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PUBLISHING COMMITTEE:

D. HUMPHREYS STORER,

SAMUEL L. ABBOT,

CHARLES K. DILLAWAY,

JEFFRIES WYMAN,

BENJ. SHURTLEFF SHAW.

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CONTENTS
OF
NO. IV., VOL. VI.

- ART. XXV. New Species of Fossil Plants, from the Anthracite and Bituminous Coal-fields of Pennsylvania; collected and described by LEO LESQUEREUX. With Introductory Observations by HENRY DARWIN ROGERS
- ART. XXVI. Observations on the Development of *Anableps Gronovii*, (Cuv. & Val.) By JEFFRIES WYMAN, M. D.
- ART. XXVII. On the *Crustacea* and *Echinodermata* of the Pacific Shores of North America. By WILLIAM STIMPSON
- ART. XXVIII. A List of the Fishes collected in California by Mr. E. SAMUELS, with Descriptions of the New Species. By CHARLES GIRARD, M. D.

*Stimpson, William,
On the crustacea & echinodermata etc.*

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CONTENTS.

	Page
ART. I. On the Embryology of Nemertes, with an Appendix on the Embryonic Development of Polynœe; and Remarks upon the Embryology of Marine Worms in general. By E. DESOR, Boston	1
ART. II. Descriptions and Figures of the Araneides of the United States. By NICHOLAS MARCELLUS HENTZ, Tuscaloosa, Alabama	18
ART. III. Chemical Examination of some American Minerals. By J. D. WHITNEY, Boston	36
ART. IV. Examination of three new Mineralogical Species proposed by Prof. C. U. Shepard. By J. D. WHITNEY	42
ART. V. Observations on some of the Habits of <i>Salmo Fontinalis</i> . By SAMUEL L. BIGELOW, M. D., Worcester	49
ART. VI. Description of a new Genus of Fishes, Malacosteus. By W. O. AYRES, Boston	53
ART. VII. On the Pselaphidæ of the United States. By JOHN L. LE CONTE, M. D., New York	64
ART. VIII. Dissection of <i>Crocodylus lucius</i> . By SAMUEL KNEELAND, Jr., M. D., Boston	110
ART. IX. Chemical Examination of Algerite, a new Mineral Species; by T. S. HUNT, of the Geological Commission of Canada; including a Description of the Mineral, by F. ALGER, Boston	118
ART. X. Examination of a Mineral from Cherokee County, Georgia. By FRANCIS ALGER, Boston	123
ART. XI. On the Cancellated Structure of some of the Bones of the Human Body. By JEFFRIES WYMAN, M. D., Cambridge	125
ART. XII. PLANTÆ LINDHEIMERIANÆ, Part II. An Account of a Collection of Plants made by F. Lindheimer in the western part of Texas, in the years 1845-6, and 1847-8, with Critical Remarks, Descriptions of New Species, &c. By ASA GRAY, M. D., Cambridge	141

	Page
ART. XIII. Description of a New Species of <i>Polypterus</i> , from West Africa. By W. O. AYRES, Boston	241
ART. XIV. Observations on the Fishes of Nova Scotia and Labrador, with Descriptions of New Species. By HORATIO ROBINSON STORER, Boston	247
ART. XV. Descriptions and Figures of the Araneides of the United States. By NICHOLAS MARCELLUS HENTZ, Tuscaloosa, Alabama. [Concluded from page 35.]	271
ART. XVI. A few Ornithological Facts, gathered in a hasty Trip through portions of New Brunswick and Nova Scotia, in June, 1850. By T. M. BREWER, M. D., Boston	297
ART. XVII. Notice of the Egg of <i>Thalassidroma Leachii</i> , with Descriptions of the Eggs of <i>Procellaria Bulwerii</i> , <i>Procellaria obscura</i> , and <i>Puffinus major</i> . By T. M. BREWER, M. D., Boston	308
ART. XVIII. Description of five new Species of Birds, and other Ornithological Notes of Cuban Species. By JOHN GUNDLACH, Havana, Cuba	313
ART. XIX. The Organic Relations of some of the Infusoria, including Investigations concerning the Structure and Nature of the Genus <i>Bodo</i> , (Ehr.) By W. I. BURNETT, M. D., Boston	319
ART. XX. Notes and Observations on the Analysis and Character of the Soils of the Scioto Valley, Ohio, with some general Considerations respecting the subject of Soil Analyses. By DAVID A. WELLS, Cambridge	324
ART. XXI. On the Skeleton of the Great Chimpanzee, <i>Troglodytes gorilla</i> . By SAMUEL KNEELAND, Jr., M. D., Boston	336
ART. XXII. A Monograph of the Species of <i>Pisidium</i> , found in the United States of North America. By TEMPLE PRIME	348
ART. XXIII. Description (with figure) of <i>Menobranchnus punctatus</i> . By LEWIS R. GIBBES, M. D., Charleston	369
ART. XXIV. Descriptions of Shells from the Gulf of California and the Pacific Coasts of Mexico and California. By AUGUSTUS A. GOULD, M. D., Boston	374
ART. XXV. New Species of Fossil Plants, from the Anthracite and Bituminous Coal-fields of Pennsylvania; collected and described by LEO LESQUEREUX. With Introductory Observations by HENRY DARWIN ROGERS	409
ART. XXVI. Observations on the Development of <i>Anableps Gronovii</i> , (Cuv. & Val.) By JEFFRIES WYMAN, M. D.	432
ART. XXVII. On the <i>Crustacea</i> and <i>Echinodermata</i> of the Pacific Shores of North America. By WILLIAM STIMPSON	444
ART. XXVIII. A List of the Fishes collected in California by Mr. E. SAMUELS, with Descriptions of the New Species. By CHARLES GIRARD, M. D.	533

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VOLUME VI.—NO. IV.

ART. XXV.—*New Species of Fossil Plants, from the Anthracite and Bituminous Coal-fields of Pennsylvania; collected and described by LEO LESQUEREUX. With Introductory Observations by HENRY DARWIN ROGERS.*

THE following new species of fossil plants, one hundred and ten in number, are some of the results of a systematic investigation of the fossil flora of the carboniferous strata of Pennsylvania and the adjacent coal-fields of Ohio and Virginia, undertaken three years ago by my able assistant in this department of the geological survey of Pennsylvania, Leo Lesquereux, Esq., formerly of Switzerland, now of Columbus, Ohio.

By far the greater part of the specimens were collected by himself, and these are now in our possession. A few of the new species were first seen and studied by him in the rich local cabinets of Mr. Clarkson, of Carbondale, and of the Rev. W. Moore, of Greensburg, to whom our best thanks are due for their liberality in thus opening their collections for the description of what was new. Many of these hitherto undescribed forms were discovered in the slates, associated with the

beds of anthracite in the coal-fields of eastern Pennsylvania, which, compared with the bituminous coal-measures of western Pennsylvania, appear not only to contain a greater variety of species, but to present them in a condition of more perfect preservation for study.

The new species here briefly described by Mr. Lesquereux, constitute about one half of the total number of well-defined forms hitherto detected by him in the coal-measures and lower carboniferous rocks (the vespertine series) of Pennsylvania; more than one hundred of the two hundred and twenty species examined by him proving to be entirely identical with species already recognized in the European coal-fields, and some fifty more of them showing differences so slight, that a fuller comparison with better specimens, may result in their identification likewise. As a further evidence of the near affinity of the North American to the European fossil flora of the carboniferous age, he has remarked, in the course of his investigations, that even these new species which seem restricted to this continent, are every one of them in close relationship with European forms. It deserves mention, moreover, that the commonest European species are likewise the most common American ones.

A stratigraphical analysis of the anthracite measures of Pennsylvania, calls for their division into two groups, a lower series, distinguished by the *white* or very pale color of the ashes of nearly all the coal seams, and an upper series, including coals as remarkable for yielding only pinkish or red ashes. Between these groups there usually exists, especially in the southern or Pottsville basin, a small transition group of two or three beds of gray ash, or pinkish-gray ash coals. The entire number of coal-seams, of a thickness admitting mining, in the middle portion of the southern basin, where the whole formation is thickest and most replete in coal-beds, does not exceed about twenty-five; and counting those of all dimensions, the total series does not amount to more than from thirty to thirty-five separate layers.

In the bituminous coal-measures west of the Alleghany Mountains, the whole number of workable seams is less than one half of that above named, as belonging to the anthracite formation, while, including the thinner and less persistent beds, the entire series cannot there amount to more than eighteen or twenty. That portion of this great Appalachian coal-field, which lies within Ohio, appears to possess even somewhat fewer than the eastern half in Pennsylvania, the beds suitable for mining being estimated at seven, and the small seams about ten, in addition.

Advancing westward to the great coal basin of Indiana and Illinois, the coals thick enough for working are counted at only six, and the thin ones proportionately few; and this remarkable progressive reduction in the coal-beds, going westward, seems to be maintained as far as we advance in the formation; for crossing the Mississippi to the wide shallow coal-measures of Missouri and Iowa, the number of the workable beds there believed to exist, does not amount to more than three or four. Accompanying this interesting gradation in the amount of coal, there occurs an equally noteworthy diminution in the thickness and coarseness of the associated strata, showing a progressive thinning down of the whole of the land-derived coal-bearing portions of the carboniferous deposits. A future comparison of the fossil plants of these broad successive coal basins will probably disclose a corresponding reduction in the number and variety of the species, a view already suggested by their relative paucity in the bituminous coal-fields of western Pennsylvania and Ohio, as measured by their abundance in the anthracitic basins.

Wherever I have studied either of the anthracite fields, of the great Appalachian basin, I have remarked that the lower or "white ash" division of the coal-measures, gives indications of more violent and frequent disturbances of level in the surface, at the time of the deposition of the strata, than are noticeable in the composition of the upper or "red ash" part of the formation. Among the proofs are, more abrupt and

frequent alternations of coarse and fine deposits, more diversified and rapid changes in the thickness, composition, and arrangement of the strata, both of the mechanical deposits and the life-derived beds of coal, and the far greater mutability and inconstancy of all those strata, even the most quietly deposited, within the same area or extent of outcrop. The lower strata of the anthracite coal-measures are, indeed, remarkable for the diversity in the coarseness of the sandstone, and for the unsteadiness in thickness of the coal-beds themselves. Though these carbonaceous layers are the accumulations of once perfectly level sea-meadows, at successive depressions of the surface, it is evident, from their comparatively rapid thickening and thinning, and frequent coalescing and diverging, that the floors upon which they were collected were neither so wide as those which open the vegetation that resulted in the bituminous coal-beds, nor so uniform and gradual and horizontal in their slow movements of elevation and depression.

Commensurate with the more fluctuating size, and more restricted range of these lower coal-seams, is a greater inconstancy and diversity in their fossil flora. The more widely extended upper beds appear to exhibit a more limited specific vegetation, expanded over wider areas.

As far as our researches have gone, we notice that the lower strata, both in the anthracite measures, and in the great Appalachian coal-field, abound in the larger species, especially in *Lepidodendra*, while the higher seams are characterized by the smaller *herbaceous species*, most generally the herbaceous ferns.

We conceive that the large proportion of species common to the coal strata of North America and Europe clearly establishes identity of age between the two deposits, and a close accordance, if not identity, in the geographical and climatal conditions prevailing at their formation. A yet closer agreement is noticeable between the species found in the several coal-fields of the United States. Indeed, so alike are all the

anthracite basins in their fossils, that Mr. Lesquereux already recognizes more than twenty familiar European species as common to these once continuously united coal-fields. It has been indicated above, that the two different groups of the coal strata of Pennsylvania, the lower or white ash, and the upper or red ash, are characterized by somewhat different species, though these more or less intermingle. Satisfied of this fact, of a general prevalence of certain forms in certain parts of the coal-measures, we have aimed at carrying our inquiry a step farther, to ascertain whether or not any or all of the individual coal-seams themselves are separately recognizable by their fossil plants. Undoubtedly, in some of the broadly deposited and uniformly conditioned coal-beds and coal-slates of the western bituminous coal-fields, we do observe a most striking prevalence of the same species within the same layer, on comparatively wide areas; but amid the more irregularly accumulated beds, of especially the lower or white ash anthracite strata, formed on a less stable portion of the nowhere absolutely stationary crust, the inconstancy in the vegetation of even the same coal-seam is, for the most part, if not even quite, too great to permit us to attempt to identify it by its fossils merely. Again, in some instances, coal-beds which are demonstrably different, are almost absolutely identical in their fossils. This is the case with the "Gate" and "Salem" coals, near Pottsville. So strikingly alike are they in their vegetation, that Mr. Lesquereux strongly inclines to regard them as but the detached parts of originally one sheet of coal, and to suspect that there is some error of obscurity in my section, which shows them to be separated by several hundred feet of strata, including a number of beds of coal. Of the validity of the proofs, showing the so-called Salem vein, to be different coal from the Gate vein, and several stages higher in the series, there cannot, however, be any question, and the palæontological evidence for identity must give way before the higher and decisive demonstration from superposition, of their difference in age.

NEW SPECIES OF FOSSIL PLANTS,

BY LEO LESQUEREUX.

GENUS CALAMITES. Brongt.

1. *CALAMITES BISTRIATUS* (spec. nov.). Stem three inches broad, cylindrical; articulations about two inches distant; ribs broad, nearly plane, narrowly striate, converging at the articulations; tubercles very small and obsolete, inserted on the articulations.

2. *CALAMITES DISJUNCTUS* (spec. nov.). Stem cylindrical, one inch broad; articulations about two inches distant, inflated and crossed by a depressed furrow; ribs elevated, half cylindrical, exactly parallel, narrow; surface covered with small elevated points; tubercles very small, round.

GENUS ASTEROPHYLLITES. Brongt.

3. *ASTEROPHYLLITES CRASSICAULIS* (spec. nov.). Stem thick, articulated; deeply striate; articulations half an inch distant; leaves verticillate on the joints, linear, acute, single nerved; tubercle or fruit obcordate, acute, attached to the stem in the axils of the leaves.

4. *ASTEROPHYLLITES OVALIS* (spec. nov.). Differs from the former by its slender stem, slender furrows, the leaves more numerous, and the tubercles oval.

5. *ASTEROPHYLLITES SUBLÆVIS* (spec. nov.). Stem thick, nearly smooth, slightly undulate above and below the inflated joints, branching at the articulations; leaves verticillate, half open, shorter than the distance between the joints; branches short and thick, with very short leaves.

6. *ASTEROPHYLLITES LANCEOLATA* (spec. nov.) (*Wolkmania major* Gutb.?). Differs from *A. tuberculata* (Lindl.) by the leaves united half their length, and terminated in a lanceolate point.

7. *ASTEROPHYLLITES APERTA* (spec. nov.). Stem scarcely

half an inch broad ; articulations very near ; leaves short, or obovate, united in their whole length ; whorls half open, not appressed on the stem.

GENUS ANNULARIA. Sternb.

8. ANNULARIA SPHENOPHYLLOIDES? Ung. Stem diffuse, articulated, marked with deep narrow furrows (narrowly striate) ; leaves verticillate, 10 to 16, flat, obovate, oblong, very entire, either slightly emarginate or pointed.

GENUS SPHENOPHYLLUM. Brongt.

9. SPHENOPHYLLUM FILICULME (spec. nov.). Stem very slender, threadlike ; leaves in whorls of six ; the lateral ones long, cuneate, deeply emarginate and crenulate ; inferior leaves much shorter and scarcely broader, of the same form.

10. SPHENOPHYLLUM TRIFOLIATUM (spec. nov.). Stem thick, inflated at the joints, striate, leaves in whorls of three or four, deeply cut in three linear, acute divisions.

GENUS NÆGGERATHIA. Sternb.

11. NÆGGERATHIA OBTUSA (spec. nov.). Frond bipinnately branching ; pinnæ elongated, slightly undulate, pinnules attached to the rachis in a very acute angle ; broad and long, obovate, rounded and lobed above ; narrowed below in a short, broad petiole ; nerves dichotomous and simple, parallel, distinct.

12. NÆGGERATHIA MINOR (spec. nov.). Frond bipinnately branching ; pinnæ long and straight, half open ; pinnules distant, small, obliquely attached to the rachis, and slightly recurved, cuneate, very obtuse above, narrowed below in a long petiole ; nerves very slender, scarcely distinct.

13. NÆGGERATHIA BOCKSCHIANA Lesqx. (*Cyclopteris Bockschiana* Göpp). Frond bitripinnately branching ; pinnæ trifo-

liate or pinnate; pinnules obliquely attached to the rachis, varying from the obovate and obcordate to the broadly cuneate form; narrowed into a short broad petiole; upper leaflet larger and broadly obovate, narrowed into a longer petiole; nerves either dichotomous or simple, distinct; stem thick, channelled, slightly margined like the branches.

GENUS CYCLOPTERIS.

14. *CYCLOPTERIS FIMBRIATA* (spec. nov.). Leaves nearly round or truncate, unequally cordate at the base; margins, especially above, fringed with long, threadlike, linear, acute, flexuous, and nearly equal divisions; nerve, flabelli-form, furcate from the base; nearly straight, distant, though very thin, parallel, ascending to the point of the divisions or fringes.

15. *CYCLOPTERIS LACINIATA* (spec. nov.). Leaves orbicular, quadrate; base equal and slightly cordate, irregularly fringed around by long, flexuous, acute divisions, somewhat unequal in length, and united in fascicles; nerves flabelliform, forking, straight, very close and distinct; surface covered with a coat of scales.

16. *CYCLOPTERIS UNDANS* (spec. nov.). Leaves broadly oval or nearly round, emarginate at the base, or irregularly cordate; margins undulate and irregularly toothed; nerves flabelliform, dichotomous, very slender and close, distinct, united in fascicles and thickened at and near the base.

17. *CYCLOPTERIS ELEGANS* (spec. nov.). Leaves nearly orbicular, (the lobes of the base converging and embracing the stem, and the point of attachment being nearly central,) entire or slightly undulate in outline; nerves very distinct, deeply marked, radiating and dichotomous from the base where they are thickened; arched.

18. *CYCLOPTERIS HIRSUTA* Lesqx. (*Cyclopteris trichomanoides* Brongt. *in parte*). Leaves oval or round in outline, either symmetrical or unequally cordate, sometimes kidney-shaped, enlarged at the base, with equal or unequal, converg-

ing or diverging lobes ; nerves very thin, flabellate or dichotomous from the base, very close and slender near the margin ; surface more or less covered with short straight hairs.

GENUS NEUROPTERIS.

19. *NEUROPTERIS SPECIOSA* (spec. nov.). Leaves oval, lanceolate, cordate at the base, 3 to 6 inches long, $1\frac{1}{2}$ to 2 inches broad ; margins entire, nervules flabelliform, and dichotomous from a scarcely inflated medial nerve ; distant, very slender and distinct ; very arched downwards, and then turned upwards on the margins.

20. *NEUROPTERIS HIRSUTA* Lesqx. *Neuropteris cordata* Brongt. *Neuropteris angustifolia* Brongt. *Neuropteris Scheuchzeri* Hoff. *Neuropteris acutifolia* Brongt? Frond pinnate or bipinnate ; pinnules trifoliate except near the summit of the pinnæ, where they become simple ; leaves cordate at the base, lanceolate, acute, or obtuse ; sometimes irregularly lobed, strongly nerved, till above the middle ; nervules dichotomous, very arched and close ; leaflets of the base kidney shaped, round, oval, much smaller, with the nerves flabelliform from the base, without any medial nerve ; surface of the leaves more or less covered with short straight hairs.

21. *NEUROPTERIS CLARKSONI* (spec. nov.). Stems irregularly bipinnately branching ; pinnules simple, broadly lanceolate above ; cordate or irregularly auriculate, and hastate at the base by the inferior lobe being more or less elongated ; terminal pinnule lance shaped, equally bilobed in the middle ; nervules dichotomous, distinct, strongly marked from a thick medial nerve, which ascends nearly to the summit.

22. *NEUROPTERIS FISSA* (spec. nov.). Frond? Pinnule oval, truncate at the base or cordate ; margin undulate ; nervules dichotomous from a medial nerve ; very distant and slender, scarcely marked.

23. *NEUROPTERIS DELICATULA* (spec. nov.). Frond bipin-

nate; pinnæ lanceolate, short, pinnules oblong, attached to the broad flattened rachis by their whole base and slightly decurrent, distinct; nervules distinct, flabellate, dichotomous, arched, thin, and close; rachis slightly winged, flexuous.

24. *NEUROPTERIS GIBBOSA* (spec. nov.). Frond bipinnate; pinnules opposite, nearly equally cordate at the base, oblong obtuse, with the margins deeply and irregularly sinuate; nervules flabellate, dichotomous, very slender, close and distinct.

25. *NEUROPTERIS UNDANS* (spec. nov.). Frond bipinnate; pinnules either large, two inches long and more, lanceolate, attenuate at the base, with the margins deeply undulate plaited, or small oblong undulate, with a very large (three times longer and broader) terminal lance-shaped, obtuse, undulate pinnule, lobate or angular below the middle; nerves flabellate, very arched, dichotomous, very thin and close on the margin; inflated at and near the base.

26. *NEUROPTERIS TENUINERVIS* (spec. nov.). Frond bipinnate; pinnules oval or oblong, with undulate margins, sometimes irregularly toothed at the summit; either regularly cordate at the base, or attenuated in a short broad petiole; nervules very thin, dichotomous from the base, slightly arched or straight, equal, not inflated below; medial nerve marked by a very thin exactly straight depression; rachis round and narrowly striate.

27. *NEUROPTERIS DENTATA* (spec. nov.). Frond pinnate; pinnules slightly cordate, at the base oval, lanceolate in outline, with the margins irregularly cut; toothed and lobed; nerves flabellate and dichotomous, deeply marked but very thin and close.

28. *NEUROPTERIS DESORII* (spec. nov.). Frond bipinnate; pinnules opposite, either oblong oval, or obovate, entire, or irregularly laciniate from the base, sometimes pinnately divided in long linear teeth; nerves flabellate, dichotomous, very thin above, thickened at the base.

29. *NEUROPTERIS MINOR* (spec. nov.). Frond bipinnate;

pinnæ short, linear, sessile on a thick, striate, round rachis, pinnatifid; pinnules oval, sessile, either separate or united in the upper part of the pinnæ; terminal leaflet very small, oval; nerves thick, obsolete, bifurcate.

30. *NEUROPTERIS MOORII* (spec. nov.). Frond bipinnate; pinnæ nearly opposite, half open; pinnules alternate, ovate, slightly acute, entire, sessile by their whole base, and somewhat contiguous; nervules emerging either from the medial nerve or from the rachis, furcate; primary rachis thick, smooth, winged by some pinnules of the same form attached to it.

31. *NEUROPTERIS ADIANTITES* (spec. nov.). Frond bipinnate; pinnules nearly decurrent on a slender rachis, oval, obtuse; inferior pinnules decurrent on the primary rachis; nervules dichotomous, distinct.

GENUS *ODONTOPTERIS*. Brongt.

32. *ODONTOPTERIS SQUAMOSA* (spec. nov.). Frond tripinnate; pinnæ long, linear-lanceolate; pinnules oblong, oval, obtuse, the terminal one smaller, oval-lanceolate, acute; nervules thin, but very distinct, dichotomous, straight, parallel; surface of the leaflets ordinarily covered with a coat of scales?

33. *ODONTOPTERIS DUBIA* (spec. nov.). Frond? Pinnule oval-lanceolate, entire on one side, cut on the other in three lobes; nervules slender, dichotomous, straight from a medial nerve. (An species propria); perhaps only a leaflet of *Odonopteris Sternbergii* Göpp.

GENUS *SPHENOPTERIS*. Brongt.

34. *SPHENOPTERIS ABBREVIATA* (spec. nov.). Frond bipinnate; pinnæ alternate, open, short, linear-lanceolate; pinnules alternate, sessile by the whole base, distinct, obliquely ovate in outline, crenulate; nerves pinnately forking, distinct.

35. *SPHENOPTERIS INTERMEDIA* (spec. nov.). Frond tripinnatifid; rachis smooth and slender, slightly striate; second-

ary pinnæ linear lanceolate, deeply pinnatifid ; pinnules small, oval, decurrent, joined together by their base, serrulate at the summit ; nerves obsolete, pinnately forked ; nervules simple.

36. *SPHENOPTERIS FLAGELLARIS* (spec. nov.). Frond bipinnatifid ; pinnæ long, linear, flexuous, slender ; pinnules alternate, oval, with a broad decurrent base, united together, crenulate ; nerves bifurcate.

37. *SPHENOPTERIS PLICATA* (spec. nov.). Frond bipinnatifid ? pinnæ long, linear-lanceolate ; pinnules distant, very open, oval, oblong, enlarged below, sessile on the winged rachis, and united together ; pinnately lobate, and undulate plaited ; medial nerves thick ; nervules obsolete.

38. *SPHENOPTERIS GLANDULOSA* (spec. nov.). Frond tripinnately divided, forked above ; primary and secondary pinnæ opposite, long, perpendicular or recurved on the broad striate rachis ; inferior pinnules equally three to five lobate, cordate at the base, lobed round ; terminal leaflet acute, and sometimes long pointed by the persistence of the broad medial nerve ; superior pinnules smaller round, entire ; texture thick, convex, glandular, punctulate, rough ; nervules entirely obsolete.

39. *SPHENOPTERIS DECIPIENS* (spec. nov.). Frond pinnate ; pinnules elongated, pinnately lobed, lobes half round, very obtuse, decurrent, and united from the middle ; the terminal broader ; nerves undulate, broad ; nervules inclined on the rachis, two to three times forked.

40. *SPHENOPTERIS NEWBERRYI* (spec. nov.). Stem forking above in a very obtuse angle ; frond bipinnate ; secondary pinnæ from one to two inches long, linear-lanceolate, acute, pinnately lobed ; inferior pinnules sessile by their whole base, but distinct, irregularly undulate, lobed ; superior ones confluent, ovate, lanceolate, entire or scarcely undulate ; terminal small and pointed ; nerves obsolete.

41. *SPHENOPTERIS SQUAMOSA* (spec. nov.). Frond tripinnatifid ; secondary pinnæ linear, $1\frac{1}{2}$ inch long, obtuse ; pinnules nearly square or half round, very entire, sessile, the

superior ones confluent; terminal leaflet large, rounded or lobate, angular, obtuse; nerves entirely obsolete; surface covered with small shining scales?

GENUS HYMENOPHYLLITES. Göpp.

42. *HYMENOPHYLLITES FURCATUS?* Göpp. Frond tripinnatifid; common rachis subulate, with its divisions nearly perpendicular; pinnules oblique, deeply pinnatifid; lobes bitrifid; the inferior ones nearly pinnately divided, with the divisions linear, lanceolate, oblique, plain, and slightly acute or truncate. It differs by the divisions being slightly truncate, (an species propria).

43. *HYMENOPHYLLITES HILDRETI* (spec. nov.). Frond bipinnate; secondary pinnæ lanceolate, open, alternate, the inferior bipinnately, the superior pinnately divided; divisions linear, acute.

44. *HYMENOPHYLLITES CAPILLARIS* (spec. nov.). Differs from the former by its very narrow and longer divisions.

GENUS PACHYPHYLLUM. Lesqx.

Frond large, thick, membranaceous, broadly oval or lanceolate in outline, either pinnately or irregularly lobed; radical or borne on a thick rachis? divisions short, lanceolate, obtuse, or long linear-flexuous; nerves thick, compound and parallel near the base, separating above and solitary in each division, or disappearing totally.

45. *PACHYPHYLLUM FIMBRIATUM* (spec. nov.). Frond large, pinnate; pinnules sessile, distant, oblique, pinnately divided; divisions lanceolate, acute, short, fringed on the slightly recurved margins; nerves pinnately branching; nervules simple in each division.

46. *PACHYPHYLLUM AFFINE* (spec. nov.). Differs from the former only by the flattened and entirely smooth margins of the divisions.

47. *PACHYPHYLLUM HIRSUTUM* (spec. nov.). Frond bipin-

nately divided, dichotomous, pinnæ decurrent, divisions short, oval, acute; nerves obsolete; surface and margins covered with long glandular hairs.

48. *PACHYPHYLLUM LACERATUM* (spec. nov.). Like the former, but smooth, and with the divisions undulate and unequally toothed.

49. *PACHYPHYLLUM LACTUCA*, Lesqx. *Schizopteris lactuca* Sternb. Frond pinnate; pinnæ lanceolate or broadly oval in outline, pinnatifid; lobes lanceolate, pinnately divided; divisions linear, obtuse; nerves obliterate, parallel, and fasciculate below; simple in each division.

GENUS ASPLENITES. Göpp.

50. *ASPLENITES RUBRA* (nov. spec.). Frond bipinnate, (or tripinnate?); pinnæ broadly linear, half open, alternate; pinnules oval, oblong, united at the base; medial nerve strong; nervules forking once near the base; fruit dots linear, placed in two rows between the margin and the medial nerve; rachis thick, not inflated.

GENUS ALETHOPTERIS. Sternb. and Göpp.

51. *ALETHOPTERIS PENNSYLVANICA* (spec. nov.). Inferior pinnæ bipinnatifid, with short, round pinnules, united half their length; superior pinnæ, pinnate only, with long lanceolate, linear, and undulate pinnules, slightly decurrent on the rachis and united at the base; medial nerve broad, canaliculate; nervules perpendicular, slender, close, simple, or dichotomous.

52. *ALETHOPTERIS DISTANS* (spec. nov.). Frond bipinnatifid; pinnæ open, linear-lanceolate; pinnules alternate, linear, narrow, very distant, pinnately crenulate, enlarged at the base; united only in the upper part of the terminal pinnæ, where they become broader, shorter, and obtuse; secondary nerves obsolete.

53. *ALETHOPTERIS OBSCURA* (spec. nov.). Frond bipin-

natifid; pinnæ pinnatifid above; pinnules lanceolate, one inch long, enlarged at the base; united together and decurrent above, distinct below; deeply undulate on the margins; secondary nerves obsolete, very slender and oblique; bifurcate, slightly arched.

54. *ALETHOPTERIS SERRULA* (spec. nov.). Frond pinnatifid, large; pinnules alternate sessile, perpendicular to the rachis or inclined backwards, straight, linear, four inches long and more, pinnately lobed; lobes alternate, two to three times toothed, sometimes entire and obtuse; secondary nerves once or twice forking.

55. *ALETHOPTERIS LÆVIS* (spec. nov?). Differs from *Alethopteris nervosa* only by its shorter pinnules and entirely smooth surface, without any trace of nerves; (an species propria.)

GENUS *CALLIPTERIS*. Brongt.

56. *CALLIPTERIS SULLIVANTII* (spec. nov.). Frond bipinnate; pinnæ lanceolate; pinnules alternate, oblique, obovate or oblong, nearly contiguous, slightly decurrent, and united together near the base by a slightly obtuse sinus; medial nerve broad, canaliculate, disappearing at the middle; secondary nerves arched, slender, close, many times forking.

GENUS *PECOPTERIS*. Brongt.

57. *PECOPTERIS DISTANS* (spec. nov.). Has the nervation of *Pecopteris polymorpha*; differs from it by its distant pinnules, oval, lanceolate, narrowed at the base, and attached to the rachis only by the thickened medial nerve.

58. *PECOPTERIS VELUTINA* (spec. nov.). Frond bipinnatifid; lower pinnæ perpendicular to the rachis, pinnate, broadly linear-lanceolate; $1\frac{1}{2}$ to 2 inches long; pinnules distinct, slightly contracted in the middle, and enlarged above the base, sessile, united only at the summit of the pinnæ; upper pinnæ simple, pinnately undulate, lobed, or entire;

nerves obsolete, surface covered with short appressed hairs ; fruit dots placed only at the upper part of the pinnules, few, two ranked, large, oval.

59. *PECOPTERIS NOTATA* (spec. nov.). Frond tripinnate ; secondary pinnæ horizontal, short, linear-lanceolate, obtuse ; pinnules short, oval, or half round, united nearly to the middle ; terminal leaflet large, oval, obtuse ; nervules strongly marked, forking once, attached at an acute angle to the undulate medial nerve, rachis striate ; fruit dots very small, punctiform, irregularly placed along the nervules and between their branches.

60. *PECOPTERIS PUSILLA* (spec. nov.). Frond bipinnate ; pinnæ oblique, linear, nearly decurrent on a broad, flexuous, and winged smooth rachis ; pinnules very small, united above the middle, oval, hairy, the lowest a little larger ; nervules simple, obsolete.

61. *PECOPTERIS CONCINNA* (spec. nov.). Frond bipinnate ; pinnæ open, with an undulate rachis ; pinnules about one inch long, oval, lanceolate, narrowed at the base and sessile, distant and perpendicular to the rachis, pinnately undulate, lobed ; medial nerve undulate ; secondary nerves pinnately forking three or four times in each lobe ; nervules simple.

62. *PECOPTERIS DECURRENS* (spec. nov.). Frond bipinnate ; pinnæ opposite, superior ones terminal by the forking of the rachis ; pinnules distant, oval, oblong, obtuse, entire, contracted above the base on the upper side, dilated on the lower, and decurrent on the broadly winged rachis ; medial nerve undulate, scarcely broader than the lateral ones which are simple, or once forked, arched ; primary rachis flattened, broad, enlarged at the articulations of the pinnæ.

63. *PECOPTERIS INCOMPLETA* (spec. nov.). Frond bipinnatifid ; pinnæ very oblique, scarcely open, lanceolate ; pinnules oval, or nearly round, decurrent, united at the base, very oblique ; the superior one very small, and the terminal wanting by the elongation of the secondary rachis pointing

above the leaflets ; medial nerve strong at the base ; nervules once forking.

GENUS CREMATOPTERIS. W. P. Schimper.

64. CREMATOPTERIS ? PENNSYLVANICA (spec. nov.). Rachis very thick, round, nearly smooth, or irregularly striate ; pinules short, linear oval, distant, sessile on the broad rachis, slightly attenuated at the base ; nerves entirely obsolete or none.

GENUS SCOLOPENDRITES. Lesqx.

Frond simple, lanceolate, large, deeply, irregularly toothed ; medial nerves very slender ; nervules thin, pinnately branching from the medial nerve, nearly straight and scarcely arched, undulate, very distant, one eighth of an inch and more, forking twice.

65. SCOLOPENDRITES GROSSE-DENTATA (spec. nov.). Specific characters the same as above.

GENUS CAULOPTERIS. Lindl. and Hutt.

66. CAULOPTERIS PUNCTATA (spec. nov.). Scars oval obtuse, about two inches long, distant, with a broad smooth margin ; fascicle of vessels simple, oval, curved above in two converging horns ; intervals between the scars *dotted* with the base of small rootlets ?

67. CAULOPTERIS GIGANTEA (spec. nov.). Differs from the former by the large size of the scars, its entirely smooth surface, and the divergence of the horns.

GENUS STIGMARIA.

68. STIGMARIA COSTATA (spec. nov.). Like *Stigmaria anabathra* ; differs by the nearly regular, strong and elevated ribs which separate the rows of scars placed in a regular, nearly spiral order.

69. *STIGMARIA UMBONATA* (spec. nov.). Differs from *Stigmarmaria ficoides* by the scars, which are at least twice as broad, elevated, and with a single ring at the border.

70. *STIGMARIA IRREGULARIS* (spec. nov.). Stem deeply and narrowly ribbed in its length; scars distant and scarce, oval, sometimes acute at both ends, sometimes round, placed without order.

71. *STIGMARIA RADICANS* (spec. nov.). Stem about two inches broad, narrowly striate in its length, scars irregular and irregularly placed; rootlets apparently round and narrowed near the base.

72. *STIGMARIA MINUTA* (spec. nov.). Stem thick, lower scars very small and close to each other, placed in a spiral order, round; the superior ones more distant, oval, pointed or open in their inferior part, central scars elongated, like a deep narrow line, dividing the general scars.

GENUS SIGILLARIA.

73. *SIGILLARIA SCULPTA* (spec. nov.). Stem irregularly and narrowly striate in its length, without ribs; striæ undulate; scars elevated, smooth, about an inch and a half distant, quadrangular-rhomboidal oblique, emarginate, cordate above, with the three other angles acute; vascular scars three, the medial one oval, crosswise; the lateral ones linear arched.

74. *SIGILLARIA FISSA* (spec. nov.). Surface striate in its length by narrow, undulate, smooth lines; without ribs; scars about one inch distant, cordate, obtuse in outline, deeply emarginate above, round obtuse below, with two acute angles at both sides, and a single oval, vascular scar, attached in the middle of a semilunar or arched ring.

75. *SIGILLARIA DILATATA* (spec. nov.). Surface marked with undulate, smooth, very narrow striæ without ribs; scars one eighth of an inch distant, plane, enlarged on the sides, being nearly twice as broad as high; emarginate, cordate above, very obtuse below; lateral angles very acute; vascular scars three, the medial one broadly oval, crosswise; the lat-

eral ones linear arched. In its corticated state, the whole surface is narrowly undulate striate, the striæ diverging only above the vascular scars which are oval; the two exterior ones, in the length, the central one crosswise.

76. *SIGILLARIA SCHIMPERI* (spec. nov.). Surface undulate, narrowly plaited and striate crosswise. Scars one inch distant, large, striate in the same direction as the intervals, nearly round in outline; the upper marginal line well marked, half circular, and extending horizontally on both sides; the inferior one slightly marked, half circular. Vascular scars two, oval, placed below an arched, linear depression.

77. *SIGILLARIA STELLATA* (spec. nov.). Surface deeply marked with undulate, branching wrinkles, diverging in every direction from the smooth scars around them. Scars nearly plane, regularly hexagonal, the upper side only obtusely emarginate. Vascular scars three; the medial one semilunar, the lateral ones oval-pointed downwards and diverging to the sides.

78. *SIGILLARIA POLITA* (spec. nov.). Stem ribbed, ribs nearly plane, very smooth, as broad as the distance between the scars; furrows narrow, deep, and straight; scars discoid, enlarged both sides, round above, the lower margin convex, with two lateral angles very obtuse. Vascular scars three; the medial one transversal linear, straight in the middle and convex at both ends; the lateral ones linear, arched.

79. *SIGILLARIA DUBIA* (spec. nov.). Like *Sigillaria Cortei* Brongt; differs by the greater distance of the scars, which are broader at the base, and by the ribs being more deeply striate.

80. *SIGILLARIA OBOVATA* (spec. nov.). Stem ribbed; ribs more than one inch broad, nearly flat, obsoletely striate; furrows deep and narrow; scars obovate, with the inferior margin very obtuse. Vascular scars three; the medial one linear, short, the lateral ones slightly arched.

81. *SIGILLARIA DISCOIDEA* (spec. nov.). Stems furrowed; furrows distant, irregular, deeply marked, and wrinkled; dis-

tance between them from two to three inches, flattened, irregularly dotted. Scars elevated, half globular, diminishing in size, slightly emarginate below, close to each other, marked in the middle by a deep, irregular point.

GENUS LEPIDODENDRON. Sternb.

82. *LEPIDODENDRON MODULATUM* (spec. nov.). Scars oval, narrowed and acuminate at both ends, curved at the base, separated by a margin one eighth of an inch broad, half round, elevated, and deeply wrinkled; wrinkles undulate and parallel to the scars. Vascular scars rhomboidal, obtuse, arched above, narrowed below in a long point, acute at both sides, marked with three transversal points, united by a depressed line; tubercles narrow, medial line deeply transversely furrowed; appendages double.

83. *LEPIDODENDRON GIGANTEUM* (spec. nov.). General scars oval-trapezoid, elongated-acute at both ends. Vascular scars placed nearly in the middle, rhomboidal-quadrangular, transversely marked with three points; appendages irregular, longer on one side, tubercles very small, oval; medial line marked in the whole length of the general scars, smooth.

84. *LEPIDODENDRON VESTITUM* (spec. nov.). General scars oval-trapezoid, acute at both ends, separated by an irregular, elevated smooth margin, covering the borders of the scars; vascular scars quadrangular, trapezoid, placed at the summit of the general scars; three-pointed in the middle, appendages none; tubercles large, oval, diverging; medial line deep and smooth.

85. *LEPIDODENDRON CONICUM* (spec. nov.). General scars oval, acute and narrowed at both ends; vascular scars triangular, conical, with a single oval point in the middle and two broad oval tubercles below; appendages none; medial line marked only by a row of undulate wrinkles, margins flat, one eighth of an inch broad, very wrinkled.

86. *LEPIDODENDRON OCULATUM* (spec. nov.). Scars oval,

acuminate both ends, one third of an inch distant ; vascular scars marked only in the superior arched outline, perpendicularly crossed by a straight line, like an arrow on a bow ; tubercles very large, oval, medial line deeply furrowed, obsolete ; intervals flat, undulately striate.

87. *LEPIDODENDRON DISTANS* (spec. nov.). Scars oval, lengthened, acuminate at both ends, half an inch distant, with the intervals undulately striate, flat ; vascular scars rhomboidal, square, three-pointed ; appendages double ; tubercles small, diverging ; medial line deep, transversely cut by broad short furrows.

88. *LEPIDODENDRON OBTUSUM* (spec. nov.). Scars trapezoid, acutely pointed above, slightly narrowed and abruptly obtuse below. Vascular scars nearly in the middle, rhomboidal, obtuse above, acute below, angular both sides, transversely three-pointed ; appendages irregular, distinct on one side only ; tubercles oval, diverging ; medial line wrinkled, margins one eighth of an inch broad, undulately striate and furrowed in their length.

89. *LEPIDODENDRON CARINATUM* (spec. nov.). Scars oval-hexagonal, angular, lengthened acute at both ends, with narrow keeled, smooth margins ; vascular scars rhomboidal, obtuse above ; triangular below ; appendages short, obsolete, tubercles small oval, medial line obsolete, transversely furrowed.

90. *LEPIDODENDRON CLYPEATUM* (spec. nov.). Scars irregularly trapezoid, acute at both ends, obtuse on the sides, with narrow linear margins ; vascular scars large, obtuse above and below, enlarged and acute on both sides, transversely three-pointed ; appendages obsolete, converging on the very obsolete medial nerve, tubercles obsolete on one side, oval.

91. *LEPIDODENDRON SIGILLARIOIDES* (spec. nov.). Scars exactly trapezoid, with the acute angles at both ends ; margins narrow, linear, smooth ; vascular scars dilated, acute on both sides, transversely marked with three points, without any appendages, nor medial lines nor tubercles.

GENUS LEPIDOPHYLLUM. Brongt.

92. *LEPIDOPHYLLUM ACUMINATUM* (spec. nov.). Blade nearly one inch broad, three inches long, slightly narrowed near the base, acuminate, binerved.

93. *LEPIDOPHYLLUM OBTUSUM* (spec. nov.). Blade three fourths of an inch broad, four inches long and more, linear, abruptly terminated in a short point, marked in the middle by a broad, obsolete, inflated nerve.

94. *LEPIDOPHYLLUM AFFINE* (spec. nov.). Differs from *Lepidophyllum lanceolatum* by its obtuse blade and its long, pointed sporange.

