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CONTRIBUTIONS

TO THE

NATURAL HISTORY

OF

KERGUELEN ISLAND,

MADE IN CONNECTION WITH THE UNITED STATES TRANSIT-OF-VENUS
EXPEDITION, 1874-75.

BY

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P R E F A C E .

This bulletin embodies the results of an examination of the eggs contained in my collection, the identification of the plants by the various specialists to whom they had been sent and the determinations of the remainder of the zoölogical collections from Kerguelen Island. The appendix contains a brief description of the collections of Surg. E. Kersbner, U. S. N., in the Chatham and Auckland Islands and in New Zealand; and of Mr. I. Russell, in New Zealand.

The unknown young bird, supposed to be a *Puffinus* (Bull. No. 2, pp. 26 and 27), proves to belong to *Æstrelata lessoni*; and many of the eggs, being new to museums, present points of greater or less scientific interest.

The botany of Kerguelen Island had already, as is well known, been very thoroughly studied by Dr. J. D. Hooker, in connection with Sir James Clarke Ross' Antarctic Expedition (1839-'41). His great monograph upon this branch of natural history, the *Flora Antarctica*, has left little for the botanical collector to do in that field, and, magnificently illustrated as it is, was of constant service to me while on the island. But seventeen flowering-plants are included in the collection, belonging to eleven natural orders; four of these being grasses. Three varieties of *Ranunculus* are added to Dr. Hooker's list, while two Phænogams attributed by him to the locality (a *Juncus* and *Limosella aquatica*) were not found. Since, however, this distinguished observer did not have an opportunity of visiting the island during the season of flowering, many of these specimens have their weight in determining points which still remained doubtful in his mind; notably with regard to *Lyallia Kerguelensis*.

Other plants not heretofore attributed to this locality are: *Polypodium vulgare*, *P. (Grammitis) australe*, and *Cistopteris fragilis*, among Ferns; *Grimmia frondosa* (new species) and *G. kidderi* (new species), among Mosses; *D'Urvillea harveyi*, *Rhodomela gaimardi*, *Callithamnion ptilota*, and *Codium adhaerens*, among Sea Weeds; and *Pannaria taylora*, *P. glauccella*, *Placodium bicolor*, and *Urceolina* (new genus) *kerguelensis* among Lichens.

The zoölogical collections, although comparatively small, contain an unusual number of new genera and species, notably in molluscs, insects, crustaceans, and echinoderms. Descriptions of these have been furnished by Profs. Verrill, S. I. Smith, Dall, Hagen, and Osten-Sacken, and will be found under the appropriate headings. Thanks are due to these gentlemen and to others whose co-operation has added much to the scientific value of this report.

The Bulletin concludes with a study of *Chionis minor*, an unique and little-known bird, with an attempt to establish its proper position in classification.

J. H. K.

SMITHSONIAN INSTITUTION,

Washington, D. C., November 1875.

OÖLOGY, ETC.

BY J. H. KIDDER AND ELLIOTT COUES.

CHIONIS MINOR, *Hartl.* (p. 1.)*

Lays two or three eggs, differing much in color (*auct.* Rev. A. E. Eaton), about January 10, in the crevices formed by fallen rocks. The nest is made of grass-stems (*auct.* Capt. J. J. Fuller, not seen by J. H. K.). But a single specimen was preserved, given by the Rev. Mr. Eaton, and this was badly broken, but has been mended upon a plaster model. The specimen is regularly oval in shape, like a rather small and narrow hen's egg. Seen under a lens, the outermost calcareous layer appears to be deposited in an irregular net-work, upon a substratum of dark slate-color. The shell is thick and of coarse texture. The superficial markings include several shades of dark sepia-brown, disposed in irregular blotches, but arranged, for the most part, longitudinally. These blotches are more plentiful and closely aggregated about the thickest part of the egg than at either end, and overlie a general *café au lait* tint, which proves, under the lens, to be due to the appearance of the dark substratum above mentioned, through the minute areolation of the outer calcareous layer. The measurements are as follows:—

Smithson. No.	Orig. No.	Measurements.
	245	2.28 × 1.48

QUERQUEDULA EATONI, *Sharpe.* (p. 4.)

Lays four or five eggs, about November 15, in a deep hemispherical nest, excavated in the ground, generally near the water, well

* This reference and others like it, placed after the name-headings, refer to a previous report upon the Birds of Kerguelen Island by Dr. J. H. Kidder, U. S. N., *Bull. Nat. Mus.*, No. 2, 1875.

Measurements of eggs are in English inches and decimals. The lengthwise and crosswise diameters, and, in some cases, the corresponding circumferences, are the dimensions given.

The structure of the egg-shell is described as it appears under a Tolles' $\frac{1}{4}$ -inch triplet.

concealed by grass, and lined with feathers from the breast of the old bird. The eggs vary in shape from a regular ovoid to an ellipsoid, and differ considerably in size. The shell is thin, smooth (as usual in this family), and compactly homogeneous in structure, showing under the lens only very shallow linear depressions. Color is a uniform pale olive-green. Measurements are as follows, the braces including specimens found together in a single nest:—

Smithson. No.	Orig. No.	Measurements.	Remarks.
17179	123a	1.80 × 1.35	} Set No. 1.
17180	123b	2.00 × 1.40	
17181	123c	2.10 × 1.42	
17182	123d	2.18 × 1.45	
17183	123e	2.10 × 1.49	
17175	154a	1.90 × 1.40	} Set No. 2.
17176	154b	2.18 × 1.50	
17177	154c	2.00 × 1.50	
17178	154d	2.08 × 1.49	

GRACULUS CARUNCULATUS, (*Gm.*). (p. 7.)

Eggs are two or three in number, first found November 5. Nests are built on rocky shelves in the precipitous faces of cliffs overlooking the sea. The base of the nest is built up to a considerable height, sometimes as much as two feet, and is composed of mud, excrement, and decaying vegetable-matter. Upon this pedestal are arranged blades of grass, inclosing a cup-shaped cavity some ten inches across. It would seem that the old nests are used year after year; a new layer being added each season, so that they differ considerably in height. In shape, the eggs are long sharply-pointed ovoids. The structure of the shell is coarsely granular, and the color is an uniform pale green. Externally, there is the usual considerable calcareous deposit, which appears under the lens to be structureless, chalky, and disposed in masses of unequal thickness. It is here and there striated, wrinkled, or otherwise marked, as if deposited in a soft state, and afterward hardened by exposure to the air, leaving the shell proper partly exposed, especially about the smaller end.

The measurements are as follows :—

Smithson. No.	Orig. No.	Measurements.	Remarks.
17195	72a	2.45 × 1.53	} Set No. 1.
17195	72b	2.40 × 1.57	
17195	72c	2.59 × 1.57	
17196	73a	2.60 × 1.62	} Set No. 2.
17196	73b	2.50 × 1.58	
17197	74a	2.40 × 1.55	} Set No. 3.
17197	74b	2.58 × 1.58	

Young.—In addition to the remarks already given upon the young of this bird by Dr. Kidder in his previous paper, the following facts are of interest: Much of the under mandible is pale bluish, the chin yellowish, with a transverse line of demarkation from corner to corner of the mouth, the color being sharply defined against the general blackish hue of the body. The horny tip of the bill is light-colored, as is usual, and the bill otherwise very soft. The aperture of the eye is extremely small; lids light-colored. The wings show the very tardy development noticed by Dr. K. in the case of the legs, being extremely small and soft. Another specimen, some eight or ten inches long, shows the same yellowish color of the pouch, abruptly defined against the blackness of the throat; the eyelids being, however, entirely dark. The wings and legs exhibit the same evidence of very tardy development.

BUPHAGUS SKUA ANTARCTICUS, (*Less.*) *Coues.* (p. 9.)

The nests are shallow cavities in the long grass, sparingly lined with grass-stems, and always situated in a dry spot. Eggs are only two in number in the four instances observed; first found November 17. A single egg was found December 20 in a nest robbed December 3. The shape is a very broad ovoid, tapering rapidly to a sharp point. Shell is brittle and of loose texture, being composed of irregularly prismatic bodies set side by side perpendicularly to the surface. Externally it is coarsely granular. Color is dark olive-drab, marked superficially by irregular blotches of Vandyke-brown. Deeper markings appear as blotches of dark bluish stone-color. The blotches are more plentiful over the butt-end. Those of the same nest agree generally in color, but different clutches show considerable variety of tint. Nos. 134 a and b, (original number) for example, are generally of a pale olive-gray, and the blotches are scarcely deeper in hue than dirty Indian-yellow.

The measurements are as follows:—

Smithson. No.	Orig. No.	Measurements.	Remarks.
	117 <i>a</i>	2.80 × 2.15	} Containing embryos.
	117 <i>b</i>	2.91 × 2.18	
17150	134 <i>a</i>	2.85 × 2.00	} Pale specimens.
17150	134 <i>b</i>	2.92 × 2.05	
17149	200	2.70 × 2.10	Second laying.

Nos. 117 *a* and *b*, containing embryos, have been sent to Prof. E. S. Morse for examination.

LARUS DOMINICANUS, *Vieill.* (p. 13.)

Nests are built of grass and sea-weed, near the sea, and are generally wet within. Eggs are three in number, and in shape a pointed ovoid, approaching to pyramidal. The shell is rather stout, brittle, and composed of two distinct layers of about equal thickness. The external layer is coarsely granular in texture, roughly mammillated superficially, and of a dark olive-drab color, blotched by irregular spots of different tints, Vandyke-brown, sepia, slate-color, and brownish-yellow. The slaty markings are within the shell, the others on the surface. As in the case of *Buphagus*, those of the same nest are generally similar in marking, while those of different nests show considerable variety of hue. The internal layer of the shell is closer in texture, of a pale apple-green color, and shows under the lens innumerable small whitish trapezoidal columns set transversely to the surface, in a matrix of a pale-green homogeneous basis-substance. The blotches are more closely aggregated at the large end of the egg than elsewhere, and vary in shade according to their situation, superficial or deep. Some specimens of these eggs are not distinguishable with certainty from those of northern gulls—*Larus argentatus* for example.

The measurements are as follows:—

Smithson. No.	Orig. No.	Measurements.	Remarks.
17151	199 <i>a</i>	2.93 × 1.90	} Set No. 1.
17152	199 <i>b</i>	2.87 × 1.92	
17153	199 <i>c</i>	2.75 × 1.85	
17154	201 <i>a</i>	2.58 × 1.98	} Set No. 2.
17155	201 <i>b</i>	2.53 × 1.92	
17156	201 <i>c</i>	2.58 × 2.00	

The young, a few days old, have the bill black, with yellow tip, the feet dull blackish, webs partly dull whitish. The general plumage is black, mottled with yellowish-brown, much paler, inclining to white, below, as usual in this family of gulls.

In embryos about to be hatched, the bill and feet are nearly colorless; the former somewhat mottled with black. The general plumage, so far as it can be determined from wet preparations, is much as has been already described.

STERNA VITTATA, *Gm.* (p. 17.)

The single egg is laid on high and broken ground, usually under the lee of a tuft of grass, and with little or no preparation. First found November 7. The shell is thin, elastic, and finely granular in texture, of general olive-green color. The ground-color varies widely, as usual in this family of birds, from rather clear green, with a suspicion of drab, to a decided brownish drab. Superficial markings are chocolate-brown of several shades, disposed in irregular spots and blotches, rather more thickly crowded toward the larger end. Deep markings show various shades of bluish slate-color, according to the thickness of the overlying deposit. The shape of the egg is a regular ovoid, and the measurements are as follows:—

Smithson. No.	Orig. No.	Measurements.
17188	61	1.78 × 1.22
17187	75	1.82 × 1.29
17184	76	1.82 × 1.27
17185	77	1.83 × 1.30
17186	78	1.75 × 1.23
17189	96	1.85 × 1.20
	97	1.80 × 1.25
	.	1.70 × 1.27

The young, when first fledged, is yellowish-brown, spotted irregularly with black; its bill, toes, and tarsus dirty-orange, blackening toward tips. Later, the colors grow darker, feet and tarsi becoming orange-red. It is as large as a chick, and very unlike the old bird in marking and general appearance. Specimens of the embryos have been sent to Professor Morse for examination.

DIOMEDEA EXULANS, *Linn.* (p. 19.)

Nests are on tall mounds, built up of grass to the height of two or more feet from the ground, and, being of different heights, seem to have

been used again and added to year after year. The egg is single, elliptical in longitudinal section, and but slightly thicker at the large than at the small end. Only occasional specimens tend somewhat to the ovoid form. The shell is white, of loose granular texture and roughly mammillated surface. There are no markings beneath the superficial calcareous layer, and the spots which appear on this seem to be adventitious stains from the secretions of the oviduct, or accidental soiling after extrusion. Some specimens show a reddish stain upon the larger end, probably dried blood, since it is readily washed off.

