appeared with the desired color. These were paired with females having the requisite shade. (See plate 2, No. 4 ♀.) In the eleventh generation so much difficulty was experienced with parasites, that the original stock was lost.

On July 12th, 1925, a fertile female was obtained, flying at large. From this example over a hundred eggs resulted, which were separated in two lots. One of these was subjected to moist warm air, the other to dry air with increased temperature. The latter stock was given particular attention, in an effort to increase the yellow coloration.

It was found that the dry warm air chamber markedly accelerated the rate of growth, to such an extent that at the present writing (in a four months period) five generations have reached maturity. This is a record for rapid development.

Plate 2, No. 5 ♀ shows a female of the first generation, raised in the electrically heated incubator, at an average temperature of about 85 deg. A variation of ten degrees one way or another seems to have little effect in producing color changes. This example showed an increase in the yellow coloration over that of the parent, the shade having extended in area.

Plate 2, No. 6 ♀ is of the second generation. In this specimen the yellow extends to the white sex mark in the apex of forewing, the ground color is lighter, and the size increased.

Color Variation

Plate 2, No. 7 ♂ is an example which was selected from the stock in which the yellow coloration was being increased, and was subjected as a chrysalis to direct sunlight with incident increased temperature for two hours daily. This is a difficult procedure, as it usually results in the death of the specimen. The result was a butterfly with darkened ground color, and black borders surrounding the ocelli.

This change probably resulted from the increased temperature applied at a critical time in development.

Plate 2, Nos. 8 ♀, 9 ♀, and 10 ♀ show a remarkable range of variation in the maculation and color of the under surfaces. All are progeny of the female captured July 12, 1925. No. 8 is of the third generation bred in dry air and high temperature. It has adopted a uniform gray color, probably as an adaptation to the increase in light.

No. 9 was bred in moist air, in a dark environment. The ocelli of the upper surfaces are reduced in size.

No. 10, bred in cool air developed the purplish-brown shade on the inferior surface, which is customary with all examples raised under like conditions.

NOTES ON CACTACEÆ

S. B. PARISH

1

Echinocactus johnsoni Parry in Englm. King's Surv. 111 (1871), char. emend. Stem simple, oblong, 8 inches high, 6 inches in base diameter; ribs 19-20, narrow, tuberculatly irregular: spine-clusters approximate, concealing the surface; spines carmine with ashy-gray exterior, all subulate, more or less enlarged at base, straight or slightly curving, never hooked, the 4 centrals 1¼-1½ inches long, the 10-14 radials slenderer, ½-1¼ inches long: flowers open-campanulate, 3 inches high and 2 inches in expanse, the outer segments green, the oblanceolate petals bright purple with a chocolate-colored blotch at base; ovary about inch high bearing a few broad, scarious, fimbriate-margined scales; fruit yellowish, inch high, crowned by the marcesent corolla, nearly naked, splitting up the side when ripe, seeds numerous, black, reniform, 3 mm. long, minutely and closely pitted. Type from St. George, southern Utah.

Ferrocactus johnsonii Britt. & Rose, Cact. 3:141 (1922).

Var. **octocentrus** Coulter, Contr. U. S. Nat. Herb. 3:374 (1896). Central spines "8," petals "pink." Type collected in the mountains east of Resting Springs, Inyo County, California.

Var. **lutescens** Parish var. nov. Corolla lemon-yellow, chocolate-brown at base. Type in Herb. Univ. Calif. Collected by Professor Marcus E. Jones on gravelly hills at Searchlight, Nev., Jan. 5, 1925.

This species occurs discontinuously in the Larrea Zone from southern Utah, through Nevada, to the southeastern borders of the Mojave Desert, California, exhibiting a marked difference in the color of the corolla, which, so far as is known, is geographically delimited. It is readily distinguished from the other Echinocacti of the region by its subulate spines, those of the other species being flattened. When wet the inner carmine color of the spines shows through the gray exterior giving the plant a handsome appearance. The flowers open in sunshine for about five days.

The var. *octocentrus* is known only from the type collection, Professor Jones, who has studied this species in the field and has it in cultivation at Pomona College, has kindly furnished me with valuable notes and specimens.

2

Echinocactus lecontii Engelm. Proc. Am. Acad. 2:274 (1856). The type locality of this species was vaguely given as "On the lower part of the Gila and Colorado rivers, and in Sonora," but in the same year (Pac. R. Rept. 4:29) it is more definitely defined as growing "Abundantly from Cactus Pass at the head of Williams River, down this stream to the Colorado, and west of it till *E. polycephalus* took its place," that is, nearly to the desert base of the San Bernardino Mountains. This appears to be the authority on which Britton & Rose (Cact. 3:129-1922) extend its range to "southern California, along the Colorado," for no collections from that region are known. In 1876 Engelman (Bot. Cal. 1:146) expressed the opinion that the species "seems to have been founded on weaker plants of *E. wislizeni*," which was confused with the species now known as *E. acanthodes*, so far as California plants are concerned. It should be sought in the region indicated, but its discovery is rather to be hoped for than expected.

3

Echinocactus emoryi Engelm. Emory's Mill. Reconn. 157 (1848) is reported from "The valley of the Mojave" in Davidson & Moxley, Flora of Southern California (243, 1923), apparently based, as no

recent collections are known, on the statement in Pac. R. Rept. 4:31, where it is vaguely reported to have been collected West of the Colorado, in the valley of the Mojave, mixed with *E. polycephalus*, and therefore not further noted. Britton & Rose (Cact. 3:127) refer Emory's type to *E. wislizeni*, a species not known to reach this state.

Sixty and seventy years have passed since these unsatisfactory records were made; the region has been explored by recent botanists, but neither species has been found. Probably the plants really seen by these early explorers were forms of some of the other species known to grow in the Mojave Desert.

University of California.

Gilia inconspicua var. dentiflora n. var.

Annual, stem single, branching above, inflorescence sparsely glandular, leaves in a rosette at base, glabrous, very sparsely glandular, coarsely toothed, each tooth tipped with a short awn; lobes of the corolla with a central tooth 1 mm. long and 1 mm. broad; otherwise as in the type.

Type No. 3617. Midway between Palmdale and Lancaster on the Mohave Desert, May 1926.

The typical **G. inconspicua** is quite common on the desert. It is glandular and pubescent throughout, has a less well defined rosette pinnatifid leaves, and rounded lobes on the corolla.

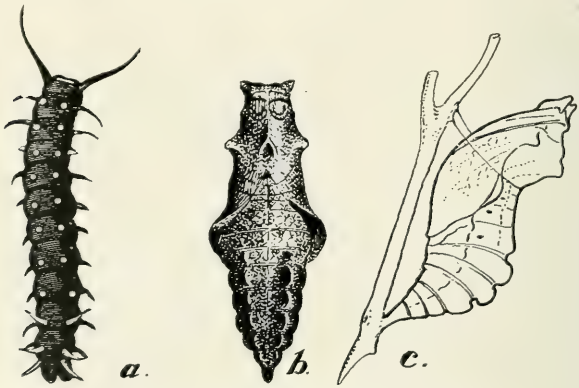
Specimens from Arizona show multiple stems and doubly pinnatifid leaves. There is evidently more than one species included under the name or the species is very variable.

Tissa leucantha var. glabra n. var.

Characters are those of the type, but the whole plant is absolutely glabrous. Flowers large, white fully half an inch in diameter.

Type 3618. Common on the margins of the dry lakes near Muroc, Kern Co., May 1926.

A. Davidson, M.D.



Papilio philenor.
a.—Larva (after Riley). b.—Chrysalis, dorsal view.
c.—Chrysalis in outline, ventral view.

FIGURE 15.

BUTTERFLIES OF CALIFORNIA

(Continued)

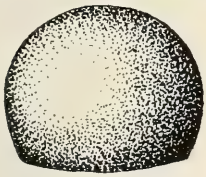
Dr. John Adams Comstock

FAMILY DANAIDÆ

Genus DANAUS L.

The Milkweed Butterflies

THE MONARCH, (*Danaus menippe* Hbn.) is the best known of our native butterflies, occuring as it does abundantly in every part of the continent. It is as stable and dependable as its name seems inconstant,—for it has appeared variously in past publications as *Anosia plexippus*, and *Danais archippus*, and now makes its bow as *Danaus menippe*. We venture the hope that all of the ancient literature touching on this familiar insect has now been fine-combed by the specialist, and that no archaic designation remains to be unearthed, to come forth on the established rule of priority and tumble *menippe* into the discard. The Monarch belongs to a group of butterflies that are believed by many writers to have obnoxious qualities which render them immune to the attacks of insectivores. This probably accounts in part for its abundance and longevity, for the Monarch lives weeks or months to the average butterfly's days.



a.

b.

Papilio rutulus.

a.—Egg, highly magnified. b.—Larva, slightly enlarged.

FIGURE 16.

Papilio zelicaon. Larva, slightly enlarged.

FIGURE 17.

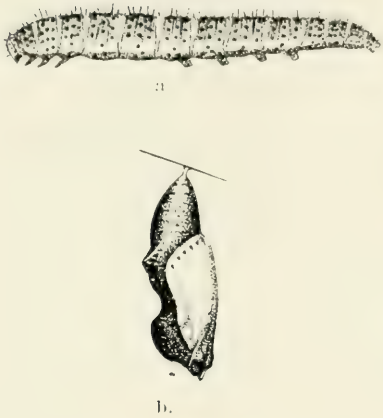
Neophasia menapia. Egg, greatly magnified.

FIGURE 18.

The species is polygoneutic, or, in other words, produces a succession of broods throughout the year. It is incapable of passing the winter in any of its phases, and the northern states must therefore be annually restocked by migration. Of the several species of butterflies which move in occasional swarms, this is the only one in North America that can be designated a true migrator. It is an inspiring sight to see one of these flights in the fall of the year, heading southward, composed of millions of individuals. The spring movement northward is of a totally different character. There is no swarming

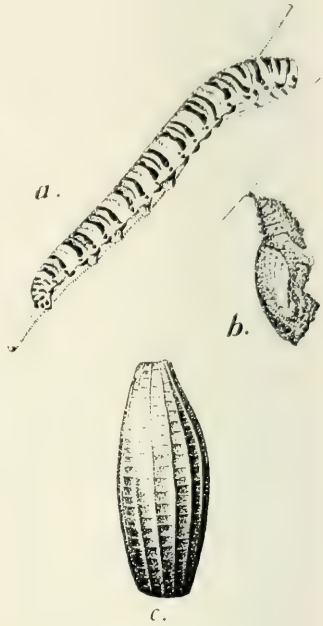
instinct connected with it, and hence it is seldom noticed. The larval foodplant of the genus is milkweed.

ILLUSTRATED. Plate 17, ♂ fig. 2; ♀ fig. 1.



Pieris beckeri.
a.—Larva, slightly enlarged.
b.—Chrysalis, slightly enlarged.
Redrawn from Edwards' figures, which show the chrysalis pendant, instead of suspended by a girdle, as is customary in the genus.

FIGURE 19.



Pieris sisymbrii.
a.—Caterpillar, slightly enlarged. b.—Chrysalis.
c.—Egg, greatly magnified.
Redrawn from Edwards' figures, which show the chrysalis pendant, instead of suspended by a girdle as is customary in the genus.

FIGURE 20.

THE SMOKY MONARCH, (*Danaus menippe* ab. *fumosus* Hlst.) is an aderration of the former species in which the ground color is of a smoky gray-brown, instead of the characteristic rich red-brown of the typical insect. It is relatively rare.

ILLUSTRATED. Plate 17, ♀ fig. 3.

THE STRIATED QUEEN, (*Danaus berenice strigosa* Bates) is not as common an insect in California as it seems to be in Arizona and Texas. It is, in fact, counted something of a rarity, and only occurs in a few isolated points in the southern part of the state. Imperial Valley is its favored location. Occasional captures have been reported as far north as Mono County. Records are available of its having been taken from April to November, with probably a succession of broods to account for its long season.

ILLUSTRATED. Plate 17, ♀ fig. 4; ♀ under side fig. 5.

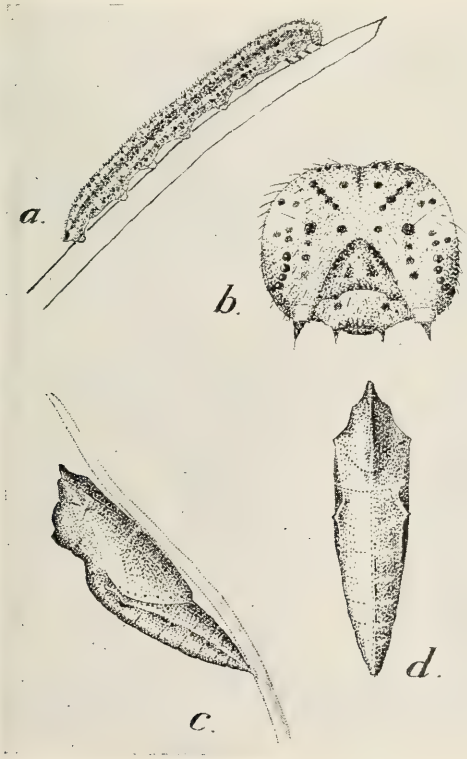
Pieris rapae.
Chrysalis slightly enlarged.

FIGURE 21.

KERR'S ABERRANT QUEEN, (*Danaus berenice strigosa* ab. *kerri* Comst.) is a variant of the above species in which all of the white spots are lacking. It was presented to the author by Mr. Laurance T. Kerr, for whom it was named. Only the one example is at present known.

ILLUSTRATED. Plate 17, ♂ (type) fig. 6.

In this issue of the "Bulletin" we are continuing our series of illustrations of the early stages of California butterflies. The captions under each cut give sufficient information concerning these, except in the matter of color. This phase of the subject will be dealt with in greater detail in our forthcoming book on the "Butterflies of California" which we hope will soon be on the press.



Pieris protodice.
a.—Caterpillar, slightly enlarged. b.—Head of caterpillar, highly magnified.
c.—Chrysalis, lateral view, enlarged. d.—Chrysalis, dorsal view, enlarged.
FIGURE 22.

NOTES ON DIURNAL LEPIDOPTERA, WITH ADDITIONS AND CORRECTIONS TO THE RECENT "LIST OF DIURNAL LEPIDOPTERA"

By Wm. Barnes and F. H. Benjamin, Decatur, Illinois

As the changes herein made are mostly unexplained in prior literature, the authors add bibliographical references or short notes. One change has been suggested by Dr. J. McDunnough, one by Mr. H. T. G. Watkins, and two by Mr. E. H. Blackmore. Otherwise the authors are responsible. Unless preceded by the letter "p," indicative of page number, all numbers in the left hand column refer to species numbers on the recent list.

26 *form alt.* hermodur *Hy. Edw.*, change *pholus* Ehr., err. typ., to *polus* Ehr.

33 add *form* transversa *B. & Benj.*

Ascia sisymbrii gen. vern. *transversa* nov.

California specimens, including the type of **sisymbrii**, show very similar forms to those produced in Arizona. Early spring specimens from the latter state, however, show a decided tendency to lose at least part of the fuscous margining the distal portions of the veins on the under side of the hindwing, the mesial portions of the veins not as intensely black—marked as normal, the medial transverse line normal and thus appearing as the heaviest marking. Only about fifty percent of the spring specimens are typical of **transversa**, the remainder intergrading into the type form.

Type localities: Paradise, Cochise Co., Ariz.; Redington, Ariz.

Number and sexes of types: Holotype ♂, Allotype ♀, 1 ♀ Paratype, all March; 1 ♂ Paratype, no date.

33 add *a* elivata *B. & Benj.*

Ascia sisymbrii race *elivata* nov.

Differing from the type form by the heavier black powdering striating the veins on the underside of the secondaries. Also tending to be somewhat smaller in size.

Type locality: Glenwood Springs, Colo.

Number and sexes of types: Holotype ♂ May 1895, Allotype ♀ May 1895, 7 ♂ 14 ♀ Paratypes, various dates April to June.

Notes: Specimens before us indicate a distribution for **elivata** of Wyoming to Colorado, and probably high altitudes of Eastern California.

49 add *corday* (Hbn.)

1820, Huebner, Verz. bek. Schmett., p. 99, **Colias.**

63*a* add *form* ♀ shastæ *B. & Benj.*

Eurymus occidentalis chrysomelas form *shastæ* nov.

Albinic ♀ of **chrysomelas**, the normal bright yellow replaced by yellowish-white, orange of discal spot on hind wing replaced by whitish.

Type locality: Shasta Retreat, Siskiyou Co., Calif.

Number and sexes of types: Holotype ♂, 1-7 July.

65 add *form* ♀ nepi *B. & Benj.*

Eurymus interior form *nepi* nov.

Albinic ♀ of **interior,** with a slight tinge of yellowish on the wings.

Type locality: Nepigon, Ontario.

Number and sexes of types: Holotype ♀, and 1 ♀ Paratype both 8-15 July.

67*a* add *form* ♀ hatui *B. & Benj.*

Eurymus alexandra edwardsi form ♀ *hatui* nov.

Albinic ♀ of Utah **edwardsi,** the white slightly creamed by yellow.

Type locality: Stockton, Utah.

Number and sexes of types: Holotype ♀, VII-30-16; 1 ♀ Paratype, VIII-5-3.

Notes: Name an anogram.

69*b* change to *b* skinneri (*Barnes*) (partim.)

Eurymus pelidne skinneri Barnes

We hereby restrict the name to a lectotype, the white ♀ type specimen, Yellowstone Park, Wyo., 8-15 July, in Coll. Barnes.

The reason for doing this is that albinic females appear to be the normal females of **pelidne** and **palæno.**

69*b* add *form* ♀ neri *B. & Benj.*

‡*skinneri.* (Barnes) (partim.)

Eurymus pelidne skinneri form ♀ *neri* nov.

Yellow ♀ of **skinneri** as described in the original description of that subspecies.

Type locality: Yellowstone Park, Wyo.

Number and sexes of types: Holotype ♀ 8-15 July; 2 ♀ Paratypes, 8-15 July and no date; all being original type females of **skinneri** Barnes.

69*c* change *c minisni* (*Bean*) to (*c*) minisni (*Bean*).

69*c* add *form* ♀ isni *B. & Benj.*

Eurymus pelidne minisni form ♀ *isni* nov.

Yellow ♀ of **minisni.** The normal ♀, and the form discussed by Bean in the original description of **minisni** is the white female.

Type locality: Laggan, Alta.

Number and sexes of types: Holotype ♀, 16-23 Aug.

91*a* add *androcardia* Hbn.

1821, Huebner, Ind. exot. Lep., 1, **Enodia.**

104 add *a* quebecensis *B. & Benj.*

Coenonympha inornata race *quebecensis* nov.

Upper side similar to **inornata,** the hind wing with a pale gray outer margin interrupted and partly bordered by a dark, disconcolorous, band. Underside similar to **ampelos,** paler and brighter than in typical **inornata,** ocellus of fore wing present or absent, when present reduced in size.

Type locality: Chelsea, Ottawa Co., Que.

Number and sexes of types: Holotype ♀, 1-7 June; 8 ♂ Paratypes 1-7 and 7-15 June.

106 add *a* subfusca *B. & Benj.*

Coenonympha ochracea race *subfusca* nov.

Much like **ochracea** on upper side. Underside of secondaries and apex of primaries heavily powdered with black, hind wing with ocelli as in **ochracea**, median band somewhat reduced, basal pale spots absent.

Type locality: White Mts., Ariz.

Number and sexes of types: Holotype ♂, 1-7 July, Allotype ♀, no date; 4 ♂ 1 ♀ Paratypes, 1-7 July and no date.

106,1 add No. 106,1 furcæ *B. & Benj.*

Coenonympha furcæ sp. nov.

Seems to be a connecting link between **california** and **ochracea**, possibly a pale form of the latter. Sexes similar. The ground color is luteous, tinted with pale ochraceous, the marking of the underside showing thru; underside with the maculation variable, similar to **ochracea**; fore wing with ground color similar to upper side, with a tendency toward the development of auxilliary ocelli; hind wing with ground color luteous white heavily powdered with fuscus, six ocelli, some obsolescent, present. The single male has the ocelli of the hind wing so reduced that they appear as pale blotches except for a few black scales in one blotch at tornus. The ocelli of the hind wing of the female range from two to six.

Type locality: Grand Canyon, Ariz.

Number and sexes of types: Holotype ♂, Allotype ♀, 3 ♀ Paratypes; no dates except on one female, 1-7 June.

113,1 add No. 113,1 damei *B. & Benj.*

Cercyonis damei sp. nov.

Upper side much as in **meadi** but with the burnt orange color obsolescent, restricted to rings around the ocelli, sometimes practically obsolete; sexual scale patch of male longer and broader, extending nearly to vein 4. Underside: the burnt orange color much reduced and largely replaced by brownish, the striations heavier and more conspicuous; hind wing as in **meadi**, as dark as the darkest of that species.

Expanse: 43-49 mm.

Type locality: Grand Canyon, Ariz.

Number and sexes of types: Holotype ♂, 1-7 June; 4 ♂ Paratypes, one only dated, 8-15 June.

129*b* remove *b* assimilis *Butl.*

130*b* *eritiosa* (Bdv.)

1833, Boisduval, Icon. Hist. Lép. Europ., I, 197, **also, Chionobas.**
1834-37, Boisduval & Leconte, Lép. Am. Sept. 222, **also, Chionobas.**
1869, Harris, in Scudder, Ent. Corresp. Harris, 176, (name an error).
1925, Barnes & Benjamin, Can. Ent., LVII, 58, **melissa semidea, Oeneis.**

Boisduval, 1833, and Boisduval & Leconte, 1834-37, list **Satyrus eritiosa** Harris manuscript as a synonym of **also.** Harris, in a letter to Doubleday dated 1849 and published, 1869, in Scudder, Ent. Corresp. Harris, states that he sent to Leconte specimens of **"Hipparachia semidea"** and **"Aegeria exitiosa"**, and that in consequence there has been a "blunder of the specific name" by Boisduval & Leconte. We find nothing in the International Zoological Code covering such cases and do not know if the name is available or not.

130*c* add *c* assimilis *Butl.*, change *c* arctica *Gibson* to *arctica* Gibson, this information furnished by Mr. H. T. G. Watkins who kindly compared Butler's type with the figures of Gibson, and informed us that both names represent the same form beyond any reasonable doubt.

138 change *a* macinus *Dbldy. & Hew.*, err. typ., to *a* mancinus *Dbldy. & Hew.*

p. 11 for **Migonitis** Hbn., type *Papilio erato* L., substitute the following which has priority:—

Sicyonia Hbn. Type *Sicyonio apseudes* Hbn.

Before 1816, Huebner, Zutr. exot. Schmett., 1, 25, No. 71, ff. 141-142, **apseudes** sole species and therefore type.

1816, Huebner, Verz. bek. Schmett., p. 13, heading Sycioniæ (!); lists **sara(clytia), thamar (rhea), apseudes, doris (quirina).**

1827, Huebner, Verz. bek. Schmett., Anzeiger, p. 7, **Sycionia(!).**

1875, Scudder, Hist. Sk., p. 268, type designated "**rhea(sara, thamar)**".

There is a reference in the Verzeichniss to the Zutrage figures of **apseudes**, indicative that these were published prior to the Verzeichniss. **Sicyonia** would therefore be a monotypical genus. Scudder's selection of type is based upon the Vereichniss.

148*a* omit *a* insularis (*Mayn.*)

According to Capt. N. D. Riley, 1926, the Entomol., LIX, 241, this race does not occur in Boreal America.

148*a* change *ab.* comstocki *Gunder* to read *a* comstocki Gunder; add *form norm.* incarnata *Riley.*

Gunder described **comstocki** as an ab. of **vanillæ.** If names described as "abs." are available specifically and subspecifically, and in general they have been so held in the past, then the name **comstocki** applies to the subspecies from Boreal America with the name **incarnata** applicable to the normal form of the same subspecies.

149 add *mariamne* Scud.

1889, Scudder, Butt. E. U. S., I, 519, **claudia, Euptoetia.**

An Abbot manuscript name listed in the synonymy by Scudder.

157 add *d* byblis *B. & Benj.*

Dryas aphrodite race *byblis* nov.

♂; size and somewhat the general appearance of **atlantis nikias.** Veins as in **aphrodite.** Base of wing as dark as in ♀ **aphrodite.** Nearest to **cypris,** differing therefrom by smaller size and brighter underside.

♀; similar but darker.

Type locality: White Mts., Ariz.

Number and sexes of types: Holotype ♂, Allotype ♀, 4 ♂ 1 ♀ Paratypes, no dates.

Notes: the present form is of equal rank with many of the so-called species in the group, but we prefer to describe as a race of **aphrodite.**

160 add *b* beani *B. & Benj.*

Dryas atlantis race *beani* nov.

Upper side and underside of fore wing similar to **lais.** Underside of hind wing similar to **atlantis** but paler in color than the average of that species. Veins of the fore wing of ♂ as in **atlantis.**

Type locality: Banff, Alta.

Number and sexes of types: Holotype ♂, 8-15 Aug., Allotype ♀, 8-15 Aug., 3 ♂ 3 ♀ Paratypes, 8-15 Aug., 15-23 Aug., and no date.

Notes: this may ultimately prove to be a distinct species.

182 synonym *egleis.* Change authorship to (Behr).

1860, Morris, Cat. Lep., p. 7, (nom. nud.), **Argynnis.**

1862, Behr, Proc. Calif. Acad. Sci., II, 174, No. 4, (as **egleis?**), **Argynnis.**

1864, Edwards, Proc. Ent, Soc. Phila., III, 435, **astarte, Argynnis.**

All three references have priority over Boisduval's original description. Morris merely lists the nom. nud.

188 add *d* nichollæ *B. & Benj.*

Brenthis aphirape race *nichollæ* nov.

Upper side similar to dark specimens of **dawsoni.** Underside similar to **dawsoni** but darker, especially on the hind wing. We suspect this is a high altitude form.

Type locality: Rocky Mts.

Number and sexes of types: Holotype ♂, Allotype ♀, 2 ♂ 1♀ Paratypes; Mrs. B. Nicholl, ex Coll. Oberthür.

192.1 add No. 192.1 reiffi (*Reuss*).

1925, Reuss, Int. Ent. Zeit., XIX, 279-280, **Boloria.**

The species is unknown to us. Described from a single ♂ from British Columbia. We rather suspect this will be close to No. 192*a*.

197*d* for alaskensis (*Lehm.*) substitute gibsoni *B. & Benj.*, with ‡ *alaskensis* (Lehm.) (nec. Holl.) in synonymy.

Brenthis frigga race *gibsoni* nov.

We apply this name to the subspecies of **frigga** discussed and figured by Gibson; 1920. Rept. Can. Arc. Exped., III, (1) 24, pl. V, f, 1. We suspect that Dr. Gibson was correct in assigning these specimens to **alaskensis** Lehm. but regardless if the synonmy is correct or not, the name **alaskensis** Lehm. falls as a homonym of **alaskensis** Holl., under the International Zoological Code subspecific names being coordinate with specific names from the standpoint of nomenclature.

We do not apply the name **gibsoni** as a nom. nov. for **alaskensis** Lehm., as we have no real knowledge of Lehmann's type. The group is a difficult one so that we prefer to erect the name **gibsoni** as a new race of **frigga,** basing it on the specimens discussed by Gibson. We select as Holotype ♂ a specimen from Barter Island, Northern Alaska, July 4, 1914, ex Coll. D. Jenness, and as Allotype ♀ the specimen figured by Gibson, the remainder of Gibson's series are designated paratypes.

This subspecies is very similar to **saga,** but with the medial band of the underside of the hind wing half again as broad. There is a tendency for the median black band of the fore wing to be more diffuse, and on the underside for the ground color to be somewhat paler. The subspecies seems intermediate between the European frigga and the Labrador **saga**

Notes: Types and Paratypes in the Canadian National Collection, Paratypes in Collection Barnes.

203 omit *phædon* (H.-S.) which is presumably only an error for **phaëton.** The name is credited to Drury, and there is no indication that there has been any deliberate alteration or emendation of the original orthography.

204 place *ab.* suprafusa *Comst.* as *suprafusa* Comst. in the synonymy of *ab.* lorquini (*Oberth.*)

204*a* the name *macglashani* (Rivers) should be withdrawn from the synonymy and placed as a subspecies intermediate between **dwinellei** and **olancha.** It can take the number 284*b* while **olancha** can take the number 284*c*.

219,1 add 219,1 alena *B. & Benj.*

Euphydryas alena sp. nov.

Similar to **maria,** somewhat larger and brighter. All markings very similar, but the usual blackish powderings and heavy black along the veins more restricted. Underside similar to **maria,** the red tints much brighter.

Expanse: ♂ 35-39 mm.; ♀ 43-49 mm.

We are describing this as a new species because of the status heretofore given to **maria** and **magdalena.** We would not, however, be surprised if subsequent investigations reveal that all of these names are geographical races of **anicia.**

Type locality: So. Utah.

Number and sexes of types: Holotype ♂, Allotype ♀ 14, 12 ♀ Paratypes, July, 1900, Wm. Barnes Collector.

220,1 add 220,1 carmentis B. & Benj.

Euphydryas carmentis sp. nov.

Allied to the **alena** and to **magdalena,** intermediate in size, in this respect resembling **maria.** Upper side with the pattern and coloration nearly as in **alena** but tending to produce forms which are much paler. Underside similar to **maria** but considerably paler, the contrast between the ground color and the yellow transverse markings much more distinct; the general appearance being more like that of **wheeleri,** but a considerably smaller and much neater looking species.

Expanse: ♂ 33-36 mm.; ♀ 40-43 mm.

Remarks on the status of **alena** also apply to **carmentis.**

Type locality: Pagosa Springs, Colo.

Number and sexes of types: Holotype ♂, Allotype ♀, 10 ♂ 9 ♀ Paratypes, 24-30 June.

251 add *?euclea* (Bergstr.)

1780, Bergstrasser, Nomencl. Ins. Hanau, IV, 23-24, pl. CCLXXXIV, ff. 9-10, **Papilio.**

1889, Scudder, Butt, E. U. S., I, 629, **tharos, Phyciodes.**

Scudder is responsible for listing **euclea** in the synonymy of **tharos.** We have not seen Bergstrasser's work. If the name actually represents a form conspecific with **tharos** it may have priority over form vern. **marcia** Edw.

282 add **pocahontas** (Scud.)

1889, Scudder, Butt. E. U. S., I, 379, **j-album, Eugonia.**

A Harris manuscript name listed in the synonymy by Scudder.

297 change tatila *H.-S.* to tatila (*H.-S.*)

p. 16 change **Celtiphaga** B. & L. to **Asterocampa** Rob. which has priority with same genotype.

333 add *geda* (Scud.)

1876, Scudder, Bull. Buff. Soc. Nat. Sci., III, 102, **borealis, Calephelis.**

A Boisduval manuscript name published in the synonymy by Scudder.

350 add *erytalus* (Butl.)

1869, Butler, Cat. Diur. Lep. Descr. Fabr., p 189, **columella, Thmolus.**

1876, Scudder, Bull. Buff. Soc. Nat. Sci., III, 107 **columella, Callicista.**

Butler lists **erytalus** Bdv. in Doubleday's List as a synonym of **columella.** We are unable to locate the Doubleday reference. Scudder lists "**erytalus** Boisd., M. S., see Butl. Cat. Fabr. Lep., 189."

The name may be a mere misspelling of **eurytulus** Hbn., but there is nothing to prove this.

354,1 add 354,1 polingi *B. & Benj.*

Strymon polingi sp. nov.

Allied to **alcestis** and **oslari** by the reduced ♂ stigma.

Upperside much as in **alcestis** but base of fore wings and hind wings with a faint blueish-green tinge. Tails much as in **autolycus ilavia.** Beneath, ground color and markings as in **autolycus** but the s. t. line on the fore wing obsolescent, sometimes practically obsolete, and the red on the hind wing more restricted.

The species looks like Edward's figure of **ontario,** but the red on the upper side of the hind wing is usually obsolete. Also **ontario** has the normal large stigma in the ♂.

Expanse: ♂ 27-29 mm.; ♀ 29-31 mm.

Type locality: Sunny Glen Ranch near Alpine, Brewster Co., Texas.

Number and sexes of types: Holotype ♀, Allotype ♀, 52 ♂ ♀ Paratypes, 1-15 June 1926; 73 ♂ ♀ Paratypes, 15-30 June 1926.

Notes: named in honor of Mr. O. C. Poling, the collector. The types and part of the paratype series are in the Barnes Collection, the remainder of the paratypes were merely loaned by Mr. Poling and have been returned to him.

363 add *b* watsoni *B. & Benj.*

Strymon titus race *watsoni* nov.

Similar to typical **titus,** larger, the underside much paler.

Expanse: ♂ 31-34 mm.; ♀ 34-40 mm.

Type localities and number and sexes of types: Holotype ♂, Allotype ♀, 1 ♂ 1 ♀ Paratypes, Kerrville, Texas, no dates; 1 ♂ Paratype, Shovel Mt., Texas, 8-15 May.

Notes: presumably collected by Mr. Lacey and Dr. Barnes.

368 change edwardsii (*Saund.*) to edwardsii (*G. & R.*).

1867, Grote & Robinson, Trans. Am. Ent. Soc., I, 172, **calanus, Thecia.**

Saunders manuscript name published as a synonym by Grote & Robinson. Saunders appears not to have published the name until 1869.

369 add calanus (*Hbn.*) which has priority, change wittfeldii (*Edw.*) to read *wittfeldii* (Edw.)

370 remove calanus (*Hbn.*) which is valid over *wittfeldii* (Edw.), change *falacer* (Godt.) to falacer (*Godt.*)

Hubner's figures of **calanus** clearly show the long-tailed species strongly marked with red to which Edwards gave the name **wittfeldii. S. falacer** appears to be the next available name for **calanus** Auct. nec Hbn. Its type, if in existence, should be examined to be certain that it is not the species subsequently described as **edwardsii.**

372 add ‡ *liparops* (Fletch.) (nec Bdv. & Lec.)

1904, Fletcher, Trans. Roy. Soc. Can., (1903), pl., **strigosa** var., **Thecia.**

1904, Fletcher, Can Ent., XXXVI, 124, pl., **strigosa** var., **Thecla.**

Fletcher attempted to "save" the Boisduval & Leconte name, and thus made a homonym. We know of no species exactly like the Boisduval & Leconte plate. The plate may be poor, or the form of **strigosa** most common in Manitoba may occur in Georgia as an occasional mutation. We rather suspect the latter explanation as a specimen ex Collections Boisduval and Oberthur was received by the Barnes Collection; its label reading, "Liparops Boisd. ♂ *hyperici* Abb. Am. bor.", and presumably labeled by Boisduval. This specimen is normal eastern **strigosa.** We suspect that some manuscript plate of Abbot's will show the fulvous patches present in **liparops** but absent in **strigosa.** The Barnes Collection did not obtain a type of **liparops,** or any specimen ex Collection Boisduval showing fulvous patches, from the Oberthur Collection.

372*a* add *ab.* pruina (*Scud.*)

1889, Scudder, Butt. E. U. S., II, 879, **liparops** ab., **Thecla.**

413 add *anthelle* (Scud.)

1847, Doubleday, List Lep. B. M., II, 55, **Polyommatus.**

1876, Scudder, Bull. Buff. Soc. Nat. Sci., III, 128, **dorcas, Epidema.**

Boisduval manuscript name first listed by Doubleday who merely gives, "Polyommatus anthelle Boisd. MSS. a-d. Martin's Falls, Albany River, Hudson's Bay. Presented by G. Barneston, Esq.".

The first indication we find rendering the name available is that of Scudder, 1876.

The Barnes Collection contains the Boisduval manuscript type.

414 add *hypoxanthe* (Kirby).

1847, Doubleday, List Lep. B. M., II, 54, **Polyommatus.**

1862, Kirby, Man, Europ. Butt., p. 91, f. 11, **Chrysophanus.**

1871, Kirby, Syn. Cat. Diur. Lep., p. 343. **Lycaena.**

1889, Kirby, Europ. Butt. & Moths, p. 54,? **dorilis, Lycaena.**

The Barnes Collection received three specimens as types of the Boisduval manuscript name **hypoxanthe** from the Oberthur Collection, and a fourth specimen, without label, not listed as a type. Dr. Hofer's letter reads, "**Chrysoph, hypoxanthe** Bdv. (**epixanthe**) Types.", but the only specimen bearing the Boisduval handwritten detremination label has this label reading, "**Hypoxanthe Boisd.** Canada.". Hofer is correct in that these specimens are **epixanthe** Bdv. & Lec., but this latter name was applied to specimens from "New Harmony, Ind.". The two Boisduval Collection specimens not bearing handwritten labels may be the types of **epixanthe,** or the manuscript name **hypoxanthe** may have been change to **epixanthe** and the Canadian "type" not mentioned.

The Boisduval manuscript name appears to have been first mentioned by Doubleday who merely gives, "Polyommatus hypoxanthe, Boisd. MSS. a. b. Polish Ukraine. Presented by Dr. Dowler." Kirby, 1871, questions the locality. In 1889 he states under **dorilis**, "**L. hypoxanthe** is probably not distinct from this."

414*a* add amicetus (*Scud.*) which has priority, change phædrus (*Hall*) to read *phædrus* (Hall).

1847, Doubleday, List Lep. B. M., II, 55, **Polyommatus.**
1876, Scudder, Bull. Buff. Soc. Nat. Sci., III, 128, **epixanthe, Epidemia.**

A Boisduval manuscript name listed by Doubleday who merely gives, "Polyommatus amicetus, Boisd. MSS. a-c Newfoundland. Presented by W. St. John, Esq." The first indication we find which renders the name available is that published by Scudder, 1876. The Boisduval manuscript type appears to have been lost, so that all we can do is to accept the comparison with it made by Doubleday, and give the name of the minor Newfoundland race of **epixanthe**, with priority over **phædrus** (Hall).

415 add **bacchus** (Scud.)

1889, Scudder, Butt. E. U. S., II, 998, **hypophlæas, Heodes.**

A Harris manuscript name listed by Scudder as a synonym of **hypophlæas.**

p. 19 change **Plebeius** L. to **Plebejus** L. to conform with original orthography. This has been called to our attention by Mr. E. H. Blackmore.

433 add (partim. ♂ nec ♀) after *argyrotoxus* (Behr).

433 after *philemon* (Bdv.) add *ab.* argyrotoxus (*Behr*) (partim. ♀ nec ♂).

456*e* add *ab.* sinepunctata *Comst.*

458 no change. A note may be of some value.

The Barnes Collection received 2 ♂ 1 ♀ as types of **Lycaenopsis pseudargiolus** (Bdv. & Lec.). The males do not agree with the original description and figures as well as the female. The males are **neglecta** Edw. and may be spurious types. The female is the form commonly going as **pseudargiolus** in collections, agrees well with the original description and figures, and presumably should be considered the existing true type.

458 *gen. æst.* neglecta (*Edw.*) add *deutargiolus* (Scud.)

1869, Doubleday, in Scudder, Ent. Corresp. Harris, p. 164, (nom. nud.).
1869, Haris, in Scudder, Ent. Corresp. Harris, p. 165, (nom. nud.).
1869, Scudder, in Scudder, Ent. Corresp. Harris, (footnote) **neglecta, L.**

The description by Harris consists of, "The name **Polyommatus pseudargiolus** must be applied exclusively to the Southern species, if the Northern blue species is distinct from it. **Deutargiolus** would be a good name for the Northern species. Your specimens will enable you to point out the distinctive characters, which I shall be glad to see from your own observations, as well as those by which you separate **Argynnis Aphrodite** from **Cybele.**"

Scudder has added a footnote to the same page, "(It has since been named **L. neglecta** by Mr. W. H. Edwards)."

It is rather questionable if the single descriptive adjective used by Harris can be construed as an indication of what the name **deutargiolus** represents, so we credit authorship to Scudder because of his indication on the same page.

479 add *hedysarum* Scud.

1889, Scudder, Butt. E. U. S., II, 1418, **lycidas, Achalarus.**

An Abbot manuscript name listed in the synonymy by Scudder.

480 add casica (*H.-S.*) which has priority; place epigena (*Butl.*) in the synonymy as *epigena* (Butl.)

Prof. M. Draudt has kindly informed us that he possesses a drawing of the type of **casica** made by the late Dr. Carl Ploetz and that the name is unquestionably applicable to the same form as **epigena** Butl. with priority.

497 add *a* freija (*Warr.*)

1924, Warren, Trans. Ent. Soc. Lond., (1-2), pp. lvi.-lvii, **Hesperia.**

1926, Bell, Ent. News, XXXVII, 109, **Hesperia.**

We would call attention to the fact that while **centaureæ** was described by Rambur, 1839, Faun. Ent. And., II, 315, pl. VIII, f. 10, that according to Boisduval, 1840, Gen. et Ind. Method., p. 36, this name is a Boisduval manuscript name based mainly upon specimens from Scandanavia and Lapland, so that if two species are present in the European collections as **centaureæ,** Warren may well have redescribed the true **centaureæ** as **freija.** If the European and Labrador types of **freija** are conspecific, and if the true **centaureæ** does not occur in North America, then the name **wyandot** (Edw.) would appear available for the North American species.

Labrador material seems intermediate between Colorado and eastern United States specimens.

Warren's superficial characters appear to be useless so far as Labrador material is concerned.

It appears to us that there is a little mix-up here which can only be satisfactorily settled by the critical examination of all types concerned. Therefore we tentatively retain the Warren name as a subspecies of **centaureæ** Auct., ?Ramb.=**wyandot** (Edw.?).

We wrote to Professor M. Draudt to see if he could throw any further light upon this matter, but he replied that the case was a very difficult one and equally a puzzle to him.

503 add *albovittata* (Grt.)

1873, Grote, Bull. Buff. Soc. Nat. Sci., I, 168, **communis, Hesperia.**

Presumably a manuscript name, quoted as a part of a letter from Zeller, but Grote gives the indication which renders the name available.

523 add *hamamœlidis* (Scud.)

1889, Scudder, Butt. E. U. S., II, 1507, **icelus, Thanaos.**

A Fitch manuscript name listed in the synonymy by Scudder.

595 add *enys* Scud.

1870, Butler, Ent. Mo. Mag., VII, 93, **Pamphila.**

1889, Scudder, Butt. E. U. S., II, 1683, **peckius, Polites.**

Presumably a Boisduval manuscript name merely mentioned by Butler, but placed in the synonymy of **peckius** by Scudder.

598 add ?‡*osyka* (Edw.) (partim. ♀ nec ♂)

See notes under *bæis* (Scud.)

605 add ? *bæis* (Scud.)

1889, Scudder, Butt. E. U. S., III, 1865, **osyka, Euphyes.**

A Boisduval manuscript name published as a synonym of **osyka** (Edw.)

According to Barnes & McDunnough, 1916, Contrib., III, (2), 135-136, the three types of **osyka** represent three different species, the ♂ type being a specimen of **vestris** (Bdv.), one ♀ type being **eufala** (Edw.) and the other ♀ type possibly being a worn **brettus.**

It, therefore, becomes questionable just what species Scudder had in mind as **osyka,** but the chances are strongly against **vestris** which was well known to him under the name **metacomet.** We merely tentatively place **bæis** under **vestris** following Barnes & McDunnough's restriction of the name **osyka.**

639 change *samoset* (Scud.) to samoset (*Scud.*) and hegon (*Scud.*) to *hegon* (Scud.)

Scudder, 1868, Proc. Bost. Soc. Nat. Hist., XI, 382, appears to be the first worker to recognize the synonymy, and took advantage of the rights of the first revisional author to select the name **samoset,** rather than **hegon,** to stand, both names having been published on the same page in the same work, 1862, Proc. Essox Inst. III, 176.

645 add *a* reversa (*Jones*)

1926, Jones, Ent. News, XXXVII, 197, **carolina** var., (? an sp. dist.), **Amblyscirtes.**

648 add *chamis* Scud.

1889, Scudder, Butt. E. U. S., II, 1768, **accius, Lerema.**

A Boisduval manuscript name listed in the synonymy by Scudder.

650 add ‡ *osyka* (Edw.) (partim., ♀ nec ♂).

See notes under *bæis* Scud.

652 add *orthomenes* Scud.

1889, Scudder, Butt. E. U. S., II, 1761, **maculata, Oligoria.**

A Boisduval manuscript name listed in the synonymy by Scudder.

656 add *cochles* Scud.

1889, Scudder, Butt. E. U. S., III, 1867, **panoquin, Prenes.**

"Latr., MS." vide Scudder, who places the name in the synonymy of **panoquin** (Scud.)

THE HUBNER TENTAMEN[1]

By Wm. Barnes and F. H. Benjamin, Decatur, Illinois.

The publication of our recent Check List of the Diurnal Lepidoptera of Boreal America in the Bulletin of the Southern California Academy of Sciences has brought letters asking what part of the nomenclature therein employed deals with the Tentamen. As it would appear that Scudder's fac-simile copies are now unavailable to many workers, we are re-publishing the Tentamen so that its names will be generally available for future discussions.

Tentamen determinationis digestionis atque denominationis singularum stirpium Lepidopterorum, peritis ad inspiciendum et dijudicandum communicatum, a Jacobo Hübner.

Lepidoptera

Phalanx I. Papiliones.

Tribus I; nymphales.

I. Nereïdes—Nereïs Polymnia.
II. Limnades—Limnas Chrysippus.
III. Lemoniades—Lemonias Maturna.
IV. Dryades—Dryas Paphia.
V. Hamadryades—Hamadryas Jo.
VI. Najades—Najas Populi.
VII. Potamides—Potamis Iris.
VIII. Oreades—Oreas Proserpina.

Tribus II; gentiles.

I. Rustici—Rusticus Argus.
II. Principes—Princeps Machaon.
III. Mancipia—Mancipium Brassicæ.
IV. Consules—Consul Fabius.
V. Urbani—Urbanus Malvæ.

Phalanx II. Sphinges.

Tribus I; papilionoides.

I. Zygænæ—Zygæna Filipendulæ.
II. Chrysaores—Chrysaor Statices.
III. Glaucopes—Glaucopis Phegea.

Tribus II; hymenopteroides.

I. Sphecomorphæ—Sphecomorpha Incendiaria.
II. Sesiæ—Sesia Culiciformis.
III. Thyrides—Thyris Pyralidiformis.

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1. We regret that the printer could not follow the copy exactly, but this appears to have been an impossibility with modern type on a small page. The point and style of all type is correct, as is the punctuation. The original Tentamen is printed two columns to the page, and is composed of only two pages. Page 1 column 1 ends with Andria Vinula; page 1 column 2 ends with Umbratica; page 2 column 1 ends with Heliaca Purpuralis, page 2 column 2 ends with "dactyla" of the combination Ripidophora Hexadactyla. The footnote, "Ne expectet . . . . " is printed the full width of page 2.

Tribus III; legitimae.

I. Bombyliæ—Bombylia Stellatarum.
II. Eumorphæ—Eumorpha Elpenor.
III. Manducæ—Manduca Atropos.
IV. Amorphæ—Amorpha Populi.

Phalanx III. Bombyces.

Tribus I; sphingoides.

I. Dimorphæ—Dimorpha Versicoloria.
II. Ptilodontes—Ptilodon Camelina.
III. Andriæ—Andria Vinula.
IV. Platypterices—Platypteryx Hamula.
V. Echidnæ—Echidna Tau.

Tribus II; veræ.

I. Herææ—Heræa Carpini.
II. Hipogymnæ—Hipogymna Morio.
III. Leucomæ—Leucoma Auriflua.
IV. Dasychiræ—Dasychira Pudibunda.
V. Melalophæ—Melalopha Curtula.
VI. Hipocritæ—Hipocrita Jacobææ.
VII. Hypercompæ—Hypercompe Caja.
VIII. Lachneides—Lachneis Catax.
IX. Trichodæ—Trichoda Neustria.
X. Eutrichæ—Eutricha Quercifolia.
XI. Heteromorphæ—Heteromorpha Cæruleocephala.

Tribus III; fodicantes.

I. Teredines—Teredo Cossus.
II. Hepioli—Hepiolus Humuli.

Phalanx IV. Noctuæ.

Tribus I; bombycoides.

I. Apatelæ—Apatele Aceris.
II. Diphtheræ—Diphthera Aprilina.
III. Jaspidiæ—Jaspidia Spoliatricula.

Tribus II; genuinæ.

I. Miseliæ—Miselia Oxyacanthæ.
II. Pyrophylæ—Pyrophyla Pyramidea.
III. Poliæ—Polia Flavicincta.
IV. Achatiæ—Achatia Atriplicis.
V. Graphiphoræ—Graphiphora Gothica.
VI. Agrotes—Agrotis Segetis.
VII. Glææ—Glæe Vaccinii.
VIII. Xanthiæ—Zanthia Fulvago.
IX. Cosmiæ—Cosmia Affinis.
X. Bombyciæ—Bombycia Or.
XI. Heliophilæ—Heliophila Pallens.
XII. Xylenæ—Xylena Lythoxylea.
XIII. Tribonophoræ—Tribonophora Umbratica.

Tribus III; semigeometræ.

I. Plusiæ—Plusia Chrysitis.
II. Erotylæ—Erotyla Sulphurea.
III. Anthophilæ—Antophila Purpurina.
IV. Heliothentes—Heliothis Dipsacea.
V. Ascalaphæ—Ascalapha Lunaris.
VI. Lemures—Lemur Maura.
VII. Blephara—Blepharum Sponsa.
VIII. Brepha—Brephos Parthenias.
IX. Euclidiæ—Euclidia Glyphica.

Phalanx V. Geometræ.

Tribus I; amplæ.

I. Hylææ—Hylæa Fasciaria.
II. Terpnæ—Terpne Papilionaria.
III. Eusarcæ—Eusarca Elinguaria.
IV. Lares—Lars Sambucaria.
V. Eutrapelæ—Eutrapela Lunaria.
VI. Erastriæ—Erastria Amataria.

Tribus II; tenues.

I. Cyclophoræ—Cyclophora Pendularia.
II. Spilotæ—Spilote Grossulariata.
III. Sphecodæ—Sphecodes Pusaria.
IV. Chleuastæ—Chleuastes Piniaria.
V. Sciadia—Sciadion Furvata.
VI. Cymatophoræ—Cymatophora Roboraria.

Tribus III; æquivocæ.

I. Pachyes—Pachys Prodromaria.
II. Epirritæ—Epirrita Dilutata.
III. Rheumapteræ—Rheumaptera Hastata.
IV. Hydriæ—Hydria Undulata.
V. Petrophoræ—Petrophora Mæniata.

Phalanx VI. Pyralides.

Tribus I; geometriformes.

I. Erpyzones—Erpyzon Barbalis.
II. Saliæ—Salia Salicalis.

Tribus II; vulgares.