95. *LEPIDOPHYLLUM HASTATUM* (spec. nov.). Sporange long, pointed; blade one inch long, enlarged at the base in two diverging auricles, hastate, slightly acute with a strong nerve.

96. *LEPIDOPHYLLUM BREVIFOLIUM* (spec. nov.). Sporange narrowed in a long point; blade very short, enlarged at the slightly obtuse sides.

97. *LEPIDOPHYLLUM PLICATUM* (spec. nov.). Blade linear, lanceolate obtuse, narrowed at the base, curved (geniculate) in the middle, nerved from the base to half its length; sporange?

GENUS BRACHYPHYLLUM? Brongt.

98. *BRACHYPHYLLUM OBTUSUM* (spec. nov.). Leaves or scales imbricated, narrowed below like the sporange of *Lepidophyllum*; rounded above, marked in the middle by an elevated line resembling a nerve.

GENUS CARDIOCARPON. Brongt.

99. *CARDIOCARPON TREVORTONI* (spec. nov.). Capsule plane, nearly orbicular; emarginate, cordiform on one side, pointed on the other, marked in the middle by a sharp elevated line, very smooth.

100. *CARDIOCARPON PLICATUM* (spec. nov.). Differs from the former by its undulate-plaited surface without medial line.

101. *CARDIOCARPON PUNCTATUM*? Göpp. Our species differs only by having a surface slightly concave and by points irregularly placed.

GENUS *TRIGONOCARPUM*. Brongt.

102. *TRIGONOCARPUM HILDRETI* (spec. nov.). Fruit oval oblong, narrowly three ribbed, with the intervals finely striate.

GENUS *RHABDOCARPUS*. Göpp. and Berg.

103. *RHABDOCARPUS VENOSUS* Lesqx. *Carpolithes venosus*. Sternb.

GENUS *CARPOLITHES*. Sternb.

104. *CARPOLITHES BIFIDUS* (spec. nov.). Fruit apparently pedicellate, oval oblong, arched, split in two parts above, three ribbed near the base; pedicel thick ribbed.

105. *CARPOLITHES DISJUNCTUS* (spec. nov.). Fruit oval-lanceolate, slightly obtuse, divided in two parts, the superior one convex, the inferior concave, diverging from the other.

106. *CARPOLITHES PLATIMARGINATUS* (spec. nov.). Fruit oval-acute, convex, smooth, broadly margined; margin flat, broader near the point, disappearing above.

GENUS *PINNULARIA*.

New species enumerated without description.

107. *PINNULARIA CALAMITARUM* (spec. nov.).

108. *PINNULARIA PINNATA* (spec. nov.).

109. *PINNULARIA FUCOIDES* (spec. nov.).

110. *PINNULARIA HORIZONTALIS* (spec. nov.).

111. *PINNULARIA CONFERVOIDES* (spec. nov.).

ART. XXVI. — *Observations on the Development of ANABLEPS GRONOVII, (Cuv. & Val.)* By JEFFRIES WYMAN, M. D.
Read Sept. 20th, 1854.

WHILE the general plan of the development of Fishes and Batrachian Reptiles conforms strictly to the an-allantoidian type, the external conditions under which the process of the formation of the embryo is carried on, vary to a very remarkable degree. In the larger majority of instances, eggs are scattered without care, or perhaps only a locality is selected which furnishes the most favorable circumstances, in relation to currents of water, the kind of bottom, the exposure to light, &c. Once deposited, they are no longer attended to.

In other cases, but these are comparatively few, the fishes construct something which serves to protect the eggs, and in a measure answers the purpose of a nest; in this the eggs are laid and undergo their evolution. The Lamprey builds a rude structure, consisting of a pile of stones brought from a distance, in the mouth; both sexes coöperating in the labor of building. The eggs are deposited between the stones as the structure is reared, and remain there in security until hatched. The Chub (*Catostomus tuberculatus*) has a similar habit. Our common Bream (*Pomotis vulgaris*), and a species of *Gobius* found in the Mediterranean, (the *Phycis* of Aristotle,)* both construct a true nest, composed of aquatic plants, in which the ova are developed, one or the other of the parents standing guard as the embryo passes through its different stages. But the most remarkable nests built by fishes, are those of the "Hassars" (*Collicthys*) of Demarara, and of the "Sticklebacks" (*Gasterostei*) of Europe. The "Round-headed Hassar" forms its nest of leaves, and the "Flat-headed Hassar" of grass. Of the two species of Stickleback described by Coste,†

* Owen. Lects. on Comp. Anat. Vol. II. p. 304.

† Instructions Pratiques sur la Pisciculture, suivies de Memoires, et de Rapports sur la même sujet. Par M. Coste, Professeur au Collège de France. Paris, 1853.

one forms a nest upon the bottom with pieces of grass and other vegetable substances, which are woven together, forming a covered structure, with two openings, so that when the fish enters it can pass through without being required to turn round to come out. If the materials prove too light, and show a tendency to float, they are loaded with stones till the nest is securely anchored.*

The other species constructs its abode upon some aquatic plant elevated above the bottom, or upon some submerged branch or twig of a tree. During incubation, the ova are guarded by the male, and protected against the depredations of the females, which are always ready to devour the eggs almost as soon as deposited.†

In another group of fishes, the eggs are neither scattered upon the bottom nor deposited in nests, but assume a more intimate relation with the parent, though still conforming to the oviparous mode. In the Pipe fishes they are attached to the body of one of the parents. In one species, *Syngnathus ophiodon*, the eggs merely adhere to the under side of the abdomen of the male, where they remain till hatched. But in *S. acus*, as observed by Ekströem and others, and in *S. Peckii*, as observed by Storer and myself, there is found a true marsupial pouch, consisting of two folds of skin, posterior to the anal opening of the male. These folds are directed inwards, and meet on the median line. In this pouch the eggs are deposited by the female, and remain there till incubation is complete, and even after the eggs are hatched the young return to the pouch as a place of refuge.

In all of the preceding instances the fœtus is developed exterior to or upon the surface of the body. The Pipe-fishes, which are analogous to the Marsupials among Mammals, form

* For a very interesting account of the nest-building of the Sticklebacks, see Hancock Ann. & Mag. of Nat. Hist. Vol. X. N. S. p. 241.

† I have witnessed this habit in a pregnant female which was in my possession. The eggs were deposited during the night, but on the following morning nothing remained of their contents, the empty envelopes being scattered about the bottom of the vessel.

a transition to the next division, where the conditions of development are wholly changed.

Extended observations have proved, that a large number of species of fishes, belonging to many genera, are truly viviparous, the fœtus passing through a real gestation by the parent before its development is complete. These Viviparous fishes may be divided into two groups, according to the position occupied by the embryo during the period of its growth.

I. In the first group may be arranged those fishes in which *the ovum leaves the ovary in an undeveloped state, and in which the process of evolution is not commenced until it reaches the lower portion of the oviduct.* The species which this group comprises are nearly all, if not all, Plagiostomes. The best known are *Spinax*, *Carcharias*, *Mustellus*, *Galeus*, and *Torpedo*. Although they are usually classified among the lowest of fishes, it is in some of them that the process of reproduction becomes most nearly analogous to that of the highest Vertebrates. Not only does the yelk reach proportions like those of the yelk of birds, but the yelk-sac itself plays the part of an allantois, and forms an organ analogous to a placenta. In *Spinax*, the vessels on the surface of the vitelline sac are brought in close contact with the highly vascular folds which line the oviducts. But in *Carcharias*, as Müller has demonstrated in his Memoir on the subject, not only is there an approximation of the fœtal and maternal vessels, but the surfaces of the yelk-sac and of the oviduct are both deeply convoluted, and the projections of the one are admitted into and embraced by the concavities of the other, and the opposing surfaces become adherent even. In both *Spinax* and *Carcharias*, the necessary conditions exist for the reaction of maternal and foetal blood upon each other, as is the case in the Mammalia, but to a much more limited extent.*

* Dr. John Davy has shown, that in *Torpedo* the embryo is nourished at the expense of materials furnished by the parent, since the mature fœtus weighs more than twice as much as the egg at the time development commenced. *Philos. Trans.* 1834. *On the development of the Torpedo.*

II. In the second group those fishes are comprised in which the gestation is either wholly or in part ovarian, the last stages only of the process usually occurring in the oviduct. Among the genera included in this division are, *Silurus*,* *Blennius*,† *Anableps*,‡ *Pæcilia*,§ and *Embiotoca*.|| In all of these genera impregnation takes place in the ovary, and, as seems probable, while the ovum is still invested with its original envelopes. In Blenny, Rathké has shown, the ovarian gestation having continued about three weeks, that about the end of September the sac ruptures, and that the embryo is discharged into the central cavity of the ovary, which is in fact the oviduct; here the fœtus remains till the beginning of January, when it is born. In *Pæcilia* the fœtus is liberated and escapes into the oviduct towards the end of gestation. Valenciennes has given several details in relation to the development of *Anableps Gronovii*, made for the most part upon specimens in an advanced stage of fœtation, the smallest embryo being more than an inch long. He found only seven or eight fœtuses in the so-called uterus of each female, and each of the young was surrounded by a distinct sac, which he regards as simply an enlargement of the original envelope of the ovum. The mature foetus he found to be more than one fourth as long as the parent, and except for the non-development of the ovary, was constituted in every respect like the adult, as regards both its internal and external structure.

For the specimens of *Anableps Gronovii*, upon which the following observations were made, I am indebted to the liberality of Dr. Francis W. Cragin, United States Consul at Paramaribo, in Surinam. Among them were three males and five females, four of which last were in different stages of gestation. The different individuals varied from three and a

* Cuvier et Valenciennes Hist. Nat. des Poissons, T. i. p. 540. 1828.

† Rathké, Mem. sur la Develop. de l'Homme et des Animaux, 2me partie. Leipsic, 1833.

‡ Cuv. and Valenciennes, Hist. Nat. des Poiss. T. xviii. p. 245. Paris, 1846.

§ Duvernoy, Ann. des Sc. Nat. T. I. N. S. p. 313. 1844.

|| Agassiz, Am. Journal of Science. Vol. XVI. Second Series, Nov. 1853.

half to nine and a half inches in length, the females being much longer than the males.

I. The smallest female measured three and a half inches in length, but on careful examination no traces of an ovary were discovered; its development did not appear to have commenced as yet.

II. The next specimen measured seven inches in length, and the ovary was in a state of gestation; the fœtuses, four or five in number, measured but five-eighths of an inch. The ovary appeared single externally; was invested with peritoneum, which was supported by a more firm but thin membrane of condensed areolar tissue; on cutting through this, the interior was found filled with sacs corresponding in number to the fœtuses, and united to each other and the ovarian walls by a very loose areolar tissue. They had no communication of any kind with each other. With the aid of the point of a needle the sacs were easily detached and removed entire with the inclosed fœtus; the envelope was much larger than was necessary to hold the embryo, and the space between the two was filled with a fluid, a portion of which (albumen?) had been coagulated by the action of the alcohol. In each instance it was ascertained that the young had no connection whatever, vascular or otherwise, with the walls of the sac which inclosed it.

The external characters of the embryo, (Pl. 17, Fig. 5,) even at this early stage, as regards its general form and the fins, resemble those of the adult; but no longitudinal black bands were yet visible on the sides; the eye had not acquired the prominence of the adult, the cornea was not divided by a transverse band, and the pupil existed in the form of an oval, with its long diameter in a vertical direction, but the sides of the iris had just commenced extending towards the centre in order to form the two laminæ, which, in the adult, give the pupil its singular shape. The umbilical sac forms a spheroidal mass about one fourth of an inch in diameter, and is sufficiently transparent to allow the folds of the intestine which fill

it, to be visible. Externally, the sac is covered with what appear to be parallel projecting lines, extending from the sides of the abdomen to its most prominent part (Figs. 6 & 8.) These Valenciennes describes as "vascular striæ," (*striæ vasculiformes*.*) Such was not the nature of these markings in the specimens which I examined; but, when placed under the microscope, were found to form a peculiar structure, which possibly may have some connection with the process of nutrition in their peculiar method of gestation.

The sac itself seemed nearly homogeneous in structure, but the striæ are made up of spherical, or in some cases, pyriform or cylindrical, papillæ or villi, (Fig. 8,) projecting from the surface, and arranged so nearly together in a linear series as to give the appearance of a continuous band. In regard to the minute structure of these papillæ, as far as it could be determined from an alcoholic specimen, they consist externally of an exceedingly thin membrane, inclosing a vast number of minute granules; no vessels were seen in connection with them nor in the membrane to which they were attached. There was no appearance of any communication between the cavity of the papilla and that of the membrane to which it was attached. Within the latter, but more nearly in contact with the intestines, there was a second more delicate membrane, which seemed to be a continuation of the parietal peritoneum. No traces of the yelk were found in connection with the intestines.

III. The third specimen is much longer and measures ten inches in length; the ovary had been ruptured, so that some of the fœtuses had escaped into the cavity of the abdomen, but the whole number of young taken from the parent was much greater than in the preceding case, namely, eighteen; one of these was projecting from the genital opening. They generally resembled the preceding except in size, though the eyes had become more prominent (Fig. 6,) and the iris now

* Op. cit. ex fol. de planche, 539.

exhibited its lateral projections sufficiently developed to give the pupil the shape of a dumb-bell. The umbilical sac has become much larger than in the embryos first described, and measures three eighths of an inch in diameter. The papillæ of the yelk-sac are much more distinct and contain colored granules. The yelk-sac communicates with the cavity of the abdomen by a long fissure extending from a point just behind the union of the opercula nearly as far as the anal opening, consequently beyond the ventral fins. It is from the circumstance just mentioned, doubtless, that an explanation is to be found of the non-union of the ventrals in the adult. The scales terminate abruptly at the edge of the fissure. The intestines, as in the first described embryos, were invested by the internal sac, which was regarded as parietal peritoneum. No bands were visible on the flanks of the body nor were the anal fins yet modified to mark the sexes. A rudimentary liver is visible in these specimens, extending backwards on the left side of the intestinal mass. The intestinal canal is of almost uniform size throughout, there being no distinction between intestine and stomach.

IV. This specimen measured a little less than ten inches in length, but the embryos were of much larger size, having a length of two and a quarter inches; the umbilical sac had disappeared, (Fig. 7,) but the fissure on the under side of the abdomen still remained, and what seems quite remarkable, had grown in dimensions just in proportion to the entire fœtus, so that in these specimens it measured one inch in length, and was consequently longer than the whole embryo of the first specimen noticed above. The edges of the fissure were united by the intermedium of a thin membrane, without scales, on which no papillæ were noticed, and was sufficiently lax to allow the edges of the fissure to separate from each other to a slight extent. The transverse band upon the cornea was now distinct, though it had not yet become as opaque as in the adult.

Seven fœtuses were found in the ovary; on the sides of

them one or two dark longitudinal lines were now visible ; the general form of the body had assumed more precisely that of the adult, and, as noticed by Valenciennes, the intestines had obtained their permanent form. The external sexual characters were not visible in any of the specimens examined, though they were seen and figured in specimens of about the the same size by Valenciennes.

All of the fœtuses of this female had escaped from their original sacs, (no traces of which were now visible,) and were all contained in one large cavity formed by the dilated ovary which now had become analogous to an uterus, and extended from the genital opening as far forwards as the bases of the pectoral fins. The walls of this ovarian sac were sufficiently thin to allow the fœtuses to be seen through them ; on its inner surface, as well as on that of some of the other specimens, were to be seen numerous immature ova, some of them microscopic and others as large as the sixteenth of an inch in diameter. The coexistence of immature ova on the walls of the ovarian cavity, with fœtuses within it, corresponds with what was noticed by Duvernoy in his investigations of the embryology of *Pœcilia*.* The more minute ovarian eggs, though for a long time macerated in alcohol, yet preserved their microscopic characters to a remarkable degree. The smallest consisted of a cell, in the centre of which a nucleus was visible, and around this last were a few granules (Fig. 1) ; in the larger ova the granules have become more and more abundant, and in some instances obscure the nucleus or germ cell. After the egg has increased to a certain size, a clear space (Figs. 2, 3 and 4) appears exterior to the vitelline membrane, which gradually increases to nearly twice the diameter of the egg itself ; this clear space is limited by the substance of the stroma which becomes condensed around it, and thus forms a distinct sac. If the ovum be compared to that of a mammal, then the sac just described may be said

* *Annales des Sc. Naturelles.* T. i. N. S. 1844.

to be analogous to a Graafian vesicle ; that is, the egg of the fish floats free in a sac much larger than itself, just as the mammiferous egg does in the vesicle of De Graaff. There were no intermediate conditions between this and the impregnated condition to enable me to determine whether or not it is this sac which forms the external covering of the fœtus. Valenciennes seems to adopt the idea that it does, and compares it to a chorion.* If this view of its nature be true, then there seems no alternative, since development advances so far before the sac ruptures, but to suppose that impregnation must take place through its parietes and that the spermatozœon cannot enter bodily into the substance, or even come in direct contact with the vitelline membrane of the egg, except through the walls of this outer covering, which is not probable. It would seem that it must act simply by its presence on the surface of the egg-sac, or by an endosmosis of its fluid contents through the membranes by which the ovum is invested.

A microscopic examination of the egg-sacs in the advanced fœtuses proves conclusively, that they do not consist of loose areolar tissue only, as stated by Valenciennes,† but that while the tissue in question forms the basis of them, they are in reality very highly vascular, large trunks and minute ramifications of vessels being easily traced by the aid of the coagulated blood which they contain.

In comparing fœtuses of different stages of development together, a very interesting question is presented to us in connection with their growth. In the smallest specimen examined, the yelk was no longer visible, it had been wholly consumed in supplying materials for the formation of the embryo ; and yet subsequent to this disappearance of the yelk, the embryo, while still in its ovarian sac and cut off from all external communication, continues to increase in size,

* "La cellule qui contient un œuf fécondé s'aggrandit et finit par former une sorte de Chorion." Op. cit. T. xviii. p. 261.

† Op. cit. p. 261.

and grows until it acquires the length of an inch and a quarter, which gives the size of the longest fœtus which our specimens furnished. Even the umbilical sac and the fissure which succeeds it, continue to grow after the yelk has disappeared. As a general rule among oviparous fishes, the yelk supplies *all* the material required for the growth of the fœtus; and the same holds good with regard to nearly all Batrachians,* to scaly Reptiles and Birds. So general has this rule been believed to be, that none but Mammals have been supposed to contribute any thing beyond the materials of the egg to the support of the young. But recent observations go to prove that some fishes, such as the Torpedo among the Plagiostomes, the Embiotoca among osseous fishes, are to be placed in the same category as Mammals, in relation to the fact of being nourished by the parent during gestation, although neither a placenta is formed nor does any direct vascular communication whatever exist between the fœtus and the maternal circulation. We cannot explain the growth of the fœtal Anableps by any other hypothesis than that it is nourished by a fluid secreted by the walls of the sac in which it is lodged in the earlier stages, or by the parietes of the general ovarian cavity in which the fœtuses are received towards the end of gestation. The high degree of vascularity of the egg-sac is favorable to this supposition. As the body of the fœtus, at a very early period, becomes covered with scales, absorption could only take place through the intestinal canal or by the surface of the yelk-sac, which invests the viscera and increases in size for a long period after the yelk itself has wholly disappeared. In the later stages of gestation, even the yelk-sac is out of the question, since it in turn wholly disappears, while the fœtus occupies the general cavity of the ovary.

* The only exception among Batrachians, as yet noticed, is found in the Pipæ of South America. See Observations on Pipa Americana, by Jeffries Wyman, M. D., in American Journal of Science, 2d Series, vol. xvii. p. 369.

Valenciennes has given a very full and detailed description of the modified ventral fin, which serves the function of an external male organ, and of its connection with the excretory tubes of the testis; yet, in some respects, the specimens which I have examined differ from his description. In these the anal fin (Fig. 9) consisted of two portions, one of which forms a conical-shaped body resting on an enlarged base and attached to or forming the anterior edge of the fin, and is covered with scales as far as its termination; its anterior half is colored black at the base, but the whole of it is so colored nearer the apex; at the extremity is the genito-urinary opening, as described by Valenciennes. Behind the genital portion, and partially imbedded in it, is the true ventral fin, containing seven or eight rays parallel to the genital tube, the posterior being the shortest, and about one half as long as the whole fin. In a larger and adult male, measuring about seven inches in length, the genital portion of the fin has become very much longer and stouter in consequence of the development of muscular fibres in its interior. The genital opening, which, in the preceding specimens, was not at the extremity of the fin, has now become terminal, the fin rays have become proportionally shorter and so closely applied to the posterior face of the genital portion as to be detected with difficulty. In the figure of the fin, given in the *Histoire Naturelle des Poissons*, the artist has erroneously represented the fin rays as if they were attached by their base to the side of the genital tube; when in reality they are attached to the under side of the abdomen, and are parallel to the genital tube, but partially imbedded in it.

Valenciennes inclines to the belief that the fin in question could not be used as an intromittent organ in consequence of the scales and fin rays pointing in such a manner as to prove an obstacle. This objection applies less to the adult than the younger specimens, since the fin rays have become much less prominent; but when the structure of the intro-

mittent organ in the males of some Mammals is remembered, as of the Agouti, where spines, projecting in different directions, offer far more serious mechanical opposition, we can readily believe that a structure like that of the anal fin of *Anableps* may be readily introduced into the genital tube of the female. Still, in the ordinary position of the two sexes it could not be thus used unless bent forwards.

EXPLANATION OF THE FIGURES.

Fig. I. Primitive ova, each consisting of a single nucleated cell.

Figs. II. and III. Ova somewhat enlarged, around which a transparent space is formed in the stroma of the ovary.

Fig. IV. A more advanced egg, in which the transparent space has become much enlarged. The vitelline membrane is distinctly visible, and the nucleus contains granules or nucleoli of different sizes. On the left of this figure is an earlier ovum, in which the transparent space is just forming.

Figs. V. and VI. Two fœtuses with yelk-bags attached. On comparing the two figures, which are of the size of nature, it will be seen that fœtus and yelk-bag both grow simultaneously.

Fig. VII. A more advanced and nearly mature fœtus, in which the yelk-bag has been absorbed, and only a linear fissure or umbilicus remains; this is closed by a thin, scaleless membrane, and extends from the space between the pectoral fins in front to that between the ventrals behind. The fœtus has acquired a length nearly one fourth of that of the adult *Anableps*.

Fig. VIII. A portion of the yelk-bag, highly magnified, showing the papillæ filled with granules, which cover its surface.

Fig. IX. The anal fin. The genital portion is shorter than the fin rays and membrane. In older specimens, however, the former becomes proportionally longer, and the latter become so much diminished in size as to be scarcely traceable.*

* For complete and accurate descriptions and figures of other details relating to structure and development, reference may be made to the *Hist. Nat. des Poissons*, by Cuvier and Valenciennes, tome xviii. p. 245.

ART. XXVII.—On the CRUSTACEA and ECHINODERMATA of the Pacific Shores of North America. By WM. STIMPSON.
Part I. CRUSTACEA.

THERE IS NO part of the world in which so large accessions to our knowledge of Zoölogy and Botany have been made within the past five years, as in that part of our continent which lies west of the Rocky Mountains. The results of the numerous government surveys, as elaborated by BAIRD and GIRARD, and the investigations of CASSIN, AYRES, and the Californian naturalists, have brought to light hundreds of new and interesting Vertebrates, while the Insects have been extensively studied by LE CONTE and the Testacea by GOULD. The Marine Invertebrata have however as yet excited but little attention among our naturalists. With the exception of the descriptions of Crustacea by DANA and RANDALL, nothing has been done here in this department, while in Europe several articles having more or less relation to the subject have recently appeared in various scientific periodicals.

It is with the view of calling attention to this interesting division of our western fauna, and of opening a rich field, that I have been led here to give something more than a description of the novelties collected by Mr. Samuels;—in fact, to present a view of the present state of our knowledge of the Crustacea and Echinodermata of the West Coast.*

* The following works have been consulted in the preparation of this article :
For the Crustacea :—

AR. FR. WIEGMANN. *Beschreibung einiger neuen Crustaceen des Berliner Museums aus Mexico*, etc. Archiv für Naturgeschichte, 1836, i. 145-151.

J. W. RANDALL. *Catalogue of the Crustacea brought by Thomas Nuttall and J. K. Townsend from the West Coast of North America, with descriptions and figures of new species*. Journal of the Academy of Natural Sciences of Philadelphia, vol. viii. 1839, pp. 106-147. Pl. III—VII.

R. OWEN. *The Zoölogy of Captain Beechey's Voyage, Crustacea*. (1839.)

M.M. MILNE-EDWARDS et H. LUCAS. *Description des Crustacés nouveaux ou peu connus*. Archives du Muséum d'Histoire Naturelle, 1841, ii. 461.

APRIL, 1857.

The Smithsonian Institution has with its usual liberality allowed me the use of the very numerous specimens in its

- W. F. ERICHSON. *Uebersicht der Arten der Gattung Astacus*. Archiv für Naturgeschichte, 1846, i. 86-103, 375-377.
- A. WHITE. *On a new genus of Crustacea*. Annals and Magazine of Natural History, 1846, xvii. 497.
- *List of the specimens of Crustacea in the British Museum*. London-1847.
- *Description of Echidnocerus cibarius, a new species and subgenus of Crustacea*. Proceedings of the Zoölogical Society of London, 1848, p. 47; Annulosa, Pl. II. and III.
- *Some remarks on Crustacea of the genus Lithodes, with a brief description of a species apparently hitherto unrecorded*. Proceedings of the Zoölogical Society of London, 1856, p. 132. Annulosa, Pl. XLII.
- G. NEWPORT. *Note on the genus Atya of Leach, with descriptions of new species, etc.* Annals and Magazine of Natural History, 1847, xix. 158-160.
- F. BRANDT. *Die Gattung Lithodes, Latreille, nebst vier neuen ihr Verwandten von Wosnessenski entdeckten als Typen einer besondern Unterabtheilung (Tribus Lithodea) der Edwards'schen Anomuren*. Bulletin physico-mathématique de l' Académie de Saint-Pétersbourg, 1849, vii. 171-175.
- *Vorläufige Bemerkungen über eine neue, eigenthümliche, der Fauna Russlands angehörige Gattung oder Untergattung von Krabben (Crustacea Brachyura) aus der Edwards'schen Abtheilung der Corysten*. Bulletin physico-mathématique de l' Académie de Saint-Pétersbourg, 1849, vii. 178, 179.
- *Beiträge zur Kenntniss der Amphipoden*. Loc. cit., 1851, ix. 132, 310, etc.
- *Middendorff's Reise in den Sibiriens, Zoölogie; Theil I. Krebse*, pp. 79-162, (1851.)
- L. R. GIBBES. *On the Carcinological Collections of the United States, and an enumeration of the species contained in them, with notes, etc.* Proceedings of the American Association for the Advancement of Science; Third Meeting, Charleston, S. C., 1850, pp. 167-201.
- C. GIRARD. *A Revision of the North American Astaci, etc.* Proceedings of the Academy of Natural Sciences of Philadelphia, 1852, vii. 87-91.
- J. D. DANA. *Crustacea of the United States Exploring Expedition, 1852*.
- *Catalogue and Descriptions of Crustacea collected in California by Dr. John L. Leconte*. Proceedings of the Academy of Natural Sciences of Philadelphia, 1854, vii. 175-177.
- *Description of a new species of Cryptopodia from California*. American Journal of Science, 2d Series, vol. xviii. p. 430, (1854.)
- M. MILNE-EDWARDS. *Mélanges Carcinologiques*. Annales des Sciences Naturelles, 1852-1853.
- H. DE SAUSSURE. *Description de quelques Crustacés nouveaux de la côte occidentale du Mexique*. Revue et Magasin de Zoölogie, 1853, v. 354-368.

museum, obtained mostly through the researches of Lieut. TROWBRIDGE, Drs. SUCKLEY and NEWBERRY, and Mr. A. S. TAYLOR. These specimens, together with those found by myself while on the North Pacific Exploring Expedition, form a large addition to Mr. Samuels's collection, and have enabled me to make more extended and satisfactory observations upon these divisions of our Western Fauna.

It will be seen that more than one hundred and thirty species of the class Crustacea have been determined to exist in the region now under consideration, a number which seems quite large when we consider that so recently as in the year 1838 not a single species was known to science as forming part of its fauna.* But we cannot suppose even this number to be more than a fourth part of that which will be reached when a thorough search shall be instituted. Many families which are undoubtedly represented here by one or more species, have not yet been noticed; and that part of the coast which is included within the

W. P. GIBBONS. *On a new genus of Crabs*. Proceedings of the California Academy of Natural Sciences, 1855, vol. i. pp. 48, 49.

T. BELL. *Horæ Carcinologicæ, or Notices of Crustacea. I. A monograph of the Leucosiadæ*. Transactions of the Linnæan Society of London, 1855, xxi. 277. Pl. XXX—XXXIV.

W. STIMPSON. *On some Californian Crustacea*. Proceedings of the California Academy of Natural Sciences, 1856, vol. i. pp. 87–90.

————— *Descriptions of new species of Crustacea from the Western Shores of North America*. Proceedings of the Boston Society of Natural History, 1857, vol. vi. pp. 84–89.

For the Echinodermata:—

ESCHSCHOLTZ. *Zölogischer Atlas*.

F. BRANDT. *Prodromus descriptionis animalium ab H. Mertensio in orbis terrarum circumnavigatione observatorum*. Fascic. I. Petropoli, MDCCCXXXV.

J. E. GRAY. *On the class Hypostoma*. Annals and Magazine of Natural History, vi. 176, etc.

VALENCIENNES. *Voyage de la Venus*.

W. O. AYRES. *On Californian Echinodermata*. Proceedings of the California Academy of Natural Sciences, 1855, i. 68.

* "Nous ne savons rien sur les Crustacés de la côte occidentale de l'Amérique du Nord." MILNE-EDWARDS, *Hist. Nat. des Crust.* iii. 564, (1840.)

tropics must swarm with Crustacea of the higher orders, the species of which are as yet entirely undetermined. Without, therefore, attempting to generalize upon so imperfect data, we may notice a few facts with regard to the character of the Crustacean fauna, which are so prominently marked that they will be but little affected by future discoveries.

The tribe *Oxyrhyncha* is very numerously represented in the rocky fiords of the upper coast, and a predominance of deep-water forms may be observed, the genera of which are mostly peculiar to this region. The restricted genus *Cancer* (*Platycarcinus*, M. Edw.) is remarkably well represented here, by four species, very abundant in individuals, and which are in fact the most common crabs known. On the other hand, with the exception of a single species of *Ozius*, no other examples of the *Cancrinea*, elsewhere so numerous, have yet occurred; and it is indeed singular that the sandy shores of California, so well adapted to *Lupa* and its allies, should have as yet furnished no species of the *Portunidæ*. In this point a striking difference is shown between the marine fauna of this and the eastern coast, where such forms are abundantly distributed.

The chief and most noticeable feature, however, which at once gives a peculiar character to the Decapoda of the Northwestern coast, is the remarkable development of the *Lithodina*. But few species of the rare and curious crabs of this family, all denizens of deep water, were until recently known, one of which (the only one described in the "Histoire Naturelle des Crustacés,") is found in the North Atlantic, one in the Antarctic Ocean, and two in the seas of Japan and Kamtschatka. Within the past ten years, however, no less than nine additional species have come to light, nearly all of which were found on the shores of California, Oregon, and Russian America. Among these are some gigantic and representative forms which tend greatly to enlarge our views of the extent, importance, and relations of the group. For our knowledge of these interesting Crustaceans, we are chiefly indebted to BRANDT of St. Petersburg.

Among the fresh-water Crustacea we may notice the fact, first observed by DANA* in *Astacus leniusculus*, that the Cray-fish of the rivers running into the Pacific have branchiæ on the fifth pair of legs, and, like those of Europe, are classed among the true *Astaci*. AGASSIZ† saw the same thing in *A. Gambelii*, and I have found it to be invariably the case in the species of this region, among which there are several not hitherto described in the Museum of the Smithsonian Institution. Our eastern Cray-fish, on the contrary, all belong to the genus *Cambarus*, having no branchiæ on the legs of the fifth pair,—a singular instance of the coincidence of peculiarities of structure with those of geographical distribution. ERICHSON‡ does indeed describe two species of *Cambarus* from Southern Mexico, but we have reason to suppose that these belong rather to the eastern slope of the Rocky Mountains.

In the preparation of the following paper I have used every means in my power to identify the species described by previous authors, and have done this by actual comparison of specimens wherever it was possible. Through the kindness of Dr. BRIDGES I was enabled, during a short visit to Philadelphia for that purpose, to examine the typical specimens of RANDALL'S species, and those of DE SAUSSURE. To Professor DANA I am indebted for much assistance, and for the use of the few specimens of his types which were particularly desired for comparison,—the admirable exactness of his figures and descriptions rendering any further means of identification in most cases unnecessary.

Full descriptions will be here given of the new species only, but notes are appended to several already known, including remarks on characters which have been overlooked by previous authors. Enough is given in most instances to enable the reader to determine any known California or Oregon species.

* U. S. Exploring Expedition, Crust. i. 524.

† Proc. Acad. Nat. Sci., Philad. vi. 375.

‡ Archiv für Naturgeschichte, 1846, i. 99.

DECAPODA BRACHYURA.

TRIBE OXYRRHYNCHA.

CHIONÆCETES BEHRINGIANUS. Stimpson.

Chionæcetes Behringianus, STIMPSON; *Proc. Bost. Soc. Nat. Hist.* vi. 84.

Carapax with numerous scattered unequal rugose prominences which are blunt and wart-like about the middle, but become more acute anteriorly and at the sides. Superior surface covered with a short pubescence. The broad channels above the postero-lateral margins are nearly smooth, but their double margins are granulated. The inferior antero-lateral margin is armed with about fourteen small bifid teeth which diminish in size forwards. The feet are everywhere slightly pubescent, with the third articles scabrous or echinulate above; those of the first pair are muricated along the angles, and everywhere somewhat scabrous on their upper surfaces. The abdomen in the male is one third the width of the sternal plastron at its penultimate article, the infero-lateral angles of which are somewhat produced and tumid. Length of the carapax, 2.5; width, 2.52 inch.

This species may be distinguished from *C. opilio*, KROYER, judging from the descriptions of that naturalist, by the shorter feet of the male;—those of the second pair, in the species here described, being not more than twice the length of the carapax, while those of the first pair are not much more than half as long as those of the second. The abdomen consists in both male and female of seven articles, the three nearest the base being strongly granulated. KROYER, in his diagnosis of the genus, states the number of articles to be six, although O. FABRICIUS* gives seven as the number in his *Cancer phalangium*.

It inhabits deep water, the specimens described being

* Fauna Grönlandica, p. 234; n. 214.

dredged on a muddy bottom at the depth of thirty fathoms, off Cape Romanzoff. It was also found in Behring's Straits, by Commodore RODGERS, of the North Pacific Expedition.

It is in the Museums of the Boston Society of Natural History, of the Smithsonian Institution, and of the Jardin des Plantes.*

HYAS COARCTATUS. Leach.

Hyas coarctatus, LEACH; *Malac. Pod. Brit.*, Pl. XXI. b. MILNE-EDWARDS; *Hist. Nat. des Crust.*, i. 312. BRANDT; *Sibirische Reise*, i. 79.

Dredged off Cape Romanzoff by the North Pacific Expedition.

This is an arctic species, found on both boreal shores of the Atlantic. It is also the most common crab found in Behring's Straits, and is reported to exist on the shores of Kamtschatka and in the Sea of Ochotsk.

Mus. Smithsonian.

HYAS LYRATUS. Dana.

Hyas lyratus, DANA; *U. S. Exploring Expedition, Crust.*, i. 86, Pl. I. f. 1.

Distinguished from the preceding species by the broad, wing-like, antero-lateral expansions of the carapax. It in-

* As it is always desirable to know where typical specimens may be found for comparison, I shall indicate in every case the different museums in which examples of the species herein catalogued are deposited. For convenience, the following abbreviations will be used :—

Museum of the Boston Society of Natural History	Mus. Bost. Soc.
“ “ “ Smithsonian Institution	“ Smithsonian.
“ “ “ Philadelphia Academy of Natural Sciences	“ Phil. Acad.
“ “ “ U. S. Exploring Expedition	“ Expl. Exped.
“ “ “ California Academy of Natural Sciences	“ Cal. Acad.
“ “ “ Yale College	“ Yale.
“ “ “ Imperial Academy of St. Petersburg	“ Acad. Petrop.
“ “ Berlin	“ Berlin.
“ “ the Garden of Plants at Paris	“ Paris.
“ “ “ Royal College of Surgeons, London	“ R. C. S.
“ “ “ Zoölogical Society of London	“ Zoöl. Soc.
British Museum	“ Brit.

habits deep water on the coast of Oregon, where it was found by the U. S. Exploring Expedition.

Mus. Expl. Expedition.

HERBSTIA PARVIFRONS. Randall.

Herbstia parvifrons, RANDALL; *Journal of the Academy of Natural Sciences of Philadelphia*, viii. 107. GIBBES; *Proceedings of the American Association for the Advancement of Science*, 1850, p. 170.

“Western America.” (Nuttall.) This species I have not seen.

LOXORHYNCHUS. nov. gen.

Carapax pyriformis, plus minusve spinosus et pubescens; regione stomachali amplâ, convexâ; regionibus hepaticis parvis, prominentibus, spinâ unâ saltem validâ in medio armatis. Rostrum bifidum, plus minusve deflexum; cornubus divaricatis. Orbita imperfecta, supra infraque sinu profundo longitudinali interrupta; cavo pediculi subtubulato. Oculi sat breves, retractiles, non sese latentes. Dens præorbitalis validus; spina postorbitalis acuta, fere longitudinalis, sub quâ spina parva juxta basim externam articuli primi antennæ externæ sita. Pars mobilis antennarum externarum rostro vix celata, flagellis longis; articulus immobilis latus, fere quadratus, apice externo spinâ acutâ lateraliter porrectâ armato. Epistoma magna, subtrapezoidalis. Maxillipedes externi fere ut in *Pisâ*; apice interno articuli secundi valdè productâ et rotundatâ. Pedes subcylindrici, secundi paris longiores; tarsi breves non spinulosi; digiti primi paris maris fæminæque margine interno toto denticulato. Abdomen 7-articulatum.

This genus is proposed for the reception of two new species of Maioid crabs, which, though differing from each other considerably in the characters of the surface of the carapax, and some other points, yet are so closely allied in the structure of the orbits and antennæ that they cannot be generically separated. They unite the characters of several generic groups, so that their position is somewhat doubtful, although probably among the *Pisinæ*. The deflection of the rostrum is quite characteristic, but this feature is much less developed in one species than in the other. The eyes are short, and do not reach the tip of the post-orbital spine.

The genus will be perhaps best characterized by a comparison with others. From *Pisa*, which it resembles in the shape of the carapax, it differs in the less excavated orbits, and single supra-orbital fissure, the want of spinules on the tarsi, and the much broader basal article of the external antennæ. This latter character also separates it from *Herbstia* and *Halimus*. From the *Choriniæ* it may be distinguished by the non-concealment of the external antennæ, and the shorter and broader rostrum. It is allied to *Paramicippa* in the deflection of the rostrum, but differs in the longer epistome, and the inferior position of the external antennæ. The cavities of the eye-peduncles are less tubular than in *Pericera*, the eyes being retractile. *Perinea* has a shorter carapax and a much shorter rostrum, leaving the external antennæ considerably exposed.

This genus, like several others of the tribe, seems to be peculiar to this coast. The species are crabs of large size.

LOXORHYNCHUS GRANDIS. Stimpson.

Plate XIX. f. 1, and XXII. f. 1.

Loxorhynchus grandis, STIMPSON; *Proc. Bost. Soc. Nat. Hist.* vi. 85.

Carapax pyriform, subglobose; branchial regions broadly expanded somewhat as in *Libinia*. Surface covered with small warts of nearly uniform size, which are blunt and rounded about the middle portion of the carapax, but become sharp and spine-like anteriorly and on the sides, where they are also more crowded. There are seven spines on the hepatic protuberances, two of which are larger. Pubescence very short and mostly obsolete above, leaving the surface punctate with minute pit-like depressions. Rostrum a little longer than wide, slit for somewhat more than half its length, and greatly deflexed, pointing downward in a direction almost at right angles with the horizontal axis of the body. The præorbital spine is emarginate at its extremity. The feet are rather short and stout, covered with a short,

thick villosity. Those of the first pair shorter than those of the second, with fingers touching each other along the whole length of their denticulated inner edges; wrist somewhat tuberculous above; third article with four small distant spines on the superior margin, the largest being at the summit of the abrupt expansion at the articulation of the fourth article. A single subterminal spine on the third article of the second pair of feet; this spine becomes almost obsolete in the posterior pairs, which are elsewhere smooth. Tarsi short and thick, somewhat curved, with corneous tips easily separable in dry specimens. The color of exposed parts is reddish inclining to roseate, becoming yellowish-white on the sides. Fingers white. The following are the dimensions of a female:—

Length of carapax	5.55 inch.
Width " "	4.54 "
Length of rostrum from base of præorbital spine	0.96 "
Distance between rostral tips	0.39 "
" " tips of præorbital spines	1.30 "
Length of 1st pair of feet	4.90 "
" " 2d " "	6.45 "
" " 5th " "	4.75 "

Taken on the coast of California, near San Francisco, by Lieut. TROWBRIDGE.
Mus. Smithsonian.

LOXORHYNCHUS CRISPATUS. Stimpson, n. s.

Plate XXII. f. 2, 3, and 4.

Carapax very much elongated, somewhat triangular; regions separated by deep depressions. There are nine large tubercles above, with sharp apices, between which smaller ones are interspersed. These tubercles are as follows: one at the posterior summit of the stomachal region, one at each hepatic region, (projecting laterally,) two on each side at the branchial regions, and one at either extremity of the abruptly convex intestinal region. The sides of

the carapax are nearly perpendicular, and provided with tubercles. The whole surface of the body and feet (excepting the pincers and tips of the tarsi) above and below, is covered with short, thick hair, which, on the front and sides of the carapax and along the angles of the legs, becomes longer, stiff, and curled. The rostrum is but slightly deflexed, and not curved; it is slit two thirds of its length, the horns diverging, but slightly turned inwards at their sharp extremities. Præorbital spines slender, sharply pointed. External antennæ long, the flagella reaching much beyond the tips of the rostrum. The feet are somewhat triangularly prismatic; a character best seen in the third joints. The fourth articles in the posterior four pairs have a longitudinal groove on the upper surface. In the first pair the fingers are rather slender, and the posterior tooth of the movable one is much larger than the others; in this pair of feet there are two small spines on the third joint. The sternal plastron and abdomen in the male are transversely grooved with deep channels corresponding in number to the articulations. The color beneath the pubescence is bluish-white, the rostrum, spines, and feet being of a bright carmine hue.