The measurements are as follows:—

Smithson. No.	Orig. No.	Length.	Width.	Long circumf.	Short circumf.
17097	222a	4.96	3.18	13.15	9.65
17098	222b	5.08	3.08	13.15	9.70
17099	222c	4.80	3.18	12.90	10.04
17100	222d	5.21	3.25	13.80	10.50
17101	222e	4.80	3.10	12.80	9.60
17102	222f	4.88	3.22	13.10	10.18

No young were hatched previous to January 11.

PHŒBETRIA FULLIGINOSA, (*Gm.*) *Reich.* (p. 21.)

Nests on rocky shelves or in caves in the faces of lofty cliffs where the birds build a conical mound, seven or eight inches high, hollowed into a cup at the top and lined rudely with grass. Egg is single, broadly ovoidal, generally white, marked by a collection of specks about the larger end, somewhat like the adventitious stains on the eggs of *D. exulans*, but, as well as we can judge, less superficial. The shell is compact in structure, rather thin for its size, and superficially smooth to the touch. Under the lens, it is seen to be marked by minute pits and linear depressions, being thus decidedly different, both to the eye and to the touch, from those of *D. exulans*.

The measurements are as follows:—

Smithson. No.	Orig. No.	Length.	Width.	Long circumf.	Short circumf.
17104	52	3.95	2.64	10.50	8.40
17103	86	3.95	2.60	10.50	8.25

An embryo has been sent to Professor Morse for examination.

OSSIFRAGA GIGANTEA, (*Gm.*) *Reich.* (p. 23.)

Lays a single egg on open, rather elevated ground, at some distance (half a mile) from the sea. There was no vestige of an artificial nest when the young were found, January 2. These were then nearly fledged, and quite as large and heavy as the adults, occupying natural hollows between mounds of *azorella*. They are exceedingly filthy birds, ejecting the contents of their stomachs for two or three feet from their bodies, and seeming to have a limitless supply to draw upon. When disturbed, they are soon surrounded by a puddle of vomited matters, and are, in this condition, by no means pleasant birds to collect. Among the ejecta were noticed many Penguin feathers. In the same neighborhood was a young bird of an earlier brood, fully fledged, but not yet able to fly. These Petrels must therefore be among the earliest in laying. The down of the young bird is entirely gray in color, the head is partly naked, and the bill, tarsi, and feet are colored nearly as in the adult, but somewhat paler. The first fully-formed feathers are similar to the adult plumage.

MAJAJQUEUS ÆQUINOCTIALIS, (*Linn.*) *Reich.* (p. 25.)

Nests in very deep burrows in hill-sides, generally under a mound of herbage. Near the entrance to the burrow, there is always, so far as observed, a small pool of fresh water. Egg is single, regularly ovoid, and white, without shell-markings of any kind. It is generally, however, much soiled by secretions from the oviduct and dirt from the burrow. The shell is thin, homogeneous, and compact in structure, very smooth to the touch, but under the lens is seen to be marked by small pits and shallow linear depressions.

The measurements are as follows: —

Smithson. No.	Orig. No.	Measurements.
17105	189a	3.00 × 2.10
17106	189b	3.08 × 2.12
17107	189c	3.18 × 2.19
17108	189d	3.17 × 2.17
17109	189e	3.32 × 2.13
17110	189f	3.14 × 2.20
17111	189g	3.26 × 2.17

No young birds were identified as of this species.

ÆSTRELATA LESSONI, (*Garn.*) *Cass.* (pp. 27, 39.)

On pages 26 and 27 of the report preceding this, upon the birds of Kerguelen Island,* were described a series of undetermined young birds, with the note by Dr. Cones, "Not seen by me—probably some *Puffinus*." Upon examination of the specimens preserved, there remains no reasonable doubt that they are the young of *Æstrelata lessoni*. The bill is that of an *Æstrelata*, and the measurements agree closely with those of *Æ. lessoni*, both from dried skins in the museums of the Philadelphia Academy and Smithsonian Institution, and as taken by Dr. Kidder from the recent specimens. These young birds were found on Kerguelen Island as early as September 15, living in deep burrows in hill-sides. At about the same time, an adult specimen was brought into camp by one of the men attached to the party, with the statement that it had been found with young, but was unfortunately not preserved, and the old birds were not found again until December 29, in a burrow without egg or young. It will be remembered that *Æ. kidderi*, the only other species of the genus known to be found on the island, was taken with egg on October 21, and is thus excluded from consideration. From the Proceedings of the Philadelphia Academy for 1866,† we extract the following description of the young of *Æ. lessoni*:—

"No. 15709, Smiths. Register, Terra del Fuego, T. R. Peale.—Entire upper parts dusky fuliginous-brown; the dorsal feathers usually with somewhat light margins; the color deepening on the wings and back into brownish-black. Some of the secondaries, tertials, and upper coverts have a slight cinereous tinge. On the head and nape, the brown is lighter than elsewhere; and a somewhat diluted shade of this color extends adown the throat, thus completely enveloping the head, and occupies likewise the upper half of the breast, quite across, as well as all the sides under the wings. On the crissum, and especially on all the under tail-coverts, except immediately around the anus, the color again deepens into brownish-black. The rest of the under parts are white. The circumocular region is darker than the adjacent parts.

"The foregoing is the most immature plumage known to me, and it will be noticed that not only the colors themselves, but the pattern of coloration, is radically distinct from those of the adults. In some specimens is recognizable a faint shade of a darker color on the tips of the feath-

* *Op. cit.* vide note to p. 1 of this report.

† Critical Review of the Family Procellariidæ, part iv, by Dr. Elliott Cones, U. S. A., p. 144.

ers of the otherwise white under parts; whence I infer that in very young birds the whole under parts may be brownish or grayish."

In the more advanced of the two specimens preserved (original No. 62), the entire body is as black as a crow. On the breast, however, and under parts generally, the bases of the feathers show white to near the ends, while upon the crissum and about the head they are grayish. The surmise of Dr. Coues, therefore, with regard to the young plumage, was in the right direction, but did not go far enough. The indications of an adult white and gray plumage are unmistakable.

The very young birds first found were completely covered, as is usual in the family, with slate-colored down. The same covering is plentiful upon the younger of the two specimens preserved (original No. 66), and still distinct upon the elder.

Below are contrasted three sets of measurements, viz: those of adult skins by Dr. Coues, and the young of the same from recent specimens by Dr. Kidder:—

Smithson No.	Orig. No.	Sex.	Length.	Ext.	Wing.	Tail.	Bill.	Head.	Tarsus.	Hind toe.	Longest claw.	Remarks.
.....	.....	.....	.....	.....	11.75	5.25	1.50	.....	1.65	2.00	0.50	Adult skin (Coues).
68969	211	♀	18.15	4.00	12.15	5.85	1.50	2.50	1.85	2.20	0.50	Adult, recent (Kidder).
.....	62	.....	16.00	3.75	12.00	5.40	1.40	2.50	1.65	2.10	0.40	Young, recent (Kidder).

It should be noted that the measurements of tail, bill, head, tarsus, middle toe, and claw of the last specimen were taken from the skin, and are therefore not "recent."

ESTRELATA KIDDERI, Coues. (p. 28.)

Nests in deep burrows excavated in a hill side, each burrow containing a little pool of fresh water near its entrance. Egg is single, dull white, and very obtusely ovoid in shape, almost as globose as a Penguin's egg; first found October 11. Shell is thin, brittle, of compact structure, and marked externally by very shallow linear depressions, discernible only by aid of a lens. There are no color-markings.

The measurements are as follows:—

Smithson. No.	Orig. No.	Measurements.
17157	35a	2.18 × 1.77
17158	35b	2.20 × 1.75
17159	35c	(Broken.)

A young bird taken December 13, and much resembling that of *Æ. lessoni*, but far less advanced than the latter at that date, was then attributed to this species, although, the old bird not having been taken at the same time, the evidence was not positive. It made no sound when taken from its burrow. Subsequent examination of the specimen fully confirms this surmise. The bird is still covered with pale slaty down; but the shape of the bill, and especially its narrowness from base to tip, taken in connection with the dates, place the identification beyond a reasonable doubt.

OCEANITES OCEANICA, (*Kuhl*) *Coues*. (p. 30.)

Nests under rocks, usually on pretty high land, laying a single white egg. There are no eggs in the collection; but one was found by Rev. Mr. Eaton, of the English party, on Thumb Mountain, some fifteen miles from the American station, December 8.

PROCELLARIA NEREIS, (*Gould*) *Bp.* (p. 31.)

Nests under tufts of grass, or other low herbage, near the sea. Sometimes it digs a small burrow; oftener the eggs are found simply covered by overhanging grass-stems, in low land. The egg is single, compact in structure, smooth, and very fragile, ellipsoidal in form, and white, excepting at the larger end, which is marked by a collection of small reddish spots interspersed with a few specks of very dark brown. If we are correct in our impression that the markings about the butts of these eggs are not adventitious, we have here an exception to the general rule that the *Procellariidæ* lay white eggs. In size, shape, and coloration, the egg recalls some of the least-spotted examples of that of the common Meadow Lark (*Sturnella magna*). By aid of the lens are to be seen a few pore-like punctations, widely scattered.

The measurements are as follows:—

Smithson. No.	Orig. No.	Measurements.
17194	157	1.30 × 0.95

We have no information concerning the young of this species, none having been hatched at the time of breaking up the American station (January 11).

PSEUDOPRION DESOLATUS, (*Gm.*) *Gray*. (p. 32.)

Nests in the same localities and has the same habits as *Halobœna cœrulea* (q. v.).

HALOBÆNA CÆRULEA, (*Gm.*) *Bp.* (p. 34.)

Nests in deep tortuous burrows in hill-sides near the sea. Egg is single, ovoidal, and dull white, without color-markings. In the specimens measured, there is, however, as shown by the figures, the usual range of variation in contour. They remind one, in size and shape, of the eggs of a bantam hen. Shell is thin, homogeneous, and compact in structure, presenting under the lens a finely granular external surface. First found October 23.

The measurements are as follows:—

Smithson. No.	Orig. No.	Measurements.
17161	49a	2.00 × 1.50
17162	49b	2.08 × 1.44
17163	49c	2.09 × 1.57
17164	49d	2.00 × 1.45
17165	49e	1.90 × 1.50
17166	49f	1.96 × 1.47
17167	49g	1.92 × 1.48
17168	49h	2.10 × 1.46
17169	49i	1.95 × 1.48
17170	49j	2.07 × 1.54
17171	—	2.02 × 1.45
17171a	41	1.91 × 1.52
17172	63	2.08 × 1.43
17173	71	1.90 × 1.47

The newly-hatched young have bill and toes slaty blue, with apparently pale-yellowish webs and brownish-black claws. The horny speck upon the bill is whitish, and situated high above the tip of the bill. The region about the base of the bill is largely denuded. They begin to hatch about November 12.

PELECANOIDES URINATRIX, (*Gm.*) *Lacépède*, (p. 36.)

Lays one egg in a burrow in the hill-side, generally selecting the same locality as *Halobæna cærulea*. Burrow is straight, slanting slightly downward, and less deep than that of *Halobæna*. Egg is a regular ovoid, tending in some specimens to ellipsoidal. First found December 10. Shell is white, thin, brittle, compact, and homogeneous in structure. No color-markings.

The measurements are as follows:—

Smithson. No.	Orig. No.	Measurements.	Remarks.
17191	190a	.....	Badly broken.
17192	190b	1.62 × 1.15	Broken.
17193	190c	1.62 × 1.27	
17174	136	1.66 × 1.26	
17190	152	1.65 × 1.25	

No young birds were found during the visit of the American party to the island.

APTENODYTES LONGIROSTRIS, *Scop.* (p. 39.)

No eggs or young in the collection. It is of this genus that the statement is made that the eggs are incubated in a sort of pouch, formed of a fold of skin, and situated between the tibiæ. The whalers met at Kerguelen Island confirm this statement; but no opportunity for direct personal observation was found during the stay of the transit-party. The male and female are said by the whalers to alternate in carrying the egg around.

PYGOSCELIS TÆNIATA, (*Peale*) *Coves.* (p. 41.)

Had already begun to lay September 10, selecting the top of a mound of *Azorella* (a densely-growing plant common on the island), and scratching therein a shallow cavity. But one egg was found at any time in a nest; yet we have good reason for believing that these Penguins rear two young in a season, laying a second egg about two months after the first, and before the young bird has left the nest. The eggs are obtusely ellipsoid, some specimens being almost spherical; white, with a very pale greenish tint. The shell is thick, inelastic, and friable, covered by a thin layer of calcareous matter that looks precisely as if it had been daubed on with a coarse brush. The specimens preserved, being from a rookery which has been often robbed, are doubtless smaller and thinner-shelled than those of the first laying.