I. Heliacæ—Heliaca Purpuralis.
II. Elophilæ—Elophila Limnalis.
III. Palpitæ—Palpita Urticalis.

Tribus III; difformes.

I. Idiæ—Idia Bombycalis.
II. Chlamiphoræ—Chlamiphora Palliola.

Phalanx VII. Tortrices.

Tribus I; lascivæ.

I. Hemerophilæ—Hemerophila Pariana.
II. Olethreutæ—Olethreutes Arcuana.
III. Archipes—Archips Oporana.

Tribus II: pigræ.

I. Nycteola—Nycteola Degenerana.
II. Pseudoipes—Pseudoips Quercana.
III. Cochlidia—Cochlidion Testudo.

Phalanx VIII. Tineæ.

Tribus I: certæ.

I. Canephoræ—Canephora Graminella.
II. Enyphantæ—Enyphantes Gelatella.
III. Broscees—Brosis Granella.
IV. Setes—Ses Pellionella.

Tribus II: incertæ.

I. Tetrachilæ—Tetrachila Conchella.
II. Hyphantæ—Hyphantes Evonymella.

Tribus III: mirabiles.

I. Elasmia—Elasmion Geerella.
II. Coleophoræ—Coleophora Anatipennella.
III. Phyllonorycteres—Phyllonorycter Rajella.

Phalanx IX. Alucitæ.

Tribus I: indubidatæ.

I. Pterophoræ—Pterophora Pentadactyla.
II. Ripidophoræ—Ripidophora Hexadactyla.

Ne expectet quis, ordinem hunc nullam amplius correctionem, esse desideraturum verumtamen magis satisfaciet necessitati, quam prævius quivis. Familiis indicandis supersedere malui.

CHANGES DUE TO THE TENTAMEN

There has been some discussion of our "List" due to the "many changes" in Diurnal genera caused by our adoption of the Tentamen.

In actuality we have used only four Tentamen genera in our list; i. e., *Dryas*, *Lemonias*, *Hamadryas*, and *Urbanus*. Two of these, in the plural, Dryades and Hamadryades are in reality subdivisions of the old genus *Papilio* L. by Borkhausen, 1788. Their status in 1788 will presumably depend upon the outcome of a discussion involving "Troes" etc., of Linnaeus. Like all early authors, Borkhausen used the plural where he intended more than a single specific organism under consideration. There appears to have been no index to the work, so we cannot say if he intended a singular usage when combined with but a single species or not. Unfortunately his plates have these "names" abbreviated. It is, however, decidedly possible that we may have to use quite a few of the Tentamen names from earlier authors.

Of the four Tentamen names used on our list, all four are to be found in the Sammlung exotischer Schmetterlinge, at early dates. If we were to discard the Tentamen we might be forced to use *Dryas* for *Phyciodes*, instead of for *Argynnis*, a change not heretofore in the literature, and therefore to our minds much worse. *Limnas*, which by the Tentamen we can sink as a synonym of *Danaus*, would appear to be a valid genus, available for certain Neotropical species, giving one more of the Tentamen names to be used in the Diurnals by the rejection of the Tentamen, than if we accept the work.

The change of the subfamily name Hesperiinae to take the place of Pamphilinae has nothing to do with the Tentamen, *Pamphila* being a straight synonym of *Hesperia* with the same type and so used by most authors until 1870.

The use of the term Urbaninae for the term Hesperiinae, as used by authors of the last generation, seems regretable, but the Sammlung uses the name *Urbanus* for a number of species, a large proportion of which fall into the Urbaninae. To discard the Tentamen would be simply to use the name *Urbanus* in a little different sense but very probably in the same subfamily. When one considers that we do not know the exact date of any of the Sammlung plates of *Urbanus* species, that these plates were presumably not issued consecutively, the discarding of the Tentamen *Urbanus* would render the fixation of a type for *Urbanus* a matter of pure guesswork subject to change at the hands of every author. We fail to see how such a condition would improve our nomenclature. And even if the Sammlung *Urbanus* could be restricted to some one plate, the transfer of the name, with priority, to some other genus, probably in the same subfamily, would scarcely be an improvement.

We are inclined to think, that from the practical standpoint, rejection of the Tentamen would involve far worse changes than its adoption, for while we might discard the work we cannot erase its names which would become available from subsequent works with entirely different genotypes, with very questionable dates, thus tearing down our whole fabric of nomenclature in Lepidoptera for a gossamer of possibilities.

Another point we might mention to show the possibilities of change by the rejection of the Tentamen is that Latreille, 1810, mentions a *Lemonias* Illiger and "other" recently erected Illiger genera. Neither we, nor any authority whom we have consulted, know of any publication of *Lemonias* by Illiger prior to 1818. But we cannot logically say that no such paper exists. Papers can disappear which have presumably once been available. As an example we have in mind the "Erlangen List" of the Hymenopterists. When Dr. Sherborn wrote his Index Animalium he mentioned nineteen such works, and a total of thirty-one volumes. A thorough search may yet reveal an Illiger paper, which if the Tentamen were rejected, may publish a number of Tentamen names, rendering them available at a very early date. Early authors may have paid little attention to such a paper because of the Tentamen, which appears to have been quite generally available. We have considerable evidence that the Tentamen was available to most of the authors of Hubner's period, including Fabricius, Illiger, Haworth, Ochsenheimer, Treitschke, Geyer, Curtis, Kirby and Spence.

Before we leave the Tentamen, a word regarding its construction might not be amiss. It is to be noted that Hubner uses the term Lepidoptera divided into nine Phalanges which are the old and well known genera and subgenera of Linnaeus, used in the plural, a usage sanctioned by Linnaeus, 1758, et seq. Each Phalanx is divided into Tribus I, etc. It is to be noted that these tribes are not in reality named, but that the so-called names applied to them are in the nature of description, so that the whole fabric of the Tentamen is in the nature of a taxonomic key. Thus the butterflies are divided into the nymph-like ones and the ones belonging to another clan or nation, heathens or *gentiles*. While this means little to present taxonomist, Hubner's divisions in the remainder of Tentamen mean a great deal. We have the old *Sphinx* broken up into three tribes; the *papilionoides* or butterfly-like, the *hymenopteroides* or wasp-like, and the *legitimæ* or legitimate ones. Here it is interesting to note that Hubner was the first taxonomist to differentiate between the real Sphingids and the Aegeriids. The old genus (or subgenus) *Bombyx* is broken up into three tribes; *sphingoides*, *veræ*, and *fodicantes;* or Sphinx-like, true, and borers; the latter based on the early stages, a recognition that our Cossids and Hepialids did not belong with the real Bombycids. The old *Noctua* is broken up into three tribes; *bombycoides*, *genuinæ*,

and *semigeometra;* or Bombycid-like (to include those with Bombycid-like larvae), genuine (the cut-worm type), and the semi-loopers (a term even used at the present time for the larvae of most of the forms placed there by Hubner). And so we might go thru the work, whose divisions are truly in the nature of a taxonomic key. The stirpes themselves are differentiated by the inauguration of a system of metonomy, as stated in the heading of the Tentamen. In other words, Hubner actually states by his method of tabulation a system of taxonomy best known by an example:—as, that *cossus* is sole species and therefore type of *Teredo* to differentiate *Teredo* from *Hepiolus* of which he selects the type *humuli*, and that both genera are borers belonging to the old genus (or subgenus) *Bombyx* of the Lepidoptera. Hubner did not have the word type or genotype available for his use in 1806, but he managed to invent metonomy. Another good example is his genus *Sphecomorpha*. He has practically stated, turning to modern phraseology:—my genus *Sphecomorpha* has as its type *incendiaria* and thus differs from the known genera *Sesia* and *Thyris*, the type of the former *culiciformis* restricted by metonomy, and the type of the latter *pyralidiformis* also restricted by metonomy. These three genera belong in the old genus *Sphinx* but are not real Sphingids, being wasp-like in superficial appearance and habits.

The idea that authors of Hubner's day were opposed to the Tentamen, or its names, is a decided error; at the most based upon Latreille. The German workers headed by Hubner and Ochsenheimer adopted it for their subsequent works. The English, headed by Kirby (the author of the first well known set of Entomological text-books) and Curtis (the first English worker to designate genotypes) adopted it. Even Fabricius, in his last and presumably unpublished work, Systema Glossatorum, seems to have adopted the Tentamen *Plusia*.

Besides the use of the Tentamen names in the nominative singular in the Sammlung exotischer Schmetterlinge, the text of the Zutrage zur Sammlung exotischer Schmetterlinge, and the Anzeiger of the Verzeichniss bekannter Schmetterlinge, we call attention to two other little known papers. One is, "Catalague des Lepidopteres de la collection de M. Frank," 8vo., pp. 102. Inquiry at the British Museum reveals the fact that in this work some of the Tentamen generic names are used as genera by Hubner just before his death. We are, however, informed that the work is mainly of the nature of a dealers catalogue. We have not seen a copy. Scudder considered it an available publication. Perhaps it is both. The second rare work is the "Systematisch alphabetisches Verzeichniss aller bisher bei den Furbildungen zur Sammlung Europaischer Schmetterlinge, ausgegebenen Benennungen mit Vormerkung auch Augsburgscher Gattungen." Certainly in the work, which its own author states modernizes the nomenclature of his Samml. Europ. Schmett., the Tentamen genera are used. The generic and specific names are written with capital letters, and between them is intercalated a word, in the main descriptive. While such a procedure may shock some of our modern authors, the work is as truly binomial as the Linnaeus "Systema Naturae."

SECRETARY'S REPORT

1926

The Academy closes its fiscal year with a total of 277 members in good standing. This represents an increase of 53 over the figure of two years ago, notwithstanding the fact that 101 members dropped out from one cause or another.

Most of the deflections from our ranks have been in the class of resident members.

This loss of local memberships is chargeable in part to the fact that it has been impossible to find a suitable hall for lecture purposes, and our activities in this direction were therefore curtailed. In larger degree however, it resulted from the policy of securing memberships on the basis of personal friendship, rather than of vital interest in science and the work of the Academy. Such members remained with the Academy only for the period of a year, and thereafter resigned, or ignored notices of delinquency.

The coming year promises renewed activity in the line of lectures, through the pledge by the Library authorities of a lecture hall suited to our needs. This will furnish a means of interesting new people in the work of the Academy, and hence of building up the membership.

Three Bulletins were issued during 1925, and two issues have been published to date for 1926.

As a result of an intensive mail campaign the subscription memberships were increased from 47 to 136 in the two year period just passed. The influence of the Bulletin as a scientific record has therefore been markedly increased.

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Southern California Academy of Sciences

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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.

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"	23,	"	3.	May,	1924	.25
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"	24,	"	2.	May,	1925	.25
"	24,	"	3.	September,	1925	.25
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DR. JOHN A. COMSTOCK, *President*

Southern California Academy of Sciences, 501 Edwards-Wildey Bldg.
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Bulletin, Southern California Academy of Sciences

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New species and varieties listed in bold face.

BULLETIN OF THE
Southern California Academy of Sciences

LOS ANGELES, CALIFORNIA

Vol. XXVI January-April, 1927 Part 1

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Southern California Academy of Sciences

OFFICE OF THE ACADEMY

203 Hillstreet Bldg., 815 S. Hill — Los Angeles, Cal.

Southern California Academy of Sciences

PROTECTIVE COLORATION AND MIMICRY

By DR. JOHN A. COMSTOCK

All of the animal forms existing on the earth today have, in the past, undergone a series of gradual changes, in response to their surroundings, which have enabled them to survive in the face of innumerable forces tending toward their destruction.

These changes are in the nature of adaptations, by means of which, through constant improvements, they have adjusted themselves to their special environments.

In the higher vertebrates, these changes have brought about remarkable modifications of the nervous system, more particularly in the brain.

With lower forms of life, adaptive modifications are preponderantly in the nature of color changes, by means of which the animal simulates its environment ,and is thus enabled to escape observation.

Most naturalists have noted the close similarity of the color and markings of certain tree toads and lizards, to the environment in which they are found. (See Plate 1).

Many sea-horses are colored like the seaweeds among which they live. The Zostera, of the Florida Coast, for example, has a coloration like that of sea grass.

The young of the British Shore-crab (*Carcinas maenas*) invariably harmonizes with the color scheme of the pool which it inhabits. The Turbit, (*Psetta maxima*) rests flat upon the sea floor, and its upper surface shows the mottled pattern of its sandy cradle.

Thousands of examples of protective resemblance have been noted in the Arthropods. A certain spider, found in California, closely resembles a bird-dropping. The simulation is further heightened by its habit of resting quietly on the upper surface of a leaf, with its legs held close to the body.

Many of the Mantids and Walking-stick insects are modified to resemble sticks, leaves and bark. (See Plate 2, fig. 3).

A Hemipterous insect occurs in San Diego County, which rests in the blossom of the wild buckwheat. Its form and color so perfectly imitate a portion of the bloom that butterflies frequently alight upon it, and are thus captured.

In the Lepidoptera, protective resemblance may be manifested in one or more of the changes through which the insect passes, in the course of its metamorphosis. A large number of the eggs of butterflies are colored after the manner of the plants on which they are deposited.

Innumerable caterpillars possess the form and coloration of their environment. Those which feed on grasses are almost invariably long, cylindrical and green. The larva of the California Sister, (*Heterochroa californica*), is a perfect match for the oak leaf. Most of the Lycaenid caterpillars are practically invisible in their natural surroundings, as witness the larva of the Juniper Hair-streak, (*Mitoura siva juniperaria*).

Many Geometrid caterpillars, of the measuring-worm type, are shaped and colored in the semblance of twigs, and the camouflage is further strengthened by the attitude they assume. *Phasiana curvata* admirably illustrates this.

Butterfly chrysalids commonly resemble leaves, twigs, bark or stone.

Some animals and insects have the power of modifying their color in response to a change of environment. A familiar example of this type is the chameleon.

It has been frequently observed that the caterpillar of the Cloudless Sulphur, (*Catopsilia eubule*), assumes a yellow tint when feeding on the blossoms of *Cassia*, whereas it is green when found on the leaves.

A large number of butterflies resemble leaves, the most familiar example being the Leaf Butterfly of India, (*Kallima inachis*). (See Plate 2, fig. 2).

The Angle-wings, (*Polygonia*) are exactly the color of bark on the under surfaces of their wings. It is a common habit for them to rest on the trunk of a tree, with their wings closed.

Another type of protective adaptation consists in certain unpleasant or noxious qualities, such as that possessed by the familiar skunk.

A few caterpillars, notably the *Papilios*, have protrusive organs which emit an offensive substance.

All of the Danaid butterflies are believed to be obnoxious to insectivores. Moths of the genus *Zygaena* possess acrid or offensive qualities, and the same holds true for many other groups.

Frequently, when characters of a poisonous or repellant nature are developed, there is also the assumption of a conspicuous pattern or color. This phenomenon is termed "warning coloration."

Many reptiles and batrachians are known, which possess this combination of qualities.

The Spotted Salamander (*Salamandra maculosa*) exemplifies this principle. Some of the showy beetles are protected in like manner, as are also many tropical butterflies and moths.

Another interesting mechanism of survival, consists in the acquisition by non-protected species of the colors and patterns of obnoxious forms.

PLATE 1.
Illustrating Protective Coloration
The figure on the left shows a tree-toad which simulates the color of the rock so perfectly as to be almost indistinguishable.
The right hand figure shows a protectively colored moth on a piece of bark.
—Photo, Courtesy W. Scott Lewis.

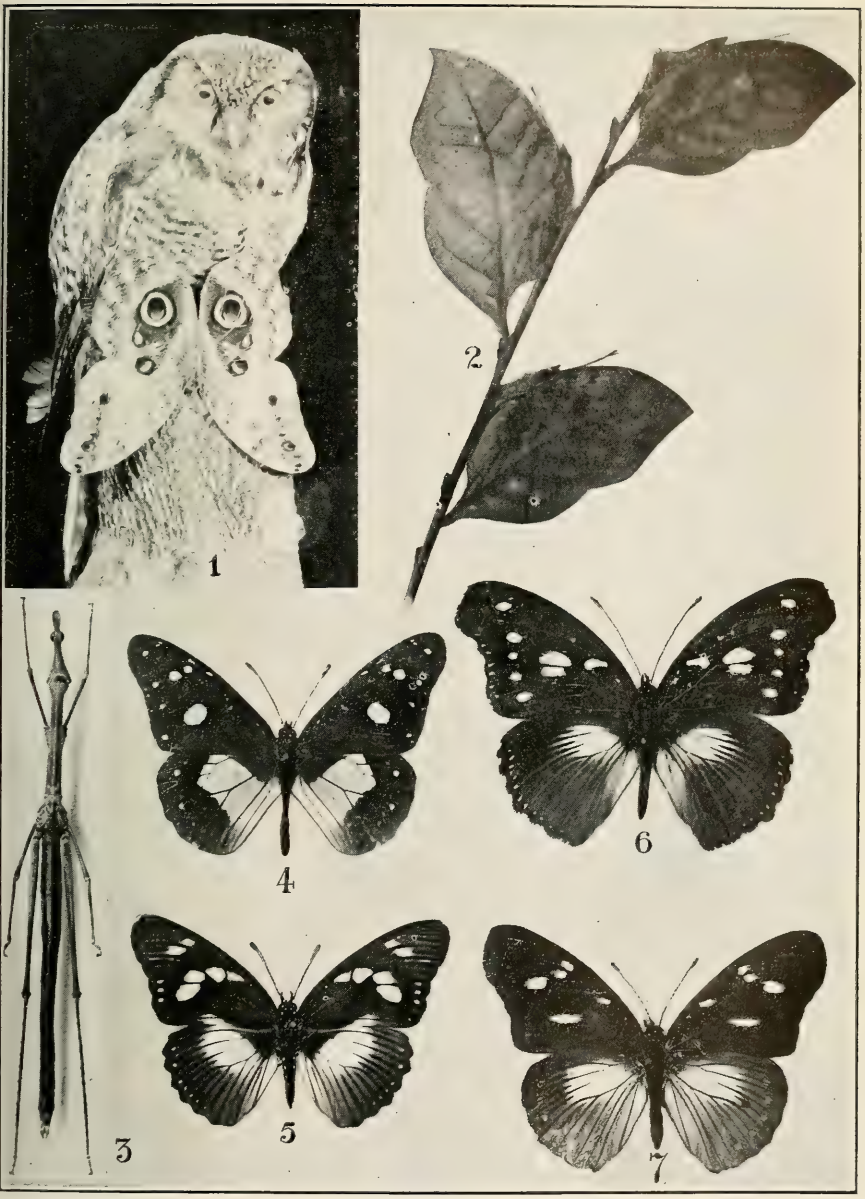

PLATE 2.
Illustrating Protective Coloration and Mimicry

Fig. 1. The Owl Butterfly of South America shown with an owl for comparison.
Fig. 2. Three Leaf-butterflies *(Kallima inachis)* of India, on twig, showing perfect simulation of leaves.
Fig. 3. Walking-stick insect resembling twigs.
Fig. 4. An *Acreid* Butterfly, protected by acrid qualities.
Figs. 5, 6, 7. Three African Butterflies which mimic the *Acreid* in color and pattern, but do not possess obnoxious qualities.

A good example of this is the case of *Basilarchia obsoleta*, which imitates *Danaus berenice*. The Basilarchias do not possess repellant qualities, and they would therefore admirably serve the palate of insectivorous birds and mammals. With the close resemblance of the two species, it is readily seen that confusion would arise, in consequence of which both would be shunned.

This imitative principle is widespread among the butterflies, and is termed "protective mimicry."

Dr. A. Seitz, in writing of the phenomena states that "there are many localities in South America, often quite circumscribed in extent, in which almost all the lepidopterous species that occur in any numbers have one and the same wing-pattern indifferently, whether they be butterflies or moths, whether stoutly-built Swallowtails or weak Pierids or shy Nymphalids.

In Columbia one may see flying about a single flowering shrub a number of butterflies, all colored and marked alike, but belonging to four entirely different groups. They are all black, with an oblique scarlet band on the forewings. The first is a Pierid (*Pereute leucodrosyne*), the second a Heliconid (*Heliconius melpomene*), the third a Swallowtail (*Papilio euterpinus*), and the fourth (*Adelpha isis*) a species of Nymphalid allied to Limenitis. In certain districts of Southern Brazil a yellow band on the forewing and dentated longitudinal stripes on a brownish yellow ground provide the general scheme, which is followed by Pierids (*Perhybris, Dismorphia*), Danaids (*Lycorea*), Heliconius (*Heliconius narcaea*) and even some moths (*Chetone*)."

Still another type of mimicry exists, in which an insect assumes the form of some totally unrelated species or form. Many Syrphid flies resemble bees, although they are without stings. A number of Sesiid moths simulate wasps.

The giant Brassolids of South America, known as Owl Butterflies, bear a remarkable resemblance to the heads of owls. (See Plate 2, fig. 1). They fly in the evening, and the great eye-like spots may have a protective significance.

It must not be assumed that the many striking protective patterns of butterflies have been acquired as a matter of conscious choice on the part of these insects. They represent the end product of a long series of gradual changes, operating in accordance with the great laws of Adaptation, and along lines of continual betterment.

A NEW RACE OF ARCTIA CAJA L.
(Lepid., Arctiidae)

By WM. BARNES and F. H. BENJAMIN,
Decatur, Illinois

Arctia caja waroi race nov.

This is the race of *caja* commonly going in American collections as *phaeosoma* Butl.

The British Columbia form has fore wings with the ground color like race *americana*, but with the white markings somewhat increased, the hind wing more tinged with crimson, and more heavily black marked in discal and cell regions.

True *phaeosoma* has the ground color of the fore wing dark, like Labrador *parva*, the hind wing brighter crimson and appearing to lack the spot on the discocellular vein usually found in *waroi*.

We suspect both *virginivir* and *opulenta* to represent races of *caja* more closely allied to one another than to *waroi*.

Type localities and number and sexes of types: Holotype, ♂, Vancouver Island; Allotype, ♀, New Westminster, B. C.; 2 ♂ Paratypes, Victoria, Vanc.; 1 ♀ Paratype, New Westminster, B. C.

Notes: We are indebted to Dr. Waro Nakahara for his kindness in supplying specimens of the Japanese *phaeosoma*, as well as for many other courtesies in the past, and take pleasure in naming the race in his honor.

A NEW ABERRATION OF BASILARCHIA WEIDEMEYRII Edwards. (Lepid.)

In the summer of 1925, Mr. Elven C. Nelson found at Boulder, Colorado, a remarkable aberration of *Basilarchia weidemeyrii*, which may be described thus: ab. **nigerrima**, nov. Wings above entirely black except for the presence of the first two subapical spots, the second reduced to about half normal size, the first six (only the first three or four clear) submarginal dots on anterior wing, and the normal broken marginal lines on both wings. Beneath the markings are reduced in size, and the broad white bands are replaced by black except for a series of spots along the outer margin.

This can not be referred to ab. *sinefascia* Edwards, which is an analogous variation of the Arizona subspecies, possessing all the submarginal dots. The specimen will be placed in the U. S. National Museum.

T. D. A. Cockerell.

Editor's Note: Photographs of both upper and under sides of this interesting specimen taken thru the courtesy of the U. S. Nat. Mus. will be shown in J. D. Gunder's forthcoming publication on "Butterfly Aberrations."

THREE NEW MOTHS FROM THE SOUTHWEST

BY CHAS. A. HILL, Glendale, Calif.

I. Family Notodontidæ Bombycia verdugoensis sp. nov.

Collar tinged with rufous basally; with black interline, sometimes obsolescent, sometimes doubled. Thorax and primaries blackish gray, tinged with rufous, and irrorated with black. Basal line obsolescent. T. A. line black, double, with mesad part obsolescent, distally jet black, waved; included space tinged with some rufous; median line blackish; obsolescent, nearly parallel to T. P. line; ordinary spots obsolescent; T. P. line doubled, its mesad part jet black, nearly erect from costa to vein 3, thence bent inward as a "V" again inwardly oblique below vein 1; distal part of T. P. line blackish, more or less obsolescent, widely separated from mesad part, nearly erect from costa to inner margin, included space tinged with some rufous; an oblique black apical dash connected to a pale waved S. P. line; a thin black terminal line; fringe fuscous gray interlined darker. Hind wing fuscous. Beneath dull fuscous with all maculation obsolescent or obsolete.

Expanse 32-34 mm.

Described from 6 ♂♂.

Taken in Verdugo Woodlands, Glendale, California, March 9 to 15, 1925, at light by the author. Holotype ♂ in coll. Wm. Barnes 2 ♂ paratypes in coll. Barnes 3 ♂ paratypes in coll. Chas. A. Hill.

An interesting species with no closely related organism described from Boreal America. The Tentamen generic name Bombycia is used here for Cymatophora of Lists. This species may require a separate genius. Superficially the resemblance is close to some of the European species.

Mr. Dunkenfield-Jones, of Glendale, captured five specimens of this species in March, 1926.

II. Family Noctnidæ Lascionycta benjamini sp. nov.

♂ antennae heavily serrated, practically pectinate, frons bulging but not roughened, eyes small but round, strongly lashed as well as hairy. Head and thorax gray, mottled with white and black. Fore wing dull gray, powdered with violaceous white and black, and tinged with ferruginous. Basal line obsolete, T. A. line obsolete; clariform defined by black; orbicular and reniform rather poorly defined, with fuscous centers, pale ringed, and blackish surrounding scales, the former irregular and oblique, the latter more or less crescent shaped; T. P. line obsolescent, produced to points on the veins; S. T. line obsolescent, inwardly defined by a band of black dashes; a thin black terminal line; fringe checkered and also interlined. Hind wings dull whitish luteous, obscured by fuscous which is darkest on veins as a discal spot and a median line, and as a broad out band. Fringe luteous basally, with fuscous interline distally white. Beneath white tinged with luteous and powdered with black and gray, the veins tending to be darkened, both wings crossed by a common line with discal spots and with broad dark outer banding. A strong black bar tends to connect the discal spot of the hind wing with the base.

Expanse 31-32 mm.

Described from 7 ♂♂ taken in Inyo Co., California, at light 18-20th July, 1922, by the author on a trip with Mr. A. C. Poling. The holotype taken at Mammoth, Inyo Co., California, 8,500 feet elevation, is deposited in coll. Wm. Barnes, paratypes in coll. Chas. A. Hill and Wm. Barnes.

This is also an interesting species in that it differs considerably from any other which has been described.

It is tentatively placed in Lasionycta because of its strongly lashed eyes. It seems to be a connecting link between that genus and "Polia" of Hampson. The small eyes are not unlike those of some "Auarta." Hampson's figure of "Auarta" or Scotogramma discolor shows either the same or a very similar species. It was not made from the type of discolor which has heretofore been known only by the unique type in the U. S. National Museum. A copy of a photograph of this is before me. Hampson's determination seems quite incorrect. I have recently found several more specimens of this new species taken with these at the same time and locality.

Named in appreciation for the courtesies shown me on many occasions by Mr. Foster H. Benjamin who kindly determined the three moths described in this paper as being new to science and the privilege of naming these species due to the generosity of Dr. Wm. Barnes, of Decatur, Illinois, who spent four days with me last March and took back home with him these new species with many others for his collection and for determinations, later returned to me.

III. Family Noctnidæ Paphia piazzi sp. nov.

Collar dark, disconcolorous with thorax which is dull gray and concolorous with the primaries. These are scarcely marked save for black t. a. and t. p. lines, the former, rather evenly rounded from costa to vein 1, thence tending to be produced along vein 1, for a short distance and to be connected to inner margin, this latter character being rather prominent in the holotype but rather obsolescent in a paratype; the t. p. line is excurved around cell, incurved from vein and the ordinary spots are obsolescent. Fringe tending to be slightly checkered. Hind wing white suffused with fuscous and crossed by a median line. Beneath: white with some fuscous suffusion, especially on primaries; both wings crossed by a common line; discal dots present but faint.

Expanse 29-31 mm.

Described from 2 ♂ from Brownsville, Texas, taken at light by E. Piazza, the holotype being labeled 4-11-25 and deposited in coll. Barnes; the paratype 2-11-25 in coll. Chas. A. Hill.

This is new to the U. S. and north but "Brownsville" localities are always "suspicious" so that it may have been described from Mexico S. Am. fauna.

Named in honor of our lamented friend whose untimely end robbed us of one of the most indefatigable collectors I have ever known. Mr. Piazzi had several more of this, but I have been unable to trace his material since his death, March, 1926, in New York.

THE GENUS CORETHROGYNE IN SOUTHERN CALIFORNIA

By MARGARET L. CANBY

This paper, presenting a revised classification of the genus Corethrogyne in Southern California, was worked out under the direction of Dr. Philip A. Munz of Pomona College. Many of the suggestions incorporated are his and to him are due thanks for obtaining reference material.

I wish to express appreciation also to those who loaned or looked up herbarium material: Miss Alice Eastwood of the California Academy of Sciences, Mr. F. W. Peirson of Pasadena, Mr. M. F. Gilman of Banning, Dr. A. Davidson of Los Angeles, Dr. B. L. Robinson of the Gray Herbarium, Dr. N. L. Gardner of the University of California Herbarium, Dr. W. A. Maxon of the National Herbarium, and Father J. C. Nieuwland of Notre Dame University.

Abbreviations used in citing specimens are:

Pomona College Herbarium.....(PC)
Gray Herbarium .....(G)
University of California Herbarium.....(UC)
Peirson Herbarium .....(FP)
Davidson Herbarium .....(AD)
California Academy Herbarium .....(CA)

Many specimens from outside our limits have been looked over in the preparation of this paper and the following general conclusions have been made. Two strictly northern species seem worthy of recognition: *C. californica* DC. and *C. leucophylla* (Lindl). I have seen authentic material of *C. obovata* Benth., *C. spathulata* Gray, and *C. caespitosa* Greene, and these appear to be synonomous with *C. californica*, having the same broad leaves, large heads and decumbent habit. Original material of *C. leucophylla* has not been available but the herbarium material labelled *C. leucophylla* seems to agree with the description in DC., Prodr. 5:278, 1836. It has very small, hoary, obovate, rather thick leaves and tomentose involucres and is low and spreading. *C. tomentella* (H. and A.) T. & G. is synomous with *C. leucophylla.* All other plants in the genus fall into *C. filaginifolia* of which the var. *typica* is a coastal form extending southward from Monterey to Santa Barbara. *Rigida* as a varietal name has been referred to Bentham, Pl. Hartweg., 316, 1849 (*C. incana* var.? rigida), but his use of the word "rigida" was as a descriptive adjective (as Heller Muhlenbergia 2:256. 1906, points out), so that the name *virgata* applies to the glandular coastal form of *C. filaginifolia*, as the oldest name for that concept. *C. viscidula* Greene is a synonym of *C. filaginifolia* var. *virgata*. *Rigida* was made by Gray to include also the common mountain form, but since this is quite distinct from the coastal plant, Greene's name *brevicula* must be used.

KEY TO THE VARIETIES IN SOUTHERN CALIFORNIA

Tomentum of uppermost parts deciduous by time of flowering.

Inflorescence glandular.

Involucres under 9 mm. high, glands short stipitate.

Plant short, generally under 4 dm.

Tomentose only around basal portion, not more than half way up the stem, the glandular portion bright green; San Antonio Mts.....5. *C. filaginifolia* var. *pinetorum.*

Tomentose at least half way up stem.

Involucres 7-9 mm. high; stems very stout, not erect; San Miguel Island.....6. *C. filaginifolia* var. *robusta.*

Involucres 6-7 mm. high; stems fairly slender, quite erect; mountain plants.....4. *C. filaginifolia* var. *brevicula.*

Plants tall, usually over 4 dm.

Tomentum extending up to involucre; inland valleys. .....3. *C. filaginifolia* var. *bernardina.*

Tomentum not extending to involucre but upper parts glandular.

Involucres turbinate to hemispheric; coastal.... ....2. *C. filaginifolia* var. *virgata.*

Involucres cylindrical, bracts squarrose, in 6 or more ranks; San Fernando to Saugus region. .....7. *C. filaginifolia* var. *Peirsoni.*

Involucres over 9 mm. high, with long stalked glands; heads numerous, hemispheric; coast of San Diego Co..... 8. *C. filaginifolia* var. *incana.*

Inflorescence scarcely if at all glandular; coastal.....1. *C. filaginifolia* var. *typica.*

Tomentum not deciduous at time of flowering.

Leaves linear; San Diego region.....9. *C. filaginifolia* var. *linifolia.*

Leaves not linear.

Involucres 8-12 mm. high, campanulate; leaves ovate to oblong to spatulate; San Bernardino Mts.....10. *C. filaginifolia* var. *sessilis.*

Involucres 7-8 mm. high, turbinate; leaves mostly broadly oblong; coast of Ventura Co.....11. *C. filaginifolia* var. *latifolia.*

TREATMENT OF VARIETIES*

1. Corethrogyne filaginifolia var. typica n. nom.

Aster filaginifolius H. and A., Bot. Beechey, 146, 1833. *C. filaginifolia* (H. and A.) Nutt., Trans. Am. Philos. Soc. ser. 2, 7:290. 1841. Torrey and Gray, Fl. N. Amer. 2:98. 1841. Gray in Bot. Calif., 1:320, 1876. Gray, Syn. Fl. 1, pt. 2:170, 1884. Hall, U. C. Pub. Bot. 3:70. 1907. Davidson and Moxley, Fl. So. Calif., 383 1923. Jepson, Man. Calif., 1042. 1925. *C. californica* D. C. var. *filaginifolia* Kuntze, Rev. Gen. Pl. 1:330. 1891.

Suffrutescent, slender, erect or ascending, 5-8 dm. high; tomentum tardily deciduous, upper parts scarcely if at all glandular; leaves lanceolate to ob-lanceolate, acute to obtuse, entire or toothed, upper ones sessile, 1-5 cm. long, 5-15 mm. wide; inflorescence paniculate with relatively few heads, each on a slender branch; involucre, broadly turbinate 7-9 mm. high, glabrate, bracts rarely recurved; rays violet, 8-10 mm. long.

Coastal, entering our region from the north. Abundant material seen from San Luis Obispo and Monterey Counties including a fragment of the type collection (G). From Santa Barbara County: Santa Barbara, *Brandegee in* 1889 (UC).

2. Corethrogyne filaginifolia var. virgata (Benth.) Gray in Bot. Calif. 1:321. 1876, Syn. Fl. N. Am. 1 pt. 2:170. 1884. Hall, U. C. Pub. Bot. 3:71. 1907. Davidson and Moxley, Fl. So. Calif., 383. 1923.

C. virgata Benth., Bot. Sulph., 23. 1844. Abrams, Fl. L. A. and Vic., 401. 1904 and 367. 1917. *C. filaginifolia* var. *rigida* of Jepson, Man. Calif. 1043, 1925 in part. *C. flagellaris* Greene, Leaflets Bot. Obs. 2:27. 1910. *C. floccosa* Greene, Leaflets Bot. Obs. 2:25. 1910. *C. californica* DC, var. *virgata* of Kuntze, Rev. Gen. Pl. 1:330. 1891. *C. lavandulacea* Greene, Leaflets Bot. Obs. 2:27. 1910. *C. filaginifolia* of Millspaugh and Nuttall, Field Mus. Bot. Ser. 5:267. 1923. *C. scabra* Greene, Leaflets Bot. Obs. 2:25. 1910.

Suffrutescent, stems slender, erect, 6-10 dm. high, tomentose below, usually shedding the tomentum above and becoming green and with short stipitate glands in whole upper portion; leaves linear-lanceolate, entire to oblong and serrate near tips, sessile with more or less clasping base or lowermost petioled, 1-6 cm. long, 2-20 mm. wide; inflorescence a diffuse panicle with numerous heads; involucre variable, generally turbinate (occasionally campanulate or hemispherical), 5-8 mm. high, bracts usually recurved, green; with numerous short stipitate glands; rays apparently violet, 6-9 mm. long.

*The collections referred to in the following references were not available for study and it was therefore impossible to determine just what varieties of *C. filaginifolia* are involved.

From Santa Cruz Island:

C. filaginifolia of Greene, Bull. Calif. Acad. Sci. 2:401. 1887.

Santa Rosa Island:

C. filaginifolia of Brandegee, Proc. Calif. Acad. Sci. ser. 2, 1:211. 1888.

Santa Cruz, Santa Rosa and San Miguel Islands:

C. filaginifolia of Brandegee, Zoe 1:138. 1890.

Catalina Island:

C. filaginifolia of Davidson, Erythea 2:30. 1894.

The variety was adequately distinguished from var. *typica* by Hall (U. C. Pub. Bot. 3:70. 1907) on the basis of stipitate glands in the inflorescence. It is the common plant along the coast from San Diego to Monterey and exhibits many variations but none clearly enough marked for nomenclatorial recognition. Material studied: San Diego Co.: Vicinity of San Diego, *Spencer* 12 (G, UC), *Wright* 123 (UC), *Reynolds in* 1897 (UC); San Diego, *K. Brandegee in* 1906 (UC), *Purpus in* 1898 (Po, UC), *Herre in* 1902 (Po); Canyon above Old Mission, *Spencer* 1342 (G); Ramona, *K. Brandegee in* 1903 (UC); North Island, San Diego, *Herre in* 1902 (Po); Linda Vista, *Macbride and Payson* 782 (G); Julian, *Dunn in* 1888 (UC); Palomar Mt., *Schellenger in* 1901 (UC). Orange Co.: Laguna Beach, *Crawford in* 1916 (Po); Balboa, *Peirson* 5087 (FP), *Johnston in* 1924 (Po). Los Angeles Co.: Ballona Harbor, *Abrams* 2177 (Po); Playa del Rey, *Abrams* 2981 (G, Po, UC); Santa Monica Exp't. Station, *Barber* 291 (UC); Santa Monica Mts., *Engelmann* 13 (G); Malibu, *Barber in* 1898 (UC); Los Angeles near Soldier's Home, *Adams in* 1905 (UC); Los Angeles, *Miss Palmer* (UC), *Braunton* 646 (UC); Elysian Park, Los Angeles, *Abrams* 4123 (G, Po), 4170 (G); Eagle Rock Canyon, *Peirson* (FP); San Gabriel Mts., Toll Road, *Peirson* 257 (FP); Lukens Peak, *Peirson* 229 (FP); Rubio reservoir, *Peirson* 126 (FP); Eaton Canyon, San Gabriel Mts., *Moxley* 514 (UC); Pomona, *Reed in* 1895 (Po); without locality, *Hasse in* 1890, type of *scabra* (US). Riverside Co.: Riverside, *Zumbro* 363 (UC). Santa Barbara Co.: San Ysidro, *Newell in* 1913 (G); Santa Barbara, *Elmer* 3856 (G, Po); Ellwood, *Eastwood* 217, type of *C. filaginifolia* var. *floccosa* (CA).

Under *C. filaginifolia* var. *virgata* also are to be cited specimens referred by Greene to *flagellaris*, since these specimens all seem to be off-season growth. Those taken latest in the season most nearly approach ordinary *virgata* and the locality is in the range of *virgata*. Los Angeles Co.: Redondo, *Braunton* 280, type of *C. flagellaris* (US), *Davy* 7772 (UC); Near Redondo, *Hall* 6723 (UC); Manhattan Beach, *Spalding* in 1924 (Po).

Extremes of variation in *virgata* are shown by: *Eastwood* 135 (G), which has linear leaves and tomentose stems and leaves up to the involucre, and the Peirson specimen from Eagle Rock, which lacks tomentum and has broad obovate leaves. The former approaches var. *linifolia*. *MacBride and Payson* 782 (G) from Linda Vista lacks tomentum, leaving the inflorescence a sticky green. *Abrams* 298 (UC) from Playa del Rey and *Abrams* 2177 (Po) from Ballona Harbor approach *C. filaginifolia* var. *pacifica* in size and shape of heads and stoutness of growth, but have not the very long stipitate involucral glands that characterize var. *pacifica*. *Moxley* 514 (UC) from Eaton Canyon represents a local variation, with broad oblong cauline leaves and very slender flowering branches with small heads. *Lyon* 7, in 1885 (G) from Eaton Canyon is the same.

Plants from Catalina Island seem best referred to var. *virgata*, although some are rather peculiar. *Eastwood* 6517 (CA) from the Isthmus has the involucres quite wooly, but with the narrow bracts of *virgata* rather than *linifolia*. Another *Eastwood* collection from the same place, *June* 10, 1918, (CA) is quite definitely *virgata*, as are: Avalon, *Trask in* 1901 (AD), *in* 1900 (US), *in* 1898, type of *C. lavandulacea* (US).

3. **Corethrogyne filaginifolia** var. **bernardina** (Abrams) Hall, U. C.

Pub. Bot. 3:71. 1907. Parish, Pl. World 20:257. 1917. Davidson and Moxley, Fl. So. Calif., 383. 1923.

C. filaginifolia of Reed, Muhlenbergia 5:97, 1909. *C. virgata* var. *bernardina* Abrams Fl. L. A. and vic., 401. 1904 and 368. 1917. *C. filaginifolia* var. *rigida* of Jepson, Man. Calif., 1043. 1925, in part.

Suffrutescent, stems slender 5-9dm. high, rather persistently white tomentose except on involucres and upper parts of peduncles, "the exposed parts then glandular;" leaves oblong to lanceolate or oblanceolate, usually entire or serrate on upper half, blades 1-5 cm. long, 0.5-2cm wide; inflorescence a loose panicle or raceme with slender, rather long divaricate branches terminating frequently in single heads and rather conspicuously leafy bracted; involucres turbinate, 5-7mm. long with squarrose bracts; rays lavender, 7-9mm. long.

Material studied: CALIFORNIA, without locality, *Brandegee* (G), Los Angeles Co.; Los Angeles, *Miss Palmer* (UC), *Nevin in* 1880 (G); Pasadena, *Jones in* 1882 (Po), *McClatchie in* 1892 (UC). San Bernardino Co.: without locality, *Pringle in* 1881 (G), *Parish in* 1893 (UC); San Antonio Canyon, *Crawford in* 1915 (Po); near Claremont, *Munz & Harwood* 4380 (Po); Etiwanda, *Abrams* 2174 (Po); Lytle Creek Canyon, *Peirson* 4609 (FP); Mentone, *Abrams* 2931, type collection (G). Riverside Co.: Riverside, *Reed* 1980 (Po), *Hall in* 1899 (UC); Reche Canyon, *Zumbro* 31 (Po); Banning, *Toumey in* 1894 (UC).

4. **Corethrogyne filaginifolia** var. **brevicula.** (Greene) n. comb.

C. brevicula Greene, Leaflets Bot. Obs. 2:26. 1910. *C. filaginifolia* var. *rigida* Gray, Syn. Fl. 1, pt. 2:170. 1884 for plants from So. Calif. Hall, U. C. Pub. Bot. 3:72. 1907, in part. Parish, Pl. World 20:257. 1917, in part. Davidson and Moxley, Fl. So. Calif., 383. 1923, in part. Jepson, Man. Calif., 1043. 1925, in part. Not *C. rigida* (Gray) Heller, Muhl. 2:256. 1906. Not *C. incana* Nutt. var.? Benth., Pl. Hartweg., 316. 1849. *C. filaginifolia* Nutt. of Hall, U. C. Pub. Bot. 1:126. 1902. *C. filaginifolia* var. *glomerata* Hall, U. C. Pub. Bot. 3:72. 1907. Parish, Pl. World 20:257. 1917. Jepson, Man. Calif., 1043. 1925. *C. racemosa* Greene, Leaflets Bot. Obs. 2:26. 1910.

Stems stiff, erect, 2-4 dm. (6) high, ligneous only at very base; tomentum close, deciduous from inflorescence and upper part of stem at time of blooming, leaving the involucre and the bare or sparsely bracted peduncles glandular; leaves spatulate to obovate with clasping base, characterized by a yellow green color made somewhat gray by the tomentose investiture, upper leaves sessile 1-5cm. long, 4-15mm. wide, lower narrowed into petioles and somewhat longer; inflorescence generally a corymbose panicle, relatively few flowered; involucres 6-7mm. high, broadly turbinate, generally with recurved bracts; rays 10-12mm. long, violet to purplish.

A practically herbaceous variety of the pine belt, ascending to about 8000 ft. altitude and fairly frequent in all the mountains from the Southern Sierras to the Lagunas of San Diego County, except in the eastern part of the San Gabriel range where it is apparently replaced by var. *pinetorum*, and from which it differs in being tomentose higher in the plant. It is further characterized by its peculiar grayish green tinge, sometimes accompanied by a touch of olive, and by its rather closely placed obovate or spatulate lower leaves. It frequents dry slopes and benches under pines.

The following material has been studied:

San Diego Co.: Mountains near U. S. boundary, *Orcutt* 624 (G), *Orcutt in* 1889, apparently types of *C. brevicula* and *C. racemosa* (US); Campo, *Palmer* 140 (UC); Laguna Mts., *Munz* 8354 (Po), *Spencer* 936 (Po, G); Cuyamaca Peak, *T. S. Brandegee in* 1894 (UC); Palomar Mt., *Spencer* 935 (G), *Spencer* 992 (G, Po); Pine Hills, *Spencer* 296 (G, Po). Orange Co.: Santiago Peak, *Munz* 7739 (Po). Riverside Co.: San Jacinto Mts., Pine Flats, *Peirson* 5017 (FP), *Munz and Johnston* 8718 (Po); Poppet Flat, *Munz and Johnston* 8858 (Po); Strawberry Valley, *Hall* 2530 (UC); Idyldwild, *Jones in* 1924 (Po). San Bernardino Co.: Forest Home. *Robertson* 110, (UC), *Robertson* 121 (UC); Mill Creek, *Munz* 7584 (Po), *Peirson* 4736 (FP); Santa Ana River, *Munz* 6245 (Po, UC); South Fork Santa Ana River, *Munz* 6245 (Po, UC), *Peirson* 3268 (FP); San Bernardino Mts., *Jones in* 1923 (Po); San Antonio Canyon, *Peirson* 2751 (FP). Los Angeles Co.: Mt. Wilson, *Davidson* 1995 (AD). Ventura Co.: Seymour Creek, Mt. Pinos, *Baldwin* 107 (UC). Kern Co.: Tehachapi, *Eastwood in* 1894 (G, UC).

The following material is more or less intermediate between *C. filaginifolia* var. *brevicula* of higher altitudes and *C. filaginifolia* var. *bernardina* of the valleys: San Bernardino Co.: Spring Hill, San Antonio Mts., *Munz* 6419 (Po). Riverside Co.: San Gorgonio Pass, *Wright* 6 (G); Banning, *Gilman* 34 (UC), *Munz and Johnston* 8713 (Po).

5. **Corethrogyne filaginifolia** var. **pinetorum** Johnston, Bull. So. Calif. Acad. 18:21. 1919. Pl. World 22:119. 1919.

Herbaceous with several short, slender, sub-erect stems, 1-4.5 dm. high; lower leaves and ca. 1 dm. of base of stem densely permanently tomentose, whole upper portion bright oily green with dense stipitate glands; leaves obovate to oblanceolate, petioled or with clasping base, generally entire or serrate near tip, blades 0.5-3 cm. long, 3-8 mm. wide; inflorescence relatively simple, corymbose with few heads, the branching divaricate and monocephalous; involucres turbinate, 5-7 mm. high, bracts squarrose, rays purplish, 8 mm. long.

This local and sometimes ill-defined variety has been collected at elevations ranging from 4,300 to 5,500 ft. and largely replaces var. *brevicula* in its region. Material studied: Los Angeles Co.: Browns Flats, *Johnston* 2137, type collection (Po, UC); Upper San Antonio Canyon, *Johnston* 1644 (Po, UC); 1 mi. So. of Sunset Peak, *Johnston in* 1924 (Po, UC).

6. **Corethrogyne filaginifolia** var. **robusta** Greene, Pittonia 1:89. 1887.

Hall U. C. Pub. Bot. 3:72. 1907. Davidson and Moxley, Fl. So. Calif., 383. 1923.

Stems stout, suffrutescent, somewhat depressed or ascending; floccose tomentum of stem and leaves deciduous only from inflorescence, peduncles then glandular; leaves numerous along entire length of stem, becoming rather conspicuous bracts in the inflorescence, sessile or more commonly petioled, broadly obovate to spatulate, entire or serrate at the tip, length 2-4 cm., width 0.5-1.7 cm., inflorescence a dense corymbose panicle; involucres hemispheric, involucral bracts linear, acuminate, 7-9 mm. long, 0.7-1 mm. wide, recurved, scarcely if at all glandular; rays 8-10 mm. long.

Material studied: Santa Barbara County: San Miguel Island, *Greene in* 1886, type collection (CA). The one specimen examined seems worthy of the varietal recognition Greene gives it on account of its stockiness, depressed habit, numerous broad leaves and recurring linear bracts that distinguish it from the mainland coastal form the var. *virgata* which it most nearly resembles.

7. **Corethrogyne filaginifolia** var. **Peirsoni** n. var.

Stems herbaceous, ligneous at base only, varying considerably in stoutness usually quite stout and spreading, 4-9 dm. high; tomentum deciduous only from upper parts or from more of the plant; leaves oblanceolate to obovate, serrate on upper half, 1-5 cm. long, 8-20 mm. wide; cauline leaves sessile, lower ones petioled and longer; inflorescence paniculate to virgate the non tomentose portions a dark green; involucres cylindric, diffusely glandular and somewhat scabrous, 7-8 mm. high; bracts squarrose, imbricated in about 6 or more ranks, viscid, glandular with stout stipitate glands; rays 9-11 mm. long, red violet in color.

Apparently a rather local variety of San Fernando Valley and vicinity. Amply characterized as a variety by the peculiar dark green color of the involucres and upper parts and by the red violet rays and the numerous squarrose bracts of the cylindrical involucres. The bracts have a tendency to continue on to the peduncle, as in *Munz* 7785 and *Pierson* 270.

Material studied: Los Angeles County: South side of Newhall Grade, *Canby* 13, (Po); Newhall, *Munz* 7785, Oct. 7, 1923; (type Pomona College Herbarium no. 18,222), *Peirson* 4159 (FP); 4 mi. n. of Saugus, *Canby* 11, (Po), 10 (Po); Ravenna, *K. Brandegee* (UC); San Gabriel Mts., Pacoima Canyon, *Peirson* 270 (FP); Bouquet Canyon, *Munz* 7788 (Po). *Munz* 7788, a peculiarly narrow leaved plant from Bouquet Canyon, has the inflorescence, etc. of *Peironi* and for want of more material is referred here. *Peirson* 270 of Pacoima Canyon does not look typical and is probably a shade plant.

8. **Corethrogyne filaginifolia** var. **incana** (Nutt.) n. comb.

