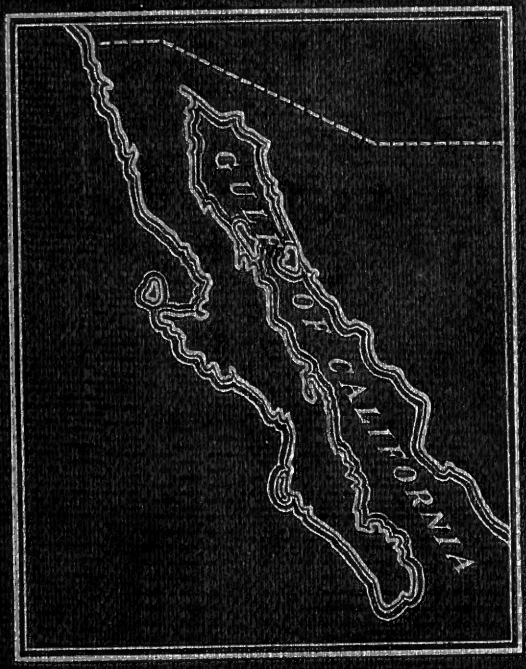
GULF OF CALIFORNIA


MARINE BIOLOGICAL LABORATORY
WOODS HOLE, MASS.

ARTHUR CURTISS JAMES

THE U. S. S. 'ALBATROSS'

IN

LOWER CALIFORNIAN SEAS

CRUISE OF 1911

Articles collected from the
AMERICAN MUSEUM BULLETIN
and NOVITATES, *and from*
ZOOLOGICA, *of the*
years 1912-1925

By
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J. A. Grossbeck
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TO

ARTHUR CURTISS JAMES

Trustee of The American Museum of Natural History, 1903-1923, expert sailor and navigator of many seas, Commander of the 'Aloha,' late Commodore of the New York Yacht Club. Through his generous confidence one of the last great voyages of the famous U. S. S. 'Albatross' namely, the cruise of 1911, was financed. The discoveries described in this volume form a fitting climax to the history of the ship designed by Spencer F. Baird and launched in 1882.

CONTENTS

INTRODUCTION

The work of the 'Albatross' in the Lower California region, as set forth in the fifteen reports comprising this volume, added much to what was already known of a section of coast and sea bottom occupying an intermediate position between the previously explored North Pacific and Panamic regions. During many years of hydrographic and fisheries work by this vessel, between California and Alaska, and also between Panama, the Galápagos Islands and southern Mexico, oceanographic knowledge respecting the eastern Pacific had been greatly advanced.

The narrow, elevated and arid peninsula of Lower California, nearly 800 miles long, that forms the western boundary of the great Gulf of California, has many forms of animal and plant life that are peculiarly its own, especially in its southern part, which touches the Tropic of Cancer.

The littoral marine fauna is no less interesting, the region being a meeting ground of many northern and subtropical forms. The pearl oyster is found far up toward the head of the Gulf, while corals of several species extend well into it. Clipperton, the only true atoll in the eastern Pacific, lies 600 miles below the mouth of the Gulf. The Pacific green turtle abounds on both sides of the Peninsula and the tortoise-shell about its southern end. Two species of marine mammals of Antarctic origin, the elephant seal and the Guadalupe fur seal, were formerly abundant along the entire west coast of the Peninsula, while the California sea-lion finds the southern limit of its range at the mouth of the Gulf. There are no other pinnipeds in this region.

The surface waters of the Gulf are decidedly warmer than in corresponding latitudes just outside of it and here sea birds of subtropical distribution abound. Boobies are found throughout the Gulf and the frigate bird and the tropic bird about its mouth. Certain auklets reach here their southern limits of distribution.

Ocean depths of 2000 fathoms are found within the mouth of the Gulf, the thousand fathom curve extends nearly a third of its length inland, and the hundred fathom line to its northern end. Bottom temperatures in the Gulf ranged from 49° Fahrenheit down to 44° in depths of 200 to 360 fathoms, and 37° in depths of 800 to 1000 fathoms. Bottom temperatures of 36° were found in the mouth of the Gulf at depths of 1200 to 1500 fathoms. Off Cape San Lucas in 630 fathoms, the bottom temperature was 39°, while at the surface it was 73°, a difference of 34°.

Currents along the west side of the Peninsula are in general southerly, those below the mouth of the Gulf northerly.

The Gulf, 700 miles in length by 100 in average width, has an abundant and varied fish fauna. Its fishery resources, although great, remain undeveloped except for the important pearl-shell industry, in connection with which an original method of pearl-oyster cultivation is practiced. A dozen species of subtropical food fishes of Atlantic origin are found here unchanged; whales are common and porpoises abound. Swordfish, sailfish and tuna have been taken in considerable numbers by the sportsmen. An account of the fishery resources of the region will be found in the first paper, pages 433 to 452. The mouth of the Gulf is nearly 300 miles in width between Cape San Lucas and Cape Corrientes.

With a salubrious climate, good harbors, and known to civilization since the time of Cortez, it has but a sparse population about its shores, and that largely at the southern part. The Gulf remains practically an unsailed sea for the sole reason that its northern end does not touch United States territory. It should be a highway of ocean traffic to the west coast of tropical America.

Large zoölogical and botanical collections were made by the 'Albatross' Expedition of 1911, along both coasts of the Peninsula and on islands in the Gulf, while oceanographic work was carried on daily during the voyage of more than a thousand miles from Cape San Lucas to Monterey, California. The hauls of the dredge along this course yielded hundreds of deep-sea fishes and thousands of invertebrates from depths varying from 284 to 1760 fathoms. Seven of these were in depths greater than one mile, one being in a depth of two miles. The large collection of deep-sea fishes brought back by the expedition contains 49 species, that of shore fishes 185 species. The collection of echinoderms numbered 2343 specimens of 117 species, and of brachyuran crabs 56 species. All of these collections were productive of species hitherto unknown.

The very large collection of mollusks from deep water and along shore contains so many new and previously known forms that it is being reported upon at great length by Dr. Paul Bartsch. The work will be published in separate volumes abundantly illustrated, volume one being practically completed both as to text and illustrations. The studies already made show that there is a close affinity with the molluscan fauna of the Panamic region. Members of widely distributed groups are common to both areas, while those less widely distributed show marked diversion from those of the Panamic faunal area, and less close relationship with those of the California faunal area extending from the end of the Peninsula northward to Santa Barbara, California. It is found that the mollusks dredged in Magdalena Bay are related to those of the Gulf

and not to those along the west coast of the Peninsula, indicating that this great lagoon was formerly connected with the Gulf, from which it is now separated by low land. There are descriptions and figures of all mollusks collected by the expedition, as well as those described from the Mazatlanic faunal area, centering at the mouth of the Gulf. The report will therefore serve as a manual of the mollusks of this region.

The progress of the dredging work from Cape San Lucas to Monterey, California, is set forth in Part One, pages 431 to 433. The records of soundings made at all dredging stations usually include air, surface, and bottom temperatures, with mud samples, and in some cases specimens of bottom water. Daily records of air and surface temperatures were kept by each watch throughout the voyage. All of the deep-sea soundings plotted on navigational charts of the Lower California region were made during previous voyages of the 'Albatross.' They show all that is known respecting the position of the 1000 and the 2000 fathom lines of depth. The bottom temperatures and other records connected with them are set forth in "Records and Bibliography of the 'Albatross,'" published by the U. S. Bureau of Fisheries. The deep-water soundings made during the voyage of 1911 will be added.

The comparatively small number of new forms of fishes and invertebrates dredged from deep water is doubtless due to the abundant dredgings previously made by the 'Albatross' both north and south of the Lower California region and during three earlier voyages into the Gulf. The dredgings in general have thrown much light on the subject of the distribution and bathymetric range of deep-sea forms. More than 450 specimens of reptiles of 63 species were obtained along the shores of the Peninsula and on islands in the Gulf. Of these, nineteen have been described as new. The total number of species of reptiles known to Lower California and the Gulf islands is 149. The reptilian fauna of the Peninsula has been derived from the north; that of the islands is related to it except in the case of those near the coast of Sonora. An interesting feature of the collecting work on certain of the Gulf islands was the discovery of lizards of large size, one (*Ctenosaurus*) exceeding thirty inches in length.

The collection of hundreds of birds and mammals contained several new species, all of which were from islands in the Gulf. The vegetation of Lower California may be roughly divided into that of the northern and central parts related to the flora of the southwestern United States and that of the southern end related in part to the flora of the Mexican mainland, from which it is, however, widely separated by the deep mouth of

the Gulf. The botanical collections were very extensive and contained many new species. The cacti of many kinds have been included in the great monograph of that family recently published in sumptuous form by the Carnegie Institution of Washington.

The general character of the localities visited and the progress of the work at each anchorage are commented upon briefly in the first paper.

CHARLES HASKINS TOWNSEND.

Scientific Results of the Expedition to the Gulf of California in Charge of C. H. Townsend, by the U. S. Fisheries Steamship 'Albatross' in 1911. Commander G. H. Burrage, U. S. N., Commanding.

Published by Permission of the U. S. Commissioner of Fisheries.

I.

Voyage of the 'Albatross' to the Gulf of California in 1911.

By Charles Haskins Townsend.

BULLETIN OF THE

AMERICAN MUSEUM OF NATURAL HISTORY.

Vol. XXXV, Art. XXIV, pp. 399–476.

New York, August 2, 1916.

Scientific Results of the Expedition to the Gulf of California in Charge of C. H. Townsend, by the U. S. Fisheries Steamship "Albatross" in 1911. Commander G. H. Burrage, U. S. N., Commanding.

Published by Permission of the U. S. Commissioner of Fisheries.

Zoölogical Papers Published.

I. Voyage of the 'Albatross' to the Gulf of California in 1911. By Charles Haskins Townsend. Bull. Am. Mus. Nat. Hist., Vol. XXXV, Art. xxiv, pp. 399–476. July, 1916.

II. The Northern Elephant Seal. By Charles Haskins Townsend. Zoologica. N. Y. Zoöl. Soc., Vol. I, No. 8, pp. 155–173, figs. 52–72. N. Y. April 15, 1912.

III. Mammals Collected in Lower California, with Descriptions of New Species. By Charles Haskins Townsend. Bull. Am. Mus. Nat. Hist., Vol. XXXI, Art. xiii, pp. 117–130, 4 illust. June 14, 1912.

IV. List of Insects Collected in Lower California. By John A. Grossbeck. Bull. Am. Mus. Nat. Hist., Vol. XXXI, Art. xxiv, pp. 323–326. Sept. 13, 1912.

V. Echinoderms from Lower California with Descriptions of New Species. By Hubert Lyman Clark. Bull. Am. Mus. Nat. Hist., Vol. XXXII, Art. viii, pp. 185–236. July 9, 1913.

VI. Shore Fishes from Lower California with Descriptions of New Species. By Raymond C. Osburn and John Treadwell Nichols. Bull. Am. Mus. Nat. Hist., Vol. XXXV, Art. xvi, pp. 139–181, figs. 1–15. May 26, 1916.

Zoölogical Papers in Preparation.

VII. Birds Collected in Lower California. C. H. Townsend.

VIII. Deep-sea Fishes from the Lower California Region. C. H. Townsend.

IX. Reptiles from Lower California. M. C. Dickerson.

X. Mollusca of the Lower California Region. Paul Bartsch.

Invertebrates other than Echinoderms and Mollusks.
(Yet to be assigned for study.)

Botanical Papers Published.

The Agaves of Lower California, By William Trelease.
Report Mo. Bot. Gard. 1911, pp. 37–65.

Botanical Exploration in Lower California, By J. N. Rose.
Jour. N. Y. Bot. Gard. Dec. 1911, pp. 263–272.

Monograph of the Huyeae, By Smith and Rose.
Part 12, Contrib. U. S. Nat. Mus., Vol. 16.

Mamillaria arida, Rose.
Monatsschrift fur Kakteenkund, Vol. 23, p. 181.

Botanical Papers in Preparation.

Monograph of the Cacti, Britton and Rose.

Article XXIV.— VOYAGE OF THE 'ALBATROSS' TO THE GULF OF CALIFORNIA IN 1911.

By Charles Haskins Townsend.

By a special arrangement with the United States Bureau of Fisheries, the American Museum of Natural History, The New York Zoölogical Society, the New York Botanical Garden and the United States National Museum, coöperated in a two months' voyage of the 'Albatross' in the Lower California region early in the year 1911.

Mr. Arthur Curtiss James, a Trustee of the American Museum, contributed $7,500 to the expedition. The Zoölogical Society and the Botanical Garden each contributed $1,000. The National Museum contributed the services of a naturalist. The Bureau of Fisheries furnished the 'Albatross,' with her officers and crew.

The various collections were to become the property of the institutions participating: all the preserved zoölogical collections to the American Museum, with a series to the National Museum; all the living specimens to the Zoölogical Society and the botanical collections to the Botanical Garden.

The Bureau of Fisheries desired information respecting the fish and fisheries and the oceanographical features of Lower California and the Gulf region, referring especially to the desirability of further knowledge regarding the supply of edible fishes, oysters and turtles, with the view to inaugurating a fish trade with our southwestern states.

The 'Albatross' being available for two months only, the voyage was accordingly arranged to include brief visits to as many different parts of the coast and islands as practicable, leaving time for considerable deep sea work during the return trip. The following itinerary shows that anchorages were made at thirty different points where marine and shore explorations were made:

Ports Visited	*Arrival*	*Departure*	
San Francisco		Feb. 23	
San Diego	Feb. 25	Feb. 28	
Guadalupe Island	Mar. 2	Mar. 4	
San Diego	Mar. 6	Mar. 7	
San Benito Ids.	Mar. 9	Mar. 10	
Cedros Island	Mar. 10	Mar. 12	(3 anchorages)
San Bartolome Bay	Mar. 13	Mar. 15	
San Cristobal Bay	Mar. 15	Mar. 15	

Ports Visited	*Arrival*	*Departure*	
San Roque Id.	Mar. 15	Mar. 15	
Abrejos Anchorage	Mar. 16	Mar. 16	
Santa Maria Bay	Mar. 18	Mar. 18	
Magdalena Bay	Mar. 18	Mar. 19	
Margarita Island	Mar. 19	Mar. 20	
Marcy Channel	Mar. 20	Mar. 21	
Cape San Lucas	Mar. 23	Mar. 25	
San Jose del Cabo	Mar. 25	Mar. 26	
La Paz (Pichiliuque Hbr.)	Mar. 27	Mar. 30	
San Josef Island	Mar. 30	Apr. 1	
Agua Verde Bay	Apr. 1	Apr. 2	
Carmen Island	Apr. 2	Apr. 3	
Mulege	Apr. 4	Apr. 5	
Concepcion Bay	Apr. 5	Apr. 8	(2 anchorages)
San Francisquito Bay	Apr. 9	Apr. 10	
Angel de la Guardia Id.	Apr. 10	Apr. 11	
Tiburon Id.	Apr. 11	Apr. 13	
San Esteban Id.	Apr. 13	Apr. 14	
Guaymas	Apr. 15	Apr. 15	
Santa Catalina Id.	Apr. 16	Apr. 16	
Santa Cruz Id.	Apr. 16	Apr. 16	
La Paz (Pichiliuque Hbr.)	Apr. 17	Apr. 19	
Espirito Santo Id.	Apr. 19	Apr. 19	
Ceralbo Island	Apr. 19	Apr. 19	
San Jose del Cabo	Apr. 20	Apr. 20	
San Bartolome Bay	Apr. 23	Apr. 23	
San Francisco	Apr. 28		

The zoölogical shore collections included 804 specimens of birds representing 143 different species; 259 specimens of mammals [1] of 59 species, ten of which proved to be new to science; 446 specimens of reptiles, of 47 species eight of which are new. A number of living reptiles were brought to the New York Zoölogical Park. A small but important series of insects was obtained and a very large collection of invertebrates.

The botanist, with assistance from the crew, made large gatherings of plants, obtaining about 1800 specimens. The collection of cacti was the most important of its kind ever brought from Lower California, and more than a thousand living specimens were sent safely to the New York Botanical Garden. Many of the plants have been described as new to science and there are many still to be studied. A short account of the botanical work by Dr. J. N. Rose appeared in the 'Journal' of the New York Botanical

[1] See 'Mammals Collected in Lower California, with Descriptions of New Species,' by Charles Haskins Townsend. Bull. Amer. Mus. Nat. Hist., Vol. XXXI, Art. XIII, pp. 117–130, June 14, 1912.

Garden for December, 1911. Most of the century plants [1] brought back by the expedition proved to be new species.

The time spent at the various anchorages was usually one or two days, affording the scientific staff opportunity for making a natural history reconnaissance of the coastal region of the peninsula at many widely separated localities.

While in the Gulf of California the ship was usually moved at night so that the days could be largely devoted to shore work. Moving rapidly from point to point as we did, the shore work could not be extended very far inland, nor could the work of collecting be made very thorough, but the naturalists made the best possible use of each day ashore.

The active interest of Captain Burrage and the officers of the 'Albatross' contributed greatly to the effectiveness of our work, while the expedition would not of course, have been undertaken without the coöperation of the Bureau of Fisheries.

Dr. Hugh M. Smith, U. S. Commissioner of Fisheries, authorized the publication of the results of the expedition by the institutions participating.

In the oceanographic work, dredge hauls were made with the large beam trawl at 27 stations in depths ranging from 284 fathoms to 1760 fathoms, mostly off the west coast of Lower California. Following is a list of the stations occupied, with their positions and depths;

Dredging Stations	*Lat. & Long.*	*Date*	*Fathoms*	*Bottom Temp.*	
5673	31 26′ 00″ N. 117 42′ 00″ W.	Mar. 1	1090	....	
5674	31 28′ 45″ N. 117 09′ 50″ W.	Mar. 8	590	39.4	
5675	27 07′ 05″ N. 114 33′ 10″ W.	Mar. 15	284	44.6	
5676	25 31′ 15″ N. 113 29′ 30″ W.	Mar. 17	645	39.0	
5677	25 23′ 45″ N. 113 16′ 00″ W.	Mar. 17	735	38.6	
5678	24 35′ 20″ N. 111 59′ 35″ W.	Mar. 21	13½	....	(Magdalena Bay)
5679	23 47′ 45″ N. 111 23′ 00″ W.	Mar. 22	325	44.1	
5680	23 40′ 30″ N. 111 12′ 45″ W.	Mar. 22	389	43.6	
5681	23 33′ 15″ N. 111 02′ 10″ W.	Mar. 22	405	43.3	
5682	22 48′ 20″ N. 109 52′ 40″ W.	Mar. 24	491	40.8	
5683	22 46′ 45″ N. 109 50′ 15″ W.	Apr. 20	630	39.1	
5684	23 23′ 30″ N. 112 00′ 30″ W.	Apr. 21	1760	....	
5685	25 42′ 45″ N. 113 38′ 30″ W.	Apr. 22	645	....	
5686	26 14′ 00″ N. 114 00′ 00″ W.	Apr. 22	930	37.3	
5687	27 39′ 15″ N. 115 16′ 00″ W.	Apr. 23	480	41.1	
5688	27 38′ 45″ N. 115 17′ 40″ W.	Apr. 23	525	39.9	
5689	29 23′ 00″ N. 116 14′ 00″ W.	Apr. 24	879	....	

[1] 'The Agaves of Lower California,' by William Trelease. Rept. Missouri Bot. Gard., 1911, pp. 37–65.

Dredging Stations	*Lat. & Long.*	*Date*	*Fathoms*	*Bottom Temp.*
5690	29 29′ 00″ N. 116 18′ 00″ W.	Apr. 24	1101	38.1
5691	31 08′ 20″ N. 118 29′ 30″ W.	Apr. 25	868	37.2
5692	31 23′ 45″ N. 118 31′ 30″ W.	Apr. 25	1076	37.1
5693	33 13′ 30″ N. 120 04′ 30″ W.	Apr. 26	451	....
5694	33 24′ 36″ N. 120 12′ 30″ W.	Apr. 26	640	....
5695	33 33′ 00″ N. 120 17′ 30″ W.	Apr. 26	534	38.9
5696	35 18′ 30″ N. 121 28′ 00″ W.	Apr. 27	440	39.9
5697	35 35′ 00″ N. 121 39′ 00″ W.	Apr. 27	485	39.8
5698	35 50′ 00″ N. 121 49′ 30″ W.	Apr. 27	475	39.9
5699	36 00′ 30″ N. 122 00′ 00″ W.	Apr. 27	659	37.9

The hydrographic observations connected with this work are presented in detail elsewhere in this report, and all sea and shore stations are indicated on the accompanying chart.

The dredgings were rich in new and interesting forms. Among the more striking results of this work for museum purposes, were fifty casts of deep sea fishes made on board from freshly dredged specimens, by Mr. J. C. Bell.

In these casts the following twenty-two genera are represented:

Venefica	Raia	Argyropelecus
Narcetes	Liparis	Leucicoris
Halosaurus	Nemichthys	Alepocephalus
Porogadus	Pleuronectes	Sebastolobus
Macrurus	Monomitopus	Melamphæs
Chaunax	Phycis	Scopelengys
Malthopsis	Merlucius	
Antimora	Lycodes	

The last (*Scopelengys*) was dredged from a depth of 1760 fathoms.

Of the deep sea collections, only the echinoderms[1] have as yet been studied. The latter consist of 1881 specimens, representing 107 species, seven of which were previously unknown; namely:

Zoroaster platyacanthus	Urechinus recticulatus
Pedicellaster hyperoncus	Lætmenœcus scotoeides
Diopederma axiologum	Stichopus parvimensis
Ophiura oligopora	

The collection of fishes obtained by the Albatross was a large one. The deep sea species have not yet been studied. The collection of shore fishes[2]

[1] Echinoderms from Lower California, with Descriptions of new Species. By Hubert Lyman Clark. Bull. Am. Mus. Nat. Hist., Vol. XXXII, Art. viii, pp. 185–236. July 9, 1913.

[2] Shore Fishes Collected by the 'Albatross' Expedition in Lower California with Descriptions of New Species. By Raymond C. Osburn and John Treadwell Nichols. Bull. Am. Mus. Nat. Hist., Vol. XXXV, Art. xvi, pp. 139–181, May 26, 1916.

contains 185 species of which the following 15 have been described as new:

Raja microtrachys	Amia guadalupensis
Urobatis concentricus	Girella simplicidens
Letharchus pacificus	Hermosilla robusta
Bascanichthys bascanoides	Callyodon compressus
Fundulus parvipinnis, sub sp. brevis	Callyodon microps
Tylosurus pterurus	Dactyloscopus cinctus
Siphostoma exile	Lucioblennius lucius
Atherinopsis sonoræ	

Most of the collection was obtained along the shores and about the islands, the deeper parts of the Gulf being muddy and apparently poor in fish life as shown by previous dredgings by the 'Albatross.'

The peninsula of Lower California is nearly 800 miles in length, with an average width of 60 or 70 miles. It is a mountainous region, having a central elevation, near the northern end, of over 10,000 feet.

The climate is almost rainless and the country as a whole is of desert character. Less than a hundred springs and streams have been described and of the latter only five or six flow permanently to the coast. Populated localities are necessarily located with reference to the limited supplies of water.

Lower California is rich in mineral resources but these remain undeveloped except in a few localities where sufficient water is obtainable. Agriculture is practiced under the same limitations as mining. The fishery resources are important but have as yet been but little drawn upon.

Zoölogically and botanically the region is of great interest to naturalists. Climatically it belongs to the Sonoran province of the temperate realm, usually described as arid. The fauna of the extreme southern end has many tropical characteristics, while much of the fauna and flora of the northern end is related to southern California.

The climate of the eastern side of the peninsula is warmer than that of the western side. Observations made on board the Albatross during the cruise along the west coast of the Peninsula from March 1 to 25 and from April 20 to 29, give the mean temperature of the air as 61° Fahr. and of the water at the surface 60°. While cruising in the Gulf of California from March 26 to April 20, the mean temperature of the air was 71° and of the water 68°.

Narrative. The steamer 'Albatross' left San Francisco at 9.30 A. M., February 23, 1911, under the command of Commander G. H. Burrage, U. S. N., who had instructions from the Bureau of Fisheries to proceed to San Diego and report for work during the months of March and April in the Lower California Region.

The vessel arrived at San Diego at noon on the 25th of February, where our party joined her. These were C. H. Townsend, Director, Dr. J. N. Rose, Botanist, Dr. Paul Bartsch, Conchologist, H. E. Anthony, Collector, P. I. Osburn, Collector, and James Bell, Modeler. Messrs. L. M. Tongue

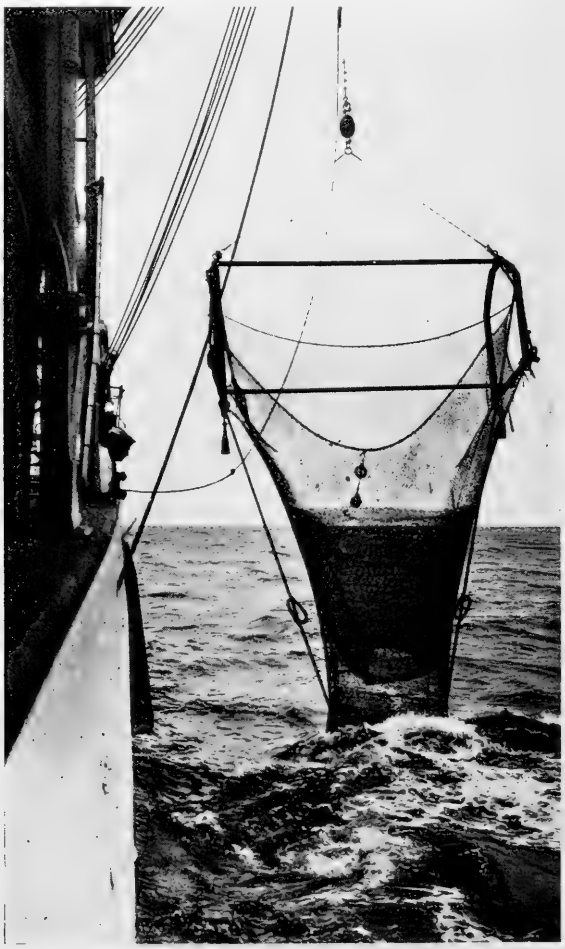

Fig. 1. The beam trawl of the 'Albatross' coming up with a load from deep water.

and W. L. Schmitt of the Fisheries Bureau were also with the expedition. After coaling and taking on supplies, the 'Albatross' sailed on the evening of the 28th, the course being laid for Guadalupe Island.

The following day a haul of the dredge was made in 1090 fathoms (Sta.

5673). The catch consisted of two fishes and numerous invertebrates, with about two barrels of stiff blue mud. The animal forms were roughly identified as follows: Fishes — 1 *Macrurus*, 1 *Raia;* Starfishes: *Eremicaster pacificus* and *Pectinaster agassizii.* Shells — *Trophon, Hemicardium,* 8 brachiopods, 8 *Dentalia;* Crustacea — 3 species of crimson prawns; miscellaneous — worms, ophiurans, holothurians, ascidians, silicious sponges, 1 very large pycnogonid, ophiurans and worms in tubes by hundreds. The blue mud obtained here proved to be interesting. Our modeler was in need of modeler's clay, of which we had but a small supply. With a little working by hand, the bluish, stiff mud from this and other dredging stations in this general region, could be made equal to the best modeler's clay. It was used constantly as a modeling clay on board the ship and was not distinguishable from the commercial article.

We arrived at Guadalupe Island on the morning of March 2, where the scientific staff was landed at the deserted camp near the northeast point. I started with the ship at once for the northwest side to examine the site of an old rookery of elephant seals which I had visited in 1892. At that time I was in charge of the schooner 'Santa Barbara,' making a reconnaissance of Guadalupe Island for the Department of State with a view to identifying the species of fur seal known to exist there. Two miles west of North Point I took a boat and began examining the coast, the 'Albatross' keeping off shore. I followed along the beach just outside of the breakers for a couple of hours to within two miles of Steamer Point, where I found about one hundred elephant seals hauled out on the sand beach below the cliffs and between two large rock slides. I killed one large male and one large female, which were skinned and taken on board at nightfall, along with six live yearlings. Early in the afternoon the ship left us some men, and returned to the east side to pick up the party landed there in the morning. On her return at dusk, she anchored about half a mile off the elephant seal beach in fifteen fathoms, where we spent the night.

The following day the sea was too rough for landing. We remained at anchor and spent the day in preparing the two large skins for museum purposes; our collectors working on the birds, plants, and other specimens obtained on the east side of the island the day before. Among the birds collected were the Guadalupe house finch, wren and snowbird. The goldfinch was observed. Nothing was seen of the Guadalupe flicker, which is believed to have been exterminated by former collectors. Several petrels were captured on board during the two nights we were anchored off elephant beach.

The beach occupied at present by the elephant seals is five or six hundred yards in length, and is not accessible from the island at any point. The

Fig. 2. Cañon at the northeast landing, Guadalupe Island, L. C.

morning of the 4th, I landed and shot two more of the large elephant seals. We spent the forenoon and half of the afternoon in skinning and skeletonizing these, several men working on the large heavy specimens. Each of the large males killed measured sixteen feet in length. Our operations caused very little disturbance of the rookeries; one large male remaining within thirty feet of where we were working. A few of the elephant seals left the beach, but the most of these soon returned and probably none of them would have moved if they had not been annoyed by the sailors walking among them.

The six yearlings taken the day before were captured by simply winding them up in nets to prevent them from biting, or escaping from the boats. I secured about fifty good negatives, showing the seals in various attitudes and the general character of the rookery. There was ample proof that this was the commencement of the breeding season; a dozen or more of the females being accompanied by very young pups. The latter were very dark colored and quite distinct in size from those of the apparently yearling class which we had captured alive. They were remarkably fat and almost incapable of movement on that account. Later in the afternoon before we sailed, I examined the shore line for a couple of miles south of Steamer Point, where I had observed fur seals in 1892, but found no signs of them. The Guadalupe fur seal (*Arctocephalus townsendi* Merriam) may be extinct. If there are any individuals left they probably occupy some of the numerous beach caves farther south, as it was the habit of the species to lie in such shelters.

Guadalupe Island is about 20 miles long and from 3 to 7 miles wide. It is 4500 feet high near the northern end and is of volcanic origin. The island is overrun with goats, which have contributed greatly to its barrenness. Although formerly used as a goat range, the animals being raised for their skins only, it has long been uninhabited. There are a few scattered cypresses, pines and cabbage palms about the higher elevations, and a few springs some of which fail in dry seasons.

Fishing at the elephant-beach anchorage was good, but the fishing ground about the island is limited, as it is surrounded by very deep water.

At nightfall the 'Albatross' sailed for San Diego in order that the young elephant seals and the large skins might be shipped eastward without delay. The entire following day was spent in cleaning and preparing the skins and skeletons of our four large specimens for shipment. We arrived at San Diego on the morning of the 6th. The young elephant seals were each crated separately and forwarded by express to the New York Aquarium, without food or water, as they would not eat and were in good condition. Later two of them were sent to the Zoölogical Park in Washington.[1]

[1] The writer has published a special account of the elephant seal in 'Zoologica,' Scientific Contributions of the New York Zoölogical Society, I, No. 8, pp. 159–173, pll. 52–72, April, 1912. He has also published an article on the same subject in the 'Century Magazine' for June, 1912, pp. 205–211.

Fig. 3. Elephant Seals. Guadalupe Island.

Fig. 4. Old male Elephant Seal. Guadalupe Island.

The 'Albatross' sailed southward in the evening. The following morning we dredged in 590 fathoms (Sta. 5674). The haul was a small but clean one, there being merely a handful of blue mud. The catch was as follows: Fishes — 1 *Stemonidium*, 1 *Cyclothone*, 2 *Melamphæs;* Invertebrates — 1 crimson prawn; schizopod, 1 starfish, and a few salpæ. This was a clean haul with only a handful of blue mud. It is interesting to note that all the fishes came up *alive*, an unusual occurrence from such a depth.

We arrived at the San Benito Islands early on the morning of the 9th. I examined carefully the north and east shores of West Benito in search of the fur seal which formerly existed there. There was a rookery of about one thousand sea-lions (*Zalophus californianus*) on the west side, extending fully half a mile along the rocks. It was evidently not the breeding season of the California sea-lion, as no pups were seen. Many weathered heaps of abalone shells were observed along the north shore, where formerly Chinese were engaged in drying abalone meat. Nests of the osprey, composed of dried sea weed, were observed on low rock pinnacles, about half of them containing sets of three eggs. As only one young osprey was observed, the nesting season was evidently not far advanced.

In the afternoon I examined the eastern shore of East Benito, looking over several small sea-lion rookeries in my search for the fur seal. There appeared to be about seven hundred sea-lions on this island. The collectors worked on both islands obtaining lizards, plants, fishes and invertebrates. Among the birds obtained were San Benito sparrow, MacGregor's house finch, sparrow hawk, rock wren, burrowing owl, osprey, oystercatcher, gull, duck hawk, hummingbird, horned lark, cormorant and Cassin's auklet. The surface of parts of East Benito was so riddled with the burrows of auklets that it was difficult to walk without breaking into them. A new species of century plant found at the San Benitos has been named *Agave disjuncta.*

We sailed early on the morning of the 10th for South Bay, Cedros Island. This locality has a much scantier vegetation than other parts of the island. The weather was extremely rough for landing. The collectors obtained comparatively little; the land birds being represented by sparrow and hummingbird only. Osprey eggs were brought on board, and gulls, cormorants and terns were seen. A few of the land birds observed were horned lark, house finch, Say's flycatcher, raven and vulture. Black-chinned hummingbirds were numerous. The collection of plants was good, and one species of mouse (*Peromyscus eremicus cedroscensis*) was obtained.

On the 11th the 'Albatross' arrived at the watering place on the southeast side of Cedros where the collectors were all landed. Birds were not abundant but a few species of land birds were obtained. The collection of plants and lizards was more important. A few mice were taken and a single

frog was captured at the spring. Work with the seine was more profitable and a good variety of fishes was obtained. Smelts and anchovies of excellent quality were very abundant, a few sweeps of the seine yielding more than a barrel of them.

Fig. 5. The 'Albatross' anchored between east and west San Benito Islands. Century plants (*Agave*) in foreground.

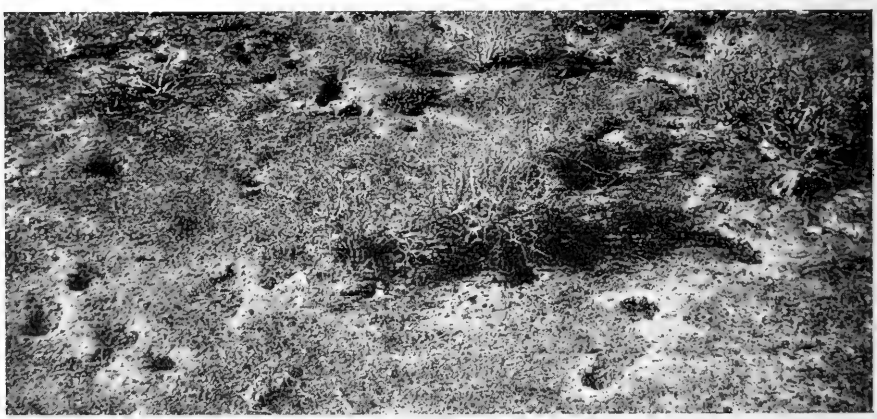

Fig. 6. Burrows of petrels. East San Benito Island.

The spring at this anchorage is the only place where fresh water can be obtained near the beach in this region of Lower California. The water is somewhat charged with sulphuretted hydrogen and has a very distinct odor.

On the morning of the 11th we arrived at the central part of the east side of Cedros and anchored opposite a beach at the foot of a wide, flat valley leading into the interior. The collectors followed up the valley, some of them climbing the high central ridge, covered with cedar trees, about four miles inland. About three miles inland the winding valley opened out into an amphitheatre, at the upper end of which is a spring of water where the main valley forks. This valley is the best route to the interior of the island. The spring water here also smelled and tasted of sulphur and left a whitish deposit on the ground. This is the only fresh water in this part of the island.

A good collection of birds, lizards and plants was obtained. The seining party got fishes similar to those obtained at the last anchorage. Photographs were taken of plants and scenery. I procured a fourteen-inch lizard

Fig. 7. The barren southern end of Cedros Island.

which had swallowed a ten-inch lizard. There were no snakes seen. Among the birds taken were finches, two species of hummingbird, burrowing owl, gnatcatcher, Audubon's warbler and wren. A few wild mice (*Peromyscus eremicus cedroscensis*) were taken in the traps.

A very interesting feature of the plant life of Cedros Island is the strange elephant tree (*Pachycormus discolor*) which takes a thick bush-like form. It sometimes reaches a height of twenty feet, with a spread of forty. The main stem may be more than a foot thick at the ground, and branches immediately into several arms, the branches are exceedingly thick and heavy and the bark, sometimes an inch in thickness, is a soft pulpy rind which may be cut readily with a penknife. The elephant tree is a monstrous growth in appearance and is commonly found on the lower hillsides and in the cañons. It is also found on the mainland. (See Fig. 10.)

The seining party obtained a good variety of fishes and the boat dredge

Fig. 8. Watering place, southeast side of Cedros Island.

Fig. 9. Head of the central valley of Cedros Island, showing on high central ridge, the cedars from which the island derives its name.

was towed by the launch with fair success. Cedros, like nearly all of the islands off Lower California, is uninhabited.

Sailing in the evening we arrived at San Bartolomé Bay, on the Peninsula, on the morning of the 13th. Here we found two camps of fishermen engaged in catching spiny lobsters (*Panulirus*), for the San Diego and Los Angeles markets. They supplied us most liberally with green turtles and lobsters in exchange for a barrel of fresh water in order to save themselves a 35-mile voyage to Cedros Island, the nearest place for fresh water.

An account of this lobster fishery will be found under another heading. Green turtles are very abundant here, and "Turtle Bay" is one of the names used for this locality. This was our first working place on the Peninsula and the scientific staff made the most of our two days' stay. We obtained specimens of coyote (*Canis peninsulæ*), deer (*Odocoileus hemionus peninsulæ*), woodrats (*Neotoma intermedia gilva*) and mice (*Perognathus penicillatus arenarius, P. fallax,* and *Peromyscus maniculatus coolidgi*). The birds included both water and land forms but the latter, as on the islands we had visited, were not very abundant or of many varieties. Among the species obtained were the large-billed sparrow, sage thrush, horned lark, wren and golden-crowned sparrow. Water birds were quite abundant, there being large rookeries of pelicans and cormorants at the entrance of the bay. Porpoises are common in the bay and we obtained one skull of *Tursiops gilli* on the beach.

The entire coastal region of Lower California is desert-like in character, as also are the outlying islands. The vegetation is low and brushy. As rain seldom falls, nearly all the vegetation has a decidedly dry and scorched appearance. The boat dredge was used successfully and the seining party obtained fishes in abundance and variety. Two large California jewfish (*Stereolepis gigas*) were taken at the anchorage. They weighed 138 and 204 pounds respectively.

Leaving on the morning of the 15th, we proceeded twenty miles south to San Cristobal Bay, where in 1884 I had obtained specimens of elephant seal for the National Museum when I was in charge of the schooner 'Laura.' While the 'Albatross' lay off shore I examined the beach for several miles from the steam launch at close range, but there were no signs whatever of elephant seals. A large California jewfish was taken at the anchorage. We moved off shore in the afternoon and dredged in 284 fathoms (Sta. 5675), making a good haul of fishes and invertebrates which were listed as follows: Fishes — 18 sharks (1 species, the largest being 18 feet long), 59 macrurids of 3 species, 1 *Nemichthys*, and two other species; invertebrates — 2 quarts of small grayish echini, 2 dozen anemones, 25 holothurians, 3 species of starfishes (*Pseudarchaster pusillus, Ceramaster leptoceramus,* and *Zoroaster*

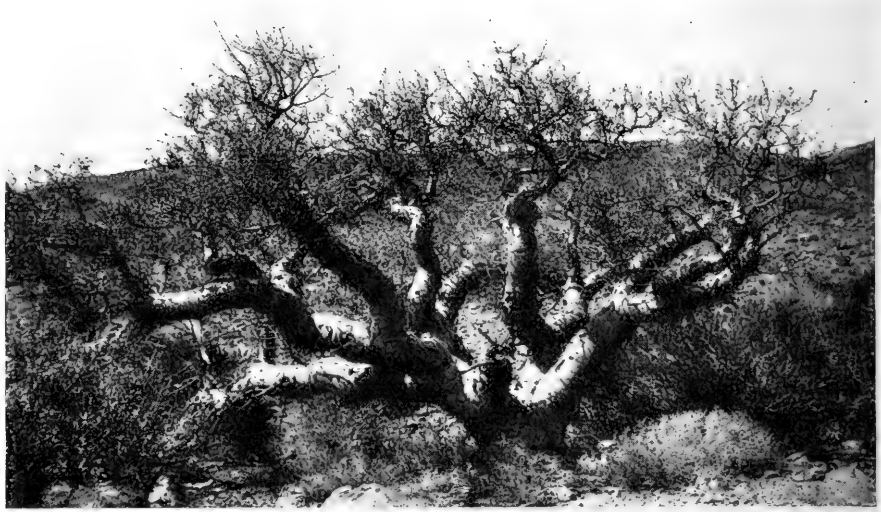

Fig. 10. Elephant Tree (*Pachycormus discolor*). San Bartolome Bay, Lower California.

Fig. 11. Seining party from the 'Albatross.' San Bartolome Bay, Lower California.

platyacanthus), 5 species of crustaceans, 25 ascidians, many *Nassa*, 4 *Amphitrite*, several Ophiurans, worms and numerous sea urchins (*Brissopsis pacifica*).

At five P. M. we landed on San Roque Island where collecting was carried on until dark. The island has rookeries of gulls, cormorants and pelicans. A few ospreys were seen about their nests. The soil of the island appears to contain considerable guano and the soft ground is riddled with the burrows of petrels and auklets. Steaming slowly during the night the 'Albatross' arrived at Abreojos Point, Ballenas Bay, on the morning of the 16th. The desert vegetation was sparse, dried up and much of it appeared dead although merely dormant. The locality was the most barren desert we had yet seen and there were no signs of fresh water. The seine hauls

Fig. 12. Pattern of lobster pot used at San Bartolome Bay.

yielded about half a barrel of large kingfish, as many young kingfish, a few flounders, smelts and anchovies. The beach was lined with rows of clam and other shells. Gulls and cormorants were abundant and a few sea lions were seen about the Point.

Sailing in the evening, we dredged the following morning in 645 fathoms (Sta. 5676), obtaining fishes and a good variety of invertebrates. The modeler made wax and plaster casts of all the species of fishes obtained. Contents of the dredge: Fishes — 5 *Malthopsis*, 1 *Venefica*, 1 *Halosaurus*, 1 *Porogadus*, 1 *Raia badia*, 3 *Macrurus*. Invertebrates — 26 hermit crabs, 12 holothurians, 14 red crustaceans, 2 *Polycheles*, 3 *Pennatula*, 3 medusæ, 1 squid, 1 salpa, 1 starfish (*Pseudarchaster pectinifer*), 4 worms, a few small mollusca.

Fig. 13. 'Abalone' (*Haliotis*) used as bait for lobster pots. Meat left attached to shell and suspended inside the pot. San Bartolome Bay.

Fig. 14. Camp of lobster fishermen, San Bartolome Bay.

We dredged again at one o'clock in 735 fathoms (Sta. 5677). The catch was roughly identified as follows: Fishes — 1 *Venefica tentaculata*, 1 *Scopelengys*, 1 *Melamphæs*, 2 other small species. Invertebrates — 2 large red *Lithodes* crabs, 1 *Polycheles*, 1 *Galacantha*, 1 *Glyphocrangon*, 2 crimson prawns, 17 small brown anemones, 1 large annelid, 2 red ophiurans, 1 *Venus*, 1 *Dentalium*, 3 purple holothurians, various small mollusca.

The large *Lithodes* crabs came up *alive*, an interesting fact considering the great depth.

Santa Maria Bay was reached on the morning of the 18th where we saw a remarkable flock of about a thousand cormorants flying in a compact mass near the anchorage. Porpoises were observed in the lagoon. Here the botanist found much that was interesting; among the plants was a new species of evening primrose which he has named after Captain Burrage, and a new century plant (*Agave connochætodon*). Among the birds obtained were mangrove warbler, yellowthroat, lutescent warbler, large-billed sparrow, Xantus jay, hummingbird, sparrow hawk, raven, Audubon's warbler, bittern and green heron. The boat dredge and seine were in operation most of the day. Among the food fishes were weak-fish, king-fish, and smelts. Lizards and shore invertebrates were also collected.

We proceeded to Magdalena Bay in the evening, arriving at ten P. M. On the morning of the 19th after calling on the collector of the port, the ship was moved to Margarita Island at the southwest part of the Bay, anchoring on the northeast side above Marcy Channel. Traps were set overnight in which several woodrats (*Neotoma intermedia pretiosa*) and mice (*Peromyscus eremicus polypolius*) were taken. This locality contained many nests of the woodrat, most of which were quite bulky and covered with the dried dung of cattle and donkeys, dried cactus and small stones. An eagle's nest was found in a large elephant tree overhanging a ravine; the old birds were present but the nest contained no eggs. A good collection of plants, birds and lizards was made. While crossing the Bay a fine yellowtail (*Seriola dorsalis*), weighing fifteen and one half pounds was obtained by trolling.

On the morning of the 20th the ship was moved to Marcy Channel, between Margarita and Mangrove islands. The collecting on Mangrove Island was good and numerous birds were secured. The seine took half a barrel of mullet in the lagoon, and numerous kingfish, smelts and flounders on the beach outside. A black-tailed jack rabbit was obtained on Margarita Island. The vessel returned to the village anchorage on the morning of the 21st, dredging on the way near the harbor entrance in thirteen and one half fathoms. All the specimens taken were shoal water forms. Seining in the lagoon near this anchorage yielded an abundance of mullet and California weakfish (*Cynoscion*). At Magdalena Bay the collectors ob-

tained a good variety of desert birds, including plumbeous gnatcatcher, Baird's verdin, Grinnell's water thrush, black-chinned sparrow, finch, rock wren and caracara vulture. Other species of land and water forms were obtained. The vegetation about Magdalena Bay was especially dry and scorched; we were told that not a drop of rain had fallen in three years. Water holes are few and far apart in this region.

Proceeding to sea in the evening, the dredge was cast at nine the following morning in 325 fathoms (Sta. 5679) at eleven o'clock in 389 fathoms (Sta. 5680), and in the afternoon in 405 fathoms (Sta. 5681). The total catch from these three hauls was very small, being as follows: Fishes — 34 *Monomitopus*, 13 small sharks. Invertebrates — a few small crabs, prawns and shells.

Cape St. Lucas was reached on the morning of the 23d, where we remained two days. Here we found a change in the character of the desert and decidedly for the better. The bushes were higher, some of them in bloom. There were many small trees and an abundance of giant cactus. Birds were numerous and of many species and we collected for the first time forms peculiar to the Cape Region. A most important collection was made of small mammals, birds, lizards and plants. Among the mammals were: *Lepus californicus xanti, Perognathus spinatus peninsulæ, P. siccus, Neotoma intermedia arenacea, Peromyscus eremicus eva* and *Ammospermophilus leucurus peninsulæ.*

This is a most interesting region to the naturalist. Our lists of the various land forms expanded immediately into several times what we had previously secured. Considerable work was done with the seine and boat-dredge. At all anchorages up to the present time more or less collecting of small pelagic forms was done with the electric light on the surface of the water. On the 24th, while the collectors were ashore, the 'Albatross' went out and made a dredge haul just south of the Cape, in 491 fathoms (Sta. 5682). The contents of the dredge were as follows: Fishes — 29 *Macrurus*, 14 *Merlucius*, 1 *Alepocephalus*, 1 *Argyropelecus*. Invertebrates — 1 *Polycheles*, 30 *Glyphocrangon*, 5 *Heterocarpus*, 36 *Peneus*, 12 *Acanthophyra*, 6 schizopods, 20 *Munidopsis*, 2 quarts of small munida, 4 *Plumularia*, 6 anemones, 6 ophiurans, 2 starfishes (*Ceramaster patagonicus* and *Henricia clarki*), 2 echini (*Brissopsis columbaris*) and 2 ascidians. The botanist obtained over 100 species of plants at Cape St. Lucas.

The ship returned to her anchorage at noon and on the 25th proceeded to San José del Cabo. Captain Burrage and I called on the officials, saddle horses having been sent to the beach and placed at our disposal. The town is situated near the mouth of San José River, and as irrigation is practised this part of the valley is under cultivation. The mammals, birds, plants

and reptiles obtained here included most of those found at Cape St. Lucas, but the variety was greater. An important collection was made of both land and sea forms; the botanist obtaining over forty species of plants. Several species of ducks were found along the shallow river.

Fig. 15. "Cholla" cactus (*Opuntia*). Cape St. Lucas. One of the most troublesome of the cacti. The minute spines break off at the lightest touch and are difficult to extract from the skin.

Fig. 16. Cape St. Lucas, Lower California. "Cardon" cactus (*Pachycereus*) at left.

Leaving on the evening of the 26th, the 'Albatross' arrived at La Paz (Pichilinque Harbor) on the 27th. I accompanied the officers on a visit to the American Consul and local officials, the call being returned the following day. Here as at all our anchorages, our party made a good collection of

Fig. 17. Cape St. Lucas, Lower California. These outlying rocks are opposite the extreme southern end of the Peninsula.

natural history specimens, obtaining some forms not previously secured. The collection included mammals, birds, reptiles, fishes, invertebrates and plants. Among the mammals were *Lepus californicus xanti*, *Perognathus spinatus peninsulæ*, *P. rhydinorhis*, and *Peromyscus eremicus eva*.

A supply of coal being taken on board, we sailed on the morning of the 30th, arriving at San Josef Island (Amortajada Bay), and this locality proved to be an interesting one. The variety of fishes obtained was large including numerous groupers and other food species. Various shore forms of vertebrates were collected in abundance including three species of small mammals peculiar to this island. The boat dredge was used to good advantage. The ship's dredge was not in use while we remained in the Gulf,

Fig. 18. . Edge of the town of San Jose del Cabo, Lower California.

previous experience showing that such dredging was unsatisfactory. The bottom is generally covered with offensive mud and animal forms are neither numerous nor varied.

San Josef is $16\frac{1}{2}$ miles long and from 2 to 6 miles wide, with a height of 2,077 feet.

On the morning of April 1, we left for Agua Verde Bay where we arrived at 3 P. M. This is an attractive little harbor with a fine beach and there are a couple of small ranches in the neighborhood. As at the localities previously visited, the principal catches in the small traps were wood rats and wild mice. Among the fishes taken at Agua Verde were several specimens of the barracuda (*Sphyræna argentea*).

We found the natives preparing tan-bark for shipment to La Paz. This appears to be the basis of an industry carried on in Lower California where-

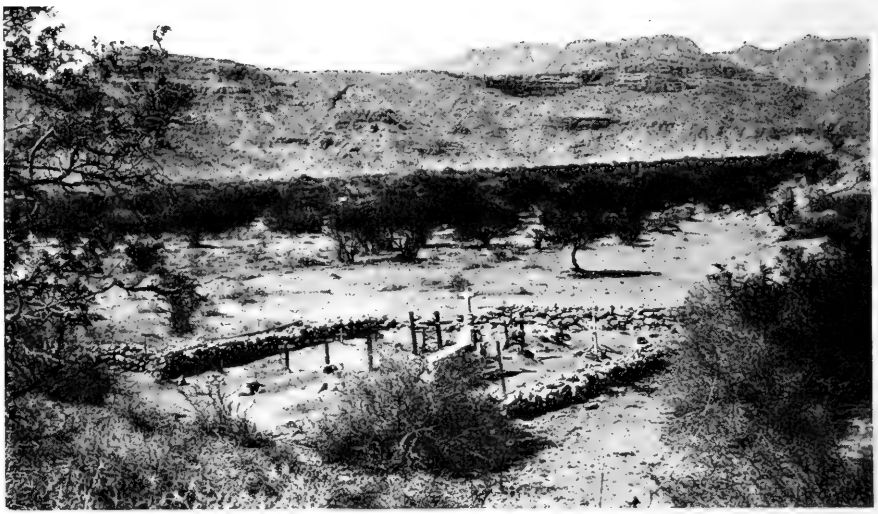

Fig. 19. View at Agua Verde Bay, Lower California.

Fig. 20. A fenced-in water hole. Agua Verde Bay, Gulf of California.

ever the Palo Blanco tree is abundant. The bark is light and is packed in sacks. The botanist obtained eight species of cacti.

The duration of the cruise being limited to two months, our reconnais-

Fig. 21. Salt Lake at Carmen Island. View of the central portion.

Fig. 22. Salt heaps at Carmen Island. Showing salt as dug from surface of lake.

sance of the coastal region of the Peninsula was necessarily carried on rapidly. We attempted, however, to make the most of our stops, and the collection of the fauna and flora grew steadily.

Leaving Agua Verde on April 2 at 11:30, we reached Carmen Island, celebrated for its salt deposits, at 3:30, anchoring off the salt works. Here, as at other islands visited, the party made the most of the time afforded. The fishing operations yielded many food and other fishes. For the benefit of the botanist, the manager of the salt works provided horses for a ride to Ballandra Bay on the west side of the Island. Passing down a valley leading to this bay we found the vegetation much more luxuriant than we had encountered elsewhere. Dr. Rose found a new century plant (*Agave carminis*) and collected ten species of cactuses, including the great barrel

Fig. 23. Salt Lake at Carmen Island. Salt digger at work.

cactus (*Echinocactus diguetii*). The seining yielded an important collection of food fishes of several species, among them being "cabrilla piritita" (*Mycteroperca pardalis*) and "mojarra dorada" (*Gnathanodon speciosus*). Among the mammals obtained were two new species of mice (*Perognathus spinatus occultus*) and (*Peromyscus eremicus carmeni*). The salt deposit of Carmen Island is a notable one. It is in reality, a lake of snow-white salt nearly two miles long and a mile wide. The surface salt is dissolved during the annual rainy season and after re-crystallizing forms new supplies. The deposit appears to be inexhaustible and only about one-tenth of the lake

surface has ever been worked. There were about sixty tons of salt piled up ready for use. The crystallization is heaviest after the rains. Later on the salt is taken from the few moist localities where a little water remains. These can be emptied by the cart-load daily, about twenty-four hours being sufficient for a new supply to form in the same spots. As much as 35,000 tons have been shipped in one year, but much more could be supplied if demanded. Its purity is such that it requires no refinement. This salt deposit has been worked commercially for about fifty years and is at present in the hands of an English company. The salt lake has no connection with the sea. The deposit of salt is known to be at least 15 feet in depth.

Carmen Island is 17 miles long by $5\frac{1}{2}$ miles wide and has a height of 1500 feet.

Leaving Carmen Island on the evening of the 3d, we anchored at Mulege on the Peninsula, on the morning of the 4th. Some of the officials visited the ship in the morning, the Captain returning the call later in the forenoon In the afternoon many of the citizens came to the ship and in the evening the officers were entertained ashore. The collectors were busy as usual, and obtained good results. Among the food fishes taken at Mulege was the large and important crevallé (*Caranx hippos*) which is found also on the Atlantic coast, numerous weakfish, kingfish and red snappers.

On the morning of the 5th, the ship proceeded to the head of Concepcion Bay, about thirty miles inland from Mulege, where our work was carried on with gratifying success. Mountain sheep occurring in this region, I made a hunt for them, but only one was seen and this one not secured. Four pairs of horns were obtained from Señor Castro, a ranchman in the neighborhood. The mountain sheep occurs on both sides of this bay but is more common among the higher ranges farther inland.

Dr. Bartsch made an important collection of marine invertebrates in this locality, both along the shore and by means of the boat dredge. Here, as at all localities visited on the Peninsula from Cape St. Lucas northward, we found quail and doves in abundance. The shore collections in general were important, but the character of the beaches did not permit of seining. A number of grunts, groupers and red snappers were taken by other means. We saw uncommonly large schools of porpoises moving about the Bay, one of them containing perhaps two hundred individuals. The ranchers here had a few cattle and donkeys, and occasionally collected iron-wood (palo ferro) for sale at Guaymas. The botanist secured among other things a new species of century plant (*Agave affinis*).

The ship was moved six miles northward to Ricason Island on the morning of the 7th, where we engaged in profitable work until the following day at 1:30, when we returned to Mulege. After a stop of three hours, we pro-

ceeded northward to San Francisquito Bay, arriving at 2 P. M. This proved to be one of the best localities visited during the cruise for marine invertebrates, and a great variety of such forms was obtained. A considerable number of fishes was secured. At nearly all localities we obtained an abundance of food fish for the crew.

On the morning of the 10th the 'Albatross' went to Angel Guardia Island, arriving at noon. This large island is said to be entirely lacking in fresh water and, like nearly all other islands in the Gulf, is uninhabited. The land forms were especially interesting; among the birds taken were burrowing owl and great-horned owl. We obtained eighteen specimens of the large black lizard (*Sauromalus hispidus*) and found rattlesnakes (*Crotalus atrox*) abundant. Four of the black lizards exceeded two feet in length. The beaches were unsuitable for successful work with the seine, but a number of fishes were obtained by other means, one of them being *Mycteroperca venadorum*, an important food fish which reaches a weight of 150 pounds. About 60 of these were taken, averaging 15 pounds each. Four large California jewfish were caught, the largest weighing 70 pounds. Among the mammals procured here were a new woodrat (*Neotoma insularis*), and a new mouse (*Peromyscus guardia*). Angel de la Guardia, near the western shore of the gulf, is 40 miles long by about 10 miles wide and has a height of about 4000 feet.

On the morning of the 11th, we proceeded to the south end of Tiburon Island, arriving at 3 P. M. The general appearance of this island is not different from that of other islands in the gulf, except in its greater height, all the islands being essentially desert-like in character and most of them entirely without fresh water. Tiburon is uninhabited by whites but there are Seri Indians on the north and east sides. We saw nothing of the latter and no signs of human occupation except a deserted camp of turtle hunters on the beach. Lieutenant Stanley killed a buck weighing 121 pounds, not including the viscera, while I killed a doe which was considerably smaller. The small traps yielded several kangaroo rats. The burrows of these animals were to be seen everywhere in the level places, and were mostly connected by well-beaten trails.

Five new species of mammals were obtained: a coyote (*Canis jamesi*),[1] a jack-rabbit (*Lepus alleni tiburonensis*), a wood-rat (*Neotoma albigula seri*), and two pocket mice (*Perognathus penicillatus seri* and *Perognathus baileyi insularis*). The mammals, birds, lizards and plants obtained here were all valuable, as very little is known of the fauna and flora of this island. One land tortoise was procured and the botanist found a new century plant (*Agave subsimplex*). Our explorations extended about five miles inland in several directions, but we found no evidences of fresh water. The seine,

[1] Named for Mr. Arthur Curtiss James of New York.

fishing lines, and boat dredge were all employed successfully. The food fishes taken included large jewfish, grouper and mullet.

Tiburon is the largest island in the Gulf. It is 30 miles long by about 15 in width and has a height of 4000 feet. It is separated from the Mexican mainland by a channel from one to three miles wide. The Seri Indian

Fig. 24. Giant cactus (*Pachycereus*) in bloom. Santa Catalina Island, Gulf of California. April 16, 1911.

inhabitants are reported by the Mexican authorities to be dangerous to small parties.

The 'Albatross' left Tiburon Island at 11 o'clock on the morning of April 13, arriving at San Esteban Island at 1:30. Almost upon landing we

began to obtain specimens of two species of large lizards, one a *Sauromalus*, the other apparently *Ctenosaura hemilopha*. They occurred in shallow depressions under large stones and were usually detected by their tails, which were not always drawn in out of sight. They were captured easily by turning the stones, which were not generally too large for a couple of men to handle. Forty-seven specimens in all were captured alive, the largest being thirty inches long. The *Sauromalus* proved to be new to science. Two rattlesnakes (*Crotalus molossus*) were also secured and a few mice and birds, while the botanist obtained a new century plant (*Agave dentiens*). A new species of mouse obtained here has been named *Peromyscus stephani*. San Esteban is about 4 miles in diameter, exceedingly rough and mountainous, with a height of 1800 feet. It lies 8 miles S. W. of Tiburon, is without fresh water and is uninhabited.

Fig. 25. Valley at south end of Tiburon Island, Gulf of California.

The flow of the tides is very strong in this part of the Gulf. During the night the ship dragged anchor somewhat on the ebb tide. When we left for Guaymas at 8:30, the anchor came up minus a fluke which had broken off. The tide was running fiercely, and with half a gale of wind also in our favor, we started for Guaymas under sail and steam. Passing San Pedro Martir Island at noon, where it was impossible to make a landing on account of the weather, we reached Guaymas after dark.

On the following morning the Captain and I called on the American Consul and some of the local officials. Dr. Bartsch left the ship at this point on his way to Panama, but finding no satisfactory transportation proceeded to Washington by rail. Two crates of live reptiles, large lizards

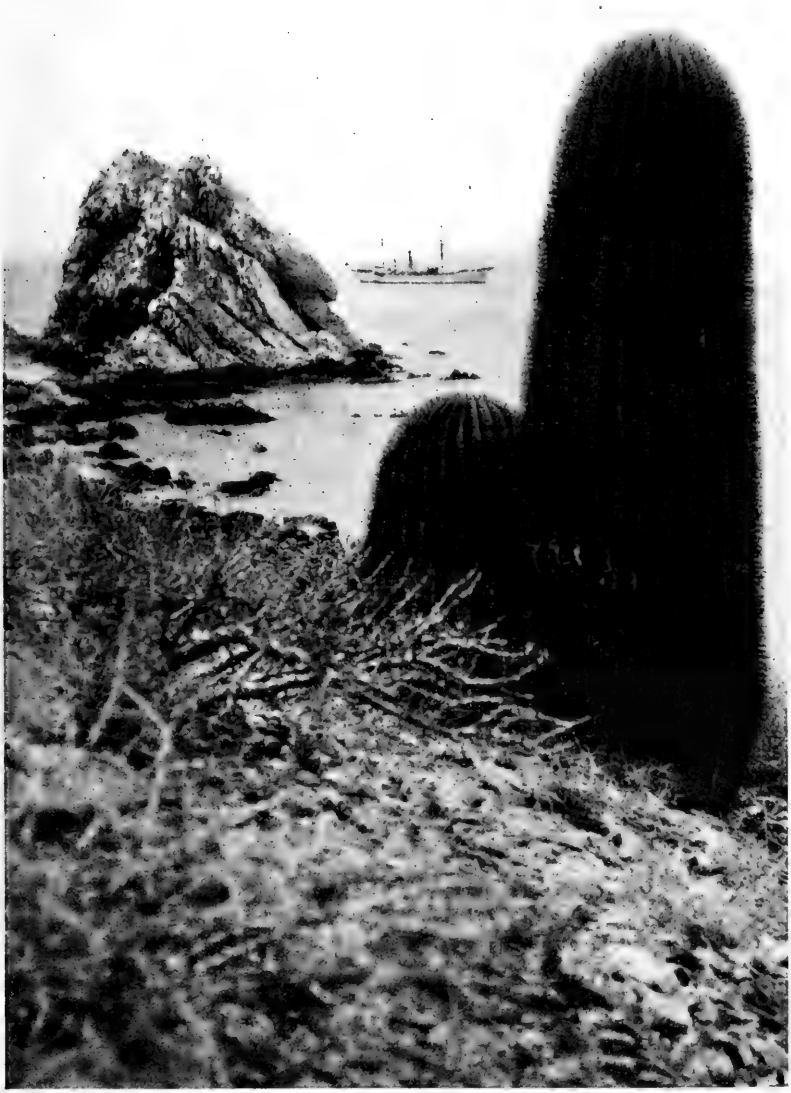

Fig. 26. The 'Albatross' at Santa Catalina Island, Gulf of California. "Viznaga" cactus (*Echinocactus diguetii*) 12 feet high.

and rattlesnakes were forwarded by express to the Zoölogical Park at New York.

We left Guaymas at 6 P. M., and reached Santa Catalina Island, near the west side of the Gulf, at 9 o'clock of the 16th. The botanist found this a rich locality, there being many large barrel cacti (*Echinocactus diguetii*) some of them 15 feet high. One of the largest measured seven feet in circumference. A number of skulls of porpoises (*Globiocephalus scammoni*) and one of *Tursiops nuuanu*, a new species, were obtained on the beach where fishermen had evidently been making porpoise oil. A good collection of fishes and lizards was obtained. The fishes included a sea bass (*Dermatolepis punctatus*) 30 inches long and some groupers.

We left at noon for Santa Cruz Island a little farther south, arriving at 3 o'clock. Here additional skulls of porpoises were obtained on the beach and a good collection was made of fishes and shore forms.

Leaving Santa Cruz at 5 P. M., we reached La Paz (Pichilinque Bay), on the morning of the 17th where the usual work of the expedition was resumed. The following day the collecting party, including the botanist, was sent by launch to Espiritu Santo Island with a tent to remain over night and be picked up by the ship the next day on her way south. While the ship was coaling, we again called on the officials, procured our mail and made inquiries respecting the fisheries.

On the morning of the 19th, the 'Albatross' reached Espiritu Santo, arriving at 9 o'clock. The collectors came on board with one specimen of the interesting black jack rabbit (*Lepus insularis*) peculiar to this locality, an introduced specimen having been previously secured on Pichilinque Island. They obtained also wood-rats, mice, lizards, birds and plants. Among the last was a new century plant (*Agave roseana*). We remained here until noon, visiting the pearl shell propagating station, under the guidance of the manager, Mr. Gaston Vives. Some excellent photographs of this important station were secured. An account of the pearl fishery will be found under another heading.

Leaving at noon, we reached Ceralbo Island on our way down the Gulf at 3 P. M. The most interesting find here was the large black and white lizard (*Ctenosaura hemilopha*) the species obtained on San Esteban Island farther up the Gulf. Seven specimens of this lizard were taken, four of which exceeded two feet in length. A few fishes were also secured.

Ceralbo is $15\frac{1}{2}$ miles long by about 4 miles wide, with a height of 2,477 feet. It lies east of La Paz Bay and is not more than five miles from the nearest point on the Peninsula.

Leaving Ceralbo at 6 P. M. we reached San José del Cabo on the morning of the 20th. Here Mr. Osburn left the ship with a collecting outfit with

instructions to hire pack animals and make a month's trip into the Sierra Laguna mountains for mammals, birds and reptiles. Governor Sanginez at La Paz had furnished him with a letter of introduction to the authorities at San José del Cabo for this purpose. He had instructions to proceed to San Diego by steamer a month later. The trip into the Sierra Lagunas yielded numerous species of mammals, birds and reptiles not obtained elsewhere by the 'Albatross' expedition.

Leaving San José del Cabo at 10 A. M., the work of dredging was taken up seriously. Off Cape St. Lucas, at 12:30, the dredge was lowered in 630 fathoms (Sta. 5683). The fishes obtained were *Macrurus, Melamphæs, Malthopsis, Serrivomer, Alepocephalus* and *Sebastolobus*. Among the crustaceans were *Gnathophausia, Glyphocrangon, Nephropsis, Galacantha, Polycheles, Munidopsis, Peneus*. Other invertebrates were sponges, holothurians, shells, worms and fragments of echini.

Proceeding northward, we dredged the following morning at 6:30 in 1760 fathoms, off Magdalena Bay (Sta. 5684). The haul was an interesting one and yielded about two quarts of black nodules resembling manganese, along with considerable animal life. It is interesting to note that the depth at this station was exactly two miles. The dredge contained the following: 1 fish (*Scopelengys*), 1 large creamy-white crustacean (*Munidopsis*), 1 very large pycnogonid, 9 sea urchins (*Cystechinus*), prawns, ophiurans, starfishes, shells, holothurians, pennatulids and worm tubes. Among the starfishes was *Eremicaster tenebrarius*, the only specimen taken during the voyage.

Continuing northward, we dredged the following morning at 8 o'clock in 645 fathoms (Sta. 5685). The catch, a most interesting one, included a specimen of *Harriotta*, the first capture of this deep-sea fish in the eastern Pacific ocean. The other fishes obtained were *Alepocephalus, Malthopsis, Melamphæs* and *Serrivomer*. The invertebrates included shells, holothurians, pycnogonids, echini and various crustacea. There were two very large bright red specimens of *Lithodes panamensis*, a starfish (*Leptychaster inermis*) and a sea urchin (*Schizaster latifrons*).

We dredged again at 3 P. M. in 930 fathoms (Sta. 5686). The only fish was an *Argyropelecus*. Among the invertebrates were starfishes (*Ctenodiscus crispatus*), ophiurans, holothurians, anemones, ascidians and crustaceans.

The following morning, April 23, at 5 o'clock, we anchored again in San Bartolome Bay. A seining party was sent to the head of the bay for a supply of fresh fish and about a barrel of edible fish, chiefly mullet, was obtained. Many spotted sharks and sting-rays were also taken and destroyed. From the lobster fishing camp we obtained several bags of fresh spiny lobsters in exchange for provisions and fresh water. The Bay was full of turtles, but the fishermen had none at hand.

The 'Albatross' proceeded to sea at 10 A. M. for San Francisco. At noon the dredge was lowered in 480 fathoms (Sta. 5687) west of Natividad Island. The fishes taken were *Melamphæs, Macrurus, Nemichthys* and *Scopelengys.* The invertebrates were ascidians, ophiurans, sponges, anemones, shrimps, annelids and a starfish (*Strongylocentrotus fragilis*).

We dredged again in 525 fathoms (Sta. 5688) at 2:30, west of Natividad Island, obtaining 20 fishes: *Alepocephalus, Macrurus* and *Melamphæs.* Invertebrates came up in abundance and variety. Among them the large red *Lithodes* crab and a starfish (*Nearchaster aciculosus*).

On the morning of the 24th the dredge was lowered in 879 fathoms (Sta. 5689) east of Guadalupe Island, bringing up *Macrurus* fishes and invertebrates of the groups already obtained, together with some sea urchins (*Urechinus reticulatus*).

The dredge was hauled again at 10 o'clock in 1101 fathoms (Sta. 5690), and brought up invertebrates only, consisting of crustaceans, shells, starfishes and holothurians. Of the starfishes there were four species: *Hymenaster quadrispinosus, Zoroaster ophiurus, Brisinga panamensis* and *Pectinaster agassizii.*

The whole catch was imbedded in about a barrel of stiff gray mud. This clay after a little working was found to be equal to modeler's clay in texture and was at once employed on board ship by our modeler for that purpose.

On the 25th, at 6 o'clock, dredging was resumed southwest of San Diego, California, in 868 fathoms (Sta. 5691). This haul was also embedded in gray mud like the modeler's clay referred to above. The contents of the dredge haul were interesting, there being among the fishes one *Cyema,* a genus not before known in the Pacific. The other fishes were *Argyropelecus* and *Melamphæs.* Among the invertebrates were a dozen fleshy starfishes (*Hymenaster perissonotus*), and some brachiopods.

At 11 o'clock on the 25th, we dredged in 1076 fathoms (Sta. 5693) west of San Nicolas Island. The haul was a large and important one, containing seven species of fishes, there being twenty large rose-red *Sebastes* and a large pink *Liparis.* Among the invertebrates was a fine *Anthomastus,* a large brachiopod and a starfish (*Psilaster pectinatus*).

The dredge was hauled again at 9 o'clock in 640 fathoms (Sta. 5694). It contained a good variety of fishes and invertebrates. There were five species of very large starfishes, and as many of small ones. Among those identified were *Thrissacanthus penicillatus, Hippasteria californica, Solaster borealis,* and *Heterozonias alternatus.*

The third haul for the day was made at 1 o'clock in 534 fathoms (Sta. 5695) and yielded a variety of fishes and invertebrates. Among the latter

were crinoids, octopus, *Lithodes* and starfish (*Solaster paxillatus, Lophaster furcilliger,* and *Pteraster jordani*).

On the 27th, at 6 A. M., we dredged again in 440 fathoms (Sta. 5696) taking an abundance of fishes and invertebrates of many kinds, among them starfishes (*Peribolaster biserialis*) and sea urchins (*Schizaster townsendi*).

At 10 A. M. the dredge was lowered in 485 fathoms (Sta. 5697) bringing up two specimens of *Chauliodus* and four other species of fishes. The most interesting of the invertebrates was an octopus with webbed arms. Additional specimens were secured of *Schizaster townsendi*, a sea urchin described by Agassiz from several points between the Gulf of California and Panama out to depths of 995 fathoms.

At 2 o'clock we dredged in 475 fathoms (Sta. 5698) with satisfactory results. The fourth haul for the day, and the last dredge haul of the voyage, was made at 6 P. M. in 659 fathoms (Sta. 5699). The results were similar to those of the preceding haul.

The 'Albatross' arrived at San Francisco on the morning of April 28 and anchored off Sausalito. The ship's collection in general being a large one, several days were required for packing and a special car was secured for its transportation to the east.

Fisheries and Fishery Resources.

Pearl Fishery.— Important pearl fisheries have been conducted in the Gulf of California ever since its discovery by the Spaniards.

La Paz is the center of the pearl shell industry of Lower California, in which there are three companies engaged. The largest of these is the Mangara Exploration Company, Ltd., an English corporation which operates from the head of the Gulf of California southward to Guatemala. According to Mr. F. W. Moore, general manager, the Lower California yield of pearl shell amounts to about 60 tons a year from the Gulf alone, valued at $100. to $350. (gold) a ton, according to the grade. (The value in 1912 was much higher ranging from $200 to $500. gold). The shell is classified in three grades, the first being the most valuable. The product finds its principal market in England. The company operates with a capital of $150,000. The principal part of the catch is made in Pacific waters, where operations are carried on from November to May. In the Gulf of California the work is done chiefly from July to October. The concession of the Mangara company extends until 1932.

The Mangara Company operates 4 schooners and 21 boats: there being diving outfits with each boat. The number of men employed by this

company is 150 and the annual yield of shell 175 to 200 tons. The schooners with their boats are divided into three fleets, the divers of each fleet using their schooner as the home base. Pearl fishing is carried on at depths varying from 20 to 120 feet.

A concession for pearl fishing around the islands of Espiritu Santo, San José and Ceralbo in the Gulf, and also in Charmela Bay, sixty miles north of Manzanillo in the Pacific, is held by Señor Miguel Cornego of La Paz. With him is associated Señor Gaston J. Vives, in the management of the "Compania Criadora de Concha y Perla de la Baja California," engaged in the propagation of the pearl oyster. The concession for oyster cultivation dates from 1903.

During the years 1910 and 1911 the total amount of shell exported from La Paz and derived from the waters adjacent to the Peninsula of Lower California was 331 tons. The industry has suffered considerably as a result of disturbed political conditions in Mexico.

The above figures relate to pearl shell only, and do not include the value of pearls, which is reported to amount to about $100,000 annually.

Pearl Oyster Cultivation.— An important feature of the pearl fishery of La Paz is a station for the cultivation of the pearl oyster under the management of Señor Gaston Vives. This station is located at San Gabriel Cove, Espiritu Santo Island, in the Gulf of California, fifteen miles from La Paz and is the only establishment of the kind in the world.

The station has the appearance of being well adapted for the purpose for which it was constructed. A great deal of space is occupied by the equipment of the station and there is evidence that a considerable amount of money has been carefully invested in the enterprise. The sub-station of La Gallina on the opposite side of the cove, we had no opportunity to visit.

The methods of pearl oyster culture practised here include the collecting of young spat or seed in the open bay in artificial collectors, the transferring of this seed to an artificial canal to which the tide is admitted and where they are protected from their enemies by wire-screened gates, and finally, after a period of growth and protection, a transferrence back to the natural bottom in the open bay, in protected crates until mature growth is attained.

The lagoon at San Gabriel has been cut off from the bay by a heavy barrier of masonry, behind which has been constructed a long zig-zag canal of masonry for the protection of the immature crop of shells. This, the so-called hatchery, is the place of growth for young shells obtained from the spat collectors in the bay outside. The numerous cross sections of the canal afford ample space for the operations of oyster cultivation and have a uniform depth of seven or eight feet.

The entrance is well screened to exclude mollusk-eating fishes, star-

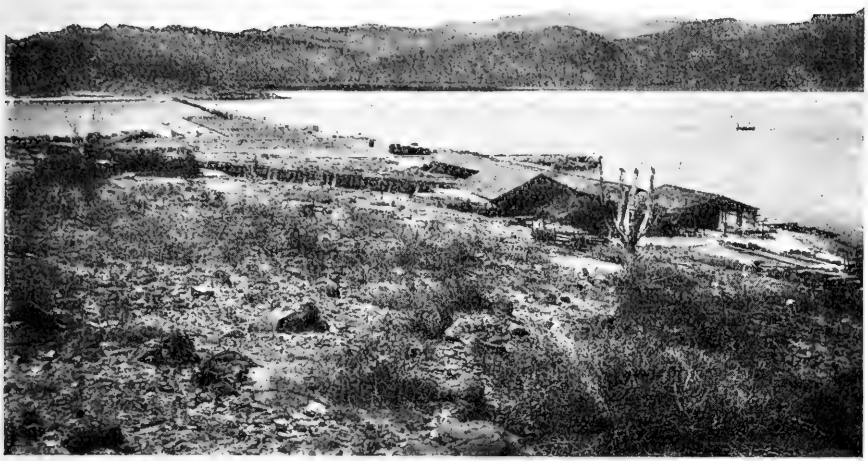

Fig. 27. General view of station for cultivation of the pearl oyster. Espiritu Santo Island, Gulf of California. (The negative was unfortunately reversed in the camera).

Fig. 28. Thatched roofs over the cross-sections of the canal; the open Bay on the right.

fishes and other enemies of the young pearl oyster, and through it the tide flows and ebbs, carrying minute forms of food for the growing young. The tide through it can also be controlled so that a sufficient covering of water for the young oysters can be maintained. The canal is provided with thatched covering throughout its entire length as a protection against undue heat when the tide is low. A general view of the station is shown in Fig. 27. The dividing barrier of masonry is seen extending to the opposite shore; nearer it is somewhat hidden by the thatch shelters of the cross sections of the canal. The general plan of the canal is indicated by the following diagram:

A closer view of the closely set roofed sections is presented in Fig. 28 taken from the protecting barrier of masonry, the open bay lying at the right. Beneath the sun shelters of each section the young shells are laid at low water, to be covered and fed by the tides. The shallow wire trays containing the shells are placed on lattice racks centrally located in each section, where they are supported above the bottom and exposed to the free flow of the water. As the shells grow larger their cultivation is continued on the rocky bottom of the canal. Some of the wire trays are shown in Fig. 29.

A view of one of the spat collectors is shown in Fig. 30. It is a heavy-framed, wire-covered crate, containing five shallow, latticed trays, closely set with short upright pieces of lath, to which the young free-swimming oysters attach when shell growth begins.

This collector has been brought to the beach from its original position in some part of the bay and hauled up the cemented grade by a chain and windlass. A nearer view of one of its trays is shown in Fig. 31, containing young shells from two to three months old.

Fig. 32 shows the trays of the crate removed, and employees ready to transfer young oysters to the shallow wire trays for placing in the canal. Each operator is provided with small wire trays.

The young shells at this stage are an inch or two in diameter, as indicated in Fig 29. They are more or less covered with marine growths of various kinds, which are for the most part removed.

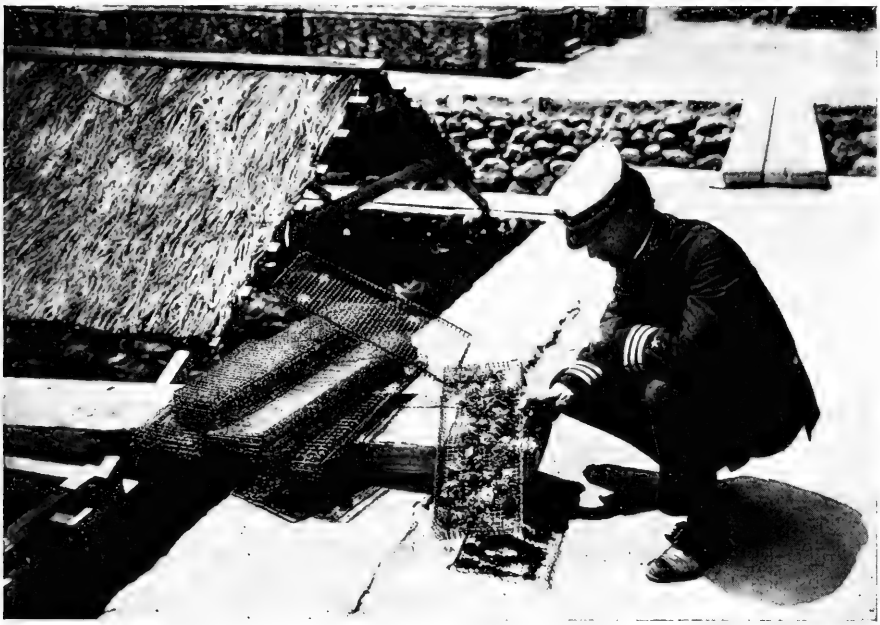

Fig. 29. Shallow wire trays on which young pearl oysters are laid for growth.

Fig. 30. A spat collector landed, with a full setting of young shells. One of the six trays is placed on top of the crate.

The station has several cemented grades where the heavy collectors are dragged up the sloping beach from the water (Fig. 33). Much of the manipulation is performed under the large thatched shelter shown at the right in the same photograph.

After a growth of eight or nine months in the protected canal, the pearl oysters are, as stated above, returned to the bay for final growth, or until they are about three years old.

All pearl oysters placed in the bay for growth are protected in wire-screened crates, and all crates whether containing spawn collectors or growing oysters, are lowered on prepared bottom which has been cleaned of marine growths, and roughly paved with rocks and stones by divers in diving armor.

The clean stony bottom on which the crates rest, serves also to catch more or less oyster spawn, but the bulk of the set of young shell is secured in the wooden trays of the wire-protected collecting crates. The bottom prepared by the divers is usually in coves, small bays or inlets.

Each collecting crate when put in proper position, is provided with numerous adult pearl oysters as breeders. Mr. Vives found by experience that some collectors, even when provided with breeders, came up without a good set of young. This he now guards against by putting as many as fifty adults in a crate as spawners, to insure the presence of both male and female oysters, the sexes being separate in the pearl oyster.

In Fig. 34 some of the matured shell is shown in boxes at the left, while a heap of shell being scraped and cleaned is shown at the right. Figs. 35, 36 and 37, show various forms of crates used in collecting and distributing growing shells and protecting them from their enemies.

There are several hundred spat collecting crates in use, some of them being sent out to favorable points many miles distant from the station at San Gabriel. All crates are protected by heavy, galvanized wire netting of about half-inch mesh. The spawning season of the pearl oyster in this region lasts from October until April or May. The intelligent efforts of Mr. Vives to secure an abundant set of spat in collectors located on the natural beds of the pearl oyster have undoubtedly been successful.

Two or three crops of matured shell had already been secured when the 'Albatross' called at San Gabriel in March, 1911, and subsequently an additional crop of shell was reported for that year.

Mr. Vives was apparently devoting all his energy to a successful solution of the problems of artificial cultivation and expressed the conviction that his work would prove successful.

There was abundant evidence that the methods of collecting spat were effective. There appeared to be also an abundance of apparatus for the different operations of pearl shell culture.

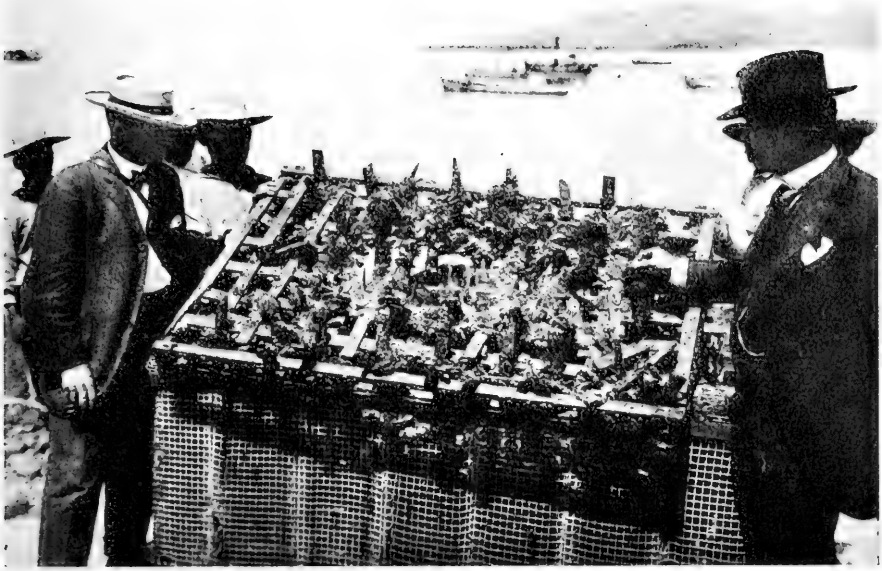

Fig. 31. Nearer view of the spat collector.

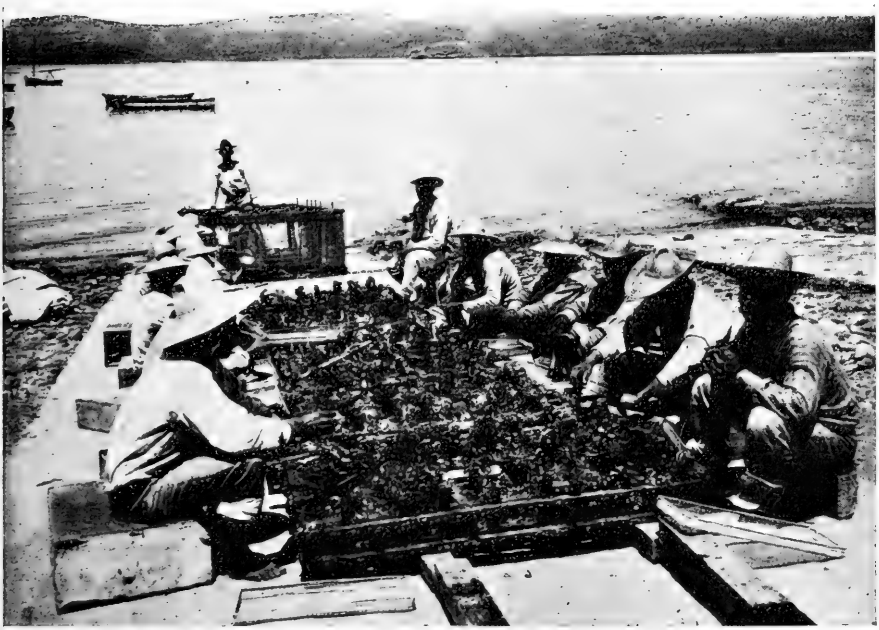

Fig. 32. Wooden trays of the spat collector removed and young oysters being placed on small wire trays for growth.

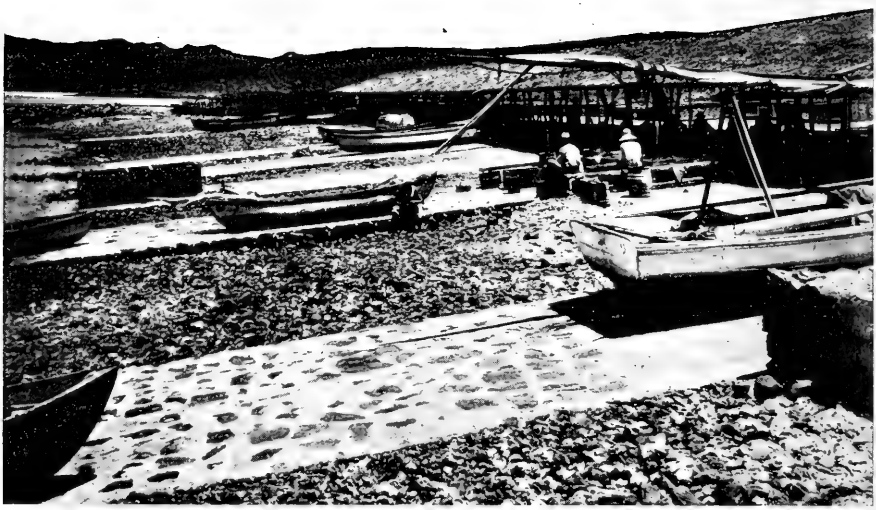

Fig. 33. Cemented grades on the beach to facilitate the handling of spat collectors and other oyster growing apparatus.

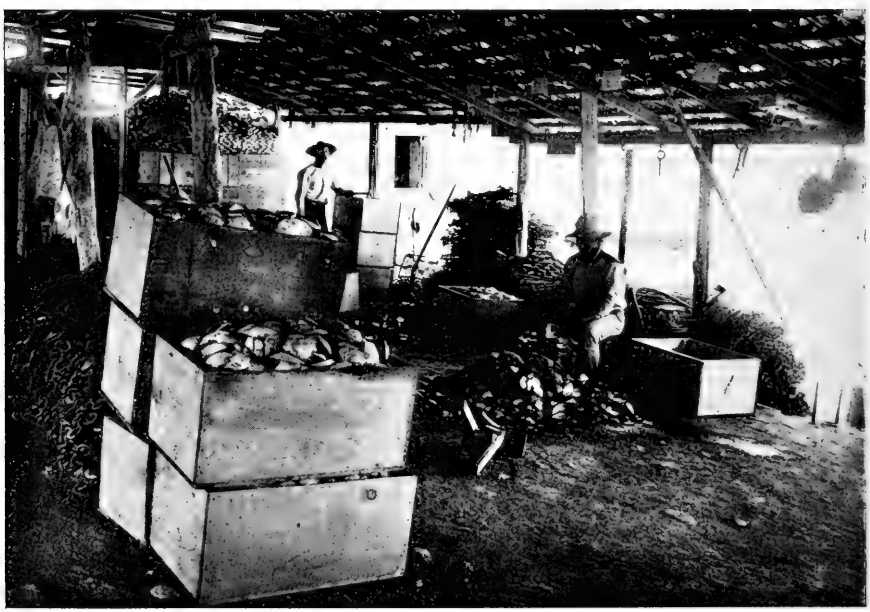

Fig. 34. Cleaning and packing shells of artificially-grown pearl oysters.

Fig. 35. Shelter and apparatus.

Fig. 36. Wooden apparatus for the protection and handling of pearl oysters laid out for growth.

Mr. Vives obtained his concession from the Mexican government in 1903. His brief report [1] relates to the years 1906–07. Considerable time must have been spent in preparation and experimentation.

From what is known of the pearl oyster in other regions, the shells grow large enough for industrial uses in about four years. They continue to grow after that period of course, but suffer deterioration from worms and boring sponges. What Mr. Vives had to say concerning the formation and growth of free pearls is interesting, and is presented here without comment as this has been a subject of much scientific and unscientific discussion.

Fig. 37. Forms of wire apparatus for the protection and handling of pearl oysters laid out for growth.

New pearls are secreted by pearl oysters of all ages, but chiefly by the younger oysters. After the pearl oyster is three years old fewer pearls are formed.

Pearls are seldom found except during the period from August to December and rarely as late as December. Mr. Vivès exhibited a small but perfect pearl in the flesh of an oyster of artificial growth known to be only three months old.

He finds the pearl to be formed within a watery blister (epithelial sac)

[1] Compañia Criadora de Concha y Perla de la Baja California, By Gaston J. Vives. Informe rendido por la Dirección General á la Secretariá de Estado y del Despacho de Fomento, Colonización é Industria, sobre los trabajos emprendidos durante los anõs de 1906 y 1907.

Fig. 38.

Fig 39.

Figs. 38 and 39. Photographs of pearl oysters (*Margaritifera* var. *mazatlantica*) showing newly formed pearls which have developed on various parts of the mantle.

In each specimen the thin sac has been cut open to expose the pearl sufficiently for good photographic results. The pearls are shown in about natural size, but the oysters have been shrunken in spirits. All of the pearls are located on some portion of the free mantle, generally on the branchial surface, some being on the inner surface. The pearls are apparently spherical and vary in size from about one to three grains.

Specimens presented to the American Museum of Natural History by Gaston J. Vives of La Paz.

located almost anywhere in the oyster, but chiefly in the mantle, and perhaps often thrown off and lost when the sac is ruptured. (See Figs. 38 and 39.)

The pearly growths of irregular form attached to the inside of the shell are of course caused by injuries of various kinds to the shell. It is now believed that pearls formed in the fleshy parts of the pearl oyster result chiefly from cestode parasites around which the oyster secretes a layer of epithelial tissue within which the pearl is eventually formed.

The inception at La Paz of an original method of pearl oyster cultivation is of more than passing interest, as the application of that method to the growing of pearl oysters in our own waters may be quite within the limits of possibility.

Spiny Lobster (*Panulirus interruptus*).— This large and valuable species is apparently common along the west coast of the Peninsula wherever there are rocky shores and reefs. Portions of their dried shells are common on the beaches in many localities, indicating a wide distribution.

At San Bartolome Bay, about 330 miles south of the United States and Mexican boundary lines, there were at the time of our visit four camps of fishermen engaged in lobstering, with two men at each camp. The camp at the entrance near the anchorage had 30 pots in use which were set in from one to twenty-five fathoms, according to the condition of the weather — the lobsters being found close to the shore in smooth weather. The pots are set outside the Bay in the vicinity of rocky ledges which are covered with kelp; they are four feet long, two feet wide at the bottom by one foot at the top, where the entrance is placed near one end. A pot of this kind will fill nearly full of lobsters. Both ends have narrow compartments at the bottom for ballast. (Fig. 12.)

The bait is principally abalones which are left attached to the shells, tied in small bunches with wire and suspended in the center of the pot. Fishes are also used to a small extent as bait. (Figs. 13, 14.)

The pots are made of lath, $1\frac{1}{2}$ inches wide and $\frac{1}{4}$ inch thick, the framework being heavier. Two men working together catch about a ton a week for which they receive 4c. a pound. The camps at San Bartolome were supposed to be visited weekly by a small steamer of the International Fisheries Company of Los Angeles, but at the time of our visit in March the steamer was three weeks overdue and most of the catch had spoiled. The fishermen were nearly out of fresh water and they would have been under the necessity of going to Cedros Island, about thirty-five miles distant, had we not furnished them with a supply from the ship. When we returned to San Bartolome late in April there was but one camp of these fishermen remaining, as the locality was desolate and totally without fresh water. The steamer was again long overdue and the fishermen short of water and provisions. The

industry did not appear to be a flourishing one although lobsters were abundant. The method of transportation makes it difficult to carry the catch through alive. The lobsters were transported in crates, a halfway stop being made at San Quentin to revive the lobsters by lowering the crates into the water over night. This species has always been taken in limited quantities in southern California, but the local supply is not large.

The lobster resources of Lower California could be utilized at less expense if regular steamer shipping facilities were available. The lonely, almost waterless shores of the Peninsula are seldom visited, and there is doubtless considerable difficulty in getting fishermen to remain for long periods in the isolated camps.

San Bartolome is apparently the only point in Lower California where a lobster fishery is carried on, and the work there appears to be intermittent.

Green Turtle (*Chelonia virgata*).— This species is found in abundance on both sides of the Peninsula. There is probably no better place for obtaining turtles than San Bartolome Bay. According to the fishermen located there, turtles are present during most of the year, being inside the bay chiefly during the winter months. They are reported to haul out on the beaches for egg laying in April and May. A few were being sent to market, but there appeared to be little demand for them.

When the 'Albatross' visited San Bartolome on April 11, 1889, a very remarkable catch of green turtle was made. The U. S. S. 'Ranger' was there at the same time and a seining party was made up consisting of members of the crew of that vessel and of the 'Albatross.' In a single haul of a seine 600 feet long we brought to shore 162 green turtles, many of them of large size. Probably half as many more escaped from the seine before it could be beached; there being a continual loss by turtles crawling over the cork lines during the entire time we were hauling it. The great bulk of this catch was, of course, liberated, although both vessels took on board all that could be used. There are doubtless other bays around the Peninsula which are frequented by turtles at the egg laying season and where large numbers might be obtained by seining.

Turtles are plentiful in the Gulf of California, and the 'Albatross' obtained specimens in the vicinity of Willard Bay, on the Peninsula near the head of the Gulf in 1889. During the present cruise, we found deserted turtle camps and an abundance of turtle shells at Tiburon and other islands in the Gulf. Turtles are said to abound near the mouth of the Rio Colorado where their eggs are deposited in the sands. The inhabitants of the Peninsula seem to have no difficulty in obtaining a supply of them. Turtles are sometimes shipped to San Francisco by steamer from Magdalena Bay.

Hawksbill or Tortoise-shell Turtle (*Eretmochelys squamata*).— The hawks-

bill is fairly common about the lower end of the Peninsula and the islands in the lower part of the Gulf. It is reported to be more abundant about the Tres Marias Islands below the mouth of the Gulf. The employees of the pearl shell companies at La Paz obtain quantities of tortoise shells, but

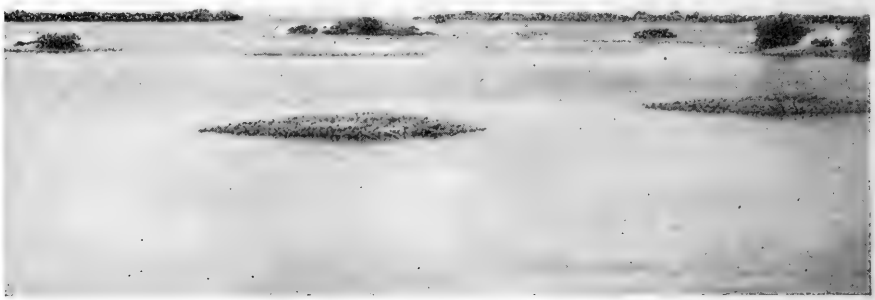

Fig. 40. Oyster reefs at low tide. Algodones Lagoon, above mouth of Yaqui River, Gulf of California.

Fig. 41. Seal Rock near San Josef Island, Gulf of California. Showing numerous shells of green turtle left on the beach by fishermen. San Josef Island in distance on the right.

some of these are received from localities along the mainland of Mexico. I obtained two very fine specimens at La Paz for museum purposes, which measured along the top shell 34 inches and 31 inches respectively. Some of the largest specimens obtained are roughly mounted and polished for exhibition purposes.

Oysters.— The oyster of the Gulf of California appears to be more abundant about the mouth of the Yaqui River, near Guaymas, than it is anywhere north of that point. The species is not apparently distinguishable from *Ostrea virginica* and has indeed been referred to *virginica* by some conchologists.

Algodones Lagoon, just north of the river delta, is a great reservoir of oysters of excellent quality. These oysters have always been used locally and are gathered chiefly by Yaqui Indians for sale at Guaymas. They are shipped to some extent to points in the interior. (Figs. 40, 42.)

Oysters are found at several points toward the head of the Gulf as at Georges Bay, on the east side and Angeles Bay and at Carmen Island on the west side.

Abalone.— Several species of the large and valuable "Abalone" (Haliotis) are found along the coast of Lower California and may be quite as abundant as they are along the shores of southern California.

The abalone is the basis of an important fishery in California where its meat is used for food and the ornamental shell used for jewelry and inlaying material. Most of the abalone meat is dried for export to China.

During a former visit to Lower California the writer found camps of Chinese fishermen located at San Bartolome Bay and at the San Benito Islands, engaged in gathering abalones. Great quantities of the meats were spread out on the ground and dried in the sun until they were quite hard. The shells were also saved.

During the voyage of the Albatross we met with no abalone fishermen, but they may have been located at points not visited by the expedition. There can be no doubt as to the abundance of abalones along the northern part of the Peninsula and the outlying islands.

The value of abalone shell varies according to the species, the green shells being worth from $100 to $150. a ton, while black shells of the best quality are two or three times as valuable.

Food Fishes.— Lower California has important fishery resources both on the Pacific and Gulf coasts, which are as yet undeveloped.

The population of the region is quite limited and while there is desultory fishing at all towns and villages, there are no fish markets worthy of the name. The methods of handling the catch are crude. Fresh fish must be sold promptly as ice is not available and there are no fishing boats fitted with wells in which fish can be transported alive. Much of the catch is roughly salted and is uninviting. The introduction of well-smacks, such as those used in Florida and some parts of the West Indies would work a transformation in this respect.

During the different voyages of the 'Albatross' to this region good food

Fig. 42. Natural oyster beds at low tide. Algodones Lagoon, above mouth of Yaqui River, Gulf of California.

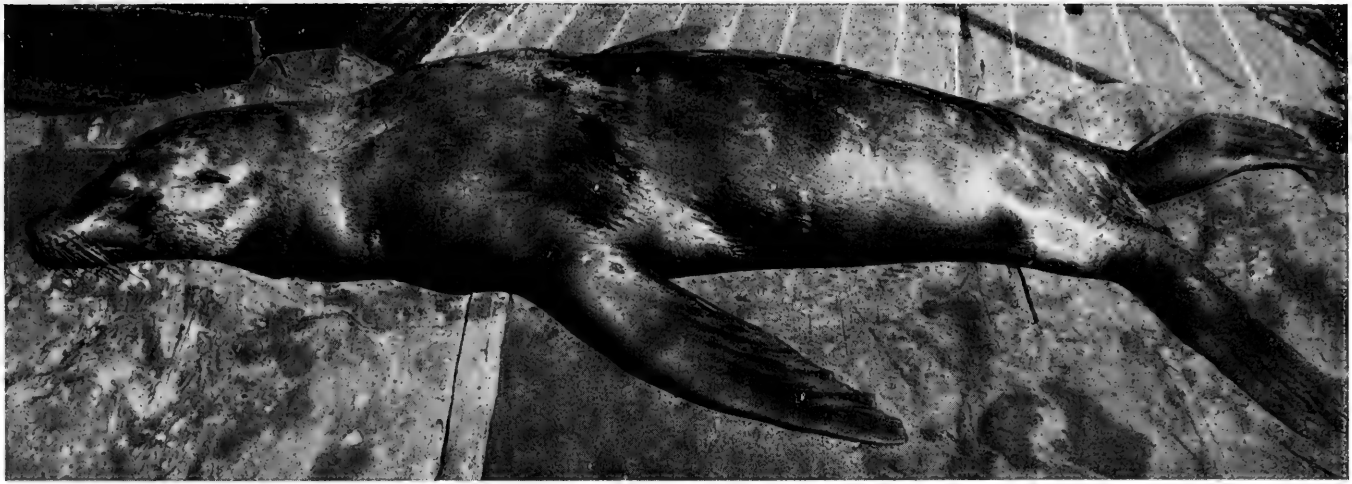

Fig. 43. California Sea Lion (*Zalophus*). San Luis Islands, near head of the Gulf of California.

fishes were found at most anchorages and were obtained with both seines and hand-lines.

Several species of food fishes of the Atlantic coast occur also in the Gulf of California. Among these may be mentioned the Spanish mackerel (*Scomberomorus maculatus*), Chub Mackerel (*Scomber colias*), Mullet (*Mugil cephalus* and *M. curema*), Jack (*Trachurops crumenophthalmus*), Crevallé (*Caranx hippos*), Horse-eye Jack (*C. latus*), Jurel (*Caranx caballus*) and Jewfish (*Promicrops guttatus*). The 'Albatross' met with most of these about the islands in the Gulf, but there are many native food fishes of impor-

Fig. 44. Fishes from Santa Cruz Island, Gulf of California.

tance, some of which were first made known to ichthyology through the earlier investigations of the 'Albatross' in this region. The most important of these is *Cynoscion macdonaldi*, locally known as "Totuava" and "sea Bass," the largest of the weakfishes, reaching a weight of 175 pounds. It is an excellent food species, common along the eastern shore of the Gulf and southward as far at least as Guaymas where it occurs during the winter months. The 'Albatross' found it in abundance at the head of the Gulf in March, 1899. Specimens taken with heavy cod gear had to be pulled aboard with the aid of gaff-hooks, three of them weighing 79, 82 and 140 pounds respectively. This species enters the brackish waters of the mouth

of the Rio Colorado and is sometimes taken there by spearing. (See Fig. 45.)

Another weakfish of the finest quality is *Cynoscion parvipinnis*, common to both sides of the Peninsula. It is called "bluefish" in Southern California.

Fig. 45. Giant Weakfish (*Cynoscion macdonaldi*) weighing 140 pounds. This species was found in abundance near the head of the Gulf of California.

The large Pez de Gallo (*Nematistius pectoralis*) is abundant in the upper part of the Gulf, and reaches a length of four feet.

Among the more or less abundant food fishes of the Gulf are Barracuda (*Sphyræna argentea*), Spotted Cabrilla (*Serranus maculato-fasciatus*), Cabrilla de Astillera (*Mycteroperca jordani*), Pargo Amarillo (*Neomænis*

argentiventris), Flamenco (*N. guttatus*), Burro (*Pomadasis macracanthus*), Mojarra Garabata (*Calamus brachysomus*), Yellow-tail (*Seriola dorsalis*), Redfish (*Pimelometopon pulcher*), Mojarra Dorara (*Gnathanodon speciosus*), Garlopa (*Mycteroperca venadorum*), Grouper (*Dermatolepis punctatus*), Cabrilla Piritita (*Mycteroperca pardalis*), Codorniz (*Umbrina xanti*), Mojarra Blanca (*Xystæma cinereum*).

Good food fishes are known to be abundant about Guaymas, but they are doubtless just as abundant at many other points on the Gulf.

Mullets of large size are very abundant at the mouth of the Rio Colorado, running up the river as far as there is brackish water.

In cruising about the Gulf the many large-sized fishes to be seen leaping indicate their abundance.

A few angler-yachtsmen from California have found their way into the upper part of the Gulf and enjoyed the best of sport with rod and reel. The fish reported by them as "tarpon" is without doubt the bone fish (*Elops saurus*), first cousin of the tarpon. It is a hard-fighting game fish, three feet in length and common at Guaymas. This species is also found on the Atlantic coast.

The Gulf of California is 700 miles long with an average width of about 100 miles. Its fishery resources are of great importance and undoubtedly worthy of development. The only existing means of communication with the United States is the Sonora Railway extending from Nogales, Arizona, to Guaymas, situated about midway on the Gulf. The head of the Gulf extends to within forty miles of the Arizona-Mexico boundary at two points, the mouth of the Rio Colorado and Adair Bay, situated fifty miles east of the mouth of that river.

If access to the northern part of the Gulf with its abundant supply of food fishes, oysters and turtles could be secured, it would be possible to inaugurate a fish trade under American auspices, between points on the Gulf and the large fishless section of the United States represented by New Mexico, Arizona, Nevada and southeastern California. An outlet to the extreme head of the Gulf of California, through a strip of American territory which might be acquired by purchase from Mexico, would be of great benefit to the people of both countries. It would lead not only to the development of latent fishery resources, but would open to traffic a great navigable waterway that has hitherto been tightly sealed.

Appendix A.

Dredging and Hydrographic Records of the U. S. Fisheries Steamship 'Albatross' during the Voyage to the Gulf of California in 1911.

Explanation of Tables.

The last previous dredging station of the 'Albatross' was No. 5672, and the last hydrographic station was No. 4937, occupied during the Philippine Expedition, 1907–1910. (See Bureau of Fisheries Document No. 741.) Twenty-seven dredging and sixteen hydrographic stations were occupied during the Lower California Expedition, extending the series of dredging stations to No. 5699, and the hydrographic series to No. 4953. In the tables the series are distinguished by the prefixed letters D and H, respectively.

Only those stations where the ship's gear was used (*i. e.*, with the ship as an instrument) to collect natural history specimens have been designated in the records as dredging stations. No numbers have been given to the shore stations, nor to minor collections made with the ship at anchor. Numbers should be given in the dredging series to hauls of the large intermediate net when used in a tideway with the ship at anchor, but this net was not used during this cruise.

Since the shore work constitutes such an important part of the total, the data regarding shore stations is shown in chronological order with the dredging stations, the locality, apparatus, etc., appearing in the appropriate columns. To economize time most of the reef collections of fishes were made with dynamite. The method was to locate the desirable fishes in the coral growth or among the rocks by means of a view glass (a glass-bottomed box) used from a boat. A small charge of dynamite with electrical connections was carefully lowered and discharged. Such fishes as floated were at once collected with a dip net, and the place marked by a buoy. As soon as the bottom had cleared it was searched and the dead fish gathered by means of long-handled spears. Seining operations were carried on wherever suitable beaches could be found within reasonable distances from where the ship was anchored. A general location of the beaches is shown in the column headed "Remarks." The dynamiting operations were usually about the reefs and rocks in close proximity to where the ship was anchored, and it is impracticable to give the locations more definitely.

The various kinds of apparatus used at each station are recorded in the tables in chronological order, each on a separate line, opposite the station number, or, in case of unnumbered stations, opposite the locality, in the column "Apparatus."

The "Position" of a station is that point occupied by the vessel, as determined by the navigator at the time of beginning the first operation at that station. The position of the subsequent operations under the same station number corresponds in a general way to the line as indicated under "Drift." The distance covered by all the operations of a station is usually, however, not greater than the negligible error of observation, except in stations near shore determined by bearings. In conformity with previous practice, an additional position, by true bearing and distance, of some prominent shore feature is given for each station when practicable.

All bearings are true unless otherwise indicated.

In the column "Chart" is noted the number and edition of the chart used at each station.

The spelling of all geographic names in these tables is that found on the charts designated in the column "Chart."

"Time of day" in the case of soundings indicates the time the plummet struck bottom; in the case of dredgings, the time at which the apparatus began to tow on the bottom; in the case of intermediate nets, the time at which the nets started to tow at the depth indicated; in the case of surface hauls, the time at which they were lowered into the water and began to be towed or the current to pass through them.

"Depth" (in fathoms) is the depth obtained by the sounding when a sounding was made. In cases where no sounding was made the depth is estimated from the chart, unless the station immediately follows another, in which case the depth obtained at the preceding station is given. In seine hauls the depths given are approximate, and represent the greatest depth of water through which the seine was hauled.

"Temperatures." The air temperatures are taken from the ship's log for the hour nearest the hour entered in the time column; the same is true of the surface temperatures. The bottom temperature was taken at the time of sounding. All readings by Fahrenheit thermometers.

"Density." The water density is in all cases reduced to 15° C. The density of bottom water was ascertained from a sample taken by the Sigsbee water bottle.

In the double column "Trial" is indicated the depth at which apparatus was worked, as well as the duration of operation. In the case of bottom apparatus this latter is the time during which it is supposed to be dragging on the bottom, up to the beginning of reeling in; for intermediate nets the

time occupied in towing at the depth shown in the depth column is indicated by the first quantity, the time occupied in hoisting by the second; for surface nets the time indicated is the time actually towed at the surface.

In the double column "Drift" is shown approximately the general direction in which the gear was hauled, as well as the distance. The state of the currents and of the wind, with the exigencies incident to the steering of the ship, make this more or less inaccurate.

The apparatus used during this expedition consisted of the usual beam trawls for all work on the bottom. No intermediate work was carried on, and the surface nets were used very seldom.

Appendix B.

Record of Air and Water Temperatures of the U. S. Fisheries Steamship 'Albatross,' March 1 to April 28, 1911.

Date 1911	Air: Dry Bulb	Water at Surface
From San Diego, Calif., to Guadalupe Island.		
Mar. 1 4 a.	57	56
8 a.	57	58
12 m.	60	59
4 p.	59	58
8 p.	57	57
Mid.	57	58
Mar. 2 4 a.	57	58
Guadalupe Island.		
Mar. 2 8 a.	61	59
12 m.	67	60
4 p.	67	60
8 p.	64	60
Mid.	65	60
Mar. 3 4 a.	54	60
8 a.	64	60
12 m.	66	61
4 p.	64	60
8 p.	60	60
Mid.	60	60
Mar. 4 4 p.	59	60
8 a.	60	60
Making passage to San Diego, Calif.		
Mar. 4 12 m.	63	60
4 p.	60	60
8 p.	58	60
Mid.	57	58
Mar. 5 4 a.	57	58
8 a.	56	57
12 m.	61	59
4 p.	61	58
8 p.	57	57
Mid.	56	57
Mar. 6 4 a.	53	55
San Diego, Calif.		
Mar. 6 8 a.	50	57
12 m.	68	58
4 p.	62	58
8 p.	58	58
Mid.	57	58
San Diego, Calif.		
Mar. 7 4 a.	55	57
8 a.	57	58
12 m.	62	58
4 p.	60	58
8 p.	61	58
Making passage to San Benito Ids.		
Mar. 7 Mid.	60	57

Date 1911	Air: Dry Bulb	Water at Surface
Mar. 8 4 a.	59	57
8 a.	61	59
12 m.	62	60
4 p.	63	59
8 p.	60	59
Mid.	61	59
Mar. 9 4 a.	61	60
8 a.	62	60
San Benito Islands		
Mar. 9 12 m.	78	61
4 p.	75	61
8 p.	63	60
Mid.	61	60
Mar. 10 4 a.	61	60
San Benito Isl. to Cedros Isl.		
Mar. 10 8 a.	61	60
12 m.	64	60
4 p.	61	60
8 p.	58	59
Mid.	57	59
Mar. 11 4 a.	56	58
8 a.	57	59
12 m.	66	61
4 p.	67	62
8 p.	58	62
Mid.	56	60
Mar. 12 4 a.	56	60
8 a.	65	59
12 m.	85	62
4 p.	79	63
Cedros Isl. to Port San Bartolome		
Mar. 12 8 p.	60	61
Mid.	57	59
Mar. 13 4 a.	58	60
8 a.	63	60
12 m.	82	61
4 p.	78	61
8 p.	63	60
Mid.	59	59
Mar. 14 4 a.	58	60
8 a.	65	60
12 m.	83	60
4 p.	76	63
8 p.	65	60
Mar. 14 Mid.	63	59
Mar. 15 4 a.	60	59
San Bartolome to Abreojos Anchorage.		
Mar. 15 8 a.	65	59
12 m.	66	64
4 p.	67	63
8 p.	64	61
Mid.	63	62
Mar. 16 4 a.	65	62
Abreojos An. to Sta. Maria Bay		
Mar. 16 8 a.	67	61
12 m.	70	63
4 p.	69	62
8 p.	63	62
Mid.	63	61
Mar. 17 4 a.	64	63
8 a.	65	66
12 m.	70	67
4 p.	75	66
8 p.	66	66
Mid.	65	65
Mar. 18 4 a.	65	65
Sta. Maria Bay to Magdalena Bay.		
Mar. 18 8 a.	69	64
12 m.	72	65
4 p½	70	66
8 p.	65	65
Mid.	62	64
Mar. 19 4 a.	61	63
8 a.	67	64
12 m.	73	67
Mar. 19 4 p.	67	67
8 p.	65	66
Mid.	62	65
Mar. 20 4 a.	63	64
8 a.	66	68
12 m.	76	69
4 p.	70	69
8 p.	65	67
Mid.	65	65
Mar. 21. 4 a.	65	66
8 a.	65	68

Date 1911	Air: Dry Bulb	Water at Surface
Magdalena Bay to St. Lucas Bay.		
Mar. 21 12 m.	71	66
4 p.	70	65
Mid.	65	65
Mar. 22 4 a.	66	67
8 a.	66	67
12 m.	71	68
4 p.	70	68
8 p.	68	68
Mid.	68	68
Mar. 23 4 a.	67	68
8 a.	72	70
12 m.	73	70
4 p.	74	70
8 p.	72	70
Mid.	70	70
Mar. 24 4 a.	67	69
8 a.	69	69
12 m.	76	69
4 p.	71	69
8 p.	68	68
Mid.	66	67
Mar. 25 4 a.	63	68
St. Lucas Bay to San Jose del Cabo		
Mar. 25 8 a.	64	68
12 m.	72	70
4 p.	70	70
8 p.	68	69
Mid.	65	69
San Jose del Cabo to Pichilinque		
Mar. 26 4 a.	64	68
8 a.	66	68
12 m.	72	70
4 p.	70	69
8 p.	69	69
Mid.	67	70
Mar. 27 4 a.	66	69
8 a.	69	69
12 m.	72	71
4 p.	77	72
8 p.	71	72
Mid.	68	70
Mar. 28 4 a.	66	69
Mar. 28 8 a.	72	70
12 m.	76	71
4 p.	87	72
8 p.	73	71
Mid.	70	69
Mar. 29 4 a.	67	69
8 a.	75	70
12 m.	79	71
4 p.	80	72
8 p.	74	71
Mid.	71	70
Mar. 30 4 a.	68	70
8 a.	73	71
Pichilinque to Amortajada Bay		
Mar. 30 12 m.	84	74
4 p.	79	73
8 p.	74	71
Mid.	74	70
Mar. 31 4 a.	73	69
8 a.	78	71
12 m.	76	72
4 p.	80	71
8 p.	73	71
Mid.	70	70
Apr. 1 4 a.	70	70
Amortajada Bay to Agua Verde Bay		
Apr. 1 8 a.	74	70
12 m.	75	71
4 p.	81	72
8 p.	77	71
Mid.	76	70
Apr. 2 4 a.	70	69
8 a.	70	68
Agua Verde Bay to Salinas Bay		
Apr. 2 12 m.	72	68
4 p.	79	71
8 p.	66	70
Mid.	64	68
Apr. 3 4 a.	63	66
Salinas Bay to Mulege Anchorage		
Apr. 3 8 a.	68	68
12 m.	71	69

Date 1911	Air: Dry Bulb	Water at Surface
Apr. 3 4 p.	73	69
8 p.	67	67
Mid.	65	67
Apr. 4 4 a.	65	67
8 a.	70	66
12 m.	70	68
4 p.	72	68
8 p.	67	68
Mid.	64	67
Apr. 5 4 a.	63	67
Mulege Anc. to Concepcion Bay		
Apr. 5 8 a.	67	67
12 m.	77	74
4 p.	82	74
8 p.	73	72
Mid.	71	72
Apr. 6 4 a.	69	72
8 a.	80	72
12 m.	82	77
4 p.	84	76
8 p.	75	74
Mid.	73	73
Concepcion Bay		
Apr. 7 4 a.	71	72
8 a.	76	72
12 m.	76	73
4 p.	75	73
8 p.	73	73
Mid.	70	72
Apr. 8 4 a.	68	72
8 a.	77	72
12 m.	74	73
Concepcion Bay via Mulege anchorage to San Francisquito.		
Apr. 8 4 p.	73	70
8 p.	70	70
Mid.	69	68
Apr. 9 4 a.	68	67
8 a.	69	64
12 m.	70	62
4 p.	70	61
8 p.	66	60
Mid.	67	59
Apr. 10 4 a.	66	59
San Francisquito to Angel de la Guardia Id.		
Apr. 10 8 a.	69	61
12 m.	65	61
4 p.	72	62
8 p.	65	68
Mid.	63	61
Apr. 11 4 a.	61	60
8 a.	65	60
Angel de la Guardia to Tiburon		
Apr. 11 12 m.	72	64
4 p.	73	63
8 p.	65	62
Mid.	62	63
Apr. 12 4 a.	72	60
8 a.	69	61
12 m.	75	64
4 p.	79	62
8 p.	69	63
Mid.	63	62
Apr. 13 4 a.	57	60
8 a.	63	60
Tiburon Id. to San Esteban Id.		
Apr. 13 12 m.	67	62
4 p.	73	58
8 p.	66	61
Mid.	67	59
Apr. 14 4 a.	68	57
8 a.	70	58
San Esteban Id. to Guaymas		
Apr. 14 12 m.	67	63
4 p.	66	63
8 p.	67	62
Mid.	67	62
Apr. 15 4 a.	70	64
8 a.	73	64
12 m.	83	64
4 p.	80	66
Guaymas to Sta. Catalina Island.		
Apr. 15 8 p.	68	63

Date 1911	Air: Dry Bulb	Water at Surface
Apr. 15 Mid.	69	68
Apr. 16 4 a.	69	68
8 a.	72	68
Sta. Catalina Id. via. Sta. Cruz, Pichilinque.		
Apr. 16 12 m.	77	69
4 p.	73	71
8 p.	73	72
Mid.	75	72
Apr. 17 4 a.	73	72
8 a.	75	73
12 m.	83	74
4 p.	86	75
8 p.	75	73
Mid.	71	72
Apr. 18 4 a.	70	73
8 a.	73	75
12 m.	83	75
4 p.	87	74
8 p.	75	73
Mid.	69	71
Pichilinque		
Apr. 19 4 a.	67	72
Via Espiritu Santo & Caralbo Islands.		
Apr. 19 8 a.	73	71
12 m.	84	74
4 p.	78	75
8 p.	74	74
Mid.	73	74
Apr. 20 4 a.	72	69
San Jose del Cabo to Port San Bartolome.		
Apr. 20 8 a.	74	74
12 m.	72	74
4 p.	68	70
8 p.	67	66
Mid.	65	68
Apr. 21 4 a.	62	64
8 a.	67	67
12 m.	72	68
Apr. 21 4 p.	66	68
8 p.	63	65
Mid.	60	63
Apr. 22 4 a.	60	62
8 a.	60	61
12 m.	61	62
4 p.	61	61
8 p.	57	58
Mid.	57	58
Apr. 23 4 a.	55	54
8 a.	57	56
Port San Bartolome to San Francisco.		
Apr. 23 12 m.	61	60
4 p.	61	60
8 p.	59	60
Mid.	59	60
Apr. 24 4 a.	58	59
8 a.	58	58
12 m.	60	58
4 p.	59	60
8 p.	58	60
Mid.	58	59
Apr. 25 4 a.	57	58
8 a.	58	59
12 m.	58	59
4 p.	58	59
8 p.	56	58
Apr. 26 4 a.	55	56
8 a.	54	54
12 m.	61	56
4 p.	55	56
8 p.	53	54
Mid.	51	54
Apr. 27 4 a.	51	54
8 a.	53	53
12 m.	56	53
4 p	52	53
8 p.	51	52
Mid.	50	50
Apr. 28 4 a.	49	52
8 a.	50	51

Appendix C.

Abbreviations and Symbols.

12′ Agz.....12-foot Agassiz beam trawl. This was the only kind of trawl used this cruise. The runners stand 4 ft. in height and the usual type of net carries a taut headline, making the full opening available. The "reversible" style of this net, for deep-sea work where the possibility of upsetting the frame is great, was not used.

botm.....bottom.

Bt. dredge.....boat dredge; made of ½-inch webbing, with a bobbinet lining; protected by a canvas apron. Towed by steam launch when used.

C. S.....Coast Survey.

D.....dredging, or collecting, station.

dip.....ordinary dip net on a 12-inch or 14-inch ring, with bamboo handle; used extensively in reef fishing with dynamite, and from the gangway ladder with electric light.

dyn.....dynamite.

e. l.....electric light.

H.....hydrographic station.

H. O.....U. S. Hydrographic Office.

hbr.....harbor.

K. 1.....a small plankton or Kofoid net, made of No. 12 silk, on a 14-inch ring.

K. 3.....same as above, but made of No. 2 silk.

Lt.....light.

Luc. sdr.....Lucas sounding machine.

m. b.....mud bag. This is a bag made of canvas, and sewed to an iron frame. It is about 3 feet long and 18 inches wide. It is attached at the tail of the dredge net.

wng. b.....wing bag. This is a circular bag, about 3 feet long, fastened to a 14-inch brass ring; usually placed at both ends of the trawl, but one was used several times this cruise at the tail of the dredge net, instead of the square mud bag.

spec.....specimen.

3½′ Tnr.....3½′ Tanner beam trawl; was used from steam launch at various places when ship was at anchor.

Tnr.-Blish sdr..Tanner-Blish sounding machine.

therm.....Negretti-Zambra deep-sea thermometer, used with Tanner case.

wat. bot.....water bottle. A water bottle was used at each sounding.

Hand leadline..this is used from the bow of the ship when approaching an anchorage, or from a small boat to make soundings in proximity of the anchorage.

‡.....signifies nets towed astern, from taffrail, side by side.

"Character of bottom," determined by the specimens from the sounding cup, is expressed by abbreviations, the key to which is appended. It will be noted that these abbreviations are arbitrarily capitalized for nouns. When used as adjectives, however, the noun abbreviations are not capitalized.

bk.....black
bl.....blue
br.....brown
br-gn...brownish-green
brk.....broken
C.....Clay
Clmps..Clumps
Co.....Coral
crs.....coarse
dk.....dark
fne.....fine
For.....Foraminifera
G.....Gravel
Glob....Globigerina
gn.....green
gn-br...greenish-brown
gn-gy...greenish-gray
gy.....gray
hrd.....hard
Lav....Lava
M.....Mud
mrgn..marginal
Mss...Masses
Oz....Ooze
P.....Pebbles
Ptr....Pteropod
R.....Rock
Rf.....Reef
rky....rocky
S.....Sand
sctrd..scattered
Sh.....shells
sml....small
Sp.....Specks
St.....Stones
vol....volcanic
W.....Seaweed
wh....white

Appendix C.

DREDGING AND HYDROGRAPHIC RECORDS OF THE U. S. FISHERIES STEAM-

Station No.	Position	Chart	Date	Time	Depth F
	Between San Diego, Cal. and Guadalupe Island, Mexico.				
D. 5673	Near U. S. Mex. Boundary	H.O. 1006	Mar. 1	6:23 A.M.	1090
	3782′ Cone– 32 18′ 30″N. 116 46′ 00″W. bore N.42 E.	(1887)		8:23 A.M.	.....
	4900′ Cone– 31 36′ 30″N., 116 14′ 30″W. bore N.82 E.				
	31 26′ 00″N. 117 42′ 00″W.				
	Guadalupe Island, East Coast, Northern End.	see below	Mar. 2	9:00 A.M.	.....
H. 4938	Black Rock, N.89 W. Near North Pt., 1.5 mi. 29 10′ 20″N., 118 15′ 45″ W.	H.O. 1681 (1897)	Mar. 2	6:55 A.M.	300
H. 4939	Near North Point, N.12 E. Block House S.78 W. 29 08′ 50″N., 118 17′ 50″W.	"	"	7:55 A.M.	290
H. 4940	Elephant Rock, S.23 W. Cone N side of Id. S.71 E. 29 09′ 30″ N., 118 23′ 00″ W.	"	"	9:10 A.M.	110
H. 4941	E. R., S.18 W., Cone N side of Id., N.75 E. 29 09′ 00″N., 118 23′ 20″W.	"	"	9:25 A.M.	30
H. 4942	E. R., S.1 W., Cone N side of Id., N.65 E. 29 08′ 40″N., 118 24′ 10″W.	"	"	9:50 A.M.	27
H. 4943	E. R., S.40 E., Cone N side of Id., N.60 E. 29 08′ 00″N., 118 24′ 30″W.	"	"	10:05 A.M.	31
H. 4944	E. R., N.46 E., Rock at Str. Pt., S.11 E. 29 06′ 50″N., 118 25′ 00″W.	"	"	10:25 A.M.	58
H. 4945	E. R., N.17 E., Rock at Str. Pt., S.7 E. 29 00′ 20″N., 118 24′ 30″ W.	"	"	11:00 A.M.	42
H. 4946	Midway bet. pts. at E. R. & Str. Pts. 29 04′ 50″N., 118 24′ 00″W.	"	"	11:30 A.M. to 3:00 P.M.	25–12
	"	"	Mar. 3	7:45 P.M.	.....
H. 4947	Rock at Str. Pt. & right tangent Inner Id. in line S.21 E.; E. R., N.6 E.; 29 00′ 30″N. 118 24′ 30″W.	"	Mar. 4	4:08 P.M.	89
H. 4948	Rock at S. Pt. & E. R. in line N.2 W. Inner Id. rt. tan. S.22 E., 28 59′ 30″N., 118 25′ 50″ W.	"	"	4:12 P.M.	250
H. 4949	S. Pt. & E. R. in line N.4 W. Inner Id. rt. tan. S.21 E.; 29 01′ 15″N., 118 23′ 00″W.	"	"	4:20 P.M.	226
H. 4950	Str. Pt. N.26 W. Inner Id. rt. tan. S.21 E. 29 01′ 15″N., 118 22′ 50″W.	"	"	4:43 P.M.	138

SHIP 'ALBATROSS' DURING THE VOYAGE TO THE GULF OF CALIFORNIA IN 1911.

Character of Bottom	Temperature F. Air	Temperature F. Surface	Temperature F. Botm.	Apparatus	Depth	Dur.	Direc.	Dis.	Remarks
bl.g y M; few Glob.	56.	56	....	Luc. sdr.	botm.	:28	N.E.	0.2	Thermo. did not capsize.
.....	58.	58	.....	12′ Agz;m.b.	.....	.....	.....	....	One bridle-stop parted.
.....	...	....	.....	dyn.	15 ft.	4:	.....	....	4 shots.
bottom not reached	...	....	.....	Tnr.-Blish sdr.	.....	.....	.....	....	Hand line fishing from ship at various times with from 2 to 8 lines when at anchor.
hrd.	...	....	....	"					
.....	....	....	.....	"					
crs bl. S.	....	...	.....	"					
"	...	....	.....	"					
"	...	....	.....	"					
g y S; St.	....	....	.....	"					
bl. crs. S.	....	....	.....	"					
"	....	....	.....	Hand lead line					
"	....	....	.....	e.l. dip.	Surf.	3:	.....	....	6 shots of 1 to 3 dyn. caps at gangway.
hrd.	....	....	.....	Tnr.-Blish sdr.					
bottom not reached	....	....	.....	"					
fne gy S.	....	....	.....	"					
"	....	....	.....	"					

Appendix C — Continued.

Station No.	Position	Chart	Date	Time	Depth F
	Between Guadalupe Island, Mexico, & San Diego, Cal. Straight run. *Between San Diego, Cal., & San Benito Is., Mexico.*				
H. 4951	3782′ Cone, N.22 E. Bluff Peak (1450′) N. 78 E., 31° 28′ 45″N., 117° 09′ 50″W.	H.O. 1149 (1909)	Mar. 8	6:11 A.M.	590
D. 5674	"	"	"	6:11–7:50A.M.	590
				8:30 A.M.	13
	Middle San Benito Id. So. side (anch.) S. E. Pt., W. San Benito Id. S.62°W., NE. Pt. N.34°W.	H.O. 1194 (1890)	Mar. 9	9:00 A.M.	—
				7:30 P.M.	13
	San Benito Islands to Cedros Is., off Lower Cal. Straight run. *Cedros Island* South Bay (anch)				
	Prominent Blk Rock N.58°W., Rock ½ mi. E. of latter N.19°E.	H.O. 1192 (1890)	Mar. 10	9:00 A.M.	17
	So. part of E. side (anch) E. tan. Cedros Id. N.26°E., Morro Redondo Pt. S.5°W.	H.O. 1310 (1909)	Mar. 11	10:30 A.M.	.....
				2:00 P.M.	.....
				8:30 P.M.	.....
	Middle of E. side (anch) E. of 1808′ Peak. Lat. 28° 13′ 00″N.	"	Mar. 12	9:00 A.M.	.....
				9:30 A.M.	.....
				2:30 P.M.	
	Cedros Is. to Port San Bartolome, Lower Cal. Straight run.				
	Port San Bartolome (anch) Coffin Rock S'n. tan. S.65°W. Entrance Rock, N.68°W.	H.O. 1204 (1890)	Mar. 13	9:00 A.M.	.....
				10:30 A.M.	.....
	"	"	Mar. 14	8:30 A.M.	.....
				9:30 A.M.	.....
				8:00 P.M.	.....
	Port San Bartolome to San Cristobal Bay, Lower Cal. Straight run.				
	San Cris. Bay (anch) Morro Hermoso Pt. N.59°W.; San Pablo Bluff, S.10°E.	H.O. 1310 (1909)	Mar. 15	10:00 A.M.	7
	San Cristobal Bay to San Roque Island, Lower Cal.				
D. 5675	Lower Cal., Mex., San Pablo Pt. N.33°E.; Asuncion Pt. N.87°E. (27° 07′ 08″ N.114° 33′ 10″W.)	H.O. 1310 (1909)	"	2:11 P.M.	284
				2:50 P.M.	.....
	San Roque Is. (anch) NE. end of Is., S.68°E., W. end of Is. S.10°W.	H.O. 1268 (1891)	"	5:00 P.M.	.....

Character of Bottom	Temperature F. Air	Sur-face	Botm.	Apparatus	Depth	Dur.	Direc.	Dis.	Remarks
gn. M; fne S: Glob.	60°	58°	39.4°	Luc. sdr.	.....	.....	.....	....	Propeller on water-bottle jammed.
"	60°	58°	39.4°	"					
	61°	59°	.....	12′Agz; m.b.	botm.	:25	N.49°W.	2.4	
.....	....	....	.....	18 handlines	botm.	8:00			
S. G. R.	....	....	.....	100′ seine	5–15ft.	2:30	.....	....	7 hauls on beach of W. San Benito Id.
.....	....	....	.....	e.l; dip.	.....	1:00			
.....	....	....	.....	6 handlines	botm.	3:	.....	....	Seining party failed to find suitable beach.
.....	....	....	.....	100′ seine	10 ft.	1:00	.....	....	3 hauls on beach
.....	....	....	.....	200′ seine	20 ft.	3:00	.....	....	near anchorage.
.....	....	....	.....	e.l. dip.	surf.	1:00	.....	...	"
S. R. G.	....	....	.....	100′seine	10′	2:00	.....	....	2 " } 30 min.
.....	....	....	.....	3½′ Tn'e	botm.	2:30	.....	....	5 " } each
.....	....	....	.....	Bt. dredge	"	1:00	.....	....	2 " }
M. S. G.	....	....	.....	130′ seine	5 ft.	4:00	.....	....	9 hauls, SE. beach near anchorage.
.....	....	....	.....	Bt. dredge	botm.	3:00	.....	....	12 hauls,5-30 mi. ea.
"	....	....	.....	130′ seine	4′	7:00	.....	....	14 " SE. beach
.....	....	....	.....	Bt. dredge	botm.	3:30	.....	....	7 " 10-30 mi. ea.
.....	....	....	.....	e.l. dip.	surf.	1:00	.....	....	Handlines used from time to time while at anchor.
.....	....	....	.....	8 handlines	botm.	1:00	.....	....	Anchored 1½ hrs. while party made observations along shore for elephant seals.
gn.M.fne S.	67°	64°	44.6°	Luc.sdr.					
.....	67°	63°	.....	12′ Agz;m.b.	botm.	0:20	S.50°W	0.7	
.....	....	....	.....	.....	.....	.....	.....	....	anchored 2½ hrs. shore party only.

Appendix C — Continued.

Station No.	Position	Chart	Date	Time	Depth F
	San Roque Id. to Abreojos Anchorage, Ballenas Bay, Lower Cal. Straight run.				
	Abreojos Anch. (anch) Abreojos Pt., S. 73°W. 312′ Hill, N.08′W.	H.O. 1294 (1891)	Mar. 16	8:30 A.M.	.....
				1:30 P.M.	.....
		.....	.....	10:00 A.M.	.....
		.....	.....	9:00 A.M.	6
	Between Ballenas Bay & Santa Maria Bay, Lower Cal.				
H. 4952	25° 31′ 15″N., 113° 29′ 30″W.	H.O. 1493 (1908)	Mar. 17	8:17 A.M.	645
D. 5676	"	"	"	8:17–9:06A.M.	645
	.....	.....	.....	.....	.....
H. 4953	25° 23′ 45″N., 113° 16′ 00″W.	"	"	1:13 P.M.	735
D. 5677	25° 23′ 45″N., 113° 16′ 00″W.	H.O. 1493 (1908)	Mar. 17	1:13 P.M.	735
				2:05 P.M.	.....
				1:40 P.M.	.....
	Santa Maria Bay (anch) Hughes Pt.S.10°W. .Mt. San Lazaro N.70°W.	H.O. 1636 (1898)	Mar. 18	7:30 A.M. 10:00 A.M.	....
	Santa Maria Bay to Magdalena Bay, Lower Cal. Straight run.				
	Magdalena Bay, off Mag. (anch) Mag. Light S.88°W., Cove Pt. S.52°E.	H.O. 1636 (1898)	Mar. 18 –19	.....	.....
	Off N. side Santa Margarita Is. (anch) L. tan. Deering Bluff N.60°E.; NW. tan. Id. N.88°W.	"	Mar. 19	1:00 P.M.	8½
	Marcy Channel (anch) Cisne Pt. S.70°W.; E. tan. Santa Margarita Id. S.46°E.	"	Mar. 20	9:30 A.M.	.....
				10:00 A.M.	.....
				2:00 P.M.	.....
D. 5678	Sail Rock, Entrada Pt.; S.53°W.; Redondo Pt. S.15°W.(24° 35′ 20″N. 111° 59′ 35″W.)	"	Mar. 21	9:58–10:03 A.M.	13½ .....
	Off Magdalena (anch) Mag. wharf S. 82°W. Cove Pt. S.57°E.	"	°"	1:45 P.M. 2:00 P.M.	....
	Between Magdalena Bay & San Lucas Bay, Lower Cal.				
D. 5679	23° 47′ 45″N., III° 23′ 00″W.	H.O. 1664 (1899)	Mar. 22	6:41–7:21A.M.	325
D. 5680	23° 40′ 30″N., 111° 12′ 45″W.	"	"	10:09–11:24 A.M.	389
D. 5681	23° 33′ 15″N.; 111° 02′ 10″W.	"	"	2:08–46 P.M.	405

Character of Bottom	Temperature F. Air	Surface	Botm.	Apparatus	Depth	Dur.	Direc.	Dis.	Remarks
fne S.	....	....	.....	130′ Seine	6′	3:00	.....	...	3 hauls, beach near anchorage.
"	....	....	.....	200′ seine	10′	2:30	.....	....	"
"	...	....	.....	Bt. dredge	botm.	3:00	.....	....	7 hauls 15–20 mi. ea.
"	....	....	.....	8 handlines	"	3:00			
gn.M; fneS; Glob.	65°	66°	39.0°	Luc. sdr.					
"	65°	66°	39.0°	"	botm.	0:20	NWxW	0.2	
.....	70°	65°	.....	12′ Agz; m.b.					
"	70°	66°	38.6°	Luc. sdr.					
gn.M;fne S. Glob.	70°	66°	38.6°	Lne sdr.12′Agz;					
.....	70°	66°	.....	m.b. K's I&3‡	botm.	0:20	WNW	0.2	
.....	70°	66°	.....	.....	surf.	0:50	"	....	Towed astern during dredging operation.
S.	....	....	.....	Bt. dredge	botm.	5:00	.....	....	13 hauls 10 min. each
.....	....	....	.....	100′ seine	8′	1:30	.....	....	3 " on N. beach
.....	....	....	.....	.....	.....	....	.....	....	Stopped for inspec. of port officials.
.....	....	....	.....	.....	.....	....	.....	....	Shore parties.
S.	....	....	.....	200′ seine	10′	2:00	.....	....	3 hauls on beach of Mangrove Id.
.....	....	....	.....	Bt. dredge	botm.	:45	.....	....	4 hauls 10 mi. ea.
M.	....	....	.....	100′ seine	5 ft.	2:30	.....	....	Worked up lagoon of Mangrove Id.
.....	....	....	.....	.....	.....	....	.....	....	
S. few brk.Sh.	71°	66°	.....	hand line					
(dredge)	71°	66°	.....	12′ Agz;m.b.	botm.	:20	N81°W.	0.6	
.....	....	....	.....	Bt. dredge	botm.	2:00	.....	....	7 hauls 5–10 mi. ea.
M.	....	....	.....	100′seine	6′	3:00	.....	....	Worked up Howland lagoon
dk gn.M.For.	65°	67°	44.1°	Luc. sdr. 12′	botm.	0:16	N68°W.	0.2	Net badly torn.
	65°	67°	..	Agz;m.b.2wng.b's					
"	68°	68°	43.6°	Luc. sdr.					
	71°	68°	..	12′Agz:wng b	botm.	:21	"	"	Wing bag at tail of net.
No specm.	70°	68°	43.3°	"	"	:20	2	"	"
dkgn.M;For (dredge)	70°	68°	..						