The measurements are as follows:—

Smithson. No.	Orig. No.	Measurements.
17112	5	2.50 × 2.08
17113	6	2.61 × 2.00
17114	7	2.52 × 2.17
17115	8	2.42 × 2.05
17116	9	2.68 × 2.18
17117	10	2.32 × 2.10
17118	11	2.70 × 2.20
17119	12	2.69 × 2.18
17120	13	2.58 × 2.10
17121	14	2.40 × 2.18
17122	15	2.49 × 2.18
17123	16	2.45 × 2.17

Young birds were found just breaking the shell December 4. They are hatched much earlier when the rookeries are not so often robbed: as early as October 12, certainly. When first hatched, the young are covered with soft, hairy, pearl-gray down. Head black above and behind; bill flesh-colored; feet black on the soles and flesh-colored above.

EUDYPTES CHRYSOLOPHA? Brandt. (p. 45.)

Begins to lay about the first of December, building among fallen rocks by the sea, making nests which are more complete than those of *Pygoscelis tæniata*, and lining them with dried grass. There are two eggs to a nest, white, with a faint tinge of greenish, obtusely ovoid in shape, and usually one is distinctly larger than the other. The shells are thick, friable, inelastic, and often smeared in parts with calcareous deposit. The external surface is punctured by minute pores, scattered widely apart, but presents no distinct surface-marking.

The measurements are as follows:—

Smithson. No.	Orig. No.	Measurements.
17124	—	2.83 × 2.05
17125	—	2.60 × 2.07
17136	*124c	2.56 × 1.88
17137	124a	2.89 × 2.16
17138	124b	2.39 × 1.92
17139	124c	2.79 × 2.20
17140	124d	2.50 × 1.79
17141	124e	3.04 × 2.18
17142	124f	2.52 × 1.89
17143	124g	2.84 × 2.12
17144	124h	2.58 × 2.00
17145	124i	2.80 × 2.30
17146	124j	2.58 × 1.93
17147	124k	2.80 × 2.11
17148	124l	2.81 × 2.02
17126	134a	2.94 × 2.15
17127	134b	2.82 × 2.19
17128	134c	2.95 × 2.15
17129	134d	2.83 × 2.10
17130	134e	2.32 × 1.80
17131	134f	2.82 × 2.04
17132	134g	2.50 × 1.99
17133	134h	2.86 × 2.10
17134	134i	2.82 × 2.15
17135	134j	2.70 × 1.95
17160	—	2.52 × 1.80

* Original number duplicated.

EUDYPTE DIADEMATUS, Gould. (p. 47.)

We have no direct information concerning the nesting or eggs of these birds. Whalers report that their habits in these respects are precisely similar to those of *E. chrysolopha*, as was to be expected.

BOTANY.

A.—PHÆNOGAMIA, FILICES, ET LYCOPODIACEÆ.

REVISED BY PROF. A. GRAY.

I.—RANUNCULACEÆ.

1. RANUNCULUS CRASSIPES, *Hook. fil.*—Very common in and by fresh-water pools, and pretty well up on the hill-sides, among *Acæna*, and in crevices of wet rocks. Varies greatly in size and vigor of growth in different localities. Begins to flower about December 15.

2. RANUNCULUS TRULLIFOLIUS, *Hook. fil.*—In small pools and running streams of fresh water. Not uncommon, but not found in flower. In two forms [the larger answering well to Dr. Hooker's specimens from the Falkland Islands; the smaller, with some entire leaves apparently much too near *R. hydrophilus*, Gaud. Neither of the two were before recorded from Kerguelen Island.—A. G.].

3. RANUNCULUS ——— ?—In low land, between two arms of the sea. Not in flower up to January 2. Found in company with *R. crassipes*, which here grew much more luxuriantly than near the station (among the hills). [A succulent species, with rounded and somewhat caudate leaves, an inch or more in diameter, deeply and obtusely 3-7-lobed, on fleshy petioles a span or more long. It can hardly be a form of the preceding.—A. G.]

II.—CRUCIFERÆ.

1. PRINGLEA ANTISCORBUTICA, *R. Brown.*—"Kerguelen cabbage" grows abundantly near the sea-shore, and I have seen it as high as 2,000 feet (Mount Crozier), where all other Phænogams but *azorella* had given place to Mosses and Lichens. Perennial, stout creeping rhizomes, sometimes 5 or 6 feet long and as many inches in diameter, stated by Dr. Hooker to be apetalous, on the authority of Mr. Anderson, who visited Kerguelen with Captain Cook ("*petala nulla!*" *Fl. Antarctica*),

but I have found very many flowers with a single petal, clawed and faintly pink-tinted at the large end; many with two, some with three, and a few with four petals. They fall early and are easily overlooked when present. Axillary flowers are more frequently petalous than those crowded together upon the spike-like raceme. Observed to be in flower November 2. The leaves were eaten, as cabbage, by ourselves and the ship's company of the *Monongahela* with relish; our fowls were fond of them, and they constituted the staple food of the live stock brought to the island by the English party and the *Monongahela*.

III.—CARYOPHYLLÆ.

.. *COLOBANTHUS KERGUELENSIS*, *Hook. fil.*—Found with ripe fruit January 2, growing in both high and low land, among loose gravel and between stones.

IV.—PORTULACÆ.

1. *LYALLIA KERGUELENSIS*, *Hook. fil.*—Grows by preference on the sides of stony hills, almost always the southwest side, where it is exposed (by rapid drainage and heavy rains) to frequent alternations of dryness and moisture. Root thick, long, fleshy, and partly exposed above ground. One specimen was found straddling a good-sized stone, sending down roots on all sides. Flowers were first observed December 14, and the plant was already in seed December 21, when no flowers could be found. The flowers are not "very inconspicuous," as Dr. Hooker supposed they might be. They are plentiful, although apetalous, and prominent as to their stamens and pistils, lending a pale yellowish-green bloom to the mound which the plant forms, and quite conspicuous enough to attract the attention of the casual observer. Neither can the plant be properly said to be "very local," in this part of the island at least, since, although rare, many are usually found collected together in the same place. [Dr. Hooker's specimens had only the capsules and calyx. With the present complete specimens, the whole structure of the flower is made out. The sepals are four, thin, somewhat petaloid, oval, nearly unconnected. Petals none. Stamens three, hypogynous or nearly so, larger than the calyx, two of them alternate with sepals, and one before a sepal; anthers didymous, two-celled. Style larger than the ovary, two-cleft at summit, the lobes linear, stigmatic for the whole length of the inner face. Ovules two or three from the base of the cell, campylotropous. Utricle fleshy, coriaceous, apiculate with the persistent base of the style, apparently indehiscent. Seeds two or three. Testa small.—A. G.]

2. *MONTIA FONTANA*, *L.*—Flowers were first observed December 7. Habitat among gravel, near the sea, and (as remarked by Dr. Hooker) almost always very near *Callitriche verna* and *Ranunculus crassipes*.

V.—ROSACEÆ.

1. *ACÆNA AFFINIS*, *Hook. fil.*—"Kerguelen Tea." The leaves have a considerable reputation among the whalers as a febrifuge and anti-scorbutic. They are used as an infusion, hence the trivial name. Abundant everywhere, especially on northeast hill-sides near the sea and in low land. In the flowering state, the specimens accord well with the *A. adscendens*, as described and figured by Dr. Hooker; but in fruit the characters relied upon to distinguish the two become quite apparent.

VI.—HALORAGÆÆ.

1. *CALLITRICHE ANTARCTICA*, *Engelm. in Hegel MS. Syst. Callitr. (C. VERNA, Hook. fil, Fl. Antarc.)*.—Grows in wet places, generally in company with *Ranunculus crassipes*, often under water or beneath precipitous rocks overhanging and limiting rocky sea-beaches. Flowers first observed December 17. *Montia fontana* is generally to be found near at hand.

VII.—CRASSULACEÆ.

1. *BULLIARDA MOSCHATA*, *D'Urv.*—Small, white, perfect, regular, tetramerous flowers, first observed in bloom December 18. Pistils and stems blood-red. Plentiful in crevices of rocks overhanging and closely neighboring to the sea.

VIII.—UMBELLIFERÆ.

1. *AZORELLA SELAGO*, *Hook. fil.*—One of the commonest plants, growing in mounds closely compacted together, often 2 to 4 feet in diameter, and composed of the dead stalks of old plants. Owing to the density of this crowding, only the surface is green, while deeply in the interior the old stems and leaves seem to be partly transformed into peat. It is this plant which makes walking so fatiguing on this island. The foot sinks into the soft mass at every step, and the hillocks are so closely joined together that for long distances it is impossible to avoid them. I could not find the hairs or bristles figured and described by Dr. Hooker as appearing upon the upper surfaces of the leaves along their venation (*Fl. Ant.* p. 284). Flowers were first observed November 12, like small starry points, scattered over the mounds. They are never very conspicuous, and do not press well, owing to the strength and

resistance of the stems. Not pink as figured (*Fl. Ant.*), but always pale greenish-yellow. Here and there is a patch of discolored leaves, white or yellow.

IX.—RUBIACEÆ.

1. *GALIUM ANTARCTICUM*, *Hook. fil.*—A small trailing plant, found as undergrowth with *Acæna*, Grasses, Ferns, etc., generally near the sea, but extending well up the hill-sides. Flowers first observed December 3. “Flores sessiles, albi, trimeri” (*Fl. Ant.* p. 303). I have found them quite as often 4-petaled as 3-petaled, and with a distinct peduncle. A single 5-petaled flower was found January 5.

X.—COMPOSITÆ.

1. *LEPTINELLA PLUMOSA*, *Hook. fil.*—First observed in flower November 30. This plant fringes the cliffs overlooking the sea, grows down to high-water mark in the low-land, and marks the “roads” to Penguin rookeries and the rocks frequented by Cormorants. It grows very thickly, forming a flat matted carpet very welcome to the eye of the wearied pedestrian, less on account of the silvery luster of its leaves than because it is a certain indication of firm ground. A decoction of the leaves is used by the whalers as an emetic, and is said to be prompt and effectual in its action.

XI.—GRAMINEÆ.

1. *TRIODIA KERGUELENSIS*, *Hook. fil.*—Flowers were first observed December 2. Grows among cliffs, altitude 300 to 2,000 feet. Very long, filiform roots.

2. *FESTUCA COOKII*, *Hook. fil.*—Very common in hollows on hill-sides near the sea. Flowers early in May. A fine large grass. [The plants seem to be male only; if fertile, they are in a much earlier state of inflorescence than Dr. Hooker’s specimens.—A. G.]

3. *FESTUCA ERECTA*, *D’Urv.*—A straight, tussocky grass, with purple panicles, observed in flower December 6. Found in flat land, altitude 200 feet, about a mile from the sea.

4. *AIRA ANTARCTICA*, *Hook.*—A graceful grass, with oat-like panicles. Found in flower near the sea-shore December 21. Also observed among cliffs at considerable altitudes.

XII.—FILICES ET LYCOPODIACEÆ.

1. LOMARIA ALPINA, *Hook. fil.*—Dr. Hooker mentions this Fern as “very scarce”. We found it exceedingly common; mostly barren.
2. POLYPODIUM (GRAMMITIS) AUSTRALE.—In crevices of rocks; rare. New to Kerguelen Island.
3. POLYPODIUM VULGARE.—Crevices of rocks by running streams; altitude 200 feet and upward. Abundant. New to the island.
4. CISTOPTERIS FRAGILIS.—Not common. Crevices of rocks near hill-tops. [* No specimens in the collection.—A. G.] New to the island.
5. LYCOPODIUM SELAGO, *Linn.*—Rare.
6. LYCOPODIUM CLAVATUM (var. MAGELLANICUM).—More common, but very local.

B.—MUSCI.

DETERMINED BY THOMAS P. JAMES, Esq.

1. ANDREZEA MARGINATA, *Hook. fil. & Wils. Fl. Antarc. ii, p. 393, t. 151, f. 1.*—On high rocks, 1,500 feet altitude.
2. CERATODON PURPUREUS, *Brid. Br. Univers, i, p. 480.*—In a variety of forms; very common.
3. GRIMMIA FRONDOSA, *James, sp. nov.*—“Laxe cæspitosa vix de fastigiata, ramosa, fusco-viridis, gracilis; folia erecto-patentia, concava curvata anguste lanceolata canaliculata, in pilum hyalinum subævem terminata, costa sub pilo evanida; inferne depilia rigida acuminata; margins erecta, cellulis basi oblongis laxioribus flavidis et usque medium folii quadratis superne remotis subrotundis versus apicem obscuris.”
Growing with *Andreæa marginata*; found only in a barren condition.
4. GRIMMIA KIDDERI, *James, sp. nov.*—“Compacte globosa, pulvillata, pusilla fastigiata, ramosissima, atrato-viridis, rigida; folia caulina densissima, erecta patentia anguste lanceolata, inferiora canaliculata acuminata strictiuscula superiora elongata curvula in pilum brevem hyalinum subævem producta; nervo ad basin lato infra apicem evanido margine erecta, cellulis basi angustis elongatis flavidis pellucidis superne sensim quadratis minutis subopacis.”

Growing in small globular masses on hill-sides at some distance from the sea. The small balls formed by this curious moss seem not to be rooted to any other plant, but to be blown about by the wind indiscriminately.