C. incana Nutt., Trans. Amer. Philos. Soc., ser. 2, 7:290. 1841. Torrey and Gray, Fl. N. Amer., 2:98. 1841. Gray Syn. Fl. N. Amer., 1, pt. 2:170. 1884. *C. californica* DC var. *incana* Kuntze, Rev. Gen. Pl. 1:130. 1891. *C. filaginifolia* var. *tomentella* Gray in Bot. Calif. 1:321. 1876, for plants from So. Calif. *C. californica* of Gray, Syn. Fl. N. Amer. 1 pt. 2:70. 1884, for plants from So. Calif. *C. filaginifolia* var. *pacifica* Hall, U. C. Pub. Bot. 3:73. 1907; Davidson and Moxley, Fl. So. Calif, 383. 1923; Jepson, Man. Calif., 1043. 1925.

Plant stout, erect, much branched above, 5-8 dm. high, "tomentum floccose, deciduous from the branchlets and involucres at time of flowering;" leaves linear to narrowly lanceolate or oblanceolate, acute, entire or with few teeth, 2-5 cm. long, 2-8 mm. wide; inflorescence an open panicle with numerous large heads, peduncles and involucres conspicuously glandular with long-stalked glands; involucres, hemispheric 10-12 mm. high; bracts imbricated, linear, acuminate, scarcely if at all recurved, "greenish except at chartaceous and strongly nerved base;" rays violet or purple, 11-12 mm. long.

Known from but few collections along the coast in San Diego County. At first glance the large hemispheric heads of this plant seem indicative of specific rank but study of a number of specimens soon reveals intergrades with *virgata* and *linifolia*. To this variety the

following material may be referred: Pacific Beach, *Purpus in* 1899, (1898?), type collection of *pacifica* (G, Po, UC); Del Mar, *K. Brandegee in* 1906 (UC); southern part of San Diego County, *Palmer in* 1875 (G); San Diego, *Parry* 1850 (G). The following specimens probably represent spring collections and are not typical of *incana* in the lack of branching in the inflorescence and in the presence of some tomentum in the involucre but by virtue of their large hemispherical heads and peculiar stalked glands they must be referred here; San Diego, *Nuttall*, type collection of *incana* (G), *Cooper in* 1860-61 (G).

Since Nuttall's specimen of *incana* without doubt applies to the same concept as Hall's *pacifica*, and since *incana* was used as a varietal name long before *pacifica*, it must be used.

9. **Corethrogyne filaginifolia** var. **linifolia** Hall, U. C. Pub. Bot. 3:71. 1907. Davidson and Moxley, Fl. So. Calif., 383. 1923. Apparently Jepson, Man. Calif., 1042. 1925, in part.

Herbaceous or apparently suffrutescent, erect, 2-4 dm. high; permanently hoary tomentose throughout including involucres; leaves, "crowded below, more scattered above, all narrowly linear, 2-5 cm. long," 1-2 (5) mm. wide; inflorescence with heads solitary on simple stems or on spreading branches; involucres broadly turbinate, 8-10 mm. high; bracts with spreading tips, imbricated in 5 ranks; rays violet, 6-8 mm. long.

Material studied: San Diego Co.: San Diego, *Spencer* 35 (G, UC); Del Mar, *K. Brandegee in* 1906 (G, UC); Torrey Pines, *Collins and Kempton* 211 (US); Encinitas, *T. S. Brandegee in* 1894 (UC). A collection from Point Loma, *Hall* 8324 (G, Po, UC) has the narrow woolly leaves of *linifolia* but involucres and upper parts of stem are as green and glandular as in any *virgata;* it is quite intermediate between the two varieties.

10. **Corethrogyne filaginifolia** var. **sessilis** (Greene) n. comb.

C. sessilis Greene, Leaflets Bot. Obs. 2:25. 1910. *C. filaginifolia* var. *rigida* of Parish, Pl. World 20:257. 1917, in part. *C. filaginifolia* var. *latifolia* of Jepson, Man. Calif., 1042. 1925 for San Bernardino Mts.

Herbaceous, scarcely if at all suffrutescent, frequently rather stout especially in exposed positions; densely and rather permanently tomentose on stems and involucres; height 1.5-7 dm.; leaves ovate to oblong-ovate to spatulate, entire or serrate at tip, grayish green to almost whitish in color, sessile (sometimes by broad clasping base) or lowermost petioled; blades 1-4 cm. long, 0.5-2 cm. wide; inflorescence varying from virgate on rather stout axis to open and spreading on a slender axis; peduncles when evident, commonly monocephalous and sparingly leafy-bracted; involucres campanulate, 8-12 mm. high, its bracts closely imbricated in about five series, with somewhat spreading tips and invested with a permanent somewhat floccose tomentum; rays violet, 10-12 mm. long.

Abundant on dry, open hillsides and under pines in Upper Sonoran and Transition Zones of San Bernardino Mountains from about 4,000 to 7,500 ft. altitude. Apparently taking on two forms, the typical, stout, densely tomentose virgate plant of open places and the more slender loosely branched, rather thinly tomentose one from shade. Amply characterized as a variety by its tomentose involucre, long rays, sparingly bracted peduncles and ovate to spatulate leaves. The following material is referred to this variety: without locality, *Hall* (UC). San Bernardino Co.: "San Bernardino," *S. B. and W. F. Parish* 1015 (UC); San Bernardino Mts., *Parish* 2233, 23rd Oct. 1891,

apparently type collection (UC), *Parish*, Oct. 22, 1891 (Po); Santa Ana River, *Munz* 6333 (Po, UC), *Munz* 6334 (Po, UC); Little Bear (Arrowhead Lake) *Wilder* 390 (Po); Arrowhead Grade, *Canby in* 1925 (Po); City Creek, *Jones in* 1925 (Po); Black Oaks in City Creek, *Jones in* 1925 (Po); Strawberry Flats, *Canby in* 1925 (Po); Bluff Lake, *Williams in* 1902, (UC); Deep Creek, *Johnston in* 1924, (Po); No. Fork Deep Creek, *Johnston* 2913 (Po); Fish Camp, *Johnston in* 1924, (Po); Bear Lake, *Jones in* 1925 (Po); Bear Valley, *Jones in* 1906 (Po); Fredalba, *Johnston in* 1924 (Po).

The two following collections from lower altitudes suggest variety *bernardina* and may be considered as intergrade between *sessilis* and *bernardina*: (1) City Creek at 1800 ft. altitude, *Johnston in* 1924 (Po), with stems, leaves and woolly involucres suggesting *sessilis* and small heads and leafy bracted peduncles suggesting *bernardina*; (2) Arrowhead Hot Springs, *Johnston in* 1924 (Po), suggesting *sessilis* in tomentum on involucres and *bernardina* in general appearance and habit.

11. **Corethrogyne filaginifolia** var. **latifolia** Hall, UC. Pub. Bot. 3:70. 1907. Davidson and Moxley, Fl. So. Calif., 383. 1923. Not of Jepson, Man. Calif., 1042. 1925.

Stems suffrutscent, stout, "5 dm. or more high," tomentose throughout, even on involucres; "lower leaves narrowed to base principal cauline leaves broadly oblong or slightly narrowed to the closely sessile base, shallowly toothed at the very obtuse summit," 1-4 cm. long, 0.5-1 cm. wide; inflorescence paniculate with few heads; involucres turbinate, 7-8 mm. high; bracts with slightly spreading tips; rays conspicuous, 10 mm. long.

Material studied: Ventura Co.; Oxnard, *Davy*, 7813 (UC), *Davy* 7814, (UC). Los Angeles Co.: "Los Angeles," *Nevin in* 1880 (G).

This coastal variety can be distinguished from our other Southern California forms with woolly involucres by its broad oblong leaves and northern coastal distribution. An off season specimen, "Los Angeles," *Gray in* 1885 (G) taken between February and May seems to belong here on basis of leaf shape but the involucre is only partially tomentose.

BOTANICAL FIELD NOTES

DR. A. DAVIDSON

Arenaria californica Brewer. Hills near Tehachapi. *Kessler.*

Sedum pumilum Benth. Abundant on the hills near Keen. *Kessler.*

Draba subsessile Wats. Mountains on S. fork of Bishop Creek, Inyo Co. *Kessler.* Previously collected in the White Mts. and on Mt. Whitney. Identified by Prof. E. B. Payson.

Ivesia Chandleri Rydb. Thomson Mts., Bishop Creek. *Kessler.* Only other known locality Mt. Goddard. Identified by Mr. Rydberg.

Vaccinium ovatum Pursh. San Marcus Pass. *Payne.*

Loiseluria flaviflora Davidson. Colorado Desert. *Mrs. S. Hutchinson.*

Oxtheca luteola Parry. Not uncommon around the dry lakes near Muroc. Hitherto only known from Lancaster.

Orobanche Ludoviciana. Nutt. Mt. Islip. *Burlew.*

Prunella vulgaris lanceolata Fernald. Mt. Islip. *Burlew.*

Zygophyllum Fabago Var. brachycarpa Bois. A native of N. Africa growing freely in an irrigation ditch along with **Centaurea repens** L at a ranch a few miles east of Rosamund. A new introduction in this country.

THE SOUTHERN CALIFORNIA SPECIES OF SALVIA
(including Ramona)

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During a period of some years of observation of our native species of Salvia, I have arrived at some conclusions that may be worthy of record. The work has been carried on in the field and herbarium, the most of the larger collections in the country having been examined. To the curators of these various herbaria, my gratitude is hereby expressed, particularly to Dr. B. L. Robinson of the Gray Herbarium and to Dr. N. L. Gardner of the University of California. In citing specimens from these herbaria, the abbreviations indicated in the following parentheses are used: Gray Herbarium (G); New York Botanical Garden (NY); Philadelphia Academy of Sciences (Ph); United States National Herbarium (US); University of California (C); and Pomona College (P).

For the most part the descriptions of species as given in Jepson's new Manual of California (1925) are so adequate as to make redescription unnecessary. Occasionally I shall give a color note, where I disagree with Jepson.

The use of the generic term Salvia for all our native sages does not mean that I necessarily feel that the genus Ramona must be suppressed. So far as my slight acquaintance with the great genus Salvia goes, I incline toward so disposing of Ramona and here follow recent usage of a number of our best workers on California Botany (Parish, Hall and Jepson). But a final disposition of Ramona must be left for a more thorough student of the whole group.

Even a superficial study of our plants leads one to believe in a number of cases of hybridization. I shall therefore discuss hybrids in a special section after the treatment of species.

KEY TO THE SPECIES

A. Lower end of the connective developed and bearing a definite rudimentary or deformed anther-cell.

B. Annual herbs with leaves largely basal.

C. Corolla lavender, 25-35 mm. long, lower lip fimbriate, anthers orange; floral bracts woolly, lance-oblong with several conspicuous lateral as well as single terminal spines; leaves thistle-like, spiny pinnatifid, white-tomentose.....1. *S. carduacea.*

CC. Corolla deep blue, 12-16 mm. long, lower lip not fimbriate; floral bracts purple, suborbicular, with single terminal spine; leaves not spiny, dark green, finely pubescent, bipinnatifid, rugose.....2. *S. Columbariae.*

BB. Shrubby plants with leaves all along the stems.

C. Calyx subglobose, with 5 short almost equal triangular teeth; leaves tomentose, whitish, with long terminal spine and from 0 to 2 pairs of lateral spines; corolla purplish, lower lip almost as long as tube; flowers in almost continuous spike. Death Valley region.

D. Corolla ca. 16mm. long; calyx 6 mm. hidden in long conspicuous tufts of wool; floral bracts broadly lanceolate to broadly ovate and with inconspicuous veins beneath. Funeral Mts.....3. *S. funerea* var. *typica.*

DD. Corolla ca. 11 mm. long; calyx 4-5 mm. with shorter and less conspicuous tomentose; floral bracts, "orbicular-ovate, abruptly acerose," with conspicuous veins beneath. Furnace Creek..... .....4. *S. funerea* var. *fornacis.*

CC. Salyx elongate, with unequal teeth; leaves less tomentose, with greenish, spinulose teeth; corolla lavender with lower lip ca. one-fourth the length of the tube; flowers in interrupted whorls. Colorado Desert....5. *S. Greatai.*

AA. Lower end of connective not developed at all or forming only a small tooth.

B. Perennial herbs, at most slightly woody at base.

C. Flowers large, ca. 30 mm. long, purplish red; leaves triangular with truncate or cordate-hastate base and blades commonly 10-20 cm. long; plants 30-80 cm. high, coarse .....6. *S. spathacea.* an open paniculate arrangement; corolla tube usually

CC. Flowers smaller, 15-18 cm. long, bluish; leaves spatu late-oblong to obovate-spatulate with blades 2-5 cm. long; plants 10-20 cm. high, slender....7. *S. sonomensis.*

BB. Shrubs, with definite woody base.

C. "Inflorescence densely whorled-glomerate and interrupted-spicate," the spikes occasionally branched and forming longer than lower lip.

D. Leaves distinctly broader above the middle than below it, spatulate-oblong to broadly obovate, not at all rugose; floral bracts membranous, rounded, highly colored.

E. Upper lip of corolla at least half as long as tube; corolla 13-15 mm. long, tube with hair well distributed; floral bracts generally less than 1 cm. long; leaves not over 3 cm.

F. Inflorescence and upper parts of stem glabrate to finely pubescent. Inyo Co. and to the east and north. 8. *S. carnosa* var. *typica.*

FF. Inflorescence and upper parts of stem villous-pubescent. San Bernardino, Los Angeles and Kern Counties..... .....9. *S. carnosa* var. *pilosa.*

EE. Upper lip of corolla one-fourth to one-fifth as long as tube; corolla usually ca. 20 mm. long; the tube with a definite transverse band of hair; floral bracts commonly 15-25 mm. long; leaves (blade plus petiole) 3-6 cm. long..... .....10. *S. compacta.*

DD. Leaves broader below middle than above (except sometimes in mellifera and vars.), rugose or with evident reticulate veining.

E. Leaves bright green, not white tomentose beneath floral bracts somewhat membraneous, not conspicuously tomentose (see also mellifera var. Jonesii). Desert plants.

F. Floral bracts pale, mucronulate, closely and finely tomentulose; calyx teeth short; corolla 15-16 mm. long. San Bernardino County eastward.....11. *S. mohavensis.*

FF. Floral bracts purplish green, spinulose tipped, hispid-ciliate to stiff glandular-pubescent; calyx-teeth elongate, spinulose tipped; corolla ca. 20 mm. long. Western edge of Colorado Desert.....12. *S. eremostachya.*

EE. Leaves green or white, definitely tomentose beneath (except in mellifera var. Jonesii); floral bracts generally tomentose.

F. Corolla 8-12 mm. long; leaves generally bright green; floral bracts ovate to oblong, cuspidate; 2 lower calyx lobes spinulose tipped. Plants of coastal drainage.

G. Stamens well exserted, quite equal to upper lip of corolla; corolla tube with norraw transverse band of hair, leaves dark green above, 2-7 cm. long.....13. *S. mellifera* var. *typica.*

GG. Stamens scarcely if at all exserted, shorter than upper lip; corolla tube and throat with hair well distributde; leaves rathre pale green.

H. Anthers of fertile stamens quite equal in length to filaments; upper lip of corolla ca. half as long as lower; calyx 8 mm. long; calyces and floral bracts greenish; leaves linear to lanceolate, tomen-revolute extremely rugose. Santa Rosa Island .....14. *S. mellifera* var. *revoluta.*

HH. Anthers ca. half as long as filaments; upper lip of corolla quite equal to lower; cadyx 5 mm. long; calyces and bracts quite purplish; leaves oblanceolate to oblong-spatulate, 1-2.5 cm. long, quite smooth . Lower Californit..15. *S. mellifera* var. *Jonesii.*

FF. Corolla 15-25 mm. long; leaves pale.

G. Calyx teeth spinulose and as long as calyx itself; flowers white, 2 cm. long. Colorado Desert.....16. *S. Vaseyi.*

GG. Calyx teeht much shorter; corolla not white. Coastal.

H. Corolla ca. 15 mm. long, light purple, tube almost included in calyx; floral bracts densely white farinose, the teeth obsolete. Orange Co. northward.....17. *S. leucophylla.*

HH. Corolla ca. 20 mm. long, blue, tube well exserted; floral bracts whitish-pubescent to viscid-pubescent, abruptly acute to sharp pointed; calyx dark iv,scid-glandular, with evident teeth. San Diego Co. southward.....18. *S. Clevelandii.*

CC. Inflorescence thyrsoid-paniculate, although lateral branches may be short and compact; floral bracts and leaves small; corolla-tube shorter than lower lip; upper lip very short.

D. Panicles open, well branched. Coastal slopes..... .....19. *S. apiana* var. *typica*.

DD. Panicles condensed, spicate. Edge of desert .....20. *S. apiana* var. *compacta*.

TREATMENT OF SPECIES

1. **Salvia carduacea** Benth., Lab. Gen. et Sp., 302. 1833.

Corolla lavender to purple; anthers bright orange to vermillion.

Type locality, "Hab. in California," Douglas. Locally abundant at low altitudes in the Sonoran Zones, growing on sandy plains and dry hills mostly of the interior portions of the coastal drainage, but occurring also along the western edge of the Colorado Desert and in the western half of the Mohave. Desert records for SAN DIEGO COUNTY: San Felipe, *Jones in* 1906 (P); Jacumba, *Eggleston* 19754 (P). SAN BERNARDINO COUNTY: Barstow, *Hall* 6167 (C); Victorville, *Jones in* 1903 (P), *Munz* 2549 (P); 20 miles W. of Barstow, *Munz & Keck* 7933 (P). LOS ANGELES COUNTY: Acton, *Elmer* 3594 (G, NY, P); Antelope Valley, *Shaw et al. in* 1917 (P), *Davy* 2665 (C).

2. **Salvia Columbariae** Benth., Lab. Gen. et Sp., 302. 1833.

Pycnosphace Columbariae Rydb., Fl. Rocky Mts., 747, 1066. 1917.

Type locality, "Hab. in California," Douglas. Generally distributed in both Sonoran Zones throughout our region, both coastal and desert. Island records are as follows: San Clemente, *Munz* 6428 (P); Catalina, Brandegee, Zoe 1:115. 1890 & 143. 1890; Millspaugh & Nuttall, Field Mus. Pub. 212: 240. 1923; Santa Rosa, Brandegee, 1. c.; Santa Cruz, Brandegee, 1. c.; Greene, Bull. Calif. Acad. Sci. 2:377. 1887.

3. **Salvia funerea** Jones var. **typica** n. nom. (figs. 1 and 2).

S. funerea Jones, Contr. West. Bot. 12:71. 1908.

A striking plant growing "on the hottest volcanic rock cliffs" at 1500 to 2000 ft. altitude in the Funeral Mts., Death Valley, *Jones in* 1907, type coll. (P).

4. **Salvia funerea** var. **fornacis** Jeps., Man. Calif., 868. 1925.

Known from a single collection at Furnace Creek, Death Valley, *Parish* 10032 (C, G). The status of this variety must remain somewhat in doubt until more material is available. Of the collection of var. *typica* by Jones, there are at Pomona College four sheets, one of which (P. C. No. 78617) approaches the var. *fornacis* in the prominent veining of the leaves and floral bracts. However, all four sheets are consistent in having larger flowers, longer and very much more tomentose calyces than in *fornacis*.

5. **Salvia Greatai** Brandg., Zoe 5:229. 1906. (figs. 3 & 4).

Corolla a pale bluish-lavender.

Known only from the type locality, a wash about four miles northeast of Dos Palmos in the northern part of the Colorado Desert: *Hall & Greata* 5848, type collection (C, G, P), *Jaeger* 1100 (P), *Hill & Canby in* 1926 (P).

6. **Salvia spathacea** Greene, Pittonia 2:236. 1892.

Audibertia grandiflora Benth., Lab. Gen. et Sp., 312. 1833. *Audibertiella grandiflora* Briq., Bull. Herb. Boiss. 2:73. 1894. *Ramona grandiflora* Briq., l. c., 440. 1894. Not *Salvia grandiflora* Etlinger, Salv., 17. 1777.

Type locality, "Hab. in California septentrionali," Douglas. Frequent on grassy and partly shaded slopes at low altitudes in the Upper Sonoran Zone, near the coast from Orange and Los Angeles Counties northward.

7. **Salvia sonomensis** Greene, Pittonia 2:236. 1892. (figs. 5 & 6).

Audibertia humilis Benth., Lab. Gen. et Sp., 313. 1833. *Audibertiella humilis* Briq., Bull. Herb. Boiss. 2:73. 1894. *Ramona humilis* Greene, Erythea 1:44. 1893. Not *Salvia humilis* Benth., Lab. Gen. et Sp., 247. 1832-33.

Corolla bluish violet.

Type locality, "Hab. in California septrionali," Douglas. In Southern California known only from the Cuyamaca region where it forms open patches on dry slopes at the upper edge of the Upper Sonoran Zone. SAN DIEGO COUNTY: Cuyamaca Peak, *Brandegee in* 1894 (C, NY), *Munz & Harwood* 7256 (G, P(; Cuyamaca Mts., *Palmer in* 1875 (G); 2 miles E. of Cuyamaca, *Abrams* 3938 (G, NY); Descanso, *Brandegee in* 1904 (C), *in* 1906 (C).

8. **Salvia carnosa** Greene var. **typica** n. nom. (figs. 7 & 8).

Salvia carnosa Greene, Pittonia 2:235. 1882. *Audibertia incana* Benth., Bot. Reg. 6: t. 1469. 1832. *Audibertiella incana* Briq., Bull. Herb. Boiss. 2: 73. 1894. Not *Salvia incana* Mart. & Gal., Bull. Acad. Brux. (2) 11:68. 1844.

Type locality, "plains of Columbia near the Priest's Rapid and the clayey hills near the Big Birch," Douglas in 1826. I have studied the Douglas specimen at the Gray Herbarium and find very little difference between *typica and pilosa.* The tendency toward more glabrous stems and inflorescence and toward having the lower lobes of the calyx slightly broader is about all I can discover. I refer to *typica* the following southern collections: CALIFORNIA, INYO COUNTY: Nelson Range, *Hall & Chandler* 7141 (P); Panamint Canyon, *Jones in* 1897 (NY, P); Shepherds Canyon, *Jones in* 1897 (P); Pleasant Canyon, *Jones in* 1897 (P); Argus Mts., *Purpus* 5414 (G,P). ARIZONA: South of Little Colorado River, *Jones in* 1890 (P); Willow Springs, *Jones in* 1890 (P); Home Rock, *Jones in* 1890 (P). NEVADA: Mt. Magruder, *Purpus* 5925 (P); Palisade, *Jones* 4035 (P); WaWa, *Jones in* 1906 (P).

9. **Salvia carnosa** var. **pilosa** (Gray) Jepson, Man. Calif., 870. 1925. (fig. 9).

Audibertia incana var. *pilosa* Gray, Syn. Fl. N. Am., ed. 2, 2, pt. 1:461. 1886. *Salvia pilosa* Merriam, N. Am. Fauna, 7, pt. 2:322. 1893, in part. *Ramona pilosa* Abrams, Bull. N. Y. Bot. Gard. 6:443. 1910. *Audibertiella argentea* Rydb., Bull. Torrey Bot. Club 36:683. 1909, in part.

Type locality, "Northern base of San Bernardino Mts., on the border of the Mojave Desert," Parish. This variety has been too inclusive and should be restricted to plants bordering the Mojave Desert of California (where it is largely in the western and southern portions) and extending eastward into adjacent parts of Nevada and Arizona, growing on dry benches of Upper Sonoran Zone. Here I refer material such as the following: CALIFORNIA, MONO COUNTY: Northern part of Volcanic Tableland, *Peirson* 6085 (P). KERN COUNTY: Johannesburg, *Jaeger* 1096 (P). LOS ANGELES COUNTY: Vincent, *Elmer* 3696 (NY, P); Rock Creek, San Gabriel Mts., *Munz* 6863 (P). SAN BERNARDINO COUNTY: Cajon Pass, *Johnston in* 1920 (P); Mojave River, *Parish* 4935 (NY, P); Hesperia, *Munz* 4443 (P), Spencer 385 (G, NY, P); Oro Grande Wash, *Johnston in* 1920 (P); No. base of San Bernardino Mts., *S. B. & W. F. Parish* 1309, type coll. (C, G); Covington Flats, Little San Bernardino Mts., *Jaeger in* 1926 (P); Providence Mts., *Munz & Harwood* 3554 (P), *Munz, Johnston & Harwood* 4037 (P); Kelso, *Jones in* 1906 (P). NEVADA: Amargosa Desert, *Jones in* 1907 (P); Eldorado Canyon, Nelson, *Jones in* 1907 (P); Good Springs, *Jones in* 1905 (P). ARIZONA: Chloride, *Jones in* 1903 (P).

10. **Salvia compacta** (Hall) n. comb. (figs. 10 & 11).

Audibertia incana var. *pachystachya* Gray, Syn. Fl. N. Am., ed. 2, 2, pt. 1:461. 1886. *Audibertia pachystachya* Parish, Erythea 6:91. 1898. *Ramona pachystachya* Heller, Muhlenbergia 1:4, 1900. *Salvia carnosa* var. *compacta* Hall, Univ. Cal. Pub. Bot. 1:111. 1902. Not *Salvia pachystachya* Tratutv., Bull. Soc. Nat. Mosc. 41:462. 1868.

Type locality, Bear Valley, San Bernardino Mts. The differently shaped corolla (longer, more tubular, with smaller upper lip and shorted lateral lobes on the lower lip), the more definite and annular arrangement of hair in the corolla-tube, the larger floral bracts and leaves, as well as the geographical distribution and higher life zone argue for the recognition of this plant as a distinct species. Where its range does overlap with that of *S. carnosa* var. *pilosa*, as at Cactus Flat in the San Bernardino Mts., the two plants growing almost side by side, maintain their strongly marked individual characters. For the most part found on dry slopes in the Transition Zone, though occasionally dropping into Upper Sonoran, as *Munz* 10501 and *Hall* 2160, and *Munz & Johnston* 5247 listed below. Ranging as follows: SAN BERNARDINO COUNTY: Cactus Flat, *Munz* 10501 (P); Bear Valley, *Abrams* 2077 (P), *S. B. & W. F. Parish* 330, type coll. (G); Sugarloaf Mt., *Munz* 10779 (P); Santa Ana River Canyon, *Hall* 7549 (G, P), *Feudge* 1242 (P), *Munz* 6147 (C, P); Fish Creek, *Munz & Johnston* 8497 (P); Quail Spring, Little San Bernardino Mts., *Munz & Johnston* 5247 (P). RIVERSIDE COUNTY: East base, San Jacinto Mts., *Hall* 2160 (NY, P); north slope San Jacinto Mts., *Jaeger* 1010 (P); Santa Rosa Mts., *Munz* 5813 (P), *Munz* 5888 (P). SAN DIEGO COUNTY: "Southern part," also given as "Tantillas," *Palmer in* 1875 (C, G, NY) is undoubtedly from Lower California. LOWER CALIFORNIA: Topo, *Orcutt in* 1882 (C, G); San Pedro Martir, *Robertson* 14 & 15 (C), *Abbott in* 1926 (P).

11. **Salvia mohavensis** Greene, Pittonia 2:235. 1892. (figs. 12 & 13).

Audibertia capitata Gray, Proc. Am. Acad. 7:387. 1868. *Audibertiella capitata* Briq., Bull. Herb. Boiss. 2:73. 1894. *Ramona capitata* Briq., l. c., 440. 1894. Not *Salvia capitata* Schlecht., Linnea 26:292. 1853-55.

Type locality, Providence Mts. Growing largely on rocky canyon-walls in the Lower Sonoran Zone in the Mojave Desert and adjacent region. SAN BERNARDINO COUNTY: Silver Lake, *Munz & Keck* 7910 (P); Camp Cady, *S. B. & W. F. Parish* 1308 (C, G); Newberry Mts., *Munz & Keck* 7863 (P); Quail Springs, Little San Bernardino Mts., *Munz & Johnston* 5235 (P); Kelso, *Jones in* 1906 (P); Providence Mts., *Cooper in* 1861, type coll. (G), *Brandegee in* 1902 (C), *Munz, Johnston & Harwood* 4051 (P); Turtle Mts., *Munz & Harwood* 3509 (P). RIVERSIDE COUNTY: Eagle Mts., *Jaeger in* 1926 (P). NEVADA: Eldorado Canyon at Nelson, *Jones in* 1907 (P); Good Springs, *Jones in* 1905 (P). ARIZONA: Chimehueyis, *Jones in* 1903 (P). SONORA: Pinacate Mt., *MacDougal* 72 (US).

12. **Salvia eremostachya** Jepson, Man. Calif., 870. 1925. (figs. 14 & 15).

Type locality, Indian Canyon, Collins Valley, western edge of Colorado Desert. Of this amply distinct species I have seen two collections from the southern edge of RIVERSIDE COUNTY: Coyote Canyon, *Hall* 2856 (C, P, Ph); Rockhouse Canyon, *Jaeger* 1098 (P).

13. **Salvia mellifera** Greene var. **typica** n. nom. (figs. 16 & 17).

Audibertia stachyoides Benth., Lab. Gen. et Sp., 313. 1833. *Audibertiella stachyoides* Briq., Bull. Herb. Boiss. 2:73. 1894. *Ramona stachyoides* Briq., l. c., 440. 1894. *Salvia mellifera* Greene, Pittonia 2:236. 1892. Not *Salvia stachyoides* HBK., Nov. Gen. et Sp. 2:287. t. 138. 1817.

Type locality, "Hab. in California septentrionali," Douglas. The usual form of the species, common on dry slopes and benches at low altitudes throughout the coastal part of our region. Occurring certainly on two of the islands: Santa Catalina, *L. W. Nuttall in* 1920 (P), (Millspaugh & Nutt., Field Mus. Pub. 212:241. 1923), and Santa Cruz, *Jones in* 1924 (P), *Brandegee in* 1888 (C). The Brandegee reference in Zoe 1:143. 1890 to the occurrence on Santa Rosa Island may refer to the var. *revoluta*. In the southern part of its range *typica* has smaller heads and flowers than does more northern material, e. g. *Spencer* 132 from San Diego (G, NY) has the calyx 5-6 mm. long and corolla 10 mm., while Douglas' type collection from "Nova California" (G) resembles the bulk of more northern plants in a 9 mm. calyx and 12 mm. corolla. But in spite of this reduction in size in San Diego County plants. I have seen none that actually grade into the var. *Jonesii* which I am proposing for Ensenada and vicinity.

14. **Salvia mellifera** var. **revoluta** (T. S. Brandg.) n. comb. (figs. 18 & 19).

Audibertia stachyoides var. *revoluta* Brandg., Proc. Calif. Acad., (2) 1:216. 1888.

So far as I have been able to determine, this variety is known from but the type collection, Island of Santa Rosa, *T. S. Brandegee in June*, 1888 (C, G). It is amply characterized by its peculiar strongly revolute leaves and very short stamens and pistil. For some time its superficial resemblance in leaf appearance to *S. eremostachya* caused confusion in my mind, but the much shorter corollas and revolute, more tomentose leaves distinguish it at once.

15. **Salvia mellifera** var. **Jonesii** n. var. (figs. 20 & 21).

Stems slender, leaves oblanceolate, smaller than in *typica*, 1-2.5 (4) cm. long, quite smooth; internodes longer than leaves; floral bracts and calyces often purplish; calyx ca. 5 mm. long; corolla bright blue, 10-12 mm. long; fertile stamens not long exserted as in var. *typica*.

This well marked variety, while not within California itself, occurs so near to our border and is so clearly related to our *Salvia mellifera* var. *typica* as to be deserving of treatment here. It has received the herbarium name of *Audibertia stachyoides* var. *australis* Brandg., on a collection made by Brandegee at Ensenada *in* 1897 (C, NY, P), but seems never to have been published. I take pleasure in naming it for Marcus E. Jones, of Pomona College, by whose collection at Gray Herbarium I was first made aware of its existence as a variety. TYPE: Near Ensenada, Lower California, *Jones, April* 10, 1882, Pomona College Herbarium No. 78620, collection also at Gray Herbarium. Other material, all from LOWER CALIFORNIA: N. Lower Calif., *Jones, April* 9, 1882 (P), April 7, 1882 (P); 20 miles N. of Eensenada, *Ballou* 1 (P); Ensenada, *Brandegee in* 1897 (C, NY, P), *Anthony* 183 (G); 4 miles S. of Refugio, *Ballou* 22* (P); Santa Clara Canyon, *Ballou* 42 (P); San Quentin, *Ballou* 33 (P), *Palmer in* 1889 (G. cf. Vasey & Rose, Proc. U. S. Nat. Mus. 11:533. 1889); Johnson's Ranch, San Antonio, *Jones in* 1925 (P); La Salinas, *Jones in* 1925 (P); Todos Santos Bay, *Orcutt* 705 (G); without definite locality, *Orcutt* 160 (G), 706 (G), *Pringle in* 1882 (G).

16. **Salvia Vaseyi** (Porter) Parish, Muhlenbergia 3:126. 1907. (figs. 22 & 23).

Audibertia Vaseyi Porter, Bot. Gaz. 6:207. 1881. *Audibertiella Vaseyi* Briq., Bull. Herb. Boiss. 2:73. 1894. *Ramona Vaseyi* Briq., l. c., 440. 1894.

Type locality, Mountain Springs, San Diego County. Ranging along the western edge of the Colorado Desert from Morongo Valley southward, mostly on dry slopes in the upper part of the Lower Sonoran Zone. RIVERSIDE COUNTY: Dry Morongo Wash, *Munz & Johnston* 5285 (C, NY, P); Morongo Canyon, *Parish* 3233 (C, G, NY); Palm Canyon, *Parish* 6164 (C, G); Palm Creek, *T. S. Brandegee in* 1895 (P); E. base of San Jacinto Mts., *Hall* 1878 (C). SAN DIEGO COUNTY: San Felipe Canyon, *Brandegee in* 1894 (C), *in* 1901 (C); Mt. Springs, *Vasey in* 1880, type coll., (G), *Palmer in* 1875 (G), *Munz* 9636 (P); LOWER CALIFORNIA: 38 miles W. of Mexicali, *Munz* 9582 (P).

17. **Salvia leucophylla** Greene, Pittonia 2:236. 1892. (figs. 24 & 25).

Audibertia nivea Benth., Lab. Gen. et Sp., 313. 1833. *Audibertiella nivea* Briq., Bull. Herb. Boiss. 2:73. 1894. *Ramona nivea* Briq., l. c., 440. 1894. Not *Salvia nivea* Thunb., Prodr. Pl. Cap., 96. 1794-1800.

Type locality, "Hab. in California septentrionali," Douglas. A species distributed along the coast and ranging from Orange County northwestward. The southeastern limits are indicated by the following: ORANGE COUNTY: "Robbers Cave," Santiago Canyon, *Geis in* 1902 (P). LOS ANGELES COUNTY: Chino Hills, *Wilder* 606 (C); San Jose Hills, 5 miles east of Brea Canyon, *Munz* 4688 (P); and Turnbull Canyon near Whittier, *Munz* 2180 (P), 2718 (P), *Johnston* 1940 (P). It frequents dry barren slopes of the Upper Sonoran Zone.

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*I am indebted to Miss Lois Ballou, formerly a student at Pomona College, for material of this variety and for various color notes on other species of Salvia, made while a student in my department.

18. **Salvia Clevelandii** (Gray) Greene, Pittonia 2:236. 1892. (figs. 26 & 27).

Audibertia Clevelandii Gray, Proc. Am. Acad. 10:76. 1874. *Audibertiella Clevelandii* Briq., Bull. Herb. Boiss. 2:73. 1894. *Ramona Clevelandii* Briq., l. c., 440. 1894.

Corolla distinctly blue, ca. 2 cm. long, with long well exserted tube.

A remarkable feature of this species is its penetrating and persistent characteristic odor which is evident even in herbarium specimens that have been dry for many years.

Type locality, "Mts. behind San Diego, at 2200 ft.," Cleveland. A common enough and rather low shrub on dry Upper Sonoran slopes of a considerable portion of San Diego County and adjacent Lower California. SAN DIEGO COUNTY: Mts. behind San Diego, *Cleveland in* 1874 (G), *in* 1875 (G); S. part of San Diego Co., *Palmer in* 1875 (G); between Ramona & Ballena, *Abrams* 3778 (G,NY); Cottonwood Grade, Potrero, *Abrams* 3745 (G, NY), 3744 (C, P); Witch Creek, *Alderson in* 1894 (C); Descanso, *Parish* 4424 (G, NY), K. *Brandegee in* 1906 (C, NY); between Descanso & Alpine, *Munz & Harwood* 7140 (P); Smith (Palomar) Mt., *Orcutt* 543 (G), *McClatchie in* 1896 (NY), *Munz* 8330 (P); Valley Center, *Chandler* 5349 (C, NY); Laguna Mts., *Spencer* 130 (C, P); Torrey Pines, *Grout in* 1910 (P); Del Mar, *T. S. Brandegee in* 1894 (C), *K. Brandegee in* 1906 (C). LOWER CALIFORNIA: Tecate River, *Mearns* 3760 (NY), 3371 (G, NY); Tecate, *Orcutt in* 1885 (G); San Rafael, *Orcutt in* 1883 (NY).

19. **Salvia apiana** Jepson var. **typica** n. nom.

Salvia apiana Jeps., Muhlenbergia 3:144. 1908. *Audibertia polystachya* Benth., Lab. Gen. et Sp., 314. 1833. *Audibertiella polystachya* Briq., Hull. Herb. Boiss. 2:73. 1894. *Ramona polystachya* Greene, Pittonia 2:235. 1895. *Salvia californica* Jeps., Fl. W. Middle Calif., 460. 1901. Not *Salvia polystachya* Orteg., Hort. Matr. Dec. 55. 1800. Not *Salvia californica* Brandg., Proc. Calif. Acad. (2) 2:197. 1889.

Panicles open, spreading, freely branched.

Type locality, "Hab. in California septentrionali," Douglas. A common plant of dry slopes and benches of the coastal drainage and in the Upper Sonoran Zone from Lower California northward. Island records are all for Catalina, *Lyon* 16 (G), *Carlson in* 1915 (NY), *Toumey in* 1894 (C); Brandegee, Zoe 1:143. 1890, Trask; Erythea 7:139. 1899; Millspaugh & Nuttall, Field Museum Pub. 212:242. 1923.,

20. **Salvia apiana** var. **compacta** n. var.

Panicles condensed, spicate, branches being reduced and appressed; otherwise much as in *typica*.

Type: Dry Morongo Wash, Colorado Desert, Riverside County, *Munz & Johnston* 5170, *May* 6, 1922, Pomona College Herbarium No. 13, 253.

The plants from the desert edge, while with the same morphological characters as in *typica* have so different an appearance because of the spicate habit, as at first glance to resemble *Vaseyi*, under which name they are often distributed. They seem worthy of varietal recognition. LOS ANGELES COUNTY: Acton, *Elmer* 3684 (G, NY, P). RIVERSIDE COUNTY: Long Valley to Palm Springs Trail, *Jaeger* 1013 (P); Whitewater, *Jones in* 1903 (P); Santa Rosa Mts., *Munz* 5828 (P). SAN DIEGO COUNTY: San Felipe Canyon, *Eastwood*

2786 (P); San Felipe Hill, *Jones in* 1906 (P); Vallecito Canyon, *Munz* 9737 (P); Jacumba, *Munz & Ballou* 8077 (P), *Schoenfeldt* 3226 (US); Mt. Springs, *Munz* 9634 (P), *Mearns* 2997 (US), 3213 (US). LOWER CALIFORNIA: 39 miles west of Mexicali, *Munz* 9590 (P). A condition intermediate between *typica* and *compacta* is represented by: Cholla Ranch, *Jones in* 1906 (P); Massacre Canyon, *Jaeger* 1186 (P).

HYBRIDS

1. Salvia apiana x S. mellifera.

Foliage quite intermediate between the two parents, leaves usually shaped like those of *mellifera*, but paler and more tomentose; flowers arranged in capitate clusters, but these clusters frequently on branching stems forming a sort of lax panicle (panicle not thyrsoid); floral bracts and calyces whitish pubescent; corollas with long exserted tube and well developed upper lip as well as lower. Hence, general aspect like that of a pale and tomentose plant of *mellifera*.

I consider the following collections as belonging to this category: LOS ANGELES COUNTY: Santa Monica Canyon, *Barber* 117 (C, G, P); Sierra Madre, *Abrams* 1497 (P); Los Angeles, *Davidson in* 1896 (C, G); Claremont, *Ballou in* 1924 (P), *Crawford in* 1915 (P); Pasadena, *Allen* 15 (G), *McClatchie in* 1897 (NY); Catalina, *L. W. Nuttall in* 1920 (P), *Lyon* 12 (G) labeled "Palmeri" by Gray (Cf. Brandg., Zoe 1:142. 1890). SAN BERNARDINO COUNTY: Hills so. of Ontario, *Johnston* 1264 (P); San Bernardino, *Parish* 4382 (G, NY), 11337 (P); Cajon Pass, *Hall* 3012 (C). RIVERSIDE COUNTY: Jurupa Hills near Riverside, *Wilder* 627 (P); Santa Rosa Mts., *Munz* 5829, apparently *apiana* var. *compacta* x *mellifera* (P).

2. X. Salvia Palmeri (Gray) Greene, Pittonia 2:236. 1892.

Audibertia Palmeri Gray, Bot. Calif. 1:601. 1876. *Audibertiella Palmeri* Briq., Bull. Herb. Boiss. 2:73. 1894. *Ramona Palmeri* Briq., l. c., 440. 1894. Not *Salvia Palmeri* Gray, Proc. Am. Acad. 21:408. 1886.

A hybrid between *apiana* and *Clevelandii* with the general aspect of *Clevelandii* but with paler and more tomentulose leaves almost like those of *apiana;* flowers in definite capitate clusters with as many as eight in a spike and with inflorescence tending to branch; corolla quite tubular, tube well exserted, upper lip shorter than in *Clevelandii* and with shorter stamens; *Clevelandii* odor very much weakened.

I have seen the type material at the Gray Herbarium and am thoroughly satisfied of the hybrid nature. SAN DIEGO COUNTY: Tighes Ranch, S. part of San Diego County, *Palmer in* 1875, type coll. (G); *Palmer* 303, *in* 1875 probably same coll. (NY); George Stone Ranch, same as Tighe Ranch, *T. S. Brandegee in* 1904 (C); Descanso Grade, *K. Brandegee in* 1906 (C); Torrey Pines Park, *Munz & Ballou* 7946 (P).

3. Salvia apiana x S. leucophylla.

Suggesting *S. apiana* x *S. mellifera*, but with white leaves and larger heads (over 4 cm. broad) from San Juan Capistrano, Orange Co., *Nevin* 686, *in* 1882 (G), labeled "Audibertia Palmeri" by Dr. Gray.

4. X. Salvia bernardina Parish, Bull. Calif. Acad. 1:211. 1885.

Salvia Columbariae var. *bernardina* Jeps., Man. Calif., 869. 1925.

Suggesting *S. Columbariae* but taller, with leaves only once pinatifid (the divisions then lobed), strongly bicolored, and distributed along a considerable part of stem; upper lip of calyx with 3 strong spinelike teeth; stamens with lower end of connective antheriferous.

I incline to the belief that this is a hybrid, since it is met with so rarely and then apparently only where both species are found, and since it resembles *Columbariae* in flower and in leaf-lobing, and *mellifera* in strongly bicolored leaves with less lobing, in greater height of plant and in distribution of leaves along stem. SAN BERNARDINO COUNTY: San Bernardino, *Parish* 4383 (C, G), *Feudge* 2 (P); Lytle Creek, *Parish* 1736 (G); Cajon Canyon, *Johnston in* 1920 (P).

It is perfectly evident that if there is so much hybridization among our native species of Salvia, some attempt should be made to produce artificial hybrids and prove the hybrid nature of plants about which we now conjecture. Some attempt has been made here at Claremont, but various mishaps to the plants, which were being used but which grew in the wild where they could not be protected from the curious, have so far prevented our obtaining definite results.

EXPLANATION OF PLATES

(*Salvia carduacea*, *S. Columbariae*, and *S. apiana* are not illustrated; the first one does not need illustration and the two latter are sufficiently figured in Jepson's Manual of California. The drawings for our other species are given in these two plates. They have been made at various times and with different instruments and are not all on the same scale. For that reason, size is given for each. Each shows calyx and corolla opened up).

Plate 3.

Fig. 1, *S. funerea* var. *typica*, 16 mm. corolla; fig. 2, 6 mm. calyx, Funeral Mts., *Jones in* 1907 (P).

Fig. 3, *S. Greatai*, 14 mm. corolla; fig. 4, 11 mm. calyx, Dos Palmos, *Hall & Greata* 5848 (G).

Fig. 5, *S. sonomensis*, 13 mm. corolla; fig. 6, 7 mm. calyx, Cuyamaca Peak, *Munz & Harwood* 7256 (P).

Fig. 7, *S. carnosa* var. *typica*, 13 mm. corolla, plains of Columbia, *Douglas* (G); fig. 8, 7.5 mm. calyx, Wilson Creek, E. Wash., *Sandberg & Leiberg in* 1893 (P).

Fig. 9, *S. carnosa* var. *pilosa*, 6 mm., calyx, Hesperia, *Munz* 4443 (P).

Fig. 10, *S. compacta*, 15 mm .corolla, Bear Valley *S., B. & W. F. Parish* 330 (G); fig. 11, 12 mm. calyx, Bear Valley, *Abrams* 2077 (P).

Fig. 12, *S. mohavensis*, 15 mm. corolla; fig. 13, 9 mm. calyx, Turtle Mts., *Munz & Harwood* 3509 (P).

Plate 4.

Fig. 14, *S. eremostachya*, 25 mm. corolla; fig. 15, 16 mm. calyx, Rockhouse Canyon, *Jaeger* 1098 (P).

Fig. 16, *S. mellifera* var. *typica*, 12 mm. corolla; fig. 17, 9 mm. calyx, Nova California, *Douglas in* 1833 (G).

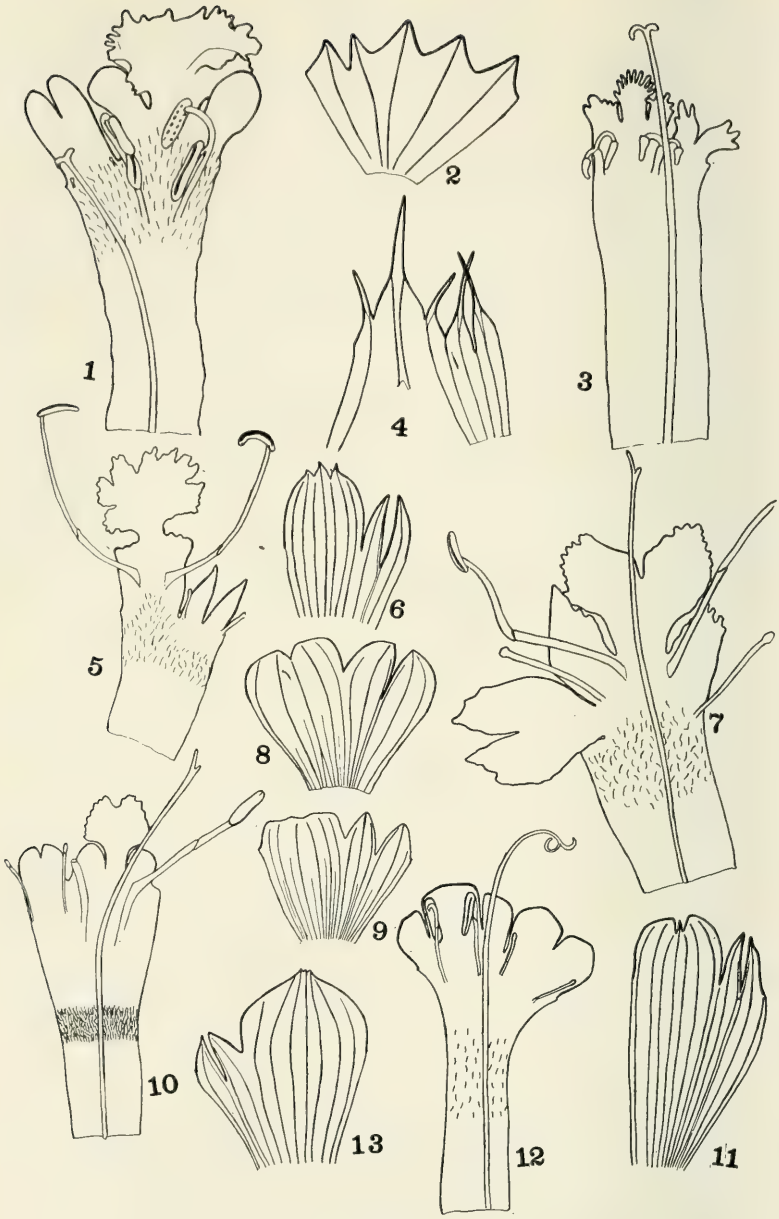
Fig. 18., *S. mellifera* var. *revoluta*, 11 mm. corolla; fig. 19, 8 mm. calyx, Santa Rosa Island, *Brandegee in* 1888, (G).

Fig. 20, *S. mellifera* var. *Jonesii*, 12 mm. corolla; fig. 21, 5 mm. calyx, Ensenada, *Anthony* 183 (G).

Fig. 22, *S. Vaseyi*, 20 mm. corolla; fig. 23, 6 mm. calyx (split up middle of lower lip), Mt. Springs, *Vasey in* 1880 (G).

Fig. 24, *S. leucophylla*, 20 mm. corolla; fig. 25, 12 mm. calyx, Sespe Creek, *Munz* 9365 (P).

Fig. 26, *S. Clevelandii*, 21 mm. corolla; fig. 27, 9 mm. calyx, Mts. behind San Diego, *Cleveland in* 1874 (G).