Appendix C — Continued.

Station No.	Position	Chart	Date	Time	Depth F
	San Lucas Bay & Vicinity				
D. 5681	S. L. Bay (anch) Cape St. L. S.70°E.; Customs House N.77°W.	H.O. 1666 (1898)	Mar. 23	8:30 A.M.	.....
				2:00 P.M.	.....
				9:30 A.M.	.....
				8:00 P.M.	13½
D. 5682	Off St. L. Bay; Cabo Falso N.61°W. Cape St. Lucas, N.11°W. (22° 48′ 20″N., 109° 52′ 40″W.	"	Mar. 24	7:32–8:18A.M.	491
	St. L. Bay (anch) Cape St. L. S.3°W.; Customs House S.88°W.	"	"	1:30–7:45P.M.	 11
	San Lucas Bay to San Jose del Cabo Bay, Lower Cal. Straight run.				
	S. J. del C. Bay (anch) Semaphore S.83°W. Customs house, N.42°W.	H.O. 1667 (1898)	Mar. 25 Mar. 26	..... 9:30 A.M.	....
	Gulf of Cal. (Western side).				
	Pichilinque Harbor (anch) SE. tan. San Juan Is. S.14°W.; SW. tan. N. side of False Bay, S.41°E.	H.O. 2087 (1902)	Mar. 27 Mar. 28 Mar. 29	7:00 P.M. " "	5¼ " "
	Amortajada Bay, San Josef Id. (anch) S. tan. Cayo Id., S.81°W.; Coyote Id. S. 12°E.	H.O. 2181 (1904)	Mar. 30 Mar. 31	7:00 P.M. 8:30 A.M.	11½ .....
				9:00 A.M.	.....
				1:30 P.M.	.....
				1:30 P.M.	.....
	Agua Verde Bay (anch) San Pasqual Pt., N.10°W.; Opposite Pt. N.83°E.	H.O. 850 (1878)	Apr. 1	4:00 P.M. 7:30 P.M.	 13
		.....	Apr. 2	8:30 A.M.	.....
		.....	.....	8:45 A.M.	.....
		.....	.....	8:15 A.M.	.....
	Salinas Bay, Carmen Id. (anch) Perice Pt., S.63°E.; White Pt. S.29°W.	H.O. 2181 (1904)	Apr. 2 Apr. 3	7:00 P.M. 8:00 A.M.	4½ .....
		.....	"	8:00 A.M.	.....
				9:00 A.M.	.....
	Mulege Anchorage, Mouth of Conception Bay (anch). Sombrerito Pt. S.44°W.; Gallite Pt. S.54°E.	H.O. 849 (1878)	Apr. 4	8:00 A.M.	.....
				1:00 P.M.	.....

Character of Bottom	Temperature F. Air	Surface	Botm.	Apparatus	Depth	Dur.	Direc.	Dis.	Remarks
crs. S.	....	....	.....	175′ seine	10–20′	3:00	.....	....	5 hauls, beach S. of village.
"	....	....	.....	200′ "	20–30′	2:30	.....	....	2 hauls, beach S. of village.
.....	....	....	.....	Bt. dredge	botm.	3:00	.....	....	13 hauls, 10–15 mi. ea.
.....	....	....	.....	e.l. dip.	surf.	1:30			
S.	69	69	40.8	Luc.sdr.					
.....	69	69	.....	12′ Agz; wng. b.	botm.	:20	S18°W.	0.6	Wing bag at tail of net.
S.	....	....	.....	100′ seine	10–15′	3:00	.....	....	6 hauls beach S. of village.
.....	....	....	.....	e.l.; dip.	surf.	2:15			
.....	....	....	.....	.....	.....	.....	.....	....	Shore parties.
M. S.	....	....	.....	16′ seine	3′	4:00	.....	....	A number of hauls in streams & small lagoons.
.....	....	....	.....	e.l. dip.	surf.	3:00			
.....	....	....	.....	"	"	2:00			
.....	....	....	.....	"	"	3:00			
.....	....	....	.....	e.l., dip.	surf.	2:00			
S.	....	....	.....	175′ seine	10–20′	3:00	.....	....	5 hauls beach near mouth of San José River.
.....	....	....	.....	Bt. dredge	botm.	1:30	.....	....	4 hauls of 10 mi. ea.
S.	....	....	.....	100′ seine	5′	3:30	.....	....	Working up S. José River.
.....	....	....	.....	dyn.	15–25′	4:00	.....	....	6 shots.
fine S.	....	....	.....	175′ seine	10–15′	1:30	.....	....	3 hauls, main beach.
.....	....	....	.....	e.l.; dip.	surf.	2:45			2 small ponds close to beach.
M.	....	....	.....	16′ seine	3′	1:00			
fine S.	....	....	.....	175′ seine	10–15′	1:30			3 hauls, main beach.
.....	....	....	.....	Bt, dredge	botm.	2:30			12 hauls 10 to 20 mi. ea.
.....	....	....	.....	e.l.; dip.	surf.	2:00			
fine S.	....	....	.....	175′ seine	10′	3:15	.....	....	6 hauls NW. beach.
.....	....	....	.....	dyn.	8–18′	3:15	.....	....	6 shots.
.....	....	....	.....	3½′ Tne.	botm.	2:15	.....	....	6 hauls 20 mi. ea.
.....	....	....	.....	Bt. dredge	"	3:30	.....	....	14 hauls varying time.
.....	....	....	.....	dyn.	6–8′	1:00	.....	....	2 shots, 1 shot lost.

Appendix C — Continued.

Station No.	Position	Chart	Date	Time	Depth F
				2:00 P.M.	.....
D. 5682	So. Part of Conception Bay (anch) Concep. Peak, S.22°E.; 500′ Peak, S.27°W.	H.O. 849 (1878)	Apr. 5	2:00 P.M.	.....
			Apr. 6	8:00 A.M.	.....
				2:00 P.M.	.....
				7:45 P.M.	14
	"	"	Apr. 7	9:00 A.M.	.....
	.....	.....		"	.....
	Ranada Pt. S.83°W.; R. tan. Ricason Id. S.39°E.	.....	.....	9:15 A.M.	.....
		.....	Apr. 8	8:30 A.M.	.....
				"	.....
	Mulege Anchorage (anch)	"	"	5:00 P.M.	.....
	San Francisquito Bay (anch) NW. tan. N.11°E.; Eastern tangent N.80°E.	H.O. 630 (1878)	Apr. 9	3:30 P.M.	.....
			.....	7:00 P.M.	10½
	Angel de la Guardia Id. SE. Side (anch) E. tan. Pond Id. N.34°E.; E. tan. Isla Partida S.28°E.	H.O. 620 (1909)	Apr. 10	1:30 P.M.	.....
			.....	"	.....
				3:45 P.M.	.....
	Tiburon Is. So. side (anch); Red Bluff Pt. S.86°W. S. tan. Turner's Is. S.47°E.	"	Apr. 11	"	.....
	.....	.....		8:30 P.M.	9½
	.....	.....	Apr. 12	8:00 A.M.	.....
	.....	.....	.....	8:30 A.M.	.....
	.....	.....	.....	9:00 A.M.	.....
	San Esteban Id. (anch) NE. tan. N.5°W.; 25′ Rock, S.54°W.	"	Apr. 13	1:15 P.M.	.....
		.....	.....	1:30 P.M.	.....
	San Pedro Martir Id.	.....	Apr. 14	11:55 A.M.	.....
	Guaymas, (anch)	H.O. 640 (1878)	.....	.....	.....
			Apr. 15	7:00 A.M.	
	Santa Catalina Id., (anch)	H.O. 850 (1878)	Apr. 16	9:15 A.M.	.....
	Santa Cruz Id.	H.O. 621 (1909)	Apr. 16	3:15 P.M.	.....
	Pichilinque Harbor (anch) off Coaling Sta.	H.O. 2087 (1902)	Apr. 17	2:00 P.M.	.....
	San Gabriel Bay, Espiritu Santo Id. (anch)	H.O. 2193 (1914)	Apr. 19	9:00 A.M.	.....

Character of Bottom	Temperature F. Air	Surface	Botm.	Apparatus	Depth	Dur.	Direc.	Dis.	Remarks
M.	....	....	.....	100′ seine	5′	2:45	.....	....	7 hauls, mouth of Mulege R.
.....	....	....	.....	Bt. dredge	botm.	2:30	.....	....	8 hauls 10-20 mi. ea. no seining beach.
.....	....	....	.....	dyn.	3–15′	7:30	.....	....	13 shots.
.....	....	....	.....	Bt. dredge	botm.	4:00	.....	....	5 hauls 20 m. to 1 hr.
.....	....	....	.....	e.l., dip.	surf.	1:15			
.....	....	....	.....	dyn.	15′	3:30	.....	....	6 shots.
.....	....	....	.....	Bt. dredge	botm.	2:30	.....	....	7 hauls varying time
S., Co.	....	....	.....	175′ seine	5–10′	3:00	.....	....	3 hauls, beaches near anchorage.
.....	....	....	.....	dyn.	15′	2:30	.....	....	5 shots.
S. Co.	....	....	.....	175′ seine	10′	"	.....	....	3 hauls beaches near anchorage.
.....	....	....	.....	.....	.....	.....	.....	....	Stopped for Bill of Health only.
.....	....	....	.....	dyn.	8–15′	2:30	.....	....	2 shots.
.....	....	....	.....	e.l., dip.	surf.	"			
.....	....	....	.....	Bt. dredge	botm.	4:00	.....		8 hauls varying time.
.....	....	....	.....	dyn.	20′	3:00	.....	....	5 shots. No beach for seining.
.....	....	....	.....	dyn.	6–25′	1:45	.....	....	4 shots.
S.	....	....	.....	175′ seine	10–15′	"	.....	....	4 hauls beach E. of Red Bluff Is.
.....	....	....	.....	e.l., dip.	surf.	:05	.....	....	Current too strong for use of light.
.....	....	....	.....	Bt. dredge	botm.	3:00	.....	....	6 hauls varying time.
S.	....	....	.....	100′ seine	8′	1:00	.....	....	2 hauls same beach.
.....	....	....	.....	dyn.	15′	2:15	.....	....	6 shots.
.....	....	....	.....	Bt. dredge	botm.	2:45	.....	....	5 hauls, 20 mi. ea.
.....	....	....	.....	dyn.	8–20′	2:30	....	....	5 shots.
.....	....	....	.....	.....	.....	.....	.....	....	Choppy sea; too rough to land.
.....	....	....	.....	.....	.....	.....	.....	....	For Bill of Health and mail.
.....	....	....	.....	dyn.	10–15′	2:00	.....	....	7 shots.
.....	....	....	.....	dyn.	10′	1:30	.....	....	4 shots.
.....	....	....	.....	dyn.	8′	2:30	.....	....	6 shots.
.....	....	....	.....	.....	.....	.....	.....	....	Stopped 3 hrs. for inspection of pearl oyster industry.

Appendix C — Continued.

Station No.	Position	Chart	Date	Time	Depth F
D. 5682	Ceralbo Is.	H.O. 621 (1909)	Apr. 19	4:00 P.M.	.....
	San Jose del Cabo Bay (anch.)	H.O. 1667 (1898)	Apr. 20	6:00 A.M.	.....
	West Coast of Lower Cal. between Cape St. Lucas & Port San Bartolome.				
D. 5683	Off Cape St. L.; Cabo Falso N.53°W.; Cabeza Belleno N.; (22° 46′ 45″N., 109° 50′ 15″W.)	H.O. 1664 (1899)	Apr. 20	12:48 P.M. 1:44 P.M.	630 .....
D. 5684	So. of Magdalena Bay, (23° 23′ 30″N., 112° 00′ 30″W.)	..... "	..... Apr. 21	6:25 A.M. .... 8:49 A.M.	1760 .....
D. 5685	So. of Abreojos Pt. (25° 42′ 45″N., 113° 38′ 30″W.)	H.O. 1493 (1908)	Apr. 22	8:14 A.M. 9:16 A.M.	645 .....
D. 5686	SW. of Abreojos Pt. (26° 14′ 00″N., 114° 00′ 00″W.)	"	Apr. 22	3:16 P.M. 4:20 P.M.	930 .....
	Port San Bartolome (anch) Entrance Rock, N.79°W.; S. tan. Coffin Id. S.52°W.	H.O. 1204 (1890)	Apr. 23	7:00 A.M.	.....
	Between Port San Bartolome, Lower Cal., Mex. & San Francisco, Cal., U. S. A.				
D. 5687	So. of Cedros Id. W. tan. Natividad Id. N.10°E. Breaker Pt., Lower Cal. N.72°E. (27° 39′ 15″N., 115° 16′ 00″W.)	H.O. 1310 (1909)	Apr. 23	12:42 P.M. 1:29 P.M.	480 .....
D. 5688	So. of C. Id. W. tan. Nat. Id. N. 15°E.; Breaker Pt., Lower Cal. N.72°E. (27° 38′ 45″N., 115° 17′ 40″W.)	..... "	..... Apr. 23	2:35 P.M. 3:22 P.M.	525 .....
D. 5689	E. of Guadalupe Id. Hat Mt. N.59°E. St. Vincent Pk. N.47°E. (29° 23′ 00″N., 116° 14′ 00″W.)	H.O. 1193 (1909)	Apr. 24	6:20 A.M. 7:32 A.M.	879
D. 5690	East of Guadalupe Id. (29° 29′ 00″N., 116° 18′ 00″W.)	"	Apr. 24	10:18 A.M. 11:33 A.M.	1101 .....
D. 5691	Off Lower Cal. SW. of San Diego (31° 08′ 20″N., 118° 29′ 30″W.)	H.O. 1006 (1887)	Apr. 25	6:17 A.M. 7:30 A.M.	868 .....
D. 5692	Off Lower Cal. SW. of San Diego. (31° 23′ 45″N., 118° 31′ 30″W.)	..... "	Apr. 25	11:32 A.M. 1:03 P.M.	1076 .....
D. 5693	W. of San Nicholas Id. Cal. (33° 13′ 30″N., 120° 04′ 30″W.)	C.S. 5002 (1904)	Apr. 26	6:11 A.M. 6:57 A.M.	451 .....
D. 5694	NW. of San Nicholas Id., Cal. (33° 24′ 36″ N., 120° 12′ 30″W.)	..... "	Apr. 26	9:16 A.M. 10:20 A.M.	640 .....
D. 5695	" (33° 33′ 00″N., 120° 17′ 30″W.)	"	Apr. 26	1:13 P.M. 2:14 P.M.	534 .....

Character of Bottom	Temperature F. Air	Surface	Botm.	Apparatus	Depth	Dur.	Direc.	Dis.	Remarks
.....	....	....	.....	dyn.	10–20′	1:30	.....	....	6 shots.
.....	....	....	.....	.....	.....	.....	.....	....	Short stop only.
crs S;gn.M;G.	70°	73°	39.1°	Luc.sdr.					
.....	69°	73°	.....	12′ Agz.	botm.	0:15	S26°W.	1.5	Frame badly bent.
?	64°	67°	?	.....	.....	.....	.....	....	Wire parted while heaving in. Sounding instrument lost.
.....	66°	67°	.....	"	"	:30	NWxW	?	
Bk S; Co.	60°	61°	?	.....	.....	.....	.....	....	Thermo defective.
.....	61°	61°	.....	"	"	"	WxS	?	
gn M; Glob.	60°	61°	37.3°						
.....	61°	61°	.....	"	"	:20	"	?	
S.	....	....	.....	250′ seine	20′	1:00	.....	....	1 haul on SE. beach.
gn.M; Glob.	61°	60°	41.1	Luc.sdr.					
.....	62°	60°	.....	12′ Agz.	botm.	:30	S.72°W	1.5	
"	61°	60°	39.9						
.....	61°	60°	.....	"	"	"	S.85°W	2.0	
gyM; fne S; Glob.	58°	58°	?	.....	.....	.....	.....	....	Thermo defective.
.....	58°	58°	.....	"	"	"	N87°W.	?	
gnM; Glob.	60°	58°	38.1						
.....	60°	58°	.....	"	"	:18	S82°W.	?	
gy M.	57°	59°	37.2						
.....	58°	59°	.....	"	"	:20	"	?	
"	58°	59°	37.1°						
.....	61°	60°	.....	"	"	"	"	?	
?	54°	56°	?	.....	.....	.....	.....	....	Wire parted while heaving in. Sounding instruments lost.
.....	53°	54°	.....	"	"	:30	N.86°W	?	
gn M.	60	57°	?	.....	.....	.....	.....	....	Thermo did not capsize.
.....	56°	57°	.....	"	"	"	S.63°W.	?	
gn,S. Glob.	58°	57°	38.9						
.....	57°	56°	.....	"	"	"	S.85°W.	?	

Appendix C — Concluded.

Station No.	Position	Chart	Date	Time	Depth F
D. 5696	W. of Pt. Buchon, Cal., Pine Mt. N.42°E. (35°18′30″N., 121° 28′ 00″W.)	C.S. 5002 (1904)	Apr. 27	6:22 A.M. 7:07 A.M.	440 .....
D. 5697	W. of Piedras Blancas, Cal., Silver Pk. N. 40°E. Pine Mt. N.75°E. (35° 35′ 00″N. 121° 39′ 00″W.)	"	Apr. 27	10:07 A.M. 10:48 A.M.	485 .....
D. 5698	Off Pt. Sur, Cal. Pt. Sur. N.6°W. Juniperre Mt. N.47°E.; (35° 50′ 00″N., 121° 49′ 30″W.)	"	Apr. 27	2:07 P.M. 2:59 P.M.	475 .....
D. 5699	Off Pt. Sur, Cal.; Pt. Sur Light N.12°E. (36° 00′ 30″N., 122° 00′ 00″W.)	"	Apr. 27	6:14 P.M. 7:06 P.M.	659 .....

Appendix D.

Record of monthly mean temperatures at La Paz, Lower California during the year 1910 (Fahrenheit).

	7 A. M.	Noon	Rain.
January,	60°	66°	
February,	58	68	
March,	62	71	
April,	66	76	
May,	69	84	
June,	73	83	
July,	72	84	2 days
August,	80	87	2 "
September,	80	87	5 "
October,	75	82	2 "
November,	69	76	
December,	63	71	
Annual mean,	74	78	

From daily records made by Lucien N. Sullivan, U. S. Consul.

Character of Bottom	Temperature F. Air	Surface	Botm.	Apparatus	Depth	Dur.	Direc.	Dis.	Remarks
no sample	50°	54°	39.9	.....	.....	.....	.....	....	Shot did not detach.
.....	52°	54°	.....	12′ Agz.	botm.	:14	N63°W	?	Frame badly twisted.
gn M. gk.S.	55°	52°	39.8						
.....	56°	53°	.....	"	"	:31	N72°W	?	
no sample	53°	53°	39.9	.....	.....	.....	.....	....	Shot failed to detach.
.....	53°	53°	.....	"	"	:20	"	?	
gn M.	51°	52°	37.9						
.....	52°	52°	.....	"	"	:30	S.86W.	?	

Appendix E.

Scientific Results of the Expedition to the Gulf of California in Charge of C. H. Townsend, by the U. S. Fisheries Steamship "Albatross" in 1911. Commander G. H. Burrage, U. S. N., Commanding.

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Zoölogical Papers Published.

I. Voyage of the 'Albatross' to the Gulf of California in 1911. By Charles Haskins Townsend. Bull. Am. Mus. Nat. Hist., Vol. XXXV, Art. xxiv, pp. 399–476. July, 1916.

II. The Northern Elephant Seal. By Charles Haskins Townsend. Zoologica. N. Y. Zoöl. Soc., Vol. I, No. 8, pp. 155–173, figs. 52–72. N. Y. April 15, 1912.

III. Mammals Collected in Lower California, with Descriptions of New Species. By Charles Haskins Townsend. Bull. Am. Mus. Nat. Hist., Vol. XXXI, Art. xiii, pp. 117–130, 4 illust. June 14, 1912.

IV. List of Insects Collected in Lower California. By John A. Grossbeck. Bull. Am. Mus. Nat. Hist., Vol. XXXI, Art. xxiv, pp. 323–326. Sept. 13, 1912.

V. Echinoderms from Lower California with Descriptions of New Species. By Hubert Lyman Clark. Bull. Am. Mus. Nat. Hist., Vol. XXXII, Art. viii, pp. 185–236. July 9, 1913.

VI Shore Fishes from Lower California with Descriptions of New Species. By Raymond C. Osburn and John Treadwell Nichols. Bull. Am. Mus. Nat. Hist., Vol. XXXV, Art. xvi, pp. 139–181, figs. 1–15. May 26, 1916.

Zoölogical Papers in Preparation.

VII. Birds Collected in Lower California. C. H. Townsend.
VIII. Deep-sea Fishes from the Lower California Region. C. H. Townsend.
IX. Reptiles from Lower California. M. C. Dickerson.
X. Mollusca of the Lower California Region. Paul Bartsch.

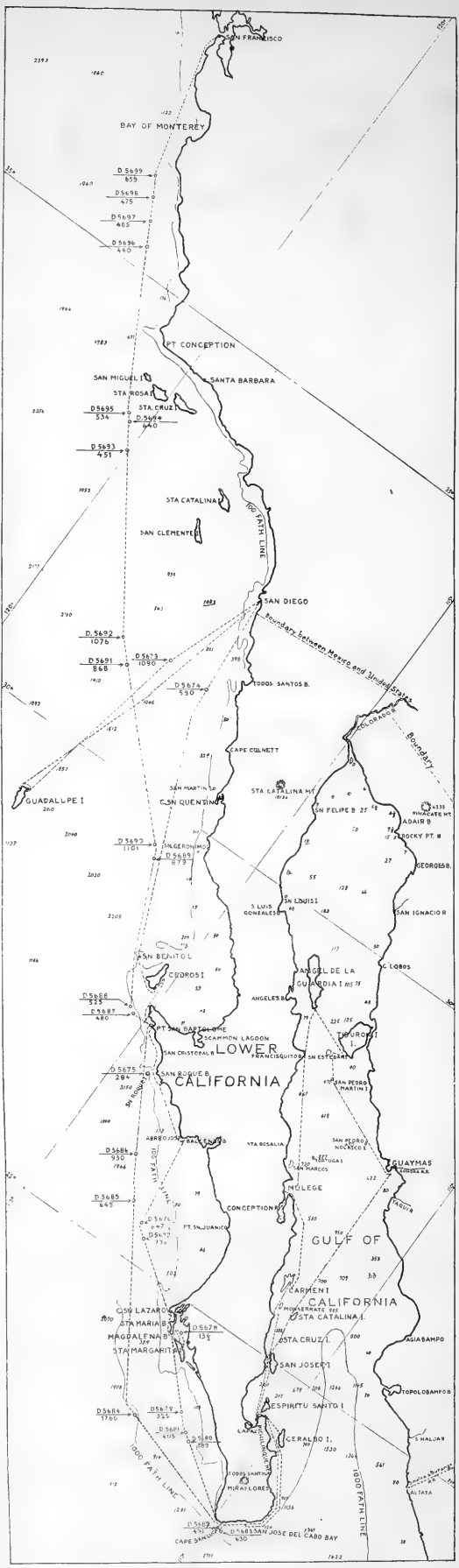
Invertebrates other than Echinoderms and Mollusks.
(Yet to be assigned for study.)

Botanical Papers Published.

The Agaves of Lower California, By William Trelease.
Report Mo. Bot. Gard. 1911, pp. 37–65.
Botanical Exploration in Lower California, By J. N. Rose.
Jour. N. Y. Bot. Gard. Dec. 1911, pp. 263–272.
Monograph of the Huyeae, By Smith and Rose.
Part 12, Contrib. U. S. Nat. Mus., Vol. 16.
Mamillaria arida, Rose.
Monatsschrift fur Kakteenkund, Vol. 23, p. 181.

Botanical Papers in Preparation.

Monograph of the Cacti, Britton and Rose.



MAP OF THE LOWER CALIFORNIA REGION
SHOWING ROUTE OF THE ALBATROSS EXPEDITION IN 1911
UNDER THE DIRECTION OF G.H. TOWNSEND

THE NORTHERN ELEPHANT SEAL

TOWNSEND

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VOLUME I, NUMBER 8.

SCIENTIFIC RESULTS OF THE EXPEDITION TO THE GULF OF CALIFORNIA, IN CHARGE OF C. H. TOWNSEND, BY THE U. S. FISHERIES STEAMSHIP "ALBATROSS" IN 1911, COMMANDER G. H. BURRAGE, U. S. N., COMMANDING.

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II

THE NORTHERN ELEPHANT SEAL

Macrorhinus angustirostris, Gill

BY

CHARLES HASKINS TOWNSEND,
Director of the New York Aquarium.

PUBLISHED BY THE SOCIETY
THE ZOOLOGICAL PARK, NEW YORK

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FIG. 52. VIEW OF NORTH END OF ELEPHANT SEAL ROOKERY, GUADALUPE ISLAND.
Males, females, two-year-olds and yearlings. The males with heads erected are in fighting attitude, with proboscis retracted and mouth wide open. U. S. S. *Albatross* in distance.

THE NORTHERN ELEPHANT SEAL.

Macrorhinus angustirostris, Gill.

By Charles Haskins Townsend,
Director of the New York Aquarium.

Illustrated with Photographs by the Writer.

The elephant seal is the largest of all seals and owes its name to its great size and to the remarkable trunk or snout developed in the adult male.

The northern elephant seal has long been on the verge of extinction and is now found only on Guadalupe, an uninhabited island lying in the Pacific Ocean 140 miles off the northern part of the peninsula of Lower California.

It formerly had a range extending from Cape San Lazaro near Magdalena Bay on the Peninsula, northward to Point Reyes near San Francisco, California, a distance of nearly a thousand miles, and has never been definitely recorded from any other region of the North Pacific Ocean. It was abundant at several points along the coast and especially so on all of the islands off the west coast of Lower California.*

Being valuable for its oil it was killed in large numbers by vessels primarily engaged in the pursuit of the gray whale which was also abundant in the same region. There is a record showing that the elephant seal was being killed for commercial purposes at Santa Barbara Island, California, as late as 1852. During the late fifties, apparently, its numbers in Lower California became reduced to mere scattered groups.

Captain C. M. Scammon, who has long been the principal authority on the northern elephant seal, writing in 1869,‡ reported that it was then "nearly if not quite extinct." Since the publication in 1874 of his work on the Marine Mammals of the

*The habitat of the southern elephant seal originally extended throughout the Antarctic islands, including Kerguelen, Heards, St. Paul, Tristan-da-Cunha, Falklands, Tierra del Fuego, South Georgia, South Shetlands, Juan Fernandez and islands south of New Zealand. It has disappeared from some of these places and is now found chiefly at Kerguelen Island.

‡Proceedings Academy Natural Sciences, Philadelphia, April, 1869, pp. 61-63.

Northwestern Coast, there has been little information available respecting the species.

In 1884 and again in 1892, I obtained information from seal hunters in California that 419 elephant seals had been taken by them at various times from 1880 to 1884 at San Cristobal Bay and Guadalupe Island, Lower California. According to my informants, some of whom had long engaged in sealing in a desultory way, the elephant seal became scarce about 1865, and only a few stragglers had been found until the discovery of a small herd at San Cristobal Bay in 1880. This bay occupies a midway position on the Peninsula and is uninhabited, there being no fresh water along the coast within fifty miles. As the beaches are narrow, elephant seals found lodgment chiefly in the dry gullies opening into them.

I visited this locality in October and December, 1884, in the schooner *Laura* of San Francisco in search of specimens of the elephant seal for the United States National Museum* The beach frequented by the seals was kept under observation from October 20 until December 31, but we obtained only sixteen animals, the skins and skeletons of which were secured for the National Museum. I visited a number of other localities on the same voyage, but the species was not observed elsewhere, although we searched both the coast and the islands as far south as Magdalena Bay. We examined the shores of Guadalupe Island in October, but on account of unfavorable weather, overlooked the locality at present occupied by the elephant seal on the northwest side of the island. It may have existed there at that time.

In 1892, I again visited Guadalupe Island in the schooner *Santa Barbara,* under the auspices of the Department of State, with a view to identifying the species of fur seal known to exist there, the information being desired for the use of the Fur Seal Arbitration then convened at Paris.† Although the entire coast line of the island was carefully examined during our search for the fur seal, we found no trace of the elephant seal until we

*An Account of Recent Captures of the California Sea Elephant and Statistics Relating to the Present Abundance of the Species. By Charles H. Townsend. Proc. U. S. National Museum, 1885, pp. 90-93.

†Notes on the Fur Seals of Guadalupe, The Galapagos and Lobos Islands. By Charles H. Townsend, Report on Fur Seal Investigations 1896-97, part III, pp. 265-69, Treas. Dept., Doc. No. 2717, Div. Special Agents.

reached the so-called Elephant Beach under the cliffs on the northwest side. According to Captain Hunt of the schooner *Santa Barbara,* eighty elephant seals were found on this beach in 1883. Here we found eight elephant seals, seven of which were killed, but the weather conditions becoming suddenly unfavorable and the landing dangerous, we were compelled to abandon four of these. At that time, May 23, the larger animals were shedding their hair.

The fur seal obtained at this island proved to be a new species of the Antarctic genus and was described as *Arctocephalus townsendi* by Merriam.

Captain J. R. Mullett of Monterey, California, is said to have obtained a few specimens of the elephant seal in 1904, presumably at Guadalupe. In 1907 Mr. Charles Harris visited Guadalupe Island in the interest of the Hon. Walter Rothschild, remaining from June 2 to 13. He found about forty elephant seals and obtained fourteen specimens, four of which were lost in the surf.*

For many years no reports have been received from San Cristobal Bay and other points in Lower California formerly inhabited by the elephant seal, and there has been no further account of the small herd found at Guadalupe Island in 1907. As Lower California is sometimes visited by parties in small vessels in search of sea-lions which are killed for their hides and oil, naturalists had little hope of its continued existence, and the recent discovery of a herd of considerable size was a matter of surprise and great zoological interest.

Rediscovery in 1911.

During the winter of 1911 while in charge of the deep sea investigations of the United States Steamship *Albatross* in the Lower California region, I called at Guadalupe Island and was fortunate enough to secure the specimens, photographs and data upon which the present paper is based.

We reached Guadalupe on March second, and immediately landed the members of the scientific staff on the east side for a day's collecting and proceeded at once with the ship to the north-

**Mirounga angustirostris* (Gill), by the Hon. Walter Rothschild, Ph. D., Novitates Zoologicae, vol. XV, 1908, p. 393. Mr. Harris also published an account of this trip to Guadalupe Island in the Pacific Monthly for April, 1909, entitled A Cruise After Sea Elephants.

west side in the hope of finding a few survivors of the elephant seal.* After a forenoon's search we located a herd of about 125 of these animals on Elephant Beach. I killed one large male and one large female which we skinned and took to the ship. Returning with larger boats and some nets, six yearlings were captured alive and sent on board. While the *Albatross* went to the east side to pick up the scientific staff, I devoted the afternoon to making observations and taking photographs, the ship not returning until nightfall. There is deep water all about the Island, but after much cautious sounding Commander Burrage found an anchorage in fifteen fathoms of water about a mile off shore. The following day being too stormy to make landings, the time was spent in the preparation of our specimens. On the morning of the fourth we succeeded after some difficulty in effecting a landing when I killed two more of the large males the skinning and skeletonizing of which occupied us for several hours.†

The sea becoming rough, we were compelled to leave the beach in the afternoon and the embarking of our heavy specimens was both difficult and dangerous.

Elephant Beach is located under high and impassable cliffs and is flanked by cliffs which extend into the sea, making the top of the island altogether inaccessible from this point. Its northern end is well marked by heavy rock slides. The beach is accessible from the sea only, and is usually further protected by a heavy surf. It is not more than three or four hundred yards in length by thirty in width, the greater part of it is sandy, the inner margin being lined with talus from the cliffs.

The seals had little fear of man, and the few animals which left the beach would probably not have done so had they not been disturbed by sailors walking among them. While the large specimens were being skinned and skeletonized, some of the animals slept undisturbed within thirty feet of where the men were working. I succeeded in obtaining about fifty good photographs showing the general character of the rookery and the attitudes of the animals. The herd consisted chiefly of large males and im-

*Members of scientific staff: Dr. J. N. Rose, Dr. Paul Bartsch, U. S. National Museum. W. L. Schmitt, L. M. Tongue, U. S. Bureau of Fisheries. Preparators: H. E. Anthony, J. C. Bell, American Museum of Natural History.

†These skins are now being mounted and will constitute an important group in the American Museum of Natural History.

mature animals of various sizes. There were probably not more than fifteen adult females present and only six of these were accompanied by newly born young. The indications were, therefore, that the breeding season was just commencing and that other adult females might arrive later. We did not observe any male with more than one female, and the family groups were distributed all along the rookery.

Size.

The three males which we killed were the largest in sight and were found to average just sixteen feet in length, with an average girth of eleven feet. The largest specimen of the northern elephant seal recorded as actually measured was "twenty-two feet long from tip to tip and yielded 210 gallons of oil."* The adult female we killed was nearly eleven feet long. Some of the females with young pups appeared to be slightly longer, but we did not attempt to measure them. There were numerous immature males about the size of the adult female and many animals of intermediate sizes between these and the newly born pups. Animals of the yearling size were distinctly more numerous than those of any other size. The newly born pups were quite distinguishable in color from the yearlings, being dusky black. They were about a week old. The color of the adults is yellowish

*Scammon. Overland Monthly, February, 1870. In this article the writer refers to individuals that attained "the enormous dimensions of twelve feet in circumference and more than twenty-four feet in length. Lydekker, in discussing the Antarctic species says, "Probably twenty-five feet would not be an undue estimate for the length of an adult male, and it is far from improbable that close upon thirty feet may have been reached in some cases." Morrell says, "I have seen the male (Antarctic) sea elephant more than twenty-five feet in length, and measuring sixteen feet around the body."

The elephant seal is much larger than the walrus, which does not exceed thirteen feet in length or fourteen feet in girth.

Captain B. D. Cleveland of New Bedford, Massachusetts, who has during the past dozen years made several voyages to Kerguelen Island after elephant seals, says in a recent article in Hampton's Magazine that the largest males measure sixteen feet in length, thirteen feet in girth and may yield as much as 245 gallons of oil. He found the blubber to be seven inches thick on the fattest animals at the commencement of the season, six or eight weeks later it was not more than two inches thick, the seals having fasted in the meantime. Captain Cleveland says he secured from 2,600 to 3,000 barrels of oil on a voyage, that the animals are killed by shooting and that the skin has no commercial value. Sealing begins in November and ends in May before the harbor freezes over. With a crew of thirty-five men, 120 elephant seals were killed and stripped in one day. The oil is worth from forty-seven to fifty cents a gallon.

brown, the younger animals being grayish brown. The largest male elephant seal obtained by Harris in 1907 was sixteen feet, eight inches in length and had a girth of eleven feet, eight inches. The proboscis was eighteen inches long, measured from its tip to the eye. The largest female obtained was eleven feet, five inches long, with a girth of six feet, five inches.

The skin of the adult male is exceedingly heavy, being nearly an inch thick about the fore part of the neck. Our knives dulled so rapidly in skinning that it was found necessary to have a grindstone sent ashore and keep two men busy at the task of sharpening. The carcasses were so heavy that it required all the strength of half a dozen men to turn them over with the aid of a rope and hand-holes cut in the skins. We found the blubber to be about four inches thick in some places.

Behavior of Males.

Unless actually teased by members of our party, the old animals did not attempt to leave the beach, and many of them did not raise their heads from the sand until closely approached, although wide awake. When driven from a comfortable resting-place they would soon settle down, and after throwing sand on their backs with the front flippers become quiet again. Both young and old have the habit of covering themselves with sand when settling down to rest. The females, although but little molested, appeared to be even more passive than the males.

Some of the large males after being driven into the sea, soon returned. While in the water they remained near the surf, disregarding the boats which passed near them, the head being usually held well above water with the proboscis partially retracted. When making a landing the large male does so very slowly with frequent pauses, from time to time raising and spreading the hind flippers to get the benefit of each low wave that helps him through the shallows. When finally clear of the water and dependent upon his own efforts in getting his ponderous bulk to a dry place well up the sloping beach, progress becomes very slow, but the elephant seal is able to crawl long distances. While at San Cristobal Bay in 1884, the sealers showed me places three or four hundred yards up the ravines where they had formerly killed them.

Most of the attitudes here described are well shown in the accompanying photographs, but it must be confessed that we could not have secured all of our pictures without getting the animals thoroughly aroused. In some cases I focused my camera on the head of an elephant seal at a distance of eight or ten feet and then had a sailor kick the animal violently in the ribs, one of them became thoroughly angered only after a sailor had jumped upon his back. When moving of its own accord the elephant seal arches the body in a way suggestive of the motion of the inch-worm, drawing the hind quarters well forward with the belly lifted from the ground, and then shifting the forequarters with the front flippers braced outward.

Fighting.

The large males that accompanied the nursing females were frequently engaged in fights with unattached males. There had evidently been considerable fighting as their necks were more or less raw and in some cases had festering sores. In comparison with them the necks of the younger males were smooth and without tooth-marks. In fighting, the large males crawl slowly and laboriously within striking distance, and then rearing on the front flippers and drawing the heavy pendant proboscis into wrinkled folds well up on top of the snout, strike at each other's necks with their large canines. The fighting was accompanied with more or less noise and snorting, but we heard none of the extremely loud bellowing described by writers as characteristic of the Antarctic species of elephant seal.

The skin of the under surface of the neck and fore part of the breast is greatly thickened, it is practically hairless and years of fighting has given it an exceedingly rough and calloused surface. This *shield,* as it may be called, is the part of the animal most exposed to attack when fighting, it extends from the throat just below the base of the jaws, down to the level of the flippers and rather more than half way back on each side of the neck and breast. Although ugly wounds are inflicted by the large canines, the heavy skin in no case seemed to be broken through. While the animal takes good care of its head and proboscis, the calloused breast shield is freely exposed to the enemy.

The fighting is not of the desperate sort indulged in by the fur seal, and the contestants soon separate; there seems to be no actual seizing and holding of the skin and after each sharp blow the head is quickly withdrawn and held aloft. When the head of the male is elevated, the skin at the top of the neck and shoulders is thrown into a series of eight or ten heavy folds which extend downward and forward. These folds do not show when the animal is at rest with the head stretched forward on the sand. The fore flippers are large and thick and have heavy claws, the posterior three claws being well separated.

Proboscis.

The proboscis is broad and fleshy to the tip where the nostrils are placed, the nasal openings being wide apart and directed somewhat downward and outward. The length of the proboscis forward from the canines is about equal to the distance between the canine and eye. It is exceedingly thick and heavy and its width is about equal to the space between the eyes. In one of our specimens, not the largest, it was about nine inches long, but the proboscis of the dead animal can be stretched out somewhat longer.* When the animal is crawling the proboscis is relaxed and pendant; when sleeping, it rests upon the sand in a shapeless mass. When persistently annoyed the old male slowly raises his head, and retracting the proboscis opens the mouth very wide. He does not bellow loudly but there is much blowing out of the breath through the nostrils with a gurgling sound, the whole proboscis vibrating heavily with the effort.

*Cleveland says of the southern species that it has "a trunk fifteen inches long;" meaning doubtless its full length back to a point opposite the angle of the mouth.

In our largest skull—twenty-three and three-quarter inches long—the distance between the canines and the orbit is nine and one-half inches. In the dried and still unmounted skins of our three males, the distance between the tip of the proboscis and the eye averaged twenty-three inches, but the skins may have been somewhat stretched. In the largest of these skins the distance from the first row of whiskers to the tip of the snout, is fourteen inches. In the largest male obtained by Harris, the distance from tip of proboscis to eye was eighteen inches, making the length of the proboscis forward from the canines about nine inches. Scammon (Proc. Acad. Nat. Sci., Phila., 1869, pp. 61-63) says, "the proboscis of the northern species in a large male extends from opposite the angle of the mouth forward about fifteen inches." The United States National Museum has a skull obtained at San Cristobal Bay in 1884 by C. H. Townsend which is twenty-four inches in extreme length.

Sometimes when the head is turned up, the proboscis relaxes until it hangs into the open mouth. The animal may continue to turn its head over backwards until the half-relaxed proboscis actually overhangs to the rear. We did not at any time see the trunk thrown into a rounded or tubular form. In fighting it is closely retracted and the seal is apparently successful in keeping it out of harm's way, as many of the animals with badly damaged necks, had trunks showing no injury whatever.

When the proboscis is fully retracted it exhibits three bulging transverse folds on top separated by deep grooves. The upper groove remains distinguishable when the proboscis is relaxed, while above it the upper fold remains as a fleshy hump. We did not observe any actual inflation of the trunk, which, as examined during the skinning operations, is fibrous and fleshy throughout. There was no special expansion of the nasal passages observable, and while the photographs appear to indicate an inflation, such is not the case; the heavy folds of the retracted proboscis must be produced by purely muscular action. It cannot be capable of inflation in the sense that the trunk of the male hooded-seal (*Cystophora*) is inflated. The massing of the heavy fleshy appendage into compact folds on top of the head, is really the opposite of inflation. There is little indication of the proboscis in the half-grown male; it probably does not develop until sexual maturity is reached. Under excitement both female and young extend the nose into a sharply pointed tip.

A careful examination of all available published photographs of the Antarctic species has failed to show in any case, a proboscis as long as those shown in our photographs of the northern species.

Food.

I have not found anything in the stomach of the elephant seal that would serve to indicate the nature of its food; in fact we never found anything but a handful of sand. Our captive elephant seals refused to eat fresh fish during the two days voyage to San Diego and took no food for more than a week after their journey overland. In the New York Aquarium they have subsisted entirely on fresh fish cut into moderate sized pieces, but

greatly preferred it alive. Live crabs and bits of seaweed placed in their pool always remained untouched.

They doubtless feed on live squid like the fur seal, but refused the dead squid we took pains to procure for them. Peron found cuttlefish beaks and *Fucus* in the Antarctic elephant seal's stomach. Lambert says, "their food is chiefly kelp, but I have found squid in their stomach." Harris found "tiny sardines not more than two inches long" in the stomachs of some of the elephant seals taken at Guadalupe Island; such fishes being abundant at the mouths of the sea caves near by. Cleveland describes the food of the southern species as consisting of "cuttlefish and mollusks."

The heavy claws of the fore flippers may be useful to the animal in procuring mollusks from sandy bottom.

Young.

The yearling elephant seal is somewhat heavier and longer than the nursing pup, but is proportionately more slim, brownish gray in color and has longer whiskers. The nursing pup is *black* and its length is about four feet. It is so remarkably fat as to be practically unable to move, while the yearling is quite active. None of the six yearlings brought to the New York Aquarium exceeded five feet in length. Their weights varied from 167 pounds to 301 pounds, males being heavier than females.

The nursing female was usually accompanied by a yearling, as well as a young pup. Doubtless the presence of the yearling with the adult female accounts for the conflicting statements of sealers about the breeding season. Judging from the conditions that we observed at Guadalupe Island, the breeding season begins just before the first of March. The period of gestation must be nearly twelve months,* as the females with black pups about a week old, were already mating. I am convinced that the young animals I described in 1884 as pups were really yearlings. I never saw the *black* pup until 1911, and there are none in museums, at least in America.

*Twelve months is known to be the period of gestation in the fur seal. Captain Cleveland makes the statement that the female of the southern elephant seal "gives birth to young twice a year," but his observations on this point have been misinterpreted. He says mating begins in November, which is the beginning of summer; a second mating would mean a breeding season at the beginning of winter, which is incredible.

It is to be regretted that we did not bring back the skin of a nursing pup and the whole head and proboscis of a large male for anatomical study. In our desire to treat this unique herd with due consideration, we have relinquished, temporarily at least, the opportunity to thoroughly investigate the character of the proboscis. With the exception of the large female, the specimens procured were such as could be taken with the least possible injury to the herd as a whole. Some of the yearlings taken alive, I regret to state, have already become available for anatomical purposes.

The yearling frequently emits a sound not unlike the scream of the peacock. On first landing we were unable to account for these singular noises and ascribed them to sea-gulls, but soon discovered their true source. This call or scream is most frequently heard when the yearling is disturbed or trampled on by larger animals.

The taking of the live yearlings was a simple matter. Some heavy pieces of netting were thrown over the animals into which they were tightly rolled, so that the sailors could handle them without fear of being bitten or of their climbing out of the boats. On board ship they were for a time given the freedom of the decks, but later were kept in a pen. They showed no inclination to bite either while on the ship or when they were received at the New York Aquarium.

The photographs of the young animals taken at the Aquarium show some attitudes which were not observed on the beach at Guadalupe Island. Assuming that they were yearlings when captured at Guadalupe, they are now (February, 1912) twenty-three months old. While the animal is plump and rounded when at rest on the floor of the empty seal pool, it may look quite slim when stretching up its head to the hand of a visitor. The neck becomes remarkably drawn out, and it may reach upward until the tips of the flippers are lifted from the flooring.

Another attitude which the young animal takes at times, shows it balanced upon the stomach with the forequarters elevated until the tips of the front flippers are clear of the floor, the head turned far backward and almost touching the hind flippers which are lifted nearly as high as the head. It can also turn the head backward until the nose touches the floor. We did not succeed in getting photographs of these two attitudes.

Although handled but little, they are very amiable, only opening the mouth when approached too closely by the photographer. In swimming about the pool the fore flippers are seldom used. The animals often go to sleep under water, stretched out on the floor of the pool. The eyes of the elephant seal are remarkably large and lustrous. They are suggestive of the eyes of nocturnal animals, and it may be that the species is more active by night than by day.

Distribution Since 1880.

The number of elephant seals known to have been killed or captured in Lower California from 1880 to 1911 is shown in the following record:

1880	San Cristobal Bay, Schooner San Diego	30
1882	San Cristobal Bay, Schooner San Mateo	46
1883	San Cristobal Bay, Schooner ———	110
1883	Guadalupe Island, Schooner ———, Wentworth, Master	80
1884	San Cristobal Bay, Sloop Liberty, Morrison, Master	93
1884	San Cristobal Bay, Schooner San Diego	40
1884	San Cristobal Bay, Schooner Laura, Morrison, Master (C. H. Townsend in charge)	16
1884	Guadalupe Island, Schooner San Diego	4
1892	Guadalupe Island, Schooner Santa Barbara, Hunt, Master (C. H. Townsend in charge)	7
1904	Guadalupe Island, Schooner ———, Mullett, Master	4
1907	Guadalupe Island, Schooner Freia (C. M. Harris in charge)	14
1911	Guadalupe Island, U. S. S. Albatross, G. H. Burrage, U. S. N. Comdg. (C. H. Townsend in charge)	10
	Total	454

The above record is probably far from complete, as only 600 animals (including those now at Guadalupe Island) accounted for in forty or fifty years would be but slow increase for animals of the seal tribe. It is interesting to note that the record of killings as far as we have it, is limited to two localities, and one of these, San Cristobal, has yielded nothing since 1884.

Continued Existence.

The northern elephant seal has persisted as a race under the most adverse conditions. Its pursuit for oil as carried on prior to 1860 or possibly 1865, having nearly exterminated it, there

followed a period of comparative immunity during which its numbers slowly increased. Again subjected to persistent slaughter from 1880 to 1884, it disappeared for a time and was not seen until rediscovered at Guadalupe Island in 1892. Since then thirty-five elephant seals have been killed at Guadalupe for museum purposes. Had that island been visited by seal oil hunters, the elephant seal would probably not be in existence to-day.

Present Number.

When the *Albatross* left Guadalupe on March 4, 1911, there were not less than 125 elephant seals on the rookery. The breeding season having just commenced and the number of adult females present being considerably less than the number of adult males, and less than half the number of yearlings, there is reason to believe that the adult female portion of the herd would be better represented before the end of the month. The present size of the herd may therefore be estimated at 150 animals of all classes.

Eleven days later when the *Albatross* reached San Cristobal Bay on the Peninsula, I examined the site of the old rookery at that locality without finding any indication of its being occupied. We found no signs of elephant seals at either San Benita or Cedros Islands where the ship called on the voyage southward. I examined the shores of San Benita very thoroughly. Both of these islands were formerly breeding resorts of the species.

Distinctness of the Northern Species.

The specific distinctness of the northern elephant seal is well shown in the accompanying photographs of skulls of *M. angustirostris* and *M. leoninus* in the American Museum of Natural History. The skulls are those of adult males and both exceed twenty-two inches in extreme length, *angustirostris* being longer, while *leoninus* has the greater zygomatic width.

In the northern species the zygomatic arch is heavier throughout than in the southern species. In the former the jugal at its narrowest point has nearly twice the height of that of the latter, while its extreme length is considerably less. Its

upper posterior branch is higher and the inferior branch shorter than in the southern species. Its union with both maxillary and squamosal is decidedly less oblique and its upper portion is more strongly curved inward.

The frontal portion of the skull is much higher and narrower than in *M. leoninus*. The lower jaw is higher and its angle greater. Other aspects of the skulls show strongly marked differences, which appear also in the four other skulls examined.

Protection.

The northern elephant seal as we have seen, now breeds only on Guadalupe Island. Its numbers are slowly increasing and it is to be hoped that it will not be molested by seal oil hunters. The principal source of danger to this herd lies in the fact that its existence is now known in California where small-scale hunting enterprises to Lower California are sometimes organized.

The island is not inhabited and the Mexican government has not heretofore been interested in the protection of its animal life. It lies 140 miles off shore in latitude 29° 10′ N., and longitude 118° 18′ W., is twenty-one miles long and has an elevation near its northern end of 4,523 feet.

A plan was presented by the writer to the Secretary of Commerce and Labor, whereby the Guadalupe herd might be protected through United States customs houses on the Pacific coast by the refusal of clearance or entry to vessels dealing in seal products from Mexican waters. We also urged that the matter of protection of the elephant seals be brought to the attention of the proper authorities in Mexico with a view to securing concerted action. We are now informed that the Secretary of State has received information that the Mexican authorities have taken steps to prevent the killing of these seals, and the Secretary of the Treasury has been requested to assist in the work of protection through the administration of the customs.

New Information.

The observations made in 1911 on the elephant seal, together with the specimens and photographs which were secured, appear

to yield information on some features of its natural history which have hitherto been obscure. The following points may be noted:

The northern species is unquestionably distinct.

It now breeds only at Guadalupe Island and there are probably about 150 of the animals in existence.

The trunk of the adult male eighteen feet long, has a length of nine or ten inches forward from the canine teeth.

The trunk is not capable of inflation, but is retracted into heavy folds on top of the head by muscular action.

The breeding season begins a few days before March first and the period of gestation is twelve months.

The color of the young at birth is black.

The yearling emits a call or scream unlike the voice of any other seal.

The food preferred by the yearling and two-year-old in captivity is fish.

The yearling and two-year-old frequently lift the head and the hind flippers above the back until they nearly meet.

NOTE.—I have recently found in Blackwood's Magazine for December, 1818, some interesting information about the elephant seal of Tristan-da-Cunha Island, which lies in mid Atlantic in the latitude of the Cape of Good Hope. The article contains a letter written at Tristan-da-Cunha in 1811 by J. Lambert, from which I quote the following: "Sea-elephants . . . are plenty and they pup yearly, coming up in the months of August and September for that purpose. About a month or five weeks they take the male and then go off to feed, and in six weeks come up and remain a month of two to shed their old coat and get a new one, and from that time are for the most part lying in the sun asleep.

"The males, however, stay off longer, as they of course require a longer period to feed. Their food is chiefly kelp, but I have found squid in their stomach. . . . This last season I think 1,000 pups were brought forth on this island, and as many more on the other two, and I suppose when I passed near those islands they must have been almost innumerable, seeing some parties or other have been oiling here ever since and so many yet remain. If they are not disturbed for two or three years, the increase must be great and profitable, especially if their skins are attended to and salted.

"We have killed about eighty since we landed, and suppose we shall kill about two a week through the year. We have made about 1,000 gallons of oil. . . . The elephant in general makes about a barrel of oil, though some of the males will produce 100 gallons; of course there would be as many skins as barrels of oil, besides, at least, 1,000 pup skins, which are very fine and pretty, and would no doubt average a dollar each."

The Challenger Expedition did not find the elephant seal at Tristan-da-Cunha in 1873, the last having been seen, according to Moseley, "two years before."

FIG. 53. MALE ELEPHANT SEAL SIXTEEN FEET LONG.

Crawling attitude with proboscis relaxed and almost dragging on the sand. The hind flippers are usually trailed in progression on land.

FIG. 54. ADULT MALE ELEPHANT SEAL THROWING SAND ON HIS BACK.
The head is turned backward until the proboscis overhangs to the rear.

FIG. 55. MALE ELEPHANT SEAL THROWING SAND ON ITS BACK WITH FORE FLIPPERS. PROBOSCIS PARTLY RELAXED.

FIG. 56. MALE ELEPHANT SEALS APPROACHING TO FIGHT.
When within striking distance, both rear high on fore flippers, retract proboscis and open mouth very wide.

FIG. 57. ADULT MALE ELEPHANT SEAL. THE SNOUT IS SOMETIMES FLATTENED AND APPEARS VERY BROAD.

FIG. 58. ADULT MALE ELEPHANT SEAL CRAWLING INTO THE SURF.

FIG. 59. ADULT MALE ELEPHANT SEAL SLEEPING—BODY AND SNOUT RELAXED, TIP OF SNOUT TURNED UNDER.

FIG. 60. ADULT MALE ELEPHANT SEAL.

The proboscis is drawn into heavy folds on the forehead, the back of the neck deeply wrinkled. The calloused shield of the neck and chest extends about half way round the neck. The fore flippers are powerful and easily raise the fore quarters from the ground.

FIG. 61. ADULT FEMALE ELEPHANT SEAL. UNDER EXCITEMENT THE NOSE IS PROJECTED INTO A POINTED TIP.

FIG. 62. VIEW OF BLACK PUP, SHOWING ITS EXCESSIVE FATNESS.

FIG. 63. ADULT MALE, ADULT FEMALE AND YEARLING.
The male is thoroughly aroused and in threatening attitude. The whiskers are erected and the mouth opened wide. The large canines are concealed by the pendant tip of the proboscis.

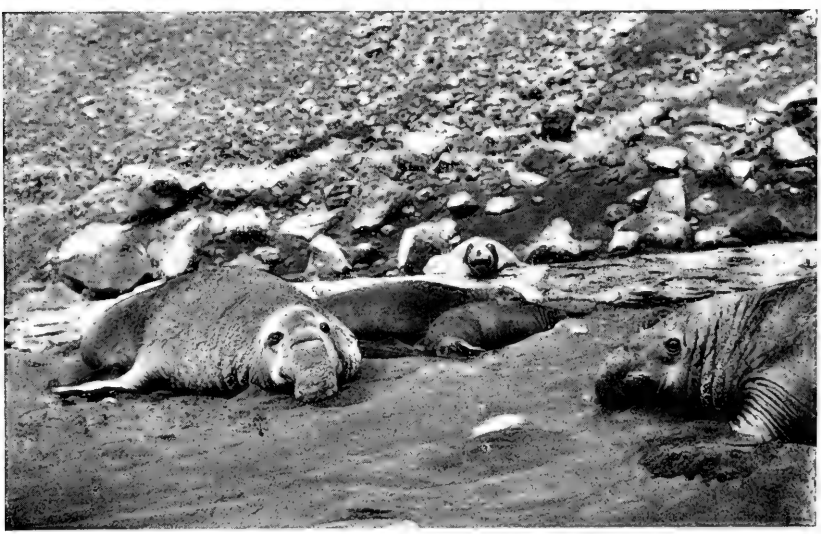

FIG. 64. ELEPHANT SEALS, ADULT MALES, FEMALE, BLACK PUP AND YEARLING.
Male at left with proboscis relaxed and its tip spread.

FIG. 65. ADULT MALE ELEPHANT SEAL WITH PROBOSCIS PARTLY RELAXED.
The eye is large and lustrous.

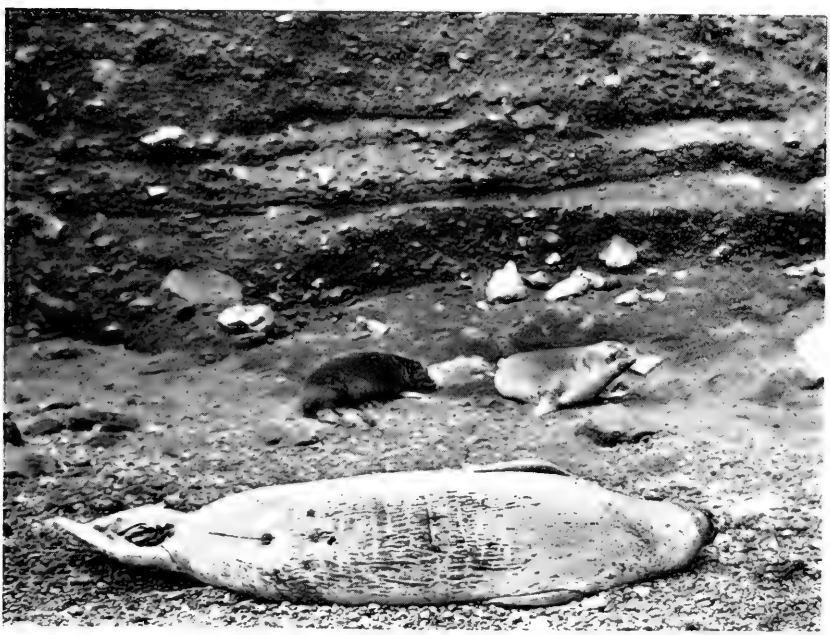

FIG. 66. SLEEPING IMMATURE MALE, YEARLING AND BLACK PUP.

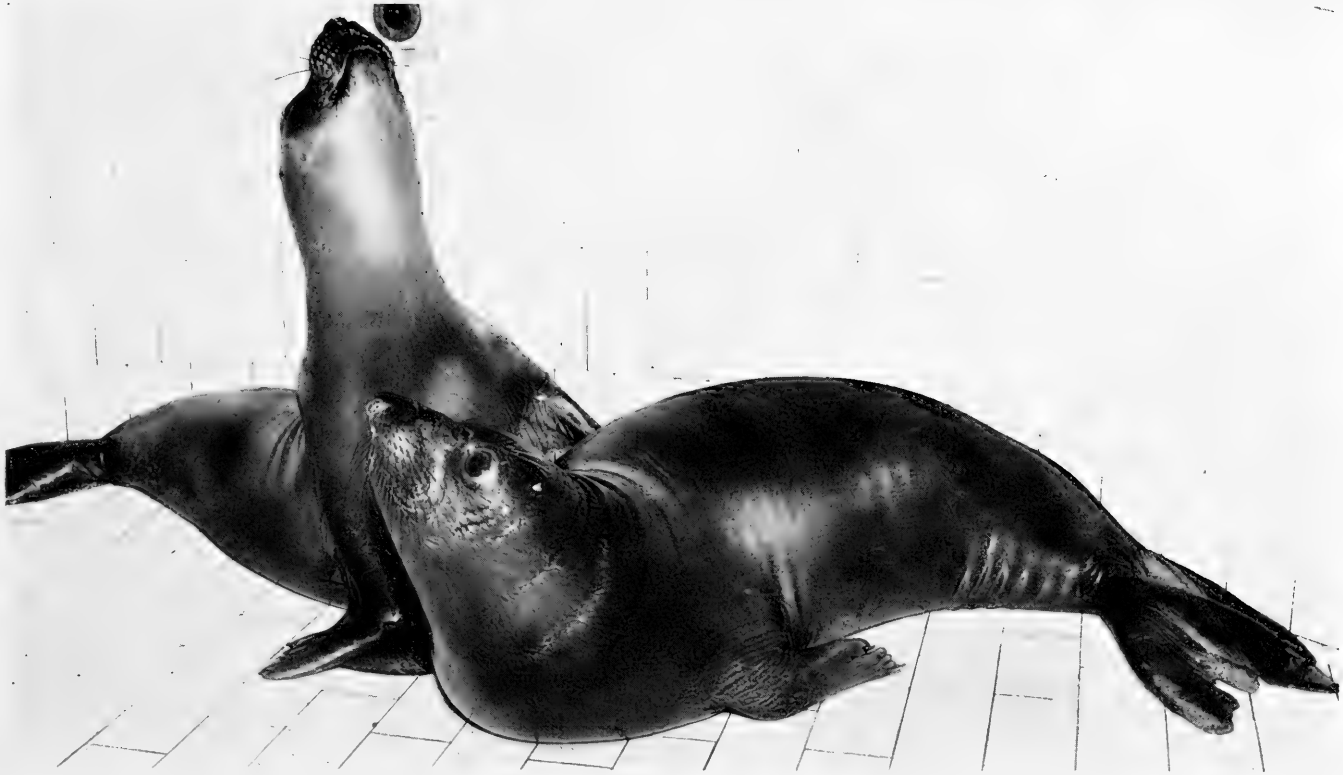

FIG. 67. ELEPHANT SEALS NEARLY TWO YEARS OLD IN NEW YORK AQUARIUM.

FIG. 68. ELEPHANT SEALS NEARLY TWO YEARS OLD IN NEW YORK AQUARIUM.
No other species of seal opens the mouth so wide when in threatening attitude.

FIG. 69. A PORTION OF THE COAST AT SAN CRISTOBAL BAY, LOWER CALIFORNIA, FREQUENTED BY ELEPHANT SEALS AS LATE AS 1884.

The animals generally occupied the mouths of the gullies, the beaches under the bluffs being narrow. The coast of this part of the Peninsula is totally lacking in fresh water for a distance of over 100 miles, and has always been uninhabited.

FIG. 70. NORTHWEST SIDE OF GUADALUPE ISLAND, AT DISTANCE OF ONE MILE.

Small beach occupied by elephant seals is in center of picture, near large rock slide.

FIG. 71. SKULL OF ADULT MALE *MACRORHINUS ANGUSTIROSTRIS*, FROM GUADALUPE ISLAND, LOWER CALIFORNIA.
Extreme length 23⅝ inches, extreme zygomatic width 13⅞ inches.

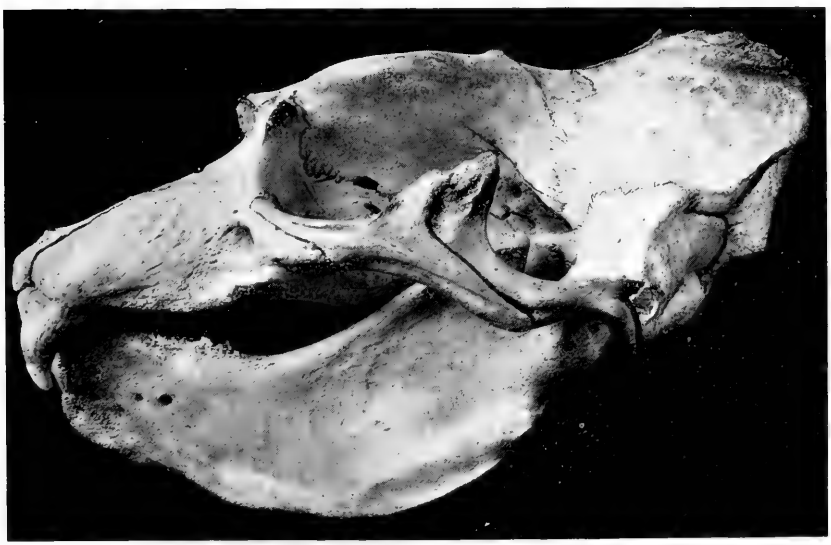

FIG. 72. SKULL OF ADULT MALE *MACRORHINUS LEONINUS*, KERGUELEN ISLAND, ANTARCTIC.
Extreme length 22¼ inches, extreme zygomatic width 14½ inches.

Scientific Results of the Expedition to the Gulf of California in Charge of C. H. Townsend, by the U. S. Fisheries Steamship 'Albatross' in 1911. Commander G. H. Burrage, U. S. N., Commanding.

Published by Permission of the U. S. Commissioner of Fisheries.

III.

Mammals Collected in Lower California, with Descriptions of New Species.

By Charles Haskins Townsend.

AUTHOR'S EDITION, extracted from BULLETIN

OF THE

American Museum of Natural History,

Vol. XXXI, Art. XIII, pp. 117–130.

New York, June 14, 1912.

Continued from 3rd page of cover.)

PART II.— The Chuckchee: Religion. By W. Bogoras. Pp. 277–536, pll. xxxii–xxxiv, and 101 text figures. 1907. Price, $4.00.

PART III.— The Chuckchee: Social Organization. By W. Bogoras. Pp. 537–733, pl. xxxv, and 1 text figure. 1909. Price, $3.00.

Vol. XII. Anthropology (not yet completed).

**Jesup North Pacific Expedition, Vol. VIII.*

PART I.— Chuckchee Mythology. By Waldemar Bogoras. Pp. 1–197, 1910. Price, $1.25.

Vol. XIII. Anthropology (not yet completed).

**Jesup North Pacific Expedition, Vol. IX.*

PART I.— The Yukaghir and the Yukaghirized Tungus. By Waldemar Jochelson. Pp. 1–133, pll. i–vii, 1 map. Price, $3.40.

Vol. XIV. Anthropology.

**Jesup North Pacific Expedition, Vol. X.*

PART I.— Kwakiutl Texts. Second Series. By Franz Boas and George Hunt. Pp. 1–269. 1906. Price, $2.80.

PART II.— Haida Texts. By John R. Swanton. Pp. 271–802. 1908. Price, $5.40.

ETHNOGRAPHICAL ALBUM.

Jesup North Pacific Expedition.

Ethnographical Album of the North Pacific Coasts of America and Asia. Part 1, pp. 1–5, pll. 1–28. August, 1900. Sold by subscription, price, $6.00.

BULLETIN.

The matter in the 'Bulletin' consists of about 24 to 36 articles per volume, which relate about equally to Geology, Palæontology, Mammalogy, Ornithology, Entomology, and (in former volumes) Anthropology, except Vol. XI, which is restricted to a 'Catalogue of the Types and Figured Specimens in the Palæontological Collection of the Geological Department,' and Vols. XV, XVII, and XVIII, which relate wholly to Anthropology. Volume XXIII and the later volumes contain no anthropological matter, which is now issued separately as 'Anthropological Papers.'

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AMERICAN MUSEUM JOURNAL.

The 'Journal' is a popular record of the progress of the American Museum of Natural History, issued monthly, from October to May inclusive. Price, $1.00 a year. Volumes I–XI, 1900–1911.

*The Anatomy of the Common Squid. By Leonard Worcester Williams. Pp. 1–87, pll. i–iii, and 16 text figures. 1909.

*Chinese Pottery of the Han Dynasty. By Berthold Laufer. Pp. 1–339, pl. i–lxxv, and 55 text figures. 1909.

For sale at the Museum.

*Published by E. J. Brill, Leiden, Holland. Not on sale at the Museum. American Agent, G. E. Stechert, 129 West 20th Street, New York City.

59.9(72.2)

Article XIII.—MAMMALS COLLECTED BY THE 'ALBATROSS' EXPEDITION IN LOWER CALIFORNIA IN 1911, WITH DESCRIPTIONS OF NEW SPECIES.[1]

By Charles Haskins Townsend.

[By permission of the U. S. Commissioner of Fisheries.]

Plates VIII and IX.

The mammals brought back by the 'Albatross' Expedition number 259 specimens, representing 59 species, ten of which, from islands in the Gulf of California, appear to be undescribed.

Mammals, usually of the smaller kinds, were obtained at nearly all of the twenty-seven localities visited by the ship. While a single night's trapping often yielded numerous specimens, many were destroyed by ants before the traps could be visited in the morning. Wood rats, pocket mice and deer mice were especially numerous, and it was possible to obtain them by setting traps almost anywhere in the bushes near the beaches.

Deer and coyotes were obtained at two, hares at six, spermophiles at three, and kangaroo rats at four localities. Specimens of lynx, fox, raccoon, skunk, and gopher were secured only in the Sierra Laguna mountains by a collector sent from the ship. The elephant seal was found only at Guadalupe Island. As the work of the cruise included deep sea investigations, sometimes at considerable distances from land, all anchorages were of short duration and at points rather widely separated.

The greater part of the collection of mammals was prepared by Mr. H. E. Anthony, now of the Museum staff.

The islands visited include Guadalupe, the San Benitas, Cedros, Magdalena, Margarita, and San Roque in the Pacific, and Ceralbo, Espiritu Santo, San José, Santa Cruz, Santa Catalina, Carmen, Angel Guardia, San Esteban, and Tiburon in the Gulf. In physical characteristics, the islands bear close resemblance to the coastal regions of the Peninsula, having the same desert-like appearance. Some of them are totally without fresh water, and most of them are uninhabited. Small mammals were obtained only at islands where the traps could be left out over night.

The following notes relate to islands from which new species were procured.

[1] Scientific Results of the Expedition to the Gulf of California in Charge of C. H. Townsend, by the U. S. Fisheries Steamship 'Albatross' in 1911. Commander G. H. Burrage, U. S. N., Commanding.

Tiburon is the largest island in the Gulf; it is thirty miles long by about fifteen in width, and has a height of 4000 feet. It is separated from the Mexican mainland by a channel from one to three miles wide, and is inhabited by Seri Indians reputed to be dangerous to small parties.

Angel de la Guardia is near the western shore of the Gulf. It is forty miles long by about ten miles wide, and has a height of about 4000 feet; it is without fresh water and is uninhabited.

San Esteban is exceedingly rough and mountainous with a height of 1800 feet and a diameter of about four miles. It lies eight miles southwest of Tiburon, is without fresh water and is uninhabited.

Carmen, near the Peninsula, is seventeen miles long by five and a half miles wide, and has a height of 1500 feet. Important salt-works are located here.

List of Species.

DELPHINIDÆ. PORPOISES, DOLPHINS, ETC.

Porpoises were observed almost daily while the 'Albatross' was in the Gulf of California. They were especially numerous about the head of Concepcion Bay, where a band of two hundred or more came near the anchorage and showed little fear of the launch which several times passed among them.

1. **Tursiops nuuanu** *Andrews.* NUUANU DOLPHIN.

Two skulls, Santa Catalina Island, April 16.

The skulls obtained by the 'Albatross' Expedition at Santa Catalina Island, when compared with a skull obtained by Mr. J. T. Nichols, in the Pacific (Lat. 12° N., Long. 120° W.), were found to be identical. The species was then described by Mr. R. C. Andrews in Bull. Am. Mus. Nat. Hist., Vol. XXX, Art. IX, pp. 233–237, August 26, 1911.

2. **Tursiops gilli** *Dall.* GILL'S DOLPHIN.

Skull, San Bartolome Bay, March 14.

Porpoises were seen daily while the 'Albatross' remained in San Bartolome Bay. The skull obtained was found on the beach with portions of the skeleton.

3. **Globicephalus scammoni** *Cope.* SCAMMON'S BLACK-FISH.

Twelve skulls, Santa Cruz Island, April 16.

There were many skulls and skeletons of this species on the beaches at

Santa Cruz Island, and also at Santa Catalina, where we called the same day. There was evidence that all the animals had been killed for their oil.

Bovidæ. Sheep, Bison, etc.

We were informed by a resident that the mountain sheep is found among the high, rugged hills on both sides of Concepcion Bay, but it is more numerous on the ranges further inland. Only one was seen by our party.

Our informant, Sr. Liberato Castro, from whom the horns were received, said that we would find good sheep hunting on Tiburon Island, but no traces of the species were found during our hunting there on April 12–13. The name used at Concepcion Bay for the mountain sheep is "borrego cimmaron." The species is found throughout the desert ranges of the eastern side of the Peninsula, from west of the mouth of the Rio Colorado southward to near La Paz.

4. **Ovis cervina cremnobates.** *Elliot.* Lower California Mountain Sheep.

Four pairs of horns, south end of Concepcion Bay, April 7.

Antilocapridæ. Prong-horn Antelope.

5. **Antilocapra americana mexicana** *Merriam.* Lower California Antelope.

One head, inland from Santa Rosalia Bay.

The antelope was formerly found on many of the plains of Lower California, but is now rare. It is not at present known to exist further south than the Santa Clara Desert, about midway on the Peninsula.

Cervidæ. Deer.

6. **Odocoileus hemionus peninsulæ** *Lydekker.* Lower California Deer.

Male juv., San Bartolome Bay, March 14; female, San Bernado Mountains, May 13; male, San Bernado Mountains, May 15, 600 ft.; male, San Bernado Mountains, May 16, 600 ft.

On the Peninsula deer were seen at only a few localities, but are said to be rather common.

7. **Odocoileus hemionus eremicus** *Mearns.* Tiburon Island Deer.

Male and female ad., Tiburon Island; male, antlers only, all from Tiburon Island, April 12.

Deer are abundant at Tiburon Island if one may judge by their tracks and trails. Several of the animals were seen and two specimens were obtained. The weight of a heavily antlered buck, killed by Lieut. Stanley, was 121 pounds after evisceration.

8. **Odocoileus cerrosensis** *Merriam.* Cedros Island Deer.

Fragments of weathered antlers, Cedros Island. Probably now extinct; killed formerly by miners for food.

Leporidæ. Hares, Rabbits.

The collection of jack rabbits although small contains two especially striking forms, the grayish or silvery rabbit of Tiburon Island, allied to species of the Mexican mainland, and the remarkably dark species peculiar to Espiritu Santo Island. The latter with its glossy black back resembles no other rabbit, and is a most striking variation from the form inhabiting the adjacent coast of the Peninsula.

9. **Lepus californicus magdalenæ** *Nelson.* Magdalena Island Jack Rabbit.

Male, Santa Margarita Island, March 20.

10. **Lepus californicus xanti** *Thomas.* Cape San Lucas Jack Rabbit.

Male, Cape San Lucas, March 24; female, Pichilinque Bay, March 28.

11. **Lepus insularis** *Bryant.* Espiritu Santo Jack Rabbit.

Female, Pichilinque Island, March 27,— introduced from Espiritu Santo Island; female, Espiritu Santo Island, April 18.

12. **Lepus alleni tiburonensis** subsp. nov. Tiburon Island Jack Rabbit.

Closely related to *L. alleni*, from which it differs in being much darker and more iron gray, the buffiness on the back being rather pale and much overlaid and mixed with black.

Sides of body and outside of legs much darker and more iron gray than in *alleni*. Rump patch darker and less differentiated from color of back. Iron gray of sides extending on underparts, leaving only a narrow median white area. Under side of neck more buff, ears darker and grayer. Top of head very similar to *alleni*.

Type, No. 31990, male. Represented by three males in rather worn spring pelage, Tiburon Island, April 13.

A dozen or more of these rabbits were seen by our party. Measurements, average of three specimens: total length, 610; tail, 63, hind foot 127.

Heteromyidæ. Pocket Mice, Kangaroo Rats, etc.

Pocket mice of the genus *Perognathus* are naturally abundant in the desert-like country of Lower California, and were obtained at all localities where the traps were set at night.

There were signs that they were quite as common on the islands as on the Peninsula. They are burrowers, nocturnal in habit, and feed on seeds which they collect and carry in their cheek pouches.

13. **Perognathus penicillatus arenarius** *Merriam.* Little Desert Pocket Mouse.

Male, San Bartolome Bay, March 14; male San Francisquito Bay, April 10.

14. **Perognathus spinatus peninsulæ** *Merriam.* Cape San Lucas Pocket Mouse.

Seven males, 3 females, Cape San Lucas, March 24; 5 males, San José del Cabo, March 26; 2 males and 2 females, Pichilinque Bay, March 28–30; male, Agua Verde Bay, April 2; male and female, Mulege, April 5; male, Concepcion Bay, April 8; 3 males, Miraflores, April 25; female, San Bernado Mountains, May 5.

15. **Perognathus penicillatus siccus** *Osgood.*

Male, 2 females, Cape San Lucas, March 24.

16. **Perognathus baileyi rhydinorhis** *Elliot.* San Quentin Pocket Mouse.

Two males and 3 females, Pichilinque Bay, March 29–30; male, Concepcion Bay, April 8.

17. **Perognathus fallax** *Merriam.* Short-eared California Pocket Mouse.

Female, San Bartolome Bay, March 14.

18. **Perognathus spinatus bryanti** *Merriam.* Bryant Pocket Mouse.

Four males, female, San José Island, April 1; 3 males, Espiritu Santo Island, April 19.

19. **Perognathus baileyi insularis** subsp. nov. Tiburon Island Pocket Mouse.

In size and color about the same as *P. penicillatus pricei.* Skull in general rather narrower; rostrum and nasals narrower; interparietal larger. Ascending branches of supraoccipital narrower; maxillary arm of zygoma weaker.

Type, No. 31846, male.

Represented by 2 males and 1 female, Tiburon Island, April 13.

Measurements, average of three specimens: total length, 212; tail, 119; hind foot, 27.3.

20. **Perognathus penicillatus goldmani** subsp. nov. Goldman's Pocket Mouse.

In general size and color about the same as *P. baileyi*; skull slightly smaller and lighter; molariform toothrow shorter; inner side of parietal shorter. Named for Edward A. Goldman.

Type, No. 31845, male, Tiburon Island, April 13.

Measurements of the type: total length, 171; tail, 90; hind foot, 23.

21. **Perognathus spinatus nelsoni** subsp. nov. Carmen Island Pocket Mouse.

Compared with *P. spinatus peninsulæ*, the color is grayer and lacks the drab brown effect seen in *peninsulæ*; general size similar, but tail slightly shorter — decidedly shorter than in *bryanti.*

Type, No. 31855, male.

Represented by 2 males and 1 female, Carmen Island, April 3. Named for Edward W. Nelson, well known for his studies of Lower California mammals. Measurements, average of three specimens: total length, 172; tail, 93; hind foot, 24.

Kangaroo rats are very abundant on Tiburon Island where there were many tracts of level ground conspicuously marked with their burrows and

well-beaten trails. Being nocturnal, we saw nothing of them, but the traps yielded specimens both nights we were at the island. They did not appear to be so common at other places visited by the 'Albatross'.

Kangaroo Rats.

Kangaroo rats are handsome animals with velvety fur, and derive their name from the long hind legs and tail and the habit of leaping kangaroo fashion. They have cheek pouches in which food is carried to their burrows.

22. **Dipodomys insularis** *Merriam.* San José Island Kangaroo Rat.

Male, 2 females, San José Island, April 1.

23. **Dipodomys merriami** *Mearns.* Tiburon Island Kangaroo Rat.

Seven males and 1 female, Tiburon Island, April 12–13.

24. **Dipodomys merriami simiolus** *Rhoads.* Allied Kangaroo Rat.

Male, 3 females, San Francisquito Bay, April 10.

25. **Dipodomys merriami melanurus** *Merriam.* Black-tailed Kangaroo Rat.

Six specimens, Miraflores, April 25–May 2.

Geomyidæ. Pocket Gophers.

These animals are active burrowers, living almost entirely under ground. They are vegetable feeders and have cheek pouches in which to carry food.

26. **Thomomys bottæ anitæ** *Allen.* Santa Anita Pocket Gopher.

Seven specimens, Miraflores, April 28–May 4.

Muridæ. Wood Rats, Deer Mice, etc.

Wood rats were obtained by night trapping at most of the localities visited by the 'Albatross'. It is, by reason of its conspicuous brush nest, more in evidence than any other mammal. Nests were seen by the dozen in all sorts of locations, from the high, rocky ridges, down to the mangrove belts along the lagoons. One nest high up on Margarita Island, was built quite in the open against the side of a rock commanding an extensive view. The broken twigs of which it was largely composed, were covered entirely

over with pieces of cactus, the dried dung of burros and cattle and a bushel of small stones. Another, just back of the beach and in the center of a clump of cactus, was five feet in diameter and completely covered with pebbles and sea shells. Another among the mangroves on Magdalena Island was six feet in diameter and composed entirely of mangrove twigs. Its base was well secured among elevated mangrove roots and more than a foot clear of the marshy ground beneath. There must have been a score of wood rat nests among the mangroves on Magdalena Island within a radius of 500 yards and many of the structures were five feet high. Any kind of portable object in the vicinity of a wood rat's nest may be used in its composition.

27. **Neotoma intermedia gilva.** *Rhoads.* Yellow Wood Rat.

Female, San Bartolome Bay, March 14.

28. **Neotoma intermedia pretiosa** *Goldman.* Matancita Wood Rat.

Five males, 3 females, Santa Margarita Island, March 19–21.

29. **Neotoma intermedia arenacea** *Allen.* Cape Wood Rat.

Three males, 2 females, Cape San Lucas, March 24–25.

30. **Neotoma intermedia perpallida** *Goldman.* San José Island Wood Rat.

Five males, 1 female, San José Island, March 31–April 1.

31. **Neotoma intermedia** *Rhoads.* Rhoads's Wood Rat.

Female, Agua Verde Bay, April 2; 2 females, Mulege, April 5, Concepcion Bay, April 8; female, San Bernado Mountains, May 16; 2 juv., Miraflores, April 25–30.

32. **Neotoma intermedia vicina** *Goldman.* Espiritu Santo Wood Rat.

Female, Espiritu Santo Island, April 19.

33. **Neotoma nudicauda** *Goldman.* Carmen Island Wood Rat.

Two females, Carmen Island, April 3.

34. **Neotoma albigula seri** subsp. nov. Tiburon Island Wood Rat.

In color similar to *N. albigula*, which it resembles more nearly than any other species. Teeth rather small; interorbitals narrow; interparietals small as compared with *albigula*. Named for the Seri Indians inhabiting Tiburon Island.

Type No. 31940, male.

Represented by 1 male and 2 females, Tiburon Island, April 12–13.

Measurements, average of three specimens: total length, 328; tail, 149; hind foot, 34.

35. **Neotoma insularis** sp. nov. Angel Island Wood Rat.

Nearest to *N. intermedia gilva* and about the same size, but paler, grayer and less yellowish. Skull relatively shorter and broader, with heavier rostrum, heavier dentition and larger auditory bullæ.

Type No. 21922, female, Angel del la Guardia Island, April 11.

Measurements of type: total length, 290; tail, 120; hind foot, 35.

Deer Mice.

These nocturnal animals, abundant in most parts of North America, are common almost everywhere in Lower California and the outlying islands. The traps set for them at night seldom failed to yield specimens, but we learned little of their habits. They feed largely on seeds and inhabit all sorts of natural crevices under rocks and the roots of trees and bushes. They are extensively preyed upon by owls, snakes, and weasels.

36. **Peromyscus eremicus cedroscensis** *Allen*. Cedros Island Mouse.

One male, 3 females, Cedros Island, March 10–12.

37. **Peromyscus maniculatus coolidgi** *Thomas*. Coolidge's Field Mouse.

Female, San Bartolome Bay, March 14.

38. **Peromyscus eremicus polypolius** *Osgood*. Margarita Island Mouse.

Three males, 4 females, Santa Margarita Island, March 19–21.

39. **Peromyscus eremicus eva** *Thomas*. Eva's Mouse.

Four males, Cape San Lucas, March 24–25; 1 male, San José del Cabo, March 26; 1 male, 1 female, Pichilinque Bay, March 28–30; 4 females,

Mulege, April 5; 2 males, 1 female, Concepcion Bay, April 7–8; 1 female, San Bernado Mountains, May 15; 1 juv., Miraflores, April.

40. **Peromyscus eremicus eremicus** *Baird.* Desert Mouse.

Female, San Francisquito Bay, April 10.

41. **Peromyscus eremicus tiburonensis** *Mearns.* Tiburon Desert Mouse.

Two males, 1 female, Tiburon Island, April 12–13.

42. **Peromyscus guardia** sp. nov. Angel Island Mouse.

Larger than *eremicus*, in color at least as pale; upper outline of skull less arched; skull similar in general to that of *eremicus*, but zygoma more compressed anteriorly and rostrum decidedly longer. Incisive foramina rather short, not reaching anterior plane of first molars; interpterygoid fossæ broader; audital bullæ larger.

Type No. 31907 female.

Measurements: average of two specimens, total length, 208; tail, 114; hind foot, 24.

Represented by male and female from Angel de la Guardia Island, April 11.

43. **Peromyscus stephani** sp. nov. San Esteban Island Mouse.

Although near to Tiburon Island, the San Esteban form is clearly not very nearly related to *P. tiburonensis*. In color it is close to typical *eremicus;* the tail averages shorter and the hind foot larger.

P. tiburonensis is one of the smallest of the *eremicus* group, while the San Esteban form is one of the largest, skull decidedly shorter than in *eremicus*, dentition about the same; nasals more pointed posteriorly and reaching beyond premaxillaries. In *eremicus* the contrary is true — the premaxillaries exceed the nasals. Posteriorly the frontals meet at an angle on the median line, instead of forming a curve as in *eremicus*.

Type, No. 31961, male.

Measurements, average of four specimens: total length, 195; tail, 97; hind foot, 22.

Represented by 2 males and 2 females, San Esteban Island, April 14.

44. **Peromyscus eremicus carmeni** subsp. nov. Carmen Island Desert Mouse.

Generally similar to *P. e. eva*, but back rather grayer and general color less rufescent, under parts more creamy white. Specimens vary from white to creamy white beneath; foot larger; teeth larger and tooth-row longer.

Type No. 31885, male.

Measurements, average of 12 specimens: total length, 197; tail, 111; hind foot, 22.

Represented by 5 males, 7 females, Carmen Island, April 13.

Sciuridæ. Squirrels, Spermophiles, etc.

Antelope squirrels were observed at three localities only. We did not see them at any point on the west side of the Peninsula. All specimens were obtained by shooting.

45. **Ammospermophilus leucurus insularis** *Nelson and Goldman.* Espiritu Santo Island Spermophile.

Three males, 1 female, 2 skulls, Espiritu Santo Island, April 19.

46. **Ammospermophilus leucurus peninsulæ** *Allen.* Lower California Spermophile.

Five males, 1 female, Cape San Lucas, March 24; 1 skull, Agua Verde Bay, April 22.

Vespertilionidæ. Insectivorous Bats.

Bats were not much in evidence during our explorations, as we were seldom ashore in the evening. The specimens with one exception were obtained in the interior by a collector sent from the ship.

Several species are known to inhabit Lower California.

47. **Pipistrellus hesperus australis** *Miller.* Allied Bat.

One female, Ceralbo Island, April 19.

48. **Dasypterus ega xanthinus** *Thomas.* Sierra Laguna Bat.

Two specimens, Miraflores, May 7.

49. **Antrozous pallidus minor** *Miller.* Little Comondu Bat.

Three specimens, Miraflores, May 1–3.

50. **Myotis peninsularis** *Miller.* Lower California Bat.

Five specimens, Miraflores, May 1–6.

Phocidæ. Seals.

One of the most interesting features of the expedition was the rediscovery of the elephant seal at Guadalupe Island, lying 140 miles west of the northern part of the Peninsula. This species was formerly taken in great numbers for its oil, and finally became so scarce that it was reported by Scammon in 1869 to be "nearly if not quite extinct." Specimens were taken by the writer in 1884 at San Cristobal Bay, Lower California, since which time it has not been seen at that locality. He also obtained specimens in 1892 at Guadalupe Island where it has been found subsequently only twice. Not having been found elsewhere than at these two localities since about 1865, it has generally been supposed to be extinct. The herd at Guadalupe Island contains about 150 animals, and is now being protected by the Mexican Government. The writer has already published a special account of the elephant seal in 'Zoologica, Scientific Contributions of the New York Zoological Society', I, No. 8, pp. 159–173, pll. 52–72, April, 1912. He has also published an article on the same subject in the 'Century Magazine' for June, 1912, pp. 205–211.

51. **Macrorhinus angustirostris** *Gill.* Northern Elephant Seal.

Plate VIII.

Three males, 1 female, skins, 2 skeletons, 6 live yearlings, Guadalupe Island, March 2–4.

Some of the young brought back lived nearly a year in the New York Aquarium. The skins of the adults with some of the young have been mounted for the American Museum of Natural History.

Otariidæ. Sea-Lions, Fur-Seals.

Sea-lions abound at many points on the Peninsula and the outlying islands, from Guadalupe Island, 140 miles west of the northern part of the Peninsula, to Consag Rock, near the head of the Gulf of California.

The California species has not been recorded from farther south than the Tres Marias Islands, below the mouth of the Gulf. The largest colony observed during the cruise occupied the western side of West San Benita Island, where there were perhaps 1000 hauled out on the rocks. All the little inlets on the eastern side of the East San Benita were filled with them, there being about 700 altogether.

A brief search was made for fur-seals at Guadalupe Island, and a very thorough one at the San Benita Islands, but none were found. The breeding season, it is said, does not commence until June. Doubtless there are some

survivors about Guadalupe, where they were taken as late as 1894. At this island they frequented the numerous sea-caves under the cliffs. (Plate VIII.

52. **Zalophus californianus** *Lesson.* California Sea Lion.

One shot at Cedros Island, not saved.

53. **Arctocephalus townsendi** *Merriam.* Lower California Fur-Seal.

This species has not been seen since 1894. There are no specimens in museums with the exception of those collected by the writer in 1892. There are incomplete records showing that 5575 fur-seals were killed at Guadalupe and San Benita Islands between 1876 and 1894.

Mustelidæ. Skunks, Weasels, etc.

54. **Spilogale lucasana** *Merriam.* Cape San Lucas Spotted Skunk.

Three specimens, Miraflores, May 2, 18, 19.

Spotted skunks of this or allied species are found in most parts of Lower California, where the inhabitants generally fear them, believing that the bite of a "*zorillo*" causes rabies.

Procyonidæ. Raccoons, etc.

55. **Procyon psora pallidus** *Merriam.*

Male, female, Miraflores, April 24 and May 10.

Canidæ. Wolves, Foxes, etc.

The coyotes from San Bartolome and Tiburon were all obtained by leaving poisoned baits on the beaches at night. Foxes and coyotes appear to inhabit all parts of the Peninsula, and fox tracks were seen on Cedros Island.

56. **Urocyon cinereoargentatus californicus** *Mearns.* California Gray Fox.

Two females, Miraflores, May 2–8.

57. **Canis peninsulæ** *Merriam.* Lower California Coyote.

Two males, 1 female, San Bartolome Bay, March 14.

58. **Canis jamesi** sp. nov. Tiburon Island Wolf.

Plate IX.

Much paler than *C. mearnsi*, and nearer *C. estor*, the desert coyote, but of a richer color and a little more buff; ears long, skull large, nearly equalling that of the type of *estor;* teeth larger and heavier than in either *mearnsi* or *estor* — about equalling those of *lestes;* bullæ rather flattened, closely resembling those of *C. lestes*.

Type No. 31987, male, Tiburon Island, April 13.

Measurements of the type: total length, 1143; tail vertebræ, 330; hind foot, 330; ear from crown, 118.

Named for Mr. Arthur Curtiss James of New York, through whose generosity the Museum was enabled to cooperate in the expedition of the 'Albatross' to the Gulf of California.

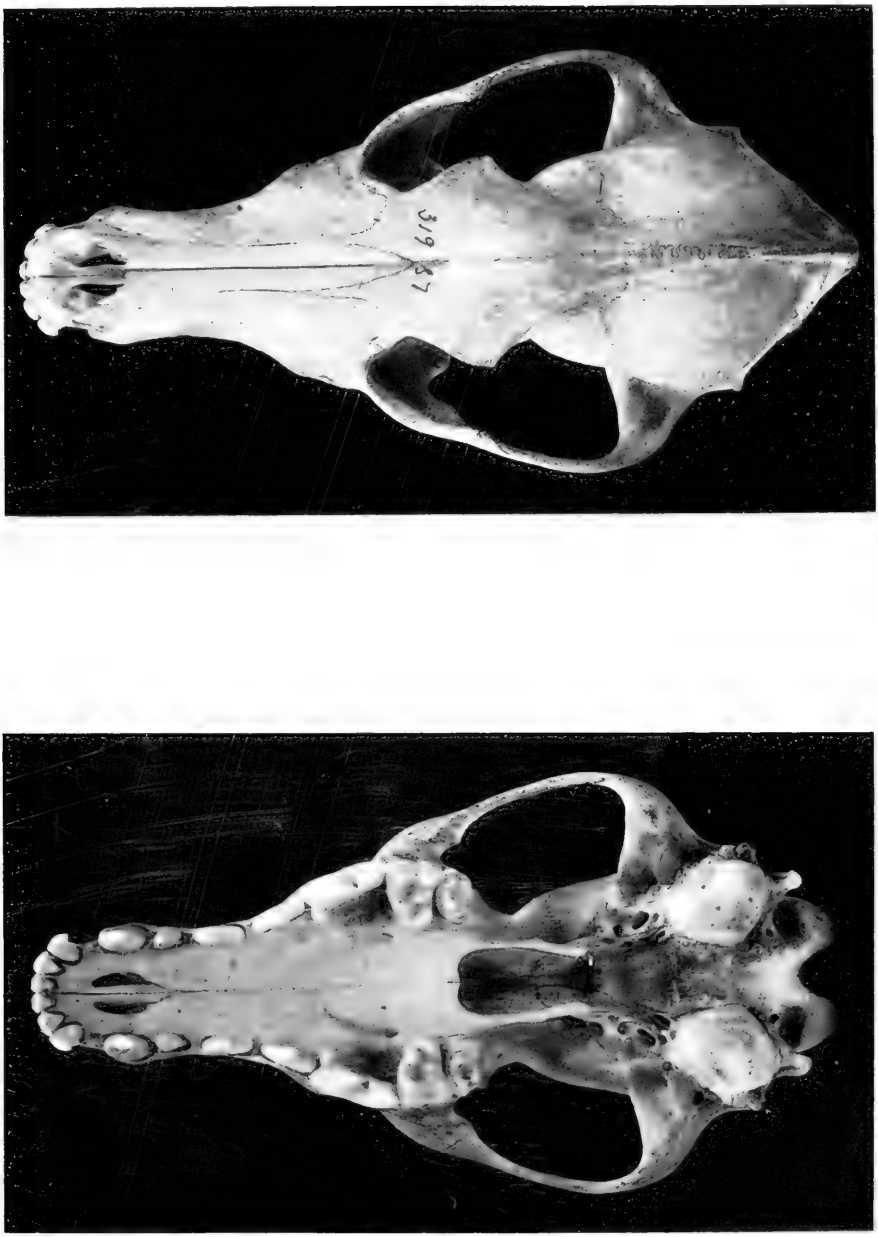
Felidæ. Cats.

59. **Lynx ruffus californicus** *Mearns.* California Lynx.

Male, Miraflores, May 21.

1. Adult male and female Elephant Seal (*Macrorhinus angustirostris*). Guadalupe Island, L. Cal.

2. View of northwest side of Guadalupe Island, L. Cal. Small beach at extreme left occupied by Elephant Seals in 1911. The rocky point in center is where Fur Seals were found in 1892.



Skull of Tiburon Island Wolf (*Canis jamesi*).

Scientific Results of the Expedition to the Gulf of California in Charge of C. H. Townsend, by the U. S. Fisheries Steamship 'Albatross' in 1911. Commander G. H. Burrage, U. S. N., Commanding.

Published by Permission of the U. S. Commissioner of Fisheries.

IV.

List of Insects Collected in Lower California.

John A. Grossbeck.

AUTHOR'S EDITION, extracted from BULLETIN

OF THE

American Museum of Natural History,

Vol. XXXI, Art. XXIV, pp. 323–326.

New York, September 13, 1912.

Continued from 3rd page of cover.)

PART II.— The Chuckchee: Religion. By W. Bogoras. Pp. 277–536, pll. xxxii–xxxiv, and 101 text figures. 1907. Price, $4.00.

PART III.— The Chuckchee: Social Organization. By W. Bogoras. Pp. 537–733, pl. xxxv, and 1 text figure. 1909. Price, $3.00.

Vol. XII. Anthropology (not yet completed).

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PART I.— Chuckchee Mythology. By Waldemar Bogoras. Pp. 1–197, 1910. Price, $1.25.

Vol. XIII. Anthropology (not yet completed).

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PART I.— The Yukaghir and the Yukaghirized Tungus. By Waldemar Jochelson. Pp. 1–133, pll. i–vii, 1 map. Price, $3.40.

Vol. XIV. Anthropology.

**Jesup North Pacific Expedition, Vol. X.*

PART I.— Kwakiutl Texts. Second Series. By Franz Boas and George Hunt. Pp. 1–269. 1906. Price, $2.80.

PART II.— Haida Texts. By John R. Swanton. Pp. 271–802. 1908. Price, $5.40.

ETHNOGRAPHICAL ALBUM.

Jesup North Pacific Expedition.

Ethnographical Album of the North Pacific Coasts of America and Asia. Part 1, pp. 1–5, pll. 1–28. August, 1900. Sold by subscription, price, $6.00.

BULLETIN.

The matter in the 'Bulletin' consists of about 24 to 36 articles per volume, which relate about equally to Geology, Palæontology, Mammalogy, Ornithology, Entomology, and (in former volumes) Anthropology, except Vol. XI, which is restricted to a 'Catalogue of the Types and Figured Specimens in the Palæontological Collection of the Geological Department,' and Vols. XV, XVII, and XVIII, which relate wholly to Anthropology. Volume XXIII and the later volumes contain no anthropological matter, which is now issued separately as 'Anthropological Papers.'

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AMERICAN MUSEUM JOURNAL.

The 'Journal' is a popular record of the progress of the American Museum of Natural History, issued monthly, from October to May inclusive. Price, $1.00 a year. Volumes I–XI, 1900–1911.

*The Anatomy of the Common Squid. By Leonard Worcester Williams. Pp. 1–87, pll. i–iii, and 16 text figures. 1909.

*Chinese Pottery of the Han Dynasty. By Berthold Laufer. Pp. 1–339, pl. i–lxxv, and 55 text figures. 1909.

For sale at the Museum.

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59.57(72.2)

Article XXIV.—LIST OF INSECTS COLLECTED BY THE "ALBATROSS" EXPEDITION IN LOWER CALIFORNIA IN 1911, WITH DESCRIPTION OF A NEW SPECIES OF WASP.[1]

By John A. Grossbeck.

(By Permission of the U. S. Commissioner of Fisheries.)

The material listed below was secured by Dr. Chas. H. Townsend in Lower California while in command of the 'Albatross' Expedition (1911), and was collected in the Cape Region between San José del Cabo and Triunfo, near sea level.

Some of the species were determined from the collections in the American Museum of Natural History, but all such determinations were verified by specialists who also identified the remainder of the material.

Mr. A. N. Caudell of the United States National Museum, Washington, D. C., is responsible for the determinations in the Orthoptera; Mr. S. A. Rohwer of the United States Department of Agriculture, Washington, D. C., is similarly responsible for those in the Hymenoptera; Mr. H. G. Barber of Roselle, N. J., has determined or verified the Hemiptera, and Messrs. Leng and Beyer of New York City have likewise determined or verified all the Coleoptera. To these gentlemen, as well as to Dr. L. O. Howard, Chief of the Bureau of Entomology at Washington, through whom Messrs. Caudell and Rohwer made their determinations, the compiler of this list expresses his sincere thanks.

List of Species.

ORTHOPTERA.

Periplaneta americana Linn.	40	specimens
Pycnoscelus surinamensis Linn.	26	"
Gryllus mexicanus Sauss.	8	"
Gryllus galapageius Scudd.	1	"
Gryllodes sigillatus Walk.	3	"
Trimeroptropis vinculata Scudd.	16	"
Heliastus aridus Bruner	2	"

[1] Scientific Results of the Expedition to the Gulf of California in Charge of C. H. Townsend, by the U. S. Fisheries Steamship 'Albatross,' Commander G. H. Burrage, U. S. N., Commanding.

Schistocerca vaga Scudd.	3	specimens
Schistocerca maya Scudd.	1	"
Melanoplus complanatipes Scudd.	1	"

HEMIPTERA.

Deinostoma dilatatum Say	23	specimens
Ambrysus parvulus Mont.?	20	"
Conorhinus maximus Uhl.	1	"
Lygæus reclivatus Say	13	"
Oncopeltus gutta H. S.	5	"
Oncopeltus fasciata Dall.	3	"
Oncoplatus varicolor Fabr. var.?	15	"
Largus cinctus H. S.	9	"
Leptoglossus zonatus Dall.	1	"
Pachylis gigas Burm.	37	"
Mozena lurida Dall.	2	"
Loxa flavicollis Dru.	2	"
Brochymena obscura H. S.	1	"
Pachycoris torridus Scop.	58	"

COLEOPTERA.

Tetracha carolina Linn.	21	specimens
Calosoma palmeri Horn	3	"
Plochionus timidus Hald.	1	"
Anisodactylus piceus Men.	29	"
Rhantus anisonychus Cr.?	1	"
Thermonectes marmoratus Hope	2	"
Megadytes fraternus Sharp	1	"
Hydrophilus insularis Lap.	2	"
Hydrophilus californicus Lec.	14	"
Coccinella sanguinea Linn.	1	"
Dermestes vulpinus Fabr.	22	"
Chalcolepidius rubripennis Lec.	10	"
Dicrepidius corvinus Caud.	2	"
Ludius texanus Lec.	1	"
Chrysobothris merkelii Horn?	1	"
Acmæodera flavomarginata Gray	1	"
Sitodrepa panicea Linn.	14	"
Amphicerus punctipennis Lec.	4	"
Dinoderus truncatus Horn	6	"
Polycaon punctatus Lec.	1	"
Atænius strigatus Say.	1	"
Lacnosterna nitida Lec.	1	"
Pelidnota lucæ Lec.?	1	"
Cyclocephala dimidiata Burm.	7	"
Ligyrus gibbosus De G.	12	"
Ligyrus sp. near *gibbosus*	1	"
Megasoma thersites Lec.	37	"

Derobrachus forreri Bates	6	specimens
Eburia ulkei Bland	2	"
Dendrobius mandibularis Serv.	32	"
Lisonotus multifasciatus Dup.	22	" [1]
Stenaspis solitaria Say	31	"
Tragidion simulatum Lec.	1	"
Stenosphenus novatus Horn	23	"
Cyllene antennatus White	2	"
Acanthoderus peninsularis Horn	1	"
Lagochirus obsoletus Thom.	1	"
Metacycla insolita Lec.	22	"
Triorophus subpubescens Lec.?	1	"
Zabrotes pectoralis Sharp	22	"
Emmenastus erosus Horn	13	"
Centrioptera spiculifera Lec.	8	"
Centrioptera angularis Horn	1	"
Asida ægrota Lec.	1	"
Asida connivens Lec.	1	"
Asida confluens Lec.	10	"
Coniontus subpubescens Lec.	26	"
Eusaithus lævis Lec.	26	"
Cerenopus concolor Lec.	6	"
Eleodes eschscholtzii lucæ Lec.	25	"
Blapstinus sulcatus Lec.?	28	"
Tribolium ferrugineum Fabr.	28	"
Cactophagus validus Lec.	1	"
Calandra orzæ Linn.	23	"

HYMENOPTERA.

Dasymutilla gloriosa Sauss.	24	specimens
Dasymutilla sp.	4	"
Elis sp. near *hamatus* Say	3	"
Elis sp.	4	"
Campsomeris dorsata Fabr.	2	"
Pepsis "formosa" Say	16	"
Pepsis sp.	1	"
Psammochares sp.	1	"
Arachnophroctonus ferrugineus unicolor Vier.	1	"
Chalybion californicum Sauss.	1	"
Sphex sp. near *femur-rubra* Fox	1	"
Eucerceris angulata Rohwer, new species	1	"
Microbembex monodonta Say	2	"
Notogonia sp.	1	"
Polistes sp.	21	"
Xylocopa sp.	22	"

[1] Two of the specimens from this lot were of the jet black variety.

Eucerceris angulata *Rohwer,* new species.

Judging from the description the following new species is related to *Eucerceris punctifrons* (Cameron), described as an *Aphilanthops,* but the clypeus does not project outwardly, the relation of the ocelli with the eyes and each other is different, and the color is somewhat different. In some respects *Eucerceris chapmanæ* Viereck and Cockerell, seems to be related to this species, but the description of *chapmanæ* does not fit the present insect in all ways.

Female. Length 11 mm. Clypeus flat, median portion with a short, flat, truncate process which narrows apically and is on the same plane as the face; nasal eye margins distinctly diverging beneath; facial quadrangle much broader beneath than high; frontal carina uniform in width, not impressed; mandibles of the narrow type; antennae rather short, the third joint much shorter than the two following; postocella line somewhat shorter than the ocelloccipital line and much shorter than the ocellocular line, neither of the latter are equal with the third and fourth antennal joints as in *punctifrons;* lateral anterior angles of pronotum obtusely, distinctly dentate; propodeal enclosure punctured similar to the propodeum, with the usual longitudinal sulcus; entire insect closely, rather coarsely, distinctly punctured; abdomen normal, pygidium about two and a half times as long as broad, rounded apically, broader basally, hypopygidium with a very deep U-shaped notch. Black: spot on median part of clypeus, frontal cariba, large spot on sides of face, spot on superior orbits, line on pronotum, metanotum, angles of propodeum, bands of first to sixth dorsal segments, uniform in width on first, narrowed in middle on following and interrupted on four and five, yellow; legs black, four anterior tibæ beneath pale, tegulæ black, piceous, and yellow, wings subhyaline, radial and subcostal cells fuscous; costa and stigma reddish-yellow, rest of venation dark brown, pubescence sparse, silvery.

Lower California, between San José del Cabo and Triunfo. One female collected by 'Albatross' Expedition, 1911.

Type: American Museum of Natural History.

Scientific Results of the Expedition to the Gulf of California in Charge of C. H. Townsend, by the U. S. Fisheries Steamship 'Albatross' in 1911. Commander C. H. Burrage, U. S. N., Commanding.

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V.

Echinoderms from Lower California, with Descriptions of new Species.

By Hubert Lyman Clark.

AUTHOR'S EDITION, extracted from BULLETIN

OF THE

American Museum of Natural History,

Vol. XXXII, Art. VIII, pp. 185–236.

New York, July 9, 1913.

(*Continued from 3rd page of cover.*)

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Article VIII.— ECHINODERMS FROM LOWER CALIFORNIA, WITH DESCRIPTIONS OF NEW SPECIES.[1]

By Hubert Lyman Clark.

Museum of Comparative Zoölogy, Cambridge, Mass.

[By permission of the U. S. Commissioner of Fisheries.]

Plates XLIV to XLVI.

The collection of echinoderms made by the 'Albatross' Expedition to Lower California in the spring of 1911 proves to be of more than ordinary interest. It consists of 1881 specimens representing 107 species, of which 40 are starfishes, 31 are ophiurans, 18 are echini and 18 are holothurians. There are no crinoids in the collection. There is one apparently new species among the echini and two undescribed forms in each of the other classes. Unfortunately no less than 33 species are represented by only one or two specimens and as these are not infrequently in poor condition and occasionally without a locality label, there are a considerable number of specimens whose identification is dubious.

The region explored by the 'Albatross' is on the boundary between the Panamic region and that of the North Pacific, at least 54 of the species having been previously taken in the Panamic region. Yet there are a considerable number of northern forms, especially among the starfishes. These, however, are as a rule from the more northern stations. So far as littoral forms are concerned the boundary between the two regions appears to be about in the latitude of San Diego. Echinoderms were taken at all of the 'Albatross' dredging stations except three, Nos. 5679, 5680 and 5681. These three stations are in 325–405 fms. off the southern end of Lower California and it seems very strange that no echinoderms whatever were gotten that day, March 22. At about half of the harbors and anchorages visited, littoral echinoderms were gathered. The largest number of species taken at any one spot was 18 at 5694; 28 species were taken in that general

[1] Scientific Results of the Expedition to the Gulf of California in Charge of Dr. C. H. Townsend, by the U. S. Fisheries Steamship 'Albatross' in 1911. Commander G. H. Burrage, U. S. N. Commanding.

region on April 26, stations 5693–5695, 451–640 fms. This locality is southwest of the Santa Barbara Islands, California. Off Monterey County, California, stations 5696–5699, 440–659 fms., 19 species were taken; and off Pt. San Tomas, west coast of Lower California, stations 5673, 5674, 5691, 5692, 590–1090 fms., 17 species were collected. Off Cape St. Lucas, at station 5682, five species were taken while at 5683, in slightly deeper water, five wholly different species were found. These two hauls were however, four weeks apart in time, as the 'Albatross' did no dredging while in the Gulf of California.

The chief interest of the collection lies in the light which it throws on the distribution of previously known species. Little light is thrown on bathymetrical distribution, and the bottom temperatures are surprisingly uniform. Nevertheless, where a species was found at more than three stations, I have given a summary of its bathymetrical and temperature ranges, so far as the present collection shows them. Several of the new forms are of more than ordinary interest. Of the two new starfishes one is a *Zoroaster*, apparently intermediate between the typical members of the genus and Fisher's proposed subgenus *Myxoderma;* the other is a *Pedicellaster* remarkable for its large size. Of the ophiurans, one is a representative of the very large cosmopolitan genus *Ophiura*, while the other represents a new generic type, allied to *Ophioderma*, but even more specialized. The new echinoid is one of the perplexing genus *Urechinus*, characteristic deep sea spatangoids. Among the holothurians it is interesting to find a new, well-characterized species of the very diversified genus *Stichopus*, the members of which are at present in a condition of the greatest confusion. Fortunately the three Pacific coast species are not only well set off from the rest of the genus but are readily distinguishable from each other. The other new holothurian seems to represent a new genus, remarkable among the Elasipods for the absence of dorsal appendages of any kind.

Holotypes of the new species are deposited in the United States National Museum. Thanks to the generosity of the American Museum of Natural History, paratypes of five of the seven are in the collections of the Museum of Comparative Zoölogy, while paratypes of the two holothurians are in the American Museum. In this connection I desire to put on record my sincere appreciation of the courtesies shown me by the authorities of the American Museum in connection with the preparation of this report. Particularly I wish to thank Dr. C. H. Townsend and Director F. A. Lucas for entrusting the collection to me for study, and for granting all my requests concerning both the specimens and the report.

ASTEROIDEA.

Eremicaster tenebrarius.

Porcellanaster (Eremicaster) tenebrarius FISHER, 1905. Bull. Bur. Fish., Vol. 24, p. 293.

Eremicaster tenebrarius LUDWIG, 1907. Zool. Anz., Vol. 31, p. 318.

There is a single specimen of this species in the collection. It has R = 25 mm. and r = 8 mm. Each of the superomarginals carries a conspicuous spine. There is only a single furrow spinelet on each adambulacral plate, but the segmental papillæ are conspicuous nearly to the end of the arm. The terminal plate has only three spinelets. There are but ten superomarginal plates. In all these points, this individual resembles Alaskan specimens more closely than it does those from California.

Station 5684. Southwest of Santa Margarita Island, west coast of Lower California, 1760 fms.

Eremicaster pacificus.

Porcellanaster pacificus LUDWIG, 1905. Mem. M. C. Z., Vol. 32, p. 89.

Eremicaster pacificus FISHER, 1907. Zool. Anz., Vol. 32, p. 14.

Both adults and young are represented in this series, the largest having R = 24 and the smallest, R = 8. As the latter is considerably smaller than any hitherto described, a few details of its structure may be worth recording. There are eight or nine adambulacral plates but only five or six marginals. Most of the superomarginal plates carry a spine and the adambulacrals usually have two, but the distal ones may have only one. The terminal plate of each arm carries five spines, of which the median is $1\frac{1}{2}$ mm. long. The median cribriform organ is made up of eight to ten lamellæ but the lateral ones are much less developed and have only four to six lamellæ. The madreporite is large and the periproctal tube is $2\frac{1}{2}$ mm. long.

Station 5673. Off Pt. San Tomas, west coast of Lower California, 1090 fms.

Station 5691. Off Pt. San Tomas, west coast of Lower California, 868 fms. Bottom Temp., 37.2°.

Station 5692. Off Pt. San Tomas, west coast of Lower California, 1076 fms. Bottom Temp., 37.1°.

Eleven specimens.

Ctenodiscus crispatus.

Asterias crispatus Retzius 1805. Diss. sp. cog. Ast., p. 17.
Ctenodiscus crispatus Duben and Koren, 1846. K. vet. Akad. Handl. f. 1844, p. 253.

A single small specimen (R = 15 mm.) is all the collection contains of this common and widespread species.

Station 5686. Off Ballenas Bay, west coast of Lower California, 930 fms. Bottom Temp., 37.3°.

Leptychaster inermis.

Parastropecten inermis Ludwig, 1905. Mem. M. C. Z., Vol. 32, p. 76.
Leptychaster inermis Fisher, 1911. Bull. U. S. Nat. Mus., No. 76, p. 53.

The two specimens are both small, the larger being about the same size as the larger of Ludwig's types (R = 18 mm.). They seem however, to belong to the Panamic species rather than to the more northern *anomalus* for there are six or seven furrow spines on each adambulacral plate and only four papulæ around each paxilla-base. The larger specimen answers well to Ludwig's description and photographs except that the rays are relatively a little shorter. The geographical range of the species is extended far northward by its occurrence off California.

Station 5685. Southwest from Ballenas Bay, west coast of Lower California, 645 fms.

Station 5699. Southwest from Monterey Bay, California, 659 fms. Bottom Temp., 37.9°.

Astropecten erinaceus.

Gray, 1840. Ann. Mag. Nat. Hist., Vol. 6, p. 182.

The status of the Astropectens of the Pacific coast of America which have spines on the superomarginal plates is still uncertain and probably must remain so until satisfactory collections can be made on the coast of Ecuador, preferably at Punta Santa Elena, whence Gray's types came. Fisher follows Perrier in considering *erinaceus* and *armatus* identical but I am not prepared to admit this as it seems to me more likely that *armatus* is the species described by Verrill under the name *peruviana*. At the same

time it is quite possible that all of these nominal species are really one. For the present, I think it desirable to retain the names *erinaceus* and *peruvianus* to distinguish the two forms now recognized, the former with spines on the *outer* edge of marginal plates at middle of arm and the series double, if anywhere, at *base* of arm; while the latter has the spines on the *inner* edge of the plates and the series double, if anywhere, near *tip* of arm.

The specimens in the present collection show interesting geographical diversity. The specimens from Ballenas Bay and San Bartolomé have relatively broad arms, inconspicuous superomarginal spines in incomplete series, central granules of paxillæ noticeably enlarged and the stout actinal spine on each adambulacral plate short and truncate; R = 85, r = 17 and br = 18 mm. or R = 62, r = 18 and br = 17 mm. So R = 3.5–5 r or br. The color of these more northern specimens is light yellowish-brown. The individuals from Cape St. Lucas are smaller, ranging from R = 8 to R = 55 mm. The latter has r and br scarcely more than 10 mm. so that the rays appear longer and narrower than in the more northern specimens. The color is also different; brown with a tinge of purple. The superomarginal spines are conspicuous and the series are quite complete, being double near the bases of the arms, but not in the arm-angles. The central granules of the paxillæ are not enlarged and the big actinal spine on each adambulacral plate is quite long and rounded at tip. These specimens from Cape St. Lucas approach those in the M. C. Z. collection from Peru, but the latter have the actinal spines on the adambulacral plates still longer and more pointed and the spinelets of the paxillæ are not at all graniform. In these particulars the difference between southern (Peru) and northern (California) specimens is very marked but the Cape St. Lucas specimens are intermediate.

San Bartolomé, west coast of Lower California.

Ballenas Bay, west coast of Lower California.

Cape St. Lucas, Lower California.

Eight specimens.

Psilaster pectinatus.

Bathybiaster pectinatus Fisher, 1905. Bull. Bur. Fish., Vol. 24, p. 295.
Psilaster pectinatus Fisher, 1911. Bull. U. S. Nat. Mus., No. 76, p. 72.

Both of the specimens before me are young (R = 13 and R = 35 mm.) and show no characters worthy of mention.

Station 5692. Off Pt. San Tomas, west coast of Lower California, 1076 fms. Bottom Temp., 37.1°.

Thrissacanthias penicillatus.

Persephonaster penicillatus Fisher, 1905. Bull. Bur. Fish., Vol. 24, p. 297.
Thrissacanthias penicillatus Fisher, 1910. Ann. Mag. Nat. Hist., (8) Vol. 5, p. 171.

While most of the specimens in this series are large adults, there are three specimens in which R is only about 25 mm. At first sight these were thought to represent another species but careful comparison with adults reveals nothing distinctive. The rays are relatively shorter and wider and the marginal spines and paxillæ spinelets are less conspicuous. The color is lighter, being nearly white. In none of the specimens examined, either large or small, have I been able to find any pedicellariæ, but probably further search would have revealed some. No specimens of this species were taken south of San Pedro, Cala.

Station 5694. Southwest of Santa Cruz Island, California, 640 fms.

Station 5695. Southwest of Santa Rosa Island, California, 534 fms. Bottom Temp., 38.9°.

Station 5696. Off San Luis Obispo County, California, 440 fms. Bottom Temp., 39.9°.

Station 5697. Off Monterey County, California, 485 fms. Bottom Temp., 39.8°.

Station 5698. Off Monterey County, California, 475 fms. Bottom Temp., 39.9°.

Station 5699. Southwest from Monterey Bay, California, 659 fms. Bottom Temp., 37.9°.

Bathymetrical range, 440–659 fms. Temperature range, 39.9°–37.9°.

Twenty-six specimens.

Luidia phragma.

H. L. Clark, 1910. Bull. M. C. Z., Vol. 52, p. 329.

There is a good series of this species, although none are very large. In the largest, R = 60 mm. The series of spinelets along each side of the ray, abactinally, is generally well developed, but may be incomplete and in one specimen extends scarcely half the length of the ray.

South end of Magdalena Bay, Lower California. Thirteen specimens.

Pectinaster agassizii.

Cheiraster agassizii Ludwig, 1905. Mem. M. C. Z., Vol. 32, p. 1.
Pectinaster agassizii Ludwig, 1910. Sitz. K. Preuss. Akad. Wiss., Vol. 23, p. 449.

These specimens appear to be typical *agassizii* as they have few papulæ in each papularium and no abactinal or marginal pedicellariæ, while actinally pedicellariæ are very common. Even the specimens from Station 5693, which are in very poor condition, seem to be no nearer the subspecies *evoplus*. The range of typical *agassizii* is thus extended considerably northward.

Station 5673. Off Pt. San Tomas, west coast of Lower California, 1090 fms.

Station 5674. Off Pt. San Tomas, west coast of Lower California, 590 fms. Bottom Temp., 39.4°.

Station 5686. Off Ballenas Bay, west coast of Lower California, 930 fms. Bottom Temp., 37.3°.

Station 5689. Off Rosario Bay, west coast of Lower California, 879 fms.

Station 5690. Off Rosario Bay, west coast of Lower California, 1101 fms. Bottom Temp., 38.1°.

Station 5692. Off Pt. San Tomas, west coast of Lower California, 1076 fms. Bottom Temp., 37.1°.

Station 5693. Northwest of San Nicolas Island, California, 451 fms.

Bathymetrical range, 451–1101 fms. Temperature range, 39.4°–37.1°.

Ninety-six specimens; one perfectly tetramerous.

Nearchaster aciculosus.

Acantharchaster aciculosus Fisher, 1910. Zool. Anz., Vol. 35, p. 550.
Nearchaster aciculosus Fisher, 1911. Ann. Mag. Nat. Hist. (8), Vol. 7, p. 92.

The specimens in which R exceeds 100 mm. have actinal intermediate pedicellariæ present and there are also a very few inferomarginal pedicellariæ to be seen. But the smaller specimens do not have actinal pedicellariæ anywhere. It seems probable that this difference if it is anything more than individual diversity, is due to age and not, as Fisher suggests, to locality. The largest specimen in this collection has R in excess of 160 mm. but the tips of all the arms are missing.

Station 5688. Off Cedros Island, west coast of Lower California, 525 fms. Bottom Temp., 39.9°.

Station 5694. Southwest of Santa Cruz Island, California, 640 fms.

Station 5695. Southwest of Santa Rosa Island, California, 534 fms. Bottom Temp., 38.9°.

Station 5698. Off Monterey County, California, 475 fms. Bottom Temp., 39.9°.

Bathymetrical range, 525–640 fms. Temperature range, 39.9°–38.9°.

Twenty-three specimens.

Pseudarchaster pectinifer.

Ludwig, 1905. Mem. M. C. Z., Vol. 32, p. 106.

It is only after the greatest hesitation that I call the largest *Pseudarchaster* in the collection by the name of the Panamic species. I certainly should not do so if Fisher had not suggested the possibility that the northern species *dissonus* intergrades with *pectinifer*. As the present specimen entirely lacks the characteristic pedicellariæ of *dissonus* and shows other, slight differences, I cannot consider it that species. On the other hand the adambulacral armature is utterly different from that of *pectinifer* as described by Ludwig. But the latter only had a single specimen, much smaller than mine, in which R = 140 mm., and perhaps with more material the differences might sink into insignificance. In the specimen before me the aboral portion of the margin of each adambulacral plate is much longer than the adoral until near the tip of the arm; or, in other words the angle of each plate which projects into the furrow and separates adjoining tube-feet is much nearer the oral end of the plate than it is the aboral. Ludwig says the opposite condition occurs in *pectinifer*. In the present specimen, there are only four or five furrow-spines on each plate, one on the adoral side, one (the largest) on the point of the angle, and two or three on the aboral side; on the actinal surface of the plate are eight to twelve somewhat smaller spines, well-spaced and only indistinctly in rows. Ludwig says there are eight or nine furrow spines and four to seven on the surface of the plate. In my specimen there are eleven or twelve adambulacral plates to ten inferomarginals, while Ludwig says that in *pectinifer* there are only nine.— In view of these differences, I think it possible that the specimen before me represents an undescribed species but more material must be examined before the question can be settled.

Station 5676. Off San Juanico, west coast of Lower California, 647 fms. Bottom Temp., 39°.

Pseudarchaster pusillus.

Fisher, 1905. Bull. Bur. Fish., Vol. 24, p. 304.

There is a very good series of this species, ranging from R = 14 mm. to R = 40 mm. They show very little variation among themselves but the paxillæ spinelets and the spines of the marginal plates and actinal surface are all so slender and so well spaced that the general facies is different from typical *pusillus* and at the opposite extreme from the form described and figured by Fisher from off San Diego, 'Albatross' St. 4367. But there is little reason to doubt the identity of the specimens for they do not approach the Panamic forms described by Ludwig.

Station 5675. Southwest of San Cristobal Bay, west coast of Lower California, 284 fms. Bottom Temp., 44.6°. Thirty specimens.

Ceramaster leptoceramus.

Tosia leptocerama Fisher, 1905. Bull. Bur. Fish., Vol. 24, p. 306.
Ceramaster leptoceramus Fisher, 1911. Bull. U. S. Nat. Mus., No. 76, p. 210.

Neither of the two specimens before me is adult. In the larger R = 35 mm.; in the smaller R = 26 mm. Few of the adambulacral plates in either specimen have more than six furrow spines. The range of the species is extended southward some distance, by its occurrence at the following station.

Station 5675. Southwest of San Cristobal Bay, west coast of Lower California, 284 fms. Bottom Temp., 44.6°. Two specimens.

Ceramaster patagonicus.

Pentagonaster patagonicus Sladen, 1889. 'Challenger' Asteroids, p. 269.
Ceramaster patagonicus Fisher, 1911. Bull. U. S. Nat. Mus., No. 76, p. 214.

A pentagonal starfish with conspicuous marginal plates and having R = 30 mm. seems to belong to this species as described and figured by Fisher. I am inclined to think that more abundant material will show that the north Pacific specimens are not conspecific with *patagonicus*.

Station 5682. Off Cape St. Lucas, Lower California, 491 fms. Bottom Temp., 40.8°.

Hippasteria californica.

Fisher, 1905. Bull. Bur. Fish., Vol. 24, p. 310.

A specimen with R = 130 mm. represents this species.
Station 5694. Southwest of Santa Cruz Island, California, 640 fms.

Hippasteria spinosa.

Verrill, 1909. Amer. Jour. Sci., Vol. 28, p. 63.

A specimen with R only 9 mm. seems to be undoubtedly the young of this species, although it was taken at a considerably greater depth than has been hitherto known for *spinosa*. There are only four marginal plates in each series. These carry conspicuous thick spines; if there are two or three on a plate, one (the median of three) is notably larger than the others. The abactinal plates are each bordered with spiniform granules from four to twelve in number according to the size of the plate. The primary plates are conspicuous and each carries a central spinelet. Actinally the furrow and subambulacral spines are conspicuous, but the spiniform granules of the actinal intermediate plates are very small. No pedicellariæ are to be seen anywhere actinally but five or six on the abactinal surface are very conspicuous; there are none on the marginal plates.
Station 5693. Northwest of San Nicolas Island, California, 451 fms.

Oreaster occidentalis.

Verrill, 1866. Trans. Conn. Acad., Vol. 1, p. 373.

There are two small specimens from Agua Verde Bay, east coast of Lower California. The larger has R = 80 mm.

Amphiaster insignis.

Verrill, 1868. Trans. Conn. Acad., Vol. 1, p. 373.

A fine specimen (R = 80 mm.) from Magdalena Bay, west coast of Lower California, is the only representative of this remarkable starfish.

Linckia columbiæ.

Gray, 1840. Ann. Mag. Nat. Hist., Vol. 6, p. 285.

This species is represented by a young individual from San Josef Island, Gulf of California, and four small adults from San Francisquito Bay, east coast of Lower California. The largest specimen has R = 82 mm.

Phataria unifascialis.

Linckia (*Phataria*) *unifascialis* GRAY, 1840. Ann. Mag. Nat. Hist., Vol. 6, p. 285.

Phataria unifascialis SLADEN, 1889. 'Challenger' Asteroids, p. 786.

Of this common and characteristic west Mexican species, there are three small specimens from Pichilingue Bay, east coast of Lower California. The largest has R about 70 mm.

Echinaster tenuispinus.

Verrill, 1871. Trans. Conn. Acad., Vol. 1, p. 577.

These specimens call for no special comment. The largest has R = 50 mm.; in the smallest R = 18 mm.

San Bartolomé, west coast of Lower California.

Agua Verde Bay, east coast of Lower California.

San Francisquito Bay, east coast of Lower California.

San Esteban Island, Gulf of California.

Five specimens.

Henricia clarki.

Fisher, 1910. Zool. Anz., Vol. 35, p. 573.

There is a single individual in the collection, which seems to belong to this species. In it R = about 75 mm. On only a few of the proximal adambulacral plates are there as many as three spinelets in the furrow, and in a few other details the specimen is not typical but in view of the locality and depth, there can be little doubt of its belonging to this species.

Station 5682. Off Cape St. Lucas, Lower California, 491 fms. Bottom Temp., 40.8°.

Henricia læviuscula annectens.

Fisher, 1910. Zool. Anz., Vol. 35, p. 572.

Two small Henricias, with R about 20 mm. seem to represent this form.

San Bartolomé, west coast of Lower California.

Station 5693. Northwest of San Nicolas Island, California, 451 fms.

Solaster paxillatus.

Sladen, 1889. 'Challenger' Asteroidea, p. 452.

Each of the three specimens has eight arms. In the smallest, R = 37 mm. In one of the large ones R = 135 and the ray is 35 mm. broad at the disk-margin, while in the other large specimen, with the rays about equally long, br is only 23 mm. These two large specimens have no locality label but there is reason to think they came from Station 5694, southwest of Santa Cruz Island, California, 640 fms. The small specimen is from Station 5695, southwest of Santa Rosa Island, California, 534 fms.; bottom Temp., 38.9°. The occurrence of this Japanese species, so far south on the American coast, is noteworthy, but I can find no good reason for refusing to refer these specimens to that species.

Solaster borealis.

Crossaster borealis Fisher, 1906, Proc. Wash. Acad. Sci., Vol. 8, p. 134.
Solaster borealis Fisher, 1911. Bull. U. S. Nat. Mus., No. 76, p. 320.

One of these specimens has only *ten* rays but each of the others has *eleven*. The largest specimen has R = 135 mm. while the smallest has R only 20 mm.

Station 5694. Southwest of Santa Cruz Island, California, 640 fms.

Station 5696. Off San Luis Obispo County, California, 440 fms. Bottom Temp., 39.9°.

Station 5698. Off Monterey County, California, 475 fms. Bottom Temp., 39.9°.

Station 5699. Southwest from Monterey Bay, California, 659 fms. Bottom Temp., 37.9°.

Bathymetrical range, 440–659 fms. Temperature range, 39.9°–37.9°.

Ten specimens.

Heterozonias alternatus.

Crossaster alternatus Fisher, 1906. Proc. Wash. Acad. Sci., Vol. 8, p. 131.
Heterozonias alternatus Fisher, 1910. Ann. Mag. Nat. Hist. (8), Vol. 5, p. 172.

There is a fine series of this interesting starfish, of which one has *nine* rays, 26 have *ten* rays and one has *eleven*. The largest specimen has R = 160 mm. while in the smallest R is only about 13 mm.

Station 5694. Southwest of Santa Cruz Island, California, 640 fms.

Station 5697. Off Monterey County, California, 485 fms. Bottom Temp., 39.8°.

Station 5698. Off Monterey County, California, 475 fms. Bottom Temp., 39.9°.

Station 5699. Southwest from Monterey Bay, California, 659 fms. Bottom Temp., 37.9°.

Bathymetrical range, 475–659 fms. Temperature range, 39.9°–37.9°.

Twenty-eight specimens.

Lophaster furcilliger.

Fisher, 1905. Bull. Bur. Fish., Vol. 24, p. 312.

These specimens are all typical *furcilliger*, as would naturally be expected in view of the depth at which they were taken. The smallest has R = 20 mm. In the largest R = 60 mm.

Station 5694. Southwest of Santa Cruz Island, California, 640 fms.

Station 5695. Southwest of Santa Rosa Island, California, 534 fms. Bottom Temp., 38.9°.

Station 5699. Southwest from Monterey Bay, California, 659 fms. Bottom Temp., 37.9°.

Twelve specimens.

Peribolaster biserialis.

Fisher, 1905. Bull. Bur. Fish., Vol. 24, p. 313.

In these specimens R ranges from 10 to 17 mm. but there is nothing noteworthy about them.

Station 5696. Off San Luis Obispo County, California, 440 fms. Bottom Temp., 39.9°.

Four specimens.

Pteraster jordani.

Fisher, 1905. Bull. Bur. Fish., Vol. 24, p. 314.

A single specimen with R = 70 mm. is in the collection.

Station 5695. Southwest of Santa Rosa Island, California, 534 fms. Bottom Temp., 38.9°.

Hymenaster perissonotus.

Fisher, 1910. Ann. Mag. Nat. Hist. (8), Vol. 5, p. 170.

Although only the smallest individual is well preserved, there is little doubt as to the identity of these specimens. There are only four oral spines on a plate, as a rule, and there is thus an approach to *gracilis* in this particular, but occasionally there are five and very rarely six such spines. The largest specimen has R = 40 mm.; in the smallest, it is about 30.

Station 5689. Off Rosario Bay, west coast of Lower California, 879 fms.

Station 5691. Off Pt. San Tomas, west coast of Lower California, 868 fms. Bottom Temp., 37.2°.

Four specimens.

Hymenaster quadrispinosus.

Fisher, 1905. Bull. Bur. Fish., Vol. 24, p. 315.

These specimens are poorly preserved but show the characteristics of the species fairly well. R ranges from about 37 to nearly 60 mm.

Station 5690. Off Rosario Bay, west coast of Lower California, 1101 fms. Bottom Temp., 38.1°. Four specimens.

Zoroaster evermanni.

Fisher, 1905. Bull. Bur. Fish., Vol. 24, p. 317.

There is an excellent series of this interesting species, which seems to be common all along the coast of California between Monterey and San Diego, in four to seven hundred fathoms. The largest specimens (R = 220 mm.) are much larger than Fisher's type, and the coarseness of the reticulation of the abactinal skeleton is very marked. But there is only a single series of abactinal plates between the radial series and the superomarginals and even at the extreme base of the ray, there are but three series of actinolateral plates. In the smallest specimen (R = 70 mm.), the third series of these plates is to be found only just indicated by two or three plates.

Station 5694. Southwest of Santa Cruz Island, California, 640 fms.

Station 5695. Southwest of Santa Rosa Island, California, 534 fms. Bottom Temp., 38.9°.

Station 5696. Off San Luis Obispo County, California, 440 fms. Bottom Temp., 39.9°.

Station 5697. Off Monterey County, California, 485 fms. Bottom Temp., 39.8°.

Station 5698. Off Monterey County, California, 475 fms. Bottom Temp., 39.9°.

Station 5699. Southwest from Monterey Bay, California, 659 fms. Bottom Temp., 37.9°.

Bathymetrical range, 440–659 fms. Temperature range, 39.9°–37.9°.

Nineteen specimens.

Zoroaster ophiurus.

Fisher, 1905. Bull. Bur. Fish., Vol. 24, p. 315.

This seems to be a more southern species than the preceding, occurring along the coast of Lower California in eight to eleven hundred fathoms. The specimens before me range from R = 25 mm. to R = 160 mm. The latter are thus larger than the type. In the small specimens, the spines on the primary plates of the disk and on the radial series of each ray are very conspicuous, 1–2 mm. long. In half grown specimens they are apparently no larger and hence are no longer conspicuous. In the little specimens, there are only two or three series of actino-lateral plates at the base of the ray.

Station 5686. Off Ballenas Bay, west coast of Lower California, 930 fms. Bottom Temp., 37.3°.

Station 5689. Off Rosario Bay, west coast of Lower California, 879 fms.

Station 5690. Off Rosario Bay, west coast of Lower California, 1101 fms. Bottom Temp., 38.1°.

Six specimens.

Zoroaster platyacanthus[1] sp. nov.

Plate XLIV, Figs. 1 and 2.

Rays 5. R = 67 mm.; r = 9½ mm. R = 7r. Breadth of ray at base, 10 mm.

Disk rather convex (concave at center in type); rays moderately long, more or less flattened not attenuate; median radial ridge not prominent; spines and spinelets not very numerous, rather stout, rough-tipped; abactinal pedicellariæ not very conspicuous.

Abactinal skeleton rather heavy; primary plates of disk not specially conspicu-

[1] πλατύς = flat wide + ἄκανθα = prickle, spine.

ous and median radial series on arms not much larger than superomarginals; all of the larger plates carry spines and scattered well-spaced spinelets; on each plate there is a central spine, 1–2 mm. long, stout and more or less blunt, and there may be also two or three smaller spines, but the latter are not very constant in number or position; pedicellariæ occur on most of the plates, but the largest of them are much smaller than the central spine.

Between the median radial series of plates on each ray and the superomarginals there is only an incomplete series of small plates, and these are found only at the very base of the ray; the superomarginals are nearly as large as the median plates and the inferomarginals are little smaller; between the latter and the adambulacrals are *three* series of actinolateral plates, the uppermost of which are nearly as large as the inferomarginals and the lowermost are much smaller, nearly quadrilateral and about three times as long as high. Each marginal and actinolateral plate carries a central spine, and a few small spines or spinelets, well-spaced and mingled with pedicellariæ; the spines on the superomarginals are like those on the median series; those on the inferomarginals are imperceptibly longer; those on the uppermost actinolaterals are longer and slightly flattened near the tip; those on the second series of actinolaterals are the longest (3–4 mm.) and are very wide and flat; those on the lowest actinolaterals are a little shorter, somewhat more slender and are less flattened. All three series of actinolateral plates are continued nearly if not quite to the tip of the ray.

Between the lower series of actinolateral plates, there are no papular areas, but between the upper and second series, the areas are as large as abactinally. Between the median and the superomarginal plates the papular areas are arranged in a double, alternating series. Elsewhere these areas are in single longitudinal series. There is only one papula to each area, and while it is large, it does not occupy all of the area, by any means.

The adambulacral plates are arranged as usual in the genus, plates projecting into the furrow alternating with those which do not. The plates are separated from each other by distinct, membranous spaces; each plate is about three times as wide as long. On the projecting plates is a single series of four or five slender spines, the first of which is well up in the furrow; the second and third are about on the rounded angle of the plate, and the fourth (and fifth, when present) are on the actinal surface; the fourth spine (or fifth) is the smallest and more or less distinctly sacculate at tip; the second and third spines are of about equal size (2 mm. ±) or the third is largest. On the non-projecting plates are two or three spines, of which the first is largest and about equals the third spine of the alternating plates; the other spine (or spines) is slightly sacculate at tip. Pedicellariæ are not specially abundant; each furrow spine may carry one to three but many have none; in the interradial angles are a very few pedicellariæ larger than elsewhere, and these may be 2 mm. long. Oral plates very short (as usual in *Zoroaster*), each with two marginal and two suboral spines, 1–2 mm. long; the distal marginal spine carries a cluster of three or four small pedicellariæ.

Tube-feet in four distinct series. Madreporite smaller than a primary disk-plate, situated about half-way between center of disk and margin. Terminal plate of ray moderately large, with two spinelets at the tip and numerous much smaller ones crowded over its surface. Color completely lost in the preserved specimens which are dingy brownish-yellow.

Type.— Cat. No. ——, U. S. N. M. from Station 5675 (not yet catalogued).

In the presence of only three series of actinal intermediate plates and in its small median, radial plates, this species resembles *Myxoderma*, a subgenus suggested by Fisher. But the spinelets are not sacculate, not at least to any notable degree, and there is only one papula to each area. This combination of characters taken with the long flat spines along the sides of the ray, actinally, serve to distinguish the species from any *Zoroaster* hitherto described. It is difficult to decide whether the flattened appearance of the rays is natural or artificial, but it is quite marked in both specimens. Possibly these specimens are not adult and spinelets and pedicellariæ would both be more abundant with age.

Station 5675. Southwest of San Cristobal Bay, west coast of Lower California, 284 fms. Bottom Temp., 44.6°.

Two specimens.

Heliaster kubiniji.