* Probably lost in transportation. The identification was given me by Rev. A. E. Eaton, of the English transit-party.—J. H. K.

inately. The detached masses generally were found disposed in a fan-shape, radiating apparently from a central point, as if a larger mass in which they had been aggregated had been broken up by the force of the wind. Found only in a barren state. Very local.

5. *Racomitrium lanuginosum*, *Brid.* i, p. 402, t. 152.—Abounds on high rocks.

6. *Orthotrichum crassifolium*, *Hook. fil. & Wils.* l. c. p. 125, t. 57, f. 8; var. β . *acutum*, *C. Müll. Syn.* i, p. 691.—This plant is monoicous, the male gemmæ being found terminal on separate, many-branched plants; also at the base of the female plants.

7. *Webera cruda*, *Schreb. Spic. Fl. Lips.* p. 83.—In the shade of, and in the crevices of rocks; appearing in many forms.

8. *Webera albicans*, *Whhb. Fl. Lips.* p. 353.—In wet, mostly springy places.

9. *Webera nutans*, *Schreb.* l. c. p. 81, var. β . *cæspitosa*.—In wet situations on mountain-sides.

10. *Webera nutans*, *Schreb.* var. γ . *bicolor*.—In shady places near the sea.

11. *Bryum warneum*, *Bland.* in *Brid.* p. 675.—Growing with *Bryum bimum*. Not common.

12. *Bryum gayanum*, *Mont.* in litt. *C. Müll. Syn.* i, p. 267.—Rare.

13. *Bryum bimum*, *Schreb.* l. c. p. 83.—Common in wet and boggy places.

14. *Bryum torquescens*, *Br. & Schp. Bry. Eur. fas.* 6-9, p. 49, t. 20.—From the rear of the transit-house, near the sea.

15. *Bryum pallescens*, *Schwaeg. Sup.* i, ii, p. 107, t. 75.—In damp situations.

16. *Bryum argenteum*, *Linn. Sp. Pl.* p. 1586.—On exposed rocks and on bare ground.

17. *Bartramia patens*, *Brid. Sp. Mus.* iii, p. 82.—Among shaded rocks.

18. *Bartramia flavicans*, *Mitt.* in *Hook. Kew Jour.* iii, 55.—Rear of the transit-house, among rocks.

19. *Bartramia appressa*, *Hook. fil. & Wils. Fl. Nov. Zel.* 89, t. 86, f. 5 = *B. exigua*, *Sulliv. U. S. Exp. Exped.*

20. *Catharina (Atrichum) compressa*, *C. Müll. Syn.* i, p. 95.—*Polytrichum compressum*, *Hook. fil. & Wils.* l. c. ii, p. 410, t. 153.—On hill-sides upon wet rocks.

21. *Plagiothecium donianum*, *Sm. Eng. Bot.* i, 1446.—*Hypnum den-*

ticulatum, Linn.—*H. obtusum*, Whlb.—On shaded ground, with *Webera cruda*.

22. HYPNUM GRACILLIMUM, *Hrsch.* Fl. Bras. i, p. 78.—Found deep in the interior of a small dark cavern in a rock; 300–400 feet altitude; caves had been tenanted by birds.

23. HYPNUM UNCINATUM, *Hedw.* Musc. Fr. iv, p. 65, t. 25.—Abundant on hill-sides, among and on the sides of *azorella* mounds.

24. HYPNUM FLUVIATILE, *Sw.* Musc. Suec. p. 63.—On wet and damp rocks in rear of transit-house, and other localities.

25. HYPNUM FRIGIDUM, *C. Müll.* in Bot. Zeit. 1856.—Growing with *Bryum Warneum*.

26. HYPNUM LECHLERI, *C. Müll.* l. c. 456, 1856.—On low ground.

27. HYPNUM FLUITANS, *Linn.* Fl. Suec. p. 1074.—In fresh water and among bogs.

28. HYPNUM RIPARIUM, *Linn.* Sp. Pl. p. 1596.—Growing with *Ranunculus crassipes* in wet places.

C.—LICHENES.*

DETERMINED BY PROF. EDW. TUCKERMAN.

The Lichens of this island were first observed by Dr. J. D. Hooker during the voyage of the *Erebus* and *Terror* (1839–1843), and his specimens were studied by Dr. Thomas Taylor, according to whose reckoning (*Lich. Antaret.* in *Lond. Journ. Bot.* 3, p. 634) the whole number of species was sixteen. Dr. Taylor's herbarium is now included in that of the Boston Society of Natural History, but contains unfortunately very little to illustrate his Kerguelen determinations; and the lack of microscopical analysis makes it difficult, therefore, to avail ourselves of his work.

The collection now before me, made by Dr. Kidder, naturalist of the United States Transit Expedition of the present year, contains more or less satisfactory evidence of as many as twenty species, though not all of them determinable. Adding the three found in the Taylor herbarium, the whole number, according to this reckoning, will be twenty-three. And as eight or nine others are found in Taylor's list, there is no doubt that this little Lichen-Flora is larger than it was taken to be.

1. USNEA SULPHUREA, *Müll.* Th. Fr.—*U. melaxantha*, Ach.—Rocks.—According to Taylor, the place of this well-known antarctic lichen is taken in Kerguelen's Land by another, the *U. Taylori*, J. D. Hook.,

* Extracted from the Bulletin of the Torrey Botanical Club, October, 1875, pp. 57–59.

called "handsomest of the vegetable products of this the island of Desolation". But this last, though received by Nylander (*Neuropogon Taylori*, Nyl. Syn. i, p. 273), is hardly well discriminated from the older species by the description of either author; and I cannot separate any of the numerous specimens before me from others got, during the same voyage, at the Falkland Islands (Herb. Hook.), which Taylor and Nylander appear to have referred to *U. melaxantha*.

2. PANNARIA TAYLORI, *sp. nov.*—Thallo foliaceo cartilagineo appresso luteo-fulvo, lobis apice rotundatis crenatis incisisque, subtus nigris hypothallo obsolescente; apotheciis (demum plusquam 2 millim. latis) lecanorinis sessilibus, margine crasso ruguloso, disco plano fuscescente. Sporæ ellipsoideæ, simplices, incolores, 0,016–21^{mm} long. 0,009–11^{mm} crass.—Rocks, *Hooker* (Herb. Taylor).—Medullary layer of compact, elongated cells. Collogonidia 0,002–5^{mm} in diameter, solitary or in chains of 2–5. The specimen is rather more than an inch across. It occurs with *Placodium elegans*, but wrapped apart, in Dr. Taylor's collection.

3. PANNARIA GLAUCELLA, *sp. nov.*—Thallo foliaceo cartilagineo arete appresso glauco-cinerascente, subtus pallido hypothallo obsolete, lobis radiantibus subintegrus; apotheciis (0^{mm}. 006–8 latis) lecanorinis adnatis, margine integro demisso, disco dein convexo fusco-nigro. Sporæ immaturæ.—Rocks.—Specimens scarcely half an inch across. Elongated cells of medullary layer compact. Collogonidia 0,004–9^{mm} in diameter, in chains often of 4–10.

4. PLACODIUM ELEGANS, *Link. D. C.*—Rocks, *Hooker* (Herb. Tayl.).—Spores 0,010–17^{mm} long and 0,007–9^{mm} thick. Called *Lecanora murorum* by Dr. Taylor (Herb.), but not reckoned in his Lichenes Antaret. l. c. It is perhaps better referable as above.

5. PLACODIUM BICOLOR, *sp. nov.*—Thallo crustaceo-adiato rimoso-areolato aurantiaco, cephalodio centrali (6–10^{mm}. lat.) pluribusve depressis radiatim rimosis, concoloribus onusto, ambitu lobato; apotheciis (2–3^{mm}. lat.) sessilibus, disco plano nigro-fusco, margine tenui demisso subintegro. Sporæ in thecis uniserialiter octonæ, ellipsoideæ, polaribiloculares, 0,020–30^{mm} lat., 0,012–20^{mm} crass., paraphysisibus capillariibus.—Rocks.—Collogonidia of the cephalodia 0,006–9^{mm} in diameter, reddish, solitary or in short chains. The name and much of the character of *Lecanora dichora*, Tayl., l. c., suggests the present lichen; but the infertile specimen, called (notwithstanding its orange color) *Lecanora gelida* by Taylor (Herb.), appears to me to belong here. Thallus at length two inches wide.

6. *LECANORA GELIDA*, *L. Ach.*—Rocks.—Thallus and cephalodia stouter than I have seen them in the northern lichen. Spores 0,015–23^{mm} long and 0,006–12^{mm} thick.

7. *L. HAGENI*, *Ach. Koerb.*—Rocks.—Several minute, lecanorine apothecia with white, crenate margins, appear to belong here, but have afforded no sufficient analysis. Taylor reckons *L. subfusca* in his list.

8. *L. MACROPHYTHALMA*, *Tayl. Nyl. Urceolaria*, *Tayl. l. c.*, *Lecanora*, *Nyl. in Flora*, 1858 cit. *Krempelsh.*—Rocks.—Thallus like that of *L. gelida*, with which it agrees in possessing similar, but more depressed, cephalodia; being the third lichen thus curiously characterized in this small collection. The apothecia are externally best comparable with those of *Lecidea endochlora* (*Tayl. sub Urceolaria*), but the lichen is probably to be referred to the sect. *Aspicilia*; though spermogones have not been observed. Thalli exceeding two inches in width.

9. *URCEOLINA*, *Geng. nov.*—Apothecia urceolata, excipulo proprio albido connivente discum rubrum submarginante, margine thalino evanido. Sporæ ellipsoideæ, incolores. Spermata acicularia, arcuata, sterigmatibus subsimplicibus. Thallus crustaceus, effiguratus.

URCEOLINA KERGUELIENSIS, *sp. nov.*—Thallo crustaceo adnato areolato-verrucoso aurantiaco-fuscescente, verrucis gibbosis centroque substipitatis in ambitum effiguratum coalescentibus; apotheciis (circ. 1^{mm} lat.) immersis, margine proprio tenui pallido v. dein livido-nigrescente. Sporæ in thecis uniserialiter octonæ, simplices, limbatæ, 0,021–30^{mm} long., 0,015–20^{mm} crass., paraphysibus filiformibus.—Rocks.—Specimen scarcely two inches in diameter. Whole habit of the pale-ash-colored young thalli that of similar thalli of *Lecanora chlorophana*; but the wart-like areoles becoming a little stalked, and the color finally making as close as possible approach, in the brown series, to dirty-orange in the lemon-colored. More or less radiation is evident in the arrangement of the warts toward the margin, which becomes lobulate, and the extreme edge blackish. Habit of apothecia that of *Urceolaria scruposa* with undeveloped thallic margin. The lichen is not referable to *Lecanora* § *Aspicilia*, and is excluded by its exciple from § *Squamaria*.

10. *CLADONIA PYXIDATA*, *L. Fr.*—On the earth.

11. *BIATORA RUBELLA*, *Ehrh. Rabenh.*—Apothecia varying no little in color and size, but all referable to the v. *inundata*, *Nyl. (Hepp. Eur. n. 289)*, as that is represented in North America. Spores 0,030–46^{mm} long and 0,0015–25^{mm} thick. Reaction of hymenial gelatine with iodine violet.

12. LECIDEA ENTEROLEUCA, *Fr.*—On dead grasses.
13. L. ENDOCHLORA, *Tayl.* sub *Urceolaria.*—Rocks. (Herb. *Tayl.*)
14. L. FUSCO-ATRA, *Ach., Fr.*—Rocks.—And traces occur of three other *Lecidæ.*
15. BUELLIA PARASEMA, *Ach., Koerb.*—Rocks.
16. B. STELLULATA, *Tayl., Br. and Rostr.*—Rocks.
17. B. GEOGRAPHICA, *L.*—Rocks.
18. SAGEDIA CHLOROTICA, *Ach., Mass.*—And there are insufficient traces of two other *Verrucarië.*

ALGÆ.

DETERMINED BY DR. W. G. FARLOW.

1. D'URVILLÆA UTILIS, *Bory.*
2. D'URVILLÆA HARVEYI, *Hook.*

Two large specimens of what seems to be this species were brought home by Dr. Kidder. In the *Flora Antarctica*, the only species of *D'Urvillæa* mentioned as found in Kerguelen's Land is *D. utilis*, but, in the two specimens above mentioned, the perforations of the root correspond clearly to the description given of *D. Harveyi*.

3. DESMARESTIA VIRIDIS, *Lam. x!*—Apparently very common.

4. MACROCYSTIS PYRIFERA, *Ag.*—Partly of the typical form, partly the var. *luxurians* of the *Flora Antarctica*.

5. ADENOCYSTIS LESSONII, *H. & H.*

6. SPHACELARIA FUNICULARIS, *Mont.?*—Quite a number of specimens, too small for accurate determination, probably belong to this species.