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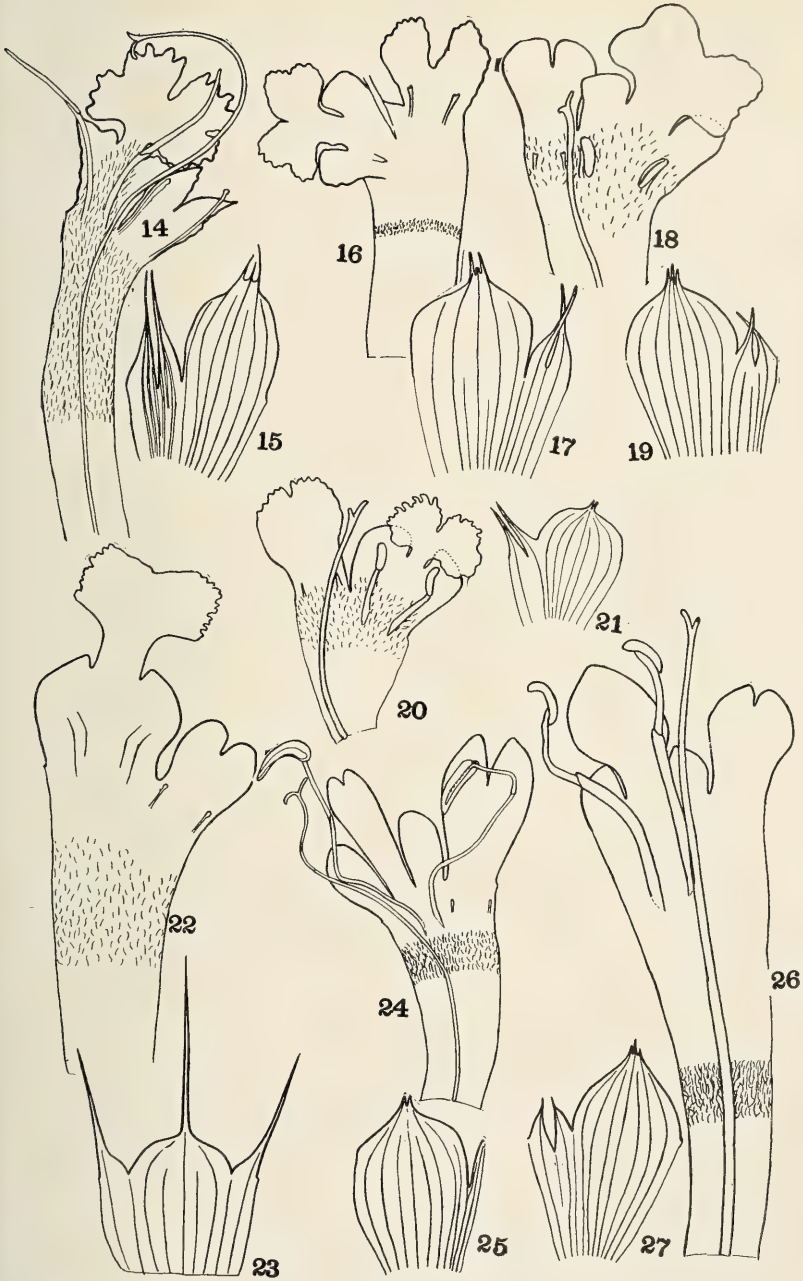

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Vol. XXVI May-August, 1927 Part 2

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CHECK LIST OF THE LEPIDOPTERA OF BOREAL AMERICA,

SUPERFAMILIES SPHINGOIDEA, SATURNIOIDEA, AND BOMBYCOIDEA

of the Families Syntomidæ and Arctiidæ

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Decatur, Illinois

INTRODUCTION

The present list is a continuation of our Check List of the Diurnal Lepidoptera of Boreal America. The same general introductory remarks apply.

Considerable time and energy has been expended during the past two years in an effort to eliminate as many errors as possible; and there has been much communication with practically all institutions containing specific types of the organisms involved. We wish to again issue our warning that lists are only tentative, and contain many errors. For example, we have endeavored to learn the exact status of the names applied by Professor M. Draudt in the genus *Cisthene*. The types of these, with the exception of *costimacula* (see B. & Benj., 1926, Ins. Insc. Menst., XIV, 1), are presumably in the British Museum being the specimens listed by Hampson, 1900, Cat. Lep. Phal. B. M., II, as "ab. 1", etc., mostly under the name *"Illice unifascia."* We are greatly indebted to Mr. Tams for many kindnesses, one of the least of which was an attempt to place these names. As yet we are not certain of the status of any of them. Professor Draudt has informed us that he did not see the specimens to which he applied names.

Following our Diurnal List we use the following markings to indicate certain facts usually omitted from check lists, but which numerous friends assure us are of decided value.

* indicates that the organism does not occur, or is of decidedly doubtful occurrence, within the fauna we are considering.

‡ means an unavailable name, usually a homonym.

Decatur, Illinois, July 1, 1927.

Superfamily **SPHINGOIDEA**

SPHINGIDÆ

ACHERONTIINÆ

Herse Oken.
Type *Sphinx convolvuli* L.
670 cingulata (*Fabr.*)
affinis (Goeze)
pungens (Eschsch.)
druræi (Don.)
ab. decolora (*Hy. Edw.*)

Cocytius Hbn.
Type *Sphinx jatrophæ* Fabr.
*671 antæus (*Dru.*)
jatrophæ (Fabr.)
a hydaspus (*Cram.*))
medor (Stoll)
anonæ (Shaw)
tapayusa (Moore)
672 duponchel (*Poey*)
duponchelii (Luc.)
godartii (Bdv.)
rivularis (Butl.)
affinis Roths.

Phlegethontius Hbn.
Type *Sphinx carolina* L.
673 sexta (*Johan.*)
carolina (L.)
nicotianæ (Mén.)
lycopersici (Bdv.)
674 quinquemaculata (*Haw.*)
celeus Hbn.
675 rustica (*Fabr.*)
chionanthi (A. & S.)
*676 brontes (*Dru.*)
pamphilius (Stoll)
collaris (Wlk.)
a cubensis (*Grt.*)
677 muscosa (*R. & J.*)
678 florestan (*Stoll*)
brevimargo (Butl.)

Chlænogramma Sm.
Type *Sphinx jasminearum* Guér.
679 jasminearum (*Guér.*)
rotundata (Roths.)

Dolba Wlk.
Type *Sphinx hylæus* Dru.
680 hylæus (*Dru.*)
a prini (*A. & S.*)
floridensis Clark

Dolbogene R. & J.
Type *Dolba hartwegii* Butl.
681 hartwegii (*Butl.*)

Isogramma R. & J.
Type *Ceratomia hageni* Grt.
682 hageni (*Grt.*)

Ceratomia Harr.
Type *Ceratomia quadricornis* Harr.
683 amyntor (*Hbn.*)
quadricornis Harr.
ulmi Bdv.
684 undulosa (*Wlk.*)
repentinus Clem.
685 catalpæ (*Bdv.*)

Isoparce R. & J.
Type *Sphinx cupressi* Bdv.
686 cupressi (*Bdv.*)

Dictyosoma R. & J.
Type *Sphinx elsa* Stkr.
687 elsa (*Stkr.*)

Atreides Holl.
Type *Sphinx plebeja* Fabr.
‡*Atreus* Grt. (nec Koch)
Type *Sphinx plebeja* Fabr.
688 plebeja (*Fabr.*)

Hyloicus Hbn.
Type *Sphinx pinastri* L.
689 lugens (*Wlk.*)
andromedæ (Bdv.)
690 eremitus (*Hbn.*)
sordida (Harr.)
691 geminus *R. & J.*
692 eremitoides (*Stkr.*)
693 separatus (*Neum.*)
694 istar *R. & J.*
695 leucophæatus (*Clem.*)
696 chersis (*Hbn.*)
cinerea (Harr.)
a pallescens *R. & J.*
b oreodaphne (*Hy. Edw.*)
697 vashti (*Stkr.*)
form albescens (*Tepper*)
698 mordecai (*McD.*)
699 gerhardi *B. & Benj.*

700 libocedrus (*Hy. Edw.*)
a insolita (*Lint.*)
701 perelegans (*Hy. Edw.*)
a vancouverensis (*Hy. Edw.*)
b asellus *R. & J.*
702 canadensis (*Bdv.*)
plota (Stkr.)
703 franckii (*Neum.*)
704 kalmiæ (*A. & S.*)
705 gordius (*Cram.*)
pœcila (Steph.)
a borealis (*Clark*)
b oslari *R. & J.*
706 luscitiosa (*Clem.*)
ab. ♀ una (*Skin.*)
a bombax *B. & Benj.*
707 drupiferarum (*A. & S.*)
a utahensis (*Hy. Edw.*)
708 dollii (*Neum.*)
a australis (*Clark*)
b coloradus (*Sm.*)
709 sequoiæ (*Bdv.*)
a engelhardti (*Clark*)
710 pinastri (*L.*)
asiaticus Butl.
saniptri (Stkr.)

Lapara Wlk.

Type *Lapara bombycoides* Wlk.
711 halicarniæ (*Stkr.*)
712 coniferarum (*A. & S.*)
cana (Martyn)
713 bombycoides *Wlk.*
harrisii (Clem.)
ab. pineum (*Lint.*)

Protambulyx R. & J.

Type *Sphinx strigilis* L.
*714 strigilis (*L.*)
**form* rubripennis (*Butl.*)
715 carteri *R. & J.*

Smerinthus Latr.

Type *Sphinx ocellata* L.
716 jamaicensis (*Dru.*)
ab. clarkii *Franck*
ab. tripartitus (*Grt.*)
f. norm. geminatus *Say*
ab. flavitincta *Nixon*
a gamma *Ckll.*
717 cerisyi *Kirby*
a astarte *Stkr.*
b ophthalmicus *Bdv.*
vancouveriensis Butl.
form pallidulus *Hy. Edw.*
ab. nigrescens *Clark*
c saliceti *Bdv.*

Paonias Hbn.

Type *Sphinx excæcata* A. & S.
718 excæcata (*A. & S.*)
pavonina Geyer.
a pecosensis *Ckll.*
719 myops (*A. & S.*)
rosacearum (Bdv.)
cerasi (Bdv.)
sorbi (Bdv.)
? *tiliastri* (Bdv.)
a occidentalis (*Clark*)
720 astylus (*Dru.*)
io (Guér.)
integerrima (Harris)

Cressonia G. & R.

Type *Sphinx juglandis* A. & S.
721 juglandis (*A. & S.*)
instabilis (Martyn)
robinsonii Butl.
ab. pallens (*Stkr.*)
ab. hyperbola Slosson

Pachysphinx R. & J.

Type *Smerinthus modesta* Harr.
722 modesta (*Harr.*)
princeps (Wlk.)
populicola (Bdv.)
cablei (Reiz.) (an ssp. dist.?)
occidentalis (Hy. Edw.)
a imperator (*Stkr.*)
form kunzei *R. & J.*

Pseudosphinx Burm.

Type *Sphinx tetrio* L.
723 tetrio (*L.*)
hasdrubal (Cram.)
‡*rustica* (Sepp) (nec Fabr.)
obscura (Butl.

Erinnyis Hbn.

Type *Sphinx ello* L.
724 alope (*Dru.*)
flavicans (Goeze)
fasciata (Swain.)
edwardsii (Butl.)
*725 lassauxii (*Bdv.*)
a merianæ *Grt.*
janiphæ (Bdv.)
726 ello (*L.*)
viridis (Ckll.)

727 œnotrus (*Stoll*)
penæus (Fabr.)
picta (Sepp)
melancholica Grt.
piperis (G. & R.)
hippothoon (Burm.)

728 crameri (*Schaus*)

729 obscura (*Fabr.*)
stheno Hbn.
pallida Grt.
cinerosa G. & R.
rhœbus (Bdv.)

730 domingonis (*Butl.*)
festa (Hy. Edw.)

731 guttularis (*Wlk.*)
suillus (Bdv.)

Phryxus Hbn.

Type *Sphinx caicus* Cram.

732 caicus (*Cram.*)

Pachylia Wlk.

Type *Sphinx ficus* L.

733 ficus (*L.*)
crameri (Mén.)
lyncea Clem.

734 resumens *Wlk.*
inconspicua Wlk.
versuta (Clem.)
tristis G. & R.

Madoryx Bdv.

Type *Sphinx oiclus* Cram.

735 pseudothyreus (*Grt.*)

Calliomma Wlk.

Type *Sphinx licastus* Stoll

736 parce (*Fabr.*)
licastus (Stoll)
galianna (Burm.)

Enyo Hbn.

Type *Sphinx lugubris* L.

737 lugubris (*L.*)
fegeus (Cram.)
luctuosus (Bdv.)

738 ocypete (*L.*)
♀ *camertus* (Cram.)
♂ *danum* (Cram.)

Cautethia Grt.

Type *Oenosanda noctuiformis* Wlk.

739 grotei *Hy. Edw.*

Perigonia H.-S.

Type *Perigonia stulta* H.-S.

*740 lusca (*Fabr.*)
a bahamensis *Clark*

Aellopos Hbn.

Type *Sphinx titan* L.

*741 tantalus (*L.*)
ixion (L.)
sisyphus (Burm.)
form zonata (*Dru.*)
terpunctata (Goeze)
form clavipes (*R. & J.*)

742 titan (*Cram.*)

743 fadus (*Cram.*)
annulosum (Swains.)
balteata (Kirtland)

Hemaris Dalm.

Type *Sphinx fuciformis* L.

744 thysbe (*Fabr.*)
pelasgus (Cram.)
ruficaudis (Kirby)
etolus (Bdv.)
form cimbiciformis (*Steph.*)
floridensis (G. & R.) (an ssp. dist.?)
uniformis (G. & R.)
buffaloensis (G. & R.)
pyramus (Bdv.)
form fuscicaudis (*Wlk.*)

745 gracilis (*G. & R.*)

746 senta (*Stkr.*)
brucei French

747 diffinis (*Bdv.*)
f. vern. tenuis *Grt.*
fumosa (Stkr.)
metathetis Butl.
f. æst. axillaris (*G. & R.*)
marginalis Grt.
grotei (Butl.)
a æthra (*Stkr.*)
b ariadne (*B. & McD.*)
c thetis (*Bdv.*)
palpalis Grt.
form cynoglossum *Hy. Edw.*
d jordani *B. & Benj.*
e rubens *Hy. Edw.*

PHILAMPELINÆ

Pholus Hbn.

Type *Sphinx crantor* Cram.
748 anchemolus (*Cram.*)
*749 satellitia (L.)
a pandorus (*Hbn.*)
ampelophaga (Wlk.)
b intermedia *Clark*
750 achemon (*Dru.*)
crantor (Cram.)
751 typhon (*Klug*)
752 vitis (*L.*)
hornbeckiana (Harr.)
linnei (G. & R.)
753 fasciatus (*Sulz.*)
jussieuæ (Hbn.)
strigilis (Vogel)
754 labruscæ (*L.*)
‡*clotho* (Fabr.) (nec Cram.)

Ampelœca R. & J.

Type *Chœrocampa versicolor* Harr.
755 versicolor (*Harr.*)
ab. lutescens *Clark*
756 myron (*Cram.*)
pampinatrix (A. & S.)
ab. lutescens *Clark*
form cnotus (*Hbn.*)
form texana *Clark*

Darapsa Wlk.

Type *Sphinx chœrilus* Cram.
757 pholus (*Cram.*)
chœrilus (Cram.)
azaleæ (A. & S.)
chlorinda (Martyn)

Sphecodina Blanch.

Type *Thyreus abbottii* Swains.
‡*Thyreus* Swains. (nec Panzer)
Type *Thyreus abbottii* Swains.
758 abbottii (*Swains.*)

Deidamia Clem.

Type *Pterogon inscriptum* Harr.
759 inscriptum (*Harr.*)

Arctonotus Bdv.

Type *Arctonotus lucidus* Bdv.
760 lucidus *Bdv.*
a clarki *B. & Benj.*
761 terlootii (*Hy. Edw.*)

Amphion Hbn.

Type *Sphinx nessus* Cram.
762 nessus (*Cram.*)
a floridensis *Clark*

Proserpinus Hbn.

Type *Sphinx œnotheræ* D. & S.
763 gauræ (*A. & S.*)
circœ Hy. Edw.
764 deceptiva *B. & Benj.*
765 juanita (*Stkr.*)
a oslari *R. & J.*
766 clarkiæ (*Bdv.*)
victoria (Grt.)
767 flavofasciata (*Wlk.*)
a ulalume (*Stkr.*)
b rachel (*Bruce*)
768 vega (*Dyar*)

Euproserpinus G. & R.

Type *Euproserpinus phæton* G. & R.
769 phæton *G. & R.*
erato (Bdv.)
770 euterpe *Hy. Edw.*

CHŒROCAMPINÆ

Xylophanes Hbn.

Type *Sphinx anubus* Cram.
771 pluto (*Fabr.*)
crœsus (Dal.)
thorates (Hbn.)
772 porcus (*Hbn.*)
773 falco (*Wlk.*)
fugax (Bdv.)
mexicana (Ersch.)
774 tersa (*L.*)

Sphinx L.

Type *Sphinx euphorbiæ* L.
*775 gallii *Rott.*
‡*euphorbiæ* L. (partim nec L.)
a intermedia (*Kirby.*)
chamænerii (Harr.)
oxybaphi (Clem.)
canadensis (Gn.)
776 lineata *Fabr.*
daucus Cram.

Superfamily **SATURNIOIDEA**

SATURNIIDÆ

Samia Hbn.

Type *Phalæna cynthia* Dru.

*777 walkeri (*F. & F.*)
a advena (*Pack.*)

Rothschildia Grt.

Type *Attacus jacobææ* Wlk.

778 orizaba (*West.*)
779 jorulla (*West.*)
cinctus (Tepper)

Platysamia Grt.

Type *Phalæna cecropia* L.

780 cecropia (*L.*)
781 gloveri *Stkr.*
a reducta *Neum.*
782 columbia (*Sm.*)
a nokomis *Brodie*
b winonah *Brodie*
783 euryalus (*Bdv.*)
californica Grt.
ceanothi (Behr)
rubra (N. & D.)
ab. parvimacula (*Grt.*)
a kasloensis (*Ckll.*)

Eupackardia Ckll.

Type *Saturnia calleta* West.

784 calleta (*West.*)
polyommata (Tepper)

Callosamia Pack.

Type *Phalæna promethia* Dru.

785 promethea (*Dru.*)
ab. ♀ cæca *Ckll.*
786 angulifera (*Wlk.*)
a carolina *Jones*

Actias Leach.

Type *Phalæna luna* L.

787 luna (*L.*)
ab. rossi *Ross*
ab. rubrosuffusa (*Ckll.*)
form vern. rubromarginata (*Davis*)
a dictynna (*Wlk.*)
form vern. mariæ (*Benj.*)

Telea Hbn.

Type *Phalæna polyphemus* Cram.

788 polyphemus (*Cram.*)
‡*paphia* (L.) (partim.)
‡*fenestra* (Perry) (nec L.)
polypheme Hbn.
rubra Dean
ab. flava *Grt.*
a oculea *Neum.*
aurelia Druce
b olivacea *Ckll.*

Agapema N. & D.

Type *Saturnia galbina* Clem.

789 galbina (*Clem.*)
a anona *Ottol.*
790 homogena *Dyar*

Calosaturnia Sm.

Type *Saturnia mendocino* Behrens

791 mendocino (*Behrens*)

Automeris Hbn.

Type *Phalæna janus* Cram.

792 pamina (*Neum.*)
form aurosea (*Neum.*)
793 zephyria (*Grt.*)
form zephyriata *B. & Benj.*
794 io (*Fabr.*)
corollaria (Perry)
varia (Wlk.)
fabricii (Grt.)
ab. argus N. & D.
a lutheri *Ckll.*
‡*trifolii* (Harris) (nec Esp.)
‡*fuscus* Luther (nec Wlk.)
b coloradensis *Ckll.*
c neomexicana *B. & Benj.*
d lilith (*Stkr.*)
e texana *B. & Benj.*

Thauma Hy. Edw.

Type *Thauma ribesii* Hy. Edw.

*795 socialis (*Feist.*)
angulifera (Wlk.)
ribesii Hy. Edw.

Coloradia Blake

Type *Coloradia pandora* Blake

796 davisi *B. & Benj.*
797 lindseyi *B. & Benj.*
798 bonniwelli *B. & Benj.*
799 pandora *Blake*
loiperda Dyar
800 duffneri *B. & Benj.*
801 chiricahua *B. & Benj.*
802 doris *Barnes*
lois Dyar
803 luski *B. & Benj.*

Hemileuca Wlk.

Type *Phalæna maia* Dru.

804 electra *Wright*
ab. ricksecker*i Wats.*
a clio *B. & McD.*
805 maia (*Dru.*)
prosperpina (Fabr.)
ab. lintneri *Ckll.*
806 lucina *Hy. Edw.*
ab. obsoleta *Reiff*
ab. lutea *Reiff*
a latifascia *B. & McD.*
807 nevadensis *Stretch*
artemis Pack.
a californica *Wright*
808 juno *Pack.*
yavapai Neum.
809 grotei *G. & R.*
a diana *Pack.*
810 neumoegeni (*Hy. Edw.*)
811 burnsi *Wats.*
ab. ilmæ *Wats.*
ab. nigrovenosa *Wats.*
ab. conjuncta *Wats.*
ab. paradoxa *Wats.*
812 tricolor (*Pack.*)
813 sororius (*Hy. Edw.*)
a hualapai (*Neum.*)
814 oliviæ *Ckll.*
ab. ♂ grisea *Ckll.*
ab. ♀ suffusa *Ckll.*

Pseudohazis G. & R.

Type *Saturnia eglanterina* Bdv.

815 eglanterina (*Bdv.*)
normalis Dyar
form shastaensis *Behrens*
form denudata *Neum.*
boisduvali Oberth.
harrisi Oberth.
a nattalli *Stkr.*
form arizonensis *Stkr.*
uniformis Ckll.
816 hera (*Harr.*)
pica (Wlk.)
chrysocarena (Harris)
a marcata *Neum.*
ab. gunderi *Hill*

Hylesia Hbn.

Type *Phalæna canitia* Stoll

817 alinda *Druce.*

CERATOCAMPIDÆ

Anisota Hbn.

Type *Bombyx stigma* Fabr.

818 stigma (*Fabr.*)
819 manitobensis *McD.*
820 senatoria (*A. & S.*)
821 consularis *Dyar*
822 virginiensis (*Dru.*)
astymone (Oliv.)
pellucida (A. & S.)
823 oslari *Roths.*
skinneri Bied.
neomexicana Brehme
824 rubicunda (*Fabr.*)
a alba (*Grt.*)
pallida (Bowles)

Adelocephala H.-S.

Type *Adelocephala cadmus* H.-S.

825 bicolor (*Harr.*)
distigma (Walsh)
form suprema *Neum.*
form immaculata *Jewett*
826 isias *Bdv.*
827 högei *Druce*
828 quadrilineata *G. & R.*
829 bisecta (*Lint.*)
nebulosa (Neum.)
830 albolineata *G. & R.*
raspa Grt.
831 heiligbrodti (*Harv.*)
a hubbardi (*Dyar*)

Citheronia Hbn.
Type *Bombyx regalis* Fabr.
832 regalis (*Fabr.*)
regia (A. & S.)
ab. infernalis *Stkr.*
ab. saengeri *Neum.*
833 splendens (*Druce*)
834 sepulchralis *G. & R.*
835 mexicana *G. & R.*

Eacles Hbn.
Type *Phalæna imperialis* Dru.
836 imperialis (*Dru.*)
imperatoria (A. & S.)
ab. punctatissima *Neum.*
a didyma (*Beauv.*)
b nobilis *Neum.*
c oslari *Roths.*

Superfamily **BOMBYCOIDEA**

SYNTOMIDÆ

Cosmosoma Hbn.
Type *Cosmosoma omphale* Hbn.
837 myrodora *Dyar*
838 teuthras (*Wlk.*)
rubrigutta Skin.

Syntomeida Harr.
Type *Glaucopis ipomœæ* Harr.
839 ipomœæ (*Harr.*)
ferox (Wlk.)
euterpe (H.-S.)
*840 epilais (*Wlk.*)
a jucundissima *Dyar*
841 hampsonii *Barnes*
befana Skin.

Pseudocharis Druce
Type *Pseudocharis nœnia* Druce.
842 minima (*Grt.*)

Didasys Grt.
Type *Didasys belæ* Grt.
843 belæ *Grt.*

Horama Hbn.
Type *Sphinx pretus* Cram.
844 texana (*Grt.*)

Eucereon Hbn.
Type *Sphinx archias* Cram.
845 carolina (*Hy. Edw.*)
cubensis Schs.
confusum Roths.

Lymire Wlk.
Type *Lymire melanocephala* Wlk.
846 edwardsii (*Grt.*)

Scepsis Wlk.
Type *Glaucopis fulvicollis* Hbn.
847 fulvicollis (*Hbn.*)
semidiaphana (Harr.)
a pallens *Hy. Edw.*
848 packardii *Grt.*
matthewi Hy. Edw.
a cocklei *Dyar*
849 wrightii *Stretch*
a gravis *Hy. Edw.*

Lycomorpha Harr.
Type *Sphinx pholus* Dru.
850 grotei (*Pack.*)
palmerii Pack.
a pulchra *Dyar*
851 regulus (*Grinnell*)
852 fulgens (*Hy. Edw.*)
tenuimargo (Holl.)
853 splendens *B. & McD.*
854 pholus (*Dru.*)
a miniata *Pack.*
855 desertus *Hy. Edw.*

Ctenucha Kirby
Type *Sphinx virginica* Charp.
856 venosa *Wlk.*
857 cressonana *Grt.*
form sanguinaria *Stkr.*
form lutea *Grt.*
858 brunnea *Stretch*
859 multifaria (*Wlk.*)
form luteoscapus *N. & D.*
860 rubroscapus (*Mén.*)
walsinghamii Hy. Edw.
form ochroscapus *G. & R*
corvina Bdv.
861 virginica (*Charp.*)
latreillana Kirby

Dahana Grt.
Type *Dahana atripennis* Grt.
862 atripennis *Grt.*

NOLINÆ

Celama Wlk.

Type *Celama liparisalis* Wlk.
863 aphyla *Hamp.*
864 pustulata (*Wlk.*)
nigrofasciata (Zell.)
obaurata (Morr.)
865 cilicoides (*Grt.*)
a eurypennis *Dyar*
866 sorghiella (*Riley*)
portoricensis (Moesch.)
867 triquetrana (*Fitch*)
trinotata (Wlk.)
sexmaculata (Grt.)
868 minna (*Butl.*)
hyemalis (Stretch)
869 ovilla (*Grt.*)
870 clethræ (*Dyar*)

Nola Leach

Type *Phalæna cucullatella* L.
871 apera *Druce.*
involuta Dyar
a exposita *Dyar*
872 laguncularíæ *Dyar*
obliquata (B. & McD.)

Nigetia Wlk.

Type *Nigetia formosalis* Wlk.
873 formosalis *Wlk.*
melanopa (Zell.)

Sarbena Wlk.

Type *Sarbena lignifera* Wlk.
874 minuscula (*Zell.*)
a phylla (*Dyar*)
b eucalyptula (*Dyar*)
875 minor (*Dyar*)
876 extusata (*Dyar*)
877 fuscula (*Grt.*)
878 dentata (*Dyar*)
879 varia (*B. & L.*)
880 conspicua (*Dyar*)
881 bicrenuscula (*Dyar*)

LITHOSIINÆ

Lexis Wallgr.

Type *Lithosia bipunctigera* Wallgr.
882 bicolor (*Grt.*)
argillacea (Pack.)

Crambidia Pack.

Type *Crambidia pallida* Pack.
883 pallida *Pack.*
884 lithosioides *Dyar*
885 uniformis *Dyar*
886 dusca *B. & McD.*
887 myrlosea *Dyar*
888 casta (*Pack.*)
candida (Hy. Edw.)
889 pura *B. & McD.*
890 cephalica (*G. & R.*)
891 suffusa *B. & McD.*
892 impura *B. & McD.*
*893 allegheniensis *Holl.*

Agylla Wlk.

Type *Agylla fasciculata* Wlk.
894 septentrionalis *B. & McD.*

Pagara Wlk.

Type *Pagara simplex* Wlk.
895 simplex *Wlk.*
murina (Wlk.)
clarus (G. & R.)
texana (Frch.)
896 fuscipes (*Grt.*)

Neoplynes Hamp.

Type *Lithosia cytheræa* Druce
897 eudora (*Dyar*)

Ptychoglene F. F. & R.

Type *Ptychoglene erythrophora* F. & F.
898 coccinea (*Hy. Edw.*)
899 phrada *Druce*
flammans Dyar
900 sanguineola (*Bdv.*)

Eudesmia Hbn.

Type *Eudesmia ruficollis* Hbn.
901 arida (*Skin.*)

Gnamptonychia Hamp.

Type *Atolonis flavicollis* Wlk.
902 ventralis *B. & L.*

Jnopsis F. & F.

Type *Jnopsis catoxantha* F. & F.
903 modulata (*Hy. Edw.*)

Pygoctenucha Grt.

Type *Ctenucha harrisii* Bdv.

904 terminalis (*Wlk.*)
harrisii (Bdv.)
votiva (Hy. Edw.)

905 pyrrhoura (*Hulst*)

906 funerea *Grt.*

Afrida Moesch.

Type *Afrida tortriciformis* Moesch.

907 minuta (*Druce*)

908 ydatodes *Dyar*
parva (B. & McD.)

Cisthene Wlk.

Type *Cisthene subjecta* Wlk.

909 schwarziorum (*Dyar*)

910 subrufa (*B. & McD.*)

911 tenuifascia *Harv.*
form mexicana (*Draudt*)
form interrupta (*Draudt*)

912 juanita *B. & Benj.*

913 unifascia *G. & R.*
a kentuckiensis (*Dyar*)
b ruptifascia (*B. & McD.*)
c flava (*Draudt*)

914 barnesii (*Dyar*)
form costimacula (*Draudt*)
form flavula (*B. & McD.*)

915 picta (*B. & McD.*)
texensis (Draudt)

916 perrosea (*Dyar*)

917 angelus (*Dyar*)

918 injecta (*Dyar*)
flavicosta (Draudt)
a gamma (*Dyar*)

919 striata *Ottol.*
apicipicta (Strand)

920 subjecta *Wlk.*

921 bellicula (*Dyar*)

922 packardii (*Grt.*)

923 conjuncta (*B. & McD.*)

924 plumbea *Stretch*

925 liberomacula (*Dyar*)
form basijuncta (*B. & McD.*)

926 nexa (*Bdv.*)
grisea Pack.
deserta (F. & F.)

927 faustinula (*Bdv.*)
form fusca *Stretch*

928 dorsimacula (*Dyar*)

Clemensia Pack.

Type *Clemensia albata* Pack.

929 albata *Pack.*
albida (Wlk.)
cana (Wlk.)
irrorata Hy. Edw.
form umbrata *Pack.*

Palpidia Dyar

Type *Palpidia pallidior* Dyar

930 pallidor *Dyar*

Lerina Wlk.

Type *Lerina incarnata* Wlk

931 incarnata *Wlk.*
robinsonii (Bdv.)

Bruceia Neum.

Type *Bruceia pulverina* Neum.

932 pulverina *Neum.*

933 hubbardi *Dyar*

Hæmatomis Hamp.

Type *Lithosia mexicana* Druce

934 mexicana (*Druce*)

Hypoprepia Hbn.

Type *Hypoprepia fucosa* Hbn.

935 miniata (*Kirby*)
vittata (Harr.)
a mississippiensis *B. & Benj.*

936 fucosa *Hbn.*
tricolor (Fitch)
form plumbea *Hy. Edw.*
a subornata *N. & D.*
inornata Ottol.
form dollii *Dyar*

937 cadaverosa *Stkr.*

938 inculta *Hy. Edw.*

ARCTIINÆ

Eupseudosoma Grt.

Type *Eupseudosoma* ‡*niveum* Grt.
(=*Phalæna involuta* Sepp)

*939 involutum (*Sepp*)
nivea (H.-S.)
‡*niveum* Grt. (nec. H.-S.)
bicolor (Roths.) (partim. ♂ nec ♀)
a floridum *Grt.*
immaculata (Graef)

Bertholdia Schaus

Type *Trichromia specularis* H.-S.

940 trigona (*Grt.*)

Cycnia Hbn.

Type *Cycnia tenera* Hbn.

941 tenera *Hbn.*
collaris (Fitch)
antica (Wlk.)
a sciurus (*Bdv.*)
yosemite (Hy. Edw.)
942 insulata (*Wlk.*)
cadaverosa (Grt.)
affinis (Grt.)
aurata (Butl.)
943 inopinatus (*Hy. Edw.*)
form nivalis (*Stretch*)

Phægoptera H.-S.

Type *Phægoptera histrionica* H.-S.

*944 astur (*Cram.*)
albicans (Wlk.)
maculicollis (Wlk.)
pustulata (Pack.)
a arizonensis (*Roths.*)
fumata (B. & McD.)

Hemihyalea Hamp.

Type *Phægoptera cornea* H.-S.

945 splendens *B. & McD.*
947 labecula (*Grt.*)
948 edwardsii (*Pack.*)
translucida (Wlk.)
quercus (Bdv.)
argillacea Roths.

No number 946.

Halisidota Hbn.

Type *Phalæna tessellaris* A. & S.

949 argentata *Pack.*
a subalpina *French*
b sobrina *Stretch*
950 ingens *H. Edw.*
scapularis Stretch
951 caryæ (*Harr.*)
annulifascia Wlk.
porphyrea H.-S.
952 mixta *Neum.*
pseudocarye Roths.
953 pura (*Neum.*)
flavescens Roths.
954 maculata (*Harr.*)
fulvoflava Wlk.
guttifera (H.-S.)
a angulifera *Wlk.*
b alni *Hy. Edw.*
texana Roths.
c agassizii *Pack.*
californica Wlk.
salicis Grt.
d eureka *Dyar*
955 indistincta *B. & McD.*
956 cinctipes *Hy. Edw.*
carinator Dyar
**ab.* ata *Strand*
**ab.* meta *Strand*
957 davisii *Hy. Edw.*
958 tessellaris (*A. & S.*)
tessellata (Guér.)
antiphola Walsh
antipholella Strand
tesselaroides Strand
959 harrisii *Walsh.*
960 oslari *Roths.*
961 longa (*Grt.*)
962 annulosa *Wlk.*
niveigutta Wlk.
nimbifacta Dyar
*963 lurida *Hy. Edw.*
a otho (*Barnes*)

Neritos Wlk.

Type *Neritos repanda* Wlk.

*964 prophæa *Schaus*

Aemilia Kirby

Type *Ameles rubriplaga* Wlk.

‡*Ameles* Wlk.
Type *Ameles rubriplaga* Wlk.

965 ambigua (*Stkr.*)
bolteri (Hy. Edw.)
syracosia (Druce)

966 roseata (*Wlk.*)
cinnamomea (Bdv.)
sanguivenosa (Neum.)
a significans (*Hy. Edw.*)
967 occidentalis (*Frch.*)

Eubaphe Hbn.

Type *Eubaphe aurantiaca* Hbn.
968 læta (*Guér.*)
a treatii (*Grt.*)
rubropicta (Pack.)
969 intermedia (*Graef*)
a parvula (*N. & D.*)
coccinicepsi (Schaus)
970 ostenta (*Hy. Edw.*)
♀ *calera* (Barnes)
971 aurantiacia *Hbn.*
form quinaria (*Grt.*)
choriona (Reak.)
bimaculata (Saund.)
a rubicundaria (*Hbn.*)
rosa (Frch.)
diminutiva Graef
b brevicornis (*Wlk.*)
belfragei (Stretch)
972 fragilis (*Stkr.*)
973 costata (*Stretch*)
opelloides (Graef)
a pallipennis *B. & McD.*
974 opella (*Grt.*)
form rubricosta (*Ehrm.*)
nigrifera (Wlk.) (part-im., ♀)
form flava *B. & Benj.*
form nigricans (*Reak.*)
nigrifera (Wlk.) (part-im., ♂)
obscura (Stretch) (part-im.)
form belmaria (*Ehrm.*)
‡*obscura* (Stretch) (part-im.)
975 ferruginosa (*Wlk.*)
trimaculosa (Reak.)
‡*obscura* (Stretch) (part-im.)
form immaculata (*Reak.*)

Dodia Dyar

Type *Dodia albertæ* Dyar
976 albertæ *Dyar*

Hypocrisias Hamp.

Type *Purius punctatus* Druce
977 minima (*Neum.*)
armillata (Hy. Edw.)
agelia (Druce)

Leptarctia Stretch

Type *Lithosia decia* Bdv.
978 californiæ (*Wlk.*)
lena (Bdv.)
adnata (Bdv.)
fulvofasciata Butl.
wrightii Frch.
form decia (*Bdv.*)
boisduvalii Butl.
latifasciata Butl.
albifascia Frch.
occidentalis Frch.
form dimidiata *Stretch*
stretchii Butl.

Parasemia (Hbn.)

Type *Phalæna* ‡*festiva* Bork.
(=*Bombyx lapponica* Thun.)
979 parthenos (*Harr.*)
borealis (Moesch.)
*980 lapponica (*Thun.*)
‡*festiva* (Bork.) (nec Hufn.)
avia Hbn.
a hypoborea (*Curt.*)
981 alpina (*Quens.*)
thulea (Dal.)
982 subnebulosa (*Dyar*)

Neoarctia N. & D.

Type *Antarctia beanii* Neum.
983 brucei (*Hy. Edw.*)
984 beanii (*Neum.*)
form fuscosa (*Neum.*)
985 yarrowii (*Stretch*)
form remissa (*Hy. Edw.*)
986 sordida *McD.*

Phragmatobia Steph.

Type *Phalæna fuliginosa* L.
*987 fuliginosa (*L.*)
a rubricosa (*Harr.*)
*? *borealis* (Staud.)
988 assimilans *Wlk.*
form franconia *Sloss.*

Mænas Hbn.

Type *Phalæna vocula* Stoll.
989 vestalis (*Pack.*)
echo (Roths.) (partim. "♂"=♀, nec ♀)
form amelaina (*Dyar*)

Euerythra Harv.
Type *Euerythra phasma* Harv.
990 phasma *Harv.*
991 trimaculata *Sm.*

Diacrisia Hbn.
Type *Phalæna russula* L.
992 latipennis (*Stretch*)
993 virginica (*Fabr.*)
congrua Wlk. (partim. ♀ nec ♂)
ab. fumosa (*Stkr.*)
994 vagans (*Bdv.*)
♀*rufula* (Bdv.)
♂ *bicolor* (Wlk.)
♂ *punctata* (Pack.)
form proba (*Hy. Edw.*)
♀*walsinghami* (Butl.)
a kasloa *Dyar*
995 pteridis (*Hy. Edw.*)
danbyi (Neum.)
a rubra (*Neum.*)

Isia Wlk.
Type *Isia intricata* Wlk.
996 isabella (*A. & S.*)
californica (Pack.)

Hyphantria Harr.
Type *Arctia textor* Harr.
997 textor (*Harr.*)
candida (Wlk.)
998 cunea (Dru.)
punctatissima (A. & S.) (partim., ♂ nec ♀)
mutans (Wlk.)
ab. punctata *Fitch*
ab. pallida (*Pack.*)
ab. suffusa *Stkr.*
ab. brunnea *Stkr.*
form budea (*Hbn.*)
‡*punctatissima* (A. & S.) (partim., ♀ nec ♂)
999 aspersa (*Grt.*)

Estigmene Hbn.
Type *Phalæna acrea* Dru.
1000 acrea (*Dru.*)
♂ *caprotina* (Dru.)
menthrastrina (Martyn)
pseuderminea (Harr.)
pseudermia (Harr.)
‡*californica* (Pack.) (nec Pack.)
packardii (Schaupp)
‡*rickseckeri* (Behr) (partim. ♀ nec ♂)
‡*echo* (Roths.) (partim. ♀ nec "♂")
klagesii (Ehrm.)
a dubia (*Wlk.*)
rickseckeri (Behr) (partim. ♂ nec ♀)
b arizonensis *Roths.*
1001 albida (*Stretch*)
1002 prima (*Slosson*)
1003 antigone (*Stkr.*)
a athena (*Stkr.*)
‡*congrua* (Wlk.) (partim, ♂ nec ♀)

Ecpantheria Hbn.
Type *Bombyx ocularia* Fabr.
1004 deflorata (*Fabr.*)
scribonia (Stoll)
oculatissima (A. & S.)
chryseis (Oliv.)
form confluens *Oberth.*
a denudata *Sloss.*
1005 muzina *Oberth.*
albicollis Oberth.
abscondens Oberth.
depauperata Oberth.
sennettii Lint.
1006 oslari *Roths.*
1007 suffusa (*Schs.*)
semiclara (Stretch)

Arachnis Geyer
Type *Arachnis aulæa* Geyer
*1008 aulæa *Geyer*
incarnata (Wlk.)
1009 pompeia *Druce*
1010 picta *Pack.*
a maia *Ottol.*
b citra *N. & D.*
c verna *B. & McD.*
d hampsoni *Dyar*
1011 midas *B. & L.*
1012 zuni *Neum.*

Apantesis Wlk.
Type *Apantesis radians* Wlk.
1013 virgo (*L.*)
ab. simplex (*Stretch*)
ab. citrinaria (*N. & D.*)
1014 intermedia (*Stretch*)
form stretchii (*Grt.*)
1015 parthenice (*Kirby*)
saundersii (Grt.)
circa (Stretch)
ab. approximata (*Stretch*)
1016 oithona (*Stkr.*)
ab. conspicua (*Stretch*)
form norm. rectilinea (*Frch.*)
1017 doris (*Bdv.*)
form nerea (*Bdv.*)
michabo (Grt.)
a minea (*Sloss.*)

1018 arge (*Dru.*)
dione (Fabr.)
incarnatorubra (Goeze)
cœlebs (Martyn)
ab. nervosa (N. & D.)
‡*strigosa* (Stretch) (nec Fabr.)

1019 ornata (*Pack.*)
shastaensis (French)
simplicior (Butl.)
perpicta (Dyar)
form sulphuricella *Strand*
form hewletti *B. & McD.*
form achaia (*G. & R.*)
maculosa (Stretch)
rivulosa (Stretch)
ab. californica *Cass.*
form ochracea-rivulosa (*Stretch*) (? ‡)
form ochracea (*Stretch*)
form edwardsii (*Stretch*)
ab. obliterata (*Stretch*)
a complicata (*Wlk.*)
barda (Hy. Edw.)

1020 anna (*Grt.*)
form persephone (*Grt.*)

1021 quenselii (*Payk.*)
‡*strigosa* (Fabr.) (nec Gmel.)
a gelida (*Moesch.*)
b turbans (*Christ.*)

1022 cervinoides (*Stkr.*)

1023 virguncula (*Kirby*)
ab. otiosa (*N. & D.*)
a speciosa (*Moesch.*)

1024 proxima (*Guér.*)
docta (Wlk.)
mexicana (G. & R.)
arizoniensis (Stretch)
a mormonica (*Neum.*)
b autholea (*Bdv.*)

1025 favorita (*Neum.*)
ab. favoritella *Strand*

1026 nevadensis (*G. & R.*)
behrii (Stretch)
a geneura (*Stkr.*)
incorrupta (Hy. Edw.)
b sulphurica (*Neum.*)
‡*ochracea* (Neum.) (nec Stretch)

1027 bolanderi (*Stretch*)
?*a* confluentis *Strand*

1028 blakei (*Grt.*)
a superba (*Stretch*)
b elongata (*Stretch*)
c dieckii (*Neum.*)

1029 williamsii (*Dodge*)
form determinata (*Neum.*)
a toœle *B. & McD.*
form ophir *B. & McD.*

1030 celia (*Saund.*)
form franconia (*Hy. Edw.*)

1031 phyllira (*Dru.*)
b-ata (Goeze)
dodgei (Butl.)

1032 figurata (*Dru.*)
ceramica (Hbn.)
form snowi (*Grt.*)
form excelsa (*Neum.*)
ab. lugubris (*Hlst.*)
form preciosa *Nixon*

1033 f-pallida (*Stkr.*)

1034 quadranotata (*Stkr.*)
moierra Dyar
a sociata *B. & McD.*

1035 placentia (*A. & S.*)
form flammea (*Neum.*)

1036 nais (*Dru.*)
cuneata (Goeze)
defloriana (Martyn)
ochreata (Butl.)
ab. naidella *Strand*
ab. subterminalis *Strand*

1037 vittata (*Fabr.*)
decorata (Saund.)
?*ab.* ♂ vittatula *Strand*
?*ab.* ♀ phaleratula *Strand*
?*ab.* ♀ rhodena *Strand*

1037,1 phalerata (*Harr.*)
rhoda (Butl.)
♀*pulcherrima* (Stretch)
ab. incarnata (*Stretch*)
a radians *Wlk.*
colorata (Wlk.)
incompleta (Butl.)
floridana Cass.
‡*ochracea* Cass. (nec Stretch)

Kodiosoma Stretch.

Type *Kodiosoma fulva* Stretch

1038 fulva *Stretch*
form nigra *Stretch*
form eavesii *Stretch*
form tricolor *Stretch*

1039 otero *Barnes*

Pygarctia Grt.

Type *Pygarctia abdominalis*, Grt.

1040 abdominalis *Grt.*

1041 grossbecki *Davis*

1042 eglenensis (*Clem.*)

1043 vivida (*Grt.*)

1044 spraguei (*Grt.*)
conspicua (Neum.)

1045 neomexicana *Barnes*

1046 murina (*Stretch*)
polyochroa Hamp.
a oslari *Roths.* (au syn. práec.?)
b albistrigata *B. & McD.*

1048 roseicapitis (*N. & D.*)
a flavidorsalis *B. & McD.*
1049 lorula *Dyar*

Euchætias Lyman.
Type *Phalæna egle* Dru.
‡*Euchætes* Harr. (nec Dejean)
Type *Phalæna egle* Dru.
1050 antica (*Wlk.*)
zonalis (Grt.)
1051 albicosta (*Wlk.*)
fumidus (Hy. Edw.)
1052 bolteri (*Stretch*)
♂ *scepsiformis* (Graef)
1053 perlevis (*Grt.*)
1054 gigantea *B. & McD.*
1055 fusca (*Roths.*)
1056 egle (*Dru.*)
form cyclica (*Hy. Edw.*)
1057 pudens (*Hy. Edw.*)
1058 elegans (*Stretch*)
1059 castalla *B. & McD.*
ab. griseopunctata *B. & McD.*
1060 oregonensis (*Stretch*)
1061 zella (*Dyar*)

Seirarctia Pack.
Type *Phalæna echo* A. & S.
1062 echo (*A. & S.*)
niobe (Stkr.)

Turuptiana Wlk.
Type *Turuptiana obliqua* Wlk.
1063 permaculata (*Pack.*)
reducta (Grt.)
cæca (Stkr.)

Calidota Dyar
Type *Halesidota* ‡*strigosa* Wlk.
(=*Halisidota cubensis* Grt.)
1064 cubensis (*Grt.*)
‡? *strigosa* (Wlk.) (nec Fabr.)
‡*strigosa* (Wlk.) (nec Wlk.)
laqueata (Hy. Edw.)
1065 muricolor (*Dyar*)

Nemeophila Steph.
Type *Phalæna plantaginis* L.
1066 plantaginis (*L.*)
petrosa Wlk.
cæspitis G. & R.
cichorii G. & R.

No number 1047.

form ♂ hospita (*D. & S.*)
form modesta (*Pack.*)
alascensis Stretch
form scudderi (*Pack.*)
selwynii Hy. Edw.
form geometrica (*Grt.*)
form geddesi *Neum.*

Arctia Schrank
Type *Phalæna caja* L.
*1067 caja (*L.*)
erinacea (Retz)
a opulenta (*Hy. Edw.*)
b virginivir *Dyar*
c waroi *B. & Benj.*
d americana *Harr.*
e utahensis (*Hy. Edw.*)
ab. transmontana (*N. & D.*)
f parva *Roths.*

Ectypia Clem.
Type Ectypia bivittata *Clem.*
1068 bivittata *Clem.*
nigroflava (Graef)
1069 clio (*Pack.*)
ab. thona *Stkr.*)
a jessica (*Barnes*)

Platyprepia Dyar
Type *Chelonia virginalis* Bdv.
1070 guttata (*Bdv.*)
form virginalis (*Bdv.*)
form ochracea (*Stretch*)

Utetheisa Hbn.
Type *Phalæna ornatrix* L.
1071 bella (*L.*)
form hybrida (*Butl.*)
form intermedia (*Butl.*)
form terminalis *N. & D.*
form nova *Sm.*
grossbecki Strand
a venusta (*Dal.*)
speciosa (Wlk.)
1072 ornatrix (*L.*)
form stretchii (*Butl.*)
pura (Butl.)
butleri Dyar

Haploa Hbn.
Type *Phalæna clymene* Brown
1073 clymene (*Brown*)
interruptomarginata (Beau.)
comma (Wlk.)

1074 colona (*Hbn.*)
carolina (Harr.)
form conscita (*Wlk.*)
lactata (Sm.)
form fulvicosta (*Clem.*)
duplicata N. & D.
form reversa (*Stretch*)
suffusa (Sm.)

1075 lecontei (*Guér.*)
leucomelas (H.-S.)
form militaris (*Harr.*)
confinis (Wlk.)
harrisii Dyar
form smithii *Dyar*
form dyarii (*Merrick*)
form vestalis (*Pack.*)
ochroleuca Strand

1076 confusa (*Lyman*)
form lymani *Dyar*
form triangularis *Sm.*

1077 contigua (*Wlk.*)
form lumbonigera *Dyar*

NAMES OMITTED FROM THIS LIST BUT APPEARING ON THE BARNES & McDUNNOUGH CHECK LIST, OR UPON RECENT REVISIONAL PAPERS

Paonias astylus hyb. *interfaunus* Neum. Mr. Jacob Doll told Mr. F. H. Benjamin that a ♀ *ocellata* from a European pupa had escaped a private collector's home, and rested on a fence. While there, a ♂ *astylus* copulated with it. The types of *interfaunus* were reared from eggs of that pair. The name has no status under the Int. Zool. Code.

Erinnyis guttularis syn. *pallida* Bdv. Not a new name, being a presumable misdetermination of *pallida* Grt.

"*Celerio lineata* syns. *melancholica* Grt. and *piperis* G. & R." Presumably synonyms of *Erinnyis œnotrus*, but placed under both names in the B. & McD. Check List.

Philosamia cynthia Dru. Name "restricted" by various authors to the Javan race, *insularis*, but Drury gives locality as China. A great deal has been written upon the question. Watson, in Packard, Monograph Bomb. Moths, III, questions if the true *cynthia* is the Javan one. The N. Am. *cynthia*,"=*advena* Pack., appears to have been derived from *walkeri* being from eggs received by Dr. Thomas Stewardson from Guérin-Ménéville, (part of the French attempt to rear *walkeri* for silk), and possibly again introduced by Herman Strecker's liberation of adults reared from eggs laid by Chinese *walkeri* near Reading, Pa. True *cynthia* is probably distinct from *walkeri*.

Rothschildia jorulla syn. *splendida* Clem. Not a new name, simply a presumably erroneous determination of *splendida* Beauv.

Automeris pamina aurosea syn. *boucardi* Druce. Exotic. See 1922, B. & Benj., Contrib., V, (1), 7.

Apantesis quenselii syn. *liturata* Mén. Specimens supplied us by Dr. Bang-Haas indicate that this is a form differing from *quenselii* and not found in N. Am.