Xantus, 1860. Proc. Philadelphia Acad. Nat. Sci., p. 568.

All but one of these specimens is adult. Ten have 23 rays, three have 22 and one has 24. The largest has R = 70 mm.

Pichilingue Bay, east coast of Lower California.

Ricason Island, Conception Bay, east coast of Lower California.

Fourteen specimens.

Pedicellaster hyperoncus[1] sp. nov.

Plate XLIV, Figs. 3 and 4.

Rays 5. R = 68 mm.; r = 7 mm. R = 9½ r. Breadth of ray at base, 7 mm. Breadth of ray, 10 mm. from base, 11 mm. Breadth of ray, 10 mm. from tip, 7 mm.

Disk small, flat; rays rather long, decidedly constricted at base and correspondingly swollen just beyond, not attenuate, bluntly pointed; median radial ridge not prominent; spines not numerous, rather small; pedicellariæ abundant. Papular areas on rays with 2–5 papulæ. Adambulacral plates numerous with only *one* spine but often with a large pedicellaria also. Tube-feet in two well-defined rows.

Abactinal skeleton fairly heavy on disk, but very open and rather delicate on rays. None of the primary plates are easily recognizable on disk. All of the disk plates carry spines, none of which are conspicuous, but the one near center of plate is the largest. On the rays, the plates usually carry only a single spine each. All the abactinal plates carry numerous small forcipiform pedicellariæ; they occur actinally as far as the inferomarginal plates, each of which carries one or two.

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[1] ὑπέρογχος = overgrown, of excessive size.

Between the median radial series of plates and the superomarginals there is only a single, somewhat irregular series of abactinal plates. There are here and there indications of a second series but they are very scattered. The inferomarginals are widely separated from the superior series but adjoin the adambulacrals very closely, as there are no intermediate plates whatever. As a result of the widely reticular skeleton, the papular areas on the rays are large and conspicuous. On the disk they are small or moderate, each with one, or rarely two papulæ. On the rays, each papular area is wider (or higher) than long and contains 2–5 papulæ; these are usually arranged in a vertical series but are occasionally more scattered. The area may also contain an isolated calcareous plate or may be more or less bisected by a calcareous projection from one of its boundary plates. The areas between the two series of marginal plates are about $2\frac{1}{2}$ mm. high by one millimeter long and generally contain three (or two) papulæ.

The adambulacral plates are very numerous, about twenty to an octet of inferomarginals; they are small, the width about equal to the length and about two thirds of the height. Each plate carries one spine, 1.5 mm. long; in addition many plates have, usually on the inner margin, a large forficiform pedicellaria almost a millimeter high. Each inferomarginal plate carries, close to the adambulacral series, a spine 2 mm. long; these are the stoutest spines found on the animal. They are distinctly rough under a lens, more so than any of the other spines. Oral plates short; each carries two, or less commonly three, spines a trifle longer than those on the adambulacral plates; generally two large forficiform pedicellariæ are also present.

Tube-feet large, in two well-marked series. Madreporite small, little more than a millimeter across, close to margin of disk. Color completely lost; the preserved specimen is the usual dingy brownish-yellow, approaching white.

Type.— Cat. No. ——, U. S. N. M., from Station 5675.

Although this species resembles the following in form and size, it is distinguishable at once by the more numerous papulæ and the characteristic adambulacral armature. The forficiform pedicellariæ are also larger and much more numerous. The large size marks this species, in comparison with other members of the genus, for except the Indian species *atratus* Alcock, which doubtless deserves separate generic rank, and the Panamic species *improvisus* Ludwig, with which it was taken, it is the giant of the genus. None of the Arctic, Atlantic or Antarctic species of the genus are half as large.

Station 5675. Southwest of San Cristobal Bay, west coast of Lower California, 284 fms. Bottom Temp., 44.6°. One specimen.

Pedicellaster improvisus.

Ludwig, 1905. Mem. M. C. Z., Vol. 32, p. 216.

The specimen representing this species was taken with the one just described, and as it is in very poor condition, it was at first supposed to be

that form. Examination however revealed the interesting fact that it is really the adult of *improvisus*, and is nearly twice as large as Ludwig's biggest specimen. R = 80 mm., r = 10 mm., R = 8r. The double series of adambulacral spines and the single papula in each area distinguish the species, and are well shown by this specimen, although it is discolored, badly distorted and shows the effect of an acid reagent of some sort.

It is certainly an extraordinary fact that the 'Albatross' should have taken two specimens of *Pedicellaster* at Station 5675, representing perfectly distinct species, and then not met with a specimen of the genus elsewhere on her cruise. But I find it impossible to consider the two specimens from Station 5675 conspecific and the only other alternative is the "extraordinary fact" just stated.

Pisaster ochraceus.

Asterias ochracea Brandt, 1835. Prod. desc. Anim., p. 269.
Pisaster ochraceus Fisher, 1908. Smiths. Misc. Coll., Vol. 52, p. 89.

Three good specimens, with R about 125 mm., represent this species but as there is no locality label, we can only assume they were collected at San Diego or some point still further south. The species has not yet been recorded from Lower California.

Asterias forreri.

De Loriol, 1887. Rec. Zool. Suisse, Vol. 4, p. 401.

In deference to the opinion of my good friend and highly respected authority on starfishes, Dr. W. K. Fisher, I have been strongly inclined to record these specimens, the largest of which has R only about 48 mm., as *Asterias sertulifera* Xantus. But as I am unable to understand how they can belong to that species, I have finally decided to let matters stand as they are. When Professor H. S. Jennings was about to publish his most interesting and important paper on the behavior of Asterias, he did me the honor of asking me to identify the species with which his work was done, and specimens were sent me from La Jolla, California. It was soon evident that the species was either *sertulifera* Xantus or *forreri* de Loriol. As the former is described as having the rays only $2\frac{1}{4}$ times the diameter of the disk, the wreaths of pedicellariæ near the tips of the spines, no pedicellariæ scattered among the spines and only a single series of adambulacral spines, while *forreri* has the rays 4 times the diameter of the disk, the wreaths of pedicellariæ near the bases of the spines, numerous scattered pedicellariæ

and a double series of adambulacral spines, I was satisfied that the La Jolla specimens, which showed clearly the latter group of characters, were *forreri*. Accordingly Dr. Jenning's paper was entitled "Behavior of the Starfish, *Asterias forreri* de Loriol." Recently there has appeared the first report of the Laguna Marine Laboratory of Pomona College. On page 89 "*Coscinasterias sertulifera*" is listed and Dr. Fisher is quoted as authority for the statement: "This is the species (under the name *Asterias ferreri*) upon which Prof. H. S. Jennings carried on a number of experiments at La Jolla. It is a member of the southern fauna, the type locality being Cape San Lucas. The true *Coscinasterias ferreri* belongs to the northern fauna and is not found along shore." (Of course, Dr. Fisher is not responsible for the misspelling of *forreri*). In correspondence Dr. Fisher has confirmed this statement and says further that *sertulifera* may have a double series of adambulacral spines. If this is so, I am puzzled to see what essential difference there is between the two species. In the M. C. Z. collection there is a large specimen of *forreri* from the type locality, Santa Cruz, on Monterey Bay, California. There are also two specimens from Monterey, identified and labelled by Dr. Fisher as *forreri*. Then there are specimens from La Jolla and from Lower California, which I have called *forreri*. On going over this material again and comparing it with the specimens in the 'Albatross' collection now before me, I am unable to see what the specific differences are. I have never seen an authentic specimen of *sertulifera* but to judge from Xantus' description, it ought to be quite different from *forreri*. It may be that specimens of *forreri* from deep water are distinguishably different from the shore specimens, like those from La Jolla, which I have called *forreri*. However, in view of the present confusion existing in the American Pacific coast species of Asterias, I think it best to present this case as I have and leave the matter with Dr. Fisher for ultimate decision.

San Francisquito Bay, east coast of Lower California. Fourteen specimens.

Brisinga panamensis.

Ludwig, 1905. Mem. M. C. Z., Vol. 32, p. 258.

All of the specimens are badly damaged and only one has any arms still attached to the disk. They show considerable diversity in some details but on the whole, it seems probable they all represent the Panamic species. The largest has the disk 24 mm. across; in the smallest it is 11. Only the largest specimen has 9 rays; all the others have 8. Among Ludwig's specimens only one had 8; all the others had 9.

Station 5673. Off Pt. San Tomas, west coast of Lower California, 1090 fms.

Station 5690. Off Rosario Bay, west coast of Lower California, 1101 fms. Bottom Temp., 38.1°.

Station 5691. Off Pt. San Tomas, west coast of Lower California, 868 fms. Bottom Temp., 37.2°.

Six specimens.

OPHIUROIDEA.

Ophioderma panamensis.

Lütken, 1859. Add. ad Hist., pt. 2, p. 91.

This species is evidently common in the Gulf of California, as a large series was brought home by the 'Albatross.' The largest are about twenty millimeters across the disk. Young individuals have the arms quite distinctly banded, but in large specimens, the bands seem to be confined to the tips of the arms.

Pichilingue Bay, east coast of Lower California.

San Francisquito Bay, east coast of Lower California.

Sixty-one specimens.

Ophioderma variegata.

Lütken, 1856. Vid. Med., p. 21.

The most highly colored animal in the whole collection is one of the representatives of this tropical species. The disk is bright green, the arms are banded with green and grayish-green, and the base of each arm with the adjoining portion of the disk is bright rose-red. In two specimens, the disk is dull yellowish-brown. The largest individual is 10 mm. across the disk. McClendon (1909, Univ. Cala. Publ. Zool., Vol. 6, no. 3) does not include this species in his list of ophiurans from the San Diego region and it is quite possible that it does not occur on the west coast of Lower California.

"Lower California."

Agua Verde Bay, east coast of Lower California.

Four specimens.

Diopederma[1] gen. nov.

Disk very flat; arms flattened, especially at base, where they are twice as wide as at middle. Disk more or less completely covered with granules. Oral papillæ numerous; teeth present, but no tooth-papillæ. Arm-spines small and numerous, appressed to side arm-plates. Tentacle scales two. Genital slits small, *four* in each interradial area, of which two lie close to oral shield, one on each side, and two are dorsal in position, lying just distal to radial shields; these dorsal slits are placed in slight prominences which carry papilliform granules, those adjoining the slits being the longest while the more distant ones merge into the disk granulation; the long axis of each slit is nearly at right angles to the long axis of the arm.

Type-species.— *Ophiura daniana* Verrill, 1867. Trans. Conn. Acad., Vol. 1, p. 254. From La Union, Salvador. Type in Peabody Museum, Yale University, New Haven, Conn.

In his description of the type-species, Verrill says: "The peculiarity in the form and position of the upper genital openings may hereafter require this species to be separated generically from *Ophiura,* if accompanied by corresponding internal differences in structure." In my judgment, such an extraordinary arrangement of the genital openings, indicating as it does an extreme development of the unusual condition characteristic of *Ophioderma,* is ample ground for establishing a new genus, regardless of "internal differences," although one can hardly doubt that such a marked external character is accompanied by internal peculiarities. The genus is a most interesting one and I have selected for its type the species described by Verrill, since it is possible that the following species will prove to be identical with it.

Diopederma axiologum[2] sp. nov.

Plate XLV, Figs. 5–7.

Disk 16 mm. in diameter; arms 54 mm. long; the smaller specimen is 10 mm. across. Disk pentagonal, very flat, closely covered with a fine granulation (about 150 grains to a square millimeter). This granulation leaves uncovered the greater part of each radial shield and the following plates in addition; in the type, a series of three plates along each radius, two lying between the radial shields and the third proximal to them; the first and biggest of these plates is larger than the first upper arm-plate, which lies distal to it; (the second, third, fourth, fifth and sixth upper arm-plates are each successively bigger, until the sixth is the widest of the upper arm-plates, while the succeeding plates are longer but become successively narrower; the first five plates are within the limits of the disk); a series of three or four small

[1] δί- = double, ὀπή = a hole in the roof, δέρμα = skin (the terminal portion of the name of the most nearly allied genus).

[2] ἀξιόλογος = remarkable.

plates in each interradius, the most distal the largest; a very small plate on each side of the first upper arm-plate, and two very small plates lying on each side of the radial series, proximal to the radial shields; in the smaller specimen, these plates are all relatively larger and are fully exposed; in addition, about forty other plates on the disc are bare, but these are small and do not seem to be definitely arranged. Around the dorsal genital slits, the granules are from a fourth to a third of a millimeter in length and are thus quite spiniform. Upper arm plates at base of arm, wider than long, tetragonal, in contact for their full width; they gradually become longer than wide and broader distally than proximally, until at tip of arm they are triangular and scarcely in contact. Interbrachial spaces below granulated distally but proximally the plates are simply bordered with minute grains. Genital slits very small; first pair (close to oral shield) is scarcely half the length of the first side-arm plate; second pair about as long, situated transverse to the long axis of the arm, in an elevation on the dorsal side of the disk, just distal to the radial shields. Oral shields distinctly longer than wide, hexagonal with rounded angles in the type, but in the smaller specimen more nearly triangular with a rounded, distal base. Adoral plates rather short and wide, at sides of oral shields; they meet within in the smaller specimen, but are widely separated in the type. Oral plates large, two thirds as large as adorals, bearing in the smaller specimen a few granules, which are much more numerous in the type. Oral papillae, nine on a side; ninth (distalmost) longest but very narrow; eighth largest, nearly as wide as long; inner ones successively narrower and more pointed. No pores between basal under arm-plates. First under arm-plate large, wider than long, roughly hexagonal; succeeding plates hexagonal, or somewhat octagonal, with rounded angles, broadly in contact, wider than long on basal third of arm but gradually becoming longer than wide and more pointed proximally, until at very tip of arm, they are triangular and well separated from each other; the fifth or sixth plate is widest, measuring in the type, 2 mm. wide and about 1 mm. long. Side arm-plates large, but broadly separated both above and below until near tip of arm; each plate carries on its distal margin, six (at middle of arm) to eleven (eighth side arm-plate), short, flat, appressed spines; uppermost sharply pointed, lower ones less noticeably so; third from bottom longest, about equal to one half the length of the arm-joint. Tentacle-scales two, inner the larger; outer does not overlap base of lowest arm-spine. Color (dried from alcohol) pale ashy-gray above, finely mottled with black and cream-color; most upper arm-plates have a light spot on their distal margin; arms faintly banded with blackish, some 15–20 indistinct dark markings showing on each arm; lower surface pale cream-color; smaller specimen like type, but a little darker.

Type.— Cat. No. ——, U. S. N. M. from Cape St. Lucas, L. C.

Whether these specimens represent a new species or should be referred to *Ophiura daniana* Verrill has been a source of much perplexity to me. Through the kindness of Miss K. J. Bush, one of the type specimens of Verrill's species was loaned me by the Peabody Museum and I have thus been enabled to compare the specimens from Lower California directly with one of those from Salvador. While the distance of fifteen hundred miles between the two localities is not specially significant, I have concluded that until specimens are known from the intervening coast, it will be quite

proper to consider the differences between the specimens as probably specific. The most striking of these differences is in the granulation of the disk; in the specimens from Lower California, many plates are exposed, while in the one from Salvador (see also Verrill's description) no plates except portions of some radial shields are free from the granules. The interbrachial areas below are also more closely granulated in the Salvadorian specimens, and the oral shields are less angular and more oval. These differences are not a matter of size, since Verrill's cotype is intermediate between the two from Cape St. Lucas, but it may be that they come well within the limits of individual variation in *daniana*. Until this can be shown however, the latter name may be kept for the southern specimens with no exposed disk plates, while *axiologum* should be used for the northern form with many exposed disk plates. If this difference is shown to be inconstant, then *axiologum* will become a synonym of *daniana*, but the status of the genus and its designated type will remain unaltered.

Cape St. Lucas. Two specimens.

Ophiura flagellata.

Ophioglypha flagellata Lyman, 1878. Bull. M. C. Z., Vol. 5, p. 69.
Ophiura flagellata Meissner, 1901. Bronn's Thierreichs, Vol. 2, pt. 3, p. 925.

There is a single adult specimen with the disk 25 mm. across and well covered with plates. Lines of decalcification radiate from the center of the disk in each radius and interradius; the latter are the longer, extending two thirds of the way to the margin.

Station 5677. North of Cape San Lazaro, west coast of Lower California, 735 fms. Bottom Temp., 38.6°.

Ophiura superba.

Ophioglypha superba Lütken and Mortensen, 1899. Mem. M. C. Z., Vol. 23, p. 116.
Ophiura superba Meissner, 1901. Bronn's Thierreichs, Vol. 2, pt. 3, p. 925.
Ophiura hadra, H. L. Clark, 1911. Bull. U. S. Nat. Mus., No. 75, p. 80.

While comparing one of these newly taken specimens with a cotype of *superba* L. &. M. and a cotype of *hadra* H. L. C., it became perfectly obvious that those two species are identical and there is no excuse to be offered for publishing *hadra* as a "new species." The present collection contains a good series, with disk-diameters ranging from 4 to 33 mm.

Station 5685. Southwest from Ballenas Bay, west coast of Lower California, 645 fms.

Station 5686. Off Ballenas Bay, west coast of Lower California, 930 fms. Bottom Temp., 37.3°.

Station 5693. Northwest of San Nicolas Island, California, 451 fms.

Station 5694. Southwest of Santa Cruz Island, California, 640 fms.

Station 5695. Southwest of Santa Rosa Island, California, 534 fms. Bottom Temp., 38.9°.

Station 5699. Southwest from Monterey Bay, California, 659 fms. Bottom Temp., 37.9°.

Bathymetrical range, 451–930 fms. Temperature range, 38.9°–37.3°.

Thirty-two specimens.

Ophiura irrorata.

Ophioglypha irrorta LYMAN, 1878. Bull. M. C. Z., Vol. 5, p. 73.
Ophiura irrorata MEISSNER, 1901. Bronn's Thierreichs, Vol. 2, pt. 3, p. 925.
See also H. L. Clark, 1911. Bull. U. S. Nat. Mus., No. 75, p. 62.

Three very large specimens add a new locality to the range of this almost cosmopolitan species. The largest one (disk-diameter, 38 mm.) is considerably larger than any that has hitherto been recorded.

Station 5684. Southwest from Magdalena Bay, east coast of Lower California, 1760 fms.

Ophiura leptoctenia.

H. L. Clark, 1911. Bull. U. S. Nat. Mus., no. 75, p. 51.

The finding of this species off central and southern California extends its known range far southward. None of the specimens are noteworthy.

Station 5694. Southwest of Santa Cruz Island, California, 640 fms.

Station 5695. Southwest of Santa Rosa Island, California, 534 fms. Bottom Temp., 38.9°.

Station 5699. Southwest from Monterey Bay, California, 659 fms. Bottom Temp., 37.9°.

Twenty-eight specimens.

Ophiura ponderosa.

Ophioglypha ponderosa LYMAN, 1878. Bull. M. C. Z., Vol. 5. p. 93.
Ophiura ponderosa MEISSNER, 1901. Bronn's Thierreichs, Vol. 2, pt. 3, p. 925.

A single small specimen is the only representative of this species.

Station 5694. Southwest of Santa Cruz Island, California, 640 fms.

Ophiura oligopora[1] sp. nov.

Plate XLV, Figs. 8 and 9.

Disk 9 mm. in diameter (6 in the smaller specimen); arms broken but about 22 mm. long. Disk moderately high, especially the radial areas; the center is somewhat depressed. Disk covered by some 200 plates, among which the central primary plate and a plate near each interradial margin are rather conspicuous; in the smaller specimen the primary radial plates are also easily made out. Radial shields large, (longer than wide), in contact at middle and distally, but with outer ends separated by first upper arm-plate and inner ends separated by one or two large scales. All the plates of the disk are thick and many are more or less swollen, but there are no knobs or tubercles developed. Arms rather short, nearly cylindrical. Upper arm-plates tetragonal, the proximal margin less than the distal; outer corners rounded; first three or four plates wider than long but remaining plates increasingly longer than wide; all broadly in contact so far as the broken arms indicate. Interbrachial areas below covered by 30–35 plates. Oral shields larger, longer than wide, pentagonal with a proximal angle, which the adoral plates adjoin, and the outer corners rounded; genital slits cause a slight reëntrant angle on each side. Adoral plates narrow, on proximal sides of oral shields; oral plates about equal in size to adorals, swollen at proximal end. Oral papillæ about five on a side; outermost as wide as next two together; only innermost, papilliform. Genital slits long and conspicuous. Genital scales short and wide distally; broadly visible from above; each scale carries ten or a dozen small papillæ, which form a continuous series orally with the minute papillæ on margin of genital slit; aborally the two or three papillæ, visible from above, are the largest, but they are inconspicuous and the arm-comb has the appearance of incompleteness. First under arm-plate very large, almost as large as second, wider than long, imperfectly octagonal with rounded corners; second plate pentagonal, wider than long; third plate similar but proximal side very short and distal angle rounded, about as long as wide; succeeding plates wider than long becoming almost spindle-shaped but outer corners rather obtuse; all the plates except first and second (and in the type, the second and third) are separated from each other. Side arm-plates large, broadly in contact beneath but narrowly separated above, at least on basal half of arm; each plate bears three minute, well-spaced, blunt, peg-like arm-spines, of which the uppermost is a trifle the longest. Oral tentacle-pores not opening into mouth-slit, guarded on either side by three or four small scales; on succeeding pores the number of scales becomes rapidly reduced, until on the fifth pore there are only two scales on outer side and one on inner; the seventh pore has one tentacle-scale and after that not even a pore is visible. Color (dried from alcohol), white.

Type.— Cat. No. 00000, U. S. N. M. from Station 5683.

Comparison of descriptions alone shows that this species is very near *O. rugosa* Lyman, collected by the 'Challenger' at 700 fms. near New Zealand. Comparison of specimens of the same size however, reveals

[1] ὀλίγος = few + πόρος = pore, in reference to the reduction of the tentacle-pores.

differences which show that we are dealing with two species. The general appearance is dissimilar because the disk-scales of *rugosa* are fewer and much more swollen, and the arms, while fully as short, are much more slender. The arm-spines too are pointed and the upper arm-plates and oral shields have a different shape. Apparently the tentacle pores do not continue to the tip of the arm in *rugosa* but there seem to be more than in *oligopora*.

This new species is quite unlike any yet recorded from the western Pacific ocean and is not likely to be confused with any of them. It was taken, unfortunately, at only one station.

Station 5683. Off Cape St. Lucas, Lower California, 630 fms. Bottom Temp., 39.1°. Two specimens.

Ophiocten pacificum.

Lütken and Mortensen, 1899. Mem. M. C. Z., Vol. 23, p. 131.

This is apparently one of the commonest ophiurans of the North Pacific ocean, as it has been found in numbers by the 'Albatross' at numerous stations from Ecuador to Washington, and in Japanese waters as well. Most of the specimens in the present collection are in very poor condition and are not noteworthy.

Station 5673. Off Pt. San Tomas, west coast of Lower California. 1090 fms.

Station 5688. Off Cedros Island, west coast of Lower California, 525 fms. Bottom Temp., 39.9°.

Station 5689. Off Rosario Bay, west coast of Lower California, 879 fms.

Station 5691. Off Pt. San Tomas, west coast of Lower California, 868 fms. Bottom Temp., 37.2°.

Station 5692. Off Pt. San Tomas, west coast of Lower California, 1076 fms. Bottom Temp., 37.1°.

Station 5693. Northwest of San Nicolas Island, California, 451 fms.

Station 5694. Southwest of Santa Cruz Island, California, 640 fms.

Station 5695. Southwest of Santa Rosa Island, California, 534 fms. Bottom Temp., 38.9°.

Bathymetrical range, 451 to 1090 fms. Temperature range, 39.9°–37.1°.

Two hundred and thirty-three specimens.

Ophiernus adspersus.

Lyman, 1883. Bull. M. C. Z., Vol. 10, p. 236.

For some notes in regard to this specimen, see under the following species.

Station 5676. Off San Juanico, west coast of Lower California, 647 fms. Bottom Temp., 39°. One specimen.

Ophiernus polyporus.

Lütken and Mortensen, 1899. Mem. M. C. Z., Vol. 23, p. 109.

A dozen or more specimens of *Ophiernus* seem to be referable to this species, but studying them in connection with the single specimen just mentioned has raised grave doubts as to whether *polyporus* is a valid species, distinct from *adspersus*, or not. The specimen of *adspersus* listed above from station 5676 is a large adult and comparison with West Indian specimens shows it is a typical example of the species. Another specimen, almost exactly like it, and also from station 5676, has the characteristic pores of *polyporus* present on the fifth joint of each arm and in four of the arms on one or both sides of the fourth or sixth joint, and in one arm on the seventh and eighth joints also; the pores are smaller than in a typical *polyporus* but are otherwise similar. In a third specimen from the same station, the pores are present on the third to eighth joints of all the arms. In typical *polyporus*, the pores extend out to the fifteenth to twenty-fifth joint. So far as I can see the presence of these pores is the only thing which distinguishes *polyporus* from *adspersus*, and I have therefore drawn an arbitrary line by which one of these specimens (as noted above) is set off as *adspersus* and the rest are called *polyporus*. The available material is in too poor condition for me to satisfy myself as to whether the presence of a few pores is indicative of hybridization or whether the presence and number of pores is a matter of individual diversity. The fact that *polyporus* has as yet been taken only in the vicinity of southern Lower California, off the Mexican coast and near Panama, while *adspersus* is practically cosmopolitan in deep water, indicates the specific importance of the pores. Better material must be awaited before the question can be definitely settled. Apparently *Ophiernus* is very fragile, all reported material being more or less badly damaged by its collection or journey in the trawl. The specimens of *polyporus* in the present collection were taken at the following points:

Station 5676. Off San Juanico, west coast of Lower California, 647 fms. Bottom Temp., 39°.

Station 5682. Off Cape St. Lucas, Lower California, 491 fms. Bottom Temp., 40.8°.

Fourteen specimens.

Ophiomusium glabrum.

Lütken and Mortensen, 1899. Mem. M. C. Z., Vol. 23, p. 132.

Ophiomusium multispinum H. L. Clark, 1911. Bull. U. S. Nat. Mus., No. 75, p. 113.

This is one of the commonest deep water ophiurans of the western Pacific, ranging from the equator to 47° N. lat. in water from 480 to 2232 fms. deep. The largest specimen in the present collection has the disk 35 mm. across and comparison of this individual with a cotype of *multispinum* shows that the latter is, as I suspected when describing it, identical with *glabrum*. The differences pointed out are individual and not specific, proving to be quite inconstant.

Station 5673. Off Pt. San Tomas, west coast of Lower California, 1090 fms.

Station 5684. Southwest from Magdalena Bay, west coast of Lower California, 1760 fms.

Station 5686. Off Ballenas Bay, west coast of Lower California, 930 fms. Bottom Temp., 37.3°.

Station 5687. Off Pt. Santa Eugenia, west coast of Lower California, 480 fms. Bottom Temp., 41.1°.

Station 5689. Off Rosario Bay, west coast of Lower California, 879 fms.

Station 5690. Off Rosario Bay, west coast of Lower California, 1101 fms. Bottom Temp., 38.1°.

Station 5691. Off Pt. San Tomas, west coast of Lower California, 868 fms. Bottom Temp., 37.2°.

Bathymetrical range, 480–1760 fms. Temperature range, 41.1°–37.2°.

Seventy specimens.

Ophiomusium lymani.

Wyville Thomson, 1873. The Depths of the Sea, p. 172.

This, the commonest and most widespread of deep-sea ophiurans, is represented by a large and uninteresting series of specimens, whose disk-diameters range from $2\frac{1}{2}$ to 30 mm.

Station 5673. Off Pt. San Tomas, west coast of Lower California, 1090 fms.

Station 5686. Off Ballenas Bay, west coast of Lower California, 930 fms. Bottom Temp., 37.3°.

Station 5689. Off Rosario Bay, west coast of Lower California, 879 fms.

Station 5690. Off Rosario Bay, west coast of Lower California, 1101 fms. Bottom Temp., 38.1°.

Station 5691. Off Pt. San Tomas, west coast of Lower California, 868 fms. Bottom Temp., 37.2°.

Station 5692. Off Pt. San Tomas, west coast of Lower California, 1076 fms. Bottom Temp., 37.1°.

Bathymetrical range, 868–1101 fms. Temperature range, 38.1°–37.1°.

Two hundred and thirteen specimens.

Amphiura carchara.

H. L. Clark, 1911. Bull. U. S. N. M., No. 75, p. 142.

The occurrence of this species off Lower California extends its range very far southwards on the American coast. The specimens range from 4 to 8 mm. across the disk but show no notable peculiarities.

Station 5673. Off Pt. San Tomas, west coast of Lower California, 1090 fms. Four specimens.

Amphiura diomedeæ.

Lütken and Mortensen, 1899. Mem. M. C. Z., Vol. 23, p. 151.

This wide-ranging species is represented by four adult specimens; in one the disk-diameter exceeds 15 mm. but the arms are all broken; in another the disk measures 13 mm. across and one of the arms is about 135 mm. or fully ten times the disk-diameter.

Station 5694. Southwest of Santa Cruz Island, California, 640 fms.

Station 5698. Off Monterey County, California, 475 fms. Bottom Temp., 39.9°.

Station 5699. Southwest from Monterey Bay, California, 659 fms. Bottom Temp., 37.9°.

Amphiura serpentina.

Lütken and Mortensen, 1899. Mem. M. C. Z., Vol. 23, p. 143.

Although the specimens are not in very good condition, I do not think the identification is in doubt. They seem to be intermediate between the typical form and the var. *a* of Lütken and Mortensen.

Station 5683. Off Cape St. Lucas, Lower California, 630 fms. Bottom Temp., 39.1°.

Station 5685. Southwest from Ballenas Bay, west coast of Lower California, 645 fms.

Station 5698. Off Monterey County, California, 475 fms. Bottom Temp., 39.9°.

Six specimens.

Amphiodia dalea.

Amphiura dalea Lyman, 1879. Bull. M. C. Z., Vol. 6, p. 27.

These specimens, of which the largest is 15 mm. across the disk, agree almost exactly with those discussed by Lütken and Mortensen (1899, Mem. M. C. Z., Vol. 23, p. 154), and on comparison with cotypes from the southern Atlantic I find no reason to criticize their identification. Verrill (1899, Trans. Conn. Acad., Vol. 10, p. 315) places the species in *Amphioplus*, no doubt because of Lyman's figure, but as Lütken and Mortensen point out that figure is misleading. There are really only three oral papillæ on each side.

Station 5684. Southwest from Magdalena Bay, west coast of Lower California, 1760 fms.

Station 5692. Off Pt. San Tomas, west coast of Lower California, 1076 fms. Bottom Temp., 37.1°.

Three specimens.

Ophionereis annulata.

Ophiolepis annulata LeConte, 1851. Proc. Acad. Nat. Sci. Phila., Vol. 5, p. 317.
Ophionereis annulata Lyman, 1860. Proc. Boston Soc. Nat. Hist., Vol. 7, p. 203.

There is a good series of this well known species, the smallest 5 mm., the largest 18 mm., across the disk.

Northern end, east side, Cedros Island, west coast of Lower California.

San Francisquito Bay, east coast of Lower California.
Pichilingue Bay, east coast of Lower California.
Forty specimens.

Ophiacantha bairdi.

Lyman, 1883. Bull. M. C. Z., Vol. 10, p. 256.

The specimens are all in poor condition and call for no comment.

Station 5688. Off Cedros Island, west coast of Lower California, 525 fms. Bottom Temp., 39.9°.

Station 5693. Northwest of San Nicolas Island, California, 451 fms.

Five specimens.

Ophiacantha bathybia.

H. L. Clark, 1911. Bull. U. S. Nat. Mus., No. 75, p. 233.

These specimens call for no special comment but the occurrence of the species off Lower California extends its range very far southward. The bathymetrical and temperature ranges are scarcely affected however.

Station 5673. Off Pt. San Tomas, west coast of Lower California, 1090 fms.

Station 5691. Off Pt. San Tomas, west coast of Lower California, 868 fms. Bottom Temp., 37.2°.

Twelve specimens.

Ophiacantha moniliformis.

Lütken and Mortensen, 1899. Mem. M. C. Z., Vol. 23, p. 171.

These specimens extend the range of this species considerably to the northward and into much shallower water.

Station 5675. Southwest of San Cristobal Bay, west coast of Lower California, 284 fms. Bottom Temp., 44.6°. Three specimens.

Ophiacantha normani.

Lyman, 1879. Bull. M. C. Z., Vol. 6, p. 58.

This species is one of the most common in the North Pacific ocean, and there is nothing notable about its numerous representatives in the present collection.

Station 5694. Southwest of Santa Cruz Island, California, 640 fms.

Station 5695. Southwest of Santa Rosa Island, California, 534 fms. Bottom Temp., 38.9°.

Station 5698. Off Monterey County, California, 475 fms. Bottom Temp., 39.9°.

Station 5699. Southwest from Monterey Bay, California, 659 fms. Bottom Temp., 37.9°.

Bathymetrical range, 475–659 fms. Temperature range, 39.9°–37.9°.

One hundred and fifty-three specimens.

Ophiacantha rhachophora.

H. L. Clark, 1911. Bull. U. S. N. M., No. 75, p. 201.

There is always room for doubt in the identification of small Ophiacanthas and the occurrence of this species on the coast of California and near Cape St. Lucas is certainly unexpected, but after comparing the present specimens with others from Bering Sea and Japan, I think they may fairly be called *rhachophora*. It is quite likely however, that the young of several species are now included under that name. The largest of these specimens has the disk only 7 mm. across.

Station 5683. Off Cape St. Lucas, Lower California, 630 fms. Bottom Temp., 39.1°.

Station 5693. Northwest of San Nicolas Island, California, 451 fms.

Station 5695. Southwest of Santa Rosa Island, California, 534 fms. Bottom Temp., 38.9°.

Twelve specimens.

Ophiocoma æthiops.

Lütken, 1859. Add. ad Hist., pt. 2, p. 145.

Only a single specimen of this common Panamic species is in the collection. It is a large adult from Angel de la Guardia Island, Gulf of California.

Ophiocoma alexandri.

Lyman, 1860. Proc. Boston Soc. Nat. Hist., Vol. 7, p. 256.

There is a good series of this less common species but it was only found at one locality.

San Francisquito Bay, east coast of Lower California. Ten specimens.

Ophiothrix spiculata.

LeConte, 1851, Proc. Acad. Nat. Sci., Philadelphia, Vol. 5, p. 318.

Another common Panamic species, this *Ophiothrix,* is represented by only a small series, mostly in poor condition.

San Esteban Island, Gulf of California.

San Francisquito Bay, east coast of Lower California.

Station 5678. Magdalena Bay, west coast of Lower California, 13½ fms.

Five specimens.

Astroschema sublæve.

Lütken and Mortensen, 1899. Mem. M. C. Z., Vol. 23, p. 187.

This fine species is represented by only a single specimen, but that is an adult in beautiful condition.

Station 5695. Southwest of Santa Rosa Island, California, 534 fms. Bottom Temp., 38.9°.

Asteronyx dispar.

Lütken and Mortensen, 1899. Mem. M. C. Z., Vol. 23, p. 185.

The large series of *Asteronyx* in the collection fall into three groups, representing species two of which were found by the 'Albatross' in 1891 in her exploration of the Panamic region, while the third was taken by the same vessel at numerous stations from California northward to Bering Sea. It is interesting to note that no two of these species occurred at the same station either in 1891 or in 1911. The present species, *dispar,* has a wide range, extending from the Galapagos archipelago to southern California. It seems to be a well defined species, easily recognized by the number and appearance of the arm-spines. The specimens at hand range in disk-diameter from 5 to 17 mm.

Station 5689. Off Rosario Bay, west coast of Lower California, 879 fms.

Station 5690. Off Rosario Bay, west coast of Lower California, 1101 fms. Bottom Temp., 38.1°.

Station 5691. Off Pt. San Tomas, west coast of Lower California, 868 fms. Bottom Temp., 37.2°.

Station 5692. Off Pt. San Tomas, west coast of Lower California, 1076 fms. Bottom Temp., 37.1°.

Station 5693. Northwest of San Nicolas Island, California, 451 fms. Bathymetrical range, 451–1101 fms. Temperature range, 38.1°–37.1°. Twenty-one specimens.

Asteronyx excavata.

Lütken and Mortensen, 1899. Mem. M. C. Z., Vol. 23, p. 185.

This species seems to be confined to the region of southern Lower California and the Tres Marias Islands. It was found in the latter area by the 'Albatross' in 1891. It is a well characterized, and apparently rare species. The largest specimen in the present collection is 26 mm. across the disk, or about one third larger than the specimen described by Lütken and Mortensen.

Station 5682. Off Cape St. Lucas, Lower California, 491 fms. Bottom Temp., 40.8°.

Station 5688. Off Cedros Island, west coast of Lower California, 525 fms. Bottom Temp., 39.9°.

Five specimens.

Asteronyx loveni.

Müller and Troschel, 1842. Sys. Ast., p. 119.

Except for the large lot (79) of young specimens taken at Station 5675, this well known species was not common, but was taken only three times and then off the coast of California. The largest specimens from Station 5675 are only 16 mm. across the disk and while I fail to find any good reason for not calling them *loveni*, I confess to being suspicious of them. They are certainly not either *plana*, *dispar* or *excavata* and comparison with young *loveni* from off British Columbia and Alaska has made me feel they should be called *loveni*. If some adult *loveni* had been taken at the same or some neighboring station, I should be better satisfied with my decision.

Station 5675. Southwest of San Cristobal Bay, west coast of Lower California, 284 fms. Bottom Temp., 44.6°.

Station 5694. Southwest of Santa Cruz Island, California, 640 fms.

Station 5698. Off Monterey County, California, 475 fms. Bottom Temp., 39.9°.

Station 5699. Southwest from Monterey Bay, California, 659 fms. Bottom Temp., 37.9°.

Bathymetrical range, 284–659 fms. Temperature range, 44.6°–37.9°.

Eighty-two specimens.

ECHINOIDEA

Eucidaris thouarsii.

Cidaris thouarsii AGASSIZ and DESOR, 1846. Ann. Sci. Nat., Vol. 6, p. 326.
Encidaris thouarsii DÖDERLEIN, 1887. Jap. Seeigel, p. 42.

There is only a single specimen, a small one, from San Josef Island, Gulf of California.

Centrostephanus coronatus.

Echinodiadema coronata VERRILL, 1867. Trans. Conn. Acad., Vol. 1, p. 294.
Centrostephanus coronatus A. AGASSIZ, 1872. Rev. Ech., Pt. 1, p. 97.

This little known species is represented simply by young individuals, the largest only 25 mm. h. d.[1]

San Josef Island, Gulf of California.
San Esteban Island, Gulf of California.
Agua Verde Bay, east coast of Lower California.
Five specimens.

Arbacia incisa comb. nov.

Echinocidaris incisa A. AGASSIZ, 1863. Bull. M. C. Z., Vol. 1, p. 20.
(= *Arbacia stellata*, *Echinus stellatus* DE BLAINVILLE, 1825, *non* Gmelin, 1788).

Since it is certain that *Echinus stellatus* of de Blainville is not identical with *Echinus stellatus* Gmelin, it is clear that the name cannot be used for de Blainville's species even though we do not know at present what species Gmelin had in mind. A. Agassiz's name seems to be the first available one. The species is characteristic of the Panamic region and while its northern limit is not yet definitely known, it is probably south of the United States. In 1901, I published (Proc. Boston Soc. Nat. Hist., Vol. 29, pp. 331, 332) records of the occurrence of this and four other Panamic echini and one or more Panamic starfishes, in Puget Sound. Some years later it came out that the collections sent to me as from Puget Sound, contained material not only from Puget Sound but from some point on the Pacific coast south of the United States and also apparently from the West Indies. Fisher (1911, Bull. U. S. Nat. Mus. No. 76) has recently called attention to this regrettable fact, in the case of the starfishes and I therefore

[1] This abbreviation for "horizontal diameter" will be used throughout this report.

wish to correct, so far as possible, the errors concerning the Echini. The *Arbacia stellata* recorded is undoubtedly from somewhere in the Panamic region, on the west coast of Central America or Mexico, or in the Gulf of California. The same is true of the *Diadema mexicanum*, *Toxopneustes semituberculatus* and *Clypeaster rotundus*. As near as can be determined now the "*Echinometra oblonga*" was an *Echinometra lucunter* from the West Indies but as the specimen seems to be no longer extant, the matter cannot be positively determined.

None of the Arbacias in the present 'Albatross' collection are adult, the largest being only 17 mm. h. d.

San Josef Island, Gulf of California.

San Esteban Island, Gulf of California.

Agua Verde Bay, Gulf of California.

Twelve specimens.

Lytechinus anamesus.

H. L. Clark, 1912. Mem. M. C. Z., Vol. 34, p. 254.

This recently described species was met with at only one place, although it is widely spread in the region. The largest specimen is very much larger than any previously known, measuring 37 mm. h. d. and 23 mm. high.

San Bartolomé Bay, west coast of Lower California.

Off Pt. San Bartolomé, west coast of Lower California, with "boat-dredge." Depth not given. March 14, 1911.

Six specimens.

Lytechinus pictus.

Psammechinus pictus Verrill, 1867. Trans. Conn. Acad. Vol. 1, p. 301.
Lytechinus pictus H. L. Clark, 1912. Mem. M. C. Z., Vol. 34, p. 258.

All of the specimens are young, the largest only about 16 mm. h. d.

"Lower California."

Agua Verde Bay, east coast of Lower California.

Twenty-six specimens.

Strongylocentrotus fragilis.

Jackson, 1912. Mem. Boston Soc. Nat. Hist., Vol. 7, p. 128.

This is still another species represented only by young specimens, the largest only about 40 mm. h. d.

Station 5687. Off Pt. Santa Eugenia, west coast of Lower California, 480 fms. Bottom Temp., 41.1°.

Station 5694. Southwest of Santa Cruz Island, California, 640 fms.

Station 5696. Off San Luis Obispo County, California, 440 fms. Bottom Temp., 39.9°.

Three specimens.

Strongylocentrotus franciscanus.

Toxocidaris franciscana A. Agassiz, 1863. Bull. M. C. Z., Vol. 1, p. 22.
Strongylocentrotus franciscanus A. Agassiz, 1872. Rev. Ech., Pt. 1, p. 163.

There are two specimens in the collection, about 75–85 mm. h. d. Both are obviously young but the failure to find more than *eight* pairs of pores in an arc has surprised me, for *nine* is the number characteristic of the species and ought to be found in many arcs of specimens as old as these. The spines are unmistakable however. Both specimens are from Cedros Island, west coast of Lower California, which is probably the southern limit of the species.

Strongylocentrotus purpuratus.

Echinus purpuratus Stimpson, 1857. Jour. Bost. Soc. Nat. Hist., Vol. 6, p. 86.
Strongylocentrotus purpuratus A. Agassiz, 1872. Rev. Ech., Pt. 1, p. 165.

As in the case of the preceding species, Cedros Island, west coast of Lower California, must be the southern limit of this form. A single specimen from that Island, about 50 mm. h. d., is the sole representative of *purpuratus* in the collection.

Echinometra vanbrunti.

A. Agassiz, 1863. Bull. M. C. Z., Vol. 1, p. 21.

There are four, fine adult specimens, about 70 mm. longer h. d., from Santa Maria Bay, west coast of Lower California. How much further north it ranges has yet to be determined.

Encope grandis.

L. Agassiz, 1841. Mon. Scut., p. 75.

There is a fine series of adults of this extraordinary clypeastroid. They are mostly about 100 mm. across, the length usually not quite so much.

The largest in 110 mm. across, but only 92 mm. long, owing to the fact that both posterior divisions of the test (between the median lunule and the postero-lateral notches) were long ago lost (bitten off?) and although healed are not at all regenerated. One specimen is 25 mm. across, and the lunule and all the notches, except the mid-anterior, are distinct. The smallest specimen is about 14 mm. across and only the lunule and posterior notches are clearly seen. These small specimens are pale brown, almost fawn-color, while the adults are deep purplish-brown, almost black.

Cape St. Lucas, Lower California.

Mulege Bay, east coast of Lower California.

Tiburon Island, Gulf of California.

Nineteen specimens.

Encope micropora.

L. Agassiz, 1841. Mon. Scut., p. 50.

These specimens are all large, measuring 90-120 mm. across, the length not quite equalling the width. The color varies from dull yellowish-brown to almost black. One specimen is labelled "Tiburon Island" but as all the others are from the *west* coast of Lower California, while the other Encopes from Tiburon Island are *grandis*, it seems possible there may have been a slip in the labelling. Yet in view of the wide range of *micropora*, its occurrence in the Gulf of California is most probable; indeed, it has been recorded from Guaymas, Mexico.

Ballenas Bay, west coast of Lower California.

South end of Magdalena Bay, west coast of Lower California.

Tiburon Island, Gulf of California.

Ten specimens.

Urechinus loveni.

Cystechinus loveni A. Agassiz, 1898. Bull. M. C. Z., Vol. 32, p. 79.
Urechinus loveni Mortensen, 1907. "Ingolf" Ech., Pt. 2, p. 50.

This rare and remarkable echinoid is represented by only one complete specimen, although the fragments of a number of others show that it is common in certain places such as Station 5684. The test is so thin and fragile and the depth at which the animals live is so great, it must be rarely indeed that unbroken specimens are brought to the surface. The larger of the two measurable specimens before me is 70 mm. long, 63 mm. wide and 43 mm. high. According to Agassiz's figure, his specimen, 88 mm.

long, was 75 mm. wide and 60 mm. high, and so was some seven per cent higher than mine. But some of the fragments at hand indicate higher tests than that of the whole specimen, so I do not think this difference is important. The color of the test is deep reddish-purple, but this color seems to be superficial and easily rubbed off leaving the bare plates purplish-white. Excepting that no globiferous ones were found, the pedicellariæ agree well with the description and figures given by Mortensen (l. c.). I agree with the latter that Cystechinus cannot be distinguished from Urechinus.

Station 5684. Southwest from Magdalena Bay, west coast of Lower California, 1760 fms. Eight (?) specimens.

Urechinus reticulatus[1] sp. nov.

Plate XLVI, Figs. 10–13.

Length of test, 67 mm.; breadth, 62 mm.; height, 46 mm. Color deep reddish purple, but spines, pedicellariæ and the surface of each plate, except around margin, dull greenish-yellow. The effect of this coloration is a yellowish animal, handsomely reticulated with deep purple. The plates composing the test are noticeably higher in proportion to their width than in *loveni*, from the ambitus upward. The plates of the ambulacra differ little from those of the ambulacra in either height or width. Thus the antero-lateral ambulacrum is 21 mm. wide at ambitus and has 20–21 plates in each column, while the antero-lateral interambulacrum is 21.5 mm. wide and has 17–18 plates in each column. An ambulacral plate just above the ambitus is 10 mm. wide and 7 mm. high; an adjoining interambulacral plate is 9.5 mm. wide and 8 mm. high. The abactinal system is somewhat distorted and obviously not normal; the madreporic genital lies, as in *U. loveni*, directly in the long axis of the animal, but there are only two genital pores, a left anterior, in a plate separate from the madreporic genital, and a right posterior; the oculars are distorted and the left posterior genital seems to be imperforate. The periproct is just below the ambitus, on an oblique surface, and not completely actinal as in *loveni*. The mouth is more nearly central than in *loveni*, lying *more* than two fifths of the long axis back of the anterior margin, while in *loveni*, it is distinctly less.

The pedicellariæ are exceedingly characteristic and indicate that this species is quite distinct from *loveni*. Four kinds of pedicellariæ were found, but the globiferous are very uncommon, only two being seen. The *ophicephalous* pedicellariæ are not to be distinguished certainly from those of *loveni;* they occur chiefly in the region about the periproct. The *ordinary tridentate* are similar to those of *loveni* but are at once distinguishable by the low basal portion of the valves with straight lateral margins; in *loveni*, the base is higher and its lateral margins are angular and often with a tooth at the angle. The most conspicuous pedicellariæ on *reticulatus* are the *stout, tridentate*, which are common around the mouth and abundant on the periproct. The heads are very robust, the valves measuring .40 to .60 mm. long and .25 to .40 mm. wide. The blade is nearly circular (*i. e.* as wide as it is long) but otherwise the valves are much like those of *naresianus* as figured by Mortensen (l. c.

[1] *reticulatus* = with lines like the meshes of a net.

Plate IX, fig. 15). The *globiferous* pedicellariæ have the basal part of the valves about as long as wide, while the tubular blade is somewhat shorter; the opening of the blade has a lower lip from which extend horizontally four, five or even six, very slender teeth, much longer than the diameter of the blade; the back or upper lip of the opening has an angular margin but carries no teeth. The valves are about .40 mm. long and the teeth below the opening of the blade are about .08 mm. While these pedicellariæ are no doubt of the same general structure as those of *Urechinus giganteus*, they are not at all like them in detail, yet I know of no others which they resemble more closely.

Type.— Cat. No. ——, U. S. N. M., from Station 5689.

Before examining the pedicellariæ, I was inclined to consider this unique specimen, a peculiar individual variant of *loveni*, but the pedicellariæ are so characteristic, I have no doubt that *reticulatus* is a good species. The test is higher, firmer and apparently thicker than in *loveni*, but these may be simply characters associated with the much shallower water in which the specimen was taken. Possibly the shallower habitat is characteristic of the species.

Station 5689. Off Rosario Bay, west coast of Lower California, 879 fms.

Schizaster townsendi.

A. Agassiz, 1898. Bull. M. C. Z., Vol. 32, p. 82.

The occurrence of this species off California extends its known range of distribution far to the northward. The specimens range from 18 to 54 mm. in length, the latter being somewhat larger than Agassiz's biggest specimen.

Station 5696. Off San Luis Obispo County, California, 440 fms. Bottom Temp., 39.9°.

Station 5697. Off Monterey County, California, 485 fms. Bottom Temp., 39.8°.

Thirty-two specimens.

Schizaster latifrons.

A. Agassiz, 1898. Bull. M. C. Z., Vol. 32, p. 81.

This species, originally taken in the Gulf of California in 995 fms., seems to have a more restricted range both geographically and bathymetrically than the preceding. Attention should be called to the fact that the figures published in 1898 as representing this species really represent the preceding species, *townsendi* (see A. Agassiz, 1904, Panamic Ech., p. 207). The figures in "Panamic Echini" (Plate 102, figs. 1–4) give a good idea of the species, although the specimen was a very small one. In the present

collection there is one individual 58 mm. long. In large specimens, the unpaired ambulacrum is not so extraordinarily broad, but the short posterior petals will always distinguish this species from *townsendi*.

Station 5683. Off Cape St. Lucas, Lower California, 630 fms. Bottom Temp., 39.1°.

Station 5685. Southwest from Ballenas Bay, west coast of Lower California, 645 fms.

Station 5694. Southwest of Santa Cruz Island, California, 640 fms.

Six specimens.

Brissopsis columbaris.

A. Agassiz, 1898. Bull. M. C. Z., Vol. 32, p. 82.

The specimens are small, less than 35 mm. long, and one is broken in fragments. Their occurrence off Cape St. Lucas, while not at all unexpected, extends the known range considerably to the north.

Station 5682. Off Cape St. Lucas, Lower California, 491 fms. Bottom Temp., 40.8°.

Two specimens.

Brissopsis pacifica.

Toxobrissus pacificus A. Agassiz, 1898. Bull. M. C. Z., Vol. 32, p. 83.

Brissopsis (*Toxobrissus*) *pacifica* Mortensen, 1907. "Ingolf" Ech., Pt. 2, p. 44.

Although this species was abundant at Station 5675, it was not found elsewhere. The specimens range from 11 to 34 mm. in length, none of them being full grown. Some are remarkably flattened, the abactinal surface being more or less concave rather than convex; one such specimen is 26 mm. long, 24 mm. wide, 8 mm. thick at margin and 6 mm. thick at center of abactinal system. The cause of such a deformity is not easy to imagine. The species was previously known only from Panama.

Station 5675. Southwest of San Cristobal Bay, west coast of Lower California, 284 fms. Bottom Temp., 44.6°.

One hundred and seventy specimens.

Lovenia cordiformis.

A. Agassiz, 1872. Bull. M. C. Z., Vol. 3, p. 57.

A single small specimen, only 20 mm. long, from Cape St. Lucas, is the sole representative of this species in the collection.

HOLOTHURIOIDEA.

Leptosynapta inhærens.

Holothuria inhaerens O. F. Müller, 1776. Zool. Dan. Prod., p. 232.
Leptosynapta inhærens Verrill, 1867. Trans. Conn. Acad., Vol. 1, p. 325.

There are two synaptids in the collection, which agree in all respects with each other, and except for color and texture of the body wall, I cannot distinguish them from *L. inhaerens*. But the body wall is soft and rather thick and the color is nearly black. The texture of the body wall may be the result of having been at first preserved in formalin, though there is no other indication of that reagent, but for the color I am quite unable to account. Each specimen is about 40 mm. long; the anchors are .16 mm. and the plates .14 mm. long in the posterior part of the body. Unfortunately the locality of these specimens is quite uncertain; one was in a jar with the specimens of *Holothuria lubrica*, which lacked a locality label; while the other was in a vial with the label "Station 5684." Now since the depth at station 5684 was 1760 fms., it is impossible to believe that this characteristically littoral genus occurs at that place. The appearance of the two specimens is such that I have little doubt both came from the same littoral station where the *Holothuria lubrica* were taken.

Protankyra abyssicola.

Synapta abyssicola Théel, 1886. "Challenger" Holoth.: Pt. II, p. 14.
Protankyra abyssicola Östergren, 1898. Öfv. Kong. Vet. Ak. Forhandl., Vol. 55, p. 116.

The specimens are all more or less fragmentary and in poor condition. The largest one is about 90 mm. long and was probably 150 mm. in life. The anchors have 2–7 teeth on each arm, so that the specimens cannot be referred to *P. pacifica*. Further material is necessary to show whether the latter species can be maintained. In the light of the present material, it seems quite improbable. These specimens are strongly tinged with red, due to a red pigment in the skin. In one specimen, this pigment was of a blackish-brown color.

Station 5673. Off Pt. San Tomas, west coast of Lower California, 1090 fms.

Station 5684. Southwest from Magdalena Bay, west coast of Lower California, 1760 fms.

Station 5698. Off Monterey County, California, 475 fms. Bottom Temp., 39.9°. Specimen decalcified and dubious.

Ten specimens.

Molpadia intermedia.

Trochostoma intermedium Ludwig, 1894. Mem. M. C. Z., Vol. 17, p. 161.
Molpadia intermedia H. L. Clark, 1907 (1908). Apodous Holoth., p. 33.

There is a very good series of this well known molpadid, the young being in the Ankyroderma stage, and having many more, and much more perfectly formed, tables than the adults. The largest specimen is over 100 mm. long, while the smallest is only 33 mm. of which 13 mm. is tail.

Station 5676. Off San Juanico, west coast of Lower California, 647 fms. Bottom Temp., 39°.

Station 5683. Off Cape St. Lucas, Lower California, 630 fms. Bottom Temp., 39.1°.

Station 5688. Off Cedros Island, west coast of Lower California, 525 fms. Bottom Temp., 39.9°.

Station 5689. Off Rosario Bay, west coast of Lower California, 879 fms.

Station 5690. Off Rosario Bay, west coast of Lower California, 1101 fms. Bottom Temp., 38.1°.

Station 5694. Southwest of Santa Cruz Island, California, 640 fms.

Station 5697. Off Monterey County, California, 485 fms. Bottom Temp., 39.8°.

Station 5698. Off Monterey County, California, 475 fms. Bottom Temp., 39.9°.

Bathymetrical range, 475–1101 fms. Temperature range, 39.9°–38.1°.

Twenty-two specimens.

Molpadia musculus.

Risso, 1826, Hist. Nat. Prin. Prod. Europe, Mer., p. 293.

These specimens are small (the largest only 70 mm. long, of which 20 mm. is tail) and two are in very poor condition. These two have minute, scattered phosphatic bodies and some anchors and rosettes, and undoubtedly are the form called by Ludwig, *Ankyroderma spinosum*. In the largest specimen neither phosphatic bodies nor anchors were found.

Station 5684. Southwest from Magdalena Bay, west coast of Lower California, 1760 fms.

Station 5692. Off Pt. San Tomas, west coast of Lower California, 1076 fms. Bottom Temp., 37.1°.

Three specimens.

Caudina californica.

Ludwig, 1894. Mem. M. C. Z., Vol. 17, p. 155.

These specimens are small, 70 mm. long of which about half is tail, but their identity is unmistakable.

Station 5698. Off Monterey County, California, 475 fms. Bottom Temp., 39.9°.

Station 5699. Southwest from Monterey Bay, California, 659 fms. Bottom temp., 37.9°.

Two specimens.

Cucumaria abyssorum.

Théel, 1886. "Challenger" Holoth.: Pt. II, p. 66.

This species is represented in the collection by a good series, ranging from 30 to 80 mm. in length, but showing no noteworthy peculiarities.

Station 5673. Off Pt. San Tomas, west coast of Lower California, 1090 fms.

Station 5684. Southwest from Magdalena Bay, west coast of Lower California, 1760 fms.

Station 5691. Off Pt. San Tomas, west coast of Lower California, 868 fms. Bottom Temp., 37.2°.

Station 5692. Off Pt. San Tomas, west coast of Lower California, 1076 fms. Bottom Temp., 37.1°.

Bathymetrical range, 868–1760 fms. Temperature range, 37.2°–37.1°.

Twenty-nine specimens.

Sphærothuria bitentaculata.

Ludwig, 1894. Mem. M. C. Z., Vol. 17, p. 141.

This remarkable species, so fully described and discussed by Ludwig, is represented by some specimens about 16 mm. long. The shallowness of the water and the high bottom temperature at the spot where they were taken is notable.

Station 5675. Southwest of San Cristobal Bay, west coast of Lower California, 284 fms. Bottom Temp., 44.6°.

Four specimens.

Psolus squamatus.

Holothuria squamata O. F. Müller, 1776. Zool. Dan. Prod., p. 232.

Psolus squamatus McAndrew & Barrett, 1857. Ann. Mag. Nat. Hist. (2) Vol. 20, p. 45.

A large *Psolus*, 88 mm. long, 45 mm. wide and 30 mm. high in its fully contracted condition, seems to belong to this northern species. I have compared it with specimens from Norway and cannot find any satisfactory grounds on which to separate them. Nevertheless I shall not be surprised if abundant material in good condition shows that the Californian *Psolus* is specifically different from the North European species.

Station 5695. Southwest of Santa Rosa Island, California, 534 fms. Bottom Temp., 38.9°.

Achlyonice ecalcarea.

Théel, 1879. Bih. Kongl. Svenska Vet. Akad. Handl., Vol. 5, no. 19, p. 13.

Although the specimens are in poor condition, it is possible to determine their generic position, the number of tentacles being constantly 12 and the arrangement of the pedicels and dorsal papillæ being determinable by comparison of the different individuals. Although there are calcareous rods present in the tentacles, I could find no calcareous ring nor any particles in the body-wall. I think therefore that their absence in Théel's specimens was not due to their dissolution in the alcohol. In any case however, Théel's change of the name to *paradoxa* is of course inadmissible. The best individual before me is only about 60 mm. long and is thus much smaller than the 'Challenger' specimens.

Station 5689. Off Rosario Bay, west coast of Lower California, 879 fms. Five specimens.

Lætmenœcus [1] gen. nov.

Body elongated, more or less cylindrical. Lateral ventral ambulacra with relatively few (15–20) large pedicels; mid-ventral ambulacrum possibly with a few similar pedicels posteriorly. Dorsal ambulacra apparently without appendages. Tentacles 15. Calcareous particles in the body-wall, wheels and rods as in Lætmogone.

Type-species.— *Lætmenœcus scotoides* sp. nov.

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[1] λαῖτμα = the deep sea + ἔνοικος = an inhabitant.

Lætmenœcus scotoeides [1] sp. nov.

Body nearly cylindrical, or perhaps somewhat flattened on ventral surface, larger posteriorly than anteriorly, 150–200 mm. long, 25–35 mm. in diameter. Along each side of the body, delimiting the ventral surface, which becomes distinctly narrower posteriorly, is a series of sixteen or seventeen large papilla-like pedicels. There appear to be no other ambulacral appendages anywhere on the body, unless there are a few scattered pedicels along the mid-ventral ambulacrum near the rear of the animal. I was unable to make myself certain on this point nor could I convince myself beyond question that there are no dorsal appendages in the living animal. However I could find no satisfactory evidence of their present or past existence. Body wall thin and soft, but completely full of the calcareous particles; even the longitudinal muscles are full of calcareous rods. Tentacles fifteen, of equal size; the terminal disk is 3–5 mm. across. Anus terminal or slightly dorsal in position. Calcareous ring well developed, very much like that figured by Théel for *Lætmogone wyville-thomsoni*. Polian vessel, single and large. Madreporic openings in back, about 35 mm. from anterior end, not at all conspicuous. No evident genital papilla. Genital glands in two short tufts, one on each side of mesentery, much like those figured by Théel for *Lætmogone*.— Calcareous particles consist of wheels and rods. The former are similar to those of *Lætmogone* and need no detailed description; the small ones are .09 mm. in diameter or less and have ten to thirteen spokes; the large ones are .15–.20 mm. across and commonly have ten spokes. The wheels are chiefly found on the dorsal surface but small ones also occur in the ventral integument. The rods are nearly straight and only slightly roughened bodies, .15–.25 of a millimeter long; they are abundant ventrally but are few and far between dorsally; they are common in the longitudinal muscles.— Color uniform deep purple.

Type.— Cat. No. ——, U. S. N. M., from Station 5685.

If the above described specimens had any obvious appendages on the dorsal surface, they would fit well into the genus *Lætmogone*, but there are no such outgrowths, nor is there any evidence to indicate that they were present in life and have been accidentally lost. In one specimen, I found what seemed to be two pedicels in the midventral line posteriorly, but the conditions of preservation prevented my determining the point satisfactorily. Under the circumstances, I cannot place these specimens in *Lætmogone* and so have instituted a new genus for them.

Station 5685. Southwest from Ballenas Bay, west coast of Lower California, 645 fms. Three specimens.

Lætmophasma fecundum.

Ludwig, 1894. Mem. M. C. Z., Vol. 17, p. 85.

These specimens are much smaller than Ludwig's types, measuring only about 85 mm. in length, and I am far from feeling satisfied as to their

[1] σκοτοειδής = dark-looking.

identity. Their condition is so poor, it is not possible to tell the number of tentacles, but on the better preserved one, only thirteen can be counted. The calcareous particles are exactly like those described and figured by Ludwig. The series of pedicels in the mid-ventral ambulacrum is evident but on neither the dorsal nor ventral surface are the ambulacral outgrowths nearly as numerous as in Ludwig's description. It is possible however that this difference is a matter of age, but the genital glands are in two well developed tufts, utterly unlike the elongate organs figured by Ludwig for *Lætmophasma*, and it is more difficult to believe that this is an effect of immaturity. I think it quite probable therefore that these specimens are not *fecundum* and very possibly not *Lætmophasma*, but in view of their condition I am not willing to describe them as a new species.

Station 5688. Off Cedros Island, west coast of Lower California, 525 fms. Bottom Temp., 39.9°. Two specimens.

Pannychia moseleyi.

Théel, 1882. 'Challenger' Holoth.: Pt. I, p. 88.

Although none of the specimens before me is in good condition, several permit a more or less accurate estimate of the number of ambulacral appendages. This estimate shows that these individuals are intermediate between Théel's typical specimens and Ludwig's proposed variety *henrici*, and makes it probable that the latter name does not cover a constant form, and need not be retained. The largest specimen in the present lot is about 160 mm. long and has twenty tentacles.

Station 5676. Off San Juanico, west coast of Lower California, 647 fms. Bottom Temp., 39°.

Station 5685. Southwest from Ballenas Bay, west coast of Lower California, 645 fms.

Nine specimens.

Oneirophanta mutabilis.

Théel, 1879. Bih. Kongl. Svenska Vet. Akad. Handl., Vol. 5, no. 19, p. 6.

There is a single specimen, 125 mm. long, in very good condition, of this widely distributed species.

Station 5684. Southwest from Magdalena Bay, west coast of Lower California, 1760 fms.

Benthodytes sanguinolenta.

Théel, 1882. 'Challenger' Holoth.: Pt. I, p. 104.

Although this species was met with at several stations, and special efforts were evidently made to preserve some good specimens, the material is all in poor condition. The individuals range in length from about 60 to nearly 250 mm. Ludwig is undoubtedly correct in saying that the absence of calcareous deposits is not accidental but is the normal condition for the species.

Station 5673. Off Pt. San Tomas, west coast of Lower California, 1090 mm.

Station 5684. Southwest from Magdalena Bay, west coast of Lower California, 1760 fms.

Station 5690. Off Rosario Bay, west coast of Lower California, 1101 fms. Bottom Temp., 38.1°.

Station 5692. Off Pt. San Tomas, west coast of Lower California, 1076 fms. Bottom Temp., 37.1°.

Bathymetrical range, 1076–1760 fms. Temperature range 38.1°–37.1°.

Seventeen specimens.

Pseudostichopus mollis.

Théel, 1886. 'Challenger' Holoth.: Pt. II, p. 169.

While it is possible that this large series contains more than a single species, the absence of calcareous deposits and of conspicuous ambulacral appendages makes it impracticable to distinguish more than one. Some of the small specimens have the body-wall very thin, but most of the adults have a thick and firm perisome. The largest specimens are 150–160 mm. long. The natural color is creamy white, but more or less fine sand adheres to the skin and in some cases, wholly conceals the ground color.

Station 5689. Off Rosario Bay, west coast of Lower California, 879 fms.

Station 5690. Off Rosario Bay, west coast of Lower California, 1101 fms. Bottom Temp., 38.1°.

Station 5691. Off Pt. San Tomas, west coast of Lower California, 868 fms. Bottom Temp., 37.2°.

Station 5693. Northwest of San Nicolas Island, California, 451 fms.

Station 5695. Southwest of Santa Rosa Island, California, 534 fms. Bottom Temp., 38.9°.

Bathymetrical range, 451–1101 fms. Temperature range 38.9°–37.2°.

Forty-eight specimens.

Stichopus parvimensis [1] sp. nov.

The specimens of this apparently new species agree with each other remarkably well in all particulars. They are about 200 mm. long but pressure from each other and from other specimens has so distorted them that their appearance in life is not easy to infer. The pedicels are very numerous both dorsally and ventrally, and there is no indication, even on the lower surface, of arrangement in longitudinal series. Along each side of the body are a few (3–6) big tubercle-like papillæ and there is at least one row and probably two of similar papillæ on the back. Judging from other species of the genus, the body in life is more or less quadrangular and there is a series of these big papillæ along each angle. There are twenty tentacles. The calcareous ring is well-developed and not peculiar. The gonads are in large equal tufts, one on each side of the dorsal mesentery. The color is light chestnut-brown, much paler below than above. Most of the pedicels, but not all, are very dark brown, and thus appear in the preserved specimens like small blackish spots.

The really characteristic feature of this species is to be found in the calcareous deposits. Like its previously-known fellow species of the Pacific coast of America, this new form has both "tables" and "buttons" in the body-wall. The buttons are about 90 μ in length and have three or four pairs of holes. They are not usually very symmetrical and hardly any two are exactly alike. As compared with the buttons of *S. californicus* and *S. johnsoni*, these deposits are very small and have a small number of holes, for in *californicus*, the buttons are 140–165 μ long and have frequently 10–12 holes, while in *johnsoni*, the buttons are 165–190 μ in length with 10–16 holes. Similar peculiarities mark the tables; in *parvimensis*, the disk is only about 45 μ across and rarely has more than four perforations, though occasionally two or three other small ones alternate externally with the primary ones; the crown of the spire has 8–10 teeth and is less than 20 μ across. In *californicus*, the tables are larger and more variable, the disk measuring from 50 to 90μ in diameter and having 8 to 18 perforations, while the spire is crowned with 12 or more teeth and measures about 25 μ across. In *johnsoni*, the tables are again much larger, 120–170 μ in diameter with 25–40 holes in the disk and the spire with 20–25 teeth on the crown which is nearly 50 μ across.

Type.— Cat. No. ——, U. S. N. M.

It is curious and a little perplexing that *johnsoni* which is geographically intermediate between the other two species is not so structurally but has the most highly specialized calcareous particles. Of course, it may be that we shall find the three species have broadly overlapping ranges and future study made show that all are forms of a single variable species. But I have compared the specimens of *parvimensis* before me with the type of Théel's species (*johnsoni*) and with specimens of *californicus* from Monterey Bay, California, and from Puget Sound, and I find no reason whatever for not recognizing each as a valid species.

The label with the three specimens of *parvimensis* says they were taken

[1] *parvimensis* = with small tables.

"in sea-weed, in 3½ ft." near shore on the east side of Cedros Island, west coast of Lower California, March 12, 1911. As the specimens have many fragments of eel-grass attached to them, it is evident that the "sea-weed" referred to is probably eel-grass. Such bottoms are favorite resorts of Stichopus in the West Indian region.

Holothuria lubrica.

Selenka, 1867. Zeits. f. w. Zool., Vol. 17, p. 329.

It is unfortunate that there is no clue to the locality where these specimens were taken, for that might throw some light on the northern limit of this Panamic species. It has not previously been reported from north of Mazatlan. These specimens are all adult and in good condition. Eight specimens.

Holothuria impatiens

Fistularia impatiens Forskål, 1775. Desc. Anim., p. 121.
Holothuria impatiens Gmelin, 1788. Linné's Sys. Nat. ed. 13, p. 3142.

With the eight specimens of *lubrica* was a single, small, poorly preserved holothurian which I refer to this species, not because I believe it to be *impatiens* but because it is one of those specimens, with papillæ all over the body and with tables and buttons in the skin, which have hitherto been referred to that East Indian species regardless of whether they came from the east or west side of Mexico and Central America. Were there more specimens and from a definite locality, they would probably serve as the basis for a new species, but as the specimen is poor and the locality unknown, no further comments on it are necessary.

Explanation of Plates.

Plate XLIV.

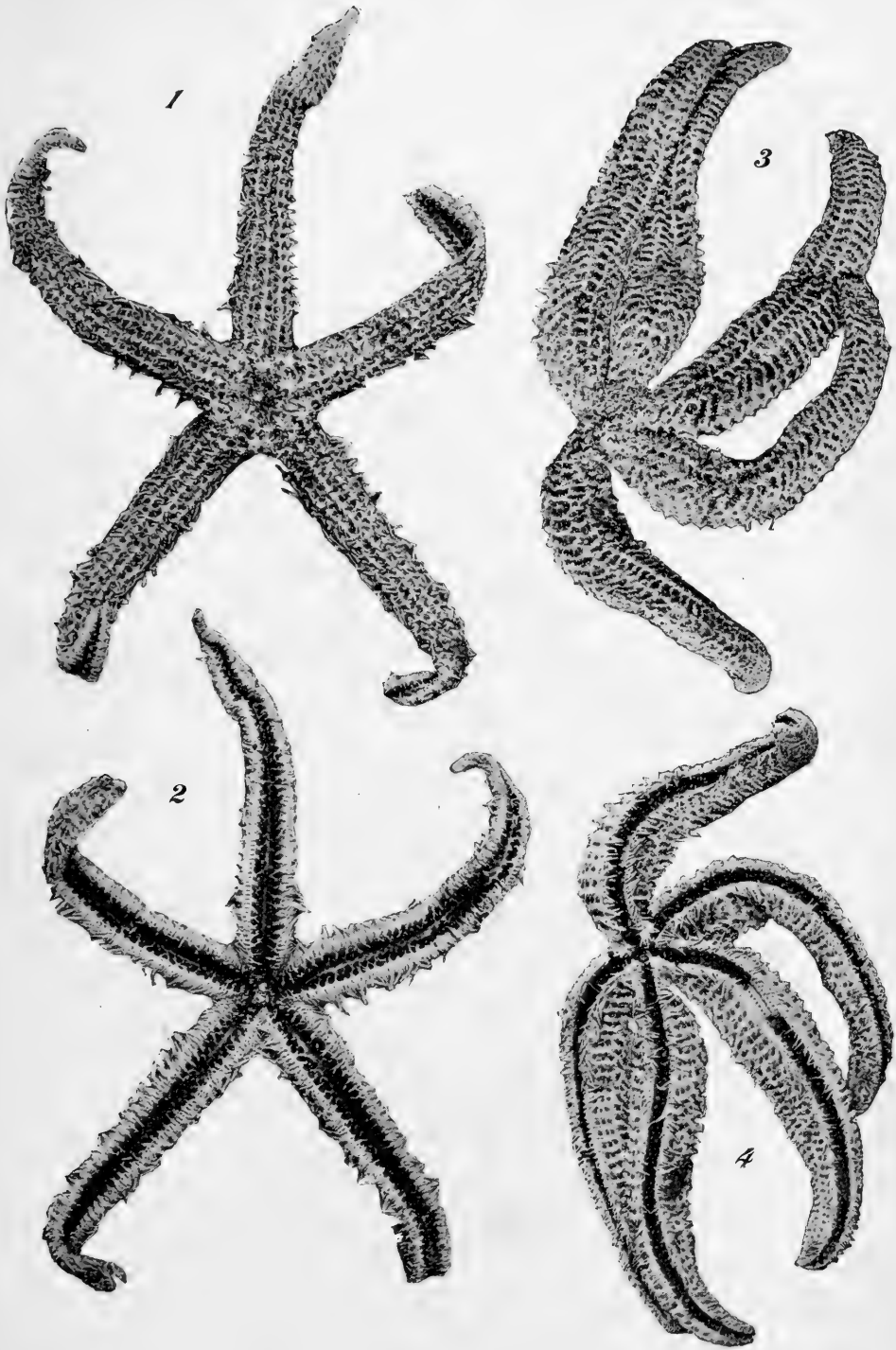
Fig. 1. *Zoroaster platyacanthus* sp. nov. Holotype (upper view). Nat. size.
Fig. 2. " " " (lower view).
Fig. 3. *Pedicellaster hyperoncus* sp. nov. Holotype (upper view). Nat. size.
Fig. 4. " " " (lower view).

Plate XLV.

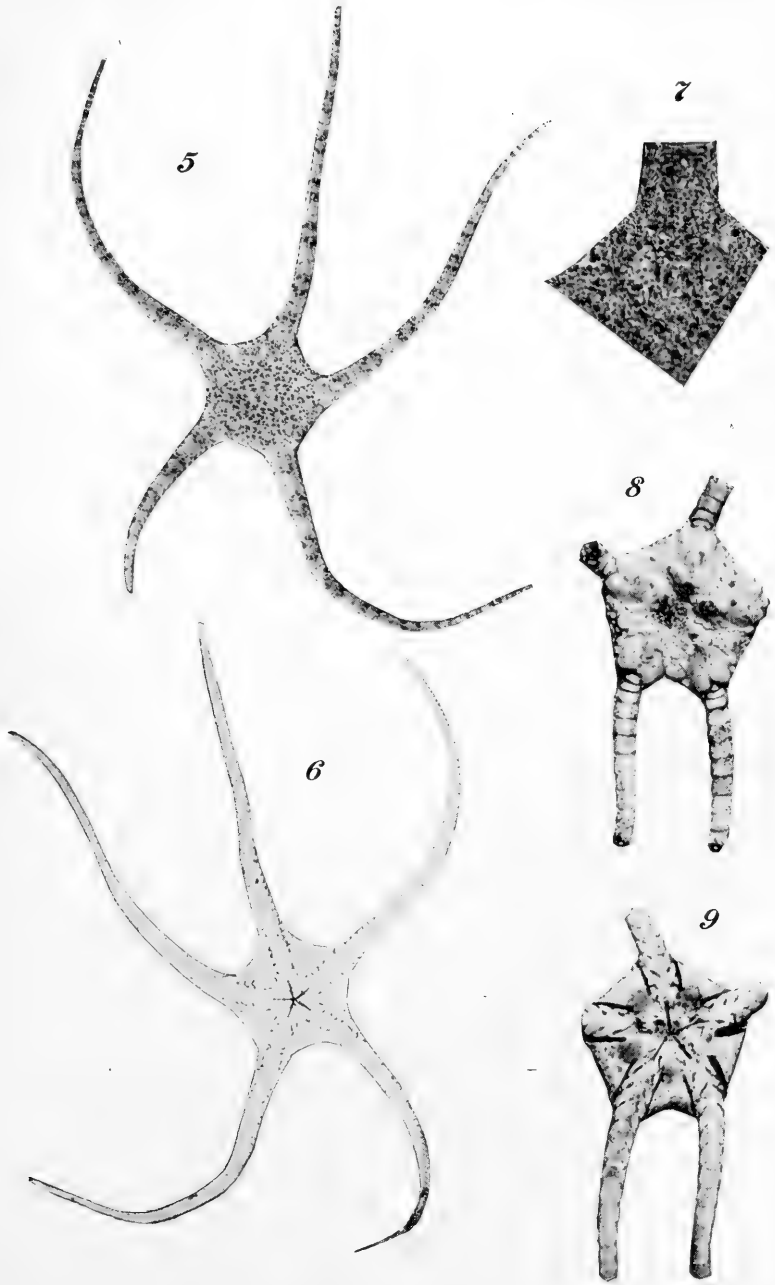
Fig. 5. *Diopederma axiologum* sp. nov. Holotype (upper view). Nat. size.
Fig. 6. " " " (lower view).
Fig. 7. " " " Base of arm and adjoining portion of disc, $\times 4\frac{1}{2}$.
Fig. 8. *Ophiura oligopora* sp. nov. Holotype (upper view). $\times 2\frac{1}{2}$.
Fig. 9. " " " (lower view).

Plate XLVI.

Fig. 10. *Urechinus reticulatus* sp. nov. Holotype (side view). $\frac{4}{5}$ nat. size.
Fig. 11. " " " (posterior view).
Fig. 12. " " " (upper view).
Fig. 13. " " " (lower view).



Figs. 1, 2. *Zoroaster platyacanthus* sp. n.
" 3, 4. *Pedicellaster hyperonicus* sp. n.



Figs 5–7. *Diopederma axiologum* gen. et. sp. n.
" 8, 9. *Ophiura oligopera* sp. nov.

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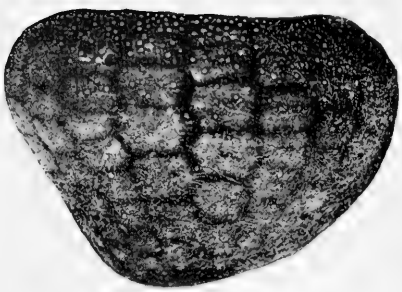

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Urechinus reticulatus sp. n.

Shore Fishes Collected by the 'Albatross' Expedition in Lower California with Descriptions of New Species.

By Raymond C. Osburn and John Treadwell Nichols.

BULLETIN OF THE

AMERICAN MUSEUM OF NATURAL HISTORY,

Vol. XXXV, Art. XVI, pp. 139–181.

New York, May 26, 1916.

(*Continued from 3d page of cover.*)

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ETHNOGRAPHICAL ALBUM.

Jesup North Pacific Expedition.

Ethnographical Album of the North Pacific Coasts of America and Asia. Part 1, pp. 1–5, pll. 1–28. August, 1900. Sold by subscription, price, $6.00.

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The matter in the 'Bulletin' consists of about 24 to 36 articles per volume, which relate about equally to Geology, Palæontology, Mammalogy, Ornithology, Entomology, and (in former volumes) Anthropology, except Vol. XI, which is restricted to a 'Catalogue of the Types and Figured Specimens in the Palæontological Collection of the Geological Department,' and Vols. XV, XVII, and XVIII, which relate wholly to Anthropology. Volume XXIII and the later volumes contain no anthropological matter, which is now issued separately as 'Anthropological Papers.'

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Article XVI.—SHORE FISHES COLLECTED BY THE 'ALBATROSS' EXPEDITION IN LOWER CALIFORNIA WITH DESCRIPTIONS OF NEW SPECIES.[1]

By Raymond C. Osburn and John Treadwell Nichols.

[Published by Permission of the U. S. Commissioner of Fisheries.]

The 'Albatross' expedition to Lower California in the spring of 1911 was unusually successful in the number and variety of the fishes taken in the shore waters of that region. The present list contains 185 species taken between the dates of March 2 and April 26, inclusive. Of this number fourteen species and one variety appear to be new and are here described.

Besides these, there is much of interest in the collection, as numerous rare species known only from one or two, often more or less distant, localities were obtained, thus adding to our knowledge of their distribution. Also one well known Atlantic species, *Hemirhamphus balao* Le Sueur, is here recorded from the Pacific for the first time, and the range of a number of the common western species extended.

Undoubtedly the richness of the collection, accumulated within so short a time, is due in large part to the fact that various methods for the capture of fishes were constantly employed side by side wherever possible. Seining naturally produced the best results. Hand-line fishing was resorted to, and an electric-light lure made by immersing a strong electric light bulb in the water at the side of the ship at night attracted numerous species which were then taken in a dipnet. A boat dredge and a three and a half foot Tanner beam trawl were used in shallow water. Some species were picked up on the beach and other small ones were taken in their natural habitat in the tide pools or at the edge of the shore. Certain others living among the rocks were obtainable only by the use of dynamite. Each of these methods of collecting yielded species not taken in any other way. The method of capture is given in most cases in the following list, and reference to it will disclose the fact that usually any single species was taken by only one method.

The numbers given in this paper are not intended to show the relative abundance of individuals of the various species. In the case of common, well-known species, frequently only a single specimen from any locality

[1] Scientific Results of the Expedition to the Gulf of California in charge of C. H. Townsend, by the U. S. Fisheries Steamship 'Albatross' in 1911. Commander G. H. Burrage, U. S. N., Commanding. No. VI.

was preserved for study. The economic aspects of the fisheries will be dealt with elsewhere.

As indicated in the title, only the fishes from the shallow waters along shore are here included. While the small trawl and boat dredge were frequently employed in collecting, the lowest depth considered in this report is only thirteen fathoms (in Magdalena Bay). The fishes of the deeper waters will constitute a separate report.

Practically all the shallow water collecting was done along the coasts of the Lower California peninsula and the closely associated islands. The only exceptions are Guadalupe Island, which lies about a hundred and forty miles to the west of the peninsula, and Tiburon and San Esteban islands, which are more closely related to the mainland of Mexico, two thirds of the way toward the head of the Gulf of California.

The accompanying chart will indicate the course of the trip and the positions of the various stations. Guadalupe Island was first visited on a special trip, after which attention was directed entirely to the work about the peninsula. Passing down the west side, then along the eastern shore as far north as the island of Angel de la Guardia, the 'Albatross' crossed the gulf to Tiburon Island. A stop was made for coaling at Guaymas on the mainland of Mexico, but no collecting was done. The vessel then recrossed to the peninsula and made several more stations. Three of the earlier stations were revisited on the return trip, viz., Pichilinque Bay, San Jose del Cabo and Port San Bartholome. Following is a list of the stations,[1] with date of arrival:

Guadalupe I.	March 2	Concepcion Bay	April 5
San Benito I.	" 9	San Francisquito Bay	" 9
Cerros I.	" 10	Angel de la Guardia I.	" 10
Port San Bartholome	" 13	Tiburon I.	" 11
San Cristobal Bay	" 15	San Estebàn I.	" 13
Ballenas Bay	" 18	Santa Catalina I.	" 16
Cape San Lucas	" 23	Santa Cruz I.	" 16
San Jose del Cabo Bay	" 25	Pichilinque Bay (repeated)	" 17
Pichilinque Bay	" 27	Espiritu Santo I.	" 19
San Josef I.	" 30	Ceralbo I.	" 19
Agua Verde Bay	April 1	San Jose del Cabo (repeated)	" 20
Carmen I.	" 2	Port San Bartholome (repeated)	" 23
Mulege	" 4		

The fisheries of the Lower California region are almost wholly undeveloped. Food fishes of excellent quality and often of large size are very abundant. A glance at the lists under the Scombroid, Serranid, Lutianid,

[1] See also the map accompanying the Narrative of the Voyage, by Dr. C. H. Townsend, to be published later in the present volume of this Bulletin.

Hæmulid and Sciænid groups will serve to indicate how varied and numerous are the economic species.

In the preparation of this report we have been greatly aided by the notes taken during the work of collecting by Dr. Chas. H. Townsend, in charge of the expedition. Many color notes on the fresh specimens were made by Dr. Townsend and some of these have been incorporated in the following text.

The illustrations of the new species are the work of Mr. K. Kimoto, under the personal supervision of the junior author. The funds for this work were supplied by the American Museum of Natural History, in which institution the types of the new species are placed.

The list of new species is as follows:

Raja microtrachys
Urobatis concentricus
Letharchus pacificus
Bascanichthys bascanoides
Fundulus parvipinnis, subsp. brevis.
Tylosurus pterurus
Siphostoma exile
Atherinopsis sonoræ
Amia guadalupensis
Girella simplicidens
Hermosilla robusta
Callyodon compressus
Callyodon microps
Dactyloscopus cinctus
Lucioblennius lucius

HETERODONTIDÆ. BULL-HEAD SHARKS.

Gyropleurodus francisci (*Girard*). BULL-HEAD SHARK.

Magdalena Bay, March 12, one specimen eight inches long, dredged at 13 fathoms.

GALEIDÆ. REQUIEM SHARKS.

Galeus dorsalis (*Gill*).

Tiburon I., April 12, a female three feet long, taken on a hand-line, contained six unborn young, each ten inches in length.

Triakis semifasciatum *Girard*. CAT SHARK.

East side of Cerros I., March 11; Port San Bartholome, March 13 and 14 and again on April 23, and Ballenas Bay, off Abreojos Pt., March 16, all taken in the seine.

Prionace glauca (*Linnæus*). GREAT BLUE SHARK.

Carmen I., April 3, a young specimen taken on a hand-line.

RHINOBATIDÆ. GUITAR FISHES.

Rhinobatis productus *Ayres.* GUITAR FISH.

East Side of Cerros I., March 12; Port San Bartholome, March 13 and again on April 23, and Agua Verde Bay, April 1. Taken on hand-lines and with the seine.

RAJIDÆ. SKATES.

Raja microtrachys sp. nov.

Fig. 1.

Cartilages weak, notably those of the snout, and structure generally loose. A deep water form allied to *isotrachys* and *trachura*, but lacking the mid-dorsal tubercle, with more white below and with other minor differences. Probably closely related also to the cotype of *R. aguja* Kendall and Radcliffe, Mem. Mus. Comp. Zoöl., Vol. 35, No. 25, pl. i, fig. 2.

Disk rhomboid, width about 1.2 times length to end of pectorals. Anterior edges meeting in an angle a little greater than 90 degrees, but slightly sinuated so that the angle of the snout is less than 90 degrees. On the hinder part of the snout the margin curves outward and is again somewhat incurved back of the spiracles. Outer and hinder angles of the pectorals broadly rounded, outer margin nearly straight. Snout moderately produced and pointed, the tip blunt, about 3.75 in length to posterior edge of pectoral. Tail from vent a little longer than the rest of the body, depressed, the lower surface nearly flat, with dermal keels posteriorly which are broad and fin-like near the end of the tail. Dorsal fins far back, contiguous (the margins too much broken to permit the form to be determined), origin of first dorsal a distance from the caudal equal to 1.4 in the snout. Pelvic fin deeply notched, separating a pointed fleshy anterior lobe which, measured from the bottom of the notch, is 2.6 in snout.

Orbit 4 in snout, interorbital the same, concave. Spiracle 1.5 in orbit. Preoral distance slightly greater than snout; mouth straight, 1.6 in preoral distance, equal to internarial space. Mesial nasal flaps large, the hinder limb with a fringe of broad, mostly bifid, papillæ, directed forward. Corners of mouth guarded by well-developed flaps; other flaps at the outer posterior margins of nares. Teeth small, with flat crowns and with backwardly directed cusps on their hinder margins.

Upper parts everywhere roughened with fine stellate prickles, these smallest and sparsest on the bases of the pectorals, largest and most closely set on the base of the tail and fine and close set between the eyes. Twenty strong retrorse tubercles on mid vertebral line between anterior pelvic lobes and origin of first dorsal, one or two of these spines apparently missing from spaces at middle of tail and again half way between this and origin of dorsal. No other tubercles anywhere. Anterior lobe of pelvic fin and entire under surface smooth, with the exception of a few scattered prickles along the ventral margins of the tail basally.

Color in spirits dark chocolate brown above, the margins narrowly darker, spiracles pale; underside slate colored, darker toward the margins of pectorals and

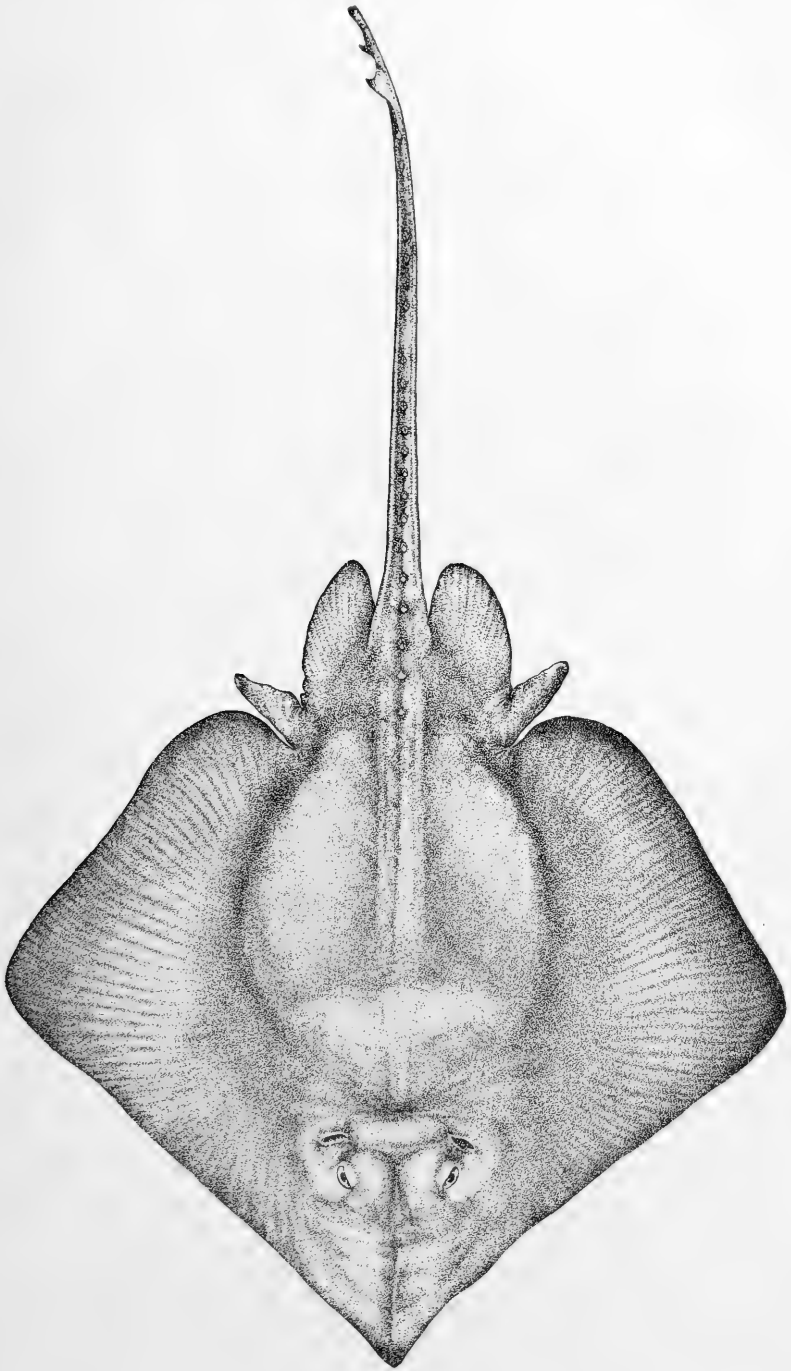

Fig. 1. *Raja microstachys* sp. nov.

on tail; center of disk broadly whitish, sharply contrasted with the slate of the pectorals, extending from about the middle of the snout backward to pelvic girdle and irregularly at the sides onto the anterior lobes of the pelvic fins.

Type No. 5198 American Museum of Natural History. Total length 29 inches. Collected at Guadalupe Island, March 1, 1911.

Our only specimen is an adult female with eggs, one of which measured $1\frac{1}{4}$ inches in diameter.

Narcobatidæ. Electric Rays.

Narcine entemedor *Jordan and Starks.*

Agua Verde Bay, April 1, and Mulege, April 4, seined.

Discopyge ommata *Jordan and Gilbert.*

Santa Cruz I., April 16, one specimen.

Dasyatidæ. Sting Rays.

Urobatis concentricus sp. nov.

Fig. 2.

Disc subcircular, anterior edges straight, meeting at snout in an obtuse angle. Breadth of disc about equal to length to base of tail. Tail to tip of caudal 1.4 in length of disc. Snout 4.5 in body to base of tail. Interorbital width 1.4 in snout. Snout from eye equal to snout from mouth. Width of mouth 1.6 in distance to tip of snout. Eye 4 in snout, equal to or slightly smaller than spiracle.

Teeth small, numerous, tessellated, with acute triangular cusps.

Tail with moderately developed lateral folds, extending backward to insertion of spine, which is about midway between the pectoral axil and the tip of the caudal. Caudal oblong, rounded at tip, its depth 2.5 in snout. Spine strong, retrorsely serrate, its length on dorsal ridge equal to interorbital width.

Skin everywhere smooth. Ground color in alcohol dark brown, broken into coarse reticulations on middle of disc by large rounded pale spots which average in diameter about one half the interorbital width. These spots are arranged more or less definitely in 3 concentric circles around a central one in the middle of the disc. Two narrower pale unbroken bands, concentric with these, on the edge of the disc, extending on the ventrals. Under side pale with a brown margin $\frac{3}{4}$ inch wide in a specimen 17 in. long and extending forward to opposite mouth. Extreme margin of disc and ventral fins pale. Under surface of tail pale, caudal dusky.

Type No. 5199 Am. Mus. Nat. Hist.

Length 17 inches, from the east side of Esteban Island, April 13, 1911.

We have two other specimens, 16 and $14\frac{1}{2}$ inches in length, from the same locality. All three are males.

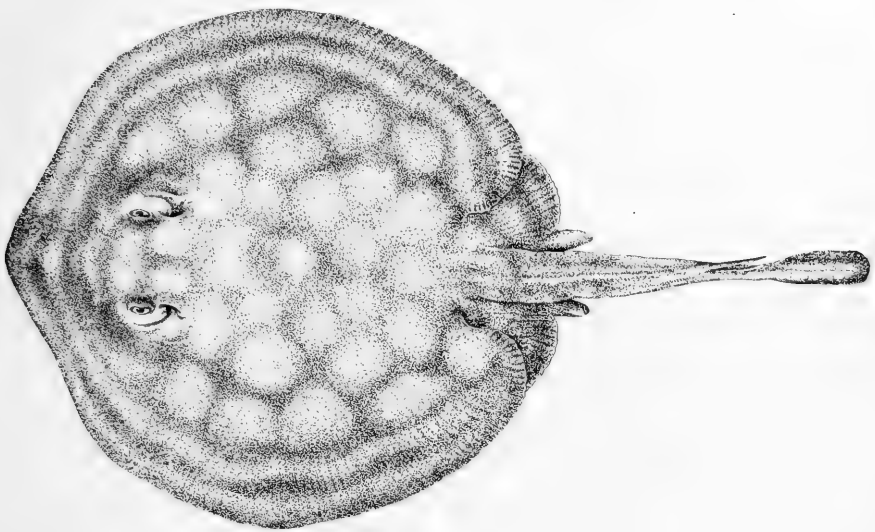

Fig. 2. *Urobatis concentricus* sp. nov.

Urotrygon mundus (*Gill*).

Port San Bartholome, March 14, one specimen seined, and east side of Esteban I., April 13.

Dasyatis dipterura *Jordan and Gilbert.*

Mulege, April 4, one specimen seined.

Pteroplatea marmorata *Cooper.* Butterfly Ray.

Port San Bartholome, March 13, one specimen seined.

Myliobatidæ. Eagle Rays.

Myliobatis californicus *Gill.*

Port San Bartholome, March 14 and again on April 23, several specimens, and Santa Maria Bay, March 18, one specimen. All were taken in seining.

SILURIDÆ. CATFISHES.

Netuma platypogon (*Günther*).

A single specimen taken at Pichilinque Bay, March 27, on a hand-line.

LEPTOCEPHALIDÆ. CONGER EELS.

Congrellus balearicus (*De la Roche*).

Cape San Lucas, March 23, one mutilated specimen, only the head and about an inch of the body being obtained.

MYRIDÆ. WORM EELS.

Myrophis vafer *Jordan and Gilbert.*

Pichilinque Bay on March 27 and again on April 18, a number of specimens taken at night by the use of the electric light lure.

OPHICHTHYIDÆ. SNAKE EELS.

Sphagebranchus selachops (*Jordan and Gilbert*).

Two specimens taken at Cape San Lucas on March 23.

Letharchus pacificus sp. nov.

Fig. 3.

Teeth conical, directed inward and backward. Snout slender, pointed, projecting $\frac{2}{3}$ of its length beyond the lower jaw, cleft of mouth longer than snout, extending back of the eye a distance about equal to the diameter of the latter. Gill openings sub-inferior, diverging at about an angle of 60 degrees from a narrow isthmus, which is about equal to the eye and $\frac{1}{2}$ the width of the slit. Eye 12; snout about 6, head in trunk $6\frac{1}{2}$; tail $1\frac{2}{3}$ in trunk; depth $2\frac{1}{2}$ in head. Lateral line conspicuous. Dorsal beginning behind the eye a distance equal to snout, high at nape, gradually lower backward, practically absent on posterior $\frac{2}{3}$ of tail. Pectoral and anal fins wanting.

Color in spirits,—head, dorsal and ventral lines and dorsal fin, whitish; sides dark chocolate brown; many dark spots, mostly smaller than eye, on head, confluent

to form about four cross bars on throat, closer together on snout and lower jaw; the dark sides with obscure darker specks, the lateral line narrowly pale.

Type No. 5200 American Museum of Natural History, Cape San Lucas, March 23, 1911, 1 specimen, 5½ inches in length.

This species differs somewhat in measurements and notably in color from the only other member of the genus, *L. velifer* Goode and Bean, from the Gulf of Mexico.

Myrichthys tigrinus *Girard.*

Pichilinque Bay, March 27, one specimen taken at the electric light lure.

Bascanichthys peninsulæ (*Gilbert*).

Pichilinque Bay, March 27, a single specimen seven and a half inches long.

Bascanichthys bascanoides, sp. nov.

Fig. 4.

Close to *bascanium* and *scuticaris* of the Atlantic, with pectorals small and trunk elongate.

Trunk subterete, depth 2.2 in length of head, breadth 2.5 in head; tail terete; head and trunk about equal to tail; head contained 11 times in head and trunk. Eye 2 in snout, which is 7 in head; lower jaw reaching to middle of snout, gape about equal to snout. Teeth subequal, short, bluntish conical, slightly recurved, in a single series in the lower jaw with a few extra ones near the symphysis; sides of upper jaw with a single series, separated by a short interspace from two or three near the tip; vomerine teeth in a triple series in front, then double, becoming single toward the posterior, anterior teeth the larger. Gill openings vertical, equal to snout, slightly greater than isthmus. Pectoral rudimentary, situated in upper part of gill opening, slightly longer than eye. Dorsal commencing about midway between gill opening and eye; both dorsal and ventral low.

Color in spirits dark reddish brown, unmarked, darkest dorsally, fading out ventrally to yellowish on belly. Vertical fins pale and a narrow pale vertebral streak the full length of the dorsal. Snout and lower jaw dusky.

Type No. 5201, American Museum of Natural History, collected off San Cristobal Bay, March 15, 1911, total length 30 inches. A single specimen, recorded in Townsend's notes as "taken from the stomach of a jew-fish" (*Mycteroperca venadorum*).

Quassiremus notochir (*Gilbert*).

Carmen I., April 3, one specimen.

Fig. 3. *Letharchus pacificus* sp. nov.

Fig. 4 *Bascanichthys bascanoides* sp. nov.

Ophichthus triserialis (*Kaup*).

Pichilinque Bay, March 27, one specimen about five inches long taken at the electric light lure.

MURÆNIDÆ. MORAYS.

Lycodontis funebris (*Ranzani*). BLACK MORAY.

Agua Verde Bay, April 1, one specimen four inches long, seined.

Uropterygius necturus (*Jordan and Gilbert*).

Agua Verde Bay, April 1, a specimen six inches in length, seined.

ALBULIDÆ. LADY FISHES.

Albula vulpes (*Linnæus*). LADY FISH.

Carmen I., April 3, three specimens, seined.

CLUPEIDÆ. HERRINGS.

Jenkinsia acuminata (*Gilbert*).

Carmen I., April 2, a specimen two inches long, seined.

Perkinsia othonops *R. S. Eigenmann.*

San Benito I., March 9, six dozen specimens, seined.

Clupanodon cæruleus (*Girard*). CALIFORNIA SARDINE.

San Benito I., March 9; Ballenas Bay and Cerros I., March 11, and Santa Catalina I., April 16, numerous specimens both young and adult.

Sardinella thrissina (*Jordan and Gilbert*). SCALED SARDINE.

Pichilinque Bay, March 27; Agua Verde Bay, April 1, and Carmen I., April 2 and 3. Numerous specimens taken with the seine and at Agua Verde Bay they swarmed about the electric light lure at night.

Sardinella stolifera (*Jordan and Gilbert*).

Mouth of Mulege River, April 4, twenty specimens, seined.

Ophisthonema libertate (*Günther*). Thread Herring.

Ballenas Bay, March 16, and Carmen I., April 3; two specimens, taken in the seine.

Engraulididæ. Anchovies.

Engraulis mordax *Girard.* California Anchovy.

San Benito I., March 9 and Cerros I., March 11, three specimens, seined.

Synodontidæ. Lizard Fishes.

Synodus lacertinus *Gilbert.*

Cape San Lucas, March 23, one specimen seined.

Pœciliidæ. Killifishes.

Fundulus parvipinnis brevis subsp. nov.

Fig. 5.

Body moderately robust, depth 3.4, back elevated. Dorsal fin rising rather steeply from snout to above insertion of pectoral fin, thence gently rounded to in-

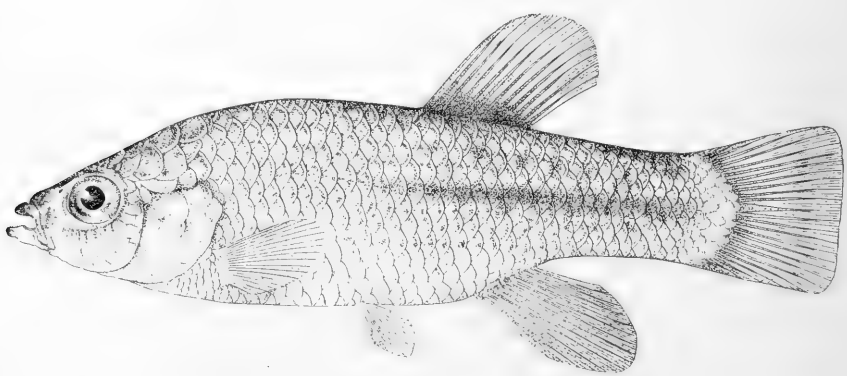

Fig. 5. *Fundulus parvipinnis brevis* subsp. nov.

sertion of dorsal, slanting downward rather steeply under base of dorsal fin, and thence more gently to base of caudal. Caudal peduncle long and slender, much

compressed, its depth 1.5 in its length. Head 3.3, eye 3.8 in head; interorbital 3; snout 3.5; mouth small, tip of snout to end of maxillary 3.5 in head. Scales 32, in 13 series. Pectoral 1.7, not quite reaching to ventral; ventral 2.3, not quite reaching to anal; anal 1.2, of 13 rays; caudal even, 1.5, with 4 rows of small scales in its base; dorsal 1.6, of 13 rays.

Color in spirits brownish, paler below, scales more or less margined with dark punctulations; about a dozen narrow, short, broken, dark bars posteriorly, connected by a lateral streak from above tips of pectorals to base of caudal.

Type No. 5208, Am. Mus. Nat. Hist.

Taken in south end of Magdalena Bay, March 20, 1911, 2.5 inches long. Four others of about the same size taken with it and two dozen of various sizes the following day, off Magdalena.

Our specimens have been compared with a series of specimens of *parvipinnis* from San Diego, Cal., from which they differ in the noticeably shorter and deeper body and in the scale count. The following table is based on the measurements of ten graded specimens of *parvipinnis* and of the subspecies.

	Length of body	*Head*	*Depth*	*Eye*	*Scales*	*Locality*
F. parvipinnis	2.9	3.4	4.0	4.2	37	San Diego
	2.8	3.5	4.0	4.1	36	"
	2.6	3.5	3.7	4.0	35	"
	2.6	3.3	4.1	4.0	36	"
	2.5	3.3	3.6	4.0	34	"
	2.5	3.5	3.9	3.8	37	"
	2.2	3.5	3.8	3.6	34	"
	2.2	3.5	4.0	3.6	35	"
	1.7	3.5	4.3	3.3	33	"
	1.8	3.4	4.0	3.3	35	"
Average	2.38	3.44	3.94	3.79	35.2	
F. parvipinnis brevis	2.7	3.0	3.3	3.5	32	Off Magdalena
	2.5	3.2	3.4	4.0	32	S. end Magdalena Bay
	2.5	3.3	3.4	3.8	32	" " " "
	2.3	3.0	3.2	3.9	33	Off Magdalena
	2.3	3.2	3.1	3.9	32	" "
	2.1	3.3	3.6	3.5	33	" "
	1.9	3.1	3.2	3.4	33	" "
	2.0	3.2	3.6	3.5	30	" "
	1.7	3.1	3.5	3.5	33	" "
	1.6	3.3	3.6	3.3	33	" "
Average	2.16	3.17	3.39	3.63	32.3	

ESOCIDÆ. NEEDLE FISHES.

Tylosurus fodiator *Jordan and Gilbert.*

Cape San Lucas, March 24, four specimens taken in the seine.

Tylosurus pterurus sp. nov.

Fig. 6.

Head 3; depth 1.4 in postorbital part of head; eye large 1.7 in postorbital part of head; snout 3.7 times postorbital part of head, base of upper jaw depressed, the maxillary entirely concealed under preorbital; top of head with a shallow scaly groove. Teeth very small, conical, not compressed, and very even for this genus, about 60 in main row on one side of upper jaw. Pectoral .8 in postorbital part of head; ventrals inserted midway between pectorals and caudal; anal rays 16, inserted distinctly in advance of the shorter dorsal which has 13 rays; distance of insertion of dorsal to upper caudal lobe contained 3 times in its distance behind preopercle; caudal deeply lunate, the lower lobe longer. Scales large, about 185 in lateral line, 102 between nape and origin of dorsal.

Caudal peduncle much depressed, its width slightly more than twice its depth; laterally forming a thin scaled keel-like expansion above the axis of the body. The lateral line very low throughout; beginning on the throat, it sends a vertical branch to the base of the pectoral, curves upward to avoid the base of the pelvic fin and posteriorly extends along the base of the peduncular keel midway between the margin of this keel and the mid-ventral line of the body.

Color in spirits, above green, becoming abruptly white on a level with the top of the eye; mid-line of back, edging of dorsal scales and portions of top of head and snout more or less dusky; dorsal, ventrals and upper caudal lobe somewhat dusky, other fins pale.

Type No. 5202, American Museum of Natural History. Carmen Island, April 3, 1 specimen, 15 inches long.

HEMIRHAMPHIDÆ. HALF BEAKS.

Hyporhamphus roberti (*Cuvier and Valenciennes*). COMMON HALF-BEAK.

South end of Magdalena Bay, March 20; Port San Bartholome, March 14; Pichilinque Bay, March 27; Carmen I., April 3; fifteen miles below the head of Concepcion Bay, April 7, and Ceralbo I., April 19. Numerous specimens were taken chiefly with the seine.

Hyporhamphus rosæ (*Jordan and Gilbert*).

Magdalena Bay, March 21, one young specimen seined.

Hemirhamphus balao *Le Sueur.*

San Josef I., March 31, and Ceralbo I., April 20, a single specimen from each of these localities was picked up on the beach. The species is well known and widely distributed in the Atlantic, but has not hitherto been reported from the Pacific Ocean.

EXOCŒTIDÆ. FLYING FISHES.

Fodiator acutus (*Cuvier and Valenciennes*). SHARP-NOSED FLYING-FISH.

Cape San Lucas, March 24, two specimens seined.

FISTULARIIDÆ. TRUMPET FISHES.

Fistularia depressa *Günther.* CORNETA.

Cape San Lucas, March 23; San Josef I., March 31; Agua Verde Bay, April 1, and Santa Catalina I., April 16, taken chiefly in the seine.

SYNGNATHIDÆ. PIPE FISHES.

Siphostoma carinatum *Gilbert.*

East side of Cerros I., March 11, one specimen seined.

Siphostoma leptorhynchum (*Girard*).

One specimen without special data.

Siphostoma exile sp. nov.

Fig. 7.

Head 9; depth 5 in head, equal to breadth; snout 2; eye 3 in postorbital part of head, equal to pectoral, equal to about $\frac{1}{2}$ of caudal. Rings 20 + 45. D. 38, on one and a quarter body rings and eight and three-quarters caudal rings, its base .8 in head, equal to distance from tip to snout to base of pectoral. Body slender, the posterior half of trunk distended, its diameter 3.6 in head; head and trunk in tail 1.4; trunk in tail 1.8. Angles rather low, a low keel on snout not extending on head; no nuchal or opercular ridges.

Color in spirits, pale yellowish; paler on belly, under side of tail with brownish flecks; a conspicuous dark brown band from chin to eye, thence more narrowly

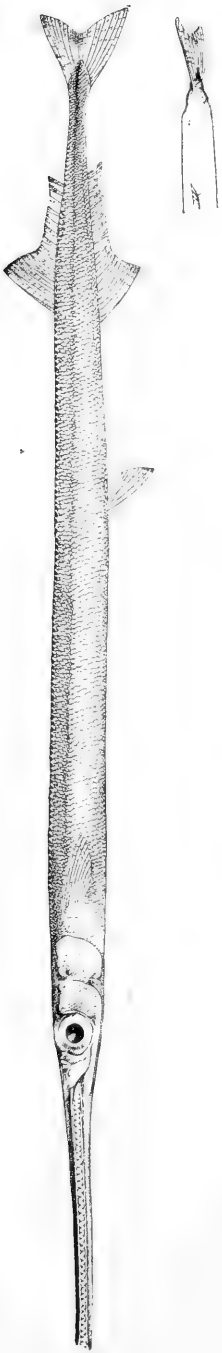

Fig. 6. *Tylosurus pterurus* sp. nov.

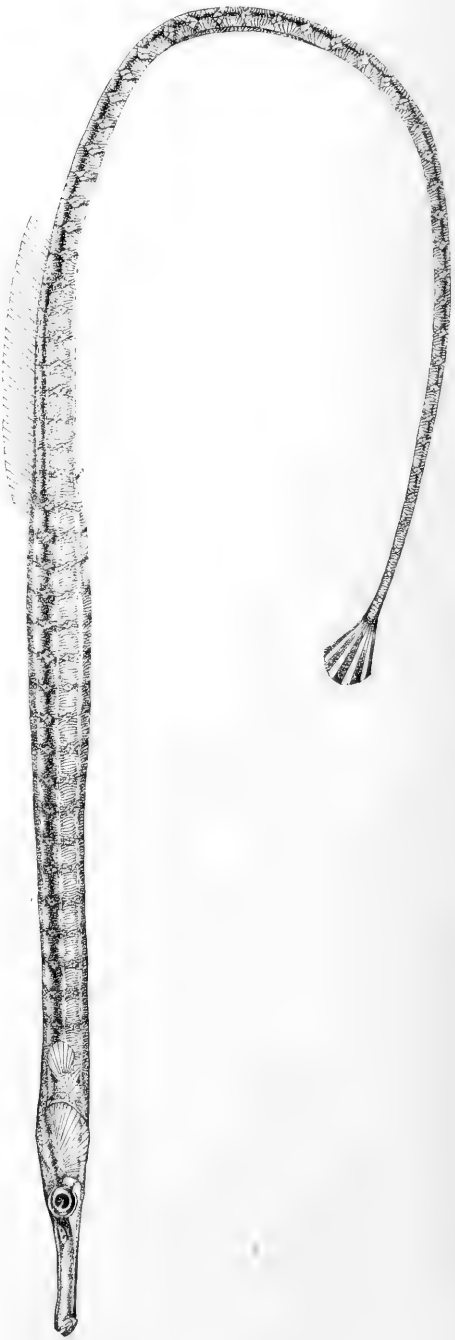

Fig. 7. *Siphostoma exile* sp. nov.

across upper part of opercle, thence backward along the upper part of the side, becoming faint and broken into specks towards caudal. A faint broken streak extends from the eye downward and backward across the lower part of the opercle. Caudal fin dusky, its upper margin whitish.

Type No. 5203 American Museum of Natural History, West San Benito I., March 9, 1911. 1 specimen, total length $6\frac{1}{2}$ inches.

Five smaller specimens, 4 to $4\frac{1}{2}$ inches long were taken at electric light in Port San Bartholome, March 14. The peculiar swollen appearance of the hinder half of the trunk is as evident in these as it is in the type. The dorsal rays in these vary from 35 to 38; the body rings are all 18, the caudal rings vary from 44 to 48. Otherwise there is a close agreement with the type in all structural points. In color, all show the stripe along the side of the snout, the oblique line downward and backward from the eye (which is more distinct than in the type) and the line across the upper part of the opercle. The dark line along the side is not so distinct, but is more or less fused with brownish spots above and below it and broken by lighter irregular crossbands. The white upper margin of the dusky caudal is more conspicuous than in the type. The largest of these approach the type more nearly than the smaller ones in the matter of coloration.

Hippocampus ingens *Girard.* Sea Horse.

Head of Concepcion Bay, April 6, one specimen.

Dr. Townsend adds the following note:

"The Sea horse of this region cannot be a common species as only one small living example was taken during the almost daily seining operations of the voyage. Two large dried specimens were found on the beach at Carmen Island, the larger being about ten inches long. The species has been recorded from but few points between San Diego, California and Mazatlan, Mex., the extremities of its known range."

Atherinidæ. Silver-sides.

Leuresthes tenuis (*Ayres*).

Ballenas Bay off Abreojos Point, one specimen six inches long, an adult female with eggs. Although this specimen is from the type locality of *L. crameri* Jordan and Everman, it has the small scales, 74, and the fin formula, D. V. 1, 9; A. 1, 22, of *L. tenuis*. In some measurements, however, it agrees more nearly with *L. crameri*, as head 4.8; depth 5.3; eye in snout 1.5,

in head 4.3; lateral band 1.2 in eye, covering one row and two half rows of scales. This suggests the probability that *crameri* is a synonym of *tenuis*.

Eurystole eriarcha (*Jordan and Gilbert*).

Cape San Lucas, March 23 and 24, ten specimens taken at the electric light lure, and Santa Catalina I., April 16, one specimen.

Atherinopsis californiensis *Girard.* California Smelt.

Ballenas Bay, March 16, and Cerros I., March 11, several specimens seined.

Atherinopsis sonoræ sp. nov.

Fig. 8.

Head 4.2; depth 5.8; D. VIII–I, 12; A. I, 22; scales 62–13. Eye 5 in head, snout 3; jaws equal; teeth pointed, in narrow bands, maxillary not reaching eye. Gill rakers long slender and numerous. Scales weakly crenate. Body slender, moderately compressed. Pectoral fin 1, 3 in head, reaching to origin of ventrals which extend $\frac{1}{2}$ distance to vent. Origin of spinous dorsal equidistant between caudal base and preopercle, considerably in advance of origin of anal; origin of soft dorsal about over middle of anal. Caudal widely forked.

Color in spirits; light brown above, silvery below, a plumbeous lateral stripe one fourth the width of the body. Pectorals, dorsals and caudal more or less dusky, ventrals and anal white.

Type No. 5211, American Museum of Natural History, $7\frac{1}{2}$ inches long, S.E. side of Cerros I. March 11, seined. Two smaller specimens 5 and 6 inches long with the same data, have respectively head 4, depth 5.9, scales indeterminate, and head 4.2, depth 5.5, scales about 58.

This species apparently differs from *A. californiensis* in the larger head, lesser depth and much larger scales.

Atherinops insularum *Gilbert.*

Guadalupe I., March 2; San Benito I., March 9, and Cerros I., March 11, numerous specimens.

Atherinops affinis (*Ayres*).

Santa Maria Bay, March 18; Port San Bartholome, March 13 and April 23; Magdalena Bay, March 20 and 21, numerous specimens.

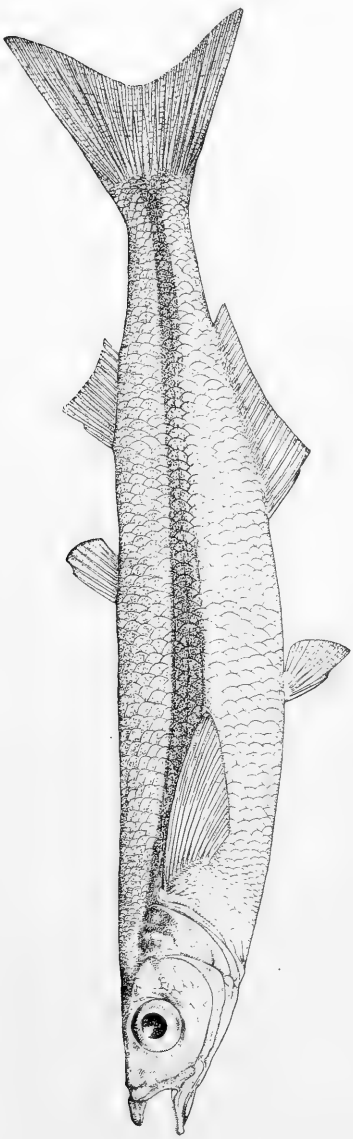

Fig. 8. *Atherinopsis sonoræ* sp. nov.

MUGILIDÆ. MULLETS.

Mugil curema *Cuvier and Valenciennes.* WHITE MULLET.

Magdalena Bay, March 20 and 21; Cape San Lucas, March 24; San Jose del Cabo, March 26; Carmen I., April 3; Mouth of Mulege River, April 4, and head of Concepcion Bay, April 6. Large numbers of various sizes were taken with the seine. At San Jose del Cabo both young and adult were taken in fresh water.

Chænomugil proboscideus (*Günther*).

Cape San Lucas, March 23, one specimen taken at electric light.

SPHYRÆNIDÆ. BARRACUDAS.

Sphyræna argentea *Girard.* CALIFORNIA BARRACUDA.

Cerros I., March 11; Port San Bartholome, March 13; and Agua Verde Bay, April 1, several specimens taken in the seine.

MULLIDÆ. SURMULLETS.

Upeneus xanthogrammus *Gilbert.* GOAT-FISH.

San Josef I., March 31; Pichilinque Bay, April 17, and Ceralbo I., April 20, several specimens.

SCOMBRIDÆ. MACKERELS.

Scomberomorus sierra *Jordan and Starks.* SIERRA.

Agua Verde Bay, April 1, one specimen taken in seine.

NEMATISTIIDÆ.

Nematistius pectoralis *Gill.*

San Josef I., March 31, and Agua Verde Bay, April 1, several specimens taken in the seine.

CARANGIDÆ. POMPANOS.

Oligoplites saurus (*Bloch and Schneider*). LEATHER JACKET.

Mouth of Mulege River, April 4, and fifteen miles below the head of Concepcion Bay, April 7, three specimens seined.

Oligoplites mundus *Jordan and Starks.*

Mulege, April 4, two taken in the seine.

Seriola dorsalis (*Gill*). YELLOW TAIL.

Carmen I., April 3, one specimen seined, and Concepcion Bay off Ricason I., April 7, one specimen.

Trachurus symmetricus *Ayres.*

Guadalupe I., March 3, three specimens taken on a hand-line.

Trachurops crumenophthalmus (*Bloch*). GOGGLE-EYED SCAD.

Carmen I., April 3, two specimens seined.

Caranx hippos (*Linnæus*). JACK.

Mulege, April 4, seined.

Caranx caballus (*Günther*).

Cape San Lucas, March 23, one specimen seined.

Gnathanodon speciosus (*Forskål*).

Carmen I., April 3, two specimens taken in the seine.

Citula dorsalis (*Gill*).

Agua Verde Bay, April 1, one large specimen seined.

Selene vomer (*Linnæus*). LOOK-DOWN OR MOON-FISH.

Mulege, April 4, two specimens seined.

Trachinotus rhodopus *Gill.* Pompano.

Santa Maria Bay, March 18, one specimen three inches long, seined.

Trachinotus palomo *Jordan and Starks.* Pompano.

Cerros I., March 11, and Ballenas Bay off Abreojos Point, March 16, several specimens two to three inches long taken in the seine.

Cheilodipteridæ. Cardinal Fishes.

Amia retrosella *Gill.* Cardenal.

San Josef I., March 31; Carmen I., April 3; San Francisquito Bay, April 9; southeast end of Tiburon I., April 11; Santa Cruz and Santa Catalina Is., April 16, and Pichilinque Bay, April 17. Numerous specimens were taken by seining.

Amia guadalupensis sp. nov.

Fig. 9.

Head 2.5; depth 2.9; scales in lateral line 26. D. V–I, 10; A, II, 8. Eye 3.5; snout 4.3; interorbital width 3.8 in head; maxillary 2. Body moderately compressed, dorsal and ventral outlines similar. Caudal peduncle very long, deep and compressed, its least depth $\frac{1}{2}$ the greatest depth of the body. Teeth small, conical, recurved, in narrow bands; anterior teeth in upper jaw somewhat enlarged, teeth present on vomer and palatines. Pectoral fin 1.7 in head, reaching beyond tips of ventrals and not quite to origin of anal; ventral 2; soft dorsal and anal similar, high, somewhat falcate; first dorsal spine the highest and strongest, 2.2 in head, second dorsal 1.7, anal 1.8; caudal emarginate, the lobes blunt, 1.6 in head.

Color in spirits, brownish; caudal dusky, narrowly tipped with pale; central rays of spinous dorsal blackish, contrasting sharply with the rest of the fin; other fins pale. The black center of the spinous dorsal is the only distinctive color mark. It appears to be closely related to *A. atrodorsatus* (Heller and Snodgrass) from the Guadalupe Islands, but differs in color markings of vertical fins and in proportions, and to *A. atricaudus* (Jordan & McGregor) from the west coast of Mexico, from which it differs in the structure and color of the dorsal fin.

Type No. 5204, American Museum of Natural History, Guadalupe Island, March 2, one specimen 4 inches long.

Serranidæ. Sea Basses.

Petrometopon panamensis (*Steindachner*).

Concepcion Bay, at the head and fifteen miles below the head, on April 5, 6 and 7, nine specimens.

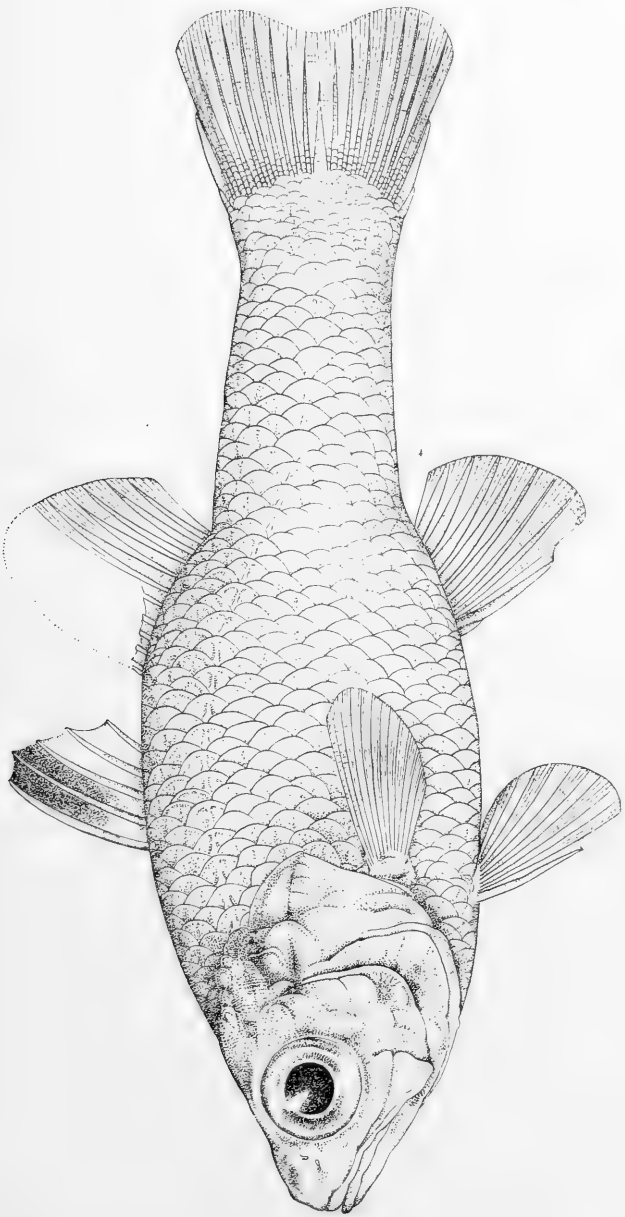

Fig. 9. *Amia guadalupensis* sp. nov.

Dermatolepis punctatus *Gill.*

Santa Catalina I., April 16, one specimen 30 inches long.

Mycteroperca venadorum *Jordan and Starks.*

Angel de la Guardia I., April 16, one specimen about 3 feet long, which contained in its stomach the type specimen of *Bascanichthys bascanoides* sp. nov.

Mycteroperca pardalis *Gilbert.*

San Josef I., March 31; Carmen I., April 3; Concepcion Bay, April 5 and 7; San Francisquito Bay, April 9; Esteban I., April 13, and Ceralbo I., April 19. Numerous specimens of various sizes were taken.

Mycteroperca rosacea (*Streets*).

Angel de la Guardia I., April 10. One adult specimen. Dr. Townsend's color notes on the fresh specimen are, "Plain colored without markings. Graded from orange on the back to light yellow on the belly; the fins, especially the pectorals, similarly graded in color from the upper edge to the lower."

Paralabrax nebulifer (*Girard*). JOHNNY VERDE.

East side of Cerros I., March 11, one specimen on a hand-line.

Paralabrax maculatofasciatus (*Steindachner*). SPOTTED CABRILLA.

Pichilinque Bay, April 17, one specimen. The collection contains three other specimens without data.

Paralabrax clathratus (*Girard*). CABRILLA.

South end of Cerros I., March 12, three specimens.

Diplectrum sciurus *Gilbert.* SQUIRREL-FISH.

Magdalena Bay, March 21, six specimens taken at 13 fathoms in the $3\frac{1}{2}$ ft. Tanner trawl.

Diplectrum radiale (*Quoy and Gaimard*). Squirrel-fish.

Northeast side of Santa Margarita I., March 19, one specimen taken on a hand-line.

Rypticus xanti *Gill.* Soap-fish.

Carmen I., April 3, one specimen.

Lutianidæ. Snappers.

Hoplopagrus güntheri *Gill.* Pargo.

San Josef I., March 31; Mulege, April 4, and Concepcion Bay off Ricason I., April 7, several specimens, seined.

Neomænis novemfasciatus (*Gill*). Black Snapper.

San Jose del Cabo, March 26, numerous specimens taken in fresh water, and Agua Verde Bay, April 2.

Neomænis argentiventris (*Peters*). Yellow Snapper.

Concepcion Bay off Ricason I., April 8, and Pichilinque Bay, April 17, several specimens.

Neomænis colorado (*Jordan and Gilbert*). Mazatlan Red Snapper.

Mulege, at the mouth of the river, one specimen, seined.

Xenistius californiensis (*Steindachner*).

Cerros I., March 11, and Port San Bartholome, March 13, several specimens seined.

Hæmulidæ. Grunts.

Hæmulon sexfasciatum *Gill.*

San Josef I., March 31, Carmen I., April 3, and Pichilinque Bay, April 17, several specimens seined.

Hæmulon steindachneri (*Jordan and Gilbert*).

Pichilinque Bay, March 28, one taken on a hand-line.

Lythrulon flaviguttatum (*Gill*).

Southeast end of Tiburon I., April 12, a dozen young specimens, and Esteban I., April 13, one specimen.

Anisotremus interruptus (*Gill*).

San Josef I., March 31; Esteban I., April 13, and Port San Bartholome, April 23, several specimens seined. These approach *A. surinamensis* somewhat more closely than the type description of *interruptus* does.

Anisotremus davidsoni (*Steindachner*).

Port San Bartholome, April 23, two specimens seined.

Brachydeuterus leuciscus (*Günther*). BURRITO.

Mulege, at mouth of river, April 4, two specimens seined.

Isaciella brevipinnis (*Steindachner*).

Carmen I., April 3, one specimen.

SPARIDÆ. PORGIES.

Calamus brachysomus (*Lockington*).

Pichilinque Bay, March 28, one taken on a hand-line, and Concepcion Bay off Ricason I., April 7, several specimens.

GERRIDÆ.

Eucinostomus californiensis (*Gill*).

Port San Bartholome, March 14 and April 23; Magdalena Bay, March 20 and 21; San Jose del Cabo, March 25; Agua Verde Bay, April 1; Carmen I., April 3; Mulege, at mouth of river, April 4; Concepcion Bay, April 5 to 7. Apparently this is a very abundant species throughout the region as numerous specimens were taken at most of the above localities. At San Jose del Cabo they were taken in fresh water.

Xystæma cinereum (*Walbaum*). Broad Shad.

Magdalena Bay, March 21; San Jose del Cabo, March 26; Agua Verde Bay, April 1 and 2; Carmen I., April 3; Concepcion Bay, April 6 and 7, and Tiburon I., April 11. This species occurred with the preceding, in most of its range, but apparently is not so abundant. The specimens from San Jose del Cabo were taken in fresh water.

Gerres peruvianus (*Cuvier and Vallenciennes*).

Mulege, at mouth of river, April 4, two specimens seined.

Gerres lineatus (*Humboldt*).

Mulege, April 4, two specimens seined.

Kyphosidæ.

Girella nigricans (*Ayres*). Green Fish.

Guadalupe I., March 2; San Benito I., March 9, and Cerros I., March 11, young and adults seined.

Girella simplicidens sp. nov.

Fig. 10.

Head 3.6; depth 2.1. D. XIV, 14; A. III, 12. Scales finely ctenoid; downward and forward from front of soft dorsal to lateral line 7, upward and forward from front of anal to lateral line 15, lateral line 50. Body deep, compressed, upper and lower outlines similar, strongly arched. Eye 5; snout 2.5; interorbital width 3; maxillary 2.8; preorbital equal to eye; preopercle finely serrate. Mouth sub-inferior, transverse, its width 2.6 in head; lips fleshy; premaxillary protractile and very broad, 1.5 in eye; teeth moveable, two to four front rows of simple incisiform teeth, with bands of minute teeth behind these. Gill rakers moderately long, slender, close set and numerous. Pectoral broad, 1.1 in head; ventrals short, not reaching vent, 1.3 in head; dorsal low, not emarginate, the longest spine 2.2, longest ray 2; anal spines rather stout, graduated, the third 2.5; longest ray 1.7; caudal lunate.

Color in spirits, uniformly dark with obscure, darker lengthwise stripes indicated by spots at the centers of the scales.

Type No. 5209, American Museum of Natural History, from San Francisquito Bay, April 8, 9½ inches long.

Besides the type we have two larger specimens, one 13 in. long from Tiburon I., April 11 and one 15 in. long from the type locality, April 8, and one smaller specimen 8 in. long from the east side of Esteban I., April 13.

In the 13 inch specimen the teeth resemble those of the type except for the presence of a small blunt cusp more or less basally situated on each side.

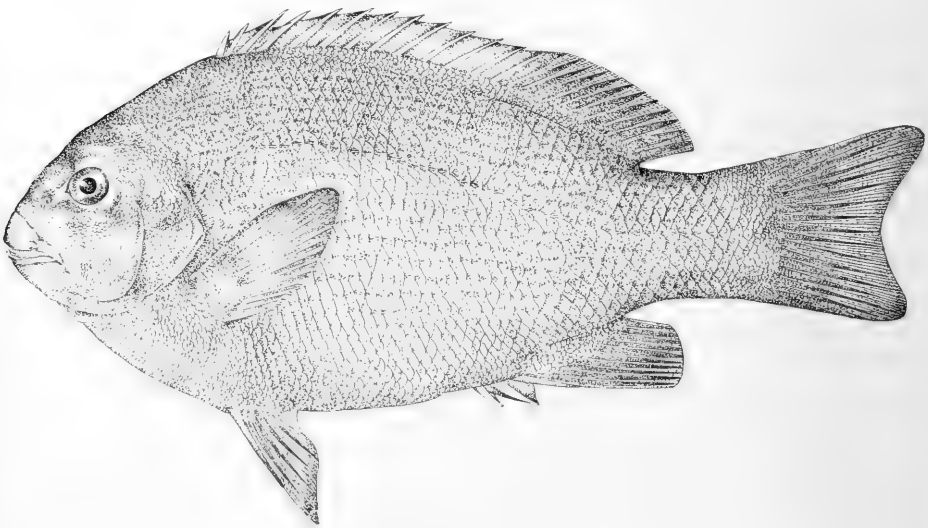

Fig. 10. *Girella simplicidens* sp. nov.

The largest specimen has a few such cusped teeth, the greater number being simple like those of the two smaller specimens. Even when the lateral cusps of these teeth are best developed they are still strongly contrasted with those of *G. nigricans* which are trident with the three cusps nearly equally developed.

Our specimens are still further distinguished from those of *G. nigricans* in the collection by the shorter, deeper body.

Hermosilla azurea *Jenkins and Evermann.*

Cerros I., March 11, four specimens, and Port San Bartholome, April 23, one specimen, seined.

Hermosilla robusta sp. nov.

Fig. 11.

Head 3.7; depth 2; eye 5 in head. D. XI, 10; A. III, 10; scales 9, 52, 19. Body deep, robust; dorsal and ventral outlines rounded, similar. Snout 3; inter-

orbital 2.4; maxillary not quite reaching front of eye, 3.5 in head; preorbital 1.5 in eye. Gill rakers short and stout, about 12 on lower limb of arch, 3 in eye. Dorsal and anal fins each with a basal sheath of scales; soft fins densely scaled. Second anal spine longest, 3.8 in head, longer and stouter than the first and third which are about 4.7 in head; when depressed the second spine reaches about to the tip of

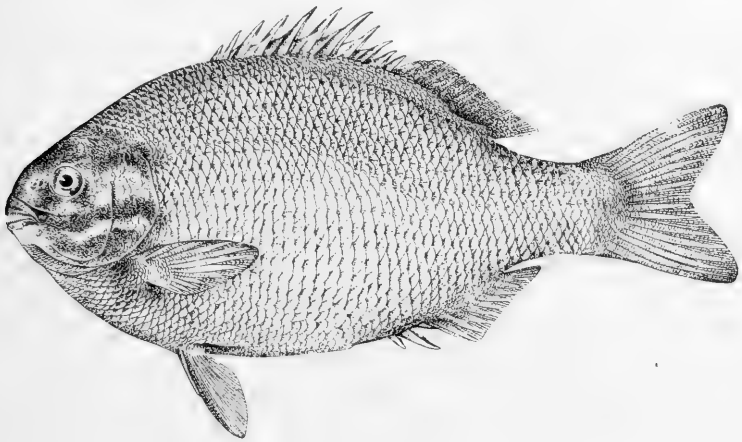

Fig. 11. *Hermosilla robusta* sp. nov.

the third. Ventrals 1.5 in head, reaching slightly more than half way to the origin of the anal.

Color in spirits dusky, somewhat paler below, lacking the cross bands of *azurea;* the fins all dusky; a silvery stripe below eye extending backward on opercle; an intense black blotch in axil of pectoral; the black mark at angle of opercle narrower than in *azurea.*

Type No. 5210, American Museum of Natural History, Tiburon I., April 12, 15 inches long.

Besides the type we have another specimen 14 inches long from Carmen I., April 3, which agrees with it in all essentials. The two differ notably from specimens of *H. azurea,* from the places listed under that species, in the following points; noticeably greater depth in specimens of the same length; the stouter gill rakers; ventral fins not extending so far backward, and the absence of vertical bars on the body.

Kyphosus analogus (*Gill*).

San Josef I., March 31; Carmen I., April 3; Mulege, April 4; Tiburon I., April 11, and Santa Catalina I., April 16, a number of specimens seined.

SCIÆNIDÆ. CROAKERS.

Seriphus politus *Ayres.* QUEEN-FISH.

Port San Bartholome, March 13, one specimen two and a half inches long taken in the seine.

Umbrina roncador *Jordan and Gilbert.* YELLOW-FINNED RONCADOR.

Port San Bartholome, April 23, two specimens seined.

Umbrina xanti *Gill.*

South end of Magdalena Bay, March 20; Mulege River at its mouth, April 4, and Concepcion Bay, April 6, several specimens seined.

Menticirrhus undulatus (*Girard*). CALIFORNIA WHITING.

Ballenas Bay at Abreojos Point, March 16, a dozen specimens seined.

Eques viola *Gilbert.*

San Josef I., March 31; Carmen I., April 3, and Concepcion Bay at various points, April 6 to 8. Seven specimens in all.

EMBIOTOCIDÆ. SURF-FISHES.

Brachyistius frenatus (*Gill*).

Guadalupe I., March 2, a half dozen specimens.

Embiotoca jacksoni *Agassiz.* COMMON SURF-FISH.

San Benito I., March 9, and north and east sides of Cerros I., March 11, several specimens seined.

POMACENTRIDÆ. DEMOISELLES.

Chromis atrilobatus *Gill.*

Santa Catalina I., April 16, one specimen.

Chromis punctipinnis (*Cooper*). BLACKSMITH.

Guadalupe I., March 2, four specimens.

Eupomacentrus rectifrænum (*Gill*).

San Josef I., March 31; Carmen I., April 3; Concepcion Bay, April 4 and 5; San Francisquito Bay, April 9; Tiburon I., April 11; San Esteban I.,

April 13; Santa Cruz I., April 16; Santa Catalina I., April 16, and Pichilinque Bay, April 17. Many specimens were taken by various methods.

Abudefduf saxatilis (*Linnæus*). Sergeant Major.

San Josef I., March 31; Carmen I., April 3; Mulege, April 4, and Concepcion Bay, April 7, a number of specimens.

Hypsypops rubicundus (*Girard*). Garabaldi.