7. RHODOMELA GAIMARDI, *Mont.*—A single specimen of this species was collected by Dr. Kidder. This species is new to Kerguelen's Land, the nearest recorded station being the Auckland Islands.

8. DASYA (POLYSIPHONIA, *H. & H.*) BERKLEYI, *Ag.*—Apparently very common.

9. PTILONIA MAGELLANICA, *Ag.*—Fine specimens in fruit.

10. DELESSERIA LYALLII, *H. & H.*

11. NITOPHYLLUM LIVIDUM, *H. & H.*

12. NITOPHYLLUM FUSCO-RUBRUM, *H. & H.*

13. RHODYMENIA PALMATA, *Grev.*

14. RHODYMENIA CORALLINA, *Grev.*—Attached to *Macrocystis* roots.

15. RHODYMENIA VARIOLOSA, *H. & H.*—A single specimen in fruit.

16. GIGARTINA RADULA, *Ag.*

17. CALLOPHYLLIS VARIEGATA, *Ag.*
18. CERAMIUM RUBRUM, *var. SECUNDATUM*, *Lyngb.*
19. BALLIA CALLITRICHIA, *Ag.*
20. CALLITHAMNION PTILOTA, *H. & H.*—New to Kerguelen's Land; previously recorded at the Crozet Islands.
21. CODIUM ADHÆRENS, *Ag.*—New to Kerguelen's Land; a not uncommon species of Europe.
22. ULVA LATISSIMA, *L.*

CROZET FLORA.

From some specimens preserved by officers of the *Monongahela*, when that ship visited Possession Island, the largest of the Crozets, on its way to Kerguelen, I have been enabled to identify the following-named plants as common to both islands:—

1. PRINGLEA ANTISCORBUTICA.—Growing much less luxuriantly than on Kerguelen Island.
 2. ACÆNA AFFINIS.
 3. AZORELLA SELAGO.
 4. GALIUM ANTARCTICUM.
 5. LEPTINELLA PLUMOSA.
 6. LOMARIA ALPINA.
 7. A moss believed to be *ANDREÆA MARGINATA*.
 8. Also "a small vine, with blue flowers, growing among scorixæ."
- No specimens preserved.

GEOLOGY.

The following is a list of the collection of minerals from Kerguelen Island, determined by Dr. F. M. Endlich, geologist to the Smithsonian Institution :

Smithsonian No.

9376. *Basalt*; containing decomposed *olivine* and small white crystals of *chabazite*.
9377. *Basaltic rock*.
9378. *Basaltic rock* decomposed. The red color is due to the presence of ferric sesquioxide.
9379. *Basaltic rock* decomposed. Stained by ferric sesquioxide.
9380. *Basaltic rock* decomposed. Stained by ferric sesquioxide.
9381. *Basaltic rock*, very compact.
9382. *Basalt*; containing small white crystals of *chabazite* in vesicles.
9383. *Basalt*, vesicular, with small crystals of *chabazite* and dark brown *olivine*. The red color of the portions exposed to atmospheric influences is due to decomposing *magnetite*. It contains also some *augite* in small particles.
9384. *Basalt*, slightly vesicular, containing *augite*, yellow *olivine*, and *chabazite*.
9385. *Basalt* with *olivine*.
9386. *Basalt* with large geodes of *olivine*—typical *olivine* color.
9387. Vesicular *basalt*, the vesicles being drawn out during the flow before rigidity of the material had occurred.
9388. *Chabazite* in *basalt*.
9389. *Basalt* coated with carbonate of lime, the result of the decomposition of its constituent minerals.
9390. *Basalt* with amygdules of *calcite* and crystals of *chabazite* and *augite*.

9391. *Basalt* with amygdules of *calcite* and crystals of *chabazite* and *augite*.
9392. *Calcite*, radio-columnar.
9393. *Dolerite*. A volcanic rock related to *basalt*, containing *olivine* and *labradorite*.
9394. *Aragonite*. Large radio-columnar colorless crystals found in deep pockets in *basalt*.

SUMMARY.—“The volcanic rocks of the region examined contain a limited number of zeolitic species, and some carbonates, as epigene products. The main rocks are *basalt* and *dolerite*, of uniform physical character and constancy of inclosed minerals.”

The foregoing list represents fairly the constitution of the surface-rock in the southern part of Kerguelen Island. The streams had cut their way deeply in places, exposing extensive surfaces of rock; but diligent search along these water-courses failed to disclose any stratified or fossiliferous beds. At the northern end of the island, however, in the neighborhood of Christmas Harbor, stratified rocks are abundant, with extensive deposits of coal (of poor quality), and contain many trunks of petrified trees. For a specimen of these last I am indebted to Mr. R. P. Maynard, bearer of dispatches on board the United States steamer *Monongahela*; my own observations having been confined to the neighborhood of the head of Royal Sound, at the southern end of the island.

Sealers and whalers say that there is a great glacier in the middle of the island, extending in a general easterly and westerly direction, and reaching quite to the sea on the western coast. It is related by them that a party of fourteen French sailors, from a wrecked sealing-schooner, tried several years ago to reach the southern part of the island on foot, and that all but six perished in crossing this glacier from exposure and starvation.

The island is hilly everywhere and in parts mountainous—Mount Ross reaching an altitude of over 5,000 feet, and Mount Crozier, near the American station, about 3,000. The higher peaks are remarkably sharp and irregular in outline, quite bare of vegetation, and mostly covered with snow. Table-topped hills are frequent, as also are level plateaux or terraces of basalt, projecting from the sloping sides of the less sharply defined hills. These terraces no doubt indicate former flows of the volcanic material, but our limited field of observation did not permit sufficiently extensive investigation to determine the points of outflow.

Should the islands of that region become at any time thoroughly well known, and a similar or identical feature be observed at different points, much could be learned regarding the distribution of land in that part of the world during the later Tertiary period.

Many of the hills slope smoothly up to abruptly projecting rocky crowns of basalt. Some are quite smooth in outline, without these characteristic rocky crowns. Others, running in general southwest and northeast, are long and barrow-like, and seem to have been thrown up only or chiefly by the action of the winds, which are in this part of the world remarkable for their violence. The lee (north and east) sides of the larger hills are covered by broken rocks of all sizes, irregularly heaped together; while the weather, or south and west, sides are less rocky and covered by fine gravel.

Some ranges, especially those fronting the southeast, present abrupt cliffs, intersected by broad rock-strewn plateaux. On the tops of these cliff-walls, particularly in the small gorges that notch their crests, are frequent pillar-shaped rocks, standing alone and near together, and curiously carved, as if by the action of the wind and sand. On the higher slopes it was a common thing to find boulders of great size resting upon flat rocks, in such a position that it seemed quite impossible for them to have rolled thither. I never succeeded in finding surface-scratches indicative of former glacial action, nor would the abruptness of the physical outline of the country agree with such a supposition. It would seem that the present hills were at first lofty and irregular projections of basalt, from which fragments have continually been broken off by the violence of the winds and the action of ice. These fragments have gradually become piled up against the bases of the hills on their lee sides until the long southeasterly slopes now existing have been built up, from which the remainder of the original rock projects as a more or less rounded crown. On the weather or southwesterly sides the approach is generally more abrupt, less marked by large boulders, and covered by small, flat gravel, through which the bed-rock frequently crops out. Possibly accumulations of snow, filling the shallower hollows in winter and sliding down the hill-sides in summer, may have their effect in moving the boulders above referred to. Such a body of snow still existed on Mount Crozier so late as December, which had been frozen by night and thawed by day until it had become nearly solid ice, quite capable of carrying rocks of considerable size with it should it ever slide down the hill-side.

In some instances the projecting rocks have become so undermined by the action of the elements as to present very remarkable outlines. An immense mass of basalt, for example, facing northwest, some four miles from our station, seemed to be held by the strength of its material alone, so far did it overhang its center of gravity; its base being deeply grooved and carved, as if by the action of the wind.

The streams are numerous, and furnish an excellent supply of pure, very cold water; sufficiently pure, indeed, to be used by the photographers. Strange to say, these streams seemed to be absolutely without animal life, perhaps owing to the extreme coldness of the water (averaging 42° Fahrenheit). Ponds are frequent on both high and low land, and often of considerable size. In many places are extensive quaking bogs, and here and there are to be seen deep pits where the surface has fallen in, sometimes to the depth of 30 or 40 feet. Quicksands, or rather mud-holes, are said by the whalers to abound, and in most unexpected places. They tell many stories of shipmates who have undertaken to explore the island and have never returned, supposed to have been swallowed up in sink-holes. Persons connected with the transit parties often got upon insecure ground, but no serious accident followed in any case.

The general aspect of the island is desolate in the extreme. Snow covers all of the higher hills, against which the abrupt outlines of their dark basaltic ridges are most clearly defined. Only along the sea-shore is a narrow belt of herbage, of which the singular Kerguelen cabbage is at once the largest and most conspicuous component. The weather is also extremely inclement, there being scarcely a day without snow or rain. Violent gales of wind prevail to an extent unknown in the same northern latitude. It was often impossible to go on foot any considerable distance from the home-station on account of the severity of the wind. Sir J. Clarke Ross tells of one of his men being actually blown into the sea, and of saving himself from a like accident only by lying flat on the ground. Little squalls called "woolleys" (willy-waws?) are particularly dreaded by the sealers. A small white sphere of cloud is seen high up on the mountain-side, and immediately comes down with immense speed and violence, often burying vessels bows under. These squalls are dangerous not only by their violence but by their nearly vertical direction. In such a squall, on the 11th September, the entire transit expedition, with many officers of the *Swatara*, narrowly escaped with their lives and the loss of two boats, being overtaken while on their way from shore to the ship, anchored not more than a mile away.

Following is the monthly summary of the meteorological observations:*

United States observing station, Kerguelen Island; latitude, $49^{\circ} 21' S.$; longitude, $70^{\circ} 15' E.$; altitude of barometer above sea-level, 130 feet.

Month.	Barometer, mean.			Thermometer, mean.			Saturation, mean percentage.			Wind, mean force.	Rain, total.
	8 a. m.	2 p. m.	8 p. m.	8 a. m.	2 p. m.	8 p. m.	8 a. m.	2 p. m.	8 p. m.			Inches.
September*	29.60	29.52	29.60	42.9	46.00	38.14	-----	-----	-----	8.1	-----
October†	29.36	29.32	29.32	41.97	41.6	34.00	-----	-----	-----	5.6	-----
November‡	29.73	29.74	29.74	44.9	50.	41.6	.855	.792	.823	5.3	2
December§	29.53	29.39	29.54	49.02	52.05	43.2	.83	.77	.84	6.45	6.3

* Snow or rain, excepting two clear days.

† Twelve days without snow or rain.

‡ Four days without snow or rain.

§ Nine days without snow or rain.

The barometer touched its highest point, 30.30 inches, on September 16 and November 17; the wind being light on both occasions, from the southward and westward, with rain on the latter date. On October 18, the day after a severe gale, the barometer fell to 28.74, the forenoon being clear with snow in the afternoon, and the wind from the southwest. Again, on October 25, the wind being light, from the northwest, with snow all day, the barometer fell to 28.72. This also was the day after a severe gale. As a rule, we were disposed to place more reliance upon the *steadiness* of the barometer as an indicator of good weather than upon its actual height; fierce gales, snow, and rain occurring with almost every position of the mercury, but generally preceded by either a rapid rise or a rapid fall. From the 4th of December, for example, to the 9th (the day of the transit), the barometer had fallen steadily but very slowly from 29.92 to 29.12; yet the morning of the 9th dawned perfectly clear, and one of the stillest that occurred during all of our stay. The barometer began to rise about 8 o'clock, coincidently with the appearance of heavy clouds, followed by rain in the evening.

The highest thermometers recorded were 64° at 8 a. m., September 18, and 65° at 2 p. m., December 5; the wind being northwest on both occasions. The lowest recorded was 23° at 8 p. m., September 26, with a westerly wind. On one occasion, during a night early in September, the thermometer was observed to be as low as 18° , this being the lowest temperature noted. In September the extremes of temperature were 64° and 23° ; in October, 54° and 27° ; in November, $60\frac{1}{2}^{\circ}$ and $33\frac{1}{2}^{\circ}$; and in December, 65° and 35° .

* For detailed meteorological register, see report to Surgeon-General of the Navy, dated June 12, 1875; published by Bureau of Medicine and Surgery, 1876.

The force of the wind is figured on the scale usually employed on sea-going vessels, according to which the maximum is 12, representing the strongest possible wind, such as is experienced in a typhoon or hurricane. According to this scale the force of the wind was three times estimated to equal 11, and fourteen times 10, in violence. Such estimates are of course liable to a certain personal error on the part of the observer; but it is not probable that in this case the error lies on the side of excess. The average daily rain-fall for November was 0.205, and for December 0.252 inch, no rain-gauge having been set up previous to November. Both the rain and tide gauges were extemporaneous contrivances, constructed by Commander Ryan as soon as opportunity and leisure offered. By the latter the rise and fall of the tide were measured with considerable accuracy, and were found to vary from 3 feet to 7 feet, according to the season of the month, and partly to the direction and force of the wind. The average rise of the tide was about 5 feet.