Length of carapax, ♂	3.45
Greatest width	2.30
Length of rostrum	0.67
Distance between tips of præorbital spines	0.82
“ “ “ anterior spines of branchial region	1.40
Length of 1st pair of legs	3.50
“ “ 2d “ “	4.40

Found at the island of San Miguel, off the coast of California, near San Pedro. This is another of the novelties for which we are indebted to that indefatigable observer, Lieut. TROWBRIDGE, who, though devoting his chief attention to the Vertebrata, has succeeded in making collections of the lower forms of animal life, of greater extent and interest than has any other student of Californian Zoölogy.

Mus. Smithsonian.

LIBINIA AFFINIS. Randall.

Libinia affinis, RANDALL; *Jour. Acad. Nat. Sci., Philad.* viii. 107. GIBBES, *Proc. Am. Assoc.* 1850, p. 170.

This species is rare, Nuttall's specimen being the only one yet found. It is very closely allied to *L. canaliculata* of the eastern coast, but differs in its less convex carapax and smoother hand.

Upper California, (Nuttall.)
Mus. Phil. Acad.

CHORILIA LONGIPES. Dana.

Chorilia longipes, DANA; *U. S. Expl. Expedition, Crust.* i. 91; Pl. I. f. 5.

This species may be distinguished from the other Oxyrynchs of this coast by its long, bifid, pubescent rostrum, the forks of which are nearly parallel. The carapax is without pubescence, with a few distant tubercles and a sharp spine on each side at the branchial region. The legs are long, and, with the exception of the first pair, very slender. It is about $1\frac{1}{2}$ inches in length.

Oregon, (Expl. Exped.)
Mus. Expl. Exped.

SCYRA ACUTIFRONS. Dana.

Seyra acutifrons, DANA; *U. S. Exploring Expedition, Crust.* i. 95; Pl. II. f. 2.

This little crab may be recognized by its ovate spineless carapax, the regions of which are strongly prominent; and by its short, bifid, lamellar rostrum.

Puget Sound, (Pickering.)
Mus. Expl. Exped.

OTHONIA PICTETI. De Saussure.

Othonia Picteti, DE SAUSSURE; *Revue et Magasin de Zoologie*, v. 357, Pl. XIII. f. 2.

Mazatlan, (Verreaux.)

Mus. Phil. Acad.

Dr. JOHNSTON used the name *Othonia* for a genus of Annelides in 1835,—prior to its application to the crustacean group by BELL. But JOHNSTON'S genus seems to be the same as *Fabricia*, BLAINV. 1828.

MITHRAX ARMATUS. De Saussure.

Mithrax armatus, DE SAUSSURE; *Rev. et Mag. Zool.* v. 355, Pl. XIII. f. 1.

Mazatlan, (Verreaux.)

Mus. Phil. Acad.

OREGONIA GRACILIS. Dana.

Oregonia gracilis, DANA; *U. S. Exploring Expedition, Crust.* i. 106, Pl. III. f. 2.

The *Oregoniæ* may be distinguished by the great length of their legs, the penultimate joint of which is not expanded; and by the long, slender, post-orbital spine. The rostrum is slender, and forked nearly from its base; in this species the horns are long, and diverge toward their extremities.

Puget Sound, (Pickering.)

Mus. Expl. Exped.

OREGONIA HIRTA. Dana.

Oregonia hirta, DANA; *U. S. Expl. Exped., Crust.* i. 107, Pl. III. f. 3.

This is more hairy than the preceding species, and has a proportionally longer rostrum. Both are inhabitants of deep water.

Puget Sound, (Pickering.)

Mus. Expl. Exped.

PUGETTIA GRACILIS. Dana.

Pugettia gracilis, DANA; *U. S. Exploring Expedition, Crust.* i. 117, Pl. IV. f. 3.

The genus *Pugettia* is characterized by the large post-orbital expansions of the depressed, unarmed carapax. Ros-

trum bifurcate, horns diverging. The deep constriction between the hepatic and branchial regions renders it easily distinguishable from all other crabs of this coast, except perhaps *Hyas lyratus*, which has a simply cleft rostrum. In the present species the post-orbital expansions are triangular.

Puget Sound, (Expl. Exped.)

Mus. Expl. Exped.

PUGETTIA RICHII. Dana.

Pugettia Richii, DANA; *U. S. Exploring Expedition, Crust.* i. 117, Pl. IV. f. 3.

In this the post-orbital expansions are bilobate, with the lobes acute. Larger than the preceding; anterior feet of great size.

San Diego, (W. Rich.)

Mus. Expl. Exped.

EPIALTUS PRODUCTUS. Randall.

Epialtus productus, RANDALL; *J. A. N. S. Phil.* viii. 110. GIBBES; *Proc. Am. Assoc.* 1850, p. 173. DANA; *U. S. Exploring Expedition, Crust.* i. 133, Pl. VI. f. 2.

Easily recognized by its smooth quadrate carapax, with two distant teeth on either side. It is the most common maioid crab on the coast of California and Oregon, and is usually found among sea-weeds on rocks just below low-water mark. Its color is olivaceous when alive.

Puget Sound, (Suckley;) Mouth of the Columbia, (Trowbridge;) Farallone Is. (Trowbridge;) Tomales Bay, (Samuels;) entrance of San Francisco Bay, (Stimpson;) Monterey, (Trowbridge.)

Mus. Smithsonian; Bost. Soc.; Phil. Acad.; Paris; Acad. Petrop.

EPIALTUS NUTTALLII. Randall.

Epialtus Nuttallii, RANDALL; *loc. cit.* viii. 109, Pl. III. GIBBES; *loc. cit.* p. 173.

Differs from the preceding by its more rounded outline and larger rostrum.

Upper California, (Nuttall.)

Mus. Phil. Acad.

PARTHENOPE PUNCTATISSIMA. Owen.

Parthenope punctatissima, OWEN; *Zoology of Beechey's Voyage, Crust.* 81, Pl. XXIV. f. 4.

This is almost certainly a *Lambrus*, but having been unable to procure a specimen and examine the characters of the antennæ, I refrain from adding to the synonymy.

Coast of California, (Belcher.)

Mus. Zoöl. Soc.; R. C. S.

CRYPTOPODIA OCCIDENTALIS. Dana.

Cryptopodia occidentalis, DANA; *Am. Jour. Sci.*, 2d Ser. xviii. 430, (wood-cut.) GIBBES, *Proc. Elliott Soc. Nat. Hist. Charleston, S. C.* i. 36.

This curious crab is distinguished from all others found on this coast, by the smallness of its posterior four pairs of feet, which are entirely concealed beneath the carapax; those of the first pair on the contrary are very large, angular, and much longer than the shell.

Monterey, (W. Rich.)

Mus. Expl. Exped.

TRIBE CYCLOMETOPA.

CANCER MAGISTER. Dana.

Cancer magister, DANA; *U. S. Exploring Expedition, Crust.* i. 151, Pl. VII. f. 1. STIMPSON; *Proc. Cal. Acad. Nat. Sci.* i. 88. *Cancer irroratus*, RANDALL, l. c. (non Say.)

The largest of the numerous species found on the Cali-

fornian coast. Antero-lateral margin ten-toothed ; teeth but little prominent, with the exception of the posterior one, which is separated from the next by a considerable space ; they gradually diminish in size toward the orbits. Terminal segment of abdomen in the male short, with a rounded extremity. Third article of outer maxillipeds somewhat granulated, with the exterior apex broadly truncated. Feet of the second pair longest, and equal in length to the width of the carapax. In adult specimens the tarsi of the fifth pair of feet are very much compressed, and not conspicuously ciliated below. In a specimen from Sitka, the granulation on the upper side of the feet of the posterior pairs is much stronger, and the teeth on the crest of the hand less numerous and higher, than in Californian specimens. The following are the measurements of several specimens in the Museum of the Smithsonian Institution :—

Locality.	Sex.	Length of Carapax.	Width of Carapax.	Proportions of Carapax.
Puget Sound,	♂	0.875 inch.	1.27 inch.	1:1.45 inch.
San Francisco,	"	1.23	1.80	1:1.46
Monterey,	"	2.51	3.77	1:1.50
San Francisco,	"	4.42	7.00	1:1.58
Sitka,	"	4.90	8.85	1:1.80
San Francisco,	♀	2.55	3.90	1:1.53

By these measurements and proportions it will be seen that this species increases in width with age, and that the female is slightly broader than the male. I have seen no specimen according in dimensions with the variety figured by Dana.

This species was erroneously referred by RANDALL to *C. irroratus*, SAY. The succeeding species, however, approaches much more closely to the eastern crab.

C. magister has been found at Sitka, (Trowbridge ;) Puget Sound, (Suckley ;) San Francisco Bay, (Pickering, Kennerly, etc. ;) and at Monterey, (Taylor.) It is the common crab of the San Francisco market, and is caught very abundantly about the wharves of the city. It is of a light

reddish-brown color, darkest anteriorly, often light orange below; inner sides of the anterior feet and hands crimson.

Mus. Smithsonian; Expl. Exped.; Phil. Acad.

CANCER GRACILIS. Dana.

Cancer gracilis, DANA; *U. S. Exploring Expedition, Crust.* i. 153, Pl. VII. f. 2.
STIMPSON; *Proc. Cal. Acad. Nat. Sci.* i. 88.

This is the smallest species of the genus known, although found of a much larger size than that figured by DANA. It may be distinguished from the young of *C. magister* by the emargination or slight tooth on the postero-lateral margin near its outer extremity, as well as by its proportions. It differs from *C. irroratus*, (*C. Sayi*, GOULD,) which also possesses the postero-lateral emargination, by its smoother and more slender tarsi, and by the granulation of the central portions of the carapax. The antero-lateral margins are nine-toothed. Lateral teeth of inter-antennary front deeply separated from, and much larger than, the middle one, although not projecting so far forward. Third article of outer maxillipeds smooth, with the exterior apex rounded. Terminal segment of abdomen in the male elongate-triangular, with a slender, pointed extremity. The following are the dimensions of several specimens now before me:—

Locality.	Sex.	Length of Carapax.	Breadth of Carapax.	Proportion.
Tomales Bay,	♂	1.51 inch.	2.30 inch.	1:1.52 inch.
“ “	“	1.60	2.40	1:1.50
“ “	“	1.70	2.55	1:1.50
Puget Sound,	♀	1.90	2.80	1:1.47
Tomales Bay,	“	1.45	2.13	1:1.47

We may thus notice that in this species the males are wider than the females.

Puget Sound, (Suckley;) Tomales Bay, (Samuels;) San Francisco Bay, (Expl. Exped.)

Mus. Expl. Exped.; Smithsonian; Bost. Soc.; Phil. Acad.; Acad. Petrop.; Paris; etc.

CANCER PRODUCTUS. Randall.

Cancer productus, RANDALL; *loc. cit.* viii. 116. DANA; *U. S. Exploring Expedition, Crust.* i. 156, Pl. VII. f. 3. STIMPSON; *Proc. Cal. Acad. Nat. Sci.* i. 88. *Platycarcinus productus*, GIBBES; *Proc. Am. Assoc.* 1850, p. 177.

This species was described by RANDALL from young specimens, which differ much from the adult, both in proportions and markings. Having seen only large individuals at the time my paper in the Proceedings of the California Academy was written, I there proposed for them the name *C. perlatus*, in case they should prove different from RANDALL'S species. But the possession of a full series of all ages, and the examination of the original specimen at Philadelphia, has now convinced me of their identity. DANA'S specimens appear also to have been young, and his description will scarce apply to the adults, in which the teeth on the front and antero-lateral margin are sufficiently projecting and well separated.

The produced and elevated front is the most prominent character of this species. The female is rather more convex than the male. The greatest width is at the penultimate lateral tooth. The postero-lateral margin is emarginated, as in the preceding species. Surface of the carapax unequally granulose, most so toward the margins and on the teeth. Head tuberculous above, scarcely cristate, the projections being few and blunt; the exterior surface 4-carinate. Posterior feet rather compressed; third articles in all ciliate along the superior edge; tarsi with three longitudinal brushes of short, thick hair along the angles, the superior one in the fifth pair and the posterior one in the other pairs being often obsolete. The terminal article of abdomen in the male is triangular, elongated, with an acuminate extremity, the sides being concave.

This species is of a dark red or madder color above; feet mottled; below dirty white. The following are the dimensions of several specimens:—

462 Stimpson on the Crustacea and Echinodermata

Locality.	Sex.	Length of Carapax.	Width of Carapax.	Proportion.
San Francisco,	♂	2.95 inch.	4.90 inch.	1:1.63 inch.
" "	"	2.56	4.18	1:1.63
" "	"	2.47	4.01	1:1.62
" "	"	2.46	4.00	1:1.62
Tomales Bay,	"	2.35	3.78	1:1.60
San Francisco,	"	2.27	3.66	1:1.60
" "	"	2.10	3.36	1:1.60
" "	"	1.97	3.05	1:1.55
" "	"	0.99	1.29	1:1.30
" "	♀	2.84	4.30	1:1.52
Tomales Bay,	"	2.73	4.20	1:1.54
San Francisco,	"	2.15	3.34	1:1.55
Tomales Bay,	"	2.16	3.32	1:1.54
" "	"	2.00	3.07	1:1.54

Here it will be perceived that the male is wider than the female; and also that the males steadily increase in width with age, while the females show some variation. The great breadth in this species renders it easily distinguishable from its congeners.

Distortions of the antero-lateral teeth often occur, rendering the sides somewhat unsymmetrical.

This *Cancer* is common at San Francisco, and is sold in the markets with *C. magister*. It was also found at Tomales Bay by Mr. Samuels, and in Puget Sound by the Exploring Expedition.

Mus. Bost. Soc.; Smithsonian; Phil. Acad.; Paris; Acad. Petrop.

CANCER ANTENNARIUS. Stimpson.

Plate XVIII.

Cancer antennarius, STIMPSON; *Proc. Cal. Acad. Nat. Sci.* i. 88.

Carapax convex; greatest breadth at the penultimate antero-lateral tooth. Superior surface much undulated, very smooth in appearance, but minutely granulated; the granulation being almost obsolete about the middle, but sufficiently well marked towards and at the margin. Antero-

lateral margin convex and well rounded, with nine teeth, the inner one forming the outer angle of the orbit; teeth deeply separated, their edges denticulated, their apices curving forward and very sharp, almost uncinatè. Posterolateral margin with a deep emargination near the extremity, forming a sharp tooth, and another, rather slight, a short distance within the first. These emarginations are much deeper in the young than in the adult. Front sufficiently broad, but not projecting farther forward than the exterior angle of the orbit; inter-antennary portion with three well-separated teeth, the middle one being smaller and rather below the lateral ones; præorbital tooth rather prominent. External antennæ very large and hairy, in length equalling two fifths that of the carapax; apex of basal article projecting considerably beyond the præorbital tooth. Third article of external maxillipeds subquadrate, a little longer than broad; anterior margin nearly transverse, ciliate with long hairs; angles rounded; notch for insertion of fourth article deep, abrupt below, continuous with the margin above. The slight ridge on the palate parallel with its inner margin is more sharply prominent in this than in any other species. Feet of the first pair large, particularly in the male. Carpus and hand rather short and thick, in the adult smoothly rounded above and microscopically granulated, in the young ornamented with small spiniform tubercles; outer surface of hand costate; costæ well marked and granulated in the young, almost obsolete in the adult. Fingers in the female with linear grooves on the sides. Ambulatory feet hairy; third articles overreaching the margin of the carapax; tarsi with thick brushes of short hair along the angles. Margins of abdomen and other parts on the inferior surface generally, very hairy. Terminal article of abdomen in the male slender, with somewhat concave sides and bluntly pointed extremity.

Color above dark purplish-brown; below yellowish-white, spotted with red; finger and thumb black.

The dimensions of two specimens from San Francisco Bay are as follows :—

♂	Length of carapax,	2.43	inch;	breadth,	3.70;	proportion,	1:1.52.
♀	“	2.13	“	“	3.08;	“	1:1.45.

The male is therefore broader than the female.

Its hairiness and the great length of the outer antennæ distinguish it from all other species. In a variety found in Tomales Bay, the upper surface of the carapax is hairy as well as the sides. The middle tooth of the inter-antennary front is sometimes wanting in this, as in other species.

It is not uncommon about the mouth of San Francisco Bay, inhabiting rocky bottoms at the depth of two or three fathoms. It was also found at Monterey by Mr. Taylor, and at Tomales Bay by Mr. Samuels.

Mus. Bost. Soc.; Smithsonian; Phil. Acad.; Paris; Acad. Petrop.

OZIUS VERREAUXII. De Saussure.

Ozius Verreauxii, DE SAUSSURE; *Revue et Magasin de Zoologie*, v. 359, Pl. XII. f. 1.

Mazatlan, (Verreaux.)

Mus. Phil. Acad.

TRIBE CORYSTOIDEA.

TRICHOCERA OREGONENSIS. Dana.

Trichocera Oregonensis, DANA; *U. S. Exploring Expedition*, Crust. i. 299, Pl. XVIII. f. 5.

This little crab has much the aspect of a small *Cancer*, and may be recognized by its rounded carapax, hairy legs, and long antennæ. The whole margin (including the postero-lateral) is dentate with about thirteen teeth on each side.

Puget Sound, (Expl. Exped.)

Mus. Expl. Exped.

CHEIROGONUS HIPPOCARCINOIDES. Latreille.

- Cancer adperso-setosus hippocarcinoides, STELLER, *MS.* (fide TILESII.)
Cancer cheiragonus, TILESIIUS; *Mem. de l'Acad. Imp. des Sciences de St. Petersb.*
1815, v. 347, Pl. VII. f. 1.
Cheiragonus hippocarcinoides, LATREILLE; *Fam. Nat.* 1825, p. 270. (fide
BRANDTII.)
Platycorystes ambiguus, BRANDT; *Bulletin physico-mathém. de l'Acad. de St.*
Petersb. 1849, vii. 179.
Platycorystes cheiragonus, BRANDT; in *Middendorff's Sibirische Reise, Zööl.* i. 85.
Cheiragonus hippocarcinoides, BRANDT; in *Midd. Sibirische Reise, Zööl.* i. 147.
Telmessus serratus, DANA; *U. S. Exploring Expedition, Crust.* i. 303, Pl. XVIII.
f. 8, (*viz* WHITE.)

This crab may be distinguished among those of this coast by its scabrous and setose surface, and the large triangular lateral teeth, of which there are four on the antero-lateral and two on the postero-lateral margin. These teeth have serrated margins, and the outer one on each side is much the largest. The inter-antennary front, which is separated from the præorbital tooth on either side by a broad sinus, has four small equal teeth. Length about two inches. It was found on the coast of Upper California by Dr. Le Conte; in Puget Sound by the Exploring Expedition; and at Sitka by Wosnessenski.

Mus. Acad. Petrop.; *Expl. Exped.*; *Phil. Acad.*

CHEIROGONUS ISENBECKII. Brandt.

- Platycorystes Isenbeckii, BRANDT; *Bulletin physico-mathém. de l'Acad. de St.*
Petersb. 1849, vii. 179.
Cheiragonus Isenbeckii, BRANDT; in *Middendorff's Sibirische Reise, Zööl.* i. 147

Unalashka, (Wosnessenski.)

Mus. Acad. Petrop.

This very distinct genus, to which so many names have recently been applied, is now known to include at least four species. That found on the west coast of North America, which occurs also along the shores of the Aleutian Islands, of Kamtschatka, and the Sea of Ochotsk, is dis-

tinct from the *Telmessus serratus* of WHITE. *Platycorystes* (*Podocanthus*) *Isenbeckii* of BRANDT is also properly placed in this genus, and I have recently discovered a new species in the seas of Northern Japan.

The reference to LATREILLE's work, (*Les Crustacés, les Arachnides, et les Insectes distribués en familles naturelles*, Paris, 1825,) for *Cheiragonus* is given on the authority of BRANDT. This book I have never seen, but it is said to have been republished in CUVIER's "Regne Animal"—edition of 1829. In this latter publication the name *Cheiragonus* certainly does not occur, which is singular, and it is also remarkable that it should have been entirely overlooked by MILNE-EDWARDS. The name occurs, however, in the "Index Universalis" of AGASSIZ, and must undoubtedly have been published somewhere by LATREILLE in 1826. Whether this author gives a generic character, or a simple reference to TILESIVS's description; and whether he designates the species as *C. hippocarcinoides*, I am of course unable to say. If this specific name were not given we must call the species *C. ambiguus*, for TILESIVS's reference to STELLER's MS. name *hippocarcinoides* is not sufficient to give it priority.

TRIBE CATOMETOPA.

GRAPSUS STRIGOSUS. Latreille.

Grapsus strigosus, LATREILLE. *Goniopsis strigosus*, DE HAAN; WHITE, *Brit. Mus. Catalogue, Crust.* 40.

Specimens in the British Museum, from Lower California, are referred to this species by WHITE.

GRAPSUS PICTUS. De Saussure.

Grapsus pictus, DE SAUSSURE; *Rev. et Mag. de Zoologie*, v. 362.

This is in all probability not the *Grapsus pictus* of LATREILLE. It may be either *G. ornatulus*, M. ED., or a new species; and is not improbably the same as the preceding.

Mazatlan, (M. Verreaux.)

PACHYGRAPSUS CRASSIPES. Randall.

Pachygrapsus crassipes, RANDALL; *Jour. Acad. Nat. Sci. Philad.* viii. 127.

Distinguished by the square form of the carapax, which has a single tooth on each side posterior to that forming the outer angle of the orbit;—the broad depressed front, and spiny tarsi. It is very common on the coast of California, south of San Francisco, and was found at the Farallone Is., (Trowbridge;) at Monterey, (Taylor;) and at San Diego, (Schott.) RANDALL states that his specimens were found at the Sandwich Is., by Nuttall. But the species has never been found there by other observers, although the Islands have been frequently and well searched for Crustacea. On the other hand, RANDALL states that his *P. parallelus** is found on the coast of Oregon, where, however, it has not been since observed; while it is common at the Sandwich Is. It is therefore probable, that in the case of Nuttall's specimens the labels of the two species were accidentally exchanged.

Mus. Bost. Soc.; *Phil. Acad.*; Smithsonian; *Acad. Petrop.*; Paris.

There seems to be no good reason why RANDALL's name *Pachygrapsus* should not be retained for the group called *Leptograpsus* by MILNE-EDWARDS. The thick, square, and evidently allied forms with a square third article of maxillipeds, for which Dr. R. instituted the genus, are quite distinct from the true *Grapsi*, though forming a group to which DE HAAN proposed to restrict the ancient name of the family. When it was found necessary to divide this group into genera, based upon the characters of the orbits and external antennæ, the name *Pachygrapsus* should certainly have been retained for one of them. That RANDALL did not describe the structure of those parts in his two species,

* *Grapsus thukuhar*, Owen; *Goniograpsus thukuhar*, Dana; *Metopograpsus thukuhar*, Milne-Edwards, *Mélanges Carcinologiques*, p. 131.

is no reason for rejecting it,—this was not necessary in the definition of the group. As well might we reject the name *Grapsus* itself, because we cannot determine from LAMARCK'S descriptions many characters now considered important. RANDALL'S first-mentioned species, *P. crassipes*, which we may consider as typical, is closely allied to the Mediterranean *Grapsus varius*; having the internal suborbital lobe widely separated from the front, admitting the external antennæ within the orbit. It therefore belongs to M. EDWARDS'S division *Leptograpsus*. *P. parallelus* will come under *Metopograpsus*, which genus seems to be the nearest ally of *Leptograpsus*, although M. EDWARDS places *Grapsus* between them. In fact, *M. thukuhar* might well be considered an intermediate species, for the suborbital lobe is here not quite joined to the front, although approximating closely to it.

PSEUDOGRAPSUS OREGONENSIS. Dana.

Pseudograpsus Oregonensis, DANA; *U. S. Exploring Expedition, Crust.* i. 334, Pl. XX. f. 6. MILNE-EDWARDS; *Mélanges Carcinologiques*, 157. STIMPSON; *Proc. Cal. Acad. Nat. Sci.* i. 88.

The *Pseudograpsi* are easily distinguished from the other *Grapsi* of this coast by the approximation of the inner margins of the outer maxillipeds, which, in the other forms, are widely separated by a rhomboidal space. The present species differs from the next in the hairiness of its feet. It is bluish-gray above, clouded anteriorly with patches of dark red dots; the feet, with the exception of the light-colored anterior pair, are sparsely dotted with red. The carapax is usually about an inch in length. The lanose spot on the hand is found in the male only.

This species occurs very abundantly on the muddy shores of sheltered bays, generally among pebbles and under stones about half-tide mark. It was found in Puget Sound, (Suckley;) Tomales Bay, (Samuels;) and in San Francisco Bay, (Ayres.)

Mus. Expl. Exped.; Bost. Soc.; Phil. Acad.; Smithsonian; Acad. Petrop.; Paris.

PSEUDOGRAPSUS NUDUS. Dana.

Pseudograpsus nudus, DANA; *U. S. Exploring Expedition, Crust.* i. 335, Pl. XX. f. 7. MILNE-EDWARDS; *Mélanges Carcinologiques*, 158. STIMPSON; *Proc. Cal. Acad. Nat. Sci.* i. 88.

This beautiful species may be at once recognized by the glossy smoothness of its feet. The posterior pair of feet are very short. It is of a dark purplish-red color above; the carpus and hand much lighter, and spotted. It grows to a large size;—the carapax of one specimen from Monterey measuring two inches in length, by two and two fifths in breadth. It has some resemblance to *Pachygrapsus crassipes*, which is found with it, but may be distinguished by the character of the maxillipeds and the nearly smooth tarsi. It is found among rocks at the mouths of bays, or on the open sea-coast, where the water is clear. Like the preceding it is a littoral species, and is often found near high-water mark. It was found in Puget Sound, (Expl. Exped.;) Tomales Bay, (Samuels;) San Francisco Bay, (Stimpson;) and at Monterey, (Trowbridge and Taylor.)

Mus. Bost. Soc.; Smithsonian; Acad. Petrop.

Heterograpsus marmoratus, M. EDW. (*Cyclograpsus marmoratus*, WHITE,) is perhaps identical with *P. nudus*. If so, DANA'S name has priority, as no description accompanies WHITE'S name in the British Museum catalogue. It is said to be found at Sitka.

GECARCINUS QUADRATUS. De Saussure.

Gecarcinus quadratus, DE SAUSSURE; *Rev. et Mag. de Zool.* v. 360, Pl. XII. f. 2.

Mazatlan, (Verreaux.)

Mus. Phil. Acad.

PINNIXA FABÆ. Stimpson.

Pinnothera faba, DANA; *U. S. Exploring Expedition, Crust.* i. 381, Pl. XXIV. f. 4.

The large palpi of the external maxillipeds in this species indicate its affinity with the *Pinnixæ*. The male resembles *P. cylindrica*, (*Pinnotheres cylindricum*, SAY,) and is much smaller than the female, while the carapax is shorter and broader; its length bearing to its breadth the proportion, 1:1.8. The hands are very large, and of nearly the same shape as in the female, the finger being, however, considerably more curved.

♂	Length of carapax,	0.36	inch;	breadth,	0.65.
♀	“	“	0.69	“	“ 1.05.

Found in the large *Lutraria* of the Oregon coast. Puget Sound, (Expl. Exped. ;) Shoalwater Bay, (Cooper.)

Mus. Smithsonian; Expl. Exped.

FABIA SUBQUADRATA. Dana.

Fabia subquadrata, DANA; *U. S. Exploring Expedition, Crust.* i. 382, Pl. XXIV. f. 5.

Distinguished from the preceding by its greater proportional length.

Puget Sound, (Expl. Exped. ;) Farallone Is. (Trowbridge.)

Mus. Expl. Exped. ; Smithsonian ; Phil. Acad.

TRIBE OXYSTOMATA.

CALAPPA CONVEXA. De Saussure.

Calappa convexa, DE SAUSSURE; *Rev. et Mag. de Zool.* v. 362, Pl. XIII. f. 3.

Mazatlan, (Verreaux.)

LEUCOSILIA JURINII. Bell.

Guaia Jurinii, DE SAUSSURE; *Rev. et Mag. de Zool.* 1853, v. 365, Pl. XIII. f. 4.
Leucosilia Jurinii, BELL; *Trans. Linn. Soc.* xxi. 295, Pl. XXXII. f. 1.

Mazatlan, (Verreaux.)

Mus. Brit.

RANDALLIA. nov. gen.

Carapax ovalis, subglobosus, ferè lævis, politus, dentibus duobus posticè armatus. Regiones pterygostomiani angulati. Frons angustata sed crassa, in medio concava. Orbita trifissa. Fossæ antennariæ parvæ, obliquæ, altissimæ. Antennarum internarum articulus basalis operculiformis, fossam claudens et partem super-mobilem retractam antennæ celans. Epistoma ex comparatione ampla. Maxillipedes et pedes ut in *Persephonâ*.

The species upon which this genus is founded was placed in *Ilia* by RANDALL, and in *Guaia* (*Persephona*) by GIBBES. Its characters will, however, exclude it from both of these genera, although it approaches closely to the latter in its general appearance. The following are its distinctive features. The carapax is not depressed, and is armed with but two teeth posteriorly; the surface is mostly smooth and ungranulated. Anterior extremity thick. Antennary fossæ small, oblique, and very deep. Basal article of internal antennæ somewhat expanded, operculiform, almost completely closing the aperture of the fossa when the antenna is retracted within it. The fossæ do not immediately border on the buccal margin as in *Persephona*, but are separated from it by a considerable space, so that the epistoma presents a greater surface than is usual in the family.

RANDALLIA ORNATA. Stimpson.

Plate XIX. f. 3.

Ilia ornata, RANDALL; *Jour. Acad. Nat. Sci. Philad.* viii. 129.

Guaia ornata, GIBBES; *Proc. Am. Assoc.* 1850, p. 186.

Randallia ornata, STIMPSON; *Proc. Bost. Soc. Nat. Hist.* vi. 85.

In this species there are generally a few granules on the stomachal region anteriorly, and on the intestinal poste-

XX

riorly. There may be either several small granules or one large one only, on the margin between the posterior teeth.

Upper California, (Nuttall.)

Mus. Phil. Acad.; Smithsonian.

DECAPODA ANOMOURA.

TRIBE LITHODEA.

CRYPTOLITHODES TYPICUS. Brandt.

Plate XX.

Cryptolithodes typicus, BRANDT; *Bulletin physico-mathém. de l'Académie de St. Petersb.* 1849, vii. 175.

AS BRANDT'S description of this remarkable crab is unaccompanied by a figure, and very short,—the general characters of the clypeus, rostrum, and antennary appendix only being given,—I take the present opportunity of presenting figures, and a detailed description, drawn up from a specimen (a female) sent in a dried state to the Smithsonian Institution by Mr. Taylor of Monterey. As the dismemberment of this most rare and unique example would be by no means desirable, the details of the inner maxillipeds, and of some other less conspicuous appendages, cannot be here given.

The most striking characteristic in this species is the great development of the carapax, which forms a broad, thin shield, of very uneven surface, completely hiding the legs, antennæ, abdomen, and all the inferior parts of the body. These parts, therefore, which form a great portion of the bulk in most crabs, seem here, when viewed from below, to be placed in the bottom of a cup-like cavity. This arrangement would lead one to refer the species to the *Cryptopodiaceæ*, to which family however it has no resemblance in its other characters; the structure of the antennæ, the position of the eyes, and the concealment of the posterior pair of feet at once distinguishing it.

The superior surface of the carapax is raised into a high ridge along the median line, deeply sinuated between the stomachal and cardiac regions, the former of which is a little shorter and less prominent than the latter. The branchial regions are rather small, and much less prominent than the cardiac. The intestinal is continuous with the cardiac posteriorly. The wings or lateral portions of the shield are broadly expanded, subtriangular; their extremities covering the terminal joints of the third pair of feet extended. The surface is rugose at the prominent parts, but generally smoothish and ungranulated, although discolored and having a somewhat eroded appearance. The rostrum is lamelliform, rectangular, pointing downwards at an angle of about 60° with the horizontal axis;—its truncate extremity is still more deflected and slightly emarginate at the middle.

The arrangement of the eyes, antennæ, and other parts in the vicinity of the mouth, is generally similar to what we see in *Echidnocerus* and other genera of the family. The ocular peduncles are closely approximated at their base, and are rather long, allowing the eyes at their tips to be seen from above in the angle between the base of the rostrum and the anterior margin of the carapax, which constitutes the only vestige of an orbit. The internal antennæ are slender, inserted behind the base of the ocular peduncles, and much within the margin of the carapax; they are directed forward between the eyes, and terminate in a slender, hairy, multiarticulate flagellum, longer than the penultimate article, and not reaching the extremity of the rostrum. The external antennæ occupy the hiatus between the anterior margin of the almost vertical pterygostomial plates, and the exterior bases of the internal antennæ. Their second article is broadly expanded, and bears a lamelliform appendix which equals it in size, projecting much beyond it exteriorly, and reaching the margin of the carapax; both are of large size, and bear short, blunt hairs on their lower

or exposed surface, their upper sides being pressed against the carapax. The terminal flagellum is very long and slender, compressed, of nearly the same width throughout, and consists of about twenty-two articles, each bearing two clavate setæ.

The external maxillipeds are rather broad, and have their outer surfaces flattened, with sharp, projecting, lamellar edges. They resemble those of the *Brachyoura* much more closely than do those of other members of the tribe. The last two articles are, however, well developed. The basal article is of great width, expanded exteriorly, and bearing at its antero-internal angle the second, small, with bilobate inner margin; the third is elongated, and presents a triangular face. The surfaces of all these points are covered with the short, clavate hairs so peculiar in this species.

The feet of the first or anterior pair are very unequal in size, the right hand being much the larger. Their second and third joints bear a sharp longitudinal crest inferiorly, against which the margin of the hand rests when retracted; the second joint also bears a sharp compressed tooth above, near its articulation with the third, which also bears a still larger and more prominent tooth almost continuous with that on the second. The larger hand is broad, convex, with about six tuberculous ridges on the outer surface, and a strong projection above at the articulation of the short, stout finger, which is also ridged, and bears a crest above. The surface of contact between the thumb and finger is broad, with its margin scarcely dentate. The feet of the second, third, and fourth pairs, about equal in size, are strongly compressed, almost lamelliform, and sharply crested above for most of their length. Those of the fifth pair are concealed beneath the carapax, (or rather beneath the abdomen,) and are nearly the same in size and structure as in the other genera of the tribe. We may remark, however, that the three articles forming the terminal portion of these feet are of greater length and more slender than is usual;—

when drawn out they reach the fourth joint of the preceding pair.

The abdomen is flattened, and without spines or tubercles. In the female it is symmetrical externally, although provided with ovigerous legs on the left side only. The basal (second) article is undivided, arched, broad and concave. The three following each consist of a convex, quadrilateral, tergal piece, transversely ridged across the middle, and the lateral or epimeral pieces, which are placed obliquely, and are wider than long, with their margins raised, and their surface depressed. The sixth article is unprovided with epimeral pieces; it is longer than the preceding ones, of a trapezoidal shape, its sides joining the posterior edges of the epimera of the article next preceding; its broader terminal side is deeply sinuated for the reception of the seventh article. This latter is very small, triangular, and fits between the basal joints of the anterior pair of feet when the abdomen is in place.

The color was reddish beneath; above indistinct. The dimensions of the specimen above described are: length, 1.16; breadth, 1.85 inch. Proportion, 1:1.60. The dimensions of Brandt's specimen were: length, 1.33; breadth, 1.91 inch. Proportion, 1:1.43.

The Smithsonian specimen was found by Mr. Taylor on surf-washed rocks near low-water mark, on the beach of Monterey. It is desirable that other specimens should be secured and well preserved in spirits, in order that the anatomy, and particularly the arrangement of the branchiæ, and the structure of the lateral apodemes can be observed. It is obvious that this genus most strongly represents the *Brachyoura* in the section to which it belongs. The carapax, usually of moderate or small size in the *Anomoura*, is here developed to a degree unequalled in any of the higher Decapods, not excepting even *Cryptopodia* and *Æthra*. It is indeed the only instance in which the cephalo-thorax entirely conceals the feet; in all other genera the anterior pair at least being seen from above.

The specimen described by Brandt was taken by Wosnessenski on the coast of Upper California, and is in the Museum of the Academy of St. Petersburg.

CRYPTOLITHODES SITCHENSIS. Brandt.

Cryptolithodes Sitchensis, BRANDT; *Mélanges Biologiques*, i. 654.

Differs from the preceding in its smooth hands, and tridentate frontal margin of the rostrum.

Hab. Sitka.

PHYLLOLITHODES PAPILLOSUS. Brandt.

Phyllolithodes papillosus, BRANDT; *Bulletin phys.-mathém. de l'Académie de St. Pétersbourg*, 1849, vii. 175.

Petalocerus Bellianus, WHITE; *Proc. Zool. Soc.* 1856, 134.

I have with some doubt referred the curious *Lithodes* recently described by Mr. WHITE, to the *Phyllolithodes papillosus* of BRANDT. The descriptions, as far as they go, are in no respect inconsistent; but unfortunately for comparative investigation, the authors have for the most part described different parts of the crab. WHITE's figure is not yet published.

This species I have not met with.

Hab. Is. of Kadjak, (Wosnessenski;) Coast of California, (Lobb.)

Mus. of Prof. Bell; Acad. Petrop.

RHINOLITHODES WOSNESSENSKII. Brandt.

Rhinolithodes Wosnessenskii, BRANDT; *Bulletin phys.-mathém. de l'Académie de St. Pétersbourg*, 1849, vii. 174.

This may perhaps be the young of some other species.

Hab. Sitka, Kadjak, (Wosnessenski.)

Mus. Acad. Petrop.

ECHIDNOCERUS CIBARIUS. White.

Echidnocerus cibarius, WHITE; *Proc. Zool. Soc.* 1848, 47. Annulosa, Pl. II.

III. *Brit. Mus. Cat. Crust.* 56.

Lopholithodes Mandtii, BRANDT; *Bulletin phys.-mathém. de l'Académie de St. Pétersbourg*, 1849, vii. 174.

The dimensions of the carapax in a specimen from Sitka are: length, 6.90; breadth, 8.35 inch.

The members of this remarkable genus are among the largest crabs known. They do not indeed cover so much space as do many of the *Maiaceæ* with their legs extended; but their carapax is nearly as large, and their weight greater than even in the *Macrocheira* of Japan. Specimens have been taken the weight of which exceeded seven pounds; the diameter of the carapax being over ten inches.

The species *E. cibarius* was found at the mouth of the Columbia by Sir George Simpson; and at Sitka by Wosnessenski, Trowbridge, and the North Pacific Expedition.

Mus. Brit.; *Acad. Petrop.*; *Smithsonian*.

ECHIDNOCERUS SETIMANUS. Stimpson.

Ctenorhinus setimanus, GIBBONS; *Proc. Cal. Acad. Nat. Sci.* i. 48, (1855.)

Echidnocerus setimanus, STIMPSON; *Proc. Cal. Acad. Nat. Sci.* i. 88.

This species most closely resembles the preceding, and will perhaps prove the same when direct comparisons of specimens of the same age and sex can be instituted. I have before me a considerable number of specimens both of the Sitka and the California species, but those from the former locality are all males, and those from the latter, as it unfortunately happens, are all females. There are, however, some differences which may prove constant. In the Californian (female) specimens, the spines of the carapax, rostrum, feet, etc., are everywhere blunt, being rather tubercles than spines; the carapax is proportionally broader, and the greatest transverse diameter is at the large postero-lateral

tubercles, instead of at the first pair of antero-lateral teeth, (S of Dana.) In these females the characters of the abdomen usual in female *Lithodinæ* are prominently shown, the terminal apex being turned considerably to the right of the median line of the body; there are no marginal plates on the left side, where the greater mass of the ova are placed, the ovigerous feet being wanting on the right side with the exception of that of the first pair.

The dimensions of three specimens are as follows:—

Loc.		Length of Carapax.	Width.	Proportion.
San Francisco,	♀	4.72 inch.	5.31 inch.	1:1.13 inch.
“ “	♀	5.58	6.30	1:1.13
? (Gibbons)	?	10.00	10.25	1:1.03

All the specimens yet found were taken off the mouth of San Francisco Bay, and near the Farallone Rocks. They have been brought to the market of the city by fishermen, who are encouraged to preserve them when caught, by the high prices (from five to ten dollars) at which they are easily sold.

Mus. Cal. Acad.; North Pacific Expedition.

LITHODES SPINOSISSIMUS. Brandt.

Lithodes spinosissimus, BRANDT; *Bulletin phys.-mathém. de l'Académie de St. Pétersbourg*, 1849, vii. 173.

The members of the tribe *Lithodea* may easily be distinguished by the apparent want of the fifth pair of feet, which are very small, and always folded up over the back and concealed beneath the carapax. The present species may be recognized by the very numerous long sharp spines with which it is everywhere covered above.

Hab. Kadjak, (Wosnessenski.)

Mus. Acad. Petrop.

LITHODES BREVIPES. Edwards et Lucas.

Lithodes brevipes, EDWARDS et LUCAS; *Archives du Museum*, ii. 463. Pl. XXIV-XXVII. BRANDT; *Bulletin phys.-mathém. de l'Acad. de St. Pétersb.* vii. 173. *Sibirische Reise, Zoölogie*, i. 99.

In this species the feet are shorter than is usual in the genus, and there are few spines on the body, all of moderate length.

Hab. Unalashka, (Wosnessenski.)

Mus. Paris; Acad. Petrop.

LITHODES CAMTSCHATICUS. Latreille.

Lithodes Camtschaticus, LATREILLE; in *Cuvier's Regne Animal*, 2d ed. iv. 65. MILNE-EDWARDS; *Hist. Nat. des Crust.*, ii. 187. BRANDT; *Sibirische Reise, Zoölogie*, i. 94.

Hab. Atcha, Unalashka, (Wosnessenski.)

Mus. Acad. Petrop.

TRIBE HAPALOGASTRINEA.

This remarkable tribe, although resembling much the *Porcellanidea* in general appearance, appears to be correctly placed between the *Lithodea* and the *Paguridea*. The distinguishing character consists in the structure of the abdomen, which, although broad and reflexed below the abdomen, is soft as in the hermit crabs; the basal and terminal articles only being provided with a hard coating. De Haan's *Lomis dentata* seems to belong to this tribe. The true *Lomis*, as described by Milne-Edwards, has a hard and crustaceous abdomen, as in *Lithodes* and *Porcellana*.

This tribe was first defined by BRANDT, the distinguished zoölogist of St. Petersburg. He describes two species, both from the northwest coast of America. The most common crab found on the shores of Jesso, one of the Japanese

480 Stimpson on the *Crustacea and Echinodermata*

islands, belongs to this division. They live under flat stones, from half-tide to low-water mark, and represent the *Porcellanæ* of warmer latitudes.

DERMATURUS MANDTII. Brandt.

Dermaturus Mandtii, BRANDT; *Mélanges Biologiques*, i. 57.