Guadalupe I., March 2, eight specimens.

Labridæ. Wrasses.

Harpe diplotænia *Gill.*

Ceralbo I., April 19, two specimens.

Pimelometopon pulcher (*Ayres*). Fat-head.

Ceralbo I., April 19, two specimens.

Iridio semicinctus (*Ayres*). Kelp-fish.

Southeast part of Tiburon I., April 11, one specimen.

Iridio dispilus (*Günther*).

Head of Concepcion Bay, April 5, one specimen.

Oxyjulis californicus (*Günther*).

North end of Cerros I., March 11, one specimen seined.

Emmeekia venusta (*Jenkins and Evermann*).

Cerros I., off the northern and the southeastern shores, March 11 and 12, two specimens taken in the $3\frac{1}{2}$ ft. Tanner trawl; southeast end of Tiburon I., April 11 and 12, two specimens.

Scaridæ. Parrot Fishes.

Callyodon perrico (*Jordan and Gilbert*).

San Josef I., March 31, one large specimen.

Callyodon microps sp. nov.

Fig. 12.

Head 2.8; the body robust, deep and compressed, depth 2.3. A conspicuous fleshy hump at the nape, extending from before the eyes to the insertion of the dorsal fin. Snout 2; preorbital 3.8; maxillary 3.2; eye very small, 11 in head, 5.5 in snout. Teeth green; no posterior canines; upper lip covering two thirds of the tooth base, the lower about two fifths. Two rows of scales on the cheek, five scales in each row. Gill membranes united, free from the isthmus.

Scales moderate, $2\frac{1}{2}$, 23, $6\frac{1}{2}$; lateral line complete.

Dorsal X, 9, beginning over the insertion of the pectoral, the posterior rays

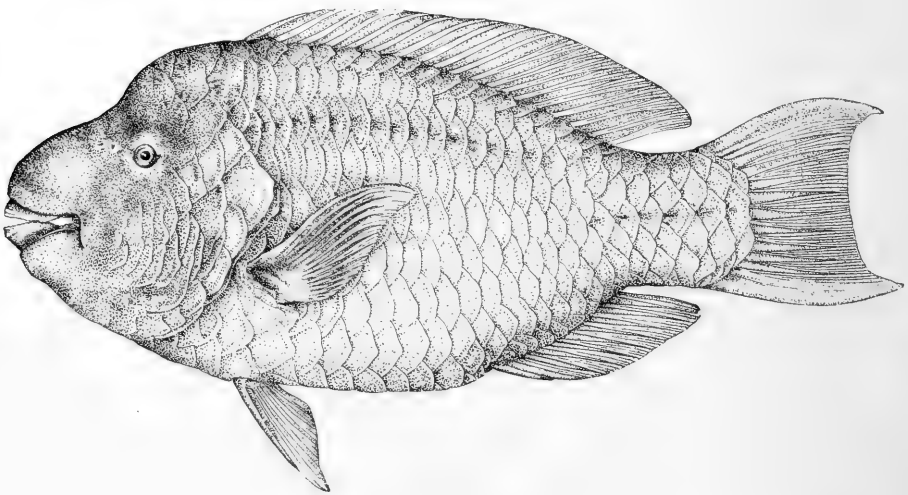

Fig. 12. *Callyodon microps* sp. nov.

highest, the longest 2.5 in head; pectoral bluntly falcate, 1.5 in head; ventrals pointed, 1.8 in head, reaching three fifths of the distance to the vent; anal II, 9, its longest ray 3.3 in head; caudal lunate, its angles strongly exserted, the lobes extending for a distance equal to 2.75 in the snout. Caudal peduncle short and deep, its depth 2.5 in head.

Color in spirits everywhere, including the fins, dark olive green; the fins with more or less dusky, especially so on the middle rays of the caudal..

Type No. 5212, American Museum of Natural History. One specimen 28 inches long, from Santa Catalina I., April 16, 1915.

Like *C. perrico*, but differs in the exserted caudal lobes, the much smaller eye, and minor points.

Callyodon noyesi (*Heller and Snodgrass*).

This species has hitherto been known from the Galapagos Is., from which place it was described in 1903. Kendall and Radcliffe in 1912 listed

it " probably from Perico Island or Panama." In the present collection it appears from two localities, San Josef I., Mch. 31, 1911, one specimen 23 inches long, and Concepcion Bay, off Ricason I., three specimens of about the same size. Although these specimens differ from the description somewhat in proportions and coloration, the differences hardly warrant their separation as a distinct species. The description of the San Josef specimen is as follows:

Body compressed, elliptical, dorsal and ventral outlines similar, depth 2.7. Head large, rather pointed, 3 in body. Eye small, 3.4 in snout, 2.5 in preorbital. Snout 2.4 in head. Gape of mouth 4.5 in head. Teeth whitish, the tessellation evident; central suture prominent; posterior canines moderate, 2 on one side and 2 and a rudiment on the other. Scales on cheek in two and a half rows. Scales of body $2\frac{1}{2}$, 25, $6\frac{1}{2}$; six before dorsal. Dorsal IX, 10; the highest spine 2.9 in head, the highest ray 2.6. Anal II, 9, increasing slightly in height posteriorly, the longest ray 3 in head. Pectoral narrowly rounded, 1.4 in head. Ventrals pointed, nearly 2 in head, reaching a little more than half way to vent. Caudal peduncle long and rather slender, 2.4 in head. Caudal fin with nearly straight hind margin, but its angles much exserted and pointed, projecting a distance equal to .4 of the head beyond the median portion of the fin.

Color in spirits, uniform yellowish white, except for a faint indication of lengthwise stripes on the sides below and dusky marks about the lower jaw; central rays of caudal very narrowly tipped with dusky.

The following color notes in life were made by Dr. Chas. H. Townsend when the specimen was taken: Pale cream or milky white color, with all markings in pale light blue. Blotches around orbit; fins, except ventrals, all bordered (only the upper edge of the pectoral so marked), a spot at the base of the caudal, and about five striped on the side, all of this color.

Callyodon compressus sp. nov.

Fig. 13.

Body much compressed, deep, 2.5 in length, lower outline more arched than upper. Head 3, moderately pointed, slightly humped over the eyes. Eye 3.7 in snout, 8.5 in head, 2.2 in preorbital, vertical distance above eye one half that from eye downward. Gape of mouth 4 in head. Snout 2.3. No canine teeth present. Scales on cheek in two and a half rows, 6, 5, 2, those of the upper row somewhat larger. Scales of body $2\frac{1}{2}$, 25, $6\frac{1}{2}$; six before dorsal.

Dorsal IX, 10, about even throughout its length, highest spine 2.4 in head, longest ray 2.6. Anal II, 9, longest ray 2.5 in head. Pectoral pointed, extending beyond tips of ventrals, 1.4 in head. Ventrals 1.6 in head, extending more than half way to vent. Caudal weakly lunate, its outer rays scarcely exserted. Caudal peduncle deep and compressed, its least depth 2 in head.

Color in alcohol, brownish, slightly darker along back; dorsal, caudal and anal fins dusky, the anal with a lighter margin. Paired fins pale. Teeth whitish, with indications of rosy toward the base.

Type No. 5205, American Museum of Natural History.

Concepcion Bay off Ricason Pt., April 7, 1911. Only the type specimen taken, total length 19 inches.

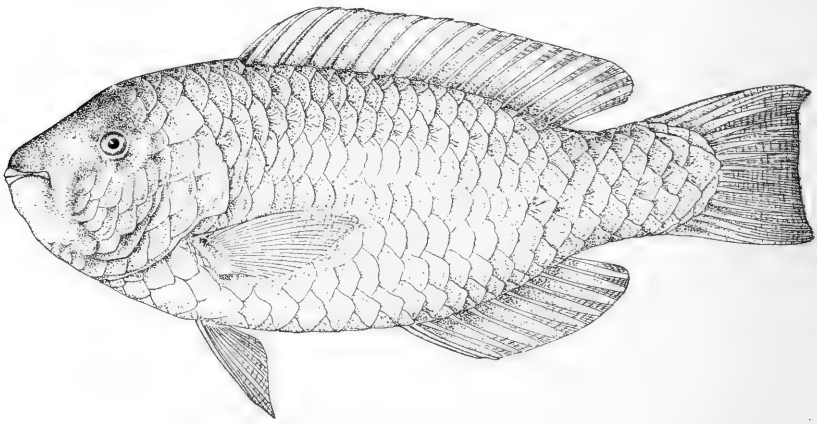

Fig. 13. *Callyodon compressus* sp. nov.

EPHIPPIDÆ. SPADE FISHES.

Chætodipterus zonatus (*Girard*). SPADE-FISH.

Santa Maria Bay, March 18, two young specimens seined.

CHÆTODONTIDÆ. BUTTERFLY FISHES.

Holocanthus passer *Valenciennes.*

Santa Cruz I., April 16, a single specimen.

TEUTHIDIDÆ. SURGEON FISHES, TANGS.

Xesurus punctatus (*Gill*).

Santa Catalina I., April 16, two specimens, each about 18 inches long.

BALISTIDÆ. TRIGGER FISHES.

Balistes polylepis *Steindachner.*

Pichilinque Bay, March 27; Carmen I., April 3; Concepcion Bay off Ricason I., and also at the head of the Bay, April 6; Angel de la Guardia I.,

April 10; Tiburon I., April 11. Specimens ranging in size from 7 to 18 inches were taken, on hand-lines, and by other methods.

Pachynathus capistratus (*Shaw*).

San Josef I., March 31; Santa Catalina I., April 16; Pichilinque Bay, April 17, and Ceralbo I., April 20, one or two specimens taken at each of these localities.

TETRAODONTIDÆ. SWELL FISHES.

Sphæroides lobatus (*Steindachner*).

Cape San Lucas, March 23, one young specimen $3\frac{1}{2}$ inches long.

Sphæroides annulatus (*Jenyns*).

Port San Bartholome, March 13 and April 23; Santa Maria Bay, March 18; Magdalena Bay, March 20; Pichilinque Bay, March 27; Agua Verde Bay, April 1; Concepcion Bay, April 7, and Tiburon I., April 11. One to several specimens taken at each locality, mostly by seining, but one was taken on a hand-line. Two specimens from San Bartholome have the small spots of the variety *politus*.

Ovoides setosus (*Rosa Smith*).

Cape San Lucas, March 23, three specimens seined, and Ceralbo I., April 20. Two of the specimens from Cape San Lucas were blue-black in color, with rounded yellow spots, while the third was black with vermiculations of yellow. The Ceralbo specimen was yellowish all over except for a black bar across the pectoral and dorsal. All were approximately of the same size.

DIODONTIDÆ. PORCUPINE FISHES.

Diodon hystrix *Linnæus*. PORCUPINE FISH.

Cape San Lucas, March 23 and 24; San Josef I., March 31; Agua Verde Bay, April 1; Carmen I., April 3, and Espiritu Santo, April 20, one or more specimens at each place. At Espiritu Santo they are injurious to the pearl oysters.

The color markings on these specimens intergraded from *D. hystrix* to *D. holocanthus*, and in some of them the frontal spines were larger than the

post-pectoral, after the manner of *D. holocanthus.* Jordan and Evermann (Fishes of North and Middle America, Bull. 47, U. S. Nat. Mus., pp. 1745–6) suggest that these supposed species may be identical. The Lower California specimens support this hypothesis.

SCORPÆNIDÆ.

Sebastopsis xyris *Jordan and Gilbert.*

Carmen I., April 3; San Francisquito Bay, April 9; southeast end of Tiburon I., April 11; Esteban I., April 13; Santa Catalina I., April 16. Numerous specimens, ranging in size from a half inch in length to adult, were taken by seining.

Scorpæna guttata *Girard.* SCORPION-FISH.

Guadalupe I., March 4; Cerros I., March 12; Port San Bartholome, March 13, and Esteban I., April 12, a single specimen at each locality, taken in the seine.

Scorpæna mystes *Jordan and Starks.* SCORPION-FISH.

Pichilinque Bay, March 27, one taken at the electric light lure, and Carmen I., April 4, one taken in the seine.

Scorpæna sonoræ *Jenkins and Evermann.* SCORPION-FISH.

Santa Maria Bay, March 18; Magdalena Bay, March 21, and Agua Verde Bay, April 1. At Magdalena Bay one specimen was taken at 13 fathoms in the Tanner Trawl; those from the other stations were seined.

COTTIDÆ. SCULPINS.

Icelinus quadriseriatus (*Lockington*).

Cerros I., March 12, and Port San Bartholome, March 13, a single specimen taken at each place by means of the boat ($3\frac{1}{2}$ ft. Tanner) dredge, in shallow water.

Clinocottus analis (*Girard*).

San Benito I., March 9, one specimen seined.

GOBIIDÆ. GOBIES.

Philypnus lateralis *Gill.*

San Jose del Cabo, March 26, a dozen specimens seined in fresh water.

Dormitator maculatus (*Bloch*).

San Jose del Cabo, March 26, one specimen, and Agua Verde Bay, April 2, several dozen specimens, ranging in size from one half to four inches long. All were taken by the seine in fresh water.

Eleotris pictus (*Kner and Steindachner*).

San Jose del Cabo, March 25, three specimens seined in fresh water.

Gobius saggitula (*Günther*).

Agua Verde Bay, April 2, six specimens seined.

Awaous taiasica (*Lichtenstein*).

San Jose del Cabo, March 26, a dozen specimens seined in fresh water.

Zalypnus emblematicus (*Jordan and Gilbert*).

San Josef I., March 31, one specimen, one and a half inches long.

Gobiosoma histrio *Jordan.*

San Francisquito Bay, April 9, one specimen.

Gobiosoma crescentale *Gilbert.*

Agua Verde Bay, April 11, two specimens, one and a half inches long, taken in the seine. Hitherto the species has been known only from the type specimen.

MALACANTHIDÆ.

Caulolatilus princeps (*Jenyns*).

Guadalupe I., March 2, one specimen, and Cerros I., March 10, three specimens, all taken on hand-lines.

DACTYLOSCOPIDÆ. SAND STAR-GAZERS.

Gillellus arenicola *Gilbert.*

Cape San Lucas, March 23, two specimens, about one and a half inches long, taken in the seine.

Dactyloscopus lunaticus *Gilbert.*

Cape San Lucas, March 23, a dozen specimens, and San Josef I., March 31, one taken. All were captured in the seine.

Dactyloscopus cinctus, sp. nov.

Fig. 14.

Head 4; depth 6; D. about 43, spines weak, indistinguishable from rays; A. II, 33. Body compressed, tapering rather evenly backward from the insertion of the pectorals. Head cuboid behind the eyes, abruptly conical in front, the profile straight, top of head flat. Eye slightly longer than snout, 5.5 in head. Snout 6. Maxillary

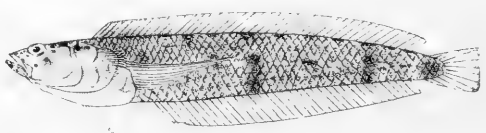

Fig. 14. *Dactyloscopus cinctus* sp. nov.

reaching posterior edge of pupil, 3.5 in head. Interorbital width half the diameter of the eye. Opercle fringed with about 20 teeth, the upper six or seven rather deeply incised.

Dorsal continuous, beginning just behind nape and well in front of anal origin. Pectoral pointed, equal to head. Ventrals a little less than one half the head. Caudal a little more than one third of the head.

Scales 53. Anterior portion of lateral line running up close to base of the dorsal fin, thence descending abruptly over three rows of scales and continuing posteriorly on the middle of the side; anterior portion contained three and a third times in the posterior portion.

Color in alcohol, faintly purplish gray, more or less straw-colored about the head. A conspicuous purplish black cross-bar at about the middle of the body, interrupted on the upper part of the side; a similar bar about half way between this and base of caudal, and a short bar across the upper part of the side just behind the head; a dark blotch at base of caudal; dark linear spots on middle line of side at intermediate points; a linear pearly white spot on midline of side on either side of median and

posterior cross-band; a pearly white blotch on opercle and a line of the same color downward from eye; a series of dark spots on mid-dorsal line and small dots on the upper side of the head.

Type No. 5206, American Museum of Natural History, Cape San Lucas, March 23, 1911, length 1.3 inches, taken in seining. Two other specimens about the same size and corresponding remarkably well in color were taken at the same time.

Dactylagnus mundus *Gill.*

South end of Magdalena Bay, March 20, one specimen seined.

Myxodagnus opercularis *Gill.*

Cape San Lucas, March 23, two specimens, one $1\frac{1}{4}$ inches, the other $1\frac{3}{4}$ inches in length, both taken in the seine.

URANOSCOPIDÆ. STAR-GAZERS.

Astroscopus zephyreus *Gilbert and Starks.*

Ballenas Bay, March 16, one specimen 8 inches long taken in the seine. Only two specimens hitherto known.

BATRACHOIDIDÆ. TOAD-FISHES.

Porichthys notatus *Girard.* MIDSHIPMAN.

San Bartholome Bay, March 13; Santa Maria Bay, March 18, and Magdalena Bay, March 21. Specimens were seined at all three places, and one was taken at 13 fathoms by the trawl at Magdalena Bay.

GOBIESOCIDÆ. CLING-FISHES.

Gobiesox adustus *Jordan and Gilbert.*

San Francisquito Bay, April 9, one specimen.

Gobiesox funebris *Gilbert.*

San Francisquito Bay, April 9, numerous specimens taken at the shore.

Arbaciosa humeralis (*Gilbert*).

San Francisquito Bay, April 9, a dozen specimens taken at the shore.

Arbaciosa eos (*Jordan and Gilbert*).

San Francisquito Bay, April 9, two specimens, and Angel de la Guardia I., April 11, ten specimens, taken at the edge of the shore.

BLENNIIDÆ. BLENNIES.

Gibbonsia elegans (*Cooper*). SPOTTED KELP-FISH.

South end of Cerros I., March 12; two specimens.

? **Malacoctenus delalandi** (*Cuvier and Vallenciennes*).

San Benito I., March 9, one specimen an inch long, apparently belongs to this species.

Labrisomus xanti *Gill.*

Port San Bartholome, March 14; south end of Magdalena Bay, March 20, and Cape San Lucas, March 24, taken with the seine. Those from Cape San Lucas were only about an inch in length.

Exerpes asper (*Jenkins and Evermann*).

Pichilinque Bay, March 27, two specimens taken at the electric light lure.

Runula azalea *Jordan and Bollman.*

Cape San Lucas, on the evenings of March 23 and 24, when a couple of dozens of specimens were taken about the electric light lure.

Hypsoblennius gentilis (*Girard*).

Port San Bartholome, March 14, and Concepcion Bay, April 7, about a dozen specimens in all were taken with the seine.

Emblemaria oculocirris *Jordan.*

San Josef I., March 31, one specimen.

Lucioblennius alepidotus *Gilbert.*

Cape San Lucas, March 23; three specimens seined, and Carmen I., April 3, one specimen taken in shallow water with the $3\frac{1}{2}$ ft. Tanner trawl.

Our specimens range in size from one to two inches, and are more elongate than the description, the head varying from 3.5 to 4, instead of 3.25. Hitherto only two specimens have been known.

Lucioblennius lucius sp. nov.

Fig. 15.

Head 3; depth 4 in head; body elongate compressed throughout; the head flat above, broader and deeper than the body; jaws pike-like, elongate, depressed and broadly rounded in front. Eyes placed high, close together, 6 in head. Mouth wide, maxillary 1.9 in head, extending well beyond the posterior border of the eye; snout 3.5; lower jaw slightly projecting; teeth rather strong, in narrow bands, a single series on the sides of the lower jaw, a few teeth on the vomer. Body scaleless.

Ventral fins 2.3 in head, composed of one spine and two soft rays, inserted

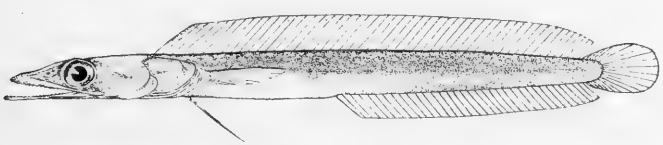

Fig. 15. *Lucioblennius lucius* sp. nov.

slightly in front of the pectorals which they equal in length. Dorsal about 50, anal about 35, both fins continuous and rather low, the rays and spines not well differentiated; dorsal beginning on nape over the anterior part of the opercle, the anterior spines the longest, about equal to eye; anal origin nearer base of caudal than tip of snout; caudal short.

Color in alcohol, pale olive; a row of small distinct, pearly white specks along upper part of side, each speck connected with its fellow of the opposite side across the back by one or two less distinct specks; other pearly white dots on the side and the lower half of the head of the same color. Anterior part of dorsal fin with a few blackish markings.

Type No. 5207, American Museum of Natural History, 1.5 inches long, San Josef Island, March 31, 1911. Another similar specimen of about the same size taken with the type.

Ulvicola sanctæ-rosæ *Gilbert and Starks.*

Guadalupe I., March 3, two specimens.

OPHIDIIDÆ. CUSK EELS.

?Otophidium galeoides (*Gilbert*).

Cape San Lucas, March 23, one mutilated specimen, the head only preserved.

BROTULIDÆ.

Ogilbia ventralis (*Gill*).

Carmen I., April 3, and at the head of Concepcion Bay, April 6, four specimens in all.

PLEURONECTIDÆ. FLOUNDERS.

Hippoglossina macrops *Steindachner.*

Cerros I., March 12, one young specimen taken in the $3\frac{1}{2}$ ft. Tanner trawl.

Paralichthys californicus (*Ayres*). BASTARD HALIBUT.

Port San Bartholome, March 14, and again on April 23; Ballenas Bay, March 16, and Magdalena Bay, March 20. Numerous specimens were seined, of which only two were sinistral, one from Ballenas Bay and one from Magdalena Bay.

Pleuronichthys verticalis *Jordan and Gilbert.*

Cerros I., March 11; Port San Bartholome, March 13; and Magdalena Bay, March 21, a single specimen from each locality. At Magdalena Bay the specimen was dredged in 13 fathoms.

Hypsopsetta guttulata (*Girard*). DIAMOND FLOUNDER.

Port San Bartholome, March 13 and 14, and Ballenas Bay, March 16, four specimens in all were seined.

Platophrys leopardinus (*Günther*).

Cape San Lucas, March 23, two specimens seined.

Syacium ovale (*Günther*).

Carmen I., April 3, one specimen seined.

Citharichthys gilberti *Jenkins and Evermann.*

San Jose del Cabo, March 26, one specimen seined in fresh water.

Etropus crossotus *Jordan and Gilbert.*

Ballenas Bay at Abreojos Point, March 16; Santa Maria Bay, March 18; Magdalena Bay, March 20 and 21, and Port San Bartholome, April 23. Numerous specimens were seined, and at Magdalena Bay a number were taken at 13 fathoms.

SOLEIDÆ. SOLES.

Symphurus fasciolaris *Gilbert.*

Port San Bartholome, March 13, Carmen I., April 3, and Tiburon I., April 12, seined, one specimen from each locality.

Symphurus atricaudus (*Jordan and Gilbert*).

Cerros I., March 12; Port San Bartholome, March 13, and Cape San Lucas, March 23, one specimen seined at each place.

Symphurus williamsi *Jordan and Culver.*

Cape San Lucas, March 23, one taken in the seine.

Diagnoses of Twenty-three New Species and a New Genus of Lizards from Lower California

By M. C. Dickerson

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Article X.—DIAGNOSES OF TWENTY-THREE NEW SPECIES AND A NEW GENUS OF LIZARDS FROM LOWER CALIFORNIA

By M. C. Dickerson

This preliminary statement of diagnoses of new species precedes a larger preliminary paper on the lizard fauna of Lower California and the Southwest, which will include descriptions and discussions, illustrations, reviews of various genera, with maps and keys.

The twenty-three species presented here are based on material collected by the Albatross Expedition to Lower California in 1911, under the auspices of the United States Bureau of Fisheries and The American Museum of Natural History. The types are to be deposited in the United States National Museum.

Among the forms represented, some are species of great distinctness, more or less remote from all other known forms, such as the two species of *Sauromalus* from San Esteban and La Paz; others, like the two Ctenosauras from San Esteban and Cerralvo, are species by island isolation, restricted to their type localities, and showing relatively close relationship with well-known mainland forms. The two species introducing the new genus *Sator* are primitive forms of considerable interest in the phylogenetic history of the Iguanidæ.

1. **Ctenosaura conspicuosa,**[1] new species

Type.—A. M. N. H. No. 5027, ♂. Collector, C. H. Townsend, Albatross Expedition, April 13, 1911.

Paratypes.—A. M. N. H. Nos. 5640 ♀, 2278, 2693, 2695, 5639.

Type Locality.—San Esteban Island, Gulf of California, Mexico.

Diagnosis.—Closely related as shown by scutellation to *Ctenosaura hemilopha* Cope, of the Cape Region. Size extremely large, total length exceeding 650 mm. in the large males, for which the following characters are diagnostic: series of high scales of the crest ending more or less abruptly at a point opposite the middle of the adpressed upper arm, the small keeled scales which continue along the vertebral line traceable to various points beyond the middle of the body and anterior to the rump; scales of dorsal tibia with strong sharp keels and spines, of dorsal foot with strong spines; tail spinous dorsally and laterally throughout its length; enlarged scales in the posterior rows of the caudal whorls (first half of tail) only moderate in size, length

[1]Because of its yellowish white color, this giant lizard is very conspicuous on the rocks of San Esteban, as is also the big yellow *Sauromalus* (*S. varius*, new species).

of largest equal to 9 dorsal scales, often exceeded by tallest spines of dorsal crest; width of the widest whorl (2 rows dorsally) very much less than distance from nostril to anterior orbit; base of 5th to end of 4th toe equal to distance from anterior border of ear to end of muzzle. Color light yellowish; black or intensely dark brown on gular region and fold, breast and thoracic region to the line of the wrists (when arms adpressed), also axilla and lateral area as high as the dorsolateral line; a short lenticular black spot crosses the back between the points of insertion of the arms (its middle corresponding with line of axillas), connected at its narrowed ends with somewhat irregular, longidutinal lines of black which, with the lenticular spot, mark out a rectangle containing a central black spot, while a smaller black spot anteriorly on the spines of the crest indicates the middle of the anterior boundary of the rectangle; also a straight band of black crosses the back on a line with the elbows, curving abruptly at the sides to join the black below the dorsolateral line.

Measurements of the Type.—Total length, 668 mm.; tip of muzzle to anus, 286; tail, 382; tip of muzzle to fold, 102; tip of muzzle to posterior border of ear, 71; head width, 60; hind leg, 170; base of 5th to end of 4th toe, 64.

The largest females in the collection are only about two-thirds the size of the large males; the crest is very low, all trace of it ending at about the middle of the body, the foot has a proportionate length as in the males, but the head is much smaller and shorter, so that from base of 5th to end of 4th toe considerably exceeds length of head from anterior ear to end of muzzle; the enlarged scales of the caudal whorls are relatively smaller, and the coloration is darker, with 7 narrow light bands between rump and axilla more or less conspicuous.

Measurements of No. 5640 ♀.—Total length, 552 mm.; tip of muzzle to anus, 207; tail, 345; tip of muzzle to fold, 66; shielded part of head, 43; head width, 35; head width across middle of orbits, 23; axilla to nostril, 81; axilla to anterior border of ear, 46; width of widest caudal whorl, 8.5; hind leg, 125; base of 5th to end of 4th toe, 49.

Comparison of the measurements of *Ctenosaura townsendi*, new species, and *Ctenosaura conspicuosa* shows that the *Ctenosaura* on Cerralvo Island is a species of considerably stouter build, with greater breadth of head and shorter neck than the San Esteban form.

2. **Ctenosaura insulana,** new species

Type.—A. M. N. H. No. 2694, ♂. Collector, C. H. Townsend, Albatross Expedition, April 19, 1911.

Paratypes.—A. M. N. H. Nos. 5641 ♀, 5568–5569, immature.

Type Locality.—Cerralvo Island, Gulf of California, Mexico.

Diagnosis.—With close resemblance in scutellation to *Ctenosaura hemilopha* Cope, of the Cape Region. Total length often exceeding 600 mm. in the large males, for which the following characters are diagnostic: high scales of the crest graduated to a point on a line just posterior to the elbows, small keeled crest scales traceable about two-thirds the distance to the rump; scales on dorsal tibia smooth or very weakly keeled, dorsal scales on foot without spines or very shortly mucronate; tail spinous to the end; scales in posterior rows of the caudal whorls very large on first half of tail, length of largest equal to 14 dorsal scales, not exceeded by length of tallest scales in

crest;' width of the whorl (2 rows dorsally) equal to distance between nostril and anterior angle of orbit; base of 5th to end of 4th toe equal to distance from anterior ear to nostril; femoral pores, 5–6. Color light yellowish, with gular region, breast, and arms black; short transverse bar of black posterior to points of arm insertion (its anterior margin about on line of axillas), connected at ends with narrow longitudinal straight lines of black forming a square open on anterior side, containing black spot at center on crest; a second black bar crosses back posterior to this, curving downward and backward to meet black of breast.

Measurements of the Type.—Total length, 608 mm. +; tip of muzzle to anus, 295; tail, 313 + (reproduced); tip of muzzle to fold; 113; tip of muzzle to posterior border of ear, 84; anterior border of ear to nostril, 62; head width, 74; hind leg, 166; base of 5th to end of 4th toe, 62.

The largest females in the collection measure only two-thirds the length of the large males; the crest is very low, ending about the middle of the body, the foot has a proportionate length as in the large males but the head is smaller and shorter (so that length from base of 5th to end of 4th toe greatly exceeds distance from anterior ear to nostril); the enlarged scales of the caudal whorls are smaller; the general coloration is darker and the color pattern retains the transverse light bands, or series of spots (7 between rump and axilla) of the immature.

Measurements of No. 5641 ♀.—Total length, 471; tip of muzzle to anus, 191; tail, 280; tip of muzzle to fold, 62; shielded part of head, 43; head width, 38; head width across middle of orbits, 25; axilla to nostril, 74; axilla to anterior border of ear, 42; width of widest caudal whorl, 10; hind leg, 120; base of 5th to end of 4th toe, 47.

3. **Sauromalus interbrachialis,**[1] new species

Type.—A. M. N. H. No. 6809. Collector, C. H. Townsend, Albatross Expedition, March 27, 1911.

Paratype.—A. M. N. H. No. 6808 (immature).

Type Locality.—La Paz, Lower California, Mexico.

Diagnosis.—Size medium, 280 mm. total length of largest specimen known (U. S. N. M. No. 12633); nuchal scales smooth, not as large as the largest head scales, scarcely larger than the supraoculars; very much smaller than the largest preauricular scale; scales on postauricular folds tubercular, not greatly enlarged; dorsal scales relatively smooth, small, from 26 to 30 in a head length; ventral scales from gular fold to anus, 133; femoral pores, 14. Color tawny brown sprinkled evenly with small dark spots everywhere dorsally and laterally between nape and tail, less conspicuously on dorsal surfaces of legs, on the breast and gular region, and below the lateral fold to the groin; a double dark bar over the back between the arms, with faint indications of a similar double bar anteriorly and three posteriorly.

Measurements of the Type.—Total length, 250 mm.; length of head and body to anus, 129; tail length, 130; tip of muzzle to posterior border of ear, 30, to gular fold, 46; head width, 27; hind leg, 74; hind foot, 31; base of 5th to end of 4th toe, 23.

The medium-sized chuckwalla collected in 1882 by L. Belding on the island of Espiritu Santo is *Sauromalus interbrachialis* (U. S. N. M.

[1]With reference to the double dorsal bar between the arms.

No. 12633; Belding, 1887, West American Scientist, III, p. 97; Stejneger, 1891, Proc. U. S. Nat. Mus., XIV, p. 409). It is a somewhat larger, older specimen than the type from La Paz.

Belding's specimen from Espiritu Santo, examined through the courtesy of Dr. Stejneger, measures 280 mm., total length; 183, tail length; it has 139 ventral scales from gular fold to anus, and 26 dorsal scales in a head length; femoral pores, 15.

4. **Sauromalus townsendi,**[1] new species

TYPE.—A. M. N. H. No. 5643, ♂ Collector, C. H. Townsend, Albatross Expedition, April 12, 1911.

TYPE LOCALITY.—Tiburon Island, Gulf of California, Mexico.

DIAGNOSIS.—General resemblance to *S. ater* Duméril but with coarser scutellation throughout, especially on extremities. Size medium, length of type (adult, but probably not full-grown; also tail reproduced) 302 mm.; dorsal scale rows in head length, 28; ventrals from gular fold to anus, 125; number of scales around thick part of tail, 80–90; femoral pores, 14. Coloration yellowish, with head, shoulders, brachials, gular region, and anterior breast, also lumbar region and hind legs dorsally and ventrally, very dark brown, and an irregular freckling of the same color dorsally and ventrally over the yellow between.

MEASUREMENTS OF THE TYPE.—Total length, 302 mm.; head and body to anus, 166; tail, 125+ (reproduced); tip of muzzle to posterior border of ear, 39, to gular fold, 55; head width, 36; hind leg, 100; hind foot, 46; base of 5th to end of 4th toe, 34.

This is possibly the species reported by L. Belding from Guaymas in 1887 (West American Scientist, III, p. 97). Its resemblance to *S. ater* Duméril may signify connection with that species in Sonora in former times if not to-day.

5. **Sauromalus varius,** new species

TYPE.—A. M. N. H. No. 5633. Collector, C. H. Townsend, Albatross Expedition, April 13, 1911.

PARATYPES.—A. M. N. H. Nos. 2698–2702, 5026, 5610–5632, 5634–5638, 5706–5708.[2]

TYPE LOCALITY.—San Esteban Island, Gulf of California, Mexico.

COMMON NAME.—Piebald Chuckwalla.

DIAGNOSIS.—Size very large, sometimes exceeding 600 mm.; nuchal scales somewhat enlarged medially, smaller than largest head scales and preauricular scales, with only faint tendency to formation of spines posteriorly; postauricular scales small; dorsal scales smooth, median subquadrangular, lateral with tendency to

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[1]Named in honor of C. H. Townsend, leader of the Albatross Expedition, 1911.

[2]Three additional specimens are mounted and on exhibition in the Lower California Habitat Group of lizards, and A. M. N. H. No. 2701 has been made into a study skeleton.

formation of posterior spine; dorsals small, larger in mid-dorsal region especially anteriorly, rows in head length near median line 28, 15 mm. distant from median line, 37; number of ventral scale rows from gular fold to anus, 143 (average in 15 specimens); scales around thickest part of tail, 72 (average in 15 specimens); femoral pores not variable, averaging 17. General color light yellowish to light reddish brown, with irregular blotching and mottling of dark over all dorsal and lateral surfaces, giving a piebald appearance.

Measurements of the Type.—Total length, 547 mm.; head and body to anus, 250; tail length, 297; tip of muzzle to posterior margin of ear, 58, to gular fold, 84; head width, 58; hind leg, 155; foot, 70; base of 5th to end of 4th toe, 54.

6. **Callisaurus carmenensis,** new species

Type.—A. M. N. H. No. 5388, ♂. Collector, C. H. Townsend, Albatross Expedition, April 2, 1911.

Paratype.—A. M. N. H. No. 5389, ♀.

Type Locality.—Carmen Island, Gulf of California, Mexico.

Diagnosis.—A small *Callisaurus* rather closely related to *C. plasticus*, new species, but with finer scutellation throughout, especially noticeable in dorsals, scales forming denticulated margin of gular fold, on chest posterior to gular fold, inferior shoulder patches of enlarged scales, and tibials; femoral pores variable, averaging 14. Blue lateroventral area very small changing to purplish brown posteriorly; black lateroventral bands obscure, short and narrow, parallel, somewhat curved; tail black-spotted below only.

Measurements of the Type.—Head and body to anus, 62 mm.; tail length, 58+ (reproduced); tip of muzzle to posterior margin of ear, 16, to gular fold, 21; head width, 13; hind leg, 62; hind foot, 30; base of 5th to end of 4th toe, 26.

7. **Callisaurus inusitatus,**[1] new species

Type.—A. M. N. H. No. 5324, ♂. Collector, C. H. Townsend, Albatross Expedition, April 13, 1911.

Paratypes.—A. M. N. H. Nos. 5317–5337, 5339–5341, 5344–5346, 5397.

Type Locality.—Tiburon Island, Gulf of California, Mexico.

Synonyms.—*Callisaurus draconoides ventralis* (part), Cope, 1898 (1900), Rept. U. S. Nat. Mus., p. 273; *Callisaurus ventralis ventralis* (part), Stejneger and Barbour, 1917, Check List, p. 47.

Diagnosis.—Size large, adults often exceeding 200 mm. total length. Hind leg equal to or longer than distance from snout to anus, reaching beyond muzzle when stretched forward along body; femoral pores, 18 (average of 29 specimens). Black lateral bands, 2; very oblique forward, long but variable in width, irregular in outline; usually obscurely marked, united inferiorly along the margin of the blue area, producing between them a conspicuous U-shaped blue spot below the lateral fold. Blue lateroventral area prominent and extending nearly to groin. Ventral tail white with 6–9 black crossbands; dorsal caudal surface brown with markings brown not black.

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[1]With reference to the union inferiorly of the black lateroventral bands, unknown in any other species of *Callisaurus* or in *Holbrookia*.

Measurements of the Type.—Length of head and body to anus, 93 mm.; tail length, 109; tip of muzzle to posterior margin of ear, 19, to denticulated gular fold, 27; head width, 15; hind leg, 80; hind foot, 37; base of 5th to end of 4th toe, 32.

I have what seems to be this species (female specimen only) also from Guaymas, Sonora, Mexico, in the W. W. Brown collection loaned for study by the Museum of Comparative Zoology. *C. inusitatus* may possibly intergrade with *C. ventralis ventralis* (Hallowell) somewhere in Sonora.

8. **Callisaurus plasticus,**[1] new species

Type.—A. M. N. H. No. 5349, ♂. Collector, C. H. Townsend, Albatross Expedition, April 1, 1911.

Paratypes.—A. M. N. H. Nos. 5308–5316, San José Island, Nos. 5346–5348, 5350, Aqua Verde Bay, Nos. 5357–5368, Mulege, Nos. 5351–5356, Concepcion Bay (south end), Nos. 5381–5387, San Francisquito Bay, Lower California.

Type Locality.—Aqua Verde Bay, Lower California, Mexico.

Synonym.—*Callisaurus draconoides* Blainville (part), Cope, 1898 (1900), Rept. U. S. Nat. Mus., p. 269.

Diagnosis.—Total length of adult seldom exceeding 170 mm. Hind leg in male about equal to length from snout to anus, extending considerably beyond the muzzle when stretched forward along body. Tail much longer than distance from snout to anus. Number of femoral pores highly variable, 13–19, averaging 15 (39 specimens). An irregular broad band of blue below the lateral fold from just posterior to axilla nearly to the groin; in this two black bands, straight, oblique forward, extending some distance on to the dorsolateral surface, narrowed where they cross the lateral fold and more or less broadened and rounded at their inferior ends (shape of bands extremely variable, the second may have extension toward groin); dorsal caudal surface in male without black bands.

Measurements of the Type.—Total length, 159 mm.; head and body to anus, 64; tail length, 95; tip of muzzle to posterior margin of ear, 16, to gular fold, 21; head width, 12.5; hind leg, 63; hind foot, 31; base of 5th to end of 4th toe, 25.

This species very possibly, in fact probably, intergrades with *Callisaurus ventralis ventralis* (Hallowell) north of the middle of the length of the Gulf side of the peninsula. I have no specimens, however, from localities where anything more than great variability in the southern species is shown. Heretofore, *Callisaurus plasticus*, new species, has been confused with *Callisaurus draconoides* Blainville. Cope's description is mainly from a specimen of the former, his drawings from a specimen of the latter. *C. draconoides* Blainville is limited to the Cape Region.

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[1]From *plasticus*, "fit for molding," with reference to the variable character of the species, especially conspicuous in the shape of the black lateroventral bands.

9. **Callisaurus splendidus,** new species

Type.—A. M. N. H. No. 5372, ♂. Collector, C. H. Townsend, Albatross Expedition, April 10, 1911.

Paratypes.—A. M. N. H. Nos. 5338, 5342, 5373–5375, 5396.

Type Locality.—Angel de la Guarda, Gulf of California, Lower California, Mexico.

Synonyms.—*Callisaurus ventralis*, Townsend, 1890,Proc. U. S. Nat. Mus., VIII, p. 144; *Callisaurus draconoides ventralis* (part), Cope, 1898 (1900), Rept. U. S. Nat. Mus.,p. 273.

Diagnosis.—Size medium, adults averaging between 150 and 160 mm., total length, probably seldom reaching 170. Hind leg in male somewhat shorter than head and body to anus, when folded forward along body little exceeding end of muzzle. Tail in male longer than head and body, never one and one-half times as long. Femoral pores 10–14, averaging 12 (8 specimens). Coloration light to dark, more or less vividly red over the whole dorsal surface as well as on gular region and anteroventral aspect of humerus. The 2 black bands on the lateroventral blue area neither large nor vivid; their position oblique forward with reference to lateral fold, the posterior of the two at its inferior end with tendency to extension backward toward the groin. Tail conspicuously banded below and above with black.

Measurements of the Type.—Total length, 150 mm.; head and body to anus, 65 mm.; tail length, 85; tip of muzzle to posterior margin of ear, 15, to gular fold, 21; head width, 12.5; hind leg, 64; hind foot, 30; base of 5th to end of 4th toe, 24.5.

10. **Sceloporus lineatulus,** new species

Type.—A. M. N. H. No. 5478, ♂. Collector, C. H. Townsend, Albatross Expedition, May 16, 1911.

Type Locality.—Santa Catalina Island, Gulf of California, Mexico.

Diagnosis.—A robust species of medium size (length of head and body of adult male, 85 mm.), especially bristling with large, long-pointed but not spinous scales; 4–6 preauriculars in oblique row, relatively long and pointed, overlapping at bases; dorsal scales (7 straight longitudinal rows) much larger than ventrals; laterals crowded in oblique rows, graduated in size to meet ventrals, the shape changing through intermediate stages from angular, long-pointed, weakly denticulate scales to the rounded ventrals with their 2–4 equal points or scallops; rump and proximal caudals equal to dorsals; dorsals about 28 from interparietal to base of tail, 5 in head length (muzzle to interparietal); distance from base of 5th toe to end of 4th equal to length from tip of muzzle to anterior border of ear; femoral pores, 20. Coloration of adult male rufous dorsally, blue lateroventrally verging into green above, blue on chest between arms, and on chin; sides prominently marked from above arm to groin with about 11 longitudinal parallel brown lines following the direction of the scales; posterior gular region black, also black more or less as follows: on ventral arm, breast, median abdominal area, groin, ventral femur.

Measurements of the type.—Total length, 199 mm. +; head and body to anus, 85; tail length, 114 + (reproduced); tip of muzzle to posterior border of interparietal, 21, to posterior border of ear, 25, to base of throat, 25; greatest head width, 23, width at posterior orbital angle, 20, at anterior orbital angle, 13.5; hind leg, 61; base of 5th to end of 4th toe, 24.

This species, while very distinct, shows relationship with the forms known as *S. zosteromus* Cope and *S. magister* Hallowell.

Sator, new genus

Type.—*S grandævus,* new species.

Diagnosis.—Body strongly compressed with high vertebral ridge in the adult; ziphisternal and poststernal ribs at acute angles with the vertebræ forming extremely long lateroventral loops nearly or quite to the groin and recurved to the mid-ventral line; a sternal fontanelle. Nostrils superior; lateral teeth tricuspid, no pterygoid teeth; labials segmental, superciliaries imbricated; head scales large, as in *Sceloporus* and *Uta;* tympanum exposed. Lateral area granular, extending high on shoulder and nape, strongly developed postauricular folds, and a well-developed lateral fold to the groin. Scales on posterior femur granular, also on exterior aspect of tibio-tarsal joint; also imbricated scales on knee and on dorsal aspect of tibia differentiated, smaller and larger respectively. A strong structural gular fold usually present, marked by differentiation of scales, homologous with anterior fold of *Holbrookia* and of the Utas which have two structural folds; a posterior fold possible, in some species indicated at the sides of the neck by a transverse extension of granules and 2 or more enlarged scales of a "denticulated border." Tail compressed, very long; caudal scales verticillate, obliquely keeled, dorsally at least with high sharp keels; long series of femoral pores; hind legs very long; digits with keeled lamellæ inferiorly; enlarged postanals in male.

Cope in 1888 (Proc. U. S. Nat. Mus., p. 397, Pl. xxxvi, figs. 1*a–g*) described a new genus, *Lysoptychus* (type species *lateralis,* from one specimen collected at San Diego, Texas), supposed to be between *Uta* and *Sceloporus,* the distinctive character being a gular fold. But the fold in the specimen in question is not marked structurally; it is similar to the fold in *Callisaurus* and certain Utas resulting from looseness of skin in the gular region, without structural differentiation and disappearing when the head is bent to a horizontal with the body. *Lysoptychus* was not recognized by herpetologists and the specimen has been referred to *Sceloporus couchii* Baird (type, U. S. N. M. No. 2739, from Santa Catarina, Nuevo Leon, Mexico) (Stejneger and Barbour, 1917, Check List, p. 53).

The genus *Sator* represents what is evidently an ancestral form, kept in existence through isolation under favorable conditions in a relatively unchanging habitat. It combines the compressed body and long compressed tail of arboreal types with many of the characters of the primitive terrestrial genus *Sceloporus,* and also with characters, such as the anterior and posterior gular folds, diagnostic of very different terrestrial forms like the Utas and the Holbrookias.

A connection of the new genus with *Sceloporus* exists in a Mexican species, *S. utiformis* Cope, 1864, from Colima (a series of which is at

hand, A. M. N. H. Nos. 12745–12752, Colima, Mexico, 1919). This species has no neck fold of any sort but it has characters—the lateral granulation, lateral fold, and scale differentiation of the posterior extremities—which relate it definitely to *Sator* as well as to *Uta*. Careful study of the skeleton may place this species under *Sator*

11. **Sator angustus,**[1] new species

Type.—A. M. N. H. No. 5712, ♂. Collector, C. H. Townsend, Albatross Expedition, April 17, 1911.

Paratypes.—A. M. N. H. Nos. 5713–5723.

Type Locality.—Santa Cruz Island, Gulf of California, Mexico.

Diagnosis.—A striking looking lizard with compressed body in the adult, high along vertebral line, and with very long and strongly compressed slender tail; bears close general resemblance to *Sator grandævus*, new species, but differs in greater size, reaching a total length of 300 mm., in coloration and pattern, in lacking the posterior gular fold at the sides of the throat, in having scales of head and nape in the adult more tubercular; also the tail more strongly compressed, with the 4–6 dorsal caudal rows quite to the end of the tail bearing high, sharp, and spine-tipped scales. Dorsals average 70 from interparietal to base of tail, 14–15 in a head length; femoral pores average 13. General coloration light or dark, brown or olivaceous; color pattern includes dark shoulder patches.

12. **Sator grandævus,** new species

Type.—A. M. N. H. No. 5491, ♂. Collector, C. H. Townsend, Albatross Expedition, April 19, 1911.

Paratypes.—A. M. N. H. Nos. 5492–5496.

Type Locality.—Cerralvo Island, Gulf of California, Mexico.

Diagnosis.—A relatively large lizard reaching a total length of 250 mm., more than two-thirds of which is the strongly compressed tail with verticils of strongly keeled mucronate scales; body compressed and with high vertebral ridge in the adult; a strong lateral fold from postauricular region to groin; broad, uninterrupted band of granules along lateral fold, broadest at shoulder, meeting keeled dorsal scales more or less abruptly throughout its length; a strong structural anterior gular fold, marked by differentiation of scales; posterior gular fold visible laterally, marked by an intrusion of granules ventralward and 3 enlarged scales of a "denticulated border"; about 60 scales between interparietal and base of tail, 16 in a head length; femoral pores average 18. General coloration light or dark grayish blue; color pattern includes black shoulder patches (sometimes nuchal collar).

Measurements of the Type.—Head and body, 70 mm.; tail, 137 + (reproduced); head length, 18.5; head width, 15; tip of muzzle to anterior fold, 22; tip of muzzle to posterior fold (at side of head), 25.5; hind leg, 55; base of 5th to end of 4th toe, 22. The measurement of No. 5492 in which the tail has not been reproduced is as follows: total length, 258 mm.; head and body, 75; tail, 183.

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[1]With reference to the very narrow, compressed body in the adult.

Measurements of the Type.—Head and body to anus, 89 mm.; tail, 136 + (reproduced; measurement of small specimen with uninjured tail, No. 5719, head and body to anus, 68, tail, 160); total length, 225 (if allowance be made for injured tail, total length, 300 mm.); head length, 22; head width, 19; tip of muzzle to anterior gular fold, 27; hind leg, 65; base of 5th to end of 4th toe, 23.

13. **Uta concinna,** new species

Type.—A. M. N. H. No. 5396, ♂. Collector, C. H. Townsend, Albatross Expedition, March 10, 1911.

Paratypes.—A. M. N. H. Nos. 5399-5413.

Type Locality.—Cerros Island, Lower California, Mexico.

Synonyms.—*Uta stansburiana* (part), Cope, 1898 (1900), Rept. U. S. Nat. Mus., p. 310; *Uta stansburiana elegans* (part), Richardson, 1915, Proc. U. S. Nat. Mus., XLVIII, p. 413, Stejneger and Barbour, 1917, Check List, p. 52.

Diagnosis.—A small short-tailed *Uta* bearing considerable resemblance in scutellation to *Uta stansburiana hesperis* Richardson; maximum total length, 115 mm., average about 100, tail less than one and one-half times length of lizard from muzzle to anus; dorsal scales very much smaller than brachials, 13–15 rows from median line to lateral granules; brachials weakly keeled, more pointed and slightly larger than scales on rump; dorsals average 85 between interorbital and base of tail, ventrals 60 from collar to anus. The all-over dotted pattern of the Utas is common in adult males; the common color pattern of the female consists of a series of short, oblique, white bands along the dorsolateral line, bordered anteriorly with black; postaxillary spot posterior in position, not concealed by the adpressed elbow, very large and conspicuous in both sexes.

Measurements of the Type.—Total length, 115 mm.; head and body to anus, 48; tail length,67; tip of muzzle to posterior border of ear, 13.5, to gular fold, 16; head width, 10.5; hind leg, 36; hind foot, 17.

14. **Uta mannophorus,**[1] new species

Type.—A. M. N. H. No. 5447, ♂. Collector, C. H. Townsend, Albatross Expedidtion, April 5, 1911.

Paratypes.—A. M. N. H. Nos. 5440–5446, 5448 (6 ♂♂, 2 ♀♀).

Type Locality.—Carmen Island, Gulf of California, Mexico.

Synonyms.—*Uta stansburiana* (part), Cope, 1898 (1900), Rept. U. S. Nat. Mus., p. 310, *Uta stansburiana elegans* (part), Stejneger and Barbour, 1917, Check List, p. 52.

Diagnosis.—A stout-bodied *Uta* reaching a total length of 150 mm.; dorsal scales small, not so large as brachials, 13–15 rows from median line to lateral granules; brachials thick and weakly keeled, not greatly larger than scales at middle of rump; dorsals 105 (in type) from interparietal to base of tail, ventrals 65 from denticulated collar to anus; femoral pores little variable, averaging 15; a series of juxtaposed black spots across the shoulders forms a scalloped collar; spots (bright blue) of sexually dimorphic dress of male unusually large (5–7 dorsals, 10–15 lateral granuules); males with much dark blue ventrally, postaxillary spot faint, or lacking.

[1]Named from the scalloped collar across the shoulders.

Measurements of the Type.—Total length, 149 mm.; head and body to anus, 54; tail length, 95; tip of muzzle to posterior margin of ear, 14, to gular fold, 18; head width, 11; hind leg, 40; hind foot, 20.

15. **Uta parva,** new species

Type.—A. M. N. H. No. 5428, ♂. Collector, C. H. Townsend, Albatross Expedition, March 13, 1911

Paratypes.—A. M. N. H. Nos. 5427 ♀, 5429, 5431–5433.

Type Locality.—San Bartolome Bay, Lower California, Mexico.

Diagnosis.—A very small, fine and smooth-scaled = *Uta* of the *Stansburiana* group, with tail twice length of head and body. Dorsal scales small, keeled, somewhat tubercular, well differentiated from lateral granules; dorsals average about 100 between interparietal and base of tail, very much smaller than brachials, 13–15 rows from median line to lateral granules; brachials more or less weakly keeled, about equal to scales on rump and very much more pointed. Head brown, dorsal color pattern an all-over arrangement of small blue spots in male, in female transverse series of long and wavy dark lines bordered behind with light, sometimes connected with a series of white transverse lines on the lateroventral blue surface; gular region anterior to collar deep blue in male; postaxillary spot of medium size, largely concealed by adpressed elbow.

Measurements of the Type.—Total length, 101 mm. +; head and body to anus, 43; tail length, 58 + (reproduced, length of tail of No. 5431 of which head and body length is 44, 80); tip of muzzle to posterior border of ear, 11.5, to gular fold, 14.5; head width, 9.5; hind leg, 42; hind foot, 17.

16. **Uta squamata,**[1] new species

Type.—A. M. N. H. No. 5424, ♂. Collector, C. H. Townsend, Albatross Expedition, May 16, 1911.

Paratypes.—A. M. N. H. Nos. 5421–5423, 5425–5426.

Type Locality.—Santa Catalina Island, Gulf of California, Mexico.

Diagnosis.—A small lizard not exceeding 135 mm., with the general appearance of the members of the *Uta stansburiana* group, but distinguished at once by the uniformity and large size of the imbricated dorsal scales (everywhere distinctly separable from the lateral granules, about equal to the brachials, 10–11 from median line to lateral granules), coupled with still greater coarseness of the femorals and tibials, and of the caudals on thickest part of the tail. Dorsals 72–76 from the interparietal to the base of the tail, 63 ventrals from denticulated collar to anus; femoral pores 13–16, averaging 15. General coloration olivaceous, males with the typical adult Uta all-over pattern of fine dots; ventral surfaces everywhere blue, no postaxillary spot but wide ventrolateral bluish black band from axilla to groin.

Measurements of the Type.—Total length, 135 mm.; head and body to anus, 52; tail length, 83; tip of muzzle to posterior margin of ear, 14, to denticulated gular fold, 19; head width, 11.5; hind leg, 39; hind foot, 20.

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[1]With reference to the imbricated dorsal scales of unusually large size and the coarseness of femorals and tibials.

17. **Verticaria cærulea,** new species

Type.—A. M. N. H. No. 5517. Collector, C. H. Townsend, Albatross Expedition, April 5, 1911.

Paratypes.—A. M. N. H. Nos. 5516, 5518–5520.

Type Locality.—Carmen Island, Gulf of California, Mexico.

Diagnosis.—Bearing in general close resemblance to *Verticaria sericea* (Van Denburgh), of San José Island, but with longer muzzle, somewhat shorter hind legs, frontal not in complete contact with second supraocular (because of interposition of granules), lighter general and dorsal coloration, and bright blue color not only ventrally but high laterally on head and neck, body, extremities, and tail, as well as on dorsal aspect of tail, at least distally.

Measurements of the Type.—Total length, 183 mm.; head and body to anus, 55; tail, 128; head length to gular fold, 20, to posterior margin of ear, 15; head width, 8.5; hind leg, 35.

18. **Cnemidophorus celeripes,**[1] new species

Type.—A. M. N. H. No. 5514. Collector C. H. Townsend, Albatross Expedition, 1911.

Paratype.—A. M. N. H. No. 5515, immature.

Type Locality.—San José Island, Gulf of California, Mexico.

Diagnosis.—A very ornamental, conspicuously black and white patterned species of *Cnemidophorus* above medium size, largest specimen at hand measuring 382 mm., tail more than two-thirds total length. It has very fine uniform dorsal scutellation, abdominal ventrals in 8 longitudinal rows (30–32 transverse); frontoparietals separate; nostril anterior to nasal suture. The nasal is not in contact with the second supralabial; scales on extreme edge of posterior neck fold small at least at middle, the largest exceeding enlarged scales at center of gular region, greatly smaller than scales on chest; 4 supraoculars; 8 femoral rows of enlarged scales, 5 tibial, 7 brachial, 3 antebrachial; scales on underside of forearm, posterior aspect, scarcely enlarged; femoral pores 20–23.

Coloration of adult six wide longitudinal bands of white tinged with olive, alternating throughout their length with 5 wide chains of round black spots more connected anteriorly, separated into the individual black spots posteriorly and in the dorsolateral chains; somewhat irregular tessellated effect of wide black markings along the sides adjoining the ventrals, extending forward over postauricular area; throat marked by 2–4 transverse bands of black, the one between inferior margins of the ear openings particularly prominent; 2 parallel oblique black bars reach downward and forward, outlining the sublabials (often interrupted in immature); extremities with irregular coarse network of black on the very light olive background; nape, head, and tail more brown; dorsal tail vivid light rose color distally and throughout its length ventrally; the same color on posterior aspects of femur, forearms, ventral surface of hind legs, and in the adult male from the chest between the forelegs forward over fold and gular region to the sublabials; breast and abdominal region blue with 7 longitudinal narrow black lines made by the juxtaposed pigmented margins of the scales.

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[1] "Swift-footed," with reference to its adaptability for very great speed.

The immature are black with 6 narrow white stripes dorsally (lowest on a line with the ear), lateral space black with irregular oblique and vertical white bars. In the development of the adult pattern, minute white spots appear above the lowest white stripe and widen to connect with it, scalloping the lower edge of the black band above; minute white spots appear in the median black band and spread obliquely, alternate ones in opposite directions to meet the adjoining white stripes, converting the median straight black band into a waved one and eventually by a deepening of the curves into a chain of round black spots; minute transverse extensions of white along the lower margin of the dorsal white stripe of each side, and similarly along upper and lower margins of the dorsolateral white stripe, scallop in a similar way the black bands adjoining, converting these also into chains of round black spots.

Measurements of the Type.—Total length, 295 mm. +; head and body to anus, 90; tail length, 205 + (reproduced); tip of muzzle to collar, 31; shielded head, or to anterior border of ear, 22.5, to posterior border, 25; greatest head width, 15, width at posterior angle of orbit, 11, at anterior angle, 8.5; hind leg, 67; base of 5th to end of 4th toe, 31. The ratios of foot to head measurements in the type do not hold good in the adult male. In a male of 102 mm. head and body length, base of 5th to end of 4th toe is 33 mm., muzzle to collar, 40, greatest head width, 19.

The range of this species probably includes the mainland of Lower California along the Gulf northward from La Paz and San José Island. It is probably the species in the collections of the Muséum d'Histoire Naturelle, from Santa Rosalia and Mulege, identified by Mocquard (1899, Nouv. Arch. du Muséum d'Hist. Nat., (4) I, p. 315) as *Cnemidophorus grahamii* Baird and Girard (type from Texas, 1852).

19. **Cnemidophorus disparilis,**[1] new species

Type.—A. M. N. H. No. 5527. Collector, C. H. Townsend, Albatross Expedition, April 12, 1911.

Paratypes.—A. M. N. H. Nos. 6884–6885, immature.

Type Locality.—Tiburon Island, Gulf of California, Mexico.

Diagnosis.—Of medium size; with fine and uniform dorsal scutellation, abdominal ventrals in 8 longitudinal rows; head depressed; frontoparietals separate, nostril anterior to nasal suture. The nasal is not in contact with the second supralabial; scales on posterior collar of considerable size, scarcely larger than enlarged scales at center of gular region, margin of fold with 1–4 rows of minute scales; 4 supraoculars; 6 femoral rows of enlarged scales, 3 tibial (of great size in two anterior rows), 7–8 brachial, 3 antebrachial; underside of forearm with narrow band of enlarged scales on posterior aspect; femoral pores, 19. General coloration in adult orange-brown dorsally, ventrally blackish over all surfaces, even of the feet. Color pattern 7–9 extremely narrow, orange-brown longitudinal lines, straight or wavy, alternating with black lines of similar narrowness; brilliant color obscured by blackish anteriorly; sides ornamented with orange spots more or less in vertical rows

[1]With reference to the coloration of the immature, at present unlike anything known in the genus outside of this species and its very close relative, *C. martyris*.

bordered anteriorly with black; the mottling with orange-brown and black extends over sides of head; the throat is crossed by 2–3 narrow bars of intense black; mid-ventral caudal line marked by a double series of small black spots.

The immature of this species is black everywhere ventrally; black also on the sides, brown on the back, with closely set pin-points of orange-yellow, verging to white laterally, on exposed surfaces of body and extremities; head and tail unspotted and lighter in general coloration; an unspotted mid-dorsal area, broad on nape and narrowing to a point opposite the elbows.

Measurements of the Type.—Total length (tail broken off 30 mm. from base, with regeneration just begun); head and body to anus, 87 mm.; end of muzzle to collar, 30; tip of muzzle to anterior ear, 20; greatest head width, 12, across anterior angle of orbits, 8.5; hind leg, 54; base of 5th to end of 4th toe, 23.5.

Measurements of No. 6884.—Total length, 144 mm.; head and body to anus, 42; tail length, 102; tip of muzzle to posterior gular gold, 17, to anterior ear, 12, to interparietal, 9, to fore limb, 18; greatest head width, 7, width across posterior supraoculars, 6; collar to anus, 25; hind leg, 28.

It would seem likely from the discovery of this rare species on Tiburon Island with immature very like the type of *C. martyris* Stejneger, 1891, that the latter species was described from immature forms only. The different general coloration in the two, lack of enlarged scales on the ventral aspect of the forearm of *martyris*, and the variation in corresponding measurements of *C. martyris* and the paratype of *C. disparilis* indicate that the species are distinct—as we should expect as a result of development of forms isolated on the two widely separated islands, Tiburon and San Pedro Martir, in a region unfrequented by man.

20. **Cnemidophorus estebanensis,** new species

Type.—A. M. N. H. No. 5571. Collector, C. H. Townsend, Albatross Expedition, April 13, 1911.

Type Locality.—San Esteban Island, Gulf of California, Mexico.

Diagnosis.—Bearing close resemblance to *C. melanostethus* Cope and *C. punctilinealis*, new species, but very greatly more elongated than the latter for a given girth and development of color pattern, and with longer head and foot measurement than the former. It differs from *punctilinealis* in having the scales on the underside of the forearm considerably enlarged, the dorsal granules smaller, more elongated, set closer together (4 instead of 2½ to a millimeter). It differs from both in the small size and large number of rows of brachials and femorals, 8 and 8 respectively.

Measurements of the Type.—Total length, 175 mm. + (tail reproduced); head and body to anus, 76.5; tail length, 98.5+; tip of muzzle to collar, 26, to anterior border of ear, 19; greatest head width, 11; hind leg, 55; base of 5th to end of 4th toe, 26.

C. melanostethus (A. M. N. H. No. 2525 from Tucson. Collector, M. C. Dickerson, 1912), with equal head and body length, has head length to fold, 25 mm., to anterior border of ear, 17, and length of 4th toe from base of 5th, 23.5 mm.

It is always unfortunate that a species should be described from one specimen only, especially in *Cnemidophorus* where evolution of the color pattern, both the method, and time in the developmental history of the lizard, furnishes one of the strongest diagnostic characters. A series of specimens from San Esteban is needed before a complete diagnosis of the color pattern can be given.

21. **Cnemidophorus punctilinealis,**[1] new species

TYPE.—A. M. N. H. No. 5532, adult, ♂. Collector C. H. Townsend, Albatross Expedition, April 12, 1911.

PARATYPES.—A. M. N. H. Nos. 5526, 5535, 5533 (immature to adult, showing development of color pattern), also A. M. N. H. Nos. 5528–5531, 5534, 5536–5539.

TYPE LOCALITY.—Tiburon Island, Gulf of California, Mexico.

DIAGNOSIS.—A teiid lizard of medium size, the largest specimen in a collection of 13, measuring 335 mm. (with tail about two-thirds the total length); closely related to *C. melanostethus* Cope. It has relatively uniform dorsal scutellation, abdominal ventrals in 8 longitudinal rows, frontoparietals separate, nostril anterior to nasal suture. The nasal is not in contact with the second supralabial; scales on posterior neck fold scarcely exceeding largest at center of gular region, 1–2 rows very small at extreme margin; 4 supraoculars; there are 7 femoral rows of enlarged scales, 3 tibial, 6 brachial, 2 antebrachial (with part of a third proximally), the superior antebrachial row and anterior tibial row extremely large; underside of forearm has scales along median line scarcely enlarged; femoral pores 20.

The final stage in the development of the color pattern gives an arrangement, from ventral scales to ventral scales, of 11 quite regular longitudinal rows of closely set minute black spots (dots, 1–5 granules large), on an olivaceous background lighter laterally—without trace of longitudinal lines or bands; the dots continue over the dorsal surface of the extremities, and are carried forward in more irregular arrangement and greater size over the sides of the head and the gular region, sometimes over the dorsal head; the breast, undersurface of arms, and the posterior gular fold are blackish in the male, often anterior gular region also black; the same linear arrangement of dots may extend conspicuously nearly one-half the length of the tail; remainder of ventral surfaces (except tibias and feet) light to dark bluish gray, with the ventrals black-margined and a double series of black spots occupying the mid-ventral caudal line; tail reddish to purplish brown distally.

Immature with 4 equidistant longitudinal light lines dorsally, between each two of which appears an irregular more or less double series of minute light spots; spots and vertical bars of lighter color closely cover the sides and extend forward on sides of head and gular region. By a process involving an increase in width of the irregular light spots of the back until they meet the light dorsal lines, 3 series of broader than long, small, pigmented bars are left. By reduction of these in size and crosswise division of the lateral bars (2 rows on each side) the adult pattern of 11 longitudinal rows of black dots comes into existence.

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[1]With reference to the adult color pattern of dots which follow one another in close series.

Measurements of the Type.—Total length, 313 mm.; head and body to anus, 85; tip of muzzle to collar, 29, to anterior border of ear, 22; greatest head width, 14.5, width at posterior angle of orbit, 12, at anterior angle of orbit, 9; hind leg, 65; base of 5th to end of 4th toe, 29.

Cnemidophorus punctilinealis, new species, compared with *C. melanostethus* Cope, attains advanced stages in the somewhat similar series of color patterns (with appearance of the black spots and elimination of the longitudinal stripes) at very much earlier periods in the development. The two species can always be distinguished by the very different color pattern of the sides, and by the longer head and foot of *C. punctilinealis*.

C. punctilinealis is represented in the W. W. Brown collection of the Museum of Comparative Zoology by one half-grown specimen (Field No. 785) from Guaymas on the coast of the Mexican mainland.

22. **Cnemidophorus bartolomas,** new species

Type.—A. M. N. H. No. 5508. Collector, C. H. Townsend, Albatross Expedition, March 13, 1911.

Paratypes.—A. M. N. H. Nos. 5507, 5509, San Bartolome Bay; 5522, Abrejos Point, Ballenas Bay.

Type Locality.—San Bartolome Bay, Lower California, Mexico.

Diagnosis.—A very long-tailed species of medium size. Dorsal scutellation uniform (somewhat coarse, 2 granules to the millimeter), 8 rows of abdominal ventrals, nostril anterior to suture, 4 supraoculars, 2 frontoparietals, a long series of femoral pores (16–19). The collar is margined with small scales about size of posterior gulars, but has 4–5 rows enlarged at the middle anterior to these, 3–4 of which equal the largest central anterior gulars; great variability in arrangement of scales about nasal, nasal sometimes in contact with the second supralabial. Brachials, 6; antebrachials 4, those in the first posterior row small, in second posterior row of moderate size; scales underside forearm posterior aspect not enlarged; femorals 7–8; tibials 3. General coloration light olive dorsally, browner on head and tail; bluish white ventrally, spotted irregularly with black from the sides of the head and gular region out on to the tail. Dorsal pattern 5 longitudinal light stripes within area continuous with space between temporal angles; dark bands between these stripes cut crosswise into spots by development of light cross-stripes; these light cross-stripes in the two dorsal bands alternate with one another, thus converting the median light longitudinal stripe into a zigzag stripe and leaving the black spots in the 2 dorsal rows alternate with one another. Black markings both dorsal and lateral moderate and relatively uniform in size and intensity, giving an effect of considerable neat regularity in longitudinal (8–10) and transverse (about 25) rows, notwithstanding their very great diversity in shape. Pattern, both stripes and spots, obscured posteriorly.

Measurements of the Type.—Total length, 304 mm.; head and body to anus, 82; tail length, 222; collar to anus, 55; tip of muzzle to collar, 27, to posterior ear, 225; to posterior margin of interparietal, 205; tip of muzzle to axilla, 33.5; head width at posterior orbital angles, 12, at anterior orbital angles, 9; hind leg, 58; length of 4th toe from base of 5th, 28.

23. **Cnemidophorus vandenburghi,**[1] new species

Type.—A. M. N. H. No. 5521. Collector, C. H. Townsend, Albatross Expedition, April 2, 1911.

Type Locality.—Carmen Island, Gulf of California, Mexico.

Diagnosis.—A small species related to *Cnemidophorus rubidus* (Cope) and *Cnemidophorus celeripes*, new species. Nasal not in contact with the second supraocular; posterior of the 4 supraoculars extremely small; all of the collar scales small except 6–10 at the middle, 2 or 3 of which may exceed the central anterior gulars. Brachials, 5–6, antebrachials, 3 (exterior row conspicuously broad), scales on underside of forearm posterior aspect somewhat enlarged; femorals, 6–7, tibials, 3; femoral pores, 21.

Head brown, not conspicuously spotted, gular region yellow, cross-banded with black and bright blue. Olivaceous dorsally, with 4 longitudinal light stripes between the temporal angles (alternating with longitudinal series of black and olive spots or bars), 6 longitudinal light stripes, counting the one stretching from postauricular area to groin on each side; median space between the two mid-dorsal light stripes twice as broad as the other spaces; black spots very irregular in shape, not opposite each other in the dorsal rows, and the whole effect of the pattern one of confused and crowded elements (in contrast with *rubidus* and *celeripes*); black lateral markings more nearly opposite than the dorsal, more regular in size and shape; pattern reduced on nape and rump. Bright blue ventrally on breast and abdomen without spots or stripes, also bright blue laterally on head, body, extremities, and tail; no spots or stripes on ventral surfaces of extremities and tail; dorsal caudal surface red distally and ventral surface red for the whole length.

Measurements of the Type.—Total length, 217 mm.; head and body to anus, 65; tail length, 152; tip of muzzle to gular fold, 24.5, to anterior ear, 17, posterior ear, 19, to posterior margin of interparietal, 17.5, to axilla, 31; head width at posterior orbital angles, 10, anterior orbital angles, 7; hind leg, 42; 4th toe to base of 5th, 21.5.

[1]Named for Dr. John Van Denburgh, of the California Academy of Siences, whose name is more closly connected with the herpelology work in Lower California than that of any other herpetologist.

Scientific Results of the Expedition to the Gulf of California in Charge of C. H. Townsend, by the U. S. Fisheries Steamship 'Albatross,' in 1911. Commander G. H. Burrage, U. S. N., Commanding.

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VIII

The Amphibians and Reptiles of Lower California and the Neighboring Islands

By Karl Patterson Schmidt

BULLETIN

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BULLETIN, NOVITATES, AND MEMOIRS

OF

The American Museum of Natural History

FRANK E. LUTZ, Editor

The following are the more recent papers on HERPETOLOGY AND ICHTHYOLOGY. Orders should be addressed, Library, The American Museum of Natural History, 77th St. and Central Park West, New York City.

HERPETOLOGY

Contributions to the Herpetology of the Belgian Congo Based on the Collection of the American Museum Congo Expedition, 1909–1915. By Karl Patterson Schmidt, 1919, Bulletin, XXXIX, Art. 2, pp. 385–624, Pls. VII–XXXII, 22 maps, 27 text figures. $3.50

Diagnoses of Twenty-three New Species and a New Genus of Lizards from Lower California. By M. C. Dickerson, 1919, Bulletin, XLI, Art. 10, pp. 461–477. 20c.

Descriptions of New Amphibians and Reptiles from Santo Domingo and Navassa. By Karl Patterson Schmidt, 1919, Bulletin, XLI, Art. 12, pp. 519–525. 10c.

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A New Name for a Subspecies of *Uta stansburiana* Baird and Girard. By Karl Patterson Schmidt, 1921, Novitates, No. 15, pp. 1–2. 10c.

New Species of North American Lizards of the Genera *Holbrookia* and *Uta*. By Karl Patterson Schmidt, 1921, Novitates, No. 22, pp. 1–6. 10c.

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The Phylogeny of the Salientia, Part I. By G. K. Noble, 1922, Bulletin, XLVI, Art. I, pp. 1–87, Pls. I–XXIII. $1.00

ICHTHYOLOGY

On a New Race of Minnow from the Rocky Mountains Park. By John Treadwell Nichols, 1916, Bulletin, XXXV, Art. 8, p. 69; and

A New *Gymnachirus* from North Carolina. By John Treadwell Nichols, 1916, Bulletin, XXXV, Art. 9, pp. 71–72. 10c.

Shore Fishes Collected by the 'Albatross' Expedition in Lower California, with Descriptions of New Species. By Raymond C. Osburn and John Treadwell Nichols, 1916, Bulletin, XXXV, Art. 16, pp. 139–181, 15 text figures. 30c.

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Article XI.—THE AMPHIBIANS AND REPTILES OF LOWER CALIFORNIA AND THE NEIGHBORING ISLANDS

By Karl Patterson Schmidt

Plates XLVII to LVII

CONTENTS

INTRODUCTION

A general account of the "Albatross Expedition" of 1911 has been given by Dr. C. H. Townsend in the first paper of the Scientific Results (1916, Bull. Amer. Mus. Nat. Hist., XXXV, pp. 399–476, 45 figs., 1 map). That paper contains the itinerary of the expedition, many valuable notes on habitat conditions, and especially photographs illustrating the topography and vegetation at the localities where collections of amphibians and reptiles were made. The additional photographs showing habitat conditions in the present paper have been kindly furnished by Dr. Townsend.

As has already been stated in other papers, the expedition was made possible largely through the generous support of Mr. Arthur Curtiss James, Trustee of The American Museum of Natural History, to whom the Museum is consequently indebted for the splendid Lower Californian collections discussed below.

The collections made by the Albatross Expedition in 1911 contain four hundred and forty-eight specimens of reptiles and seven amphibians, representing two species of amphibians and sixty-one species of reptiles. In a previous paper, Dickerson (1919, Bull. Amer. Mus. Nat. Hist., XLI, pp. 461–477) has described a new genus and twenty-three new species from the Albatross collection, of which sixteen are recognized in the present paper. To these must be added three forms described below, making a total of nineteen forms new to science contained in the collection. Perhaps the most important part of the collection is the material

secured on the islands of the Gulf of California, many of which had not been visited previously by a scientist, while some additions are made to the faunæ of even the better known islands.

In connection with the work on the Albatross collection, the Field Museum of Natural History in Chicago has kindly loaned a part of the Heller collection from the northern part of the peninsula, which has been especially valuable for comparison with the distinct fauna of southern Lower California. The United States National Museum has loaned the valuable collection of Lower Californian amphibians and reptiles, consisting of one hundred and sixty specimens, made by Dr. E. W. Nelson and A. E. Goldman in the course of the Lower Californian explorations of the Bureau of Biological Survey, for study in connection with the Albatross material. My heartiest thanks are due to Dr. Leonhard Stejneger, Head Curator of Biology, for information on other specimens in his charge and for many courtesies in connection with this loan. The specimens from this collection have been listed in a separate paragraph in the discussion of the species. Valuable specimens loaned by the Museum of Vertebrate Zoölogy of the University of California and by the Academy of Natural Sciences of Philadelphia, chiefly in connection with other studies, have been drawn upon to some extent in the preparation of the present paper, and my thanks are due to these institutions.

I am greatly indebted to Mr. Charles L. Camp for important suggestions and corrections drawn from his intimate knowledge of Californian herpetology. Miss M. C. Barnett has assisted in many details of the manuscript and bibliography.

It was the purpose of Miss Mary C. Dickerson to follow her paper on the new species of the Albatross collection with a more detailed study of the lizard fauna of the southwestern United States in which the Lower Californian fauna was to be included. I originally hoped to be able to extract from her manuscript, which has been in my hands, an account of the reptiles of the Albatross collection; but I find myself so frequently at variance with her conclusions on the taxonomy of the fauna concerned that it has seemed preferable to drop the plan of editing her work and present an entirely independent paper. Many of the illustrations in the present paper, however, were prepared under Miss Dickerson's direction, and much bibliographical work was done under her direction by Dr. W. B. Veazie.

For the adequate study of the herpetological collections of the Albatross Expedition, it has been necessary to consider the fauna of the whole peninsula and adjacent islands. The 'Herpetology of Lower California'

by Van Denburgh, published in 1895, with numerous subsequent papers by the same author, and especially the recent papers by Van Denburgh and Slevin on the unrivalled Lower Californian collections of the California Academy of Sciences, form an excellent introduction to this fauna, greatly facilitating systematic work, and I have had constant reference to them in the course of the work on the present paper. Several points have been cleared up by correspondence with Dr. Van Denburgh and by reference to specimens received in exchange from the California Academy of Sciences. In order to make clear the cases in which I have differed from these authors, and especially to corroborate or place definitively in the synonymy the species proposed by Dickerson, I have given a new "complete list" of the species recognized. As I have been compelled to make preliminary revisions of several genera concerned, I have included keys to the peninsular species of the remaining genera and have prefixed artificial keys to the genera, in the hope of increasing the usefulness of the paper to amateurs and especially to students of other departments of science who may have occasion or opportunity to deal with the herpetological fauna of Lower California. Too large a proportion of the species in the Lower Californian fauna are unrepresented in the material available to me for study at the present time to warrant a more complete account. I have not included the geographically unrelated Tres Marias Islands off the west coast of Mexico, but have included the reptiles found in the Revilla Gigedo Islands, following the limits of the 'Check List of North American Amphibians and Reptiles,' Stejneger and Barbour, 1917. This extremely useful list has been constantly at hand. As it establishes the nomenclature of the North American species more satisfactorily than any other authority, I have included a reference to it under each species and, in all cases in which I have not followed its nomenclature, I have quoted the authority made use of or have stated my own reasons for such divergence.

The recent monograph of Lower California by Dr. Edward W. Nelson, Chief of the Bureau of Biological Survey, U. S. Dept. of Agriculture (1921, Mem. Nat. Acad. Sci., XVI, pp. 1–194, Pls. I–XXXV) describes the physical conditions of the peninsula of Lower California, illustrates the character of every part of the peninsula in a fine series of plates, and gives an account of the distribution of its plant and animal life. Unfortunately, no complete account of the amphibians and reptiles subsequent to that of Van Denburgh in 1895 was available for the discussion of the distribution of the reptile fauna in Dr. Nelson's paper, and I have no hesitation, therefore, in presenting a new account of the distribu-

tion of the Lower Californian amphibians and reptiles in the present paper. His important conclusions on the faunal subdivisions and life zones of the peninsula are, of course, independent of his discussion of the reptile fauna. In the present account, I have applied his subdivisions into faunal districts to the more complete and accurate list of the reptiles now available.

List of New Forms Proposed in the Present Paper

	Type Locality
Crotaphytus dickersonæ	Tiburon Island
Phrynosoma nelsoni	San Quintin
Phrynosoma jamesi	San Bartolome Bay
Crotalus atrox elegans	Angel de la Guardia Island
Crotalus goldmani	El Piñon

List of New Forms in the Albatross Collection, 1911[1]

(Described by Dickerson, 1919,[2] and below)

New Genus

Sator Dickerson; type, *S. grandævus.*

New Species and Subspecies	Type Locality
Sauromalus townsendi Dickerson	Tiburon Island
Sauromalus varius Dickerson	San Esteban Island
Crotaphytus dickersonæ, new species	Tiburon Island
Callisaurus ventralis inusitatus Dickerson	Tiburon Island
Callisaurus splendidus Dickerson	Angel de la Guardia Island
Sceloporus lineatulus Dickerson	Sta. Catalina Island
Sator angustus Dickerson	Sta. Cruz Island
Sator grandævus Dickerson	Ceralvo Island
Uta concinna Dickerson	Cedros Island
Uta squamata Dickerson	Sta. Catalina Island
Phrynosoma jamesi, new species	San Bartolome Bay
Cnemidophorus celeripes Dickerson	San José Island
Cnemidophorus disparilis Dickerson	Tiburon Island
Cnemidophorus estebanensis Dickerson	San Esteban Island
Cnemidophorus punctilinealis Dickerson	Tiburon Island
Cnemidophorus bartolomas Dickerson	San Bartolome Bay
Cnemidophorus vandenburghi Dickerson	Carmen Island
Verticaria cærulea Dickerson	Carmen Island
Crotalus atrox elegans, new subspecies	Angel de la Guardia Island

[1]The United States National Museum numbers assigned to the types from the Albatross collection will be found in the text of the present paper.

[2]*Ctenosaura insulana, C. conspicuosa, Sauromalus interbrachialis, Callisaurus carmenensis, C. plasticus, Uta mannophorus*, and *U. parva* described by Dickerson in 1919 are referred to synonymy in the present paper.

GEOGRAPHIC ANALYSIS OF THE FAUNA

The herpetological fauna of Lower California is relatively well known and the number of species which further search may be expected to add to the list, aside from insular forms, is probably small. Nevertheless, a serious gap in our knowledge of the distribution of the amphibians and reptiles is the inadequacy of the collections from the middle of the peninsula. Only one considerable collection comes from this area, that made by Diguet and reported on by Mocquard (1899, p. 297, ff.), although Van Denburgh records a few specimens from San Ignacio, Comondu, and San Xavier. Unfortunately, the material available to Mocquard was not critically examined and many of his identifications are uncertain. I need only cite *Chrysemys elegans*, *Uta stansburiana*, and *Cnemidophorus grahamii* listed by him, to indicate this uncertainty. *Holbrookia propinqua* is recorded by him from Santa Rosalia; but the genus is almost certainly absent from Lower California. The most important contributions to Lower Californian herpetology which remain to be made are a thorough exploration of this central part of the peninsula, to determine the southern limit of the distribution of the northern forms and the northern limits of the San Lucan fauna, and further studies of the northeastern corner of the peninsula, where a number of additions to the fauna may be expected from its close relations with the Colorado Desert. It is possible to give a general review of the fauna, but the limits of the ranges of the majority of the species are still undefined in one direction or another. The chief defect of the present review is the absence of complete and accurate data bearing on the habitat associations of the species concerned.

An investigation of the herpetology of the State of Sonora on the east side of the Gulf of California could not fail to add greatly to our understanding to the origin and relations of the Lower Californian reptile fauna.

The general conclusion of all who have dealt with the Sonoran reptile fauna is that the Lower Californian fauna in its main features is directly derived from the areas to the north. This conclusion I can fully confirm.

The Lower Californian herpetological fauna as listed below contains 149 species and subspecies, 11 amphibians and 138 reptiles, the latter composed of 90 lizards, 47 snakes and one turtle. Of this number, 39 lizards and 7 snakes are insular species, not found on the peninsula, leaving a total of 92 species of reptiles at present known from the peninsula of Lower California.

With the exception of the genus *Sator*, all of the insular forms are more or less directly allied to those of the peninsula or the Mexican mainland. The faunæ of the individual islands are considered below. *Sator* appears to be a relict form, its survival on two islands (Ceralvo and Santa Cruz) being a fairly conclusive proof of its former presence on the peninsula, probably as a distinct form. Its relations are with a generalized *Uta* and with *Sceloporus utiformis* of western Mexico.

Of the amphibians, all the genera and species have a fairly wide range outside and to the north of Lower California, with the exception of the insular *Batrachoseps leucopus*. *Aneides* is not yet known from the mainland of the peninsula, but may be expected in the northwestern corner as it reaches the Coronados Islands. *Plethodon croceater* is probably confined to this area also, Cope's statement (1889, p. 151) that he has seen a specimen from Cape San Lucas being unverified and improbable. *Rana aurora draytonii*, *Scaphiopus hammondii*, and *Bufo boreas halophilus* belong to this northwestern fauna and do not range far to the south in Lower California. *Hyla arenicolor* is known in Lower California only from Ensenada. Four species remain which range throughout the peninsula but with very discontinuous distribution, occurring where suitable habitat conditions exist: *Batrachoseps attenuatus*, *Scaphiopus couchii*, *Bufo punctatus*, and *Hyla regilla*. *Batrachoseps* and *Hyla* are members of the Pacific fauna, not present in the Sonoran subregion, and the *Scaphiopus* and *Bufo* are Sonoran forms, absent from the Pacific subregion. The origin of this mixture of faunæ will be considered below.

The genera of lizards (exclusive of the insular *Sator*) found in Lower California are the following.

Phyllodactylus	*Uta*
Coleonyx	*Phrynosoma*
Ctenosaura	*Gerrhonotus*
Dipso-saurus	*Anniella*
Crotaphytus	*Xantusia*
Sauromalus	*Cnemidophorus*
Callisaurus	*Verticaria*
Uma	*Plestiodon*
Sceloporus	*Bipes*

Of these, *Phyllodactylus*, *Ctenosaura*, and *Bipes* are of Mexican affinity, each with a distinct species in Lower California absent from northern Lower California, while *Phyllodactylus tuberculosus* is identical on the peninsula and in west Mexico. *Uma* enters the peninsula only in the northeastern area, which is continuous with the Colorado Desert. *Coleonyx* also, although ranging farther south on the Gulf side of the

peninsula, may be considered as directly derived from the Colorado Desert. *Anniella* enters the peninsula only a short distance on the Pacific side. The remaining twelve genera reach the southern part of the peninsula. *Verticaria* is nearly confined to Lower California, ranging to the north only a short distance into the San Diegan area. Of the remaining eleven genera, *Dipso-saurus*, *Sauromalus* and *Callisaurus* form a group whose distribution is very similar, ranging through the whole of Lower California except the northwestern part, the Colorado and Mohave deserts in California, southern Nevada, extreme southwestern Utah, and southwestern Arizona, entering Sonora probably in the desert areas bordering the Gulf of California. *Xantusia*, with a restricted distribution in California, is represented by a distinct species (*X. gilberti*) in southern Lower California, by one in the San Diegan area (*X. henshawi*, not yet recorded from Lower California), and by one in the Mohave Desert (*X. vigilis*) which enters northeastern Lower California. *X. gilberti* appears to be most closely related to the Mohave Desert species.

The remaining genera have a wide distribution in North America. Of *Crotaphytus*, only the widely distributed *C. wislizenii* reaches southern Lower California. The Lower Californian *Plestiodon* is scarcely distinct from the northern *P. skiltonianus*, which is a Pacific form. *Gerrhonotus* has a distinct species in southern Lower California and one in the San Diegan area, while it is also absent from the Colorado Desert, reappearing on the Mexican plateau. *Sceloporus*, *Uta*, *Phrynosoma*, and *Cnemidophorus*, each with several species in the peninsula and others on the adjacent islands, are the best developed genera in the fauna of Lower California. Each has one or more species confined to the southern part of the peninsula. *Uta* is remarkable for the two species, *Uta thalassina* and *Uta mearnsi*, respectively of the southern and northern half of the peninsula. If *mearnsi* were extinct, *thalassina* could be considered as forming a distinct monotypic genus; but *mearnsi* is so exactly intermediate between *thalassina* and typical *Uta* that it is impossible to place it with either.

The eighteen genera of snakes in Lower California are the following.

Siagonodon	*Rhinocheilus*
Lichanura	*Hypsiglena*
Coluber	*Natrix*
Salvadora	*Thamnophis*
Phyllorhynchus	*Sonora*
Elaphe	*Chilomeniscus*
Arizona	*Tantilla*
Pituophis	*Trimorphodon*
Lampropeltis	*Crotalus*

Of these, the water snake *Natrix* shows especial Mexican relations, the same species occurring in western Mexico and Lower California. *Lichanura, Phyllorhynchus,* and *Chilomeniscus* are nearly confined to the peninsula, but range into southern California and southwestern Arizona at the north. The distribution of *Trimorphodon lyrophanes* appears to be discontinuous, a wide gap separating the records in southern Arizona from the Lower Californian localities, a distribution paralleled by *Phrynosoma solare* among the lizards. The single species of *Elaphe* is also without a representative in either the San Diegan or Colorado Desert faunæ, its nearest relative geographically being west Mexican. The twelve remaining genera are all wide-ranging North American forms. *Thamnophis* enters Lower California from the North and is absent from the southern end of the peninsula, as probably also is *Rhinocheilus.*

The single fresh-water turtle is apparently closely related to the Mexican species, *Pseudemys ornata.*

To repeat, of the thirty-eight genera of reptiles in Lower California, six are absent in the Pacific area and in the Sonoran deserts of the United States, and by their presence in western Mexico, as allied or identical species, suggest a "Mexican element" in the Lower Californian fauna; these genera are *Ctenosaura, Sator, Bipes, Natrix, Elaphe,* and *Pseudemys.* The three last are widespread in North America, and their absence in the Sonoran deserts of the United States is due to absence of suitable habitat conditions. The aquatic forms may have entered the peninsula directly from Mexico, though this is improbable. Their northward range on the coast of Sonora is, unfortunately, not satisfactorily known. *Ctenosaura* is a characteristically Mexican and Central American genus. A species reaches the Arizonan border from Mexico, and it is not impossible that the genus may formerly have ranged farther into the Sonoran deserts to the north and so may have found access to Lower California, where subsequent isolation is shown by the specific distinctness of the west Mexican and Lower Californian forms. *Bipes* and *Sator* I regard as examples of relict distribution, their present restriction being due to the extinction of the intermediate Sonoran forms. The genus of geckos, *Phyllodactylus,* has a characteristically erratic distribution, and not much importance can be ascribed to its presence in both Lower California and Mexico. *P. tuberculosus* has recently been discovered in southern California. Without knowing the relations of *Elaphe rosaliæ* within the genus, it is impossible to form an opinion as to its geographic relations. It is not improbable that it belongs with *Ctenosaura* in the history of its distribution. The range of certain other

genera and species suggests a different and somewhat earlier stage in this distributional process, *Trimorphodon lyrophanes* and *Phrynosoma solare* being the best examples (see below).

Nelson (*loc. cit.*, p. 117, Pl. xxxi) finds a division of the peninsula into faunal districts, independent of the "life zones," useful in discussing the fauna. The extent of his divisions is shown in the accompanying copy of his map (Fig. 1). The San Diegan, the San Pedro Martir, and the Colorado Desert districts at the north are continuous with faunally similar areas in California. The Cape district, occupying nearly the southern half of the peninsula, has by far the most distinct fauna. The Vizcaino Desert, intermediate in position between the Colorado Desert and San Diegan districts at the north and the Cape district at the south, has an intermediate fauna, with a number of peculiar forms. In the northward extension of the San Lucas fauna to nearly the middle of the peninsula and the adoption of an intermediate district, these faunal subdivisions appear to present a distinct advance. Their agreement with the distribution of the herpetological fauna can now be examined in detail.

The San Pedro Martir district of Nelson, coinciding very nearly with the transitional zone, is characterized herpetologically by the extreme poverty of its fauna. *Sceloporus graciosus vandenburgianus* appears to be confined to this area in Lower California, but otherwise it is scarcely more than an impoverished appendage of the San Diegan fauna. This area is therefore united with the San Diegan for the present discussion.

The San Diegan and San Pedro Martir faunæ, so far as recorded from Lower California, consist of the following forty-three species.

Amphibians

Plethodon croceater
Aneides lugubris lugubris
Batrachoseps attenuatus
Batrachoseps leucopus
Scaphiopus hammondii
Bufo boreas halophilus
Hyla regilla
Hyla arenicolor
Rana aurora draytonii

Reptiles

Crotaphytus wislizenii
Callisaurus ventralis gabbii
Sceloporus occidentalis bi-seriatus
**Sceloporus graciosus vandenburgianus*
**Sceloporus rufidorsum*
**Sceloporus orcutti*
**Uta mearnsi?*
**Lichanura roseofusca*
Coluber flagellum piceus
Coluber lateralis
Salvadora hexalepis
Arizona elegans
Pituophis catenifer rutilus
**Pituophis catenifer annectens*

*Species confined, or nearly so, to the area discussed.

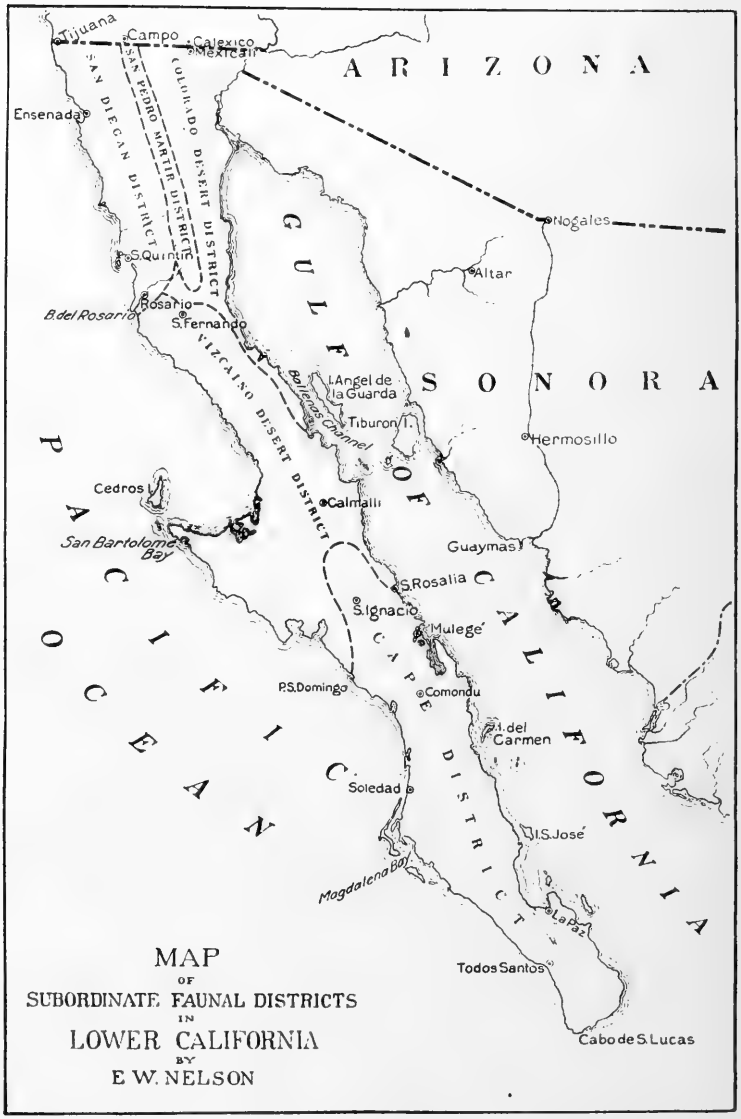

Fig. 1. Map showing the subordinate faunal districts in Lower California, from Nelson (1921, Plate xxxi).

**Uta stansburiana hesperis*
Uta microscutata
**Phrynosoma blainvillii blainvillii*
**Phrynosoma nelsoni*
**Gerrhonotus scincicauda webbii*
**Anniella pulchra*
**Cnemidophorus tessellatus stejnegeri*
**Verticaria hyperythra beldingi*
Verticaria hyperythra schmidti
Plestiodon skiltonianus
Diadophis amabilis
Lampropeltis getulus boylii
**Lampropeltis californiæ californiæ*
Rhinocheilus lecontei
Hypsiglena ochrorhynchus ochrorhynchus
Thamnophis ordinoides vagrans
**Thamnophis ordinoides hammondii*
Crotalus oreganus
**Crotalus exsul*
**Crotalus goldmani*

Of the amphibians, only *Hyla regilla* and *Batrachoseps attenuatus* range to the south of this area; *Hyla arenicolor* reappears in the mountains of Arizona, but is absent in the Colorado Desert proper, as is the wide ranging *Scaphiopus hammondii*. *Batrachoseps leucopus* is confined to the Coronados Islands. The remaining four species are all typical members of the Pacific fauna which reach their southern limits in the San Diegan district.

The reptile fauna is much more heterogeneous. A number of species have a wide range to the north or south of the San Diegan district proper, such as *Sceloporus occidentalis bi-seriatus, Uta microscutata, Verticaria hyperythra schmidti, Plestiodon skiltonianus, Coluber lateralis, Diadophis amabilis, Lampropeltis getulus boylii, Rhinocheilus lecontei, Hypsiglena ochrorhynchus ochrorhynchus, Thamnophis ordinoides vagrans,* and *Crotalus oreganus.* Of these, *Uta microscutata* and *Verticaria hyperythra schmidti* do not range to the north of the area, and *Sceloporus occidentalis bi-seriatus, Thamnophis ordinoides vagrans,* and *Crotalus oreganus* do not range south of it. A number of species range south to Cedros Island: *Sceloporus rufidorsum, Uta stansburiana hesperis* (to San Bartolome Bay), *Verticaria hyperythra beldingi,* and *Crotalus exsul.* A few forms cross over from the Colorado Desert: *Crotaphytus wislizenii, Callisaurus ventralis gabbii, Coluber flagellum piceus, Salvadora hexalepis, Pituophis catenifer rutilus,* and *Arizona elegans.*

The seventeen species of reptiles starred in the list above may be considered characteristic of the San Diegan fauna. *Phrynosoma nelsoni,* however, known only from San Quintin, may prove to be more properly a Vizcaino Desert form. This includes the four species which range south to Cedros Island; and *Uta stansburiana hesperis, Gerrhonotus scincicauda webbii, Anniella pulchra* and *Lichanura roseofusca* range slightly outside the limits of the San Diegan district to the north. *Xantusia henshawi* may be named as a characteristic San Diegan form not yet recorded from

*Species confined, or nearly so, to the area discussed.

Lower California, and *Clemmys marmorata* is a wide ranging Pacific form which may be expected in the San Diegan area in Lower California. *Uta mearnsi* is included in this list, but it seems probable that it is in fact a relict Sonoran form with a unique distribution; it is recorded chiefly from the desert side of the Coast range, and the record from "75 miles southeast of San Diego" is somewhat indefinite.

The Colorado Desert fauna is a highly peculiar one, with two distinctive groups of habitat associations, the desert and the riparian (Grinnell, 1914). In southeastern California, the following amphibians and reptiles are represented.

Amphibians

Bufo cognatus cognatus
Bufo punctatus
Bufo alvarius
Bufo woodhousii
Rana pipiens

Reptiles

Phyllodactylus tuberculatus
Coleonyx variegatus
Dipso-saurus dorsalis dorsalis
Uma notata
Callisaurus ventralis gabbii
Crotaphytus wislizenii
Crotaphytus collaris baileyi
Sauromalus obesus
Uta mearnsi
Uta stansburiana stejnegeri
Uta ornata symmetrica
Uta graciosa
Sceloporus magister
Phrynosoma platyrhinos
Phrynosoma m'callii
Xantusia vigilis
Cnemidophorus tessellatus tessellatus
Kinosternon sonoriense
Siagonodon humilis
Thamnophis marcianus
Chilomeniscus ephippicus
Sonora occipitalis
Sonora episcopa
Lampropeltis getulus yumensis
Lampropeltis getulus boylii
Phyllorhynchus decurtatus
Salvadora hexalepis
Coluber flagellum piceus
Arizona elegans ?
Pituophis catenifer deserticola
Crotalus mitchellii
Crotalus atrox atrox
Crotalus cerastes
Testudo agassizii

Pituophis catenifer rutilus, *Thamnophis megalops*, and *Chilomeniscus cinctus* may be added to this list from Arizonan records, making forty-two species in the Colorado Desert fauna.

Twenty-two of these species have been recorded from northeastern Lower California as follows: *Coleonyx variegatus*, *Dipso-saurus dorsalis dorsalis*, *Crotaphytus collaris baileyi*, *Uma notata*, *Callisaurus ventralis gabbii*, *Uta mearnsi*, *Uta stansburiana stejnegeri*, *Uta graciosa*, *Uta ornata symmetrica*, *Sceloporus magister*, *Phrynosoma platyrhinos*, *Xantusia vigilis*, *Cnemidophorus tessellatus tessellatus*, *Coluber flagellum piceus*, *Lampropeltis getulus yumensis*, *Pituophis catenifer rutilus*, *Phyllorhynchus decur-*

tatus, Thamnophis megalops, Crotalus atrox atrox, Crotalus mitchellii, and *Crotalus cerastes.* Nine more have been recorded from the Cape district but are as yet unknown from the Colorado Desert district in Lower California: *Bufo punctatus, Phyllodactylus tuberculosus, Crotaphytus wislizenii, Sauromalus obesus, Siagonodon humilis, Chilomeniscus ephippicus, Chilomeniscus cinctus, Sonora episcopa,* and *Salvadora hexalepis.* Eleven species remain unrecorded from this area in Lower California, most of which may be expected as additions to its fauna in the future: *Bufo cognatus cognatus, Bufo alvarius, Bufo woodhousii, Rana pipiens, Phrynosoma m'callii, Thamnophis marcianus, Sonora occipitalis, Lampropeltis getulus boylii, Arizona elegans, Testudo agassizii* and *Kinosternon sonoriense.*

The occurrence of *Xantusia vigilis* at San Matias Pass, where it is associated with a species of tree yucca as in the Mohave Desert, indicates a more or less distinct fauna bordering the Colorado Desert district in Lower California on the eastern slopes of the San Pedro Martir Mountains. The distribution of *Uta mearnsi* has been mentioned above. The peculiar case of *Phrynosoma solare,* which is absent in California and reappears at Las Animas Bay, Lower California, a third of the distance down the Gulf side of the peninsula, seems to indicate a somewhat recent "invasion" of the Colorado Desert into a less arid area. Unfortunately, the eastern escarpment of the Sierra Juarez and San Pedro Martir is so precipitous that there is little hope of tracing a continuous zone through this area.

The Vizcaino Desert district of Nelson's map occupies the area between the three districts just discussed and the Cape district. It should include, in my opinion, the Magdalena Plain. Its fauna is imperfectly known and this area quite certainly offers a most interesting field for further herpetological exploration.

In view of this lack of information, it is not possible to present a list of the amphibians and reptiles of this area. Four species are characteristic of and confined to it, as far as known: *Callisaurus crinitus, Phrynosoma jamesi, Cnemidophorus bartolomas,* and *Cnemidophorus rubidus.*

There is a "crossing over" of the Sonoran desert fauna in this area, cutting off a remnant of the San Diegan fauna on Cedros Island. My inference that the fauna of the Magdalena Plain is to be directly associated with that of the Vizcaino Desert is based primarily on the distribution of *Callisaurus crinitus,* the close relations between *Cnemidophorus rubidus* and *C. bartolomas,* and the presence of *Verticaria hyperythra beldingi.* It would be of great interest to know whether *Cnemidophorus*

bartolomas and *Phrynosoma jamesi* are confined to the Pacific Coast, as appears at present, or to what extent these species range into this district. The occurrence of certain species at La Paz (*Crotaphytus wislizenii*, for example) may indicate a route of migration via the Vizcaino Desert and the Magdalena Plain of the undifferentiated Sonoran elements in the fauna of the Cape district.

The San Lucan fauna is the most characteristic and the most differentiated of the four Lower Californian herpetological faunæ though scarcely more distinct from the Colorado Desert fauna than the latter is from the San Diegan. Five, possibly seven, species of the Vizcaino Desert fauna are distinct from the species of the two northern districts. The Cape district has no less than twenty-nine species strictly confined to it. The total number of species recorded from it is fifty-two, as follows.

Amphibians

Batrachoseps attenuatus
Scaphiopus couchii
Bufo punctatus
Hyla regilla

Reptiles

Phyllodactylus tuberculosus
**Phyllodactylus unctus*
**Ctenosaura hemilopha*
**Dipso-saurus dorsalis lucasensis*
Crotaphytus collaris baileyi
Crotaphytus wislizenii
**Sauromalus ater*
**Callisaurus draconoides*
Callisaurus ventralis gabbii
**Sceloporus zosteromus*
**Sceloporus licki*
**Uta thalassina*
Uta mearnsi
**Uta elegans*
Uta microscutata
**Uta nigricauda*
**Phrynosoma coronatum*
**Gerrhonotus multi-carinatus*
**Xantusia gilberti*
**Cnemidophorus maximus*
**Verticaria hyperythra hyperythra*
Verticaria hyperythra schmidti
Plestiodon skiltonianus
**Bipes biporus*
Siagonodon humilis
**Lichanura trivirgata*
Coluber flagellum piceus
Coluber lateralis
**Coluber aurigulus*
Salvadora hexalepis
Phyllorhynchus decurtatus
**Elaphe rosaliæ*
**Pituophis vertebralis*
**Lampropeltis getulus conjuncta*
**Lampropeltis californiæ nitida*
Rhinocheilus lecontei
Hypsiglena ochrorhynchus ochrorhynchus
Natrix valida
Sonora episcopa
**Chilomeniscus stramineus*
**Chilomeniscus punctatissimus*
Chilomeniscus cinctus
**Tantilla planiceps*
Trimophodon lyrophanes
**Crotalus atrox lucasensis*
**Crotalus enyo*
**Crotalus mitchellii*
**Pseudemys ornata nebulosa*

The species starred are confined to this area. The degree of peculiarity is much increased if the insular species are included. Since most of these simply represent peninsular forms, I have not included them in

the discussion; but the two insular species of *Sator*, which is not represented on the peninsula, may be mentioned in this connection, especially as *Sator* is the only genus of reptiles entirely confined to Lower California (cf. *Verticaria*, etc., above).

Of the species occurring outside the Cape district, only *Natrix valida* and possibly *Gerrhonotus multi-carinata* (cf. Stejneger and Barbour, 1917, p. 61) are West Mexican and not found in northern Lower California, although *Ctenosaura hemilopha*, *Bipes biporus*, and possibly *Elaphe rosaliæ* are most closely allied to West Mexican forms at present. The relations of the San Lucan fauna with the San Diegan and the Colorado Desert faunæ are very unequal.

Of the fifty-two species, fifteen occur also in the Colorado Desert fauna and seven more are obviously closely allied to Colorado Desert forms; ten are identical with San Diegan forms, but of these, two are found also in the desert; while five more species are more closely allied to San Diegan forms than to desert forms; the proportion of Colorado Desert element to San Diegan element is therefore about 22 to 13. The San Lucan forms in the San Diegan district, however, appear to be largely derived forms, as with the exception of *Hyla regilla*, *Plestiodon skiltonianus*, and *Rhinocheilus lecontei*, these find their northern limit in this area, while the San Lucan forms which reach the desert for the most part (generically if not specifically) have a wide range. This I have shown more fully above in discussing generic ranges.

San Lucan Species Occurring in the Colorado Desert or Allied Sonoran Faunæ

(*a*). As Identical Species

Scaphiopus couchii	*Siagonodon humilis*
Bufo punctatus	*Coluber flagellum piceus*
Phyllodactylus tuberculosus	*Salvadora hexalepis*
Crotaphytus collaris baileyi	*Phyllorhynchus decurtatus*
Crotaphytus wislizenii	*Sonora episcopa*
Callisaurus ventralis gabbii	*Chilomeniscus cinctus*
Uta mearnsi	*Trimorphodon lyrophanes*
	Crotalus mitchellii

(*b*). As Related Species

San Lucan	Colorado Desert
Dipso-saurus dorsalis lucasensis	*Dipso-saurus dorsalis dorsalis*
Sauromalus ater	*Sauromalus obesus*
Sceloporus zosteromus	*Sceloporus magister*
Uta elegans	*Uta stansburiana stejnegeri*
Xantusia gilberti	*Xantusia vigilis*
Tantilla planiceps	*Tantilla nigriceps*
Crotalus atrox lucasensis	*Crotalus atrox atrox*

San Lucan Species Occurring in the San Diegan Fauna

(*a*). As Identical Species

Batrachoseps attenuatus
Hyla regilla
Uta microscutata
Verticaria hyperythra schmidti
Plestiodon skiltonianus
Coluber lateralis
Rhinocheilus lecontei
Hypsiglena ochrorhynchus ochrorhynchus

(*b*). As Related Species

San Lucan	San Diegan
Sceloporus licki	*Sceloporus occidentalis bi-seriatus*
Gerrhonotus multi-carinatus	*Gerrhonotus scincicauda webbii*
Lichanura trivirgata	*Lichanura roseofusca*
Lampropeltis getulus conjuncta	*Lampropeltis getulus boylii*
Lampropeltis californiæ nitida	*Lampropeltis californiæ californiæ*

As there are no important additions to be made to the faunæ of the Revilla Gigedo Islands and islands off the Pacific coast of Lower California, with the exception of Cedros Island, they may be omitted from the present résumé. Van Denburgh and Slevin (1914) have given a complete account of these insular faunæ.

The fauna of Cedros at present known consists of eleven species:

Hyla regilla
Crotaphytus wislizenii
**Uta concinna*
Sceloporus rufidorsum
**Phrynosoma cerroense*
**Phrynosoma schmidti*
Verticaria hyperythra beldingi
**Cnemidophorus multiscutatus*
**Cnemidophorus labialis*
Siagonodon humilis
Crotalus exsul

The five species starred are peculiar to the island. *Hyla regilla*, *Sceloporus rufidorsum*, the *Verticaria*, and *Crotalus exsul* are San Diegan forms reaching Cedros. It is not impossible that they are cut off by a considerable gap from their nearest mainland occurrence, as the *Crotaphytus* and *Siagonodon* apparently represent an invasion of the desert forms. The relations of the peculiar forms are not fully established, but it seems certain that *Uta concinna* and *Cnemidophorus multiscutatus* are most closely allied to San Diegan forms, while the remaining three are representatives of the adjacent Vizcaino Desert fauna.

The islands of the Gulf of California appear to fall simply enough into two groups, those nearest the peninsula having a non-Mexican and strictly Lower Californian fauna, while those nearer the mainland have a fauna derived from Mexico.

The fauna of the island of Angel de la Guardia consists of the following seven forms:

**Sauromalus hispidus*
**Crotaphytus insularis*
**Callisaurus splendidus*
Uta stansburiana stejnegeri
**Cnemidophorus dickersonæ* (Isla Partida)
**Crotalus atrox elegans*
Crotalus mitchellii

Of these, the five starred are peculiar to the island. As far as our present knowledge of these species goes, they are equally related to Lower Californian and West Mexican representatives.

From Sal Si Puedes Island, only one species, *Cnemidophorus canus*, is known.

A single species, *Crotalus tortugensis*, is known from the island of Tortuga.

From San Marcos Island, only *Verticaria hyperythra schmidti* is known, a form widely distributed on the peninsula.

Five species are known from Carmen Island:

Callisaurus ventralis gabbii
Uta elegans
Uta microscutata
**Verticaria cærulea*
**Cnemidophorus vandenburghi*

Of these, the two last are peculiar to the island; the other three are found on the adjacent shores of the peninsula. *Verticaria cærulea* is interesting as an insular representative of the more plastic peninsular form, *Verticaria hyperythra schmidti.*

From Monserrate Island, only two species, *Sceloporus monserratensis* and *Verticaria picta*, are known.

Five species are known from Santa Catalina Island:

Dipso-saurus dorsalis lucasensis
**Sceloporus lineatulus*
**Uta squamata*
**Cnemidophorus catalinensis*
**Lampropeltis catalinensis*

The peculiar species of *Sceloporus* differs very slightly from the mainland form, while the *Uta*, *Cnemidophorus*, and *Lampropeltis* are much more distinct from their peninsular allies.

Only a single highly peculiar species, *Sator angustus*, is known from Santa Cruz Island.

Six species are now known from San José Island:

Callisaurus ventralis gabbii
Sceloporus zosteromus
Uta elegans
Uta microscutata
**Cnemidophorus celeripes*
**Verticaria sericea*

The latter two are peculiar to the island, the *Verticaria* being most closely allied to the species on Carmen Island, while the similarity to the Carmen Island fauna is increased by the species in common with it and the peninsula.

San Francisco Island has a single peculiar species, *Verticaria franciscensis*.

The fauna of Espiritu Santo Island comprises seven species:

Sauromalus ater
Uta elegans
Sceloporus zosteromus
Sceloporus licki
**Verticaria espiritensis*
Chilomeniscus punctatissimus
**Coluber barbouri*

The peculiar species of snake is, I believe, more closely related to the mainland form from which it is obviously derived than is the case with the species peculiar to other islands.

From Ceralvo Island, three species are known, *Verticaria ceralbensis*, *Sator grandævus*, and *Ctenosaura hemilopha*. The occurrence of a related but highly distinct species of *Sator* on the island of Santa Cruz indicates that this genus was formerly present on the peninsula, while the divergence shown by these two insular species indicates a considerable antiquity for the genus. I am unable to distinguish the *Ctenosaura* from the peninsular species.

Turning to the islands which I believe to be more closely related to the Mexican mainland than to the Lower Californian peninsula, San Esteban Island, in the middle of the gulf, has three species, *Ctenosaura hemilopha*, *Cnemidophorus estebanensis* and *Crotalus molossus*, at present known from it besides the peculiar *Sauromalus varius*. Of these, the first is found in Lower California, the *Cnemidophorus* is almost identical with the *C. melanostethus* of Sonora, and the *Crotalus* is identical with a Mexican form not found in Lower California. The relations of the *Sauromalus* are not evident. As the question of relations stands, therefore, it is two to one in favor of a Mexican relation of the island. From the soundings of the gulf north and south of San Esteban, it is evident that this is the most probable location of a connection of Lower California with Sonora, if such a connection ever existed.

The species known from Tiburon Island are the following:

**Sauromalus townsendi*
Crotaphytus wislizenii
**Crotaphytus dickersonæ*
**Callisaurus ventralis inusitatus*
**Cnemidophorus punctilinealis*
**Cnemidophorus disparilis*
Micrurus euryxanthus

While five of these are at present known only from the island, it seems probable that they occur on the adjacent coast of Sonora. The appearance of *Micrurus euryxanthus* is a striking evidence of the non-Californian character of the Tiburon fauna.

The two species of lizards known from San Pedro Martir Island, *Uta palmeri* and *Cnemidophorus martyris*, are highly peculiar but the relations of the latter with *C. disparilis* of Tiburon Island lead me to associate this island with the Mexican mainland.

Only two species, *Uta nolascensis* and *Cnemidophorus bacatus*, are known from the island of San Pedro Nolasco.

A large number of species confined to islands in the Gulf of California are now known, the total (to January 1, 1922) being thirty-four, with sixteen islands represented. As no less than fourteen of these are known to me only from the preliminary diagnoses, I am unable to form definite opinions as to their relations. The mere list, however, is instructive:

Crotaphytus dickersonæ
" *insularis*
Sauromalus hispidus
" *townsendi*
" *varius*
Callisaurus splendidus
" *ventralis inusitatus*
Sceloporus lineatulus
" *monserratensis*
Sator angustus
" *grandævus*
Uta palmeri
" *squamata*
" *nolascensis*
Cnemidophorus vandenburghi
" *celeripes*
" *estebanensis*
" *punctilinealis*
Cnemidophorus disparilis
" *martyris*
" *catalinensis*
" *dickersonæ*
" *canus*
" *bacatus*
Verticaria ceralbensis
" *espiritensis*
" *sericea*
" *cærulea*
" *franciscensis*
" *picta*
Coluber barbouri
Lampropeltis catalinensis
Crotalus tortugensis
" *atrox elegans*

There are thirty species of lizards and only four snakes. Of the thirty lizards, sixteen are teiids belonging to the two genera *Cnemidophorus* and *Verticaria*. The ten insular *Cnemidophorus* compare with five peninsular species, the six insular *Verticarias* with three on the peninsula. The great majority of all of the species will certainly be found to be very closely allied to the peninsular or Mexican forms from which they are derived. In contrast to these stands a small number of very distinct forms, such as the species of *Sauromalus*, the *Sators*, and possibly *Verticaria ceralbensis*. The latter group of species I believe to have been differ-

entiated at a much earlier stage than the former, and I regard their present isolation as "relict distribution." They were probably elements of the older Lower Californian fauna co-existing with the earlier and more widely differentiated species of the peninsula, such as *Uta thalassina*, while the less distinct forms have become differentiated since the relatively recent faulting or submergence which has separated the islands from the peninsula.

SPECULATIONS ON THE ORIGIN OF THE FAUNA

The factors in the geologic history of Lower California which seem to bear most directly on the origin of its present fauna are: (1) the ancient (pre-Cretaceous) granitoid character of the southern tip of the peninsula; (2) the extensive Miocene lava-flows of the middle of the peninsula; and (3) the recent (post-Pliocene) submergence of the middle of the peninsula, where marine fossils and beaches are found to a height of over 3000 feet.

Although recent beaches are not recorded from the immediate vicinity of La Paz, the submergence to the north indicates that the hypothesis of Eisen (1895, p. 755) and Nelson (1921, p. 53), that the Cape area south of La Paz has been separated from the peninsula at a relatively recent date, is probably correct. I believe, however, that Nelson is right in regarding this separation as of comparatively little importance in the history of the fauna. The islands which parallel the gulf coast of the peninsula were quite certainly part of the peninsula at a fairly recent date. The topographical similarity of many of the islands with isolated capes and mountains of the adjacent coast is very strikingly illustrated in Nelson's map (*loc. cit.*, Pl. xxxv).

As the bulk of the middle part of the peninsula consists of Miocene deposits with extensive late Miocene lava-flows (Darton, 1921, p. 720, ff.) it is evident that, if there are remnants of a pre-Miocene fauna in Lower California, they must be looked for in the southern tip of the peninsula.

It is possible that the apparently oldest element in the fauna (see below) antedates the Miocene igneus activity. The larger part of the fauna, and that with a more characteristically desert facies, however, must have entered the peninsula from the north subsequent to the late Tertiary volcanic activity. It is possible that another element of the fauna might be dated from the most recent submergence (late Pleistocene) and this probably consists of the Colorado Desert species (such as *Crotaphytus wislizenii, Callisaurus ventralis gabbii, Coluber flagellum*

piceus, and *Salvadora hexalepis*) which reach the Cape area without having been differentiated from the northern stock.

The Lower Californian amphibians and reptiles are accordingly divisible into groups or "faunal elements" which seem to represent successive invasions from the continental fauna at the north. These may be arranged in a very tentative order as shown in the accompanying table.

I. The "Mexican" forms	Middle or Pre-Miocene	Early Tertiary immigration
Extensive Destruction of Fauna by Igneus Activity		
II. The forms in common with the San Diegan area and Mexican Plateau	Post-Miocene and Pliocene	Late Tertiary and Pleistocene immigration
III. The forms bordering the Colorado Desert	Pleistocene	
IV. The Colorado Desert forms which have become differentiated in the Cape area		
Last Extensive Submergence		
V. The Colorado Desert forms which reach the Cape unchanged	Subsequent to the last submergence	Recent immigration *in process*
VI. The desert forms which have not yet spread beyond the borders of the Colorado Desert proper	Contemporary	

The most important consideration bearing on the history of the Lower Californian fauna is the discontinuity of the ranges of numerous genera and species at the Colorado Desert to the north, which appears to be inserted like a wedge separating closely related forms in Arizona and Lower California. It may be supposed that an increasing aridity in this area during Pleistocene and post-glacial time has led to the evolution of forms specifically adapted to desert conditions in this area, their ancestors, where they continue, being forced to follow their migrating

habitat, both through their lack of adaptation to the increasing aridity and through the pressure exerted on them by their better adapted derivatives. This accordingly parallels on a small scale the large-scale process of climatic evolution of faunæ elaborated by Matthew (1915). On the theory that this has been a long-continued and fairly uniform process, the composite character of the fauna may be quite simply explained. The numerous species confined to the Colorado Desert proper and extending only into the northeastern part of Lower California represent the most recent faunal development, i.e., are the most recent element in the Lower Californian fauna. The only genus peculiar to this fauna is *Uma*, which is closely restricted in habitat. A slightly older element consists of the genera confined to the Colorado and adjacent desert areas, which reach southern Lower California; these are *Dipso-saurus*, *Sauromalus*, *Callisaurus*, *Phyllorhynchus*, and *Chilomeniscus*. With the exception of *Phyllorhynchus*, they have developed a distinct species in the Cape district. The desert species which range into southern Lower California without differentiation may represent the intermediate stage between these two elements. A "highway" for their immigration seems to be present in the Vizcaino Deserts and the Magdalena Plain. Correlated with the development and spread of this strictly desert fauna is the distribution of the species which in some sense border the desert. *Scaphiopus couchii*, *Hyla arenicolor*, *Phrynosoma solare*, *Rhinocheilus lecontei*, *Hypsiglena ochrorhynchus ochrorhynchus*, and *Trimorphodon lyrophanes*, which are apparently absent from the Colorado Desert but present in Lower California, reappear in Arizona at the border of the Mexican Highland (Physiographic nomenclature of Fenneman, 1916, p. 34). *Natrix valida*, which probably ranges into the State of Sonora in Mexico, may be included with this list, and, somewhat more doubtfully, the fresh-water turtle, *Pseudemys ornata nebulosa*, which is subspecifically distinct in Lower California. A number of other species which border the Colorado Desert on one side only are in full accord with the distribution of the above, *Uta mearnsi*, *Xantusia vigilis*, and *Lichanura roseofusca*, being examples. In the light of the discontinuity of the ranges of the foregoing list of species, it seems logical to interpret the oldest element in the fauna in the same way. This element consists of genera absent in the strictly desert areas to the north but present in the Cape district or the San Diegan district and reappearing in southern Arizona or farther south in Mexico, such as *Gerrhonotus*, *Ctenosaura*, *Plestiodon*, *Bipes*, *Elaphe*, and *Tantilla*. The section of the genus *Uta* with an entire frontal (*Uta nigricauda* and *microscutata*) belongs here, and probably the

genus *Sator*, now entirely restricted to islands in the Gulf of California. *Uta thalassina*, restricted to southern Lower California, also may be placed with this "older" element. Finally, the species common to the Cape district and the San Diegan district are believed to represent a radiating migration antedating the present conditions, as it is difficult to see how migration from the relatively humid San Diegan area to the restricted similar areas in the Cape district could take place at present, on account of the intervening deserts. It must therefore be supposed that a continuous, or nearly continuous, semi-humid belt connected the San Diegan and the Cape areas at an early date. It is not incompatible with this theory that, in the diverse habitat conditions of Lower California and its isolated position, a large number of species have developed "in place." This differentiation after migration accounts in part for the distinctive species of the various faunal districts.

ARTIFICIAL KEYS TO THE GENERA OF AMPHIBIANS AND REPTILES IN LOWER CALIFORNIA

The amphibians are scantily represented in Lower California by eleven species of seven genera, which may be recognized as follows:

1. Adult tailed ..... 2.
   Adult tailless ..... 4.
2. Toes four in front, five behind ..... 3.
   Toes four on each foot ..... *Batrachoseps.*
3. Tail longer than head and body; size large, adult exceeding 10 inches. . *Plethodon.*
   Tail shorter than head and body; size smaller, adult rarely exceeding 6 inches. *Aneides.*
4. Digits dilated at the tip ..... *Hyla.*
   Digits not dilated ..... 5.
5. Skin smooth ..... *Rana.*
   Skin more or less warty ..... 6.
6. Two metatarsal tubercles, not black or horny ..... *Bufo.*
   A single (inner) metatarsal tubercle with a black and horny edge. . *Scaphiopus.*

The two species of *Hyla* may be distinguished as follows:

Skin rough, with small warts; two phalanges of fourth toe free from web. *H. arenicolor*
Skin smooth, three phalanges of fourth toe free from web ..... *H. regilla*

The two species of *Bufo* do not occur in the same area; they are very different in form, the *Bufo boreas halophilus* in the northwestern part of the peninsula being a large species with a deep head, the *Bufo punctatus* from the cape region much smaller, with a flattened head.

The species of *Scaphiopus* in Lower California may be distinguished as follows:

Snout sharply truncate in profile ..... *S. hammondii.*
Snout rounded in profile ..... *S. couchii.*

The reptiles of Lower California include lizards, snakes and a single species of non-marine turtle. The lizards represent nine families: Gekkonidæ, Eublepharidæ, Iguanidæ, Anguidæ, Anniellidæ, Xantusiidæ, Teiidæ, Scincidæ, and Amphisbænidæ. The snakes represent four families: Leptotyphlopidæ, Boidæ, Colubridæ and Viperidæ. These families may be distinguished as follows:

1. Both pairs of limbs present ..... 2.
   Only one pair of limbs, or none ..... 8.
2. Eyelids absent ..... 3.
   Eyelids developed ..... 4.
3. Top of head covered with small granular scales; tips of digits dilated with a pair of plates beneath ..... Gekkonidæ.
   (a single genus in Lower California, *Phyolldactylus*).
   Top of head with large plates; tips of digits not dilated ..... Xantusiidæ.
   (a single genus in Lower California, *Xantusia*).
4. Top of head covered with very small granular scales, skin free from skull, pupil vertical ..... Eublepharidæ.
   (a single genus in Lower California, *Coleonyx*)
   Top of head covered with scales larger than those of the back, skin not free from skull ..... 5.
5. A series of femoral pores ..... 6.
   No femoral pores ..... 7.
6. Ventral scales in regular transverse and longitudinal series ..... Teiidæ.
   (see key below).
   Ventral scales not in regular series, more numerous ..... Iguanidæ.
   (see key below).
7. Dorsal scales smooth, laterals and ventrals not much different ..... Scincidæ.
   (a single genus in Lower California, *Plestiodon*).
   Dorsal scales keeled, lateral scales smaller than dorsals or ventrals, a strong lateral fold ..... Anguidæ.
   (a single genus in Lower California, *Gerrhonotus*).
8. A pair of anterior limbs, no posterior pair ..... Amphisbænidæ.
   (a single genus in Lower California, *Bipes*, forming a distinct subfamily (Bipedinæ) of this otherwise limbless family).
   No anterior or posterior limbs ..... 9.
9. Scales of the lower surface not enlarged ..... 10.
   Ventral scales enlarged ..... 11.
10. Eyes present, external ..... Anniellidæ.
    (a single genus in Lower California, *Anniella*).
    Eyes absent externally, visible as a black dot beneath the scales which cover them ..... Leptotyphlopidæ.
    (a single genus in Lower California, *Siagonodon*).

11. A pair of spurs just in front of the anal cleft, (representing the vestigial hind limbs); scales of top of head small.....Boidæ.
(a single genus in Lower California, *Lichanura*).
No spurs in front of anal cleft.....12.
12. A pair of large erectile fangs in the upper jaw.....Viperidæ.
(a single genus in Lower California, *Crotalus*).
No erectile fangs in the upper jaw.....Colubridæ.
(see key below).

Key to the Genera of Teiidæ in Lower California

Two frontoparietal plates.....*Cnemidophorus.*
A single frontoparietal plate.....*Verticaria.*

Key to the Genera of Iguanidæ in Lower California

1. A dorsal crest.....2.
No dorsal crest.....3.
2. Tail spinous at base.....*Ctenosaura.*
Tail not spinous at base.....*Dipso-saurus.*
3. Head with strong spines or horns.....*Phrynosoma.*
Head without horns.....4.
4. Supraciliary scales juxtaposed; size large; form stout.....*Sauromalus.*
Supraciliary scales strongly imbricate; form slender.....5.
5. Upper labials oblique, imbricate.....6.
Upper labials not oblique or imbricate.....7.
6. Back with an ocellated color pattern; two rows of subdigital scales; a series of very long lateral fringes on the digits.....*Uma.*
Back without ocellation; a single row of subdigital scales; fringes present in one species.....*Callisaurus.*
7. Head covered with small irregular scales; no large occipital scale..*Crotaphytus.*
Head scales enlarged, a large occipital.....8.
8. A well-defined collar, preceded by a transverse gular fold.....*Uta.*
No collar.....9.
9. A well-defined transverse gular fold; body compressed; tail very long..*Sator.*
No transverse gular fold; body usually depressed.....*Sceloporus.*

Key to the Genera of Colubrine Snakes in Lower California

1. Scales keeled.....2.
Scales smooth.....4.
2. The two prefrontal plates longitudinally divided, forming four prefrontals.
Pituophis.
Only two prefrontal plates.....3.
3. Anal plate simple.....*Thamnophis.*
Anal plate divided.....*Natrix.*
4. Anal entire.....5.
Anal divided.....8.
5. Loreal scales 2–4; rostral projecting.....*Phyllorhynchus.*
One loreal; rostral not projecting.....6.

6. Subcaudal scales usually undivided ..... *Rhinocheilus.*
   Subcaudal scales in two rows ..... 7.
7. Dorsal scales 27–31 ..... *Arizona.*
   Dorsal scales less than 27 ..... *Lampropeltis.*
8. Loreal absent ..... 9.
   Loreal present ..... 10.
9. Nasal fused with the frontonasal plate ..... *Chilomeniscus.*
   Nasal not fused with the frontonasal ..... *Tantilla.*
10. Two loreals ..... *Trimorphodon.*
    A single loreal ..... 11.
11. Rostral projecting, its lateral edges free; color pattern of longitudinal bands. *Salvadora.*
    Rostral not projecting; coloration various ..... 12.
12. Dorsal scales in 15 rows ..... *Sonora.*
    Dorsal scales in more than 15 rows ..... 13.
13. Pupil vertical ..... *Hypsiglena.*
    Pupil round ..... 14.
14. Dorsal scales in 17–19 rows ..... *Coluber.*
    Dorsal scales in about 33 rows ..... *Elaphe.*

DISTRIBUTIONAL LIST OF THE AMPHIBIANS AND LAND REPTILES OF LOWER CALIFORNIA AND THE NEIGHBORING ISLANDS, WITH NOTES ON THE SPECIES CONTAINED IN THE COLLECTION MADE BY THE 'ALBATROSS' IN 1911

AMPHIBIA

Caudata

Batrachoseps attenuatus (Eschscholtz)

Salamandrina attenuata Eschscholtz, 1833, p. 1, Pl. xxii, figs. 1–4.
Batrachoseps attenuatus Stejneger and Barbour, 1917, p. 13.

Range.—S. W. Oregon, California, and Lower California.

Lower Californian Records.—La Paz, Lockington, 1880, p. 295; San Pedro Martir Mts., Van Denburgh, 1895*a*, p. 560.

Batrachoseps leucopus Dunn

Batrachoseps leucopus Dunn, 1922, Copeia, No. 109, p. 60.

Range.—Coronados Islands, Lower California.

Plethodon croceater Cope

Plethodon croceater Cope, 1867, p. 210; Stejneger and Barbour, 1917, p. 14.

Range.—Lower California and California north to El Dorado County.

Lower Californian Records.—"75 miles S. E. of San Diego," Lockington, 1880, p. 295; Cape St. Lucas, Cope, 1889, p. 150. (Occurrence doubtful in the Cape district.)

Aneides lugubris lugubris (Hallowell)

Salamandra lugubris Hallowell, 1849, p. 126.

Aneides lugubris lugubris Stejneger and Barbour, 1917, p. 21.

Range.—California; the Coronados Islands.

Lower Californian Records.—Coronados Islands, Van Denburgh and Slevin, 1914, p. 139.

Salientia

Scaphiopus couchii Baird

Scaphiopus couchii Baird, 1854, p. 62; Stejneger and Barbour, 1917, p. 25.

Range.—Texas to Arizona, northern Mexico and Lower California.

Lower Californian Records.—Cape St. Lucas, Cope, 1863*a*, p. 52; La Paz, Yarrow, 1882, p. 177; San José del Cabo, Miraflores, Van Denburgh, 1895*a*, p. 558; San Ignacio, Mulege, Mocquard, 1899, p. 342; between La Paz and San Pedro, Van Denburgh and Slevin, 1921*a*, p. 53.

Scaphiopus hammondii Baird

Scaphiopus hammondii Baird, 1859*a*, p. 12, Pl. xxviii, fig. 2; Stejneger and Barbour, 1917, p. 25.

Range.—Montana to Mexico, westward to the Pacific Coast and northern Lower California.

Two specimens in the collection of the Biological Survey add this form to the fauna of Lower California. U. S. N. M. No. 37710 is from Ensenada; 37709, without locality, is probably also from the northwestern part of the peninsula.

Bufo punctatus Baird and Girard

Bufo punctatus Baird and Girard, 1852, p. 173; Stejneger and Barbour, 1917, p. 29.

Range.—Western Texas, Utah, southern California, and Lower California.

Lower Californian Records.—La Paz, Yarrow, 1875, p. 162; Cape St. Lucas, Cope, 1889, p. 262; Santa Anita, San Ignacio, Agua Caliente, San José del Cabo, Corral de Piedras (Sierra el Taste), Miraflores, Van Denburgh, 1895*a*, p. 559; Santa Rosalia, Mocquard, 1899, p. 334; San Antonio, San Pedro, foothills of Sierra Laguna, Van Denburgh and Slevin, 1921*a*, p. 53.

This species was secured by the Albatross Expedition at Miraflores, Lower California (A. M. N. H. Nos. 3163, 3165–67, U. S. N. M. No. 64454).

Specimens at hand from the Biological Survey collection come from Santa Anita (U. S. N. M. Nos. 37713–15); Santana (37716); San Ignacio (37717–18); and La Providencia Canyon, east base of San Pedro Martir Mountains (37719–20).

The last of these localities is the most northerly record for this species in Lower California.

Bufo boreas halophilus Baird and Girard

Bufo halophila Baird and Girard, 1853*a*, p. 301.

Bufo boreas halophilus Stejneger and Barbour, 1917, p. 27.

Range.—Western Nevada, California, and northern Lower California.

Lower Californian Records.—Ensenada, Van Denburgh and Slevin, 1921*a*, p. 53.

Two specimens in the collection of the Biological Survey come from La Grulla (U. S. N. M. Nos. 37711–37712).

Hyla arenicolor Cope

Hyla arenicolor Cope, 1866, p. 84; Stejneger and Barbour, 1917, p. 32.

Range.—Utah to Texas and northern Lower California, south in Mexico to Guadalajara and Toluca.

Lower Californian Records.—Ensenada, Van Denburgh and Slevin, 1921*a*, p. 54.

Hyla regilla Baird and Girard

Hyla regilla Baird and Girard, 1852*a*, p. 174; Stejneger and Barbour, 1917, p. 33.

Range.—Vancouver Island and British Columbia to Lower California.

Lower Californian Records.—Cedros Island, Streets, 1877, p. 35; La Paz, Yarrow, 1882, p. 171; Cape St. Lucas, Cope, 1889, p. 360; Sierra Laguna, San Rafael Valley, San Pedro Martir Mt., San Ignacio, Comondu, Miraflores, San José del Cabo, Van Denburgh, 1895*a*, p. 556; Santa Rosalia, Mocquard, 1899, p. 339.

This species was collected on Cedros Island by the Albatross Expedition (A. M. N. H. No. 3161, U. S. N. M. No. 64453).

A specimen from La Grulla (U. S. N. M. No. 37708) was collected by the Biological Survey Expedition.

Rana aurora draytonii Baird and Girard

Rana draytonii Baird and Girard, 1852*a*, p. 174; Stejneger and Barbour, 1917, p. 37.

Rana aurora draytonii Camp, 1917, p. 115.

Range.—Oregon, California and northern Lower California.

Lower Californian Records.—San Pedro Martir Mts., Van Denburgh, 1896, p. 1008.

Three specimens in the collection made by the Biological Survey are from San Tomas (U. S. N. M. No. 37699); La Grulla (37700); and Rancho San Antonio (37701).

Reptilia

Lacertilia

Phyllodactylus tuberculosus Wiegmann

Phyllodactylus tuberculosus Wiegmann, 1835, p. 241, Pl. xviii, figs. 2–2*a*; Stejneger amd Barbour, 1917, p. 42.

RANGE.—Western Mexico, Lower California and extreme southern California.

LOWER CALIFORNIAN RECORDS.—Cape St. Lucas, Cope, 1863, p. 102; La Paz, Yarrow, 1882, p. 73; Santa Rosalia, Mocquard, 1899, p. 300; San Xavier, Bartolo, Van Denburgh and Slevin, 1921*a*, p. 54.

The collection made by the Albatross Expedition contains a single adult specimen (U. S. N. M. No. 64455) from Miraflores.

Phyllodactylus unctus (Cope)

Diplodactylus unctus COPE, 1863, p. 102.

Phyllodactylus unctus STEJNEGER AND BARBOUR, 1917, p. 42.

RANGE.—Lower California.

LOWER CALIFORNIAN RECORDS.—Cape St. Lucas, Cope, 1863, p. 102; Triunfo, Streets, 1877, p. 35; La Paz, Yarrow, 1882, p. 73; San José del Cabo, Miraflores, Van Denburgh, 1895, p. 86; Agua Caliente, Van Denburgh and Slevin, 1921*a*, p. 55.

Key to Distinguish the Species of *Phyllodactylus* in Lower California

Small dorsal granular scales interspersed with large tubercles.....*P. tuberculosus.*
Dorsal scaling uniform.....*P. unctus.*

Coleonyx variegatus (Baird)

Stenodactylus variegatus BAIRD, 1858, p. 254.

Coleonyx variegatus STEJNEGER AND BARBOUR, 1917, p. 43.

RANGE.—Texas to California and northern Lower California.

LOWER CALIFORNIAN RECORDS.—Santa Rosalia, Mulege, Mocquard, 1899, p. 300; San Felipe, Meek, 1905, p. 4.

Ctenosaura hemilopha Cope

Ctenosaura hemilopha COPE, 1863, p. 105; STEJNEGER AND BARBOUR, 1917, p. 44.

Ctenosaura conspicuosa DICKERSON, 1919, p. 461.[1]

Ctenosaura insulana DICKERSON, 1919, p. 462.[2]

RANGE.—Lower California, north to San Esteban Island, in the Gulf of California.

LOWER CALIFORNIAN RECORDS.—Cape St. Lucas, Cope, 1863, p. 105; La Paz, Yarrow, 1882, p. 71; San José del Cabo, Miraflores, Agua Caliente, Pescadero, Sierra San Lazaro, Van Denburgh, 1895, p. 88; San Pedro, Triunfo, San Antonio, San Bartolo, Buena Vista, Santiago, Todos Santos, Van Denburgh and Slevin, 1921*a*, p. 55.

This species was collected by the Albatross Expedition at Miraflores on the peninsula (A. M. N. H. Nos. 5665–7, U. S. N. M. Nos. 64554–6), on Ceralvo Island (A. M. N. H. No. 5568, U. S. N. M. No.

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[1]Type: U. S. N. M. No. 64439.
[2]Type: U. S. N. M. No. 64440.

64553) on San Esteban Island, near Tiburon Island (A. M. N. H. No. 2278, U. S. N. M. Nos. 64439, 64551–2), and Lower California (A. M. N. H. Nos. 5639–41, 5657–8, U. S. N. M. Nos. 64440, 64557–9).

Specimens in the National Museum, collected by the Biological Survey Expedition, are from Santa Anita (U. S. N. M. Nos. 37578–9), Cape San Lucas (37580–81), and San José del Cabo (37582).