MAMMALS.

The only land-mammal found on the island is the common mouse (*Mus musculus*), which abounds everywhere; doubtless imported by one of the earlier sealers. It builds its nest in holes in sand-banks (in one instance in the brain-cavity of the skull of a sea-elephant), lining it with dried grass-stems or bits of oakum. From the husks of grass-seeds scattered about the entrances to its burrows, I suppose these to be its principal food.

Upon Cat Island, one of those bounding Three Island Harbor, the wintering-place of the sealers, the domestic cat has, for many years, existed in a wild state. It lives in holes in the ground, preying upon sea-birds and their young, and is said to have developed extraordinary ferocity. Recent attempts to retame individuals, even when taken quite young, have always, as I am informed, failed. I was not able to visit Cat Island during the stay of the transit expedition, and therefore am unable to say whether any obvious structural signs of reversion were presented by these animals.

Rabbits, swine, and goats have been introduced upon the Crozet and some of the Kerguelen Islands from time to time, and have always thriven well. Hog Island, the westernmost of the Crozet group, is overrun with rabbits, which have also been introduced into Kerguelen by the English transit party.

In former years the Kerguelen group of islands was noted as a favorite breeding-place for the sea-elephant (*Macrorhinus leoninus*, L.). On this account it has been much frequented by sealers for the last forty years, and resorted to also by whalers as a wintering-place, on account of the great security of Three Island Harbor. The sea-elephants have been so recklessly killed off year after year, no precautions having been taken to secure the preservation of the species, that now they have become very rare. Only a single small schooner, the Roswell King, was working the island during our visit, two others and a bark working Heard's Island, some three hundred miles to the south, where the elephants are still found in considerable numbers. Probably they would long since have abandoned the Kerguelen Islands altogether but for a single inaccessible stretch of coast, "Bonfire Beach," where they still "haul up" every spring (October and November) and breed in considerable numbers. The beach is limited at each end by precipitous cliffs, across which it is quite impossible to transport oil in casks, nor can boats land from the sea, or vessels lie at anchor in the offing, from the fact that the beach is on the west, or windward coast, and exposed to the full violence of the wind.

No sea-elephants "hauled up" in the neighborhood of the American station previous to December. On the 13th of that month, while a boat's crew from the United States steamer Monongahela were waiting at a rocky beach for their officers, a small female of this species came out of the water and was captured and killed by them. It measured in length 8 feet 10 inches, and in girth 8 feet 4 inches, being enormously fat. The layer of fat beneath the skin was 4 inches deep, and the body seemed almost formless; a skin stuffed with semi-fluid fat, that quivered and trembled, when moved, like jelly. The skin was prepared and preserved, and the skeleton partly cleaned and sunk in a barrel for small crustaceans to work on. Most unfortunately, during a very severe gale about Christmas time, it was carried away by the violence of the sea and lost. Two other skins and skeletons were procured for me by captains of sealers, one of which, a fine full-grown bull from Heard's Island, said to have measured 23 feet in length, was also lost, along with fifty barrels of oil, while being rafted off to the schooner. The other, a small and immature specimen, came from the eastern Kerguelen coast, and has been brought home in safety. It was procured for me by Captain Fuller, of the schooner Roswell King. (See Nos. 15336 and 12455 National Museum Catalogue.) The dentition of this specimen is complete, but the

ossific centra of many bones, notably of the vertebræ, have not yet become united together. Prof. Theo. Gill has examined and identified the skeleton, which, with two skins, constitutes the collection of this species finally preserved.

The sea-elephant begins to "haul up" on the beaches of its breeding-places about October 10, and remains ashore until well into the month of January. The old bulls, which alone are provided with a proboscis, take charge, each, of a large number of females, guarding them from the approach of other bulls, and (so the sealers assert) prevent them from returning to the sea before the young are old enough to do so with safety. During the breeding-season the bulls are very pugnacious, fighting fiercely with each other, and even attacking the sealers themselves. Although seemingly so unwieldy, they are described as getting over the beaches with surprising speed, advancing both flippers at a time and using them like crutches. The beaches of Royal Sound are fringed by innumerable wallows—cradle-shaped pits—in which the animals lie during the breeding-season, recalling the buffalo-wallows of our western prairies.

The increasing scarcity of the sea-elephant, and consequent uncertainty in hunting it, together with the diminished demand for the oil since the introduction of coal-oil into general use, have caused a great falling-off in the business of elephant-hunting. The Crozet Islands, for example, had not been "worked" for five years, and at Kerguelen there was only one small schooner engaged in this pursuit, two others making Three Island Harbor their headquarters, but spending the "season" at Heard's Island, three hundred miles to the southward. It may, therefore, be reasonably hoped that these singular animals, but lately far on the way toward extinction, will have an opportunity to increase again in numbers, and that the sealers may learn from past experience to carry on their hunting operations with more judgment, sparing breeding females and very young cubs. When the *Monongahela* visited the Crozet Islands on December 1, they found the sea-elephant very numerous, although left undisturbed for only five seasons.

Besides the sea-elephant the sea-leopard, (*Ogmorhinus* leptonyx*, Blainv.) often visits the island, as do several species of seal. The sea-leopard is also sought for its oil, but is less valuable, being a much more

*This name is substituted for *Stenorhynchus*, because the latter has already been ascribed to other animals: to a crab in 1819, and to an insect in 1823 and 1825. See W. Peters in *Monatsbericht der Königlich Preussischen Akademie der Wissenschaften zu Berlin*, June, 1875.

active animal, and therefore less heavily loaded with blubber. The king-penguin is said to be its favorite food, a statement which speaks well for the sea-leopard's activity in the water, the penguin swimming rapidly enough of course to catch the fish upon which it feeds. The leopard is described as pursuing and overtaking the penguin under water, rising to the surface and tossing it into the air, so as to catch it more securely, crosswise, in its jaws.

Dr. W. Peters also describes a new species of *Otaria*,* the *Arctophoca gazella*, its specific name being given in honor of the sloop of war *Gazelle*, which carried the German transit of Venus expedition to Kerguelen Island. And Rev. Mr. Eaton, naturalist to the English expedition, speaks of two "species of platyrrhine seal",† in addition to the sea-elephant and sea-leopard. By our own party only four individuals of the *Phocidæ* were seen during four months' residence on the island. Two of these were thought to be sea-leopards, and two sea-elephants, one of the latter having been captured and preserved, as above stated. Sealers speak of a few scattering fur-seals upon this and Heard's Islands, but they have never been found in large numbers.

Many species of whales and porpoises abound in the neighboring seas. In the early days of whaling in the Indian Ocean, these islands are said to have literally swarmed with whales, for which the numerous inlets and bays of the archipelago furnished secure and sheltered breeding-places. Even now this region is one of the best whale-fishing grounds of the Antarctic Seas.

FISH.

(IDENTIFIED BY PROF. THEO. GILL.)

Very few fish were collected, owing to the want of boats. Several attempts were made with set-lines from the shore, but without success. From the deck of the *Swatara*, September 9, was caught, with a hand-line, a fine specimen of *Chænicthys rhinoceratus*, Richardson, which has been preserved. (Catalogue National Museum, No. 16642.)

There were also captured, at various times, under stones on the beach, at low water, small specimens of *Notothenia purpuriceps*, Rich., and *Harpagifer bispinis*, Rich. On the 2d January, dredging at 5 fathoms from the steam-cutter of the *Monongahela*, I obtained two small speci-

* Loc. cit.

† Annals and Magazine, October, 1875.

mens, one of which proves to be *Notothenia purpuriceps*, and the other (probably) *Notothenia tessellata*, Rich., hitherto reported from the Falkland Islands. Some of the dorsal rays having been injured in transportation, the diagnosis is not positive.*

The sealers reported that at times they had caught a fish of considerable size, "like a tom cod", at the outer edges of the kelp-beds; but state that fish are never very plentiful. None were found in the fresh-water streams.

A single specimen each of a species of *Gobiesox* and *Clinus* was brought from Table Bay, South Africa, having been captured on the shore.

MOLLUSKS.

BY W. H. DALE, SMITHSONIAN INSTITUTION.

CEPHALOPODA:

Octopus?

Beaks of a cephalopod, perhaps an *Octopus*, were discovered by Dr. Kidder in the stomachs of sea-birds. Also an *Octopus*, dead on the beach, after a storm, in too imperfect a condition for identification.

GASTEROPODA.

RISSOIDÆ.

GENUS EATONIELLA, Dall.

Eatonia, E. A. Smith, Ann. Mag. N. Hist. xvi, ser. iv, July, 1875, 70; (*not Eatonia*, Jas. Hall, 10th Rep. N. Y. State Univ. 90, 1857; Pal. N. Y. iii, 432, 1858.)

The name *Eatonia* being pre-occupied, as above, by Hall for a genus of brachiopods, I have substituted a modified form of it which does not appear to have been used. This genus is practically a thin, smooth *Rissoina*, as far as the shell goes, apparently bearing much the same relation to *Rissoina* that *Cingula* does to *Rissoa*.

EATONIELLA KERGUELENENSIS.

Eatonia kerguelensis, E. A. Smith, l. c. 70.

Mus. No. 11898.

The specimens, five in number, collected by Dr. Kidder at low-water

* Gill, Synops. Notothenioids, Proc. Phil. Acad. Nat. Sci. 1861, 591.—Richardson, Ichthyology of the Erebus and Terror, 5.—Günther, Cat. Acanth. Fishes, ii, 260.

mark on fuci, show such great variations in form of aperture, acuteness of the spire, and general proportions, that I am unwilling to describe them as new, though the diagnosis of Mr. Smith does not seem in all respects applicable to them. None of them exceed four and a half whorls in extent, the aperture being nearly one-half as long as the shell. A faint umbilical chink is perceptible in a greatly enlarged camera-drawing. The largest specimen is 4.5^{mm}. in length and 2.3^{mm}. in width. If, on comparison, the specimens should be found to differ from the form described by Mr. Smith, they may be called *Eatoniella inflata*.

The operculum of this species, besides being subspiral instead of concentric, differs from that of *Rissoella* Gray (= *Jeffreysia*, Alder) in having the process extended at a much more obtuse angle, but on the same side of the operculum.

EATONIELLA CALIGINOSA.

Eatonia caliginosa, E. A. Smith, l. c. 71.

Mus. No. 11899.

Two specimens, apparently of this species, were obtained by Dr. Kidder.

MURICIDÆ.

PURPURA STRIATA.

Buccinum striatum, Martyn, Un. Conch.

Mus. No. 11900.

New Zealand, Martyn; Kerguelen, Dr. Kidder, two specimens, one living; probably this species, which is common in New Zealand.

PATELLIDÆ.

PATINELLA MAGELLANICA.

Patinella magellanica, Dall, Am. Jour. Conch. vi, 273, 1871.

Patella magellanica, Gmelin.

Patella deaurata, Auct.

Patella ferruginea, Wood, Index Test. No. 22.

Patella fusca, Dillwyn, Cat. ii, 1047, No. 70.

Mus. No. 11901.

Straits of Magellan, United States Exploring Expedition; Kerguelen, dead on beach, seven specimens, much worn, Dr. Kidder.

PATELLA? DELESSERTII, Philippi.

Mus. No. 11902.

Straits of Magellan, authors; Kerguelen, one dead specimen probably of this species, Dr. Kidder.

CHITONIDÆ.

GENUS HEMIARTHURUM, Cpr., MS.

Valvæ terminales laminatæ, haud articulatæ, laminæ laterales obsoletæ; zona lanuginosa, porifera; branchiæ posticæ.

HEMIARTHURUM SETULOSUM, Cpr., n. s.

Mus. No. 11903.

H. t. latiore, curvata, olivaceo-fusca; jugo plauato; mucrone sub-centrali? areis haud definitis; totâ superficie sensim quincunxiter granulosâ, granis satis extantibus.

Intus; valva anticâ et posticâ conspicue laminata; laminis acutis, haud incisus, haud regularibus, valde extantibus; subgrundis spongiosis, minimis; valvis centralibus et posticâ laminis suturalibus, triangularibus, maxime distantibus, extantibus, decliviter lateraliter, continuis; sinu maximo, valde spongioso.

Zona modicâ, haud expansâ, solida, leve; sparsim minutissime lanuginatâ; poris minutissimis, setuliferis ad suturas, et circ. iv, circum valvas terminales situs, instructâ, setulis minimis, curtissimis.

Animal, pede capiteque normalibus; branchiis majoribus posticis, utroque latere circiter vi, medio pede tenuis. *Lon.* 13^{mm}. *Lat.* 7^{mm}. *Div.* variante ad 130°.

Kerguelen Island, on stones at low water, Dr. Kidder, two specimens.