Hab. Island of St. Paul.

Mus. Acad. Petrop.

HAPALOGASTER MERTENSII. Brandt.

Hapalogaster Mertensii, BRANDT; *Mélanges Biologiques*, i. 58.

Hab. Sitka, (Wosnessenski.)

Mus. Acad. Petrop.

TRIBE PORCELLANIDEA.

PORCELLANA EDWARDSII. De Saussure.

Porcellana Edwardsii. DE SAUSSURE; *Rev. et Mag. de Zool.* v. 366. Pl. XI. f. 3.

Carapax strigose; surface of hands scabrous; anterior margin of carpus in the first pair of feet, and of the third article in the remaining pairs, strongly toothed.

Hab. Mazatlan, (Verreaux.)

Mus. Paris.

PORCELLANA RUPICOLA. Stimpson.

XX
Plate XIX. f. 2.

Porcellana rupicola, STIMPSON; *Proc. Bost. Soc. Nat. Hist.* vi. 85.

Carapax moderately depressed; front triangular, considerably deflected, with a blunt extremity, and a notch or groove at the base separating it from the orbit. Surface of the feet and anterior half of the carapax scarcely rugose, with granules but slightly prominent. The portion of the

upper surface between the eyes is depressed, with a shallow median groove. Ocular peduncles broad; eyes small. Superior margin of orbit somewhat concave. External antennæ one and a half times as long as the carapax; flagella with few setæ, some of which are twice as long as the width of the flagellum. Anterior feet very large and broad; margins smooth; carpus scabrous on its infero-exterior surface, and conspicuously granulated above, along the slightly elevated ridge forming its outer margin, which terminates anteriorly in a tooth. The surface of the carpus near its somewhat projecting, rounded, postero-interior angle, is also granulated. Pincers smooth, with somewhat hooked extremities. Second, third, and fourth pairs of feet of moderate size; fourth joint with a slight ridge along the middle of the upper surface; fifth joint and tarsus provided with tufts of hair, which are most conspicuous in the fourth pair of feet, in which pair the fourth joint also has sometimes one or two small tufts near its extremity.

Color, dark purplish-red. Length of carapax in a male specimen, 0.85; breadth, 0.80; length of hand, 1.47; breadth, 0.64 inch.

Its affinities are with *P. valida*, *violacea*, and *granulosa*. It is easily distinguished from the preceding species by the smooth anterior margin of its carpus.

It is very common among the rocks of the Californian coast, preferring an open shore, with clear water. It is littoral in its habits, and is usually found at about half-tide mark. It was taken at the Farallones and at San Luis Obispo by Lieut. Trowbridge; at Monterey by Mr. Taylor.

Mus. Bost. Soc.; Phil. Acad.; Smithsonian,

TRIBE PAGURIDEA.

EUPAGURUS MIDDENDORFFII. Brandt.

Pagurus (Eupagurus) Middendorffii, BRANDT; *Sibirische Reise, Zoologie*, i. 108.
Pl. V. f. 1.

Hab. Sitka, (Wosnessenski.)

Mus. Acad. Petrop.

EUPAGURUS SAMUELIS. Stimpson.

Eupagurus Samuelis, STIMPSON; *Proc. Bost. Soc. Nat. Hist.* vi. 86.

Front acute at the middle. Outer antennæ articulated at the extreme antero-exterior corners of the carapax; extremity of terminal article of peduncle reaching much beyond the eyes; flagellum reaching the extremity of the larger hand. Anterior feet very unequal in size, the right being much the longer and stouter; carpus and hand granulated; larger hand nearly twice as long as broad; finger less than half as long as the hand, with a slight crest not conspicuously denticulated. Left hand narrower than its carpus, which has a slightly prominent double crest. Feet of the second and third pairs very slender, somewhat hairy; the right foot of the second pair longer than that of the first pair. Color yellowish. Length three fourths of an inch.

This is a very small species, found in shells of the genera *Nassa*, *Littorina*, etc. It most resembles *E. tenuimanus*, from which, however, it may be distinguished by its more oblong, non-cristate hand. From *E. Middendorffii* it differs in the more prominent granulation of its anterior feet, and the more numerous and smaller teeth on the inner margin of the thumb and finger.

It was taken in Tomales Bay, near low-water mark, by Mr. Samuels, to whom I have dedicated the species, as a memorial of his labors in this department of science. It is in the Museum of the Smithsonian Institution.

EUPAGURUS BERNHARDUS. Brandt.

Pagurus Bernhardus, FABR.; *Entom. Syst.* ii. 469.

Pagurus streblonyx, LEACH; *Mal. Pod. Brit.*, Pl. XXVI. f. 1.

Pagurus (Eupagurus) Bernhardus, BRANDT; *Sibirische Reise, Zoölogie*, i. 106.

Bernhardus streblonyx, DANA; *Proc. Acad. Nat. Sci., Philad.* 1852, vi. 6.

This is an Arctic species, found on both shores of the continent.

Hab. Unalashka, (Wosnessenski.)

Mus. Acad. Petrop.

Brandt's name *Eupagurus* has priority over *Bernhardus* of Dana by a few weeks only; the former appearing in a work the printing of which was finished (as appears from the reverse of title-page) Sept. 30, 1851; while Dana's name was presented at the Philadelphia Academy's meeting of the same date, and could not therefore have been printed until October.

EUPAGURUS MERTENSII. Brandt.

Pagurus (Eupagurus) Mertensii, BRANDT; *Sibirische Reise, Zoöl.* i. 112.

Differs from *E. Bernhardus* in its longer and more slender chelæ.

Hab. Kadjak, Nootka Sound, and coast of Upper California, (Wosnessenski.)

Mus. Acad. Petrop.

EUPAGURUS TENUIMANUS. Stimpson.

Bernhardus tenuimanus, DANA; *U. S. Exploring Expedition, Crust.* i. 447.
Pl. XXVII. f. 7.

The hands in this species are very unequal; the larger one is short and broad, but thin, and granulose. Carapax and feet all without pubescence.

Hab. Puget Sound, (Expl. Exped.)

Mus. Expl. Exped.

EUPAGURUS ARMATUS. Stimpson.

Bernhardus armatus, DANA; *U. S. Exploring Expedition, Crust.*, i. 442.
Pl. XXVII. f. 2.

Distinguished by its spinulose feet, which, together with the carapax, are apparently destitute of hair.

Hab. Puget Sound, (Expl. Exped.)

Mus. Expl. Exped.

EUPAGURUS HIRSUTIUSCULUS. Stimpson.

Bernhardus hirsutiusculus, DANA, *U. S. Exploring Expedition, Crust.*, i. 443.
Pl. XXVII. f. 3.

Differs from *E. Mertensii* in its proportionably longer tarsi. Body everywhere hairy.

Hab. Dungeness, Puget Sound, (Expl. Exped.)

Mus. Expl. Expedition.

CLIBANARIUS TURGIDUS. Stimpson.

Plate XXI. f. 1.

Eupagurus turgidus, STIMPSON; *Proc. Bost. Soc. Nat. Hist.* vi. 86.

Carapax rough, hairy, scabrous at the sides. Front broad, with an acute point at the middle, and one on either side, between the bases of the outer antenna and the peduncle of the eye. Antennæ very hairy; inner ones three fourths as long as the outer ones, which are shorter than the carapax. Eyes at the extremities of rather long, slender peduncles, reaching the extremity of the terminal joint of the peduncle of the outer antennæ. Chelopoda equal, rather short, covered above with short spines and tufts of long hair; hands short and very thick, strongly tumid below; finger about half as long as the hand; both finger and thumb with a few calcareous teeth near the base on the surface of contact, and a sharp, corneous, minutely denticulated

cutting edge near the extremity. Feet of the second and third pairs nearly equal; those on the right side sometimes slightly the longer; all spinulose and very hairy throughout their length. Tarsi much longer than the penult joint. Color yellowish, obscured by the hirsute covering; eye peduncles and internal antennæ with a longitudinal streak of crimson. Length about three inches.

It differs from *C. æquabilis* in its longer tarsi, greater size, and less variegated coloration. It may be distinguished from the other Oregon Paguri by its equal hands and hairy tarsi.

Found in large shells of the genera *Buccinum*, *Tritonium*, etc., in Puget Sound. The specimens described were collected by Dr. Suckley.

Mus. Smithsonian.

CLIBANARIUS ÆQUABILIS. Dana.

Clibanarius æquabilis, DANA; *U. S. Exploring Expedition, Crust.*, i. 464. Pl. XXIX. f. 4.

C. æqualis, DANA; *Proc. Acad. Nat. Sci. Philad.* 1854, vii. 175.

Hab. California, (Dr. Le Conte.)

Mus. of Prof. Dana.

TRIBE HIPPIDEA.

ALBUNEA LUCASII. De Saussure.

Albuminea Lucasia, DE SAUSSURE; *Rev. et Mag. de Zool.* v. 367. Pl. XII. f. 4.

This species, according to M. DE SAUSSURE, differs from *A. symnista* in having the anterior margin of the carapax less sinuous, and in its long, styliform ocular peduncles, which are closely approximated at the base, leaving the angle between them very acute and narrow.

Hab. Mazatlan, (Verreaux.)

Mus. Phil. Acad.

BLEPHAROPODA OCCIDENTALIS. Randall.

Blepharipoda occidentalis, RANDALL; *Jour. Acad. Nat. Sci. Philad.* viii. 131.

Pl. VI. GIBBES; *Proc. Am. Assoc.* 1850, p. 187.

Albunhippa occidentalis, DANA; *U. S. Exploring Expedition, Crust.* i. 404.

Blepharopoda is a well-marked genus first instituted by RANDALL in 1839; and subsequently named *Albunhippa* by MILNE-EDWARDS in the *Archives du Muséum d'Histoire Naturelle*, Vol. II. (1841.) The name *Blepharopus* occurs in Entomology; but this is scarce near enough to RANDALL'S term to warrant its rejection.

Hab. San Diego, (Nuttall.)

Mus. Phil. Acad.

HIPPA ANALOGA. Stimpson.

Hippa emerita, DE SAUSSURE; *Rev. et Mag. de Zool.* v. 367.

Hippa talpoidea, DANA; *Proc. Acad. Nat. Sci. Philad.* 1854, vii. 175.

Hippa analoga, STIMPSON; *Proc. Bost. Soc. Nat. Hist.* vi. 85.

In an examination of a great number of specimens of the common Californian *Hippa*, and a careful comparison of them with specimens from all parts of the eastern coast of the United States, I find differences which are so constant, that it is not difficult to determine at a glance, with regard to any specimen, whether it be from the eastern or western side of our continent. This being the case, I have been led to propose a new name for the western species.

It differs from *H. talpoidea* in the following characters. It is much broader,—the breadth of the carapax being to its length as 1 to 1.29; against 1:1.43 in *H. talpoidea*. It is more depressed, and the back is much less arched and convex, along the middle. In *H. talpoidea* the posterior margin of the carapax is concave on each side, and its postero-inferior corner forms a lobe-like projection; while in our species the margin is straight and forms no projection. In *H. talpoidea* the upper surface is rugose only toward the extremities,

chiefly the anterior one, while it is smooth in the middle;— in our species it is generally everywhere rugose, except at the postero-inferior wings, and much more so anteriorly than in the other species. In female individuals of equal length, the terminal segment of the abdomen is one sixth longer in *H. talpoidea* than in *H. analoga*. Finally there are slight differences in the details of the feet and antennæ, not as well marked, however, nor as constant as those of the carapax. One of the most prominent of these is in the spines of the acicle or appendicular scale of the outer antennæ, which in our species are somewhat longer, more slender, and more curved, than in the eastern one.

Compared with *H. emerita*, the teeth of the frontal margin of the carapax are found to be much less acute than in that species; the spines of the acicle are not as long, and are curved inward instead of outward.

It is of a bluish or cinereous color above, and yellowish-white below; the fringing hairs are mostly black. The dimensions of a female specimen from Tomales Bay are as follows: length of carapax, 1.19; breadth, 0.91.

It inhabits sandy beaches on the open coast.

Hab. Tomales Bay, (Samuels;) near San Francisco, (Trowbridge;) Monterey, (Taylor;) and Mazatlan, (Verreaux.)

Mus. Bost. Soc.; Phil. Acad.; Smithsonian; Paris; Acad. Petrop.

TRIBE GALATHEIDEA.

GRIMOTEA GREGARIA. Leach.

Galathea gregaria, FABR.

Grimotea gregaria, LEACH; *Dict. des Sci. Nat.* xviii. 50. OWEN; *Zoöl. of Beechey's Voy.* p. 87. See figure in DANA'S Report on the Crustacea of the Exploring Expedition, Atlas, Pl. XXXI. f. 1.

A pelagic species, found swimming at the surface off the coast of California by the naturalists of the "Blossom."

Mus. Zoöl. Soc. of London.

DECAPODA MACROURA.

TRIBE THALASSINIDEA.

GEBIA PUGETTENSIS, Dana.

Plate XXI. f. 2.

Gebia Pugettensis, DANA; *U. S. Exploring Expedition, Crust.* i. 510, Pl. XXXII.
f. 1.

Gebia Californica, STIMPSON; *Proc. Cal. Acad. Nat. Sci.* i. 88.

The *Gebia* may be distinguished from the other fossorial *Macroura* of this coast, by its rough, hairy rostrum, and equal anterior feet.

The thumb in this species (see the figure) is considerably curved, and bears on its inner side a strong tooth. This tooth is a prominent character in all the very numerous specimens in the Smithsonian Museum, but is obsolete in the specimen described by DANA, although actual comparison shows them to be the same. The species attains a large size, the dimensions of an Oregon specimen being as follows:—

Length of the animal	.	.	.	.	.	.	.	4.00 inches
"	"	carapax	.	.	.	.	.	1.38 "
"	"	hand	.	.	.	.	.	1.00 "
Width	"	carapax	.	.	.	.	.	.80 "
"	"	abdomen	.	.	.	.	.	1.05 "
"	"	hand	.	.	.	.	.	.46 "

A curious parasitic bivalve, apparently new, both in genus and species, is frequently found adhering by its byssus to the inner surface of the abdomen of this crustacean. It approximates in character to the genus *Lepton*.

Gebia Pugettensis is found on the whole coast from Puget Sound to Monterey. It excavates its subterranean chambers in the sand and mud of beaches, near low-water mark, preferring that which is more or less indurated.

Mus. Bost. Soc.; Phil. Acad.; Smithsonian; Expl. Exped.; Acad. Petrop.

CALLIANASSA GIGAS. Dana.

Plate XXI. f. 3.

Callianassa gigas, DANA; *U. S. Exploring Expedition, Crust.* i. 512.
Pl. XXXII. f. 3.

The *Callianassæ*, like the *Gebiæ*, lead a subterranean life, and by these are formed the numerous holes, half an inch or more in diameter, which may be observed on most sandy beaches. They may be distinguished by their thin, soft shell, and smooth, glossy carapace. One of the hands is invariably much larger than the other, and this may be either the right or left in the same species. In *C. gigas* the larger hand is remarkably short and stout. Length, often five inches.

Hab. Puget Sound, (Expl. Exped.)

Mus. Expl. Exped.

CALLIANASSA CALIFORNIENSIS. Dana.

Plate XXI. f. 4.

Callianassa Californiensis, DANA; *Proc. Acad. Nat. Sci. Philad.* 1854, vii.
p. 175.

Callianassa occidentalis, STIMPSON; *Proc. Cal. Acad. Nat. Sci.* i. 88.

Eye-peduncles subtriangular, closely approximated at their bases, but diverging and curving a little upward at their pointed tips. Length of the external antennæ two thirds that of the body. The larger of the anterior feet is smooth and glossy on the sides, and ciliate along the edges. Hand broadest at the base, but little longer than the carpus and much less in breadth. A considerable hiatus intervenes between the fingers when closed, and between their bases

arises a small but prominent blunt tooth, which curves upward. Movable finger half as long as the hand, with hooked extremity; inferior edge swelling out near the base, and minutely denticulated. Both fingers hirsute with scattered tufts of hair. Color of the body a delicate orange; anterior feet rose-colored. Length, three inches. The proportional dimensions as compared with the other species, will be given in the table under *C. longimana*. In this species, I have seen only one case in which the left hand is the larger.

Hab. San Francisco Bay, near its mouth, (Trask;) Fort Steilacoom, Puget Sound, (Suckley.)

Mus. Smithsonian; Cal. Acad.

CALLIANASSA LONGIMANA. Stimpson.

Plate XXI. f. 5.

Callianassa longimana, STIMPSON; *Proc. Bost. Soc. Nat. Hist.* vi. 86.

A slender species, closely allied to the preceding, from which it may be distinguished by the following characters: It is more slender and elongated, and grows to a larger size, being often four inches in length. The outer maxillipeds are less broad. The larger foot of the anterior pair, (see figure,) which is most frequently on the left side, is more slender and less hairy than in the preceding species, with the hand much longer and of equal breadth with the carpus. In our species the carpus is shorter than the *body* of the hand, while in *C. Californiensis* it is longer. In the smaller chelopod, the fingers are of equal length in our species, while in *C. Californiensis* the finger exceeds the thumb in length. With *C. gigas* our species would never be confounded on account of the great difference in the length of the hand. The three species resemble each other very much, however, in general appearance and characters other than those derived from the chelopoda. The following table will show their relative proportions:—

	<i>C. gigas.</i>	<i>C. Californiensis.</i>	<i>C. longimana.</i>
Length of the body from anterior extremity of carapax to end of caudal segment	1.	1.	1.
Length of carapax . . . . .	.24	.28	.24
Breadth of do. . . . .	.16	.21	.16
Breadth of abdomen at 3d segment	.20	.22	.19
Length of caudal segment . . . . .	.10	.13	.11
Length of larger chelopod . . . . .	.55	.81	.70
“ “ brachium . . . . .	.12	.18	.12
“ “ carpus . . . . .	.11	.24	.15
“ “ body of hand . . . . .	.12	.13	.16
“ “ finger . . . . .	.06	.14	.12

C. longimana was found in considerable numbers at Fort Steilacoom, Puget Sound, by Dr. Suckley.

Mus. Bost. Soc.; Phil. Acad.; Smithsonian.

TRIBE ASTACIDEA.

PANULIRUS INTERRUPTUS. Stimpson.

Palinurus interruptus, RANDALL; *Jour. Acad. Nat. Sci. Philad.* viii. 137.

GIBBES; *loc. cit.* p. 194.

Panulirus interruptus, STIMPSON; *Proc. Cal. Acad. Nat. Sci.* i. 88.

This is the common “lobster” of the San Francisco market; and is the *langouste* of the French. It inhabits rocky ledges in rather deep water, and is taken in considerable numbers by the fishermen at Santa Barbara and other ports on the coast south of San Francisco. North of this point it is never found. The traps, or “pots” used in their capture are similar to those in which lobsters are taken on the New England coast, consisting of a strong wooden basket, with a funnel-shaped entrance projecting inwards. The bait used, however, is generally meat of some kind rather than fish.

Mus. Phil. Acad.; Smithsonian.

A species of *Panulirus* in the British Museum is said to have been brought from Sitka,—a very high latitude for this genus, if the locality is correct. It is catalogued as *P. sulcatus*, which is an East Indian species.

ASTACUS GAMBELII. Agassiz.

Cambarus Gambelii, GIRARD; *Proc. Acad. Nat. Sci. Philad.* 1852, vi. 90.
Astacus Gambelii, AGASSIZ; *Proc. Acad. Nat. Sci. Philad.* 1853, vi. 375.

This species may be distinguished by the partly pilose upper surface of its chelæ, and the convex serrated margins of its rostrum, which has no distinct antero-lateral teeth or angles.

Hab. California, (Gambel.)

Mus. Phil. Acad.; Smithsonian.

ASTACUS NIGRESCENS. Stimpson.

Astacus nigrescens, STIMPSON; *Proc. Bost. Soc. Nat. Hist.* vi. 87.

Rostrum concave above; margins nearly parallel, denticulated with five or six small sharp spines on either side. Thoracic spines of the anterior pair rather long; a pair of minute spines between them and the posterior pair. Dorsal area between the branchial regions about as wide as in *A. Gambelii*. Hands smaller and less broad than in the preceding species; surface without pubescence. The sides of the abdominal segments (lateral projections of the dorsal arch) are sharply triangular. Color blackish. The following are the dimensions of a male specimen:—

Length of body	3.10 inches
“ carapax	1.60 “
Width of “ . . . . .	.83 “
Length of rostrum . . . . .	.40 “
“ terminal of spine of rostrum . . . . .	.15 “
“ hand	1.25 “
Width of “ . . . . .	.45 “

Hab. California. My specimens were purchased in the market of San Francisco.

Mus. Smithsonian.

ASTACUS LENIUSCULUS. Dana.

Astacus leniusculus, DANA; *U. S. Exploring Expedition, Crust.* i. 524.
Pl. XXXIII. f. 1.

May be recognized by its well-developed thoracic spines, and light color.

Hab. Columbia River, (Expl. Exped. ;) Puget Sound, (Expl. Exped., and Dr. Suckley.)

Mus. Expl. Exped.; Smithsonian.

ASTACUS TROWBRIDGII. Stimpson.

Astacus Trowbridgii, STIMPSON; *Proc. Bost. Soc. Nat. Hist.* vi. 87.

This large species has a general resemblance to *A. leniusculus*. It differs from that species in having much less prominent thoracic spines, the posterior pair of which is here but little developed, even in adult specimens. The rostrum is also somewhat shorter and broader than in the preceding species, with smooth, nearly parallel sides; terminal tooth of moderate length; antero-lateral teeth sufficiently prominent. Dorsal area broader than in *A. Gambelii*, but narrower than in *A. leniusculus*. Hands large, robust, equal in size; surface rough; fingers spinulose. A prominent sharp spine on the superior edge of the brachium near its extremity.

This species is of a reddish-olive color in preserved specimens, probably much darker in life. The color of the chelæ is much darker than that of the body. The dimensions of a male specimen are as follows:—

Length of body	. . . . .	4.80 inches
Breadth	"	1.30 "
Length of rostrum	. . . . .	.50 "
" terminal tooth of rostrum	. . . . .	.18 "
" hand	. . . . .	2.60 "
Breadth of "	. . . . .	1.15 "

This species was found abundantly near Astoria by Lieut. Trowbridge. It occurs sometimes in brackish water, as I am informed by Dr. Cooper.

Mus. Bost. Soc.; Smithsonian; Paris; Acad. Petrop.

ASTACUS KLAMATHENSIS. Stimpson.

Astacus Klamathensis, STIMPSON; *Proc. Bost. Soc. Nat. Hist.* vi. 87.

A small species with a smooth carapax; thorax somewhat contracted in front. Thoracic spines of the anterior pair very small; those of the posterior pair obsolete. Rostrum small; margins smooth, converging; antero-lateral teeth sufficiently distinct; terminal tooth short. Dorsal area broad. Anterior feet with rather small, smoothish hands; inferior edge of arm less strongly dentated than in the other species. Sides of the abdominal segments broadly rounded, scarcely at all angular at the middle. The minute lateral spines of the caudal segment are rather short and stout. Color, in preserved specimens, yellowish-white, clear and bright; hand slightly tinted with olive or bluish. The dimensions of a female specimen are as follows:—

Length of body	3.00 inches
“ carapax	1.38 “
“ rostrum . . . . .	.29 “
“ terminal tooth of rostrum . . . . .	.10 “
“ hand . . . . .	.90 “
Breadth of “ . . . . .	.40 “

It may be distinguished from the preceding species by its lighter color, shorter and somewhat tapering rostrum, less developed spines, and smaller hands. It was found in Klamath Lake by Dr. Newberry.

Mus. Smithsonian

ASTACUS OREGANUS. Randall.

Astacus Oregonus, RANDALL; *Jour. Acad. Nat. Sci. Philad.* viii. 138, Pl. VII.
ERICHSON; *Archiv für Naturgeschichte*, 1846, i. 375.
Cambarus Oregonus, GIRARD; *Proc. Acad. Nat. Sci. Philad.* 1852, vi. 87.

Dr. RANDALL's single specimen of this species was unfortunately lost by the artist employed in delineating it. No other example has since been found, although its locality has been since repeatedly searched. If the figure in the eighth volume of the Journal of the Philadelphia Academy is correct, this is a very remarkable species, differing from all others known, in possessing a median thoracic spine as well as in the length of the terminal rostral tooth; and above all in the singular lateral appendages of the abdominal segments.

Hab. Columbia River, (Nuttall.)

NEPHROPS OCCIDENTALIS. Randall.

Nephrops occidentalis, RANDALL; *Jour. Acad. Nat. Sci. Philad.* viii. 139.
GIBBES; *Proc. Am. Assoc.* 1850, p. 195.

This curious lobster-like crustacean may be recognized by the three rows of spines on the dorsal surface of the carapax. It is a marine species, and grows to a length of six inches. It was found on the "West Coast of America," by NUTTALL. The fine specimen in the cabinet of the Philadelphia Academy is the only one yet known.

TRIBE CARIDEA.

CRANGON FRANCISCORUM. Stimpson.

Plate XXII. f. 5.

Crangon Franciscorum, STIMPSON; *Proc. Cal. Acad. Nat. Sci.* 1856, i. 89.

This species is more slender and depressed than is usual in the genus. Rostrum small, subtriangular, rounded in front. Spines of the thorax nearly as in *C. vulgaris*. Hand

large, (see figure,) with an oblique palm, more nearly longitudinal than transverse, occupying nearly one third of the length of its inner side; thumb-like process long and spiniform. Sternal spine long, and followed by two or three sharp tubercles on the succeeding thoracic segments. A small sharp spine on each side of the abdomen at the supero-lateral angle of the antepenultimate segment. Caudal segment long, slender, and pointed, smoothly rounded above. Color light and dark yellowish-gray, mottled. Eyes salmon-colored in life. Length about three inches.

The peculiar character of the hand in this species will enable it to be readily distinguished from all others.

This is the common shrimp of the San Francisco market. It is found very abundantly in the sandy coves around the Bay, is perhaps the most valuable crustacean of this coast, for besides being used as food, it is the common, and almost the only bait with which fish of all kinds are taken.

Among other localities in which this species has been found, the following may be mentioned: Puget Sound, (Suckley;) Shoalwater Bay, (Cooper;) Tomales Bay, (Samuels;) and Monterey, (Taylor.)

Mus. Bost. Soc.; *Phil. Acad.*; *Smithsonian*; *Paris*; *Acad. Petrop.*

CRANGON NIGRICAUDA. Stimpson.

Plate XXII, f. 6.

Crangon vulgaris, OWEN, (non FABR.) *Zool. of Beechey's Voyage*, p. 87. DANA, *U. S. Exploring Expedition, Crust.* i. 536, ii. 561.

Crangon nigricauda, STIMPSON; *Proc. Cal. Acad. Nat. Sci.* i. 89.

This species resembles very closely the common shrimp of Europe and of the Northern United States. It differs, however, from that species in its broader carapax, its slightly smaller, and comparatively shorter hand, and more pointed caudal segment, which has also a shallow longitudinal furrow along the upper surface. The antepenultimate abdom-

inal segment exhibits a rather sharp ridge along the dorsal edge, which is not perceptible in *C. vulgaris*. These differences are indeed very slight, but they are nevertheless constant, and taken together with the remoteness of the geographical limits of the two forms, they seem to indicate with certainty a specific diversity.

The color of our species is a very dark gray, or blackish, becoming entirely black at the tail. Hands tinted with lilac. The hand (see figure) is very different from that of *C. Franciscorum*, but even without reference to this character, the black tail will enable any one readily to pick out specimens of this species from the heaps of the common kind which may be seen on every fish-stand in the market.

C. nigricauda is much less abundant in San Francisco Bay than the preceding species, and is found in deeper water. It occurs in Puget Sound, (Exploring Expedition;) at the mouth of the Columbia, (Trowbridge;) Tomales Bay, (Samuels;) and at Monterey, (Capt. Beechey.)

Mus. Bost. Soc.; Phil. Acad.; Smithsonian; Expl. Exped.; Paris; Acad. Petrop.; R. C. S.; Zoöl. Soc.

CRANGON MUNITUS. Dana.

Crangon munitus, DANA; *U. S. Exploring Expedition, Crust.* i. 536. Pl. XXXIII. f. 5.

Remarkable for the four strong spines with which its carapax is armed on the superior surface.

Hab. Puget Sound, (Expl. Exped.)

Mus. Expl. Exped.

PARACRANGON ECHINATUS. Dana.

Paracrangon echinatus, DANA; *U. S. Exploring Expedition, Crust.* i. 538. Pl. XXXIII. f. 6.

With the hands of a *Crangon* this species resembles

Hippolyte in its long elevated rostrum and inflexed abdomen. The carapax is everywhere spinous.

Hab. Puget Sound, (Expl. Exped.)

Mus. Expl. Exped.

ATYA SCABRA. Leach.

Atya scabra, LEACH; *Zoöl. Miscel.* v. iii. Pl. CXXXI. MILNE-EDWARDS; *Hist. Nat. des Crust.* ii. 348. Pl. XXIV. f. 15-19. NEWPORT; *An. and Mag. Nat. Hist.* 1847, xix. 159.

Atya Mexicana, WIEGMANN; *Archiv für Naturgeschichte*, 1836, i. 145.

The specimens in the Museum of the Smithsonian Institution from the fresh waters of Western Mexico agree in all their characters with the description given by WIEGMANN of his *A. Mexicana*, while they are exactly represented by the published figures of *A. scabra*. Under these circumstances, I have ventured to cite WIEGMANN'S name as a synonym. MILNE-EDWARDS considers *A. scabra* to be a marine form, but there is great doubt that any species of the genus is found in the sea.

Hab. Misantla, (Deppe;) Western Mexico, (Mus. Smithsonian.)

Mus. Phil. Acad.; Smithsonian; Paris; Berlin; Brit. Mus.

HIPPOLYTE AFFINIS. Owen.

Hippolyte affinis, OWEN; *Zoöl. of Beechey's Voyage*, 90, Pl. XXVII. f. 4.

Hab. Monterey, (Capt. Beechey.)

Mus. R. C. S.; Zoöl. Soc.

HIPPOLYTE LAMELLICORNIS. Dana.

Hippolyte lamellicornis, DANA; *U. S. Exploring Expedition, Crust.* i. 567. Pl. XXXVI. f. 6.

This species is very closely allied to *H. Ochotensis*, BRANDT, and to *H. affinis*, OWEN. From the latter it appears to differ in wanting teeth on the inferior side of the rostrum.

Hab. Straits of De Fuca, (Expl. Exped.)

Mus. Expl. Exped.

HIPPOLYTE LAYI. Owen.

Hippolyte Layi, OWEN; *Zoöl. of Beechey's Voyage*, 90, Pl. XXVII. f. 3.
BRANDT; *Sibirische Reise*, *Zoöl.* i. 117.

In this and the succeeding species the rostrum is much longer than in any other herein mentioned, often exceeding three fourths that of the thorax. Only two or three of the dorsal teeth belong to the thorax proper, and the posterior one of these is at about the anterior third of its length.

Hab. Monterey, (Capt. Beechey.)

Mus. R. C. S.; Zoöl. Soc.

HIPPOLYTE SITCHENSIS. Brandt.

Hippolyte Sitchensis, BRANDT; *Sibirische Reise*, *Zoöl.* i. 116, Pl. V. f. 18.

This differs from *H. Layi*, in having a smaller number of larger and more crowded teeth on the rostrum, but it is probably only a variety.

Hab. Sitka, (Brandt;) Monterey, (A. S. Taylor.)

Mus. Acad. Petrop.

HIPPOLYTE PALPATOR. Owen.

Hippolyte palpator, OWEN; *Zoöl. of Beechey's Voyage*, 89, Pl. XXVII. f. 3.
BRANDT; *Sibirische Reise*, *Zoöl.* i. 117. STIMPSON; *Proc. Cal. Acad. Nat. Sci.* i. 89.

This species may be determined by its rather slender form, small rostrum, and very long outer maxillipeds. The dorsal crest is six-toothed above, the posterior tooth being just in front of the middle of the thorax. The rostrum is very slender, about one fourth as long as the thorax, and tapers to a sharp, sometimes bifid, extremity.

Hab. Monterey, (Capt. Beechey.)

Mus. R. C. S.; Zoöl. Soc.

HIPPOLYTE BREVIROSTRIS. Dana.

Hippolyte brevirostris, DANA; *U. S. Exploring Expedition, Crust.* i. 566. Pl. XXXVI. f. 5. STIMPSON; *Proc. Cal. Acad. Nat. Sci.* i. 89.

Some individuals of this species approach so closely to *H. palpator*, that I am half inclined to consider it as a variety. Both are characterized by having greatly elongated outer maxillipeds, two subocular teeth on the margin of the carapax, and large thoracic dorsal teeth, the posterior one near the middle of the thorax. *H. brevirostris* is apparently a more robust species; the rostrum is generally shorter, and has fewer teeth; and the shield of the second abdominal segment is much larger than that of *H. palpator* as figured by OWEN. The slender flagellum of the internal antennæ is generally scarcely longer than the stout one. Posterior feet moderately spinulose. Basal joints of outer maxillipeds with serrated margins. Color, uniform light crimson or scarlet.

Hab. Straits of De Fuca, (Expl. Exped. ;) San Francisco Bay, (W. S.)

Mus. Expl. Exped. ; Phil. Acad. ; Smithsonian.

HIPPOLYTE TAYLORI. Stimpson, n. s.

In this species the rostrum is exceedingly short, consisting only of the small terminal tooth of the dorsal crest, and projecting scarcely beyond the anterior margin of the thorax. This dorsal crest is serrated with six teeth, including the terminal one. The posterior tooth is at the middle of the thorax; and the second and third (from the front) are rather above than behind the first, which is much the smallest. There is a single sharp spine beneath the eye, but hardly a vestige of another beneath this. The feet of the first pair are very stout; those of the second pair reach the tips of the maxillipeds. This species is more slender than the

preceding, and is further distinguished by the extreme shortness of the rostrum.

Found at Monterey, by Alexander S. Taylor, Esq., to whom this species is dedicated in recognition of his services in enriching our collections with new forms of Californian animals.

Mus. Smithsonian.

PANDALUS PUBESCENTULUS. Dana.

Pandalus pubescentulus, DANA; *U. S. Exploring Expedition, Crust.* i. 568.
Pl. XXXVI. f. 8.

Rostrum seven-toothed below, and, including the dorsal ridge, seventeen-toothed above; teeth small; apex of rostrum bifid. Surface minutely pubescent.

The *Pandali* may be distinguished from the *Hippolytes* by their non-chelate anterior feet.

P. pubescentulus is known only by the excellent figures and description of DANA, drawn from specimens collected in the Straits of De Fuca, by the Exploring Expedition, in the Museum of which they are deposited.

PANDALUS BOREALIS. Kroyer.

Pandalus borealis, KROYER; *Tidsskrift*, 1838, ii. 254. BRANDT; *Sibirische Reise, Zoöl.* i. 122.

This species is common to the boreal waters of both oceans.

Hab. Unalashka, (Wosnessenski.)

Mus. Acad. Petrop.

PANDALUS PLATYCEROS. Brandt.

Pandalus platyceros, BRANDT; *Sibirische Reise, Zoöl.* i. 123.

Hab. Unalashka, (Wosnessenski.)

Mus. Acad. Petrop.

PANDALUS HYP SINOTUS. Brandt.

Pandalus hypsinotus, BRANDT; *Sibirische Reise*, i. 125.

Hab. Unalaska, (Wosnessenski.)

Mus. Acad. Petrop.

The preceding four species appear to resemble each other closely, and may perhaps be reduced to two upon more careful examinations of numerous individuals. Having no specimens of any of them, I have preferred to follow previous authors rather than to attempt identifications from descriptions alone.

PANDALUS DANÆ. Stimpson.

Pl. XXI. f. 6, 7.

Pandalus Danæ, STIMPSON; *Proc. Bost. Soc. Nat. Hist.* vi. 87.

Thorax glabrous. Twelve teeth on the superior edge of the rostrum, including the dorsal crest, the posterior one being at about the middle of the carapax. Rostrum smooth above near its trifid apex, and six-toothed below, the basal tooth being large and much curved. Feet spinulose; the spinules on the third joints few and distant. Length two and five tenths inches.

This species differs from all of those above mentioned in the much smaller number of teeth on the dorsal crest. The trifid apex is also quite characteristic.

Dredged opposite Fort Townsend, in Puget Sound, by Capt. Murden, of the cutter "Jefferson Davis." This, with several other species of great interest, were forwarded by Dr. Suckley.

Mus. Smithsonian; *Phil. Acad.*

PALÆMON BRACHYDACTYLUS. Wiegmann.

Palæmon brachydactylus, WIEGMANN; *Archiv für Naturgeschichte*, 1836, i. 148.

Inhabits the fresh waters of Western Mexico.

Mus. Berlin.

PALÆMON HETEROCHIRUS. Wiegmann.

Palæmon heterochirus, WIEGMANN; *Archiv für Naturgeschichte*, 1836, i. 149.

This is another of the large fresh-water shrimps of Mexico. They frequently attain a length of two feet, including that of the chelopoda, which are at least as long as the body.

Mus. Berlin.

STOMAPODA.

SQUILLA DESAUSSUREI. Stimpson.

Squilla scabricauda, DESAUSSURE, (non LATR.) *Rev. et Mag. de Zool.* v. 367.

Hab. Mazatlan, (Verreaux.)

Mus. of M. Verreaux, Paris.

ISOPODA.

IDOTÆA CONSOLIDATA. Stimpson.

Idotæa consolidata, STIMPSON; *Proc. Cal. Acad. Nat. Sci.* i. 89.

Body convex, broadest at the fourth thoracic segment. First four segments of thorax larger in every dimension than the last three, each bearing an umbo near the lateral margin, which is turned up a little. A sharp, slightly elevated transverse ridge across the thorax on each segment near its posterior margin. No distinct epimeral sutures. Abdomen convex, formed of a single piece, with a slight transverse impressed line, indicating the partial separation of an anterior segment; it is narrowed toward the posterior extremity, which is terminated by a slight concavity. Head emarginate at the middle in front; cephalic suture distinct, separating a small segment from the posterior part of the head; eyes strongly convex, laterally projecting; a prominent minute tubercle just in front of each eye. External antennæ half as long as the body; flagellum with ten

oblong joints. Internal antennæ reaching to the fourth joint of the peduncle of the external ones. Feet slender, slightly pilose, with rather long hairs; their terminal joints elongated. Color in one specimen opaque whitish; in another, reddish and brownish, mottled. Length, 0.4; breadth, 0.18 inch. Taken on a sandy bottom in ten fathoms, in the Bay of San Francisco near its entrance.

Mus. N. P. Expl.

IDOTÆA WOSNESSENSKII. Brandt.

Idotæa Wosnessenskii, BRANDT; *Sibirische Reise*, Zool. i. 146.

Idotæa hirtipes, DANA; *U. S. Exploring Expedition*, Crust. ii. 704. Pl. XLVI. f. 6.

Idotæa Oregonensis, DANA; *Proc. Acad. Nat. Sci. Philad.* 1854, vii. 175.

An exceedingly common species, of a dark green color, found among sea-weeds on rocky or stony shores between high-water and half-tide marks.

Hab. Atcha and Sitka, (Wosnessenski;) Puget Sound, (Suckley,) "Oregon," (Expl. Exped.;) Shoalwater Bay, (Cooper;) Upper California, (Wosnessenski, Le Conte;) San Francisco Bay, (Stimpson.)

Mus. Acad. Petrop.; Paris; Expl. Exped.; Smithsonian; Phil. Acad.; Bost. Soc.

IDOTÆA MEDIA. Dana.

Idotæa media, DANA; *Proc. Acad. Nat. Sci. Philad.* vii. 175.

Differs from the preceding species in having a comparatively longer abdomen.

Hab. California, (Le Conte.)

Mus. of Prof. Dana.

IDOTÆA RESECATA. Stimpson.

Pl. XXII. f. 7.

Idotæa resecata, STIMPSON; *Proc. Bost. Soc. Nat. Hist.* vi. 88.

Body slender, convex along the middle above; thorax flat or even concave below. Greatest breadth at the sixth

thoracic segment. Abdomen subrectangular, broadest anteriorly, nearly twice as long as broad, and equalling in length the four preceding thoracic segments taken together; its sides slightly concave; posterior extremity with a deep concavity, terminating on either side in a sharp angular projection or tooth. First and second segments of the abdomen sufficiently well marked, the third also distinct on the sides:—the three occupying the anterior third of the length of the abdomen. Outer antennæ reaching the fourth thoracic segment; peduncle rather stout; flagellum 17-articulate. Basal article of inner antennæ greatly expanded, suborbicular. The opercular (first) pair of abdominal feet are broad, with the terminal joint square. Inner sides of ambulatory feet with short setæ. Color greenish yellow, with a median line of dark-red. Length, 1.7; breadth, 0.33 inch. Proportion of breadth to length, 1:5.15.

This species resembles the Mediterranean *I. hectica* in general appearance, and is not liable to be confounded with any other species found on our western coast.

The only specimen known was dredged in the Straits of DeFuca, opposite Fort Townsend, by Capt. Murden.

Mus. Smithsonian.

STENOSOMA GRACILLIMUM. Dana.

Stenosoma gracillimum, DANA; *Proc. Acad. Nat. Sci. Philad.* 1854, vii. 175.

Hab. California, (Le Conte.)

Mus. of Prof. Dana.

SPHERILLO AFFINIS. Dana.

Spherillo affinis, DANA. *Proc. Acad. Nat. Sci. Philad.* 1854, vii. 176.

A terrestrial species found in California by Dr. Le Conte.

Mus. of Prof. Dana.

PORCELLIO GEMMULATUS. Dana.

Porcellio gemmulatus, DANA; *U. S. Exploring Expedition, Crust.* ii. 725.

Pl. XLVII. f. 7. *Proc. Acad. Nat. Sci. Philad.* vii. 176.

Philoscia tuberculata, STIMPSON; *Proc. Cal. Acad. Nat. Sci.* i. 89.

This little wood-louse is somewhat variable in many of its characters. The dorsal granulation is coarser in some specimens than in others, and often shows no tendency to arrangement in rows. The spines of the feet of the second pair are simple in some specimens. A comparison of many individuals convinces me of the identity of my *Philoscia tuberculata* with the species previously described by DANA.

Hab. Oregon, (Expl. Exped. ;) "California," (Le Conte ;) San Francisco, (Expl. Exped. and N. P. Exped.)

Mus. Expl. Exped. ; N. P. Exped.

STYLONISCUS GRACILIS. Dana.

Styloniscus gracilis, DANA; *Proc. Acad. Nat. Sci. Philad.* vii. 176.

Hab. California, (Le Conte.)

Mus. of Prof. Dana.

ALLONISCUS PERCONVEXUS. Dana.

Alloniscus perconvexus, DANA; *Proc. Acad. Nat. Sci. Philad.* vii. 176.

Hab. California, (Le Conte.)