Dickerson, 1919, *loc. cit.*, has named two insular species from San Esteban and Ceralvo Islands, on the basis of this material. Upon careful examination of the types and paratypes, I am unable to maintain their validity even as insular races. The difference in proportions between the two new forms (*loc. cit.*, p. 462) appears to be due to the fact that several of the San Esteban specimens are more or less shrunken from too strong alcohol, while the Ceralvo specimens are females, consequently with somewhat stockier bodies. Furthermore, the records now available do not indicate that all of these specimens are actually from the islands to which they are ascribed by Dickerson; the localities assigned above are from the department catalogue.

The tails of the older males are nearly always more or less injured. The regenerated portion is covered with sharply keeled scales, which are, however, scarcely spinose and not arranged in whorls.

The stomach of A. M. N. H. No. 5641 was entirely filled with the flowers of a leguminous plant.

Dipso-saurus dorsalis lucasensis Van Denburgh

Dipso-saurus dorsalis lucasensis Van Denburgh, 1920*b*, p. 33.

Range.—Cape region of Lower California.

Lower Californian Records.—La Paz, Cape St. Lucas, Yarrow, 1882, p. 54; San Luis Gonzales Bay, Townsend, 1890, p. 144; San José del Cabo, Magdalena Island, Comondu to San Quentin, Miraflores, Van Denburgh, 1895, p. 92; San Ignacio Mocquard, 1899, p. 301; San Pedro, Triunfo, San Bartolo, Buena Vista, Santiago, Agua Caliente, Todos Santos, Van Denburgh and Slevin, 1921*a*, p. 56.

Like Van Denburgh, I am unable to find any difference between Cape specimens of this species and those from Arizona, except the difference in the scales between rostral and nasal in which the sixteen specimens collected by the Albatross Expedition agree excellently with those of the California Academy of Sciences. The localities represented in the collection of the Albatross Expedition are San José del Cabo (A. M. N. H. Nos. 5552–4, 5556–7, U. S. M. N. Nos. 64543, 64547–50), Miraflores (A. M. N. H. No. 5663, U. S. N. M. Nos. 64544–6), and Santa Catalina Island (A. M. N. H. No. 5548). The specimen from

Santa Catalina Island is a juvenile one, the smallest in the series, but apparently indistinguishable from the mainland specimens.

Dipso-saurus dorsalis dorsalis (Baird and Girard)

Crotaphytus dorsalis Baird and Girard, 1852*a*, p. 126.

Dipso-saurus dorsalis Stejneger and Barbour, 1917, p. 44.

Range.— Colorado and Mohave Deserts, east to the Colorado River, northern Lower California.

Lower Californian Records.—San Felipe, Meek, 1905, p. 4; San Xavier, Van Denburgh and Slevin, 1921*a*, p. 56.

Specimens in the Biological Survey collection from northern Lower California come from Volcano Lake (U. S. N. M. No. 37631), and San Felipe Bay (37632). I have also referred Meek's specimen from San Felipe to the typical subspecies. The area of intergradation between the two forms remains to be determined.

Crotaphytus collaris baileyi Stejneger

Crotaphytus baileyi Stejneger, 1890, p. 103, Pl. xii, fig. 1.

Crotaphytus collaris baileyi Stejneger and Barbour, 1917, p. 45.

Range.—Northern Mexico, Arizona, the Great Basin; east in southern New Mexico to southwestern Texas; west to eastern California and Lower California.

Lower Californian Records.—San Felipe, San Salado, Meek, 1905, p. 8; (observed at Cañon Esperanza and Trinidad by Heller); Cerro de las Palmas, Mocquard, 1899, p. 303.

Specimens in the Biological Survey collection come from Volcano Lake (U. S. N. M. No. 37625) and San Pablo (37626). The juvenile specimen from San Pablo, in the same general area as the type locality of *Crotaphytus fasciatus* Mocquard (1899, p. 303, Pl. xiii, fig. 1), is of especial interest for comparison with this form. Mocquard's specimen measured 113 mm. in length, of which the body occupied 40 mm. They are consequently of approximately the same age. The coloration of the back, black with six transverse white lines, is almost exactly the same, Mocquard's specimen having an additional white line. This coloration corresponds with that described by Cope (1900, p. 249) as the juvenile coloration of *C. collaris*. Unfortunately I have no juvenile *collaris* of comparable age at hand, but I am convinced that *fasciatus* is merely a juvenile color phase. The characters other than coloration employed by Mocquard to distinguish *C. fasciatus* are either juvenile or inconstant.

Crotaphytus dickersonæ,[1] new species

Diagnostic Characters.—Closely related to *Crotaphytus collaris baileyi* Stejneger, from which it is distinguished by having the hind leg considerably longer than the body, a longer, more distinctly compressed tail, and slightly enlarged scales on the mid-dorsal line of the tail.

Range.—Known only from the type locality, Tiburon Island.

Type.—U. S. N. M. No. 64451, ♀, Tiburon Island; April 12, 1911, C. H. Townsend, collector (Albatross Expedition).

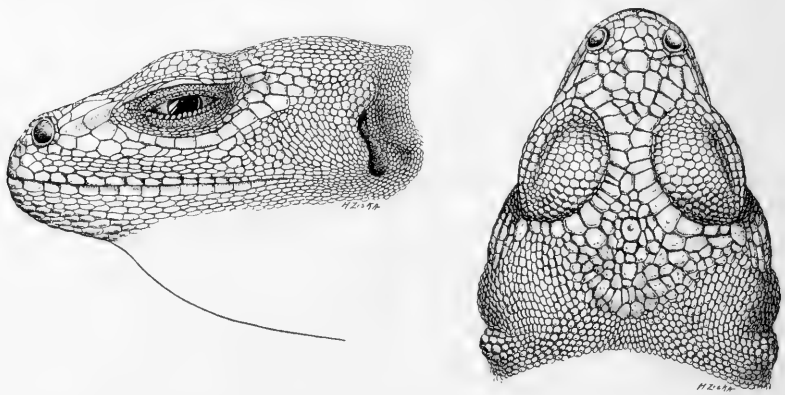

Fig. 2. Lateral and dorsal views of the head of the type of *Crotaphytus dickersonæ*, new species U. S. N. M. No. 64451, ♀. × 1½.

Description of Type.—

Habitus of *Crotaphytus collaris*, but legs and tail markedly longer; hind leg reaching considerably beyond the snout when laid along the body; tail more than twice as long as the head and body. Scales of the supraorbital semicircles distinct, as in *C. collaris baileyi;* supraoculars small, occipital slightly enlarged, separated from the supraorbital semicircles by two rows of smaller scales. Auricular opening narrow, oblique, bordered in front by small tubercular scales directed away from the opening. Ventral scales very small, not one-half the size of the ventral caudals. Soles of the feet with a few keeled, tridentate, more or less mucronate scales. Tail compressed with one or two median dorsal scale rows slightly enlarged. Femoral pores 19.

Two black collars, separated by a white band, the posterior wide, complete dorsally, and ending at insertion of the arm, the anterior extending to unite on the midline ventrally. Dorsal surface bluish gray with broad reticulating bands of darker color. More or less regular transverse rows of small white spots. Tail with dark spots proximally. A gular patch and groin patches reddish brown.

Total length, 313 mm.; tail, 218 mm.; snout to posterior border of ear, 30 mm.; width of head, 22 mm.; hind leg, 99 mm.; tibia, 37 mm. The tail forms .70 of the total length.

[1]Named for Miss Mary C. Dickerson, former Curator of the Department of Herpetology of The American Museum of Natural History.

The single specimen in the collection is a gravid female, considerably injured in collecting. The stomach contents consist of a ground beetle, a large wasp, and the tail of a lizard.

I have compared the type with a series of nineteen *C. collaris baileyi* in The American Museum of Natural History. In these, the average proportion of hind leg to body length is .87, while in the present specimen it is 1.04. The tail length in the series of *C. c. baileyi* averages .66 of the total, .70 in the type of *C. dickersonæ*.

It is possible that this species will be found to extend on the Mexican mainland and that it will ultimately be referred to a subspecific rank under *C. collaris*, occupying the southern portion of the range of the species on the western coast of Mexico.

Crotaphytus insularis Van Denburgh and Slevin

Crotaphytus insularis Van Denburgh and Slevin, 1921*b*, p. 96.

Range.—Angel de la Guardia Island.

Crotaphytus wislizenii Baird and Girard

Crotaphytus wislizenii Baird and Girard, 1852*b*, p. 340, Pl. iii; Stejneger and Barbour, 1917, p. 46.

Crotaphytus copeii Yarrow, 1882*a*, p. 441; Stejneger and Barbour, 1917, p. 45.

Range.—Idaho, the Great Basin, southward into Mexico, southern California and Lower California.

Lower Californian Records.—La Paz, Yarrow, 1882*a*, p. 441; Magdalena Island, Van Denburgh, 1895, p. 93; San Tomas, 1896, p. 1004; San Quentin, Meek, 1905, p. 8; Cedros Island, Van Denburgh and Slevin, 1914, p. 144; Tiburon Island, Dickerson, 1917, p. 96.

Specimens in the Biological Survey collection come from Ensenada (U. S. N. M. No. 37629) and Yubay (37630). The record from Ensenada extends the range of this species northward on the Pacific coast of Lower California, the nearest previous record being Santo Tomas. The record from Yubay, in the central part of the peninsula, fills a gap in the known distribution, connecting the Cedros Island record with those to the north and south.

I have followed Van Denburgh (1905, p. 25) in regarding the Lower Californian *Crotaphytus* of this type as *C. wislizenii*. The specimens secured by the Albatross Expedition in 1911, one each on Cedros and Tiburon Islands, are certainly insufficient to establish the validity of *C. copeii*, much less of insular races, in view of the great variability of typical *wislizenii*. Larger series from the peninsula may reëstablish *C. copeii*, and I append the measurements of the two insular specimens for reference.

Number	A. M. N. H. No. 5544	U. S. N. M. No. 64464
Locality	Cedros Island	Tiburon Island
Sex	♂	♂
Length	358 mm.	377 mm.
Tail	239 mm.	266 mm.
Length of Head	32 mm.	30 mm.
Breadth of Head	23 mm.	21 mm.
Hind Leg	88 mm.	93 mm.
Tibia	33 mm.	34 mm.

Key to Distinguish the Species of *Crotaphytus* in Lower California

Interorbital scales in two rows; a series of subequal suboculars. . *C. collaris baileyi.*
Interorbital scales in three or four series, a single much enlarged subocular.
C. wislizenii.

Sauromalus ater Duméril

Plate L, Figure 3

Sauromalus ater Duméril, 1856, p. 536, Pl. xxiii, fig. 3.
Sauromalus sp. Stejneger, 1891*b*, p. 411.
Sauromalus interbrachialis Dickerson, 1919, p. 463.[1]

Range.—Lower California, north to the island Espiritu Santo, off La Paz.

Lower Californian Records.—Island of Espiritu Santo, Stejneger, 1891, p. 411.

Two specimens of *Sauromalus* from La Paz are included in the collections of the Albatross Expedition. These are possibly from the island of Espiritu Santo, off La Paz, like the specimen recorded by Yarrow and Stejneger.

In defining *Sauromalus hispidus* in 1891, Stejneger remarked the discrepancy between the *Sauromalus ater* of California and Arizona and the single immature specimen from Lower California. With two additional specimens from the same locality, I believe the recognition of a distinct species is fully warranted. Mr. Charles L. Camp has pointed out to me the fact that it is highly improbable that the type of *S. ater* Duméril, collected by Lieut. Jaurès during the circumnavigating voyage of the frigate Danaide, and presented without locality to the Museum d'Histoire Naturelle in Paris, could have been collected in California or Arizona, since *Sauromalus* does not reach the coast of California. With this in mind, I applied to Professor Louis Roule, of the Museum d'Histoire Naturelle in Paris, for information regarding the type of *ater*, and he has very kindly supplied me with an excellent photograph of the ventral aspect of the type. The ventral scales from anus to gular fold number about 135, compared with a range of 160–182 in the California

[1] Type: U. S. N. M. No. 64443.

and Arizona specimens described by Stejneger. In the two specimens from La Paz in the Albatross collection (U. S. N. M. No. 64443, A. M. N. H. No. 6808), the ventral scales number 126 and 133, and in the specimen from Espiritu Santo already mentioned (U. S. N. M. No. 12633) they number 139.

In view of this agreement in the ventral scale character, I believe we are justified in assigning the name *ater* definitely to the species in southern Lower California.

	U. S. N. M.	A. M. N. H.	U. S. N. M.
Number	64443	6808	12633
Locality	La Paz	La Paz	Espiritu Santo Id.
Total Length	250 mm.	153 mm.	280 mm.
Tail Length	130 mm.	85 mm.	165 mm.
Femoral Pores	14–14	14–14	15–15
Dorsal Scales in Head Length	32	28	26
Ventral Scales from Gular Fold to Anus	133	126	139
Scales about Thickest Part of Tail	60	40	. .

Sauromalus obesus (Baird)

Euphryne obesa Baird, 1858, p. 253.
Sauromalus ater Stejneger and Barbour, 1917, p. 46.

Range.—Southern Nevada, southwestern Utah, Arizona, southern California, and northern Lower California, south to Mulege on the Gulf side.

Lower Californian Records.—Santa Agueda, San Ignacio, Mulege, Mocquard, 1899, p. 302; "Northern Lower California," Meek, 1905, p. 9.

The application of the name *ater* to the Lower Californian species releases Baird's name *obesus*, type locality Fort Yuma, Arizona, for the form occurring in the United States. Dr. Roule has kindly included a photograph of the ventral surface of one of the specimens recorded by Mocquard from the middle of the gulf side of the peninsula of Lower California with the photograph of the type of *ater*. The ventral scale count, 160, agrees closely with that of the series described by Stejneger (*loc. cit.*).

Sauromalus varius Dickerson

Plate XLIX

Sauromalus varius Dickerson, 1919, p. 464.[1]

Range.—Known only from the type locality, San Esteban Island, to which it is doubtless confined.

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[1]Type: U. S. N. M. No. 64441. Paratypes: U. S. N. M. Nos. 64560–71, A. M. N. H. Nos. 2701 5610–20, 5625–32, 5634–5, 5637–8.

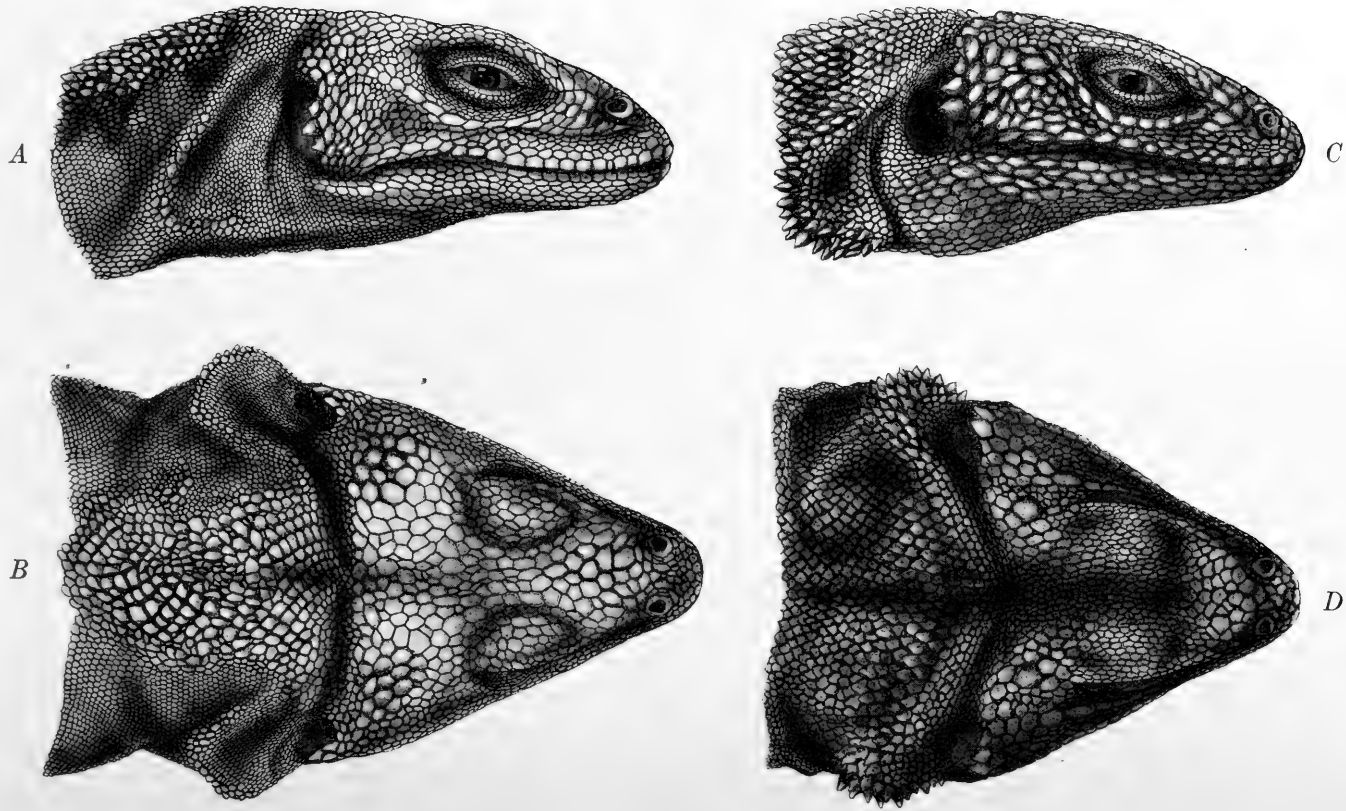

Fig. 3. *A* and *B*, lateral and dorsal views of the head and neck of *Sauromalus varius* Dickerson, A. M. N. H. No. 5630. × 1⅓. *C* and *D*, lateral and dorsal views of the type of *Sauromalus townsendi* Dickerson, U. S. N. M. No. 64442. × 1⅓.

The Albatross Expedition in 1911 secured forty-one specimens of this large lizard from San Esteban. Comparison with *S. hispidus* from Angel de la Guardia, *S. ater* from the peninsula, and *S. obesus* from California proves that it is quite as distinct a species as *S. hispidus*. From *S. obesus* it is distinguished by the distinctly smaller auricular spines and the smaller number of ventral scales, from *S. ater* by the large size and coloration, while from *S. townsendi* and *S. hispidus*, it is readily distinguished by the non-spinose nuchals.

In coloration the species is strikingly distinct from the much darker adults of *obesus* and *hispidus*. I have no large specimens of *S. ater* and *S. townsendi* but neither of these species shows any trace of the blotching of *S. varius*. The dorsal dark patches take on most irregular shapes and arrangements, never symmetrical, sometimes ill-defined, sometimes rather sharply set off from the ground color. Ventrally, the color is yellowish with a few small dark spots. Even on the tail the arrangement of the dark color is not symmetrical, as in juvenile *hispidus*.

The Albatross Expedition visited San Esteban Island on April 13, 1911. Large numbers of the big spotted lizards of this species, as well as of *Ctenosaura hemilopha*, were conspicuous, and were secured by pulling them out from under the rocks where they took refuge, or by turning over the rocks.

Dr. J. N. Rose, who was a member of the party, has kindly identified the stomach contents of three specimens. He writes: "The contents of two stomachs are entirely made up of the flowers of *Pachycereus pringlei* Britton and Rose. The third stomach is also largely filled with this cactus flower, but also contains numerous small leaflets of some leguminous plants, probably some *Cercidium*."

Measurements and scale characters of fifteen specimens of this species may be tabulated as follows.

	Extremes	Average
Total Length	465–615 mm.	513 mm.
Tail-Length	245–335 mm.	280 mm.
Tail-Length/Total Length	.53–.60	.55
Femoral Pores	15–19	
Dorsal Scales in Head Length	35–41	37
Ventral Scales from Gular Fold to Anus	136–151	142
Scales Around Thickest Part of Tail	69–76	72

Sauromalus townsendi Dickerson

Sauromalus townsendi Dickerson, 1919, p. 464.[1]

Range.—Tiburon Island; coast of Sonora?

[1]Type: U. S. N. M. No. 64442.

This species is founded on a unique specimen collected by the Albatross Expedition on Tiburon Island, April 11–13, 1911. It is in several respects intermediate between *S. obesus* and *S. hispidus*, but fully distinct from both. The nuchals and scales of the gular pouches are much larger and more spinose than in *S. obesus* of the same size, but much less spinose than in *S. hispidus*, while the dorsal scales are not appreciably spinose. The number of ventral scales from gular fold to anus is 125, which allies it to *hispidus* and distinguishes it from *obesus*. The number of scales around the thickest part of the tail is 60, not 90 as in the original description. It is interesting that the species on Tiburon Island should be sharply distinguished from that on San Esteban, only a few miles away. Belding (1893, p. 97) records seeing *Sauromalus* at Guaymas, on the Mexican mainland, not far south of Tiburon and it is not unlikely that this will be found to be *Sauromalus townsendi*.

Dr. J. N. Rose has kindly identified the stomach contents of this specimen as made up chiefly of *Fouquieria splendens* Engelmann and leaflets of the desert shrub *Olneya tesota* Gray.

Sauromalus hispidus Stejneger

Plate L, Figures 1 and 2

Sauromalus hispidus Stejneger, 1891*b*, p. 409; Stejneger and Barbour, 1917, p 46.

Range.—Angel de la Guardia Island, Gulf of California.

Fourteen specimens of this species were secured by the Albatross Expedition (A. M. N. H. Nos. 2696–97, 5566–67, 5607–09, 5705, and U. S. N. M. Nos. 64572–77).

This species equals the San Esteban *Sauromalus varius* in size, the maximum in the series collected by the Albatross Expedition of 1911 being 608 mm., (615 in *S. varius*). The adults in alcohol are very dark in color, differing strikingly in this respect from the *S. varius*. It is difficult to see how even a large capacity for color change in life could lessen the distinction in this respect between the two species.

Juvenile specimens (150 mm.) are light gray in color, with four dark crossbands on the back and six on the tail, those on the tail being most sharply defined. In this coloration, the young *hispidus* agree with juvenile *S. obesus*.

Measurements and scale characters of specimens of *S. hispidus* in The American Museum of Natural History:

	Number of Specimens	Extremes	Average
Total Length	9	435–608 mm.	526 mm.
Tail Length	9	230–318 mm.	280 mm.
Tail Length/Total Length	13	.50–.54	.52
Femoral Pores	13	12–16	
Dorsal Scales in Head Length	13	15–23	18
Ventral Scales from Gular Fold to Anus	13	113–122	117
Scales Around Thickest Part of Tail	12	39–50	45

Key to the Species of the Genus *Sauromalus*

1. Nuchals distinctly spinose.....2.
   Nuchals not distinctly spinose.....3.
2. Largest nuchals about equal to auricular spines; dorsal scales in head length, 16. *S. hispidus.*
   Largest nuchals about one-half the length of auricular spines; dorsal scales in head length, 28.....*S. townsendi.*
3. Ventral scales from gular fold to anus more than 155.....*S. obesus.*
   Ventral scales from gular fold to anus less than 155.....4.
4. Dorsal scales in head length 26–32; adult size under 400 mm.....*S. ater.*
   Dorsal scales in head length 35–41; adult size over 500 mm.....*S. varius*

Callisaurus crinitus Cope

Plate LI, Figure 1; Plate LII, Figures 1 and 3

Callisaurus crinitus Cope, 1896*a*, p. 1049; Stejneger and Barbour, 1917, p. 47.

Range.—Balenas Bay and San Bartolome Bay, Pacific Coast of Lower California, to the Magdalena Plain.

Lower Californian Records.—Balenas Bay, Cope, 1889, p. 147.

This exceptionally interesting species was taken by the Albatross Expedition at Abreojos Point (A. M. N. H. No. 5390), not far from the type locality, and at San Bartolome Bay, some distance to the north (A. M. N. H. Nos. 5369–71, 5501–2, 5504, U. S. N. M. No. 64530).

In the series at hand, one male (U. S. N. M. No. 64530) has three lateroventral bars on both sides, followed by a large and distinct spot on one side, which is less distinct on the other side; two males (A. M. N. H. Nos. 5371, 5502) have three bars on each side, the posterior ones being prolonged caudad from its ventral angles; in A. M. N. H. No. 5501, there are three bars followed by a spot on one side, while on the other side the middle bar forks slightly below the lateral fold, so that there appears to be four bars followed by a spot; in A. M. N. H. No. 5369, the middle bar forks in the other direction, i.e., it is single ventrally and divides on the side. The latter condition appears in A. M. N. H. Nos. 5502 and 5371, but the division is concealed by the lateral fold.

Two specimens, one of each sex, in the Biological Survey collection from Santo Domingo (U. S. N. M. Nos. 37644, 37646) greatly extend the range of this species which has hitherto been known only from the type locality, Ballenas Bay, and San Bartolome Bay (Albatross collection). The occurrence of a species characteristic of the Vizcaino Desert district on the Magdalena Plain adds to the evidence that the latter is faunally more closely allied to the Vizcaino area than to the Cape district proper, as I have elsewhere indicated.

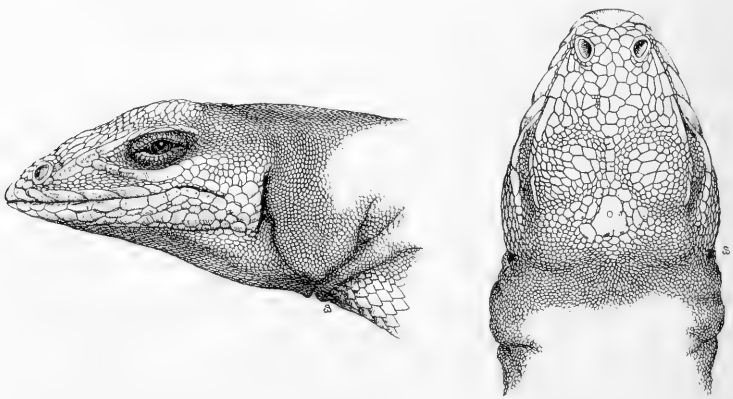

Fig. 4. Lateral and dorsal views of the head of *Callisaurus crinitus* Cope, U. S. N. M. No. 64530. × 2.

In the male specimen from Santo Domingo the fringes of the toes appear to be less strongly developed than in specimens from San Bartolome Bay, but the specimen shows signs of having been subjected to friction, and the points of some of the fringe scales are broken off. There are four lateroventral bands on one side, three on the other. The female specimen has the fringe scales well developed.

Callisaurus draconoides Blainville

Plate LI, Figures 1 to 3

Callisaurus draconoides Blainville, 1835, p. 286, Pl. xxiv, fig. 2; Stejneger and Barbour, 1917, p. 47.

Range.—Southern Lower California.

Lower Californian Records.—Cape St. Lucas, Baird, 1859*a*, p. 299; La Paz, Yarrow, 1882, p. 50; San José del Cabo, Sierra San Lazarro, Van Denburgh, 1895, p. 95; San Ignacio, Santa Rosalia, Mocquard, 1899, p. 305; Todos Santos, Miraflores, Agua Caliente, Buena Vista, San Bartolo, San Antonio, Triunfo, San Pedro, Van Denburgh and Slevin, 1921*a*, p. 57.

Thirteen specimens of this species were collected by the Albatross Expedition in 1911, from the following localities: Cape San Lucas (U. S. N. M. Nos. 64514–8); San José del Cabo (A. M. N. H. Nos. 5392–95); and Miraflores (A. M. N. H. Nos. 5391, 5659–60, U. S. N. M. No. 64519).

Specimens in the Biological Survey collection come from Cape San Lucas (U. S. N. M. No. 37637), Espiritu Santo Island (37638), and La Paz (37634).

The specimens from San Ignacio and Santa Rosalia recorded by Mocquard (*loc. cit.*) are north of the established range of this species, but the fact that he mentions three ventral spots makes it fairly certain that he had true *draconoides* before him.

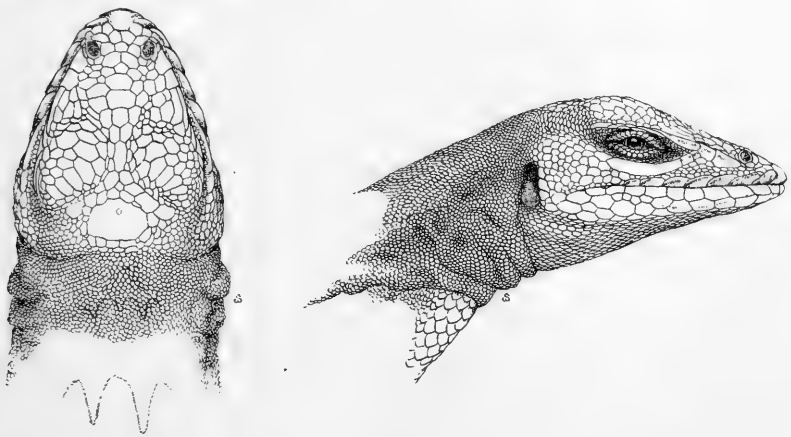

Fig. 5. Lateral and dorsal views of the head of *Callisaurus draconoides* Blainville, U. S. N. M. No. 64514. × 2.4.

The presence of a black spot posterior to the two lateroventral black bars is a conspicuous difference between *C. draconoides* and the other species of the genus, and is invariable in the series before me; the dorsal bars are often confluent, forming continuous wavy transverse markings.

Callisaurus splendidus Dickerson

Plate LI, Figure 1

Callisaurus dracontoides (part) Townsend, 1890, p. 144.
Callisaurus splendidus Dickerson, 1919, p. 467.

Range.—Angel de la Guardia, Gulf of California.

The Albatross Expedition of 1911 collected eight specimens of a *Callisaurus* on Angel de la Guardia Island (A. M. N. H. Nos. 5338, 5342, 5373–75, 5396, 6807, U. S. N. M. No. 64254 (Type)).

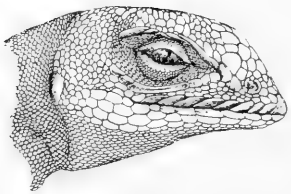

Fig. 6. Lateral view of the head of *Callisaurus splendidus* Dickerson, A. M. N. H. No. 5373. × 2.

The distinctness of this species rests primarily on the convex frontal region of the head, which is accompanied by an enlargement of the scales in the same area, and the low number of femoral pores. The tail is rather short, ranging from .54 to .56 of the total, mean .55. The length of the hind leg is moderate, ranging from .86 to .98 of the length from snout to vent, mean .92. The occipital is in contact with the supraorbital semicircles in seven out of eight specimens.

Callisaurus ventralis inusitatus (Dickerson)

Plate LI, Figure 1; Plate LII, Figure 2

Callisaurus inusitatus Dickerson, 1919, p. 465.[1]

Callisaurus ventralis ventralis (part) Stejneger and Barbour, 1917, p. 47.

Range.—Tiburon Island and adjacent part of Sonora, Mexico.

Twenty-nine specimens of a species of *Callisaurus* were collected on Tiburon Island by the Albatross Expedition.

In spite of the fact that I have no actual intergrades between this form and the Arizonan *C. ventralis*, the nature of the characters used to distinguish it from *ventralis ventralis* on one hand and *ventralis gabbii* on the other is such that I prefer to give it subspecific rank.

The series before me is rather strikingly different from *C. ventralis ventralis* in habitus, being much more slender bodied and longer limbed. This character does not appear in its real value in a tabulation of measurements, *C. ventralis ventralis* with the same length of body and tail being much heavier. The length of the hind leg is variable but averages much longer than in the Arizonan specimens, while the femoral pores, averaging 18, distinguish it from the form in southern California and Lower California (*C. ventralis gabbii*).

The character of the union of the black lateroventral bands inferiorly in the males is invariable in the present series.

Callisaurus ventralis gabbii Cope

Plate LI, Figure 1

Callisaurus ventralis gabbii Cope, 1900, p. 272.

Callisaurus plasticus Dickerson, 1919, p. 466.[2]

Callisaurus carmenensis Dickerson, 1919, p. 465.[3]

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[1]Type: U. S. N. M. No. 64256. Paratypes: U. S. N. M. Nos. 64520–29, A. M. N. H. Nos. 5317–19, 5322, 5325–37, 5346.

[2]Type: U. S. N. M. No. 64255. Paratypes: U. S. N. M. Nos. 64531–42; A. M. N. H. Nos. 5308–14, 5346–48, 5350–54, 5357–60, 5381–87.

[3]Type: U. S. N. M. No. 64253.

Callisaurus ventralis ventralis (part) Stejneger and Barbour, 1917, p. 47.

Range.—Lower California from La Paz north to the deserts of southern California and adjacent areas in Arizona.

Lower Californian Records.—San Luis Gonzales Bay, Townsend, 1890, p. 144; El Llano de Santano, San Ignacio, Santa Margarita Island, Van Denburgh, 1895, p. 97; San Fernando, Seven Wells (Salton River), Gardner's Laguna (Colorado Desert), Cope, 1900, p. 273; Trinidad, San Matias, San Felipe, Cañon Esperanza, San Antonio, Matomi, and Aguas Escondita, Meek, 1905, p. 7; San José Island, Carmen Island, Agua Verde Bay, Conception Bay, Mulege, San Francisquito Bay, Dickerson, 1919, pp. 465–66; San Xavier, Van Denburgh and Slevin, 1921*a*, p. 57.

Specimens in the Biological Survey collection come from Alamo (U. S. N. M. No. 37642), Rancho San Antonio (37640–1), Volcano Lake (37647–9), Cocopah Mts., east base (37650–1), San Felipe Bay (37635–6), San Francisquito (37639), San Ignacio (37643), and Santo Domingo, Magdalena Plain (37645).

With the northern Lower Californian specimens collected by Heller and recorded by Meek (*loc. cit.*) before me in addition to those of the Biological Survey collection, I am unable to find any adequate character by which they could be distinguished from the peninsular specimens described by Dickerson as *C. plasticus*. An examination of the measurements of all the Lower Californian specimens at hand indicates that they are not distinguishable; the results of the tabulation may be condensed as follows.

Locality	No. of Spec.	Tail: Total Length: Extremes	Tail: Total Length: Mean	Hind Leg: Body: Extremes	Hind Leg: Body: Mean	Femoral Pores: Mean	Occipital and Supraorbital Semicircles: In Contact	Occipital and Supraorbital Semicircles: Separate
Northern Lower California (Heller Coll.)	18	.56–.60	.58	.85–1.00	.94	15.1	1	17
Middle Lower California San Francisquito Bay to Conception Bay	25	.58–.63	.59	.85– .97	.92	14.8	9	16
Southern Lower California, Carmen Id. to San José Id.	23	.57–.65	.60	.86–1.01	.94	15.1	2	12

If the above conclusions are correct, i.e., that a single subspecies of *C. ventralis* extends from Yuma, Arizona, to La Paz, Lower California, it seems preferable to introduce the name *gabbii* in spite of the very inadequate description of Cope in 1900. Cope had specimens from northern Lower California (the type locality) before him, at least the National Museum specimens above mentioned and probably also the original specimens collected by Gabb on which his manuscript name in 1875 was based.

I do not find any characters in the type and paratype of *C. carmenensis* which warrant its distinction from *C. gabbii*.

In seventy-eight specimens from Tucson, I find a mean tail-length of .54 of the total, and the length of the hind leg .86 of that of the body, the average of femoral pores higher (17.4) and the proportion of specimens with the occipital separated from the supraorbital semicircles a minority, instead of a majority, as in the Lower Californian series.

Turning to the description of *C. ventralis myurus* (Richardson, 1915, p. 408), I find that he has compared the proportionate tail-length in *myurus* from Pyramid Lake, Nevada, with the tail-length of a series of *ventralis* from Yuma, Arizona, and San Diego County, California, with an average of .55 for the former and .58 for the latter. (I have transposed his figures for body/tail to tail/body and tail, for comparison with mine.) It will be seen that the Yuma specimens agree with the Lower Californian ones, while *myurus* has a tail of practically the same length as Tucson *ventralis*, from which it is distinguished, therefore, chiefly by the lower number of femoral pores. As the type locality of *ventralis* is "New Mexico west of the Rio Grande" (including Arizona in 1852), I believe I am justified in regarding the Tucson specimens as typical *ventralis*, distinct from the form at Yuma.

Additional evidence on this question is furnished by the character of the occipital, which may be more or less broadly in contact with the supraorbitals or separated from them by a row of scales. In our series of *C. v. gabbii* as above defined, twelve specimens have the supraorbitals in contact with the occipital and forty-three have an intercalated row of scales. In the seventy specimens examined from Tucson, the proportions are reversed, fifty-one specimens having the supraorbitals and occipital in contact, while nineteen have them separated. Dr. Stejneger has kindly examined a series of specimens in the National Museum from west of the mouth of the Colorado River in this respect, and states that out of fifty-seven specimens, seventeen have the supraorbitals and the occipital in contact, six have them in contact on one side, separated on the other,

and thirty-four have them separated by a row of scales. The general conclusion, therefore, is that the range of *C. v. gabbii* should include the desert areas of southern California and of Arizona west of Tucson.

In the larger series of specimens reported by Van Denburgh (1921, p. 33) the notable difference in tail-length between the series from Yuma and the other Arizonan specimens confirms this conclusion. In his table, however, the specimens from Cavecreek, Maricopa County, are indistinguishable from *myurus*. It is evident, therefore, that further study is required to establish the limits of *ventralis* and *myurus*. The range of variation in the characters above discussed is shown in the following tabulation for the several forms of *Callisaurus*.

	Tail / Total Length			Hind Leg / Body Length			Femoral Pores		Occipital and Supraorbital Semicircles	
	No. Spec.	Extremes	Mean	No. Spec.	Extremes	Mean	No. Spec.	Mean	In Contact	Separated
Callisaurus										
ventralis gabbii	116	.55–.65	.59	64	.85–1.01	.93	116	15.5	27	77
ventralis ventralis	70	.51–.56	.54	70	.78– .95	.86	78	17.4	51	19
ventralis myurus	53	.54–.58	.55				53	14.2		
ventralis inusitatus	15	.56–.59	.57	29	.88–1.04	.96	29	18.0	16	13
splendidus	8	.54–.56	.55	8	.86– .98	.92	8	12.2	7	1
draconoides	16	.49–.59	.54	16	.82– .97	.89	16	15.1	13	3
crinitus	9	.55–.58	.56	9	.83– .93	.86	9	19.0	2	4

Uma notata Baird

Plate LIII

Uma notata Baird, 1858, p. 253.

Callisaurus notatus Stejneger and Barbour, 1917, p. 47.

Range.—Deserts of southern California and northeastern Lower California.

Lower Californian Records.—Gardner's Laguna, Cope, 1900, p. 281; Laguna Salada, 80 mi. south of Mexicali, Van Denburgh and Slevin, 1921*a*, p. 56.

While *Uma* (of which I recognize only a single species) is unquestionably more closely allied to *Callisaurus* than to any other iguanid genus, I do not believe that it is directly allied to *Callisaurus crinitus*, nor that the occurrence of digital fringes in *crinitus* necessitates the reference of *Uma notata* to *Callisaurus*.

Uma is distinguished from all of the species of *Callisaurus* by its unique dorsal color pattern and structurally by the presence of an inter-

calated row of small subdigital scales between the fringe and the subdigital lamellæ proper. The accompanying figures illustrate these characters of the digits in *Uma notata*, *Callisaurus crinitus* and *Callisaurus ventralis*. It seems evident that *crinitus* is much more closely allied to *ventralis* than to *Uma notata*, and that the development of the fringe has been independent in the two forms.

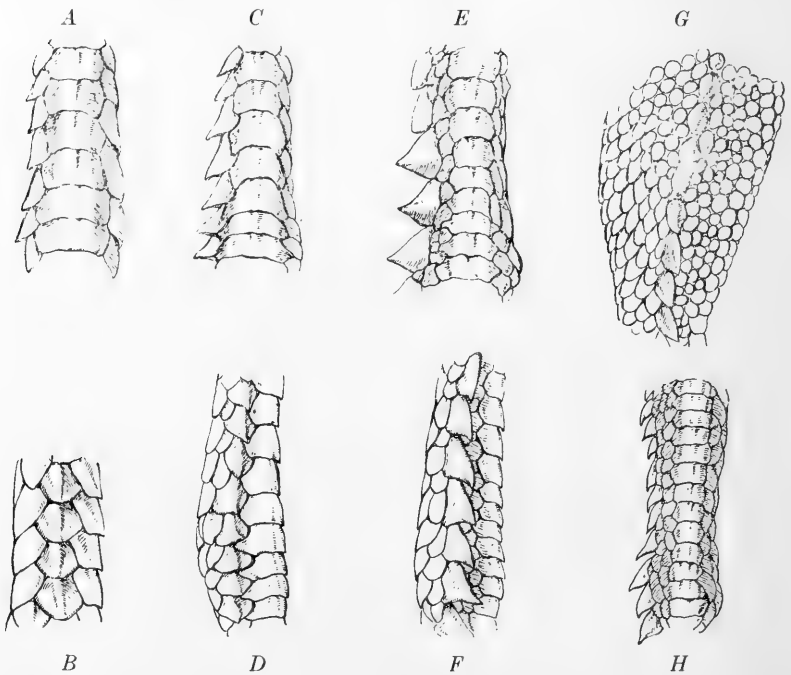

Fig. 7. *A* and *B*, ventral and posterior lateral views of the base of the fourth toe of *Callisaurus ventralis ventralis* (A. M. N. H. No. 2454). *C* and *D*, same of *Callisaurus crinitus* (U. S. N. M. No. 64530) *E* and *F*, same of *Uma notata*, Field Mus. No. 1203. *G*, posterior lateral surface of foot between base of fourth and fifth toes, showing extension of the fringe scales and transition to smooth scales of same specimen. *H*, distal joint of third toe, showing narrowness of the ventral lamellæ and insertion of a double row of small scales between them and the fringe scales, same specimen. All × 6.6.

Key to the Species of *Callisaurus* and *Uma*

1. Digits with or without a lateral fringe; subdigital scales broad, in a single row; coloration not ocellated..... .....*Callisaurus.*—2.
   Digits with a long lateral fringe; subdigital scales in more than one row; dorsal coloration ocellated. (A single species, *Uma notata;* deserts of southern California and adjacent parts of Arizona.).....*Uma.*

2. Digits with a lateral fringe of long spinose scales. (Pacific Coast of Lower California.).....*C. crinitus.*
   Digits not fringed.....3.
3. Lateroventral black spots, 3; dorsal spots more or less united into a scalloped crossband. (Confined to Cape District of Lower California.).*C. draconoides.*
   Lateroventral spots, 2; dorsal spots more widely separated.....4.
4. Frontal region of head strongly convex; femoral pores usually 12. (Angel de la Guardia Island, Gulf of California.).....*C. splendidus.*
   Frontal region of head plane or nearly so; femoral pores more than 12 (average). *C. ventralis.*—5.
5. Lateroventral black spots confluent at their lower extremities; body very slender; femoral pores (average) 18; hind leg averaging .96 of body length; tail .57 of total. (Tiburon Island and Sonora, Mexico.) *C. ventralis insulatus.*
   Lateroventral bars always distinct.....6.
6. Femoral pores (average) 14; tail length (average) .55. (Pyramid Lake, Nevada).....*C. ventralis myurus.*
   Femoral pores (average) more than 14.....7.
7. Femoral pores (average) 17 or more; tail length averages .54; hind leg averages .86. (Central Arizona; border of the Plateau.).....*C. ventralis ventralis.*
   Femoral pores average less than 17; tail length averages .58 or more; hind leg averages .92 or more. (Lower California from La Paz north; the Colorado Desert.).....*C. ventralis gabbii.*

Uta thalassina Cope

Uta thalassina Cope, 1863, p. 104; Stejneger and Barbour, 1917, p. 52.
Uta repens Van Denburgh, 1895, p. 102; Pl. vii–viii, figs. *a–e.*

Range.—Southern Lower California.

Lower Californian Records.—Cape St Lucas, Cope, 1863, p. 104; La Paz, Yarrow, 1882, p 54; Playitas, San Lazaro, Belding, 1887, p. 96; San José del Cabo, San Bartolome, Corral de Piedras (Sierra El Taste), Miraflores, Sierra San Lazaro, Comondu, Van Denburgh, 1895, p. 99; Mulege, Mocquard, 1899, p. 311. San Xavier, Triunfo, San Bartolo, Agua Caliente, Sierra Laguna, Van Denburgh and Slevin, 1921*a*, p. 57.

The Albatross Expedition collected six specimens of this species at San Bernardo Mountain, Lower California (A. M. N. H. Nos. 5547, 5650–51, 5653–54, U. S. N. M. No. 64485).

Uta repens Van Denburgh was based on a single specimen, distinguished from *Uta thalassina* by (1) shorter hind leg, (2) shorter head, and (3) four dorsal black bars instead of three, followed by three dusky bars. In the typical coloration of *Uta thalassina*, there are three distinct anterior black bars on the back, followed by two dusky ones. The anterior bars are outlined with very light greenish gray, leaving a darker interspace between the true bars, which may approach them in depth of pigmentation; the two posterior bars are less distinctly outlined, but in

one specimen I am able to trace the pattern of five primary crossbars (three black and two dusky), with four secondary bars on the interspaces. In other specimens, only the anterior secondary bars are evident, making seven crossbands, as in the type of *U. repens*. The length of the hind leg, when compared with that of the body from snout to anus, varies from .58 to .73 (ten specimens). In the type of *repens*, the ratio is .60, and in one of the specimens of *thalassina*, whose measurements are given by Van Denburgh, it is likewise .60. The length of the head in *repens* is .31 of that of the body, .23–.27 in the available *thalassinas*. In view of these facts, I do not think that *U. repens* can be maintained.

Uta mearnsi Stejneger

Uta mearnsi Stejneger, 1894*a*, p. 589; Stejneger and Barbour, 1917, p. 50.

Range.—Boundary region of Lower California and California.

Lower Californian Records.—"Seventy-five miles south-east of San Diego," Lockington, 1880, p. 295 (=Ensenada, Todos Santos Bay, *vide* Stejneger, 1894*a*, p. 591); Santa Rosalia, Mocquard, 1899, p. 308; San Salado, San Matias, Cañon Esperanza, Parral, Matomi, Meek 1905, p. 9.

Specimens in the Biological Survey collection come from La Providencia Cañon, east base of San Pedro Martir Mts., (U. S. N. M. Nos. 37627–8).

The specimen (Acad. Nat. Sci. Phila., No. 12644, Cope collection) recorded by Lockington as *U. thalassina* is a typical *Uta mearnsi*. It is interesting that a specimen of so distinct a species should have passed through Cope's hands and remained undescribed.

In two specimens of this species with a reproduced tail (in the collection of the Field Museum) the tail is as long as, or slightly longer than, the normal tail.

Uta stansburiana stejnegeri Schmidt

Uta stansburiana elegans (part) Stejneger and Barbour, 1917, p. 52.

Uta stansburiana stejnegeri Schmidt, 1921, p. 1.

Range.—Western Texas and northern Mexico through New Mexico and Arizona to the coast range in California; northeastern Lower California; Angel de la Guardia Island, Gulf of California.

Lower Californian Records.—San Matias, Cañon Esperanza, Agua de las Fresas, San Felipe, Parral, and Matomi, Meek, 1905, p. 10.

A specimen in the National Museum (U. S. N. M. No. 37689), from Volcano Lake, northeastern Lower California, is a typical *stejnegeri*. A single immature specimen in the Albatross collection (U. S N. M. No. 64487), from Angel de la Guardia Island, where a distinct form might be expected, resembles *stejnegeri* in scales and leg length. It is probable

that some of the specimens recorded by Meek, and here assigned to this species on geographical grounds, may be intergrades between *stejnegeri* and *hesperis*. Two specimens in the Academy of Natural Sciences of Philadelphia, collected by S. N. Rhoads in the Cocopah Mountains, northeastern Lower California, represent this form (A. N. S. P. Nos. 16102, 16106).

Uta stansburiana hesperis Richardson

Uta stansburiana hesperis Richardson, 1915, p. 415. Stejneger and Barbour, 1917, p. 52.

Uta parva Dickerson, 1919, p. 471.[1]

Range.—Coastal region of southern California and Lower California, south to San Bartolome Bay.

Lower Californian Records.—San Bartolome Bay, Townsend, 1890, p. 144; Todos Santos Bay, Lockington, 1880, p. 295; Guadalupe to Colnett, San Tomas to Guadalupe, Van Denburgh, 1895, p. 105; San Rafael, San Telmo, foothills of San Martir Mt., Van Denburgh, 1896, p. 1004; El Alamo, Hanson's Lagoon, San Salado Cañon, Trinidad, San Antonio, Santa Rosa, and San Quentin, Meek, 1905, p. 10; Ensenada, Van Denburgh and Slevin, 1921*a*, p. 59.

The Albatross collection contains six specimens from San Bartolome Bay on which *Uta parva* is based. I am unable to find any characters sufficient to distinguish this series from *hesperis*. The length of hind leg, given in the original description as 42 mm. (for the type), is in error for 32. A. M. N. H. No. 5431 measures 48 mm. from snout to anus, which is not appreciably different from the average size of *hesperis*. The keeling of the posterior femorals distinguishes it slightly from *concinna*.

Uta martinensis Van Denburgh

Uta martinensis Van Denburgh, 1905, p. 18, Pl. vi; Stejneger and Barbour, 1917, p. 50.

Range.—San Martin Island, off the Pacific coast of Lower California.

The only characters which distinguish this species from *Uta stansburiana hesperis* are the considerably larger size and the slightly larger scales. The type of *martinensis* measured 62 mm. from snout to anus, while the maximum body length recorded for *hesperis* by Richardson is 53 mm.

Uta concinna Dickerson

Uta concinna Dickerson, 1919, p. 470.[2]

Range.—Cedros Island and Natividad Island, off Pacific coast of Lower California.

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[1]Type: U. S. N. M. No. 64258.

[2]Type: U. S. N. M. No. 64257. Paratypes: U. S. N. M. Nos. 64489–93; A. M. N. H. Nos. 5399–407, 5410

Uta concinna was based on sixteen specimens collected on Cedros Island by the Albatross Expedition. Three specimens from Natividad Island, between Cedros and the mainland, in the U. S. National Museum, have also been examined.

The dorsal scales from a point opposite the posterior surface of the thigh to the occipital average 92 in eight male specimens, ranging from 85 to 97. The difference from *Uta stansburiana hesperis* is slight, though the dorsal scales are slightly larger and slightly smoother and the posterior femorals are more weakly keeled in *concinna*. The two latter characters distinguish it also from *stejnegeri*.

Uta palmeri Stejneger

Uta palmeri Stejneger, 1890, p. 106; Stejneger and Barbour, 1917, p. 51.

Range.—San Pedro Martir Island, Gulf of California.

Uta stellata Van Denburgh

Uta stellata Van Denburgh, 1905, p. 21, Pl. viii; Stejneger and Barbour, 1917, p. 52.

Range.—San Benito Islands, off the Pacific coast of Lower California.

The Albatross Expedition collected seven specimens (A. M. N. H. Nos. 5414–5418, 5420, U. S. N. M. No. 64486) on East and West San Benito. These agree excellently with the original description of Van Denburgh. The dorsal scales from the occipital to rump number from 110 to 125 in the specimens examined. The femoral pores in the large series recorded by Van Denburgh and Slevin (*loc. cit.*) average 15.

Uta squamata Dickerson

Uta squamata Dickerson, 1919, p. 471.[1]

Range.—Santa Catalina Island, Gulf of California.

The series of six specimens collected by the Albatross Expedition, on which this species is based, is excellently preserved. The species is a very distinct one, though directly allied to *Uta elegans* of the peninsula. The dorsal scales from the occipital to the base of the tail range from 70 to 78. The length of the hind leg divided by that of the body averages .79, in which respect *squamata* is the only species of the *stansburiana* group approaching *elegans*.

Uta elegans Yarrow

Uta elegans Yarrow, 1882*a*, p. 442.

Uta stansburiana elegans (part) Stejneger and Barbour, 1917, p. 52.

Uta mannophorus Dickerson, 1919, p. 470.[2]

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[1]Type: U. S. N. M. No. 64259.

[2]Type: U. S. N. M. No. 64260.

Range.—Southern Lower California, north at least to Francisquito Bay.

Lower Californian Records.—La Paz, Yarrow, 1882*a*, p. 442; Cape St. Lucas, Yarrow, 1882, p. 57; Carmen Island, Townsend, 1890, p. 144; San José del Cabo, Espiritu Santo Island, Van Denburgh, 1895, p. 105. Santa Rosalia and San Ignacio, Mocquard, 1899, p. 306; Buena Vista, Todos Santos, Van Denburgh and Slevin, 1921*a*, p. 59.

The Albatross collections contain a sufficient series of specimens to establish the validity of this species definitely. The localities represented are: Magdalena (U. S. N. M. No. 64511); Cape San Lucas (U. S. N. M. Nos. 64512–13); San José del Cabo (U. S. N. M. No. 64505); Pichilinque Bay (A. M. N. H. Nos. 5459, 5461, U. S. N. M. Nos. 64506–10); San José Island (5439); Agua Verde Bay (5449); Carmen Island (5440–46, 5448, U. S. N. M. No. 64260); and Francisquito Bay (5452–53). In addition a fine series from Espiritu Santo Island, opposite La Paz, has been kindly loaned for study by the U. S. National Museum.

The number of dorsal scales from rump to occipital ranges from 82 to 106, the average of twenty specimens being 91. The femoral pores average 14.5 (twenty-one specimens). The most satisfactory character distinguishing the series at hand from Arizonan and New Mexican specimens is the notably greater length of the hind leg. In eighteen male specimens, this ranges from .74 to .85 of the body length, while in the northern series, the range is .65 to .79, average .71, in twenty-four male specimens examined. The average given by Richardson, who includes four specimens from southern Lower California, is .74 for twenty-three specimens.

Uta mannophorus Dickerson agrees with *elegans* in scale counts and length of hind leg; the color characters on which it is based are so closely approached in specimens of *U. elegans* and so ill defined in some paratypes of *mannophorus* that I do not think it can be maintained even as an insular race.

Van Denburgh and Slevin (1921*a*, p. 59) note the difference in habitat between *Uta elegans* in Lower California and the subspecies of *U. stansburiana* to the north. *Uta elegans* frequents the coast and was not found inland.

Uta nolascensis Van Denburgh and Slevin

Uta nolascensis Van Denburgh and Slevin, 1921*c*, p. 395.

Range.—San Pedro Nolasco Island, Gulf of California.

Uta microscutata Van Denburgh

Uta microscutata Van Denburgh, 1894, p. 298; Stejneger and Barbour, 1917, p. 50.

Uta stansburiana Mocquard, 1899, p. 306.

RANGE.—Lower California south to San José, Gulf of California.

LOWER CALIFORNIAN RECORDS.—San Pedro Martir Mts., northern Lower California, Van Denburgh, 1894, p. 298; San José Island, Gulf of California, Van Denburgh, 1895, p. 106; Santa Rosalia, San Ignacio, and Mulege, Mocquard, 1899, p. 306; San Salado Cañon, San Matias, Cañon Esperanza, Parral, San Quentin, and Rosarito, Meek, 1905, p. 10; San Xavier, Van Denburgh and Slevin, 1921*a*, p. 59.

The Albatross collection contains two specimens, one of each sex, (A. M. N. H. No. 5451, U. S. N. M. No. 64488), from Castro Rancho, Pt. Conception. The male specimen has the frontal more elongate and transversely divided, but is in every other character identical with the female, which has the normal single frontal of the species. It is evident that the specimens referred to *Uta stansburiana* by Mocquard belong to this species, since they are said to have very small dorsal scales and the frontal entire.

Uta nigricauda Cope

Uta nigricauda COPE, 1864, p. 176; STEJNEGER AND BARBOUR, 1917, p. 51.

RANGE.—Southern Lower California

LOWER CALIFORNIAN RECORDS.—Cape St. Lucas, Cope, 1864, p. 176; La Paz, Yarrow, 1882, pp. 55, 56; Magdalena Island, San José del Cabo, Miraflores, and Sierra San Lazaro, Van Denburgh, 1895, p. 108; Todos Santos, Agua Caliente, Santiago, San Antonio, Triunfo, San Pedro, foothills of the Sierra Laguna, Van Denburgh and Slevin, 1921*a*, p. 58.

The Albatross collection contains thirty-five specimens of this species representing the following localities: Cape San Lucas (A. M. N. H. No. 5438); San Bernardo Mts. (A. M. N. H. Nos. 5471–72; U. S. N. M. No. 64494); Miraflores (A. M. N. H. Nos. 5466, 5563, 5676-91, U. S. N. M. Nos. 64495–504); Pichilinque Bay (A. M. N. H. No. 5454); and the island of Espiritu Santo, opposite La Paz, (A. M. N. H. Nos. 5463–64).

Four specimens have a divided frontal. The dorsal scaling is highly variable, on one hand approaching *Uta microscutata*, while in the other direction the enlarged dorsals are as distinct as in *Uta ornata* or *graciosa*. Thus, in A. M. N. H. No. 5690, there are only four rows of prominently enlarged dorsals; normally, there are six to eight enlarged rows; and exceptionally, the dorsals are little enlarged and pass more gradually into the smaller laterals.

Uta ornata symmetrica Baird

Uta symmetrica BAIRD, 1858, p. 253.

Uta symmetrica (part) STEJNEGER AND BARBOUR, 1917, p. 52.

Uta ornata symmetrica SCHMIDT, 1921*a*, p. 6.

RANGE.—Valley of the Colorado River and adjacent areas of the Colorado Desert.

This form is represented in the collections of the Academy of Natural Sciences of Philadelphia by two specimens (A. N. S. P. Nos. 16103–4), collected in the Cocopah Mountains of northeastern Lower California by S. N. Rhoads.

Uta auriculata Cope

Uta auriculata Cope, 1871, p. 303; Stejneger and Barbour, 1917, p. 49.

Range.—Socorro Island, Revilla Gigedo Islands, to which it is confined.

Uta clarionensis Townsend

Uta clarionensis Townsend, 1890, p. 143; Stejneger and Barbour, 1917, p. 50.

Range.—Clarion Island, Revilla Gigedo Islands, to which it is confined.

Uta graciosa (Hallowell)

Uro-saurus graciosus Hallowell, 1854, p. 92.

Uta graciosa Stejneger and Barbour, 1917, p. 50.

Range.—Southern Nevada, southeastern California, southwestern Arizona, and northeastern Lower California.

Lower Californian Records.—Santa Rosalia, Mocquard, 1899, p. 307; San Felipe, Meek, 1905, p. 10; Laguna Salada, 80 mi. south of Mexicali, Van Denburgh and Slevin, 1921*a*, p. 58.

Mocquard's identifications are not wholly reliable (see above under *Uta microscutata*) but, on analogy with *Sauromalus obesus* and *Callisaurus ventralis gabbii*, *Uta graciosa* might be expected as far south as Santa Rosalia.

Key to the Species of *Uta* in Lower California and Adjacent Islands

1. Dorsal granules very small, perfectly smooth; enlarged supraoculars in more than one row ..... 2.
   Dorsal granules less than 40 in the length of the head, at least faintly keeled posteriorly; enlarged supraoculars in one row ..... 3.
2. Caudal scales small, smooth. (Southern Lower California.) ..... *thalassina.*
   Caudal scales large, keeled, spinose. (Northern Lower California.) ..... *mearnsi.*
3. Dorsal scales nearly uniform, graduated into the smaller laterals ..... 4.
   Dorsal scales with a few median rows abruptly enlarged ..... 13.
4. Frontal entire ..... 5.
   Frontal transversely divided ..... 6.
5. Dorsal scales very small, about 35 in head length. (Northern Lower California.) *microscutata.*
   Dorsal scales larger, a broad band of enlarged scales down the back. (Southern Lower California.) ..... *nigricauda.*
6. Gular scales about 40; femoral pores 17. (San Pedro Martir Island, Gulf of California.) ..... *palmeri.*
   Gular scales less than 35; femoral pores less than 17 7

7. Hind leg short, .71 to .72 of the body length; dorsal scales very weakly keeled, very small (average 115 from rump to occipitals). (San Benito Islands, off Pacific Coast of Lower California.) ..... *stellata.*
   Hind leg more than .72 of the body length; dorsal scales sharply keeled, larger.. . 8.
8. Dorsal scales largest in the group, 70–78 from occiput to rump; hind leg .79 of the body length; femoral pores average 15. (Santa Catalina Island, Gulf of California.) ..... *squamata.*
   Dorsal scales average more than 80 ..... 9.
9. Hind leg averages .80 of the body length. (Southern Lower California.) . *elegans.*
   Hind leg averages .74 to .75 of the body length ..... 10.
10. Dorsal scales average about 86. (Southeastern California to western Texas and adjacent areas in Mexico; Angel de la Guardia Island.) *stansburiana stejnegeri.*
    Dorsal scales average more than 90 ..... 11.
11. Size large, snout to anus 62 mm. (San Martin Island, off Pacific Coast of Lower California.) ..... *martinensis.*
    Smaller, rarely exceeding 50 mm. in body length ..... 12.
12. Dorsal scales strongly keeled, average about 100; posterior femorals strongly keeled. (Southwestern California, San Joaquin Valley, and northwestern Lower California.) ..... *stansburiana hesperis.*
    Dorsal scales weakly keeled, average about 92; posterior femorals weakly keeled. (Cedros and Natividad Islands, off Pacific Coast of Lower California.) ..... *concinna.*
13. Frontal transversely divided..... ..... 14.
    Frontal entire. (Southern Lower California.) ..... *nigricauda.*
14. Enlarged dorsal scales nearly uniform, with no series of small scales on vertebral line; tail long, about two-thirds of total. (Southern Nevada, southeastern California, and southwestern Arizona.) ..... *graciosa.*
    One or more vertebral series of small scales ..... 15.
15. No tubercular scales forming a well defined dorsolateral line; enlarged dorsals nearly smooth; upper posterior scales on thigh smooth. (Socorro Island, Revilla Gigedo Islands.) ..... *auriculata.*
    A well-defined dorsolateral row of tubercles ..... 16.
16. Enlarged dorsals beginning on the nape; dorsolateral tubercles very large, close set. (Clarion Island, Revilla Gigedo Islands.) ..... *clarionensis.*
    Enlarged dorsals beginning on the shoulders, dorsolateral tubercles smaller and more widely spaced. (The Colorado Desert.) ..... *ornata symmetrica.*

Uta nolascensis is not entered in the above key, information on its "key characters" being insufficient. It should apparently be placed next to *Uta stansburiana stejnegeri.*

Sceloporus occidentalis bi-seriatus Hallowell

Sceloporus bi-seriatus Hallowell, 1854, p. 93.

Sceloporus occidentalis bi-seriatus Stejneger and Barbour, 1917, p. 55.

Range.—The Great Basin, south to Texas and California.

Lower Californian Records.—San Pedro Martir Mt., and Valladares, Van Denburgh, 1895, p. 114; between Ensenada and San Rafael Valley, and San Telmo, Van Denburgh, 1896, p. 1005; Santo Tomas and Los Encinos, Meek, 1905, p. 11 (Heller's notes); Ensenada, Van Denburgh and Slevin, 1921*a*, p. 59.

Specimens in the Biological Survey collection come from Hanson Laguna (U. S. N. M. No. 37674) and Ojos Negros (37677–8).

Sceloporus graciosus vandenburgianus Cope

Sceloporus vandenburgianus Cope, 1896, p. 834.

Sceloporus graciosus vandenburgianus Stejneger and Barbour, 1917, p. 54.

Range.—Mountain ranges south of Ventura County, California, into northern Lower California.

Lower Californian Records.—San Pedro Martir Mt., Van Denburgh, 1895, p. 114; Agua de las Fresas, Vallecitos, and La Grulla, Meek, 1905, p. 11.

A specimen in the Biological Survey collection comes from La Grulla (U. S. N. M. No. 37673).

Sceloporus magister Hallowell

Sceloporus magister Hallowell, 1854, p. 93; Stejneger and Barbour, 1917, p. 55.

Range.—Southern Nevada, southwestern Utah, southeastern California, southwestern Arizona, northwestern Lower California.

Lower Californian Records.—Gardner's Laguna, Salton River, Cope, 1900, p. 361.

Specimens in the Biological Survey collection come from Volcano Lake (U. S. N. M. Nos. 37659–60), Cocopah Mts., east base (37663), and San Felipe Bay (37664).

Sceloporus rufidorsum Yarrow

Sceloporus rufidorsum Yarrow, 1882*a*, p. 442; Van Denburgh and Slevin, 1921*a*, p. 60.

Range.—Northwestern Lower California to Cedros Island.

Lower Californian Records.—75 miles S. E. of San Diego, Lockington, 1880, p. 295; San Quentin Bay and Cedros Island, Yarrow, 1882*a*, p. 442; San José, Matomi, Rosarito, and San Quentin, Meek, 1905, p. 11; Ensenada, Van Denburgh and Slevin, 1921*a*, p. 60.

Specimens in the Biological Survey collection come from Ensenada (U. S. N. M. Nos. 37661–2).

Three specimens of this species from Cedros Island (A. M. N. H. Nos. 5474, 5476, U. S. N. M. No. 64473) bear out the remarks of Van Denburgh (*loc. cit.*) in distinguishing *rufidorsum* from *zosteromus*, especially in the presence of a broad mid-dorsal rufous band and similar indistinct dorsolateral lines, and in the larger size as compared with *zosteromus* from the Cape Region.

Sceloporus zosteromus Cope

Sceloporus zosteromus Cope, 1863, p. 105; Stejneger and Barbour, 1917, p. 57.

Range.—Southern and central Lower California.

Lower Californian Records.—Cape St. Lucas, Cope, 1863, p. 105; La Paz, Yarrow, 1882*a*, p. 442; San Pablo, Magdalena Island, Santa Margarita Island,

San José Island, Miraflores and San José del Cabo, Van Denburgh, 1895, p. 110; Mulege and San Ignacio, Mocquard, 1899, p. 313; Todos Santos, Agua Caliente, Buena Vista, San Antonio and San Pedro, Van Denburgh and Slevin, 1921*a*, p. 60.

Specimens in the Biological Survey collection come from San Ignacio (U. S. N. M. Nos. 37666–9), Santa Anita (37671), and Cape San Lucas (37672).

Twelve specimens of this species were secured in the Cape Region of Lower California by the Albatross Expedition. The localities represented are: Cape San Lucas (A. M. N. H. Nos. 5437, 5473); San José del Cabo (U. S. N. M. Nos. 64468–71); Miraflores (5484, 5489, U. S. N. M. Nos. 64466–7); Espiritu Santo Island (5486).

Sceloporus lineatulus Dickerson

Sceloporus lineatulus Dickerson, 1919, p. 467.[1]

Range.—Santa Catalina Island, Gulf of California.

Two specimens collected by the Albatross Expedition on Santa Catalina Island were distinguished from *S. zosteromus* by Dickerson on the basis chiefly of the strongly lineate lateral scales. In this character, the single paratype (A. M. N. H. No. 5477) agrees excellently with the type, each scale bearing two sharply defined brown lines, which combine to form very irregular, curved lines extending from the black throat patch nearly as far back as the groin. This specimen measures 96 mm. from snout to vent, thus considerably exceeding the average for the peninsular *zosteromus*. The ventral color in both specimens is dark blue without the broad light mid-ventral band common in *S. zosteromus*. I do not find any distinctive characters in addition to size and coloration, and Van Denburgh and Slevin (1921, p. 60) refer to lineate lateral scales as a character of adult male *zosteromus*. I prefer, however, to maintain *lineatulus* as distinct until further evidence bearing on the question is available.

Sceloporus monserratensis Van Denburgh and Slevin

Sceloporus monserratensis Van Denburgh and Slevin, 1921*c*, p. 396.

Range.—Monserrate Island, Gulf of California.

Sceloporus orcutti Stejneger

Sceloporus orcutti Stejneger, 1893, p. 181, Pl. 1, fig. 4; Stejneger and Barbour, 1917, p. 56.

Range.—Northern Lower California and southern California.

Lower Californian Records.—San Rafael Valley, Wasson's Ranch (in San Rafael Valley), between Ensenada and Rafael Valley, and in the foothills of the San Pedro Martir Mts., Van Denburgh, 1896, p. 1005; Nochoguero Valley near U. S.

[1]Type: U. S. N. M. No. 64263.

boundary, Cope, 1900, p. 356; San Salado Cañon, Trinidad, San Matias, Agua de la Fresas, Cañon Esperanza, Parral, Matomi, Rosarito, San Antonio, and Los Encinos, Meek, 1905, p. 11; San Xavier, Van Denburgh and Slevin, 1921*a*, p. 61.

Specimens in the Biological Survey collection come from Ojos Negros (U. S. N. M. Nos. 37675–6) and Rancho San Antonio (37665).

Sceloporus licki Van Denburgh

Sceloporus licki Van Denburgh, 1895, p. 110, Pl. x; Stejneger and Barbour, 1917, p. 54.

Range.—Southern Lower California.

Lower Californian Records.—San José del Cabo, Corral de Piedras (Sierra El Taste), Miraflores, and Sierra San Lazaro, Van Denburgh, 1895, p. 114; San Antonio, Todos Santos, Guamuchil Ranch, Cape San Lucas, Agua Caliente, San Bartolo, Triunfo, and La Paz, Van Denburgh and Slevin, 1921*a*, p. 61.

The Albatross Expedition contains six specimens referable to this species; the localities represented are Miraflores, (A. M. N. H. Nos. 5564, 5669, 5702, U. S. N. M. No. 64472); San Bernardo Mts., (5487); and Espiritu Santo Island, (5485).

A specimen in the Biological Survey collection comes from Espiritu Santo Island (U. S. N. M. No. 37670).

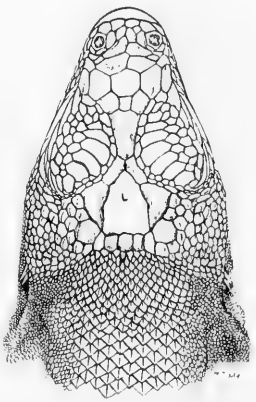


Fig. 8. Dorsal view of the head of the type of *Sator grandævus* Dickerson, U. S. N. M. No. 64261.

Key to the Species of *Sceloporus* in Lower California

1. Enlarged supraoculars separated from the parietal and frontoparietal scales by a semicircle of small scales ..... 2.
   Enlarged supraoculars in contact with the parietals and frontoparietals ..... 3.
2. Dorsal scales small, 45–66 on middle of back from occipital to base of tail; scales on back of thigh smooth ..... *S. graciosus vandenburgianus.*
   Dorsal scales larger, 35–46, scales on back of thigh keeled; males with a blue patch on center of throat ..... *S. occidentalis biseriatus.*
3. Dorsal scales shortly mucronate, the central point scarcely extending beyond the lateral; no black patch in front of shoulder ..... *S. orcutti.*
   Dorsal scales sharply mucronate; a black patch in front of shoulder ..... 4.
4. Femoral pores usually less than 14, average 12 on each side ..... *S. magister.*
   Femoral pores usually more than 14, average 16 or more ..... 5.
5. Dorsal scales from occipital to base of tail more than 30 (32–38) ..... *S. licki.*
   Dorsal scales 30 or less (28–30) ..... 6.
6. Femoral pores fewer, average 16.6; back with mid-dorsal and dorsolateral light bands ..... *S. rufidorsum.*
   Femoral pores more numerous, average 18.5; dorsolateral and mid-dorsal bands not evident ..... *S. zosteromus.*

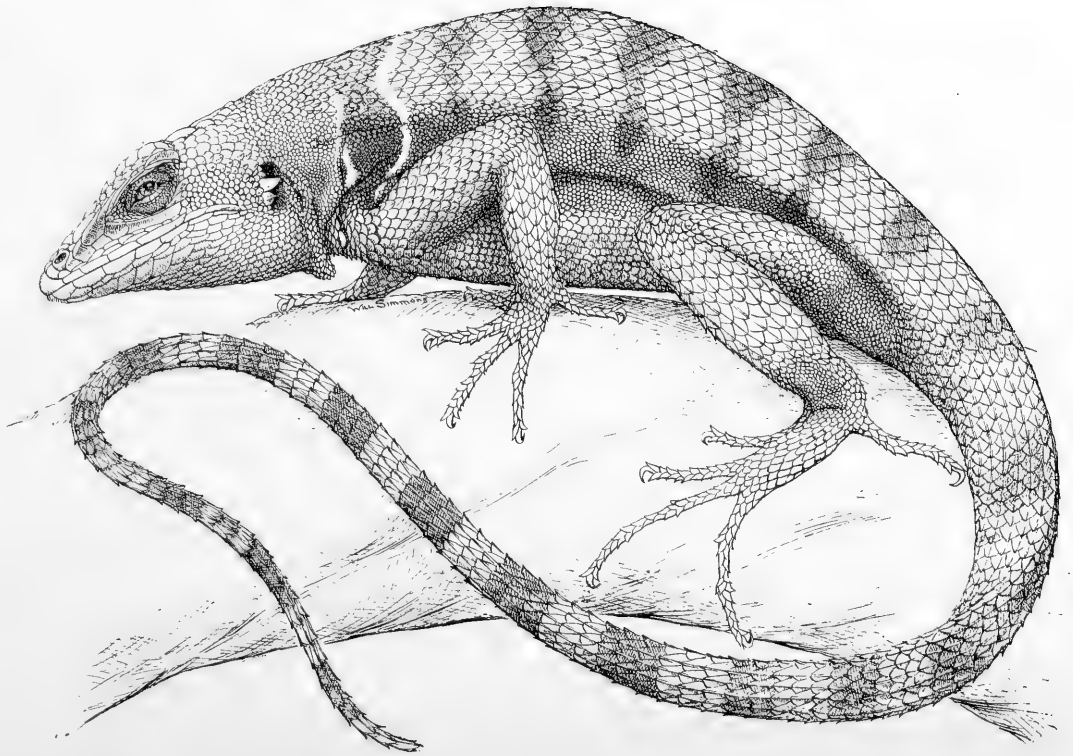


Fig. 9. *Sator grandævus* Dickerson, A. M. N. H. No. 5492.

Sator grandævus Dickerson

Sator grandævus Dickerson, 1919, p. 469.[1]

Range.—Ceralvo Island, Gulf of California.

This species and the following are certainly closely related to *Sceloporus* through *S. utiformis* of the Coliman region in Mexico and are much more closely allied to *Sceloporus* than to *Uta*. The development of the gular fold and the rudiment of a collar illustrate excellently an intermediate stage between *Sceloporus* with differentiated dorsal and lateral scales and a *Uta* of the *Uta nigricauda* type; but it is not at all necessary to assume that *Sator* is the direct representative of the ancestral *Utas*, which I believe to have been very different from *Sceloporus*. The gular fold being more strongly developed than in *Uta*, and the collar less developed, it may well be that both are parallel structures and that the species of *Sator* have arisen independently from a *Sceloporus* stock related to *S. utiformis*. The three genera *Sceloporus*, *Sator*, and *Uta* form a group of North American iguanid genera much like that formed by *Callisaurus*, *Uma* and *Holbrookia*.

The distribution of the two insular species of *Sator*, on widely separated islands off the Gulf coast of the peninsula, suggests that the genus must formerly have inhabited the mainland of the peninsula, where it is now almost certainly extinct.

Sator angustus Dickerson

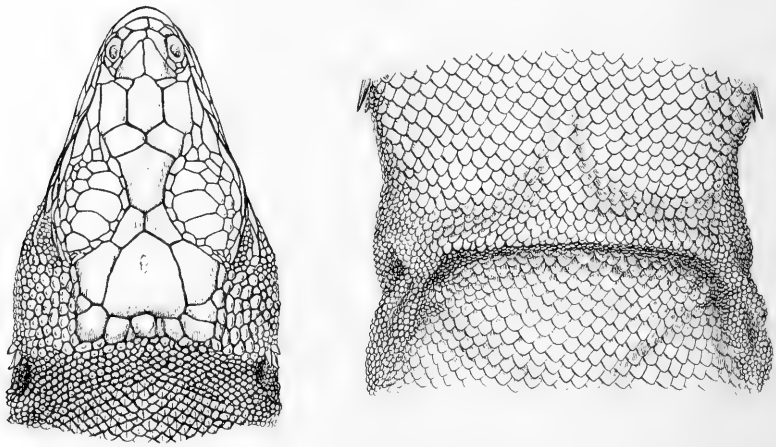
Sator angustus Dickerson, 1919, p. 469.[2]

Range.—Santa Cruz Island, Gulf of California.

The measurements of the type of this species are, unfortunately, placed after those of *Sator grandævus* in the original description. The anterior gular folds in this species is much more definitely marked by differentiation of the scales than it is in *grandævus*. In the latter, the fold is marked by an abrupt transition in size of the gular scales, which are about twice as wide behind the fold as the scales in the series anterior to it. In *angustus*, a double row of granular scales, much smaller than those on the fold, crosses the throat immediately behind the fold, which thus becomes very similar to the collar of other genera, but is not a homologous structure. In *Sator grandævus*, there is a distinct lateral invasion of granules in the position of the posterior gular fold, i.e., an incipient collar homologous with the collar of *Uta*. In *angustus*, there

[1]Type: U. S. N. M. No. 64261.

[2]Type: U. S. N. M. No. 64262. Paratypes: U. S. N. M. Nos. 64474–78; A. M. N. H. Nos. 5713–16, 5719, 5722.



A *B*

Fig. 10. *A*, Dorsal view of head of *Sator angustus* Dickerson, A. M. N. H. No. 5716. × 2.5 *B*, Throat of type of *Sator angustus*, to show differentiation of scales at the gular fold, U. S. N. M. No. 64262. × 3.

is no trace of the posterior fold or incipient collar, and the better development of the anterior fold may be correlated with this fact.

Phrynosoma blainvillii blainvillii Gray

Plate LIV, Figure 2

Phrynosoma blainvillii Gray, 1839, p. 96, Pl. xxix, fig. 1; Stejneger and Barbour, 1917, p. 57.

Phrynosoma blainvillii blainvillii Grinnell and Camp, 1917, p. 164.

Range.—Southwestern California and northwestern Lower California.

Lower Californian Records.—Valladares, Van Denburgh, 1895, p. 118; Ensenada, San Telmo, Wasson's Ranch in San Rafael Valley, Van Denburgh, 1896, p. 1005; Nochoguero Valley, United States boundary, Cope, 1900, p. 427; San Salado and Trinidad, Meek, 1905, p. 12; Ensenada, Van Denburgh and Slevin, 1921*a*, p. 62.

A specimen in the Biological Survey collection comes from Ojos Negros (U. S. N. M. No. 37583).

Phrynosoma nelsoni,[1] new species

Plate LIV, Figure 3

Phrynosoma coronatum (*non* Blainville) Meek, 1905, p. 12.

Diagnostic Characters.—Two lateral fringes of elongate scales; enlarged gulars present; nostrils on the canthus rostralis; ventral scales smooth; temporal and occipital horns well developed; a large subrictal spine, followed by a postrictal; tympanum nearly concealed by folds of the neck; closely allied to *P. blainvillii blainvillii*, from which it is distinguished by the smaller and rugose scales of the top of the head, the fewer enlarged dorsal scales, and the larger and more strongly keeled scales of the vertebral line.

[1]Named for Dr. Edward W. Nelson, Chief, Bureau of Biological Survey, United States Department of Agriculture, whose explorations in Lower California make this name especially appropriate.

Range.—Known only from the type locality.

Type.—U. S. N. M. No. 37585; ♀; San Quintin, Lower California; E. W. Nelson and A. E. Goldman; August 15, 1905. (Biological Survey Collection.)

Description of Type.—Habitus stout, apparently wider in proportion to length than *P. blainvillii;* tail round; tympanum nearly concealed by the folds of the neck; nostril just below the canthus rostralis; superciliary region expanded; a series of four temporal spines, the last largest and nearly equalling the occipital; two strong occipital spines with a smaller median spine nearly in line with them; all somewhat grooved basally; scales of front very rugose, much smaller than in *b. blainvillii,* larger than those of *b. frontale;* no connecting ridge between the superciliary angles; a transverse series of four conical spines in front of the occipitals; six infralabials, the fifth largest, the last (very small) beneath the anterior side of the subrictal; a strong subrictal above the line of the infralabial spines, followed by a smaller, pointed spine (the postrictal) in the line of the infralabials; two lateral groups of spines on the neck; three rows of enlarged gulars on each side; eight or ten irregular rows of large keeled scales on the back, continuing as a lateral and a dorsolateral series on the tail; vertebral line covered with enlarged, flat, keeled scales; strong spinose scales on the thighs, two well-marked series of elongate lateral scales forming a double marginal fringe; ventral scales flat, smooth; femoral pores 15–16.

Grayish above, with four pairs of obscure transverse brown blotches on the back, corresponding in position to the larger of the enlarged dorsal scales; two brown crossbands on base of tail; venter grayish, spotted with brown posteriorly.

Measurements of Type.—Total length, 127 mm.; body, 87 mm.; tail, 40 mm.; foreleg, 38 mm.; hind leg, 51 mm.; snout to tip of temporal horn, 29 mm.; greatest width of head (between tips of third temporal horns), 31 mm.

Notes on Paratypes.—The smaller male paratype, U. S. N. M. No. 37584, from the same locality, has a narrower body, and only five infralabials, but agrees in essential characters with the type. A third specimen in the series before me, Field Museum No. 1127, a female, recorded by Meek as *P. coronatum* (*loc. cit*), thus recognizing its distinctness from *P. blainvillii,* has the tympanum completely concealed by the neck folds. The measurements of the two paratypes are as follows:

Number	U. S. N. M. No. 37584	F. M. No. 1127
Total Length	110 mm.	122 mm.
Length of Body	73 "	88 "
Length of Tail	37 "	34 "
Length of Foreleg	34 "	38 "
Length of Hind Leg	43 "	51 "
Greatest Width of Head	27 "	31 "

I have no doubt that this species is fully distinct from *P. blainvillii blainvillii,* which is unquestionably the most closely allied species. Its relationship with *P. blainvillii frontale,* shown in the rugosity of the frontal scales, appears to be closer than with the typical subspecies, although the range of the latter is inserted between that of *nelsoni* and *frontale.* From *frontale* it is distinguished by the larger frontal scales and the keeled scales of the vertebral line. *Phrynosoma coronatum* has much

larger scales on the frontal region of the head, a more fully exposed tympanum, stronger and much more divergent occipital spines, and is immediately distinguishable from *nelsoni* by the absence of a postrictal spine.

Phrynosoma schmidti Barbour

Phrynosoma schmidti Barbour, 1921, Proc. New England Zoöl. Club, VII, p. 113.

Range.—Confined to Cedros Island.

Phrynosoma jamesi,[1] new species

Plates LV and LVI

Diagnostic Characters.—Closely allied to *Phrynosoma cerroense* Stejneger, from which it is distinguished chiefly by the presence of a ventral lateral fringe; enlarged gulars present; nostrils very large, just below the canthus rostralis; ventrals smooth; temporal and occipital horns well developed; a large subrictal nearly in line with the labial spines, followed by a slender postrictal spine; tympanum not concealed.

Range.—Known only from the type locality.

Type.—U. S. N. M. No. 64450; ♀; San Bartolome Bay, Lower California; H. Townsend; 1911.

Description of Type.—Habitus rather narrow, probably similar to that of *P. cerroense;* head small, snout very obtuse, truncate in profile; tail round; nostril very large, just below the line of the canthus rostralis; ear opening not closed; superciliary angle not produced; temporal region little expanded, with four spines, of which the two middle ones are in contact; the last temporal spine about half the length of the occipital; two occipitals, straight, somewhat grooved at the base; a low tubercular spine between the occipitals; scales of front smaller than in *helleri* or *coronatum*, rugose; no connecting ridge between the superciliary angles; a transverse series of four low conical scales in front of the occipital spines; five infralabials, the last largest, followed after an interspace by the somewhat larger subrictal, which is very nearly in line with the labials; a small, slender postrictal spine; two lateral groups of tubercular scales on the neck, but no spines; three or four rows of enlarged gulars on each side; irregular rows of widely separated, flat, keeled scales on the back; vertebral line covered with smaller, flat, keeled scales; tail with two dorsal rows of spines and a lateral row on each side; two lateral fringes of spinose scales, the lower one much smaller than the upper; ventral scales flat, smooth; femoral pores 17–17.

Grayish above, with two obscure nuchal marks; venter with a few scattered brown spots.

Measurements of Type.—Total length, 120 mm.; body, 86 mm.; tail, 34 mm.; foreleg, 34 mm.; hind leg, 46 mm.; snout to tip of occipital horn, 24 mm.; greatest breadth of head, 24 mm.

Notes on Paratypes.—The single paratype, A. M. N. H. No. 5497, agrees excellently with the type; the last temporal spines are somewhat longer, and are curved upward. The back is marked with large brown spots, two elongate nuchal spots, a transverse series of four spots behind these, with two pairs of more obscure spots between these and the base of the tail.

[1]Named for Mr. Arthur Curtiss James, Trustee of The American Museum of Natural History.

The close relation of this species to *P. cerroense*, its nearest neighbor geographically, is especially evident in the arrangement of the spines of the head; from the figure of the type of *cerroense* it appears that *jamesi* has a much more truncate muzzle. The two are readily distinguishable by the absence of the ventral lateral fringe in *cerroense*.

As *cerroense* was considered intermediate between *blainvillii* and *coronatum* by Stejneger (1893, p. 187) and Cope (1900, p. 430), it is evident that the present form, with its two lateral fringes, is much more nearly intermediate between them and that *cerroense* is to be regarded as divergent from a stock similar to *jamesi*. Our knowledge of the distribution of the four Lower Californian species, *blainvillii*, *nelsoni*, *jamesi*, and *coronatum* is very inadequate. It is not at all unlikely that *nelsoni* may prove to be a third subspecies of *blainvillii*. *P. jamesi* and *coronatum*, however, appear to be sufficiently distinct to preclude any possibility of their intergradation. It would be highly interesting to know if the species of *Phrynosoma* in Lower California really have a restricted distribution, with wide areas where they are absent, as might be inferred from the present information regarding them.

Phrynosoma cerroense Stejneger

Phrynosoma cerroense Stejneger, 1893, p. 187; Stejneger and Barbour, 1917, p. 58.

Range.—Confined to Cedros Island, off the Pacific coast of Lower California.

Phrynosoma coronatum (Blainville)

Plate LIV, Figure 1

Agama (*Phrynosoma*) *coronatum* Blainville, 1835, p. 284, Pl. xxv, fig. 1.

Phrynosoma coronatum Stejneger and Barbour, 1917, p. 58.

Range.—Southern Lower California.

Lower Californian Records.—Cape St. Lucas, Cope, 1866*a*, p. 312; La Paz, Yarrow, 1882, pp. 67–68; Comondu to San Quentin, Poso Grande, San José del Cabo, San Francisquito (Sierra Laguna), and Miraflores, Van Denburgh, 1895, p. 115; Santa Anita, McLain, 1899, p. 2; Santa Rosalia, San Ignacio, and Mulege, Mocquard, 1899, p. 314; Todos Santos, Pescadero, Agua Caliente, Triunfo, and San Pedro, Van Denburgh and Slevin, 1921*a*, p. 62.

Three specimens of *P. coronatum* were secured by the Albatross Expedition, from Miraflores (A. M. N. H. Nos. 5499, 5701) and San José del Cabo (U. S. N. M. No. 64465). A fourth is contained in a small collection with the general locality "La Paz" received from the Museo Nacional de Mexico.

Five specimens in the Biological Survey collection come from Matancita (U. S. N. M. Nos. 37586–90).

Phrynosoma platyrhinos Girard

Phrynosoma platyrhinos Girard, 1852, pp. 361, 363, Pl. vii, figs. 1–5; Stejneger and Barbour, 1917, p. 60.

Range.—Washington and Idaho, south through Utah and Nevada to southeastern California, northeastern Lower California and southwestern Arizona.

Lower Californian Records.—San Felipe, Meek, 1905, p. 12.

A specimen in the Biological Survey collection comes from Pozo San Augustin (U. S. N. M. No. 35791). This locality extends the range of this form considerably to the south, the only previous record from Lower California being that of Meek from San Felipe Bay.

Phrynosoma solare Gray

Phrynosoma solaris Gray, 1845, p. 229.

Phrynosoma solare Stejneger and Barbour, 1917, p. 60.

Range.—Northeastern Lower California, southwestern Arizona and Sonora.

Lower Californian Records.—Las Animas Bay, Van Denburgh, 1894*b*, p. 456.

The distribution of *P. solare* is remarkable for the wide gap between the Lower Californian record (opposite Angel de la Guardia Island) and the area of relative abundance of this species at the border of the Mexican Plateau in Arizona. It appears to be absent from the Colorado Desert, and thus forms one of the best examples of what I have called attention to (above) as peripheral distribution, bordering the Colorado Desert.

Key to the Species of *Phrynosoma* in Lower California

1. A single marginal (lateral) fringe of elongate scales . . . . . 2.
   Two or three complete marginal fringes . . . . . 3.
2. Nostrils within the lines of the canthi rostrales . . . . . *P. platyrhinos.*
   Nostrils on the lines of the canthi rostrales . . . . . *P. cerroense.*
3. Three closely set lateral fringes; tail flattened. (Not recorded from Lower California, but probably entering the northeastern area.) . . . . . *P. m'callii.*
   Two lateral fringes; tail round distally . . . . . 4.
4. Four large subequal occipital spines in line with the temporals . . . . . *P. solare.*
   Occipital spines unequal, not in line with the temporals . . . . . 5.
5. Subrictal spine broadly expanded at base, its anterior border overlapping the last spine of the sublabial series . . . . . 6.
   Subrictal not overlapping the last of the sublabials, nearly in line with them . . . 7.
6. Scales of mid-dorsal line keeled, pointed and strongly imbricate; scales of front rugose . . . . . *P. nelsoni.*
   Scales of vertebral line smaller, rounded and less imbricate; scales of front convex and smooth . . . . . *P. blainvillii blainvillii.*
7. No slender elongate postrictal spine . . . . . *P. coronatum.*
   A slender elongate postrictal spine, about as long as the subrictal . . . . . 8.
8. Lower of the two lateral fringes weak; occipital spines slender . . . . . *P. jamesi.*
   Lower lateral fringe strongly developed; occipital spines short and stout. *P. schmidti.*

Gerrhonotus scincicauda webbii Baird

Gerrhonotus webbii Baird, 1858, p. 255.
Gerrhonotus scincicauda webbii, Grinnell and Camp, 1917, p. 168.

Range.—Southwestern California, chiefly west of the desert divides, north to Mariposa County, south into northwestern Lower California.

Lower Californian Records.—Coronados Islands, Belding, 1887, p. 97; Valladares and San Pedro Martir Mt., Van Denburgh, 1895, p. 121; San Antonio, Meek, 1905, p. 12; San Martin Island, Van Denburgh, 1905, p. 19.

Specimens in the Biological Survey collection come from Rancho San Antonio (U. S. N. M. No. 37681) and Hanson Laguna (37682).

Gerrhonotus multi-carinatus (Blainville)

Cordylus (*Gerrhonotus*) *multi-carinatus* Blainville, 1835, p. 289, Pl. xxv, fig. 2.
Gerrhonotus multi-carinatus Stejneger and Barbour, 1917, p. 61.

Range.—Lower California and Mexico.

Lower Californian Records.—La Paz, Yarrow, 1882, p. 47; San José del Cabo, Corral de Piedras (Sierra El Taste), Sierra San Lazaro, Miraflores, and Sierra Laguna, Van Denburgh, 1895, p. 120.

Three specimens in the Biological Survey collection come from Santa Anita (U. S. N. M. Nos. 37683–5). This species has been excellently characterized by Van Denburgh (1898, p. 65). In addition to the characters employed by him, it may be noted that the limbs are much weaker and the body and tail more elongate than in *G. scincicauda webbii*. The proportions of arm and leg to body length in two specimens of each species are as follows:

	G. multi-carinatus	*G. s. webbii*
Arm/Body Length	.19, .23	.25, .27
Leg/Body Length	.27, .29	.35, .36

Key to Distinguish the Species of *Gerrhonotus* in Lower California[1]

Dorsal scales usually in 16 rows, weakly keeled.....*G. multi-carinatus.*
Dorsal scales usually in 14 rows, strongly keeled.....*G. scincicauda webbii.*

Anniella pulchra Gray

Anniella pulchra Gray, 1852, p. 440; Stejneger and Barbour, 1917, p. 63.

Range.—Coastal Region of southern California and northern Lower California.

Lower Californian Records.—San Salado Cañon, San José, Meek, 1905, p. 13; Coronados Islands, San Geronimo Island, Van Denburgh and Slevin, 1914, pp. 140, 142.

Xantusia vigilis Baird

Xantusia vigilis Baird, 1858, p. 255; Stejneger and Barbour, 1917, p. 64.

Range.—Southeastern California, southern Nevada, and northeastern Lower California.

Lower Californian Records.—San Matias Pass, Heller, in Meek, 1905, p. 13.

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[1]After Van Denburgh, 1898, p. 64.

A specimen in the Biological Survey collection comes from San Felipe Bay (U. S. N. M. No. 37679).

Xantusia gilberti Van Denburgh

Xantusia gilberti Van Denburgh, 1895, p. 121, Pl. xi; Stejneger and Barbour, 1917, p. 64.

Range.—Southern Lower California.

Lower Californian Records.—San Francisquito, Sierra Laguna, Van Denburgh, 1895, p. 121.

A specimen in the Biological Survey collection comes from Laguna, Sierra Laguna (U. S. N. M. No. 37680). This specimen is of great interest, proving that *X. gilberti* is very closely related to *vigilis* and that some of the distinctive characters of the type were abnormal. In the type, the frontal is divided, and in contact with the interfrontonasal. In the present specimen, the head shields are disposed exactly as in *vigilis*, the prefrontals meeting in the mid-line in front of the single frontal. The head shields differ from those of *vigilis*, however, in being flatter and smoother. The head is smaller, the nose more pointed, and the eye smaller. In addition to the smallness of the eye, this specimen agrees with *X. gilberti* in the disposition of the postmentals, the second pair being separated by a narrow scale, as figured by Van Denburgh (1895, Pl. xi, fig. D). In *vigilis*, this median scale is much broader. There is no question, therefore, of the validity of *gilberti*, though its diagnosis must be changed.

In two specimens of *vigilis* from Lane's Mill, California, collected by Heller in 1903 and preserved in the Field Museum of Natural History, the frontal is completely divided, as in the type of *gilberti*. In another specimen in the same series the frontal is in contact with the interparietal.

The back of the present specimen of *gilberti* is nearly uniform brown, with scarcely any of the darker brown maculation of *vigilis*.

Key to Distinguish the Species of *Xantusia* in Lower California

Second pair of postmentals widely separated; eye larger; back maculate or lineolate with dark brown spots ..... *X. vigilis.*

Second pair of postmentals narrowly separated; eye smaller; back nearly uniform in color ..... *X. gilberti.*

Cnemidophorus tessellatus tessellatus (Say)

Ameiva tessellata Say, 1823, p. 50.

Cnemidophorus tessellatus tessellatus Stejneger and Barbour, 1917, p. 67.

Range.—Texas to California, the Great Basin; entering northeastern Lower California.

Lower Californian Records.—San Felipe, Meek, 1905, p. 14.

Van Denburgh lists this species as probably entering northeastern Lower California but not yet definitely recorded from the peninsula. It seems highly probable that the specimen recorded by Meek as *C. stejnegeri* from San Felipe, on the Gulf side of the peninsula, should be placed here.

I have referred specimens in the Biological Survey collection from Cocopah Mts., east base (U. S. N. M. Nos. 37693–4), San Felipe Bay (37690), and Poso Altamirano (37696) to this subspecies. The specimen from Poso Altamirano, near the center of the peninsula, differs slightly in coloration and in having smaller antebrachials from the typical *tessellatus*. It seems best, however, to place it with this species, pending the accumulation of further data.

Cnemidophorus tessellatus stejnegeri Van Denburgh

Cnemidophorus stejnegeri Van Denburgh, 1894, p. 300.

Cnemidophorus tessellatus stejnegeri Stejneger and Barbour, 1917, p. 68.

Range.—Coastal district of southern California and northern Lower California.

Lower Californian Records.—Near Ensenada, San Telmo, foothills of San Pedro Martir Mts., Van Denburgh, 1894, p. 300; "Comondu to San Quentin," Van Denburgh, 1895, p. 126; San Fernando, Cope, 1900, p. 599; Trinidad, San Matias, Cañon Esperanza, San Antonio, Parral, Matomi, Rosarito, Aguas Escondito, Meek, 1905, p. 14.

A specimen in the Biological Survey collection comes from Ojos Negros (U. S. N. M. No. 37689).

Cnemidophorus bartolomas Dickerson

Cnemidophorus bartolomas Dickerson, 1919, p. 476.

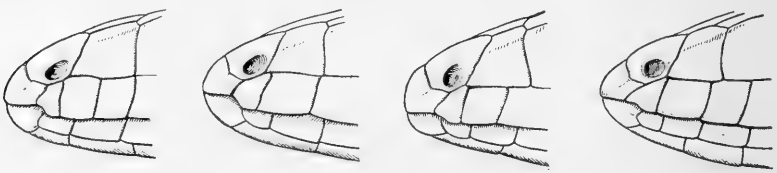
Range.—San Bartolome Bay, Lower California.

Lower Californian Records.—San Bartolome Bay, Abreojos Point, Dickerson, 1919, p. 476.[1]

The four specimens of this form brought back by the Albatross Expedition are of considerable interest for the variations they exhibit. In two specimens, the nasal is in contact with the second labial on one side, separated from it on the other; in one case, just touching; in the other, more broadly in contact. In two specimens, there are only two complete rows of enlarged antebrachials; in the others, there are three complete rows. In coloration, one specimen, No. 5522, from the more southern locality, Abreojos Point, approaches *C. rubidus* in the distinctness and wide separation of the black spots. The remaining three are fully adult specimens, the spots somewhat smaller and less sharply defined.

[1]Type: U. S. N. M. No. 64448.

In the variation of the antebrachials and of the second labial, these specimens show an approach to *C. labialis* Stejneger, which is amply distinguished, however, by other characters (single posterior anal plate, low number of femoral pores and coloration). I believe that *C. bartolomas* is directly related to *C. tessellatus stejnegeri*, and that it is derived from that form. It seems amply distinct in the character of the throat scales described in the key. *C. multiscutatus* is somewhat less distinct from *C. tessellatus stejnegeri* in coloration and in other characters than *C. bartolomas*. It is evident that for an adequate revision of the Lower Californian *Cnemidophorus* much additional material is needed.



A *B* *C* *D*

Fig. 11. Variation in the labials of *Cnemidophorus bartolomas* Dickerson. *A*, Type, U. S. N. M. No. 64448, left side, nasal in contact with second labial; *B*, same specimen, right side (reversed in figure) nasal not in contact with second labial; *C*, A. M. N. H. No. 5507, and *D*, A. M. N. H. No. 5522, showing different degrees of separation of nasal and second labial.

Cnemidophorus multiscutatus Cope

Cnemidophorus tessellatus multiscutatus Cope, 1892*a*, p. 38.

Cnemidophorus multiscutatus Stejneger and Barbour, 1917, p. 66.

Range.—Cedros Island, off the Pacific Coast of Lower California.

Three specimens (A. M. N. H. Nos. 5505–6, U. S. N. M. No. 64462) were collected on Cedros Island by the Albatross Expedition. They do not differ in any important respect from the description of Cope (1900, p. 586).

Cnemidophorus rubidus Cope

Cnemidophorus tessellatus rubidus Cope, 1892*a*, p. 36, Pl. xii, fig. *f*.

Cnemidophorus rubidus Stejneger and Barbour, 1917, p. 67.

Range.—Santa Margarita and Magdalena Islands, Pacific coast of Lower California.

Lower Californian Records.—Santa Margarita Island, Cope, 1892*a*, p. 36; Magdalena Island, Comondu, Van Denburgh, 1895, p. 126.

A single specimen of this species was collected by the Albatross Expedition on Santa Margarita Island (U. S. N. M. No. 64463).

Cnemidophorus labialis Stejneger

Cnemidophorus labialis Stejneger 1890, p. 643; Stejneger and Barbour, 1917, p. 66.

Range.—Confined to Cedros Island.

Cnemidophorus vandenburghi Dickerson

Cnemidophorus vandenburghi Dickerson, 1919, p. 477.[1]

Range.—Carmen Island, Gulf of California.

The single specimen (U. S. N. M. No. 64449), collected by the Albatross Expedition, on which this species is based appears to be sufficiently distinct from any peninsular *Cnemidophorus* or from *C. celeripes* on San José Island. Although much smaller in size than the specimens of *celeripes*, the color pattern represents the end stage of the usual *tessellatus* development, being distinguished further by an unusually fine division of the residual black spotting.

Cnemidophorus celeripes Dickerson

Plate LVII

Cnemidophorus celeripes Dickerson, 1919, p. 472.[2]

Range.—San José Island, Gulf of California.

Two specimens of a *Cnemidophorus* were collected on San José Island by the Albatross Expedition. Aside from the species related to *C. martyris* Stejneger, they certainly represent the most distinct of the insular species of this genus in the Gulf of California, being readily distinguishable from the remaining Lower Californian species of the *tessellatus* group by their retention of sharply defined black lines in the adult phase of coloration.

Dickerson (*loc. cit.*) has tentatively referred the *Cnemidophorus grahami* recorded from Santa Rosalia and Mulege by Mocquard (1899, p. 315) to this form. In the examination of the Gulf insular faunas which I have been able to make, it appears that the San José species are in general more distinct from the peninsular forms than are those on Carmen Island, the latter being frequently identical with those on the mainland. It is, therefore, more probable that Mocquard's *C. grahami*, and probably his *C. sexlineatus* from Santa Rosalia as well, are *C. vandenburghi*. This question must await the evidence of further collections, which are urgently needed from the whole of the Gulf side of the peninsula north of La Paz. It is not improbable that *C. maximus* will be discovered in this area when it is more fully explored.

Cnemidophorus estebanensis Dickerson

Cnemidophorus estebanensis Dickerson, 1919, p. 474.[3]

Range.—Confined to San Esteban Island, Gulf of California.

The single *Cnemidophorus* collected by the Albatross Expedition on San Esteban Island is the type of this species. It is certainly well dis-

[1]Type: U. S. N. M. No. 64449.
[2]Type: U. S. N. M. No. 64444.
[3]Type: U. S. N. M. No. 64446.

tinguished from *C. punctilinealis* Dickerson from Tiburon Island by the much longer head and neck, and the smaller size. The scales of the under surface of the forearm are not notably different from those of *punctilinealis*. The femoral pores number 22–23.

The differences cited in the original description to distinguish *estebanensis* from *melanostethus* are inadequate, and I am unable to find other characters of greater weight. The coloration appears to be practically identical. I have, nevertheless, retained *C. estebanensis* in the present list, as it is not improbable that the examination of series of specimens will justify its retention as an insular race. On the other hand, the examination of adequate material of this form and its near relatives on the neighboring islands may quite as probably disprove their supposed distinctness.

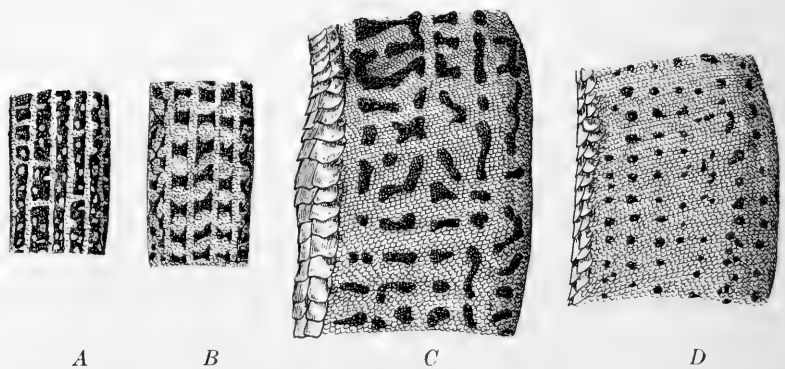


Fig. 12. Stages in the development of the color pattern of *Cnemidophorus punctilinealis* Dickerson. *A*, U. S. N. M. No. 64460; *B*, A. M. N. H. No. 5539; *C*, A. M. N. H. No. 5533; *D*, (type), U. S. N. M. No. 64447. *A* and *B*, dorsal views; *C* and *D*, lateral views.

Cnemidophorus punctilinealis Dickerson

Cnemidophorus punctilinealis Dickerson, 1919, p. 475.[1]

Range.—Tiburon Island, Gulf of California; coastal strip of Sonora (?).

The specimens described under this name by Dickerson apparently represent a fairly distinct race of *C. melanostethus*, the dorsal coloration being more nearly that of *C. tessellatus tessellatus*, the ventral of *C. melanostethus*. This is exactly the coloration described by Van Denburgh and Slevin in specimens from Isla Partida, near Angel de la Guardia Island, as *C. dickersonæ;* a paratype of this species, in the collection of The American Museum of Natural History, is more nearly allied in color pattern to adult *C. disparilis*.

[1]Type: U. S. N. M. No. 64447. Paratypes: U. S. N. M. Nos. 64456–60, A. M. N. H. Nos. 5533–39.

Cnemidophorus maximus Cope

Cnemidophorus maximus Cope, 1863, p. 104; Stejneger and Barbour, 1917, p. 66.

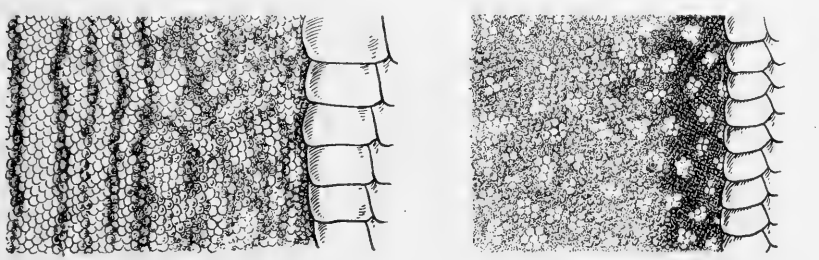
Range.—Southern Lower California.

Lower Californian Records.—Cape St. Lucas, Cope, 1863, p. 104; La Paz, Yarrow, 1882, p. 42; San José del Cabo, Miraflores, Sierra San Lazaro, Van Denburgh, 1895, p. 122; Espiritu Santo Island, Cope, 1900, p. 570; San Pedro, Triunfo, San Antonio, San Bartolo, Buena Vista, Agua Caliente, Todos Santos, Guamuchil Rancho (about 25 miles north of Cape St. Lucas), Van Denburgh and Slevin, 1921*a*, p. 62.

Six specimens of *Cnemidophorus maximus* were collected by the Albatross Expedition, two at Miraflores (A. M. N. H. Nos. 5542, 5570), and four in the San Bernardo Mts. (5549, 5551, 5656, U. S. N. M. No. 64461).

Two specimens in the Biological Survey collection come from Cape San Lucas (U. S. N. M. No. 37688) and Espiritu Santo Island (37691).

It is possible that the *C. grahami* and *C. sexlineatus* recorded by Mocquard (1899, p. 315) from Santa Rosalia and Mulege belong here.



A *B*

Fig. 13. *A*, Dorsal color pattern of type of *Cnemidophorus disparilis*, U. S. N. M. No. 64445, from the mid-dorsal line to the ventral plates. *B*, Similar view of dorsal pattern of *Cnemidophorus catalinensis*, A. M. N. H. No. 6885.

Cnemidophorus disparilis Dickerson

Cnemidophorus disparilis Dickerson, 1919, p. 473.[1]

Range.—Tiburon Island, Gulf of California.

This species was based on three specimens in the Albatross collection, one (the type) from Tiburon Island, and two juvenile specimens with no further data than "Lower California." The association of these two specimens with the type appears to be unjustifiable, as comparison of one of them with the types of *C. catalinensis* Van Denburgh and Slevin proves them to be indistinguishable (Van Denburgh, in correspondence).

[1]Type: U. S. N. M. No. 64445.

Conclusions on the development of the peculiar coloration of *disparilis* from the still more distinctive pattern of *C. martyris* and *C. catalinensis* are therefore baseless. An adequate understanding of the relations of the fifteen species of *Cnemidophorus* in the present list can only be reached by the comprehensive study of large series of each species, which are not at present available.

Cnemidophorus martyris Stejneger

Cnemidophorus martyris Stejneger, 1891, p. 407; Stejneger and Barbour, 1917, p. 66.

Range.—San Pedro Martir Island, Gulf of California.

Cnemidophorus catalinensis Van Denburgh and Slevin

Cnemidophorus catalinensis Van Denburgh and Slevin, 1921*c*, p. 396.

Range.—Santa Catalina Island, Gulf of California.

Two specimens (A. M. N. H. Nos. 6884–85), without other locality than "Lower California," referred to *C. disparilis* by Dickerson, almost certainly belong to this species, as has been noted above.

Cnemidophorus dickersonæ Van Denburgh and Slevin

Cnemidophorus dickersonæ Van Denburgh and Slevin, 1921*b*, p. 97.

Range.—Confined to Isla Partida, near Angel de la Guardia Island, Gulf of California.

Cnemidophorus canus Van Denburgh and Slevin

Cnemidophorus canus Van Denburgh and Slevin, 1921*b*, p. 97.

Range.—Sal Si Puedes Island, Gulf of California.

Cnemidophorus bacatus Van Denburgh and Slevin

Cnemidophorus bacatus Van Denburgh and Slevin, 1921*b*, p. 97.

Range.—San Pedro Nolasco Island, Gulf of California.

Key to the Species of *Cnemidophorus* in Lower California (Exclusive of Insular Forms)

1. Postmental little if at all longer than the mental; parietals subequal in length to the fronto-parietals; size very large ..... *C. maximus.*
   Postmental longer than mental; parietals decidedly longer than the fronto-parietals; size moderate ..... 2.
2. Tail red distally; dorsal pattern of sharply defined black spots, in regular longitudinal and transverse rows ..... *C. rubidus.*
   Tail not red at end; dorsal pattern of longitudinal lines or rows of spots, not in regular transverse rows ..... 3.
3. Granular scales between collar and enlarged central gulars very small, abruptly differentiated from the latter ..... *C. bartolomas.*

Granular scales between collar and central gulars larger, passing more gradually into the latter.....4.

4. Central gulars strongly enlarged; throat heavily spotted with black, often united into transverse bands or reticulation.....*C. tessellatus stejnegeri.*
Central gulars little enlarged; throat often unspotted.....*C. t. tessellatus.*

Verticaria ceralbensis Van Denburgh and Slevin

Verticaria ceralbensis Van Denburgh and Slevin, 1921*c*, p. 396.

Range.—Ceralvo Island, Gulf of California.

Verticaria hyperythra hyperythra (Cope)

Cnemidophorus hyperythrus Cope, 1863, p. 103.

Verticaria hyperythra hyperythra Stejneger and Barbour, 1917, p. 65.

Range.—Southern Lower California.

Lower Californian Records.—Cape St. Lucas, Cope, 1863, p. 103; La Paz, Yarrow, 1882, p. 45; San José del Cabo, Miraflores, Van Denburgh, 1895, p. 128; Todos Santos, Agua Caliente, Buena Vista, San Bartolo, San Antonio, Triunfo, San Pedro, Guamuchil Ranch, and foothills of Sierre Laguna opposite Todos Santos, Van Denburgh and Slevin, 1921*a*, p. 63.

This species was collected by the Albatross Expedition at Cape San Lucas (U. S. N. M. No. 64483), Miraflores (A. M. N. H. Nos. 5565, 5670, 5672–75, U. S. N. M. No. 64481–2), and Pichlinque Bay (U. S. N. M. No. 64484). It agrees excellently with the definition of Van Denburgh (1895, p. 128) in the character of the supraoculars employed by him to distinguish it from *beldingi*. Eight specimens have the third supraocular only partly separated from the central head shields, two have it completely separated.

A specimen in the Biological Survey collection comes from Santa Anita (U. S. N. M. No. 37698).

Verticaria hyperythra beldingi Stejneger

Verticaria beldingi Stejneger, 1894, p. 17.

Verticaria hyperythra beldingi Stejneger and Barbour, 1917, p. 65.

Range.—Southwestern California, northeastern Lower California at least as far as Ensenada, Cedros Island, and Santa Margarita Island and Magdalena Islands.

Lower Californian Records.—Cedros Island, Stejneger, 1894, p. 17; Magdalena Island, Van Denburgh, 1895, p. 131; San Telmo, Ensenada, and between Salado and San Vicente, Van Denburgh, 1896, p. 1005.

The only *Verticaria* collected by the Albatross Expedition which I refer to this subspecies is a specimen from Santa Margarita Island (U. S. N. M. No. 64479). For a discussion of the relations of this form and *V. h. schmidti*, to which I refer the *Verticarias* of the remaining part of the peninsula north of the Cape area, see below.

Verticaria hyperythra schmidti Van Denburgh and Slevin

Verticaria sericea Meek, 1905, p. 14.

Verticaria hyperythra schmidti Van Denburgh and Slevin, 1921*c*, p. 397.

Range.—San Antonio (in northern Lower California) to Conception Bay and San Marcos Island.

Lower Californian Records.—Aguas Escondito, San Antonio, San Salado Cañon, and Rosarito, Meek, 1905, p. 14; San Marcos Island, Van Denburgh and Slevin, 1921*c*, p. 397.

Two specimens of *Verticaria* in the Albatross collection, from Castro Rancho, Concepcion Bay (U. S. N. M. No. 64252, and A. M. N. H. No. 5524) have a mid-dorsal light line, forked anteriorly, and four supraoculars, and are accordingly identified with the form found on the island of San Marcos, to which my name is attached through the courtesy of Dr. Van Denburgh. A third specimen, from Mulege (A. M. N. H. No. 5523), has the typical coloration of *V. h. beldingi*, but I have included it with the present form on geographical grounds and on the evidence of specimens from northern Lower California.

Examination of the specimens from northern Lower California recorded by Meek as *V. sericea* shows that his reason for so recording them was their possession of the *sericea* color pattern; seven out of eleven specimens have a sharply defined median dorsal white line, dividing at the shoulders or a little farther back and sending the two branches to the parietals. Six of these specimens are from San Antonio, one from Aguas Escondito. The remaining four specimens from San Salado Cañon, Rosarito, Aguas Escondito and San Antonio exhibit various stages in the fusion of the two dorsal lines. In one, they are juxtaposed, but not actually united, on the posterior half of the body; in one, they are plainly fused on the posterior third of the back; in two, they unite at mid-body, but separate again for a short distance, reuniting at the base of the tail; three of these specimens show traces anteriorly of the fainter median dorsal line which is present in the normal pattern of both *hyperythra* and *beldingi*. Nine out of twelve specimens examined by me have the *sericea* type of color pattern. Van Denburgh's series of thirty-eight specimens of *V. h. beldingi* (1895, p. 131) did not exhibit this variation, and Van Denburgh and Slevin (1920, p. 64) in their recent paper, with twenty-four fresh specimens at hand from Ensenada, make no mention of it.

As far as I can discover, the specimens before me with the *sericea* color pattern or with a pattern intermediate between that of *sericea* and *hyperythra* are not structurally distinguishable from *V. h. beldingi;* and the color pattern itself is not firmly fixed, although it appears in the majority of the specimens before me. The specimens from Santa Rosalia

and San Ignacio recorded by Mocquard may be placed with this form on geographical grounds. His description indicates that they do not have the *sericea* pattern, and are therefore like our specimen from Mulege. My conception of *V. h. schmidti* therefore allows for the appearance of a minority of specimens colored like the form from which I believe it to be directly derived or in process of derivation.

Two localities represented by specimens in the Biological Survey collection from San Esteban (U. S. N. M. No. 37695) and San Francisquito (37697) are very satisfactory links between the records from the northern part of the peninsula and those from Mulege and San Marcos Island. In these two specimens the mid-dorsal pair of light lines is juxtaposed but not entirely confluent on the posterior two-thirds of the back.

Verticaria espiritensis Van Denburgh and Slevin

Verticaria espiritensis Van Denburgh and Slevin, 1921*c*, p. 397.
Range.—Espiritu Santo Island, Gulf of California.

Verticaria franciscensis Van Denburgh and Slevin

Verticaria franciscensis Van Denburgh and Slevin, 1921*c*, p. 397.
Range.—San Francisco Island, Gulf of California.

Verticaria sericea Van Denburgh

Verticaria sericea Van Denburgh, 1895, p. 132, Pl. xii ; Stejneger and Barbour, 1917, p. 65.
Range.—Confined to San José Island, Gulf of California.

A single specimen of this handsome and distinct species was taken by the Albatross Expedition on San José Island (U. S. N. M. No. 64480). It agrees excellently with the description of the type, the small scales of the border of the collar being quite unlike those of any form of *V. hyperythra*.

Verticaria cærulea Dickerson

Verticaria cærulea Dickerson, 1919, p. 472.[1]
Range.—Confined to Carmen Island, Gulf of California.

Five specimens forming the typical series of this species were collected by the Albatross Expedition on Carmen Island. They are directly related to *V. sericea* Van Denburgh from which they are slightly distinguishable in measurements. In the specimen of *V. sericea* at hand, the length of the hind leg forms .75 of the body length (.81 in the type). In the five *cæruleas*, the proportion ranges from .64 to .73, average .70.

[1]Type: U. S. N. M. No. 64251.

In addition to the generally light coloration mentioned in the original description, the absence of the two white lines on the posterior and superior aspect of the hind leg, which are very distinct in *sericea*, appears to be the most important distinctive character.

Verticaria picta Van Denburgh and Slevin

Verticaria picta Van Denburgh and Slevin, 1921*b*, p. 98.

Range.—Confined to Monserrate Island, Gulf of California.

The relations of this newly discovered form with those of the Lower Californian peninsula are unknown, the preliminary diagnosis only being at present available.

Key to the Peninsular Species of *Verticaria*

1. A single mid-dorsal line, forked anteriorly . . . . . *V. hyperythra schmidti.*
   A pair of sharply defined dorsal lines, sometimes with a faint line between them . 2.
2. Second supraocular usually in contact with the frontal . . . . *V. h. hyperythra.*
   Second supraocular usually separated from the frontal by a row of granules.
   V. h. beldingi.

Plestiodon skiltonianus Baird and Girard

Plestiodon skiltonianum Baird and Girard, 1852*b*, p. 349, Pl. iv, figs. 4–6.

Plestiodon skiltonianus Stejneger and Barbour, 1917, p. 71.

Range.—British Columbia to Lower California.

Lower Californian Records.—Cape St. Lucas, Yarrow, 1882, p. 41; San Francisquito, Sierra Laguna, Van Denburgh, 1895, p. 134; Los Coronados Islands, Van Denburgh, 1905, p. 18.

A specimen in the Biological Survey collection comes from Todos Santos Island, opposite Ensenada, (U. S. N. M. No. 37686).

The *P. lagunensis* described by Van Denburgh from the Sierra Laguna (*loc. cit.*) is not recognized by Stejneger and Barbour. It does not appear to me to warrant specific separation. Mr. Charles L. Camp informs me that the salmon-colored tail, one of the characters on which *lagunensis* was based, is common in *skiltonianus* in California.

Bipes biporus (Cope)

Euchirotes biporus Cope, 1894*a*, p. 436, figs. 5*a–e*.

Bipes biporus Stejneger and Barbour, 1917, p. 72.

Range.—Southern Lower California.

Lower Californian Records.—La Paz, Streets, 1877, p. 37.

Serpentes

Siagonodon humilis (Baird and Girard)

Rena humilis Baird and Girard, 1853, p. 143.

Siagonodon humilis Stejneger and Barbour, 1917, p. 73.

RANGE.—Southeastern California, southwestern Arizona, northwestern Mexico, and Lower California; southwestern Texas.[1]

LOWER CALIFORNIAN RECORDS.—Cape St. Lucas, Cope, 1861, p. 305; La Paz, Yarrow, 1882, p. 142; San Francisquito, Sierra Laguna, Van Denburgh, 1895, p. 136; San José del Cabo, Boulenger, 1896, p. 591; San Ignacio, Mocquard, 1899, p. 315; Cedros Island, Van Denburgh and Slevin, 1914, p. 145.

Two specimens of this species were secured at Cape San Lucas by the Albatross Expedition (A. M. N. H. No. 5576, U. S. N. M. No. 64580) Comparison with specimens from Tucson, Arizona, and Fort Clark, Texas, does not show any important differential character.

Lichanura roseofusca Cope

Lichanura roseofusca COPE, 1868, p. 2; STEJNEGER AND BARBOUR, 1917, p. 73.

RANGE.—Southern California and Arizona, northern Lower California.

LOWER CALIFORNIAN RECORDS.—Ensenada, Van Denburgh, 1896, p. 1005.

Lichanura trivirgata Cope

Lichanura trivirgata COPE, 1861, p. 304; STEJNEGER AND BARBOUR, 1917, p. 73.

RANGE.—Southern Lower California.

LOWER CALIFORNIAN RECORDS.—Cape St. Lucas, La Paz, Yarrow, 1882, p. 142.

U. S. N. M. No. 37525, ♂, Biological Survey collection, is from Santa Anita.

The scale counts of this specimen are as follows: Dorsals, 31–37–25; ventrals, 229; subcaudals, 47; scales about eye, 9; upper labials, 12; lower labials, 13; loreals, 3+4. The total length is 610 mm., the tail-length, 96 mm. The upper row of loreals contains two scales on one side, three on the other. The lower row has only one on each side.

Key to the Species of *Lichanura* in Lower California

Three dark longitudinal bands in strong contrast with the ground color; ventral plates 215–229 ..... *L. trivirgata.*

Bands, if present, not strongly contrasted with the ground color; ventral plates 224–241 ..... *L. roseofusca.*

Coluber flagellum piceus (Cope)

Bascanium piceum COPE, 1892, p. 625.

Coluber flagellum piceus STEJNEGER AND BARBOUR, 1917, p. 79.

RANGE.—Southwestern Arizona and Lower California.

LOWER CALIFORNIAN RECORDS.—La Paz, Yarrow, 1882, p. 112; Santa Margarita Id., Cope, 1895, p. 679; San José del Cabo, Miraflores, Van Denburgh, 1895, p. 148; Santa Rosalia, San Ignacio, Mocquard, 1899, p. 323; Joruncho Ranch, San Quentin, Rosarito, Parral, Meek, 1905, p. 15; San Pedro, Triunfo, San Bartolo, Agua Caliente, Todos Santos, Van Denburgh and Slevin, 1921*a*, p. 64.

[1]A specimen in The American Museum of Natural History (No. 8596) from Fort Clark, Kinney County, Texas, collected May 29, 1915, by Mr. Chapman Grant, U. S. Army, greatly extends the known range of this species.

The Albatross collection contains thirteen specimens of this form, the following localities being represented: Cape San Lucas (A. M. N. H. Nos. 5584, 6890); Miraflores (A. M. N. H. Nos. 5585, 5600–6503, U. S. N. M. Nos. 64591–5); and San Bartolome Bay (U. S. N. M. No. 64590).

The specimens range in size from 887 mm. to 1780 mm. The dorsal scale formula is regularly 19–17–13, but may be 19–17–12 by the loss of the median scale row posteriorly (U. S. N. M. Nos. 64590–91). There does not appear to be any sex difference in the number of ventral plates or subcaudals, nor in the proportionate length of the tail. In scale characters, this series does not change the range of variation shown in the tabulation of Van Denburgh (1921*a*, *loc. cit.*).

Specimens in the Biological Survey collection come from San Felipe Bay (U. S. N. M. No. 37549), Trinidad Valley (37551), Ojos Negros (37559), and San Ignacio (37552–3). Two of these (37559 and 37552) are of the dark color phase originally described as *piceus*. They correspond so closely in coloration to the specimen in the Albatross collection from San Bartolome Bay, and this in turn with Cope's description of *C. lateralis fuliginosus* from Santa Margarita Island, that I am convinced of their identity.

Two specimens, U. S. N. M. Nos. 37549 and 37559, show very distinct light lateral lines on the anterior third of the body, indicating, I believe, the relation of this form with *C. tæniatus*.

Coluber lateralis (Hallowell)

Leptophis lateralis Hallowell, 1853, p. 237.

Coluber lateralis Stejneger and Barbour, 1917, p. 80.

Range.—Southern and Lower California, absent from the Cape area.

Lower Californian Records.—Santa Rosalia, Mulege, San Ignacio, Mocquard, 1899, p. 324.

I refer Mocquard's records of *C. tæniatus* to this species, although it is entirely possible that they may prove to represent a distinct peninsular form or that they may be more nearly related to *C. barbouri* from Espiritu Santo Island.

Coluber aurigulus (Cope)

Drymobius aurigulus Cope, 1861, p. 301.

Coluber aurigulus Stejneger and Barbour, 1917, p. 78.

Range.—Southern Lower California.

Lower Californian Records.—Cape St. Lucas, Cope, 1861, p. 301; San José del Cabo, Van Denburgh, 1895, p. 149.

Coluber anthonyi (Stejneger)

Bascanion anthonyi Stejneger, 1901, p. 715.
Coluber anthonyi Stejneger and Barbour, 1917, p. 78.

Range.—Clarion Island, Revilla Gigedo Islands.

Coluber barbouri Van Denburgh and Slevin

Coluber barbouri Van Denburgh and Slevin, 1921*b*, p. 98.

Range.—Confined (as far as known) to Espiritu Santo Island, Gulf of California.

Key to the Species of *Coluber* in Lower California (Exclusive of Insular Forms)

1. No longitudinal light lines. Light brown above, with black nuchal bars (a melanistic phase occurs which is black or dark).....*C. flagellum piceus.*
   Longitudinal light lines on the sides.....2.
2. Lateral stripe continuous and uniform to base of tail.....*C. lateralis*
   Lateral stripe interrupted anteriorly, faint posteriorly.....*C. aurigulus.*

Salvadora hexalepis (Cope)

Phymothyra hexalepis Cope, 1866*a*, p. 304.
Salvadora hexalepis Stejneger and Barbour, 1917, p. 81.

Range.—Arizona, southern California and Lower California.

Lower Californian Records.—Cape St. Lucas, La Paz, Yarrow, 1882, p. 98; Comondu, Agua Caliente, San José del Cabo, Sierra San Lazaro, Van Denburgh, 1895, p. 147; San Pedro Martir Mt., Van Denburgh, 1896, p. 1005; Santa Anita, McLain, 1899, p. 3; Santa Rosalia, San Ignacio, Mocquard, 1899, p. 325; San Matias, Meek, 1905, p. 15; San Pedro, Buena Vista, Santiago, Miraflores, Todos Santos, Van Denburgh and Slevin, 1921*a*, p. 65.

A single specimen of this species (U. S. N. M. No. 64581, ♀), was collected by the Albatross Expedition at Miraflores. The total length is 678 mm.; tail, 162 mm.; ventral plates, 198; subcaudals, 89; dorsal scales, 19–17–13; a small inferior loreal on each side below the true loreal.

Two specimens in the Biological Survey collection are from 20 miles west of Santa Rosalia (U. S. N. M. No. 37517) and Todos Santos (37518).

Phyllorhynchus decurtatus (Cope)

Phimothyra decurtata Cope, 1868*a*, p. 310.
Phyllorhynchus decurtatus Stejneger and Barbour, 1917, p. 81.

Range.—Lower California, north to Riverside County, California and Yuma, Arizona.

Lower Californian Records.—Northern Lower California, Cope, 1868*a*, p. 310; La Paz, Stejneger, 1890, p. 155.

A study of the published records of the scale characters of this species reduces the distinctive characters of *P. browni* Stejneger, from Tucson,

to the keeling of the scales on the posterior part of the body in the latter species. Stejneger, in the original description (*loc. cit.*, p. 153) distinguished *P. browni* by the following characters:

	P. decurtatus	*P. browni*
Posterior Dorsal Scales	Smooth	Keeled
Ventral Plates	172–177	159
Subcaudals	26–27	31
Tail-Length	.08–.09	.13
Lateral Spots	Present	Absent
Dorsal Spots	29–32	15

The specimen recorded from La Paz by Van Denburgh and Slevin (1921*a*, p. 66) has 161 ventrals and 35 subcaudals, thus agreeing with the scale counts of *P. browni*. Mr. Tracy I. Storer of the Museum of Vertebrate Zoölogy of the University of California has kindly examined the specimen recorded from Palm Springs, Riverside Co., California, by Atsatt (1921, p. 38) and informs me that it has 187 ventral plates and 32 subcaudals.

A specimen (A. M. N. H. No. 20590) collected by Dr. F. E. Lutz and J. A. G. Rehn near Tucson agrees with *browni* in every scale character, but has the dorsal coloration of *decurtatus* while a second specimen from the same locality is a typical *browni*. This extraordinary dimorphism in coloration can only be explained by further studies, depending on the discovery of additional specimens. My suspicion that the differences in scale counts alluded to is a sex character is apparently groundless, as Dr. Stejneger reports U. S. N. M. No. 62561, a *browni*, as a female, and the specimen from Palm Springs is reported to be a male by Mr. Storer. I append a tabulation of the characters of the extant specimens of these two species so far as I can determine them.

Elaphe rosaliæ (Mocquard)

Coluber rosaliæ Mocquard, 1899, p. 321, Pl. xii, fig. 1.

Elaphe rosaliæ Stejneger and Barbour, 1917, p. 84.

Range.—Central and southern Lower California.

Lower Californian Records.—Santa Rosalia, Mocquard, 1899, p. 321; San Bartolo, Van Denburgh and Slevin, 1921*a*, p. 66.

Arizona elegans Kennicott

Arizona elegans Kennicott, 1859, p. 18, Pl. xiii; Stejneger and Barbour, 1917, p. 85.

Range.—Southwestern United States, northern Mexico, northern Lower California.

Lower Californian Records.—Ensenada, Van Denburgh and Slevin, 1921*a*, p. 67.

	Mus. No.	Sex	Locality	V. P.	Subc.	Tail / Total Length	No. of Dorsal Spots
Phyllorhynchus browni— Dorsal Scales Keeled	U. S. N. M.						
	15719 Type	?	Tucson	159	31	.13	15
	19258	♂	Tucson	156	30		
	62561	♀	Sabino Canyon, Arizona	158	32		
	A. M. N. H.						
	20590	♂	Tucson	159	33	.14	46
	A. N. S. P						
		♂	Tucson	160	33	.14	13
Phyllorhynchus decurtatus— Dorsal Scales Perfectly Smooth	A. N. S. P.						
	— Type		N. Lower Calif.	177	26	.08	32
	—		Yuma, Arizona	183	30	.10	47
	U. S. N. M.						
	12639	♀	La Paz	172	27	.09	29
	Cal. Acad. Sci.						
	45983		La Paz	161	35		
	Mus. V. Zoöl. Cal.						
		♂	Palm Springs, Calif.	187	32	.09	46

Two specimens in the Biological Survey collection come from San Tomas (U. S. N. M. No. 37519) and San Quintin (37529).

This species, while unquestionably present in the Colorado Desert area (Van Denburgh and Slevin, 1913, p. 417), appears to be more abundant in the San Diegan fauna, and also, perhaps locally, to the east of the desert.

Pituophis catenifer annectens Baird and Girard

Pituophis annectens Baird and Girard, 1853, p. 72.
Pituophis catenifer annectens Van Denburgh, 1920, p. 17.

Range.—Coast region of southern California and northern Lower California.

Lower Californian Records.—San Martin Island, Streets, 1877, p. 40; South Coronado Island, Van Denburgh and Slevin, 1914, p. 141; Ensenada, Van Denburgh, 1920, p. 17.

Pituophis catenifer rutilus Van Denburgh

Pituophis catenifer rutilus Van Denburgh, 1920, p. 24.

Range.—Southwestern Arizona, ranging into northern Lower California.

Lower Californian Records.—(?) Gardner's Laguna (Salton River), Cope, 1900, p. 879; (?) Trinidad, Meek, 1905, p. 15.

A single specimen (U. S. N. M. No. 37536) of *Pituophis* in the collection of the Biological Survey from Alamo appears to be referable to this form. The dorsal scale count is 29–31–23; the ventral plates number 239; the subcaudals, 50; the preoculars are two on each side; the dorsal dark spots are 32, the caudal, 8.

Van Denburgh (*loc. cit.*) has recorded this form from Yuma, and it is therefore not improbable from a geographic standpoint that it should occur in northern Lower California. Its presence on the Pacific slope in the San Diegan fauna, however, is an anomaly. It can only be explained by the assumption that it has entered Lower California via the deserts and spread northward from the southern end of the San Pedro Martir Mountains, (or via the San Felipe valley) very much as I suppose *Crotaphytus wislizenii* to have done.

There does not seem to be any possibility of regarding the present specimen as an aberrant *annectens*, as both scale and color characters separate it sharply from Van Denburgh's diagnosis of that form. Whether or not *P. c. deserticola* may occur in Lower California is uncertain, but I believe that the present form will be found to inhabit the northeastern part of the peninsula rather than *deserticola*, and I have therefore tentatively referred the records of Cope and Meek to *rutilus*.

Pituophis vertebralis (Blainville)

Coluber vertebralis Blainville, 1835, p. 293, Pl. xxvii, figs. 2–2*B*.
Pituophis vertebralis Stejneger and Barbour, 1917, p. 86.

Range.—Southern and central Lower California.

Lower Californian Records.—Cape St. Lucas, Cope, 1860*a*, p. 342; La Paz, Yarrow, 1882, p. 107; San José del Cabo, Miraflores, Van Denburgh, 1895, p. 150; San Ignacio, Arroyo de Santa Agueda, Mocquard, 1899, p. 320; Ballenas Bay, Cope, 1900, p. 879; San Pedro, San Antonio, San Bartolo, Agua Caliente, Van Denburgh and Slevin, 1921*a*, p. 67.

Four specimens (A. M. N. H. Nos. 5588–90, U. S. N. M. No. 64583) collected at Miraflores are in the Albatross collection. The lengths range from 965 to 1665 mm.; the tail-length from 118 mm. to 220 mm. The tail-length/total length ranges from .13 to .15 in the three male specimens, .12 in the single female. In scale characters, these specimens fall within the range of variation of the four specimens recorded by Van Denburgh and Slevin (*loc. cit.*).

Specimens in the Biological Survey collection come from Santa Margarita Island (U. S. N. M. No. 37537), Cape San Lucas (37538), San José del Cabo (37539), and Santa Anita (37540).

Key to the Species of *Pituophis* in Lower California[1]

1. Coloration on anterior half of body largely red; upper labials usually 9 or 10; scales usually in 33 or 35 rows ..... *P. vertebralis.*
   Coloration anteriorly not reddish; upper labials usually 8; scale rows usually less than 35 ..... 2.
2. Dorsal blotches numerous, 54 to 89 on body, 14–29 on tail. *P. catenifer annectens.*
   Dorsal blotches fewer, 32–55 on body, 8–14 on tail ..... *P. c. rutilus.*

Diadophis amabilis Baird and Girard

Diadophis amabilis Baird and Girard, 1853, p. 113; Stejneger and Barbour, 1917, p. 75.

Range.—Oregon to Lower California, west of the desert divides in California.

The specimen in the Biological Survey collection, U. S. N. M. No. 37526, from San Matias Pass, in the San Pedro Martir Mountains, established this species in the fauna of Lower California.

The specimen measures 503 mm., tail-length, 86 mm. The dorsal scales are 15–15–14; the ventral plates, 203; the subcaudals, 60; preoculars, 2–2; postoculars, 2–2; temporals, 1–1, 1–1; upper labials, 7–8; lower labials, 8–8.

The ventral color includes the first lateral scale row; the small dark ventral spots are irregularly disposed, but are on the posterior margins of the ventral plates.

[1]After Van Denburgh, 1920, p. 12.

Lampropeltis getulus boylii (Baird and Girard)

Ophibolus boylii Baird and Girard, 1853, p. 82.
Lampropeltis getulus boylii Blanchard, 1920, p. 3.

Range.—Southwestern Utah to southern California and northern Lower California.

Lower Californian Records.—San Pedro Martir Mt., Van Denburgh, 1896, p. 1006; Beveridge Cañon, San Salado Cañon, San Quentin, Meek, 1905, p. 15; Ensenada, Blanchard, 1921, p. 87.

Lampropeltis getulus conjuncta Cope

Lampropeltis boylii var. *conjuncta* Cope, 1861, p. 301.
Lampropeltis getulus conjuncta Blanchard, 1920, p. 4.

Range.—Southern Lower California.

Lower Californian Records.—Cape St. Lucas, Cope, 1860, p. 255; La Paz, Yarrow, 1882, p. 92; San José del Cabo, Van Denburgh, 1895, p. 142; Santa Anita, Blanchard, 1921, p. 93.

Two specimens of this form were collected by the Albatross Expedition at Miraflores (A. M. N. H. No. 5649, U. S. N. M. No. 64584). The dorsal scales are 23–23–19 in one, 23–23–20 in the other; ventral plates 227 and 236; subcaudals 50 in both; specimens poorly preserved, measurements consequently not given. The coloration and head shields present nó anomalies.

Lampropeltis getulus yumensis Blanchard

Lampropeltis getulus yumensis Blanchard, 1919, p. 6, Pl. 1, fig. 2; 1921, p. 66, fig. 28.

Range.—Southwestern Arizona, southeastern California, and adjacent areas in Lower California and Sonora.

Lower Californian Records.—Volcano Lake, Blanchard, 1919, p. 10 (list).

Lampropeltis californiæ californiæ (Blainville)

Coluber (Ophis) californiæ Blainville, 1835, p. 292, Pl. xxvii, figs. 1–1*B*.
Lampropeltis californiæ californiæ Blanchard, 1920, p. 3.

Range.—Fresno County, California, to northern Lower California.

Lower Californian Records.—San Ysidra Ranch, Cope, 1900, p. 922.

Lampropeltis californiæ nitida Van Denburgh

Lampropeltis nitida Van Denburgh, 1895, p. 143, Pl. xiv.
Lampropeltis californiæ nitida Blanchard, 1920, p. 3.

Range.—Southern Lower California.

Lower Californian Records.—San José del Cabo, Van Denburgh, 1895, p. 143.

I have referred a single specimen, taken at Miraflores, May 6, 1911 (U. S. N. M. No. 64585), to this species. The dorsal scales are 25–25–19; ventral plates, 226; subcaudals, 46; total length, 865 mm., tail, 106 mm.

In coloration, this specimen is even more closely allied to *L. californiæ californiæ* than the juvenile specimen described by Van Denburgh (*loc. cit.*, p. 144), thus fully justifying Blanchard's reference of *nitida* to subspecific rank.