This shell, externally, resembles some of the coarse, ill-defined acanthochitons. The girdle, however, is narrower and smoother than in that genus, and the pores so extremely minute that in a dry specimen they would escape attention. Within, however, the features are entirely new, though not unexpected. It forms a transition between *Hanleia* (*mendicaria*) and the articulate chitons. A single unslit lamina surrounds both the terminal valves, projecting far beyond the external layer. In the posterior plate this is continued forward to form part of the sutural laminæ. These, in all the valves, slope off, both toward the middle and toward the sides, so as to take the place of the ordinary side-laminæ, which here do not exist.

The specimen examined—hardened by preservation in alcohol and

softened in water only—had the plates so much affected by the decortication of the whole jugular portion that I was unable to extract them in a perfect condition. However, all the characters could be made out except the *muco*, which, judging by the remaining striæ of growth, must have been central, or nearly so. (Carpenter MS.)

HELICIDÆ.

HELIX (HYALINA) HOOKERI.

Helix hookeri, Pfr. Mon. Hel. iii, 88, No. 531.

Helix hookeri, Reeve, Conch. Icon. 208, n. 1474.

Mus. No. 11904.

Kerguelen Island, Hooker, Dr. Kidder. Gregarious about and under stones. Occasionally the shell of this species appears to be partly membranous, and in drying, from this cause, the spire is frequently abnormally flattened.

SIPHONARIIDÆ.

SIPHONARIA TRISTENSIS.

Siphonaria tristensis, Sby. Gen. Sh. f. 3.; Dall. Am. Journ. Conch. vi, 1870.

Siphonaria lessoni, Blainv. teste Rve. Ic. v., fig. 23, a, 6.

Mus. No. 11905.

Tristan d'Acunha, Rve. Orange Harbor, Patagonia, United States Exploring Expedition; Kerguelen, Dr. Kidder; abundant between tide-marks.

ACEPHALA.

LASEIDÆ.

LASEA RUBRA, Mont.

Mus. No. 11906.

Kerguelen Island, Dr. Kidder, four specimens; with mussels. Distribution world-wide. These individuals are rather larger than most northern specimens.

LEPTONIDÆ.

LEPTON PARASITICUM, n. s.

Mus. No. 11907.

Shell small, elongate ovate, inflated, thin; beaks nearly central, not prominent, surface shining, but not polished, with the texture of a *Pandora*. Shell white, hardly sculptured, but under a high magnifying

power showing delicate concentric lines and fine radiating, apparently pubescent, lines extending from the umbones. Margins of the shell covered by an extension of the mantle, provided on each side with seven or eight stout cirri or tentacular processes. A single larger cirrus above the foot at the anterior end. Siphon short, foot small, very close to the anterior end of the shell.

Length, 2^{mm}; height, 1.6^{mm}.

Habitat, in the channels leading to the oral aperture of a species of echinoid (*Tripylus*), where it appears to lead a parasitic or at least a commensal existence. These echini were dredged by Dr. Kidder at Royal Sound, Kerguelen Island, near the station of the United States observers, in five and twelve fathoms. These tiny mollusks were quite abundant on the particular portion of the echinus mentioned, but none were found on any other part. It would seem as if the soft parts, before becoming contracted by the alcohol, must have almost entirely enveloped the shell. The latter was of such extreme tenuity that all efforts to remove it entire from the specimens resulted in its destruction. The teeth appeared, however, to resemble those of the other species of the genus; none of which, so far as I can recall, have been reported as commensal animals.

MODIOLARCIDÆ.

KIDDERIA, n. g.

Shell minute, byssiferous, concentrically sculptured, with two minute cardinal teeth in each valve, and a partially internal ligament attached to a more or less prominent process on the inner hinge-margin of each valve. Pallial line simple.

KIDDERIA MINUTA, n. s.

Mus. No. 11908.

Shell minute, thin, inflated; shaped not unlike a short *Lithodomus*; the upper posterior surface dark rose-color, the basal and umbonal portions of the valves whitish, with an excessively thin epidermis; the interior more or less suffused with rose-color, smooth, but not polished. Muscular scars indistinct, anterior scar rounded, posterior ovate. Umbones rounded, inflated, nearly terminal; anterior end of shell subtruncate, posterior end rounded. Surface smooth, under a high power showing minute rounded incremental concentric ridges. Cardinal teeth very minute, anterior largest, hinge-margin not thickened except at the ligamentary processes. Ligament strong and thick, attached almost exclu-

sively to the inner side of the hinge-margin, but partly visible from the outside between the edges of the valves.

Length of largest specimen, 4^{mm}; height, 3^{mm}; diameter, 2.5^{mm}.

This minute shell was found attached to the byssus of *Mytilus canaliculus*, and at first sight might be readily taken for the fry of that species. An examination of the hinge and muscular scars, however, is sufficient to dispel this impression.

It differs from *Modiolarca*, in its single anterior muscular scar, the presence of strong *nymphæ* for the subinternal ligament, and in the full development of the cardinal teeth; which, though minute, stand sharply out from under the cardinal border, instead of being subobsolete upon its internal face. The ligament falls little short of being entirely internal. So strong, and so strongly attached is it, that all attempts to clear it from the hinge-processes were ineffectual, and their exact shape (which appears to differ slightly in different individuals) could not be made out. In fact, in opening the shell, the valves would usually give way before the ligament. Its attachments appear to be entirely internal, though the edges of the valves do not quite close over its outer surface. The margin of the shell appears perfectly plain, and most of the specimens possess a slender byssus.

Modiolarca pusilla, Gould, appears (from the type specimens) to belong to this group, but it differs from *K. minuta* in form, color, and larger proportional size of the teeth. Gould's figure does not well represent his typical specimens. They were from Tierra del Fuego, and among some *minutiæ* from Orange Harbor, collected by the United States Exploring Expedition, I found several specimens of *K. minuta*. In some respects this shell recalls *Ceropsis* of the *Carditidæ*.

I am pleased to be able to connect with this interesting little form the name of Dr. Kidder, who has, with very limited opportunities and the disadvantage of a comparatively short stay on the island, succeeded in accumulating a most interesting fund of specimens and biographical notes.

MYTILIDÆ.

MYTILUS MAGELLANICUS, Ohemn.

Mus. No. 11909.

New Zealand, Straits of Magellan, authors; Kerguelen Island, Dr. Kidder; four living specimens, much eroded, and numerous dead valves.

MYTILUS CANALICULUS, Hanley.

Mytilus latus, auct. non. Lam.

Mytilus unguatus, Rve. Conch. Ic. ii, 4.

Mus. No. 11910.

Chili, Reeve; New Zealand, Hanley; Kerguelen Island, Dr. Kidder, living; abundant. The shell of this species closely resembles some varieties of *Mytilus edulis*, but the soft parts are quite different. The foot is large and quite flat beneath. The viscera and branchiæ are white; the foot and mantle edge streaked with dark brown.

The following species, not obtained by Dr. Kidder, but described as new, by Mr. Smith, in the paper referred to; and other previously-described species, which are not enumerated in the paper in the Annals, were found by the Rev. A. E. Eaton, of the English party at Kerguelen.

Struthiolaria mirabilis, Smith.

Buccinopsis (?) eatoni, Smith.

Trophon albolabratum, Smith.

Littorina setosa, Smith.

Rissoa Kergueleni, Smith.

Eatoniella subrufescens, Smith, sp.

Skenca subcanaliculata, Smith.

Scissurella supraplicata, Smith.

Solenella gigantea, Smith.

Yoldia subæquilateralis, Smith.

[In addition to the foregoing, the collection contains individuals of an undetermined *Doris*, found in tide-pools, at low-water.—J. H. K.]

MOLLUSCOIDA.

The class TUNICATA is numerously represented, both solitary and compound ascidians being abundant upon rocky beaches and attached to the great masses of kelp (*Macrocystis*) which fringe the shores of the island. A large solitary ascidian, of dark mahogany color, with tough, leathery envelope, was especially common just below low-water mark. Specimens were found as long as 5 inches.

Flustra and numerous other forms of POLYZOA grow luxuriantly upon the stems and leaves of sea-weed, presenting often remarkably

delicate and beautifully branching forms. No brachiopods were collected, owing, I suppose, to the want of facilities for dredging, since better-known regions in the same latitude have been found to be particularly rich in animals of this class. None of the *Molluscoïda* have yet been identified specifically.

INSECTS.

COLEOPTERA.

Several species of curculio, and a very few specimens of a small black beetle, were found at different times and in very diverse localities. The little black beetles were caught on rocks near the sea and about the roots of wet tufts of moss. They belong to the genus *Oethebius*, Leach, a member of the aquatic family *Helophoridae*, McLeay, and are vegetable feeders in the perfect state. The British species are described as slow in their movements, creeping along the stems of aquatic plants, and often crawling out of the water upon the margins of fresh-water pools. There was no body of fresh water near the habitat of these Kerguelen specimens, but the herbage in which they were found is constantly drenched with rain and snow water. Westwood states (Guide to the Classification of Insects, London, 1839) that "this family appears to be confined to temperate climates, no species having been hitherto found as inhabitants of tropical countries, or, indeed, as belonging to the southern hemisphere."

A small black species of curculio was captured near the top of Mount Crozier, above the snow-line, early in the summer (November). It had just crawled out of a tuft of moss upon the surface of a rock. Other similar specimens had been found still earlier in the season under stones in gravelly soil, apparently torpid. Later, many different forms, some of moderate size, were found on the sunny faces of rocks near the sea. Many of these were colored green, blue, or brown, but the colors were generally dull. Most of the species were incapable of flight, their wing-cases being soldered together. Some of the largest forms were good fliers, however, the largest and most brilliantly colored specimen taken having flown into my hut one night, attracted by the light. These curculios were not observed to counterfeit death when approached, as is the habit of the family elsewhere. All of these various forms are pronounced by Professor Gerstaecker (to whom both these and the preceding were sent for identification) to belong to the genus *Phillobius*,

Schönherr, the specimens being too much injured in transportation to admit of the determination of the species. The few drops of carbolic acid, added to the bottle of glycerine, alcohol, and water, in which they were preserved, seem to have been destructive to the more minute parts.

Besides the foregoing, a single specimen of a small brown beetle, supposed to be an elater, was captured and preserved, but has somehow been lost in transportation. Mr. Eaton speaks of finding longicorn beetles, and "several species of *Brachyelytra*." (Ann. and Mag. Nat. History, Oct., 1875, p. 291.)*

It is somewhat remarkable that the prominent form in the *Coleoptera* of Kerguelen, an island destitute of trees and shrubs, should be the curculio, and that the only other form collected by our party should be a water-beetle, living at a distance from any pond or pool. The possibility of importation by the whalers, which have so long frequented the island, should be borne in mind in this connection.

LEPIDOPTERA.

The small vial containing the collection of *Lepidoptera* has been lost in transportation. A single flying tineid moth was observed soon after our landing, but supposed to be a clothes-moth from our own boxes. While preparing some botanical specimens for the press on the evening of December 18, I captured two lepidopterous insects of moderate size, with very imperfect and abbreviated wings, active in their movements, and "seeming to be provided with two pairs of antennæ, one being long and thread-like, the other shorter, pectinate, and curling backward over the top of the head." These insects are noted in my diary as "*Podura*-

* The following species from Mr. Eaton's collection have been described by Mr. Chas. O. Waterhouse, in the Entomologists' Monthly Magazine (London, Aug., 1875, 54), as from Kerguelen's Land:

SUB-ORDER BRACHYELYTRA:

FAMILY, ALEOCHARIDÆ:

Phytosus atriceps, sp. nov.

SUB-ORDER RHYNCHOPHORA:

FAMILY, BRACHYDERIDINÆ:

Canonopsis sericeus, gen. et sp. nov.

Agonelytra, gen. nov.

Agonelytra angusticollis, sp. nov.

Agonelytra gracilipes, sp. nov.

Agonelytra brevis, sp. nov.

like moths of large size, with partly-developed wings, from the roots of plants." Small *Poduræ* were not uncommon. With these exceptions, no members of this order were observed during our stay, although often sought for, particularly at night.*

DIPTERA.

FAM. ACALYPTERA.

(IDENTIFIED BY C. R. OSTEN SACKEN.)

Calycopteryx mosleyi, Eaton, g. and sp. nov.;

Anatalanta aptera, Eaton, g. and sp. nov.;

Amalopteryx maritima, Eaton, g. and sp. nov.—Entom. Mag., Aug., 1875.

Early in November, the first species named above was found on the leaves of the Kerguelen cabbage (*Pringlea antiscorbutica*), and thereafter in increasing numbers. The insects are of considerable size, dark brown in color, with long legs, and considerable activity of movement, looking not unlike large ants. This species is distinguished on superficial examination by its long ovipositor, and by the prominent pubescence covering its abdomen. Upon the approach of the observer the insects drop from the leaves in great numbers, doubling up their legs and counterfeiting death. As the axils of these large leaves always contain a considerable quantity of water, the utility of the pubescence with which the insects are covered becomes very apparent, protecting them from getting wet by the film of air entangled in the hairs. Footless larvæ, supposed to belong to these insects, were found in abundance among the damp roots of moss and grass.