Mus. of Prof. Dana.

Both the above species, like the two preceding them, are terrestrial.

LYGIA OCCIDENTALIS. Dana.

Lygia occidentalis, DANA; *U. S. Exploring Expedition, Crust.* ii. 742.

Pl. XLIX. f. 7.—*Proc. Acad. Nat. Sci. Philad.* vii. 176.

The *Lygiæ* are isopoda of rather large size, and nearly amphibious habits, generally found running about with

great velocity among the stones or debris of shores after the retreat of the tide. They are never found elsewhere than in close proximity with water, which may be either salt, brackish, or fresh. *L. occidentalis* was originally discovered on the banks of the Sacramento River, by Dr. Pickering of the Exploring Expedition, and has since been found in various parts of California.

LYGIA DILATATA. Stimpson.

Pl. XXII. f. 8.

Lygia dilatata, STIMPSON; *Proc. Bost. Soc. Nat. Hist.* vi. 88.

Body variable in its proportions, but usually very broad; the proportion of the breadth to the length being often 1:1.5. Surface granulated. Margins of the articulations raised or thickened, and smooth. Head with a transverse ridge between the eyes, interrupted at the middle. External antennæ not very slender, reaching the sixth thoracic segment; flagellum consisting of fourteen scarcely oblong joints. Caudal appendages, very short, generally not more than one fifth the length of the body, often even shorter; basal joint or peduncle as broad as long, with a sharply produced angle exterior to the insertion of the stylets, the inner one of which is provided with a terminal bristle as in *L. occidentalis*. Color blackish.

Young specimens are much less broad than the adults, as the breadth increases with growth much faster than the length. It is at first difficult to conceive how they can belong to the same species, but a careful examination of specimens of all ages shows this to be the case. The dimensions of two specimens are as follows:—

Adult,	length,	1.42	breadth,	0.96 inch.
Young,	“	0.98	“	0.45 “

Found in considerable numbers in the summer of 1856, at Fort Steilacoom, Puget Sound, by Dr. George Suckley, a gentleman to whose assiduous and successful researches in the field of natural science we are indebted for many

most interesting additions to the fauna of Washington Territory.

Mus. Smithsonian.

LIVONECA VULGARIS. Stimpson.

Pl. XXII. f. 9.

Livoneca vulgaris, STIMPSON; *Proc. Bost. Soc. Nat. Hist.* vi. 88.

This is the common fish-louse of the San Francisco market. It is variable in shape, often distorted, and frequently abruptly widened at the fifth thoracic segment. Head small, wider than long; inner antennæ somewhat shorter and stouter than the outer or posterior ones. Epimeral pieces narrow, separated from the tergal piece in the anterior segments by a distinct suture, in the posterior segments by a deep incision; the point reaching the margin of the tergum in the anterior four segments, and not extending much beyond it in the posterior three. Posterior thoracic segment deeply sinuated for the reception of the middle portion of the anterior abdominal segments. Lamelliform caudal segment always transverse in the adult. Color yellowish gray; posterior pair of false feet always black. Length, 1.5; breadth, 0.9 inch. It resembles *L. Desmarestii* in general appearance.

Parasitic on fish of several kinds. Tomales Bay, (Samuels;) San Francisco Bay, (Stimpson;) Monterey, (Trowbridge.)

Mus. Smithsonian; Bost. Soc.

ÆGA MICROPHTHALMA. Dana.

Æga microphthalma, DANA; *Proc. Acad. Nat. Sci. Philad.* 1854. vii. 176.

Hab. "California," (Le Conte;) Monterey, (Taylor.)

Mus. Smithsonian.

The body in this species is generally considerably broader in the young than in the adult. Upper surface covered with

a short pubescence. Head and first three thoracic segments sculptured with impressed lines parallel to the margin. All the thoracic segments except the first are provided with large sculptured epimera; those of the first two pairs smaller in size, with two submarginal impressed lines; those of the posterior five pairs projecting beyond their segments, and marked with a diagonal median line as well as one parallel to the lower margin.

The specimens to which the above description applies approximate somewhat, in the character of the anterior thoracic feet, to the genus *Cirolana*, and, although probably only a variety of *Æga microphthalma*, may perhaps prove distinct, in which case I would propose for them the name *Cirolana pubescens*.

ÆGACYLLA LECONTII. Dana.

Ægacylla LeContii, DANA; *Proc. Acad. Nat. Sci. Philad.* vii. 177.

Hab. California, (Le Conte.)

Mus. of Prof. Dana.

SPHÆROMA OREGONENSIS. Dana.

Sphæroma Oregonensis, DANA; *U. S. Exploring Expedition, Crust.* ii. 778.
Pl. LII. f. 4. *Proc. Acad. Nat. Sci. Philad.* vii. 177.

This little crustacean is very common on the coasts of California and Oregon, and congregates in large numbers under stones near low-water mark in sheltered situations. It looks very much like an *Oniscus*, or pill-bug, rolling itself into a ball when disturbed. It was found in Puget Sound, (Pickering;) Shoalwater Bay, (Cooper;) and in San Francisco Bay, (Expl. Exped.)

Mus. Smithsonian; Bost. Soc.; Phil. Acad.; Paris; Acad. Petrop.

SPHÆROMA AMPLICAUDA. Stimpson.

Pl. XXIII. f. 1.

Sphæroma amplicauda, STIMPSON; *Proc. Bost. Soc. Nat. Hist.* vi. 89.

Body gradually widening from the head backwards. Thorax transversely ridged, the ridges corresponding in number to the segments; and provided with three (sometimes five) longitudinal rows of small tubercles, those of the middle row becoming gradually larger posteriorly, the terminal one subspiniform, pointing backward. Epimeral pieces, distinct and well separated, especially those of the posterior segments, and thickened so as to give a raised margin to the thorax. Abdomen large, forming two fifths of the length of the body, triangular, terminating in an acute point; segments all coalescent with the exception of the first, next the abdomen, which is distinctly separate, and bears a tubercle on either side in the line of those of the thorax. There are sometimes also two slight, approximated tuberculous ridges, along the middle of the anterior half of the caudal plate. Lamellæ of posterior pair of false feet very large, much expanded, but not extending posteriorly beyond the extremity of the abdominal plate; the exterior margin of the outer lamella is anteriorly much reflexed. The antennæ in this species are rather long.

Dimensions,—Length,	0.25 inch
Breadth at seventh thoracic segment,	0.119 “
“ of caudal extremity including appendages,	0.17 “

The epimera in this species are much more distinct than is usual in the genus. A few specimens were found adhering to some fragments of star-fishes picked up on the beach of Tomales Bay, by Mr. Samuels.

Mus. Smithsonian.

ANISOPODA.

ARGEIA PUGETTENSIS. Dana.

Argeia Pugettensis, DANA; *U. S. Exploring Expedition, Crust.* ii. 804.
Pl. LIII. f. 7.

Found under the thoracic shield of *Crangon munitus*.

Hab. Puget Sound, (Expl. Exped.)

Mus. Expl. Exped.

ARGEIA PAUPERATA. Stimpson, n. s.

This species is somewhat larger than the preceding; the head is comparatively smaller, more tumid, and bilobate; the egg-pouch covers the eggs more completely; and the thoracic branchial appendages are apparently absent in some of the anterior segments. The inner branches of the first three pairs of abdominal appendages are broader; those of the last three pairs are wanting. Length, 0.35; breadth, 0.23 inch. This description is taken from a female.

Found in specimens of *Crangon Franciscorum*, from San Francisco Bay.

PHYLLODURUS. Nov. gen.

Femine pedes thoracis sat validi, toti ancorales, unguiculati; appendicibus branchialibus carentes. Appendices abdominis branchiales; superiores laterales, laminis duabus æquis magnis elongatis; inferiores papilliformes. Abdominis segmentus primus setis dorsalibus unguiculatis instructus.

PHYLLODURUS ABDOMINALIS. Stimpson, n. s.

This curious form of parasitic anisopods was found attached to, and lying between the abdominal feet of the common *Gebia*, adhering by the sharp hook-shaped terminal

joints of its feet, and perhaps aided in keeping its position by the sharp dorsal setæ of the abdomen. As might be expected from this external parasitism, the shape of the body is symmetrical, being never distorted, as is almost always the case in those forms which live in the usual position—in the confined space under the thoracic shield of the shrimp or cray-fish.

In our species the thorax is somewhat cordate in shape, broadest behind, the short abdomen being set in the concavity. The thoracic segments are well separated and provided with distinct tumid epimera; the external envelope is soft, being even less hard and crustaceous than in *Argeia*. The head is somewhat broader than long, strongly tumid, and in the character of its appendages resembles somewhat that of *Ione*. The front projects abruptly, forming a horizontal margin to the head, beneath the anterior part of which the small inner antennæ are concealed. The outer antennæ arise laterally, and behind the inner ones, which they much exceed in length, being as long as half the width of the head. There are no thoracic branchial appendages. The thoracic feet are similar in character throughout; they gradually increase in length posteriorly, and are each provided with a small hand, the hooked finger of which is of moderate length, more than reaching the projecting inferior angle of the antepenultimate article.

The abdomen is triangular, and consists of six deeply separated segments, the terminal one being very minute. The basal segment is much the largest, and bears upon its dorsal surface two papillæ, one on each side, which are provided with short, stiff, somewhat hooked setæ. The lateral extremities of the abdominal segments are split by a marginal furrow into superior and inferior rami; the latter being simply conical with two or three circular wrinkles; and the former (superior) each surmounted by a cylindrical pedicle which bears two large cultriform lamellæ. There are thus twelve pairs of these lamellæ, which are of large size, and

being crowded, project in different directions, nearly concealing the posterior half of the animal. Each is about one fifth as broad as long, compressed on the inner and thickened along the outer or convex edge.

Only females of this species have as yet been found. The dimensions of one specimen are,

Length of body,	0.58 inch.
“ “ abdomen,	0.12 “
“ “ superiorabdominal appendages,	0.24 “
Breadth of thorax,	0.45 “

Several examples of this singular crustacean have been found on *Gebia* from Puget Sound and Tomales Bay.

AMPHIPODA.

CAPRELLA CALIFORNICA. Stimpson.

Caprella Californica, STIMPSON; *Proc. Cal. Acad. Nat. Sci.* i. 89.

The body in this species is slender. The antennæ are exceedingly variable in their proportions; the flagella of the superior ones 10–15 articulate; inferior ones subpediform. A more or less developed spine, which curves forward, and is sometimes of considerable length, is placed upon the dorsal surface at the anterior extremity of the first thoracic segment. Hand of the second pair of feet generally three-toothed on the inner surface; teeth (in full grown specimens) about equal in size, and placed mostly toward the outer extremity of the palm. Two or three sharp tubercles along each of the sides of the branchiferous segments; and a short dorsal spine on each of the three posterior segments. Hands of posterior feet slender. Color, variable. Length, one inch; breadth, about 0.03 inch.

Found on seaweeds, etc., below low-water mark in San Francisco Bay, near its entrance.

Mus. of the North Pacific Expedition.

COROPHIUM SPINICORNE. Stimpson.

Corophium spinicorne, STIMPSON; *Proc. Cal. Acad. Nat. Sci.* i. 89.

This species is rather thick and robust in shape. The inferior antennæ are half as long as the body, without flagella, and with a large, curved, sharp-pointed spine at the inferior extremity of the very thick antepenultimate article. There is also a stout spine beneath on the basal article, and a small one at the inner base of the penult. Superior antennæ slender, and but little shorter than the inferior ones. Feet well brushed with plumose hairs; those of the first pair with minute subcheliform hands, with the palm transverse; third and fourth articles with long setæ along the inferior edge. Feet of the second pair simple, but with the third and fourth joints conjoined laterally, as if forming a hand, not however subcheliform; the fourth article is placed inferiorly and fringed with long hairs. Caudal stylets placed rather underneath than on the sides of the abdomen, but otherwise much as in *C. longicorne*, except that the external ramus in the second pair is scarcely cultriform. Color brownish, darkest at the head, with transverse bands of light yellow corresponding to the segments; antennæ brownish. Length, 0.4 inch; breadth at the fifth thoracic segment, 0.08 inch.

It is common among confervæ, etc., in the little creeks of the salt marshes on the shores of San Francisco Bay.

Mus. N. P. Exp.

COROPHIUM SALMONIS, Stimpson, n. s.

In examining anatomically a species of salmon from Puget Sound, in the museum of the Smithsonian Institu-

tion, the stomach was found to be filled with Amphipoda, chiefly a species of *Corophium*. The specimens were not in a very good state of preservation, but enough remained to show that although agreeing with the preceding species in most characters, particularly in the spines of the antennæ and the hairiness of the feet, they are yet specifically distinct. The body is rather more elongated and depressed than in *C. spinicorne*; the inferior antennæ are much longer, and the superior ones smaller. The color is a reddish purple.

Mus. Smithsonian.

ERICHTHONIUS RAPAX. Stimpson, n. s.

If the obsolescence of the first two pairs of epimera in EDWARDS' *Erichthonius*, shall prove a constant and not an accidental character, the species here described will properly be referred to *Pyctilus*, DANA. There are small epimera on the first thoracic segment, and larger ones on the second; both narrow, not touching each other. Antennæ sub-equal, one third as long as the body; superior ones with six-articulate flagella; inferior ones strongly toothed at the inferior angle of their basal joint, and with ten-articulate flagella. Mandibular palpi reaching beyond the middle of the basal joint of the superior antennæ. Eyes on lobes which protrude forward between the bases of the antennæ. Hands of the first pair small, sub-cheliform; those of the second pair of great size, with a bi-articulate finger, and a thumb one third as long as the finger, with a strong tooth at the middle of its inner side. Color, brownish. Length, one fourth of an inch.

It was dredged on a sandy bottom at the depth of two fathoms, in the Bay of San Francisco, near the city.

Mus. N. P. Exp.

MEGALORCHESTIA SCABRIPES. Stimpson.

Orchestia scabripes, DANA; *U. S. Exploring Expedition, Crust.* ii. 860,
Pl. LVII. f. 4.

Hab. Puget Sound, (Expl. Exped.)

Mus. Expl. Exped.

MEGALORCHESTIA CALIFORNIANA. Brandt.

Megalorchestia Californiana, BRANDT; *Bulletin physico-mathém. de l'Acad. de St. Pétersb.* ix. 311. Pl. I. f. 1-6.

This differs from *M. scabripes* among other characters in the great length of the fifth epimeral, and in having the outer branch of the first pair of caudal stylets equally spinulose with the inner one. The feet are not scabrous, while the antennæ are so on a considerable portion of their surface.

Hab. Bodega, (Wosnessenski,) Monterey; (Taylor.)

Mus. Acad. Petrop.; Philad.; Smithsonian.

ORCHESTIA CALIFORNIENSIS. Dana.

Orchestia Californiensis, DANA; *Proc. Acad. Nat. Sci. Philad.* 1854, vii. 177.

Hab. California, (Le Conte;) Puget Sound, (Suckley.)

Mus. of Prof. Dana; Smithsonian.

ORCHESTIA PUGETTENSIS. Dana.

Orchestia Pugettensis, DANA; *U. S. Exploring Expedition, Crust.* ii. 859.
Pl. LVII. f. 3.

Hab. Puget Sound, (Expl. Exped.)

Mus. Expl. Exped.; Smithsonian.

ORCHESTIA PICKERINGII. Dana.

Orchestia Pickeringii, DANA; *U. S. Exploring Expedition*, *Crust.* ii. 882,
Pl. LIX. f. 9. *Proc. Acad. Nat. Sci. Philad.* VII. 177.

California, (Le Conte.)

Mus. Expl. Exped.

ORCHESTIA TRASKIANA. Stimpson.

Orchestia Traskiana, STIMPSON; *Proc. Cal. Acad. Nat. Sci.* i. 90.

Male, with the inferior antennæ about one third as long as the body; the flagella forming more than half their length, and consisting of fourteen oblong joints; superior antennæ reaching to the extremity of the second joint of the inferior ones. Feet of the first pair with a small hand with a produced lobe at the inferior angle, and a minute finger, as in *O. littorea*, *pollicifera*, etc.; fourth joint and that preceding it, each with a small tooth below. Feet of the second pair with an ovate hand, with no teeth on the oblique, convex, spinous palm, which terminates posteriorly in a slight notch; finger about half as long as the hand, smooth and much curved. In the *female* the first pair of hands resemble those of the male, except in being smaller, having less produced lobes, and a comparatively longer finger; those of the second pair with a small elongated hand, with a rounded extremity and a rudimentary finger applied at about the middle of the lower edge. In *both*, the feet of the sixth and seventh pairs are about equal in length. Eyes rounded, black. Color, light gray, sometimes greenish or brownish, always very pale. Length, three fifths of an inch.

This species has much resemblance to *O. Pickeringii* and *O. Pugettensis*, but is clearly distinct from both in the following characters. From the former, it differs in the greater length and obliquity of the palm in the hand of the

second pair, which is also destitute of tooth-like lobes; in the tooth on the inferior margin of the third article in the first pair of feet; and in its shorter and stouter antennæ. From the latter, it differs in having oblong instead of transverse joints in the flagella of the inferior antennæ; the flagella being also longer than their peduncles, which are not scabrous; there is also no two-jointed process on the third joint in the second pair of feet.

O. Traskiana is exceedingly abundant in the vicinity of San Francisco, living among the rejectamenta along high-water mark. Were it not that I have had opportunity of comparing it with the original specimens kindly lent me by Prof. Dana, I should scarcely have believed that it was not identical with one of the numerous species already described from this coast.

ALLORCHESTES PUGETTENSIS. Dana.

Allorchestes Pugettensis, DANA; *U. S. Exploring Expedition, Crust.* ii. 901.
Pl. LXI. f. 6.

Hab. Puget Sound, (Expl. Exped.)

Mus. Expl. Exped.

ALLORCHESTES SEMINUDA. Stimpson.

Allorchestes seminuda, STIMPSON; *Proc. Cal. Acad. Nat. Sci.* i. 90.

Body somewhat compressed; eye oval; superior antennæ three fifths as long as the inferior ones, with flagella consisting of thirteen sub-oblong joints; inferior antennæ two-fifths as long as the body, with 14-articulate flagella. On both pairs of antennæ there are a few short setæ at the extremity of each joint. Hand in the first pair of feet small, palm oblique, almost transverse; finger of moderate size; carpus produced at its inferior angle into a sharp projection. Hand in the second pair rather large, oblong-

ovate, deeply excavated below for the reception of the point of the finger, which is more than half as long as the hand. Color pale green; antennæ red. Length, half an inch.

This species is closely allied to *A. Pugettensis*, but is smaller, and more compressed; the superior antennæ are more setose, and the hand of the first pair is different in shape, the palm being much less oblique.

It is common at San Francisco, living among barnacles and seaweed on stones and the piles of wharves, in the littoral zone.

Mus. N. P. Exp.

ALLORCHESTES PLUMULOSUS. Stimpson. n. s.

In this species, the inferior antennæ are about one third as long as the body, and thickly tufted with plumose hairs along the inferior edge; the terminal joint of the peduncle, and all the joints of the 11-articulate flagellum except those near the extremity, being provided below with plume-like bundles of branching setæ, as well as the usual simple ones above and on the sides. The superior antennæ have only a few, simple setæ, which are, however, of considerable length. The hand of the second pair is oblong, two-thirds as broad as long, and rather quadrangular than ovate, with the palm curved, less excavated, and with a much less prominent projection at the extremity of the finger than in the preceding species; the finger is scarcely half as long as the hand. In other characters this species has considerable resemblance to *A. seminuda*. Length, two fifths of an inch. Color, greenish.

It is common on gravelly shores in the littoral zone near the mouth of San Francisco Bay.

Mus. N. P. Exped.

ALLORCHESTES ANGUSTUS. Dana.

Allorchestes angustus, DANA; *Proc. Acad. Nat. Sci. Philad.* 1854, vii. 177.

This species may be recognized by its high epimerals.

Hab. California, (Le Conte.)

Mus. of Prof. Dana.

GAMMARUS PUGETTENSIS. Dana.

Gammarus Pugettensis, DANA; *U. S. Exploring Expedition, Crust.* ii. 957.
Pl. LXVI. f. 1.

Hab. Puget Sound, (Expl. Exped.)

Mus. Expl. Exped.

GAMMARUS SITCHENSIS. Brandt.

Gammarus Sitchensis, BRANDT; *Sibirische Reise, Zool.* i. 137. Pl. VI. f. 28.

Hab. Sitka, (Wosnessenski.)

Mus. Acad. Petrop.

GAMMARUS ATCHENSIS. Brandt.

Gammarus Atchensis, BRANDT; *Sibirische Reise, Zool.* i. 138. Pl. VI. f. 29.

Hab. Atcha and Unalashka, (Wosnessenski.)

Mus. Acad. Petrop.

GAMMARUS CONFERVICOLUS. Stimpson.

Mæra confervicola, STIMPSON; *Proc. Cal. Acad. Nat. Sci.* i. 90.

Body somewhat compressed, smooth, except at the posterior three abdominal segments, the dorsal surfaces of which are angular and spinulose or setose. Antennæ of both pairs slender, about equal in their length, which is half that of the body. Superior ones with thread-like 22-articulate flagella constituting two-thirds of their length;

appendiculus 4-5 articulated. In the inferior antennæ the flagellum, of 11 oblong articles, is scarcely shorter than the peduncle, the terminal and penult joints of which are of equal length, and each four or five times as long as the antepenult. The four hands are rather small, of nearly the same size and shape, suboblong; palm transverse, minutely denticulated and setose, finger short, considerably curved. Posterior caudal stylets with unequal rami; the outer ones large, nearly as long as the three posterior segments of the abdomen; inner ones very small and inconspicuous. Color, dark brownish, rarely blackish. Length, 0.5 inch.

This species differs from *G. Atchensis* in the smoothness of the dorsal surface of the first three abdominal segments.

Is found among confervæ in salt marshes near San Francisco; and a few specimens were obtained from the stomachs of salmon caught in Puget Sound.

Mus. N. P. Exped.; Smithsonian.

IPHIMEDIA PUGETTENSIS. Dana.

Iphimedia Pugettensis, DANA; *U. S. Exploring Expedition*, *Crust.* ii. 932, Pl. LXIII. f. 6.

Hab. Puget Sound, (Expl. Exped.)

Mus. Expl. Exped.

PHOXUS GRANDIS. Stimpson, n. s.

This species is of a much larger size than is usual in the genus. Body broad and robust. Rostrum lamelliform, expanded over the bases of the superior antennæ, with a broadly rounded extremity. Superior antennæ bi-flagellate, the inner flagella very little smaller than the outer ones; both 12-articulate; penultimate article of peduncle entirely concealed beneath the rostrum. Inferior antennæ a little longer than the superior ones; terminal article of peduncle broad at its extremity where its outer angle is

produced and rounded; its inner angle bearing the 15-articulate flagellum. Eye transversely oblong. Feet covered with simple hairs. Those of the first and second pairs with small subcheliform hands; those of the third and fourth pairs with the third and fourth articles dilated, the fifth slender, the sixth very small. Feet of the posterior three pairs very much widened; those of the sixth pair largest. Caudal stylets of the first and second pairs with short styli-form rami, the inner ones being a little shorter than the outer ones; those of the third pair with long, flattened, equal rami, the outer ones spinulose along their outer edges, both fringed with long setæ on the inner sides. Terminal caudal spines of considerable length.

The color is yellowish-white. Length, half an inch.

It was dredged on a sandy bottom in ten fathoms, in the channel near the entrance of San Francisco Bay.

Mus. N. P. Exp.

PÆCILOPODA.

ARGULUS PUGETTENSIS. Dana.

Argulus Pugettensis, DANA; *U. S. Exploring Expedition*, *Crust.* ii. 151, Pl. XCIV, f. 2.

Several specimens of this species were taken from fishes in Tomales Bay, by Mr. Samuels.

Mus. Expl. Exped.; Smithsonian.

ECHINODERMATA.

The Echinoderms, as yet known from this coast, are few in number. In fact, the character of the greater part of the shores of California and Oregon is not such as affords the most favorable conditions for the development of numerous species of this order. Nearly the whole line of coast is

open, and presents a succession of inaccessible, perpendicular, rocky cliffs alternating with barren beaches of sand, all being completely exposed to the action of the breakers, which roll in upon them with the concentrated force of the storms of a wide and unbroken ocean. There is a want of variety in station, and a paucity of inlets, bays and islands, in the protected nooks of which such animals as we are now to consider usually find shelter. Extensive dredging operations would no doubt bring to light many species in places where the nature of the bottom is favorable, but the submarine zone in which the depth of water is not too great for the existence of animal life, is narrow; since, as we might judge from the mountainous character of the shores, the sea-bottom dips far beyond the reach of the ordinary sounding-line, in close proximity with the land.

There are but two important inlets on the coast, and of these Puget Sound is without doubt the best locality for researches among the marine invertebrata. The Bay of San Francisco, from the admixture with its waters of the turbid flood of two large rivers, and the smallness of the gate which admits to it the clear water of the ocean, is nearly barren of animal life except at its entrance. At a former epoch, and one geologically speaking quite recent, the sea had a much freer sweep through the bay. On its shores I have often observed extensive superficial deposits of shells, of the same species that now live on the coast, (*Mytili*, *Ostreæ*, etc.) lying in a horizontal stratum at a slight elevation above the present high-water mark. These are particularly abundant beneath the soil in the valleys of Petaluma and Sonoma, extending thence toward the sea at Bodega; and here perhaps an ancient gate existed. Another opening may have been situated at the southern extremity, through what is now the Valley of Santa Clara.

A preponderance of *Asteriadae* will be noticed among the Echinodermata now to be described. The restricted genus *Asterias* (*Asteracanthion*, Müll. et Trosch.) is par-

ticularly well represented on the Northwest Coast. Of the *Ophiuridæ* but two species are here known to exist, neither of which can be now specifically indicated, as the specimens are not at hand. One is a small *Ophiolepis*, dredged by me near San Francisco, and the other an *Astrophyton* taken in Puget Sound by the captain of a coasting vessel, in whose hands it was seen and reported to me by Dr. Cooper.

HOLOTHURIADÆ.

HOLOTHURIA CALIFORNICA. Stimpson, n. s.

Body much elongated, of nearly the same thickness throughout; below, flattened and thickly covered with stout sucker-bearing feet not arranged in rows. Dorsal surface with about forty large conical cutaneous processes (or false feet) sparingly scattered; between which there are numerous small cirriform feet, also diskless. Tentacula twenty, short, peltate, with broad disks. Color, reddish-brown above; below, lighter. Length, $1\frac{1}{2}$ ft.; thickness, $1\frac{1}{4}$ inches.

Taken in Tomales Bay by Mr. Samuels.

HOLOTHURIA SITCHÆNSIS. Brandt.

Diploperideris Sitchænsis, BRANDT; *Prod. desc. anim. Mertens.*, 52.

Hab. Sitka, (Mertens.)

ASPIDOCHIR MERTENSII. Brandt.

Aspidochir Mertensii, BRANDT; *Prod. desc. anim. Mertens.*, 46.

Hab. Sitka, (Mertens.)

PENTACTA FRONDOSA. Jæg.

Pentacta frondosa, JÆG. AYRES; *Proc. Cal. Acad. Nat. Sci.* i. 68.

The small *Pentactæ*, found in the vicinity of San Francisco, are referred by Dr. Ayres to this species.

PENTACTA MINIATA. Brandt.

Cladodactyla miniata, BRANDT; *Prod. desc. anim. Mertens.*, 44.

Hab. Sitka, (Mertens.)

PENTACTA NIGRICANS. Brandt.

Cladodactyla nigricans, BRANDT; *l. c.* 44.

Hab. Sitka, (Mertens.)

PENTACTA ALBIDA. Brandt.

Cladodactyla albida, BRANDT; *l. c.* 44.

Hab. Sitka, (Mertens.)

CUVIERIA SITCHÆNSIS. Brandt.

Cuvieria Sitchænsis, BRANDT; *l. c.* 47.

Hab. Sitka, (Mertens.)

LIOSOMA SITCHÆNSE. Brandt.

Liosoma Sitchæense, BRANDT; *l. c.* 58.

Hab. Sitka, (Mertens.)

LIOSOMA ARENICOLA. Stimpson, n. s.

Body thick fusiform; skin coriaceous; surface smooth and glabrous, without suckers or processes of any kind. Tentacles fifteen in number, very small, contracting into a circular groove at the margin of the mouth, where they are each concealed in a small cavity formed by folds of the skin. Each tentacle is composed of a short peduncle with four or five digitations at the disk-like summit; these branches being also minutely pinnate toward their extremities. Oral ring composed of five slender calcareous pieces,

projecting and bifurcate below, notched above. Respiratory trees very slender; genital tubes two or three times divided. Color, yellowish-white, clouded with reddish above. Length of an alcoholic specimen four inches; thickness, two inches.

Found at San Pedro, Cal., by Lieut. Trowbridge.

The genus differs from *Chirodota* in the want of the calcareous deposits of the skin so characteristic of the latter form.

CHIRODOTA DISCOLOR. Esch.

Chirodota discolor, ESCHSCHOLTZ; *Zoölogischer Atlas*, Pl. X. f. 2.

Hab. Sitka.

CHIRODOTA VERRUCOSA. Esch.

Chirodota verrucosa, ESCHSCHOLTZ; *Zoölogischer Atlas*, Pl. X. f. 3.

Hab. Sitka.

ECHINIDÆ.

ECHINUS CHLOROCCENTROTUS.

Echinus chlorocentrotus, BRANDT; *l. c.* 64.

This may be distinguished by its very short spines.

Hab. Sitka, (Mertens.) Dr. Cooper informs me that a green *Echinus* is common on the shores of Puget Sound, which is probably this species.

ECHINUS PURPURATUS. Stimpson, n. s.

Form depressed. Outline somewhat pentangular. Ambulacral areas of the same width as the interambulacrals; (sometimes even wider;) with eight pairs of pores in each of the very oblique rows, which are separated from each other by rows of small tubercles. Interambulacral area with

six rows of larger tubercles, between which smaller ones are interspersed; the tubercles of the two rows next within the exterior ones are largest. Auricles slender. Spines of moderate length, rather stout and blunt. Color, deep purple. Diameter, $2\frac{1}{2}$ inches; height, $1\frac{1}{3}$ inch.

Found at low-water mark on rocky ocean shores near San Francisco. It is often sold in the market, being used as food by some classes of the citizens, chiefly those from Southern Europe.

DENDRASTER EXCENTRICUS. Esch.

Scutella excentrica, ESCHSCHOLTZ; *Zoölogischer Atlas*, Pl. XX. f. 2.

Echinarachnius excentricus, VALENCIENNES; *Voy. Venus, Zoöph.* Pl. X.

Dendraster excentricus, AGASSIZ; *Cat. des Echinides*, 77.

This is the common cake-urchin of the coast, and is found at all points from Sitka to Monterey.

ASTERIADÆ.

ASTERIAS OCHRACEA. Brandt.

Pl. XXIII. f. 2.

Asterias ochracea, BRANDT; *Prod. desc. anim. Mertens*, 69.

Rays five, each scarcely twice as long as the disk is wide. Larger dorsal spines capitate, somewhat reticulating, and forming a pentagon at the middle of the disk which encloses the madreporic body. Diameter, eight inches.

It is very common near San Francisco, on rocks at low-water mark, and was also taken at Tomales Bay by Mr. Samuels. It was originally found at Sitka. *A. ianthina*, BRANDT, is probably only a variety.

The figure represents a small portion of the upper surface of one of the rays, to show the arrangement of the spines.

ASTERIAS EPICHLORA. Brandt.

Asterias epichlora, BRANDT; *l. c.* 70.

Asterias Katherinæ, GRAY; *An. & Mag. Nat. Hist.* vi. 179.

This slender-rayed species sometimes reaches a diameter of more than a foot. The specimens in the Smithsonian collection were sent from Puget Sound by Dr. Suckley.

ASTERIAS BREVISPIA. Stimpson, n. s.

Pl. XXIII. f. 3.

Rays five, each equalling in length twice the diameter of the disk. Upper surface covered with very short, blunt, nearly uniform spines, moderately numerous, sometimes forming an irregular row along the middle of the ray, and showing a tendency to reticulation on the sides. Beneath there is a single row of slender ambulacral spines, which are blunt and somewhat irregular in length; between these and the marginal channel there are four rows of short compressed spines, gouge-shaped, or notched by an oblique concavity at their truncated extremities. Madreporic body large. Color yellowish. Diameter, six inches.

Taken from a sandy bottom in ten fathoms near the mouth of San Francisco Bay. The figure represents a portion of the lower surface.

ASTERIAS GIGANTEA. Stimpson, n. s.

Pl. XXIII. f. 4. 5. 6.

Body very large, swollen; rays six in number, in length somewhat less than twice the diameter of the disk. Upper surface covered with numerous short, blunt, equidistant spines, uniform in size and regularly distributed; these spines are somewhat conical in shape, but truncated at the tip and constricted at the base, with the sides longitudinally furrowed. The spines of the lower surface are

short and thick, but slightly compressed and notched at the extremity. Diameter, two feet.

Taken in Tomales Bay, by Mr. Samuels.

ASTERIAS HELIANTHOIDES. Brandt.

Asterias helianthoides, BRANDT; *l. c.* 71.

Hab. Sitka, (Mertens;) Puget Sound, (Suckley;) Tomales Bay, (Samuels.)

ASTERIAS HELIANTHUS. Lamk.

Asterias helianthus, LAMK; GRAY; *An. & Mag. Nat. Hist.* vi. 179.

Hab. Mazatlan, (Moores.)

SOLASTER DECEMRADIATA. Brandt.

Asterias endeca, *var. decemradiata*, BRANDT; *l. c.* 71.

Hab. Sitka, (Mertens.)

LINCKIA LEVIUSCULA, Stimpson, n. s.

Disk very small; rays elongated, cylindrical, in length $2\frac{1}{2}$ times the diameter of the disk. Upper surface covered with slightly protuberant, uniform, spinulose paxilli, which are somewhat irregularly crowded together, leaving deep but very narrow chinks leading to the holes in the network of the skin. The spinules of the paxilli are so crowded that the surface of each appears nearly smooth. Below, the paxilli are still more crowded, but are here quadrate in shape and arranged in three or four rows on each side of the ambulacral furrow; those of the ambulacral row having their spinules less crowded and somewhat longer, forming the marginal series. Diameter, two inches.

Found in Puget Sound, by Dr. Suckley.

ASTERISCUS MINIATUS. Brandt.

Asterias miniata, BRANDT; *l. c.* 68.

This pentagonal star-fish may be readily distinguished by its thin disk and sharp edge.

Hab. Sitka, (Mertens;) Tomales Bay, (Samuels;) San Francisco, (Ayres;) Island of San Miguel, (Trowbridge.)

MEDIASTER EQUALIS. Stimpson. Nov. gen. et sp.

Pl. XXIII. f. 7, 8, 9, 10, 11.

This name is proposed for a Goniastroid star-fish, common on the coast of Oregon and California, which I cannot refer to any described genus or species, although it is not impossible that it may belong to one of the numerous genera of J. E. Gray, which are however so imperfectly characterized that it is extremely difficult, if not impossible, to identify them.

Body of little thickness, flat above and below; five-rayed; length of rays equalling or exceeding the diameter of the disk. Skin set with numerous small rounded plates, nearly uniform in size but becoming somewhat smaller toward the margin; they are rather more crowded below than above. Scattered pores on the surface of the skin between the plates. Margins with a double row of large quadrangular plates; those in the upper and lower series opposite. All of the plates above and below, including the marginal ones, are covered with granules nearly uniform in size and easily rubbed off. On the lower surface the granules are somewhat larger and angular, and those on the plates bordering the ambulacral furrows are elongated so as to form subprismatic spines, eight or ten to each plate, the inner ones largest. Anus central, surrounded by a circle of spine-like granules. No pedicellariæ or "two-lipped pores," excepting a single one in the centre

of each plate of the lower marginal series. Color in life, bright red above, pale orange below. Diameter, four inches.

Found in Puget Sound by Dr. Suckley, and by myself near San Francisco.

EXPLANATION OF THE PLATES.

PLATE XVIII.

Cancer antennarius, ♂ of the natural size.

PLATE XIX.

Fig. 1. Side view of carapax of *Loxorhynchus grandis*, ♀ $\frac{1}{2}$ nat.

“ 2. *Porcellana rupicola*, ♂ nat. size.

“ 3. *Randallia ornata*, ♀ “ “

PLATE XX.

Fig. 1. *Cryptolithodes typicus*, ♀ nat. size.

“ 2. The same from below.

“ 3. “ view from behind.

“ 4. “ side view.

“ 5. Inferior surface of the head magnified.

“ 6. Portion of flagellum of external antennæ, showing the clavate setæ.

PLATE XXI.

The figures of this plate are all of the natural size.

Fig. 1. *Clibanarius turgidus*.

“ 2. Hand of *Gebia Pugettensis*, with the setæ removed.

- Fig. 3. Hand of *Callianassa gigas*.
 " 4. " *C. Californiensis*.
 " 5. " *C. longimana*.
 " 6. *Pandalus Danæ*.
 " 7. Rostrum of *Pandalus Danæ*.

PLATE XXII.

The figures on this plate are all of the natural size.

Fig. 1. Orbit, antennæ, and rostrum of *Loxorhynchus grandis*, ♀ seen from beneath.

Fig. 2. Orbit, external antennæ, and rostrum of *Loxorhynchus crispatus*, ♂ seen from above.

Fig. 3. Side view of orbit, etc., of *L. crispatus*.

- " 4. Outer maxilliped of *L. crispatus*.
 " 5. Hand of *Crangon Franciscorum*.
 " 6. " *C. nigricauda*.
 " 7. *Idotea resecata*.
 " 8. *Lygia dilatata*.
 " 9. *Livoneca vulgaris*.

PLATE XXIII.

Fig. 1. *Sphæroma amplicauda*, magnified six diameters.

- " 2. Portion of the upper surface of a ray of *Asterias ochracea*, natural size.
 " 3. Portion of lower surface of a ray of *Asterias brevispina*, nat.
 " 4. Portion of upper surface of *Asterias gigantea*, nat.
 " 5 and 6. Views of spines of *A. gigantea*.
 " 7. Part of upper surface of *Mediaster æqualis*, natural size, with the granules removed from one half to show the plates.
 " 8. Lower surface of the same.
 " 9. Part of ambulacral furrow and spines of the same, magnified.
 " 10. A paxillus of upper surface of the same, magnified.
 " 11. One from the lower surface.

ART. XXVIII.—*A List of the FISHES collected in California, by MR. E. SAMUELS, with Descriptions of the new Species.* By CHARLES GIRARD, M. D.

I. COTTIDÆ.

1. COTTOPSIS PARVUS, GIRARD, in Proc. Acad. Nat. Sci. Philad. VII. 1854, 144.

Locality. Petaluma, Sonoma Co.

2. OLIGOCOTTUS MACULOSUS, GIRARD, in Proc. Acad. Nat. Sci. Philad. VIII. 1856, 133.

Pl. XXIV, fig. 7.

Description. The head is but very slightly broader than deep; its upper surface is depressed and smooth, the interocular space grooved, the snout very declivous and consequently short, narrow, and rounded upon its periphery. The upper jaw protrudes slightly beyond the lower one; the mouth is small, being but moderately cleft; the posterior extremity of the maxillary extending to a vertical line intersecting the pupil. The eye is subcircular, and its diameter contained four times in the length of the side of the head, exactly once in advance of its anterior rim. The head itself forms a little less than the fourth of the entire length. A rather stout bicuspid process arises from the convexity of the preopercle with its acute spines directed obliquely upwards, no other spines being apparent upon the opercular apparatus. In speaking of the upper surface of the head, we omitted mentioning two prominent and acute nasal spines; the nostrils being as usual placed one behind and the other beneath each spine. The branchial apertures are continuous under the throat and the branchiostegal rays six in number.

The body is very much compressed, subfusiform, and deeper than broad even anteriorly. The first dorsal is lower

than the second and contiguous to the latter upon its base; its anterior margin is situated in advance of the base of the pectorals. The caudal fin is slender and proportionally well developed; it constitutes a little less than the fifth of the entire length. The origin of the anal fin is situated a little in advance of the anterior ray of the second dorsal; the interradiation membrane is deeply emarginated. The extremities of the posterior rays do not extend so far back as those of the opposite dorsal. The ventrals are slender, inserted posteriorly to the base of the pectorals, their tip reaching and slightly overlapping the vent, which is situated near the anterior margin of the anal fin and provided upon its posterior edge with a double cutaneous flap. The pectorals are well developed; their base is unusually oblique and extends nearly to the inferior surface of the thorax, while their extremities project beyond the origin of both anal and the second dorsal.

Br. VI: VI.; D VIII, 17; A 13; C 3, i, 5, 4, i, 2; VT 3; P 13.

The skin is perfectly smooth and the lateral line well marked, running from the upper part of the thoracic arch to the base of the caudal, making a downward inflection or curve upon the middle of the flanks.

The ground color of the upper region of the head and body is yellowish brown, mottled or variegated with blackish; along the dorsal region a series of blotches of a deeper hue may be observed from the occiput to the base of the caudal; the lower half of the sides is vermiculated rather than mottled in the male, and the abdomen of a bright saffron or yellow hue. The inferior surface of the head presents traces of black markings; the throat and abdomen are unicolor as also the ventrals and anal. The dorsals, caudal, and pectorals are transversely barred upon a yellowish ground.

Specimens were collected in Tomales Bay, Cal. Plate XXIV. fig. 7, represents the species just described, size of life.

3. LEPTOCOTTUS ARMATUS, GIRARD, Proc. Acad. Nat. Sci. Philad. VII. 1854, 131, 145; VIII. 1856, 133.

Acanthocottus inermis, AYRES. Ms.

Locality. Tomales Bay.

4. SCORPAENICHTHYS MARMORATUS, GIRARD, Proc. Acad. Nat. Sci. Philad. VII. 1854, 131, 145; VIII. 1856, 133.

Hemitripteris marmoratus, AYRES, Proc. Cal. Acad. Nat. Sci. I. 1854, 4.

Locality. Tomales Bay.

5. ASPICOTTUS BISON, GIRARD, Proc. Acad. Nat. Sci. Philad. VII. 1854, 130; VIII. 1856, 133.

Clypeocottus robustus, AYRES, Proc. Cal. Acad. Nat. Sci. I. 1854, 11.

Locality. Tomales Bay.

6. ARTEDIUS NOTOSPILOTUS, GIRARD, Proc. Acad. Nat. Sci. Philad. VIII. 1856, 134.

Plate XXIV, figs. 5 and 6.