The superior head shields are entirely dark; a yellow spot extends on the nasals, loreal and preocular; the fourth and fifth upper labials, and the temporals are spotted with yellow; a small spot just behind the parietals; an oblique band crosses the neck, from the fifth ventral to the tenth, about two scales wide dorsally, expanding to include five ventrals below, and extending at each end, about to the mid-ventral line; a half collar anterior to this band; two similar oblique bands follow these, beginning on the fifteenth and twenty-fifth ventrals respectively; behind this, there are no complete dorsal crossbands on the body, but there are six on the tail; twenty-two large yellow blotches on each side, beginning on the ends of the ventrals, one or two of which, however, may be entirely yellow, and extending dorsally to the fourth scale row; above these blotches is an obscure, much interrupted, yellow dorsolateral line on each side, on the seventh and eighth scale rows; the lateral blotches are connected by a lateral line at the edge of ventrals and on the first scale row on the posterior half of the body; an irregular, frequently indistinct vertebral line begins at a point opposite the thirty-fourth ventral, and continues with eight interruptions to the base of the tail; part of this line is straight, part wavy, and at several of the interruptions, the expanded end descends laterally and nearly joins a lateral blotch, indicating its derivation from a fundamentally ringed pattern.

The chief, if not the only, difference between this coloration and that of typical *californiæ* is the predominance of the dark color on the venter. On this ground, and for geographical reasons, the specimen is referred to *nitida*. It is not unlikely that larger collections will ultimately prove that *nitida* is a variety of the species *californiæ* rather than a vicarious geographical race.

Lampropeltis catalinensis Van Denburgh and Slevin

Lampropeltis catalinensis Van Denburgh and Slevin, 1921*c*, p. 397–398.

Range.—Santa Catalina Island, Gulf of California.

Key to the Species of *Lampropeltis* in Peninsular Lower California[1]

1. Dorsal longitudinal stripe, complete or interrupted ..... 2.
   Pattern of rings ..... 3.
2. Dorsal stripe white or yellow, sharply defined on a dark ground color.
   L. californiæ californiæ.

[1]After Blanchard, 1920, pp. 1–7.

Dorsal stripe less strongly contrasted with the ground color; belly uniform brown or with a few yellow blotches.....*L. californiæ nitida.*

3. White scales white to their bases, forming rings of uniform white; white bars on prefrontals broad, convex behind; lower labials usually 9. . *L. getulus boylii.*

White scales mostly brown at their bases; white bars on prefrontals broad or narrow; lower labials 9 or 10.....4.

4. White bars on prefrontals occupying less than half the area of these scutes; frontal plate uniform black, or with the white restricted to a narrow transverse bar at its anterior end; no white on parietals; lower labials usually 9. *L. getulus yumensis.*

White bars on prefrontals occupying more than half the area of these plates; frontal plate with prominent white markings; each parietal with one or more white spots; lower labials usually 10.....*L. getulus conjuncta.*

Rhinocheilus lecontei Baird and Girard

Rhinocheilus lecontei Baird and Girard, 1853, p. 120; Stejneger and Barbour, 1917, p. 91.

Range.—Idaho to Lower California, east to Texas.

Lower Californian Records.—"At or to the south of Magdalena Bay," Lockington, 1880, p. 295.

A specimen in the Biological Survey collection, U. S. N. M. No. 37516, is from Ensenada.

The scale characters of this specimen, a male, are as follows: Dorsal scales, 23–23–19; ventral plates, 208; subcaudals, 49; preoculars, 1–1; postoculars, 2–2; temporals, 2–4, 2–3, upper labials, 7–8; lower labials, 9–9. The total length is 625 mm., the tail-length, 83 mm.

Hypsiglena ochrorhynchus ochrorhynchus Cope

Hypsiglena ochrorhynchus Cope, 1860, p. 246.

Hypsiglena ochrorhynchus ochrorhynchus Stejneger and Barbour, 1917, p. 93.

Range.—Lower California, southern California, and adjacent parts of Arizona and Sonora.

Lower Californian Records.—Cape St. Lucas, Cope, 1860, p. 246; Magdalena Bay (or south), Lockington, 1880, p. 295; San José del Cabo, Sierra San Lazaro, San Francisquito (Sierra Laguna), Van Denburgh, 1895, p. 144; Mulege, Mocquard, 1899, p. 325; Los Coronados Islands, Van Denburgh and Slevin, 1914, p. 141; Sierra Laguna, Van Denburgh and Slevin, 1921*a*, p. 68.

Two specimens in the Biological Survey collection come from Cape San Lucas (U. S. N. M. No. 37528) and Santa Anita (37527).

The scale characters and measurements of these specimens are as follows:

Number	37527, ♂	37528, ♂
Dorsal Scales	21–21–15	21–21–17
Ventral Plates	172	168
Subcaudals	51	(tail broken)
Total Length	347 mm.	
Tail-length	63 mm.	

They agree with the specimen described by Van Denburgh and Slevin (1921*a*, p. 68) in the disposition of the head shields, with the exception that there are two preoculars, a small inferior and a large superior, in each.

Natrix valida (Kennicott)

Regina valida Kennicott, 1860, p. 334.
Natrix valida Stejneger and Barbour, 1917, p. 97.

Range.—Western Mexico, Lower California.

Lower Californian Records.—Cape St. Lucas, Cope, 1860*a*, p. 341; La Paz, Yarrow, 1882, p. 132; San José del Cabo, Miraflores, Van Denburgh, 1895, p. 154; Mount San Rafael (near Agua Caliente), Santiago, Van Denburgh and Slevin, 1921*a*, p. 68.

The six specimens in the Albatross collection from San José del Cabo (A. M. N. H. Nos. 5573, 5581, 5583, U. S. N. M. No. 64582) and Miraflores (A. M. N. H. Nos. 5604–5) present no variation not already known in this species.

One specimen in the Biological Survey collection comes from San José del Cabo (U. S. N. M. No. 37545).

Thamnophis ordinoides vagrans (Baird and Girard)

Eutænia vagrans Baird and Girard, 1853, p. 35.
Thamnophis ordinoides vagrans Van Denburgh and Slevin, 1918, p. 240.

Range.—Eastern Washington and Oregon, Idaho, south to northern Arizona and eastern California, reappearing in the San Pedro Martir Mountains, Lower California.

Lower Californian Records.—San Pedro Martir Mountain, Van Denburgh, 1896, p. 1007.

Thamnophis ordinoides hammondii (Kennicott)

Eutænia hammondii Kennicott, 1860, p. 322.
Thamnophis ordinoides hammondii Van Denburgh and Slevin, 1918, p. 256.

Range.—Southwestern Lower California and northwestern Lower California.

Lower Californian Records.—Comondu, Van Denburgh, 1896, p. 1008; Mulege, San Ignacio, Mocquard, 1899, p. 327; San Antonio, La Grulla, Ruthven, 1908, p. 133.

Four specimens in the Biological Survey collection come from Hanson Laguna (U. S. N. M. Nos. 37542–4) and Ensenada (37541).

Thamnophis megalops (Kennicott)

Eutænia megalops Kennicott, 1860, p. 33.
Thamnophis megalops Stejneger and Barbour, 1917, p. 101.

Range.—The Mexican Plateau region, north to southern Arizona and New Mexico, west to Yuma, Arizona, and the Cocopah Mountains, Lower California.

A specimen in the Biological Survey collection, U. S. N. M. No. 37514, from the Cocopah Mountains, east base, is the first record of this form from Lower California.

The lateral light line is plainly on the third and fourth scale rows anteriorly. The dorsal scale formula is 23–21–19–17; ventral plates, 152; subcaudals, 41 +; preoculars, 1–1; upper labials, 8–8; lower labials, 10–10.

The occurrence of this form in northern Lower California is not surprising in view of its occurrence at Yuma.

Key to the Species of *Thamnophis* in Lower California

1. Dorsal light line present ..... 2.
   No dorsal light line ..... *T. ordinoides hammondii.*
2. Lateral light line anteriorly on the third and fourth scale rows .... *T. megalops.*
   Lateral light line anteriorly on the second and third scale rows.
   T. ordinoides vagrans.

Sonora episcopa (Kennicott)

Lamprosoma episcopum Kennicott, 1859, p. 22, Pl. viii, fig. 2.
Sonora episcopa Stejneger and Barbour, 1917, p. 92.

Range.—Texas to southeastern California, south into Mexico.

Lower Californian Records.—Cape St. Lucas, Baird, 1859, p. 299; Santa Rosalia, Mocquard, 1899, p. 319.

Chilomeniscus stramineus Cope

Chilomeniscus stramineus Cope, 1860*a*, p. 339; Stejneger and Barbour, 1917, p. 94.

Range.—Southern Lower California.

Lower Californian Records.—Cape St. Lucas, Cope, 1860*a*, p. 339; La Paz, Yarrow, 1882, p. 86; San José del Cabo, Miraflores, Van Denburgh, 1895, p. 138; San Marthe, Cope, 1900, p. 950.

Four specimens in the present collection, one from Cape San Lucas (A. M. N. H. No. 5578), three from Miraflores (A. M. N. H. Nos. 5574–5, U. S. N. M. No. 64579).

These specimens show very little variation; the dorsal scales are uniformly in thirteen rows; ventral plates (in the order named) 109, 117, 113, 121; subcaudals 24, 25, 28, 25; rostral in every case separated from the prefrontals and the nasals from the preoculars. The largest specimen (5578) measures 230 mm., tail, 32 mm.

Chilomeniscus ephippicus Cope

Chilomeniscus ephippicus Cope, 1867*a*, p. 85; Stejneger and Barbour, 1917, p. 93.

Range.—Southern Lower California to the Colorado Desert, reaching Tucson, Arizona, to the east.

Lower Californian Records.—La Paz, Yarrow, 1882, p. 86; Santa Rosalia and Mulege, Mocquard, 1899, p. 317; San Fernando, Cope, 1900, p. 951; Todos Santos, Van Denburgh and Slevin, 1921*a*, p. 70.

The record of Van Denburgh and Slevin (*loc. cit.*) is only tentatively referred to this form, as they do not describe its coloration.

Chilomeniscus punctatissimus Van Denburgh and Slevin

Chilomeniscus punctatissimus Van Denburgh and Slevin, 1921*b*, p. 98.

Range.—Espiritu Santo Island, Gulf of California, and Magdalena Island.

A specimen in the Biological Survey collection, U. S. N. M. No. 37521, from Magdalena Island, appears to be very closely allied to this newly described form from the opposite side of the peninsula. It differs from the type in having the scales of the light bands immaculate, instead of spotted. The large number of crossbands, which is the same in both specimens, seems to me a more important character than the spotting.

The specimen from Magdalena Island has the rostral broad and in contact with the prefrontals posteriorly; nasals expanded on the upper side of the snout, probably by fusion with the frontonasals; prefrontals reaching the labials on each side; frontal broad, six-sided; supraoculars small; a minute preocular on each side; two postoculars; temporals, 1–1 on each side; upper labials, 7, third and fourth entering the eye; lower labials, 9, the first five in contact with the anterior chin shields; dorsal scales, 15–13–13; ventral plates, 127; subcaudals, 25.

Top of the head very dark brown, lighter on the snout, the lower border of the labials light; back crossed by 32 bands of dark brown about equal to the light interspaces and reaching the first row of scales on each side; 7 bands on the tail.

The total length is 98 mm.; tail, 11 mm.

Chilomeniscus cinctus Cope

Chilomeniscus cinctus Cope, 1861, p. 303.

Range.—The Colorado Desert, to middle Lower California on the west and Sonora on the east.

Lower Californian Records.—Ballenas Bay, Cope, 1900, p. 952.

A specimen in the Biological Survey collection, U. S. N. M. No. 37520, from San Quintin, is characterized by a pattern of dark rings, completely encircling the body.

Dorsal scale rows, 15–13–13, ventral plates, 120; subcaudals, 25; the prefrontals meet the labials laterally; upper labials, 7–7; lower labials, 9–9; preoculars, 1–1; postoculars, 2–2; rostral broadly in contact with the prefrontals.

There are twenty-two dark brown rings encircling the body, with four more on the tail and a nuchal bar which does not reach the ventrals. The dark rings are wider than the interspaces dorsally, narrower ventrally, where they occupy quite regularly two ventral plates.

The forms of the genus *Chilomeniscus* are in considerable confusion and by no means well understood. Without sufficient material at hand to clear up the points in question, I prefer to lean to the side of the excessive analysis rather than synthesis. Van Denburgh and Slevin (1913, p. 410) reduce the genus to two species, *stramineus* from the Cape area of Lower California, and *cinctus* ranging from southern Lower California, southeastern California, western Arizona, and Sonora. This view is maintained by them in their recent list of Lower Californian forms (1921*a*, p. 52), with the subsequent addition of a new form, *C. punctatissimus* from Espiritu Santo Island.

Cope's analysis of the genus (1900, p. 948), unfortunately somewhat confused in compilation, recognizes, in addition to the well-defined *stramineus*, three crossbanded forms, *C. ephippicus*, *C. fasciatus*, and *C cinctus*. Of these *ephippicus* and *fasciatus* have the venter immaculate, with crossbands confined to the back, while *cinctus* is sharply set off by having the body completely encircled by black bands. This may well prove to be a variable character, not of specific value, but I know of no evidence at present of intergradation or variation in this character. The scale character employed by Cope to separate *fasciatus* and *ephippicus*, however, has been shown by Van Denburgh and Slevin (1913, *loc. cit.*) to be invalid, and I follow them in uniting these two forms, but not in uniting *ephippicus* with *cinctus*. Van Denburgh and Slevin make no mention of the coloration. The evidence presented by Mocquard for the union of *fasciatus* and *cinctus* (1899, p. 318) does not seem to be sufficient for a final decision on this point.

Reference to the following key will make clear the characters which distinguish the forms recognized in the present analysis. It is notable that *C. cinctus* and *C. ephippicus* have broadly overlapping ranges, *C. ephippicus* occurring alone in southern Lower California, *C. cinctus* alone in Sonora, while northern Lower California and the Colorado Desert area have both forms.

Key to the Species of *Chilomeniscus*

1. Rostral not in contact with the prefrontals; no dark crossbands, each scale with a dark spot ..... *C. stramineus.*
   Rostral in contact with the prefrontals; dark crossbands or rings on the body . 2.
2. Body completely encircled by dark rings ..... *C. cinctus.*
   Dark crossbands on the back, venter immaculate ..... 3.
3. Crossbands about 25 ..... *C. ephippicus.*
   Crossbands about 39, with or without dark spots on the scales of the light rings. *C. punctatissimus.*

Tantilla planiceps (Blainville)

Coluber planiceps Blainville, 1835, p. 294, Pl. xxvii, figs. 3–3*B*.
Tantilla planiceps Stejneger and Barbour, 1917, p. 105.

Range.—Southern Lower California.

Lower Californian Records.—San José del Cabo, Sierra Laguna, Van Denburgh, 1895, p. 140; Santa Rosalia, San Ignacio, Mocquard, 1899, p. 316.

Trimorphodon lyrophanes (Cope)

Lycodon lyrophanes Cope, 1860*a*, p. 343.
Trimorphodon lyrophanes Stejneger and Barbour, 1917, p. 104.

Range.—Southern Arizona and Lower California.

Lower Californian Records.—Cape St. Lucas, Cope, 1860*a*, p. 343; La Paz, Yarrow, 1882, p. 98; San Josè del Cabo, Sierra San Lazaro, Van Denburgh, 1895, p. 155; Santa Rosalia, Mocquard, 1899, p. 330.

A single specimen, (U. S. N. M. No. 64578), from Miraflores, is in the Albatross collection. Its stomach contains a juvenile specimen of *Ctenosaura hemilopha*.

The dorsal scales are 25–21–15; ventral plates, 241; subcaudals, 58+. The total length is somewhat more than 800 mm. (tail slightly mutilated). The loreal is double on one side, single on the other.

There are three specimens in the collection made by the Biological Survey, one from La Paz (U. S. N. M. No. 37522), and two from Santa Anita (37523–4).

Micrurus euryxanthus (Kennicott)

Elaps euryxanthus Kennicott, 1860, p. 337.
Micrurus euryxanthus Stejneger and Barbour, 1917, p. 106.

Range.—Southern New Mexico and Arizona, northern Mexico.

Recorded from Tiburon Island by Streets, 1877, p. 40.

Crotalus molossus Baird and Girard

Crotalus molossus Baird and Girard, 1853, p. 10; Stejneger and Barbour, 1917, p. 110.

Range.—Southern Texas to Arizona and northern Mexico; San Esteban Island.

This species does not enter peninsular Lower California. A specimen secured on San Esteban Island in the Gulf of California by the Albatross Expedition (U. S. N. M. No. 64586) is referable to this species in all scale characters, but is exceptionally pale in color, neither the outlines of the rhombs nor the two spots normally enclosed in the rhombs being distinctly marked. This is due chiefly to the paleness of the general coloration.

The ventral plates number 189, the subcaudals 26, and the dorsal scale formula is 31–27–21. The total length is 476 mm., the tail (exclusive of a single rattle) 36 mm.

The presence of this species on San Esteban is further indication of the Sonoran, not Lower Californian, character of its fauna; and this conclusion is quite independent of the possibility that further adult specimens from San Esteban might justify the description of an insular race.

Crotalus tortugensis Van Denburgh and Slevin

Crotalus tortugensis Van Denburgh and Slevin, 1921*c*, p. 398

Range.—Tortuga Island, Gulf of California.

Crotalus oreganus Holbrook

Crotalus oreganus Holbrook, 1840, p. 115, Pl. xxix.

Crotalus oregonus Stejneger and Barbour, 1917, p. 110.

Range.—British Columbia to northwestern Lower California.

Lower Californian Records.—Los Coronados Islands, Streets, 1877, p. 40; "75 miles S. E. of San Diego," Lockington, 1880, p. 295; San Pedro Martir Mt., Van Denburgh, 1896, p. 1007; San José, Meek, 1905, p. 17.

A specimen in the Biological Survey collection, U. S. N. M. No. 37575, is from La Grulla.

Crotalus atrox atrox Baird and Girard

Crotalus atrox Baird and Girard, 1853, p. 5; Stejneger and Barbour, 1917, p. 108.

Range.—Texas and northern Mexico to southeastern California, entering northeastern Lower California.

Lower Californian Records.—East side of Cocopah Mountains, Murphy, 1917, p. 57.

I have no hesitation in recording this species from Lower California on the basis of the verbal record above quoted, as there is no snake in this area with which *Crotalus atrox* could readily be confused.

Crotalus atrox lucasensis Van Denburgh

Crotalus lucasensis Van Denburgh, 1920*a*, p. 29, Pl. iii.

Range.—Southern Lower California.

Lower Californian Records.—Cape St. Lucas, Cope, 1861, p. 292; La Paz, Yarrow, 1882, p. 75. San José del Cabo, Sierra El Taste, Van Denburgh, 1895, p. 156; Santa Rosalia, San Ignacio, Mulege, Mocquard, 1899, p. 332.

Six specimens of this species were collected by the Albatross Expedition at Miraflores (A. M. N. H. Nos. 5596–97, 5644–45, U. S. N. M. No. 64589) and head of Concepcion Bay (A. M. N. H. No. 6883). They agree with Van Denburgh's description in having the dorsal rhombs distinctly outlined laterally.

The dorsal scales range from 35–27–23 to 31–25–21. The ventrals range from 182 to 188 in four males, 189 and 195 in the two females; subcaudals 25 to 29 in males, 21 in both females. There are three black

caudal rings in the females, five to seven in the males. The tail is relatively much shorter in the female specimens, .05 of the total length, .07 to .08 in the males. The largest specimen (A. M. N. H. No. 5645, ♂) measures 1015 mm., tail 88 mm.

As *Crotalus atrox* certainly enters the peninsula of Lower California at the north, and as the differences on which *lucasensis* is based are slight, the use of a trinomial seems warranted.

Three specimens in the Biological Survey collection from Cape San Lucas (U. S. N. M. No. 37567), La Laguna (37568), and Santa Anita (37569).

Crotalus atrox elegans, new subspecies

Diagnsotic Characters.—Characters of *Crotalus atrox*, from which it is distinguished by the higher number of ventral plates and the reddish brown color; distinguished from *C. atrox lucasensis* by the incompleteness laterally of the light outlines of the dorsal rhombs, and by the higher number of ventral plates.

Range.—Angel de la Guardia Island, Gulf of California.

Type.—U. S. N. M. No. 64452; ♂; Angel de la Guardia Island, Gulf of California; April 10, 1911; Albatross Expedition.

Description of Type.—Head subtriangular, covered with numerous small scales; ten scales in a line, between the large supraoculars; rostral higher than wide; two large preoculars on each side, of which the lower enters the loreal pit; two superior loreals on each side; four or five scales from the eye to the upper labials; upper labials 16–17, lower labials 18, of which only three on each side are in contact with the chin shields; dorsal scales, 35–27–21; ventrals, 197; subcaudals, 26; total length, 920 mm.; tail, 60 mm.

General color light reddish brown, marked dorsally with a series of slightly darker rhombs, which are bordered by narrow light lines; rhombs lighter at the center; these rhombic markings become difficult to distinguish on the anterior fourth of the body, but the light scales of their borders can be distinguished on the vertebral line; on the posterior fourth of the body, the light lines become entirely faded, the slightly darker markings forming broad transverse bands. Tail yellow, with five black rings, incomplete ventrally; venter uniform pale yellow; an indistinct light line from the preoculars to the middle of the labial border, and a very faint line from the posterior corner of the eye to the sixteenth upper labial.

Notes on Paratypes.—The two female specimens from Angel de la Guardia (A. M. N. H. Nos. 5231 and 5586) have respectively 200 and 199 ventrals, and 21 and 20 subcaudals. The dorsal scale count is 31–27–21. The ground color is more grayish but shows a trace of the reddish tinge which is better marked in the type. The dorsal light lines enclosing the rhombs are incomplete at the sides.

I have described this form as a subspecies of *C. atrox* in order to indicate its obvious relations. The higher ventral scale count is nearly reached in a specimen of *C. atrox lucasensis* which has 195 ventrals; the average for the two forms is evidently quite different, but the extremes probably overlap. Additional material is required to determine whether it is to be considered an off-shoot of *lucasensis* or of *atrox atrox*.

Crotalus exsul Garman

Crotalus exsul Garman, 1883, p. 114; Stejneger and Barbour, 1917, p. 109.

Range.—Southwestern California and northeastern Lower California to Cedros Island.

Lower Californian Records.—Cedros Island, Garman, 1883, p. 114; Ensenada, Van Denburgh, 1896, p. 1007; San Salado Cañon, San Matias, Santa Cataline, Agua Escondito, Matcmi, San Quentin, Meek, 1905, p. 17; "Turtle Bay," Van Denburgh and Slevin, 1921*a*, p. 71.

The Albatross collection contains a single very large specimen (U. S. N. M. No. 64588) of this species, without definite locality, but almost certainly from Cedros Island.

Three specimens in the collection of the Biological Survey are from San Quintin (U. S. N. M. Nos. 37571–2) and San Tomas (37574).

The characters employed by Cope in his key to the species of *Crotalus* (1900, p. 1152) to distinguish *Crotalus ruber* (=*exsul*) are somewhat misleading, especially as he separates *ruber* widely from *atrox* which I believe to be its nearest relative. There is a tendency to widening of the rostral, and to obscurity of the canthus rostralis in *exsul*, but neither character is constant, and the reddish coloration must be relied on in most cases as a key character.

Crotalus enyo (Cope)

Caudisona enyo Cope, 1861, p. 293.

Crotalus enyo Stejneger and Barbour, 1917, p. 109.

Range.—Southern Lower California.

Lower Californian Records.—Cape St. Lucas, La Paz, Yarrow, 1882, p. 74; San José del Cabo, Van Denburgh, 1895, p. 157; Mulege, Mocquard, 1899, p. 333; Miraflores, San Antonio, Todos Santos, San Bartolo, San Pedro, Sierra Laguna, Van Denburgh and Slevin, 1921*a*, p. 71.

A specimen collected by the Biological Survey, U. S. N. M. No. 37570, is from Santa Anita.

Crotalus cerastes Hallowell

Crotalus cerastes Hallowell, 1854, p. 95; Stejneger and Barbour, 1917, p. 108.

Range.—Southwestern Utah to southeastern California and northeastern Lower California.

Lower Californian Records.—San Felipe, Meek, 1905, p. 18.

Four specimens in the collection of the Biological Survey are from San Felipe Bay (U. S. N. M. Nos. 37562–3), Cocopah Mountains, east base (37564), and San Francisquito (37565).

Crotalus mitchellii (Cope)

Caudisona mitchellii Cope, 1861, p. 293.

Crotalus mitchellii Stejneger and Barbour, 1917, p. 110.

Range.—Southwestern Arizona to southern Lower California.

Lower Californian Records.—Cape St. Lucas, Cope, 1861, p. 293; Angel de la Guardia Island, Streets, 1877, p. 39; La Paz, Yarrow, 1882, p. 73; Santa Margarita Island, Las Huevitas, Sierra El Taste, San José del Cabo, Van Denburgh, 1894*a*, p. 450; Santa Rosalia, Mulege, San Ignacio, Mocquard, 1899, p. 331; Parral, San Matias, Meek, 1905, p. 18; Agua Caliente, Van Denburgh and Slevin, 1921*a*, p. 72.

Two specimens (A. M. N. H. No. 5646 and U. S. N. M. No. 64587) of this species were collected by the Albatross Expedition at Miraflores.

One typical pale specimen, U. S. N. M. No. 37566, comes from the Cocopah Mountains, east base, collected by the Biological Survey Expedition.

Crotalus goldmani,[1] new species

Diagnostic Characters.—Allied to *Crotalus mitchellii* by the separation of the rostral and nasal plates by a row of scales; distinguished by: (1) dark reddish brown coloration, with the dark markings more nearly rhombic, and with light centers; (2) scales narrower and more convex; (3) supraocular plate broken up into three or four small scales.

Range.—Known only from the type locality.

Type.—U. S. N. M. No. 37573, ♂; El Piñon, Lower California, 5300 feet; July 9, 1905; E. W. Nelson and A. E. Goldman.

Description of Type.—Habitus apparently stout, tail short, muzzle short; scales of top of head small, somewhat convex; canthus rostralis obtuse; rostral slightly higher than wide; a single row of scales between rostral and nasal; two preoculars, with two loreals between them and the posterior nasal, on each side; upper labials, 18–19; lower labials, 16–17; a small triangular area of small scales (8 or 9) between the loreal pit, the nasals, and the labials; supraocular divided into four scales on one side, three on the other, but with the fourth indicated; scales rather convex, especially on the head and tail, only the first row smooth; ventral plates, 180; subcaudals, 25; dorsal scales, 23–27–21.

Total length, 850 mm.; tail-length to base of rattle, 70 mm.

General color brownish; ventrals with irregular brown punctation; back with rhombic markings of darker brown, as long as wide; on the anterior part of the body they are notched on the mid-line; posteriorly they become wider and narrower, with seven dark bands on the top of the tail, the last three nearly black.

In view of the known variability in the scutellation of *C. mitchellii*, the present specimen may prove to be merely an abnormal one of that species. *C. mitchellii*, however, has not previously been recorded from the Pacific slope of the San Pedro Martir Mountains. It is typically a desert species, although it ranges into the lower border of the upper Sonoran life zone in California (4500 feet, at Asbestos Spring, east slope of the San Jacinto Mountains). The conditions described at El Piñon by Nelson (1921, p. 20) indicate thoroughly non-arid habitat conditions.

[1]Named for Mr. A. E. Goldman, Bureau of Biological Survey, associated with Dr. E. W. Nelson in the Lower Californian explorations of the Bureau of Biological Survey.

The true status of *C. goldmani*, therefore, remains to be cleared up, and in naming it, I hope to have emphasized the fact that it presents a problem for investigation.

Key to the Species of *Crotalus* in Lower California and Adjacent Islands

1. Superciliary scales produced into a horn-like process.....*C. cerastes.*
   Superciliary scales flat.....2.
2. Nasal plate separated from the rostral by one or two rows of small scales....3.
   Nasal in contact with the rostral.....4.
3. Supraocular a single shield.....*C. mitchellii.*
   Supraocular broken up into several plates.....*C. goldmani.*
4. Top of head anteriorly with three pairs of enlarged scales in contact..*C. molossus.*
   Top of head anteriorly with small scales.....5.
5. Rostral wider than high.....*C. enyo.*
   Rostral higher than wide (rarely nearly as wide as high).....6.
6. Canthus rostralis often ill-defined; coloration reddish, markings indistinct in adult; pattern of side of head as in *C. atrox*.....*C. exsul.*
   Canthus rostralis distinct, dorsal rhombs distinct.....7.
7. Tail light with three to six black rings; light postsuperciliary line reaches the scale row next to the labials anterior to the angle of the mouth. (*C. atrox*).8.
   Tail with more numerous crossbands, less sharply defined; postsuperciliary line passes behind angle of mouth.....*C. oreganus.*
8. Dorsal rhombs with a light spot on each side (as in *C. molossus*), sometimes confluent.....*C. tortugensis.*
   Dorsal rhombs not as above.....9.
9. Ventral plates 197–200.....*C. atrox elegans.*
   Ventral plates fewer, maximum 195.....10.
10. Dorsal rhombs sharply defined; light borders well defined laterally. *C. atrox lucasensis.*
    Dorsal rhombs less distinct, especially at the sides, the coloration without strong contrast.....*C. atrox atrox.*

Crotalus tortugensis is not sufficiently characterized to make its place in the above key certain; I have tentatively placed it as an ally to *C. atrox*.

TESTUDINATA

Pseudemys ornata nebulosa (Van Denburgh)

Chrysemys nebulosa VAN DENBURGH, 1895, p. 84, Pls. IV–VI.

Pseudemys ornata nebulosa STEJNEGER AND BARBOUR, 1917, p. 120.

RANGE.—Southern Lower California.

LOWER CALIFORNIAN RECORDS.—Los Dolores, Agua Caliente, San José del Cabo, Van Denburgh, 1895, p. 85.

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PLATES XLVII TO LVII

PLATE XLVII

Valley of the San José River looking westward, the town of San José del Cabo visible at the foot of the distant hills. The luxuriant vegetation of the irrigated fields of the river bottom (at left) contrasts with the sparse growth, among which cacti may be distinguished, on the rise of ground (at right). Most of the species of reptiles characteristic of the Cape fauna may be found here.

PLATE XLVIII

Agua Verde Bay. The abrupt eastern escarpment of the mountains, with a narrow stretch of coastal plain is characteristic of the topography of the gulf coast of Lower California. *Callisaurus ventralis gabbii* and *Verticaria hyperythra schmidti* are among the reptiles characteristic of this locality, and of this side of the peninsula.

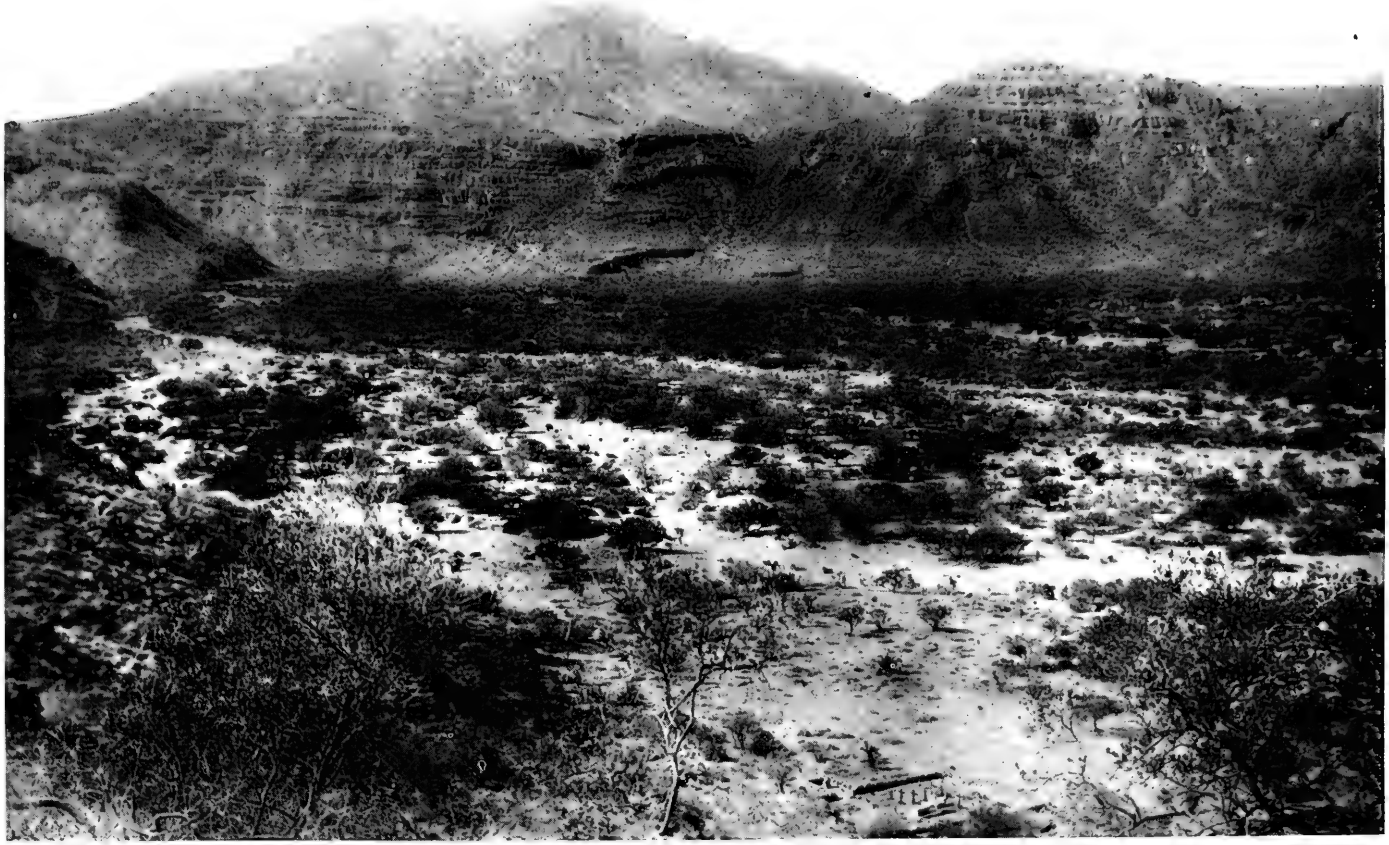


PLATE XLIX

Sauromalus varius Dickerson. A. M. N. H. No. 5618, San Esteban Island, × ½ (total length 458 mm.).

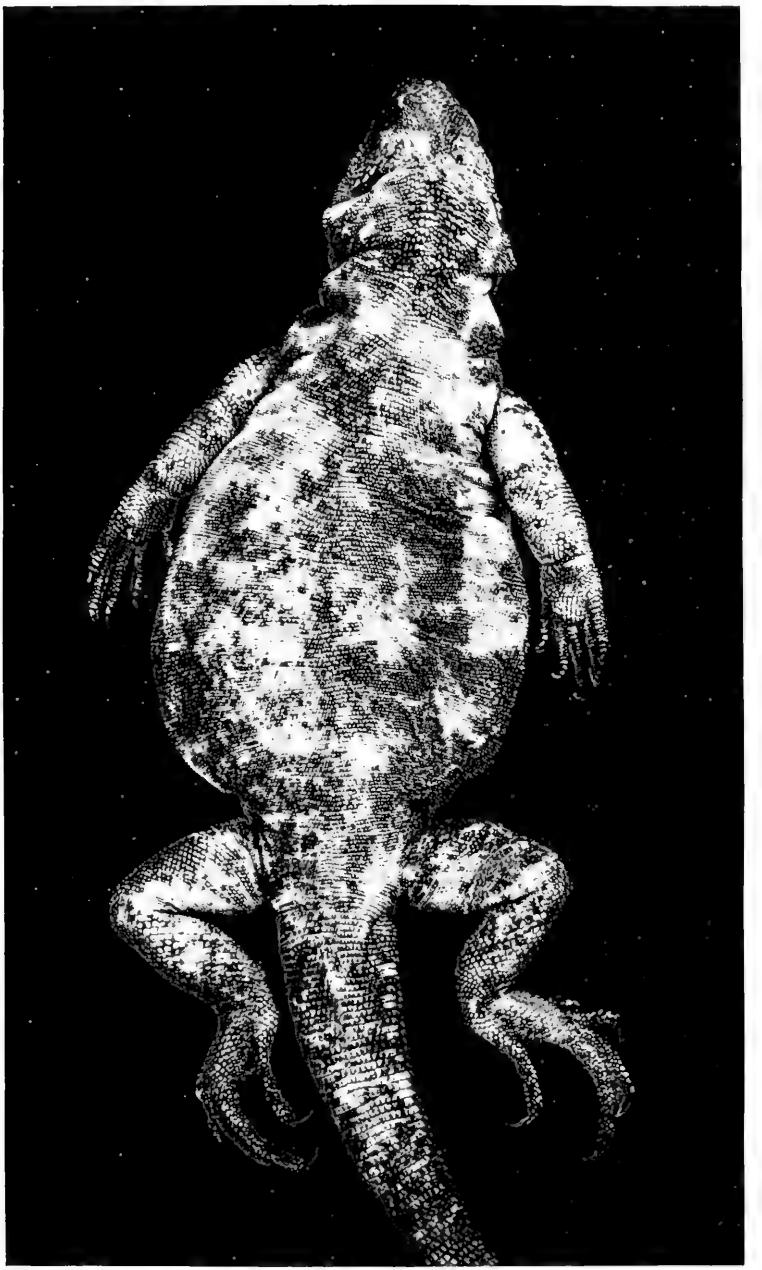
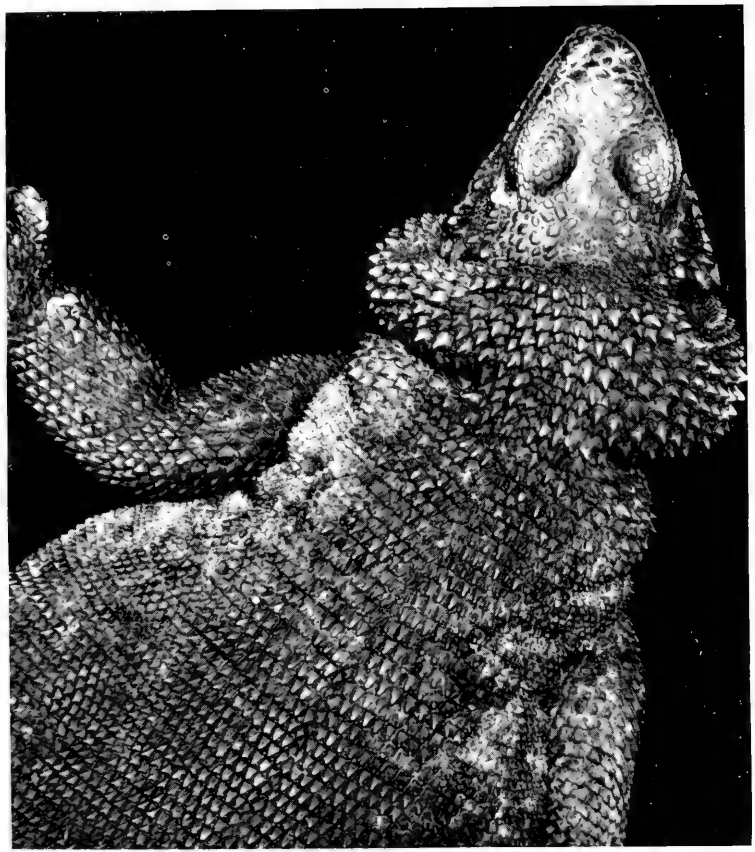


PLATE L

Fig. 1. *Sauromalus hispidus* Stejneger. A. M. N. H. No. 5608, Angel de la Guardia Island. To show spinous character of nuchal scales in the adult.

Fig. 2. *Sauromalus hispidus* Stejneger, U. S. N. M. No. 64572, same locality. To show transverse dorsal bands of the juvenile coloration. (Neck constricted by label.)

Fig. 3. *Sauromalus ater* Duméril. A. M. N. H. No. 6808, La Paz. To show the similarity of the juvenile coloration and the difference in nuchal scales in a specimen of approximately the same size as *S. hispidus* in Fig. 2.



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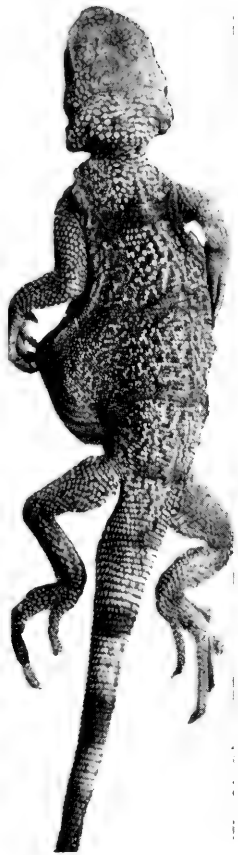

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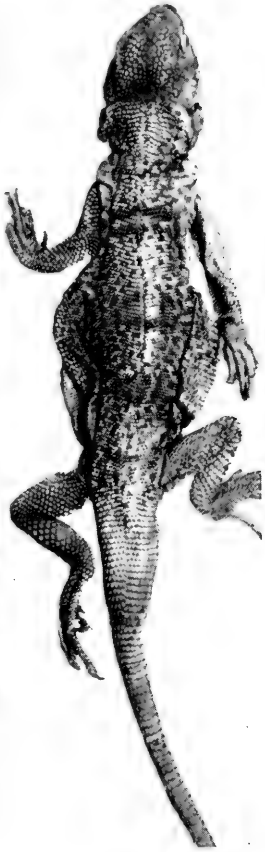

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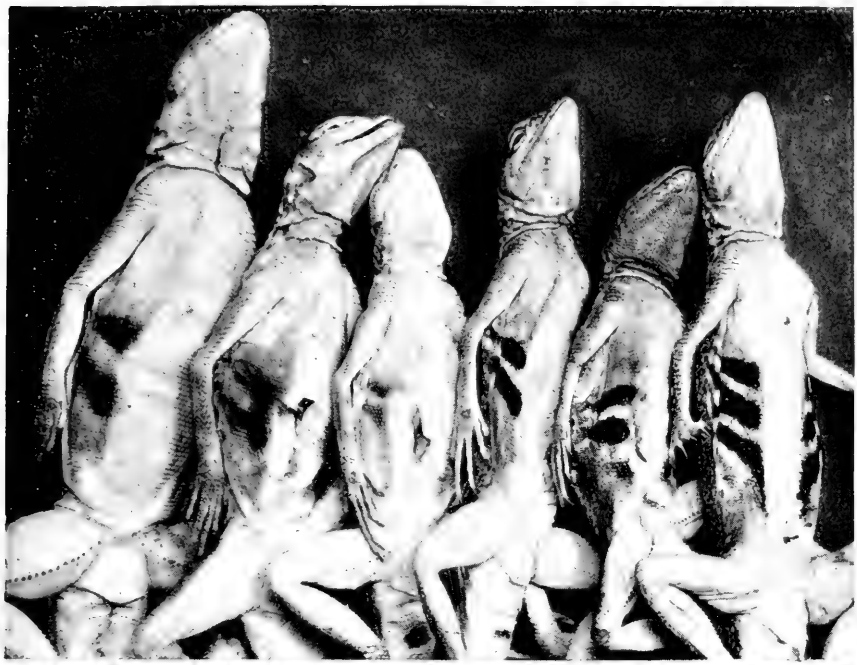
PLATE LI

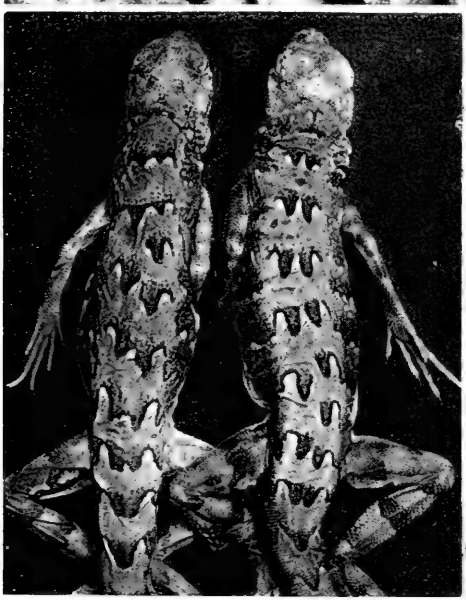
Fig. 1. Ventral coloration in males of the several species of *Callisaurus*. From left to right, *C. ventralis ventralis* Hallowell, A. M. N. H. No. 2451; *C. ventralis inusitatus* Dickerson, A. M. N. H. No. 5334; *C. splendidus* Dickerson, A. M. N. H. No. 5372; *C. ventralis gabbii* Cope, A. M. N. H. No. 5308; *C. draconoides* Blainville, U. S. N. M. No. 64514; and *C. crinitus* Cope, A. M. N. H. No. 5502. The coloration of *C. ventralis myurus* (not figured) is indistinguishable from that of *C. ventralis ventralis*.

Fig. 2. *Callisaurus draconoides* Blainville, normal dorsal coloration; A. M. N. H. No. 5659 (left) and U. S. N. M No. 64518 (right).

Fig. 3. Same species, light color phase; A. M. N. H. No. 5391 (left) and U. S. N. M. No. 64514 (right).

1





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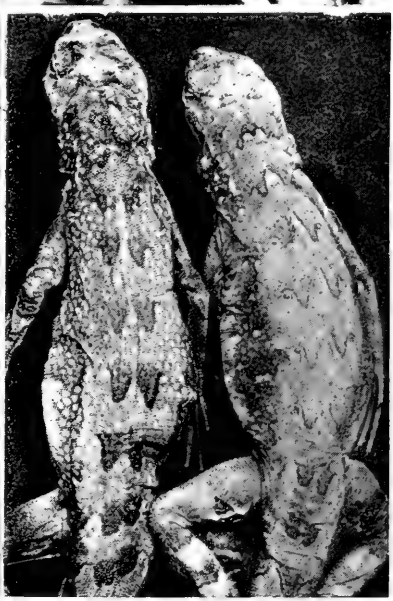

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PLATE LII

Fig. 1. *Callisaurus crinitus* Cope, U. S. N. M. No. 64530. To show the characteristic, finely maculate dorsal coloration.

Fig. 2. *Callisaurus ventralis inusitatus* Dickerson, A. M. N. H. No. 5317. To show extreme elongation of body and limbs, and dorsal color pattern.

Fig. 3. Enlarged view of the lateral digital scales of the fourth toe of *Callisaurus crinitus* which form the "fringe."

3

1 2

PLATE LIII

Fig. 1. *Uma notata* Baird, A. M. N. H Nos. 22240 (right) and 22241 (left). To show dorsal color pattern and stout, short-l gged habitus.

Fig. 2. Enlarged view of the base of the fourth toe of *Uma notata* Field Mus. No. 1203, to show scales of the digital fringe

1 2

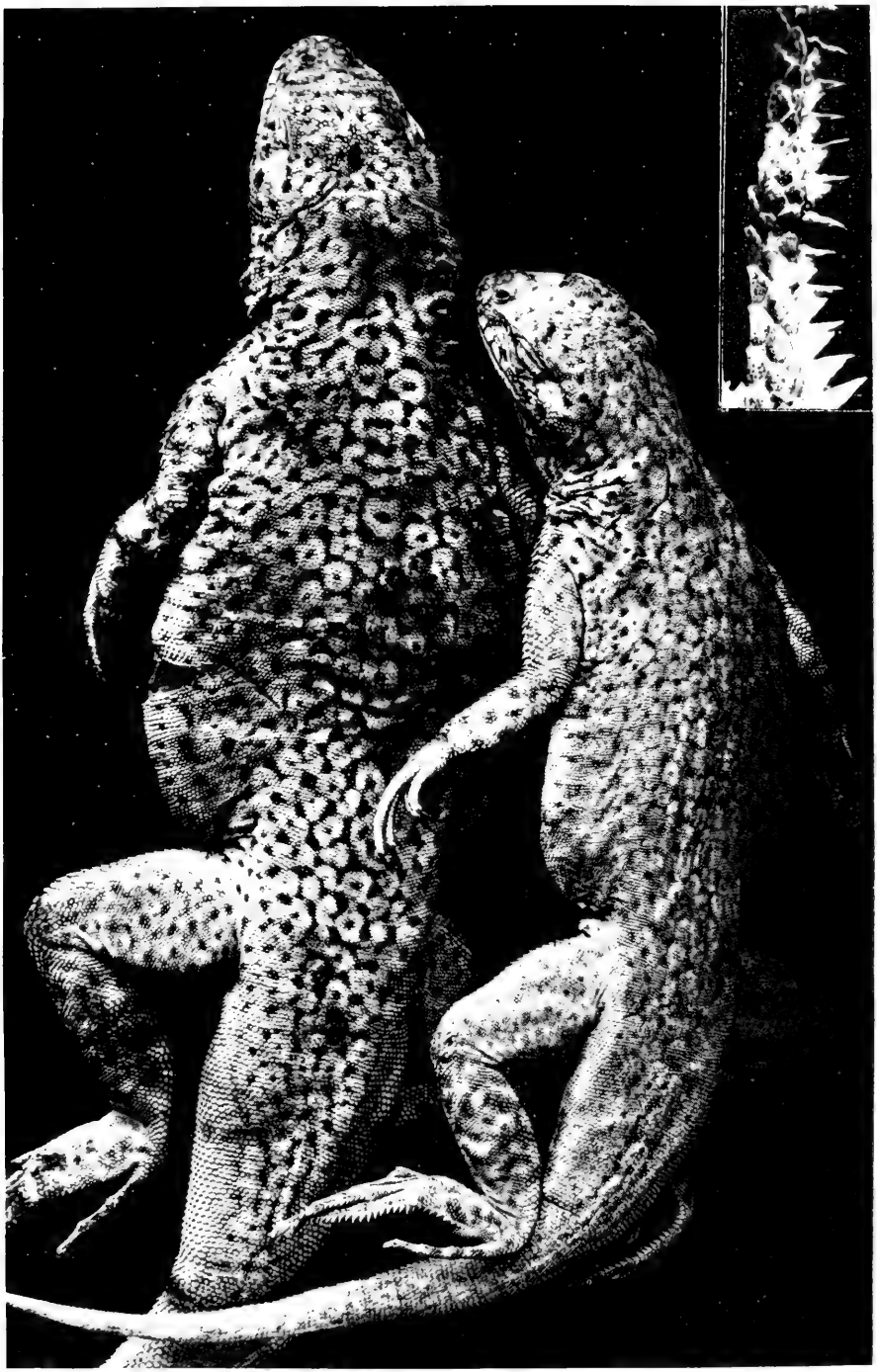

PLATE LIV

Fig. 1. *Phrynosoma coronatum* Blainville, U. S. N. M. No. 64465.

Fig. 2. *Phrynosoma blainvillii blainvillii* Gray, Field Mus. No. 1074, Trinidad, Lower California.

Fig. 3. *Phrynosoma nelsoni*, new species, paratype, Field Mus. No. 1127, San Quintin, Lower California.

To show the character of the frontal scales.

1 2 3

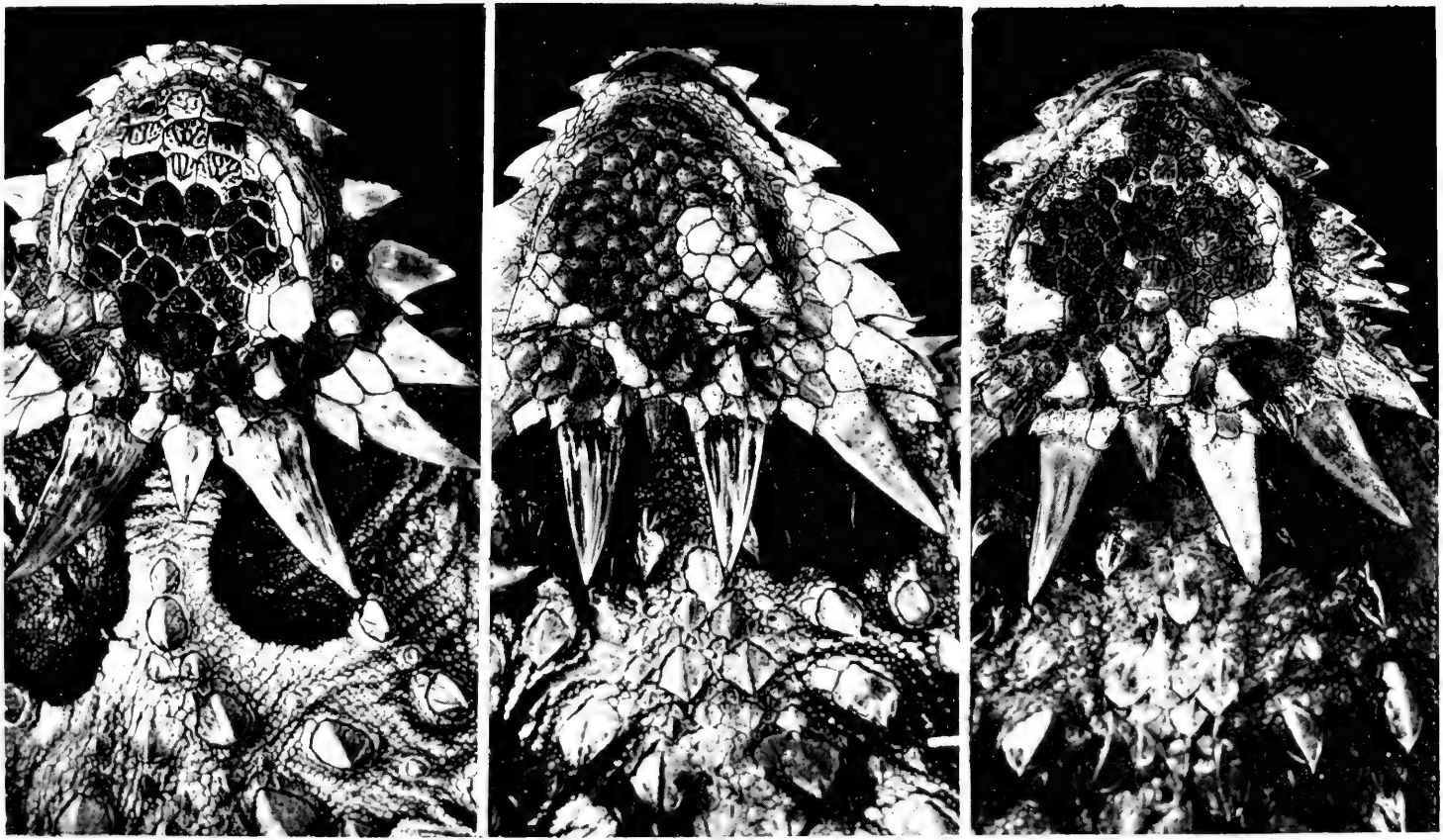

PLATE LV

Phrynosoma jamesi, new species, U. S. N. M. No. 64450, type.

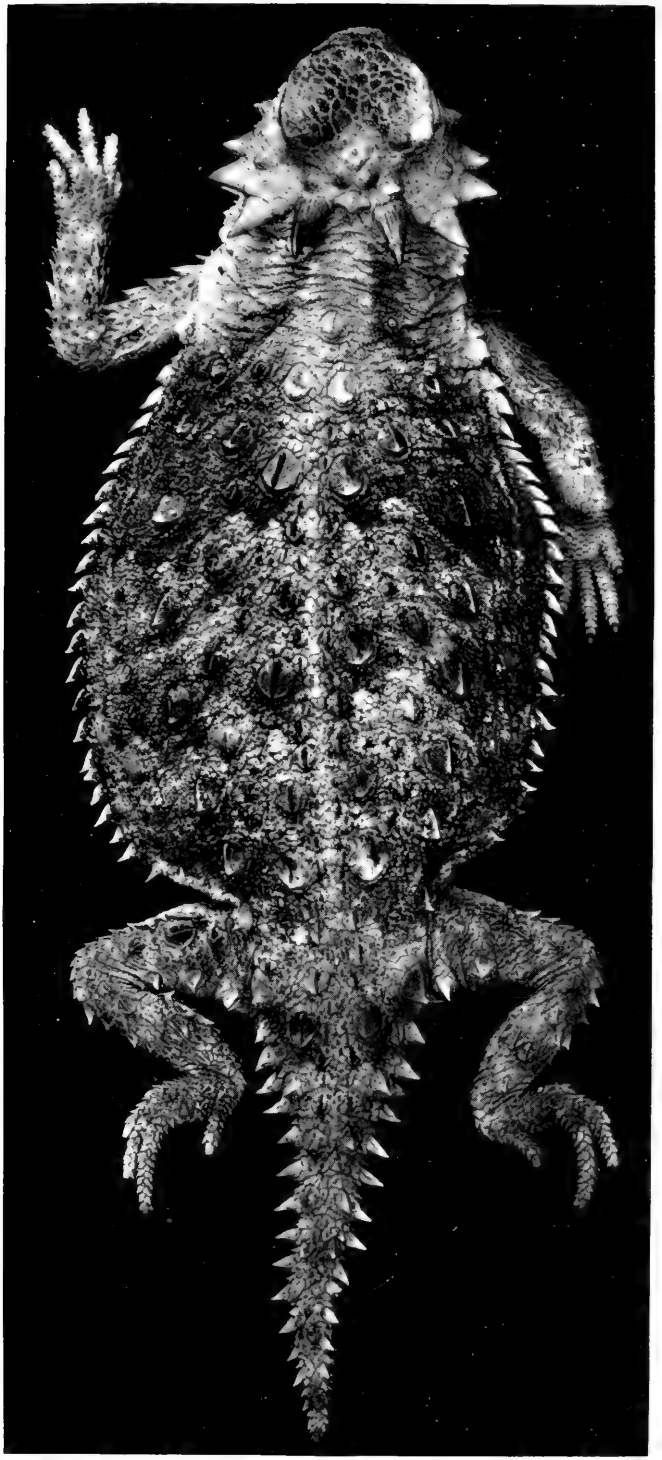

PLATE LVI

Phrynosoma jamesi, new species, A. M. N. H. No. 5497, paratype. Enlarged views of head.

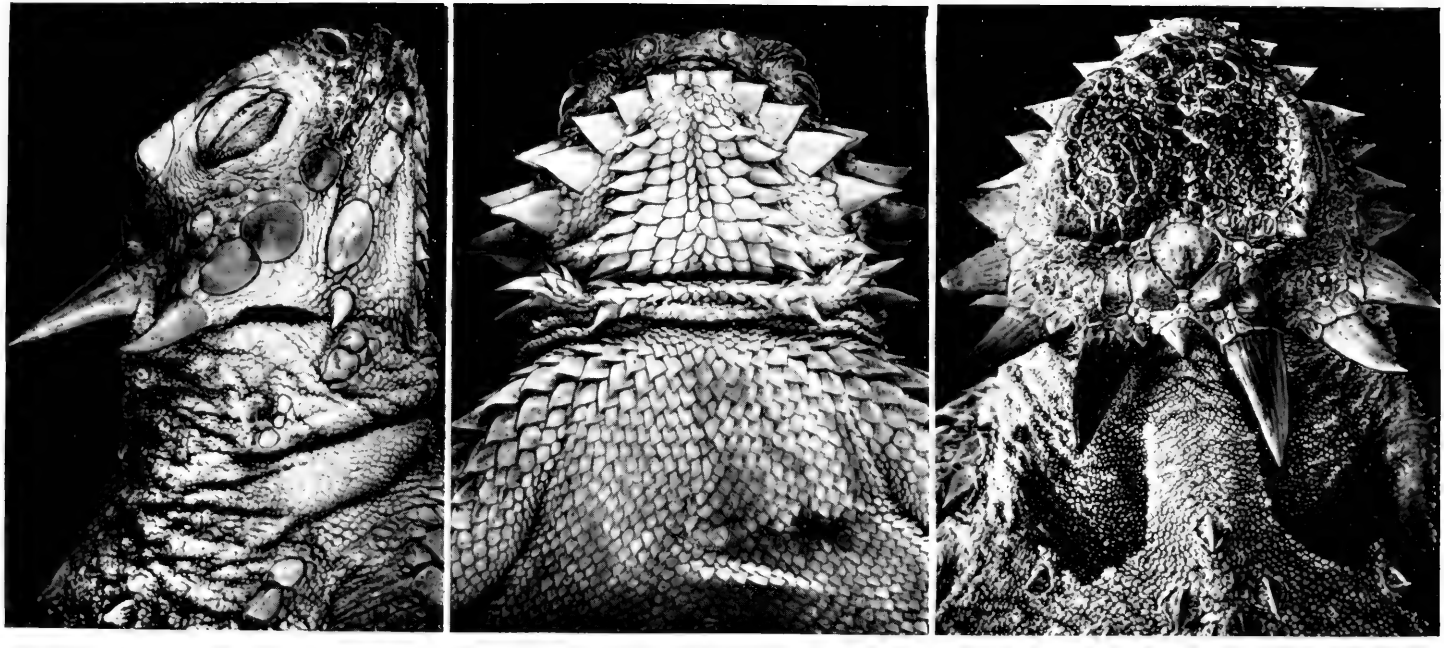

PLATE LVII

Cnemidophorus celeripes Dickerson, U. S. N. M. No. 64444, San José Island.

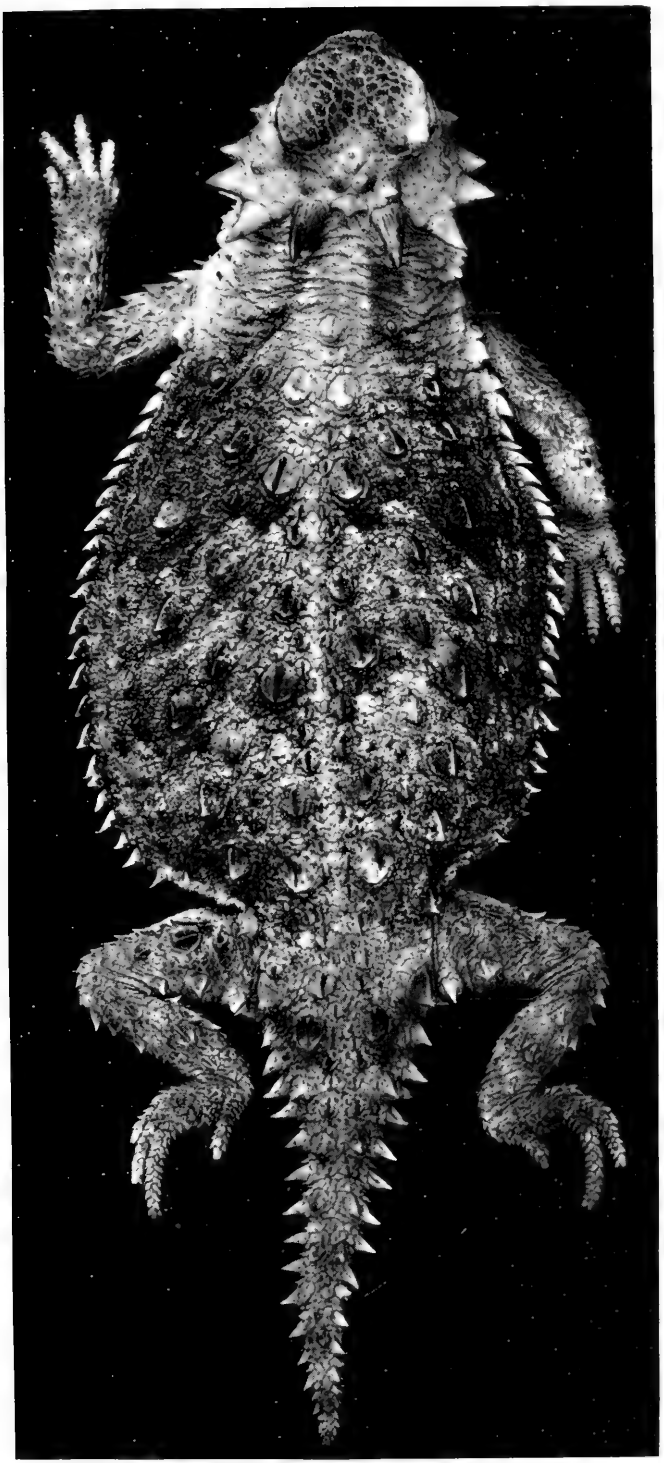

PLATE LVI

Phrynosoma jamesi, new species, A. M. N. H. No. 5497, paratype. Enlarged views of head.

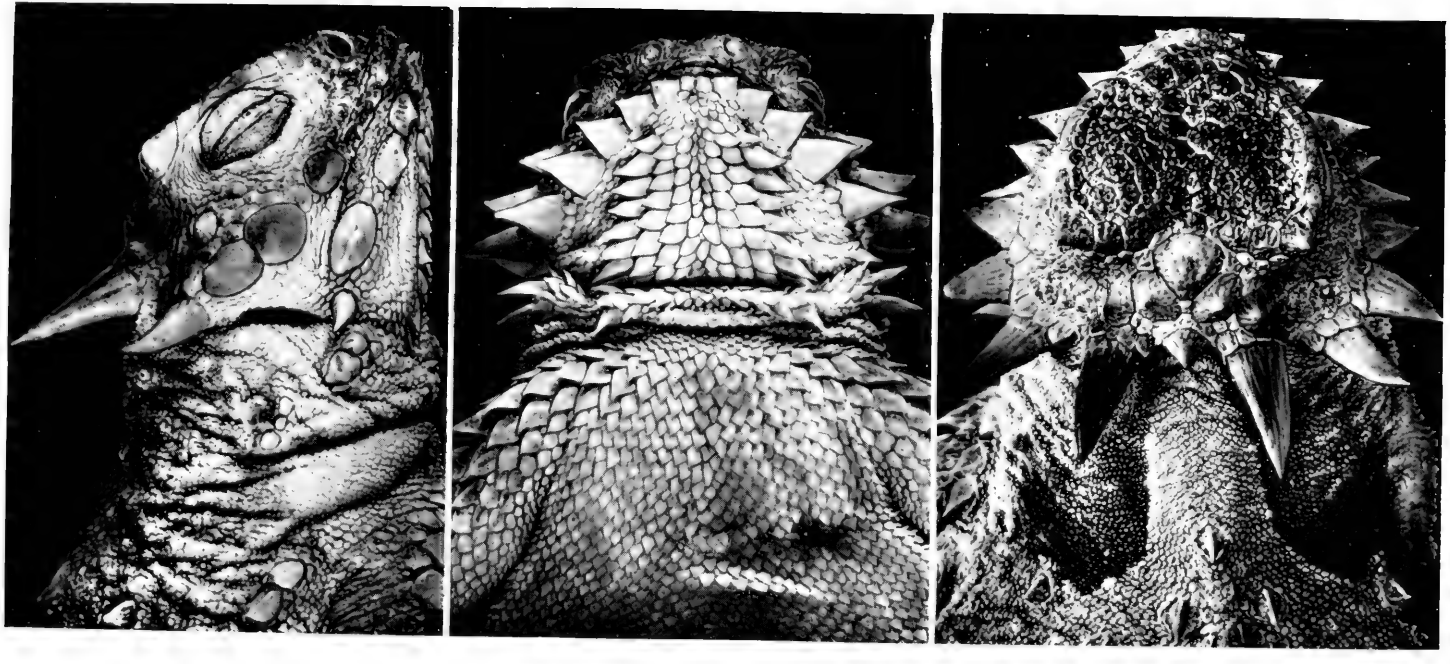

PLATE LVII

Cnemidophorus celeripes Dickerson, U. S. N. M. No. 64444. San José Island.

Scientific Results of the Expedition to the Gulf of California in Charge of C. H. Townsend, by the U. S. Fisheries Steamship 'Albatross,' in 1911. Commander G. H. Burrage, U.S.N., Commanding.

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IX

Birds Collected in Lower California

By Charles Haskins Townsend

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OF

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Tiburon Island Towhee
Pipilo fuscus jamesi Townsend

BULLETIN

OF

THE AMERICAN MUSEUM OF NATURAL HISTORY

VOLUME XLVIII, 1923

59.82(72.2)

Article I.—BIRDS COLLECTED IN LOWER CALIFORNIA

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PLATE I

During the voyage of the U. S. Fisheries Steamer 'Albatross' in Lower California waters in 1911, collecting parties were sent ashore at thirty different points on the lower part of the peninsula, on islands in the Gulf of California and along the west coast. Among the collections were 804 birds representing 159 species and subspecies. As more than three-fourths of these were land birds, many of them peculiar to Lower California, and as certain islands had not previously been visited by naturalists, the collection is of considerable interest.

With the exception of those from Guadalupe Island, all of the birds taken were from points south of the San Benita Islands in the Pacific and Angel de la Guardia Island in the Gulf, a section including the lower half of the peninsula, and embracing all of the Cape faunal district. Specimens were obtained of most of the species characteristic of this district which lies within the arid tropical life zone.

The expedition being engaged in several lines of inquiry, including fishery and oceanographic work, and the duration of the voyage limited to two months, the time available for bird collecting was not sufficient for any very thorough examination of the bird fauna. The total number of days or parts of days spent at anchor was forty-three, but at some points the vessel remained at anchor only a few hours.

Following is a list of the anchorages, with dates of arrival and departure:

Ports Visited	Arrival	Departure
San Francisco		Feb. 23
San Diego	Feb. 25	Feb. 28
Guadalupe Island	Mar. 2	Mar. 4
San Diego	Mar. 6	Mar. 7
San Benito Ids	Mar. 9	Mar. 10
Cerros Island	Mar. 10	Mar. 12
San Bartolome Bay	Mar. 13	Mar. 15
San Cristobal Bay	Mar. 15	Mar. 15
San Roque Id	Mar. 15	Mar. 15
Abreojos Anchorage	Mar. 16	Mar. 16
Santa Maria Bay	Mar. 18	Mar. 18
Magdalena Bay	Mar. 18	Mar. 19
Margarita Island	Mar. 19	Mar. 20
Marcy Channel	Mar. 20	Mar. 21
Cape San Lucas	Mar. 23	Mar. 25
San Jose del Cabo	Mar. 25	Mar. 26
Pichilingue Bay	Mar. 27	Mar. 30
San Josef Island	Mar. 30	Apr. 1
Agua Verde Bay	Apr. 1	Apr. 2
Carmen Island	Apr. 2	Apr. 3
Mulege	Apr. 4	Apr. 5
Concepcion Bay	Apr. 5	Apr. 8
San Francisquito	Apr. 9	Apr. 10
Angel de la Guardia Id	Apr. 10	Apr. 11
Tiburon Id	Apr. 11	Apr. 13
San Esteban Id	Apr. 13	Apr. 14
Guaymas	Apr. 15	Apr. 15
Santa Catalina Id	Apr. 16	Apr. 16
Santa Cruz Id	Apr. 16	Apr. 16
Pichilingue Hbr. (La Paz)	Apr. 17	Apr. 19
Espiritu Santo Id	Apr. 19	Apr. 19
Ceralbo Island	Apr. 19	Apr. 19
San Jose del Cabo	Apr. 20	Apr. 20
San Bartolome Bay	Apr. 23	Apr. 23
San Francisco	Apr. 28	

The islands visited by the expedition that are known to have endemic species of birds are Guadalupe, the San Benitas, Cedros off Lower California, and Tiburon off the coast of Sonora.

Guadalupe Island, in latitude 29° and 135 miles west of San Quintin Bay, is about 20 miles long and from 3 to 7 miles wide. It is mountainous, the greatest height being 4,500 feet. Guadalupe is partly wooded and has a few fresh-water springs. It has been inhabited temporarily.

The following species and subspecies of land birds are peculiar to the island:

Polyborus lutosus
Colaptes cafer rufipileus
Carpodacus amplus
Junco insularis
Pipilo consobrinus
Salpinctes obsoletus guadeloupensis
Thryomanes brevicauda
Regulus calendula obscurus

There are three small islands in the San Benito group which lie about 15 miles west of Cedros Island. West Benito, the largest island, has a central height of 661 feet. All lack fresh water and are uninhabited. There are two endemic birds, *Passerculus rostratus sanctorum* and *Carpodacus mcgregori*.

Cedros Island, about 10 miles from the nearest point of the mainland, has a length of 21 miles and a width of from 3 to 9 miles. It is mountainous, the highest peak being nearly 4,000 feet. The island is sparsely wooded, with some cedars and pines on the higher elevations. Cedros has a few springs of fresh water and has been temporarily inhabited by miners. The only land bird peculiar to the island is *Thryomanes bewickii cerroensis*.

Tiburon is the largest island in the Gulf; it is thirty miles long by fifteen in width, and has a height of 4,000 feet.

The fauna of Tiburon Island has been derived chiefly from the mainland of Sonora, from which it is separated by a channel varying from one to three miles in width.

None of the thirteen species of land birds secured on Tiburon Island are referable to races belonging to Lower California. The width of the Gulf of California averages considerably greater than that of the peninsula, exceeding 100 miles in the latitude of Guaymas, its central portion. The following land birds were taken on Tiburon Island:

Passerculus rostratus rostratus
Pipilo fuscus jamesi
Cardinalis cardinalis affinis
Phainopepla nitens
Dryobates scalaris cactophilus
Myiarchus cinerascens cinerascens
Empidonax difficilis difficilis
Colaptes chrysoides mearnsi
Centurus uropygialis uropygialis
Toxostoma bendirei
Auriparus flaviceps lamprocephalus
Heleodytes brunneicapillus brunneicapillus
Polioptila plumbea

One of the birds in the above list (*Pipilo fuscus jamesi*) is described elsewhere in this paper as a new subspecies. It is probable that this large and mountainous island contains other unknown birds. It had not previously been visited by ornithologists. Tiburon is inhabited by Seri Indians believed to be dangerous to small parties. Science as yet knows nothing of the interior of this island.

Although most species of birds should have been nesting at this season, March and April, very few nests were seen.

Birds were collected chiefly by Messrs. H. E. Anthony and P. I. Osburn, although many were obtained by Dr. Paul Bartsch and myself. The naval officers attached to the 'Albatross' brought on board numerous specimens of water birds.

Lower California has not yet been fully explored ornithologically. The following records, relating mostly to the distribution of the species met with, include some localities not previously visited by ornithologists, and are, with a few exceptions, restricted to localities visited by the expedition.

Fig. 1. The 'Albatross' at San Josef Island, Gulf of California.

The nomenclature is that of the A. O. U. list, with such additions as have appeared in Ridgway's 'Birds of North and Middle America.'

For information on the physiography of the localities here referred to, reference may be made to part one of this series of reports, which contains the narrative of the voyage with numerous illustrations.

Colymbus nigricollis californicus (Heermann)

Eared Grebe

The eared grebe was observed at several points in the Gulf, being quite common at San Josef Island, Agua Verde Bay, San Francisquito Bay, and Angel Guardia Island. Eight specimens, San Josef Island, March 30 and San Francisquito Bay, April 10.

Gavia pacifica (Lawrence)

Pacific Loon

One specimen was taken April 11 at Tiburon Island where it was rather abundant. Our notes do not show that it was observed elsewhere.

Cerorhinca monocerata (Pallas)

Rhinoceros Auklet

A single specimen was secured at San Cristobal Bay on March 15. There are no records of this auklet having been found farther south.

Ptycorhamphus aleuticus (Pallas)

Cassin's Auklet

Four specimens taken: Guadalupe Island, March 2–4, and West San Benito Island, March 10. We found parts of East Benito so riddled with burrows of auklets that it was difficult to walk without breaking into them. When cruising in the schooner 'Laura' late in November, 1884, I took two specimens of this auklet off San Cristobal Bay.

Brachyrhamphus craverii (Salvadori)

Craveri's Murrelet

This bird we found only at San Esteban Island in the Gulf, where a single example was secured April 14. San Esteban Island is about twenty miles from Isla Raza where Dr. T. H. Streets found Craveri's murrelet breeding in abundance in April, 1875. The species is peculiar to Lower California and the Gulf regions.

Larus philadelphia (Ord)

Bonaparte's Gull

Specimens were taken at Carmen Island, April 3, Mulege, April 4, and Tiburon Island, April 12. It was fairly common at La Paz on April 18. On March 27, 1889, I obtained this gull in the northern part of the Gulf.

Larus heermanni Cassin

Heerman's Gull

This species was observed from April 1 to 19 at many points in the Gulf, from Ceralbo Island northward to Angel Guardia and Tiburon islands. It breeds in considerable numbers at Isla Raza and Ildefonso.

Sterna maxima Boddaert

Royal Tern

Numerous at San Josef Island on March 30 and at Guaymas on April 15. Specimens were obtained at San Cristobal Bay, March 15, Abreojos Point, March 16, and Angel Guardia Island, April 10.

Sterna elegans Gambel

Elegant Tern

Common in April at several points in the Gulf from La Paz to Angel Guardia and San Esteban islands. Observed at Guaymas, April 15. Sixteen specimens, one of which was obtained on the west side of the peninsula at Abreojos Point, March 16.

Puffinus opisthomelas Coues

Black-vented Shearwater

One specimen, San Bartolome Bay, March 13.

Oceanodroma macrodactyla W. Bryant

Guadalupe Petrel

Two specimens, Guadalupe Island, March 2–5.

Oceanodroma kaedingi Anthony

Kaeding's Petrel

While the 'Albatross' was anchored at Guadalupe Island, March 2–5, nine specimens were captured on board at night, doubtless attracted by the electric lights around the deck house. Petrels were very numerous and their calls were heard about the vessel all night.

Oceanodroma melania Bonaparte

Black Petrel

Two specimens, San Jose del Cabo March 26 and San Francisquito Bay, April 9. On a former voyage I found this petrel abundant off Guaymas.

Oceanodroma homochroa (Coues)

Ashy Petrel

One specimen, taken on board at night, off San Benito Islands, April 23.

Sula brewsteri Goss

Brewster's Booby

Observed in the Gulf from March 30 to April 18, at most of the points visited by the expedition. One specimen, taken at San Josef Island, March 31. In 1889 I found this booby breeding in considerable numbers at Georges Island near the head of the Gulf.

In 1888 Col. N. S. Goss estimated that about 700 of this species and about 1000 blue-footed boobies were breeding on San Pedro Martir Isle, which lies midway in the Gulf about 25 miles south of Tiburon

Fig. 2. San Pedro Martir Island, Gulf of California.
Nesting place of *Sula brewsteri*.

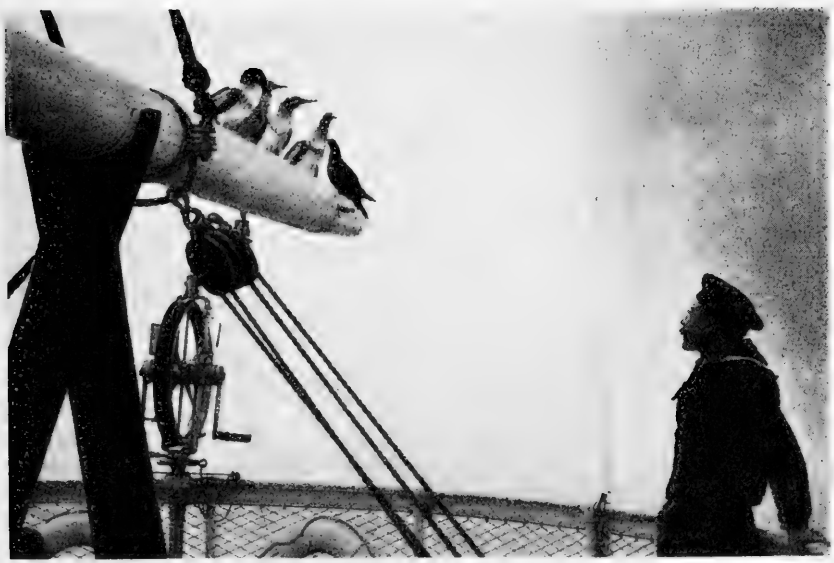


Fig. 3. Boobies. U. S. S. 'Albatross,' in the Gulf of California.

Island. At that time a guano company with about 135 employees was removing guano and causing great disturbance among the nesting birds. Col. Goss predicted that with the exhaustion of the guano supply the birds would return in great numbers, and this has evidently taken place. The accompanying photograph taken on April 15 from the deck of the 'Albatross' while passing San Pedro Martir, shows the greater part of the island densely covered with birds. This barren rock, less than a mile in length and width, is over 1000 feet in height. We did not attempt to land, owing to the force of the gale which was blowing.

Phalacrocorax auritus albociliatus Ridgway

FARALLON CORMORANT

One specimen, Magdalena Bay, March 20. Cormorants were seen almost daily during the voyage. A compact flock of a thousand or more was seen at Santa Maria Bay, March 18, and a flock of nearly as many at San Roque Island, March 15.

Fregata aquila (Linnæus)

MAN-O'-WAR-BIRD

This bird is common about the lower part of the peninsula from Magdalena Bay on the Pacific, where it nests on the mangroves, to Concepcion Bay on the Gulf.

Chaulelasmus streperus (Linnæus)

GADWALL

San Jose del Cabo, March 26, one specimen.

Marila americana (Eyton)

REDHEAD

San Jose del Cabo, March 26, one specimen.

Anas platyrhynchos Linnæus

MALLARD

Three mallards were seen at San Josef Island on March 30. Not observed elsewhere.

Marila affinis (Eyton)

LESSER SCAUP DUCK

Seen at La Paz and San Josef Island late in March, and at Angel Guardia Island, April 10.

Nettion carolinense (Gmelin)

Green-winged Teal

A small flock seen at La Paz, March 28.

Mareca americana (Gmelin)

Baldpate

Seen at Angel Guardia Island, April 10. Wild ducks are not common in Lower California as there are few permanent streams and no lakes or fresh-water marshes.

Oidemia perspicillata (Linnæus)

Surf Scoter

A few were observed at Angel Guardia Island, April 10 and 11.

Mergus serrator Linnæus

Red-breasted Merganser

Observed at Mulege, April 4 and at Tiburon Island, April 11.

Guara alba (Linnæus)

White Ibis

Rather common at San Josef Island, March 30 to April 1. One specimen.

Plegadis guarauna (Linnæus)

White-faced Glossy Ibis

Two specimens, San Jose del Cabo, April 22.

Botaurus lentiginosus (Montagu)

American Bittern

Magdalena Bay, March 20, one specimen.

Ardea herodias treganzai Court

Western Great Blue Heron

Santa Maria Bay, March 18 and Angel Guardia Island, April 10, two specimens.

Egretta candidissima (Gmelin)

Snowy Egret

Obtained at San Francisquito Bay, April 9 and at Tiburon Island, April 10.

Dichromanassa rufescens (Gmelin)

Reddish Egret

Specimens obtained at Magdalena Bay, March 20 and at San Josef Island, March 30. This egret was observed at Concepcion Bay, April 8 and at Guaymas, April 7.

Hydranassa tricolor ruficollis (Gosse)

Louisiana Heron

Magdalena Bay, March 20, one specimen. Observed at Concepcion Bay, April 7.

Florida cærulea (Linnæus)

Little Blue Heron

Magdalena Bay, March 21, one specimen. Several were seen at La Paz, April 18.

Butorides virescens frazari (Brewster)

Frazar's Green Heron

Specimens of this form of the green heron were obtained at Santa Maria Bay, March 18, and at San Josef Island, March 31. Green Herons probably of this race were seen at Mulege, April 4.

Nycticorax nycticorax nævius (Boddaert)

Black-crowned Night Heron

Specimens were taken at Abreojos Point, March 16, and at Magdalena Bay, March 22. Night herons apparently of this form were observed at San Josef Island, March 30, and at Concepcion Bay, April 5.

Nyctanassa violacea (Linnæus)

Yellow-crowned Night Heron

Taken at Santa Margarita Island, March 20.

Pisobia minutilla (Vieillot)

Least Sandpiper

Taken at San Bartolome Bay, March 13 and 14 and at Abreojos Point, March 16.

Ereunetes mauri Cabanis

Western Sandpiper

Obtained at San Bartolome Bay, March 13 and 14, Abreojos Point, March 16, and at Magdalena Bay, March 20.

Calidris leucophæa (Pallas)

SANDERLING

Abreojos Point, March 16, two specimens.

Limosa fedoa (Linnæus)

MARBLED GODWIT

Magdalena Bay, March 20, two specimens.

Totanus melanoleucus (Gmelin)

GREATER YELLOW-LEGS

Abreojos Point, March 16, Magdalena Bay, March 20, five specimens.

Catoptrophorus semipalmatus (Gmelin)

WILLET

Abreojos Point, March 16, five specimens.

Heteractitis incanus (Gmelin)

WANDERING TATLER

Cerros Island, March 10, two specimens.

Actitis macularis (Linnæus)

SPOTTED SANDPIPER

San Bartolome Bay, March 13, Concepcion Bay, April 8, and La Paz, April 9, three specimens.

Numenius americanus Bechstein

LONG-BILLED CURLEW

Abreojos Point, March 16 and Magdalena Bay, March 21, two specimens.

Numenius hudsonicus Latham

HUDSONIAN CURLEW

Santa Margarita Island, March 19, two specimens.

Squatarola squatarola (Linnæus)

BLACK-BELLIED PLOVER

Abreojos Point, March 16, two specimens.

Oxyechus vociferus (Linnæus)

KILLDEER

San Jose del Cabo, March 26 and Miraflores, May 11, three specimens.

Ægialites semipalmata (Bonaparte)

Semipalmated Plover

Abreojos Point, March 16, Tiburon Island, April 12, two specimens.

Ægialitis nivosa Cassin

Snowy Plover

Abreojos Point, March 16, Magdalena Bay, March 20, and Carman Island, April 23, eight specimens.

Ochthodromus wilsonius (Ord)

Wilson's Plover

La Paz, March 27, one specimen.

Aphriza virgata (Gmelin)

Surf-bird

The surf-bird probably winters in considerable numbers in the Lower California and Gulf region, having been taken at Abreojos Point on the Pacific side of the peninsula on March 16, at San Josef Island in the Gulf on March 31, and at Tiburon Island off the coast of Sonora on April 12. Twenty or more were seen at San Josef Island.

It is not mentioned by Bryant, or Brewster, nor in any of the papers on Lower California birds with which the writer is familiar. Although its migration route extends from Alaska to Chili, it has never been recorded as common anywhere, and its breeding range is still unknown. So far as observed by the writer, it frequents low rocks along shore that are almost a-wash. All that were seen were comparatively fearless, showing little concern when approached.

Arenaria melanocephala (Vigors)

Black Turnstone

San Roque Island, March 15, Abreojos Point, March 16, and Tiburon Island, April 12, five specimens.

Hæmatopus frazari Brewster

Frazar's Oyster-catcher

San Benito Islands, March 9, Cerros Island, March 10, Magdalena Bay, March 20, San Josef Island, March 31, and San Esteban Island, April 1, seven specimens.

The oyster-catcher was observed at Agua Verde Bay, April 1, Angel Guardia Island, April 10, and Santa Catalina Island, April 16. A nest and eggs were found at Concepcion Bay, April 7.

Hæmatopus bachmani Audubon

Black Oyster-catcher

Cerros Island, March 10, and San Roque Island, March 15, two specimens.

Lophortyx californica vallicola (Ridgway)

Valley Quail

Not observed by the expedition on the Pacific coast of the peninsula, but found common at many places on the Gulf coast from Cape San Lucas northward to Agua Verde Bay, seven specimens.

Columba fasciata vioscæ Brewster

Viosca's Pigeon

Miraflores, April 25, May 5 and 20, and San Bernardo Mountain, May 13, eight specimens. Not seen north of the Cape region.

Melopelia asiatica mearnsi Ridgway

Western White-winged Dove

Late in March ten specimens were obtained at Cape San Lucas, San Jose del Cabo, and La Paz.

Observed at most points in the Gulf visited by the 'Albatross,' including Tiburon Island.

Zenaida macroura marginella (Woodhouse)

Western Mourning Dove

Cape San Lucas, March 22 and 23. Observed at Mulege, April 4 and at Tiburon Island, April 13.

Chamæpelia passerina pallescens Baird

Mexican Ground Dove

Cape San Lucas, March 24, San Jose del Cabo, March 26, six specimens. The ground dove was seen at Mulege, April 4.

Accipiter cooperi (Bonaparte)

Cooper's Hawk

Cape San Lucas, March 24, one specimen.

Parabuteo unicinctus harrisi (Audubon)

Harris's Hawk

Cape San Lucas, March 23, one specimen.

Buteo borealis calurus Cassin

Western Red-tail

Miraflores, April 25, one specimen.

Falco sparverius phalæna (Lesson)

Desert Sparrow Hawk

West San Benito Island, March 9 and San Jose del Cabo, March 26, three specimens.

Falco sparverius peninsularis Mearns

San Lucas Sparrow Hawk

Cape San Lucas, March 24 and Miraflores, May 2 and 18, six specimens.

Polyborus cheriway (Jacquin)

Audubon's Caracora

Santa Margarita Island, March 19 and Magdalena Bay, March 21, two specimens.

Pandion haliætus carolinensis (Gmelin)

Osprey

Observed at many places. Nests are conspicuous on the uninhabited islands such as Cedros and the San Benitos. Young ospreys were brought on board at Agua Verde Bay.

Cerros Island, March 10, one specimen.

Asio flammeus (Pontoppidan)

Short-eared Owl

Cape San Lucas, March 23, one specimen.

Otus xantusi Brewster

Xantus's Screech Owl

Miraflores, April 25 and May 18, twelve specimens.

Bubo virginianus elachistus Brewster

Dwarf Horned Owl

Angel Guardia Island, April 11, Espiritu Santo Island, April 18, Miraflores, April 30 and May 12, and La Palma, April 20, eight specimens.

Speotyto cunicularia hypogeæa (Bonaparte)

Burrowing Owl

San Benito Islands, March 9 and Angel Guardia Island, April 10, two specimens.

Glaucidium hoskinsi Brewster

Hoskin's Pigmy Owl

Miraflores, April 25 and 30, two specimens.

Micropallas whitneyi sanfordi Ridgway

Sandford's Elf Owl

Miraflores, April 25 and May 11 and San Bernardo Mountain, May 15, eight specimens.

Geococcyx californianus (Lesson)

Road Runner

A single specimen was taken at San Jose del Cabo, April 24. Although the road runner is an inhabitant of most parts of the peninsula, it was seldom observed by our party. I saw one at San Cristobal Bay, November 16, 1884.

Megaceryle alcyon (Linnæus)

Belted Kingfisher

Magdalena Bay, March 20 and La Paz, March 29, two specimens.

Dryobates scalaris lucasanus (Xantus)

San Lucas Woodpecker

Common from Cape San Lucas to La Paz. Obtained also at Carmen, San Josef, and Santa Cruz islands, 17 specimens.

Dryobates scalaris cactophilus Oberholser

Cactus Woodpecker

Tiburon Island, April 12.

Melanerpes formicivorus angustifrons Baird

Narrow-fronted Woodpecker

Miraflores, April 28 and May 8, ten specimens.

Centurus uropygialis brewsteri Ridgway

Brewster's Woodpecker

Common from Cape San Lucas northward along the Gulf Coast to Mulege, 23 specimens.

Centurus uropygialis uropygialis Baird

GILA WOODPECKER

Tiburon Island, April 13, one specimen.

Colaptes chrysoides chrysoides Malherbe

GILDED FLICKER

Agua Verde Bay, April 2 and Miraflores, May 17, two specimens.

Colaptes chrysoides mearnsi Ridgway

MEARN'S GILDED FLICKER

Tiburon Island, April 13, one specimen.

Phalænoptilus nuttalli californicus Ridgway

DUSKY POOR-WILL

Miraflores, May 4, one specimen.

Chordeiles acutipennis inferior Oberholser

SAN LUCAS NIGHTHAWK

Miraflores, May 19, one specimen.

Calypte costæ (Bourcier)

COSTA'S HUMMING-BIRD

Cerros Island, March 10 and 12, Santa Maria Bay, March 18, Agua Verde Bay, April 1, San Josef Island, April 1, ten specimens.

Calypte anna (Lesson)

ANNA'S HUMMING-BIRD

Cerros Island, March 12, three specimens.

Basilinna xantusi (Lawrence)

XANTUS'S HUMMING-BIRD

San Josef Island, March 31, Agua Verde Bay, April 1, and Miraflores, May 4 and 11, ten specimens.

Tyrannus vociferans Swainson

CASSIN'S KINGBIRD

Cape San Lucas, March 23, San Jose del Cabo, March 26. Several were seen at Agua Verde Bay, April 2, three specimens.

Myiarchus cinerascens pertinax (Baird)

LOWER CALIFORNIA FLYCATCHER

Common from Cape San Lucas northward along the Gulf coast to San Francisquito Bay. Taken also on San Josef and Ceralbo islands, 33 specimens.

Myiarchus cinerascens cinerascens (Lawrence)

ASH-THROATED FLYCATCHER

Tiburon Island, April 11 and 12, San Esteban Island, April 13 and 14, five specimens.

Sayornis sayus (Bonaparte)

SAY'S PHŒBE

Cerros Island, March 11 and 12 and Cape San Lucas, March 24.

Empidonax difficilis cineritius Brewster

SAN LUCAS FLYCATCHER

San Josef Island, March 31 and Agua Verde Bay, April 2.

Empidonax difficilis difficilis Baird

WESTERN FLYCATCHER

Tiburon Island, April 12.

Empidonax trailli trailli (Audubon)

TRAILL'S FLYCATCHER

San Bernardo Mountain, May 15. The only specimen secured is tentatively referred to the western form.

Empidonax wrighti Baird

WRIGHT'S FLYCATCHER

Cape San Lucas, March 23 and 24, La Paz, March 30, and Santa Cruz Island, April 16, seven specimens.

Otocoris alpestris actia Oberholser

CALIFORNIA HORNED LARK

Cerros Island, March 10, San Bartolome Bay, March 13 and 14. Shore larks were seen at Carmen Island, April 3.

Aphelocoma californica hypoleuca Ridgway

XANTUS'S JAY

Found from Santa Maria Bay on the Pacific to Concepcion Bay on the Gulf coast, 18 specimens.

Corvus corax sinuatus Wagler

RAVEN

Specimens were taken at Cerros Island, March 12, Abreojos Point, March 16, and San Bartolome Bay, March 14. Ravens were seen at nearly all points visited by the expedition including Tiburon Island.

Icterus parisorum Bonaparte

SCOTT'S ORIOLE

Cape San Lucas, March 23 and 24, Miraflores, April 25 and May 6. Seen also at Tiburon Island, April 11.

Icterus cucullatus nelsoni Ridgway

ARIZONA HOODED ORIOLE

Common from Cape San Lucas northward along the Gulf coast to Agua Verde Bay. Seen also at Carmen Island, 11 specimens.

Carpodacus mexicanus ruberrimus Ridgway

SAN LUCAS HOUSE FINCH

Common from Miraflores northward to Mulege. Observed also at Espiritu Santo and Santa Catalina islands, 29 specimens.

Carpodacus mexicanus clementis Mearns

SAN CLEMENTE HOUSE FINCH

Cerros Island, March 12.

Carpodacus mexicanus frontalis (Say)

HOUSE FINCH

The house finches seen on Tiburon and San Esteban islands were probably of this form, which occurs in Sonora.

Carpodacus amplus Ridgway

GUADALUPE HOUSE FINCH

Guadalupe Island, March 1, 28 specimens.

Carpodacus mcgregori Anthony

MCGREGOR'S HOUSE FINCH

West San Benito Island, March 9.

Astragalinus psaltria hesperophilis Oberholser

GREEN-BACKED GOLDFINCH

San Jose del Cabo, March 25, Agua Verde Bay, April 2, and Mulege, April 4.

Passerculus sandwichensis alaudinus Bonaparte

Western Savannah Sparrow

San Bartolome Bay, March 13.

Passerculus rostratus guttatus Lawrence

San Lucas Sparrow

Abreojos Point, March 16, Santa Maria Bay, March 19, and Magdalena Bay, March 20 and 21, ten specimens.

Passerculus rostratus rostratus (Cassin)

Large-billed Sparrow

Found at most points on the peninsula visited by the expedition and also at Tiburon Island, 16 specimens.

Passerculus rostratus sanctorum Ridgway

San Benito Sparrow

San Benito Island, March 9, 16 specimens.

Chondestes grammacus strigatus Swainson

Western Lark Sparrow

Cape San Lucas, March 22 and 24, five specimens.

Zonotrichia leucophrys leucophrys (J. R. Forster)

White-crowned Sparrow

San Bartolome Bay, March 13, Cape San Lucas, March 24, and San Jose del Cabo, March 26.

Zonotrichia coronata (Pallas)

Golden-crowned Sparrow

Cerros Island, March 12 and Cape San Lucas, March 24.

Spizella pallida (Swainson)

Clay-colored Sparrow

Cape San Lucas, March 24, five specimens.

Spizella breweri Cassin

Brewer's Sparrow

Cape San Lucas, March 24, Carmen Island, April 3, and Espiritu Santo Island, April 19, five specimens.

Junco insularis Ridgway

Guadalupe Junco

Guadalupe Island, March 2, five specimens.

Amphispiza bilineata deserticola Ridgway

Desert Sparrow

Taken at nearly all points visited by the expedition including San Esteban, Carmen, Santa Catalina, Santa Cruz, and Espiritu Santo islands.

Melospiza lincolni lincolni (Audubon)

Lincoln's Sparrow

Tiburon Island, April 12.

Pipilo maculatus magnirostris Brewster

Large-billed Towhee

San Bernardo Mountain, May 14.

Pipilo fuscus albigula Baird

San Lucas Towhee

San Bernardo Mountain, May 10, Miraflores, May 7–10.

Pipilo fuscus jamesi, new subspecies

Tiburon Island Towhee

Subspecific Characters.—Smaller than *P. f. intermedius*, but bill and feet larger; coloration similar but paler throughout; chin, throat, breast and abdomen paler; upper parts and flanks much more ashy, ear coverts slightly ashier; anal and femoral regions and under tail-coverts decidedly less tawny; crown lighter rufous.

Aver. of 2 ♀.—Length (skin), 198. Wing, 88. Tail, 92. Culmen, 15. Tarsus, 24. Middle-toe, 25.

Aver. of 2 ♂.—Length (skin), 197. Wing, 90. Tail, 89. Culmen, 16. Tarsus, 23. Middle-toe, 24.

Type.—No. 131,854, Amer. Mus. Nat. Hist., ♂ ad., Tiburon Island.

In general appearance of under parts this bird has more resemblance to *P. f. albigula*, the Lower California form, than to *intermedius* of the adjacent Sonoran mainland, but is paler than either. The Tiburon birds were compared with specimens from Guaymas, taken March 3 to 23. Tiburon Island, April 12, 13. 4 specimens.

Named for Mr. Arthur Curtiss James of New York.

Oreospiza chlorura (J. K. Townsend)

Green-tailed Towhee

Specimens were taken at Cape San Lucas, March 24 and La Paz, March 29. It was observed also at Tiburon Island.

Cardinalis cardinalis igneus Baird

San Lucas Cardinal

Found by the expedition in the Cape region where it is common and as far north as Concepcion Bay. Specimens were taken also at Carmen Island.

Cardinalis cardinalis affinis Nelson

Alamos Cardinal

The single specimen of this genus, a female, secured at Tiburon Island on April 12 is tentatively referred to *affinis*, but appears to be smaller with larger feet.

Pyrrhuloxia sinuata peninsulæ Ridgway

San Lucas Pyrrhuloxia

This bird was found by our party only at the extreme lower end of the peninsula, being taken at Cape San Lucas on March 23 and 24 and at San Jose del Cabo on March 26, seven specimens.

Zamelodia melanocephala (Swainson)

Black-headed Grosbeak

Cape San Lucas, March 24, Agua Verde Bay, April 12, Concepcion Bay, April 2, and Miraflores, May 10, six specimens.

Passerina amœna (Say)

Lazuli Bunting

Concepcion Bay, April 7. Observed at San Francisquito Bay, April 9, and at Tiburon Island, April 13.

Passerina versicolor pulchra Ridgway

Beautiful Bunting

Miraflores, May 7 and 17, San Bernardo Mountain, May 14, six specimens.

Calamospiza melanocorys Stejneger

Lark Bunting

Cerros Island, March 11, Santa Margarita Island, March 20, and Cape San Lucas, March 23, seven specimens.

The record for Cerros Island indicates an extension of its known range. It was observed at Carmen and Tiburon islands.

Tachycineta thalassina brachyptera Brewster

San Lucas Swallow

San Jose del Cabo, March 25 and 26, Agua Verde Bay, April 2, San Francisquito Bay, April 9, Espiritu Santo Island, April 18, 13 specimens.

Phainopepla nitens (Swainson)

Phainopepla

Obtained at Agua Verde Bay, April 1 and 2, Tiburon Island, April 12, and Miraflores, May 7, 11 specimens.

Although known to be common in many parts of the peninsula, we did not see it except at the points mentioned.

Lanius ludovidianus gambeli Ridgway

California Shrike

Shrikes were taken at Cape San Lucas, March 24, San Jose del Cabo, March 25, and Angel Guardia Island, April 11. They were observed also at Tiburon Island.

Vireosylva gilva swainsoni (Baird)

Western Warbling Vireo

Miraflores, April 25 and May 17 and San Bernardo Mountains, May 13, seven specimens.

Lanivireo solitarius lucasanus (Brewster)

San Lucas Vireo

Same localities and dates as preceding, eight specimens.

Vireo belli pusillus Coues

Least Vireo

Santa Cruz Island, April 16.

Vermivora celata lutescens (Ridgway)

Lutescent Warbler

Santa Margarita Island, March 17 and 18 and Cape San Lucas, March 23.

Dendroica bryanti castaneiceps Ridgway

Mangrove Warbler

Santa Maria Bay, March 17 and 18, La Paz, March 27, and San Jose del Cabo, March 25, six specimens.

This warbler is common among the mangroves at Santa Maria Bay.

Dendroica auduboni auduboni (J. K. Townsend)

Audubon's Warbler

Cerros Island, March 12, and at sea, north of Guadalupe Island, April 25.

Dendroica nigrescens (J. K. Townsend)

Black-throated Gray Warbler

Concepcion Bay, April 8.

Seiurus noveboracensis notabilis Ridgway

Grinnell's Water Thrush

Magdalena Bay, March 21.

Geothlypis trichas arizela Oberholser

Pacific Yellow-throat

Magdalena Bay, March 20 and 21.

Geothlypis beldingi Ridgway

Belding's Yellow-throat

San Jose del Cabo, March 24 and 25 and Miraflores, May 5 and 9, six specimens.

Wilsonia pusilla pileolata (Pallas)

Pileolated Warbler

At sea, north of Guadalupe Island, April 25.

Anthus rubescens (Tunstall)

American Pipit

San Jose del Cabo, March 26 and Carmen Island, April 3.

Oreoscoptes montanus (J. K. Townsend)

Sage Thrasher

San Bartolome Bay, March 13, four specimens.

Mimus polyglottos leucopterus (Vigors)

Western Mockingbird

Specimens were taken at Cerros Island, March 11, Magdalena Bay, March 19, Cape San Lucas, March 23 and 24, La Paz, March 27 and 30, and at Agua Verde Bay, April 2.

The mockingbird was observed also at Mulege, Concepcion Bay, San Francisquito Bay, and Tiburon Island. It was fairly common wherever met with.

Toxostoma bendirei (Coues)

Bendire's Thrasher

Tiburon Island, April 3.

Toxostoma cinereum cinereum (Xantus)

San Lucas Thrasher

Cape San Lucas, March 23, San Jose del Cabo, March 25, Agua Verde Bay, April 1 and 2, and Miraflores, May 9 and 10.

Heleodytes brunneicapillus affinis (Xantus)

San Lucas Cactus Wren

Cape San Lucas, March 23, San Jose del Cabo, March 25 and 26, La Paz, March 29 and April 19, Agua Verde Bay, April 1 and 2, and Miraflores, May 19.

Heleodytes brunneicapillus brunneicapillus (Lafresnaye)

Guaymas Cactus Wren

Tiburon Island, April 12.

Salpinctes obsoletus obsoletus (Say)

Rock Wren

San Benito Islands, March 9 and Magdalena Bay, March 21.

Salpinctes obsoletus guadeloupensis Ridgway

Guadalupe Rock Wren

Guadalupe Island, March 2, ten specimens.

Catherpes mexicanus polioptilus Oberholser

Intermediate Canyon Wren

Espiritu Santo Island, April 18 and 19.

Thryomanes bewickii cerroensis (Anthony)

Cerros Island Wren

Cerros Island, March 12, three specimens.

Telmatodytes palustris plesius (Oberholser)

Western Marsh Wren

San Francisquito Bay, April 10.

Auriparus flaviceps lamprocephalus Oberholser

Cape Verdin

Magdalena Bay, March 19 and 21, Cape San Lucas, March 23 and 24, La Paz, March 30, Agua Verde Bay, April 2, Concepcion Bay, April

6 and 7, Angel Guardia Island, April 11, Ceralbo Island, April 19, Miraflores, May 10 and 11, and Tiburon Island, April 12.

A nest and two eggs were taken at Cape San Lucas on March 23, and a nest with three eggs at Tiburon Island, April 12, the eggs on the latter date being at the point of hatching.

Polioptila cærulea obscura Ridgway

Western Gnatcatcher

Specimens were taken at La Paz, March 29 and 30, Agua Verde Bay, April 12, Concepcion Bay, April 9, Ceralbo Island, April 19, Miraflores, May 8.

It was observed also at Mulege and Santa Catalina Island, and was rather common at most of the localities where it was found.

Polioptila plumbea (Baird)

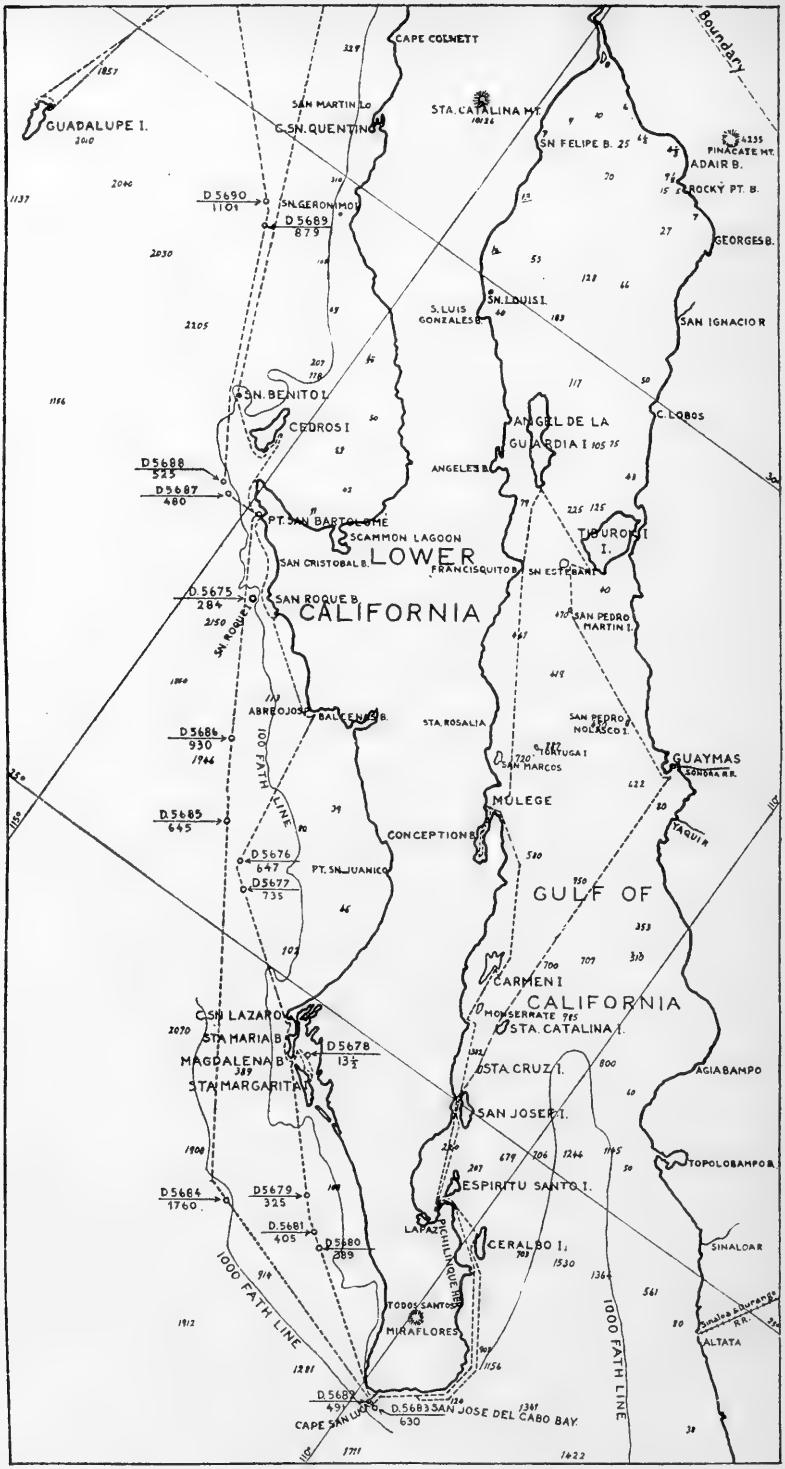
Plumbeous Gnatcatcher

Santa Margarito Island, March 19, Cape San Lucas, March 24, San Jose del Cabo, March 26, La Paz, March 29 and 30, and Tiburon Island, April 12.

Planesticus confinis (Baird)

San Lucas Robin

San Bernardo Mountain, May 12–15, three specimens.



MAP OF THE LOWER CALIFORNIA REGION
SHOWING ROUTE OF THE ALBATROSS EXPEDITION IN 1911
UNDER THE DIRECTION OF C.H. TOWNSEND

AMERICAN MUSEUM NOVITATES

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POLYCHÆTOUS ANNELIDS FROM LOWER CALIFORNIA WITH DESCRIPTIONS OF NEW SPECIES[1]

By Aaron L. Treadwell

The following taxonomic paper refers to a collection of polychætous annelids made by the U. S. S. 'Albatross' off the coast of Lower California. The specimens were in most cases poorly preserved, so that determination of species was sometimes uncertain and in a few cases not possible. The families certainly represented and the number of species found in each are shown in the following table.

Family	Old Species	New Species
Amphinomidæ	1	
Polynoidæ	5	1
Sigalionidæ	1	
Aphroditidæ	2	
Nephthydidæ	1	
Nereidæ	3	
Leodicidæ	8	
Cirratulidæ	?	
Maldanidæ	1	1
Terebellidæ	2	

With two exceptions each species is represented by only a very few individuals. These exceptions are *Onuphis* (*Nothria*) *hiatidentata* Moore, and *Hyalinœcia tubicola* (Müller) Malmgren subspecies *stricta* Moore, which together make up more than half the bulk of the collection. In connection with these two species the following ecological note is of interest.

In his original description Moore comments on the "remarkable example of associative resemblance" which *Onuphis* (*Nothria*) *hiatidentata* exhibits, for it lives in close association with *Hyalinœcia tubicola* Malmgren subspecies *stricta* Moore and superficially looks more like *Hyalinœcia* than like *Onuphis*. I find that it appears to be developing the habit of occupying *Hyalinœcia* tubes instead of making some of its own. A considerable number were found in what are evidently the normal form of tubes for this species of *Onuphis*. These tubes are oval in cross-section, have a groundwork of a thin whitish material that looks like wet tissue paper but is extremely tough, and have on the outside more or less foreign matter, the most abundant of which consists of much-worn

[1]Scientific Results of the Expedition to the Gulf of California in charge of C. H. Townsend, by the U. S. Fisheries Steamer, 'Albatross,' in 1911; Commander G. H. Burrage, U. S. N., Commanding. X. Published by permission of the U. S. Commissioner of Fisheries.

cylindrical shells of foraminifera. *Hyalinœcia tubicola* (Müller) Malmgren subspecies *stricta* Moore, like other species of this genus, builds a quill-like tube of very hard, tough chitin, slightly narrower at one end than at the other, open at both ends, and slightly curved. Rarely cœlenterates or barnacles are attached to the surface. Small tubes are translucent white, older ones are brown.

As stated above, many of the *Onuphis* were in the tubes I have described as typical. Others had attached bits of *Hyalinœcia* tubes to the outside of their own. In other cases the *Onuphis* was living inside a *Hyalinœcia* tube of which one side had broken away and the break was repaired with characteristic *Onuphis* material. Still others were living in complete *Hyalinœcia* tubes and there was no trace of the characteristic *Onuphis* tube-material. This occurred often so that I very soon learned that it is not safe to assume that the animal in a *Hyalinœcia* tube is really *Hyalinœcia* and not *Onuphis*. Obviously, *Onuphis* may construct a tube of its own, but it frequently uses instead an empty one of *Hyalinœcia*.

Amphinomidæ

Chloeia flava (Pallas)

Aphrodita flava Pallas, 1766, p. 97, Pl. viii, figs. 7–11.

One specimen. Beach at Francisquito Bay, Lower California.

Polynoidæ

Lagisca multisetosa Moore

Lagisca multisetosa Moore, 1902, pp. 267–269, Pl. xiv, figs. 29–36; 1908, p. 335.
Harmothoë multisetosa Moore, 1910, pp. 340 and 341.

Through an error in locality labels, Moore first described this species as from Greenland, but he later corrected this and showed that it is really an Alaskan form. In the last of the above references, Moore reports on the study of a number of individuals and concludes that it is a highly variable species whose limits can be accurately ascertained only if a large number are available for study.

The present collection contains a single specimen lacking the median tentacle and with only a fragment of an elytron left. In many respects it agrees with Moore's description but it does not show cilia on the palps or on the peristomial cirri. The fragment of the elytron is thickly studded with conical spines, but not enough of it is left to enable me to determine whether the papillæ described by Moore are present. In view of the similarities between this and Moore's description, I have tentatively located it here.

Station D. 5682; 491 fathoms; bottom temperature F. 40.8°.

Admetella hastigerens Chamberlin

Admetella hastigerens CHAMBERLIN, 1919, pp. 64–67, Pl. IX, figs. 6–8.

Chamberlin described this species from one specimen collected off Panama in 581 fathoms. The Albatross collection contains five specimens, none of which is complete, but it is possible by a comparison of the five to get a fairly complete description. The largest was 100 mm. long and 8 mm. wide, thus a trifle larger and narrower than Chamberlin's specimen. The individual which is in most respects the best preserved is 50 mm. long.

The prostomium agrees in general with Chamberlin's description, but the "lateral extensions" are much more delicate than one would infer from that description, being extremely thin, scale-like structures, which, if the preservation has not been good, look very much like flakes of epidermis that have loosened from the surface. The median tentacle has a large ceratophore inserted into the dorsal middle line of the prostomium and with a diameter about one-fourth that of the latter. It has a length about equal to twice its diameter. The style is extremely delicate and slender, extending to about somite 9. It broadens near the end and then abruptly narrows to an acute apex. In the 50 mm. specimen the ceratophores of the lateral tentacles are hidden under the scale mentioned above, while the styles are very short and slender, hardly longer than the scale. In a specimen of twice this size the styles are relatively longer, slightly swollen toward the end and with a sharp-pointed apex. There is a faint trace of pigment around the swollen portion. The palps are more slender than in Chamberlin's specimen and have acute apices.

The dorsal and ventral cirri of the first parapodium resemble the median tentacle in form and size and are larger than the palps. The ventral cirrus of the third parapodium is similar to these in form and size but that of the fourth is much shorter and hardly longer than the parapodium. Succeeding ventral cirri are progressively shorter and the eighth is a slender, sharp-pointed structure attached to the ventral face of the parapodium and not reaching the apex. The dorsal cirri are broken in nearly all specimens, but those that remain agree in all respects with those of the first two somites. The pharynx is protruded in a 100 mm. specimen. It is 12 mm. long, smooth throughout the greater part of its length, but with roughenings toward the end. At the apex, above and below, is a row of about fourteen soft papillæ and three light-brown teeth.

A single elytron, the first or second, remains on the 100 mm. animal. It is of sufficient size to cover, with its mate, the dorsal surface of the body

and probably did so during life. It is too poorly preserved for accurate description, but is apparently nearly circular in outline and of a very delicate texture. In the preserved condition the color is gray, deepening into black on the margin near the point of attachment of the elytrophore. From this point a colorless band runs diagonally to the margin of the elytron.

In addition to the broad flat type of setæ described by Chamberlin in Pl. IX, figs. 7 and 8, I find another type having long slender stalks, flattened and with serrated margins toward the ends.

Station D.5676; 645 fathoms; bottom temp., F. 39°.
Station D.5677; 735 fathoms; bottom temp., F. 38.6°.
Station D.5685; 645 fathoms.
Station D.5692; 1076 fathoms; bottom temp., F. 37.1°.

Halosydna brevisetosa Kinberg

Halosydna brevisetosa Kinberg, 1855, p. 385.

Station D.5678; 13½ fathoms. One specimen.

Lepidasthenia curta Chamberlin

Lepidasthenia curta Chamberlin, 1919, pp. 61–63, Pl. v, figs. 4–9.

Station D.5683; 630 fathoms; bottom temp., F. 39.1°.

Polynoë lordi (Baird)

Lepidonotus lordi Baird, 1863, p. 107.

Pichilingue Bay, Lower California. Three specimens.

Eunoë exoculata, new species

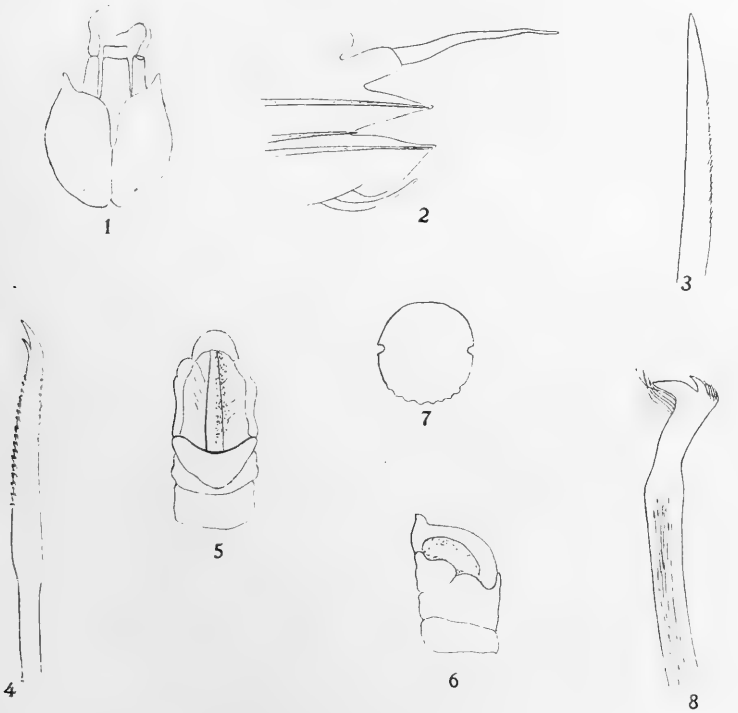
Figures 1 to 4

Two specimens, one incomplete. The entire specimen is 30 mm. long and 7 mm. in greatest body width. The body narrows somewhat abruptly toward the anterior end, and much more gradually posteriorly. There are 38 somites in the body and 15 pairs of elytrophores. No elytron remains in the complete specimen, but the other retains one which is much wrinkled.

The prostomium is a trifle longer than wide, its greatest width being about in the middle (Fig. 1). Posteriorly it narrows gradually to a base that is not more than one-third the greatest diameter. Anteriorly the narrowing is very slight, each half terminating in a peak which is placed well toward the outer margin and at a considerable distance from the median tentacle. The median groove is prominent and the ceratophore of the median tentacle is inserted into it to about the middle of the prostomium. On either side of the prostomium are two spots which evidently are eyes, though they are not pigmented. I am uncertain if this is normal or if the pigment may not have been removed in the preservation. The posterior pair of these lie on the dorso-lateral surface of the prostomium near its posterior end, the anterior on the ventro-lateral surface at the region of its greatest width, and are not visible in a dorsal view of the head region.

The ceratophore of the median tentacle is about one-third as wide as the prostomium, and the length of its free portion is about equal to its width. The style is absent in both specimens. The ceratophores of the lateral tentacles arise at some distance from the peaks, are shorter than that of the median tentacle, and about one-third its diameter. The style is slender and about three times as long as the ceratophore (foreshortened in the drawing). Only one palp remains. This is slender and about four times as long as the prostomium. Most of the dorsal cirri are lost but the larger of the two specimens retains a few at the posterior end. These are slender and longer than the transverse diameter of the body. They do not have any swelling at the ends.

A parapodium from near the middle of the body (Fig. 2) has neuropodium and notopodium of approximately equal length, each with an acute apex into which an acicula extends. Another acicula reaches the surface at the middle of the parapodium. The aciculæ are dark brown at the bases but have slender colorless apices. The dorsal cirrus has a heavy ceratophore and a slender style, the ventral cirrus is more slender



Figs. 1 to 4. *Eunoë exoculata*, new species.

Fig. 1, prostomium × 10; 2, middle parapodium × 7; 3, seta × 45; 4, seta × 45.

Figs. 5 to 8. *Maldane cristata*, new species.

Fig. 5, anterior end, dorsal view × 5; 6, anterior end lateral view × 5; 7, anal plate × 5; 8, uncinus × 185.

than the dorsal and does not reach the apex of the parapodium. Except for variations in length, the notopodial setæ are all alike, with moderately acute apices and poorly defined denticulations along one face (Fig. 3). The neuropodial setæ (Fig. 4) are all longer than the notopodial and are all alike in form, except that some near the dorsal face of the tuft are much longer than the others. Each suddenly widens toward the end and then gradually narrows, ending in a large terminal and a smaller subterminal tooth. Along the widened region are rows of toothed plates which appear most clearly in profile but apparently extend entirely around the seta.

No elytra are retained on the type. The paratype has one very much shriveled elytron, with a circular outline but with no fimbriations or surface markings.

Station D.5698; 475 fathoms; bottom temp., F. 39.9°.

Type in The American Museum of Natural History.

Sigalionidæ

Sthenolepis areolata (McIntosh)

Leanira areolata McIntosh, 1885, p. 151, Pl. xxi, fig. 3; Pl. xxv, figs. 8, 9; Pl. xiii,*a* fig. 1.

Sthenolepis areolata Chamberlin, 1919, p. 90.

Station D.5695; 534 fathoms; bottom temp., F. 38.9°.

Aphroditidæ

Aphrodita defendens Chamberlin

Aphrodita defendens Chamberlin, 1919, pp. 80–81.

Station D.5699; 659 fathoms; bottom temp., F. 37.9°.

Station D.5676; 645 fathoms; bottom temp., F. 39.0°.

Lætmonice pellucida Moore

Lætmonice ["*Lætmatonice*"] *pellucida* Moore, 1903, p. 420, Pl. xxiii, figs. 19, 20.

Two specimens, which I have assigned to this species because of their general resemblance to Moore's description. Lack of agreement is shown in the subapical barbs of the arrow-pointed setæ, which are symmetrical instead of unequal in number on different sides of the shaft, and I could find no papillæ on the anterior ventral surface.

Station D.5695; 534 fathoms; bottom temp., F. 38.9°.

Nephthydidæ

Nephthys ectopa Chamberlin

Nephthys ["*Nepthys*"] *ectopa* Chamberlin, 1919, pp. 94–97, Pl. xv, figs. 1–7.

Probably of this species, but too poorly preserved to allow of positive identification.

Station D.5698; 475 fathoms, bottom temp., F. 39.9°.

Nereidæ

Nereis mediator Chamberlin

Nereis mediator Chamberlin, 1919*a*, page 11.

One specimen. Labeled as from Lower California.

Platynereis integer Treadwell

Nereis (*Platynereis*) *integer* Treadwell, 1920, p. 595, figs. 1–4.

One specimen. Labeled as from Lower California.

Nereis kobiensis McIntosh

Nereis (*Platynereis*) *kobiensis* McIntosh, 1885, pp. 210–212, Pl. xxxiv, figs. 3, 4, 5, 6; Pl. xvi*a*, figs. 2, 3, 4.

One specimen. Labeled as from Lower California.

Leodicidæ

Leodice segregata Chamberlin

Leodice segregata Chamberlin, 1919, p. 237–240, Pl. liv, figs. 1–5.

Station D.5695; 534 fathoms; bottom temp., F. 38.9°.

Station D.5682; 491 fathoms; bottom temp., F. 40.8°.

Onuphis litabranchia Chamberlin

Onuphis litabranchia Chamberlin, 1919, pp. 274–279, Pl. l, fig. 7; Pl. li, figs. 1–10; Pl. lii, fig. 1.

Chamberlin described the ceratophores as smooth. In the single incomplete specimen of this collection these are ringed. Each of the median and the outer paired ceratophores has seven rings, while each of the inner paired ones has twelve or thirteen. The gill structure agrees more closely with Chamberlin's paratype than with his type, for many are branched. The specimen is a female with eggs.

Station D.5673; 1090 fathoms.

Onuphis lepta Chamberlin

Onuphis lepta Chamberlin, 1919, pp. 290–295, Pl. xlv, figs. 1–7; Pl. xlvi, figs. 3–12.

A small and evidently immature specimen living in a mud tube attached to the outer wall of a *Hyalinœcia* tube was collected at Station D.5691. At Station D.5684 were collected a considerable number of these tubes, most of which were empty but one contained the anterior end of an individual which agrees in all respects with Chamberlin's description.

Station D.5684; 1760 fathoms.

Station D.5691; 868 fathoms; bottom temp., F. 37.2°.
Station D.5692; 1076 fathoms; bottom temp., F. 37.1°.

Onuphis vexillaria Moore

Onuphis vexillaria Moore, 1911, pp. 266–269, Pl. xvii, figs. 69–76.

These agree with Moore's description in every respect except that the frontal tentacles are closer together and in no somite are there more than four gill filaments. Four specimens.

Station D.5690; 1101 fathoms; bottom temp., F. 38.1°.

Onuphis iridescens (Johnson)

Northia iridescens Johnson, 1901, p. 408, Pl. viii, figs. 86, 87; Pl. ix, figs. 88–92.
Nothria iridescens Moore, 1911, p. 255.

Station D.5698; 475 fathoms, bottom temp., F. 39.9°.

Onuphis hiatidentata (Moore)

Nothria hiatidentata Moore, 1911, pp. 259–262, Pls. xvi and xvii, figs. 41–50.

In his description of this species Moore comments on the resemblance which it bears to *Hyalinœcia tubicola*, with which it is commonly associated. I have already mentioned the relations of the two in the matter of tube construction. See above, p. 2.

Station D.5673; 1090 fathoms.
Station D.5686; 930 fathoms; bottom temp., F. 37.3°.
Station D.5689; 879 fathoms.
Station D.5692; 1076 fathoms; bottom temp., F. 37.1°.
Station D.5691; 868 fathoms; bottom temp., F. 37.2°.
Station D.5690; 1101 fathoms; bottom temp., F. 38.1°.
Station D.5697; 485 fathoms; bottom temp., F. 39.8°.

Hyalinœcia tubicola (Müller) Malmgren subspecies **stricta** Moore

Hyalinœcia tubicola (Müller) Malmgren subspecies *stricta* Moore, 1911, p. 280, Pl. xviii, figs. 96, 97.

Station D.5673; 1090 fathoms.
Station D.5683; 630 fathoms; bottom temp., F. 39.1°.
Station D.5686; 930 fathoms; bottom temp., F. 37.3°.
Station D.5687; 480 fathoms; bottom temp., F. 41.1°.
Station D.5690; 1101 fathoms; bottom temp., F. 38.1°.
Station D.5691; 868 fathoms; bottom temp., F. 37.2°.
Station D.5692; 1076 fathoms; bottom temp., F. 37.1°.

Lumbrinereis bifilaris Ehlers

Lumbriconereis bifilaris Ehlers, 1901, pp. 139–144, Pl. xviii, figs. 1–10.
Lumbrinereis bifilaris Moore, 1911, pp. 291–294, Pl. xx, figs. 135–142.

Station D.5694; 640 fathoms.

Cirratulidæ

A fragment of a cirratulid of indeterminable species was collected at Station D.5694; 640 fathoms.

Maldanidæ

Maldane similis Moore

Maldane similis Moore, 1906, pp. 233–236, Pl. xi, figs. 26–30.

The only deviation from Moore's description which these show is that on the lateral margins of the cephalic plate the lobes are more definitely toothed.

Station D.5683; 630 fathoms; bottom temp., F. 39.1°.

Maldane cristata, new species

Figures 5 to 8

Distinguished by the prominence of the cephalic crest and the smooth margins of the cephalic and anal plates. The type is 130 mm. long and has a cephalic width of 2.5 mm. It is entire, though the median region is very poorly preserved.

The prostomium makes an angle of about 45° with the body axis (Figs. 5 and 6). The cephalic plate is roughly triangular in outline, and is surrounded by a definite raised margin, which, possibly as a result of the preservation, is thrown into folds but shows no trace of lobings or denticulations. On either side at the postero-lateral angle is a notch separating the margin into a basal and two lateral lobes. The basal lobe is the more prominent and is bent caudad near its middle. The lateral lobes decrease in height anteriorly and are separated by a constriction from the hemispherical palpode. The crest is narrow, elevated and prominent, extending from the posterior margin of the cephalic plate into the base of the palpode (Fig. 6). Numerous fine grooves extend outward from the side of the ridge at an angle of 45 degrees, but these may be due to shrinkage after preservation. The mouth is a narrow elongated slit with no prominent lips.

The first two setigerous somites have thick body-walls; on succeeding somites the dorsal wall becomes thinner while the ventral wall remains thick; on the seventh setigerous somite only a small portion of the ventral wall is thick, while in the following somites the thickening is restricted to the line of insertion of the setæ. In the type there is not much difference between the preanal somites and those in the middle of the body, but in another specimen the five somites in front of the pygidium are short and thick-walled, while those through the middle of the body are long and thin-walled. These variations are doubtless due to differences in the degree of contraction.

The anal plate is circular in outline (Fig. 7). On either side is a rounded notch, whose ventral margin lies at the equator of the circle, thus dividing the circle into a dorsal and ventral portion, the ventral being the larger. The margin of the dorsal part is smooth, that of the ventral part is six- to eight-lobed. The anus is situated

dorsally near the margin of the plate, and has a dorsal and ventral lip, the latter the larger and with radiating lines.

Uncini (Fig. 8) appear on the second setigerous somite, only slender setæ appearing on the first. The rows of uncini are at first short but soon lengthen. Each uncinus has a long, gently curved shaft, of which I have figured only the terminal portion. At the apex is a single tooth with a much larger one ventral to it. Dorsal to the apical tooth are a series of fine denticulations, hardly large enough to be called teeth, which extend laterally around the end of the uncinus. Ventral to the larger tooth are a series of fine hair-like processes. In the tuft dorsal to the uncinus-row are two kinds of setæ. One has rather heavy brown-colored bases, which are bilimbate just outside the body wall but distally to this narrow into an extremely long delicate white apical portion with two marginal rows of minute denticulations. The second kind are smaller and not so dark in color as the first; they widen slightly toward the end and narrow abruptly asymmetrically to form a long, slender, needle-like apex which forms an angle with the main axis of the seta.

Station D.5698; 475 fathoms; bottom temp., F. 39.9°.

Terebellidæ

Terebella robusta (Johnson)

Amphitrite robusta Johnson, 1901, pp. 425–426, Pl. xvi, figs. 164–168.

Station D.5698; 475 fathoms; bottom temp., F. 39.9°. One specimen.

Thelepus crispus Johnson

Thelepus crispus Johnson, 1901, p. 428, Pl. xvii, figs. 175–178*b*.

One imperfectly preserved and evidently immature individual. In form of gills, setæ, and uncini this agrees with Johnson's description, but it does not show the eye spots which Moore describes in the young individuals.

Station D.5693; 451 fathoms.

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59.53,4P(72.2)

A NEW GENUS AND SPECIES OF PARASITIC COPEPOD FROM LOWER CALIFORNIA[1]

By Charles Branch Wilson

In 1912 Gravier published as one of the scientific documents of the second French Antarctic Expedition under Dr. Jean Charcot a paper entitled 'Crustacés parasites d'annélides polychètes.'[2] In addition to presenting new genera and species he gave a general discussion of many forms previously described belonging to that heterogeneous group known as the Ascidicolidæ. He noted that this name is very poorly suited to the parasites that compose the group, since it includes a large number whose hosts are not ascidians, and he was equally opposed to the name Annelidicolidæ proposed by some authors for such copepods as are found parasitic upon annelids. He stated very clearly that our present knowledge of these annelid parasites is insufficient to enable us to group them at all rationally. The males of many of them have never been seen and we know nothing of the development stages of most of them.

We may make a general distinction between those that live within the digestive tube of their host and those that live upon the outside of the host's body. But this difference in habitat ought not to separate related genera, and Gravier located his new genus, *Bactropus*, an intestinal parasite, in the same family with genera that live upon the outside of the annelid's body.

This family was first proposed by Giesbrecht in 1895, Mittheilungen Zool. Station Neapel, XII, p. 225. After describing *Seridium rugosum*, a new annelid parasite, he remarked that several of these copepods agreed in having an elongated body and rather distinct segmentation. For this reason he grouped them into a family which he named Clausiidæ from *Clausia*, the oldest of them. He included in the family *Clausia* Claparède, 1863; *Donusa* Nordmann, 1864; *Rhodinicola* Levinsen, 1878; and *Seridium* Giesbrecht, 1895. He mentioned also *Sabellacheres* M. Sars, 1861, but said it had never been described with enough detail to be certain of its systematic position. This statement was undoubtedly

[1]Scientific Results of the Expedition to the Gulf of California in charge of C. H. Townsend, by the U. S. Fisheries Steamer 'Albatross,' in 1911; Commander G. H. Burrage, U. S. N., commanding. XI. Published by permission of the U. S. Commissioner of Fisheries.

[2]'Deuxième expédition antarctique française (1908–1910).'

true but at least Sars's description was sufficient to show that his genus could not be grouped with the others above named.

The genus about to be described seems also to belong here and yet differs enough from the other genera to make its establishment valid. The number and structure of the swimming legs and the number of joints composing the first antennæ vary considerably in the genera of this family, but in none of them do we find the combination which exists here of six-jointed antennæ with only three pairs of swimming legs.

PHERMA,[1] new genus

Body spindle-shaped with segmentation distinctly indicated by transverse grooves or lateral invaginations. Cephalon fused with the first thorax segment, but with a distinct groove between the two on the dorsal surface. Fourth thoracic segment strongly narrowed posteriorly; genital segment with projecting convex sides; abdomen made up of a single segment. Egg strings slender, eggs multiseriate and very numerous. Two pairs of filiform antennæ; one pair of stout, uncinate maxillipeds; three pairs of swimming legs, each biramose, the exopod 2-jointed, the endopod 1-jointed.

Type of the genus *Pherma curticaudatum*, new species. Monotypic.

Pherma curticaudatum,[2] new species

Figures 1 to 9

HABITAT AND RECORD OF SPECIMENS.—Three adult females, one of which bore egg strings, were taken from the parapodia of an unnamed annelid dredged from a depth of 645 fathoms by the Bureau of Fisheries steamer 'Albatross' off the coast of Lower California in April, 1911. These specimens are deposited in the Department of Lower Invertebrates of The American Museum of Natural History (Cat. No. 4617), where they become the types of the new genus and species.

SPECIFIC CHARACTERS OF THE FEMALE.—In addition to what has been given under the genus diagnosis we may append the following. General body form cylindrical, considerably swollen, widest across the third thoracic segment. Body segmentation somewhat indistinct but well indicated by lateral invaginations. Head fused with the first thoracic segment, but with the separation of the two marked by a dorsal groove. Head semielliptical and regularly rounded, one-half narrower than the first thoracic segment. Antennæ attached to the frontal margin on the dorsal surface and turned backward along the lateral margins. First thoracic segment barrel-shaped, one-half longer than the head; second and third segments increasing in length and width; fourth segment longer than the third but not as wide, considerably narrowed posteriorly. Fifth segment only one-third the width and one-seventh the length of the fourth segment, forming a slender waist in front of the genital segment. The latter one-third wider than the fifth segment with strongly convex sides, to the center of which are attached the egg strings. Abdomen made up of a single short

[1] φερμα, "a burden."
[2] *Curticaudatum*, "short tail."

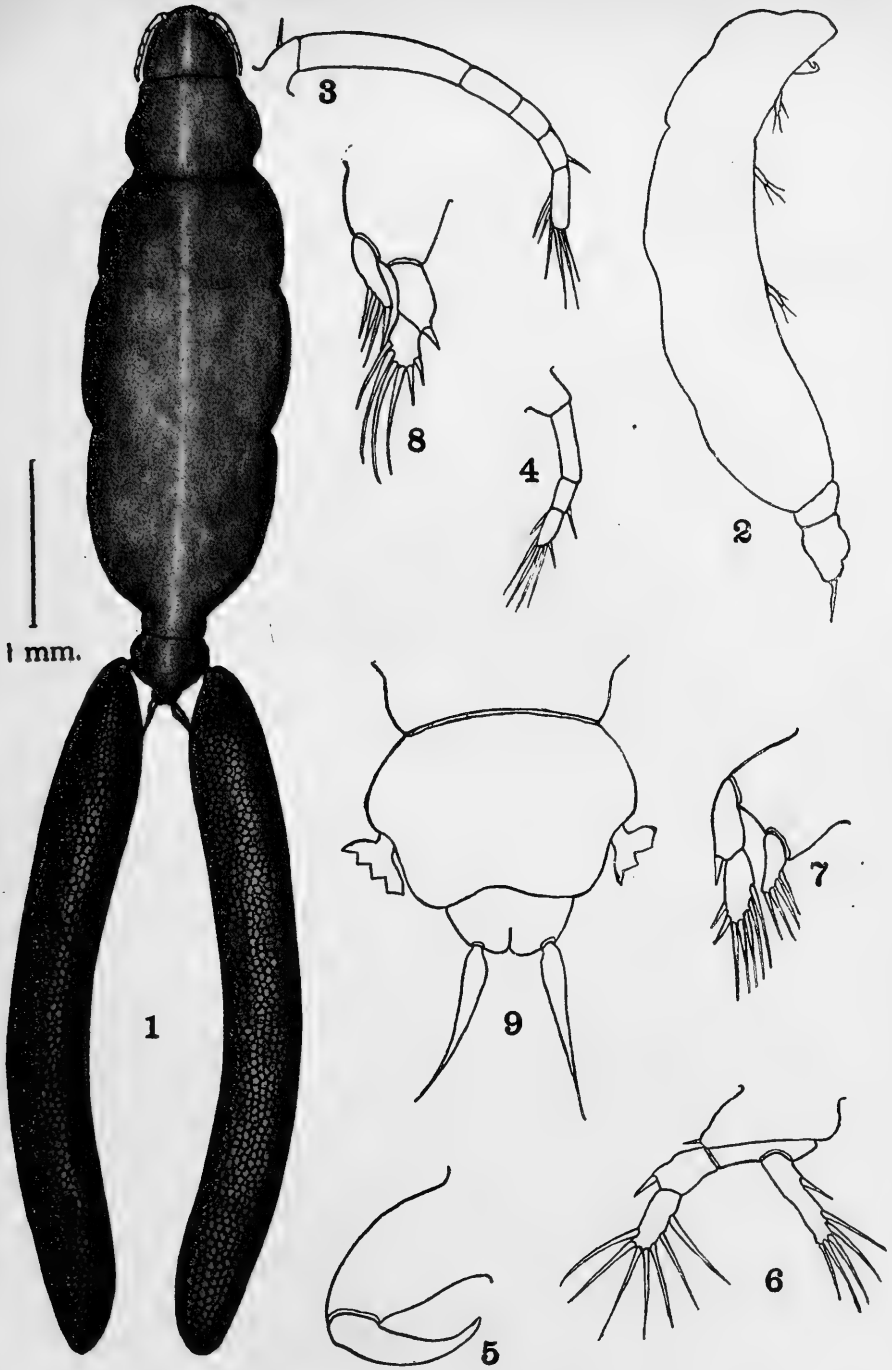

Fig. 1. Dorsal view of female. Fig. 2 Side view of another specimen without egg strings. Fig. 3. First antenna. Fig. 4. Second antenna. Fig. 5. Maxilliped. Figs. 6 to 8. First, second, and third swimming legs. Fig. 9. Ventral view of posterior body enlarged, showing abdomen and anal laminæ.

segment, one-third the width of the genital segment. Anal laminæ elongate-lanceolate, acuminate at the tips and destitute of setæ.