Arctia caja phaeosoma Butl., Asiatic; *phaeosoma* Auct. from British Columbia is *waroi* B. & Benj.

A NEW RACE OF HEMARIS DIFFINIS
(Lepid., Sphingidae)

By WM. BARNES and F. H. BENJAMIN,
Decatur, Illinois

Hemaris diffinis race jordani nov.

Much like *thetis* but with reddish cast and apical spot on the primary as in *rubens*. From this latter it may easily be distinguished by its much less hairy thorax and abdomen. From *ariadne* it can be distinguished by its more uniform greenish thoracic coloration, and by its abdominal markings which are much like those of *rubens*.

This is one of the forms called *thetis* by Rothschild and Jordan (Revision Sphingidae), and discussed by Barnes and McDunnough (1910, Psyche, XVII, 203) as *rubens* (in part).

Thirty-four examples of *rubens* from various British Columbia localities, Wallace, Idaho, and Modoc Co., California are before the authors. These are all quite hairy in appearance and do not seem to intergrade with other *diffinis* forms.

Type locality: Southern Utah (Wm. Barnes and O. C. Poling).

Number and sexes of types: Holotype ♂, Allotype ♀, 36 ♂, 4 ♀ Paratypes.

Notes: A somewhat shorter series from Arizona may represent the present subspecies. The difference in size mentioned by Barnes and McDunnough, (1910), does not hold in the twenty-eight Arizona examples now in the Barnes Collection.

IN MEMORIAM: HOLDRIDGE OZRO COLLINS

As he was alighting from an interurban car, near his home in Hollywood, February 19th, 1927, Holdridge Ozro Collins was run down by a reckless motorist, and instantly killed. Although Mr. Collins was 83 years of age, he was sound mentally and physically, and a man of remarkable caution and alertness; hence it is certain that the driver of the automobile was inexcusable for his atrocious act. This is attested by the fact that he did not stop to render assistance, but ran away at breakneck speed, and it is much to be regretted that his identity was not discovered. There were two young men and two women in the machine, and, although they managed to escape apprehension, they will carry a cloud of guilt on their consciences as long as they live.

Mr. Collins was one of the early active members of the Academy of Sciences, and rendered valuable service to that organization when it most needed support. In May, 1908, he was elected Secretary, and he filled that position most efficiently for nearly twelve years. He was interested in every phase of scientific development, and had a gift for recording, filing, indexing and keeping the documents and records of the Academy in a readily available shape. He had a fine literary instinct and an appreciation of scientific values, which enabled him to edit the Academy's Bulletin in a most able manner during his incumbency as Secretary. These services were all performed gratuitously.

Mr. Collins was born in Sennett, Cayuga County, New York, Dec. 10th, 1844, the son of Ozro and Ann Van Etten Collins. His early training was in the public schools of New York, Connecticut and Ohio. He graduated from St. Louis University with the degree of LL.B. After this full preparation he entered Harvard University, and gradu-

ated with full honor in 1867. Choosing the law as his profession, he was in due time admitted to the Bar and practiced in Chicago for many years. On removing to Los Angeles in 1889 he continued in practice almost up to the time of his death.

While a resident of Illinois he married Miss Mary Ballance, daughter of Charles Ballance, of Peoria. From this union there were born four children, Rejoyce Ballance Collins, Gladys Collins, Constance Dorothy Collins and Jessie Fremont Collins. Two of the daughters died in infancy, and Rejoyce married Charles Maclay Booth; and Constance married Noel Condiff Edwards. Mrs. Collins died some twenty years ago, but the two married daughters still reside in or near Los Angeles.

Military service was always attractive to Mr. Collins, and he entered upon this avocation, quite actively. He became a member of the Illinois National Guard, being eventually appointed Assistant Adjutant General of the State of Illinois with the rank of Lieutenant-Colonel. Rendering valued service for his state and city during the railroad riot of 1887, he with two other officers wer presented with a pistol and sabre by the Council of the City of Chicago.

Having previously connected himself with the Society, Sons of the Revolution in the State of New York, it was quite natural that he should formulate a plan to organize a State Society of the same patriotic institution in California. In 1893, he associated with himself five other gentlemen who became Founders of the California Society. They were Col. Holdridge Ozro Collins, Col. John Miner Carey Marble, Lieut. Col. William Anthony Elderkin, U. S. A., Capt. Charles Lee Collins, Col. Edward Thomas Harden and Mr. James Monroe Allen. These gentlemen, of patriotic and loyal lineages instituted in May, 1893, and incorporated May 8th of the same year, the Society, Sons of the Revolution, in the State of California. Colonel Collins was its first President which office he retained until 1907, and was again elected President for the period from 1909 to 1912. He always interested himself in the publications of the Society, preparing and printing many of its pamphlets. In this service he prepared a history of the institution and organization of the General Society, Sons of the Revolution, which is the standard source of reference upon those points. For several years, he served as General Historian of the General Society, and at the time of his death was Historian of the California Society, having just recently issued a printed report in that official capacity which had been transmitted by mail, in envelopes addressed by his own hand, just previous to his death. Painstaking, thorough and faithful to fact and detail, he was a careful recorder of the events and achievements of the Society.

NEW TRANSITION FORMS or "ABS." (LEPID. RHOPALOCERA)

By J. D. GUNDER, Pasadena, Calif.

The generic names herein used follow the Jan. 1926, Barnes & Benjamin List. All classification references to transition forms are as per article on page 132, vol. 38, May, 1927, Entom. News. Where necessary, these specimens will be illustrated later in a private publication by the Author.

POLYGONIA SATYRUS (Edw.), race MARSYAS (Edw.), nov. tr. f. HOLLANDI.

Mr. W. H. Edwards in vol. 2, Grapta plate 3 of "Butterflies of North America" very clearly illustrates in color this interesting transition form. His fig. 5 shows the upperside and fig. 6 shows the underside. Mr. Edwards in text simply refers to it as a "suffused" *marsyas*. Upon examining European "aberrations" of "Graptas," I find this American specimen worthy of a special name. As Mr. Edwards figures the specimen so well, a detailed description here would seem unnecessary.

Classification: transition form; melanifusism, degree final (note position of black, comparing it to final degree of *Cynthia carye*, tr. f. *letcheri*, for example).

Data: Holotype ♂; expanse 50 mm.; locality, etc. as per Edwards text; in Edwards Coll. at Carnegie Museum, Pittsburgh, Pa., as per letter dated April 14, 1927 from Mr. Hugo Kahl in which he says Dr. Avinoff and himself located the specimen without difficulty.

Note: Named after Dr. W. J. Holland to whom American lepidopterists owe much thanks for preserving the great Edwards Collection.

LYCAENA THOE (Guer.), nov. tr. f. WORMSBACHERI.

All the orange-red ground color found on typical specimens here becomes yellow on both upper and under sides. The maculation is unchanged.

Classification: Transition form; chromatism, color sequence—red to yellow.

Data: Holotype ♀; expanse 34 mm.; in coll. of Henry Wormsbacher, Cleveland, Ohio; to be deposited later in the U. S. Nat. Museum, Washington, D. C.

Note: The above specimen was received for description in May, 1926, from Mr. Wormsbacher. I regret this long delay in recording its validity.

CYNTHIA CARYE (Hbn.), nov. tr. f. NIVOSA.

Typical in all respects except that the normal yellow-orange ground color here becomes white or rather a whitish color. Very similar to *Cynthia cardui*, tr. f. *pallens*. This latter reference is unrecorded in Am. Lists to date; but should be noted in future catalogues as a specimen is in the Author's coll. being taken at San Diego, Calif.

Classification: Transition form; albinism, color change final.

Data: Holotype ♂; expanse 50 mm.; San Francisco (Cottle), Aug. 1915; in Author's collection.

Note: The above holotype specimen is illustrated in Comstock's "Butterflies of California," plate 44, fig. 3.

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"	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
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"	24,	"	1.	January,	1925	.25
"	24,	"	2.	May,	1925	.25
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Southern California Academy of Sciences

LOS ANGELES, CALIFORNIA

Vol. XXVI September-December, 1927 Part 3

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Southern California Academy of Sciences

THE BONE DRIFT IN THE TAR-BEDS OF RANCHO LA BREA

By JAMES Z. GILBERT

To the west of Los Angeles, now chiefly within the city limits, lies a comparatively level plain. (Fig. 1.) In the midst of this plain was discovered by the writer and others the most remarkable deposit of prehistoric animal remains ever unearthed:—great in variety of species of plants, birds and mammals; enormous in quantity, perfect in preservation in a matrix of tar, and unique in the methods of accumulation.

Literature is not wanting in description of the species of animals and plants found in these beds, but the methods of accumulation have received little publicity in print. Two methods have been proposed, one known as the "trap"[1] method and the other, the "drift"[2] method. The evidences of the latter so far as the writer is aware, have not been given except in his early lectures before scientific societies and to visiting scientists[4].

The trap method of accumulation considers that the animals were caught by accident in the tarry mass in their passing, or by sinking while drinking of the shallow water in the pool or eating of the scanty vegetable growth around it. The drift method finds evidences of alternating rainy and dry seasons, the death of animals on a building plain, and tar-seeps or springs for capturing the drifting bones and other debris in flood-time. Since evidences indicating the drift method of deposit have been confirmed during the years following the early discoveries, this method may well be set forth in a more extended sketch.

GENERAL CONDITIONS

The deposit of these Pleistocene fossils lies near the surface of a broad, slightly undulating flood-plain (Pl. 6) which rises toward the Santa Monica Mountains on the north and slopes gently to the south and west toward the sea some 14 miles away. The fossil bearing portion is limited to a few acres in area and to a depth ranging from three or four feet from the present surface to about thirty feet below. The bones occur in very limited spaces only where the preserving tar appeared.

The chief part of the plain is made up of fresh-water materials brought down during the Pleistocene age from higher levels and spread out in valley form during the flood season thru a long period of time. The soil analysis also shows the fresh-water origin and the

[1] J. C. Merriam, Sunset Magazine, October, 1908.
[2] J. Z. Gilbert, Southern California Academy of Sciences, January, 1910, pp. 16, 19.
[4] Southern California Academy of Sciences Nature Club; Dr. Charles Schuschert, 1915; Dr. Franz X. Schaffer, Vienna, Austria, 1927.

PLATE 6.

The alluvial plain in which the fossil remains of Rancho La Brea were deposited.

structure indicates here and there alternating layers of sand, gravel, clay and silt and over all the recent soil. The formation of the tar-seeps, pools (Pl. 7) or mounds (Pl. 8) which are responsible for the capture of the drifting materials, is unique resulting from the combination of a number of conditions. The plain of Pleistocene material is underlaid with the Pliocene and Miocene formations, which at this place imprison quantities of oil and gas of the oil-sands. This tarry material[3] is under great pressure, thereby making possible the hundreds of oil wells (Pl. 10) of this district, and during ages past has been forced up thru cracks and crevices in the overlying strata to the surface. Here the gas forms tar bubbles which break as the gas escapes into the air and the tarry mass remains behind. Water also in most cases is brought up with the escaping gas and all together frequently form a sticky mass which penetrates the soil for from a few inches to several feet around. These places in the rainy season became soft and may have served to capture straying animals as at present, but more likely to have served a lodging place for passing materials. Sometimes the tar accumulated in the depression around the mouth of the vent or "spring" (Pl. 7) and formed a small pool. This might have become filled with water, and covered with a film of lighter oil. Again the tar in other places being thicker would build up in the overflow a low broad mound (Pl. 8), which with the other places would form ideal

[3] La Brea, Spanish for *the tar.*

PLATE 7.

A tar seep or pool in the center of these bones which served as the drift center for lodging materials.

conditions for the capture of anything that might float into them—such as sand, small animals, leaves, twigs, limbs and trunks (Pl. 12) of trees and bones of animals scattered over the plain. Once lodged this mterial would gradually be covered with the dust of the dry season and sealed for all time by the rising tar.

These pits or tar-springs occur in an irregular line across the flood-plain almost at right angles to the general direction of the slope and flow and the debris was found chiefly on the side of the mounds or pools nearest the source of the flood. Yet another corroborating evidence is found in the fact that these beds are found nearer the middle of the plain which is also the lowest portion now being cut thru by a shallow depression. It is also observed that at other tar-seeps in the vicinity, where drifting was not favorable, these animal remains are not found. Lastly it should likely be noted that the drift method better accounts for the conditions in which the fragmentary human remains were found. In some such fashion, therefore, the chimney-like forms or columns of bones and debris were built up from season to season until the extinction of the race occurred.

PLATE 8.

A mound form, active at present, which served as a lodge for drifting material.

PLATE 8-A.

Showing small size of the vent caused by escaping gas and tar.

EVIDENCES WITHIN THE DEPOSITS

Within the deposits many evidences of the drift method of accumulation are found. The soil around the piles of bones is of fresh water origin. The matrix is a tarry mass of sandy soil, soft or hard, depending much upon the relative amount of liquid tar present. The bones themselves became completely saturated with the tar and every foramen and cavity became filled with every kind of debris. Packed in and around the bones were found sand, fine and coarse gravel,

PLATE 9.

The "chimney" like form of deposit in the building up of the plain.

PLATE 10.

The "pit," an artificial pool in the bank of which the bone deposit ceased about four feet below the present surface of the plain.

small boulders, seeds, cones of trees yet native in the mountains, several species of insects, leaves, twigs, broken limbs and badly worn trunks of trees—all massed together and most certainly brought together by wash. Parts of skeletons were found in most unusual places as a rib or a tooth, or a carpal in the neural canal of a vertebra or the scutes of the giant ground sloth, the phalanges of the wolf and a tooth of the lion in the cranial cavity of some skull.

The specimens show a larger number of aged and younger individuals than of the middle aged ones. The skeletons were never complete, it being the rarest occasion when the major part of a skeleton of an individual could be found, and only such parts of the many as could resist destruction—limb bones, vertebrae, skulls and teeth are the most common finds. The elements of the skeleton were invariably separate, scattered, and most often fragmentary, doubtless by having suffered complete separation and scattering on the plain, break and wear in the transportation, decay outside the preserving tar or gnawing by the carnivorous animals. Occasionally two or more consecutive bones, e. g. vertebrae were found together, but only because of adhesions in disease. Again the skeletal elements were found in the most topsy-turvy relation possible. For example to remove from the

PLATE 11.

"Mastodon" pit showing the contemporaneous deposit of mastodon tiger, wolf and sloth skulls with other bones and debris.

pit a bone of the camel which was in sight, 23 other bones of 12 different animals had to be removed first. Or in another case, side by side in contact with each other were found the skulls of a mastodon (Pl. 11), a sabre-toothed tiger, a wolf and a giant ground sloth, all packed about by other bones. Thus the skeletal parts were so mixed, and the elements of a single individual so few in one place that the sorting and matching of bones proved the longest and most difficult task for the museum paleontologist. Indeed parts of the same individual in different pits was an occurrence not unknown.

This scattering far and near can be easily accounted for by the work of carnivorous animals and the flood of shallow waters. All in all it would take no wild stretch of the imagination to picture what most likely occurred in those ancient days of starvation, struggle and extinction. For evidently during the extinction of this most remarkable fauna this plain was in process of building, affording here and there vegetable growth and water, and continued to build for some time after the last individuals had perished. Thus the aged and young, the weak and strong, the diseased and sound, wandered in their struggle for existence over the plain, grazed, ate, drank and perished from starvation or by the attacks of ravenous beasts and birds. These animals abounded in astonishing numbers and in the last hopeless struggle fought each other only to leave their remains on the field of strife, victims of their own ravages. Thus from year to year the struggle went on, leaving the scattered bones of enemies

and prey alike to bleach in the summer sun, only to be carried with the floods of winter and left stranded in their tarry beds, there, with other debris to be sealed for all time. In some such manner the bone drift in the tar beds of *Rancho La Brea* was accumulated.

PLATE 12.

Badly worn trunks of trees

STUDIES IN PACIFIC COAST LEPIDOPTERA
(Continued)

JOHN ADAMS COMSTOCK

Early in the spring of this year I received from Mr. Fred Thorne of San Diego, a few eggs of *Euphydryas quino*. The following notes and accompanying drawing were prepared therefrom.

E. quino Behr. Egg; slightly taller than broad, the upper half fluted with about 20 vertical ribs, and the lower half pitted. Base broadly rounding. Micropyle not depressed. Minute, barely perceptible horizontal ridges occur on the floor of the grooves between the vertical columns.

Color, at first yellow, changing to a brownish-yellow.

A race of *Tharsalea arota* occurs in the Tejon Mountains which is about intermediate between the typical form, and the race *nubila*. Examples of this were noted ovipositing on *Ribes cereum*. The egg did not differ from that of *nubila*, which has been previously illustrated in "Butterflies of California," except for a slightly more pyramidal form. The food-plant is a new record.

PLATE 13.
Egg of *Euphydryas quino* much enlarged.

PLATE 14
Egg of *Tharsalea Arota* nubila, enlarged.

Callipsyche behrii Edw. Egg. Echinoid, with a deep micropyle, surrounding which is a circular eminence. About half as broad as high, and covered with pearly projections irregularly placed. These are largest on the outer circumference and smallest as they approach the micropyle. Around each of these pearly knobs are a number of deep pits, which show only with higher magnification.

Color, when first laid, yellow, changing in 5 to 10 seconds to a glistening white.

In the Tejon Mountains, near Lebec, the females were observed ovipositing on *Purshia glandulosa*, the first week in July.

Heodes heteronea clara Hy. Edw. This blue is one of the rarest Californian species, being confined to the Tehachapi and Tejon regions. It is exceedingly local in spite of the fact that the genus of food-plants on which it is dependent is widely distributed and abundant throughout the state.

It was my good fortune to find a colony of this butterfly near Lebec, in the Tejon Mountains, during the first week in July of this year. The females were observed ovipositing on *Eriogonum fasciculatum* and *E. microthecum*. The first named seemed to be the preferred

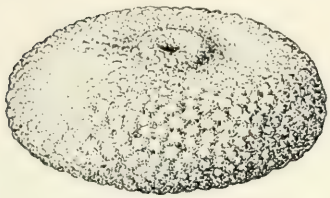
plant. A number of eggs were collected, and from these the accompanying drawing and description were prepared.

Egg. Covered by irregular depressions separated by thin upright walls, at the junctures of which are projecting papillae. This gives the entire egg a spiny appearance. Shape, nearly spherical, about four-fifths as tall as broad; the micropyle a deep pit with abrupt walls.

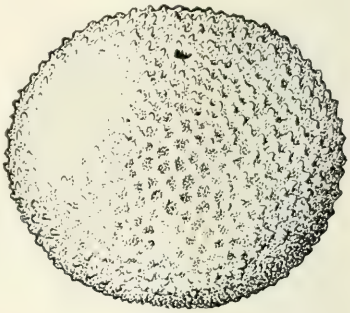
Color, when first laid a delicate green, changing in a few seconds to clear white.

The eggs are laid, usually, on the under side of the leaves of *Eriogonum*.

As *clara* is only a geographic race of *heteronea*, it is likely that the parent species has much the same egg, and feeds on the same genus of plants.



Egg of *Callipsyche behrii* much enlarged.



Egg of *Heodes heteronea clara* much enlarged.

PLATE 15.

Mr. T. M. Blackman of Los Angeles has presented me with ova of *Ochlodes agricola* Bdv. together with a sketch of the newly emerged larva, from which the following brief description is prepared.

Egg. Cone-shaped, as per the accompanying cut; the surface covered with slightly raised ridges in a minute honeycomb pattern. Color, dull white. See page 70. Plate 18.

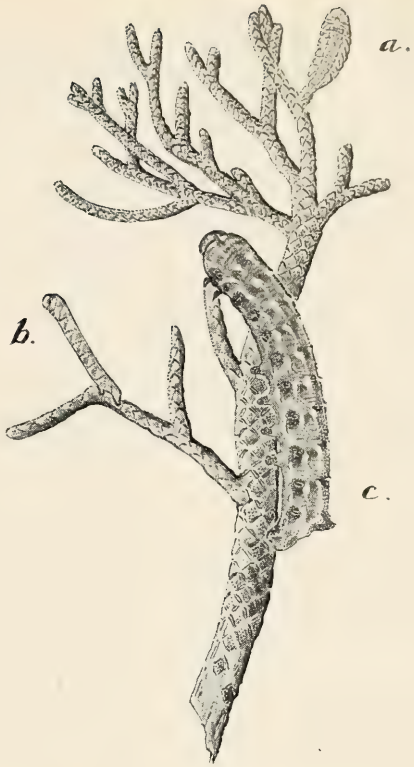
Newly emerged larva. White; head black and shiny. A narrow black transverse band on dorsal area of second segment, with a black lateral spot below each end of this band. Small black spots on segments 3 to 13, on dorsal and lateral areas, disposed as shown in the cut. Legs and prolegs, white.

On page 165, fig. A52b of "Butterflies of California" is shown a figure of the larva of *Phasiana curvata*. This interesting Geometrid caterpillar imitates to a remarkable degree, the terminal twigs of the juniper. It is marked in a series of diamond shaped spots, with varying shades of green, the pattern becoming darker and more clearly defined in the last larval instar.

The chrysalis of this moth is illustrated in the accompanying figure, which renders a description unnecessary; it is a deep glistening black.

PLATE 16.

Sprig of Juniper showing larva of *Phasiana curvata* at b., also two other protectively colored caterpillars .



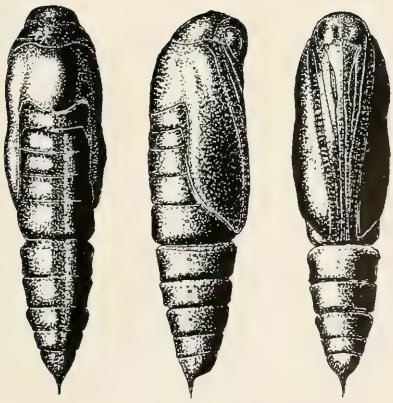
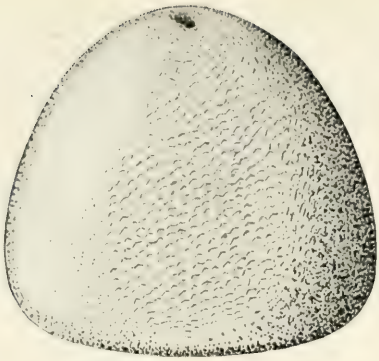


PLATE 17.

Pupa of *Phasiana curvata* much enlarged.



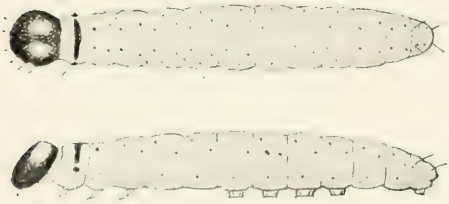


PLATE 18.

Egg and newly emerged larva of *Ochlodes agricola*, greatly enlarged.

LUPINUS PIPERITA n. sp.

A. DAVIDSON, M.D.

Upright perennial 6-8 d. m. high, stem fistulose; petioles 10 cm. long, leaflets 6 or 7, lanceolate, 6-8 cm. long, 2-2½ cm. wide; racemes 4-5 cm. long; flowers crowded, not verticillate; bracts early deciduous; pedicels 5 cm. long, flowers 1-1½ cm. long, blue, banner with a yellow blotch; lower sepal green entire, upper semimembranous, acutely cleft nearly half its depth; pods 5 cm. long, 6-8 seeded, covered with short hairs; seeds light brown with a dark line near hilum and scattered dark spots above. Whole plant otherwise than the pod absolutely glabrous except a tiny tuft of hairs on tip of lower sepal and a few hairs in the cleft of the upper sepal. The flowers have a characteristic pepper like odor.

Type No. 3645. Sequoia National Park, July 1927. Abundant in the meadow near the main camp.

I first saw this plant many years ago and was struck by its unusual fragrance but I failed to secure fruit. This season Mrs. Susan Hutchinson gathered complete specimens. She informs me that the natives there know it as the pepper lupine.

DELPHINIUM INFLEXUM n. sp.

By DR. A DAVIDSON

Plant glabrous throughout, 6-8 dm. high; stem leaves 5-lobed the 2 lower unequally forked, lobes about 3 cm. long, 3mm. wide, acute at tip; lower petioles 10-15 cm. long; inflorescence a virgate raceme, peduncles 2-3 cm. long; flowers dark dull blue, 2.5 cm. long, spur 1.5 cm. long, straight or with slight turn up at tip; sepals with the callous triangular tip infolded. Fruit unknown.

Type No. 3641. Discovered by Robert Kessler in Fish Canyon, San Gabriel Mts. growing along side specimens of *D. cardinale* and *D. Parryi*. Easily recognized by the color and the peculiar sepals.

In Memoriam

ARTHUR BURNETT BENTON

Arthur Burnett Benton, one of the most widely known architects of California and past President of the Southern California Academy of Sciences, died at his home in Los Angeles, September 18th, 1927. Nearly two years ago Mr. Benton underwent a serious surgical operation, from which he apparently recovered, and was able to resume the practice of his profession, but was prostrated again, and after lingering several months in a sanitarium, passed away. Mr. Benton was a man of sunny temperament and, aside from his professional work, took a leading part in many social, cultural and intellectual activities. He was a member of the Old Colony Club, Jonathan Club, and Union League Club. He was Governor of the California Society of the Colonial Wars from 1908 to 1910; President of the Society Sons of the Revolution, 1925-26; President of the Southern California Academy of Sciences, 1913-16; Fellow of the American Institute of Architects, and served as President of the Southern California Chapter; past President Association of Engineers and Architects for Southern California; Secretary and Architect of the Landmarks Club; served as Vice-President of the Los Angeles Municipal Art Commission; was a member of the Board of Governors of the Los Angeles County Museum; former vestryman of St. Paul's Pro-Cathedral; on the advisory board for the restoration of the Santa Barbara Mission, and rendered assistance in the restoration of the missions of San Juan Capistrano, San Fernando, Palo, San Diego and San Luis Rey.

Mr. Benton was born in Peoria, Ill., April 17th, 1858. He attended the grade and high school of his native city, graduated from the latter in 1877. Following this he took a course of two years in the School of Art and Design at Topeka, Kans. He was a farmer in Morris County, Kans., for eight years. then took a position as architectural draftsman in the office of the Chief Engineer of the Atchison, Topeka and Santa Fe Railway, at Topeka, Kans., 1887-88; draftsman in the office of the Chief Engineer of the Union Pacific Railroad at Omaha, Neb., 1889-91. He came to California in 1891, first settling in Santa Barbara, where he did some architectural work, then coming to Los Angeles in 1892, when he established an office on his own account, which was maintained until the time of his death.

Mr. Benton's most notable achievement in architecture is the Mission Inn, at Riverside, which is unique and world-famous. To this great enterprise he gave much study, as it was gradually building up through a period of 27 years. It is probably the most complete expression of the Mission type of architecture in all phases to be found in the United States. This and other work on these lines gained for Mr. Benton an enviable reputation, and he was regarded as the highest authority on the Mission type of architecture. However, he did not confine his efforts to this style, but approved himself a master planner in several others. He designed the New Arlington Hotel at Santa Barbara, the Y. M. C. A. and the Y. W. C. A. buildings at Los Angeles, the Clark Memorial Home for young women, the building for the Mission Play at San Gabriel, restorations of old missions at San Diego, San Juan Capistrano and San Luis Obispo, many dwellings, schools, churches, hospitals, etc.

Altogether, Mr. Benton led a busy and a useful life, making a strong impress upon the culture of his time, and leaving monuments to attest his worth to coming generations. He was not only an architect with artistic and romantic gifts, but he was a poet as well. He wrote a poem setting forth the traditions back of the Mission Inn, published in an illuminated de luxe edition, illustrated by Mr. Sharpe, his artistic assistant, which is probably the most beautiful book ever issued in California.

Mr. Benton was married in Morris County, Kansas, in 1883, to Phillipina Harriet Schilling-Von Constatt. His wife and one daughter, Edith May Benton, survive him.

W. A. SPALDING.

Arthur Burnett Benton

TRANSACTIONS OF THE ACADEMY

Academy Meeting

Regular meeting of Academy was held in the Auditorium of the Los Angeles Public Library June 7th, 1927. The speaker of the evening was Mr. H. K. Sergent, who delivered an extremely interesting and instructive address on "Worlds Around Us." It was illustrated by numerous slides from the latest photographs made with the telescope on Mt. Wilson, as well as pictures by the lecturer, and simply depicted Mans' relations to the distant orbs of the Universe in which we live.

Annual Meeting

The annual meeting was held in the banquet hall of the Artland Club on June 29th, 1927. At the close of the dinner reports of the President, Secretary and Treasurer were heard. Motion carried to reinstate present Board of Directors for following year. The meeting adjourned to the Music Room where an illustrated lecture was given by Mr. B. R. Baumgardt, F.R.A.S. The subject was "Joan of Arc; in the Footsteps of the Maid of France Through La Touraine and Along the Loire". It was the same lecture the speaker had recently given before the National Geographic Society in Washington, creating so much praise of the artistic merit of the pictures and talk. Members of the Academy not present missed one of the best lectures of the year.

Academy Meeting

On September 15th, 1927, regular meeting was held in Artland Club and Mr. C. Warren Temple, artist and world traveler, spoke of "Life Among the Arabs," gained from years of observation living with them as one of them. The talk was illustrated by pictures never before shown of the holy places of the East. The speaker wore the native costume of the Bedouins.

Academy Meeting

Mr. Keith Kennedy of Australia, well known musician and lecturer, delivered a most unusual talk to the Academy on "Music of Many Lands." From his great collection he demonstrated the development of modern instruments from primitive sound producers of ancient and barbaric peoples. The lecture was held September 26th, 1927, at the Artland Club Music Room.

Academy Meeting

Regular meeting was held with the Nature Club at the Public Library on November 1st, 1927. Our ex-President, Dr. F. C. Clark, gave an illustrated talk on "Our Relatives the Animals" in his usual instructive style. Specimens were shown from members' collections.

Academy Meeting

Meeting held in Artland Club, November 4th, 1927, was addressed by Prof. H. H. Nininger, A.M., on "Meteors and Meteorites," illustrated by specimens from his marvelous collection, one of the most complete private collections in existence. The talk gave the latest scientific thought on these masses from space.

Board Meeting

A regularly called meeting of Directors was held in the Artland Club, 1 p. m., November 21st, 1927. There were present Mrs. S. J. Keese, chairman; Dr. J. A. Comstock, Dr. F. A. Carpenter, Dr. R. H. Swift, Dr. M. F. Baumgardt, Dr. A. Davidson, Mr. W. A. Spalding and Mr. G. W. Parsons. Dr. Carpenter was authorized to investigate wheareabouts of plaque on memorial tree in Exposition Park.

Appointments of Committees

Publication Committee: Dr. Comstock, Dr. Davidson, Mr. Keese and Mr. Spalding.

Finance Committee: Mr. Parsons, Dr. Davidson and Mr. Keese.

Program Committee: Dr. Swift, Dr. Comstock and Dr. Baumgardt.

Appointments of Sections and Officers

Astronomical Section: Dr. M. F. Baumgardt, chairman; W. A. Spalding, secretary.

Botanical Section: Dr. A. Davidson, chairman; T. Payne, secretary.

Geology Section: G. W. Parsons, chairman.

Meteorology and Aeronautic Section: Dr. F. A. Carpenter, chairman.

Zoology Section: J. Z. Gilbert, chairman.

Mr. Spaulding authorized to write memorial for bulletin for the late A. B. Benton.

Board adjourned, 2 p. m.

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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501 EDWARDS-WILDEY BLDG.,

Los, Angeles, Cal., U. S. A.

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.

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
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"	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

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
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Bulletin, Southern California Academy of Sciences

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Bold type indicates new species or varieties.

BULLETIN OF THE

Southern California Academy *of* Sciences

LOS ANGELES, CALIFORNIA

Vol. XXVII January-April, 1928 Part 1

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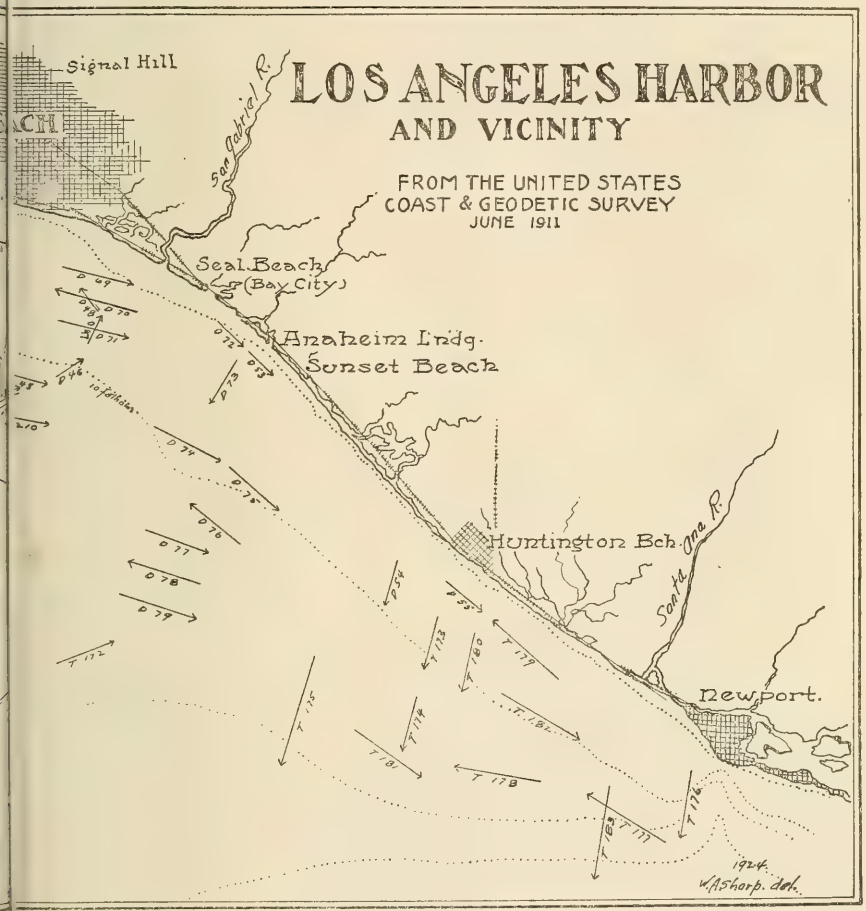

PEDRO BAY REGION

Sciences. Vol. XXVII. January, 1928.

A LIST OF THE MARINE FISHES (TELEOSTEI) OF SOUTHERN CALIFORNIA WITH THEIR DISTRIBUTION

By

ALBERT B. ULREY,
PROFESSOR OF ZOOLOGY
University of Southern California

and

PAUL O. GREELEY,
INSTRUCTOR IN ZOOLOGY
University of Southern California

Contributions from the Marine Biological Station
of the
University of Southern California

THE MARINE FISHES (*TELEOSTEI*) OF SOUTHERN CALIFORNIA

The following list of the fishes (Teleostei) of Southern California includes those taken between the Mexican boundary on the South and Point Conception on the North, including the region off the Channel Islands.

We have included the species reported by the authorities quoted and those taken during the explorations made with the Marine Station launch, the Anton Dohrn.

Our chief purpose has been to facilitate the study of the fishes of this region, thereby stimulating an interest in their study. To this end the key to the families of fishes found in Southern California waters has been published in the Bulletin of the Academy of Science, Southern California, March-April, 1924. Sufficient references are given with each species to enable the student readily to refer to the standard publications on these fishes. We have included in the Bibliography appended a fairly complete list of the more important publications relating to Southern California fishes.

The List does not include a series of forms taken near the arbitrary boundary line we have set. A considerable number of these border line species will doubtless be taken in the near future. These will be included in a subsequent list.

Concerning the distribution of the species listed we have given the general distribution reported by the authors quoted, and in the case of forms in our collections (indicated by the asterisk*) we have given somewhat in detail the locality from which the species was taken.

In the maps the hauls made with the trawl are indicated by the letter "T," each being followed by a serial number, and those made with the dredge by the letter "D" followed by a serial number.

We are indebted to a group of friends for valuable aid in the preparation of the List and Bibliography. In our previous paper we have mentioned the contribution of Frank W. Yocom and of Henry W. Fowler of the Academy of Sciences of Philadelphia. To these should be added, (1) Chancellor Emeritus David Starr Jordan, who generously gave us his helpful counsel and permission to use some data in manuscript form soon to be published by the U. S. Bureau of Fisheries—a Check List of the Fishes of North and Middle America; (2) Will F. Thompson in charge of the California Fisheries Laboratory at San Pedro, California, who aided materially in completing the list and bibliography as well as placing at our disposal the efficient library of the fisheries laboratory. (3) Dr. Carl L. Hubbs, of the Museum of the University of Michigan, who has made an extensive study of Southern California fishes, kindly gave us the benefit of his intimate knowledge of this group.

The authors believe that the best interests of the student will be served by an alphabetical arrangement of the list and by placing in footnotes certain data not yet readily available to other than the specialist.

Maps showing the dredging and trawling stations of the Anton Dohrn.

I The San Pedro Bay region.
II The Santa Monica Bay region.
III The Santa Catalina Island region.

THE MARINE FISHES (TELEOSTEI) OF SOUTHERN CALIFORNIA

I Acrotidae

1. **Acrotus willoughbyi** Bean
   (Cal. Fish and Game, July 1921, Vol. VII, no. 3, p. 179)
   San Pedro, March 31, 1921.
   (Jordan and Evermann, Vol. III, 1898, p. 2849, fig. 408)
   Port Townsend & Monterey.

II Agonidae (Sea Poachers)

2. **Asterotheca pentacantha** (Gilbert)
   (Gilbert, 1915, p. 343)
   San Diego, Catalina Island, San Nicholas Island, Monterey Bay; 75-497 fathoms.
   (Xeneretmus pentacanthus) (Gilbert)
   (Starks and Morris, 1907, p. 222)
   San Diego, off Oregon, and the Santa Barbara Islands, San Pedro, Bering Sea.
   (Xenochirus pentacanthus) (Gilbert)
   (Jordan and Evermann, 1898, II, p. 2080)
3. **Averruncus emmelane** Jordan and Starks
   (Gilbert, 1915, p. 343)
   Monterey Bay, 32-44 fathoms.
4. ***Averruncus sterietus** Gilbert
   (Jordan and Evermann, 1898, II, p. 2071, figs. 750-750a)
   Coast Southern California, Coronado Island.
   (Starks and Morris, 1907, p. 222)
   Near Coronado Islands in 45 fathoms.
   Local distribution:
   Catalina Island T127 49-53F.

5. ***Odontopyxis trispinosus** Lockington
(Jordan and Evermann, 1898, II, p. 2085)
Coast of California from Puget Sound to Santa Barbara.
Common in 11 to 57 fathoms.
(Starks and Morris, 1907, p. 223)
Point Loma and San Pedro.
Local distribution:

Breakwater	T216		8-13-14
El Segundo	T64	20F	8-12-14
Long Wharf (Santa Monica wharf destroyed)			11-1907
" "	T116		7-17-15
" "	T117		7-17-15
Newport	T110	21F	6-16-15
Santa Monica	T67	28F	8-13-14
" "	T121		7-24-15
Venice	T66	27F	8-13-14
"	T68	25F	8-13-14

6. **Xeneretmus latifrons** (Gilbert)
(Starks and Morris, 1907, p. 223)
Deep water off Oregon and San Diego, 50-204 fathoms.
(Xenochirus latifrons) (Gilbert)
(Jordan and Evermann, 1898, II, p. 2082)

7. **Xeneretmus leiops** Gilbert
(Gilbert, 1915, p. 348, plate 17, fig. 10)
Off Catalina Island; 178-195 fathoms.

8. **Xeneretmus ritteri** Gilbert
(Gilbert, 1915, p. 350, plate 17, fig. 11)
Near San Diego, 176-181 fathoms.

9. ***Xeneretmus triacanthus** (Gilbert)
(Gilbert, 1915, p. 352)
Off San Diego and Monterey Bay, 40-199 fathoms.
Local distribution:

Portuguese Bend	T46	30F	12-27-13

III Albulidae (Lady-fishes)

10. **Albula vulpes** (Linnaeus) Lady fish.
(Jordan and Evermann, 1896, I, p. 411, fig. 179)
North to San Diego.
(Starks and Morris, 1907, p. 176)
San Diego and Monterey Bay.

IV Alepocephalidae

11. **Alepocephalus tenebrosus** Gilbert
(Jordan and Evermann, 1896, I, p. 453)
Santa Barbara Channel, in 359 to 822 fathoms.
(Gilbert, 1915, p. 310)
Near San Diego, in 161 to 680 fathoms.

12. **Xenognathus profundorum** Gilbert
(New genus)
(Gilbert, 1915, p. 311, plate 14, fig. 2)
Southwest of Catalina in 1,350 to 2,182 fathoms.

V Anarrichadidae (Wolf-fishes)

13. ***Anarrhichthys ocellatus** (Ayres)[1] Wolf Eel.
(Jordan & Evermann 1898, III p. 2445)
Local distribution:

Venice	7-26-19

---

[1]Anarrhichthyidae, Jordan, 1923.

VI Anoplopomatidae (Skil-fishes)

14. *Anoplopoma fimbria (Pallas) Coal fish.
(Jordan and Evermann, 1898, II, p. 1862, fig. 675)
Monterey to Unalaska.
(Starks and Morris, 1907, p. 216)
Off Point Loma, Northward to Sitka, abundant in Puget Sound.
Local distribution:
Santa Catalina, Redondo Beach.
San Pedro, Calif. Fish & Game Comm.

VII Antennariidae

15. Antennarius avalonis Jordan and Starks
(Starks and Morris, 1907, p. 247)
Avalon, Santa Catalina Island.

VIII Argentinidae (The Smelts)

16. Argentina sialis Gilbert Smelt.
(Jordan and Evermann, 1896, I, p. 526)
Coast of California.
Local distribution:
Huntington Beach. Cal. Fish & Game Comm.

16a. Leuroglossus Stilbius Gilbert
(Gilbert, 1915, p. 312)
Off Santa Cruz Island.
(Jordan and Evermann, 1896, p. 527)
Coast of California in deep water.

IX Atherinidae (Silver sides)

17. *Atherinops affinis litoralis Hubbs Little "Smelt."
(Hubbs, Carl L., 1918b)
(Atherinops affinis (Ayres)
(Jordan and Evermann, 1896, I, p. 807, fig. 342)
Coast of California in Sandy bays with A. californiensis.
(Starks and Morris, 1907, p. 187)
Magdalena Bay to San Francisco.
Local distribution:

Venice			11-5-13
Venice Pier			8-12-14
Anaheim Landing			5-18-23
" "			1916
Catalina Island	T127	49-53F	3-30-16

18. Atherinops insularum Gilbert Catalina "Smelt."
(Jordan and Evermann, 1896, I, p. 807)
(Starks and Morris, 1907, p. 187)
Santa Barbara Group, Cerros Island and Guadalupe Island.

19. *Atherinopsis califoriensis Girard "California smelt."
(Jordan and Evermann, 1896, I, p. 806, fig. 341)
Cape Mendocino to San Diego.
(Starks and Morris, 1907 p. 186)
San Diego Bay northward to San Francisco.
Local distribution:

Venice	11-5-13
Venice Pier	5-16-12

20. *Leuresthes tenuis (Ayres) Grunion.
(Jordan and Evermann, 1896, I, p. 802)
(Starks and Morris, 1907, p. 186)
San Diego to San Francisco.
Local distribution:

Long Beach	6-15-19
Del Rey (taken while spawning)	8-3-19
Venice (taken from fisherman's bait)	7-30-19

X Aulorhynchidae

21. **Aulorhynchus flavidus** Gill
    (Jordan and Evermann, 1896, I, p. 754)
    San Nicolas Island, Monterey and Northward to Sitka, Alaska.
    (Starks and Morris, 1907, p. 183)

XI Balistidae (Trigger-fishes)

22. **Balistes polylepis** Steindachner
    (Jordan and Evermann, 1898, II, p. 1700)
    Lower California to Panama.
    (Starks and Morris, 1907, p. 204)
    Magdalena Bay, Lower California.
    Two specimens taken at Catalina Island.
    Local distribution:
    San Pedro Market, Calif. State fisheries laboratory, 1-13-22
    7-25-24

23. **Xanthichthys mento** (Jordan and Gilbert)
    (Jordan and Evermann, Vol. II, 1898, p. 1710)
    Rocky Islands off West Coast of Mexico, not common.
    (Hubbs, Amer. Mus. of Nat. Hist., 1918)
    Mainland shores of Ventura, Orange, Los Angeles and San Diego Co.

XII Bathymasteridae (Ronquils)

24. **Rathbunella hypoplecta** (Gilbert)
    (Jordan and Evermann, 1898, III, p. 2290)
    (Starks and Morris, 1907, p. 230)
    Off Santa Barbara Islands, 30 fathoms, one specimen.

XIII Batrachoididae (Toad Fish)

25. ***Porichthys notatus** Girard Singing Fish, (Cabezon) (Midshipman)
    (Jordan and Evermann, 1898, III, p. 2321)
    (Starks and Morris, 1907, p. 230)
    Abundant from Puget Sound to Gulf of California.
    In tide pools and under stones northward; under deep water southward.
    Local distribution:

Anaheim Landing			
Catalina Island	T127	50F	3-30-16
" "	T126	49F	3-30-16
" "	T161	30F	6-24-16
Del Rey	T64	25F	8-12-14
El Segundo	T35	5½F	8-2-13
" "	T64	20F	8-12-14
" "			8-14-17
Long Point	T49	25F	12-27-13
" "	T59	18F	6-22-14
" "	T204	18F	7-15-22
Long Beach	T212	8F	8-5-22
" "	T216	12F	8-12-22
Newport Bay	T83	In bay	11-27-14
" "	T82	" "	11-27-14
Point Fermin			6-17-16
Portuguese Bend			12-7-11
" "	T46	30F	12-27-13
Redondo	T169	28F	7-29-16
Santa Monica	D31	21F	8-1-14
" "	D34	23F	8-8-14
" "	T67	28F	8-13-14
" "	T121	18½F	7-24-15
Venice	T66	27F	8-13-14

XIV Belonidae (Esocidae) (Needle Fish)

26. *Strongylura exilis (Girard)
(Tylosurus exilis Girard) Needle fish.
(Jordan and Evermann, 1896, p. 714)
Point Conception southward to Cerros Island.
(Starks and Morris, 1907, p. 182)
Point Conception south to Guaymas, Mexico, Common.
Local distribution:
Venice

XV Berycidae (The Berycoids)

27. Melamphaes bispinosus Gilbert
(Gilbert, 1915, p. 325)
Off Coronado Islands, 624-666 fathoms.

28. Melamphaes cristiceps Gilbert[1]
(Gilbert, 1915, p. 324)
Monterey Bay and San Clemente, rare, 505 to 599 fathoms.

29. Melamphaes nycterinus Gilbert
(Gilbert, 1915, p. 326)
Off Santa Catalina Island, 2113 to 2259 fathoms.

XVI Blenniidae (Blennies)

30. Auchenopterus integripinnis (Rosa Smith)[2]
(Jordan and Evermann, 1898, III, p. 2372)
Coast of California and Southward to Todos Santos.
(Starks and Morris, 1907, p. 237)
San Pedro to San Cristobal, Lower California.

[2]Clinidae, Jordan ms. 1924

31. Chaenopsis alepidota (Gilbert)[3]
(Lucioblennius alepidotus) (Gilbert)
(Jordan and Evermann, 1898, III, p. 2404)
Gulf of California, Albatross, two specimens.
(Starks and Morris, 1907, p. 240)
Avalon, Santa Catalina Island.

32.* Cryptotrema corallinum Gilbert[4]
(Jordan and Evermann, 1898, III, p. 2366, fig. 817)
(Starks and Morris, 1907, p. 237)
Santa Barbara Islands, 30 fathoms.
(Gilbert 1915, p. 360)
Near San Nicolas Island, 32 to 33 fathoms.
Local distribution:

Catalina Island	T127	50F	3-30-16
Long Beach	T55	10F	3-14-14
Pt. Fermin	T12	25F	11-29-12
San Pedro	T51	20F	2-14-14

33. *Gibbonsia elegans (Cooper)[4] Spotted Kelp-fish.
(Jordan and Evermann, 1898, III, p. 2353)
Abundant in rock pools lined with Corallina from Point Conception to Todos Santos.
(Starks and Morris, 1907, p. 232)
San Diego, San Clemente Island, San Pedro, and Monterey Bay.
Local distribution:

Catalina Island	1914
Malibu	1-4-12
"	2-9-14

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[1]Melamphaeidae, Jordan, 1923
[2]Clinidae, Jordan, 1923
[3]Chaenopsidae, Jordan ms. 1924
[4]Clinidae, Jordan, 1923

34. **Gibbonsia evides** (Jordan and Gilbert) Senorita (Kelp-fish)
(Jordan and Evermann, 1898, III, p. 2352)
Coast of California South to Point Conception.
(Starks and Morris, 1907, p. 235)
Local distribution:

San Diego		10-29-10
Point Fermin		4-2-13

35. ***Heterostichus rostratus** Girard[1] Great Kelp-fish
(Jordan and Evermann, 1898, III, p. 2351)
San Francisco to San Diego.
(Starks and Morris, 1907, p. 232)
Abundant from San Francisco to Guadalupe Island.
Local distribution:

Anaheim Landing		7-13-15
Alamitos Bay		2-19-11
Catalina Island	T102	4-1-15
Del Rey	T34	8-2-13
Long Beach	T200	12-6-19
Malibu		2-9-14
Portuguese Bend		7-14-14
Venice Breakwater		3-1-13

36. ***Hypsoblennius gentilis** (Girard)
(Jordan and Evermann, 1898, III, p. 2387)
Monterey to Cape San Lucas.
(Starks and Morris, 1907, p. 238)
Monterey to Guaymas, Mexico. Common at San Diego and San Pedro in the open bays.
Local distribution:

El Segundo	8-4-17
Newport	12-16-14
Point Fermin	3-20-17
Santa Monica	7-18-14
Venice	2-14-11

37. ***Hypsoblennius gilberti** (Jordan)
(Jordan and Evermann, 1898, III, p. 2386)
Point Conception to Todos Santos or beyond.
(Starks and Morris, 1907, p. 238)
Santa Barbara to Todos Santos Bay.
Local distribution:

Malibu	1-4-12
"	2-9-14

38. ***Neoclinus blanchardi** Girard[1]
(Jordan and Evermann, 1898, III, p. 2354)
Monterey to Santa Barbara, not rare.
Local distribution:

Santa Monica	1-31-14

39. **Plectobranchus evides** Gilbert[2]
(Jordan and Evermann, 1899, p. 2432) III
Coast of Oregon, 46 fathoms.
(Gilbert 1915, p. 259)
San Diego, Monterey Bay.