Description. About three inches and a quarter in total length, the head constituting the third of it, the caudal fin excluded. The occipital region is depressed, and the interocular region, which is broader than in *Artedius lateralis*, instead of being convex is groove-like. The rostral distance gently slopes towards the extremity of the snout, exhibiting two stout and conspicuous nasal spines, behind which is a depression for a tubular posterior nostril; the anterior nostril being as usual on the side of the snout nearer the orbit than the extremity of the rostrum. The posterior extremity of the maxillary extending to a vertical line, passing rather posterior to the middle of the pupil. The eye is large, subcircular, situated towards the upper surface of the head; its horizontal diameter is contained four times in the length of the side of the head: not quite once in advance of the anterior rim of the orbit. A short and flattened tricuspid process may be observed upon the con-

vexity of the preopercle, two of the spines pointing upwards, the third downwards. Upon the inferior branch of the same bone there are two minute spines, whilst a third one, directed forwards, is inserted upon the interopercle.

The general disposition and structure of the fins is the same as in *A. lateralis*; the origin of the anal, however, is opposite the third ray of the second dorsal, and not as deep as the latter is high, and the insertion of the ventrals is situated upon a vertical line intersecting the middle of the base of the pectorals.

D IX, 15; A 10; C 3, i. 5, 4, i 2; V_T, 3; P 17.

A membranous flap may be seen upon the posterior superior rim of the orbit. The occipital region exhibits small spines and tubercles symmetrically disposed, whilst the entire surface is spread over with small scales similar to those of the dorsal region, with only this difference, that the ciliated or spiny edge is less conspicuous. These scales extend over the temporal region, opercular apparatus and interocular region. The dorsal band or zone has the same disposition as in *A. lateralis*, but is broader, though composed of a lesser number of scales; the latter are more apart, and their edge more strongly ciliated or rather spinous. The lateral line is very conspicuous and its curve quite depressed, upon the middle of the flanks. The ground color is olivaceous, darker above than beneath: a series of four black blotches may be observed, saddle like, along the dorsal region; the first one across the anterior dorsal fin, the second and third over the second dorsal, and the fourth upon the peduncle of the tail between the two fins. The lower half of the sides, below the lateral line, is ocellated with dull white or yellow. The inferior surface is unicolor. The fins are unicolor, of the general hue of the region to which they belong.

Specimens were collected in Tomales Bay.

Plate XXIV, fig. 5 represents this species, size of life. Fig. 6 is a magnified scale.

Plate XXIV, fig. 5, represents, size of life, the species now described. Fig. 6 is a magnified scale from the dorsal zone.

II. GASTEROSTEIDÆ.

7. GASTEROSTEUS PLEBEIUS, GIRARD, Proc. Acad. Nat. Sci. Philad. VII. 1854, 147.

Locality. Petaluma, Sonoma Co.

III. ATHERINIDÆ.

8. ATHERINOPSIS CALIFORNIENSIS, GIRARD, Proc. Acad. Nat. Sci. Philad. VII. 1854, 134, 141, 151.

Atherina Storeri, AYRES, Ms.

Plate XXIV, figs. 1-4.

Description. The body is very much compressed, rather slender in its general appearance, and gracefully subfusiform. The greatest depth, taken immediately in advance of the origin of the ventrals, is contained about seven times in the total length; the least depth, on the peduncle of the tail, is about half of the greatest. The head is proportionally small, slightly convex above, and sub-quadrangularly pyramidal, though the sides slope inwardly downwards, thus rendering the inferior plane much narrower than the upper. The snout itself is subconical in its retracted state. Protractile to a certain degree, the mouth, which is moderate in size, preserves nevertheless its horizontal gape; it is the only portion of the head, the preorbital region included, which is deprived of scales, and hence perfectly smooth. The teeth are very exiguous, of the velvet-like type. The tongue is narrow, anteriorly rounded, and perfectly smooth. The anterior nostril is situated midway between the anterior rim of the orbit and the extremity of the snout. The eye is subcircular and of moderate size; its horizontal diameter enters about four times and a half or a little more

in the length of the side of the head. The branchial fissures are continuous under the throat, and prolonged towards the hyoid apparatus. The branchiostegals are five on either side and quite slender. The inter- and subopercle are quite developed.

The origin of the anterior dorsal fin is equidistant between the extremity of the snout and the fork of the caudal fin. It is composed of seven spiny rays, the first of which is the highest. The second dorsal is situated opposite the anal, and since its base is a good deal shorter than that of the latter, the posterior extremities and the anterior margins of these two fins do not coincide with the same vertical line. The rays are thirteen in number, diminishing less rapidly in height than in the anterior dorsal, thus giving the upper margin of the fin a more gradual slope. The caudal fin is deeply forked and contained about six times in the total length, the same as the head. The anal is as deep anteriorly as the second dorsal is high, diminishing, however, very rapidly backwards. The origin of the ventrals is nearer the terminus of the anal than the extremity of the snout; they are composed of five well-developed and dichotomised rays, and a rudimentary undivided one upon their external edge. The pectorals are well developed, posteriorly falciform, and tapering to a point.

Br. VI: VI; D VII, 13; A i, 27; C 5, i, 8, 7, i, 7; VI, 5; P 15.

The scales are large, constituting but thirteen longitudinal series upon the line of greatest depth of the body. Longer than deep on the dorsal region, and deeper than long on the abdominal region, they are rounded off upon their posterior margin, and truncated upon their anterior margin. Radiating grooves may be seen upon the posterior section of the scale only. The cheeks, opercular apparatus, and the upper surface of the head, are covered with large and imbricated scales, similar to the scales of the body, except that their outline is subjected to infinite variations.

The dorsal region above the silver band is greyish brown, as also the upper surface of the head; the silver band is margined with bluish black; the flanks, sides of head and belly are light brown in the young, and silvery in the adult. The fins are olivaceous throughout.

Locality. Specimens collected in Tomales Bay.

Plate XXIV, fig. 1, represents this fish somewhat reduced in size. Fig. 2 is a view of the inferior surface of the head, size of life. Fig. 3, a scale from the dorsal region. Fig. 4, a scale from the abdominal region.

IV. GOBIDÆ.

9. GOBIUS NEWBERRII, GIRARD, Proc. Acad. Nat. Sci. Philad. VIII. 1856, 136. Plate XXV, figs. 5-8.

Description. This is quite a handsome species, less elongated in its general aspect, and more fusiform in its outline than *G. lepidus*. The largest specimen which we have seen measured but a little over two inches.

The body is compressed, swollen upon the thoracic region, and tapering posteriorly in a very decided manner. The greatest depth is contained about five times and a half in the total length, and the least depth, on the peduncle of the tail, is about one half the greatest.

The head is obtuse, or else the snout is anteriorly rounded so as to give the entire region an obtuse aspect. It is contained four times and a half in the entire length. The jaws are equal and the gape of the mouth is oblique precisely as in *G. lepidus*. The posterior extremity of the maxillary extends to a vertical line drawn back of the orbit. The eye is small, subcircular; its horizontal diameter entering about four times in the length of the side of the head. The interocular space is quite broad compared to the same region in *G. lepidus*, since in specimens a good deal smaller, it is nearly double the width it has in the latter. The branchial fissures are likewise separated under the throat by a wide isthmus.

The first dorsal fin is separated from the second by a narrow space, not contiguous as formerly stated by us. It is also lower. As to its length, it is contained once and a half in that of the second dorsal, measured along their bases. The anal is as deep as the second dorsal is high; it is shorter upon its base, and its anterior margin placed a little posterior to the anterior margin of the latter. Both fins terminate evenly posteriorly, whilst in *G. lepidus* the tips of the posterior rays of the dorsal project further back than those of the anal. These fins have also a proportionally longer base in *G. lepidus* than in the present species. The caudal fin is rounded upon its posterior margin, constituting a little more than the fifth of the entire length. The vent has the same position, opposite the anterior margin of the second dorsal, as in *G. lepidus*, and the tips of the ventral fins are far from reaching it. The latter are subovate, inserted immediately under the base of the pectorals themselves, and their posterior extremity projects beyond that of the ventrals. Thus in the relative position and extension of the pectoral and ventral fins, we have good discriminating characters between this species and *G. lepidus*.

The formula of the fins is as follows :

D VIII, 13; A 12; C 3, i. 6, 6, i. 2; V 5; P 18.

The scales are small and quite inconspicuous; a lateral line, if extant, is not apparent. The scales themselves are subcircular, deeper than long, cycloid in structure, exhibiting diverging furrows upon their anterior margin only. They are smaller upon the upper than upon the lower regions of the body.

The ground color is olivaceous, though the dorsal region appears almost blackish, owing to the accumulation of innumerable black dots which constitute small blotches encircling isolated spots of the ground color. The middle region of the flanks is mottled equally with black. The inferior regions alone being unicolor. The dorsals and

anal are either entirely blackish and margined with white, or else the second dorsal is spotted like the back. The caudal is olivaceous with transverse series of black spots simulating continuous narrow bands. The pectorals and ventrals are unicolor, and rather lighter than the belly and inferior surface of the head. The upper surface of the head presents the same hue as the back.

Locality. Specimens from Tomales Bay.

Plate XXV, fig. 5, represents this species size of life. Fig. 6, the ventral fins. Fig. 7, a scale from the dorsal region. Fig. 8, a scale from the abdominal region.

V. EMBIOTOCIDÆ.

10. RHACOCHEILUS TOXOTES, AGASSIZ, Amer. Journ. of Sci. 2d Series, XVII. 1854, 367; GIRARD, in Proc. Acad. Nat. Sci. Philad. VIII, 1856, 136.

Locality. Tomales Bay.

VI. CYPRINIDÆ.

11. POGONICHTHYS INÆQUILOBUS, B. & G. Proc. Acad. Nat. Sci. Philad. VII. 1854, 136, VIII. 1856, 188.

Locality. Petaluma, Sonoma Co.

VII. SALMONIDÆ.

12. SALAR IRIDEA, GIRARD, Proc. Acad. Nat. Sci. Philad. VIII. 1856, 220.
Salmo iridea, GIBBONS, Proc. Cal. Acad. Nat. Sci. I. 1855, 36. (Young.)
Salmo rivularis, AYRES, Proc. Cal. Acad. Nat. Sci. I. 1855, 43. (Female.)

Locality. Petaluma, Sonoma Co.

VIII. PLEURONECTIDÆ.

- 13 PLATICHTHYS RUGOSUS, GIRARD, Proc. Acad. Nat. Sci. Philad. VII. 1854, 139, 155.

Locality. Tomales Bay.

14. PLEURONICHTHYS GUTTULATUS. GIRARD, Proc. Acad. Nat. Sci. Philad. VIII. 1856, 137.

Plate XXV, fig. 1-4.

Description. The body is subelliptical, deeper than in *P. canosus*. The figure will show its outline better than any description could do. Needless to say that it is very thin.

The head is of moderate size and constitutes about the fourth of the total length. The eyes situated on the right side, are well developed, elliptical, their longitudinal diameter being contained three times in the length of the side of the head. The interocular space is exceedingly narrow and raised, ridge-like, above the surface of the head. The snout is very blunt and short, the mouth small, with its gape oblique upwards, and both jaws even. The posterior extremity of the maxillary corresponds to a vertical line drawn midway between the anterior rim of the orbit and the pupil. The opercular apparatus and cheeks are scaly; the branchial fissures moderate and not continuous under the throat.

The origin of the dorsal fin corresponds to a vertical line drawn immediately in advance of the pupil; it is gradually increasing in height to the line of the greatest depth of the body to diminish again gradually posteriorly, terminating at a small distance from the base of the caudal. The anterior margin of the anal corresponds to a vertical line drawn immediately behind the base of the pectorals. It is shaped like the dorsal, and terminates evenly with that fin. The caudal, which enters about five times in the total length, is rounded upon its posterior margin. The origin of the ventrals is situated in advance of the base of the pectorals, in advance even of the posterior edge of the opercular apparatus; they are small and sublanceolate; their posterior extremity overlaps the vent and reaches the anal

fin. The pectorals themselves are rather small, and directed obliquely upwards and backwards.

D 67; A 47; C 4, i, 8, 7, i, 3; V 6; P 13.

The scales are quite small, longer than deep, cycloid in structure, with diverging grooves upon their anterior section only. The lateral line is slightly arched above the pectorals, thence nearly straight along the middle of the flanks to the base of the caudal fin. A similar mucous line may be traced from the upper rim of the upper eye, along the back, giving off an anastomotic branch to the lateral line across the occipital region, and losing itself in the dorsal fin, beyond the middle of the length.

The ground color is grayish or plumbeous, densely sprinkled all over with black dots and whitish spots; the fins being olivaceous, similarly dotted with black, but exhibiting fewer white spots.

Locality. Specimens were collected in Tomales Bay.

Plate XXV, fig. 1, represents the right side of this species, size of life. Fig. 2, exhibits the left side of the same specimen. Fig. 3, a scale from the dorsal region. Fig. 4, a scale from the abdominal region.

15. PSETTICHTHYS SORDIDUS, GIRARD, Proc. Acad. Nat. Sci. Philad. VII. 1854, 142.

Locality. Tomales Bay.

IX. LOPHOBRANCHII.

16. SYNGNATHUS CALIFORNIENSIS, STORER, Proc. Bost. Soc. Nat. Hist. II. 1845, 73, and Synops. 1846, 273. GIRARD, Proc. Acad. Nat. Sci. Philad. VIII. 1856, 137.

Locality. Tomales Bay.

X. RAJIDÆ.

17. RHINOPTERA VESPERTILIO, GIRARD, Proc. Acad. Nat. Sci. Philad. VIII. 1856, 137. Plate XXVI, figs. 1-3.

Description. This species is closely allied to *R. javanica*, from which it differs by the shape or outline of the head, which is semicircular anteriorly and very slightly emarginated, instead of being notched or concave, and by the pectoral fins, which are pointed.

The specimen before us measures nineteen inches and a half from the extremity of the snout to the tip of the tail, six inches and three quarters being the length of the body and head together. The width, from the tip of one pectoral fin to the other, is twelve inches.

The cephalic region is as long as the trunk properly so called; its anterior outline, as already observed, is rounded and but very slightly emarginated. The eyes are quite prominent and somewhat raised above the surface of the head. The lips are fringed, and the edge of the tongue scalloped. The respiratory apertures, five pairs in number, are transversely elongated and disposed upon an open curve.

There is a small dorsal fin situated posteriorly to the ventrals upon the anterior portion of the tail and followed by a lanceolate horizontally flattened spine, serrated upon its edges. The tail is very attenuated, flagelliform, tapering into a filiform extremity.

The color above is of a purplish blue or slate hue, lighter towards the periphery than upon the dorsal region. Beneath dull olivaceous.

Locality. From Tomales Bay.

Plate XXVI, fig. 1, represents this species seen from above and somewhat reduced in size. Fig. 2, is a profile of the head, size of life. Fig. 3, the inferior surface of the head, exhibiting the mouth and branchial apertures, also size of life.

INDEX.

- Abutilon holosericeum*, 162.
 ——— Texense, 161.
 ——— Wrightii, Gray, 162.
Acacia Roemeriana, 184.
Acanthocottus Labradoricus, 247.
 ——— ocellatus, H. R. Storer,
 253.
Acanthias Americanus, 270.
Achillea millefolium, 231.
Acmæa paleacea, Gould, 376.
Actinella linarifolia, 231.
 ——— scaposa, 231.
Actinomeris Wrightii, 229.
Adranes, nov. gen. Le Conte, 83.
 ——— cæcus, " 83.
Egacylla Lecontii, 509.
Ega microphthalmia, 508.
Esculus pavia, 167.
Agassizia, Gray and Engelm. 229.
 ——— suavis, " 230.
Agelaius assimilis, Gundl. 316.
Albunea Lucasii, 485.
Aldama uniserialis, 228.
Alethopteris distans, Lesq'x, 422.
 ——— lævis " 423.
 ——— obscura " 422.
 ——— Pennsylvanica, " 422.
 ——— serrula " 423.
Algarobia glandulosa, 181.
 Alger, F., on Algerite, 118; on a mineral
 from Cherokee county, Georgia, 123.
 Algerite, chemical examination of, with
 a description, 118.
Alloniscus perconvexus, 506.
Allorchestes angustus, 520.
 ——— plumulosus, Stimpson, 519.
 ——— Pugettensis, 518.
 ——— seminuda, Stimpson, 518.
Alosa cyanonoton, 266.
Ambrosia aptera, 226.
 ——— coronopifolia, 226.
Ammannia latifolia, 188.
Ammodytes Americanus, 270.
Amorpha fruticosa, 174.
Amphiachyris dracunculoides, 224.
Amphidesma flavescens, Gould, 392.
Anabates Fernandinæ, Lemb. 317.
Anableps Gronovii, observations on the
 development of, 432.
Anguilla Bostoniensis, 269.
 Analysis of soil from Scioto Valley, 324.
Annularia sphenophylloides, Lesq'x, 415.
Anodon ciconia, Gould, 402.
 Ant-hills, deserted, in Texas, 240.
Aplopappus spinulosus, 223.
Apogon gracilis, 232.
Araneides of the United States, descrip-
 tions and figures of, 18, 271; Tribe
Ventricosæ, 282; Tribe *Partitæ*, 280;
 Synopsis of genera and species, 289.
Arceuthobium, 213.
 ——— Americanum, 214.
 ——— campylopodum, Gray, 214.
 ——— cryptopodum " 214.
 ——— oxycedri, 213.
Argeia pauperata, 511.
 ——— Pugettensis, 511.
Argulus Pugettensis, 522.
 Arkansite, examination of, 42.
Artemis notospilotus, Girard, 535.
Artemisia caudata, 231.
 ——— dracunculoides, 231.
 ——— Ludoviciana, 231.
 ——— vulgaris δ . Mexicana, 231.
Arthemis saccata, Gould, 396.
Arthmius, nov. gen. Le Conte, 91.
 ——— globicollis, " 91.
Aspicarpa hyssopifolia, 167.
Aspicottus bison, Girard, 535.
Aspidochir Mertensii, 524.
Asplenites rubra, Lesq'x, 422.
Astacus Gambelii, 492.
 ——— Klamathensis, Stimpson, 494.
 ——— leniusculus, 493.
 ——— nigrescens, Stimpson, 492.
 ——— Oregonus, 495.
 ——— Trowbridgii, Stimpson, 493.
Aster carneus, 219.

- Aster carneus*, β . *subasper*, 219.
 — *divaricatus*, 219.
 — *Drummondii*, 219.
 — *multiflorus*, 219.
 — *sericeus*, 219.
 — *simplex*, 219.
 — *spinosus*, 219.
 — *virgatus*, 219.
Asterias brevispina, Stimpson, 528.
 — *epichlora*, 528.
 — *gigantea*, Stimpson, 528.
 — *helianthoides*, 529.
 — *helianthus*, 529.
 — *ochracea*, 527.
Asteriscus miniatus, 530.
Asterophyllites aperta, Lesq'x, 414.
 — *crassicaulis*, " 414.
 — *lanceolata*, " 414.
 — *ovalis*, " 414.
 — *sublævis*, " 414.
Astragalus, arrangement of fibres of, 135.
 — *caryocarpus*, 176.
 — *Mexicanus*, 176.
 — *Wrightii*, Gray, 176.
Atherinopsis Californiensis, Girard, 537.
Attus retiaris, Hentz, 288.
 — *sinister*, " 288.
Atrema Americana, 212.
Atya scabra, 498.
Avicula sterna, Gould, 404.
 Ayres, W. O., description of a new genus of Fishes, *Malacosteus*, 53; on a new species of *Polypterus* from West Africa, 241.
Baccharis angustifolia, 224.
 — *Texana*, 224.
Batrisus albionicus, 102.
 — *armiger*, Le Conte, 94.
 — *bistriatus*, " 101.
 — *confinis*, " 96.
 — *cristatus*, " 96.
 — *ferox*, " 95.
 — *frontalis*, " 96.
 — *globosus*, " 100.
 — *Ionæ*, " 94.
 — *lineaticollis*, " 101.
 — *monstruosus*, " 95.
 — *nigricans*, " 99.
 — *punctatus*, " 97.
 — *riparius*, " 97.
 — *scabriceps*, " 98.
 — *Schaumii*, " 102.
 — *spretus*, " 100.
 — *striatus*, " 99.
Batrisus, synopsis of species of, 93.
Berberis (Trilicina) trifoliolata, 142.
Berlandiera Texana, 225.
Bidens chrysanthemoides, 229.
 Bigelow, Samuel L., observations on the habits of *Salmo fontinalis*, 49.
 Biogen liquid, 3.
Blepharipoda occidentalis, 486.
 Bodo, structure and nature of, 319.
Brachyphyllum obtusum, Lesq'x, 430.
 Brewer, T. M., ornithological observations in New Brunswick, 297; on eggs of *Thalassidroma Leachii*, *Procellaria Bulwerii*, *P. obscura*, and *Puffinus major*, 308.
Brickellia (Bulbostylis) cylindracea, 218.
Bryaxis abdominalis, Le Conte, 86.
 — *abnormis*, " 89.
 — *conjuncta*, " 85.
 — *dentata*, " 85.
 — *formiceti*, " 90.
 — *hæmatica*, " 87.
 — *longula*, " 89.
 — *luniger*, " 87.
 — *propinqua*, " 88.
 — *puncticollis*, " 87.
 — *rubicunda*, " 88.
 — *velutina*, " 86.
Bulimüs excelsus, Gould, 376.
 — *vegetus*, " 375.
 — *vesicalis*, " 375.
Bulla (Tornatina) cerealis, Gould, 378.
 — (*Akera*) *culcitella*, " 377.
 Burnett, W. I., on the organic relations of some of the Infusoria, and the structure and nature of the genus *Bodo*, 319.
Calamites bistriatus, Lesq'x, 414.
 — *disjunctus*, 414.
Calappa convexa, 470.
 California fishes, 533; shells, 374.
Callianassa Californiensis, 489.
 — *gigas*, 489.
 — *longimana*, Stimpson, 490.
Callipteris Sullivantii, Lesq'x, 423.
Callirrhœ digitata, 160.
 — *involutata*, 159.
 — *pedata*, 160.
Cancer antennarius, Stimpson, 462.
 — *gracilis*, 460.
 — *magister*, 458.
 — *productus*, 461.
Caprella Californica, Stimpson, 513.
Cardiocarpon plicatum, Lesq'x, 431.
 — *punctatum*, " 431.
 — *Trevortoni*, " 430.
Cardium luteolabrum, Gould, 401.
Carpolithes bifidus, Lesq'x, 431.
 — *disjunctus*, " 431.
 — *platimarginatus*, " 431.
Cassia (Chamæsenna) Bauhinioides, Gray, 180.
 — (*Chamæsenna*) *Lindheimeriana*, 179.
 — (*Chamæsenna*) *Rœmeriana*, 180.
 — *pumilio*, Gray, 180.
Caulopteris gigantea, Lesq'x, 425.
 — *punctata*, " 425.
Ceanothus ovalis, 170.
Cedius, nov. gen. Le Conte, 74.
 — *spinosus*, " 75.
 — *Ziegleri*, " 74.
Centauridium Drummondii, 223.
Ceophyllus, nov. gen. Le Conte, 73.

- Ceophyllus monilis*, Le Conte, 73.
Cerasus serotina, 186.
Cercis occidentalis, 177.
Cereus cæspitosus, 202.
——— *procumbens*, Gray, 203.
——— *Rœmeri*, " 204.
——— *variabilis*, 205.
Chærophyllum Teinturieri, 211.
Cheirogonus hippocarcinoides, 465.
——— *Isenbeckii*, 465.
Chemical examination of some American minerals, 36.
Chemnitzia tenuicula, Gould, 383.
——— *torquata*, " 384.
Chionœcetes Behringianus, Stimpson, 449.
Chirodota discolor, 526.
——— *verrucosa*, 526.
Chorilia longipes, 455.
Chryopsis canescens, 223.
——— *hispidula*, 223.
Cicuta maculata, 210.
Clangula histrionica, 298.
Clavigera Riddellii, 218.
Clematis Drummondii, 141.
Clibanarius æquabilis, 485.
——— *turgidus*, Stimpson, 484.
Clupea elongata, 266.
Colubrina Texensis, 169.
Columba caniceps, Gundl. 315.
Condalia obovata, 169.
Conus comptus, Gould, 387.
——— *pusillus*, " 388.
——— *ravus*, " 386.
Coreopsis Drummondii, 229.
——— *tinctoria*, 229.
Corophium salmonis, Stimpson, 514.
——— *spiniorne*, " 514.
Corvus Jamaicensis, Gmel. ? 316.
——— *minutus*, Gundl. 315.
Cottopsis parvus, Girard, 533.
Crangon Franciscorum, Stimpson, 495.
——— *munitus*, " 497.
——— *nigricauda*, " 496.
Cratægus coccinea var. ? *mollis*, 186.
CreMATopteris ? *Pennsylvanica*, Lesq'x, 425.
Crepidula explanata, Gould, 377.
Crocodylus lucius, dissection of, 110.
Crustacea of Pacific Shores of N. America, 444.
Cryptacanthodes maculatus, H. R. Storer, 254.
Cryptolithodes Sitchensis, 476.
——— *typicus*, 472.
Cryptopodia occidentalis, 458.
Ctenistes consobrinus, Le Conte, 79.
——— *piceus*, " 78.
——— *Zimmermani*, " 79.
Ctenolabrus cœruleus, 264.
Cucurbita perennis, 193.
——— *Texana*, 193.
Cuvieria Sitchensis, 525.
Cyclanthera dissecta, 193.
Cyclopteris elegans, Lesq'x, 416.
Cyclopteris fimbriata, Lesq'x, 416.
——— *hirsuta*, " 416.
——— *laciniata*, " 416.
——— *undans*, " 416.
Cyrena altilis, Gould, 400.
Dalea aurea, 175.
——— *frutescens*, 175.
——— *laxiflora*, 175.
——— *nana*, 175.
——— *pogonathera*, 175.
Daucosma laciniatum, 211.
Delphinium virescens, 142.
Dendraster excentricus, 527.
Dermaturus Mandtii, 480.
Descriptions of new California Fishes, 533.
Desmanthus brachylobus, 184.
——— *velutinus*, 183.
Desmodium Wrightii, Gray, 177.
Desor, E., on Embryology of Nemertes, Polynœ, and Marine Worms in general, 1.
Diaperia prolifera, 224.
Diodia tricoeca, 215.
Donax flexuosus, Gould, 394.
——— *obesus*, " 394.
Draba platycarpa, 148.
Drapocis amplexicaulis, 227.
Echinacea angustifolia, 227.
Echinocactus setispinus, α . *hamatus*, β .
——— *setaceus*, 201.
——— *Texensis*, 202.
Echidnocerus cibarius, 477.
——— *setimanus*, Stimpson, 477.
Echinodermata of Pacific Shores of N. America, 444.
Echinus chlorocentrotus, 526.
——— *purpuratus*, Stimpson, 526.
Egletes ramosissima, 220.
Elatine (*Merimea* seu *Bergia*) *Texana*, 187.
Embryology of Nemertes, Polynœ, and Marine Worms in general, 1.
Engelmannia pinnatifida, 226.
Epeira alba, Hentz, 20.
——— *cancer*, " 23.
——— *Caroli*, " 24.
——— *caudata*, " 23.
——— *cornigera*, " 20.
——— *heptagon*, " 20.
——— *infumata*, " 19.
——— *mitrata*, " 22.
——— *pentagona*, " 18.
——— *rugosa*, " 21.
——— *scutulata*, " 19.
——— *spinea*, " 21.
——— *stellata* ? " 22.
——— *verrucosa*, " 19.
Epialtus Nuttallii, 458.
——— *productus*, 457.
Erato leucophæa, Gould, 386.
Erichthonius rapax, Stimpson, 515.
Erigeron Canadense β . *glabratum*, 220.

- Erigeron modestum*, 220.
Erodium Texanum, 157.
Eryngium Leavenworthii, 209.
 ———— *præaltum*, 210.
 ———— *Ravenellii*, Gray, 209.
 ———— *Virginianum*, 210.
Erysimum Arkansanum, 144.
Eucnide Bartonoides, 191.
Eupatorium ageratifolium, β . *Texense*, 219.
 ———— *serotinum*, 219.
Eupagurus armatus, Stimpson, 484.
 ———— *Bernhardus*, " 483.
 ———— *hirsutiunculus*, " 484.
 ———— *Mertensii*, 483.
 ———— *Middendorffii*, 482.
 ———— *Samuelis*, Stimpson, 482.
 ———— *tenuimanus*, " 483.
Euplectus arcuatus, Le Conte, 106.
 ———— *canaliculatus*, " 107.
 ———— *confluens*, " 105.
 ———— *difficilis*, " 106.
 ———— *dubius*, " 108.
 ———— *globifer*, " 107.
 ———— *interruptus*, " 105.
 ———— *linearis*, " 104.
 ———— *parvulus*, " 108.
 ———— *pumilus*, " 106.
Eupsenius, nov. gen. Le Conte, 90.
 ———— *glaber*, " 90.
Eysenhardtia amorphoides, 173.
 ———— *spinosa*, Gray, 174.

Fabia subquadrata, 470.
Faronus Tolulæ, Le Conte, 109.
Fedia amarella, Lindh. Mss. 217.
 ———— (*Valerianella*) *stenocarpa*, Engelm. Mss. 216.
Filaginopsis multicaulis, 224.
 Fineness of Ohio soils, 329.
 Fishes of Nova Scotia and Labrador, with descriptions of new species, 247; of California, 533.
 Fossil plants, new species, from the coal-fields of Pennsylvania, 409.
Franseria tenuifolia, var. *tripinnatifida*, 227.
Fusus ambustus, Gould, 385.

Gaillardia picta, 230.
Galactia canescens, 171.
 ———— *Texana*, 170.
Galinum triflorum, 215.
 ———— *uncinulatum*, 215.
 ———— *virgatum*, 215.
Galphimia linifolia, 166.
Gammarus confervicolus, 520.
 ———— *Pugettensis*, 520.
 ———— *Sitchensis*, 520.
Gasterosteus biaculeatus, 256, 260.
 ———— *Cuvieri*, 254.
 ———— *plebeius*, Girard, 537.
Gaura Drummondii, 190.
 ———— *hirsuta*, 191.
 ———— *parviflora*, 190.

Gaura sinuata, 190.
 ———— *suffulta*, 190.
Gebia Pugettensis, 488.
Gecarcinus quadratus, 469.
Geminatæ tribe, 271.
 Gibbes, Lewis, R., on *Menobranthus punctatus*, 369.
 Girard, Charles, on new species of Fish from California, 533.
Gobius Newberrii, Girard, 539.
 Gould, A. A., on Shells from Mexico and California, 374.
Gnaphalium polycephalum, 231.
Grapsus pictus, 466.
 ———— *strigosus*, 466.
 Gray, Asa, an account of a collection of Plants made by F. Lindheimer in West-ern Texas. in the years 1845-1848, &c. &c., 141.
Grimotea gregaria, 487.
Grindelia squarrosa, 223.
Guaiacum angustifolium, 158.
 Gundlach, John, description of new species of Birds of Cuba, 313; notes concerning, 316.
Gunnellus ingens, H. R. Storer, 261.
 ———— *macrocephalus*, 263.
 ———— *mucronatus*, 261.
Gutierrezia Texana, 222.
Gymnospermum corymbosum, 222.

Halea Texana, 227.
Hamotus humeralis, Le Conte, 84.
Hapalogaster Mertensii, 480.
Hedyotis (Houstonia) humifusa, Gray, 216.
 ———— (*Amphiotis*) *stenophylla*, 215.
Helenium autumnale, 231.
Helianthus cucumerifolius, 228.
 ———— *lenticularis*, 228.
 Hentz, Nicholas M., on the Araneides of the United States, 18, 271.
Herbstia, parvifrons, 451.
Hermannia Texana, 165.
Hippa analoga, Stimpson, 486.
Hippoglossus vulgaris, 267.
Hippolyte affinis, 498.
 ———— *brevirostris*, 500.
 ———— *lamellicornis*, 498.
 ———— *Layi*, 499.
 ———— *palpator*, 499.
 ———— *Sitchensis*, 499.
 ———— *Taylori*, Stimpson, 500.
Hirundo coronata, 318.
Hoffmanseggia caudata, Gray, 179.
 ———— *Jamesii*, 178.
Holothuria Californica, Stimpson, 524.
 ———— *Sitchensis*, 524.
 Hunt, T. S., on Algeria, 118.
Hyas coarctatus, 450.
 ———— *lyratus*, 450.
Hydrargyra ornata, 264.
Hydrocotyle interrupta, 209.
 ———— *repanda*, 209.
 ———— *umbellata*, 209.

- Hymenatherum Wrightii*, 229.
Hymenopappus corymbosus, 230.
Hymenophyllites capillaris, Lesq'x, 421.
 — *furcatus*, " 421.
 — ——— *Hildreti*, " 421.
- Idotæa consolidata*, Stimpson, 503.
 — *media*, 504.
 — *resecata*, Stimpson, 504.
 — *Wosnessenskii*, 504.
- Ionidium lineare*, 151.
Iphimedia Pugettensis, 521.
Isopappus divaricatus, 223.
Iva angustifolia, 226.
- Kallstroemia maxima*, 158.
Katadysas, Hentz, subgenus, 287.
 — *pumilus*, Hentz, 287.
- Keerlia bellidifolia*, 220.
 — *effusa*, Gray, 222.
 — *ramosa*, 221.
- Kneeland, S., dissection of *Crocodylus lucius*, 110; on the skeleton of *Troglydytes gorilla*, 336.
- Krameria lanceolata*, 151.
Kuhnia eupatorioides, δ . *gracillima*, 218.
- Lagenaria vulgaris*, 194.
Larus argentatus, 302.
 " " nest of, 303.
- Le Conte, John L., on the *Pselaphidæ* of the United States, 65.
- Lepachys columnaris* β . *pulcherrima*, 227.
- Lepidodendron carinatum*, Lesq'x, 429.
 — *clypeatum*, " 429.
 — *conicum*, " 428.
 — *distans*, " 429.
 — *giganteum*, " 428.
 — *modulatum*, " 428.
 — *obtusum*, " 429.
 — *oculatum*, " 428.
 — *sigillarioides*, " 429.
 — *vestitum*, " 428.
- Lepidophyllum acuminatum*, " 430.
 — *affine*, " 430.
 — *brevifolium*, " 430.
 — *hastatum*, " 430.
 — *obtusum*, " 430.
 — *plicatum*, " 430.
- Leptocottus armatus*, 535.
Leria nutans, 232.
- Lesquereux, Leo, on new species of fossil plants from Pennsylvania coal-fields, 409.
- Leucosilia Jurinii*, 471.
Liatris punctata, 218.
Libinia affinis, 455.
Lima tetrica, Gould, 405.
- Linckia leviuscula*, Stimpson, 529.
Lindheimera, Gray and Engelm., 225.
 — *Texana*, 226.
- Linum rupestre*, 232.
 — *Berlandieri*, 156.
 — *Boottii*, 155.
- Linum Hudsonioides*, 156.
 — *multicaule*, 155.
- Linyphia ? autumnalis*, Hentz, 30.
 — *coccinea*, " 30.
 — *communis*, " 28.
 — *conferta*, " 30.
 — *? costata*, " 31.
 — *marmorata*, " 29.
 — *? neophita*, " 31.
 — *scripta*, " 29.
- Liosoma arenicola*, Stimpson, 525.
 — *Sitchense*, 525.
- Lipochæta Texana*, 229.
- List of known Species of *Pisidium*, and their Synonymy, 367.
- Lithodes brevipes*, 479.
 — *Camtschaticus*, 479.
 — *spinosissimus*, 478.
- Lithodomus falcatus*, Gould, 403.
- Livoneca vulgaris*, Stimpson, 508.
- Lonicera albiflora*, 213.
- Loxorhyncus*, nov. gen., Stimpson, 451.
 — *crispatus*, " 453.
 — *grandis*, " 452.
- Lucina orbella*, Gould, 395.
- Ludwigia natans*, 190.
 — *palustris*, 190.
- Lumpus Anglorum*, 269.
- Lupinus Texensis*, 177.
- Lutraria undulata*, Gould, 391.
 — *ventricosa*, " 390.
- Lygia dilatata*, Stimpson, 507.
 — *occidentalis*, 506.
- Lygodesmia aphylla* β . *Texana*, 232.
- Lythrum alatum* var. *breviflorum*, 187.
 — " *lanceolatum*, 188.
 — " γ , 188.
 — " *linearifolium*, 188.
 — " *ovalifolium*, 187.
 — " *pumilum*, 187.
- Mactra mendica*, Gould, 393.
 — *nasuta*, " 393.
- Magnesia*, Fibrous Hydrate of, 36.
- Malacosteus*, Ayres, a new genus of fishes, 53.
- Malacosteus niger*, Ayres, 54.
- Mallotus villosus*, 265.
- Malvastrum carpinifolium*, 161.
 — *pedatifidum*, Gray, 160.
 — *Wrightii*, 160.
- Mammillaria applanata*, Gray, 198.
 — *calcarata*, 195.
 — *compacta*, 196.
 — *gummifera*, 199.
 — *hemisphærica*, Gray, 198.
 — *Nuttallii*, 199.
 — *radiosa*, Gray, 196.
 — *similis*, *a. cæspitosa*, β . *robustior*, 200.
- Marine Worms, Embryology of, 1.
- Marshallia cæspitosa*, 231.
- Mediaster æqualis*, Stimpson, 530.
- Megalorchestia Californiana*, 516.
 — *scabripes*, Stimpson, 516.

- Melampodium cinereum*, 225.
Melochia pyramidata, 165.
Menobranthus punctatus, 369.
Mentzelia oligosperma, 191.
 ——— (Bartonia) *nuda*, 191.
 Mexican shells, 374.
Micrommata pinicola, Hentz, 237.
 ——— *subinflata*, " 238.
Mimetus, nov. gen. Hentz, 31.
 ——— *interfactor*, " 32.
 ——— *syllipsis*, " 34.
 ——— *tuberosus*, " 34.
Mimosa fragrans, Gray, 182.
 ——— *Lindheimeri*, Gray, 181.
 ——— *malacophylla*, " 182.
 Mineral from Cherokee County, Georgia,
 Examination of, 123.
Mithrax armatus, 456.
Modulus dorsuosus, Gould, 383.
Morrhua Americana, 267.
Muscicapa caribæa, 316.
 ——— *Lembeyei*, Gundl., 314.
 ——— *Sagræ*, " 313.
Mygale fluviatilis, Hentz, 286.
Myriophyllum heterophyllum, 191.
Mytilus glomeratus, Gould, 402.

Narica ovoidea, Gould, 380.
Negundo aceroides, 166.
 Nematite, 36.
 Nemertes, Embryology of, 1.
Nephrops occidentalis, 495.
Neuropteris adiantites, Lesq'x, 419.
 ——— *Clarksoni*, " 417.
 ——— *delicatula*, " 417.
 ——— *dentata*, " 418.
 ——— *Desorei*, " 418.
 ——— *fissa*, " 417.
 ——— *gibbosa*, " 418.
 ——— *hirsuta*, " 417.
 ——— *minor*, " 418.
 ——— *Moorii*, " 419.
 ——— *speciosa*, " 417.
 ——— *tenuinervis*, " 418.
 ——— *undans*, " 418.
Noctua Siju, 318.
Nœggerathia Bockschiana, Lesq'x, 415.
 ——— *minor*, " 415.
 ——— *obtusa*, " 415.
 Notes and Observations on the Analysis
 and Character of the Soils of the Scioto
 Valley, Ohio, with general considera-
 tions concerning soil analyses, 324.

Odostomia Achates, Gould, 385.
 ——— *gravida*, " 384.
Odontopteris dubia, Lesq'x, 419.
 ——— *squamosa*, " 419.
Ænothera (Megapteris) Missouriensis,
 188.
Ænothera (Meriolix) serrulata ♂. *spinu-*
losa, 189.
Ænothera serrulata ♀. *pinifolia*, 189.
 ——— *speciosa*, 189.
 ——— (*Lavauxia*) *triloba*, 189.

Oligocottus maculosus, G., 533.
Oophora, Hentz, subgenus, 285.
 ——— *meridionalis*, Hentz, 286.
Opuntia arborescens, 208.
 ——— *Engelmanni* (Salm. Mss.), 207.
 ——— *frutescens*, 208.
 ——— *intermedia*, 206.
 ——— *Lindheimeri*, Gray, 207.
 ——— *macrorhiza*, " 206.
Orchestia Californiænsis, 516.
 ——— *Pickeringii*, 517.
 ——— *Pugettensis*, 516.
 ——— *Traskiana*, 517.
Oregonia gracilis, 456.
 ——— *hirta*, 456.
 Organic Relations of some of the Infuso-
 ria, 319.
 Ornithological Observations in New
 Brunswick, by Dr. T. M. Brewer, 297.
Orpheus Saturninus, 315.
Os calcis, arrangement of fibres of, 136.
Osteodesma nitidum, Gould, 390.
Othonia Picteti, 455.
Oxalis vespertilionis, 158.
Ozarkite, Examination of, 44.
 ———, 44; Schorlomite, 45.
Ozius Verreauxii, 464.

Pachygrapsus crassipes, 467.
Pachyphyllum, nov. gen. Lesq'x, 421.
 ——— *affine*, " 421.
 ——— *fimbriatum*, " 421.
 ——— *hirsutum*, " 421.
 ——— *laceratum*, " 422.
 ——— *lactuca*, " 422.
Palæmon brachydactylus, " 502.
 ——— *heterochirus*, 503.
Pandalus borealis, 501.
 ——— *Danæ*, Stimpson, 502.
 ——— *hypsinotus*, 502.
 ——— *platyceros*, 501.
 ——— *pubescentulus*, 501.
Panulirus interruptus, Stimpson, 491.
Paracrangon echinatus, 497.
Paronychia dichotoma, 152.
 ——— *Lindheimeri*, Engelm., 152.
Parthenium hysterochorus, 226.
Parthenope punctatissima, 458.
Passerina collaris, Vigors, 317.
Passiflora affinis, 233.
 ——— *tenuiloba* (Engelm. Mss.), 192.
Pavonia Wrightii, 161.
Pecopteris concinna, Lesq'x, 424.
 ——— *decurrens*, " 424.
 ——— *distans*, " 423.
 ——— *incompleta*, " 424.
 ——— *notata*, " 424.
 ——— *pusilla*, " 424.
 ——— *velutina*, " 423.
 Pectolite and Stellite, analyses of, and
 proposed union of, 40.
Pentacta albida, 525.
 ——— *frondosa*, 524.
 ——— *miniata*, 525.
 ——— *nigricans*, 525.