Egg strings cylindrical, slightly curved like parenthesis marks, tapered at both ends and about as long as the entire body. Eggs minute, irregularly arranged in about 25 rows, 75 to 80 eggs in each row. This is an unusually large number of eggs and indicates that the dangers encountered during development by this species are also unusually severe.

First antennæ 6-jointed, filiform and but slightly tapered; the relative lengths of the six joints may be expressed by the numbers 7, 33, 12, 8, 8, 12. The basal joint has a short seta near the center of its anterior margin, and the terminal joint has a tuft of setæ at the tip and several on its posterior margin. The second antennæ are immediately behind the first pair and are 4-jointed, the basal joint the shortest, the second joint as long as the third and fourth together. The third joint carries a small seta on its anterior margin at the distal corner; the terminal joint is tipped with a tuft of long setæ. The form of the mandibles and maxillæ could not be definitely ascertained from any of the three specimens. The maxillipeds are situated some distance behind the mouth and their basal joints are so large that they cover much of the ventral surface of the head. Each is composed of this basal joint and a curved terminal claw; they are evidently the organs of prehension. Color (preserved material), a uniform yellowish-brown without markings; egg strings light orange-yellow.

Length, 4.40 mm. Width of third thoracic segment, 1.25 mm. Egg strings, 4.35 mm. long, 0.50 mm. wide.

The points of particular interest about this new parasite are the very considerable depth at which it was found and the exceptionally large number of eggs in its egg strings. The way in which the parasite and host come together would be of great interest, and this in connection with the development stages of the copepod will form one of the most instructive problems for future development.

Scientific Results of the Expedition to the Gulf of California in Charge of C. H. Townsend, by the U. S. Fisheries Steamship 'Albatross' in 1911. Commander G. H. Burrage, U. S. N., Commanding.

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XII

Echinoderms From Lower California, with Descriptions of New Species: Supplementary Report

By Hubert Lyman Clark

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FRANK E. LUTZ, Editor

The following are the more recent papers on LOWER INVERTEBRATES. Orders should be addressed, Library, The American Museum of Natural History, 77th St. and Central Park West, New York City.

Notice of Two Very Large Lobsters in the Collection of The American Museum of Natural History. By R. P. Whitfield, 1899, Bulletin, XII, Art. 15, pp. 191–194, Pl. IX. 20c.

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Echinoderms from Lower California with Descriptions of New Species. By Hubert Lyman Clark, 1913, Bulletin, XXXII, Art. 8, pp. 185–236, Pls. XLIV–XLVI. 35c.

A New Slug from the Himalaya Mountains. By T. D. A. Cockerell, 1913, Bulletin, XXXII, Art. 41, pp. 617–619, 7 text figures. 10c.

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59.39(72.2)

Article VI.—ECHINODERMS FROM LOWER CALIFORNIA, WITH DESCRIPTIONS OF NEW SPECIES: SUPPLEMENTARY REPORT[1]

By Hubert Lyman Clark
Museum of Comparative Zoölogy, Cambridge, Massachusetts

When the collection of echinoderms made by the 'Albatross' Expedition to Lower California in the spring of 1911 was sent to me about ten years ago, by some mistake a considerable amount of material was not shipped. This was discovered and sent to me in the late fall of 1921 and, as it contains species not in the original lot, it seems desirable to publish this supplementary report.[2]

This second collection contains 462 specimens of 58 species, and no fewer than ten of these species were not represented in the first collection. Moreover, two of the ten additional species are new to science, though unfortunately each is represented by only a single broken specimen. The entire collection of echinoderms made by the 'Albatross' on her Lower California cruise, therefore, consisted of 2343 specimens of 117 species, of which nine were undescribed. There were 41 kinds of sea-stars, 34 of brittle-stars, 21 of echini and 20 holothurians, and a single specimen, in the supplementary collection, represents the comatulids or feather-stars. The presence of this comatulid, which is of an undescribed species, is perhaps the most interesting feature of the additional material.

More than a third of this second collection is from shore stations, of which San Francisquito Bay is easily the most important, 98 specimens of 10 species coming from there, two of these not being in the first collection. It is interesting to note that the remarkable new brittle-star, described beyond, was taken at Station 5694, which was noted in my first report as being the station where the most species were taken. Here, at a depth of 640 fms., no fewer than 19 species were collected. The new comatulid is from Station 5692, which is off Point San Tomas, west coast of Lower California, a region noted in my earlier report for the large number of species found there.

I desire to express here my thanks to Mr. Roy W. Miner, of The American Museum of Natural History, for courtesies in connection with the preparation of the present report.

[1]Scientific Results of the Expedition to the Gulf of California in charge of Dr. C. H. Townsend, by the U. S. Fisheries Steamship 'Albatross' in 1911; Commander G. H. Burrage, U. S. N., Commanding. XII. Published by permission of the U. S. Commissioner of Fisheries.

[2]The present report is supplementary to 'Echinoderms from Lower California, with descriptions of new species.' By Hubert Lyman Clark, 1913, Bull. Amer. Mus. Nat. Hist., XXXII, pp. 185–236, Pls. XLIV–XLVI.

Crinoidea

Trichometra europacifica, new species

Centro-dorsal relatively large, conical, covered by the cirrus sockets, which are arranged in about three horizontal series, no vertical series or radial groups being indicated.

Cirri about 20 in number, 4 or 5 mm. long, with 15 or 16 segments. The cirri at the apex of the centro-dorsal are noticeably smaller than those in the outer or marginal series. Basal segment almost discoidal, its length not one-half its thickness; second segment not quite so long as wide; third, distinctly longer than its distal diameter, which is greater than the proximal; fourth segment the longest of all, twice as long as the distal diameter, which is much greater than the proximal; the segment is nearly cylindrical where its diameter is least, proximal to the middle; the distal margin is flaring, especially on the dorsal side, where it projects considerably. Fifth segment very similar to fourth, but sixth and seventh are shorter and stouter. Succeeding segments each a trifle shorter and smaller than its predecessor, and the least diameter is at the proximal margin more and more clearly. But even the fifteenth and sixteenth segments are longer than their distal diameter. Sixteenth segment with a conspicuous opposing spine which is not quite so long as the diameter of the segment. Terminal claw moderately slender, slightly curved, about equal to the last segment in length.

Radials almost bowl-shaped, the width nearly three times the length in the median line, which is somewhat less than the lateral margins, as the distal margin is distinctly concave. The first costals are similar to the radials but are lower, the width being fully three times the length. Costal axillaries rhombic, about as long as broad, the margins slightly concave, the angles blunt and rounded; the anterior margins are swollen, flaring and a little roughened. Surface of all the I Br series otherwise quite smooth. Costals and axillaries scarcely in contact, but first brachials externally appressed; hence there is a distinct pit-like depression between the I Br series of adjoining radii.

Ten arms, all broken distally so the length can only be estimated; probably about 25 mm. long. First brachial short, its outer edge about twice as long as inner, its distal margin only a little concave and not at all flaring, and nearly smooth; second brachial irregularly pentagonal, about as long as thick; third and fourth brachials, united by syzygy, together longer than the second and therefore distinctly longer than broad; following brachials about as long as broad, except syzygial pairs, which distally probably occur at intervals of two bifascial articulations. Beyond the third brachial, the distal margin of each pinnule-bearing segment projects as a spiny knob, characteristic of the genus, but these knobs are not conspicuous and are best seen in a perfectly profile view of a dried arm; when thus viewed the dorsal median line of each brachial is distinctly concave.

Pinnules all broken and defective, but enough segments are left to show that all were very slender and distally filiform. In the first pinnule the basal joint is about as long as wide, the second is longer, the third still longer and the fourth is fully twice as long as thick. The distal segments on all the pinnules are extremely slender at middle, but conspicuously swollen at the joints. Genital glands are present on some of the basal pinnules.

Color very pale brown dorsally, the cirri nearly white; oral surface dark brown.

Type.—Cat. No. —, U. S. Nat. Mus., from Station 5692.

Station 5692. Off Pt. San Tomas, west coast of Lower California, 1076 fms. Bottom temp. 37.1°.

One specimen.

Owing to the locality and the fact that there was only a single small broken specimen, I was inclined to list this comatulid as *Thaumatometra parvula* (Hartlaub), in spite of the obviously different cirri, but Mr. Austin H. Clark suggested to me that the arms were evidently the arms of a *Trichometra* and the combination of characters shown by the cirri, pinnules, and arms clearly indicated an undescribed species. Oddly enough, the species most closely resembling this new one from the eastern Pacific is the little *Trichometra minutissima* A. H. Clark, from off the Brazilian coast in 818 fms. But the Atlantic species has a very different centro-dorsal, far more numerous cirri, much rougher costals and somewhat more slender pinnules. For convenience in comparing the two species, I have modeled my description of *europacifica* after the pattern of the original description of *minutissima* (1908, Proc. U. S. Nat. Mus., XXXIV, p. 233).

ASTEROIDEA

Astropecten erinaceus Gray

Astropecten erinaceus GRAY, 1840, Mag. Nat. Hist., (new series), VI, p. 182.

The present specimens are large, R=80 and 125 mm., and are conspicuously spiny. The color is the usual yellow-brown of dry sea-stars. In the larger specimen, r and br each=28 mm. and hence R=4.5 r.

Conception Bay, east coast of Lower California.

Two specimens.

Thrissacanthias penicillatus (Fisher)

Persephonaster penicillatus FISHER, 1905, Bull. U. S. Bur. Fish., XXIV, p. 297.
Thrissacanthias penicillatus FISHER, 1910, Ann. Mag. Nat. Hist., (8) V, p. 171.

These specimens are large adults, ranging from R=100 mm. to R=225 mm., and call for no special comment. They are merely additional specimens from four stations previously recorded, namely Stations 5694, 5697, 5698, and 5699.

Thirteen specimens.

Pectinaster agassizii (Ludwig)

Cheiraster agassizii LUDWIG, 1905, Mem. Mus. Comp. Zoöl., XXXII, p. 1.
Pectinaster agassizii LUDWIG, 1910, Sitz. K. Preuss. Akad. Wiss., XXIII, p. 449.

These specimens range in length of R from 15 to 55 mm. They are in part from Stations 5689 and 5692, whence they were previously

recorded, but there are 18 specimens from Station 5696. Off San Luis Obispo County, California, 440 fms. Bottom temp., 39.9°.

Forty-four specimens.

Nearchaster aciculosus (Fisher)

Acantharchaster aciculosus Fisher, 1910, Zool. Anz., XXV, p. 550.
Nearchaster aciculosus Fisher, 1911, Ann. Mag. Nat. Hist., (8) VII, p. 92.

These are simply five additional adult specimens from Station 5694. The length of R ranges from 90 to 150 mm.

Pseudarchaster pusillus Fisher

Pseudarchaster pusillus Fisher, 1905, Bull. U. S. Bur. Fish., XXIV, p. 304.

This is merely additional material from Station 5675. There are 18 specimens with R = 28 to 33 mm.

Ceramaster leptoceramus (Fisher)

Tosia leptocerama Fisher, 1905, Bull. U. S. Bur. Fish., XXIV, p. 306.
Ceramaster leptoceramus Fisher, 1911, Bull. U. S. Nat. Mus., No. 76, p. 210.

There are two additional specimens from Station 5675 with R = 35 to 40 mm. They seem to me more like *japonicus* than *leptoceramus*, except for the presence of abactinal radial secondary plates.

Oreaster occidentalis Verrill

Oreaster occidentalis Verrill, 1867, Trans. Connecticut Acad. Sci., I, p. 278.

The present large series shows great diversity in the number, distribution, and acuteness of the abactinal spines and the tubercles. The five radial spines near margin of disk are usually, but not always, conspicuous. A perfectly preserved specimen, which seems to have retained the living form very well, has R = 80 mm., r = 35 mm., br = 25 mm. and vertical diameter of disk = 45 mm. Hence R = 2.3r, 3br, and only 1.3 v.d. None of the specimens give any clue as to the color in life. The largest specimens have R = 105 mm.

San Francisquito Bay, east coast of Lower California. Carman Island, east coast of Lower California.

Thirty-two specimens.

Amphiaster insignis Verrill

Amphiaster insignis Verrill, 1868, Trans. Connecticut Acad. Sci., I, p. 373.

There is a single small specimen, with R = only 30 mm., from Conception Bay, east coast of Lower California.

Phataria unifascialis (Gray)

Linckia (*Phataria*) *unifascialis* Gray, 1840, Mag. Nat. Hist., (new series), VI, p. 285.

Phataria unifascialis, Sladen, 1889, 'Rep. Voy. 'Challenger,' Zoöl.,' XXX, p. 786.

These dried specimens from two additional localities have R = 55 to 80 mm.

Espiritu Santo Island, east coast of Lower California.

San Francisquito Bay, east coast of Lower California.

Twelve specimens.

Pharia pyramidata (Gray)

Ophidiaster (*Pharia*) *pyramidatus* Gray, 1840, Mag. Nat. Hist., (new series), VI, p. 284.

Pharia pyramidata Sladen, 1889, 'Rep. Voy. 'Challenger,' Zoöl.,' XXX, p. 784.

This well-known and characteristic "West coast" species was not represented in the first collection, but now there are some small specimens at hand, with R = 67 to 74 mm.

San Francisquito Bay, east coast of Lower California.

Three specimens.

Solaster borealis (Fisher)

Crossaster borealis Fisher, 1906, Proc. Washington Acad. Sci., VIII, p. 134.

Solaster borealis Fisher, 1911, Bull. U. S. Nat. Mus., No. 76, p. 320.

There is an additional specimen from Station 5694, with 11 rays, R = 30 mm., and another from Station 5696, with 11 rays, R = 50 mm.

Heterozonias alternatus (Fisher)

Crossaster alternatus Fisher, 1906, Proc. Washington Acad. Sci., VIII, p. 131.

Heterozonias alternatus Fisher, 1910, Ann. Mag. Nat. Hist., (8) V, p. 172.

Considerable additional material of this species is at hand from Stations 5694, 5697, and 5698. They show a good range in size, as R = 23 to 110 mm. One specimen has eleven rays; all the others ten.

Fourteen specimens.

Lophaster furcilliger Fisher

Lophaster furcilliger Fisher, 1905, Bull. U. S. Bur. Fish., XXIV, p. 312.

There are ten more specimens of this sea-star from Station 5694, with R ranging from 27 to 60 mm.

Peribolaster biserialis Fisher

Peribolaster biserialis Fisher, 1905, Bull. U. S. Bur. Fish., XXIV, p. 313.

There is another specimen from Station 5696, and it is the largest of those taken, as R = 20 mm.

Hymenaster perissonotus Fisher

Hymenaster perissonotus Fisher, 1910, Ann. Mag. Nat. Hist., (8) V, p. 170.

Two specimens from Station 5691 are much larger than those of the first collection, as R = about 60 mm.

Zoroaster evermanni Fisher

Zoroaster evermanni Fisher, 1905, Bull. U. S. Bur. Fish., XXIV, p. 317.

There are three specimens from Station 5699 with R = 135 to 152 mm. One has the big pedicellariæ characteristic of Fisher's subspecies *mordax*, but these are lacking in the other two. It is worth noting that the locality is on the border line, both geographically and bathymetrically, of the range of the subspecies.

Zoroaster ophiurus Fisher

Zoroaster ophiurus Fisher, 1905, Bull. U. S. Bur. Fish., XXIV, p. 315.

There are three additional specimens of this species from Station 5689, with R = 125 to 140 mm.

Myxoderma platyacanthum (H. L. Clark)

Zoroaster platyacanthus H. L. Clark, 1913, Bull. American Mus. Nat. Hist., XXXII, p. 199.

Myxoderma platyacanthum Fisher, 1919, Ann. Mag. Nat. Hist., (9) III, p. 393.

There are three additional specimens in the present collection, with R = 60 to 70 mm. They bear the label "D 5695. Mar. 15, 1911." This is clearly a mistake as the station number and date do not correspond. It is evident that these specimens are from the type locality, Station 5675, where collecting was done on March 15.

Fisher's further investigations into the anatomy of the Zoroasteridæ have established the generic rank of *Myxoderma* and have shown that the present species belongs in the genus.

Myxoderma sacculatum (Fisher)

Zoroaster (*Myxoderma*) *sacculatus* Fisher, 1905, Bull. U. S. Bur. Fish., XXIV, p. 316.

Myxoderma sacculatum Fisher, 1919, Ann. Mag. Nat. Hist., (9) III, p. 392.

This species is not recorded as in the first collection. There are five specimens from Station 5694, having R = 180 to 185 mm.

Heliaster kubiniji Xantus

Heliaster kubiniji Xantus, 1860, Proc. Acad. Nat. Sci. Philadelphia, p. 568.

In the present series of very poorly preserved specimens, there is great range in size, as R = 13 to 100 mm. The number of rays ranges

from 15 to 24, but all the large specimens have 23. There is one with 15 rays, one with 17, one with 19, one with 20, five with 21, five with 22, eight with 23, and one with 24.

Espiritu Santo.

San Francisquito Bay, east coast of Lower California.

Twenty-four specimens.

Asterias forreri De Loriol

Asterias forreri De Loriol, 1887, Rec. Zool. Suisse, IV, p. 401.

There is a very poorly preserved sea-star in the present collection with R = 95 mm. from San Francisquito Bay, which is evidently identical with the sea-stars from the same place which are recorded in the first report as *Asterias forreri*. As Fisher's revision of the Pacific coast Asteriidæ is not yet published, I let the name stand as in the former report, to prevent any possible confusion later on.

Ophiuroidea

Since the publication of the first report, the classification of the ophiurans has undergone quite a revolution and the sequence of the species is almost reversed. To facilitate comparison and prevent confusion, it seems best to follow the sequence of species that was used in the earlier report. Fortunately, no changes of nomenclature are necessitated by the activity of recent years in ophiuran taxonomy.

Ophiura leptoctenia H. L. Clark

Ophiura leptoctenia H. L. Clark, 1911, Bull. U. S. Nat. Mus., No. 75, p. 51.

An additional specimen, 6 mm. across the disk, from Station 5694 calls for no comment.

Ophiura superba (Lütken and Mortensen)

Ophioglypha superba Lütken and Mortensen, 1899, Mem. Mus. Comp. Zoöl., XXIII, p. 116.

Ophiura superba Meissner, 1901, Bronn's 'Thierreich,' II, pt. 3, p. 925.

There are six additional specimens, 14 to 28 mm. across the disk, from Station 5694. In one fairly perfect specimen, 18 mm. across the disk, the arms are 90 mm. long.

Ophiocten pacificum Lütken and Mortensen

Ophiocten pacificum Lütken and Mortensen, 1899, Mem. Mus. Comp. Zoöl., XXIII, p. 131.

Two badly damaged specimens, one from Station 5689 and one from 5694, are scarcely worth recording.

Ophiernus polyporus Lütken and Mortensen

Ophiernus polyporus Lütken and Mortensen, 1899, Mem. Mus. Comp. Zoöl., XXIII, p. 109.

An additional specimen, 13 mm. across the disk, from Station 5682 throws no light on the question of the validity of this species.

Ophiomusium glabrum Lütken and Mortensen

Ophiomusium glabrum Lütken and Mortensen, 1899, Mem. Mus. Comp. Zoöl., XXIII, p. 132.

There are five additional specimens from Station 5689. They are about 30 mm. across the disk and the arms are about 165 mm. long.

Ophiomusium jolliense McClendon

Ophiomusium jolliense McClendon, 1909, Univ. of California Publ., Zoöl., VI, No. 3, p. 36.

There is a typical example of this species, 7 mm. across the disk, in the present collection, but it was not represented in the material reported on previously.

Station 5682. Off Cape St. Lucas, Lower California, 491 fms. Bottom Temp. 40.8°.

One specimen.

Ophiomusium lymani Wyville Thomson

Ophiomusium lymani Wyville Thomson, 1873, 'The Depths of the Sea,' p. 172.

One of the 18 additional specimens now at hand from Station 5689 is larger than any in the earlier collection, measuring 32 mm. across the disk, while the others are from 13 mm. up.

Amphiura diomedeæ Lütken and Mortensen

Amphiura diomedeæ Lütken and Mortensen, 1899, Mem. Mus. Comp. Zoöl., XXIII, p. 151.

An additional, well-preserved specimen from Station 5694 has the disk 15 mm. across and the arms about 180 mm. long.

Amphipholis squamata (Delle Chiaje)

Asterias squamata Delle Chiaje, 1828, 'Mém. Anim. s. Vert.,' III, p. 74, Napoli.

Amphipholis squamata Verrill, 1899, Trans. Connecticut Acad. Sci., X, p. 312.

A tiny brittle-star with disk about 2 mm. across is evidently an *Amphipholis* but shows no characters by which it can be distinguished from the ubiquitous species of Europe and eastern North America. Of course, were it full grown, it might show distinctive characters, but, as it

is, no other course seems right than to refer it to the cosmopolitan *squamata*. There was no representative of the genus in the earlier collection. The present specimen bears the label—"Middle of east side of Cerros Island, March 12, 1911." This island is off the western coast of Lower California.

Ophiacantha normani Lyman

Ophiacantha normani Lyman, 1879, Bull. Mus. Comp. Zoöl., VI, p. 58.

There are 51 additional specimens of this common brittle-star from Station 5694. They range from 9 to 17 mm. across the disk.

Ophiacantha parasema[1], new species

Disk about 22 mm. in diameter and 8 to 10 mm. thick; arms all broken near base, 4 to 5 mm. wide, the longest basal piece little more than 10 mm. long. Disk covered with a rather thick soft skin, the surface of which bears numerous crowded, more or less circular, minute plates, each of which carried a single, very acute, slightly rough spine. These spines are relatively thick at the base and taper to the sharp point; they are considerably longer than the diameter of the plate and hence the disk appears to be crowded with them. The longest are about a millimeter in length. Radial shields completely concealed and apparently wanting, but when the inner surface of the disk is examined, they can be detected as thin, flat plates, about 3 mm. long and half as wide, lying side by side, nearly parallel but scarcely in contact.

Upper arm plates quadrilateral, overlapping, with distal margin strongly convex and lateral margins converging proximally. The basal plate has a slightly convex proximal region and the lateral margins are a little concave. It is about as long as wide, but all the succeeding plates are much wider than long. There are, however, only half a dozen upper arm plates on the longest arm fragment present and it is hard to say how much of their shortness and overlapping is due to the highly contracted condition of the arms. For the three fragments that are still attached to the disk are pulled back dorsally so strongly that the upper surface rests against the disk, much as occurs in the usual specimens of *Ophiotholia*, and, when forcibly laid down horizontally, their upper surfaces are markedly concave from the evident contraction of dorsal muscles. Side arm plates moderately large, the spine-bearing ridges prominent, not meeting above, but apparently meeting narrowly below between the under arm-plates. It is possible however that in a relaxed arm, lying horizontally, the distal margin of the under arm-plates would overlie and conceal the side arm plates in the median line. Each side arm plate bears 6 or 7 arm-spines, of which the uppermost is probably the longest, or the next to the uppermost perhaps, and the lowest shortest; as all are broken, neither their actual nor relative lengths can be determined. They are glassy, acicular, longitudinally ridged and somewhat rough, but not thorny; the longest was evidently longer than the arm segment and apparently equalled two segments at least. Under arm plates small, depressed at center so that they are distinctly concave, quadrilateral, with rounded corners and concave lateral margins. They are not in contact in the present condition of the arms.

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[1] παράσημος = spurious, in reference to its not being a typical member of the genus.

Tentacles long and basally large, scarcely contracted at all. Tentacle pores large, guarded by three tentacle-scales which were apparently somewhat spiniform, but as all are broken at the tip their actual form is uncertain.

Interbrachial spaces below covered with thin, soft skin, with a few spine-bearing scales like those of the dorsal surface; these are most numerous, naturally, near the disk margin and are wanting near the mouth. Genital slits conspicuous, especially orally, margined by well-developed genital plates and at the oral end by the adoral plates and side arm plates. Oral shields conspicuous, nearly three times as wide as long, except the madreporite in which the length almost equals the width; the proximal margin has a distinct sharp median angle, but the narrow lateral angles are rounded. Adoral plates L-shaped, the tip of each branch expanded, especially the shorter; they meet broadly in front of oral shield, but abut on the first under arm plate at the other end. Oral plates rather large and a little swollen. Teeth in a vertical series of about 4, bluntly pointed, about twice as long as wide. Oral papillæ 4 on each side, the smallest ones distalmost, the largest at apex of jaw; the largest are as long as the teeth but not quite so wide. Besides the oral papillæ, the sides of the jaw are armed with conspicuous oral tentacle-scales; the first oral pore is guarded by two large ones, as big as the smaller oral papillæ but of course above them (apparently below, when the mouth-parts are being examined); the outer pore is guarded by three similar spiniform scales which are nearly at the same level and in line with the oral papillæ. Color pale gray.

TYPE.—Cat. No. —, U. S. Nat. Mus., from Station 5694.

Station 5694. Southwest of Santa Cruz Island, California, 640 fathoms.

One specimen.

The actual relationships of this brittle-star are dubious, owing to the defective condition of the specimen. The swollen disk and dorsally contracted arms, with the apparent absence of radial shields, remind one of *Ophiotholia*, but the mouth-parts are quite like many species of *Ophiacantha*. If the distal part of the arms were present, we should be better able to decide whether the relationship to *Ophiotholia* is at all close. Under existing conditions, it seems better to put the species in *Ophiacantha*, although it is obvious that it is not closely related to any species of that genus. The whole family of the Ophiacanthidæ needs revision with a careful comparison of internal skeletal plates which have hitherto been largely ignored. When this revision is made there will no doubt be a considerable increase in the number of genera which should be recognized.

Ophiocoma æthiops Lütken

Ophiocoma æthiops LÜTKEN, 1859, 'Add. ad Hist.,' pt. 2, p. 145.

A very small brittle-star bearing every indication of being an *Ophiocoma*, and certainly not *O. alexandri*, is referred to this Panamic species. The disk is less than 2 mm. across, prettily variegated, as are

the arms, with yellow-brown and cream-color. Accompanying this specimen is a slip on which is written: "Lower California on oyster shells. No locality label." Only a single specimen of *æthiops* was in the original collection and that was from Angel de la Guardia Island in the Gulf of California.

Ophiocoma alexandri Lyman

Ophiocoma alexandri Lyman, 1860, Proc. Boston Soc. Nat. Hist., VII, p. 256.

A young specimen of this species, 4 mm. across the disk and yellow-brown in color, is very finely preserved, but, like the young *æthiops*, it is accompanied by a slip reading "Lower California. No locality label. On oyster shells."

Ophiothrix spiculata Le Conte

Ophiothrix spiculata Le Conte, 1851, Proc. Acad. Nat. Sci. Philadelphia, V, p. 318.

There are 30 very badly preserved small specimens of this common Panamic brittle-star with the disk 2 to 7 mm. across. They bear a label "D 5695" but this locality is obviously wrong, as the depth at Station 5695 was 534 fms. and *spiculata* is essentially a littoral species. It has been recorded from depths near the 100 fms. line, but that is extreme. The label with the specimens bears the date April 26, 1911 and the specimens themselves indicate that they were taken in very shallow water.

Astroschema sublæve Lütken and Mortensen

Astroschema sublæve Lütken and Mortensen, 1899, Mem. Mus. Comp. Zoöl., XXIII, p. 187.

There are two more specimens from Station 5695, one an adult with disk 13 mm. across and arms fully 200 mm. long, but only 3 mm. in diameter; the other very young, with disk smooth, only 2 mm. across and arms so tightly coiled on the gorgonian, on which both it and the adult are borne, that they cannot be measured.

Asteronyx excavata Lütken and Mortensen

Asteronyx excavata Lütken and Mortensen, 1899, Mem. Mus. Comp. Zoöl., XXIII, p. 185.

There is a single additional specimen, 22 mm. across the disk, on a gorgonian from Station 5688.

Echinoidea

Eucidaris thouarsii (Agassiz and Desor)

Cidaris thouarsii Agassiz and Desor, 1846, Ann. Sci. Nat., VI, p. 326.
Eucidaris thouarsii Döderlein, 1887, 'Jap. Seeigel,' p. 42.

There are some good representatives of this species in the present collection and they show no little diversity in form. For example, one 42 mm. in diameter is 24 mm. high, v.d. thus equal to less than .60 h.d., while another specimen 58 mm. in diameter is 41 mm. high, v.d. equaling more than .70 h.d. In the best-preserved specimens the spines are nearly or quite equal to the diameter of the test. In one specimen there are 7 or 8 coronal plates in a series, while in another there are 9 or 10, a very large number for *thouarsii*. The specimens from Espiritu Santo bear a label reading "Enemies of pearl oyster at propagating plant." It seems highly improbable that this can be a fact, though it may be the impression of the pearl-shell growers. It would be interesting to know in just what way the sea-urchin is supposed to injure the pearl shells.

Espiritu Santo.

San Francisquito Bay, east coast of Lower California.

Six specimens.

Centrostephanus coronatus (Verrill)

Echinodiadema coronata Verrill, 1867, Trans. Connecticut Acad., I, p. 294.

Centrostephanus coronatus A. Agassiz, 1872, Illust. Cat. Mus. Comp. Zoöl., VII, p. 97.

There are five unusually large specimens at hand, 45 to 50 mm. h.d.: thus twice as big as the largest in the earlier collection. The coloration too indicates maturity, for the banded spines of the young are no longer in evidence. Although all of the primaries have the tips broken off, they are long enough to show the absence of bands; they are deep claret distally but browner basally.

San Francisquito Bay, east coast of Lower California.

Astropyga pulvinata (Lamarck)

Cidarites pulvinata Lamarck, 1816, 'Anim. s. Vert.,' III, p. 59.

Astropyga pulvinata Agassiz and Desor, 1846, Ann. Sci. Nat., VI, p. 345.

This interesting sea-urchin was not represented in the former collection, but there is a fine series at hand now, ranging from 15 to 95 mm. in diameter. Unfortunately, they are not in the best of condition, the small ones in particular being more or less damaged. On the larger specimens the spines are mostly missing or broken. The most interesting feature of these Astropygas is the coloration. All specimens of *pulvinata* which I have seen hitherto have had a dull greenish ground color, in marked contrast to the deep red of *A. radiata*. The present specimens however show that the ground color in *pulvinata* is deep, purplish red at and above the ambitus and that the greenish color of dry museum mate-

rial is due to the peeling off and loss of the red epidermis, which appears to flake off and disappear very easily. A very constant feature of the coloration of *pulvinata*, conspicuous in all but one of the present series, is a yellowish triangular spot in each interradius just above the ambitus. This is usually visible even in the greenish specimens and is very noticeable in the red ones. Apparently this spot is pale yellow, or possibly even white, in life.

San Francisquito Bay, east coast of Lower California.

Fifteen specimens.

Arbacia incisa (A. Agassiz)

Echinocidaris incisa A. Agassiz, 1863, Bull. Mus. Comp. Zoöl., I, p. 20.

Arbacia incisa H. L. Clark, 1913, Bull. American Mus. Nat. Hist., XXXII, p. 220.

There is a fine series of this species in the present collection, for the most part in good condition. They range from 10 to 38 mm. in diameter. The relative length of the primary spines shows some diversity; in the individual with the test 38 mm. h.d., the spines are 39 mm. long, but in one having h.d. 16 mm. the spines are 23 mm. long. Half a dozen of the specimens lack a locality label but the others are from San Francisquito Bay, east coast of Lower California.

Twenty specimens.

Clypeaster speciosus Verrill

Clypeaster speciosus Verrill, 1870, American Journ. Sci., (2) XLIX, p. 95.

This fine clypeastroid was not represented in the first collection, but beautifully preserved specimens are now at hand, 76 mm. long, 66 mm. wide and 18 mm. high. They have the lower side very flat and the color is a deep, dull purple.

San Esteban Island, Gulf of California.

Two specimens.

Encope californica Verrill

Encope californica Verrill, 1871, Trans. Connecticut Acad. Sci., I, p. 586.

This remarkable clypeastroid was also wanting in the earlier collection, although two other species of *Encope* were represented. The three species are easily distinguished from each other and show no tendency to intergrade or hybridize. It is possible that they do not occur together at any given place, but that each species has its own particular habitat. The 'Albatross' collections indicate that *californica* and *grandis* occur at the same locality and that *grandis* and *micropora* are

both found at Tiburon Island, but that of course does not prove that they are actually living together at the same spot.

The specimens of *californica* in the present lot show interesting diversity in the proportions of length and breadth. A typical specimen is 93 mm. long and 93 mm. wide, but three others are 95 by 93, 104 by 101 and 116 by 110. As a rule, the length is slightly greater than the width, but occasionally the width is greater; thus one specimen 109 mm. long is 112 mm. wide. The color of the dry specimens is brown, with a marked violet tinge around the lunules and along the margin.

Conception Bay, east coast of Lower California.

Twenty-one specimens.

Encope grandis Agassiz

Encope grandis Agassiz, 1841, 'Monogr. Echin., Scutelles,' II, p. 75.

There are additional specimens of this extraordinary creature at hand from new localities. The length exceeds the width, the measurements being 98 by 93 mm. and 100 by 98.

Conception Bay, east coast of Lower California.

San Francisquito Bay, east coast of Lower California.

Two specimens.

Urechinus loveni (A. Agassiz)

Cystechinus loveni A. Agassiz, 1898, Bull. Mus. Comp. Zoöl., XXXII, p. 79.

Urechinus loveni Mortensen, 1907, 'Dan. Ingolf.-Exp., IV, Echinoidea,' pt. 2, p. 50.

There are two additional specimens of this odd and fragile sea-urchin from Station 5684. One is 78 mm. long, 57 mm. wide and 35 mm. high, while the other is 75 by 44 mm.

Schizaster townsendi A. Agassiz

Schizaster townsendi A. Agassiz, 1898, Bull. Mus. Comp. Zoöl., XXXII, p. 82.

Additional material from Station 5697 consists of eight more or less complete specimens, 40 to 50 mm. long, and fragments of others.

Brissopsis pacifica (A. Agassiz)

Toxobrissus pacificus A. Agassiz, 1898, Bull. Mus. Comp. Zoöl., XXXII, p. 83.

Brissopsis (*Toxobrissus*) *pacifica* Mortensen, 1907, 'Dan. Ingolf.-Exp., IV, Echinoidea,' pt. 2, p. 44.

There are 42 additional specimens, 10 to 30 mm. long, and many fragments, from Station 5675.

Holothurioidea

Molpadia musculus Risso

Molpadia musculus Risso, 1826, 'Hist. Nat. Princip. Product. Europe Mer.,' p. 293.

There is a single *Molpadia* from Station 5684, in fine condition, 80 mm. long by 25 mm. in diameter where largest, and with the caudal portion 13 mm. long. The color is pale gray and there are no phosphatic bodies. The calcareous particles seem to warrant referring it to this species, but it is certainly not a typical example.

Cucumaria abyssorum Théel

Cucumaria abyssorum Théel, 1886, 'Rep. Voy. 'Challenger,' Zool.,' XXXIX, p. 66.

There are two additional specimens from Station 5684 and five from 5691. They are well preserved and several show their ten tentacles. They are 50 to 95 mm. long and in the largest the genital papilla is conspicuous.

Psolus squamatus (O. F. Müller)

Holothuria squamata O. F. Müller, 1776, Proc. Zool. Dan., p. 232.

Psolus squamatus McAndrew and Barrett, 1857, Ann. Mag. Nat. Hist., (2) XX, p. 45.

There is another large *Psolus* at hand from Station 5695, measuring 80 mm. long by 55 mm. wide and 30 mm. high. It seems to me almost incredible that these specimens can really have been taken at a depth of 534 fms. and not show any differences to distinguish them from specimens taken in shallow water on the Norwegian coast. The species of *Psolus* are in need of critical revision and the Pacific coast material is not at present sufficient to make such a revision satisfactory.

Thyonepsolus nutriens H. L. Clark

Thyonepsolus nutriens H. L. Clark, 1901, Zool. Anz., XXIV, p. 168.

There is a small psolid at hand with only the unsatisfactory label "Gulf of California" to indicate whence it came. It is 12 mm. long by 6.5 mm. wide and about 4 mm. high. The calcareous deposits in the sole can be roughly grouped in three classes and are almost exactly like those of *Psolidium dorsipes* Ludwig. But the dorsal surface is quite unlike *Psolidium* and is exactly as described for *Thyonepsolus*, soft, thick, with no visible scales or plates, and very numerous pedicels not arranged in longitudinal series. The validity of *Thyonepsolus* has been questioned and some have relegated the genus to the synonymy of *Psolidium*, but

the examination of the present specimen confirms my belief that it is a recognizable, natural group. In one respect, however, this specimen from the Gulf of California is unlike those from Monterey, California, and that is in the deposits of the sole. It is probable, however, that my original description failed to recognize the diversity to be found in these desposits.

Benthodytes sanguinolenta Théel

Benthodytes sanguinolenta Théel, 1882, 'Rep. Voy. 'Challenger,' Zool.,' XIII, p. 104.

There are three fairly well preserved specimens of this deep sea holothurian, 125 to 175 mm. long, but they have with them no locality label. The 'Albatross' met with the species at four stations in depths exceeding one thousand fathoms.

Pseudostichopus mollis Théel

Pseudostichopus mollis Théel, 1886, 'Rep. Voy. 'Challenger,' Zool.,' XXXIX, p. 169.

There are three additional specimens from Station 5695. They are smooth, shiny white, and 110 to 150 mm. long.

Stichopus parvimensis H. L. Clark

Stichopus parvimensis H. L. Clark, 1913, Bull. American Mus. Nat. Hist., XXXII, p. 234.

A young *Stichopus* only 40 mm. long seems to belong to this species. The dorsal papillæ have very dark tips.

Point San Bartolomé, west coast of Lower California. "Boat dredge."

Holothuria lubrica Selenka

Holothuria lubrica Selenka, 1867, Zeitschr. f. w. Zool., XVII, p. 329.

The specimens listed in the earlier report bore no locality label, but of those now at hand only two lack such a label. The specimens run from 20 to 160 mm. in length, the last being a maximum for the species. It is interesting to note that the species occurs on both sides of Lower California as well as far up in the Gulf.

Angel de la Guardia Island, Gulf of California.

Pichilingue Bay, east coast of Lower California.

Santa Maria Bay, west coast of Lower California.

Eight specimens.

Holothuria monacaria (Lesson)

Holothuria (*Psolus* Oken) *monacaria* Lesson, 1830, 'Cent. Zool.,' p. 225.
Holothuria monacaria Jaeger, 1833, 'De Holoth.,' p. 24.

A small holothurian, 60 mm. long from Pichilingue Bay, east coast of Lower California, seems to represent this Indo-Pacific species, although it has not previously been recorded from the coast of America. A much smaller specimen, 15 mm. long, with no locality label other than "Lower California," is too young for certain identification, but may, for want of a better place, be referred to this species. I have little doubt however, that when the genus *Holothuria* is critically and carefully revised, the range of true *monacaria* will not include the western coast of America.

Scientific Results of the Expedition to the Gulf of California in Charge of C. H. Townsend, by the U. S. Fisheries Steamship 'Albatross,' in 1911. Commander G. H. Burrage, U. S. N., Commanding

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XIII

The Brachyuran Crabs Collected by the U. S. Fisheries Steamer 'Albatross' in 1911, Chiefly on the West Coast of Mexico

By Mary J. Rathbun

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FRANK E. LUTZ, Editor

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A Bibliography of Fishes, Vol. II, 1917. Authors' Titles L–Z, pp. 1–702. By Bashford Dean, Edited by Charles Eastman. $5.50

Fresh-water Fishes of the Congo Basin Obtained by the American MuumseCongo Expedition, 1909–1915. By John Treadwell Nichols and Lu dlow Griscom. With Field Notes by the Collectors, Herbert Lang

59.53,842(72.2)

Article XX.—THE BRACHYURAN CRABS COLLECTED BY THE U. S. FISHERIES STEAMER 'ALBATROSS' IN 1911, CHIEFLY ON THE WEST COAST OF MEXICO[1]

By Mary J. Rathbun

Plates XXVI to XXXVI

The number of species in this list is 56, which by no means represents the existing fauna of the region. There are, however, a number of new and rare species which add value to the collection. A new species of *Sesarma* has already been described from Magdalena Bay, and the males of two unknown species of *Pinnotheres* are described below; these may later on be linked up with the females of the species, which are perhaps already described. The differences in shape and general appearance between males and females of this genus are usually too great for one to identify both sexes of a species unless they are found associated. A series of *Pilumnus* from Lower California enables the author to establish the presence of two closely allied species with continuous ranges which overlap at Magdalena Bay. The ranges of various species are extended, including those of *Lophopanopeus heathii*, *Panopeus bradleyi* and *Collodes tumidus*. Also noteworthy is the presence in the collection of a well-developed specimen of *Pliosoma parvifrons*, a species of rare occurrence.

A considerable collection of young stages, chiefly crab megalopa, was obtained. It is impossible to identify all of them with certainty, as our knowledge of the development of these creatures is still very limited. It has been thought best to publish drawings of the different forms, that future students who contrive to raise the young from the eggs may be able to classify them. The drawings of larvæ were made by Dr. Charles J. Fish, of the Bureau of Fisheries, who is making an intensive study of the plankton of the Woods Hole region. He has suggested the generic position of several of the Lower Californian larvæ which are akin to others on the Atlantic side.

Dromiidæ

Dromidia larraburei Rathbun

Dromidia sarraburei (by error) Rathbun, 1910, Proc. U. S. Nat. Mus., XXXVIII, October 20, p. 553, Pl. xlviii, fig. 4.

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[1]Scientific Results of the Expedition to the Gulf of California in charge of Dr. C. H. Townsend, by the U. S. Fisheries Steamship 'Albatross' in 1911; Commander G. H. Burrage, U. S. N., commanding. XIII. Published by permission of the U. S. Commissioner of Fisheries.

Dromidia segnipes Weymouth, 1910, Leland Stanford Jr. Univ. Publ., Univ. Ser., No. 4, November 12, p. 15, Pl. 1, figs. 1–2.

Dromidia larraburei Schmitt, 1921, Univ. Calif. Publ. Zoöl., XXIII, p. 183, Pl. xxxiii, fig. 1.

Magdalena Bay: Sail Rock, Entrada Point, S. 53° W.; Redondo Point, S. 15° W.; lat. 24° 35′ 20″ N., long. 111° 59′ 35″ W.; 13.5 fathoms; S. brk. Sh.; March 21; station D5678; 2 small ♀; one "had a large compound ascidian on its back."

Without locality label; 1 ♀, soft-shell.

See also list of larvæ.

Hypoconcha digueti Bouvier

1898, Bull. Mus. Hist. Nat., Paris, IV, pp. 374 and 376.

San Estaban Island; 1 ♂ without chelipeds. Length of carapace 10.2 mm., width 10.6 mm.

The type female came from La Paz Bay.

Calappidæ

Cycloes bairdii Stimpson

Cyclois bairdii Stimpson, 1860, Ann. Lyc. Nat. Hist. N. Y., VII, p. 237 [109].

Cape San Lucas; March 23; 2 ♂ 1 ♀.

Portunidæ

Portunus (Portunus) xantusii (Stimpson)

Acheloüs xantusii Stimpson, 1860, Ann. Lyc. Nat. Hist. N. Y., VII, p. 222 [94].

Point San Bartholome; 2 juv. Also with boat dredge; March 13; 3 ♂ 5 ♀.

Santa Maria Bay; boat dredge; March 18; 100 juv.

Magdalena Bay: Sail Rock, Entrada Point, S. 53° W.; Redondo Point, S. 15° W.; lat. 24° 35′ 20″ N., long. 111° 59′ 35″ W.; 13.5 fathoms; S. brk. Sh.; March 21; station D5678; 1 ♂ 1 ♀.

Cape San Lucas; March 23; 6 ♂ 8 ♀ (2 ovigerous).

Pichilinque Bay: By electric light; March 27; 6 ♂ 1 ♀ 16 juv. April 18; 6 ♂ 1 ovigerous ♀. By electric light; 1 juv.

San Josef Island; March 31; 1 ♂ 1 ♀.

Agua Verde Bay; April 1; 1 juv.

Without locality label; 59 juv.

Arenæus mexicanus (Gerstæcker)

Euctenota mexicana Gerstæcker, 1856, Arch. f. Naturg., XXII, pt. 1, p. 131, Pl. v, figs. 3 and 4.

Ballenas Bay; March 16; 1 ♂ 1 ♀.

Callinectes arcuatus Ordway

1863, Boston Journ. Nat. Hist., VII, p. 578.

San Jose del Cabo; March 26; 2 ♂ 2 ♀ (1 immature, 1 soft-shell).

Callinectes bellicosus (Stimpson)

Lupa bellicosa Stimpson, 1859, Ann. Lyc. Nat. Hist. N. Y., VII, p. 57 [11].

Point San Bartholome: With boat dredge; March 13; 3 ♂ 2 ♀. March 14; 1 ♂. In seine; 4 juv.

Abreojos Point; March 16; 2 ♀.

Ballenas Bay; March 16; 2 ♂ juv., 1 ♀ juv.

S. end of Magdalena Bay; March 20; 10 ♂ 2 ♀.

Pichilinque Bay: By electric light; March 27; 6 juv. March 29; 1 ♂ juv.

Agua Verde Bay; April 2; 2 immature ♀.

Mulege, at mouth of river; in 100-foot seine; April 4; 1 ♂.

Ricason Island, Concepcion Bay; April 7; 8 ♂ 2 ♀.

Cronius ruber (Lamarck)

Portunus ruber Lamarck, 1818, 'Hist. Nat. Anim. sans Vert.,' V, p. 260.

Amphitrite edwardsii Lockington, 1877, Proc. Calif. Acad. Sci., VII, 1876, p. 43 [3].

Point San Bartholome; in seine; March 14; 2 ♂ 2 ♀.

Atelecyclidæ

Pliosoma parvifrons Stimpson

Plate XXVI

1860, Ann. Lyc. Nat. Hist. N. Y., VII, p. 228 [100], Pl. III, fig. 6.

Cape San Lucas; March 23; 1 ♂. Carapace 20 mm. long, 18.8 mm. wide.

The specimen is larger than those collected by Xantus and is better developed. The spines are reduced in size, the gastric, hepatic and two inner branchial prominences being scarcely more than tubercles. The first ambulatory leg is nearly twice as long as the carapace; the cheliped is stronger than the legs and one and two-thirds times as long as the carapace; surface finely granulate except on distal half of fingers; merus subcylindrical, carpus subspherical; propodus a little compressed, increasing in width gradually and regularly almost to the fingers where the lower margin bows outward, giving the fixed finger a sinuous edge and making a considerable gape between the proximal halves of the fingers, into which a very low, broad tooth projects from the dactylus; meeting edges crenulate.

Cancridæ

Cancer jordani Rathbun

1900, Amer. Nat., XXXIV, p. 133.

Middle of east side of Cerros Island; March 12; 1 ♀.

Cancer amphiœtus Rathbun

1898, Proc. U. S. Nat. Mus., XXI, p. 582.

Middle of east side of Cerros Island; March 12; 1 juv.
Santa Maria Bay; with boat dredge; March 18; 2 juv.

Xanthidæ

Leptodius occidentalis (Stimpson)

Chlorodius occidentalis Stimpson, 1871, Ann. Lyc. Nat. Hist. N. Y., X, p. 108.

Pichilinque Bay; March 27; 5 ♂ 3 ♀.
Agua Verde Bay; April 1; 3 ♂.

Xanthodius hebes Stimpson

1860, Ann. Lyc. Nat. Hist. N. Y., VII, p. 208 [80].

Pichilinque Bay; March 27 and 29; 16 ♂ 17 ♀.
Agua Verde Bay; April 1; 2 ♂ 8 ♀ (1 ovigerous).
San Francisquito Bay; April 9; 1 ♀.

Cycloxanthops novemdentatus (Lockington)

Xanthodes? novem-dentatus Lockington, 1877, Proc. California Acad. Sci., VII, 1876, p. 32.

Point San Bartholome; in seine; 1 ♀.

Glyptoxanthus labyrinthicus (Stimpson)

Actæa labyrinthica Stimpson, 1860, Ann. Lyc. Nat. Hist. N. Y., VII, p. 204.

San Francisquito Bay; beach; April 9; 1 ♂.

Panopeus bradleyi Smith

1869, Proc. Boston Soc. Nat. Hist., XII, p. 281.

Santa Maria Bay; with boat dredge; March 18; 1 ♀.
Head of Concepcion Bay; April 6; 1 ♂.

Eurypanopeus planissimus (Stimpson)

Xantho planissima Stimpson, 1860, Ann. Lyc. Nat. Hist. N. Y., VII, p. 205.

Agua Verde Bay; April 1; 1 ♂.
San Francisquito Bay; beach; April 9; 4 ♂.

Micropanope nitida Rathbun

1898, Proc. U. S. Nat. Mus., XXI, p. 587, Pl. XLII, fig. 9.

Agua Verde Bay; April 1; 1 ♂ 3 ♀.

Locality not given; 23 ♂ 16 ♀ 1 juv.

Lophopanopeus heathii Rathbun

1900, Amer. Nat., XXXIV, p. 137.

Middle of east side of Cerros Island; March 12; 1 ♂ and carapace.

Pilumnus spinohirsutus (Lockington)

Plate XXVII

Acanthus spino-hirsutus Lockington, 1877, Proc. California Acad. Sci., VII, 1876 pp. 33 and 102.

Pilumnus spino-hirsutus Streets and Kingsley, 1877, Bull. Essex Inst., IX, p. 107.

Pilumnus spinohirsutus Rathbun, 1904, 'Harriman Alaska Exped.,' X, p. 185 (part), not Pl. VII, fig. 2; 1910, Proc. U. S. Nat. Mus., XXXVIII, p. 585 (part).

Point Abreojos; March 6; 1 ♂.

Magdalena Bay: Sail Rock, Entrada Point, S. 53° W.; Redondo Point, S. 15° W.; lat. 24° 35′ 20″ N., long. 111° 59′ 35″ W.; 13.5 fathoms; S. brk. Sh.; March 21; station D5678; 1 ♂ 1 ♀ 2 juv.

Occurs in southern California and on the west coast of Lower California as far south as Magdalena Bay.

From Magdalena Bay southward as far as Manzanillo, including the Gulf of California, *P. spinohirsutus* is replaced by a form which I formerly regarded as a variation, but a considerable series of both sorts from many localities shows consistent differences.

Lockington's types are not extant. His description would apply to either species, according to the reader's interpretation of this sentence: ". . . four larger spines on antero-lateral margin of carapax, besides those on upper margin of orbit." Did he include the spine at the outer angle of the orbit with the antero-lateral spines or with the upper orbital spines? We can judge only by the locality of his specimens, San Diego, which is included in the range of the northern species, and from which the National Museum possesses two specimens belonging to that species. In it, there are four antero-lateral spines beside the outer orbital spine; the latter therefore was classed by Lockington with "those on upper margin of orbit."

The species have much in common. In both, the dorsal surface of carapace and appendages is covered with long hairs, except the hinder part of the carapace, while the carapace and ambulatory legs have a short

coat of pubescence. The carapace is very convex antero-posteriorly, slightly convex from side to side. The antero-lateral margins are armed with long spines, the orbit and the front with shorter spines. Chelipeds spinous above and also on the outer surface of the palms except on the lower portion of the larger palm. On the legs, the upper surface of the carpus-propodus and the distal extremity of the merus are spined.

The differences are as follows:

P. spinohirsutus	*P. townsendi*
Antero-lateral spines 5; the first or orbital spine is a little shorter than the others and the space between first and second is less than the other spaces, the bases of those spines often contiguous, so that they appear like one deeply bifid spine.	Antero-lateral spines 4, equally separated.
No subhepatic spine, although there may be some small spinules.	A slender, well-marked, subhepatic spine, below the interval between first and second lateral spines.
Frontal spines short.	Frontal spines longer.
In male usually half of outer surface of larger hand is smooth and naked, the smooth area separated obliquely from the rough area by a line running from the lower proximal corner to the distal end opposite the middle of base of dactylus. In female the smooth space is similar to, but smaller than, that of the male.	In both sexes less than half of outer surface of larger hand is smooth. A continuous line of short, conical spines runs lengthwise in line with the base of cutting edge of propodal finger.
Carapace wider, width (exclusive of spines) more than $1\frac{1}{3}$ times length.	Carapace narrower, width (exclusive of of spines) $1\frac{1}{3}$, or less than $1\frac{1}{3}$, times length.

P. spinohirsutus runs larger than the next species, measuring 23.4 mm. (Cat. No. 32964, U. S. N. M.) in total length of carapace as contrasted with 14.2 in *townsendi* (type).

P. spinohirsutus shows a tendency to produce a posterior branch on the third lateral spines.

Pilumnus townsendi,[1] new species

Plate XXVIII

Pilumnus spinohirsutus RATHBUN, not Lockington, 1904, 'Harriman Alaska Exped.,' X, p. 185 (part), Pl. VII, fig. 2; 1910, Proc. U. S. Nat. Mus., XXXVIII, p. 585 (part).

[1]For Dr. Charles H. Townsend, in charge of the 1911 expedition.

Type-locality.—Off Adair Bay, Gulf of California, Mexico; 17 fathoms; station 3026, 'Albatross'; 2 females (1 is holotype).

Type.—Cat. No. 17413, U. S. N. M.

Measurements.—Female holotype, length of carapace on median line 13.8, length including spines 14.2, width excluding spines 18.3, including spines 21.4 mm.

Specimens Collected by the 1911 Expedition.—

Magdalena Bay: Sail Rock, Entrada Point, S. 53° W.; Redondo Point, S. 15° W.; lat. 24° 35′ 20″ N., long. 111° 59′ 35″ W.; 13.5 fathoms; S. brk. Sh.; March 21; station D5678; 1 ♂ 1 ♀.

Head of Concepcion Bay; April 6; 1 ♂ 3 juv.

A lot containing 1 ♀, 3 juv., is labeled "Station 5695," obviously incorrect, as the depth at that station is 534 fathoms.

Range.—Magdalena Bay to Manzanillo, via Gulf of California, to a depth of 22 fathoms.

For description of this species and its relations, see under *Pilumnus spinohirsutus*, above.

Pilumnus gonzalensis Rathbun

1893, Proc. U. S. Nat. Mus., XVI, p. 240.

San Francisquito Bay; April 9; 2 ♀.

Eurytium affine (Streets and Kingsley)

Panopeus affinis Streets and Kingsley, 1877, Bull. Essex. Inst., IX, p. 106.

Pichilinque Bay; March 27; 3 ♂ 1 ♀.

Eriphia squamata Stimpson

1859, Ann. Lyc. Nat. Hist. N. Y., VII, p. 56 [10].

Agua Verde Bay; April 1; 1 ♂ 1 ♀.

Pichilinque Bay; March 27; 5 ♂ 8 ♀ (3 ovigerous).

Mazatlan; 1 propodus of right cheliped.

Pinnotheridæ

Pinnotheres jamesi,[1] new species

Plate XXIX, Text Figures 1 and 2

Type-locality.—Pichilinque Bay, Lower California; by electric light; 1 male.

Type.—Cat. No. 57005, U. S. N M.

Measurements.—Length of carapace of type male 3.7 mm., width the same.

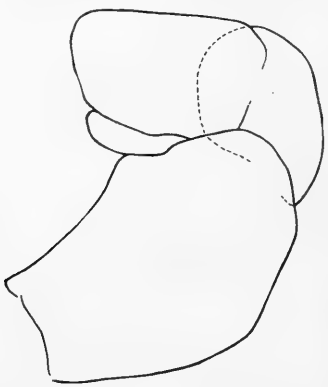
Diagnosis of Male.—Carapace hard, nearly circular, bordered with hair around lateral angles. Last leg very much smaller than the others. Male abdomen extremely long and narrow.

Description of Male.—Carapace subcircular, inclining toward the hexagonal, broadest at the middle of its length; evenly convex in all directions; surface smooth and shining except for a narrow border of pubescence, 1.4 mm. long, embracing the

[1]For Mr. Arthur Curtiss James, a patron of the expedition.

widest part of the carapace. Posterior margin 2.3 mm. long, slightly curved; postero-lateral margin thickened over the last pair of legs. Front 1.2 mm. wide, nearly truncate, extremities curved; middle part bent under and ending in a point.

Chelipeds shorter than first leg and very little stouter. Margins of chelipeds and legs hairy. Palm increasing in width distally; fingers with a small tooth near base of inner edges, tips curved toward each other. The legs are similar in form, their relative lengths represented by 2.3.1.4, the second longest, fourth very much shorter than the others, its merus not reaching the middle of the merus of the third leg; in all, the margins of the merus are subparallel, the upper margin of the propodus is slightly arched, the dactylus is strongly curved, gradually tapering, but with a very slender tip; the carpus-propodus of the second and third legs has a fringe of long hairs on the posterior surface which proceed from near the upper margin.



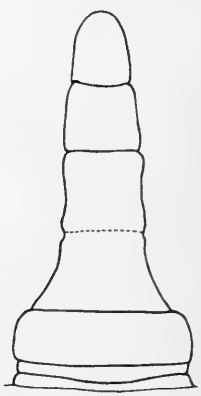


Fig. 1. *Pinnotheres jamesi*, left outer maxilliped of ♂ holotype, × 77.5.
Fig. 2. *Pinnotheres jamesi*, abdomen of ♂ holotype, × 18.

The abdomen is very narrow and long, reaching to the buccal cavity; the first two segments are linear, the third occupies little more than half the width of the sternum, its ends rounded; fourth and fifth segments fused, the line of union partially visible; the fourth tapers a little, the fifth is nearly square; the sixth is a little shorter than the fifth and narrows slightly to the seventh, which is suboblong with rounded tip.

This species belongs to the same group as *P. concharum*[1]; it differs from male *concharum* in its rounder carapace with pubescence along the lateral angles instead of around the anterior half of the carapace, in the broader front, the more convex posterior margin, the shorter and broader legs, especially noticeable in the propodus, the longer and differently shaped abdomen. The outer maxilliped is akin to that of *P. reticulatus*,[2] from the Gulf of California, which is known only from the female and has no other obvious relation to *P. jamesi*.

[1]Rathbun, 1918, Bull. U. S. Nat. Mus., No. 97, p. 86, Pl. xx, figs. 3–6, text-fig. 42.
[2]*Op. cit.*, p. 93, Pl. xxi, figs. 1 and 2.

Pinnotheres pichilinquei, new species

Plate XXX; Text Figures 3 to 5

Type-locality.—Pichilinque Bay, Lower California; by electric light; March 27; 4 males.

Type.—Cat. No. 57004, U. S. N. M.

Measurements.—Length of carapace of type male 4.4 mm., width 4.3 mm.

Diagnosis of Male.—Pubescent. Carapace deeply sculptured. Chelipeds very heavy. Legs subequal.

Description of Male.—Carapace subhexagonal, the postero-lateral regions deeply hollowed, the posterior ambulatory leg fitting into the hollow; surface covered with a dense soft pubescence which forms a smooth, as opposed to a ragged, surface, but does not conceal the inequalities of the shell. Cardiac region surrounded by a deep groove except posteriorly; branchial and gastric regions grooved in such a

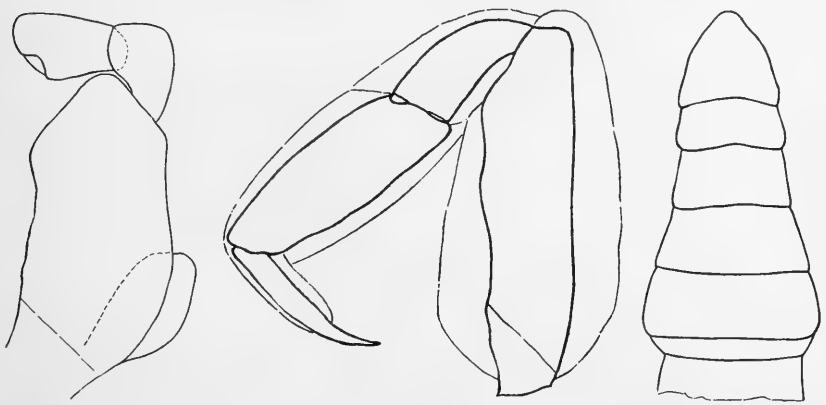


Fig. 3. *Pinnotheres pichilinquei*, left outer maxilliped of ♂ paratype, × 33⅓.

Fig. 4. *Pinnotheres pichilinquei*, right first ambulatory leg of ♂ paratype, × 27. The outer line marks the extent of the fringe of hair.

Fig. 5. *Pinnotheres pichilinquei*, abdomen of ♂ paratype, × 27.

way as to form a regular pattern; hepatic region depressed. Front viewed from above, advanced, broadly subtriangular, edge arcuate; viewed from before, the front is deflexed and pointed. Orbits round, eyestalks stout, corneæ smaller but of good size and black. Antennules when folded bulging; antennæ as long as one-half width of front.

Chelipeds pubescent like the carapace and with a dense short fringe on the inner border; they are stout; carpus somewhat nodose, chela thick and high; palm with upper surface concave, outer surface with two longitudinal grooves; lower margin of propodus convex from one end to the other; fingers heavy, meeting when closed, tips slender and crossing; a small tooth near base of each finger.

Ambulatory legs similar, diminishing slightly from first to fourth pair; carpus-propodus broader than merus, and having a fringe of long hairs attached on the posterior surface just below the upper margin, the hairs lying against the surface; dactyli slender, long, curved.

Color.—The preserved specimens show a great deal of dark color on the carapace; in the type-specimen the front is light with a narrow, dark, median line, the extreme rear is light, the remainder is dark shading to nearly black; chelipeds and legs mostly light.

This is the Pacific counterpart of *P. shoemakeri*[1] which inhabits the Gulf of Mexico and the West Indies. The Atlantic species has a longer carapace with smaller areoles and wider furrows; the fingers are narrower and the legs much slenderer.

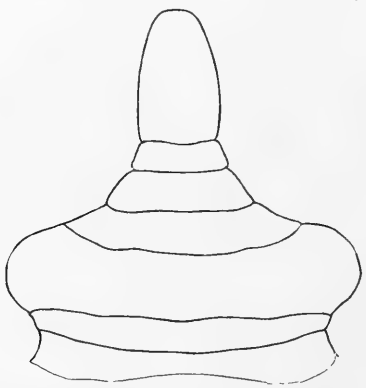


Fig. 6. *Parapinnixa nitida*, Pichilinque Bay, abdomen of ♂, × 27.

Parapinnixa nitida (Lockington)

Text Figure 6

Pinnixa (?) nitida Lockington, 1877, Proc. California Acad. Sci., VII, 1876, p. 155 [11], part (type-locality, Angeles Bay).

Parapinnixa nitida Rathbun, 1918, Bull. U. S. Nat. Mus., No. 96, p. 107, text-fig. 58, and synonymy.

Pichilinque Bay; by electric light; 1 ♂.

Carapace 2.6 mm. long, 5.6 mm. wide. The male is similar in shape to the female which is known to us only through Holmes's figure, the type specimen itself being no longer extant. Just behind the front there is a transverse furrow which laterally curves forward until it meets the upper margin of the orbit. The carpus and propodus, taken together, are more nearly of a size in the first three ambulatory legs than is represented in Holmes's figure where the second and third legs were narrowed by perspective.

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[1]Rathbun, 1918, Bull. U. S. Nat. Mus., No. 97, p. 95, Pl. xxii, figs. 1–4, text-fig. 48.

Dissodactylus nitidus Smith

1870, Trans. Connecticut Acad. Arts and Sci., II, p. 173.

Santa Maria Bay; from boat dredge; March 18; 6 ♂ 2 ♀.

GRAPSIDÆ

Grapsus grapsus (Linnæus)

Cancer grapsus LINNÆUS, 1758, 'Sys. Nat.,' 10 Ed., I, p. 630.

South end of Cerros Island; March 10; 1 ♂.
Santa Maria Bay; March 18; 2 ♂.
San Estaban Island; April 13; 1 ♂.
Label illegible; 1 ♂.

Geograpsus lividus (Milne Edwards)

Grapsus lividus MILNE EDWARDS, 1837, 'Hist. Nat. Crust.,' II, 1837, p. 85.

Pichilinque Bay; March 27; 2 ♀ (1 ovigerous).

Pachygrapsus crassipes Randall

1840, Journ. Acad. Nat. Sci. Philadelphia, VIII, 1839, p. 127.

Guadalupe Island; March 2; 1 ♂ 1 ♀.
E. San Benito Island; March 9; 1 ♂ 2 ♀ (1 ovigerous).
W. San Benito Island; March 9; 4 ♂ 2 ♀.
S. end of Cerros Island; March 10; 6 ♂ 8 ♀.
Santa Maria Bay; March 15; 1 ♂.
Point Abreojos; March 16; 1 ♂ 3 ♀ (1 soft-shell).
Margarita Island; March 19; 3 ♀.
Tiburon Island; April 12; 1 ♀.

Pachygrapsus transversus (Gibbes)

Grapsus transversus GIBBES, 1850, Proc. Amer. Assoc. Adv. Sci., III, p. 181.

Pichilinque Bay; March 27; 1 ovigerous ♀.
Agua Verde Bay; April 1; 2 ♂ 1 ovigerous ♀.

Goetice americanus, new species[1]

Plate XXXI; Text Figure 7

Hemigrapsus oregonensis RATHBUN, Bull. U. S. Nat. Mus., No. 97, p. 270 (part).

TYPE-LOCALITY.—San Luis Gonzales Bay, Lower California (gulf side), Mexico; March 27, 1889; 'Albatross'; 70 males; 41 females (27 ovigerous). One male is holotype. A set of paratypes has been placed in the American Museum.

TYPE.—Cat. No. 17452, U. S. N. M.

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[1]Not represented in the 1911 collection. Published here by permission of the Smithsonian Institution.

Measurements.—Male holotype, length of carapace 14, greatest width 15.8, width between outer orbital angles 14.4 mm.

Description.—Dorsal aspect very much as in *Hemigrapsus oregonensis*. In specimens of equal carapace length, the width is a little less, both at the widest part and at the orbital angles, than it is in *oregonensis*, the posterior of the lateral teeth is smaller, the granulated ridge setting off the steep postero-lateral region is fainter, the blunt ridge just above and parallel to the margin of the front is more extensive, punctate and smoother than in *oregonensis*.

The most noticeable difference in the species is in the outer maxillipeds; the ischium is distinctly smaller than the merus and diminishes in width from the distal to the proximal end, its distal margin is concave forward except for a smooth arcuate lobe at the inner end which is strongly produced forward and partially overlaps the merus; merus elongate; palpus strongly developed, reaching, when it is folded in place, quite to the ischium.

Fig. 7. *Goetice americanus*, left outer maxilliped of ♂ paratype (Cat. No. 17452, U. S. N. M.), × 8.

The chelipeds in the well-developed male are very heavy and equal; palms high height greater than length measured from articulation with carpus to sinus between fingers; anterior margin of palm very oblique; tip of immovable finger curved upward, wider than tip of dactylus; dactylus slender, a large lobe near its base, the distal half of which has a crenulated edge, continued also along the edge of the dactyl as far as the tip; a large brush of coarse hair occupies the greater part of the inner surface of the palm.

Ambulatory legs of moderate size and bordered with long, soft hair.

Abdomen of male narrow, the sides converging little from the third to the middle of the sixth segment.

Variation.—There is considerable variation in individuals from the same locality. Large specimens have not always as well developed chelipeds as smaller specimens. The two chelipeds may be unlike, one with a tooth on the dactyl, the other without a tooth, and with meeting fingers, similar to those of females and young. Most of the specimens of the type lot including all the females are devoid of hair on the legs; in a lot from Guaymas, there is a greater proportion of hairy individuals, including some females.

Range.—From San Bartolome Bay, on the west coast of Lower California to the Gulf of California where it has been found at Guaymas, Puerto Refugio on Angel Island, and at San Luis Gonzales Bay. It was not taken by the 1911 expedition of the 'Albatross.'

Hemigrapsus oregonensis, with which this species was formerly confounded, does not occur in Mexico farther south than Todos Santos Bay on the west coast of Lower California just below the United States line (not Todos Santos near the tip of the peninsula).

The genus *Goetice*,[1] distinguished by the form of the outer maxillipeds, has not before been noted in America. Its type species, *G. depressus* (de Haan),[2] is a common shore crab in Japan; it differs from the American species in its carapace narrowed behind instead of squarish and the articulation of merus and ischium of endognath of outer maxillipeds more oblique. Male abdomen and chelipeds similar, except that the inner surface of the palm is bare in *depressus*.

Sesarma (holometopus) magdalenense Rathbun

Plate XXXII

1918, Bull. U. S. Nat. Mus., No. 97, p. 305, Pl. lxxxvi.

Type-locality.—Mangrove Island, Magdalena Bay, Lower California; March 20, 1911; 'Albatross'; 8 ♂ 8 ♀ (1 ♂ is type).

Type.—Cat. No. 45793, U. S. N. M.

Measurements.—Type male, length of carapace 11.6 mm., width between the outer angles of the orbits 14.2 mm., width at postero-lateral angles 13.1 mm.

Carapace distinctly broader than long, broadest at the outer angles of the orbit, diminishing posteriorly, a very shallow sinus in the lateral margins behind the antero-lateral angles. Surface for the most part smooth and shining, depressions moderately deep; pits of two sorts, a few large scattered ones visible to the naked eye, and numerous small ones, which become crowded on the anterior branchial region. On the anterior and antero-lateral regions, there are a few scale-like granules. Antero-lateral angle a well-marked tooth.

Front about three-fifths as wide as carapace, surface nearly vertical, with the lower edge advanced; front widening below, lower margin arcuate, outer corners rounded; surface uneven, wrinkled and unevenly granulate with fine, depressed granules; superior frontal lobes nearly smooth and feebly separated, the middle pair the wider.

Chelipeds of male massive; merus and carpus covered on the outer surface with short granulated rugæ; chelæ high, swollen; immovable finger short, high, horizontal; dactylus strongly arched. Palm with lower margin very arcuate, its upper surface with several longitudinal, broken lines of fine granules, its outer surface, as well as the upper surface of the proximal half of the dactylus, covered with fine scabrous granules; fingers punctate, gaping; basal half of prehensile edge of the

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[1] Gistel, 'Natur. Thierreichs,' 1848, p. x.

[2] *Grapsus* (*Platynotus*) *depressus* de Haan, 'Fauna Japon., Crust.,' 1835, p. 63, Pl. viii, fig. 2, Pl. *D* (mouth-parts, *Platynotus*).

dactylus cut out in a deep sinus, into which projects a crenulated tooth of the immovable finger; both fingers irregularly dentate.

The chelipeds of the female have both fingers horizontal and longer than the immovable finger of the male; they do not gape, and the teeth fit rather closely together. In the young male the chelæ are intermediate in form between those of the adult male and of the female, and the gape is lacking.

Ambulatory legs with merus-joints rather short, (in the fourth pair 2¼ times as wide as long), widening distally, and crossed by fine short rugæ; dactyli slender, longer than their respective propodi measured on the outer or anterior margin.

Abdomen of male broadly triangular; terminal segment as broad as long. Appendages of first segment rather slender, tips oblique.

Color.—Specimens preserved in alcohol have a greenish-blue carapace mottled with purple; upper, proximal half of chelæ reddish-brown; upper surface of legs covered with a pattern of fine dots of dark purple on a light ground.

This species is unlike other American Sesarmæ in its faintly marked frontal lobes, which give it much the appearance of a *Metasesarma*, e.g., *M. rousseauxi* Milne Edwards[1] and *M. aubryi* (A. Milne Edwards).[2] In *Sesarma magdalenense*, however, the inner orbital lobe, although large, does not meet the angle of the front and exclude the antenna from the orbit.

Gecarcinidæ

Cardisoma crassum Smith

1870, Trans. Connecticut Acad. Arts and Sci., II, p. 144, Pl. v.

Agua Verde Bay; 1 ♀.

Ocypodidæ

Ocypode occidentalis Stimpson

1860, Ann. Lyc. Nat. Hist. N. Y., VII, p. 229.

Cape St. Lucas; March 23; 3 ♂.

Carmen Island: with 175-foot seine; April 3; 3 ♂ 3 ♀. April 7; 2 ♂.

Uca crenulata (Lockington)

Gelasimus crenulatus Lockington, 1877, Proc. California Acad. Sci., VII, 1876, p. 149.

Mangrove Island, Magdalena Bay; March 20, 1911; 4 ♂.

Agua Verde Bay; April 2; 1 ♂.

Head of Concepcion Bay; April 6; 13 ♂.

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[1] 1853, Ann. Sci. Nat., Zoöl., (3) XX, p. 188 [154].

[2] *Sesarma* (*Holometopus*) *aubryi* A. Milne Edwards, 1869, Nouv. Arch. Mus. Hist. Nat. Paris, V, p. 29.

Parthenopidæ

Heterocrypta macrobrachia Stimpson

1871, Ann. Lyc. Nat. Hist. N. Y., X, p. 103.

Magdalena Bay: Sail Rock, Entrada Point, S. 53° W.; Redondo Point, S. 15° W.; lat. 24° 35′ 20″ N., long. 111° 59′ 35″ W.; 13.5 fathoms; S. brk. Sh.; March 21; station D5678; 1 juv.

Majidæ (=Inachidæ)

Stenorynchus debilis (Smith)

Leptopodia debilis Smith, 1871, Rept. Peabody Acad. Sci., 1869, p. 87.

Without locality label; 1 ovigerous ♀.

Podochela hemphillii (Lockington)

Microrhynchus hemphillii Lockington, 1877, Proc. California Acad. Sci., VII, 1876, p. 30 [3].

San Estaban Island; April 14; 1 ♂.

"Station D5679"; 1 ♂. As the depth at this station is 325 fathoms, the label is probably erroneous.

Eucinetops panamensis Rathbun

1923, Proc. Biol. Soc. Washington, XXXVI, p. 73.

San Francisquito Bay; beach; April 9; 1 ♂, soft-shell.

Euprognatha bifida Rathbun

1893, Proc. U. S. Nat. Mus., XVI, p. 231.

Middle of east side of Cerros Island; March 12; 3 ♂ 2 ♀.

Collodes granosus Stimpson

1860, Ann. Lyc. Nat. Hist. N. Y., VII, p. 194 [66], Pl. II, fig. 4.

Cape San Lucas; March 23; 1 ovigerous ♀.

Collodes tumidus Rathbun

1898, Proc. U. S. Nat. Mus., XXI, p. 569, Pl. XLI, fig. 1.

Middle of east side of Cerros Island; March 12; 1 ♀ juv.

Inachoides tuberculatus (Lockington)

Inachus tuberculatus Lockington, 1877, Proc. California Acad. Sci., VII, p. 30.

Santa Maria Bay; with boat dredge; March 18; 1 ♂ 4 ♀.

Without locality label; 3 ♂ 3 ♀.

Epialtus sulcirostris Stimpson

1860, Ann. Lyc. Nat. Hist. N. Y., VII, p. 198 [70].

Santa Maria Bay; with boat dredge; March 18; 1 ♂.

Epialtus nuttallii (Randall)

Libinia nuttallii Randall, 1840, Journ. Acad. Nat. Sci. Philadelphia, VIII, 1839, Pl. III.

W. San Benito Island; March 9; 1 ♀ juv.

Loxorhynchus grandis Stimpson

1857, Proc. Boston Soc. Nat. Hist., VI, p. 85.

Point San Bartholome; 1 ♀. This is farther south than the species has hitherto been recorded.

Chorilia longipes Dana

1851, Amer. Journ. Sci., (2) XI, p. 269.

W. of Point Buchon, California: Pine Mountain, N. 42° E.; lat. 35° 18′ 30″ N., long. 121° 28′ W.; 440 fathoms; temp. 39.9° F.; April 27; station D5696; 1 ♂ 1 ♀.

W. of San Nicolas Island, California: lat. 33° 13′ 30″ N., long. 120° 04′ 30″ W.; 451 fathoms; April 26; station D5693; 4 ♂ 3 ♀.

Chionoecetes tanneri Rathbun

1893, Proc. U. S. Nat. Mus., XVI, p. 76, Pl. IV, figs. 1–4.

Taken at the following localities off the California coast:

Off Carmelo Bay: lat. 36° 30′ N., long. 122° W.; 659 fathoms; gn. M.; temp. 37.9° F.; April 27; station D5699; 7 ♂ 9 ♀.

Off Point Sur: Point Sur, N. 6° W.; Juniperro Mountain, N. 47° E.; lat. 35° 50′ N., long. 121° 49′ 30″ W.; 475 fathoms; temp. 39.9° F.; April 27; station D5698; 8 juv.

W. of Piedras Blanca: Silver Peak, N. 40° E.; Pine Mountain, N. 75° E.; lat. 35° 35′ N., long. 121° 39.8′ W.; 485 fathoms; gn. M. bk. S.; temp. 39.8° F.; April 27; station D5697; 14 juv.

W. of Point Buchon: Pine Mountain, N. 42° E.; lat. 35° 18′ 30″ N., long. 121° 28′ W.; 440 fathoms; temp. 39.9° F.; April 27; station D5696; 2 large ovigerous ♀, 2 ♂, 3 ♀ immature, and 16 juv.

N. W. of San Nicolas Island: lat. 33° 33′ N., long. 120° 17′ 30″ W.; 534 fathoms; gn. S. Glob.; temp. 38.9° F.; April 26; station D5695; 1 large ♂, 4 juv.

N. W. of San Nicolas Island: lat. 33° 24′ 36″ N., long. 120° 12′ 30″ W.; 640 fathoms; gn. M.; April 26; station D5694; 1 immature ♀, 1 juv.

The specimens are of various sizes and have very slender spines on the margins and also in the two dorsal branchial lines, one transverse, the other oblique. The slender meropodites of the legs are very narrow, not at all dilated, although tapering gradually to the distal end and are bristling with sharp spines especially on both margins.

Length of largest specimen (male) on median line 124.4 mm., width between lower branchial margins (finely spined) 135 mm.

Libinia setosa Lockington

1877, Proc. California Acad. Sci., VII, 1876, p. 68 [6].

Santa Maria Bay; with boat dredge; March 18; 1 ♂ 2 ♀ 13 juv.
Without locality label; 4 juv.

Thoe sulcata Stimpson

1860, Ann. Lyc. Nat. Hist. N. Y., VII, p. 177.

San Francisquito Bay; beach; April 9; 1 ♂.

Pitho picteti (Saussure)

Othonia picteti Saussure, 1853, Rev. et Mag. de Zool., (2) V, p. 357, Pl. xiii, fig. 2.

Without locality label; 1 ♂.

Mithrax sinensis Rathbun

1892, Proc. U. S. Nat. Mus., XV, p. 266, Pl. xxxviii, fig. 2.

San Estaban Island; 1 ♂.

Stenocionops triangulata (Rathbun)

Pericera triangulata Rathbun, 1892, Proc. U. S. Nat. Mus., XV, p. 246, Pl. xxxii, fig. 1.

Magdalena Bay: Sail Rock, Entrada Point, S. 53° W.; Redondo Point, S. 15° W.; lat. 24° 35′ 20″ N., long. 111° 59′ 35″ W.; 13.5 fathoms; S. brk. Sh.; March 21; station D5678; 1 ♀ juv.

Microphrys triangulatus (Lockington)

Mithraculus triangulatus Lockington, 1877, Proc. California Acad. Sci., VII, 1876, p. 73 [11].

San Josef Island; March 31; 1 ♂.
Agua Verde Bay; April 2; 1 ♂.
Without locality label; 1 ♂.

Microphrys branchialis Rathbun

1898, Proc. U. S. Nat. Mus., XXI, p. 577, Pl. xli, fig. 5.

Magdalena Bay: Sail Rock, Entrada Point, S. 53° W.; Redondo Point, S. 15° W.; lat. 24° 35′ 20″ N., long. 111° 59′ 35″ W.; 13.5

fathoms; S. brk. Sh.; March 21; station D5678; 1 immature ♂, the chelipeds slightly developed, scarcely larger than the first ambulatory leg.

List of Larval Forms

Dromidia larraburei

Cape San Lucas, ship's anchorage, taken by electric light; one megalops, 5 mm. long. (See Pl. XXXIII, fig. 4.)

Point San Bartholome; one megalops, lacking chelipeds.

Middle of east side of Cerros Island, March 12, one female, early postlarval stage.

As *D. larraburei* is the only dromiid in the region, the identification of the above is reasonably certain.

Carmen Island, southeast side, taken by electric light; one megalops, 2.9 mm. long. (See Pl. XXXIII, fig. 3.) This and the following forms are placed under *Dromidia* on account of the great development of the coxa of the hind legs.

Cape San Lucas; 5 megalopa, 3 mm. long. (See Pl. XXXIII, figs. 1 and 2.)

Callinectes

Cape San Lucas; 50+ megalopa, 5 mm. long. (See Pl. XXXVI, fig. 3.)

Cape San Lucas; 50+ megalopa, of two sizes. Seem to be the same as the figured lot.

Carmen Island, southeast side, taken by electric light; 50+ megalopa. Perhaps same as the two preceding lots.

San Francisquito Bay, taken by electric light; about 10 megalopa, with legs broken off. Perhaps belong here.

There are three species of *Callinectes* in the region; *arcuatus*, *toxotes* and *bellicosus*. The first two were described from Cape San Lucas; *bellicosus* is as near the Cape as La Paz on the one side and Magdalena Bay on the other. According to Dr. Fish, the megalopa figured is almost identical with that of *Callinectes sapidus* of the Atlantic coast.

Portunidæ, genus unknown, perhaps *Callinectes*

Cape San Lucas; 3 megalopa, 6.6 mm. long. (See Pl. XXXVI, fig. 4.)

Pliosoma (?), or *Libinia* (?)

Carmen Island, southeast side; one megalops, 2.2 mm. long. (See Pl. XXXVI, fig. 2.) Dr. Fish says that this closely resembles an Atlantic species of *Libinia*.

Pachygrapsus crassipes (?)

Cape San Lucas; one megalops.

Guadalupe Island, taken by electric light, March 3; 25+ megalopa, 6 mm. long. (See Pl. XXXIV, figs. 1 and 2.) The large size indicates a large species of Grapsoid.

Sesarma (*Holometopus*) *magdalenense*

Carmen Island, southeast side, taken by electric light; one megalops.

Cape San Lucas; 3 megalopa, 5.5 mm. long. (See Pl. XXXIV, figs. 3–5.)
Cape San Lucas, ship's anchorage, taken by electric light; 5 megalopa.

The larvæ show (Pl. XXXIV, fig. 5) the humped movable finger peculiar to *S. magdalenense* (Pl. XXXII).

Grapsoid. A pair of pigment spots on each abdominal somite.

Point San Bartholome; one megalops.
Benito Island; 6 megalopa, 5 mm. long. (See Pl. XXXV, figs. 4–6.)

Grapsoid, different from the preceding. Body thick, color reddish in alcohol, speckled.

Cape San Lucas; 20 megalopa, 2.3 mm. long. (See Pl. XXXV, figs. 1–3.)

Libinia setosa

Cape San Lucas; 4 megalopa, 3.15 mm. long. (See Pl. XXXVI, fig. 1.) Dr. Fish says that this is very similar to an Atlantic species of *Libinia*, the rostrum of which is more pointed. The only *Libinia* known from Cape San Lucas is *L. setosa*. Another Mexican form, *L. mexicana*, has been taken only at the extreme head of the Gulf of California.

Plate XXVI

Pliosoma parvifrons

Fig. 1. Cape San Lucas, ♂, carapace 20 mm. long, dorsal view.
Fig. 2. Same specimen, ventral view.

1

2

Plate XXVII

Pilumnus spinohirsutus

Fig. 1. Female (Cat. No. 54763, U. S. N. M.), carapace 17.2 mm. long, dorsal view.

Fig. 2. Same specimen, ventral view.

1

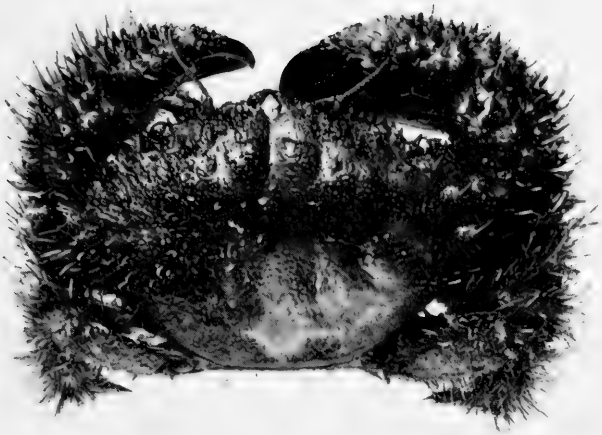

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Plate XXVIII

Pilumnus townsendi

Fig. 1. Female holotype, carapace 13.8 mm. long, dorsal view. The second lateral tooth counting from the orbit is below the margin of the carapace.

Fig. 2. Same specimen, ventral view.

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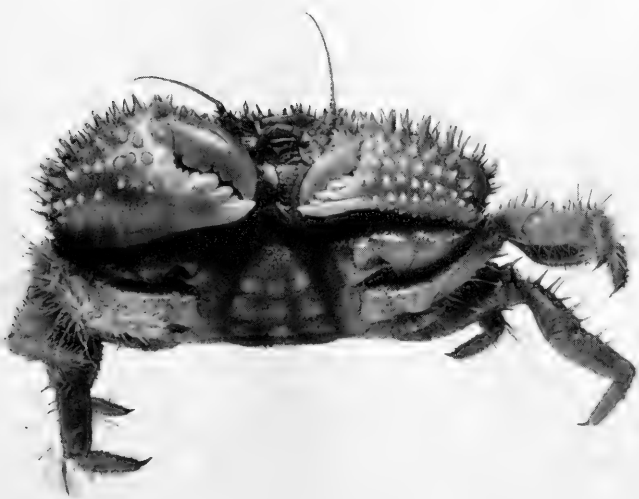

Plate XXIX

Pinnotheres jamesi

Fig. 1. Male holotype, carapace 3.7 mm. long, dorsal view.

Fig. 2. Same specimen, ventral view.

1

2

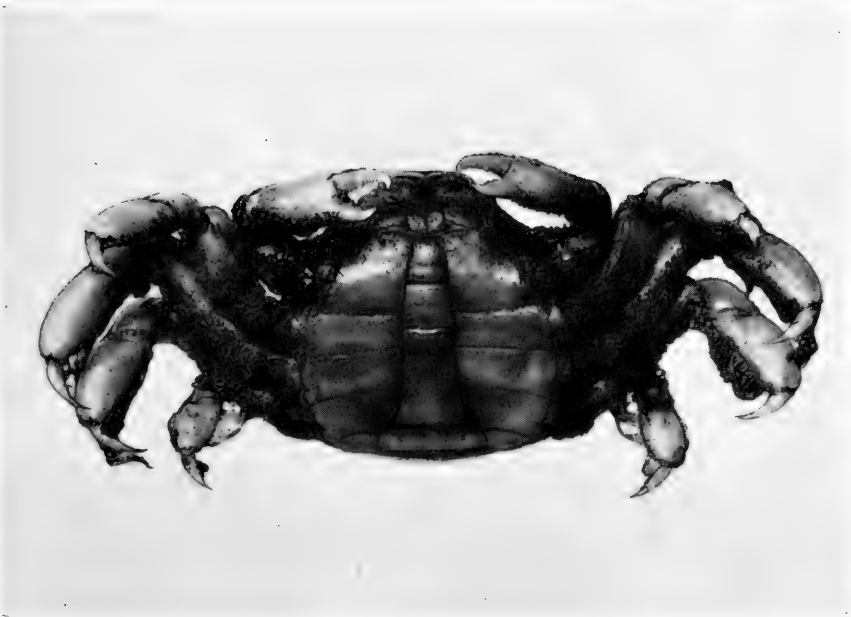

Plate XXX

Pinnotheres pichilinquei

Fig. 1. Male holotype, carapace 4.4 mm. long, dorsal view.

Fig. 2. Same specimen, ventral view, to show abdomen.

Fig. 3. Same specimen, ventral view, to show chelæ.

1

2

3

Plate XXXI

Goetice americanus

Fig. 1. Male, Guaymas (Cat. No. 17292, U. S. N. M.), carapace 10 mm. long, dorsal view.

Fig. 2. Same specimen, ventral view.

1

2

Plate XXXII

Sesarma (*Holometopus*) *magdalenense*

Photographs lent by U. S. National Museum

Fig. 1. Male holotype, carapace 11.6 mm. long, anterior view.

Fig. 2. Same specimen, dorsal view.

Fig. 3. Same specimen, ventral view.

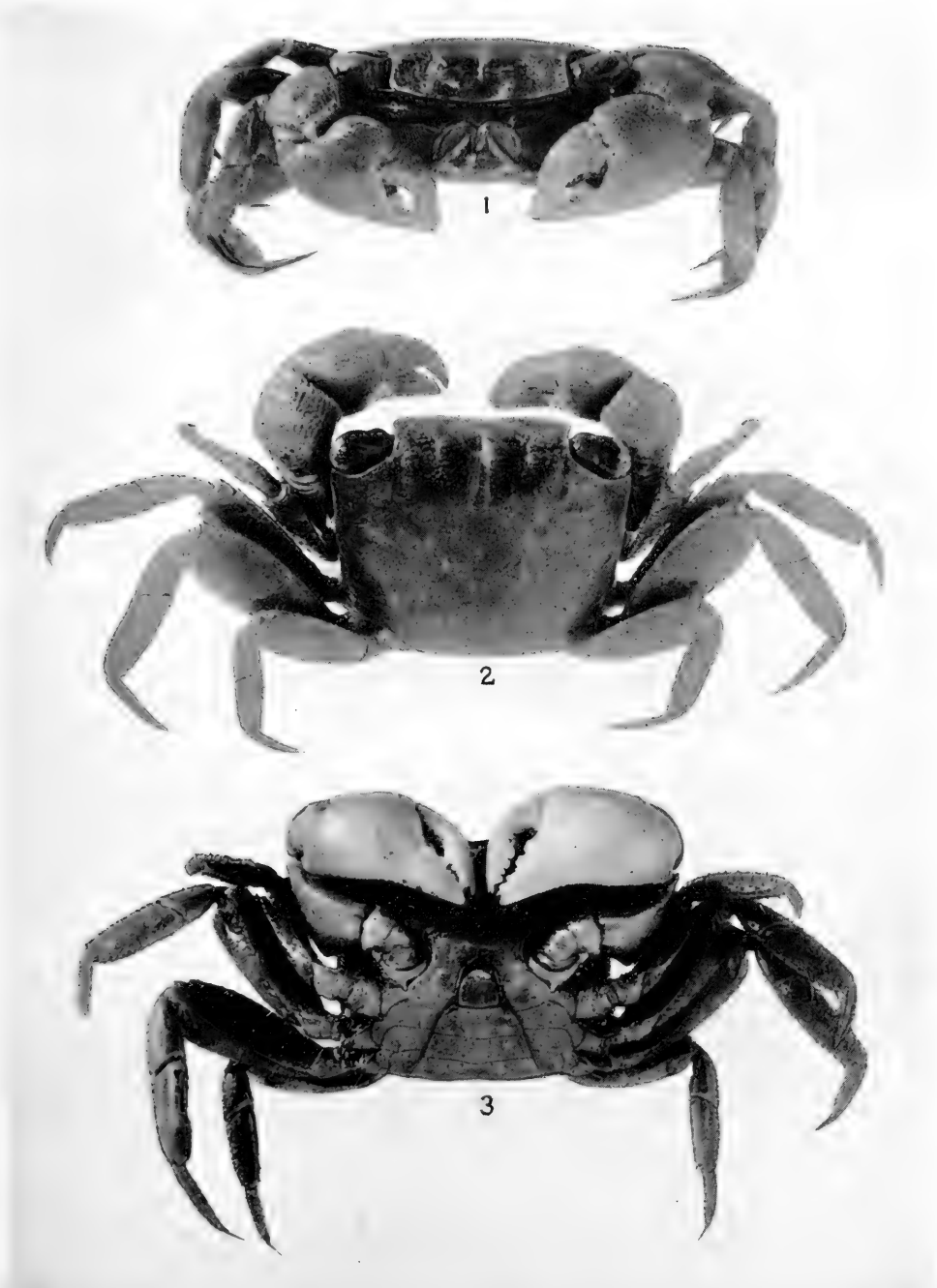
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Plate XXXIII

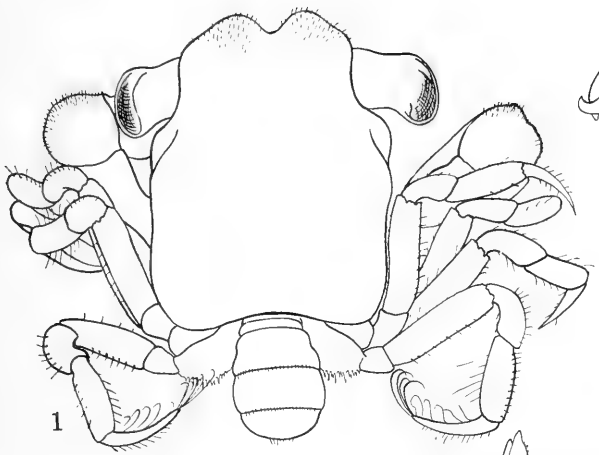
Dromidia larraburei

Fig. 1. Megalops, Cape San Lucas, carapace 3 mm. long, dorsal view.

Fig. 2. Left cheliped of Fig. 1.

Fig. 3. Megalops, Carmen Island, carapace 2.9 mm. long, dorsal view.

Fig. 4. Megalops, Cape San Lucas, carapace 5 mm. long, dorsal view.



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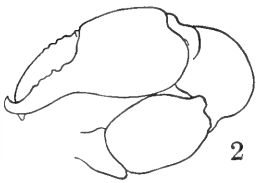

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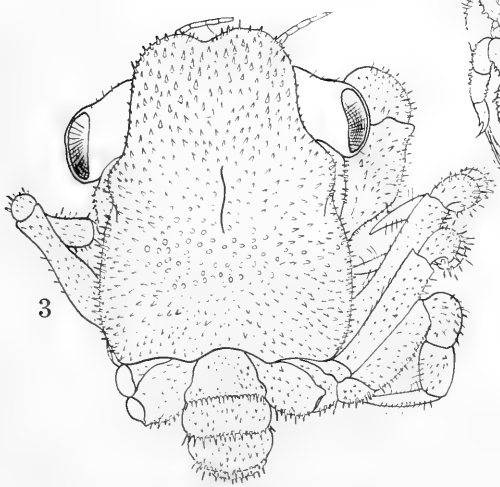

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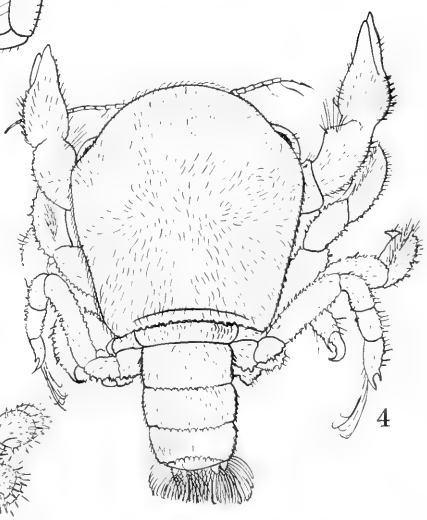

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PLATE XXXIV

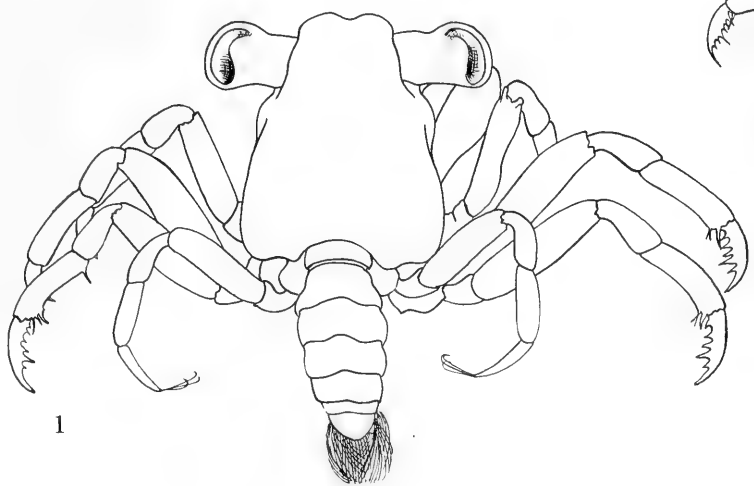
Fig. 1. *Pachygrapsus crassipes* (?), megalops, Guadalupe Island, carapace 6 mm. long, dorsal view.

Fig. 2. Front view of Fig. 1.

Fig. 3. *Sesarma magdalenensis*, megalops, Cape San Lucas, carapace 5.5 mm. long, dorsal view.

Fig. 4. Front view of Fig. 3.

Fig. 5. Left cheliped of Figs. 3 and 4.



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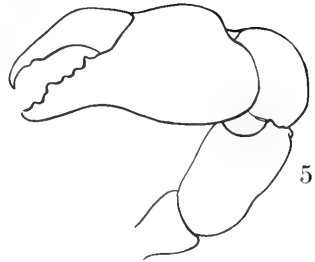

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Plate XXXV

Fig. 1. Grapsoid, megalops, Cape San Lucas, carapace 2.3 mm. long, dorsal view.

Fig. 2. Right cheliped of Fig. 1.

Fig. 3. Front view of Fig. 1.

Fig. 4. Grapsoid, megalops, unlike Fig. 1, Benito Island, carapace 5 mm. long, dorsal view.

Fig. 5. Left cheliped of Fig. 4.

Fig. 6. Front view of Fig. 4.

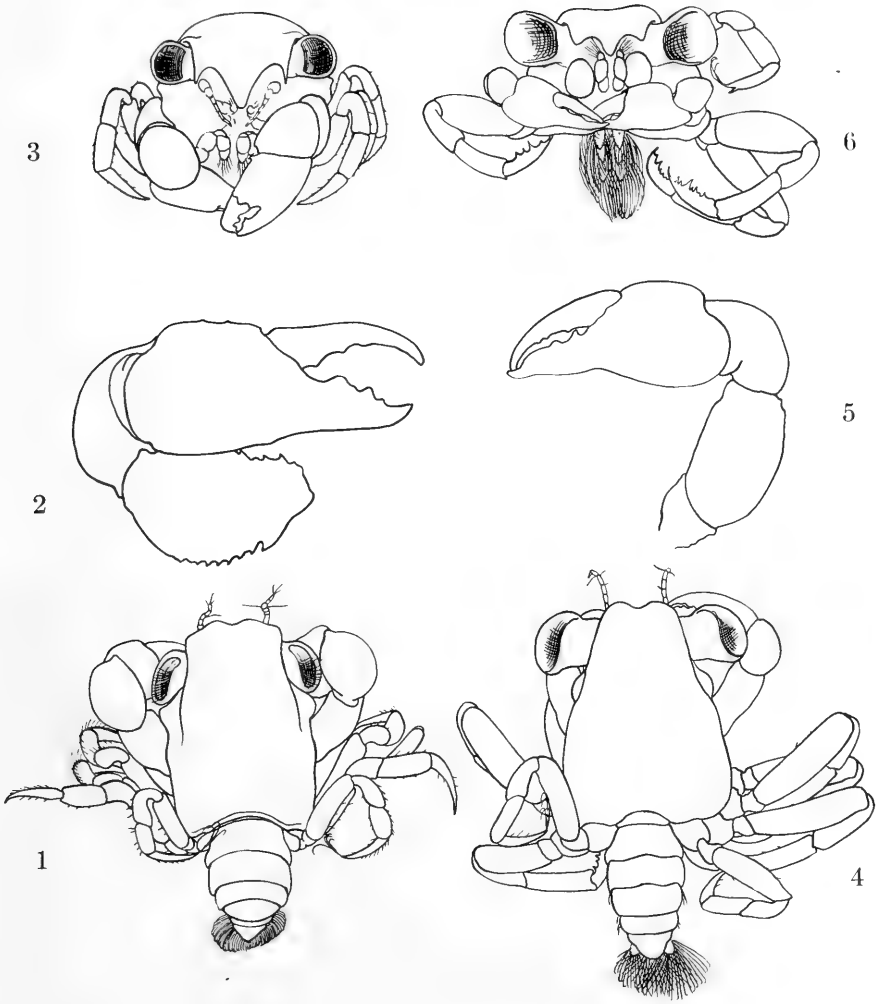
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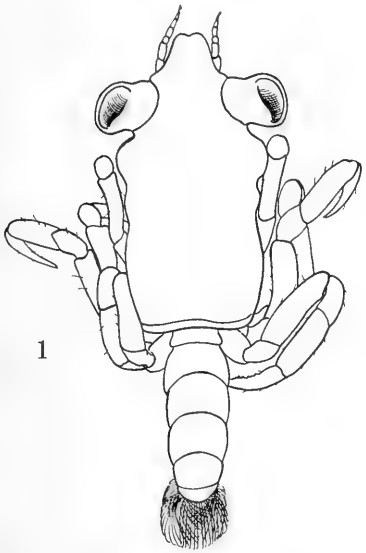
Plate XXXVI

Fig. 1. *Libinia setosa*, megalops, Cape San Lucas, carapace 3.15 mm. long, dorsal view.

Fig. 2. *Pliosoma*, megalops, Carmen Island, carapace 2.2 mm. long, dorsal view.

Fig. 3. *Callinectes*, megalops, Cape San Lucas, carapace 5 mm. long, dorsal view.

Fig. 4. Portunid, megalops, Cape San Lucas, carapace 6.6 mm. long, dorsal view.



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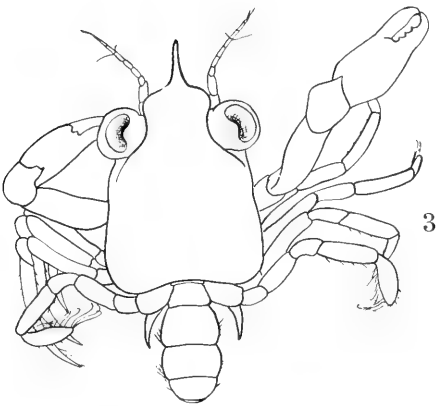

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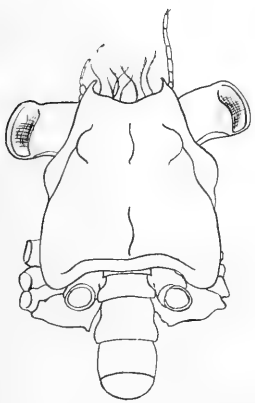

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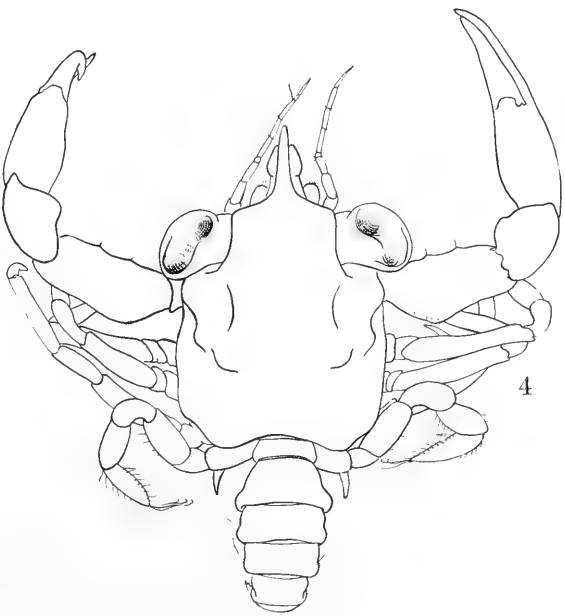

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Scientific Results of the Expedition to the Gulf of California in Charge of C. H. Townsend, by the U. S. Fisheries Steamship 'Albatross,' in 1911. Commander G. H. Burrage, U. S. N., Commanding.

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XIV

Deep Sea Fishes of the 'Albatross' Lower California Expediton

By Charles H. Townsend and John T. Nichols

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Article I.—DEEP SEA FISHES OF THE 'ALBATROSS' LOWER CALIFORNIA EXPEDITION[1]

PLATES I TO IV AND 1 MAP

BY CHARLES H. TOWNSEND AND JOHN T. NICHOLS

The deep-sea fishes obtained by the 'Albatross' Expedition of 1911 to the Gulf of California were dredged at twenty-six stations between Cape San Lucas, Lower California, and Monterey, California, all but four being within the 1000-fathom line of depth.

The region covered by the dredgings, a thousand miles or more in length, is, in general, rich in those forms of life characteristic of the "deep-sea" fauna. Both fishes and invertebrates, including those taken near shore at a depth no greater than 284 fathoms, were often found in abundance.

The collection of fishes, numbering several hundred specimens, contains forty-nine species, of which only five are here described as new. This small proportion of new forms may be explained by the fact that the deep-sea fishes of this region are already well known from dredgings made by the 'Albatross' during many years of fishery service along the Pacific Coast.

The large number of species discovered since 1888 indicates that the continental slope here has a fish fauna largely its own. While there is some mingling with the many forms now known from Alaskan depths, there is comparatively little identity with those taken southward from the Gulf of California and still less with the deep-water fishes of the Hawaiian region.

[1]Scientific Results of the Expedition to the Gulf of California in charge of C. H. Townsend, by the U. S. Fisheries Steamship 'Albatross,' in 1911. Commander G. H. Burrage, U. S. N., Commanding. XIV. Published by permission of the U. S. Commissioner of Fisheries.

Only a few fishes were taken in the four hauls deeper than 1000 fathoms, although invertebrates were well represented in number and species. The fishes are *Raja microtrachys*, *Bathysaurus mollis*, *Narcetes stomias*, *Cyclothone acclinidens*, *Plectromus maxillaris*, *Lycodapus fierasfer*, *Macrourus acrolepis*, and *Macrourus albatrossus*. Single representatives of Atlantic and Antarctic genera, *Cyema*, *Bathysaurus*, and *Harriotta*, are new to eastern Pacific waters, the last being different from the Atlantic form.

Deep-sea fishes were sometimes taken in considerable numbers; at station 5675 in 284 fathoms the dredge brought up fifty-nine *Macrourus*, eighteen *Catulus*, and one *Nemichthys*.

From station 5682 in 491 fathoms, there are forty-four fishes representing *Macrourus*, *Merluccius*, *Alepocephalus*, and *Argyropelecus*.

Station 5693, in 457 fathoms, yielded thirty fishes of four genera. Station 5696, in 440 fathoms, yielded nine species of fishes.

At most stations where fishes were taken there was a much greater weight and variety of invertebrates, good hauls of fishes, in fact, usually depending on the abundance and variety of invertebrate life as represented by crustaceans, mollusks and annelids. Fishes were at times, however, dredged with quantities of invertebrates showing nothing more palatable than starfishes, sea urchins, and crinoids.

It is probable that the deep-sea fishes already known to science represent but a moderate proportion of those that move aside from the path of the dredge, and that the discovery of other and larger forms awaits the use of some larger apparatus.

It is of interest to note that at station 5674, in 590 fathoms, three fishes, *Plectromus*, *Cyclothone* and *Serrivomer* came up alive, a most unusual occurrence in the case of fishes from such a depth. The difference between bottom and surface temperature at this station was recorded as nineteen degrees. There is a difference of more than half a ton to the square inch in sea pressure between the bottom at 590 fathoms and the surface, while the difference in the amount of light would be equal to that between night and day. Such are the barriers between the deep-sea and the shore faunæ, even at this moderate depth.

The records of bottom temperature kept during the voyage show that, at depths greater than 500 fathoms, bottom temperatures ranged from 37 to 39 degrees. In depths between 300 and 500 fathoms, bottom temperatures were from 40 to 44 degrees.

The greatest difference between bottom and surface temperatures was found off Cape San Lucas, where at a depth of 630 fathoms the

bottom temperature was 39 degrees, while at the surface it was 73 degrees. Bottom temperatures of 36 degrees were obtained by the Albatross in the lower part of the Gulf at depths of 1200 to 1500 fathoms.

About ten miles off Cape San Lucas the 1000-fathom line turns away from the coast until in Lat. 23° 20′ N. it is sixty miles off-shore. At Magdalena Bay it lies about half that distance away. A hundred miles farther north it is 65 miles off, again approaching the coast within 25 miles off San Hipolito Bay. From this point northward to the San Benito Islands there are depths of 1000 fathoms within sight of land.

North of the San Benitas the line lies farther off, trending nearer the coast at San Quentin. In the latitude of the United States and Mexican boundary the 1000-fathom line is more than 100 miles from the coast, passing from 20 to 40 miles outside of the islands of southern California. From Point Conception northward to near Monterey it lies at distances varying from 30 to 50 miles.

Four hauls were made in depths exceeding 1000 fathoms, the deepest being about 100 miles northwestward of Cape San Lucas in 1760 fathoms (two miles exactly), where the only fish taken was *Bathysaurus mollis*. The last dredge haul of the season was made about 35 miles south of Monterey in 659 fathoms.

The 2000-fathom line of depth, still imperfectly known, is not far beyond the 1000-fathom line, its distance from it apparently averaging less than the distance of the latter from the coast.

While the 1000-fathom curve extends into the Gulf of California as far as 180 miles north of Cape San Lucas, deep-water dredging was not attempted there, the results obtained during two former voyages having yielded little of interest.

During the voyage plaster casts of thirty-one deep-sea fishes in perfect condition were made by Mr. J. C. Bell, modeler of the Museum staff. Some of these yielded more exact measurements than the alcoholic specimens from which they were made when fresh. Photographs of the most interesting are reproduced herewith. The casts are of decided value as museum exhibits of deep-sea types, otherwise difficult to display in attractive form.—C. H. T.

Dredging Stations

U. S. S. 'Albatross' Lower California Cruise, 1911

Dredging Stations	Lat. and Long.		Date	Fathoms	Bottom Temp.
5673	31° 26′ 00″ N.	117° 42′ 00″ W.	Mar. 1	1090	....
5674	31° 28′ 45″ N.	117° 09′ 50″ W.	Mar. 8	590	39.4
5675	27° 07′ 08″ N.	114° 33′ 10″ W.	Mar. 15	284	44.6
5676	25° 31′ 15″ N.	113° 29′ 30″ W.	Mar. 17	645	39.0
5677	25° 23′ 45″ N.	113° 16′ 00″ W.	Mar. 17	735	38.6
5678	24° 35′ 20″ N.	111° 59′ 35″ W.	Mar. 21	13½	....
5679	23° 47′ 45″ N.	111° 23′ 00″ W.	Mar. 22	325	44.1
5680	23° 40′ 30″ N.	111° 12′ 45″ W.	Mar. 22	389	43.6
5681	23° 33′ 15″ N.	111° 02′ 10″ W.	Mar. 22	405	43.3
5682	22° 48′ 20″ N.	109° 52′ 40″ W.	Mar. 24	491	40.8
5683	22° 46′ 45″ N.	109° 50′ 15″ W.	Apr. 20	630	39.1
5684	23° 23′ 30″ N.	112° 00′ 30″ W.	Apr. 21	1760	....
5685	25° 42′ 45″ N.	113° 38′ 30″ W.	Apr. 22	645	....
5686	26° 14′ 00″ N.	114° 00′ 00″ W.	Apr. 22	930	37.3
5687	27° 39′ 15″ N.	115° 16′ 00″ W.	Apr. 23	480	41.1
5688	27° 38′ 45″ N.	115° 17′ 40″ W.	Apr. 23	525	39.9
5689	29° 23′ 00″ N.	116° 14′ 00″ W.	Apr. 24	879	....
5690	29° 29′ 00″ N.	116° 18′ 00″ W.	Apr. 24	1101	38.1
5691	31° 08′ 20″ N.	118° 29′ 30″ W.	Apr. 25	868	37.2
5692	31° 23′ 45″ N.	118° 31′ 30″ W.	Apr. 25	1076	37.1
5693	33° 13′ 30″ N.	120° 04′ 30″ W.	Apr. 26	451	....
5694	33° 24′ 36″ N.	120° 12′ 30″ W.	Apr. 26	640	....
5695	33° 33′ 00″ N.	120° 17′ 30″ W.	Apr. 26	534	38.9
5696	35° 18′ 30″ N.	121° 28′ 00″ W.	Apr. 27	440	39.9
5697	35° 35′ 00″ N.	121° 39′ 00″ W.	Apr. 27	485	39.8
5698	35° 50′ 00″ N.	121° 49′ 30″ W.	Apr. 27	475	39.9
5699	36° 00′ 30″ N.	122° 00′ 00″ W.	Apr. 27	659	37.9

Polistotrema curtiss-jamesi, new species

The common hagfish, *Polistotrema stouti*, is frequently recorded from depths down to several hundred fathoms, but perhaps specimens from the depths have not been carefully compared with those from shallow water. We have hagfish dredged from south of Monterey, California, to west of the Santa Barbara Islands, approximate latitudes 36° to 34°, depths of from 440 to 585 fathoms, as follows: one from station 5697 in 585 fathoms, one from station 5695 in 534 fathoms, three from station 5696 in 440 fathoms, and one from station 5698 in 475 fathoms, and these show constant differences which we here recognize as specific from *P. stouti*. They differ from it in two or three obvious proportional measurements as follows:

Head to first branchial aperture contained between 5 and 6, versus 4½, times in total length; branchial region between 6 and 7, versus 8. Anal fin and abdominal keel uniform in color, lacking the pale edge. Branchial apertures 10 to 11. All are full-grown specimens—that from Sta. 5695, 15 inches total length; the stations are from Santa Barbara Islands to near Monterey.

The type, No. 8341, American Museum of Natural History, collected by the 'Albatross' Lower California Expedition of 1911 off Central California, between Monterey Bay and Pt. Conception, Sta. 5697, 585 fath., April 27, 1911, is 15½ inches in total length. Snout, 18 times in total length; head to first branchial aperture, 6; branchial region, 6; tail, 6⅗. Depth at beginning of abdominal keel, 2⅓ in head. Dorsal and anal confluent with caudal, which is rounded, depth of this compound fin, 2 in head. Dorsal extending as a low keel to before vent; abdominal keel to a distance back of last branchial aperture equalling depth of body at that point. Branchial apertures 11. Uniform dark plum color, including fins, the barbels paler.

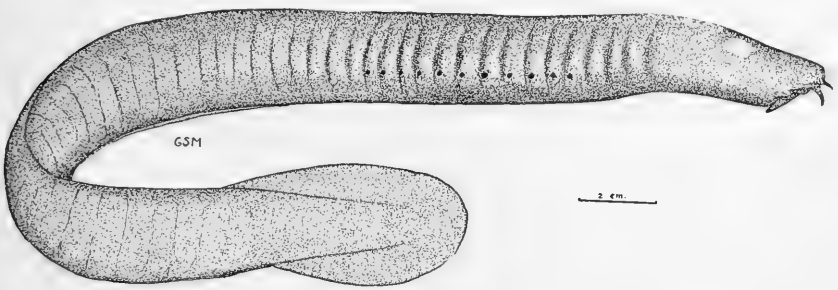


Fig. 1. *Polistotrema curtiss-jamesi.* Type.

Directly compared with a specimen of *P. stouti* (No. 2702 American Museum of Natural History) of the same length taken in Monterey Bay by E. C. Starks. All our six specimens (as well as the specimen of *P. stouti* with which they have been compared) have only the last branchial aperture of the left side conspicuously enlarged.

Named for Mr. Arthur Curtiss James, of New York.

Catulus xaniurus Gilbert

A number of specimens (18) from station 5675, approximate latitude 27°, in 284 fathoms, off the middle of the west coast of Lower California. The largest of these measures 18 inches.

Catulus brunneus Gilbert

One small specimen from station 5696 (north of Pt. Conception, California) in 440 fathoms, approximate latitude 35°.

Catulus cephalus Gilbert

One specimen from station 5680 in 389 fathoms and several from station 5681 in 405 fathoms; approximate latitude 24°, north of Cape San Lucas on the west coast of Lower California.

Raja trachura Gilbert

A male specimen 28 inches long, from station 5694 (southwest of Santa Barbara Islands, California, approximate latitude 33°), in 640 fathoms.

This differs from the type of *R. trachura*, apparently the only specimen of that fish previously described, 18 inches long and probably a female (though we find no definite statement to that effect), in several particulars which can be referred to age and sex.

Eye smaller, 1⅔ in interorbital, 4 in snout. No tubercle in center of back between shoulders. A conspicuous patch of erectile hooks on the pectoral, consisting of 22 rows, with five spines in the longest of these. No median dorsal spines forward of pectoral angle. Color, fresh, plumbeous.

Raja microtrachys Osburn and Nichols

The type of *R. microtrachys* is from station 5673 (southwest of San Diego, California, approximate latitude 31°) in 1090 fathoms, and is so tagged. Osburn and Nichols erroneously attributed it to Guadaloupe Island, the nearest shore station where collecting was done by the 'Albatross' at this time, due to its having in some way become confused with the shore material.

So few specimens of deep-water skates allied to this and the preceding have been collected that it is impossible to state with certainty how many species should be recognized. Color, fresh, dark grayish brown.

Harriotta curtiss-jamesi, new species

A single specimen of *Harriotta* six inches in total length and the first fish of this genus to be recorded in the eastern Pacific is very similar to *Harriotta raleighiana*, from the Atlantic, as described by Goode and Bean in 'Oceanic Ichthyology.' Its eye is notably larger and the species apparently a smaller fish than its Atlantic representative. This specimen (No. 8342, American Museum of Natural History) is from station 5685, 645 fathoms, about 26° N. lat., off Lower California.

Four specimens of *H. raleighiana* are described; three of these similar, supposed to represent the adult form (of which the largest was

25 inches, the smallest about one foot in length) and it is these that our specimen closely resembles. The fourth specimen of *raleighiana*, a young one four inches long, was quite dissimilar. It might be argued that our young fish was of minimum size for the adult form of this previously described species and that the eye would become relatively smaller with growth. However, the four-inch Atlantic fish just referred to had a small eye and, if we are to accept it as the young of the same species represented by larger Atlantic specimens, this little Pacific specimen is not the same. It might reasonably be supposed that, if allied, it would be recognizably different.

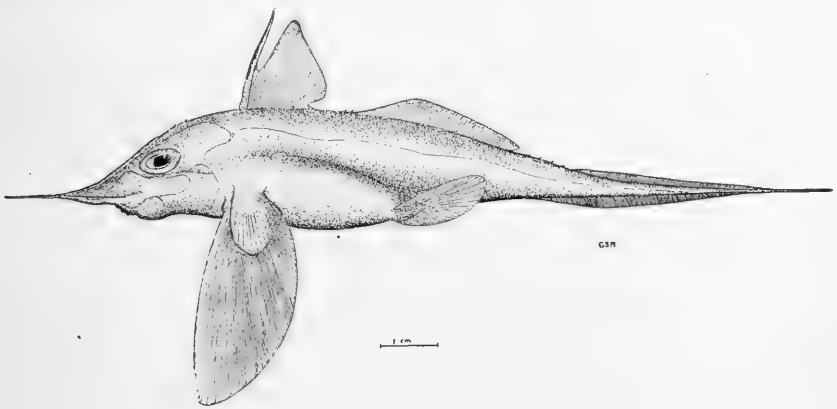


Fig. 2. *Harriotta curtiss-jamesi.* Type.

We find it shows the following discrepancies with the description of *Harriotta raleighiana.*

The interval between the two dorsal fins is two-thirds the diameter of the eye instead of nearly the diameter of the eye; the height of the second dorsal is two-thirds of the diameter of the eye instead of equaling the diameter of the eye; the length of the second dorsal is contained one and a half times in the head, instead of equaling the head; the ventrals extend to a point just short of the end of the second dorsal, instead of only to a point two-thirds of the distance between its origin and end; they measure a little more than two-thirds of the snout instead of a little less than half the snout; the eye is contained a scant three times in the snout instead of five and a half times in the larger specimens, four and a half times in the one of about a foot length, and in the young one of about four inches the eye is appreciably larger than the interorbital.

Otherwise this fish agrees closely with the figures and description of *Harriotta raleighiana*, having the same filamentous tail, long leaflike snout, arrangement of lateral lines, spines on the head and back, proportions and relative position of fins, shape of body, etc. It is black in color.

Named for Mr. Arthur Curtiss James through whose munificence the Museum was enabled to participate in the Lower California Expedition.

Alepocephalus tenebrosus, Gilbert

Plate II, Figure 1

Specimens from stations 5682, 5685, 5688 in 491 to 645 fathoms, and two others too imperfect to be determinable with certainty from stations 5683 and 5694 in 630 to 640 fathoms. The above stations range from approximate latitudes 28° off Pt. San Bartholome to 23° off Cape San Lucas, Lower California, with the exception of the last named which is farther north, approximate latitude 33°, southwest of the Santa Barbara Islands, California.

Color, fresh, entirely black (station 5682). Five specimens, station 5688, pebbly bottom, head deep blue-black, body lighter.

Alepocephalidæ

Bajacalifornia, new genus

Body covered with small thin cycloid scales. Ventrals well developed. Mouth moderately wide, larger than in *Alepocephalus*. Lower jaw strongly projecting, ending in a pointed knob directed obliquely forward. Edge of jaws with a single row of small teeth. Gill openings wide, membranes joined below, free from isthmus. Dorsal and anal short, of about equal length, anal origin behind middle of dorsal.

Named for the peninsula of Lower California. Based on the following new species.

Bajacalifornia burragei, new species

The type and only specimen (No. 8343, American Museum of Natural History) collected by the 'Albatross' Expedition of 1911 off Todos Santos Bay, Lower California, station 5674, approximate latitude 31°, 590 fathoms, is 4¾ inches long to base of caudal (which is broken). Head, 3½ in length to base of caudal; depth 5½. Eye, 3½ in head; maxillary, 2¼; snout, 3; interorbital space, ½ eye.

Mandible projecting a distance equal diameter of pupil. Origin of dorsal equidistant from base of caudal and margin of preopercle. Base of ventral equidistant from base of caudal and center of eye. Origin of anal slightly behind center of dorsal. Greatest depth at back of head. Eye impinging on upper outline of head. A distinct ridge over each eye. Interorbital narrowly concave. Snout rather broad and rounded in cross section, concave in profile. Maxillary wide, barely reaching center of eye. Mandible with a pointed knob at symphasis directed forward and downward. Width of snout ⅔ diameter of eye. Width of posterior end of maxillary ⅗ eye. Color uniform black.

Dorsal, 16; anal, 13; pectoral, 17; ventral, 10.

Named for Commander G. H. Burrage, U. S. N., commanding the 'Albatross' in 1911.

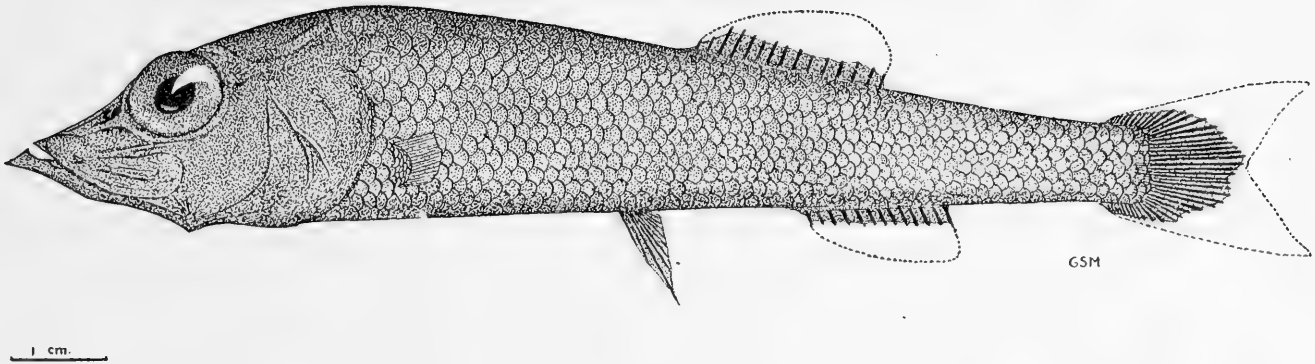


Fig. 3. *Bajacalifornia burragei.* Type.

Narcetes stomias (Gilbert)

One specimen fifteen inches long from station 5692, approximate latitude 31°, 1076 fathoms, southwest of San Diego, California, unquestionably represents Gilbert's *stomias*, but seems to belong in *Narcetes* rather than *Bathytroctes*. Garman's *Narcetes pleuriserialis* is not very different and may be the same.

Color, fresh, body and caudal dusky black, head blue-black.

Bathysaurus mollis Günther

Plate I, Figure 1

One from station 5684, in 1760 fathoms. The only fish from this station, which is off the west coast of southern Lower California, approximate latitude 23°. It is 17¼ inches long to base of caudal.

Although we can find no character to separate our fish from *mollis*, we give herewith a detailed description of this interesting specimen.

Head, 4½ in length to base of caudal; depth, 7⅘; eye, 7½ in head. Dorsal with 15 rays; anal 12; ventral 8. Scales (estimated) 100. Width of head ½ its length; gape 6½ in total length of fish. Teeth slightly barbed.

Gape extending behind eye for a distance much greater than interorbital width; equaling distance from center of eye to snout. Dorsal inserted 1⅔ times the length of its base behind snout. Length of fourth dorsal ray slightly greater than that of maxillary. Mandible projecting beyond snout a distance equal to width of pupil. Maxillary 1½ in head. Interorbital width 5½ in head. Seven to 8 large oval pores on mandible, elongated except the two anterior ones. Head naked, except cheeks and nape. Adipose dorsal present, half-way between origin of ventral and base of caudal. Anal inserted behind dorsal a distance equal to the length of its own base. Anal base 1⅓ in dorsal base. Ventral, pectoral and dorsal rays equal in length, ⅚ of head. Color white, lining of gill cavity black.

Myctophum californiense Eigenmann and Eigenmann

A specimen from station 5695 (southwest of the Santa Barbara Islands, approximate latitude 34°) in 534 fathoms.

Nannobrachium leucopsarum (Eigenmann and Eigenmann)

A specimen from station 5693, southwest of the Santa Barbara Islands, California, in 451 fathoms; one from station 5694 in 640 fathoms; and a third (imperfect) from station 5697 between Monterey and Pt. Conception, California, in 485 fathoms, latitudes 36° to 33°.

Nannobrachium regale (Gilbert)

One large and one small specimen from station 5693, southwest of the Santa Barbara Islands, California, in 451 fathoms, and a small one from station 5695 in 534 fathoms, approximate latitudes 33° to 34°.

Scopelengys dispar Garman

One each from station 5687, off Pt. San Bartholome, Lower California, in 480 fathoms, and station 5677, somewhat farther south, in 735 fathoms, approximate latitudes 28° to 25°.

Cyclothone acclinidens Garman

One each from station 5693, 451 fathoms, and station 5692, 1076 fathoms; two from station 5687, 480 fathoms; southwest of the Santa Barbara Islands, California, to off Pt. San Bartholome, Lower California, approximate latitudes 33° to 28°. These fragile specimens are apparently *acclinidens* of Garman, which possibly may be what earlier authors have identified as Pacific *microdon*.

Chauliodus sloanei Bloch and Schneider

One from station 5697 (south of Monterey, California, approximate latitude 36°), in 485 fathoms, not in good condition.

Argyropelecus lichnus Garman

One taken at station 5682, in 491 fathoms.

Argyropelecus affinis Garman

A specimen from station 5691, in 868 fathoms (off Todos Santos Bay, Lower California, approximate latitude 31°), and another from station 5686, in 930 fathoms (off Balenas Bay, approximate latitude 26°).

Halosaurus attenuatus Garman

One from station 5676 (approximate latitude 26°, off Pt. San Juanico, Lower California), 645 fathoms. Identification somewhat uncertain owing to mutilation of specimen.

Venefica tentaculata Garman

Four specimens of this genus we refer to this single variable species. All approximate Garman's description thereof, and differ from *V. ocella* chiefly in having a decidedly shorter tentacle on snout. All are from near the same locality, approximate latitudes 25° to 26°, off Pt. San Juanico, Lower California, 647 to 735 fathoms.

One from station 5677, in 735 fathoms, 28 inches long, has well-developed caudal, equaling ⅘ snout. One from station 5676, 647 fathoms, 30 inches long has less developed caudal equaling ⅗ snout.

Another from the same station, 29 inches long, has whip-like caudal region and very narrow caudal equaling ⅔ snout. One from station 5685, in 645 fathoms, 23½ inches long, has wide and heavy caudal and much the broadest caudal region, caudal 1⅕ times snout.

Serrivomer sector Garman

A specimen nineteen inches long from station 5674, approximate latitude 31°, off Todos Santos Bay, 590 fathoms, and a second somewhat imperfect one from station 5683, off Cape San Lucas, approximate latitude 23°, 630 fathoms, are obviously this species of Garman, which, as Gilbert suggests ('Deep Sea Fishes of the Hawaiian Islands,' p. 586), may be identical with *S. beani* of the Atlantic.

Nemichthys fronto Garman

One from station 5685 southwest of Balenas Bay, approximate latitude 26° in 284 fathoms, and one from station 5687 off Pt. San Bartholome, approximate latitude 28°, in 480 fathoms.

Cyema atrum Günther

One specimen from station 5691, 868 fathoms (approximate latitude 31°, off Todos Santos Bay, Lower California).

Color, fresh, entirely black.

This is the first record of the occurrence of this genus in eastern Pacific waters.

Plectromus [Melamphæs] maxillaris Garman

A specimen from station 5695 (near the Santa Barbara Islands, California, approximate latitude 34°) in 534 fathoms, and one from station 5692 (west of San Diego, California, approximate latitude 31°) in 1076 fathoms. A third specimen of this genus from station 5675 is too mutilated for specific determination.

Color, fresh, black (station 5692).

Plectromus [Melamphæs] cristiceps Gilbert

Plate II, Figure 2

Specimens from station 5674, off Todos Santos Bay, Lower California in 590 fathoms; station 5687, off Pt. St. Bartholome in 480 fathoms; station 5691, off Todos Santos Bay, in 868 fathoms; and one of 5¼ inches length to base of caudal, station 5674, 590 fathoms. Others from station 5688, 525 fathoms; 5693, 451 fathoms; 5685, 645

fathoms; and 5677 in 735 fathoms, probably represent the same species, but are not in condition for definite specific determination. Approximate latitudes of these stations run from 33° to 25°, depths from 451 to 868 fathoms.

Color, fresh, black (station 5685).

Plectromus [Melamphæs] lugubris Gilbert

Two of about 3½ inches total length from station 5683 in 630 fathoms off Cape San Lucas, approximate latitude 23°.

Sebastolobus alascanus Bean

Plate II, Figure 3

Numerous specimens from station 5694, off the Santa Barbara Islands, approximate latitude 33° in 640 fathoms.

Sebastolobus altivelis Gilbert

Numerous specimens from station 5693, off the Santa Barbara Islands, in 451 fathoms (approximate latitude 33°). One from station 5683, off Cape San Lucas, 630 fathoms (approximate latitude 23°).

It would seem from the above that, for the same latitude, *altivelis* occurs in shallower water than *alascanus*.

There is also *Sebastolobus* material from several other stations showing intergradation between the two forms. From station 5695 (approximate latitude 34°), off the Santa Barbara Islands, in the intermediate depth of 534 fathoms we have two typical *altivelis*, two specimens which are *altivelis* except for having sixteen dorsal spines, characteristic of *alascanus*, one is an *alascanus* except for fifteen dorsal spines characteristic of *altivelis*, and another with fifteen spines has the longest spine of intermediate length.

From station 5696 (approximate latitude 35°) north of Point Conception, in 440 fathoms, eight specimens are referable to *altivelis*, but one has sixteen spines, two others have the longest spine 2.2 and 2.3 in head respectively, which is a little short for that species.

On the other hand, three specimens from station 5699 (approximate latitude 36°), south of Monterey, California, in 659 fathoms, are intermediate, dorsal spines 16 in one, 15 in two, the longest spine 2.3 to 2.4 in head. A specimen from station 5697 (approximate latitude 36°) in 485 fathoms has dorsal XV, spine of intermediate length.

Of two specimens from station 5698 (approximate latitude 36°), south of Monterey, in 475 fathoms, one is an *altivelis*, the other an

alascanus (with longest dorsal spine 2.8 in head, but spines XV). Five others appear to be *alascanus*, but these are small, averaging 3 inches in length, and small specimens, of which we have a number from the other stations, have been excluded from the above discussion, where they might cause confusion due to our uncertainty regarding age changes.

To sum up, north of Pt. Conception, coastwise in latitude 36°, depths 475 to 659 fathoms, both species occur (at 475 fathoms) but intermediates are the rule. South of Pt. Conception off the Sta. Barbara Islands (latitude 33°) we find *alascanus* (described from Alaska in 159 fathoms) at 640 fathoms, intermediates at 534 fathoms, *altivelis* (described from Alaska in 625 fathoms) at 451 fathoms; and we have a single specimen of *altivelis* off Cape San Lucas (latitude 23°) in 630 fathoms.

Color, fresh, uniformly rose red.

Zesticelus profundorum Gilbert

Two small specimens from station 5695, southwest of the Santa Barbara Islands (approximate latitude 34°), in 534 fathoms.

Liparis osborni, new species

The type (No. 8344, American Museum of Natural History) is our only specimen, collected by the 'Albatross' Lower California Expedition of 1911, north of Pt. Conception, California (approximate latitude 35°), station 5696 in 440 fathoms. Head, 3¾

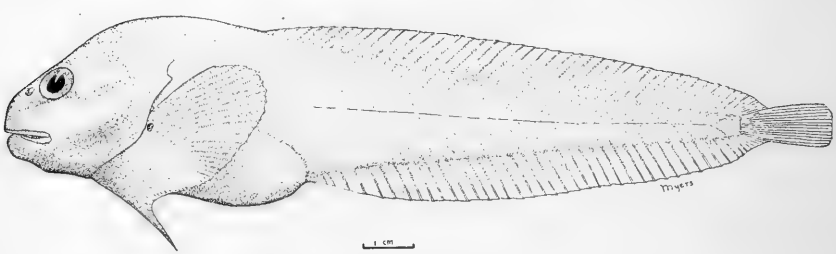


Fig. 4. *Liparis osborni.* Type.

in standard length; depth, 4 1/10; eye, 5⅓ in head; snout, 3⅓; maxillary, 2½; interorbital, 3⅕; pectoral from its upper axil, 1⅔; length of disk, 3; longest dorsal ray, 3½; longest anal ray 3½; cuadal, 2⅔. Dorsal with 44 rays; anal with 39.

Body swollen in front of anal fin, thence compressed, slender, tapering backward; nape gibbous, profile concave above eye; interorbital flat. Gill opening moderately wide, its width equal to snout, extending for ⅓ of its length below upper edge of pectoral. Lower rays of pectoral produced in a pointed lobe which reaches vent. Vent equidistant from front of anal and front of disk. Dorsal and anal adnate to caudal for ⅓ its length. Dorsal origin behind nape, almost directly over the membranous tip of opercle. Caudal narrow, subtruncate, scarcely rounded at tip. Color in spirits whitish, in life uniformly pink.

Named for President Henry Fairfield Osborn of The American Museum of Natural History, a promoter of the 'Albatross' Expedition of 1911.

Careproctus melanurus Gilbert

Plate III, Figure 1

One from station 5693, off the Santa Barbara Islands, approximate latitude 33°, in 451 fathoms.

Color, fresh, pink.

Paraliparis cephalus Gilbert

One from station 5696, approximate latitude 35° (north of Pt. Conception) in 440 fathoms.

Embryx crassilabris (Gilbert)

Plate III, Figure 2.

A specimen ten inches in length from station 5694, approximate latitude 33° (off the Santa Barbara Islands) in 640 fathoms.

Color, fresh, black.

Bothracara mollis Bean

Plate I, Figure 2

A small specimen from station 5699 in 475 fathoms south of Monterey (approximate latitude 36°), and one ten inches long from station 5697, 485 fathoms, a few miles farther south.

Melanostigma pammelas Gilbert

One from station 5693 off the Santa Barbara Islands (approximate latitude 33°) in 451 fathoms.

Color, fresh, jet-black.

Lepophidium emmelas (Gilbert)

Numerous specimens representing four stations off the west coast of Lower California as follows: 5675, 5679, 5680, 5681. Approximate latitudes range from 27° (in 284 fathoms) to 24° (in 325 to 405 fathoms).

Color, fresh, pink above, belly bluish, iris whitish (station 5681).

Lycodapus dermatinus Gilbert

One from station 5696 north of Pt. Conception, California (approximate latitude 35°) in 440 fathoms.

Lycodapus fierasfer Gilbert

One from station 5692 west of San Diego California (approximate latitude 31°) in 1076 fathoms.

Color, fresh, head black, body pale.

Mœbia promelas Gilbert

Plate III, Figure 3

Three specimens from off the west coast of Lower California, approximate latitudes 31° to 26°, from stations 5676, 645 fathoms, 5689 679 fathoms, and 5692, 1076 fathoms.

Merluccius productus (Ayres)

Fourteen specimens from station 5682, in 491 fathoms, of Cape San Lucas (approximate latitude 23°).

Color, fresh, silvery, top of head and fins blackish.