40. **Poroclinus rothrocki** Bean[3]
(Jordan and Evermann, 1898, III, p. 2432)
Unalaska
(Starks and Morris, 1907, p. 240)
Off San Diego.

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[1]Clinidae, Jordan, 1923
[2]Pholidae, Jordan ms. 1924
[3]Lumpenidae, Jordan ms. 1924

41. *Pterognathus satiricus (Girard)[3]
(Neoclinus satiricus Girard)
Jordan and Evermann, 1898, III, p. 2355, fig. 816)
Monterey to Santa Barbara, rare.
(Starks and Morris, 1907, p. 237)
Northward to Monterey.
Local distribution:

Catalina Island	T127	50F	3-30-16
Newport			11-28-14

42. *Starksia holderi Jordan and Starks[1]
(S. Cremnobates (Gilbert)
(Starks and Morris, 1907, p. 237)
A type from Avalon is the only specimen known.
Local distribution:
Avalon Bay 8-20-13

43. Ulvicola sanctae-rosae Gilbert and Starks[2]
(Jordan and Evermann, 1898, III, p. 2413)
Albatross Collection Santa Rosa Island 1889, rare.
(Starks and Morris, 1907, p. 239)
Santa Rosa Island

44. *Xererpes fucorum (Jordan and Gilbert)
(Jordan and Evermann, III, p. 2413)
Monterey to Puget Sound, abundant in rock pools.
(Starks and Morris, 1907, p. 239)
Northward to Puget Sound, Coronado Islands.
Local distribution:
Catalina Island 6-19-13
" " 11-27-13

XVII Bramidae (Pomfrets)

45. Brama raii (Bloch) Pomfret
(Jordan and Evermann, 1896, I, p. 959)
Santa Catalina Island to Puget Sound.
(Starks and Morris, 1907, p. 193)
Southern California Coast north to Vancouver Island.
Local distribution:
San Pedro, Calif. Fish & Game Comm.

XVIII Brotulidae (Brotuloid Fishes)

46. Brosmophycis marginatus (Ayres)
(Calif. Fish and Game Com.)

47. *Cataetyx rubrirostris Gilbert
(Gilbert, 1915, p. 369)
Off San Diego, 161 to 510 fathoms.
(Jordan and Evermann, 1898, III, p. 2498)
Off Coast of California.
Local distribution:

Newport	T110	21F	6-16-15

XIX Carangidae (The Pampanos)

48. Caranx caballus (Gunther)
(Starks and Morris, 1907, p. 192)
San Diego to Panama.
(Jordan and Evermann, 1896, I, p. 921)
Pacific Coast of Tropical America, North to San Diego.
Very common from Guaymas southward.

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[1]Clinidae, Jordan ms. 1924
[2]Pholidae, Jordan ms. 1924
[3]Clinidae, Jordan, 1923

49. *Naucrates ductor Linnaeus Pilot-fish (Romero)
(Jordan and Evermann, 1896, I, p. 900)
Point Conception to Mazatlan; abundant in summer about Santa Barbara Islands.
Local distribution:
Catalina Island

50. *Seriola dorsalis (Gill) Yellow Tail
(Starks and Morris, 1907, p. 192)
Abundant on Southern California Coast.
(Jordan and Evermann, 1896, I, p. 902, fig. 380)
Point Conception to Mazatlan; abundant in summer about Santa Barbara Islands.
Local distribution:
Catalina Island

51. *Trachurus symetricus (Ayres) Horse "mackerel"
(Trachurus picturatus (Bowdich)
(Jordan and Evermann, 1896, I, p. 909)
Coast of California, San Francisco south to Galapagos Islands. Abundant in summer in San Francisco.
(Starks and Morris, 1907, p. 192)
Monterey to San Diego.
Local distribution:
Venice 5-16-12

XX Ceratiidae (Sea Devils)

52. Monoceratias acanthias Gilbert
(Gilbert, 1915, p. 379)
Off Santa Cruz Island, 764 to 891 fathoms.
(Jordan and Evermann, III, p. 2727)

XXI Chauliodontidae (Viper Fishes)

53. Chauliodus Macouni Bean
(Gilbert, 1915, p. 321)
Off Santa Catalina Island, San Clemente Island, Monterey Bay, 645 to 2259 fathoms.
(Jordan and Evermann, 1896, I, p. 585)
Coast of California to British Columbia, about 4 specimens known, 876 fathoms.

XXII Clupeidae (Herrings)

54. Alosa sapidissima (Wilson) Shad.
(Jordan and Evermann, 1896, I, p. 427)
Atlantic Coast of the United States from Mirima to Alabama. Introduced on Pacific Coast; abundant from Monterey northward.
Local distribution:
Seal Beach, California Fish & Game
(July, 1919, p. 158 vol. V. no. 3) as far south as San Diego.

55. Clupea pallasii (Cuvier and Valenciennes) (Shad) Pacific Herring.
(Jordan and Evermann, 1896, I, p. 422, fig. 186)
Kamchatka to San Diego.
(Starks and Morris, 1907, p. 176)
Behring Sea to San Diego, Spawning in San Diego Bay in January.

56. Etrumeus micropus Schlegel[1] Japanese Herring
(Perkinsia othonops)
(Jordan and Evermann, 1896, I, p. 420)
Point Loma, San Diego, one specimen known.
(Starks and Morris, 1907 p. 176)
One specimen in America, not uncommon in Japanese waters.

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[1]Dussumieriidae, Jordan, 1923

57. *Sardinia coeruleus (Girard) California sardine (Pilchard)
(Clupanodon caeruleus)
(Sardinella caeruleus)
(Jordan and Evermann, 1896, I, p. 423)
Puget Sousd to Magdalena Bay, abundant California Coast.
Spawns in sea. An excellent food fish.
(Starks and Morris, 1907, p. 176)
Puget Sound to Cerros Island. 19 instead of 14 dorsal rays.
Local distribution:
Venice 7-31-14

XXIII Coryphaenidae ("Dolphins")

58. Coryphaena hippurus Linnaeus "Dolphin"
(Jordan and Evermann, I, 1906, p. 952)
(Holder, 1912, p. 97)
Channel Islands, spring to October.

XXIV Cottidae (The Sculpins)

59. Astrolytes notospilotus (Girard)[1]
(Starks and Morris, 1907, p. 219)
Abundant off Santa Barbara, North to Puget Sound.
(Jordan and Evermann, 1898, II, p. 1899, fig. 689)
Cape Mendocino southward; abundant off Santa Barbara.

60. Montereya recaiva Greeley
(Hubbs, C. L., 1926)
San Francisco Peninsula to Point Conception. Farther south it has not been taken along the mainland, but is known from Los Coronados Islands, near the coast just south of the international boundary.
(Blennicottus recalvus, Greeley)
(Jordan and Evermann, 1900, IV, p. 3178)
San Diego to Santa Cruz, in the deep shaded tide pools near low water mark.
(Starks and Morris, 1907, p. 222)
Northward to Santa Cruz; abundant in Monterey Bay.

61. Calycilepidotus spinosus Ayres[1]
(Jordan and Evermann, 1898, II, p. 1937)
Coast of California, in rather deep water, not common.
(Starks and Morris, 1907, p. 219)
Monterey and San Francisco in rather deep water, Santa Barbara Islands.

62. *Chitonotus pugetensis (Steindachner)[1]
(Jordan and Evermann, 1898, II, p. 1890, fig. 687)
Puget Sound to San Francisco, in waters of moderate depth not rare.
(Starks and Morris, 1907, p. 218)
San Diego to Puget Sound.
Local distribution:

Catalina	Island	T43	Isthmus Cove	8-19-13
"	"	T17	Catalina Harbor	12-30-12
"	"	T126	49F	3-30-16
"	"	T127	50F	3-30-16
"	"	T130	30F	6-14-16
"	"	T135	30F	6-15-16

[1]Icelidae, Jordan, 1923

Catalina Island	T137	40F	6-15-16
" "	T148	30F	6-21-16
" "	T154	20F	6-23-16
" "	T156	30F	6-23-16
El Segundo	T64	20F	8-12-14
Huntington Beach	T175	21F	4-5-17
Long Point	T49	25F	12-27-13
Manhattan	T63	16F	8-12-14
Newport	T89	27F	3-20-15
"	T109	23F	6-16-15
"	T110	21F	6-16-15
"	T111	23F	6-16-15
"	T112	18F	6-16-15
"	T113	17½F	6-16-15
Playa del Ray	T65	30F	8-12-14
Portuguese Bend	T48	30F	12-27-13
Redondo	T169	28F	7-29-16
Santa Cruz	T192	25F	8-30-17
Santa Monica	T67	28F	8-13-14
San Pedro	T51	9F	3-14-14
" "	T171	26F	12-27-16
Venice	T68	25F	8-13-14
"	T66	27F	8-13-14
"	T28	28F	7-26-13
"	T33	22F	8-2-13

63. ***Clinocottus analis** (Girard)

(Jordan and Evermann, 1898, II, p. 2012)
Abundant in rock pools from Monterey to lower California.
(Starks and Morris, 1907, p. 220)
San Francisco to San Martin Island.
Local distribution:

Catalina Island		6-18-13
" "	Isthmus Cove	11-27-13
" "	" "	3-29-15
" "		3-30-15
Coronado Island		12-1-11
Malibu Cove		1-4-12
" "		2-9-14
Point Fermin		4-2-13
Portuguese Bend		10-29-10
" "		6-26-14
San Pedro		7-27-02
" "		4-1-13

64. **Clinocottus analis analis** Girard

(Hubbs, C. L., 1926)
Fort Bragg southward to Santa Cruz Island and to the mouth of the Ventura River, within the tidal zone, and southward to San Diego in the sublittoral zone.

65. ***Clinocottus analis australis** Hubbs

(Hubbs, C. L., 1926)
Pt. Loma, San Diego

66. **Dialarchus snyderi** Greeley

(Jordan and Evermann, 1900, IV, p. 3181)
San Francisco to Monterey.
(Hubbs, C. L., 1926)
Ucluele, British Columbia, to Pt. Loma, San Diego Co.

67. **Enophrys bison** (Girard)[1] Stone sculpins
(Jordan and Evermann, 1898, II, p. 1938)
San Francisco to Sitka, very abundant, especially at Puget Sound.
(Starks and Morris, 1907, p. 220)
Point Conception to Sitka, Alaska.

68. **Greeleya rugellio** (Greeley)
(Obligocottus rubellio (Greeley)
(Eximia rubellio)
(Jordan and Evermann, 1900, IV, p. 3182)
Monterey Bay only.
(Starks and Morris, 1907, p. 221)
Tide pools on ocean side of Point Loma.
(Hubbs, C. L., 1926)
Fort Bragg, Mendocino County, to Point Loma, San Diego Co.

69. **Icelinus fimbriatus** Gilbert[1]
(Jordan and Evermann, 1898, II, p. 1894)
Off Southern California in rather deep water.
(Starks and Morris, 1907, p. 218)
Deep water off Santa Barbara Islands.

70. **Icelinus fuscescens** Gilbert[1]
(Gilbert, 1915, p. 340)
Off Santa Barbara Island, 260 to 310 fathoms.

71. ***Icelinus quadriseriatus** (Lockington)[1]
(Jordan and Evermann, 1898, II, p. 1897)
Coast of California, Point Reyes and Golden Gate.
(Starks and Morris, 1907, p. 219)
Abundant off Point Loma and near San Pedro, in waters of moderate depth north of San Francisco.
Local distribution:

Catalina Island			12-30-12
" "	T20	Isthmus Cove	1-1-13
" "	T43	" "	8-19-13
" "			11-27-13
" "	T96	30F	3-31-15
" "	T127	50F	3-30-16
" "	T126	49F	3-30-16
" "	T128	58F	4-1-16
" "	T154	28F	6-23-16
" "	T159	40F	6-23-16
El Segundo	T64	22F	8-12-14
Hermosa Beach	T62	14F	8-12-14
Huntington Beach	T174	15F	4-5-17
" "	T175	21F	4-5-17
Long Point	T204	20F	7-15-22
Manhattan	T63	16F	8-12-14
Newport	T89	27F	3-20-15
"	T110	21F	6-16-15
"	T109	23F	6-16-15
"	T111	23F	6-16-15
"	T178	15F	4-6-17
"	T183	14F	4-7-17
Playa del Rey	T65	25F	8-12-14
Point Fermin	D49	9F	11-18-22
" "	T12	25F	11-29-12
Portuguese Bend	T46	30F	12-27-13
" "	T47	30F	12-27-13
Redondo	T169	28F	7-29-16

[1]Icelidae, Jordan, 1923

Santa Monica			1907
" "	T11	5F	7-9-12
" "	OT38	50F	8-7-13
" "	OT37	50F	8-7-13
" "	D37	22F	8-11-14
" "	T67	28F	8-13-14
" "	T119	10F	7-17-15
" "	T116	15F	7-17-15
" "	T120	8F	7-24-15
" "	T121	15F	7-24-15
" "	T122	28F	7-24-15
" "	T123	28F	7-24-15
San Pedro	D3	23F	11-30-12
" "	T218	20F	10-14-22
Venice	T33	22F	8-2-13
"	T28	30F	7-26-13
"	T31		7-29-13
"	T66	27F	8-13-14
"	T68	25F	8-13-14
"	T66	27F	8-13-14
"	T167	28F	7-22-16
"	T186	40F	7-28-17

72. **Icelus australis** Eigenmann and Eigenmann[1]
(Jordan and Evermann, 1898, II, p. 1918)
(Starks and Morris, 1907, p. 219)
Known from two specimens from stomach of sebastodes miniatus.
Taken at Cortez banks.

73. ***Leiccottus hirundo** Girard
(Jordan and Evermann, 1898, p. 2011, fig. 732)
Santa Barbara Islands in shallow water, not rare.
(Starks and Morris, 1907, p. 220)
Off Santa Barbara Islands, abundant.

74. ***Leptocottus armatus australis** Hubbs Smooth Cabezon
(Hubbs, 1921)
(Jordan and Evermann, 1898, II, p. 2012, fig. 733)
Kadiak to San Diego, very common.
(Starks and Morris, 1907, p. 220)
Very abundant in San Diego bay, most abundant in shallow water.
Local distribution:

Anaheim Landing	1916
Venice	2-26-14

75. **Parartedius hankinsoni** Hubbs
(Hubbs, C. L., 1926)
Point Loma, California, on the ocean side, tide-pool.

76. **Paricelinus hopliticus** Eigenmann and Eigenmann
(Jordan and Evermann, 1898, II, p. 1886)
Cortez Banks off San Diego, from stomach of Sebastodes lebis.
(Starks and Morris, 1907, p. 217)
Gilbert reports specimen (partly digested) from off Oregon, 48 fathoms.

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[1]Icelidae, Jordan, 1923

77. **Radulinus asprellus** Gilbert[1]
(Gilbert, 1915, p. 341)
Catalina, Santa Barbara, San Nicholas, Monterey Bay, 65 to 310 fathoms.
(Jordan and Evermann, 1898, II. p. 1920)
Coast of Oregon and Washington, in Puget Sound.

78. **Radulinus boleoides** Gilbert[1]
(Jordan and Evermann, 1898, II, p. 1919)
Off Santa Catalina Island, 59 fathoms.
(Starks and Morris, 1907, p. 219)

79. **Ruscariops creaseri** Hubbs
(Hubbs, C. L., 1926)
Bird Rock, San Diego Co., and low pools on White's Point, Los Angeles Co.

80. **Rusulus saburrae** Starks and Mann
(Starks and Mann, 1911)
(Indentified as young of Clinocottus analis analis, Hubbs, 1926.
San Diego Bay, 10F.

81. ***Scorpaenichthys marmoratus** (Ayres)[2] Cabezon (Sculpin)
(Jordan and Evermann, 1898, II, p. 1889)
Puget Sound to San Diego, very abundant, largest of the cottidas.
(Starks and Morris, 1907, p. 217)
Not rare near San Diego, most abundant about Monterey.

82. **Tarandichthys cavifrons** (Gilbert)[3]
(Jordan and Evermann, 1898, II, p. 1891)
Coast of Southern California, numerous species, 30 to 40 fathoms.
(Starks and Morris, 1907, p. 218)
One specimen from San Pedro, in deep water about Santa Barbara Islands.
Local distribution:

Point Vincente	T207	25F	7-22-22
Venice	T66	27F	8-13-14
"	T165	50F	7-15-16

83. **Tarandichthys filamentosus** (Gilbert) [1]
(Jordan and Evermann, 1898, II, p. 1892)
Coast of Southern California, 145 and 155 fathoms.
(Starks and Morris, 1907, p. 218)
Coast of Southern California in rather deep water.

84. **Tarandichthys tenuis** (Gilbert)[1]
(Jordan and Evermann, 1898, II, p. 1893)
Coast of Southern California in rather deep water.
(Starks and Morris, 1907, p. 218)
Several specimens from San Pedro, species known only from Santa Barbara Islands, rather deep water.

85. **Zesticelus profundorum** (Gilbert)
(Gilbert, 1915, p. 342)
Off San Diego and Monterey Bay, 49 to 155 fathoms.
(Jordan and Evermann, 1898, II, p. 1990, fig. 727)
Bering Sea in rather deep water, 399 and 664 fathoms, Unalaska.

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[1]Icelidae, Jordan, 1923
[2]Scorpaenidae, Jordan, 1923
[3]Icelidae, Jordan, 1923

XXV Diodontidae (Porcupine Fishes)

86. **Chilomycterus affinis** Gunther
(Chilomycterus californiensis)
(Jordan and Evermann, 1898, II, p. 1751)
San Pedro, California.
(Starks and Morris, 1907, p. 205)
Japan, Hawaii, and Galapagos Islands, one specimen by Eigenmann.

87. **Diodon hystrix** Linnaeus
(Jordan and Evermann, Vol. II, 1898, p. 1745)
Tropical Seas, Lower California, Florida, and Hawaiian Islands.
(Eigenmann and Eigenmann, 1892)
San Diego

XXVI Echenedidae (Remoras)

88. **Echeneis naucrates** Linnaeus
(Jordan and Evermann, 1898, III, p. 2269)
Warm seas occasionally to San Francisco.

89. **Remora remora** (Linnaeus) Remora
(Echeneis remora Linnaeus)
(Jordan and Evermann, 1898, III, p. 2271)
Warm seas, north to San Francisco, not rare, usually found attached to large sharks.
(Starks and Morris, 1907, p. 230)
Common at San Diego in summer, cosmopolitan distribution.

XXVII Embiotocidae (Surf Fishes)

90. ***Amphistichus argenteus** Agassiz Silver Perch
(Jordan and Evermann, 1898, II, p. 1503)
Cape Flattery to San Diego, very abundant on sandy shores.
(Starks and Morris, 1907, p. 201)
Local distribution:

Anaheim Inlet			7-13-15
Santa Monica	T67	28F	8-13-14
Venice			7-16-14

91. **Amphigonopterus aurora** (Jordan & Gilbert)
(Hubbs, Carl L., 1921)
(Abeona aurora, Jordan & Gilbert)
(Jordan and Evermann, 1898, p. 1497)
Monterey Bay, abundant in rock pools. Feeds upon Ulva.

92. **Brachyistius frenatus** Gill
(Jordan and Evermann, 1898, II, p. 1499, fig. 580)
Vancouver Island to Guadalupe, common.
(Starks and Morris, 1907, p. 200)
Apparently rare on Southern California Coast.

93. ***Cymatogaster aggregatus** Gibbons Viviparous perch.
(Jordan and Evermann, 1898, II, p. 1498, figs. 579-579a)
Alaska to Todos Santos Bay, exceedingly abundant in sandy and muddy shallows, and about wharves.
(Starks and Morris, 1907, p. 200)
South of Puget Sound, very abundant, northern most species of the family.
Local distribution:

Anaheim Landing		In bay	
San Pedro		So. Pacific slip	10-6-14
" "	T216	15F	8-12-22

94. *Damalichthys argyrosomus (Girard) White perch.
(Jordan and Evermann, 1898, II, p. 1509, fig. 586)
Vancouver Island to San Diego, everywhere common.
(Starks and Morris, 1907, p. 203)
Local distribution:

San Pedro	T211	8F	8-5-22
Venice			5-16-12

95. *Embiotoca jacksoni Agassiz Black perch.
(Jordan and Evermann, 1898, II, p. 1504)
Vancouver Island to Todos Santos Bay, not abundant.
(Starks and Morris, 1907, p. 201)
The young probably born in January.
Local distribution:

Playa del Rey	OT34	4F	8-2-13
Venice			8-20-14

96. *Holconotus rhodoterus Agassiz
(Jordan and Evermann, 1898, II, p. 1502)
(Starks and Morris, 1907, p. 201)
San Francisco to San Diego, rather rare.
Local distribution:

Anaheim Landing	1916

97. *Hyperprosopon agassizii Gill
(Jordan and Evermann, 1898, II, p. 1502)
(Starks and Morris, 1907, p. 201)
San Francisco to Santa Barbara, not generally abundant.

98. *Hyperprosopon argenteus Gibbons Wall-eyed Perch.
(Jordan and Evermann, 1898, II, p. 1501)
(Starks and Morris, 1907, p. 200)
Astoria, Oregon, to San Diego, on sandy shores in the surf. Everywhere common.
Local distribution:

Santa Cruz Island	Smuggler's Cove	10-14-14
Venice		3-30-13

99. Hypocritichthys analis (A. Agazziz)
(Jordan and Evermann, 1898, II, p. 1500, fig. 582)
San Francisco to Point Conception, rare, abundant at Santa Cruz.
(Gilbert 1915, p. 328)
Monterey, 25 to 85 fathoms.

100. *Hypsurus caryi (Agassiz) Bugara.
(Jordan and Evermann, 1898, II, p. 1508, fig. 585)
Cape Mendocino to San Diego, common northward.
(Starks and Morris, 1907, p. 202)
Local distribution:

Venice	12-27-13
"	12-25-15

101. *Micrometrus minimus (Gibbons)
(Abeona minima) (Gibbons)
(Jordan and Evermann, 1898, II, p. 1497)
San Francisco to San Diego.
(Starks and Morris, 1907, p. 200)
It has also been taken from San Nicholas, Santa Cruz and San Martin Islands.
(Hubbs, Carl L., 1918, p. 13)
Local distribution:

Catalina Island	T43	Isthmus Harbor	8-19-13
Venice			8-1-19
"			11-3-13

102. ***Phanerodon atripes** (Jordan and Gilbert)
(Jordan and Evermann, 1898, II, p. 1507)
(Starks and Morris, 1907, p. 202)
Monterey Bay to San Diego, abundant northward.
Local distribution:

Venice			7-27-14
San Pedro	Cal. Fish Game Com.		

103. ***Phanerodon furcatus** Girard White surf perch.
(Jordan and Evermann, 1898, II, p. 1506, fig. 583)
Vancouver Island to San Diego, abundant.
(Starks and Morris, 1907, p. 202)
Local distribution:

Anaheim Landing			7-13-15
" "			1916
Portuguese Bend	T46	30F	12-27-13
San Pedro	T217	11F	8-12-22
Venice			4-2-13

104. ***Rhacochilus toxotes** Agassiz Alfione.
(Jordan and Evermann, 1898, II, p. 1507, fig. 584)
San Francisco to San Diego, rather common.
(Starks and Morris, 1907, p. 202)
Local distribution:
Venice 8-20-14

105. ***Taeniotoca lateralis** (Agassiz) Blue Perch (Striped surf-fish)
(Jordan and Evermann, 1898, II, p. 1505)
(Starks and Morris, 1907, p. 202)
San Benito Island, Lower California, to Puget Sound. Rare southward.
Local distribution:
Venice 11-3-13

106. ***Zalembius rosaceus** (Jordan and Gilbert) Pink Perch.
(Jordan and Evermann, 1898, II, p. 1500, fig. 581)
(Starks and Morris, 1907, p. 200)
San Francisco to San Diego, not rare.
Local distribution:

Portuguese Bend	T46	30F	12-27-13
Santa Monica	T67	28F	8-13-14
White's Point	T45	30F	12-26-13

XXVIII Engraulidae (Anchovies)

107. ***Anchoviella compressa** (Girard)
(Stolephorus compressus)
(Jordan and Evermann, 1896, I, p. 447)
Point Conception to lower California, abundant about San Diego.
(Starks and Morris, 1907, p. 177)
Local distribution:
Anaheim Landing 7-13-15

108. **Anchoviella delicatissima** (Girard) Southern Anchovy.
(Stolephorus compressus)
(Jordan and Evermann, 1896, I, p. 444)
(Starks and Morris, 1907, p. 177)
Newport Bay and San Diego.

109. ***Engraulis mordax** Girard California anchovy (Northern Anchovy)
(Jordan and Evermann, 1896, I, p. 448)
Vancouver Island to lower California.
(Starks and Morris, 1907, p. 177)
Largest and most valuable as a food fish of our anchovies.
Local distribution:
Venice 7-31-14

XXIX Ephippidae (Spade-fishes)

110. **Chaetodipterus zonatus** (Girard) Angel fish.
(Jordan and Evermann, 1898, II, p. 1668)
(Starks and Morris, 1907, p. 204)
The type of this species from San Diego, abundant from Mazatlan to Guayaquil, Ecuador.

XXX Exocoetidae (Flying fishes)

111. **Cypsilurus californicus** (Cooper) The great flying fish. (Volador)
(Exocoetus Californicus, Jordan and Evermann)
(Jordan and Evermann, I, p. 740, fig. 319)
Santa Barbara and Coronado Island, largest of the flying fishes.
San Pedro, Santa Barbara and Coronado Islands.

112. **Exonautes rondelettii** (Cuvier and Valenciennes)
(Exocoetus rondeletii Cuvier and Valenciennes)
Tropical Seas, north to Florida.
France, and Acapulco; not uncommon in the West Indies and in Southern Europe.
Local distribution:
San Diego, California Fish and Game Comm., Vol. V., No. 2, April, 1919, p. 95.

XXXI Gadidae (Cod fishes)

113. **Physiculus nematopus** Gilbert
(Gilbert, 1890, p. 114)
Gulf of California and the western coast of lower California.
(Jordan and Evermann, 1898, III, p. 2548)
Coast of Southern California.

XXXII Gerridae (Mojarras)

114. **Eucinostomus californiensis** (Gill) Mojarra cantilena.
(Jordan and Evermann, 1898, II, p. 1369)
(Starks and Morris, 1907, p. 196)
One specimen taken at San Diego, known southward to Guayaquil, Ecuador.

XXXIII Gobiesocidae (Cling fishes)

115. ***Arbaciosa rhessodon** (Rosa Smith)
(Jordan and Evermann, 1898, III, p. 2340)
(Starks and Morris, 1907, p. 231)
Abundant in tide pools on oceanside of Point Loma, at La Jolla, and San Pedro, south to San Bartolome Bay.
Local distribution:

Catalina Island		Isthmus Harbor	11-27-13
" "			11-28-13
Redondo			11-6-11
San Pedro			11-29-12
" "	T51	20F	3-14-14

116. ***Gobiesox papillifer** Gilbert Cling Fish.
(Jordan and Evermann, 1898, III, p. 2330)
(Starks and Morris, 1907, p. 231)
San Pedro; Magdalena Bay.

117. **Rimicola eigenmanni** (Gilbert)
(Jordan and Evermann, 1898, III, p. 2339)
(Starks and Morris, 1907, p. 231)
Point Loma; San Cristobal Bay.

XXXIV Gobiidae (Gobies)

118. **Aprolepis barbarae** Hubbs
(Hubbs, 1921, No. 99)
Salt marsh, near Carpenteria, California.
(This is the young of Gillichthys mirabalis)

119. **Clevelandia ios** (Jordan and Gilbert)
(Clevelandia rosae)
(Jordan and Evermann, 1898, III, p. 2254)
(Starks and Morris, 1907, p. 229)
Vancouver Island to San Diego.
Local distribution:

Venice		Taken in lagoon	8-15-13

120. **Eucyclogobius newberryi** (Girard)
(Jordan and Evermann III, 1898, p. 2248)
Streams of California near sea.
(Hubbs, C. L., 1921, 1926)
Brackish water, Carpenteria.

121. ***Evermannia logipinnis** (Steindachner)
(Jordan and Evermann, 1898, III p. 2256)
Gulf of California.
Local distribution:

Newport		In bay	11-28-14
"	T84		11-27-14
"			12-15-14
Santa Monica	D38	25F	8-11-14

122. **Gillichthys mirabilis** Cooper Long-jawed goby.
(Jordan and Evermann, 1898, III, p. 2250)
(Starks and Morris, 1907, p. 225)
Puget Sound to Gulf of California, lives in burrows on the mud flats.
(Hubbs, C. L., 1926)
Series from San Diego Bay.

123. **Gobionellus sagittula** (Gunther)
(Gobius sagittula)
(Jordan and Evermann, 1898, III, p. 2228)
(Starks and Morris, 1907, p. 224)
San Diego Bay near Old Town, Gulf of California to Ecuador.

124. **Ilypnus gilberti** (Eigenmann and Eigenmann)
(Jordan and Evermann, 1898, III, p. 2253)
(Starks and Morris, 1907, p. 228)
San Pedro, south to the Gulf of California.

125. ***Lepidogobius lepidus** (Girard)
(Jordan and Evermann, 1898, IIIc, p. 2249)
Vancouver Island to Lower California. Used as food.
(Starks and Morris, 1907, p. 225)
Local distribution:

Santa Monica	T67	28F	8-13-14

125a. **Lethops connectens** Hubbs
(Hubbs, C. L., 1926b)
Tide pools of Carmel and White's Point.

126. ***Lythrypnus dalli** (Gilbert)
(Gobius dalli)
(Jordan and Evermann, 1898, III, p. 2230)
(Starks and Morris, 1907, p. 224)
Catalina Island, Catalina harbor, Gulf of California.
Local distribution:

Catalina Island	T99	30F	3-31-15
" "		Isthmus Harbor	1-22-13

127. **Quietula y-cauda** (Jenkins and Evermann)
(Jordan and Evermann, 1898, III, p. 2251)
(Starks and Morris, 1907, p. 227)
Vancouver Island to Guaymas, Mexico.

128. **Rhinogobiops nicholsii** Bean
(Hubbs, C. L., 1926)
Santa Barbara Channel and Newport.
(Rhinogobius nicholsii (Bean)
(Gobius)
(Jordan and Evermann, 1898, III, p. 2218)
(Starks and Morris, 1907, 223)
Three specimens from San Pedro, apparently common. Known from coast of British Columbia.
Local distribution:

Catalina Island	T127	50F	3-30-16
" "	T106	35F	4-1-15
" "	T105	30F	4-1-15
" "	T95	30F	3-30-15
" "	T42	Isthmus Harbor	8-19-13
" "	T19		12-30-12
Huntington Beach	T175	21F	4-5-17
Long Beach	T54	12F	3-14-14
Malibu	D31	21F	8-1-14
Newport	T109	23F	6-16-15
"	T110	21F	6-16-15
"	T113	17½F	6-16-15
"	T89		3-20-15
Point Fermin	T12	25F	11-29-12
Santa Cruz	T192	25F	8-30-17

129. ***Typhlogobius californiensis** Steindachner Blind goby (pinkfish)
(Jordan and Evermann, 1898, III, p. 2262, fig. 795)
(Starks and Morris, 1907, p. 229)
Point Firmin to Cerros Island.
Local distribution:

Point Firmin	2-22-13
" "	4-2-13

130. **Zonogobius zebra** (Gilbert)
(Gobius zebra)
(Jordan and Evermann, 1898, III, p. 2226)
(Starks and Morris, 1907, p. 223)
San Clemente Island, Todos Santos and Galapagos Island.
Local distribution:

Catalina Island	T127	53F	3-30-16
Newport	T110	21F	6-16-15

XXXV Haemulidae (The Grunters)

131. **Anisotremus davidsoni** (Steindachner)
(Jordan and Evermann, 1898, II, p. 1321)
Not rare at San Diego and the Santa Barbara Islands.
(Starks and Morris, 1907, p. 196)
San Pedro to San Bartolome Bay, Lower California.
Local distribution:

Venice	8-1-19

XXXVI Hemiramphidae (The Raldos)

132. **Hyporhamphus rosae** (Jordan and Gilbert)
(Jordan and Evermann, 1896, I, p. 721)
(Starks and Morris, 1907, p. 182)
Rather common in San Diego Bay, found southward to Guaymas, Mexico.

XXXVII Hexagrammidae (The Greenlings)

133. **Ophiodon elongatus** Girard[1] Blue "Cod" (Cultus "Cod")
(Gilbert, 1915, p. 337)
(Jordan and Evermann, II, p. 1875, fig. 682)
Sitka to Santa Barbara, very abundant, reaching a weight of 30 to 40 pounds, one of the most important food fish.

134. **Hexagrammos superciliosus** (Pallas) Red Rock "Trout"
(Jordan and Evermann, 1898, II, p. 1872, fig. 680)
Behring Island to Monterey; not rare; becoming more common northward; a very showy species, extremely variable in color; abundant in Unalaska.
Local distribution:
Single specimen taken at Catalina Island. Identified by Howard Hill, Los Angeles Museum.

XXXVIII Icosteidae (Ragfishes)

135. **Schedophilus heathii** Gilbert
(Gilbert, 1904, p. 260, pl. XXVI)
(Starks and Morris, 1907, p. 193)
One specimen 3½ inches in length taken at San Pedro.

XXXIX Idiacanthidas

136. **Idiacanthus antrostomus** (Gilbert)
(Gilbert, 1915, p. 323)
Off Santa Barbara Island, 131 to 638 fathoms.
(Jordan and Evermann, 1896, I, p. 605)
Off coast of Southern California, 603 fathoms.
Local distribution:
Catalina Island, California Fish & Game Commission.

XL Istiophoridae (Sail fishes)

137. **Tetrapterus mitsukurii** Jordan and Snyder Marlin spike (Spear fish)
(Jordan and Snyder, 1901, p. 304)
(Starks and Morris, 1907, p. 191)
Occasionally taken off Santa Catalina Island, one specimen twelve feet long on record at Avalon.

XLI Kyphosidae (Rudder fishes)

138. ***Girella nigricans** (Ayres)[2] Green fish (Spot "Perch")
(Jordan and Evermann, 1898, II, p. 1382)
(Starks and Morris, 1907, p. 197)
San Francisco to Guaymas, Mexico.
Local distribution:

Alamitos Bay		5-6-11
Catalina Island	Isthmus Cove	11-27-13
" "	" "	3-29-15
Rocky Point		2-9-14
Portuguese Bend		10-29-10
San Pedro		7-27-02

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[1]Ophiodontidae, Jordan, 1923
[2]Girellidae, Jordan, 1923

139. *Medialuna californiensis (Steindachner) Half Moon (Blue "Bass")
(Jordan and Evermann, 1898, II, p. 1391, fig. 560)
Point Conception southward to Cerros Island, common about rocky places.
(Starks and Morris, 1907, p. 197)
Local distribution:

Catalina Island	T42	Isthmus Cove	8-19-13

XLII Labridae (Wrasse-fishes)

140. *Halichoeres semicinctus (Ayres)[1] Kelp-fish (Senorita)
(Iridio semicinctus)
(Jordan and Evermann, 1898, II, p. 1592)
Santa Barbara Island to Cerros Island. Rather common in kelp off shore.
(Starks and Morris, 1907, p. 204)
Local distribution:

Catalina Island		Isthmus Cove	11-27-13
Venice			2-16-14

141. *Oxyjulis californica (Gunther)[1] Senorita
(Jordan and Evermann, 1898, II, p. 1601)
Monterey to Guadalupe Island, one specimen taken at Sausalito, San Francisco Bay.
(Starks and Morris, 1907, p. 204)
Local distribution:

Catalina Island		Avalon Bay	8-20-13
" "		Isthmus Cove	11-27-13
" "	T102	30F	4-1-15

142. *Pimelometopon pulcher (Ayres) (Fat-head) Sheepshead (Red Fish)
(Jordan and Evermann, 1898, II, p. 1585, fig. 598)
(Starks and Morris, 1907, p. 203)
Monterey to Guadalupe Island.
Local distribution:

Catalina Island		Isthmus Cove	11-27-13
" "	T104	30F	4-1-15

XLII Lampridae (Mariposas)

143. Lampris regia (Bonnaterre) Mariposa (Moon fish) (Opah)
(Lampris luna)
(Starks and Morris, 1907, p. 192)
Two skins at Avalon.
(Jordan and Evermann, 1896, I, p. 954)
Open waters of Pacific.

XLIV Lepidopidae

144. Lepidopus antusi Goode and Bean
(Jordan and Evermann, 1898, III, p. 2843 Genus I, p. 886)
(Starks and Morris, 1907, p. 191)
At Avalon and Cape San Lucus.

XLV Liparididae (Sea snails)

145. Careproctus melanurus Gilbert
(Jordan and Evermann, II, p. 2135)
In depths from 178 to 339 fathoms off the coast of California, and Oregon.
(Gilbert, 1915, p. 354)
Off San Diego, depth 169-496 fathoms.

146. Lipariscus nanus Gilbert
(Gilbert, 1915, p. 358, p. 19, fig. 15)
Monterey Bay, 285 to 357 fathoms.

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[1]Coridae, Jordan, 1923

147. **Nectoliparis pelagicus** Gilbert and Burke
(Gilbert, 1915, p. 358)
Coast of Southern California, throughout the Bearing Sea. A deep pelagic form. Off San Diego, off San Nicholas Island, Monterey Bay.

148. ***Neoliparis mucusus** (Ayres)
(Jordan and Evermann, 1898, II, p. 2111)
San Francisco, one specimen known.
Local distribution:

San Pedro	T220	16F	10-14-22

149. **Paraliparis cephalus** Gilbert
(Jordan and Evermann, 1898, III, p. 2141)
Alaska to California in deep water.
(Gilbert, 1915, p. 354)
Off San Diego, and north Coronado Island. Depth 161-518 fathoms.

XLVI Lophotidae

150. **Lophotes cepedianus** Giorna
(Jordan, 1923)
(Goode and Bean, 1895, p. 351, fig. 390)
(Calif. Fish & Game, Jan., 1920, Vol. VI, No. 1, p. 34, fig. 14)
Local distribution:

Long Beach	July 25, 1919

XLVII Lutianidae (Snappers)

151. **Xenistius californiensis** (Stenidachner)[1]
(Jordan and Evermann, 1898, II, p. 1286)
San Diego to Guaymas, Mexico. Rather common southward.
(Starks and Morris, 1907, p. 196)

XLVIII Luvaridae

152. **Luvarus imperialis** Rafinesque
(Jordan and Starks, 1906, p. 72)
(Starks and Morris, 1907, p. 192)
Off Catalina Island.

XLIX Lycodapodidae

153. **Lycodapus fierasfer** Gilbert
(Jordan and Evermann, 1898, III, p. 2493)
(Starks and Morris, 1907, p. 241)
Off Southern California and Washington in very deep water. One station in 27 fathoms.

L Macrorhamphosidae (Snipe fishes)

154. **Macrorhamphosus hawaiiensis** Gilbert Snipe fish.
(Gilbert, C. H., 1903, p. 613, fig. 237)
(Jordan, 1923, p. 176)
(Calif. Game & Fish, Jan., 1920, Vol. VI, No. 1, p. 32)
Local distribution:

Catalina Island	Calif. Fish & Game Comm.

LI Macrouridae (Crenadiers)

155. **Lionurus liolepis** Gilbert
(Jordan and Evermann, 1898, p. 2593)
Coast of Southern California. Many specimens taken in 603 fathoms. Albatross station 2980.

156. **Macrourus acrolepis** Bean
(Gilbert, 1915, p. 376)
San Diego, Catalina Island, San Clemente Island, Monterey Bay.
(Jordan and Evermann, 1898, III, p. 2585)

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[1]Xenichthyidae, Jordan, 1923

157. **Macrourus stelgidolepis** (Gilbert)
(Gilbert, 1915, p. 376)
San Diego to Monterey Bay, 518-1350 fathoms.
(Jordan and Evermann, 1898, III, p. 2585)

158. **Nematonurus abyssorum** Gilbert
(Gilbert, 1915, p. 374, pl. 21, fig. 23)
Off Santa Catalina Island, 1350-2182 fathoms. The only type known.

LII Malacanthidae (The Blanquillos)

159. ***Caulolatilus princeps** (Jenyns) Blanquillo (White-fish)
Rocky Islands off Pacific Coast, abundant.
(Jordan and Evermann, 1898, III, p. 2276)
(Starks and Morris, 1907, p. 230)
Abundant from Monterey to Cape San Lucas and from Galapagos Islands to coast of Peru.
Local distribution:
Venice 1919

LIII Merlucciidae (The Hakes)

160. **Merluccius productus** (Ayres) Hake
Pacific Coast of America, Santa Catalina Islands north to Puget Sound.
(Jordan and Evermann, 1898, III, p. 2531, fig. 884)
(Starks and Morris, 1907, p. 241)
Gulf of California to Puget Sound.

LIV Molidae (The Head-fishes)

161. **Mola mola** (Linnaeus) "Sun-fish" (Mola)
(Jordan and Evermann, 1898, II, p. 1753, fig. 651)
Largest specimen known taken at Redondo Beach, California, 1893.
(Starks and Morris, 1907, p. 205)
Found as far north as England, Cape Cod, and San Francisco.

LV Mugilidae (The Mullets)

162. **Mugil cephalus** Linnaeus Mullet
(Jordan and Evermann, 1896, I, p. 811, fig. 343)
Pacific Coast from Monterey to Chili.
(Starks and Morris, 1907, p. 187)
Not uncommon in San Diego Bay. Cosmopolitan in distribution.

LVI Muraenidae (The Morays)

163. ***Gymnothorax mordax** (Ayres) Conger eel of California.
(Lycodontis mordax)
(Jordan and Evermann, 1896, I, p. 395)
(Starks and Morris, 1907, p. 175)
Rock pools at La Jolla.
Local distribution:
Venice 1919

164. **Rabula aquae-dulcis** (Cope)
(Jordan and Evermann, 1896, I, p. 390)
Two specimens known, one from San Diego, one from Costa Rica.
(Starks and Morris, 1907, p. 175)

LVII Myctophidae (The Lantern fish)

165. **Diaphus theta** Eigenmann and Eigenmann
(Jordan and Evermann, 1896, I, p. 564)
Point Loma, near San Diego to Oregon in deep water.
(Starks and Morris, 1907, p. 179)
From coast of Washington to San Diego (type locality) deep water.

166. **Lampanyctus regalis** (Gilbert)
(Gilbert, 1915, p. 316)
Off San Diego, Santa Catalina Island, Santa Barbara Island, Monterey, 161-891 fathoms.

167. **Lampanyctus ritteri** Gilbert
(Gilbert, 1915, p. 318 pl. 15, fig. 3)
Off San Clemente Island. Monterey Bay, 350-599 fathoms.

168. **Macrostoma angustidens** Risso Prick fish; Maire d'Amplora
(Jordan and Evermann, 1896, I, p. 555)
(Starks and Morris, 1907, p. 178)
Known only from Cortex Banks.

169. **Myctophum affine** (Lütken)
(Gilbert, 1915, p. 312)
Santa Catalina Island only specimen taken from this coast.
(Jordan and Evermann, 1896, I, p. 570)

170. **Myctophum californiense** Eigenmann and Eigenmann
(Jordan and Evermann, 1896, I, p. 572)
Cortez Banks, near San Diego.
(Starks and Morris, 1907, p. 179)

171. **Nannobrachium leucopsarum** (Eigenmann and Eigenmann)
(Jordan and Evermann, 1896, I, p. 562)
Alaska to San Diego in rather deep water, not rare.
(Starks and Morris, 1907 p. 179)

172. **Nyctimaster townsendi** (Eigenmann and Eigenmann)
(Jordan and Evermann, 1896, I, p. 558)
Cortez Banks, near San Diego, 45 fathoms.
(Starks and Morris, 1907, p. 179)

173. **Tarletonbeania crenularis** (Jordan and Gilbert)
(Jordan and Evermann, 1896, I, p. 575)
Santa Barbara Channel, Coast of Washington, only two small specimens known.
(Starks and Morris, 1907, p. 179)

174. **Tarletonbeania tenua** Eigenmann and Eigenmann
(Jordan and Evermann, I, p. 575, fig. 575)
Coronado Islands, near San Diego. One specimen from stomach of Sebastodes.
(Starks and Morris, 1907, p. 179)

LVIII Nettastomatidae (The Sorcerers)

175. **Chlopsis gilberti** Garman
(Gilbert, 1915, p. 309)
Four specimens taken near San Diego, 191-292 fathoms.

176. **Venefica tentaculata** Garman
(Gilbert, 1915, p. 309)
Single specimen off San Diego, 639-671 fathoms.

LIX Ophichthyidae (Snake Eels)

177. ***Ophichthys triserialis** (Kaup) Snake Eel.
(Jordan and Evermann, 1896, I, p. 384)
(C. L. Hubbs, 1916)
Common west Coast of Mexico, also recorded from La Jolla, San Pedro and Tomales Bay.
Local distribution:

San Pedro	4-25-19
Venice	7-26-19

178. **Ophichthys zophochir** Jordan and Gilbert
(Jordan and Evermann, 1896, I. p. 385)
(C. L. Hubbs, 1916)
Panama to Playa del Rey.

LX Ophidiidae (Cush ells)

179. ***Otophidium taylori** Girard
(Hubbs, Carl L., 1916, p. 166)
(Chilara taylori) (Girard)
(Jordan and Evermann, 1896, III, p. 2498)
Coast of California from Monterey to San Diego.
(Starks and Morris, 1907, p. 240)
Local distribution:

Whites Point	T45	30F	12-26-13

LXI Oxylebiidae

180. ***Oxylebius pictus** (Gill)
(Gilbert, 1915, p. 338)
(Jordan and Evermann, 1898, II, p. 1878, fig. 683)
Monterey to Puget Sound.
Local distribtuion:

Catalina Island	T102	30F	4-1-15

LXII Paralepididae

181. **Lestidiops Sphyraenopsis** Hubbs
(Hubbs, 1916)
Avalon Bay, Santa Catalina Island.

182. **Sudis ringens** Jordan and Gilbert
(Jordan and Evermann, 1896, I, p. 600)
Santa Barbara Channel, California, specimen.
(Starks and Morris, 1907, p. 181)

LXIII Pleuronectidae (Flounders)

183. **Eopsetta jordani** (Lockington)[1] Jordan's Flounder (English "sole")
(Jordan and Evermann, 1898, III, p. 2613)
Puget Sound to Point Conception, abundant in shallow water from Monterey northward.
(Starks and Morris, 1907, p. 242)
Food fish. One specimen recorded from San Diego.

184. **Errex zachirus** (Lockington)
(Glyptocephalus zachirus Lockington)
(Jordan and Evermann, 1898, III, p. 2658)
San Francisco northward.
(Starks and Morris, 1907, p. 246)
Southern California to Behring Sea.

185. *Hippoglossina stomata Eigenmann and Eigenmann[2]
(Jordan and Evermann, 1898, III, p. 2620)
Coast of California.
(Starks and Morris, 1907, p. 242)
Southern part of Lower California north to Point Conception. Typical specimens in deep water off San Diego.
Local distribution:

Catalina Island	T127	50F	3-30-16
Long Beach			5-18
Newport	T109	23F	6-16-15
Point Firmin	T24		4-1-13
Venice	T66	27F	8-13-14
San Diego			5-19-23

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[1]Hippoglossidae, Jordan, 1923
[2]Paralichthyidae, Jordan, 1923

186. ***Hypsopsetta guttulata** (Girard) Diamond flounder
(Jordan and Evermann, 1898, III, p. 2639)
Cape Mendocino to Magdalena Bay.
(Starks and Morris, 1907, p. 244)
Common on beaches of San Diego and San Pedro, California.
Local distribution:

Alamitos Bay		5-6-11
Anaheim Landing		7-13-15
Long Beach		
Newport	T87	11-27-14
San Diego		2-19-19

187. **Lepidopsetta bilineata** (Ayres)
(Jordan and Evermann, 1898, Vol. III, p. 2643)
Pacific Coast of North America, Behring Strait to Monterey.
(Gilbert, 1898)
Catalina Island, Station 3664, 80F.

188. ***Lyopsetta exilis** (Jordan and Gilbert)[2]
(Jordan and Evermann, 1898, III, p. 2612)
San Francisco to Puget Sound.
(Starks and Morris, 1907, p. 241)
Two specimens off San Pedro. Is known to San Diego.
Local distribution:

Newport	T110	21F	6-10-15

189. ***Microstomus pacificus** (Lockington)
(Jordan and Evermann, 1898, IIIc, p. 2655)
[2]Hippoglossidae, Jordan, 1923
Monterey to Unalaska.
(Starks and Morris, 1907, p. 245)
San Pedro to San Diego.
Local distribution:

Off Redondo pier	T169	28F	7-29-16

190. ***Orthopsetta sordidas** (Girard)[1] San Dab (West Coast)
(Citharichthys sordidus) (Girard) (Soft flounder)
(Jordan and Evermann, 1898, III, p. 2679, fig. 943)
British Columbia to Lower California.
(Starks and Morris, 1907, p. 246)
Local distribution:

Catalina Island	T156	30F	6-23-16
" "	T155	25F	6-23-16
" "	T128	57F	4-1-16
" "	T105	30F	4-1-15
" "	T154	20F	6-23-16
" "	T162	25F	6-24-16
" "	T148	30F	6-21-16
" "	T127	50F	3-30-16
El Segundo	T188		8-4-17
" "	T64	20F	8-12-14
" "	T63	16F	8-12-14
" "	T35	5½F	8-2-13
Hermosa	T62	14F	8-12-14
Huntington Beach	T111	23F	6-16-15
" "	T174	15F	4-5-17
" "	T175	21F	4-5-17
Long Beach	T217	13F	8-12-22
" "	T181	17F	4-7-17
" "			12-6-19

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[1]Bothidae, Jordan, 1923
[2]Hippoglossidae, Jordan, 1923.