- Petalostemon virgatum*, 176.
Petricola bulbosa, Gould, 389.
Phaseolus diversifolius, 170.
 — *retusus*, 170.
Phillyra, nov. gen. Hentz, 24.
 — *mammeata*, " 25.
 — *riparia*, " 26.
Pholas ovoidea, Gould, 388.
Pholcus, 284.
 — *Atlanticus*, Hentz, 284.
Phoradendron, 212.
 — *Californicum*, 213.
 — *flavescens*, 212.
 — *juniperinum*, 213.
 — *lanceolatum*, 213.
 — *tomentosum*, 212.
 — *villosum*, 212.
Phoxus grandis, Stimpson, 521.
Phycis Americanus, 267.
Phyllocladus, nov. gen. Stimpson, 511.
 — *abdominalis*, " 511.
Phylloolithodes papillosus, 476.
Physa elata, Gould, 379.
Pinaropappus roseus, 232.
Pinnixa faba, 470.
Pinnularia calamitarum, Lesq'x, 431.
 — *confervoides*, " 431.
 — *fucoides*, " 431.
 — *horizontalis*, " 431.
 — *pinnata*, " 431.
Pisidium, Monograph of North American
 Species of, 348, 367.
Pisidium *abditum*, 359.
 — *Adamsii*, Prime, 352.
 — *altile*, 353.
 — *arcuatum*, Prime, 364.
 — *compressum*, " 356.
 — *dubium*, 354.
 — *equale*, 367.
 — *equilaterale*, Prime, 366.
 — *ferrugineum*, " 362.
 — *Kurtzii*, " 361.
 — *minus*, 360.
 — *notatum*, Prime, 365.
 — *obscurum*, " 359.
 — *regulare*, " 363.
 — *rotundatum*, Prime, 357.
 — *tenellum*, 358.
 — *variabile*, Prime, 351.
 — *ventricosum*, Prime, 355.
 — *zonatum*, " 364.
Plantæ Lindheimerianæ. Part II.
 141.
Platessa plana, 267.
 — *rostrata*, 268.
Platichthys rugosus, Girard, 541.
Plectrophanes nivalis, breeding habits of,
 306.
Pleuronichthys guttulatus, Girard, 542.
Pluchea camphorata, 224.
Pogonichthys inæquilateralis, 541.
Polanisia trachysperma, 150.
Polygala Lindheimeri, Gray, 150.
Polymnia uvedalia, 225.
Polynœ, Embryonic development of, 1.
Polypterus, new species of, from Africa,
 241.
Porcellana Edwardsii, 480.
 — *rupicola*, Stimpson, 480.
Porcellio gemmulatus, 506.
Portulaca Gilliesii, 155.
 — *lanceolata*, Gray, 154.
 — *oleracea*, 154.
 — *pilosa*, 155.
 — *retusa*, Gray, 154.
Prime, Temple. On the species of *Pisidium*
 found in the United States, 348.
Procellaria Bulwerii, Description of its
 Egg, 309.
Procellaria obscura, Egg of, 310.
Proserpinaca pectinacea, 191.
Prunus minutiflora, 185.
 — *rivularis*, 186.
Pselaphus Erichsonii Le Conte, 81.
 — *longiclavus*, " 81.
Pselaphidæ of the United States, Descrip-
 tions of, 65; Index to, 109; Table of
 corresponding genera and species of
 Europe and the United States, 67.
Psetichthys sordidus, G., 543.
Pseudograpsus nudus, 469.
 — *Oregonensis*, 468.
Psoralea cuspidata, 172.
 — *cyphocalyx*, Gray, 172.
 — *floribunda*, 173.
 — *hypogæa*, var. *scaposa*, 173.
Puffinus major, Egg of, 310.
Pugettia gracilis, 456.
 — *Richii*, 457.
Purpura pansa, Gould, 406.
Pyrrhula nigra, 317.

Randallia, nov. gen. Stimpson, 471.
 — *ornata*, 471.
Ranunculus repens, var. *macranthus*,
 141.
Rare Shells from California, 407.
Rhabdocarpus venosus, Lesq'x, 431.
Rhacocheilus toxotes, 541.
Rhexius, nov. gen. Le Conte, 102.
 — *insculptus*, " 103.
Rhinolithodes Wosnessenskii, 476.
Rhinoptera vespertilio, Girard, 544.
Rhus copallina var. *leucantha* and
 — *lanceolata*, 158.
 — *toxicodendron*, 159.
 — (*Lobadium*) *trilobata*, 159.
 — *virens* (Lindheimer, Mss.), 159.
Rhynchosia Texana, 171.
Rogers Henry D. Observations on Fossil
 Plants of Pennsylvania Coal-fields, 409.
Rosa foliolosa, 186.
Rudbeckia bicolor, 227.
Rutosma Texana, 158.

Salar iridea, Girard, 541.
Salmo fontinalis, 264.
 — *fontinalis*, habits of, 49.
 — *immaculatus*, H. R. Storer, 264.
 — *salar*, 264.

- Samuels, E., Collection of California Fishes, 533.
- Sanicula Canadensis*, 209.
- Sapindus marginatus*, 168.
- Saurothera Merlini*, 319.
- Schorlomite, Examination of, 45.
- Schrankia platycarpa*, Gray, 183.
- Scolopendrites*, nov. gen. Lesq'x, 425.
 ——— *grosse-dentata*, Lesq'x, 425.
- Scomber vernalis*, 260.
- Scorpænichthys marmoratus*, G., 535.
- Scymnus brevipinna*, 270.
- Scyra acutifrons*, 455.
- Scytodes cameratus*, Hentz, 35.
- Sedum sparsiflorum*, 209.
- Senecio aureus* ϵ . *Balsamitæ*, 231.
 ——— *Riddellii*, 232.
- Sesbania macrocarpa*, 172.
- Shells from the Gulf of California and the Pacific Coasts of California and Mexico, 374.
- Sicydium* (an *Melothriæ* sect.?) *Lindheimeri*, Gray, 194.
- Sicyos angulatus*, 193.
- Sida anomala*, 163.
 ——— *cuneifolia*, Gray, 165.
 ——— *filicaulis*, 163.
 ——— *filipes*, Gray, 164.
 ——— *heterocarpa*, Engelm., Mss., 163.
 ——— *physocalyx*, Gray, 163.
 ——— *tragiæfolia*, " 164.
- Sigaretus debilis*, Gould, 379.
- Sigillaria dilatata*, Lesq'x, 426.
 ——— *discoidea*, " 427.
 ——— *dubia*, " 427.
 ——— *fissa*, " 426.
 ——— *obovata*, " 426.
 ——— *polita*, " 427.
 ——— *Schimperi*, " 427.
 ——— *sculpta*, " 426.
 ——— *stellata*, " 427.
- Silphium laciniatum*, " 226.
- Simsia* (*Barrattia*: *æchenia calva glabra*) *calva*, 228.
- Solaster decemradiata*, 529.
- Solidago decemflora*, 223.
 ——— *incana* β . ? 223.
 ——— *nemoralis*, 223.
 ——— *speciosa* γ . *rigidiuscula*, 222.
- Somateria mollissima*, 298.
- Sophora* (*Styphnolobium*) *affinis*, 178.
 ——— (*Dermatophyllum*) *speciosa*, 178.
- Sphæroma amplicauda*, Stimpson, 510.
 ——— *Oregonensis*, 509.
- Sphenophyllum filiculme*, Lesq'x, 415.
 ——— *trifoliatum*, " 415.
- Sphenopteris abbreviata*, " 419.
 ——— *decipiens*, " 420.
 ——— *flagellaris*, " 420.
 ——— *glandulosa*, " 420.
 ——— *intermedia*, " 419.
 ——— *Newberryi*, " 420.
 ——— *plicata*, " 420.
 ——— *squamosa*, " 420.
- Spherillo affinis*, 505.
- Sphæralcea Lindheimeri*, Gray, 162.
- Spintharus*, Genus, Hentz, 283.
 ——— *flavidus*, " 284.
- Squilla Desaussurei*, Stimpson, 503.
- Stellaria prostrata*, 152.
- Stenosoma gracillimum*, 505.
- Stigmaria costata*, Lesq'x, 425.
 ——— *irregularis*, " 426.
 ——— *minuta*, " 426.
 ——— *radicans*, " 426.
 ——— *umbonata*, " 426.
- Stimpson, William. On the Crustacea and Echinodermata of the Pacific Shores of North America, 444.
- Storer, H. R. Observations on Fishes of Nova Scotia and Labrador, with descriptions of new species, 247.
- Streptanthus bracteatus*, 143.
 ——— *petiolaris*, 143.
- Structure, cancellated, of some of the Bones of the Human Body, 125.
- Styloniscus gracilis*, 506.
- Symphoricarpus spicatus* (Engelm., Mss.), 215.
- Synemosyna noxiosa*, Hentz, 288.
- Syngnathus Californiensis*, 543.
- Talinum aurantiacum*, Gray, 153.
 ——— *sarmentosum*, " 153.
- Tauschia Coulteri*, (Gray & Harv. ined.) 211.
- Tauschia* (*Museniopsis*) *Texana*, Gray, 211.
- Tellina* (*Strigilla*) *fucata*, Gould, 399.
 ——— *gemma*, " 399.
 ——— *miniata*, " 397.
 ——— *pura*, " 398.
 ——— *tersa*, " 398.
- Tephrosia Lindheimeri*, Gray, 172.
- Terebra arguta*, Gould, 380.
- Tetragnatha grallator*, Gould, 26.
 ——— *laboriosa*, " 27.
- Thalamia*, nov. subgen. Hentz, 34.
 ——— *parietalis*, " 35.
- Thalassidroma Leachii*, 21; Notice of its Egg, 301, 308.
- Theridion*, 271.
 ——— *Anglicanum*, Hentz, 275.
 ——— *blandum*, " 278.
 ——— *boreale*, " 274.
 ——— *cancellatum*, " 278.
 ——— *cruciatum*, " 275.
 ——— ? *fictilium*, " 282.
 ——— *foliaceum*, " 277.
 ——— *frondeum*, " 275.
 ——— *funebre*, " 276.
 ——— *globosum*, " 279.
 ——— *intentum*, " 278.
 ——— *lineatum*, " 281.
 ——— *leoninum*, " 276.
 ——— *lyra*, " 279.
 ——— *marmoratum*, " 273.
 ——— *morologum*, " 277.
 ——— *oscitabundum*, " 275.

- Theridion? *pertenuæ*, Hentz, 283.
 ———? *pullulum*, " 282.
 ——— *roscidum*, " 277.
 ——— *serpentinum*, " 273.
 ——— *sphærulea*, " 279.
 ——— *studiosum*, " 274.
 ——— *sublatum*, " 276.
 ——— *trigonum*, " 280.
 ——— *verecundum*, " 280.
 ——— *vulgare*, " 271.
 Thigh bone, neck of, arrangement of fibres in, 128; Theory of Mechanical Action of, 131.
 Tmesiphorus, nov. gen., Le Conte, 75.
 ——— *carinatus*, " 76.
 ——— *costalis*, " 77.
 Trichocera Oregonensis, 464.
 Trigonocarpum Hildreti, Lesq'x, 431.
 Trochus marcidus, Gould, 381.
 ——— *picoides*, " 381.
 ——— (Monodonta) *pyriformis*, Gould, 382.
 Troglodytes gorilla, skeleton of, 336.
 Trogon temnurus, 319.
 Turdus brunneus, 304.
 " " two species confounded under this name. Description of Nests and Eggs, 305.
 Turdus rubripes, 318.
 Tychus longipalpis, Le Conte, 82.
 ——— *minor*, " 82.
 Tyrannus caudifasciatus, 318.
 Tyrus compar, Le Conte, 80.
 Ungnadia speciosa, 167, 168.
 Uranium, oxide of; Chemical examination of a mineral containing it, 37.
 Venus tantillus, Gould, 406.
 Vernonia Lindheimeri, 217.
 Vertebræ human, arrangement of fibres in, 127.
 Vesicaria angustifolia, 145.
 Vesicaria argyræa, Gray, 146.
 ——— *densiflora*, " 145.
 ——— *Engelmanii*, 144.
 ——— *gracilis*, 147.
 ——— *grandiflora*, 146.
 ——— *Gordoni*, Gray, 149.
 ——— *Lindheimeri*, Gray, 145.
 ——— *recurvata*, 147.
 ——— *stenophylla*, Gray, 149.
 Vicia Leavenworthii, 170.
 Viguiera brevipes, 228.
 ——— β , 228.
 Viscum, 212.
 Vitis æstivalis, 166.
 — (Cissus) *incisa*, 166.
 — *vulpina*, 166.
 — *rupestris*, 165.
 Voluntary motion in embryo of Nemertes, 12.
 Wells, David A. On the Soil of Scioto Valley, Ohio; and Soil Analyses in general, 324.
 Whitney, J. D. Analyses of Pectolite and Stellite, 40; On Arkansite, 42; On Fibrous Hydrate of Magnesia or Nematolite, 36; On a Mineral containing Oxide of Uranium, 37.
 Wyman, J. On the arrangement of fibres in the cancellated structure of some of the Bones of the Human Body, 125; On the development of Anableps Gronovii, 432.
 Xanthornus dominicensis, 318.
 Zoarchus anguillaris, 263.
 Zizyphus lycioides, 168.
 ——— *obtusifolia*, 168.
 Zonotrichia monticola. Nest and eggs of, 307.
 Zornia tetraphylla, 177.

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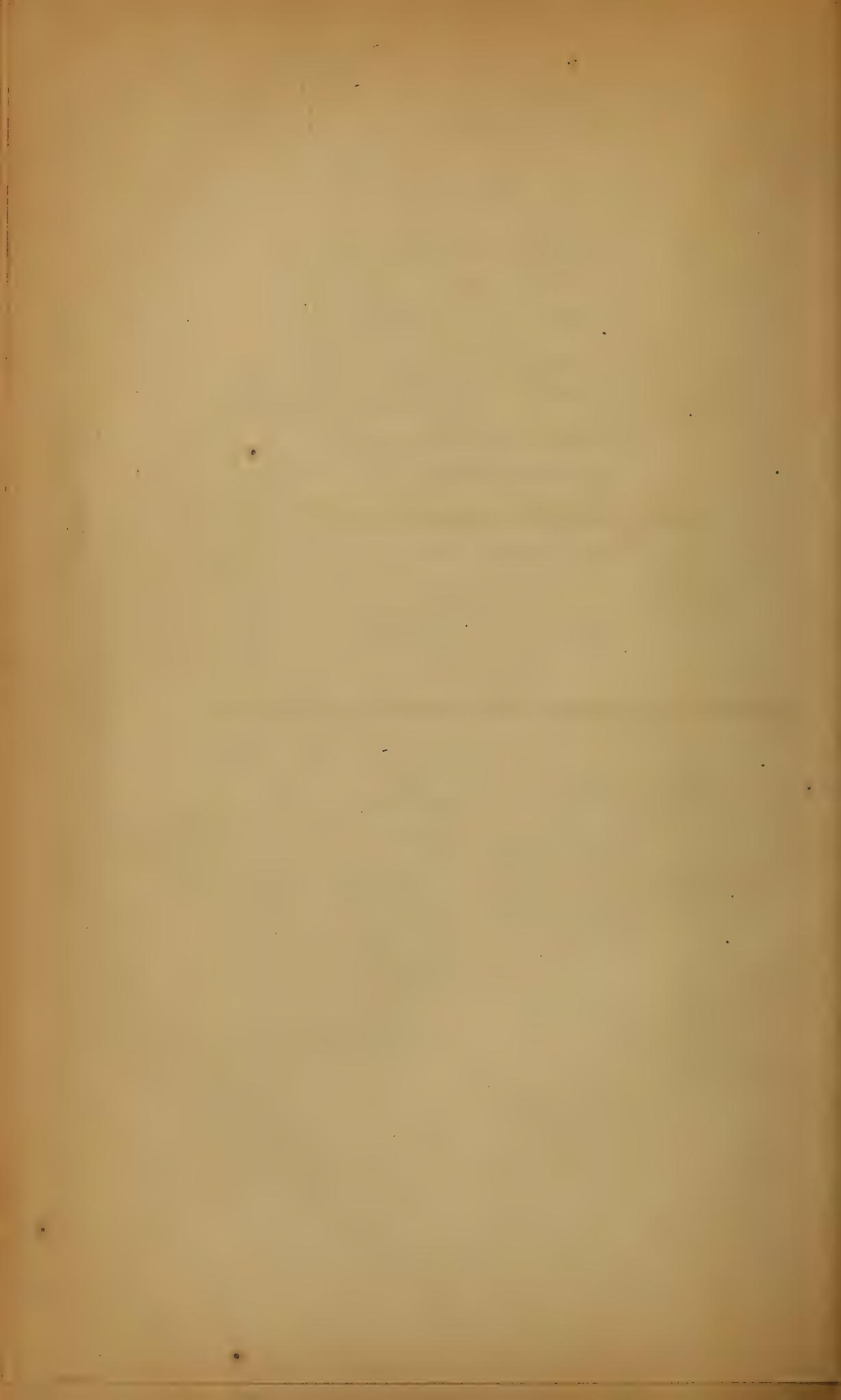
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Charles Stodder.



CONSTITUTION AND BY-LAWS

OF THE

BOSTON SOCIETY OF NATURAL HISTORY.

ACT OF INCORPORATION.

Commonwealth of Massachusetts.

In the year of our Lord one thousand eight hundred and thirty-one.

An Act to incorporate the BOSTON SOCIETY OF NATURAL HISTORY.

SECTION 1. *Be it enacted by the Senate and House of Representatives in General Court assembled, and by the authority of the same,* That Benjamin D. Greene, George Hayward, John Ware, Walter Channing, Edward Brooks, Amos Binney, Jr., D. Humphreys Storer, Simon E. Greene, Joshua B. Flint, William Grigg, George B. Emerson, and Henry Codman, with their associates, and such other persons as shall from time to time be duly admitted members of the Corporation hereby created, be, and they hereby are constituted a body corporate and politic, by the name of the BOSTON SOCIETY OF NATURAL HISTORY, and by that name they shall have perpetual succession, and shall be capable of suing and being sued, of prosecuting and defending unto final judgment, in all Courts and places whatsoever, and may have a Common Seal, with power to change the same at pleasure.

SECT. 2. *Be it further enacted,* That the said Society shall have power to hold real or personal estate by gift, grant, devise, or otherwise, and the same or any part thereof to alien or convey, provided that the clear annual income of such personal and real estate, shall not exceed the sum of three thousand dollars, nor be applied to any other purposes than the encouragement and promotion of the science of Natural History.

SECT. 3. *Be it further enacted,* That said Society shall have power to elect a President and all other necessary officers; to make

rules and by-laws for the election and government of its members, for the management of its property, for collecting annual contributions from its members, for regulating the times and places of meeting, for expelling such members as refuse to comply with the by-laws or regulations, and for the managing of the affairs of the Society, provided such rules and by-laws be not repugnant to the Constitution and Laws of this Commonwealth, or of the United States.

SECT. 4. *Be it further enacted*, That the persons herein before named, or any three of them, shall have power to call the first meeting of the members of said Society, in such manner as they may think proper.

SECT. 5. *Be it further enacted*, That this Act may be altered, amended, or repealed, at the pleasure of the Legislature.

In House of Representatives, February 23, 1831, passed to be enacted.
WM. B. CALHOUN, *Speaker.*

In Senate, February 24, 1831, passed to be enacted.
SAML LATHROP, *President.*

FEBRUARY, 25, 1831.

Approved,

LEVI LINCOLN.

A Copy of the Original Act,
Attest,

EDWARD D. BANGS,
Secretary of the Commonwealth.

An Act to authorize the BOSTON SOCIETY OF NATURAL HISTORY to amend its Constitution.

Be it enacted by the Senate and House of Representatives, in General Court assembled, and by the authority of the same, as follows: —

The BOSTON SOCIETY OF NATURAL HISTORY is hereby authorized and empowered to amend the eighth article of its Constitution, by inserting after the word "members," in the third line of the printed copy thereof, the following words: "present at any two consecutive meetings of the Society, the members having been first duly notified of any proposed alteration."

[Approved by the Governor, April 3d, 1852.]

CONSTITUTION AND BY-LAWS

OF THE

BOSTON SOCIETY OF NATURAL HISTORY.

CONSTITUTION.

ARTICLE I.

THE Society shall be called the BOSTON SOCIETY OF NATURAL HISTORY.

ARTICLE II.

It shall consist of Members, Corresponding and Honorary Members, and Patrons.

ARTICLE III.

Members shall be chosen by ballot, after having been nominated at the meeting immediately preceding that on which the ballot is taken: the affirmative votes of *three fourths* of the members present shall be necessary to a choice. Corresponding and Honorary members shall be elected in a similar manner, but *their* nomination shall proceed from the Council. Any person who shall contribute at one time, to the funds of the Society, a sum not less than fifty dollars, shall be a Patron.

ARTICLE IV.

Members only shall be entitled to vote, to hold office, or to transact business: Corresponding and Honorary Members and Patrons may attend the meetings, and take part in the scientific discussions of the Society.

ARTICLE V.

The officers of the Society shall be a President; two Vice-Presidents, first and second; a Corresponding Secretary; a Recording Secretary and Clerk; a Treasurer; a Librarian; ——— Curators, and a Cabinet Keeper; who, together, shall form a Board for the management of the concerns of the institution, and be called the Council.

ARTICLE VI.

Officers shall be chosen by ballot, and a majority of votes shall be sufficient for a choice.

ARTICLE VII.

By-laws, for the more particular regulation of the Society, shall from time to time be made.

ARTICLE VIII.

This Constitution may be altered or amended in any of the preceding articles, by a vote to that effect, of three fourths of the members present at any two consecutive meetings of the Society, the members having been first duly notified of any proposed alteration: but the article which immediately follows this shall be unalterable.

ARTICLE IX.

The consent of every member shall be necessary to a dissolution of the Society. In case of a dissolution, the property of the Society shall not be distributed among the members, but donors may claim and receive such donations as they have made to the museum, and the remainder shall be given to some public institution, on such conditions as may then be agreed on; and the faithful performance of such conditions shall be secured by bonds, with sufficient penalties for the non-fulfilment thereof.

BY - L A W S .

SECTION I.

OF MEMBERS.

ART. 1. Every person who shall have been elected a member of this Society, shall subscribe an obligation, promising to conform to the Constitution and By-laws thereof, and shall pay into the treasury an initiation fee of five dollars. He shall possess none of the rights of membership, nor shall his name be borne upon the roll of members until the said fee shall have been paid. Any person of respectable character and attainments, residing in the city of Boston or its immediate neighborhood, shall be eligible as a member of this Society.

ART. 2. Corresponding and Honorary members shall not be required to pay an initiation fee, or other contribution. Corresponding members shall consist of persons not resident in the city, who may be interested in the study of Natural History, or desirous of promoting the interests of the Society. Honorary members shall be selected from persons eminent for their attainments in science, on whom the Society may wish to confer a compliment of respect.

ART. 3. Persons who have been unsuccessful candidates for admission, shall not be again proposed as members until after one year.

ART. 4. Any member may withdraw from the Society, by giving written notice of his intention, and paying all arrearages due from him. A refusal or neglect on the part of a member to pay any due for the space of one year, shall be considered an intimation of a wish to withdraw from the Society; and it shall be the duty of the Treasurer to report the names of such delinquent

members yearly to the Council, at their first meeting after the annual meeting, who may thereupon order their names to be stricken from the rolls.

ART. 5. Members may be expelled from the Society, by a vote of three fourths of the members present, at a meeting specially called for that purpose, by a notice given at least one month previous.

SECTION II.

OF OFFICERS AND THEIR DUTIES.

ART. 1. The President shall preside at meetings of the Society and of the Council; shall preserve order, regulate debates, and announce donations and other interesting information.

ART. 2. The Vice-President shall perform the duties of President, in his absence.

ART. 3. The Corresponding Secretary shall conduct the correspondence of the Society, and keep a record thereof; shall keep the common seal; acknowledge all donations; notify corresponding members of their election, and receive and read to the Society all communications on scientific subjects which may be addressed to him.

ART. 4. The Recording Secretary and Clerk shall take and preserve correct minutes of the proceedings of the Society and Council, in a book to be kept for that purpose; shall have the charge of the papers and documents belonging to the Society; shall notify members of their election, and committees of their appointment; shall call meetings when directed by the President; and shall give written notice to the Treasurer and Corresponding Secretary of all matters which shall occur at any meeting requiring the action of those officers.

ART. 5. The Treasurer shall have charge of all moneys and other property of the Society, except their Library and Museum; shall collect all fees and assessments, and receive any donations in money which may be made to it; shall pay all accounts against the Society, when the same are approved by a vote of the Council; shall keep a correct account of all receipts and expenditures in a book belonging to the Society, and shall, at each annual meeting, and at other times when required by the Council, make a detailed report of the same.

ART. 6. The Librarian shall have control of the books belonging to the Society, or deposited for their use ; he shall make a correct catalogue of them, and keep a record of such as are taken from the Library by the members ; shall permit the use of the Library to members and others, under such regulations as may from time to time be adopted, and shall annually report the condition of the Library.

ART. 7. The Curators shall be intrusted with the care of the Museum. They shall, within six weeks after a donation is made, deposit such donation in their particular Cabinets. Each Curator shall have his particular department allotted to him at the time of his election. The Curator having charge of any division of the collection, shall keep the keys thereof ; shall arrange the specimens after some approved system, and, so far as is practicable, label them with the names they bear in such system. He shall keep a correct catalogue of articles in his care, and shall be alone authorized to select duplicate specimens from the Cabinet, and effect exchanges. He may select from among the members of the Society a person to assist him in arranging and labelling the specimens. The Curators shall, at the annual meeting, make a written report to the Society, concerning the Museum, the state of the different Collections, the additions made during the past year, and the deficiencies which exist.

ART. 8. The Cabinet Keeper shall have the general charge of the room or rooms belonging to the Society ; shall see that their contents are kept in the best order ; shall select a competent person as a porter or attendant, and this person shall be considered as under his immediate control. He shall keep the Donation Book, and see to the execution of the duties enjoined in Art. 4, Sec. 5. He shall also, when convenient, attend personally, during the days of public visitation.

ART. 9. The Council shall provide suitable rooms for the meetings of the Society, for lectures, and for the Museum ; they shall select the subjects of the lectures, regulate the order in which they shall be given, and determine on what terms the public may be admitted to them ; appoint Lecturers, and fix their compensation ; authorize the expenditure of money for the increase of the Library and Museum, and designate the books which shall be purchased ; and do any other acts not inconsistent with the Constitution and

By-Laws, which they may think necessary to the continuation and success of the Society.

SECTION III.

OF ASSESSMENTS.

ART. 1. Every member who shall have resided in the city of Boston, or within ten miles thereof, during the six months preceding the first of October in each year, or during any part of said term, shall be subject to an annual assessment of three dollars, payable on that day; Provided, that no assessment shall be required of any member during the six months succeeding his election.

ART. 2. Any member who shall pay into the treasury at one time, the sum of thirty dollars, shall be exempt from the annual assessments.

ART. 3. Whenever a member of this Society shall become acquainted with a young man of good moral character, who is desirous of joining the Society from a pure love of Natural Science, and shall be aware of his inability to become a member should an initiation or assessment fee be demanded,—he shall be allowed to nominate the said individual in the usual way, sparing his feelings by making no reference to his situation. But in case of his election, he shall state his situation to the Treasurer, and pledge the honor of the individual elected, that all the fees which would ordinarily be demanded, shall be promptly paid, except arrears, whenever his situation will allow; and the Treasurer shall make known his circumstances to no one save his successor, who shall as carefully guard his feelings.

SECTION IV.

OF THE LIBRARY.

ART. 1. The Library shall consist of works on Natural History, and other subjects connected therewith.

ART. 2. The selection of books to be purchased for the Library shall be made by the Council; but for the present, such books as are not found in other public Libraries in the city of Boston, shall be purchased in preference.

ART. 3. Members may deposit books in the Library for the use of the Society; but such books shall not be taken from the Library-room, without the consent of the owners.

ART. 4. The Society shall be responsible for the safe-keeping and careful usage of books deposited, and shall recompense the owners for any damage which may occur to them while in the Society's keeping.

ART. 5. Books owned by the Society may be taken from the Library by members, upon signing a receipt for the same, and promising to make good any damage which may be sustained when in their possession, and to replace the same if lost.

ART. 6. The Council may prohibit valuable and rare books from circulation.

ART. 7. Books shall not be kept from the Library more than one calendar month, by the same person, without renewing the loan.

ART. 8. The Council may appoint particular days for taking books from the Library.

ART. 9. All books shall be returned to the Library on the third Wednesday of April, annually, and remain one fortnight; and any person having then one or more books, and neglecting to return the same, shall be reminded of his delinquency by the Librarian.

ART. 10. The Council may extend the use of the Library to other persons than members.

SECTION V.

OF THE MUSEUM.

ART. 1. The Museum shall consist of collections in the different departments of Natural History.

ART. 2. All specimens sent to the Museum shall be considered the property of the Society, unless the owner shall make known in writing his wish to retain the privilege of withdrawing them.

ART. 3. When a member deposits in the Museum a sufficient number of articles to fill an entire case, a key of the case shall be at all times at his command.

ART. 4. The names of donors, with the articles given, shall, in every instance, be recorded in a book kept for that purpose, by the Cabinet Keeper, under the direction of the Curators of each department.

ART. 5. No specimens shall be removed from the Museum, without the leave of the Curator of the department to which they

belong, who shall take a receipt for the same, and give notice thereof to the Cabinet Keeper, and be himself responsible for the restoration of the same in good order.

ART. 6. Members, Honorary and Corresponding Members, and Patrons, shall have access to the Museum at all times, and the public occasionally, subject to the regulations of the Council.

ART. 7. Members or other persons desirous of examining or describing specimens, or of taking them from the cases for the purpose of study, must apply to the Curators who have charge of them, who may grant such request at discretion.

SECTION VI.

OF LECTURES.

ART. 1. Public lectures, when judged expedient by the Council, shall be given under the auspices of the Society, on the several branches of Natural History.

ART. 2. The order in which the lectures shall follow each other, shall be fixed by the Council.

ART. 3. Members of the Society shall have free admission to the lectures; other persons shall be admitted on such terms as the Council shall prescribe.

ART. 4. The moneys received for admission to the lectures shall go to pay the compensation of Lecturers and other expenses; the balance, if any, shall be paid into the Treasury of the Society.

SECTION VII.

OF MEETINGS.

ART. 1. A meeting shall be held on the first Wednesday in May annually, for the choice of officers and other general purposes. At this meeting, or at a subsequent meeting, if so ordered by a vote of the Society, reports shall be made, by the Treasurer, on the state of the Funds; by the Librarian, on the condition of the Library; and by the Curators, on the condition of the Museum.

ART. 2. Stated meetings of the Society shall be held on the first and third Wednesday of every month.

ART. 3. Six members shall form a quorum for business.

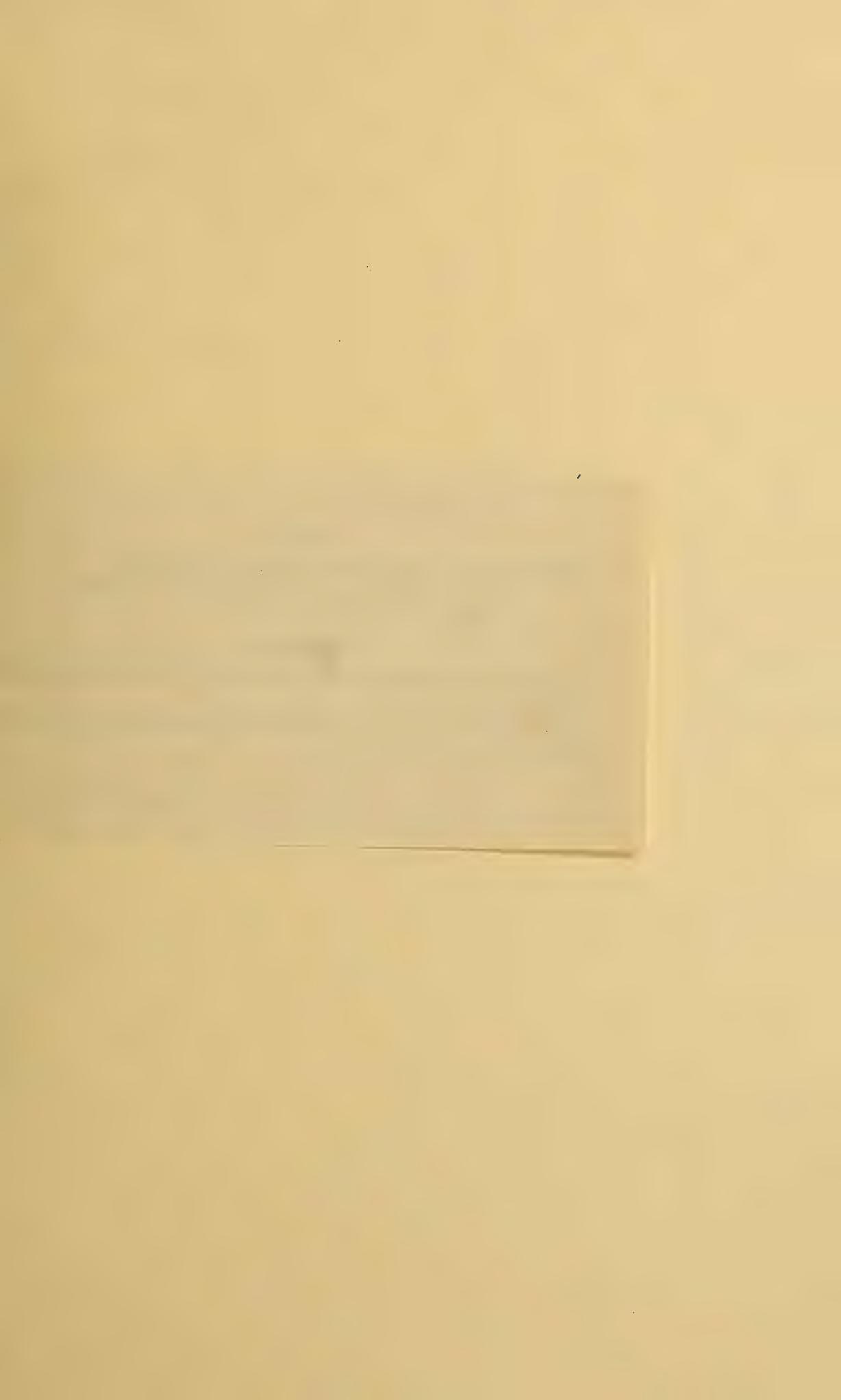
ART. 4. Members will be expected to communicate at the meetings of the Society, such interesting information as may come into

their possession respecting Natural History in general, and particularly any new facts respecting that of our own country.

ART. 5. Written communications on subjects connected with Natural History, may be made by the members ; the subjects, and time of reading, shall be chosen by themselves ; but after the same shall have been read, the opinions and facts therein contained, shall be open to remark by other members.

ART. 6. The order of proceeding at meetings shall be as follows, to wit :

1. Record of preceding meeting read.
2. Written communications read.
3. Verbal communications made.
4. Business called up by special resolutions.
5. Donations announced.
6. Candidates for membership proposed.
7. Adjournment.



NOTE.

Figures 1 to 6, Plate XI, are twice the size of the shell.

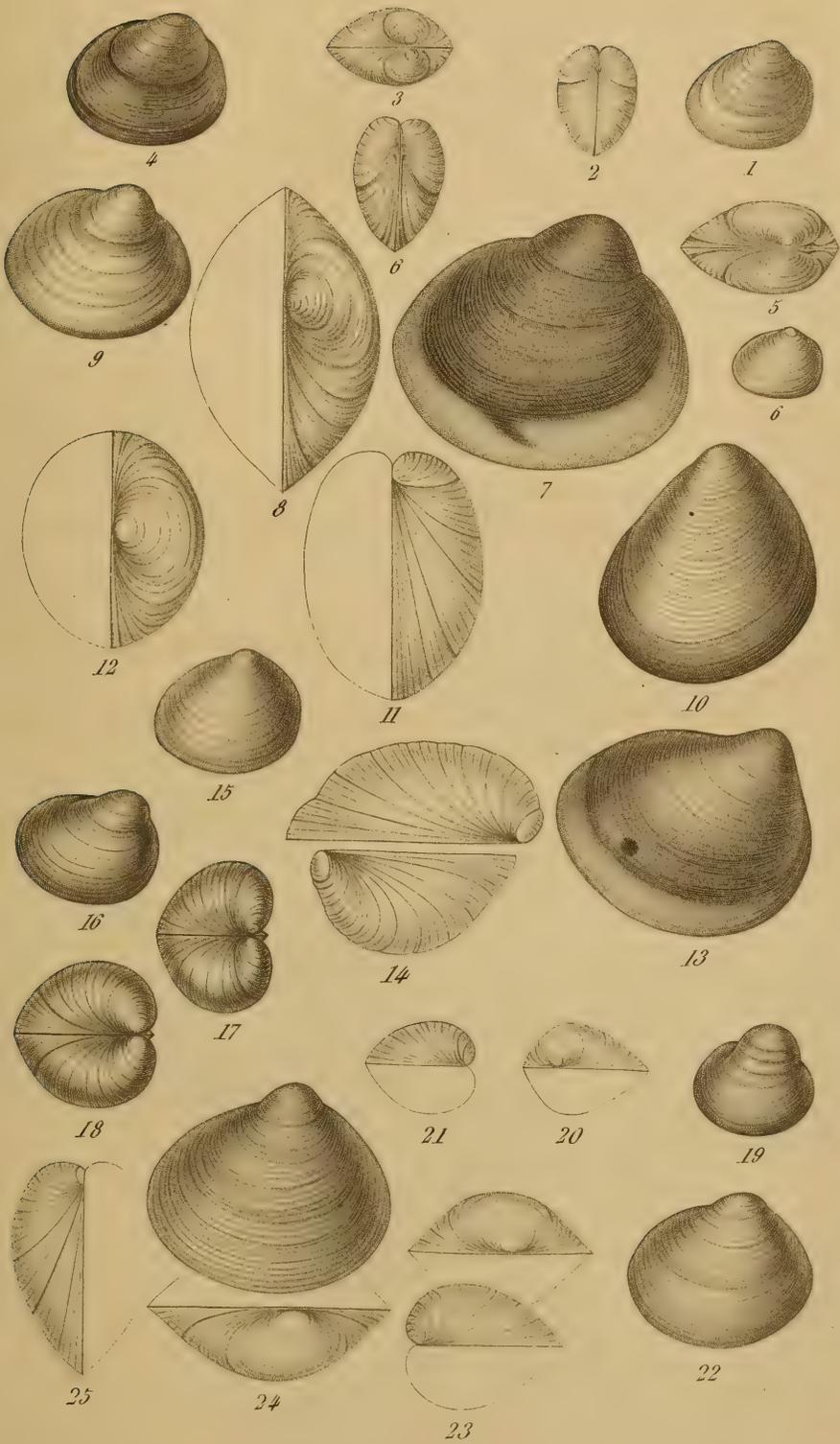
“ 7 to 25, Plate XI, are six times the size of the shell.

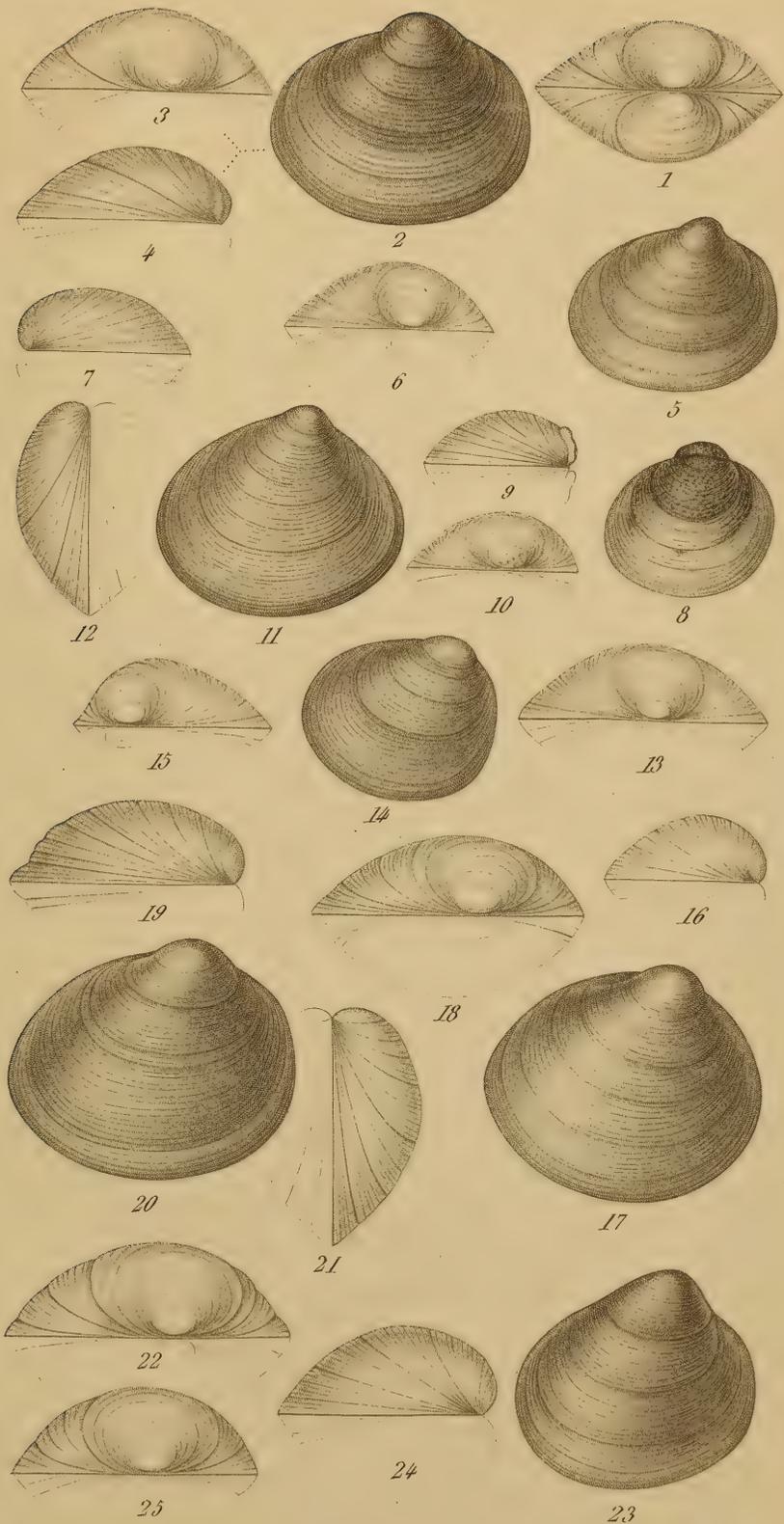
“ 1 to 25, “ XII, “ “ “ “

ERRATA.

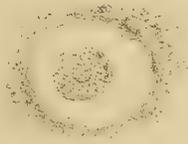
Species No. 8, *Pisidium tenellum*, p. 358, line 11, is represented by Plate XI, figures 22 and 23 only.

Species No. 11, *P. minus*, p. 360, line 17, is represented by Plate XII, figures 2, 3, 4, instead of 5, 6, 7.





II.



I.



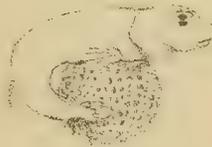
III.



IV.



VI.