Antimora microlepis Bean

Five specimens from as many different stations (5687, 5693, 5694, 5695, 5696) these being in approximate latitudes 35° (north of Pt. Conception) to 33° (off the Santa Barbara Islands, California) and 28° off northern Lower California, in depths of 440 to 640 fathoms.

Color fresh, pale bluish gray (station 5692, specimen 10½ inches).

Macrourus acrolepis Bean

Plate IV, Figure 1

Numerous specimens representing various stations as follows: 5673, 5689, 5692, 5694, 5695, 5698, 5699. Obtained from southwest of Monterey, California, approximate latitude 36°, 649 fathoms; south to approximate latitude 29° off northern Lower California, and from depths of 534 to 1090 fathoms.

Color, fresh, dark grayish brown (5673). One very large specimen (station 5672) 1 foot 10 inches long, brownish dusky.

Six large specimens, station 5695, plumbeous black, lighter on belly.

Macrourus stelgidolepis Gilbert

Five specimens about 10 inches long from station 5675 off the west coast of Lower California, approximate latitude 27°, in 284 fathoms.

Fresh specimens dark slaty in color.

Macrourus albatrossus, new species

Plate IV, Figure 2

A single specimen (No. 8345, American Museum of Natural History) from station 5692, approximate latitude 31°, west-southwest of San Diego in 1076 fathoms, is clearly different from our other species of *Macrourus*, apparently a representative of a deeper water species. It is not in the best state of preservation, and, although we cannot match it with the description of any known form, we would hesitate to describe it as new were it not that a very satisfactory description can be drawn up with the aid of a plaster cast made of it when caught.

Head, 5⅗ in total length; depth, 6⅒. Eye, snout and interorbital equal, 3⅔ in head; maxillary, 2⅓; ventral, including filamentous ray, apparently 1; depth at origin 2nd dorsal, 2. Mouth to snout 2 in eye; base of first dorsal 2½ in dorsal interspace. First dorsal with 10 soft rays; anal 101–105.

Orbit impinging on upper profile, its rim slightly raised; interorbital flat; low median ridge on snout ending in a slight knob; suborbital ridge low and rounded ending in a slight knob on side of snout; snout short, broad, blunt; a short low ridge on head above posterior margin of each eye. Height of dorsal slightly exceeding eye and snout; length of pectoral about the same. Origin of first dorsal slightly behind and origin of ventral slightly before origin of pectoral. Second dorsal very low. Depth of body equal to the distance from front of mouth to edge of opercle. Scales ridged, the ridges low, about five to a scale on the back.

Named for the good ship 'Albatross.'

Lionurus liolepis Gilbert

Numerous specimens representing various stations as follows: 5675, 5676, 5682, 5683, 5688, 5697, from north of Point Conception, California, to Cape San Lucas, Lower California, at depths of from 284 to 645 fathoms.

Color, fresh, bluish black (5682).

Embassichthys bathibius (Gilbert)

Plate IV, Figure 3

Four large specimens from depths of 440 to 659 fathoms. Stations 5694, 5696, 5697, 5699, south of Monterey to the Santa Barbara Islands, California.

From station 5696, 440 fathoms, north of Pt. Conception, California, there is also a juvenal individual 2½ inches total length. This is more slender than the adults, depth 2.5 in length.

Color, fresh, black with gray mottling.

Malthopsis erinacea Garman

Plate I, Figure 3

Four specimens from station 5676 in 645 fathoms; and another in too poor condition for positive determination from station 5685 in 645 fathoms. The two stations are near together off the middle of Lower California, approximate latitude 26°.

Color, fresh, slaty (station 5685).

Dibranchus hystrix Garman

One from station 5683, off Cape San Lucas, in 630 fathoms.

Summary

The following forms are new.

New Genus

Bajacalifornia

New Species

Polistotrema curtiss-jamesi
Bajacalifornia burragei
Harriotta curtiss-jamesi
Liparis osborni
Macrourus albatrossus

List of Stations with Species Collected at Each

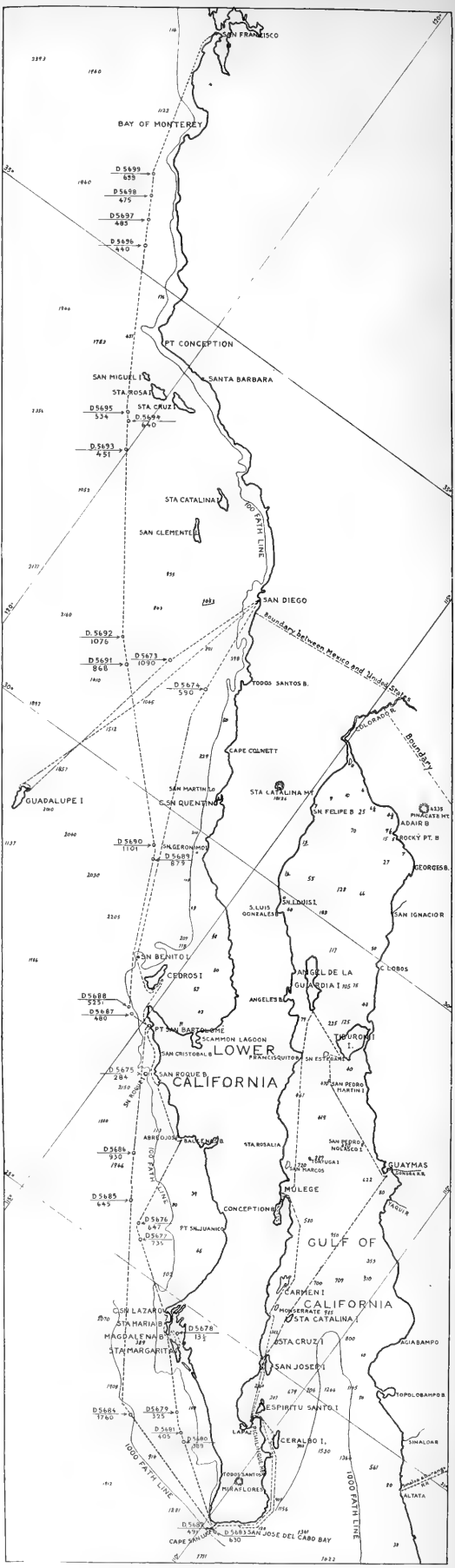
Station	Fathoms	
5673	1090	*Macrourus acrolepis*
		Raja microtrachys
5674	590	*Serrivomer sector*
		Plectromus cristiceps
		Bajacalifornia burragei
5675	284	*Catulus xaniurus*
		Nemichthys fronto
		Macrourus stelgidolepis
		Lionurus liolepis
		Plectromus, sp.
		Lepophidium emmelas
5676	645	*Halosaurus attenuatus*
		Venefica tentaculata
		Mœbia promelas
		Lionurus liolepis
		Malthopsis erinacea
5677	735	*Scopelengys dispar*
		Venefica tentaculata
		Plectromus cristiceps

List of Stations with Species Collected at Each (*Continued*)

Station	Fathoms	
5679	325	*Lepophidium emmelas*
5680	389	*Lepophidium emmelas*
		Catulus cephalus
5681	405	*Lepophidium emmelas*
		Catulus cephalus
5682	491	*Alepocephalus tenebrosus*
		Argyropelecus lichnus
		Merluccius productus
		Lionurus liolepis
5683	630	*Serrivomer sector*
		Plectromus lugubris
		Lionurus liolepis
		Dibranchus hystrix
		Sebastolobus altivelis
		Alepocephalus tenebrosus
5684	1760	*Bathysaurus mollis*
5685	645	*Alepocephalus tenebrosus*
		Harriotta curtiss-jamesi
		Venefica tentaculata
		Plectromus cristiceps
		Malthopsis erinacea
5686	930	*Argyropelecus affinis*
5687	480	*Scopelengys dispar*
		Cyclothone acclinidens
		Nemichthys fronto
		Plectromus cristiceps
		Antimora microlepis
5688	525	*Alepocephalus tenebrosus*
		Plectromus cristiceps
		Lionurus liolepis
5689	679	*Macrourus acrolepis*
		Mœbia promelas
5690		(No fishes)
5691	868	*Cyema atrum*
		Argyropelecus affinis
		Plectromus cristiceps
5692	1076	*Plectromus maxillaris*
		Macrourus acrolepis
		Macrourus albatrossus
		Narcetes stomias
		Lycodapus fierasfer
		Cyclothone acclinidens
5693	451	*Sebastolobus altivelis*
		Antimora microlepis
		Nannobrachium leucopsarum

List of Stations with Species Collected at Each (*Continued*)

Station	Fathoms	
		Nannobrachium regale
		Cyclothone acclinidens
		Plectromus cristiceps
		Careproctus melanurus
		Melanostigma pammelas
5694	640	*Macrourus acrolepis*
		Alepocephalus tenebrosus
		Raja trachura
		Nannobrachium leucopsarum
5694	640	*Sebastolobus alascanus*
		Embassichthys bathibius
		Antimora microlepis
		Embryx crassilabris
5695	534	*Myctophum californiense*
		Zesticelus profundorum
		Polistotremus curtiss-jamesi
		Nannobrachium regale
		Plectromus maxillaris
		Antimora microlepis
		Macrourus acrolepis
5696	440	*Embassichthys bathibius*
		Paraliparis cephalus
		Liparis osborni
		Sebastolobus altivelis
		Polistotremus curtiss-jamesi
		Catulus brunneus
		Lycodapus dermatinus
		Antimora microlepis
		Embassichthys bathibius
5697	485	*Polistotrema curtiss-jamesi*
		Nannobrachium leucopsarum
		Sebastolobus altivelis
		Bothrocara mollis
		Lionurus liolepis
		Embassichthys bathibius
		Chauliodus sloanei
5698	475	*Polistotrema curtiss-jamesi*
		Sebastolobus altivelis
		Macrourus acrolepis
5699	659	*Sebastolobus altivelis*
		Bothrocara mollis
		Macrourus acrolepis
		Embassichthys bathibius

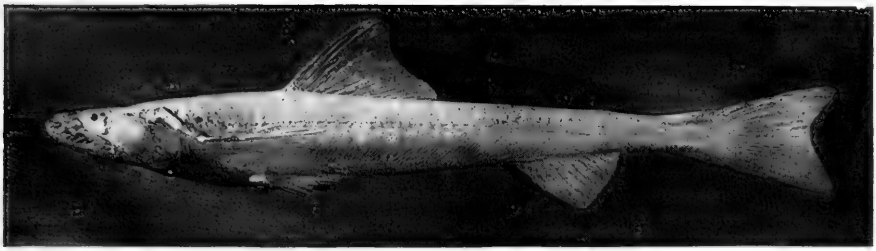


MAP OF THE LOWER CALIFORNIA REGION
SHOWING ROUTE OF THE ALBATROSS EXPEDITION IN 1911
UNDER THE DIRECTION OF G.H. TOWNSEND

PLATES I TO IV

PLATE I

Fig. 1. *Bathysaurus mollis* Günther.
Fig. 2. *Bothrocara mollis* Bean.
Fig. 3. *Malthopsis erinacea* Garman.



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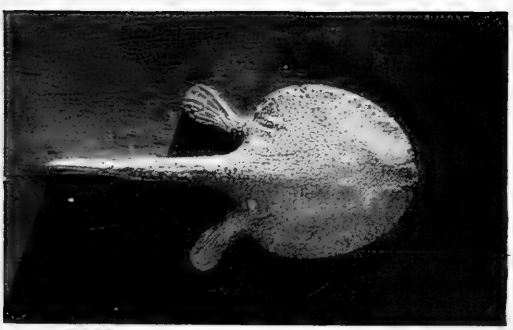

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PLATE II

Fig. 1. *Alepocephalus tenebrosus* Gilbert.
Fig. 2. *Plectromus cristiceps* Gilbert.
Fig. 3. *Sebastolobus alascanus* Bean.

1

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Plate III

Fig. 1. *Careproctus melanurus* Gilbert.
Fig. 2. *Embryx crassilabris* (Gilbert).
Fig. 3. *Mæbia promelas* Gilbert.

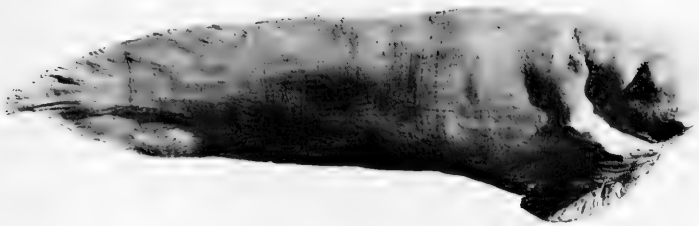

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PLATE IV

Fig. 1. *Macrourus acrolepis* Bean.
Fig. 2. *Macrourus albatrossus* Townsend and Nichols, type.
Fig. 3. *Embassichthys bathibius* (Gilbert).

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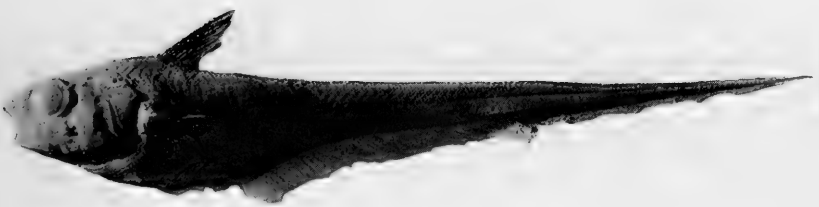

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Scientific Results of the Expedition to the Gulf of California in Charge of C. H. Townsend, by the U. S. Fisheries Steamship 'Albatross,' in 1911. Commander G. H. Burrage, U. S. N., Commanding.

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XV

The Amphipoda Collected by the United States Fisheries Steamer 'Albatross' in 1911, Chiefly in the Gulf of California

By Clarence R. Shoemaker

BULLETIN

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Article II.—THE AMPHIPODA COLLECTED BY THE UNITED STATES FISHERIES STEAMER 'ALBATROSS' IN 1911, CHIEFLY IN THE GULF OF CALIFORNIA[1]

By Clarence R. Shoemaker

While the collection of Amphipods procured on this cruise of the 'Albatross' is comparatively small, it has, nevertheless, been found to contain a large percentage of new forms. As this is the first collection of Amphipods to be worked up from this little-known region, it is not surprising that many new forms should appear. Among the one hundred and sixty-seven specimens of the collection, thirteen families, sixteen genera, and sixteen species are represented. Three genera and eight species are new to science.

The genus *Batea* was described in 1865 by Fritz Müller from the coast of Brazil, and it is now for the first time reported from the West Coast of North America. The hyperiid genera *Anchylomera, Symprone, Lycæa, Platyscelus, Tetrathyrus,* and *Amphithyrus* also are new records for the West Coast.

List of Species Collected

Heterophoxus pennatus, new species. Pichilinque Bay.
Paraphoxus spinosus Holmes. Carmen Island.
Œdiceropsoides abyssorum, new species. Sta. D. 5689.
Batea rectangulata, new species. San Francisquito Bay.
Elasmopus species. Sta. D. 5678.
Bemlos macromanus, new species. No definite locality.
Vibilia californica Holmes. Agua Verde Bay.
" " " Carmen Island.
" " " Guadalupe Island.
Hyperia species. San Josef Island.
" " Carmen Island.
Anchylomera blossevillii M.-Edw. Cape San Lucas.
Symprone anomala, new species. Cape San Lucas.
" " " " Agua Verde Bay.
Brachyscelus crusculum Bate. Carmen Island.
" " " San Josef Island.
" " " Cape San Lucas.
" " " Agua Verde Bay.

[1]Scientific Results of the Expedition to the Gulf of California in charge of C. H. Townsend, by the U. S. Fisheries Steamship 'Albatross,' in 1911. Commander G. H. Burrage, U. S. N., commanding. XV. Published by permission of the U. S. Commissioner of Fisheries.

Lycæa bajensis, new species. San Josef Island.
" " " " Cape San Lucas.
" " " " Carmen Island.
Parascelus zebu Stebbing. Carmen Island.
Platyscelus dubius, new species. Cape San Lucas.
" " " " Carmen Island.
" " " " San Josef Island.
" " " " Agua Verde Bay.
Tetrathyrus sancti-josephi, new species. San Josef Island.
" " " " " Agua Verde Bay.
" " " " " Carmen Island.
Amphithyrus orientalis Stebbing. San Josef Island.

GAMMARIDEA

Phoxocephalidæ

HETEROPHOXUS, new genus

Body not very broad. Head with evenly vaulted hood, not carinate or deflexed. Eyes well-developed. Side-plates plumose, fourth broadly produced backward, fifth with oblique hind lobe. Eyes very large, oval, black. Antenna 1 in ♂, first joint very large, flagellum in ♂ with calceoli and sensory clubs. Antenna 2 in ♂, lower anterior corner of second joint produced into a prominent lobe, flagellum nearly as long as body, fifth joint and flagellum with calceoli. Mandible, cutting edge and spine-row well developed, accessory cutting plate present, molar feeble, tipped with three spine-teeth, palp linear with few setæ, third joint very little shorter than second. Maxilla 1, palp 1-jointed, well developed, inner plate well developed with two setæ. Maxilla 2, plates subequal. Maxilliped, outer plate reaching nearly to middle of second joint of palp, inner plate obtusely rounded at apex, third joint of palp not produced, fourth very short, tipped at apex with two long curved spines. Gnathopods and peræopods much as in *Harpinia*. Peræopod 3, second joint not expanded. Peræopod 4 much longer than the rest, second joint narrowed distally. Peræopod 5 rather small, second joint much expanded. Uropod 3 in ♂ well developed, outer ramus the shorter and both rami bearing long, plumose setæ. Telson rather short and broad, cleft a little over half its length, lobes broadly rounded apically.

Heterophoxus pennatus, new species

TYPE LOCALITY.—Pichilinque Bay, Gulf of California, March 28–29, 1911, electric light; 2 specimens (1 ♂ type).

MALE.—Head with evenly vaulted hood, broadly rounded in front and reaching just beyond the end of the second joint of antenna 1, postero-antennal angles quadrate. Eyes large, oval, black, and nearly meeting at top of head. Antenna 1, first joint very large, provided on the lower anterior corner with numerous sensory bristles and several plumose setæ, second joint about half the length and width of first, third joint about half the length and width of second, flagellum about the length of the first joint of the peduncle and composed of eight joints which are provided with sensory clubs and a few calceoli, accessory flagellum half the length of the primary and composed of five joints. Antenna 2 nearly as long as the entire animal, second joint

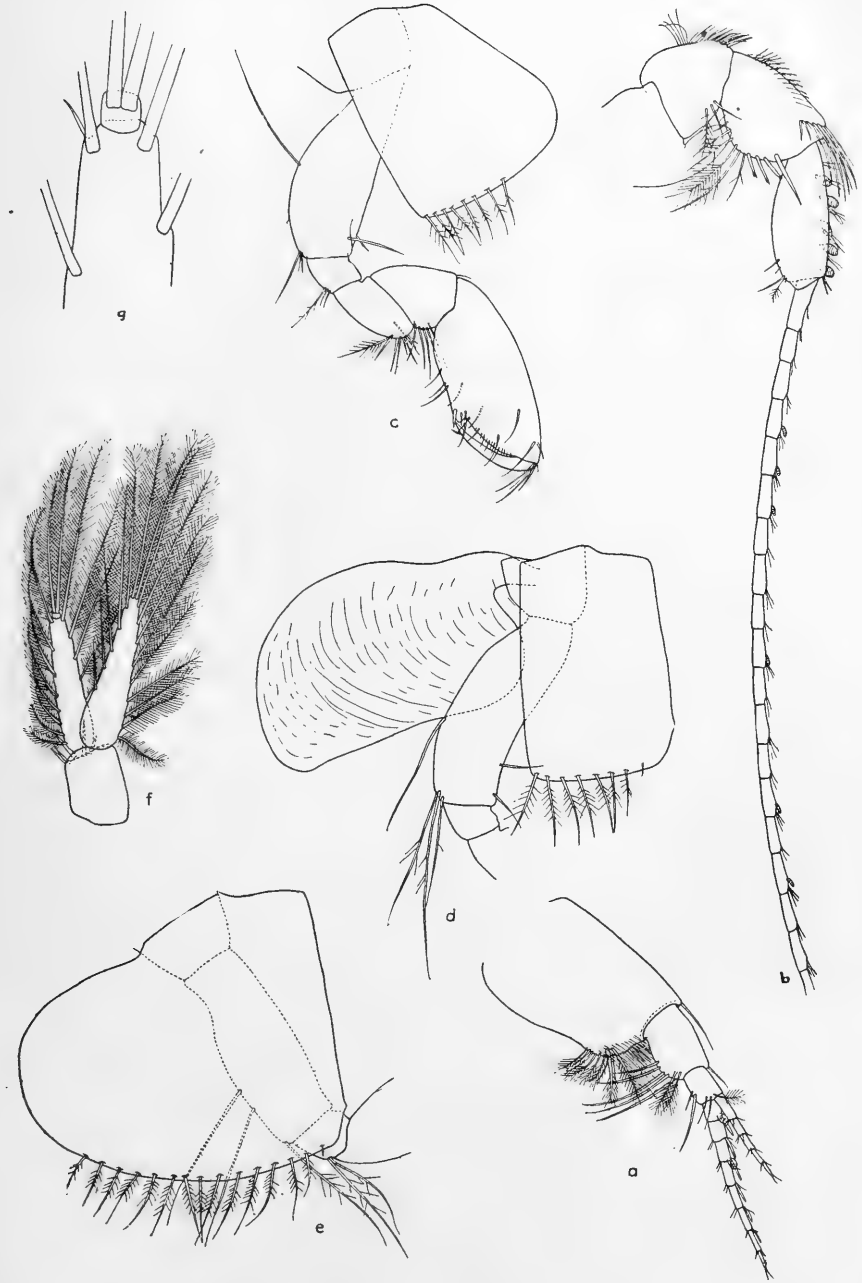

Fig. 1. *Heterophoxus pennatus*, new species

MALE.—*a*, antenna 1; *b*, antenna 2; *c*, gnathopod 1; *d*, gnathopod 2; *e*, peræopod 2; *f*, uropod 3, right side; *g*, end of outer ramus of uropod 3 showing minute second joint.

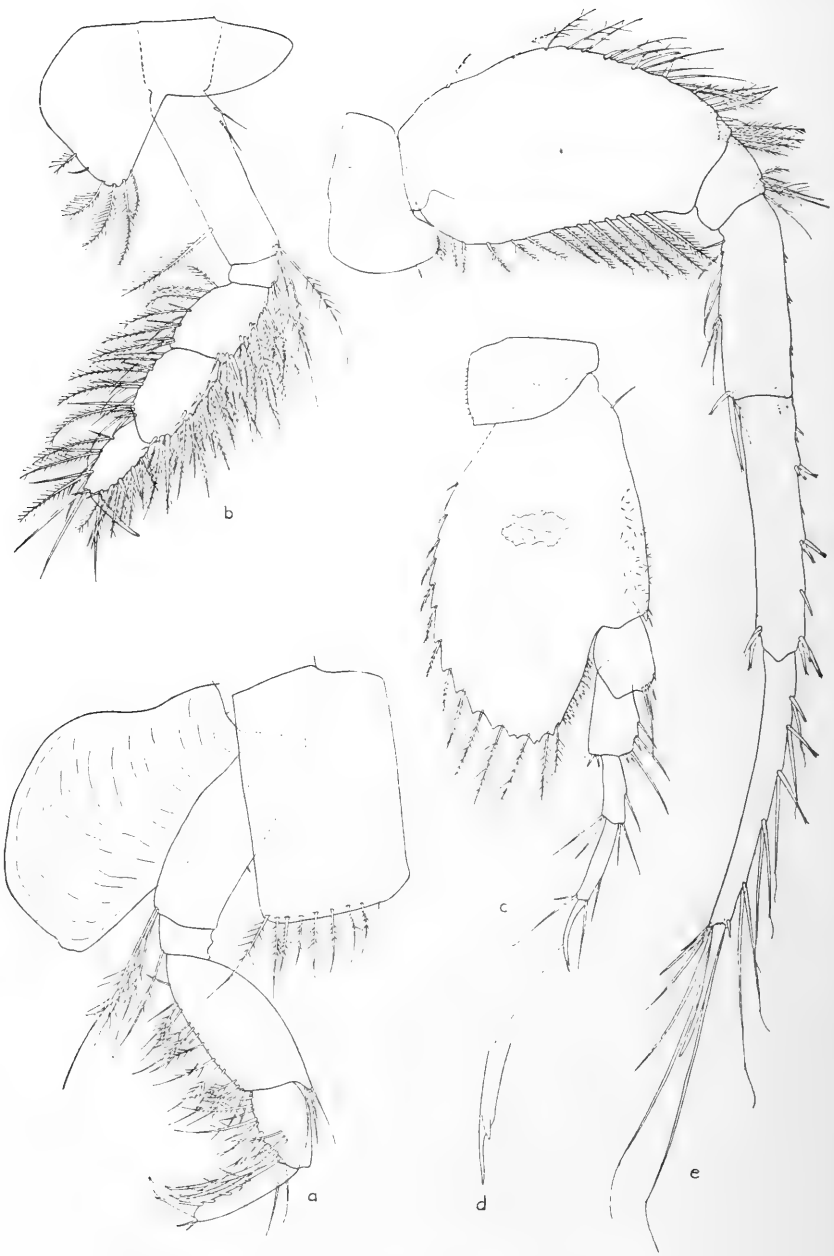

Fig. 2. *Heterophoxus pennatus*, new species

MALE.—*a*, peræopod 1; *b*, peræopod 3; *c*, peræopod 5; *d*, end of dactyl of peræopod 5; *e*, peræopod 4.

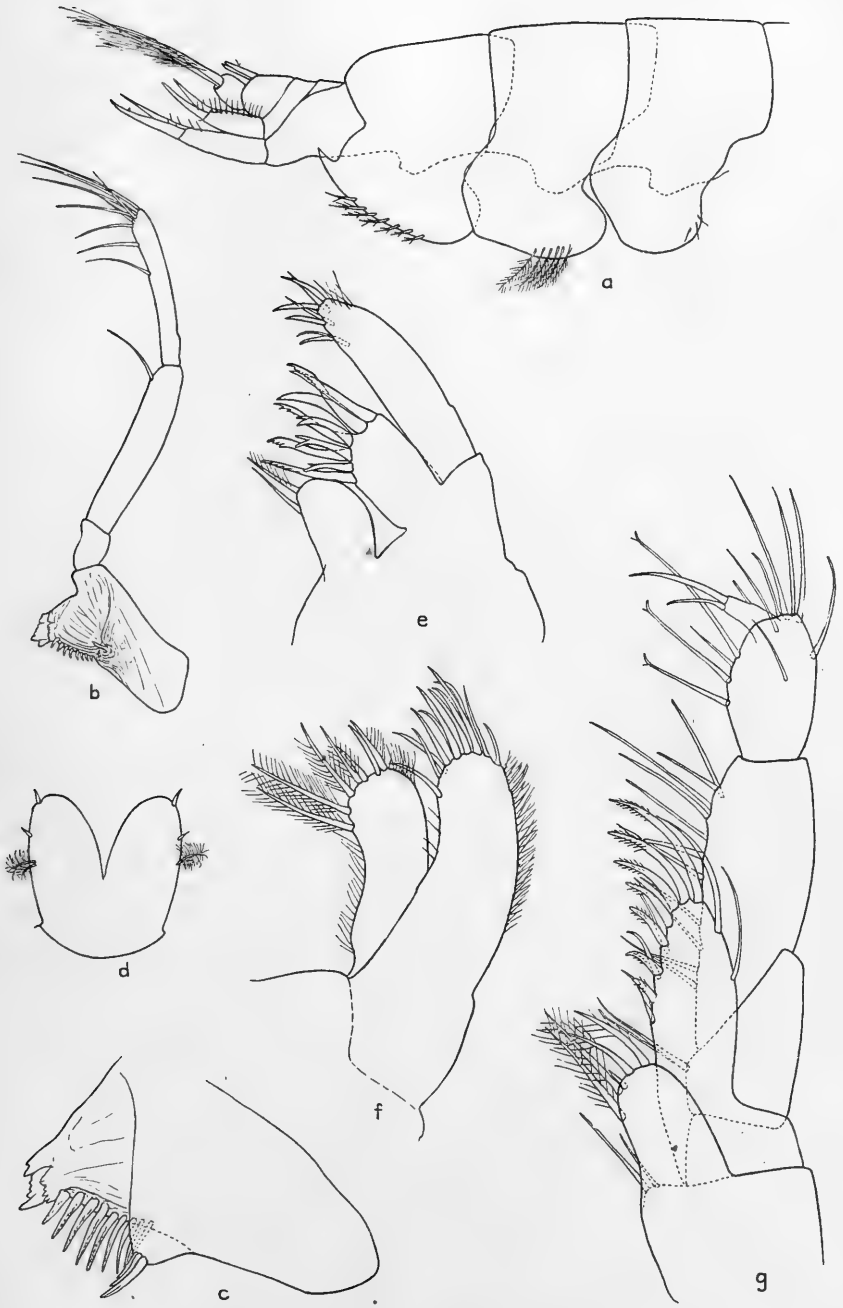

Fig. 3. *Heterophoxus pennatus*, new species

MALE.—*a*, abdomen, uropods and telson; *b*, mandible; *c*, cutting edge, spine-teeth and molar spine-teeth of mandible; *d*, telson; *e*, maxilla 1; *f*, maxilla 2; *g*, maxilliped.

with prominent, forward-pointing lobe on lower anterior corner, third joint short and thick, fourth joint a little longer than third, lower margin very convex and provided with several long plumose setæ and short blunt spines, fifth joint a little longer than fourth, lower margin evenly convex, upper margin provided with calceoli and short bristles, flagellum very long and slender and provided with calceoli on the upper anterior ends of the joints. Mandible, cutting edge narrow, accessory plate well developed, nine very well-developed spine-teeth, molar prominence surmounted by three strong spine-teeth, palp slender, third joint slightly shorter than second with oblique end provided with several long setæ, and several setæ on lower margin of joint near distal end. Maxilla 1, palp twice as long as outer plate with several spines on rounded apex, outer plate short and provided with nine curved spine-teeth, some of which are serrate and some bifurcate, inner plate nearly as large as outer and bearing on its rounded apex two plumose setæ. Maxilla 2, plates subequal, and bearing many curved spines and setæ on their rounded ends. Maxilliped, outer plate reaching nearly to the middle of second joint of palp and provided on its rounded end and inner edge with curved serrate spines, inner plate short with rounded end, provided with long plumose setæ, palp with third joint rather short, dactyl short and tipped with two long curved spines. Side-plate 1 expanded distally and provided on the posterior half of the lower edge with plumose setæ; side-plate 4 broadly expanded posteriorly, lower edge provided with plumose setæ; side-plate 5, posterior lobe oblique with plumose setæ on lower rounded edge. Gnathopods 1 and 2 as in *Harpinia plumosa* (Krøyer). Peræopods 1–3 as in *Harpinia plumosa* (Krøyer). Peræopod 4, second joint little expanded at proximal end and not at all at distal end, front margin convex, hind margin nearly straight and bearing a row of plumose setæ, fourth, fifth and sixth joints linear, sixth joint provided on front edge and distal end with long, slender spines, some of which are tipped with a very fine hair-like setule, dactyl long and slender. Peræopod 5 short, second joint expanded backward and decidedly downward, hind margin serrate with plumose setæ between the serrations, third and fourth joints short and broad, fifth and sixth joints linear, dactyl very nearly as long as sixth joint and bearing a tooth near the apex. Pleon segment 3, lower posterior angle produced into an acute upward-pointing tooth above which the margin is slightly convex, lower margin convex and bearing a row of plumose setæ. Uropod 3 not extending backward as far as uropod 1, peduncle short and thick, rami knife-shaped and bearing on their margins and apices long plumose setæ, outer ramus a little shorter than inner with very minute second joint. Telson extending a little beyond the peduncle of uropod 3, about as long as broad, cleft a little beyond the middle, lobes rounded apically and each bearing a minute spinule at the outer distal edge, two minute plumose setules and a minute spinule on each other edge.

Length.—5 mm.

Paraphoxus spinosus Holmes

Paraphoxus spinosus Holmes, 1903, American Naturalist, XXXVII, p. 276.

Paraphoxus spinosus Holmes, 1905, Bulletin of the Bureau of Fisheries for 1904, XXIV, p. 477, text figure.

Paraphoxus spinosus Kunkel, 1918, State of Connecticut. State Geological and Natural History Survey, Bulletin No. 26, p. 76, text fig. 13.

Carmen Island, southeast side, Gulf of California, electric light; 14 specimens.

This species was described by S. J. Holmes from the New England coast of the United States and it is now recorded for the first time from the western coast of America.

Œdicerotidæ

Œdiceropsoides, new genus

Female.—Rostrum or frontal process long and narrow. Eyes absent. Lateral lobes of head produced and truncated. Antenna 1 well developed, not short. Antenna 2 about half the length of the body, fourth joint of peduncle large, flagellum of many calceoliferous joints. Upper lip with margin evenly convex. Mandibular palp elongate. Maxilla 2, inner plate much wider than outer. Plates of maxillipeds rather broad in proportion to length. Side-plates 1–4 rather large, first expanded distally, fourth with hind margin slightly concave. Gnathopods 1 and 2 very much alike but 2 a little the larger, fifth joint large with prominent setose lobe, sixth joint longer than fifth, ovate, palm much longer than hind margin. Peræopods 1 and 2 rather feeble, 3 and 4 strong, 5 long. Pleon segments 1–3, postero-lateral corners very rounding. Abdominal segments 4–6 missing from the single specimen dredged.

Œdiceropsoides abyssorum, new species

Type Locality.—Station 5689. East of Guadalupe Island: Hat Mt., N. 59° E.; St. Vincent Peak, N. 47° E. (29° 32′ N., 116° 14′ W.), 879 fathoms; 1 specimen.

Female.—Head about as long as the first three segments of body, rostrum long, narrow, evenly rounded at apex, curved slightly downward and reaching just to the end of the first joint of antenna 1, lateral lobes prominently produced forward and obliquely truncated. Eyes absent. Antenna 1 reaching to the end of the fifth joint of antenna 2, flagellum equal in length to the peduncle. Antenna 2, fourth and fifth joints long, fifth about four-fifths as long as fourth, two long curved spines on inside margin and three at the distal end. Flagellum nearly as long as peduncle, composed of many short calceoliferous joints. Upper lip evenly rounded on lower edge. Mandible short and stout, cutting-edge with few teeth, small, dark tooth at base of cutting edge, eight teeth in spine row, molar very prominent with triturating surface concave, palp long, third joint nearly as long as second, second and third joints provided on their lower edges with a row of spines. Maxillæ 1 and 2 nearly as in *Œdiceropsis brevicornis* Lillj. Maxillipeds much as in *Œ. brevicornis* Lillj., except that the outer plate and the second joint of the palp are comparatively broader. The distal edge of the palp of maxilla 1, the distal edge of the inner and outer plates of maxilla 2, the inner edge of the outer plate of maxillipeds, and the inner edge of the second joint and the distal edge of the third joint of the palp of maxillipeds are provided with elongate, cylindrical appendages, which become very easily detached. Side-plate 1 greatly expanded and extended straight forward. Side-plate 2 comparatively narrow with sides nearly parallel. Side-plate 3 much broader than 2, with sides nearly parallel. Side-plate 4 deeper than 3, front margin convex and hind margin slightly concave. Side-plate 5 a little over half the depth of 4, front lobe much larger than hind lobe.

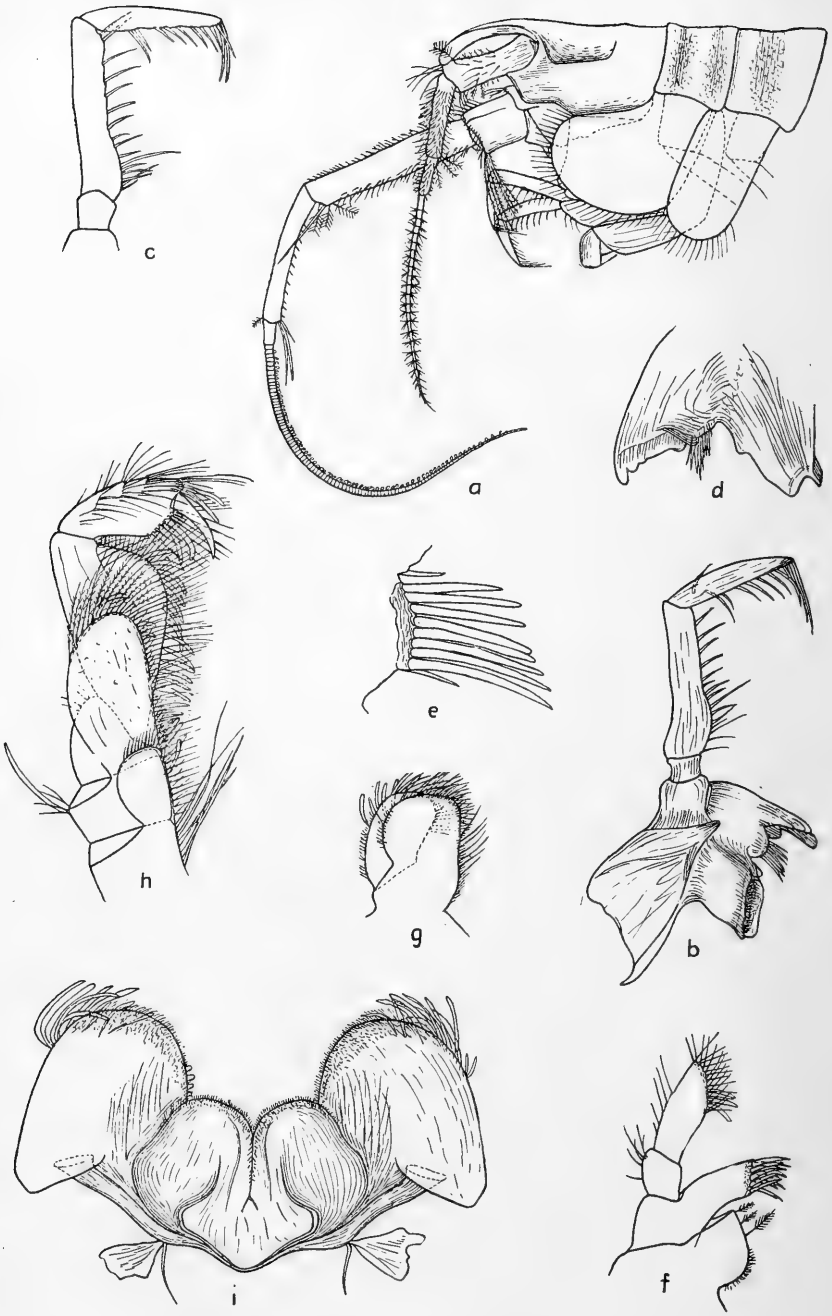

Fig. 4. *Œdiceropsoides abyssorum*, new species

FEMALE.—*a*, head, first two thoracic segments, and antennæ; *b*, mandible; *c*, mandibular palp; *d*, cutting edge, spine-teeth, and molar of mandible; *e*, spine-teeth of mandible; *f*, maxilla 1; *g*, maxilla 2; *h*, maxilliped; *i*, lower lip.

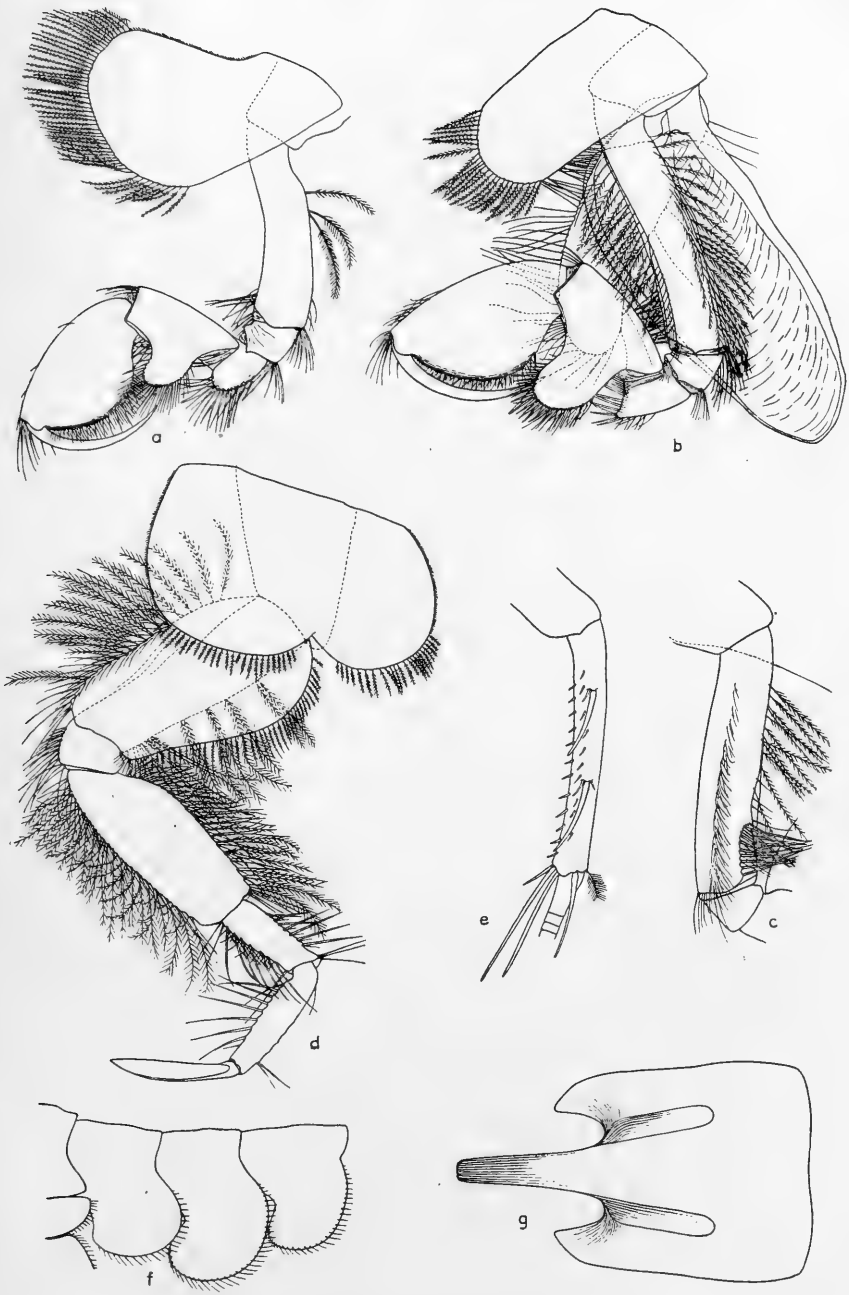

Fig. 5. *Œdiceropsoides abyssorum*, new species

FEMALE.—*a*, gnathopod 1; *b*, gnathopod 2; *c*, inside view of second joint of gnathopod 2; *d*, peræopod 3; *e*, inside view of fifth joint of antenna 2; *f*, abdominal segments 1–3; *g*, dorsal view of head.

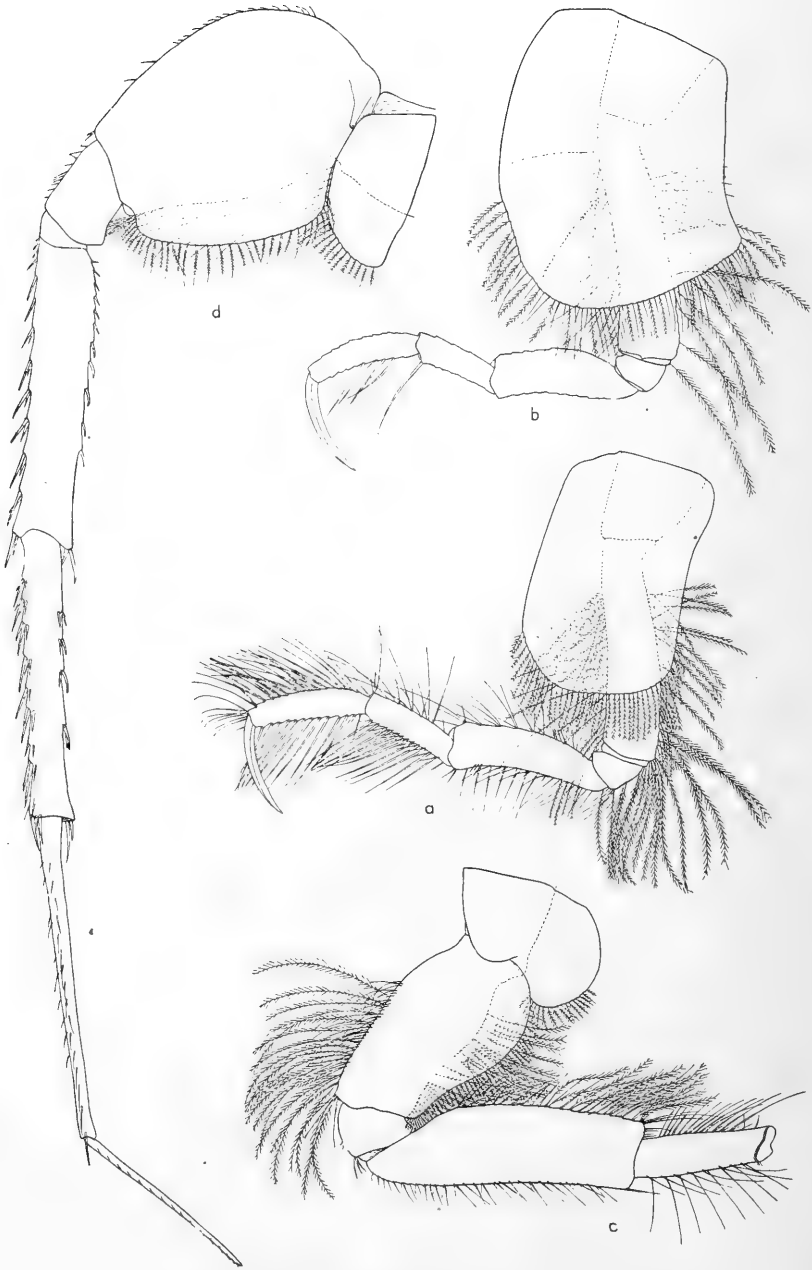

Fig. 6. *Œdiceropsoides abyssorum*, new species
FEMALE.—*a*, peræopod 1; *b*, peræopod 2; *c*, peræopod 4; *d*, peræopod 5.

Side-plate 6 shallower than 5, hind lobe much deeper than front lobe. Side-plate 7 shallow, widest at upper margin. All side plates fringed with plumose setæ. Gnathopods 1 and 2 very much alike, 2 a little the stouter. Gnathopod 1, second joint slender, slightly curved, and with an oval depression surrounded by stout bristles on the inner distal end, fourth joint short with lower margin evenly convex and furnished with many bristles, fifth joint as wide as sixth and about two-thirds as long, lower margin produced into a prominent lobe, the edge of which is provided with many bristles, sixth joint stout, more or less oval, palm very convex, much longer than hind margin, defined by a prominent bristle and furnished throughout with many fine bristles, finger long, slender, smooth, and of about the curvature of the palm. Gnathopod 2, second joint slender, provided on front and hind margins with plumose setæ, and on the inside distal end with an oval depression surrounded by stout bristles, fourth joint short with lower margin produced into a blunt point, fifth joint wider than sixth and about two-thirds as long, lower margin produced into a very prominent lobe which is edged with many stout bristles, sixth joint and finger as in gnathopod 1 but a little stouter. Peræopods 1 and 2 long and slender, first joint provided on front and hind margins and inner surface with many long, plumose setæ, fourth, fifth and sixth joints are provided on their front and back margins with many long stout spines, dactyls flat, and nearly as long as sixth joints. Peræopod 3, stout, second joint widest above, hind margin evenly convex above and nearly straight below, both front and hind margins provided with long plumose setæ, fourth joint densely clothed on inner surface and front and hind margins with long plumose setæ, fifth joint about one-half as long as fourth and two-thirds as long as sixth, fifth and sixth joints provided on their front and hind margins with many stout bristles, dactyl broad and flat, and equal in length to sixth joint. Peræopod 4 with sixth joint and dactyl missing, in general outline much like peræopod 3, but longer, and less plumose on fourth joint. Peræopod 5 long and slender, second joint widest through the upper third, hind margin slightly convex and provided with plumose setæ, fourth joint very slightly longer than fifth, sixth joint very slightly longer than fourth, dactyl nearly two-thirds as long as sixth joint. Abdominal segments 1–3 with lower margins evenly rounded and provided with a fringe of plumose setæ, segment 2 the deepest. Fourth, fifth, and sixth segments missing.

Length.—From tip of rostrum to end of third abdominal segment 24 mm.

Bateidæ

Batea rectangulata, new species

Type Locality.—San Francisquito Bay, Gulf of California, electric light; 1 specimen.

Female.—This single female specimen is the first of this genus to be described from the west coast of America, all previous records having been from Brazil, West Indies, and the east coast of the United States. There are several very definite characters which differentiate it from the east coast species. Antennæ missing excepting the first few joints of the peduncles. Eyes too badly distorted for any definite outline to be discerned. Head with rostrum strongly curved downward and acutely pointed. Mandibles with five spine-teeth on left and four on right, third joint of palp about two-thirds as long as second, and provided on distal half of inner margin with many long, curved minutely-plumosed setæ, and near the proximal end of outer

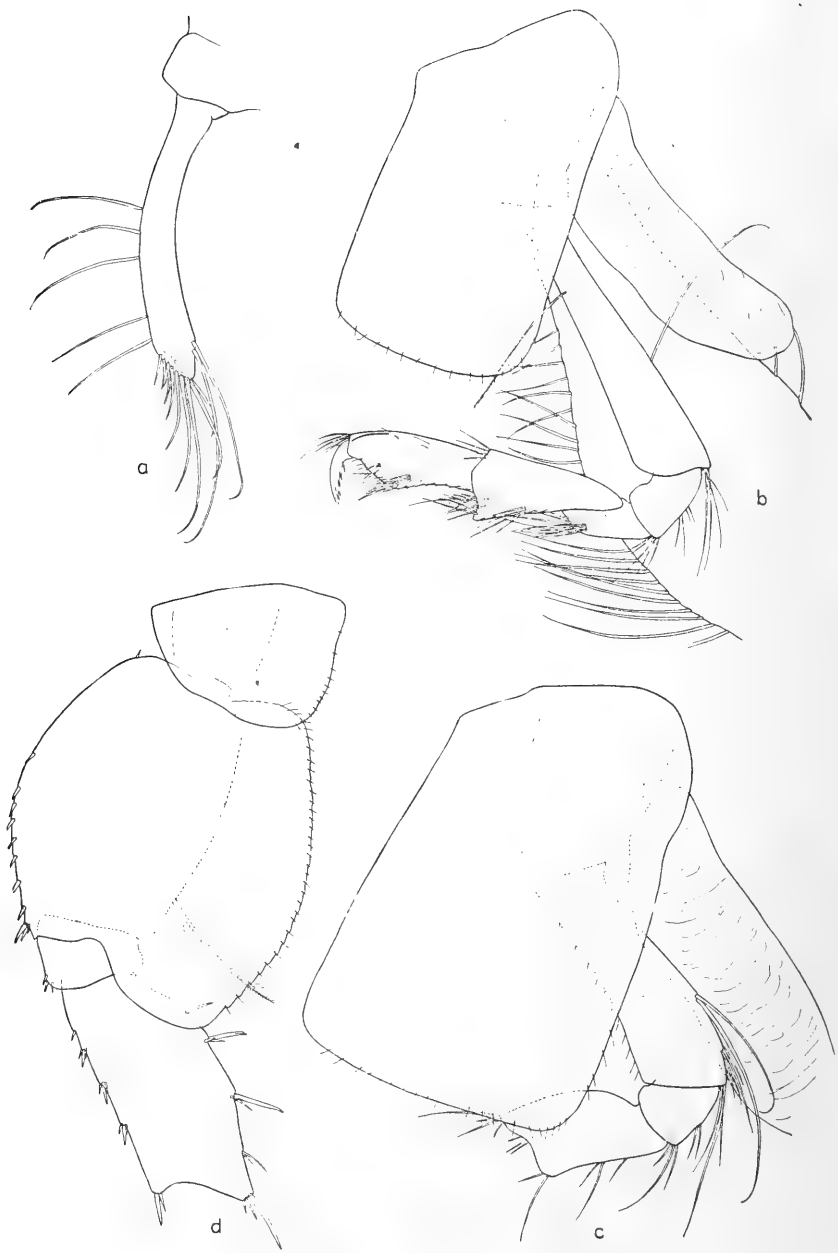

Fig. 7. *Batea rectangulata*, new species

FEMALE.—*a*, gnathopod 1; *b*, gnathopod 2; *c*, peræopod 1; *d*, peræopod 5.

Fig. 8. *Batea rectangulata*, new species

FEMALE.—*a*, gnathopod 2 showing teeth of palm and finger; *b*, peræopod 2; *c*, peræopod 3; *d*, peræopod 4.

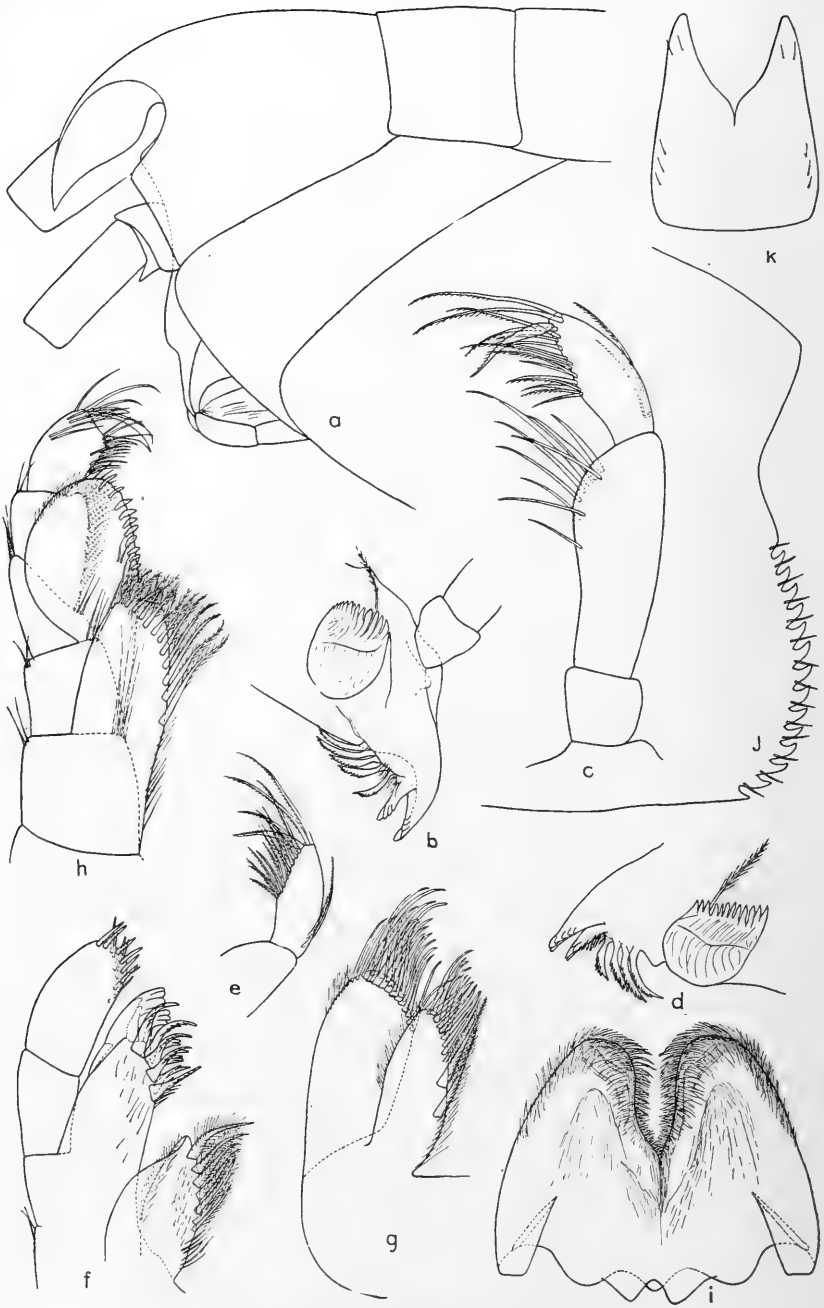

Fig. 9. *Batea rectangulata*, new species

FEMALE.—*a*, head and first two thoracic segments; *b*, left mandible; *c*, palp of left mandible; *d*, right mandible; *e*, palp of right mandible; *f*, maxilla 1; *g*, maxilla 2; *h*, maxilliped; *i*, lower lip.

margin with two long, curved, minutely-plumosed setæ. One of the distal spines of the third joint of palp is much enlarged, making it appear quite dactyl-like. Second joint of palp with stout setæ on distal half of inner margin. Lower lip without inner lobes, or at best only a mere suggestion of them. Maxilla 1, inner plate with seven plumose setæ, below which are several setules, outer plate provided with ten or eleven very stout, curved, toothed spine-teeth, palp with first joint about two-thirds the length of second, second joint evenly rounded distally and provided with many short spines. Maxilla 2 with both plates evenly rounded distally, inner plate furnished with two plumose setæ and many long, sharp spines, outer plate furnished distally with many long, sharp, curved spines. Maxillipeds, inner plate reaching to about the middle of the first joint of the palp, armed on truncated end and along inner margin with long, plumose setæ, one sharp spine-tooth among the setæ on the truncated end of this plate could be discerned, but if others were present they were completely hidden by the mass of surrounding plumose setæ, outer plate reaching beyond the second joint of palp and provided on the inner edge with twelve tooth-like spines, no plumose setæ at distal end of this plate, outer edge provided with a row of fine setules. The three joints of the palp all of equal length, dactyl stout with downward-pointing tip. Gnathopod 1 with the terminal spines of second-joint much as in *B. catharinensis*, front margin with five or six long setæ, and two long curved setæ near the distal end of hind margin. Gnathopod 2 proportionately longer and more slender than in *B. catharinensis*, second joint very slender and nearly as long as the third, fourth, fifth and sixth joints combined, fifth joint slender and slightly longer than sixth, sixth joint slender, palm oblique, about two-thirds the length of hind margin and minutely serrate throughout its length, dactyl slightly curved and bearing four forward-pointing teeth and several setules on inner margin. Peræopod 1, fifth and sixth joints missing, second joint with a row of short, slender spines on front margin and two groups of long bristles near the distal end of hind margin. Peræopod 2, fifth and sixth joints missing, second, third and fourth joints about as in peræopod 1. Peræopod 3, second joint with lobe of hind margin rounding and without any downward dip. Peræopod 4, second joint not wider above than below, but about the same width throughout, hind margin evenly convex. Peræopod 5, second joint about as broad as long, lower posterior margin not forming as deep a lobe as in *B. catharinensis*. Side-plates all much deeper than in *B. catharinensis*. Side-plate 2 rectangular in outline, front and back margins nearly parallel, lower margin transverse, slightly convex and provided with a row of setules. Side-plate 3 extending slightly beyond the second joint of the peræopod, sides nearly parallel but slightly wider below, lower margin transverse, very slightly convex and bordered by a row of minute setules. Side-plate 4 with hind margin not so deeply excavated as in *B. catharinensis*, lower margin bordered by a row of minute setules. Side-plate 5, hind lobe deeper and more acute than in *B. catharinensis*. Side-plates 6 and 7 differing very slightly from those of *B. catharinensis*. Posterior lateral margin of abdominal segment 3 bearing a greater number of serrations than that of *B. catharinensis*. Uropods about as in *B. catharinensis*. Telson proportionately shorter and broader than in *B. catharinensis*, lobes with apexes acute and inside margins concave, each lobe with two setules near the apex, and each side of telson bearing three setules near the base.

LENGTH.— ♀ 6 mm.

Gammaridæ

Elasmopus species

Station 5678. 24° 35′ 20″ N. 111° 59′ 35″ W. Magdalena Bay, western coast of Lower California, March 21, 1911, 13½ fathoms; 1 specimen.

A single female specimen was taken at this station. As the females of the genus *Elasmopus* show but poorly the specific characters and the species of this genus belonging to the west coast of America are but imperfectly known, a specific identification of this specimen would be of very doubtful value.

Aoridæ

Bemlos, new genus

Characters of this new genus are in general like those of *Lembos*. Gnathopod 1 in male has the fifth joint short and broad, and the sixth broader and three times longer than the fifth, palm transverse, short and toothed, finger overlapping palm. Inner plate of maxillipeds with three teeth on upper edge. Female as in *Lembos*.

Bemlos macromanus, new species

Type Locality.—Lower California, no definite locality given; 13 specimens (1 ♂ type).

Male.—Antenna 1 slender and nearly as long as the body, accessory flagellum composed of seven long and one short joint and reaches just beyond the sixth joint of the primary flagellum. Antenna 2 normal. Mandible with 9 spines in spine-row, molar with small accessory process, third joint of palp about one-third longer than second, and bearing many long bristles, and on the front edge also a comb of fine short bristles, second joint with bristles on front edge. Maxilla 1, inner plate with one plumose seta, outer plate normal, palp normal, but bearing an oblique row of slender bristles on outside. Maxilla 2 normal. Maxilliped, outer plate reaching a little beyond the middle of the second joint of palp and bearing eleven odontoid spines on inner edge, inner plate, upper end truncated and bearing three short teeth at inner corner, inner edge bearing a row of long plumose setæ. Lower lip with long, thin, pointed mandibular processes, inner lobes very large and tumid. Side-plates shallow, first produced very slightly forward. Gnathopod 1, second joint stout, excavated along the front margin, lower anterior corner produced to a point, fifth joint stout, broader than long and somewhat triangular, sixth joint very stout, three times as long and one-third broader than the fifth, widest through the middle, palm with a broad, stout, setose tooth in the middle, a strong, straight tooth continuous with the hind border of the joint defines the palm, the strong, curved finger overlaps the palm. Gnathopod 2 normal, with fifth joint slightly longer than sixth, sixth with palm oblique, slightly convex and very finely toothed throughout, finger fitting palm and having a row of small teeth and a few setæ on the inner edge, fifth and sixth joints provided with many long bristles. Peræopods 1 and 2 normal. Peræopods 3 and 4, side-plates with front half produced downward into a lobe, second joints slightly expanded, upper hind margin produced into an angular point, second joint of fourth peræopod bearing

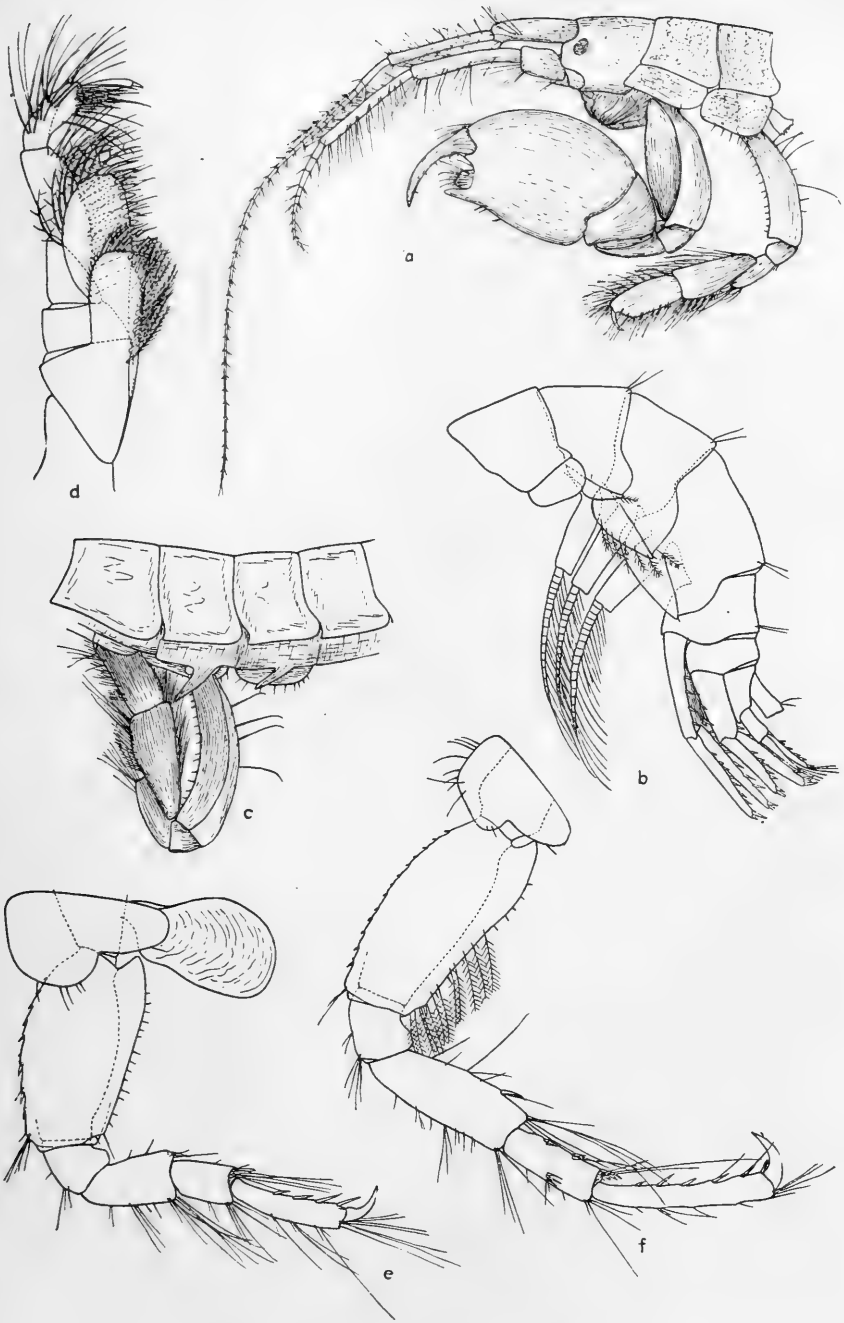

Fig. 10. *Bemlos macromanus*, new species

MALE.—*a*, head, first two thoracic segments, gnathopods and antennæ; *b*, abdomen, uropods and telson; *c*, conical appendages on the ventral surface of second and third thoracic segments; *d*, maxilliped; *e*, peræopod 3; *f*, peræopod 4.

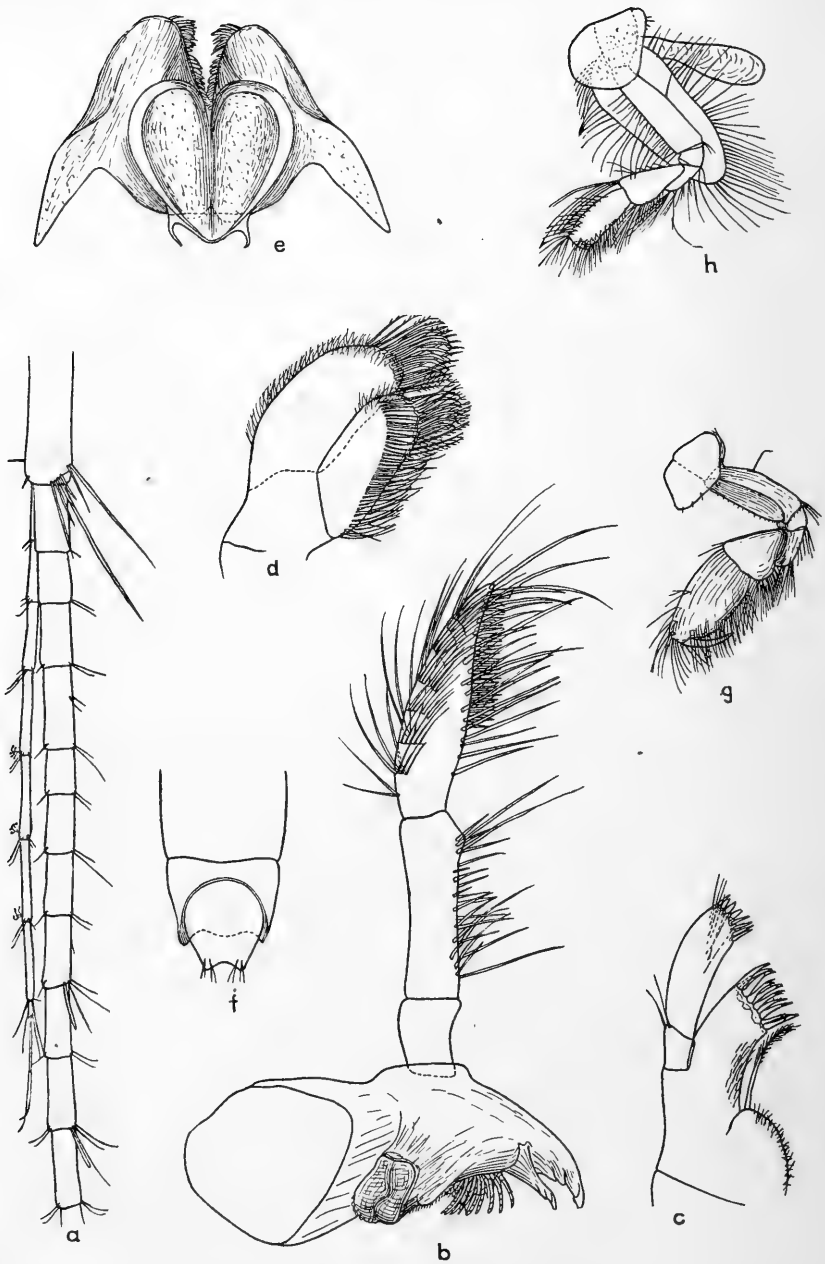

Fig. 11. *Bemlos macromanus*, new species

MALE.—*a*, antenna 1 showing accessory flagellum; *b*, mandible; *c*, maxilla 1; *d*, maxilla 2; *e*, lower lip; *f*, telson.

FEMALE.—*g*, gnathopod 1; *h*, gnathopod 2.

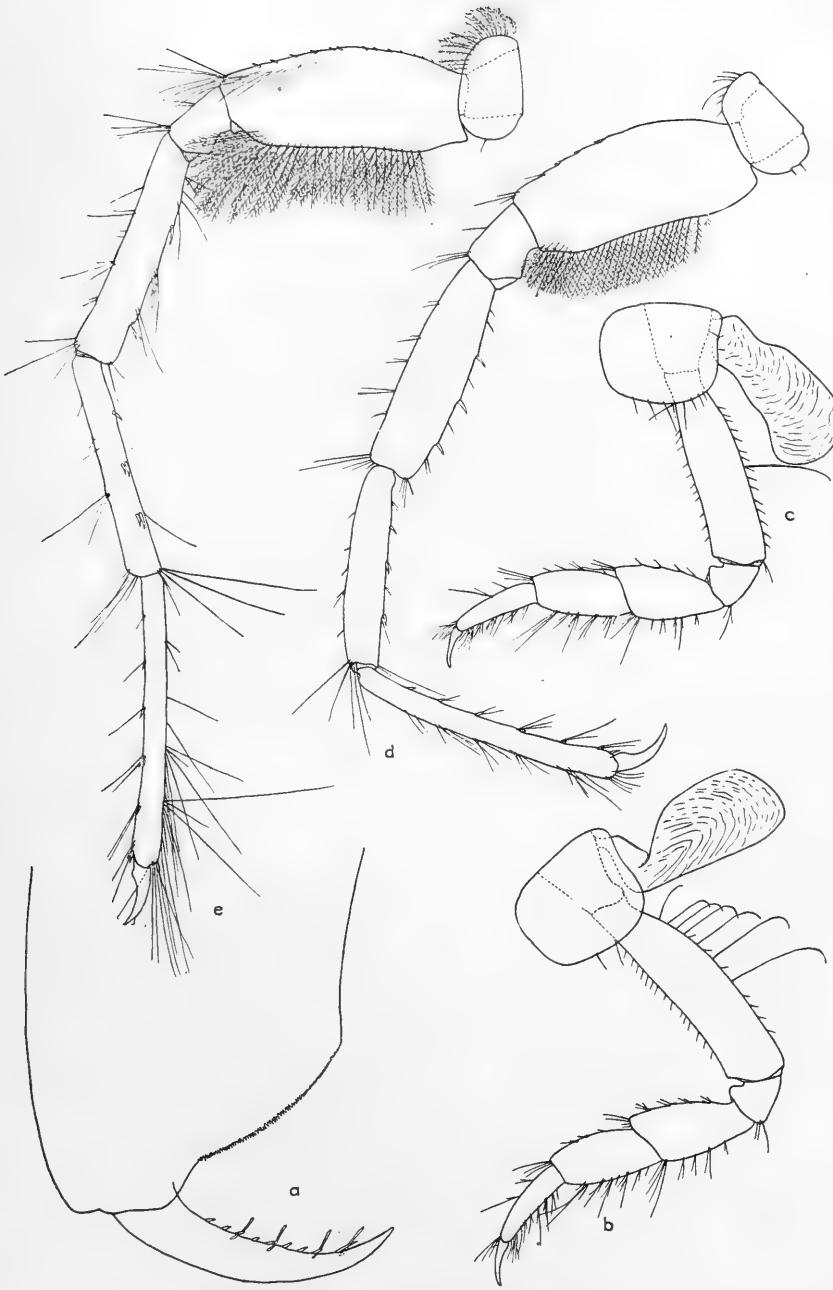

Fig. 12. *Bemlos macromanus*, new species

MALE.—*a*, gnathopod 2 showing teeth of palm; *b*, peræopod 1; *c*, peræopod 2; *d*, peræopod 5.
FEMALE.—*e*, peræopod 5.

Fig. 13. *Bemlos macromanus*, new species

FEMALE.—*a*, gnathopod 1 showing palm and teeth of finger; *b*, gnathopod 2, showing fine teeth of palm and teeth of finger; *c*, peræopod 1; *d*, peræopod 2; *e*, peræopod 3; *f*, peræopod 4.

a few plumose setæ on hind margin. Peræopod 5 the longest, second joint little expanded, hind margin bearing many plumose setæ. The posterior lateral margins of the abdominal segments 1–3 are evenly convex and their lower posterior angles produced into minute points, lower margins slightly convex. Uropods about as in *Lembos*. Uropod 3 with outer ramus slightly shorter than inner. Telson very little longer than wide, narrow hind margin slightly excavate with each of the blunt lobes bearing a few setæ.

FEMALE.—Side-plates comparatively narrower and deeper than in male. Gnathopod 1 with second joint excavate on front margin, lower anterior corner produced into a point, fifth and sixth joints subequal in width, fifth a little over half the length of the sixth and triangular in general outline, sixth with edges slightly convex and narrowing slightly toward the distal end, palm convex, oblique and smooth, dactyl fitting palm and bearing a row of small teeth on the inner edge. Gnathopod 2 much as in the male, fifth and sixth joints subequal in length, palm less oblique and very finely toothed throughout, dactyl fitting palm and bearing a row of small teeth on the inner edge. Peræopods as in male; the second joints of peræopods 4 and 5, however, are more densely furnished with plumose setæ on their hind margins.

LENGTH.—♂ 9 mm., ♀ 10 mm.

The second and third thoracic segments of the male bear on the center of their ventral surfaces a forward-pointing, slightly conical process probably of the same nature as those which have been observed on several fresh-water amphipods by Sars, Smith, Haswell, Chilton, Tattersall and others. These processes, the function of which is not known, appear to have been very seldom observed in marine species.

HYPERIIDEA

Vibiliidæ

Vibilia californica Holmes

Vibilia californica HOLMES, 1908, Proc. U. S. National Museum, XXXV, p. 490.

Guadalupe Island, Gulf of California, March 3, 1911, electric light; 1 specimen. Agua Verde Bay, Gulf of California, electric light; 1 specimen. Carmen Island, Gulf of California, electric light; 8 specimens.

This species was described by S. J. Holmes from two specimens dredged by the Steamer 'Albatross' off Point Loma, Southern California.

Hyperiidæ

Hyperia species

San Josef Island, Gulf of California, electric light; 1 specimen.

Carmen Island, Gulf of California, electric light; 2 specimens.

These specimens are all quite young, so that it is hardly possible to identify them specifically.

Phrosinidæ

Anchylomera blossevillii Milne-Edwards

Anchylomera blossevillii Milne-Edwards, 1830, Ann. des Sci. Nat., XX, p. 394 (extr., p. 43).

Hieraconyx abbreviatus, ♂, Guerin, 1836, Magasin de Zoologie, Classe VII, p. 5, Pl. xvii, figs. 2, 2*a*-2*f*.

Cheiropristis Messanensis, ♂, de Natale, 1850, Crost. del porto di Messina, tav. i, fig. 2.

Anchylomera purpurea, ♂, Dana, 1853, 'U. S. Explor. Exped.,' XIII, Pt. 2, p. 1001, Pl. lxviii, figs. 9*a-m*.

Anchylomera thyropoda, ♀, Dana, 1853, 'U. S. Explor. Exped.,' XIII, Pt. 2, p. 1004, Pl. lxviii, figs. 10*a-g*.

Anchylomera antipodes Spence Bate, 1862, 'Brit. Mus. Catal. Amph. Crust.,' p. 322, Pl. li, figs. 9, 10.

Anchylomera Blossevillei Spence Bate, 1862, 'Brit. Mus. Catal. Amph. Crust.,' p. 323, Pl. lii, fig. 1.

Anchylomera Hunteri Spence Bate, 1862, 'Brit. Mus. Catal. Amph. Crust.,' p. 324, Pl. lii, fig. 2.

Anchylomera abbreviata Spence Bate, 1862, 'Brit. Mus. Catal. Amph. Crust.,' p. 324, Pl. lii, fig. 3.

Anchylomera purpurea Spence Bate, 1862, 'Brit. Mus. Catal. Amph. Crust.,' p. 325, Pl. lii, fig. 5.

Anchylomera thyropoda Spence Bate, 1862, 'Brit. Mus. Catal. Amph. Crust.,' p. 325, Pl. lii, fig. 6.

Anchylomera abbreviata Bovallius, 1887, 'Arctic and Antarctic Hyperids, Vega-Exped.,' IV, p. 571.

Anchylomera antipodes Bovallius, 1887, 'Arctic and Antarctic Hyperids, Vega-Exped.,' IV, p. 572.

Anchylomera blossevillii Stebbing, 1888, 'Challenger Amphipoda,' p. 1433, Pl. clxxvii.

Anchylomera blossevillei Chevreux, 1900, 'Rés. Camp. Sci., Monaco,' Fasc. 16, p. 147.

Anchylomera blossevillii Chilton, 1912, Trans. Roy. Soc. Edinburgh, XLVIII, Pt. 2 (No. 23), p. 516.

Cape San Lucas, Lower California, ship's anchorage, March 24, 1911, electric light; 2 specimens.

This species is very widely distributed, both in the Atlantic and Pacific Oceans, but the present record is the first for the western coast of North America.

Pronoidæ

Symprone anomala, new species

Localities.—Cape San Lucas, Lower California, ship's anchorage, electric light; 2 specimens. Cape San Lucas, Lower California; 1 specimen. Agua Verde Bay, Gulf of California, electric light; 6 specimens (1 ♂ type).

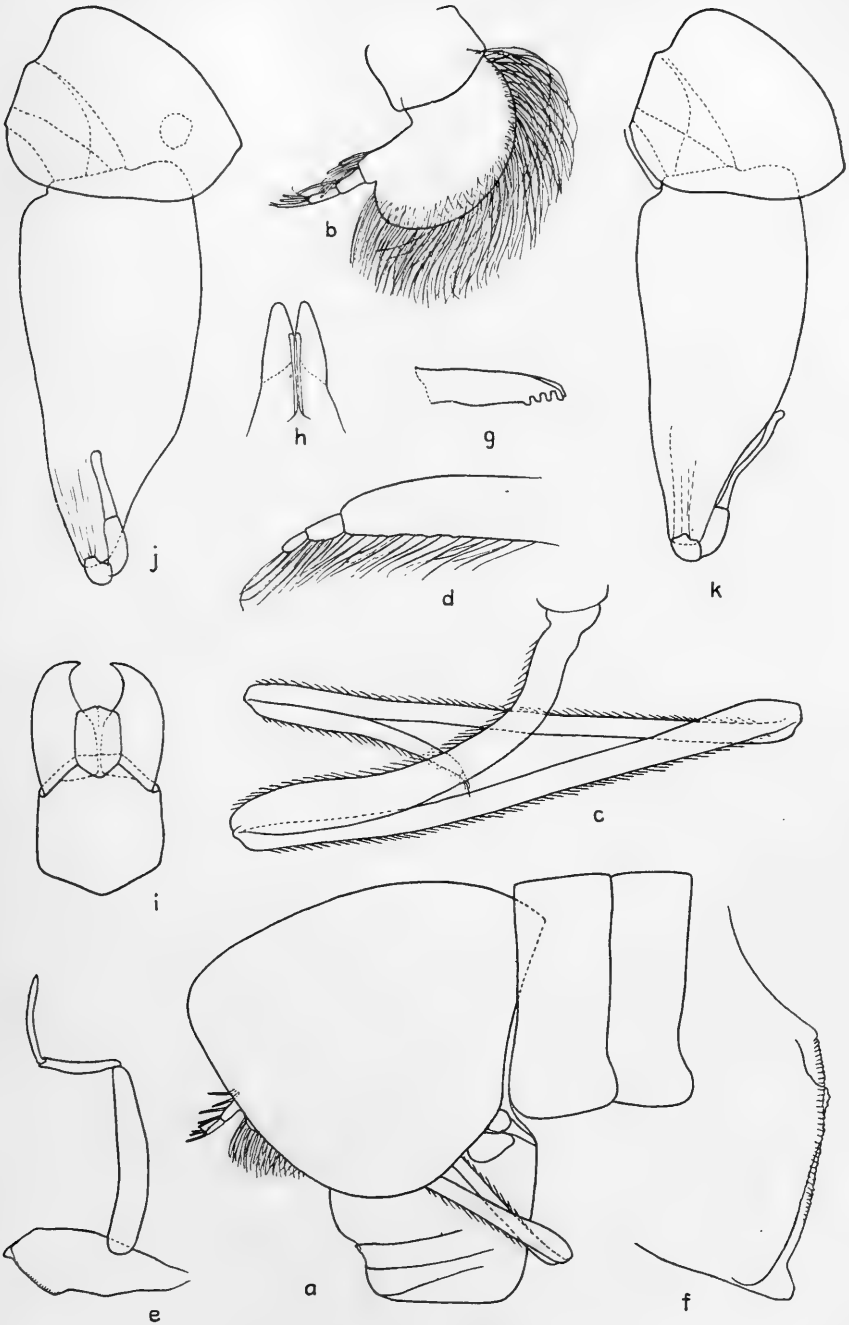

Fig. 14. *Symprone anomala*, new species

MALE.—*a*, head and first two thoracic segments; *b*, antenna 1; *c*, antenna 2; *d*, end of flagellum enlarged; *e*, mandible; *f*, cutting edge of mandible; *g*, maxilla 1; *h*, maxilla 2; *i*, maxillipeds; *j*, peræopod 5; *k*, peræopod 5 of another specimen.

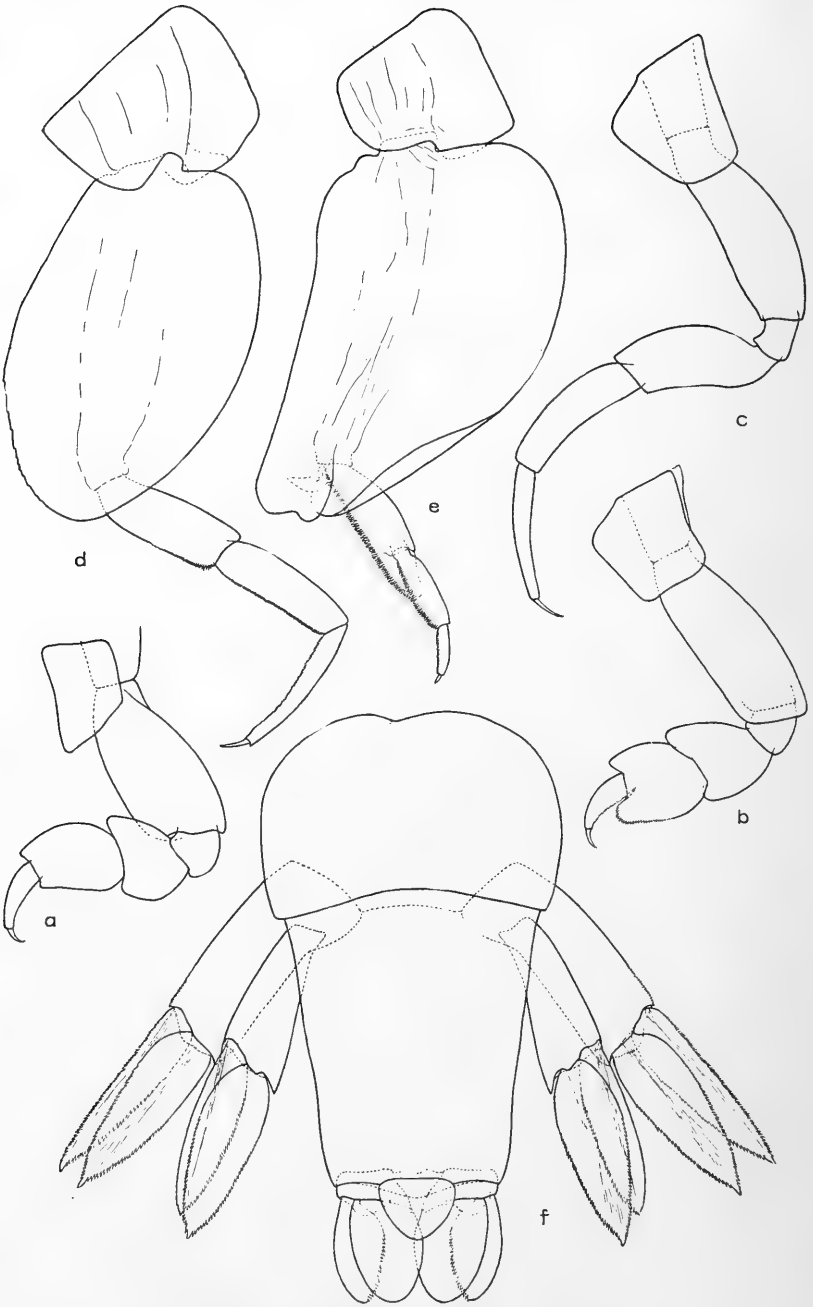

Fig. 15. *Symprone anomala,* new species

MALE.—*a*, gnathopod 1; *b*, gnathopod 2; *c*, peræopod 2; *d*, peræopod 3; *e*, peræopod 4; *f*, uropod and telson.

Male.—These specimens agree very closely with *Symprone parva* (Claus) and *Symprone propinqua* Stebbing, but differ from both of these species in a few well-marked characters. The front angle of the head is a little more acute. Antenna 1, first joint of flagellum somewhat wider and produced into more of a lobe distally; second and third joints subequal in length, fourth joint very slender and a little longer than third. Antenna 2, fifth joint of peduncle a little shorter than fourth, first joint of flagellum over half the length of the third joint of peduncle and less than half the length of the fifth, second joint of flagellum very small, third joint of flagellum shorter and narrower than second. Maxillipeds much shorter proportionately than in *S. parva*. Other mouth-parts agreeing with those of *S. parva*. Gnathopod 1, joints shorter and broader proportionately than in either *S. parva* or *S. propinqua*. Gnathopod 2 with upper distal end of fifth joint somewhat produced. Peræopod 4 with second joint not distally rounded, but slightly emarginate. Peræopod 5 with second joint as in *S. parva*, but with three narrow terminal joints instead of two, the first of these joints short, the second longer and somewhat narrower, and the third narrower and longer than the second, this last joint varies in length being in some cases little longer than the preceding and in others nearly twice as long. Uropods and telson much as in *S. parva* except that the telson is obtusely pointed and is one-fourth wider than long.

Length.—7 mm.

Brachyscelidæ Stephensen, 1923

Brachyscelus crusculum Spence Bate

Brachyscelus crusculum Spence Bate, 1861, Ann. and Mag. Nat. Hist., (3) VIII, p. 7, Pl. II, figs. 1, 2.

Brachyscelus crusculum Spence Bate, 1862, 'Brit. Mus. Catal. Amph. Crust.,' p. 333, Pl. LIII, figs. 2, 3.

Thamyris crusculum Bovallius, 1887, 'Systematical List of Amph. Hyper.,' Bihang till K. Svensk. Vetensk.-Akad. Handl., XI, No. 16, p. 31.

Thamyris mediterranea Claus, 1887, 'Platysceliden,' p. 60, Pl. XVI, figs. 11–18.

Brachyscelus crusculum Stebbing, 1888, 'Challenger Amphipoda,' p. 1544, Pl. CXCV, specimen *a*.

Brachyscelus crusculum Chevreux, 1893, Bull. Soc. Zool. France, XVIII, pp. 70–74, text figs. 1–9.

Brachyscelus crustulum Norman, 1900, Ann. Mag. Nat. Hist., (7) V, p. 134.

Brachyscelus crusculum+*B. mediterraneus* Chevreux, 1900, 'Rés. Camp. Sci. Monaco,' Fasc. XVI, p. 153, 154.

Brachyscelus mediterraneus Senna, 1903, Ann. Mus. Zool. Napoli, (N. Ser.) I, No. 6, p. 5.

Brachyscelus crusculum Tattersall, 1906, Fisheries, Ireland, Sci. Invest., 1905, No. 4, Pt. 8, p. 26.

Brachyscelus crusculum Holmes, 1908, Proc. U. S. Nat. Mus., XXXV, p. 490.

Brachyscelus crusculum Stephensen, 1923, 'The Danish Ingolf-Exped.,' III, 'Crust. Malacos.,' V (Amphipoda. 1), p. 37.

Cape San Lucas, Lower California, ship's anchorage, electric light; 5 specimens. Carmen Island, southeast side, Gulf of California, electric light; 1 specimen. San Josef Island, Gulf of California, electric light;

2 specimens. Agua Verde Bay, Gulf of California, electric light; 15 specimens.

This is a very widely distributed species and was reported off Point Loma, southern California, by S. J. Holmes in 1908.

Lycæidæ

Lycæa bajensis, new species

LOCALITIES.—San Josef Island, Gulf of California, electric light; 23 specimens (1 ♂ type). Cape San Lucas, Lower California, ship's anchorage, electric light; 4 specimens. Cape San Lucas, Lower California, ship's anchorage, electric light; March 24, 1911, 1 specimen. Carmen Island, southeast side, Gulf of California, electric light; 3 specimens.

MALE.—Head globular. Antenna 1, upper edge of first joint of flagellum nearly straight, there being a very shallow angle near the peduncle, the upper distal extremity of this joint forming nearly a right angle, second joint longer than third or fourth, which are subequal. Antenna 2 as in Stebbing's figure of *L. vincenti*, except that the fifth joint of the peduncle is very slightly shorter than fourth and the flagellum reaches very nearly to the end of the fifth joint. Maxillipeds as in *L. vincenti*. Mandibular palp with third joint slightly longer than second. Gnathopods 1 and 2 as in *L. vincenti*, but the lower distal angle of fifth joint not so sharply produced. Peræopod 2 as in *L. vincenti* except the rear edge of sixth joint is without minute teeth. Peræopod 3 much as in *L. vincenti*, but with the hind margin of second joint more convex. Peræopod 4, front margin of second joint having a decided hump in the middle. Peræopod 5, second joint, strikingly widest through the middle, hind margin not evenly convex, succeeding joints and dactyl as in *L. vincenti*. The posterior lateral corners of abdominal segments 1–3 evenly rounded. The rami of all the uropods are straight and their edges finely pectinate except the outer edge of the outer ramus of uropods 2 and 3. Telson with sides evenly convergent, except at the basal fourth, where they are constricted, and about parallel.

LENGTH.—7 mm.

FEMALE.—Thorax quite tumid, narrowing suddenly to the slender abdomen. Head not so long as in male, but just as deep. Antenna 1, first joint of flagellum not expanded, second joint short, third joint a little longer than second. Gnathopod 1, as in male, except there are no fine teeth on the fifth or sixth joints and the lower distal corner of the fifth joint is not so sharply produced. Gnathopod 2 as in male, but without the fine teeth on fiffh or sixth joints. Peræopods as in male. Posterior lateral corners of abdominal segments 1–3 as in male. Uropods as in male. Telson with sides nearly straight and evenly convergent, not constricted at base.

LENGTH.—7 mm.

Parascelidæ

Parascelus zebu Stebbing

Parascelus zebu STEBBING, 1888, 'Challenger Amphipoda,' p. 1496, Pl. CLXXXV.

Carmen Island, southeast side, Gulf of California, electric light; 2 specimens.

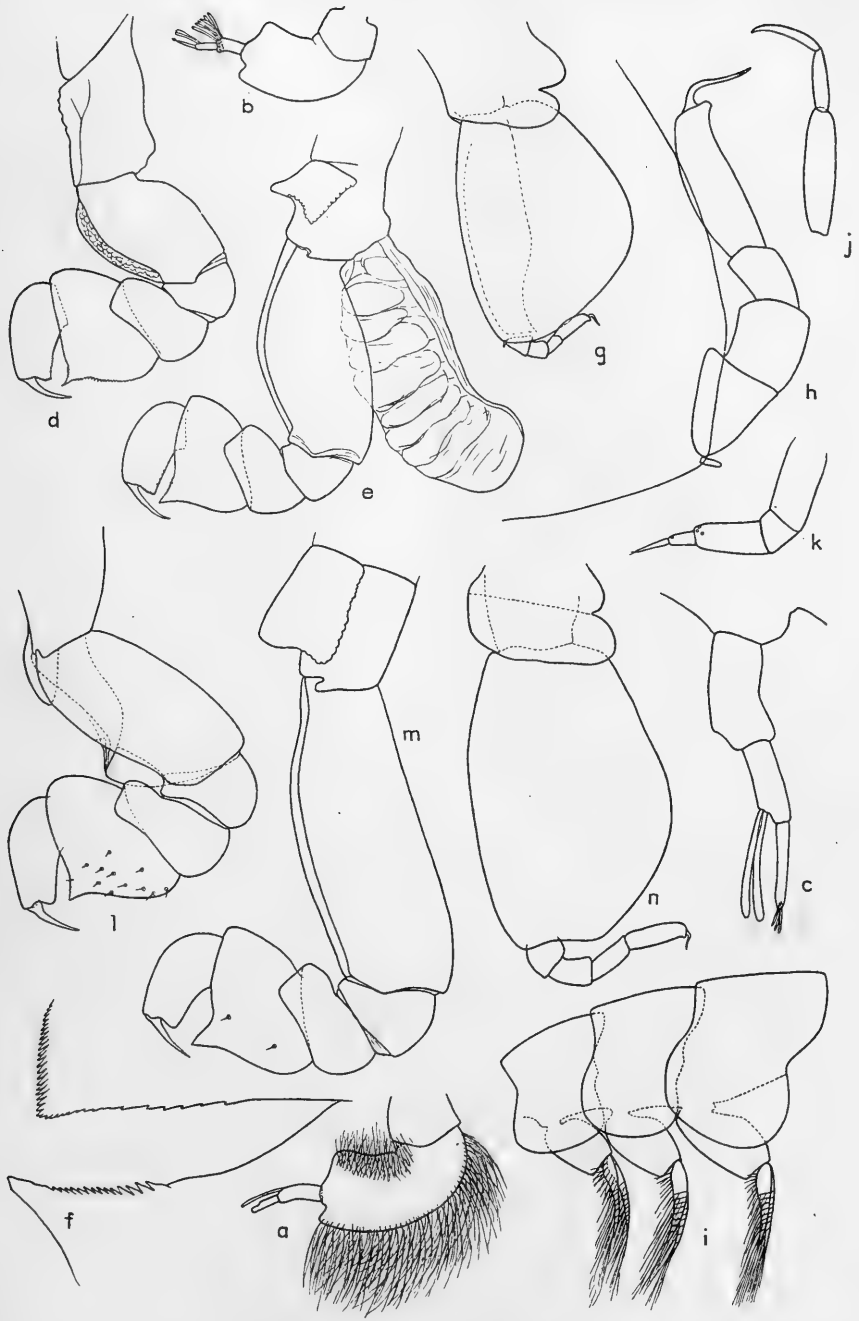

Fig. 16. *Lycæa bajensis*, new species

MALE.—*a*, antenna 1, fourth joint of flagellum missing; *b*, antenna 1 of another specimen showing fourth joint of flagellum; *c*, second, third, and fourth joints of flagellum enlarged; *d*, gnathopod 1; *e*, gnathopod 2; *f*, fifth and sixth joints of gnathopod 2 enlarged; *g*, peræopod 5; *h*, third, fourth, fifth, and sixth joints of peræopod 5 enlarged; *i*, abdominal segments 1–3; *j*, palp of mandible.

FEMALE.—*k*, antenna 1; *l*, gnathopod 1; *m*, gnathopod 2; *n*, peræopod 5.

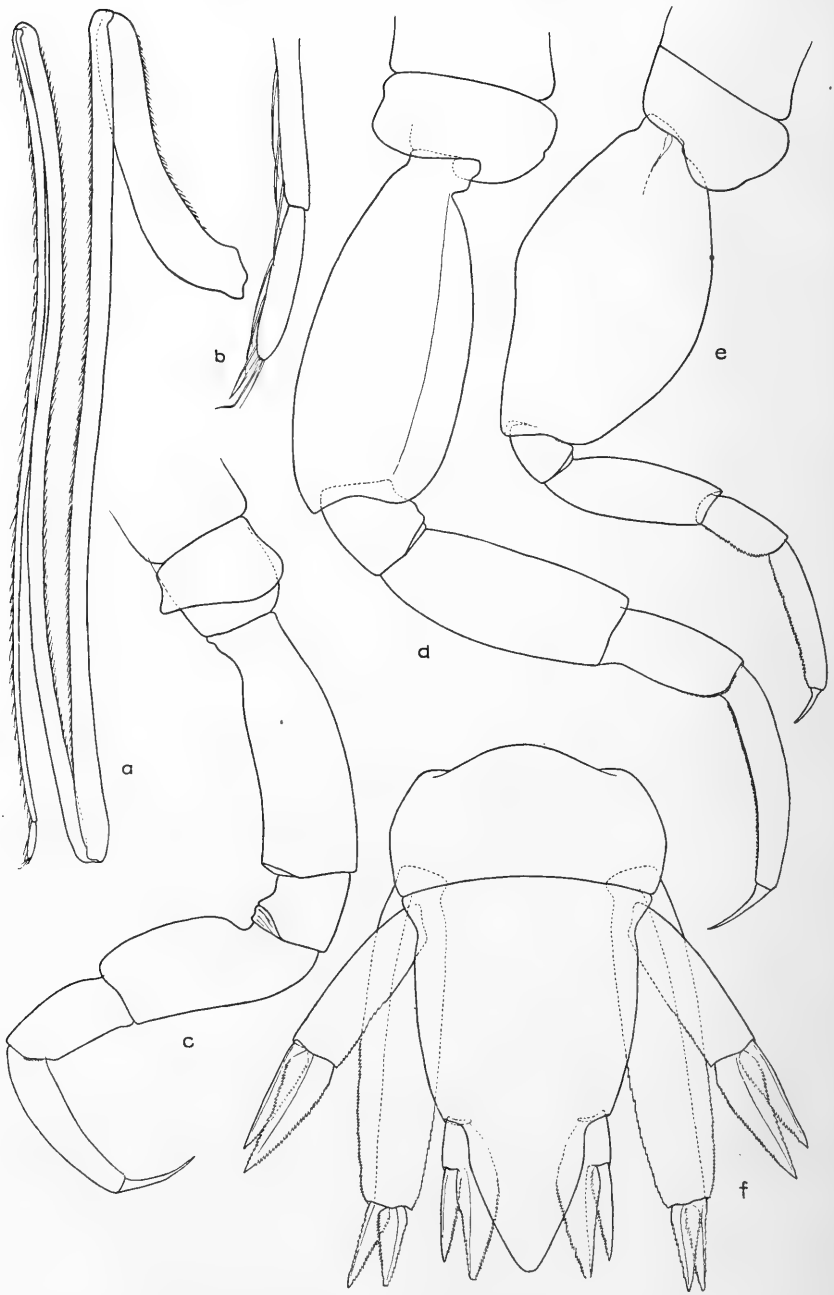

Fig. 17. *Lycæa bajensis*, new species

MALE.—*a*, antenna 2; *b*, end of flagellum of antenna 2 enlarged; *c*, peræopod 2; *d*, peræopod 3; *e*, peræopod 4; *f*, uropods and telson.

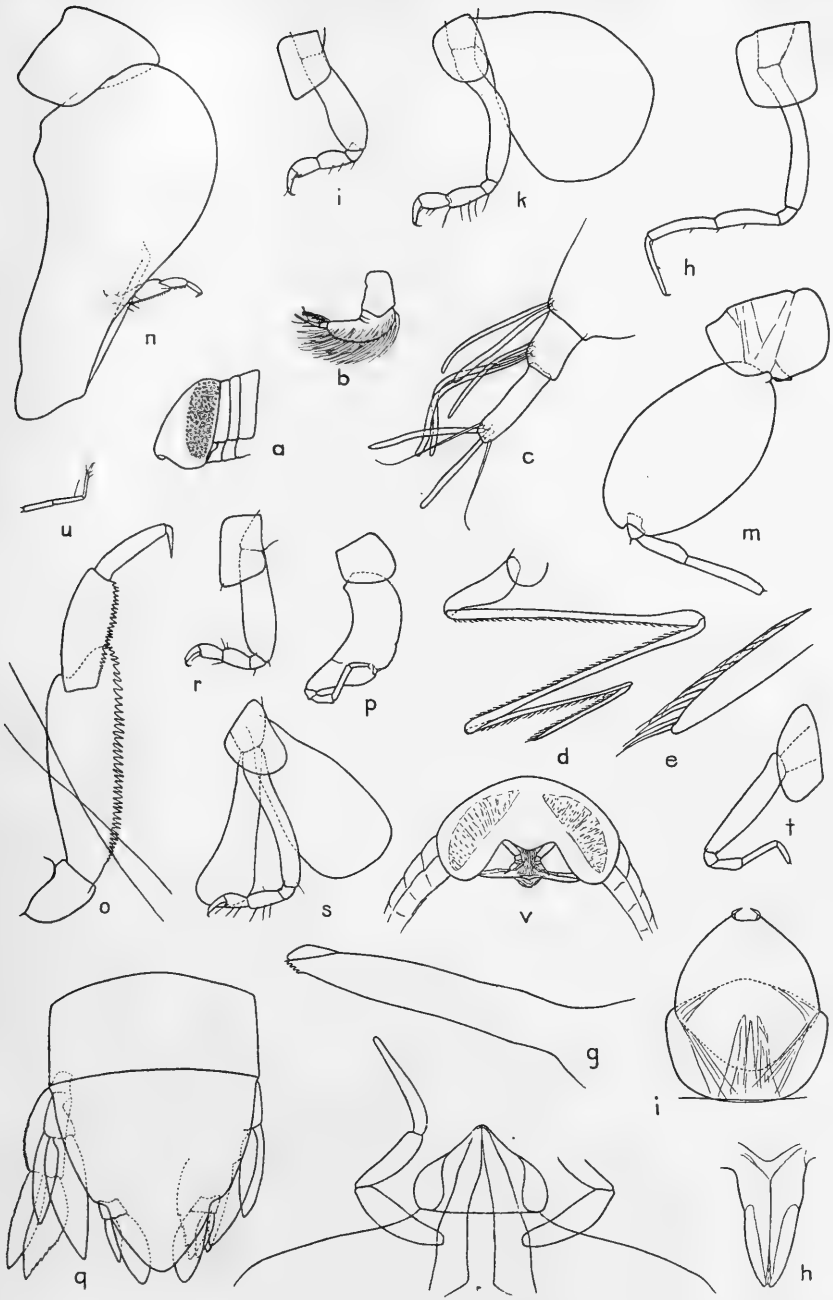

Fig. 18. *Parascelus zebu* Stebbing

Male.—*a*, head; *b*, antenna 1; *c*, first, second, and third joints of flagellum enlarged; *d*, antenna 2; *e*, end of second joint of flagellum of antenna 2 enlarged; *f*, mandibles; *g*, maxilla 1; *h*, maxillæ 2; *i*, maxillipeds; *j*, gnathopod 1; *k*, gnathopod 2; *l*, peræopod 2; *m*, peræopod 3; *n*, peræopod 4; *o*, third, fourth, fifth, and sixth joints of peræopod 4 enlarged; *p*, peræopod 5; *q*, uropods and telson.

Female.—*r*, gnathopod 1; *s*, gnathopod 2; *t*, peræopod 5; *u*, antenna 2; *v*, head from below.

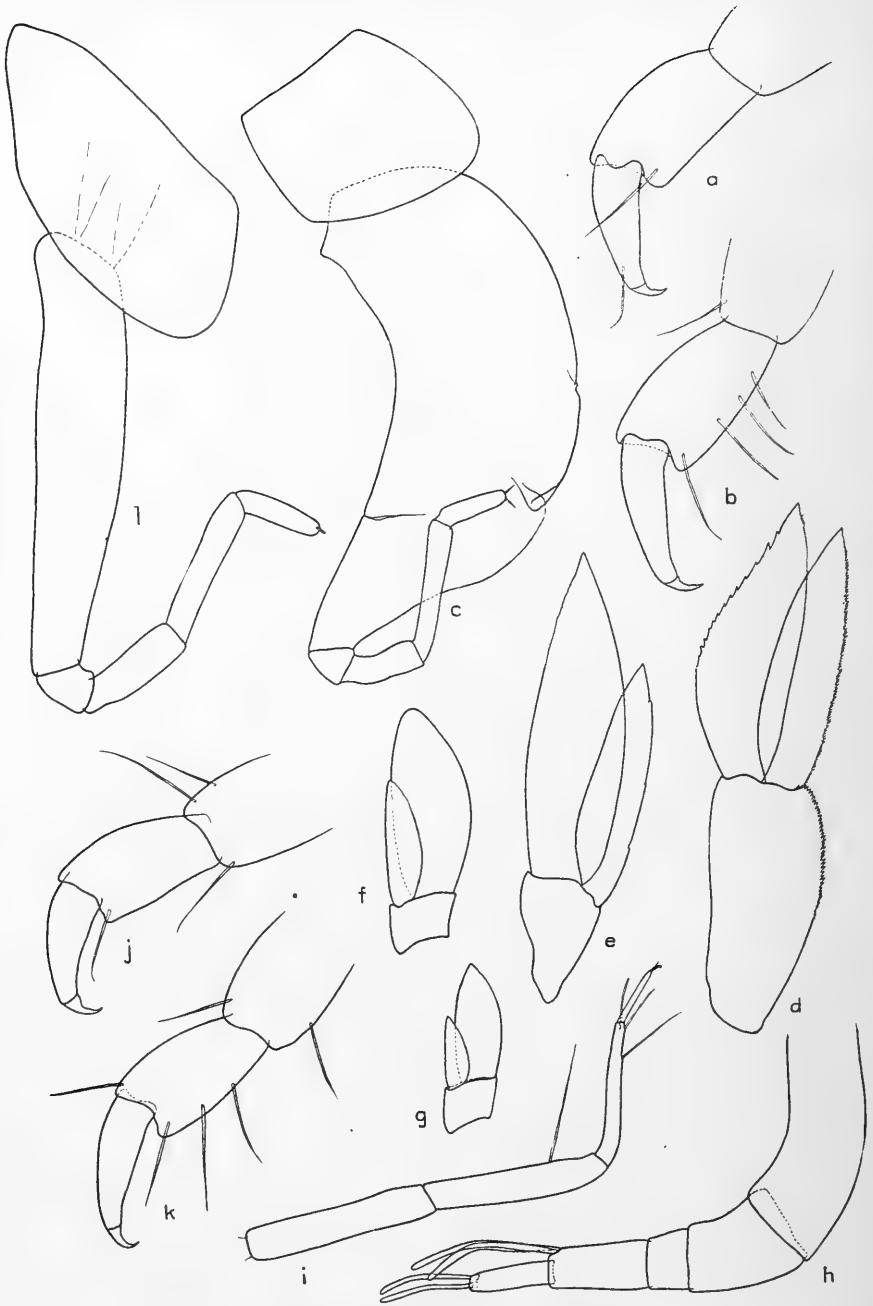

Fig. 19. *Parascelus zebu* Stebbing

MALE.—*a*, gnathopod 1; *b*, gnathopod 2; *c*, peræopod 5; *d*, uropod 1; *e*, uropod 2; *f*, uropod 3.
FEMALE.—*g*, uropod 3; *h*, antenna 1; *i*, antenna 2; *j*, gnathopod 1; *k*, gnathopod 2; *l*, peræopod 5.

These specimens, of which one is male and the other female, agree quite well with Stebbing's figures. The inner ramus of uropod 3 in the male is not pointed as in his figure, but is bluntly rounded; this, however, may be an individual peculiarity, as that of the female is much more like Stebbing's figure. Peræopod 5 of female with second joint not expanded as in male, and with the succeeding portion of the limb proportionately longer. Length of the specimens, 6 mm.

Platyscelidæ

I am here using the name Platyscelidæ, which was established by Bate in 1862. Stebbing points out that, the genus *Typhis* having been preoccupied, *Platyscelus* remains its earliest synonym. Then by right of priority the family must become Platyscelidæ from the earliest genus *Platyscelus*. The family is much more restricted now and does not include the *Pronoinæ* (Dana) as when established by Bate.

Platyscelus dubius, new species

Localities.—Cape San Lucas, Lower California, ship's anchorage, electric light; 19 specimens (1 ♂ type). Carmen Island, southeast side, Gulf of California, electric light; 2 specimens. San Josef Island, Gulf of California, electric light; 3 specimens. Agua Verde Bay, Gulf of California, electric light; 3 specimens.

Male.—Head with a depression just above the rostrum. Rostrum prominent. Eyes arranged in four groups. Antenna 1, first joint of flagellum tumid with upper edge short, and lower distal angle rounded and produced, second joint twice as wide as third, but equalling it in length, fourth joint a little longer and a little narrower than third. Antenna 2, third joint nearly straight, fourth a little longer than fifth, first joint of flagellum a little less than half the length of the fifth peduncular joint, second joint of flagellum a little longer than first. Maxillipeds, outer plates short and broad with inner edges slightly concave. Mandible, cutting edge oblique and provided with two rows of small blunt teeth, first joint of palp nearly straight and longer than second, second curved and longer than third, third slightly curved. Gnathopod 1 shorter than 2, the produced lobe of the fifth joint serrated on both edges, sixth joint serrated on inner edge. Gnathopod 2, the produced lobe of the fifth joint serrated on both edges and extending a little beyond the sixth joint, sixth joint serrated on inner edge. Peræopods 1 and 2 normal, sixth joint with 2 small teeth just above the dactyl. Peræopod 3, lower edge of second joint evenly rounded; fourth, fifth and sixth joints very nearly equaling one another in length and all with very fine serrations on the front margin. Peræopod 4, second joint with low, blunt tooth near the proximal end of front margin, lower margin oblique and nearly straight, fourth joint widest at distal end and twice as long as fifth, both fourth and fifth with conspicuous serrations on front margin, sixth joint very short and curved. Peræopod 5 nearly as that figured by Claus for *Eutyphis ovoides*,[1] second joint curved, third joint reduced to a mere knob,

[1] 'Die Platysceliden,' Taf. I, fig. 9.

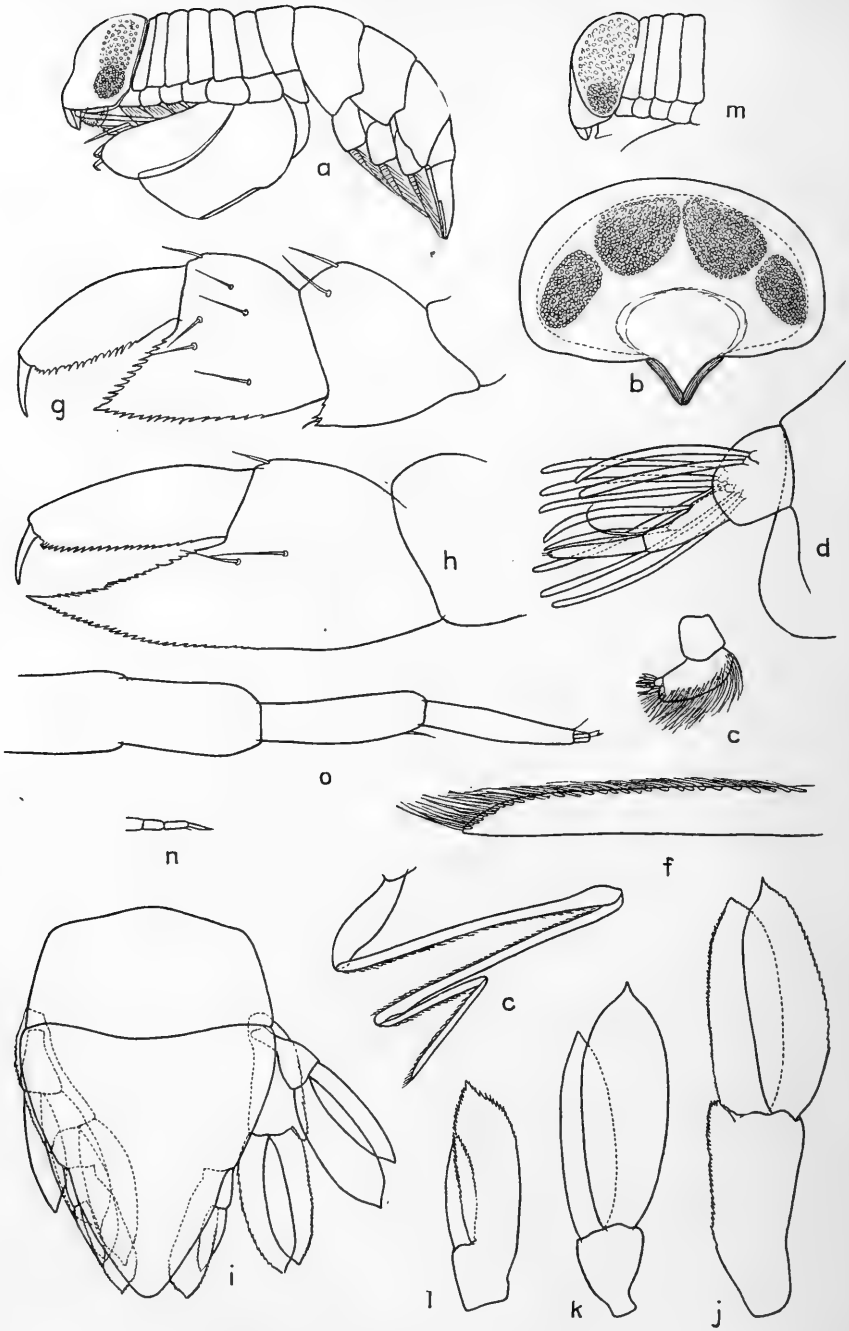

Fig. 20. *Platyscelus dubius*, new species

MALE.—*a*, entire animal; *b*, front of head; *c*, antenna 1; *d*, first, second, third, and fourth joints of flagellum of antenna 1 enlarged; *e*, antenna 2; *f*, end of flagellum of antenna 2 enlarged; *g*, gnathopod 1, *h*, gnathopod 2; *i*, uropods and telson; *j*, uropod 1; *k*, uropod 2; *l*, uropod 3.

FEMALE.—*m*, head; *n*, antenna 2; *o*, antenna 2 enlarged.

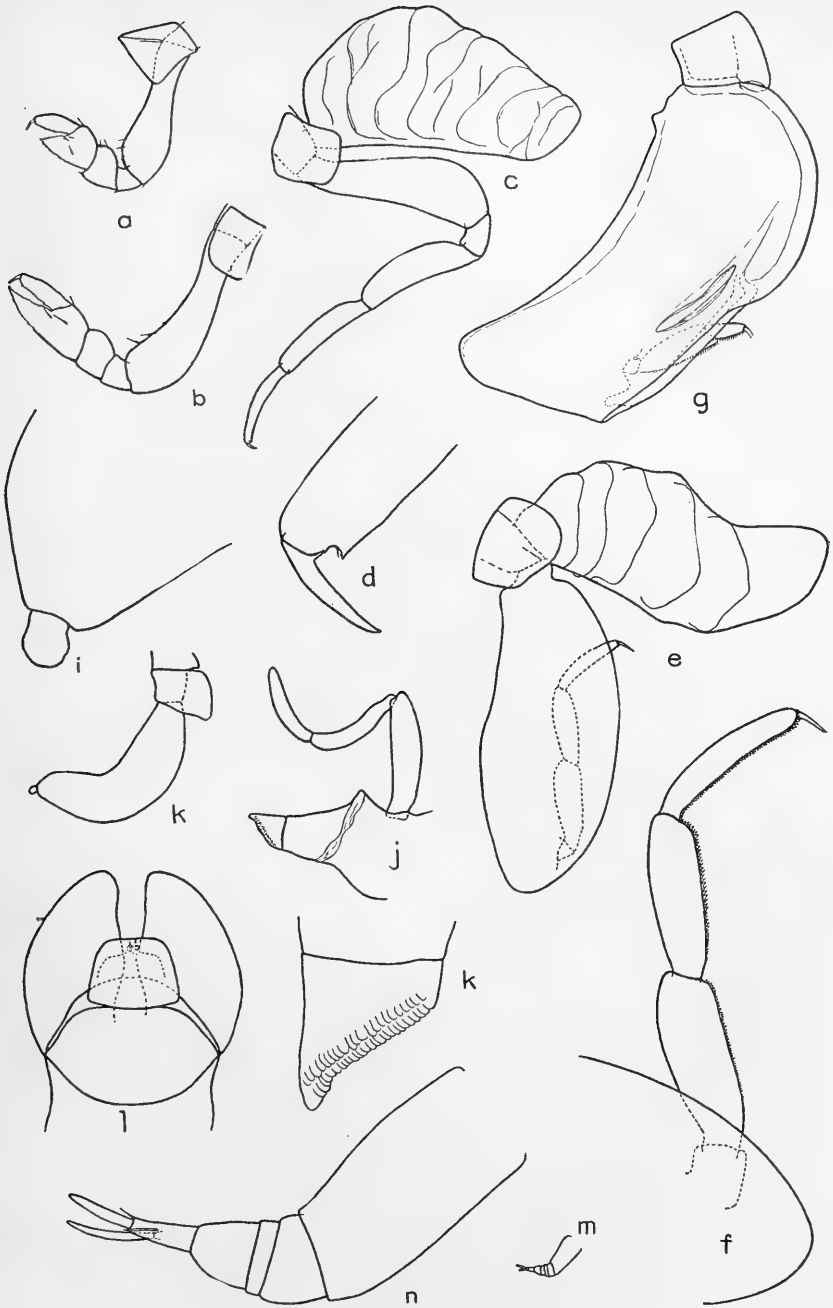

Fig. 21. *Platyscelus dubius*, new species

MALE.—*a*, gnathopod 1; *b*, gnathopod 2; *c*, peræopod 2; *d*, end of sixth joint and dactyl of peræopod 2 enlarged; *e*, peræopod 3; *f*, third, fourth, fifth, and sixth joints of peræopod 3 enlarged; *g*, peræopod 4; *h*, peræopod 5; *i*, end of second and small third joint or peræopod 5 enlarged; *j*, mandible; *k*, cutting edge of mandible enlarged; *l*, maxillipeds.

FEMALE.—*m*, antenna 1; *n*, antenna 1 enlarged.

the rest of the limb suppressed. Uropod 1, outer margin of outer ramus, and inner margin of inner ramus finely serrate. Uropod 2, rami without serrations. Uropod 3, outer ramus with inner edge serrate, inner ramus with outer margin and upper part of inner margin serrate. Telson with edges nearly straight, slightly constricted at base.

LENGTH.—5.5 mm.

FEMALE.—Like the male generally but with the thorax much broader proportionately. Head with front perpendicular, and rostrum short and broad. Antenna 1, first joint about as long as all the rest combined, second joint twice as long as third, flagellum with three joints of about equal length but successively narrower. Antenna 2, fourth joint slightly shorter than fifth, fifth equal in length to the flagellum which consists of one joint with a few setules near the distal end.

LENGTH.—5 mm.

Tetrathyrus sancti-josephi, new species

LOCALITIES.—San Josef Island, Gulf of California, electric light; 1 specimen (1 ♂ type). Agua Verde Bay, Gulf of California, electric light; 1 specimen. Carmen Island, southeast side, Gulf of California, electric light; 25 specimens.

MALE.—In general this species closely resembles *Tetrathyrus moncoeuri* Stebbing; but in a few characters it differs from that species. In the second antenna the fifth joint extends only to the smallest degree beyond the fourth. Peræopod 5 consists of only the first and second joints; the second joint is curved, about three times as long as wide, and terminates in a small knob. Uropods agreeing very closely with those of *T. moncoeuri* except that no division can be observed between the inner ramus and peduncle of uropod 2, thus forming a coalition as in uropod 3. Telson without terminal spinules.

LENGTH.—4 mm.

FEMALE.—Front of head perpendicular, not sloping at all forward as in the male. Antenna 1, flagellum equal in length to the peduncular joint, first joint of flagellum very short, second joint about three times as long as first and bearing a group of four setæ about the middle of the upper edge and one at the distal end, third joint about two-thirds as long as second and bearing two short spinules about the middle of the upper edge, one on the under edge near the distal end and one at distal end of upper edge, fourth joint a very little more than one-half the length of the third and bearing one or two minute spinules at the distal end. Gnathopods very closely resembling those of male; the lower distal angle of the sixth joint is not so much produced but is rather blunt and bears a single spinule. Peræopods 1–3 as in male. Peræopod 4 with second joint proportionately broader and the rest of the limb proportionately shorter than in male. Peræopod 5, second joint proportionately much narrower than in male and tapering off distally into an acute point. In one female examined the second joint of this peræopod ended less acutely and appeared to have a very minute third joint or an enlarged terminal spine as shown in the figure. Telson and uropods as in male except the rami end in more acute angles. Uropod 2 as in male has the inner ramus united with the peduncle.

LENGTH.—4.5 mm.

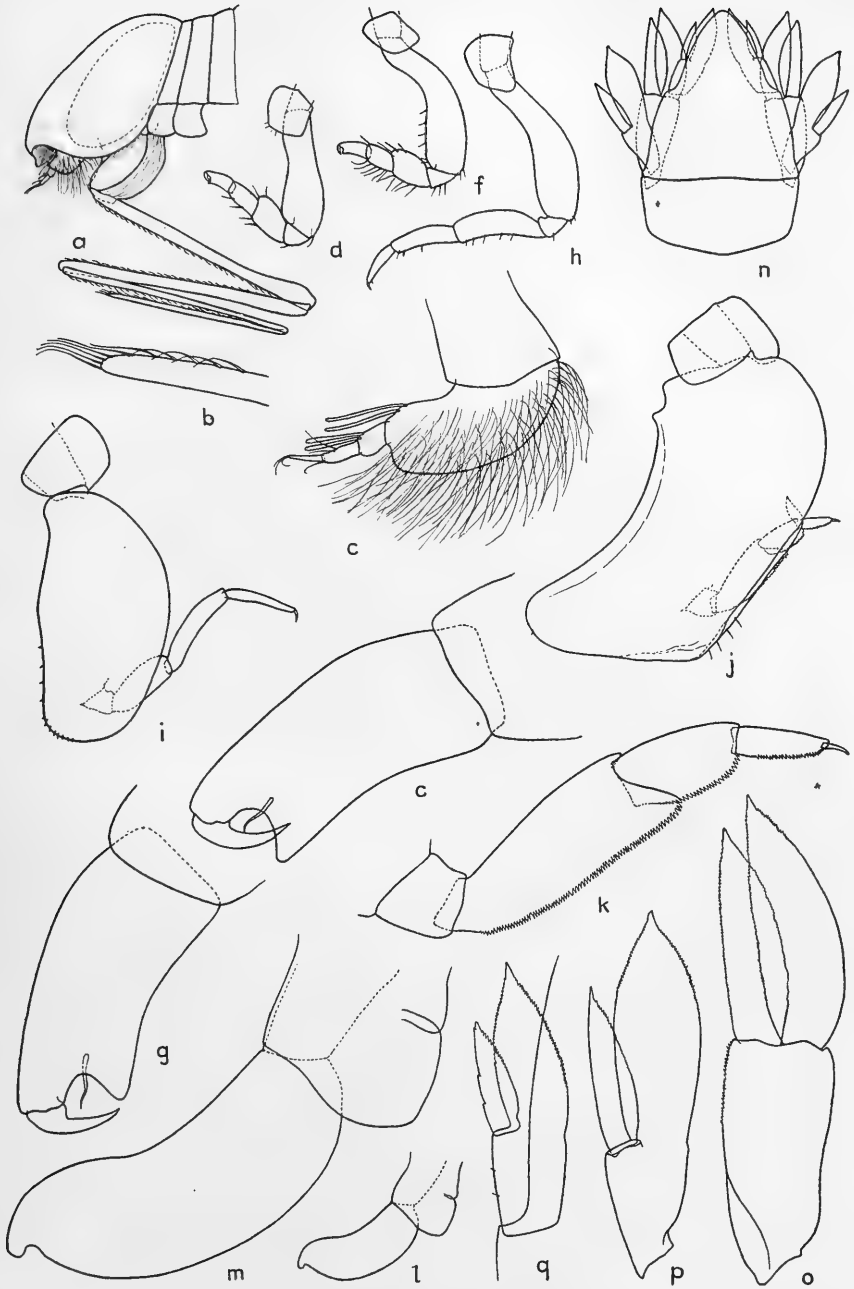

Fig. 22. *Tetrathyrus sancti-josephi*, new species

MALE.—*a*, head and antennæ; *b*, end of flagellum of antenna 2; *c*, antenna 1; *d*, gnathopod 1; *e*, gnathopod 1 enlarged; *f*, gnathopod 2; *g*, gnathopod 2 enlarged; *h*, peræopod 1; *i*, peræopod 3; *j*, peræopod 4; *k*, third, fourth, fifth, and sixth joints of peræopod 4 enlarged; *l*, peræopod 5; *m*, peræopod 5 enlarged; *n*, uropods and telson; *o*, uropod 1; *p*, uropod 2; *q*, uropod 3.

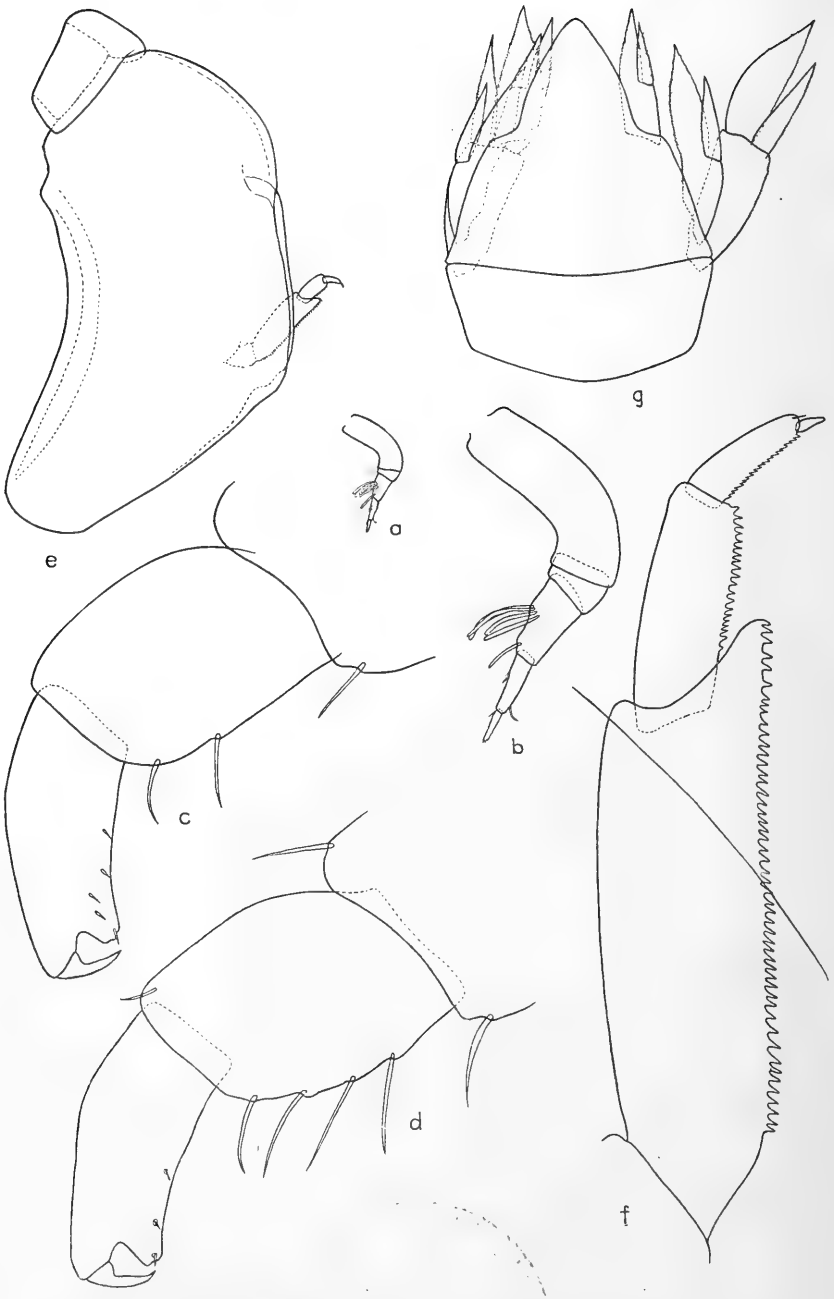

Fig. 23. *Tetrathyrus sancti-josephi*, new species

FEMALE.—*a*, antenna 1; *b*, antenna 1 enlarged; *c*, gnathopod 1; *d*, gnathopod 2; *e*, peræopod 4; *f*, fourth, fifth, and sixth joints of peræopod 4 enlarged; *g*, uropods and telson.

Fig. 24. *Tetrathyrus sancti-josephi*, new species

FEMALE.—*a*, gnathopod 1; *b*, gnathopod 2; *c*, peræopod 2; *d*, peræopod 3; *e*, sixth joint of peræopod 3 enlarged; *f*, peræopod 5; *g*, end of peræopod 5 enlarged; *h-i*, peræopod 5 of another specimen showing small third joint or an enlarged spine. *j-o*, peræopod 5 of other specimens showing variation in end of second joint.

Amphithyrus orientalis Stebbing

Amphithyrus orientalis Stebbing, 1888, 'Challenger Amphipoda,' p. 1485.

San Josef Island, Gulf of California; 2 specimens.

These specimens agree quite closely with Stebbing's description of this species in the 'Challenger Amphipoda.' He says, however, that the telson forms in outline an inverted arch with apex acute, but in the present specimens the apex is narrowly rounded as I have shown in the figure.

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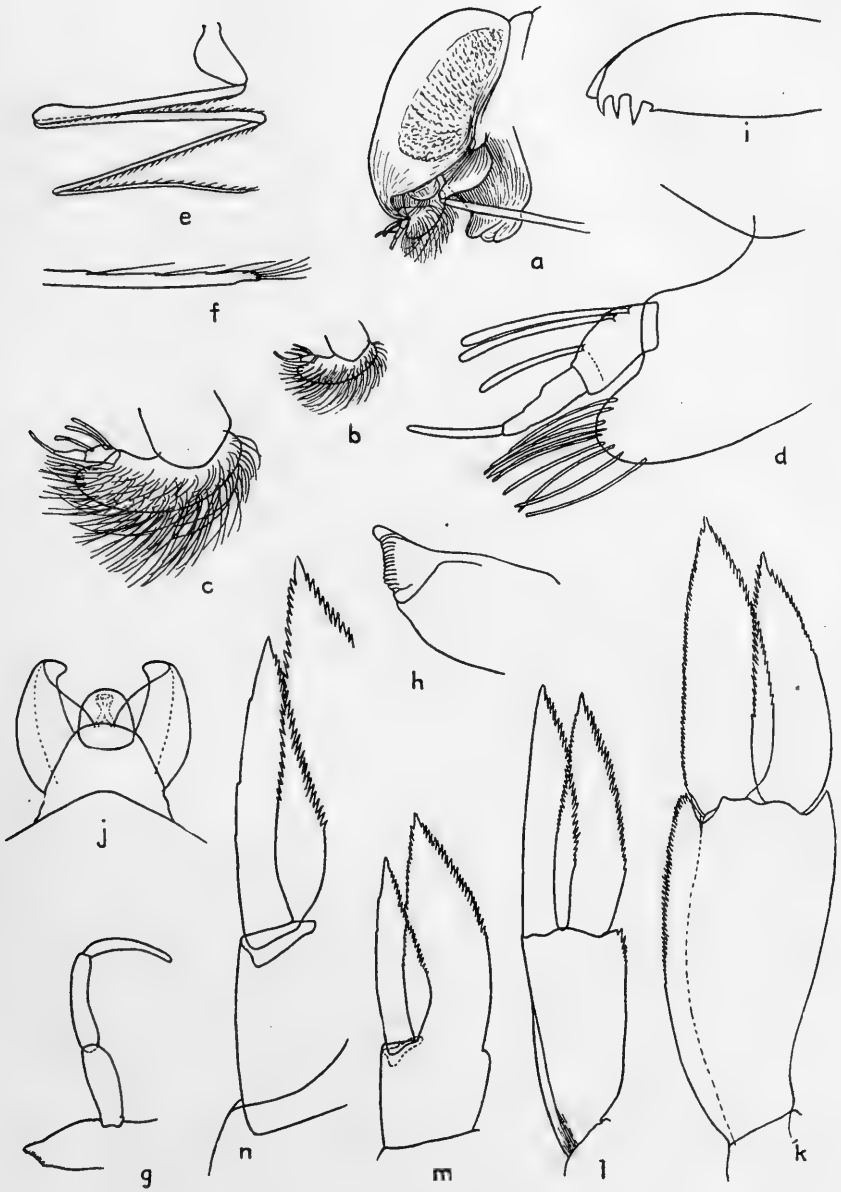

Fig. 25. *Amphithyrus orientalis* Stebbing

MALE.—*a*, head; *b*, antenna 1; *c*, antenna 1 enlarged; *d*, flagellum of antenna 1 enlarged; *e*, antenna 2; *f*, end of flagellum of antenna 2 enlarged; *g*, mandible; *h*, cutting edge of mandible; *i*, maxilla 1; *j*, maxillipeds; *k*, uropod 1; *l*, uropod 2; *m*, uropod 3; *n*, uropod 3 enlarged.

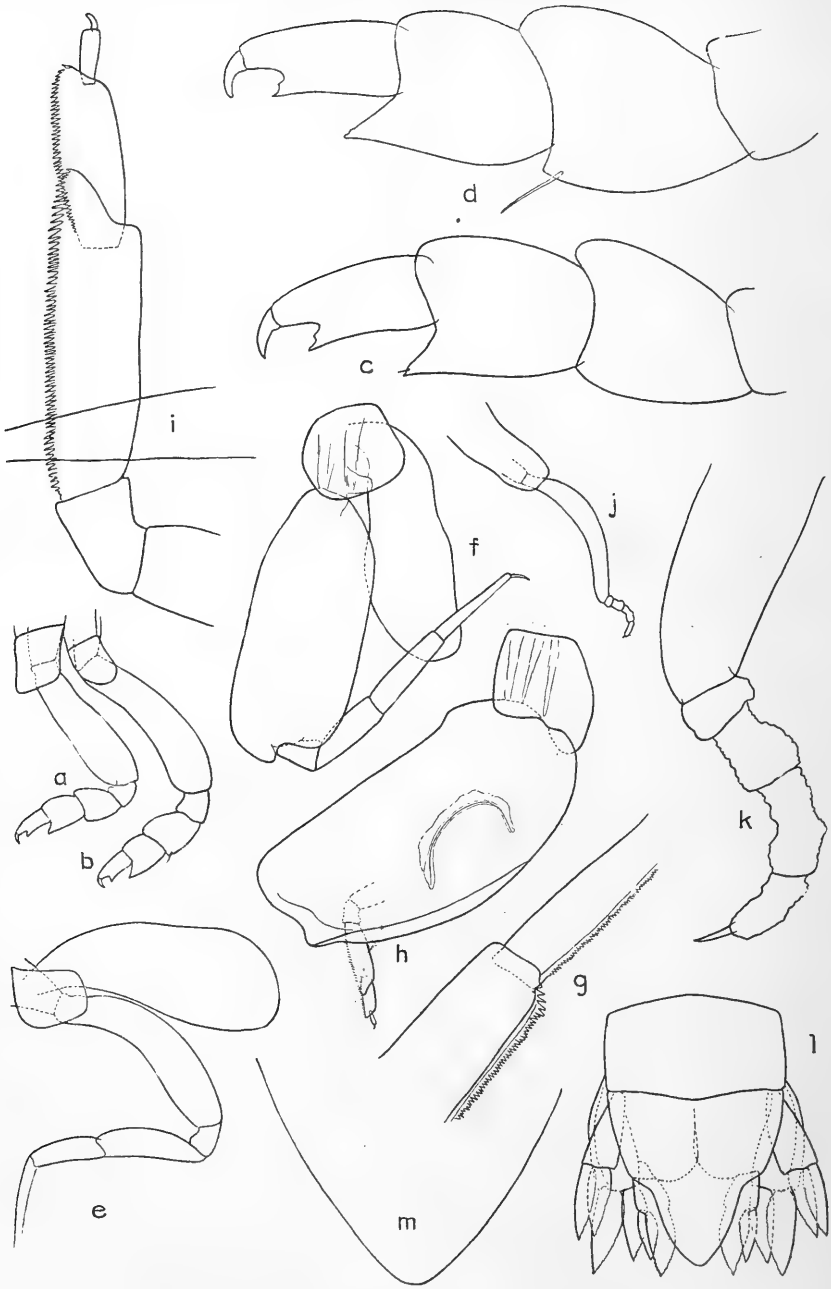

Fig. 26. *Amphithyrus orientalis* Stebbing

Male.—*a*, gnathopod 1; *b*, gnathopod 2; *c*, gnathopod 1 enlarged; *d*, gnathopod 2 enlarged; *e*, peræopod 2; *f*, peræopod 3; *g*, fifth and sixth joints of peræopod 3 enlarged; *h*, peræopod 4; *i*, third, fourth, fifth, and sixth joints of peræopod 4 enlarged; *j*, peræopod 5; *k*, third, fourth, fifth, and sixth joints of peræopod 5 enlarged; *l*, uropods and telson; *m*, apex of telson enlarged.

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