Newport	T110	21F	6-16-15
"	T112	18F	6-16-15
"	T113	17½F	6-16-15
"	T71	in the bay	11-26-14
"	T86	" " "	11-27-14
"	T87	" " "	11-27-14
"	T88	" " "	12-16-14
"		25F	3-20-15
"	T109	23F	6-16-15
"	T178	15F	4-6-17
"	T183	14F	4-7-17
Playa del Rey			7-29-13
" " "	OT40	20F	8-8-13
Point Firmin	T12	25F	11-29-12
" "	T24	24F	4-1-13
" "	D49	9F	11-18-22
Portuguese Bend	T46	30F	12-27-13
Redondo	T169	28F	7-29-16
"	T61	23F	8-12-14
San Pedro			7-27-02
" "	T171		11-30-12
" "	T171	26F	12-27-16
" "			7-21-17
" "	T215	12F	8-12-22
" "	T216	14F	8-12-22
" "	T218	20F	10-14-22
Santa Cruz	T192	25F	8-30-17
Santa Monica	T120		7-24-15
" "	T212		7-24-15
" "	OT37	50F	8-7-13
" "	OT38	10F	8-7-13
" "	T115		7-17-15
" "	T116		7-17-15
" "	T119		7-17-15
Venice	T28		7-26-13
"	T31	30F	7-29-13
"	T33	22F	8-2-13
"	T36	18F	8-2-13
"	T65	26F	8-12-14
"	T154	50F	7-15-16
"	T186		7-28-17
Point Vincente	T59	25F	6-22-14
White's Point	T45	30F	12-26-13

191. ***Orthopsetta stigmaea** (Jordan and Gilbert)[1] Speckled Flounder
(*Citharichthys stigmaeus Jordan and Gilbert)
(Jordan and Evermann, 1898, III, p. 2681)
Coast of California, rare, in rather deep water.
(Starks and Morris, 1907, p. 246)
Specimens from San Deigo and San Pedro. North to Oregon.
Local distribution:

Catalina Island	T126	49F	3-30-16
" "	T127	50F	3-30-16
" "	T128	57F	4-1-16
" "	T130		6-14-16
" "	T159		6-23-16
Hermosa Beach	T62	14F	8-12-14
Long Point	T49		12-27-13
Newport	T109	23F	6-16-15
"	T110	21F	6-16-15
Point Firmin	T143		6-17-16

[1]Bothidae, Jordan, 1923.

Point Vincente	D15		6-24-14
" "	T207		7-22-22
San Pedro			2-21-13
Santa Monica	T11		7-9-12
" "	T67	28F	8-13-14
" "	T117		7-17-15
" "	T123	25F	7-24-15
Venice	T66	27F	8-13-14

192. ***Orthopsetta xanthostigma** Gilbert [1]
(*Citharichthys xanthostigma Gilbert)
(Jordan and Evermann, 1898, III, p. 2680)
Lower California.
Local distribution:

Catalina Island	T130		6-14-16
" "	T126	49F	3-30-16
" "	T127	49F	3-30-16
Long Beach	T212	9F	8-5-22
Newport	T111	23F	6-16-15
"	T183	14F	4-7-17
"	T110	21F	6-16-15
Playa del Rey	T65	27F	8-12-14
Point Firmin	D50	13F	11-18-22
Redondo	T169		7-29-16
San Diego			2-19
Santa Monica			11-07
" "	T116		7-17-15
" "	T117		7-17-15
Venice	T33	22F	8-2-13
"	T165	50F	7-15-16
Vincente	D15		6-24-14

193. ***Paralichthys maculosus** Girard[2] So. Calif. Halibut
(Paralichthys californicus) (Ayres)
(Jordan and Evermann, 1898, III, p. 2625)
Tomales Bay to Cerros Island, California.
(Starks and Morris, 1907, p. 242)
Common flat fish on beaches of San Diego Bay.
Local distribution:

Anaheim Landing			7-13-15
" "			7-17-16
" "			7-17-17
Alamitos Bay			5-6-11
Long Beach			3-19
Newport Bay	T69		11-26-14
" "	T70		11-26-14
" "	T80		11-27-14
" "	T86		11-27-14
" "	T87		11-27-14
" "	T88		12-16-14
Venice	T165		7-15-16

194. ***Parophrys vetulus** Girard California "Sole."
(Jordan and Evermann, 1898, III, p. 2640)
Sitka to Santa Barbara, California.
(Starks and Morris, 1907, p. 245)
Unalaska to San Diego.
Local distribution:
Long Beach 5-18-23

195. ***Pleuronichthys coenosus** Girard
(Jordan and Evermann, 1898, III, 2638)
Sitka to San Diego.
(Hubbs, Carl L., 1916, p. 169)
La Jolla and Avalon, off Point Firmin D49.

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[1]Bothidae, Jordan, 1923 [2]Paralichthyidae, Jordan, 1923

196. *Pleuronichthys decurrens Jordan and Gilbert
(Jordan and Evermann, 1898, III, p. 2637)
Pacific Coast, U. S. South to Monterey.
(Starks and Morris, 1907, p. 244)
Known from San Francisco to Santa Barbara Islands.

197. *Pleuronichthys ritteri Starks & Morris
(Starks and Morris, 1907, p. 243)
Specimens taken at San Diego Bay and San Pedro.
Local distribution:

Newport Bay	T69	

198. *Pleuronichthys verticalis Jordan and Gilbert
(Jordan and Evermann, 1898, III, p. 2638)
Coast of California.
(Starks and Morris, 1907, p. 243)
Not rare in San Diego Bay.
Local distribution:

Alamitos Bay	T23		3-31-13
Anaheim Inlet			7-13-15
Huntington Beach	T174	15F	4-5-17
Long Beach			
Malibou			8-14-13
Newport			11-26-14
"	T183	14F	4-7-17
"	T87		11-27-14
Playa del Rey	T29		7-29-13
" " "	OT35	5½F	8-2-13
Point Firmin			4-1-13
" "	T143		6-17-16
San Diego			2-19
San Pedro	T216		8-12-22
Santa Cruz	T192	25F	8-30-17
Santa Monica	OT38	10F	8-7-13
" "	T20		7-24-15
" "			11-07
Venice	T31	30F	7-29-13
Vincente	D15		6-24-14
White's Point	T108		4-10-15

199. *Xystreurys liolepis Jordan and Gilbert [1]
(Jordan and Evermann, 1898, III, p. 2623)
Point Conception southward to San Diego.
(Starks and Morris, 1907, p. 242)
Specimens from San Pedro south to Gulf of California.
Local distribution:

Newport	T89	3-20-15
Playa del Rey	OT40	8-8-13

LXIV Poeciliidae (Killifishes)

200. *Fundulus parvipinnis Girard[2]
(Jordan and Evermann, 1896, I, p. 640)
Point Conception to Cerros Islands, California, abundant. in bays and lagoons.
(Starks and Morris, 1907, p. 181)
Local distribution:

Alamitos Bay	4-29-11
Anaheim Inlet	7-13-15
Del Rey	7-5-15

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[1]Paralichthyidae, Jordan, 1923
[2]Cyprinodontidae, Jordan, 1923

LXV Polynemidae (Thread fins)

201. **Polynemus approximans** Lay and Bennett
Polydactylus approximans (Lay and Bennett)
(Jordan and Evermann, 1896, I, p. 829)
(Jordan and Starks, 1907, p. 68)
From Guaymas to Panama.
Common at Mazatlan, once taken at Santa Catalina, and San Diego.

202. **Polynemus opercularis** (Gill)
(Polydactylus opercularis) (Gill)[2]
(Jordan and Evermann, 1896, I, p. 830)
Cape San Lucas to Panama.
(Starks and Morris, 1907, p. 188)
Specimens recorded from oil painting in San Diego of specimens secured from fisherman.

LXVI Pomacentridae (Demoiselles)

203. ***Chromis punctipinnis** (Cooper) Blacksmith
(Jordan and Evermann, 1898, II, p. 1548)
Point Conception to Cerros Island.
(Starks and Morris, p. 203)
Cerros Island to Santa Barbara.
Local distribution:

Hermosa			1917
Point Firmin	T12	25F	11-29-12

204. ***Hypsypops rubicundus** (Girard) Garabaldi (Gold fish)
(Jordan and Evermann, 1898, II, p. 1564, fig. 591)
Point Conception to Todos Santos Bay.
(Starks and Morris, p. 203)
La Jolla and San Pedro and Santa Barbara Island.
Local distribution:

Venice	1919

LXVII Regalecidae (Oar fishes)

205. **Regalecus russelli** (Shaw) Oarfish.
(Jordan, 1905, II, p. 472)
Newport, Orange County, California.
(Starks and Morris, 1907, p. 191)
Newport and Santa Catalina Island.

LXVIII Sciaenidae (Croakers)

206. ***Corvina saturna** (Girard)
(Sciaena saturna) (Girard) Black croaker (Red Roncador)
(Jordan and Evermann, 1898, II, p. 1458)
Santa Barbara to Cerros Island. Important food fish.
(Starks and Morris, 1907, p. 198)
Local distribution:

Venice	1919
"	1-28-16

207. **Corvina thompsoni** (Hubbs)
(Sciaena thompsoni Hubbs)
(Hubbs, Carl L., 1921)
Local distribution:
Santa Catalina Island

208. ***Cynoscion nobilis** (Ayres)[1] White Sea Bass.
(Jordan and Evermann, 1898, II, p. 1413)
Coast of California north to San Francisco.
(Starks and Morris, 1907, p. 197)
Many from Santa Barbara, few from Point Loma. Food fish.
South to Gulf of California.

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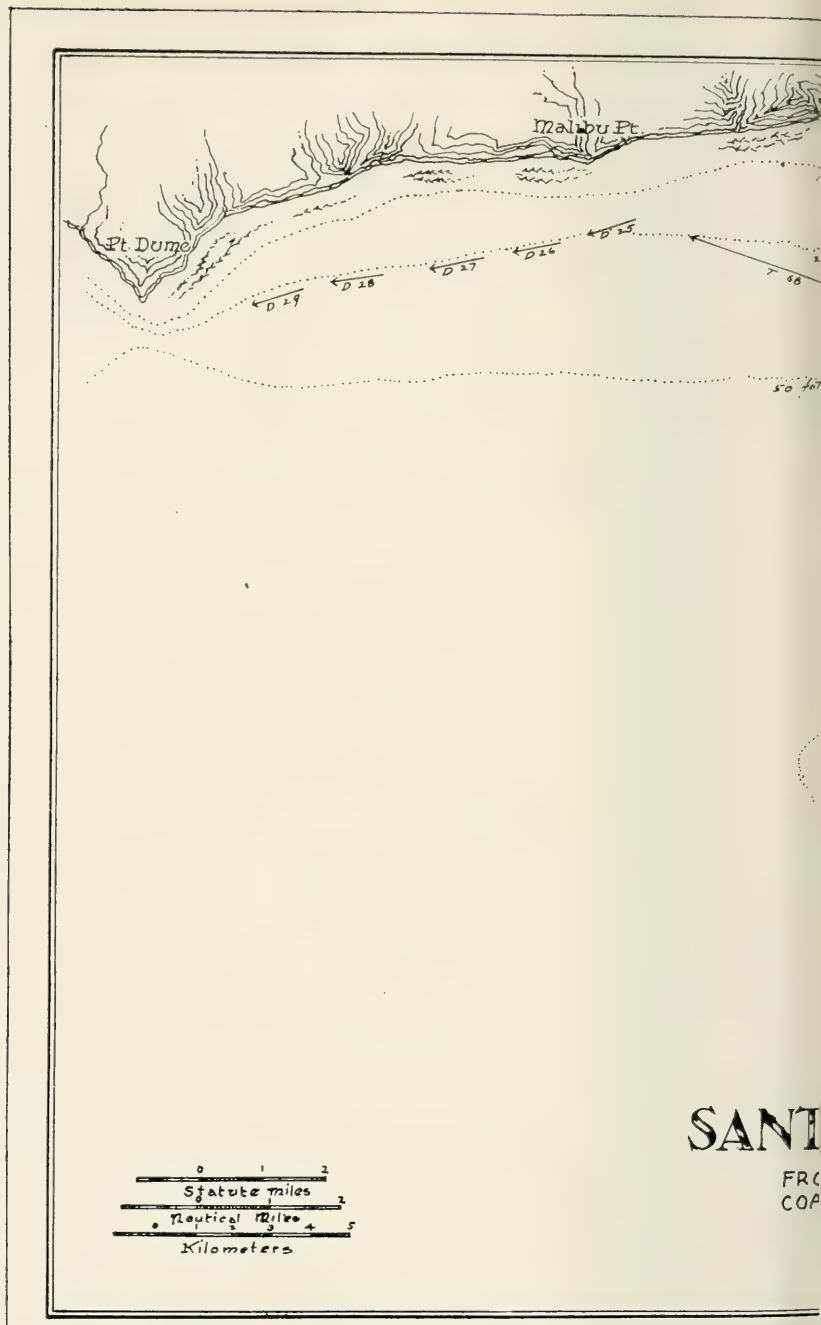
[1]Otolithidae, Jordan, 1923

[2]Probably insufficient evidence for this species. See Starks and Mann, 1911.



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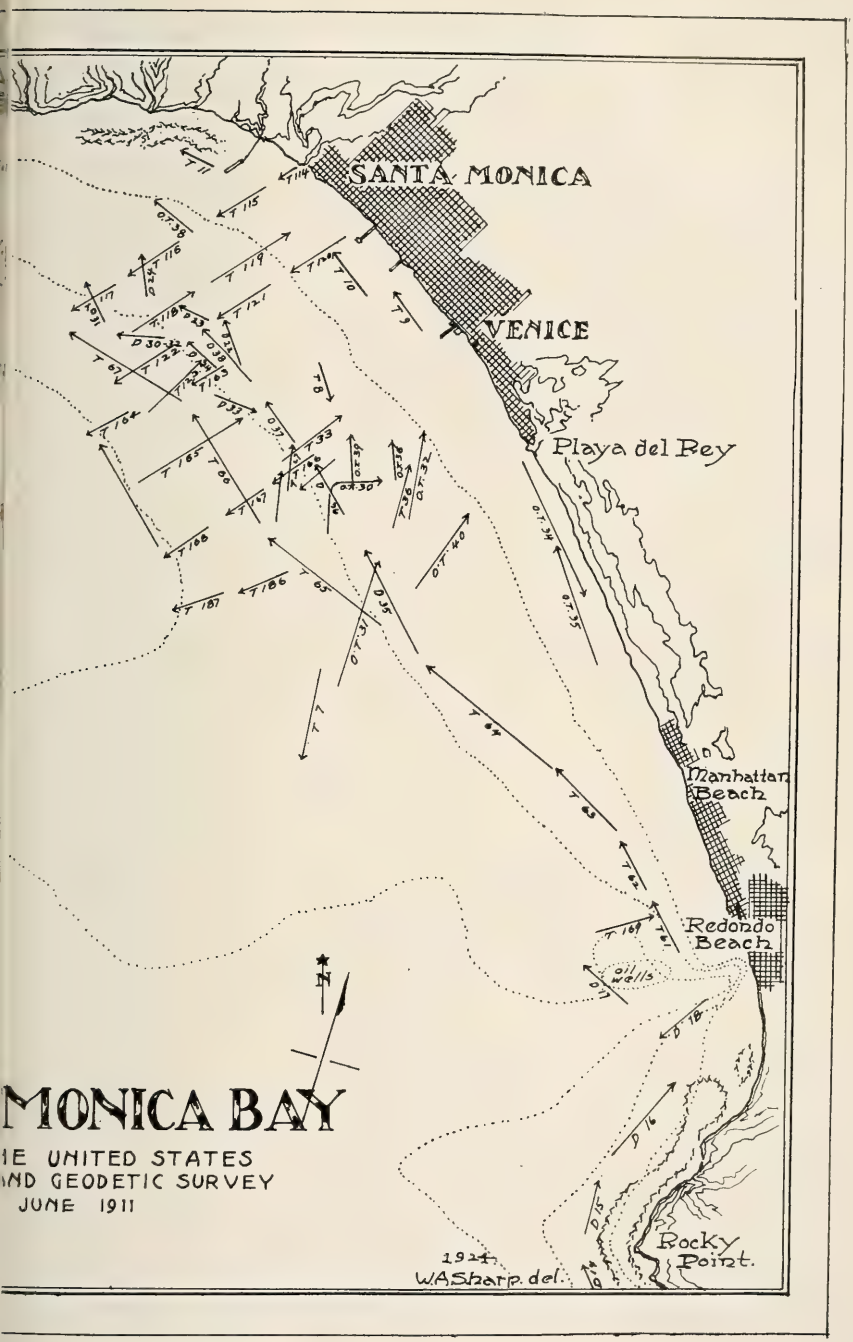

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209. ***Cynoscion parvipinnis** Ayres [1] California Bluefish.
(Jordan and Evermann, 1898, II, p. 1410)
From Santa Barbara to Mazatlan.
(Starks and Morris, 1907, p. 198)
San Pedro to Guaymas, Mexico.

210. ***Genyonemus lineatus** (Ayres) King fish. "Tom cod."
(Jordan and Evermann, 1898, II, p. 1460)
Common, San Francisco to Cerros Island.
(Starks and Morris, 1907, p. 199)
Local distribution:

Anaheim Landing			1916
" "			5-18-23
Long Beach	T3	5F	3-24-12
" "	D43	10F	10-21-22
San Pedro	T216	12F	8-12-22
" "	T211	8F	8-5-22
Venice			7-3-14

211. ***Menticirrhus undulatus** (Girard) California whiting (Corvina)
(Jordan and Evermann, 1898, II, p. 1476, fig. 570)
Southern California to Santa Barbara.
(Starks and Morris, 1907, p. 199)
South to head of Gulf of California, north to Santa Barbara.
Local distribution:
Anaheim Landing 7-13-15

212. ***Roncador stearnsi** (Steindachner) Spotfin Croaker (Roncador)
(Jordan and Evermann, 1898, II, p. 1457, fig. 568)
(Starks and Morris, 1907, p. 198)
Abundant, San Diego, north to San Francisco.

213. ***Seriphus politus** Ayres [1] Queen fish, (White croaker)
(Jordan and Evermann, 1898, II, p. 1397)
Point Conception to Cerros Island.
(Starks and Morris, 1907, p. 198)
Common in San Diego Bay. North to San Francisco.
Local distribution:

Long Beach	T43	12F	10-21-22
Portuguese Bend	T46	30F	12-27-13
San Pedro	T211	8F	8-5-22
Venice			5-16-12

214. ***Umbrina roncador** Jordan and Gilbert Yellow finned croaker, (Yellow tailed croaker)
(Starks and Morris, 1907, p. 199)
San Francisco to San Diego where it is common.
(Jordan and Evermann, 1898, II, p. 1467)
Point Conception to Guaymas.
Local distribution:
Anaheim Landing 7-13-15

LXIX Scombresocidae (Sauries)

215. ***Cololabis brevirostris** (Peters)
(Jordan and Evermann, 1896, I, p. 726)
Known from Tomales Bay, San Francisco, and San Diego.
(Starks and Morris, 1907, p. 183)
Local distribution:
San Diego, California Fish & Game Commission.

216. **Cololabis saira** (Brevort)
(California Fish & Game, October, 1919, Vol. V, No. 4, p. 203)
Local dsitribution:
San Diego
(Hubbs, C. L., 1916. Is unable to separate his specimens of C. brevirostris from C. saira.)

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[1]Otolithidae, Jordan, 1923

LXX Scombridae (Mackerel)

217. **Auxis thazard** (Lacepede)[1] Frigate mackerel.
(California Fish & Game, Vol. IV, No. 4, Oct., 1918, p. 183)
Described from Japan, East Indies, and Mediterranean.
Recently taken in small numbers around Catalina and San Pedro.
(Jordan and Evermann, 1896, Vol. I, p. 867)
All warm seas, northward to Cape Cod. Rarely reaches United States, but comes in large numbers.

218. **Germo alalunga** (Gemelin)[1] Long-finned albacore (White meat "Tuna")
(Jordan and Evermann, 1896, I, p. 871, fig. 367)
(Starks and Morris, 1907, p. 189)
Abundant, northward as far as San Francisco. One of the most important food fishes of Pacific Coast. Used only when kippered or canned.

219. **Katsuwonus pelamis** (Linnaeus)[1] Skipjack (Oceanic Bonito) (Striped "Tuna")
(Gymnosarda pelamis (Linnaeus)
(Jordan and Evermann, 1896, I, p. 868)
(Starks and Morris, 1907, p. 188)
Not recorded north of San Diego.

220. **Neothunnus macrobterus** (Temminck and Schlegel)[1] Yellow-finned tuna (Yellow-finned albacore)
(Germo macropterus (Schlegel)
(Starks and Morris, 1907, p. 189)
Occasionally taken off Avalon.

221. **Parathunnus sibi** (Temminick and Schlegel)
(Paraththunnus mebachi)
(Kishinouye, K., 1921)
San Pedro

222. ***Pneumatophorus diego** (Ayres) Mackerel (Chub Mackerel) (Jack "Smelt")
(Scomber japonicus Houttuyn)
(Starks and Morris, 1907, p. 188)
(Scomber colias)
(Jordan and Evermann, 1896, I, p. 866, fig. 364)
North to San Francisco, very common.
Local distribution:

Catalina	11-6-14
Venice	7-31-14

223. **Sarda chilensis** Cuvier and Valenciennes[1] California Bonito.
(Jordan and Evermann, 1896, I, p. 872)
(Starks and Morris, 1907, p. 189)
Chili to Puget Sound, abundant off Point Loma.

224. **Scomberomorus sierra** Jordan and Starks Spanish Mackerel.
(Jordan and Evermann, 1896, I, p. 874)
(Starks and Morris, 1907, p. 190)
Cortez Banks southward to Panama.

225. **Thunnus thynnus** (Linnaeus)[1] Tuna (Blue-fin Tuna) (Leaping Tuna)
(Jordan and Evermann, 1896, I, p. 870)
(Starks and Morris, 1907, p. 189)
Abundant about the Santa Barbara Islands, largest of bony fishes, reaching weight of 1500 pounds. Northward to San Francisco.

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[1]Thunnidae, Jordan, 1923

LXXI Scorpaenidae (Rock fishes)

226. **Sebastolobus alascanus** Bean [1]
(Jordan and Evermann, II, p. 1761)
(Gilbert, 1915, p. 328)
(Starks and Morris, 1907, p. 205)
Alaska to Santa Barbara Islands, 10 to 15 fathoms off San Diego, Santa Catalina and San Nicolas Islands.

227. **Sebastolobus altivelis** Gilbert [1]
(Gilbert, 1915, p. 329)
(Jordan and Evermann, II, p. 1763, fig. 654)
Alaskan Peninsula to San Diego, in deep water. Near San Clemente, Santa Catalina and San Nicolas Islands.

228. ***Scorpaena guttata** Girard Scorpion fish "Sculpin."
(Jordan and Evermann, II, p. 1847)
(Gilbert, 1915, p. 337)
(Starks and Morris, p. 215)
Monterey to Ascension Island, very abundant about San Diego; a good food fish.
Local distribution:

Catalina Island	T96		3-31-15
" "	T136	22F	6-15-16
" "	T148		6-21-16
Del Rey	OT34		8-2-13
Newport Bay	T86		11-27-14
Point Firmin	T12		11-29-12
Venice			1913

229. **Sebastodes alutus** (Gilbert)
(Jordan and Evermann, II, p. 1790, fig. 661)
Bearing Sea to Santa Barbara, common northward in deep water.
(Starks and Morris, 1907, p. 208)
Santa Cruz Island.

230. **Sebastodes atrovirens** (Jordan and Gilbert) Guarrupa
(Gilbert, 1915, p. 331)
(Jordan and Evermann, II, p. 1797)
San Diego to San Francisco, abundant southward.
San Clemente Island.
(Starks and Morris, 1907, p. 209)
San Diego to San Francisco.

231. **Sebastodes auriculatus (Girard)** Brown rock fish.
(Jordan and Evermann, II, p. 1817)
(Gilbert, 1915, p. 330)
(Starks and Morris, 1907, p. 213)
(Cape Mendocino to Cerros Island, very abundant.

232. **Sebastodes aurora** (Gilbert)
(Gilbert, 1915, p. 336)
(Jordan and Evermann, II, p. 1802)
About the Santa Barbara Islands, in 233 to 267 fathoms.
Monterey Bay.

233. ***Sebastodes ayresii,** Gilbert and Cramer.
(Jordan and Evermann, II, p. 1808)
(Starks and Morris, 1907, p. 211)
Cortez Banks near San Diego. One specimen.

234. **Sebastodes carnatus** (Jordan and Gilbert) Flesh-colored rock fish.
(Jordan and Evermann, II, p. 1824)
(Starks and Morris, 1907, p. 214)
Abundant in rather shallow water. San Diego to San Francisco.

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[1]See Hubbs, 1926

235. **Sebastodes chlorostictus** (Jordan and Gilbert) Pesca vermiglia.
(Jordan and Evermann, II, p. 1811)
San Diego to San Francisco, abundant in deep water.
(Starks and Morris, 1907, p. 212)
San Pedro to San Francisco.

236. **Sebastodes chrysomelas** (Jordan and Gilbert)
(Jordan and Evermann, II, p. 1825)
Puget Sound to San Diego, abundant in rather deep water.
(Starks and Morris, 1907, p. 214)
San Diego to San Francisco.

237. **Sebastodes constellatus** (Jordan and Gilbert) Spotted rock fish.
(Jordan and Evermann, II, p. 1806)
San Diego to San Francisco, abundant in rather deep water.
(Starks and Morris, 1907, p. 210)

238. **Sebastodes diploproa** (Gilbert)
(Gilbert, 1915, 335)
(Jordan and Evermann, II, p. 1801)
Coast of Southern California, Coronado Islands, 24 fathoms.
San Diego, Santa Catalina and San Nicolas Islands.

239. **Sebastodes elongatus** (Ayres) Reina.
(Gilbert, 1915, p. 337)
(Jordan and Evermann, II, p. 1815)
San Diego to San Francisco, not rare in rather deep water.
Off Santa Catalina Island.

240. **Sebastodes eos** Eigenmann and Eigenmann
(Jordan and Evermann, II, p. 1810)
(Starks and Morris, 1907, p. 211)
Point Loma, San Diego, 100 fathoms.
Local distribution:
San Clemente, California Fish & Game Commission.

241. **Sebastodes flavidus** (Ayres)
(Jordan and Evermann, II, p. 1781)
San Diego to San Francisco, abundant. An important food fish.
(Starks and Morris, 1907, p. 207)

242. **Sebastodes gilberti** Cramer
(Jordan and Evermann, II, p. 1823)
Coast of California, rare.

243. **Sebastodes gilli** Eigenmann and Eigenmann
(Jordan and Evermann, II, p. 1811)
(Starks and Morris, 1907, p. 212)
Point Loma near San Diego.

244. **Sebastodes goodei** Eigenmann and Eigenmann
(Jordan and Evermann, II, p. 1779)

245. **Sebastodes introniger** (Gilbert)
(Gilbert, 1915, p. 336)
Off San Diego, Santa Catalina and Santa Barbara Islands.
(Jordan and Evermann, II, p. 1803)

246. **Sebastodes levis** (Eigenmann and Eigenmann) Cow-fish.
(Jordan and Evermann, II, p. 1816)
(Starks and Morris, 1907, p. 123)
San Diego to Monterey, not rare in deep water. A food fish.

247. **Sebastodes macdonaldi** (Eigenmann and Beeson)
(Jordan and Evermann, II, p. 1786)
San Diego.
(Starks and Morris, 1907, p. 208)
Described off San Diego, length 24 inches.

248. **Sebastodes belanostomus** Eigenmann and Eigenmann
(Jordan and Evermann, II, p. 1803)
Point Loma, California.
(Starks and Morris, 1907, p. 210)

249. **Sebastodes melanops** (Girard)
(Jordan and Evermann, II, p. 1782)
Monterey to Kodiak, most abundant northward.
(Gilbert, 1915, p. 331)
Near Santa Cruz, 11 to 14 fathoms.

250. **Sebastodes minatus** (Jordan and Gilbert) Red Rock "Cod."
(Jordan and Evermann, II, p. 1749)
San Francisco to San Diego.
(Gilbert, 1915, p. 331)
Monterey Bay, 28 to 35 fathoms.

251. **Sebastodes mystinus** Jordan and Gilbert Black rock fish.
(Jordan and Evermann, II, p. 1784, fig. 627)
Puget Sound to San Diego, abundant about San Francisco in rather shallow water.
(Starks and Morris, 1907, p. 207)
Specimens seen in San Diego markets. Ranges northward to Puget Sound, abundant about San Francisco. It is an important food fish reaching the weight of five pounds.

252. **Sebastodes ovalis** (Ayres)
(Jordan and Evermann, II, p. 1788)
San Diego to San Francisco.
Found in rather deep water.
(Starks and Morris, 1907, p. 208)
Rather common in San Diego markets. Ranges northward to San Francisco.

253. **Sebastodes paucispinis** (Ayres) Bocaccio.
(Jordan and Evermann, II, p. 1780)
San Diego to San Francisco, abundant in rather deep water.
(Starks and Morris, 1907, p. 207)
Abundant in deep water off San Diego and ranging northward to San Francisco. It is one of the most important of the rock fish reaching a weight of 15 pounds. The young known as "Tom Cod."

254. **Sebastodes pinniger** (Gill) Orange rockfish.
(Jordan and Evermann, II, p. 1793, fig. 662)
San Diego to Puget Sound. One of the most abundant species.
(Starks and Morris, p. 208)
(Jordan and Gilbert, 1880, p. 455)
Ranges north to Puget Sound and about San Francisco.
(Gilbert, 1915, p. 331)
Monterey Bay, 10 fathoms.

255. **Sebastodes proriger** (Jordan and Gilbert)
(Jordan and Evermann, II, p. 1792)
San Diego to San Francisco, in deep water, not rare.
(Starks and Morris, 1907, p. 208)
Rather abundant in deep water off San Diego. Ranges northward to San Francisco.

256. **Sebastodes rastrelliger** (Jordan and Gilbert) Grass rock fish.
(Jordan and Evermann, II, p. 1819)
San Diego to San Francisco, abundant southward.
(Starks and Morris, p. 213)
San Diego to San Francisco, abundant in water of moderate depth, especially south of Point Conception, and reaches a length of 15 inches.

257. **Sebastodes rhodochloris** (Jordan and Gilbert) Fly-fish.
(Jordan and Evermann, II, p. 1809)
(Gilbert, 1915, p. 330)
(Starks and Morris, 1907, p. 211)
Off Monterey and off Point Conception, San Diego, Coronado Islands, Santa Catalina Islands.

258. ***Sebastodes rosaceus** (Girard) Corsair.
(Gilbert, 1915, p. 328-336)
(Jordan and Evermann, II, p. 1808)
(Starks and Morris, 1907, p. 211)
San Francisco to Cerros Island.

259. **Sebastodes ruberrimus** Cramer Red rock fish.
(Jordan and Evermann, II, p. 1805)
(Gilbert, 1915, p. 336)
(Starks and Morris, 1907, p. 210)
Puget Sound to San Diego, length 30 inches.

260. **Sebastodes rubrivictus** (Jordan and Gilbert) Spanish flag.
(Jordan and Evermann, II, p. 1817)
(Gilbert, 1915, p. 337)
(Starks and Morris, 1907, p. 213)
San Diego to San Francisco, rather rare in deep water.

261. **Sebastodes rufus** Eigenmann and Eigenmann
(Starks and Morris, 1907, p. 207)
(Jordan and Evermann, II, p. 1786)
Off Point Loma and Cortez Banks. Reaches a length of 22 inches. San Nicolas Island. Abundant from San Diego to San Francisco, known southward to Cerros Island. Coloration very brilliant.
Local distribution:

Catalina Island	T97		3-31-15

262. **Sebastodes rupestris** (Gilbert)
(Gilbert, 1915, p. 337)
(Jordan and Evermann, II, p. 1812)
Five specimens, the largest 5½ inches, from the Santa Barbara Islands. Santa Catalina Islands.

263. ***Sebastodes saxicola** (Gilbert)
(Jordan and Evermann, II, p. 1798)
(Gilbert, 1915, p. 331)
(Starks and Morris, 1907, p. 209)
Abundant about Santa Barbara Islands from 44 to 155 fathoms.
Off San Diego, north to Oregon.
Local distribution:

Long Point	T59		6-22-24
Newport	T110	21F	6-16-15
Portuguese Bend			12-7-11
Santa Cruz	T192	25F	8-30-17
Santa Monica	T67	28F	8-13-14
Venice	T165	50F	7-15-16
"	T68	25F	8-13-14

264. ***Sebastodes semicinctus** Gilbert
(Gilbert, 1915, p. 335)
(Jordan and Evermann, II, p. 1800)
(Starks and Morris, 1907, p. 209)
Deep water in the Santa Barbara Channel, only 7 inches long.
Local distribution:

Long Point	T48	30F	12-27-13
Venice	T164	27F	7-15-16

265. **Sebastodes serranoides** Eigenmann and Eigenmann
(Jordan and Evermann, II, p. 1782)
(Starks and Morris, 1907, p. 207)
In deep water off San Diego, Cortez Banks.
Northern range unknown.

266. ***Sebastodes serriceps** (Jordan and Gilbert) Tree fish.
(Jordan and Evermann, II, p. 1827, fig. 667)
(Starks and Morris, 1907, p. 215)
Point Reyes to Cerros Island.

267. **Sebastodes umbrosus** (Jordan and Gilbert,
(Jordan and Evermann, II, p. 1807)
(Starks and Morris, 1907, p. 210)
Point Conception to Coronado Islands. Scarce.

268. **Sebastodes vixillaris** (Jordan and Gilbert)
(Jordan and Evermann, II, p. 1821)
(Gilbert, 1915, p. 337)
(Starks and Morris, 1907, p. 214)
San Diego to San Francisco, abundant.

269. **Sebastodes zacentrus** (Gilbert)
(Jordan and Evermann, II, p. 1814)
Santa Barbara Islands.
(Starks and Morris, 1907, p. 212)
North to Coos, Oregon.
(Gilbert, 1915, p. 331)
Near San Diego.

LXXII Serranidae (Sea Bass)

270. ***Paralabrax clathratus** (Girard) Rock Bass (Cabrilla)
(Jordan and Evermann, I, p. 1197)
San Francisco to Cerros Island, most common species of Paralabrax on the California Coast; an excellent food fish.
(Starks and Morris, 1907, p. 195)
San Francisco to Todos Santos Bay (Jordan and McGregor, 1898, p. 278)
Local distribution:

Catalina Island.	Isthmus Harbor	11-27-14
Newport Bay	T80	11-27-14
" "	T87	11-27-14

271. ***Paralabrax maculatofasciatus** (Steindachner) Spotted Cabrilla (Spotted Kelp Bass)
(Jordan and Evermann, I, p. 1196, fig. 498)
San Pedro to Mazatlan, everywhere common in sandy bays. A good food fish.
(Starks and Morris, 1907, p. 194)
San Francisco to Todos Santos Bay. (Jordan & McGregor, 1898, p. 278)
Local distribution:
Long Beach

272. ***Paralabrax nebulifer** (Girard) Johnny verde.
(Jordan and Evermann, I, p. 1195)
Monterey to Magdalena Bay, generally common in shallow water. A food fish of excellent quality.
(Starks and Morris, 1907, 194)
Known northward to Monterey (Jordan & Gilbert, 1880, p. 456) southward to Ascension Island (Jordan & Gilbert, 1881a, p. 278)
Local distribution:

Venice	T66	8-13-14

273. ***Stereolepis gigas** Ayres[2] Jew fish, (Black Sea Bass)
(Jordan and Evermann, I, p. 1137)
Coronados Island north to the Farallones. A huge fish rather common about rocks, reaching a weight of 400 to 500 pounds and a length of 5 to 7 feet.
(Starks and Morris, 1907, p. 193)
Often abundant in deep water, especially about the Coronado Islands. The flesh is cured in brine and commands a high price.

LXXIII Soleidae (The Soles)

274. ***Symphurus atricaudas** (Jordan and Gilbert)[1] San Diego Sole.
(Jordan and Evermann, III, p. 2707)

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[1]Cynoglossidae, Jordan, 1923
[2]Epinepohelidae, Jordan, 1923.

San Diego to Cape San Lucas, in sandy bays. Common in the bay of San Diego.
(Starks and Morris, 1907, p. 247)
Abundant outside of San Diego Bay in 50 fathoms. Unknown to the seive fisherman. Known to the Gulf of Lower California.
Local distribution:

Catalina Island	T127	50F	3-30-16
Del Rey	T65	25F	8-12-14
Malibu Point	T68	25F	8-13-14
Portuguese Bend			12-7-11
Point Vincente	D15	18F	6-24-14
San Pedro	T216	14F	8-12-22
Venice	T30	24F	7-29-13
White's Point	T45	30F	12-26-13

LXXIV Sphyraenidae (Barracudas)

275. ***Sphyraena argentea** Girard California Barracuda.
(Jordan and Evermann, I, p. 826)
San Francisco to Cape San Lucas. Very abundant about the Santa Barbara Islands. An important food fish.
(Starks and Morris, 1907, p. 188)
Abundant in the open ocean, and the young are common in the bays in the spring time. Found from San Francisco to Guaymas, Mexico.

LXXV Stomiatidae

276. **Zastomias scintillans** Gilbert
(Gilbert, 1915, p. 322, plate 15, fig. 4)
Monterey Bay, 389 to 551 fathoms. The only type known.

LXXVI Stromateidae (Fiatolas)

277. ***Palometa simillima** (Ayres) California pompano.
(Peprilus simillimus (Ayres) (Rhombus simillimus)
(Jordan and Evermann, I, p. 967)
Puget Sound to San Diego, abundant in summer, especially about Santa Cruz; highly prized as a food fish.
(Starks and Morris, 1907, p. 193)
Known northward to Puget Sound. One small specimen seen at San Diego.
Local distribution:

Venice	8-15-14
"	5-16-12

LXXVII Stylophthalmidae

278. **Stylophthalmus paradoxus** Brauer
(California Fish & Game, Apr. 1919, vol. V, No. 2, p. 95)
(Jordan, 1923)
Local distribution:
Taken by "Albacore."

LXXVIII Syngnathidae (Pipe fishes)

279. **Hippocampus ingens** Girard Sea Horse.
(Jordan and Evermann, I, p. 776)
Gulf of California north to San Diego, shallow water, scarce. One of the largest sea-horses.
(Starks and Morris, p. 186)
Pacific Coast of northern Mexico. One foot in length. Known at San Diego, very rare. One of the largest of the sea-horses.

280. **Syngnathus arctus** (Jenkins and Evermann) Short-nosed pipe fish. (Siphostoma arctum)
(Jordan and Evermann, I, p. 771)
Gulf of California, south to Mazatlan.
(Starks and Morris, 1907, p. 185)
San Diego and La Jolla, the Gulf of California, rare.

281. **Syngnathus auliscus** (Swain)
(Siphostoma auliscus, Swain)
(Jordan anl Evermann, I, p. 767)
North to Point Conception, not very common.
(Starks and Morris, p. 184, 1907)
San Diego, San Pedro, known southward to Panama; taken in Magdalena Bay.

282. **Syngnathus barbarae** (Swain)
(Siphostoma barbarae)
(Jordan and Evermann, I, p. 765)
Santa Barbara, one specimen known.
(Starks and Morris, 1907, p. 185)
Known only the type from Santa Barbara.
(Carl L. Hubbs, 1921, considers S. barbarae Swain as indentical with s. leptorhynchus)

283. ***Syngnathus californiensis** Storer Great pipe fish.
(Siphostoma californiense, (Storer)
(Jordan and Evermann, I, p. 764)
Santa Barbara northward, common south of San Francisco.
(Starks and Morris, 1907, p. 183)
Two specimens taken at San Pedro. Known northward to Puget Sound. Southward to San Bartolome Bay.
Local distribution:

Long Beach	T3	4F	3-24-12
Venice lagoon			8-15-13

284. ***Syngnathus leptorhynchus** Girard Pipe fish.
(Siphostoma leptorhynchum (Girard)
(Jordan and Evermann, I, p. 764)
San Francisco to San Diego, generally common along the sandy shores.
(Starks and Morris, 1907, p. 184)
Abundant northward to San Francisco.
Local distribution:

Alamitos Bay			5-13-11
Anaheim Landing		Inlet	7-13-15
Newport Bay	T87		11-27-14

285. **Syngnathus punctipinnis** (Gill)
(Siphostoma punctipinne)
(Jordan and Evermann, I, p. 763)
San Diego, known only from the original types.
(Starks and Morris, 1907, p. 184)
Known only from the types taken at San Diego in 1862.

LXXIX Synodontidae (Lizard fishes)

286. ***Synodus lucioceps** (Ayres)
(Jordan and Evermann, I, p. 539)
San Francisco to Santa Barbara, rather common in summer.
(Starks and Morris, 1907, p. 178)
San Pedro and San Diego, ranges northward to San Francisco, not uncommon.
Local distribution:

Del Rey	OT40	20F	8-8-13
" "	OT34	4F	8-2-13

El Segundo	T64	23F	8-14-13
Malibu			8-14-13
Newport	T109	23F	6-16-15
Santa Monica	T120	8F	7-24-15
Santa Monica	T121	15F	7-24-15
" "	T119	10F	7-17-15
" "	T115	8F	7-17-15
" "	T11	5F	7-9-12
Venice	T33	22F	8-2-13

LXXX Tetragonuridae (Square Tails)

287. **Tetragonurus cuvieri** Risso
(Jordan and Evermann, 1896, I, p. 976)
Woods Hole
(California Fish & Game Commission, Apr., 1919, Vol. V, No. 2, p. 94)
Local distribution:
Near Catalina Island, California Fish & Game Commission.

LXXXI Tetraodontidae (Puffers)

288. **Spheroides politus** (Girard)
(Spheroides annulatus politus)
(Jordan and Evermann, 1898, IIc, p. 1736)
Found at Mazatlan.
(Starks and Morris, 1907, p. 205)
Found from San Diego to Mazatlan.

LXXXII Trachypteridae (King of Herrings)

289. **Trachypterus rex-salmonorum** Jordan and Gilbert [1]
(Jordan and Evermann, 1898, III, p. 2599)
(California Fish & Game, Apr., 1919, Vol. V, No. 2, p. 95)
Local distribution:
Taken by "Albacore."

LXXXIII Triehiuridae

290. **Troshiurus lepturus** Linnaeus Sable fish (Silver fish)
(Jordan and Evermann, I, 1896, p. 889)
Western Atlantic, north to Virginia. Lower California.
Local distribution:
Long Beach, California Fish & Game, July, 1921, Vol. VII, Jan., 1921, No. 2, p. 179.

LXXXIV Xiphiidae (Sword fish)

291. **Xiphias gladius** Linnaeus Sword fish (Broadbill)
(Jordan and Evermann, I, p. 894)
Occasionally taken about the Santa Barbara Islands.
(Starks and Morris, 1907, p. 190)
Common in open sea at San Diego in summer. North to Santa Barbara Islands.

LXXXVI Zaniolepidae

292. ***Xantocies frenatus** (Eigenmann)[2]
(Zaniolepis frenatus Eigenmann)
(Gilbert, 1915, p. 338)
(Jordan and Evermann, 1898, II, p. 1877)
San Diego to Monterey.
Local distribution:

Huntington Beach			4-6-17
Santa Monica	T67	28F	8-13-14

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[1]Young of Trachypterus seleniris Snyder, Hubbs, 1925.
[2]See Jordan, Copeia, 1917, No. 49, p. 88.

LXXXVII Zoarcidae (Eel-pouts)

293. **Aprodon cortezianus** Gilbert
(Jordan and Evermann, III, p. 2461)
Cortez Banks, near San Diego. Six specimens, 266 to 339 fathoms.
(Gilbert, 1915, p. 361)
Off San Nicolas Island, 216 to 399 fathoms.

294. **Bothrocara remigera** Gilbert [2]
(Gilbert, 1915, p. 366, plate 20, fig. 19)
Off San Diego in 822 to 530 fathoms.

295. **Embryx crassilabris** Gilbert
(Jordan and Evermann, III, p. 2458)
Pacific Coast of Southern California, a single specimen twelve inches long from Albatross, station 2839.
(Starks and Morris, 1907, p. 240)
Same as above.

296. **Furcimanus diapterus** (Gilbert)
(Jordan and Evermann, III, p. 2472)
Off the coasts of California and Oregon, 82 to 376 fathoms.
(Gilbert, 1915, p. 362)
Off San Diego, 191 to 284 fathoms. Males much less abundant than females.

297. **Lycodopsis pacificus** (Collet)
(Jordan and Evermann, III, 1898, p. 2460)
San Francisco to Puget Sound.
Local distribution:
Huntington Beach—California Fish & Game Commission, Apr., 1919, Vol. V, No. 2.

298. **Lycogramma brunnea** (Bean)
(Gilbert, 1915, p. 364, plate 20, fig. 18)
Off San Diego, Coronado Islands.
San Clemente Island, Santa Catalina Island, Monterey Bay, 161 to 756 fathoms.

299. **Maynea californica** Gilbert
(Gilbert, 1915, p. 362, plate 19, fig. 17)
Off San Nicolas Island, 229 to 298 fathoms.

300. **Melanostigma pammelas** Gilbert
(Jordan and Evermann, III, p. 2479)
(Gilbert, 1915, p. 368)
Off San Diego, near Santa Cruz Island, and Santa Barbara Channel, 274 to 1100 fathoms.

301. **Lyconema barbatum** Gilbert
(Jordan and Evermann, III, p. 2474)
(Gilbert, 1915, p. 362)
A single specimen, off San Diego, 167 to 191 fathoms. So far as known this species is confined to Southern California.

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[2]Brotulidae, Jordan, 1923


MAP OF
SANTA CATALINA ISLAND
INCLUDING THE TRAWLING STATIONS
OF THE
ANTON DOHRN
DEPT. OF BIOLOGY
UNIVERSITY OF SOUTHERN CALIFORNIA
SCALE OF MILES
SAN PEDRO CHANNEL
OUTER SANTA BARBARA PASSAGE
Bird Rock
Isthmus Cove
Fisherman's Cove
Catalina Harbor
Little Harbor
Whittley's Cove
Long Pt.
Cape Ft.
100 Fathom Curve
50 Fathom Curve
N
W.A.SHARP DEL.
OCT 1926.

INDEX TO GENERA OF FISHES OF SOUTHERN CALIFORNIA

(Synonyms in **bold face** type.)

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IN MEMORIAM: SAMUEL JOHN KEESE

Samuel John Keese, a citizen of Los Angeles for forty years and prominent in electrical engineering and scientific lines, died at the family residence, 1509 Shatto Street, Thursday night, January 19. Mr. Keese had a serious attack of the heart about two years ago, and since that time has been a semi invalid, although able to attend to his business most of the time. The immediate cause of his death was an attack of pneumonia, which brought complications with his organic weakness.

Mr. Keese was of Quaker stock, born in Cardington, Ohio, November 26, 1852. He was the son of Richard Keese and Gulielma Taber Keese. His early education was in the primary schools of his native city, and he later attended the Ohio Wesleyan College. He had a strong bent for scientific and technical work from boyhood, and one of his early achievements was to construct physical and electrical apparatus for the institution in which he was a student. Following his college training one of the commissions which he executed was to install the first telephone service in the West Indies.

Mr. Keese came to California in 1887, first settling in Pasadena. There he married Everetta Abbott in 1889. He came to this locality primarily in the interest of the General Electric Company, to investigate the electric railroad which had recently been constructed by Colonel Howland, and which was one of the first ventures of the kind. In fact, the invention was not sufficiently complete to insure the success of the enterprise, and the property was subsequently taken over by other parties, who rebuilt and reorganized it on more approved lines. Mr. Keese built and exhibited the first arc-light seen in Pasadena. He also installed the lighting plant for the Mount Lowe Railway. In 1900 he came to Los Angeles as a member of the firm of Rhodes & Keese, and for a number of years that was the only electrical supply house in the city. In the meanwhile Mr. Keese formed a connection with the Westinghouse Company and finally became their Los Angeles manager, a position which he held for some eighteen years.

Mr. Keese identified himself with the Academy of Sciences at an early date, becoming a member of the directorate and Treasurer, which positions he held for more than twenty-five years. Within the past year he was elected President of the Academy. Through this long period he was one of the main-stays of the organization, and his long time associates will miss him sorely.

Mr. Keese took an active part in many organizations, and held important offices at various times in most of them. He was a member of the American Institute of Electrical Engineers, an officer of the Commonwealth Home Builders, a Life Member of the Veteran Employers Association, and a member of the City Club, The Los Angeles Athletic Club, and the Artland Club.

Outside of his own profession, Mr. Keese was much interested in optics, and he constructed a device for employing polarized light in a stereopticon, by which he entertained his friends with wonderful demonstrations of the processes of crystallization. He was among the first to take up color photography, and in this he achieved fine results, delighting many audiences with his stereopticon exhibits.

Altogether Mr. Keese was a charming character, a lovable associate and an ideal scientist. He leaves a son and three daughters: Richard A. Keese, Mrs. June Keese Hartley, Mrs. Harriet Keese Lamfair, and Miss Annette Keese.

W. A. Spalding.

SAMUEL JOHN KEESE

1852—1928

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:

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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.

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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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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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BULLETIN OF THE

Southern California Academy of Sciences

LOS ANGELES, CALIFORNIA

Vol. XXVII May-August, 1928 Part 2

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Southern California Academy of Sciences

EARLY HISTORY OF THE SOUTHERN CALIFORNIA ACADEMY OF SCIENCES

DR. A. DAVIDSON

As the early minutes of the Academy are missing I think it may be of interest to give some details of its origin.

On Nov. 6, 1891, a small band of scientific students met and formed "The Science Association" of Los Angeles. Of that number Major E. W. Jones and I are, I think, the only surviving members. Some years later the name was changed, as "Christian Science" had entered the religious field and the notice of a science meeting led to confusion.

The primary inception of the society followed on a visit of C. R. Orcutt a botanist from San Diego who desired to see science associations established in all the towns of Southern California to be affiliated in one organization. This did not appeal to our members and our association was organized as an independent unit.

Our association flourished from the beginning. Its purpose then, as now, was to furnish free lectures on scientific and natural history subjects. Sections were formed in geology, botany, and astronomy for special study by those specially interested.

Our lectures were very well attended, proportionally better than they are at present when the population is so much more numerous.

The advent of the movies has seriously affected attendance at the public lectures unless they are accompanied by lantern illustrations.

In 1901 we began the publication of a monthly bulletin hoping to continue it as such. The expense of printing was more than we could assume so the monthly number was discontinued. Some years not more than 2 issues were published. Now we are able to support a quarterly issue. We may congratulate ourselves on even that modest accomplishment as we are the only scientific body in California that has been able to publish continuously for so many years. That we have been able to do so is due to the enthusiastic support of our members and especially to the late J. D. Hooker who was a generous contributor to our funds when an occasional deficit appeared.

It has been the ambition of some of our members to have, some day, a home of its own to house its library and possibly maintain a museum. Personally I do not favor the latter as we have in The Southwest and Exposition Park ample accommodations and facility for study in all branches of science. Before the present museums were

established we conceived the idea of combining a museum building and public library in one building in the Central Park, now Pershing Square. Mr. Guinn of the historical society, Miss Kelso then librarian, and myself approached the town council on the subject. Mr. Sumner Hunt the architect presented a plan to cost $40,000 and the council agreed to put the matter to a vote at the next election. On the ballot there was joined to this an appropriation of $25,000 to buy the block south of the present West Lake Park, and extend the lake.