V.



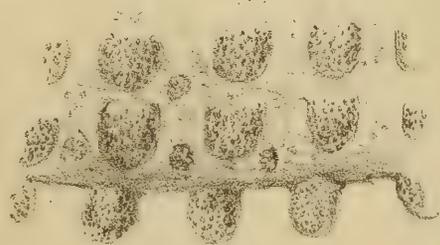
VII.

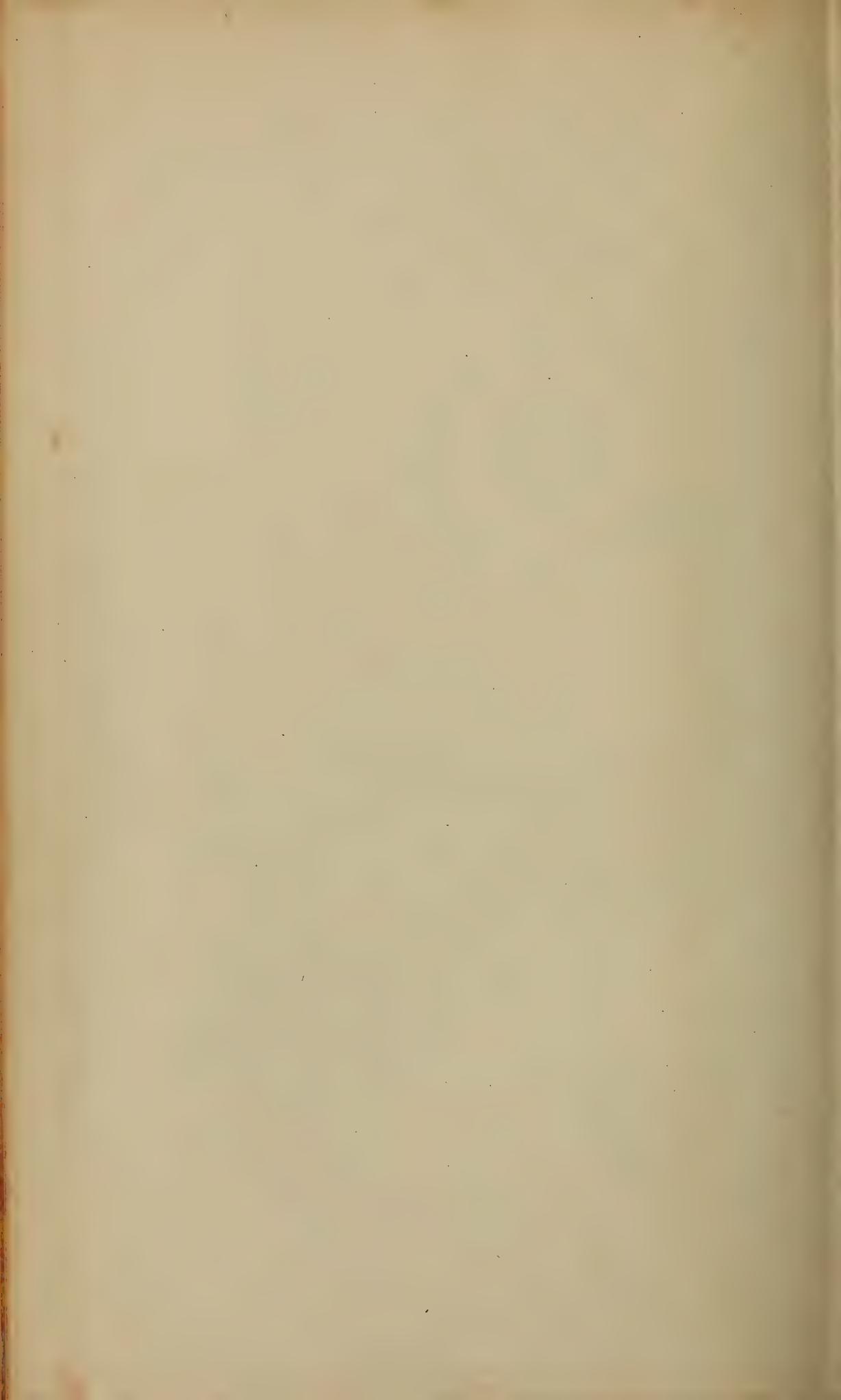


IX.



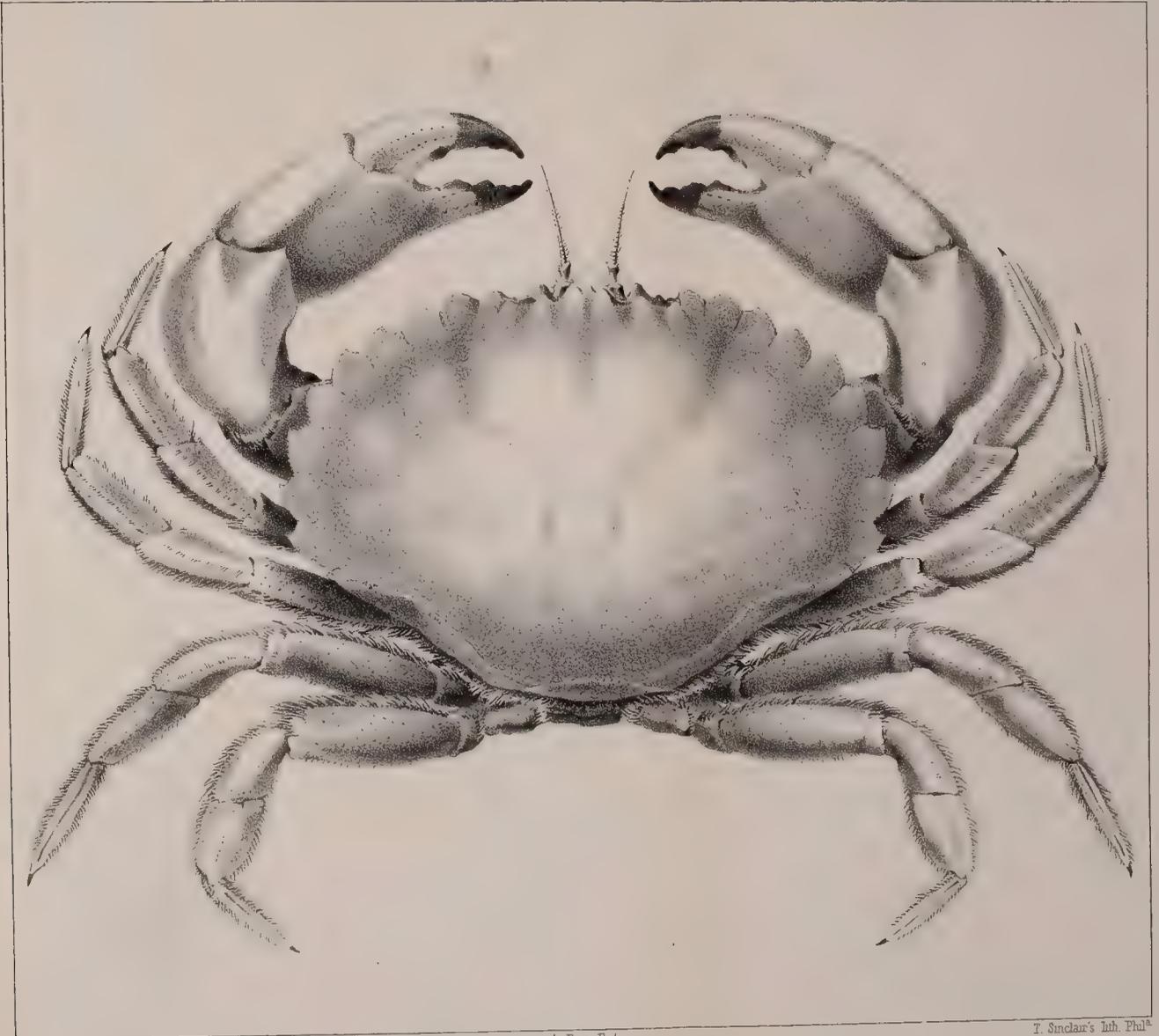
VIII.





V6L

A



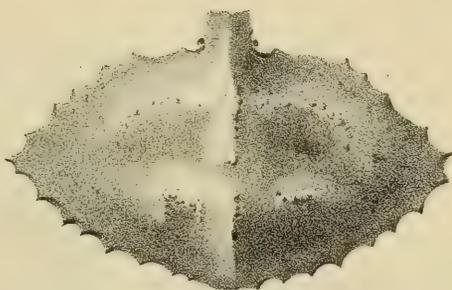
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A Frey Eng.

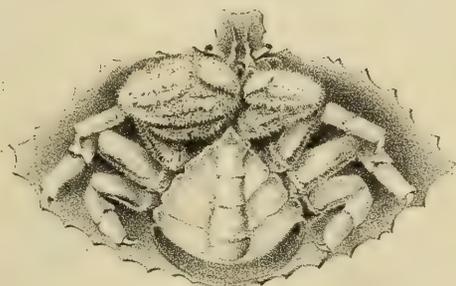
T. Sinclair's Lith. Phil^a



3.



1.



2.



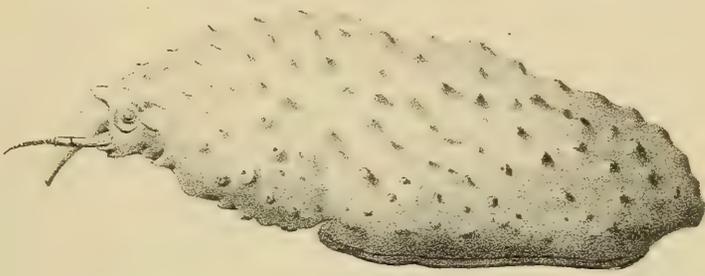
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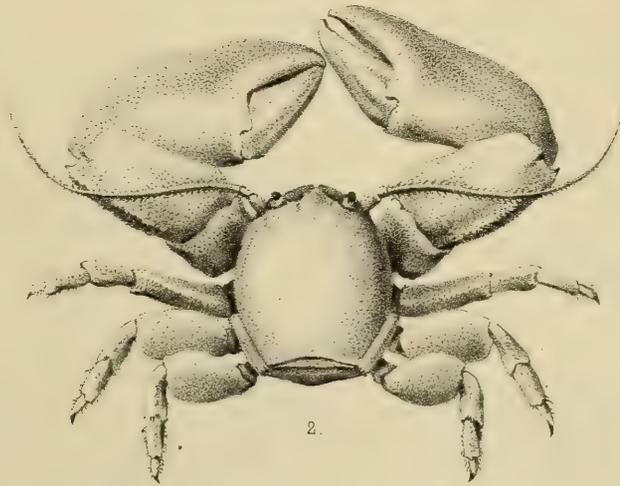
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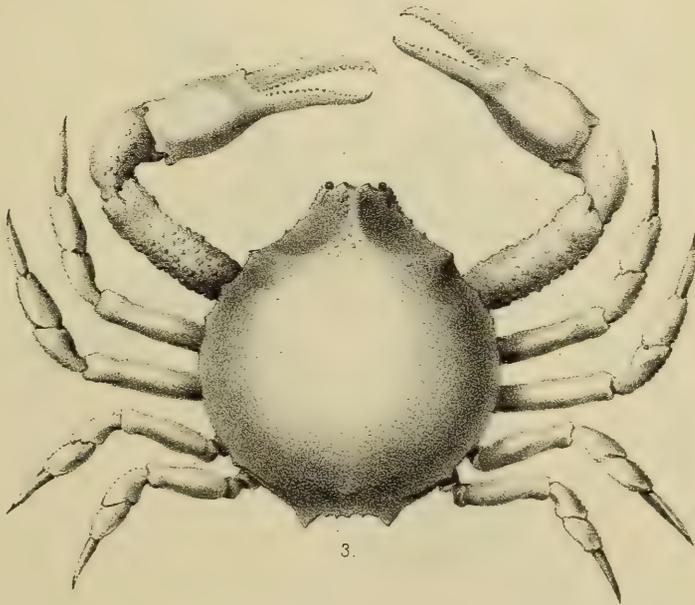
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1.



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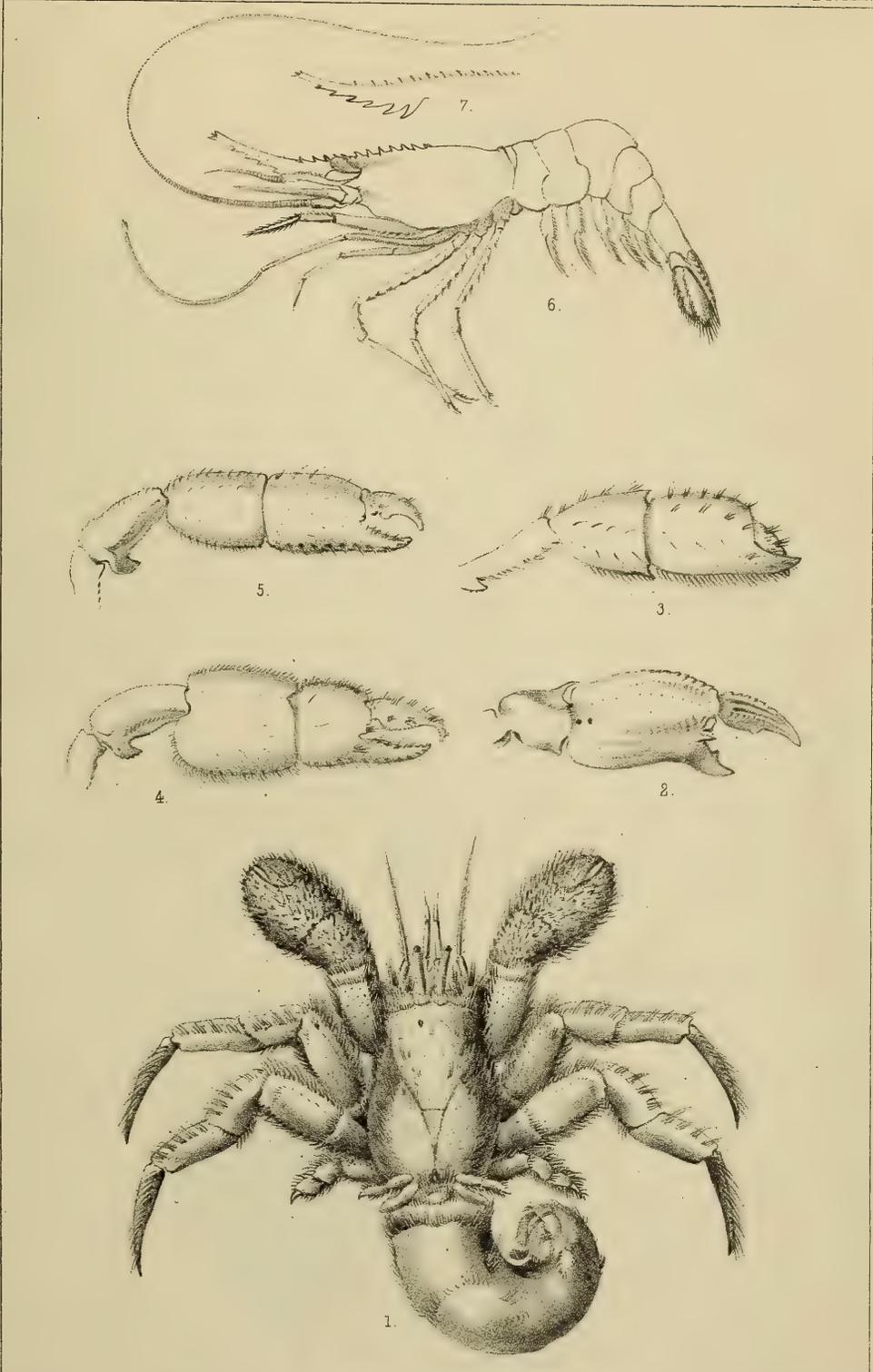


3.

A. Schönborn, Del.

A. Frey, Eng.

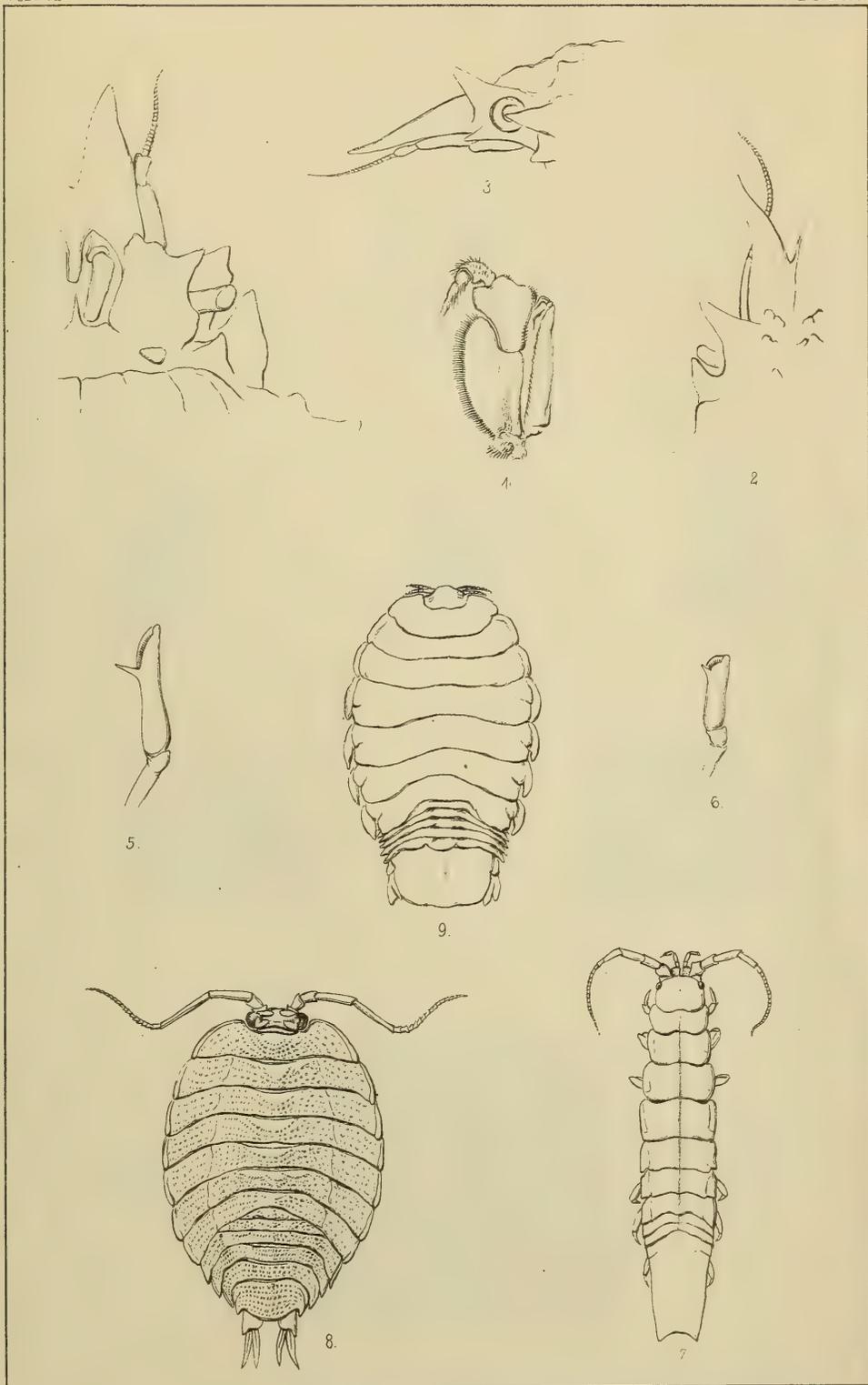
T. Sinclair's Lith, Phil^a



A Schönborn et W.S. del.

A. Frey Eng.

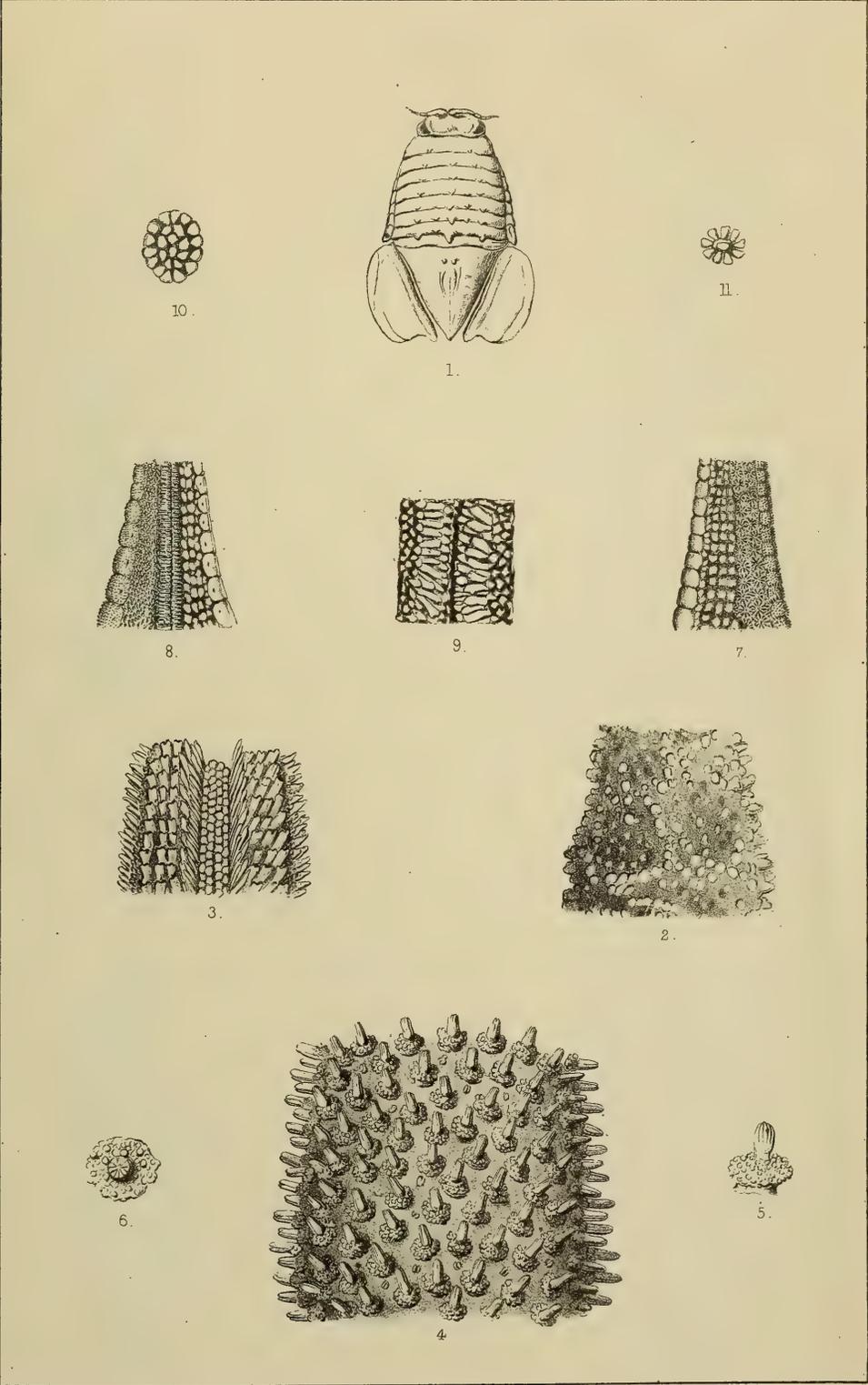
T. Sinclair's lith. Phil^a.

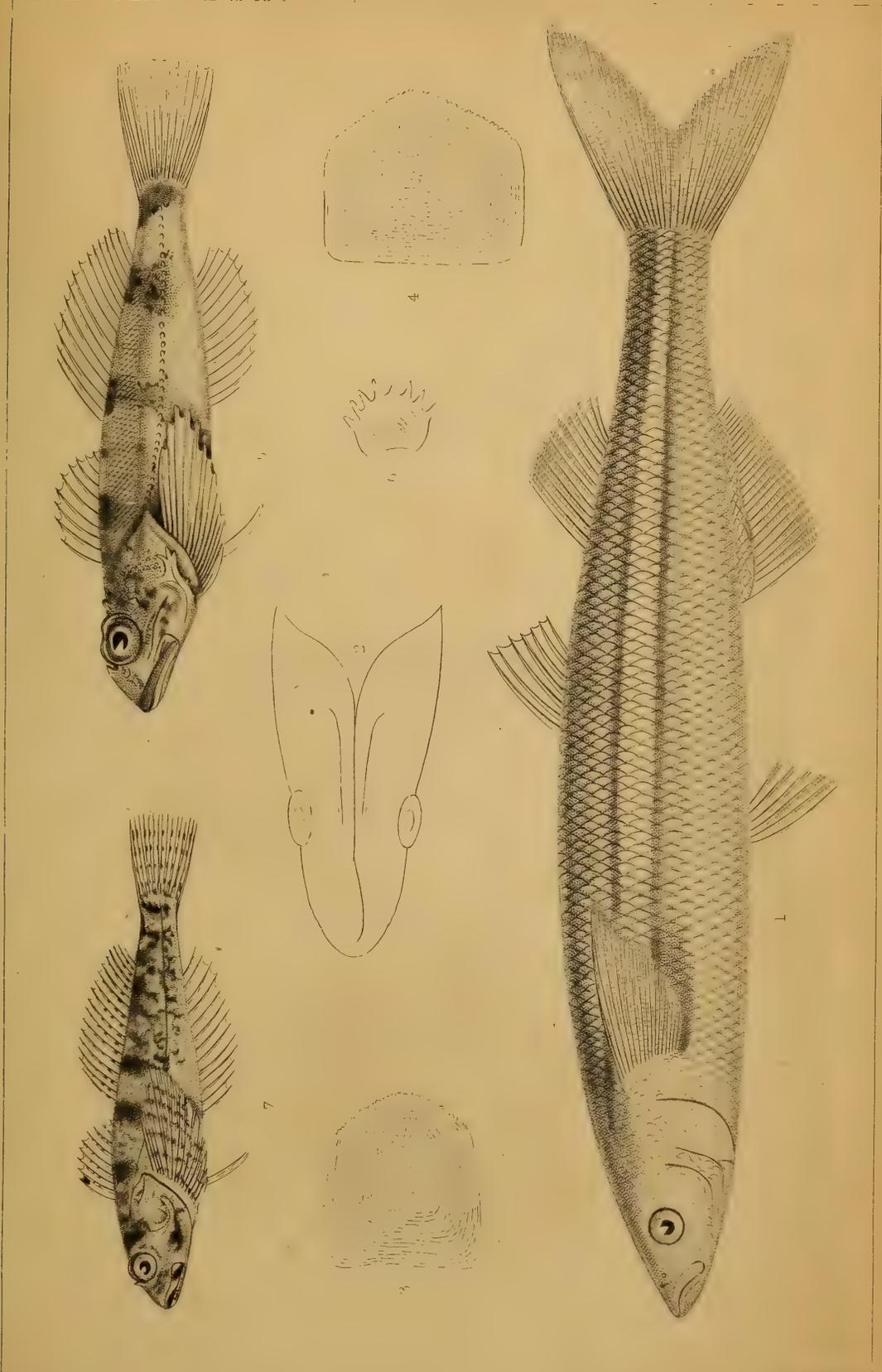


W. S. Del.

A. Bigot, fac

T. Sinclair's lith, Phil^a





J.H. Richard del.

H. Merzbach sc.

Figs 1-4. *Atherinopsis californiensis*.—Grd. Figs 5-6. *Artedius notospilotus*.—Grd.
 Fig 7. *Oligocottus maculosus*.—Grd.



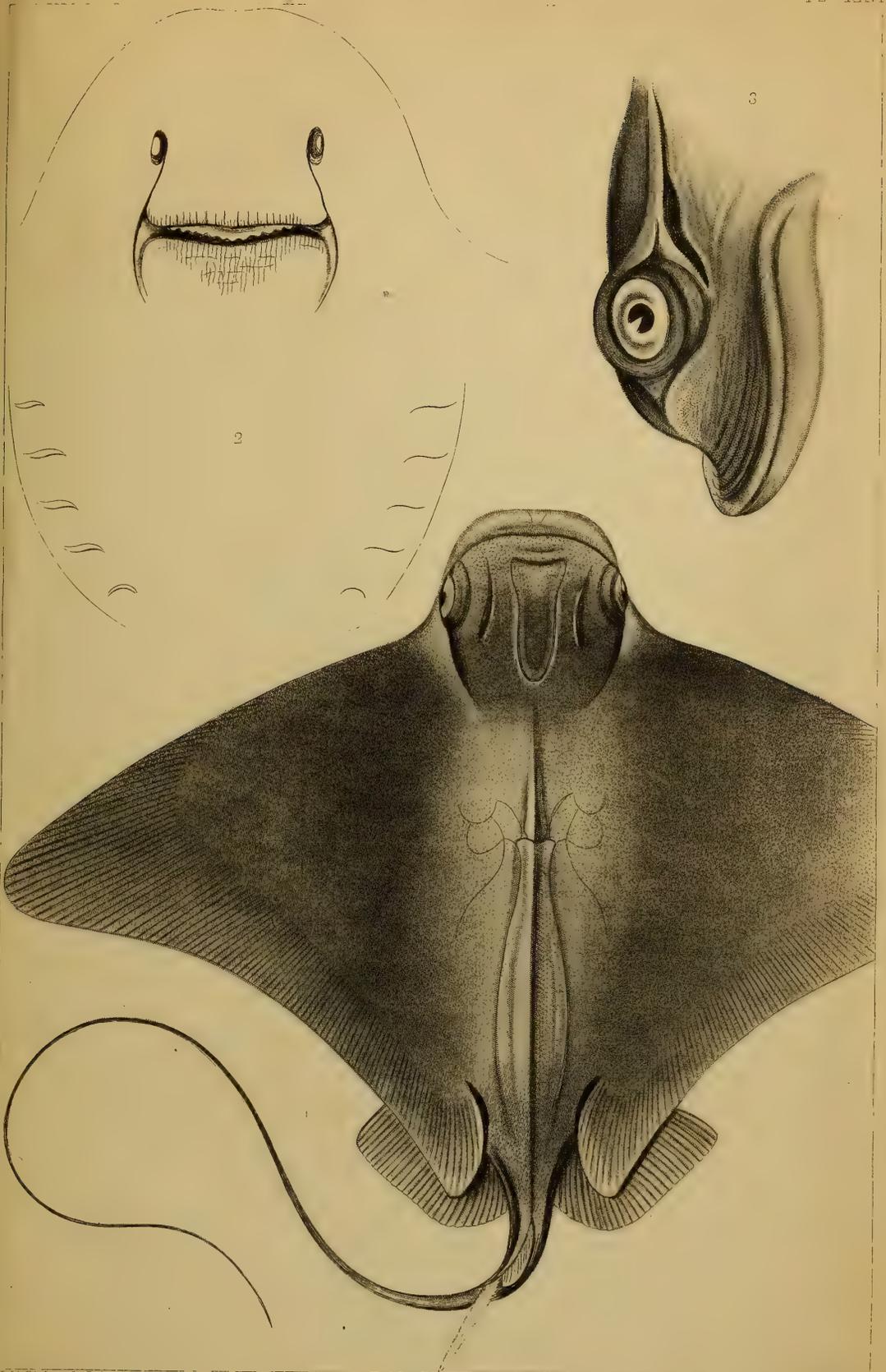


H. Richard del.

R. Metzger sc.

Figs. 1-4. Pleuronichthys guttulatus - Grd. Figs. 5-8. Gobius newberii - Grd.

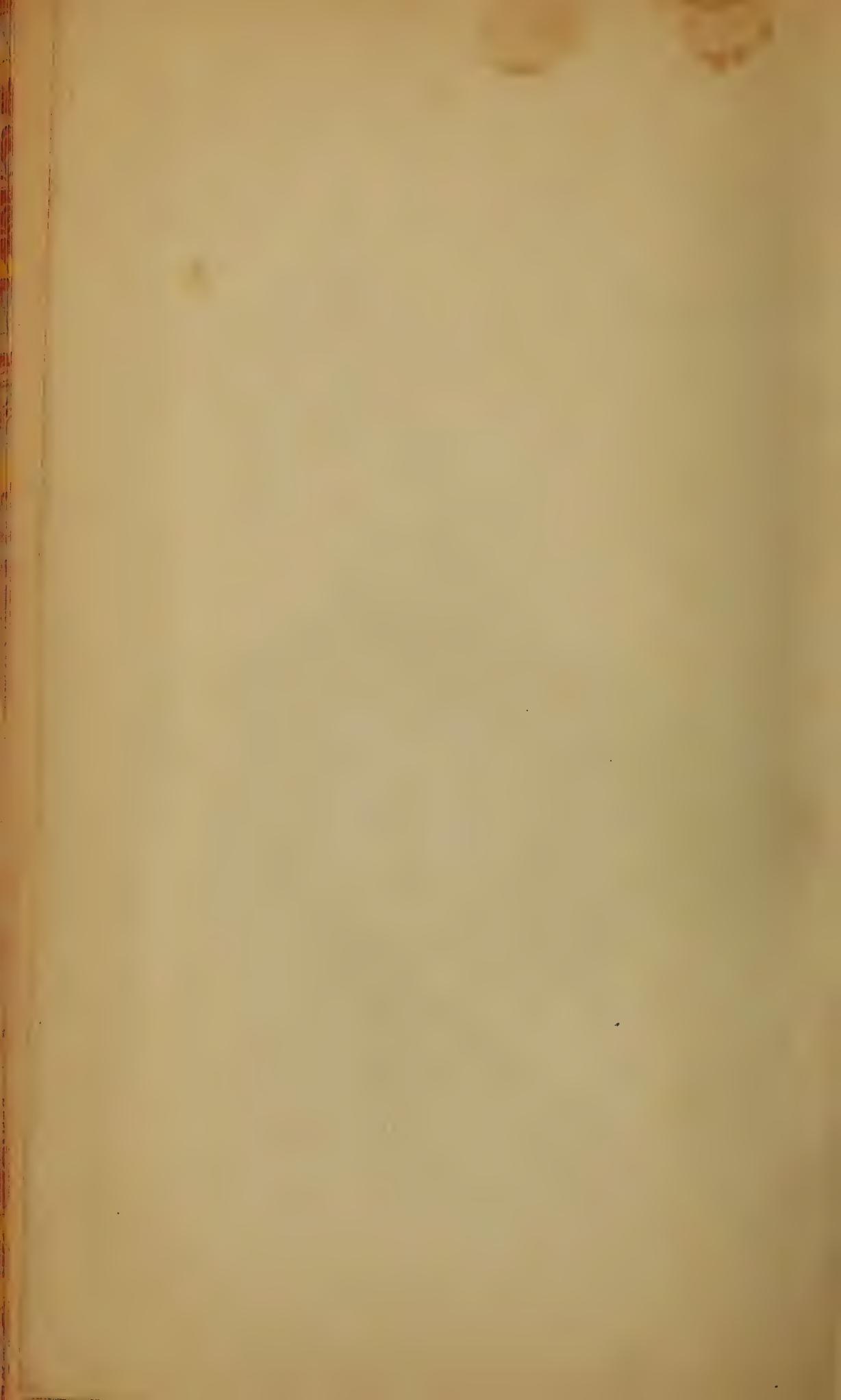


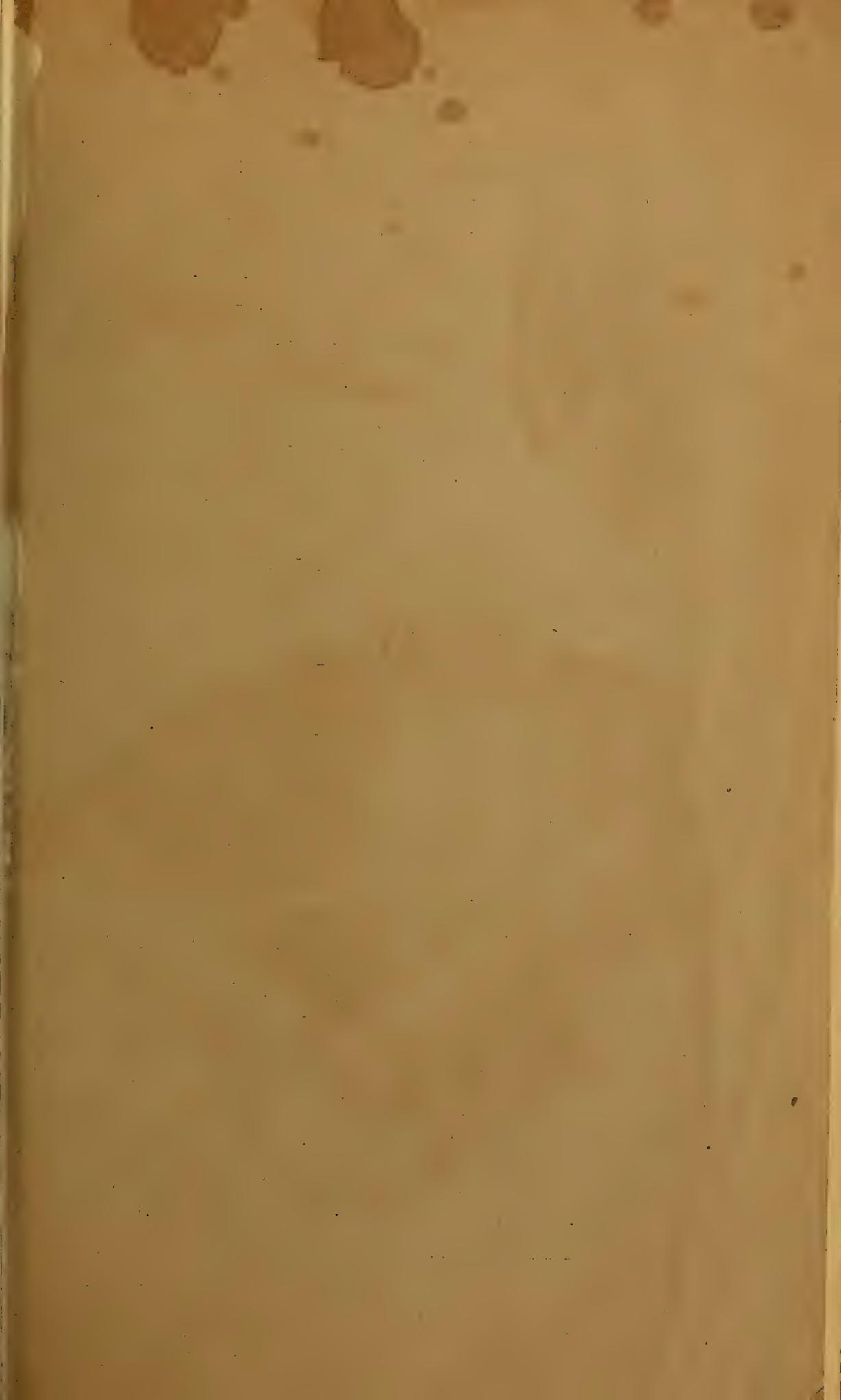


J. H. Richard, del.

B. Metzgeroth sc.

Rhinoptera vespertilio — Grd.





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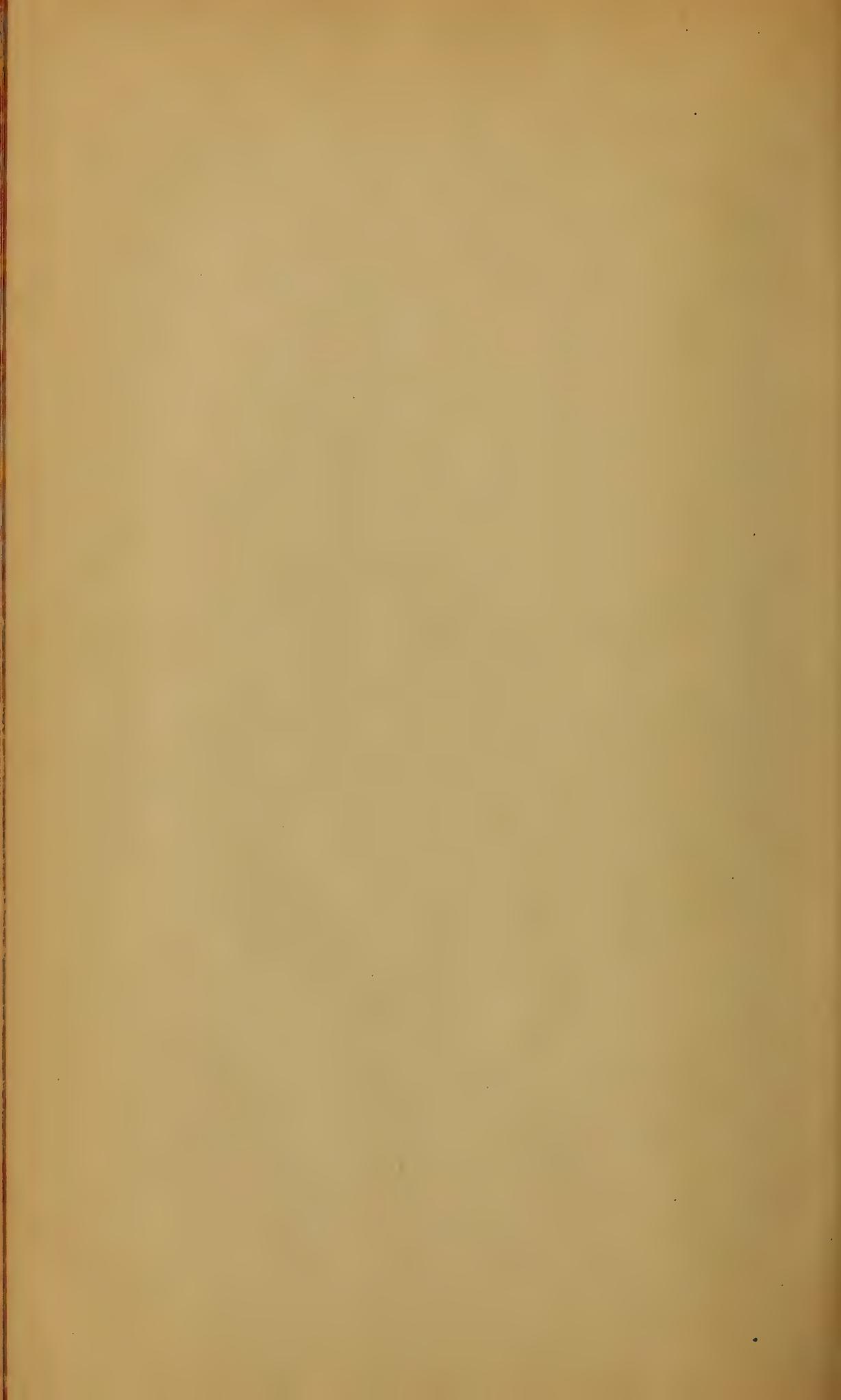
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