The public looked on the latter as an attempt to load a mud hole on the city at an exorbitant price and defeated the bonds by a small margin. To the members of the Academy the city owes the museum in Exposition Park. When we from our funds and donated contributions revealed the wealth of fossils in the Brea pits there was no possibility of presenting them to view except by establishing a museum. By the efforts of Mr. Bowen who had generously devoted years of his time to prevent the exposition park from being appropriated by the old agricultural association; to Mr. Howard Robinson of the Audubon Society; Mr. Guinn of the Historical Society and the members of the Academy the supervisors were induced to consider the feasibility of establishing a museum. Fortunately for the public and all concerned we had an unusually intelligent body of supervisors who were heartily in accord with us.

The museum has been built but is already too small, so the architectural association have evolved a plan whereby the existing unit can be gradually added to and all combined in a harmonious manner.

But for the initiative action taken by the Academy of Sciences it is doubtful if any museum would have been built for many years to come. The Academy has done and is doing good work for southern California. The funds acquired by life memberships is devoted to the publication of the Bulletin. The members ought therefore to make a special effort to augment this fund as it is only through the printing press that we can fill our niche in the scientific world.

It is learned with regret that Samuel Bonsall Parish passed away in Berkeley, Cal., June 5, 1928. He was born in Patterson, N. J., January 13th, 1838. Mr. Parish contributed many noteworthy botanical papers to the "Bulletin."

STUDIES IN PACIFIC COAST LEPIDOPTERA

(Continued)

JOHN ADAMS COMSTOCK

In the issue of September, 1927, Bulletin, So. Calif. Academy of Sciences, p. 67, was given a description of the egg of *Callipsyche behrii* Edw. An illustration was also included on page 68. This year, in the same district of the Tejon Mountains, in which the eggs were collected, a large number of the larvæ of this species were secured by beating the *Purshia* bushes. This makes possible a description of both the larval and pupal stages.

Larva, when mature, length, 12 mm. Greatest width 3.75 mm. Predominant color green, although a few examples show a rich brown.

There is a narrow whitish mid-dorsal line, poorly defined on the anterior segments, and missing on the caudel segment, but clearly shown throughout the greater part of the body. Lateral to this line, on each of the typical segments, is a reniform dark green spot. External to this is a diagonal series of lines, composed of yellow, white and green elements. These give to each segment, when viewed dorsally, a sagittate appearance. Lateral to this series of diagonal lines occurs a clearly de-

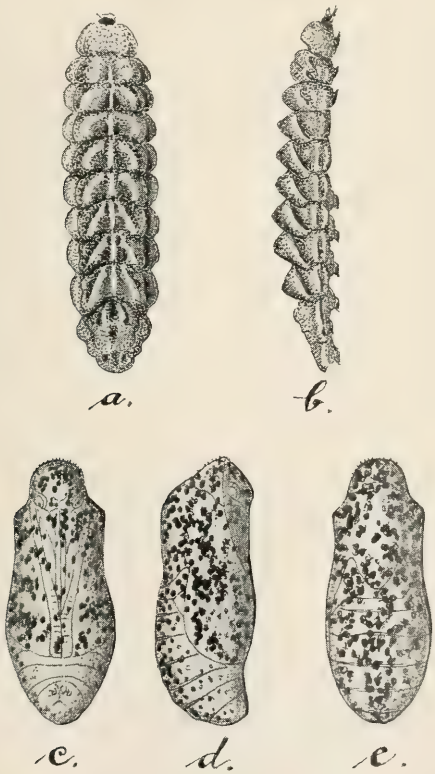

PLATE II.

a. and b.—Larva of **Callipsyche** behrii, dorsal and lateral views, enlarged.
c. d. and e.—Pupa of Callipsyche behrii, ventral, lateral and dorsal views, enlarged.

fined substimatal yellow line, bordered below by a dark green stripe. Inferior to this is a very narrow broken yellow line.

Head, brownish to black. Abdomen and prolegs, green. True legs yellowish.

The entire body is covered with minute short yellowish pile. The protruded segments and depressed intersegmental lines, together with the mottling of yellow and green, are an excellent protective pattern, causing the caterpillar to blend harmoniously with the foliage of its food plant, *Purshia glandulosa.*

Larvæ were found in practically all stages of development, on May 6th, and again on May 20th. Probably the species overwinters as an egg.

Pupa.

Length, average—8 to 9 mm. Greatest width, 3.75 to 4 mm. Ground color light tan, on which blotches of dark brown are irregularly scattered. A few extremely short simple hairs are scattered over the head region and the dorsum, the remainder of the chrysalis being bare. A few examples show a ground color over the dorsum and wing covers that is of an olive shade. The accompanying cut gives the shape more accurately than would a lengthy description.

———————:O:———————

The egg of a southern race of *Tharsalea arota* was illustrated in our "Butterflies of California". A large number of larvæ of the typical insect were secured this spring (May 6, 1928) on *Ribes cereum.* From these, the following descriptions were prepared:

Tharsalea arota Bdv. Larva, when mature, 15 mm. Greatest width 5 mm. Slug-shaped as with most Lycænid larvæ. Ground color, green, a little darker at the head end. Some examples acquire a rosy blush shortly before pupation. Under magnification the dermis is seen to be sprinkled with minute white tubercles, and to be covered with short single yellowish-white vibrissæ arising irregularly from the skin surface, not from the tubercles. These are so short as to be barely discernible with the naked eye on the full grown larvæ.

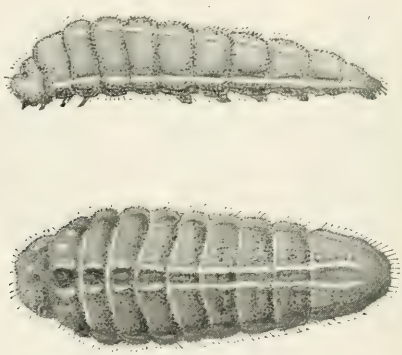

PLATE III.

Larva of **Tharsalea arota,** dorsal and lateral view, much enlarged.

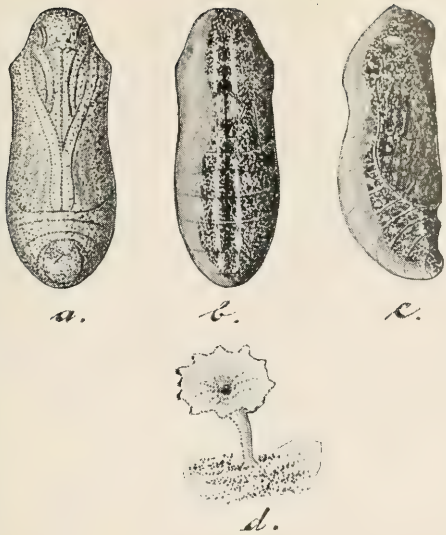

PLATE IV.

Pupa of **Tharsalea arota.**

a, b, c—Ventral, dorsal and lateral views. d—Minute hair-like process occuring on chrysalis; much enlarged.

A double whitish line occurs dorsally, from the second dorsal segment almost to the anal extremity. This is broken at the first three segmental junctures, but is practically continuous from then on. A fine single yellowish line also occurs laterally.

Head, yellowish-green, except for a slight brownish tinge about the mouth parts. True ocelli black. Abdomen green. True legs green except for the tips, which are brown. Prolegs green.

The same color and pattern occurs on a larva only 7 mm. long, probably in the second instar.

Chrysalis. Length, 9.5 mm. Greatest width, 4.75. Ground color of newly formed chrysalis, olive green, changing to a brown or mottled yellowish-brown. On the dorsum there is a faint suggestion of a double broken transverse line of a dirty white, over which the brown blotchings are absent. In the mid dorsal area, between these lines there is a slight intensification of the brownish mottling. There is also a suggestion of a light sub-stigmatal line on the sides of the abdomen.

Under low magnification the surface of the chrysalis appears to be finely pitted with translucent white points, but higher magnification shows these to be minute hair-like processes with flaring trumpet-shaped termini, as shown in the illustration. These are not present on the wing covers, or along the abdominal surface. They are particularly numerous anteriorly and on the dorsum of the abdominal segments.

As the chrysalis nears maturity the dark blotchings become heavier and darker. There is, however, great variation in the color, some examples being very light, others almost black.

A delicate silken loop is formed by the caterpillar, for suspension over the thorax. A few examples fail to show this, pupation with these occuring in the debris at the bottom of the breeding cage.

Plebejus melissa Edw. is one of the widely distributed blues of western North America, occurring from Kansas to the Pacific Coast. In spite of this extensive range and comparative abundance, almost nothing is known of the early stages. In the mountains of southern California, *melissa* is well represented by the race *lotis* Lint. An example of this race was observed in the act of ovipositing, and a few specimens of the eggs secured for purposes of illustration. The single female under observation laid most of her eggs on small pebbles close to the base of a lupine, or on small leaves of the main stem near its juncture with the ground.

Egg. Color, light green; shape, echinoid, the top flattened, micropyle depressed, the area around it slightly raised. The surface is covered with a reticulation of raised ridges which help to form depressed pits disposed in irregular pattern over all exposed surfaces. Where the ridges meet there are protruding points. The floor of each pit is finely perforated. Those pits which occur within the mocropyle are very minute, while those around the micropyle, though slightly larger, are of lesser size than on other surface areas. These pits grow progressively larger as the outer surface is reached.

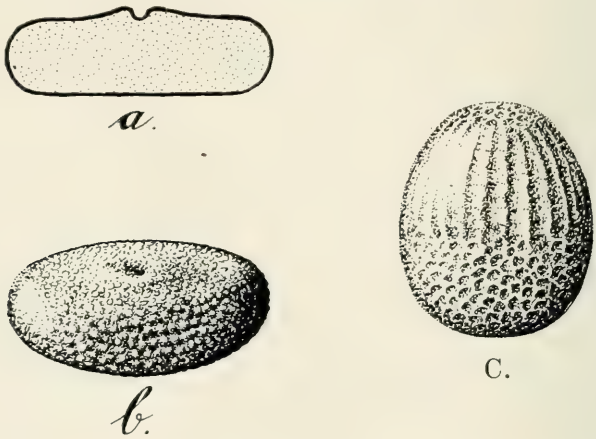

PLATE V.

a, b—Egg of **P. melissa**, highly magnified, the upper cut representing a cross section.
c.—Egg of **Mel. neumoegeni**, highly magnified.

In Vol. 22 of the "Bulletin" p. 69, a number of notes were given concerning the early stages of *Melitæa neumœgeni* Skin. During March of this year we were fortunate enough to observe the ovipositing of this species, which thus completes the description of the life cycle, except for detailed observations of all the larval moults.

Egg. Light green, exactly harmonizing with the foliage. Measures about ½ by ¾ mm. Micropyle not depressed; finely pitted. Upper half of egg covered with raised longitudinal ridges, about twenty in number. Lower half finely pitted.

The female approached the foodplant (*Aster tortifolius*) by dropping to the ground near it, and then crawling into the bush. The eggs were deposited in a mass, on the under surface of a small leaf, low down in the bush. There were 97 eggs in the cluster, deposited irregularly, and close together, the centre of the mass being three deep. Approximately half an hour was consumed in the act of laying. Eggs laid March 26th; emerged April 5.

The larvæ, when newly hatched are covered with long dark single hairs, sparsely scattered over the surface. Head, blue-black. True legs, sooty black. Body, yellowish white—also prolegs.


1.
2.
3.
Some parasite flies, and cocoons.
4.
(Polyembryony.)
(many individuals from a single egg.)
A. nest of 324 parasite flies hatched out, open, destroyed caterpillar. Aug 16th. 1926.
5.
Some parasite wasps, and cocoons.
6.
7.
8.
9.
10.

PLATE VI.

EXPERIMENTS ON A SPECIES OF MIGRATING BUTTERFLY

By WILHELM SCHRADER

Los Angeles, California

A number of butterfly species have the habit of migration, perhaps the most noted of which is Pyrameis cardui, commonly known as the Painted Lady. This designation is particularly fitting on account of the gay coloration and intricate pattern of this interesting butterfly. It is a widely distributed insect occurring in most portions of the globe. Much has been written concerning its habits and life history. There are, however, several points still to be determined, some of which concern the origin of the migratory swarms that have been recorded. For this reason the author has undertaken a comprehensive study of the species.

It is obvious that in order to produce the great aggregations of butterflies, such as have been noted, the species must be very prolific. To determine this fact I secured in the spring of 1927 a number of small caterpillars for experimental breeding. To accelerate their growth these were placed in the incubator. The resulting butterflies were allowed to copulate in captivity. It was found that the species is much longer lived than the average butterfly and also that it has the peculiar habit of copulating late in the day rather than in the warm mid-day hours. This condition accounts for the fact that Pyrameis cardui is observed in flight after five o'clock P. M., while other species have settled for rest before that time. The first pair from the above hatching were observed in copulation May 11. These were put in a separate wire cage with small plants of a species of Malva. The young larvae became so numerous that the food plant had to be renewed three times. On the 19th day of May the same pair were again observed in copulation which is an unusual occurrence. The male lived until the 27th and the female was killed on the 31st, after she had ceased laying, and owing to her damaged condition. From this single female there resulted by actual count 685 caterpillars. In a state of nature it is not unlikely that even a greater number would have been produced. Thus we note not only the increased life span of this species but also the great number of progeny.

The preferred food plant of this butterfly, notably, Malva, is plentiful in this state in the early spring, but dries out during the summer. If the season happens to be favorable the spring brood of Pyrameis would occur in great numbers and the resulting larvae would soon exhaust the food plant. The following generation would find insufficient foliage on which to oviposit and would not be able to reproduce unless it migrated to a district of greater rainfall or later season. This may perhaps account for the northerly drift of great swarms of these butterflies in the spring of certain years. The scarcity of Malva and related plants through the summer and fall probably serves as a check on the reproduction of subsequent broods, hence we do not find migration occurring in the fall.

There seems to be a provision in nature for maintaining a balance between species. If a given insect occurs in abnormal numbers it is soon followed by the increase of its parasites. The butterfly under consideration has a considerable number of enemies in the form of parasitic wasps and flies.

The metamorphosis of Pyrameis cardui has been described by several authors, but a brief summary would not be out of place. The eggs are green in color, simulating the shade of immature leaves of Malva. They are deposited singly. The newly hatched larva first consumes the egg shell and then for a while feeds upon the upper surface of the leaf. Shortly it constructs a web over itself drawing the edges of the cup-shaped leaf together and thus creating a protective covering. In spite of this protection a number of minute parasites may gain access. One of the latter is shown in our figure 1 of plate VI. These parasites deposit their eggs on the dermis of the caterpillar and the larval parasite burrows in and feeds upon the tissues of its host. Cardui larvae that are parasitized by the insect previously referred to usually succumb when about one-third grown. The parasitic larva cuts its way out through the skin of its host and forms an oblong silk cocoon as shown in figure 2, plate VI. The adult parasite emerges in a few days and is ready to repeat its life cycle.

As the larva of P. cardui grows it consumes the walls of its enclosure and is then compelled to move. During this period of its exposure and before it has constructed a new abode it is subject to the attack of the small fly shown in figure 3, of plate VI. The caterpillar thus attacked may mature and form a chrysalis before the parasites emerge. Eventually, from 12 to 18 parasitic larvae emerge, and form separate brownish cocoons, as shown in figure 3, of plate VI.

The caterpillars of P. cardui are exceedingly variable in color, ranging from a silvery gray to nearly a solid black, the shade and intensity of color being influenced by the amount of sunlight they have received.

The chrysalis is protectively colored in gray and gold, and because of its inconspicuous pattern is not often observed.

When disturbed it frequently sets up a wagging motion, vigorously jerking itself from side to side, in a manner calculated to discourage the attack of smaller enemies. The chrysalis is attached at the extreme tip of the abdomen, and is suspended by a number of minute hooks fastened into a tuft of silk.

Practically all insect larvae are subject to parasitic attack. Figure 4 of our plate shows the caterpillar of a small moth with a portion of the 324 minute flies which emerged from it. Figure 5 of the same plate illustrates 20 parasitic wasps with their pupal cases, which resulted from another parasitized caterpillar. The last two figures are examples of that remarkable phenomenon of polyembryony (i.e. many individuals from a single egg) as noted by Prof. W. S. Showalter.

Pyrameis cardui can stand a wide range of temperature. I have subjected chrysalids to a continuous dry air environment at 116 degrees Fahrenheit and had them emerge in the remarkably short time of three days and twelve hours. The lightly colored example shown in figure 6 resulted from such an experiment.

In contrast to the above, figure 7, a dark example, was subjected to moist air at 40 degrees F. for four weeks, at the end of which it emerged without the temperature having been raised above that point.

When we observe the marked change in color and intensity of markings in a single generation, resulting from different temperatures, it is more easily understood that a given species, subjected to a cold climate for countless generations has a fixed color pattern differing from that of the same species residing in a location of high temperatures. Seasonal color changes are also explainable for the same reason,—since the marked contrasts between the spring and fall, or the wet and dry seasons in certain regions, would subject the seasonal broods of caterpillars to vastly different thermal influences.

Figures 8, 9, and 10 of our plate illustrate some of the interesting aberrations of P. cardui which are occasionally observed during a short period of the summer season. There has been much speculation as to the causes of these peculiar color and pattern changes. The author is carrying on a series of experiments in an effort to answer these questions, the results of which will be published in a subsequent issue of this Bulletin.

PROCEEDINGS OF THE SOUTHERN CALIFORNIA ACADEMY OF SCIENCES

Regular meeting was held in the Auditorium of Los Angeles Public Library, December 6th, 1927 at 8 P. M. The lecture of the evening was given by Colonel J. R. White, Superintendent of General Grant and Sequoia National Parks whose subject was "Sequoia Park and the Big Trees." The talk was illustrated by beautifully colored lantern slides, and all who attended, were filled with desire to visit our California giant groves.

Regular meeting was held in the Auditorium of the Los Angeles Public Library January 3rd, 1928 at 8 P. M. Alfred Cookman, M. S., President of the Nature Club, and instructor in biology in the Polytechnic High School, gave an address on "Two Creatures Feared and Hated by Man." The reference being to spiders and snakes. The speaker illustrated his instructive talk with lantern slides and specimens from his collection, both living and preserved. Much time was given to the most deadly of insects the "Black Widow" and valuable advice given to those who might be so unfortunate as to be victims of its bite. Interesting statistics were given as to the relative toxicity of the venom of these animal groups. To offset this unsavory power of these creatures the lecturer spent time in speaking of the beauty of workmanship and architectural ability of the Arachnidæ and the many good points of the reptiles, often lost sight of by Man in his instinctive fear of the whole group.

Regular meeting was held Feb. 17th at 8 P. M. in the Public Library. "The National Parks and Policies Governing their Protection," was the subject of the evening, and was illustrated by lantern slides and reels of film depicting the natural beauties of our parks. We had three speakers, Hon. Stephen T. Mather, Director of the National Park Service, Horace M. Albright, Supt. of the Yellowstone, and Cl. J. R. White, Supt. of Sequoia. Time was devoted to showing the care taken by our government in preserving these natural wonderlands, and in answer to criticisms by those not fully informed.

Regular meeting was held in the Artland Club Auditorium on Feb. 20th. A Danish musical program was followed by a lecture on "The Dutch East Indies," by Baron Thoe Swartzenberg who illustrated the life of his people in this distant colony by beautifully colored slides. The result of the talk was the realization of the masterful colonizing ability of the Hollanders, and a desire to know better the interesting natives of those islands.

Regular meeting held in Auditorium of Public Library on March 6th. The subject of the evening was "The Antiquity of Man," by Dr. John A. Comstock, who traced the evidence of Man from the earliest discovery of a primitive brute to the coming of those prehistoric artists who painted and carved the walls of the caves of Southern France. The talk was illustrated by lantern slides, instructive charts and diagrams, and flint implements of early European Man from the collection of Dr. R. H. Swift, showing clearly Man's rise to the dominant figure we find him at the dawn of history.

Regular meeting of Academy held in Auditorium of Public Library April 3rd. "The Lily, Iris and Orchid of California" was the subject of the address of the evening by F. M. Fultz, illustrated by beautiful lantern slides of these flowers from his new book on the subject.

Regular meeting in the Auditorium of the Polytechnic High School was held April 10th. An illustrated lecture by Mary Proctor, noted English Astronomer and daughter of the late Richard A. Proctor, was given on "The Romance of the Sun and Moon," a wonderfully told story of Man's progress in his knowledge of the Universe in which he lives.

On April 13th the first monthly meeting of the newly formed Archæological Section of the Academy was held in the County Museum. An illustrated lecture on "The Ruins of the Mesa Verde," by Dr. J. A. Comstock was followed by a discussion on recent finds placing the Antiquity of Man in America by the members of the section present. Invitation to join this new section, and take active part in its work was extended to all members.

May 1, 1928. A lecture was held in the L. A. Public Library, the subject being "The Islands of the Santa Barbara Channel", presented by Mr. Norman Stewart of the Santa Barbara Museum of Natural History. The speaker touched on the history, archæology and geological formation of these comparatively little known islands of our southern coast. His presentation gave strong influence to the plea for the acquiring and preservation of Santa Cruz Island, under the administration of the State Parks Commission.

* * * *

On May 11th, the second meeting of the Archæological Section of the Academy was held at the Los Angeles Museum. The Section showed a very gratifying growth in greatly increased attendance. The program was given by Mr. C. Warren Temple, and was illustrated with slides prepared from the speaker's photographs. The subject, "Araba Petra" was presented in a graphic and entertaining manner, and gave a vivid impression of the rock-hewn temples and marvelous preservations of this closely guarded Greco-Roman citadel. Mr. Temple made three trips to the mountain encircled valley of Petra, where few travelers have been able to penetrate. His photographic successes while there were made possible largely through his knowledge of the Bedouin language, customs and religious prejudices, and his personal friendship with certain chiefs.

May 17th, 8:00 P.M., in the Lecture Hall of the Artland Club. The Astronomical Section sponsored a lecture by Mr. Harry K. Sargent, on "Stars and Planets". This was a popularization of the subject of the planetary relations of our solar system, illustrated with lantern slides.

DR. R. H. SWIFT, Secretary.

RECORDS OF THE LORQUIN ENTOMOLOGICAL SOCIETY

The informal discussions held monthly by the Lorquin Entomological Society have brought to our attention many interesting observations concerning the species of Lepidoptera peculiar to the arid regions of California. Desert collecting this spring has been unusually productive, but the light, early rains have caused the butterflies to emerge from one month to six weeks sooner than is usual. *Plebejus emigdionis*, for example, was recorded as early as April 2, by Dr. J. A. Comstock, while previous experience has shown the latter part of May to be the normal season for this small blue, which flies on the banks of the Mojave River, near Victorville.

An exceptional catch of two rare species, *Anthocharis cethura* and *Euchloe creusa* race *lotta* was recorded by Mr. F. W. Friday for March 15, near Little Rock, on the north side of the Sierra Madre Mountains. Mr. Friday captured 100 of the former, and 200 of the latter species in a few hours.

Mr. Charles Ingham, returned from Arizona, exhibited specimens of *Anthocharis pima* taken on Tucson Hill about March 15, where they flew in abundance in company with a few *Papilio bairdii*.

Dr. Comstock announces the determination of *Drudeophytum parishii* as the larvel food plant of *Papilio pergamus* by the capture of a female in the act of oviposition. The plant grows sporadically on the slopes of Sheep Canyon, near Wrightwood, where Dr. Comstock also netted seven of the large yucca-boring skipper, *Megathymus navajo*.

At the April meeting, Dr. Lyman J. Muchmore of the Los Angeles Museum lectured on "Beetles and How to Know Them," illustrating his lecture with specimens of the lead-boring beetle, the burying beetle, several lady-bird beetles, and many brilliantly-colored exotic Coleoptera.

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.

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
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"	9,	"	1.	January,	1910	1.00
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"	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
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DR. JOHN A. COMSTOCK

Southern California Academy of Sciences, 501 Edwards-Wildey Bldg.
Los Angeles, California.

BULLETIN OF THE
Southern California Academy of Sciences

LOS ANGELES, CALIFORNIA

Vol. XXVII   Sept.-December, 1928   Part 3

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Issued December 31, 1928.

Southern California Academy of Sciences

PLATE VIII

FRITILLARIA HUTCHINSONI n.sp.

Dr. A. Davidson

Bulbs subtended by numerous rice-grain bulblets; stems 4-5 dm. high, smooth, lower leaves in whorls of 7, linear-lanceolate, 5-6 cm. long, 5-7 mm. wide; racemes 10 flowered; flowers greenish, umbellate, not blotched; perianth segments ovate lanceolate, 12 mm. long, 4 mm. wide with an ovate lanceolate central purplish patch; pedicels sharply curved, 1½-2½ cm. long; filaments 3 mm. long; anthers 2 mm. long; pistil 5 mm. long, styles connate throughout; fruit unknown.

Type No. 3652. Discovered by Mrs. W. W. Hutchinson on Glenville grade between Summit and Kern Co. Park; April 28, 1928.

In general appearance this plant resembles *F. mutica gracilis.* It differs in size and color of perianth and in the form of the pistil. From *F. Brandegie* it differs in having no hairs on the perianth segments.

STYLOPHYLLUM ANOMALUM n.sp.

Dr. A. Davidson

Caulescent and woody at base, branching above; basal leaves 4 cm. long, light green, linear, terete, slightly flattened at base; flowering stems several, 3-5 dm. high, rather weak, paniculately branched, leafy throughout, the leaves 5-15 mm. long, turgid, sessile and clasping at base; pedicels 5-10 mm. long; calyx lobes 3 mm. long, acutish; corolla 10-12 mm. long, white with a faint green central stripe; petals lanceolate-ovate acute, 4 mm. wide slightly overlapping at base but not united; stamens linear, 5 mm. long every alternate one adherent to the petal; anthers red; carpels united at base, spreading moderately.

Type No. 3653. Cultivated by Robert Kessler from specimen found on Coronado Islands.

This species can be distinguished from all the other Stylophyllums in having the petals non-adherent at the base and the cauline leaves clasping the stems. The form of the petals is also characteristic.

STUDIES IN PACIFIC COAST LEPIDOPTERA
(Continued)

Dr. John A. Comstock

Early Stages of Calephelis Australis Edw.

Through the courtesy of Commander C. M. Dammers, of Riverside, we have received examples of the egg, larva, and pupa of the Southern Metal-mark, *Calephelis australis*, which enables us to describe and illustrate the early stages of this exquisite little insect.

EGG: echinoid, about .6 mm. in diameter; a little more than half as tall as it is broad. Color of the main body of egg, a reddish wine, of the reticulations, glistening white.

Micropyle: depressed, finely reticulated, and surrounded by a circular raised white ring, which is minutely pitted over its surface. From this ring radiate 18 to 20 raised partitions or ridges,

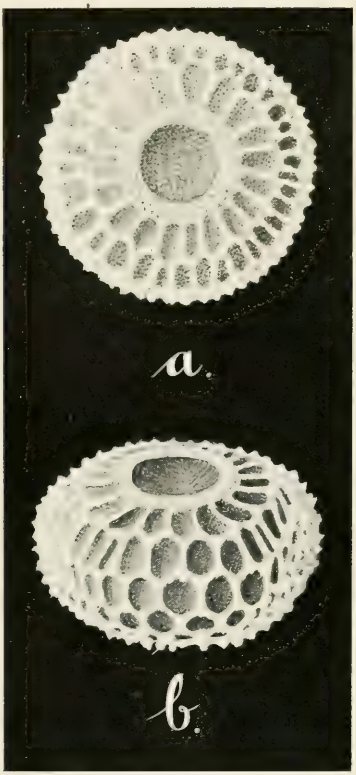

PLATE IX
Egg of *Calephelis australis* Edw. greatly magnified.

which connect with the walls of a series of hexagonal cells. At the point of juncture of these walls or partitions are raised white points. The remainder of the surface is covered in quite regular manner by rows of hexagonal cells, beautifully sculptured, their floors showing the beautiful lustrous wine color, and the walls crystalline white, with raised papillæ at the points of juncture. See Plate IX, Figures a and b.

LARVA: last instar; ground color, greyish-white, the dermis profusely studded with raised white nodules, which under high magnification are seen to be many-pointed branching stars of a crystalline white. There is a greyish mid-dorsal line, poorly defined, on each side of which occurs a line of nodules, bearing long filamentous white hairs. On the first few segments these nodules are single on each side, but from the fourth segment back they are doubled, making four to the segment. The posterior pair in each group are black and relatively more prominent. There is also a substigmatal row of these hair-bearing tubercles. The stigmata are yellow, and above each one is a lighter, irregularly squared area, margined superiorly with black.

Head; yellow, with brownish black blotchings, and short stubby hair. Ocelli; shaded at their bases with brown; mouth parts of the same color. Abdomen and legs, yellow. See Plate X.

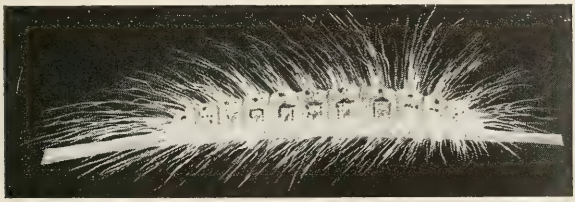

PLATE X
Mature larva of *Calephelis australis* Edw. enlarged.

This caterpillar is so profusely supplied with long white hair that it is difficult to observe its various parts. Particularly is this true of the head, which is hidden under a long fringe.

PUPA. Length, 9.5 mm. Greatest width 4 mm. Color, predominantly a light grey-green, somewhat translucent, the posterior segments tinged with light brown.

Thorax not strongly protruded, bearing a few short bristles. A faint mid-dorsal line, more strongly defined posteriorly. A few short bristles are scattered irregularly over the abdominal segments. There is a series of rather poorly defined tubercles bearing tufts of short bristles, placed sub-stigmatally.

The wing covers are bare, with a series of elongate triangular spots near their margins. A few small spots and shadings are disposed on the surface of the pupa, as shown in the accompanying

illustration, Plate XI, Figures a, b, c. No suspending girdle or button has been observed, the larva pupating on the ground.

The larva and pupa were described from a single example, hence it is impossible to record the range of variation in color and pattern. Commander Dammers states that in ovipositing, the female flies into the bush, and crawls down to the point of juncture of two lower limbs of the foodplant, *Bebbea juncea*, where the egg is deposited in the crotch. The larva feeds upon the greenish covering of the stems.

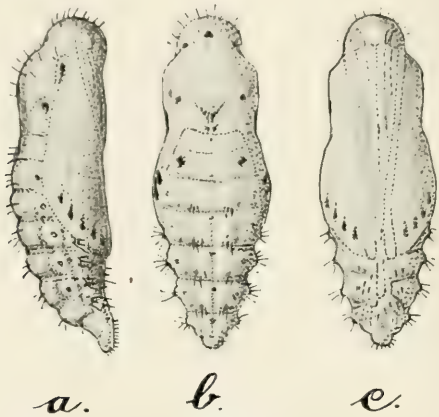

PLATE XI
Pupa of *Calephelis australis* Edw. enlarged.

Early Stages of Papilio Pergamus

This season has been a particularly favorable one for the observation and collecting of that rare butterfly of the southern Sierras, *Papilio pergamus*. In the early spring we reported the foodplant, in one of the meetings of the Lorquin Club, and this was followed by a number of our members collecting eggs and larvae.

Through the generosity of Mr. Hal Newcomb and Mr. F. C. Morand in donating ova, and of Mr. John Garth of Long Beach in presenting us with larvae, we are enabled to record the early stages, and prepare drawings illustrative thereof.

EGG. Spherical, pearly yellow, with irregular blotchings of brown: probably a clear yellow when first laid. The color changes to a bluish or purplish shade just prior to emergence. See Figure b of Plate XII.

PLATE XII

Egg and larva of *Papilio pergamus*

a.—Head, greatly magnified. b.—Egg, greatly magnified. c.—Larva, first instar, greatly magnified. d.—Mature larva, enlarged.

LARVA. First Instar: body dull black, covered with numerous jet black branching spines. Head, glistening black, covered with short simple vibrissae. The first thoracic segment bears three branching spines on each side, the two largest pointing somewhat anteriorly. There are two white points close to the juncture with the head in the mid-dorsal line, and eight or ten similar points close to the posterior border of the segment, the remaining portions being black.

The second dorsal segment has a few white points (6 or 8) close to its posterior border. This segment bears six large branching spines, and two rudimentary spines near the middorsal area. The third segment is solidly black except for two minute points on the anterior border, frequently hidden by the segmental fold.

It bears the same number of spines as the second segment. The fourth segment is similar to the third except for being entirely black.

The segment which bears the first pair of prolegs has eight small white spots, the largest being at the base of the proleg. The next posterior segment bears a broad irregular white band over its upper half, and a small white point on each side, lateral to the white saddle-like mark. The rudimentary spines of the mid-dorsal area are absent on this segment. The remaining segments are more or less typical, except for the few white points close to the anal area, as shown in our illustration.

A tuft of black hair occurs at the posterior end of the anal segment.

Abdomen, dull black. Prolegs, dull black, covered with minute hair. True legs, shiny black. See illustration, Figure c of Plate XII. Immature larva, second or third instar: Head, shiny black, covered with minute vibrissae. First thoracic segment, ground color dull black. There are 10 spines, 5 on each side of the mid-dorsal line. These are small, but otherwise of the usual branching character. The second from mid-dorsal line are the largest of the series. Anterior to these spines are 4 yellow spots, and posterior thereto are 8 or 10 similar in color and character.

The next dorsal segment has the same arrangement of spines, but with 8 yellow spots posterior to the spines only.

The next two segments are entirely black, the spines similar in number and character, except that the small spines next to the mid-dorsal region tend toward suppression, and one spine on each side laterally is lost.

The next segment, on which are the first pair of prolegs, is jet black, except for 8 small quadrate white spots on its posterior margin, and a large white spot on each side just above the base of the proleg.

The next segment is largely covered with white on its dorsal aspect, giving place to black on the latero-inferior area. On this segment the two small tubercles next to the mid-dorsal line have been entirely suppressed. Minute black hairs are noted protruding from the white surfaces, which are similar to those covering the entire body of the caterpillar, but are here shown in greater contrast.

The next two segments are entirely black, the spines being similar to those on other typical segments. Posterior to these, the next segment is black except for one small white spot, postero-laterally placed.

The next caudal segment has three large white spots on each side, on the black ground color.

The anal segment has one large white spot at the anterior base of the largest spine on each side, and a small pair of similar spots immediately above the anal orifice on each side.

Abdominal region, black, but of a less intense shade.

True legs, jet black.

Mature larva, last instar: ground color grey, of a soft velvety texture, each segment striped and blotched with black and with numerous yellow points.

Head: ground color yellow, mouth parts greenish yellow. The face is marked anteriorly by an upright triangle of shiny black, slightly open at the superior juncture. The ocelli are black or yellow, and rest on a shiny black oval. There is an elongate black area along the lateral edge of the face at its point of juncture with the first body segment.

The first dorsal segment is edged anteriorly with yellow, and has a broad band of velvety black stretched across it. The second segment is grey, with a saddle of black across it, and two yellow points at the side where the saddle ends. The next segment is similar except for a large blotch of black just above and in front of the base of the leg. There is a yellow sopt on a grey field, laterally placed on this segment. The next two segments are grey with an orange spot each side of the mid-dorsal line, back of which, (and partly surrounding the orange) is a saddle-like black spot. Laterally there is a spot of yellow on each side, just below the stigma, surrounded by an irregular black area. Similar markings with slight variations, occur on all other segments.

The true legs are yellow, with black on their upper surfaces and the false legs (prolegs) are a yellow-grey ground color, with large black spots on the sides. The abdominal surface is of a greenish grey shade. See Figures a and d of Plate XII.

PUPA. Length, 1⅛ inches for the average individual. The color is variable, ranging from a mottled brownish black to a

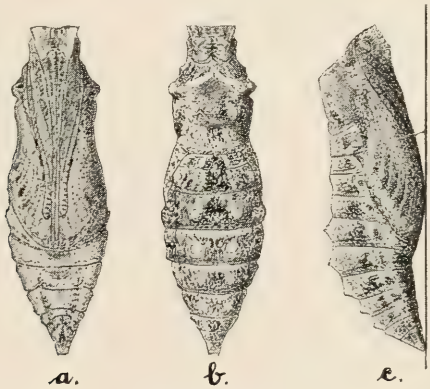

PLATE XIII
Pupa of *Papilio pergamus* Hy. Edw. slightly enlarged.

light sandy grey. In shape it is somewhat less robust than in *zelicaon*, with the anterior points less protruded. The form is accurately depicted in Plate XIII.

PLATE XIV

Egg and immature larva of *Nathalis iole* Bdv.
Both figures greatly magnified.

EGG. Color, orange yellow. Length approximately 1 mm., width .33 mm.

Shape, elongate, tapering at both ends, somewhat as in *Eurema*. The neck slightly constricted, the surface smooth, with barely perceptible colorless striations running longitudinally. There are approximately 30 of these fine lines running through the central robust portion of the egg, but these are reduced by fusion with adjacent lines as the constricted ends are approached.

Described and drawn from a single example sent to me by Com. Dammers. See Plate XIV, Figure a.

LARVA, newly emerged.

Length 1.25 mm. Color olivaceous, the head jet black, and bearing a few short vibrissae of same shade. There is a slight suggestion of a mid-dorsal line, lateral to which is a row of single black hairs, arising from dark papillae. A second and third row occurs lateral to the first as shown on our figure. See Plate XIV, Figure b. There is also a sub-stigmatal row, placed too far ventrally to show in our drawing.

Larval foodplant, *Bidens pilosa*.

MATURE LARVA. Two examples were submitted to us by Com. Dammers, which are widely dissimilar and show a considerable range of variation in the species. One of these is a solid dark green, entirely lacking the mid-dorsal stripe, and with only a faint suggestion of a stigmatal creamy line. The two cervical tubercles protruding anteriorly are faintly tipped with pinkish red. The second example is more characteristically colored, as follows:

Ground color, dark green. The dermis appears smooth under low magnification, but under higher power is seen to be granular in appearance. Each typical segment is divided into approximately five secondary folds, along the center of which are a number of single short colorless hairs (though an occasional example is dark), arising from greenish tubercles. At the base of each tubercle the dermis is of a slightly darker shade, surrounded by an irregular lightish green area. The median band is chocolate brown, and is free of tubercles and hairs. The stigmatal line is a well-defined creamy yellow, edged above with chocolate brown. There are two cervical tubercles pointing anteriorly, rose-pink in color, with a number of protruding hairs. The true legs are green, slightly shaded with brown at their tips. Prolegs, green. Head green, covered with short colorless pile. Ocelli, brown at the base, greenish at apices. Mouth-parts green, shaded at the tips of the protuberances. Length, 15 mm. See Plate XV, Figures a and b.

The color pattern of this larva is an excellent adaptation to the food plant—*Bidens pilosa* which is the same shade of green, and bears chocolate-brown stripes along the stems.

PLATE XV
Mature larva of *Nathalis iole* Bdv.
a.—Head and cervical segments, enlarged.
b.—Side view of larva, enlarged.

PUPA. Length 11 mm., greatest width 2¾ mm.

Color green, profusely mottled with minute white points over the dorsum and abdominal segments. Stigmata, white. The form is shown in Plate XVI, Figures a and b.

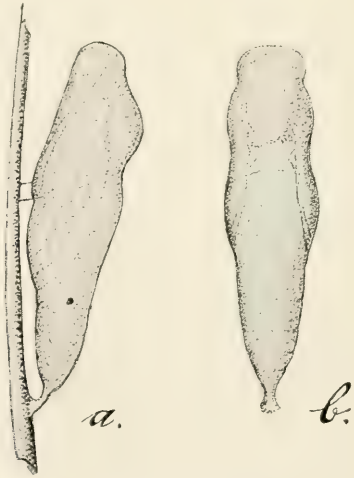

PLATE XVI
Pupa of *Nathalis iole* Bdv., enlarged.

Mr. John Garth, of Long Beach, observed a female of *Argynnis apacheana* in the act of ovipositing, and secured a single ovum, which has been placed at our disposal.

The egg was laid on a sprig of dried grass, in the vicinity of violets, the observation being made in Round Valley, Inyo County, California. For figure see Plate XVII.

EGG: Sub-conical, approximately 1 mm. high by 1 mm. broad at the base. Color, at first, cream, speckled with brown, changing to a dirty white with purplish mottlings. In the single example before us there are nineteen longitudinal ridges, between which are depressed troughs with numerous fine cross striations.

LARVA, newly emerged. Length 1.75 mm. Ground color of body, olivaceous. Head, brownish-black over crest, shading to olivaceous around the mouth. Ocelli black. A number of long vibrissae protrude from the surface of head, which are of an olive shade.

On each typical segment there are six single tubercules arranged in rows, three on each side of the median line, and below each stigma occurs a double tubercle. These tubercles are blackish and glistening and each one bears a single olivaceous long hair. The first cervical segment differs from the typical in having the four dorsal tubercles united to form a single plate.

The anal segment also bears a similar plate.

Legs, prolegs and abdomen, olivaceous.

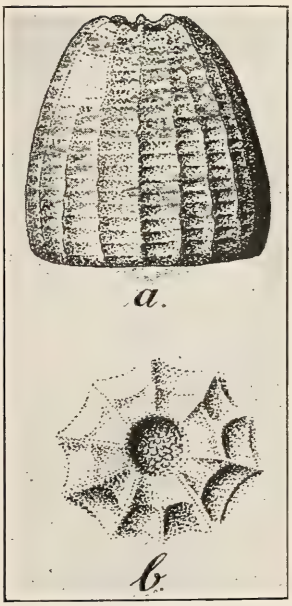

PLATE XVII

Egg of *Argynnis apacheana* Skinner.

a. Side view of egg, greatly magnified. b. Micropyle, greatly magnified.

THE BEAK OF PARAPAVO CALIFORNICUS (MILLER)

HILDEGARDE HOWARD, *Los Angeles Museum*

In 1927 the writer presented a review of *Parapavo californicus* (Miller), the California "Peacock".* This review comprised a detailed study of the main skeletal elements of *Parapavo*, with the exception of the mandible and beak. Comparisons were made with the existing turkeys, *Meleagris gallopavo* and *Agriocharis ocellatus*, and with the peacock, *Pavo cristatus*. It was concluded that *Parapavo* occupied a position in the family Meleagridae somewhat intermediate with regard to *Meleagris* and *Agriocharis*, though tending toward greater similarity with *Agriocharis*.

A description of the mandible was omitted at the previous writing due to the scarcity of specimens of this element and to the fragmentary nature of those which were available. The beak of *Parapavo* was not known at that time. No additional specimens of mandible are at hand, but fourteen, heretofore unidentified beaks, included in the collections of the Los Angeles Museum, have now been identified as *Parapavo*. These specimens are of a large gallinaceous bird, but were not recognized as such at first, because of their relatively great breadth; they are decidedly broader and flatter than the modern *Meleagris gallopavo*. Comparison with *Agriocharis*, however, shows the beaks to be unmistakably meleagrine, with *Agriocharis* intermediate in relative breadth between *Parapavo* and *Meleagris*.

The following table of measurements includes only five specimens of *Parapavo*. The other nine are on exhibit in the Los Angeles Museum and are not available for measurement.

Table of Measurements

	Breadth**	Depth	†Ratio of Depth to Breadth
Meleagris gallopavo			
L. H. Miller Coll.	11.7mm.	5.1mm.	42%
Agriocharis ocellatus			
L. H. Miller Coll.			
No. 19851	12.8	5.0	39
Parapavo californicus			
L. A. Museum Coll.			
No. K2477	15.1	5.1	33
K2476	14.8	5.1	34
K2474	14.7	5.1	34
K2475	14.7	4.7	31
K2478	14.7	4.6	31

*A Review of the Fossil Bird, **Parapavo californicus** (Miller), from the Pleistocene Asphalt Beds of Rancho La Brea. H. Howard, Univ. Calif. Publ. Bull. Dept. Geol. Sci. Vol. XVII, 1927, pp. 1-62.

**Measurement taken on a line with external nares.

†Measurement taken approximately 4mm. anterior to external nares.

In its closer resemblance to *Agriocharis* than to *Meleagris*, the beak of *Parapavo* agrees with the cranial portion of the skull. The conclusions previously set forth, regarding the relationships of *Parapavo*, are therefore substantiated by a study of the characters of this bone.

Pinus Edulis Engelm. Occurs in California.

During the latter part of March of the present year I journeyed into eastern San Bernardino County and spent a number of days in the New York Mountains. This is a rather picturesque range of granite and metamorphosed lavas lying close to the Colorado River. It rises to an elevation of 7500 feet and the higher portions of the range have a sufficient rainfall to encourage a growth of scrub oaks, piñons and junipers.

While descending the main peak my eye fell upon a two-needle piñon tree standing among one-needle specimens of *Pinus monophylla*. Further search revealed many of the trees, a goodly number of which bore fresh cones of the previous season. Inasmuch as the range of *Pinus edulis* extends to nearby areas along the Colorado River in the vicinity of the Grand Cañon it occurred to me that this tree might also occur within the limits of our state. The question was also raised that it might be merely a two-needle form of *Pinus monophylla*. Accordingly specimens of the branches and cones were collected and brought home for further study. Sections of the needles reveal that the number and arrangement of the resin ducts is that given as indicators of *Pinus edulis* Engelm (See Tidestrom, Flora of Utah and Nevada, p. 53). The cones are uniformly smaller than those of *Pinus monophylla* as are also the nuts. The local residents when questioned said that they had noticed that there were two sizes of nuts and that the smaller nuts always occurred on the trees bearing needles in bunches of two. Every character studied thus indicates that the tree is truly *Pinus edulis* and that we have a new tree to record for the state. Specimens have been deposited at the Pomona College Herbarium.

Edmund C. Jaeger,
Riverside Junior College.

May 15, 1928.

Regular meeting of the Academy was held in the Library Tuesday, June 5, at 8 P. M. The address of the evening was, "Old China of Yesterday." An intimate illustrated story of the life and art of old Cathay, by Dr. Edward T. Thwing, who has spent thirty years in the Orient. For some years the speaker was Educational Advisor to the Chinese Republic. Account was given of the contrasts of the Oriental Mind with the Western viewpoint. The development of Chinese writing and literature was shown in its relation to the mind of the people.

The annual meeting and banquet was held in the City Club, Monday, June 11. Reports were read by the president, secretary, treasurer and editor of the Bulletin. The president spoke of the history of the Academy, many of the early members being present. The secretary made a plea for increased membership, and for active participation in Academy affairs by the members. The treasurer assured the Academy of its financial stability and bright outlook.

B. R. Baumgardt, F. R. A. S., and past president, gave the address of the evening on, "The Millikan Cosmic Rays and Their Bearing on Our New Conception of the Universe." The development from the ancient Greek concept to our present understanding was attractively presented. The history of Dr. Millikan's discovery, the remarkable properties of the ray, such as penetrating nineteen feet of lead due to its minute wave length, and its probable origin in the "birth of matter," were handled in the speaker's usual masterful way. Those fortunate enough to be present agreed that it was a superb popular presentation of this difficult subject.

The season was started by an address on, "The Worlds Around Us," by Harry K. Sargent in a beautifully illustrated talk on man's recent advances in the study of the universe. It was a novel presentation in Mr. Sargent's usual good style. Some time was given to locating our sun in the stellar universe, to the enormity of some stars, and to the finds of other groups outside of the cluster of which our sun is but an insignificant member. This lecture was given September 18 in the Library.

The Archeological Section held its first monthly meeting of the season in the County Museum. Arthur Woodward, formerly with the Museum of the American Indian, spoke on "Wampum, and Early Trade with the Indians." It proved to be a very instructive talk on a very important phase of early contact with the Red Man. He pointed out from original sources, that while beads were used as barter among the early Indian peoples, that the great trade in Wampum was fostered by the Dutch, who placed it upon a commercial basis, so that it became used even by the whites of the

colonies up to quite modern time. Numerous examples were shown from the speaker's collection. The usual informal after-talk meeting proved most interesting as many phases of Indian craft and history were discussed by the speaker.

Regular meeting of the Academy was held at the Library on Tuesday, October 16. George W. Parsons, our president, spoke on "Arctic Alaska in the Gold Days." The talk was illustrated by slides made in the far North, about Nome, in those stirring days at the start of this century. The numerous personal touches caused to live again the trials and tribulations of men gone mad in the lust for gold, many wholly unprepared to stand the hardships of this land of the "Midnight Sun." Incidents of the dishonesty of officials, foiled by the law-abiding citizens, formed a rather amusing portion of the lecture.

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

REPORT OF THE LORQUIN ENTOMOLOGICAL SOCIETY OF LOS ANGELES

The meeting of September 28, 1928, was of particular interest because of the many productive summer trips of Lorquin members. Enterprising entomologists have collected in the Sierra Nevada Range north to Mt. Shasta, in the Colorado Rockies, and in the mountainous regions of Arizona and Nevada.

Mr. F. W. Friday and Mr. Charles Hill, returning from a three weeks' stay at Gold Lake, declared the predominant species of that section to be *Melitaea hoffmani* and *palla, Euphydryas sierra,* and several species of the complex genus *Argynnis.*

Mr. George Malcolm exhibited a remarkable series of *Pseudohazis eglanterina* and the dark form, *shastensis,* all collected in Northern California in the vicinity of Mt. Shasta. In June Mr. Malcolm took specimens of *Melitaea acastus* and *Euphydryas olancha* at Casa Diablo Lake, Mono County.

Mr. Morand, who visited Charleston Peak, near Las Vegas, Nevada, in July, brought back several hundred of the rare *Plebejus shasta,* specimens of the latter being even darker than the normal form *comstocki.* In addition, Mr. Morand was fortunate in obtaining a good series of a number of the genus *Euphydryas* hitherto unknown, which flies at elevations varying from 8,000 to 11,000 feet.

Mr. J. S. Garth and F. G. Wood, who collected in the Monache Meadows of Tulare County, were unable to secure specimens of *Melitaes pola monache,* known only from types taken by Dr. J.

A. Comstock in 1924; but succeeded in netting *Argynnis mormonia*, *Lycaena rubidus* and *editha*, and *Plebejus aquilo podarce* in abundance.

Commander R. M. Dammers, a recent and most valuable addition to the Lorquin membership, reports fall collecting in the neighborhood of Riverside quite productive. Mr. Dammers has recently contributed to our knowledge of the western butterflies by working out the life histories of *Nathalis iole* and *Calephelis australis*.

JOHN S. GARTH,
Secretary Lorquin Society.

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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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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"	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
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Bulletin, Southern California Academy of Sciences

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New species indicated by bold face type.

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