On the 27th of November, I set a jar with its rim even with the surface of the earth and baited it with carrion in the hope of catching beetles. It contained, in the morning, large numbers of *Diptera* of the second species (*Anatalanta aptera*), differing superficially from the preceding by their lesser size, darker color, less pubescence, and much less distinct ovipositors. They were also much more active in their movements, and almost always found upon dead animal matter. They were not observed to counterfeit death on being approached.

It was not until late in December that the third species was discovered on wet rocks at the edge of the sea. These are smaller than either of the others, quite black, not visibly pubescent, and provided

* Mr. Eaton describes only the tineid moth, viz: *Embryonopsis hallicella*, gen. et sp. nov. Ent. Mag., loc. cit.

with small, triangular rudiments of wings. They cannot fly, but seem to use the wings in jumping, which they do with great activity, making it quite difficult to catch them. They do not appear to jump in any definite direction, but spring into the air, buzzing the small winglets with great activity, and seem to trust to chance for a spot on which to alight, tumbling over and over in the air. I never observed them jumping when undisturbed.

These three genera of wingless flies present several anomalies not heretofore observed. With the structure of flies, they possess many of the habits of beetles, such as that of counterfeiting death when in danger, and seem to represent this order in the economy of the locality. The carrion-feeder (*Anatalanta aptera*) has no vestige of either wings or balancers (halteres), "*Aptera anhalterata*," Mr. Eaton calls them. The leaf-feeders show small scale-like bodies, which Mr. Eaton supposed to represent the balancers ("*halteribus brevibus et parvis*"). Baron Osten Sacken, however, finds that these scales are really representatives of the wings. The third genus (*Amalopteryx maritima*) represents a further step in the progress of development, possessing both wings and balancers, but still unable to fly. A small gnat, observed only during the time of flowering of the "Kerguelen tea" (*Acana affinis*, Hook. fil.), was the only flying insect observed by me while on the island. Even the common house-fly had not yet been naturalized. Mr. Eaton mentions also a species of *Tipulidæ*,* with imperfect or abortive wings.

PSEUDO-NEUROPTERA.

BY H. A. HAGEN.

RHYOPSOCUS ECLIPTICUS.

Head large, triangular, scarcely longer than broad, flattened above; occipital margin straight, very little notched in the middle. Eyes black, scarcely prominent, placed in the hind angle of the head; half as long as the head, half as broad as long, slightly rounded externally, with very large facets, only 15 along the external margin; ocelli wanting (Note 1). Nasus large, tumid, nearly straight before, the angles rounded; labrum half as long as broad, front margin straight, angles rounded; antennæ inserted between the base of the clypeus and the eyes, long, nearly as long as the body, thin, 26-jointed; the two basal joints much larger, of equal length, cylindrical; the six following ones nearly equal, cylindrical, a little shorter than the second one; the eight following ones a little shorter, somewhat ovoid; the last of them (the 16th) a

* Described as *Halyritus amphibius*, Eaton, Entom. Mag., Aug., 1875.

little shorter and more dilated; the following ten cylindrical, a little longer, except the shorter terminal one. Fine hairs are inserted around the joints, sometimes two on each side, sometimes more—up to four or six. In the basal part of the antennæ the hairs are longer (Note 2). Mouth-parts strong; mandibulæ hooked, the base interiorly dilated and denticulated; maxillæ with an elongated interior lobe, with two series of teeth at the base; the long horny stem straight, bifid on tip, exterior branch a little longer; maxillar palpus 4-jointed, large, last joint longer, hatchet-shaped, with numerous hairs in small holes on the apical margin; labium with two triangular inner lobes, and 2-jointed palpæ, the first very short, the last large, similar to the last joint of the maxillary ones, but smaller. Prothorax more than half as broad as the head; the hind angles protracted into triangular lobes. Mesothorax and metathorax not very distinct, seemingly as broad as the prothorax, side lobes more rounded.

Fore wings shorter than the abdomen, three times longer than broad, rounded on tips, anterior margins in a very flat curve, posterior nearly straight; base of the wing a little narrower than the tip, rounded posteriorly. The whole margin around the wing is bordered by a strong vein, thickly beset with oblique darker stripes or tubercles; and at larger intervals with longer stiff hairs, set in holes, mostly on the veins, some near by in the membranous part of the wings. One middle vein is soon furcated beyond the base into a superior and an inferior branch. The superior branch provides the anterior half of the wing; it is furcated very soon again, the two branches running parallel and uniting at about the middle of the length of the wing by an oblique vein. From the upper end of this oblique vein goes a short branch straight to the anterior margin of the wing, and two longer ones to its rounded apex, the inferior of them again furcated at about its middle; from the inferior end of the oblique vein goes one branch, furcated half-way to the inferior part of the wing-apex; the inferior branch of the two last ones is, in the other wing, furcated again a short distance from the margin. The inferior branch of the furcation just beyond the base of the wing is again furcated just before the middle of the wing, and its superior branch again; so it goes, somewhat incurved, with three veins, to the apical half of the hinder margin. There go one (or two) straight veins from the basis in an oblique line to the basal half of the posterior margin. I am not sure whether a short oblique vein goes from the basis to the anterior margin. The right wing is more irregular, and it seems that

the inferior branch, distributed to the apical half of the hinder margin, comes from the superior one, somewhat in front of the oblique vein, and that its two inferior branches are derived, as in the other wing, from the basis. All veins are beset at intervals with stiff hairs, like the marginal vein.

The hind wings are similar in shape to the fore wings, but shorter and narrower. The surrounding marginal vein similar but not so strong. There are none of the long hairs in the hind wing. A middle vein gives off in the first third an oblique branch to the hind margin. This is the only vein in the hind wings reaching the marginal vein. All others cease more or less abruptly before reaching them. Shortly after a similar oblique vein goes to the anterior margin. In the middle of the length of the wing the main vein is branched, and gives a long inferior branch going to the hind margin near the tip without reaching it; then, the superior branch furcates in two parallel branches going to the tip; the inferior one shows posteriorly an indication of the beginning of a branch.

Legs long, stout, the posterior longer than the abdomen; femurs stout and thick (perhaps the species jumps like many *Psocidæ*); tibia cylindrical, as long as the femur, slightly hairy, with two movable spines on the apex below; tarsi 3-jointed, one-third shorter than the tibia, cylindrical, the last joint long, the two others equal, and together two-thirds of the length of the basal joint; at the apex of the last joint two claws, thicker at their bases, the apex fine, a little bent at tip; between the claws a rounded plantula.

Abdomen ovoid, more pointed toward the apex. The egg-valves very clearly visible (the specimen is a female); two exterior membranous, elongated lobes, two horny interior stems, long, narrow, perhaps articulated; the apical part bent inward, and the tip again outward; between the two horny ones are two smaller elongated, pointed, horner stems, much shorter than the others.

The color is pale brownish-yellow, darker on head and mandibles; antennæ grayish; wings hyaline, colorless, the long hairs of the fore-wings dark.

Length of the body a little less than 2 millimeters; expanse of fore wing $1\frac{1}{2}$ millimeters. Locality Kerguelen Island, October, 1874.*

* The only specimen noticed during the stay of the Transit Party at Kerguelen was captured October 17, within doors, and was mounted in balsam upon a microscopic slide. Shortly before its capture some instrument-boxes, brought from Washington and containing a quantity of packing-straw, had been unpacked in the same room; a circumstance rendering the habitat of the insect very doubtful at the time.—J. H. K.

The specimen belongs, doubtless, to the so-called micropterous forms of *Psocidæ*, which occur occasionally and are observed in many species. Mr. Westwood has founded upon such specimens the genus *Lachesis* proved by M'Lachlan to be, probably, a micropterous condition of *Cæcilius pedicularius*. In the Kerguelen specimen the shortness of the wings (the fore wings are shorter than the body), and the reticulation not identical in both wings, show an aborted condition. The systematic place is rather doubtful.

Within the section of *Psocidæ* with ocelli (I have stated that I believe the Kerguelen specimen to be *without* ocelli) two genera have legs with 3-jointed tarsi. But in both (*Myopsocus* and *Elipsocus*) the second joint is much shorter than the third, and the antennæ only 13-jointed. Of the species described for those genera *E. pumilis* from New York is not very much larger, and is similar in colors. But the reticulation is very different and ocelli are present. In my two specimens the antennæ and tarsi are broken.

Among the *Psocidæ* without ocelli only *Psoquilla* could be taken into account. The tarsi are of the same shape, the palpi also; the antennæ are equally multiarticulate, but *Psoquilla* possesses no hind wings, and the reticulation is scarcely related. I should add that *Psoquilla* is known only by three specimens of uncertain locality, and not in good condition.

The genus *Psyllipsocus*, founded by Baron De Selys Longchamps on *Psocus pedicularius Rambur*, approaches this species more nearly in regard to the reticulation of the fore-wings, and has 3-jointed tarsi, but nothing is stated about their length, or about the presence of ocelli, or the number of joints of the antennæ. The single specimen, in bad condition, is perhaps also exotic, that is, imported into Paris with plants or merchandise.

Therefore the specimen, not agreeing with any known species or genus, must belong to a new genus, which I name *Rhyopsocus*. The character of the genus would be sufficiently established; *ocellis nullis; antennis 26-articulatis palpis maxillaribus articulo apicali magno, truncato; tarsis triarticulatis, articulis duobus apicalibus æqualibus; alis quatuor*.

The question whether the species is introduced from America, is not to be answered with certainty. All species hitherto known from America differ from one another. The only species I have not seen is *P. pusillus* Harris, but the description differs. Now it is certain that not more than ten per cent. of the species living in North America are known, probably even less.

The introduction of the Psocidæ into foreign countries is very easy. Two species, living in Ceylon upon the coffee-tree, have been collected near Rio de Janeiro by Mr. B. P. Mann, on the coffee-trees introduced long ago from Ceylon. Perhaps they are also introduced in Ceylon. *Atropos oleagina* occurred in Ceylon, and was stated to have been imported with oil-cake from England; but there is no evidence that the species is British. Other species of *Atropos* and *Psocus* occur in many parts of the world. The curious instance that *R. eclipticus* has aborted wings, like most of the Kerguelen insects, would in this case not be a certain proof for the habitat. But it is certainly not impossible.

NOTES.

NOTE 1.—As the presence or the absence of the ocelli is a very important character, I have spent a considerable time in examining those organs. I confess that there are still some doubts about this matter. In the middle of the head, and in the same direction with the upper ends of the eyes, is a transverse air-bubble, or better, a hole filled with air, assuming the shape of the cerebrum, narrower toward the middle from behind, rounded at the end. But the two sides differ in shape. The left side is cylindrical, rounded at the outer end, with a cup like a watch-glass, imitating well the cornea of an ocellum; the right side has a similar shape, but the outer end is in some way extravasated, beginning from the place where on the left side the cornea-like cup begins. The place filled with the extravasation is represented on the left side by a hollow space, to be seen well marked in the interior of the head. A third anterior ocellus is entirely wanting, although the parts are all quite visible, and I see two little prominences which would represent the beginning of the two nervous commissures encircling the œsophagus. Though the whole interior of the body is transparent, and the digestive organs are quite visible, I cannot distinguish anything belonging to the nervous system, not even the ganglia; probably they are too transparent. After all, I consider the above transparent, transversal organ to be the cerebrum, and the ocelli as wanting, the more so since the Psocidæ known have either three ocelli or none, but never two. And even here, if the two posterior ocelli only were represented, they are much more separated from each other than in any species hitherto known.*

NOTE 2.—The antennæ were broken; on one side only eight joints remained, on the other, twelve; but lying near by was the apical part of

* So large a number of joints in the antennæ is only to be found in species without ocelli.

fourteen joints. The joints are covered with numerous fine pores; but commonly one much larger pore on each side, below the middle, is very conspicuous in the middle joints of the antennæ, principally in the sixteenth and preceding joints. Such a large pore contains the insertion of a sensitive hair.

No other order of insect proper seems to be represented on Kerguelen Island than those already mentioned. Neither was any member of the class *Myriapoda* observed. Spiders of the wandering sort are abundant, their tents being numerous under almost every large stone. There are no web-builders, however, and, although individuals are numerous, the variety in form is slight. The collection has been sent to Mr. William Holden, of Marietta, Ohio, for identification.

A small red acarinus was very plentiful upon the leaf-stalks of the Kerguelen cabbage, and, indeed, wherever succulent vegetation was luxuriant. Broad yellow bands, observed on the sides of rocks frequented by cormorants, were found to consist almost entirely of another variety of acarinus, yellow in color, and spotted on the back, somewhat like the "lady-bird" (*Coccinella*).

CRUSTACEANS.

DESCRIBED BY S. I. SMITH.

DECAPODA.

PINNOTHERIDÆ.

HALICARCINUS PLANATUS, White.

Cancer planatus, J. C. Fabricius, *Entomologia Systematica*, ii, 446, 1793.

Leucosia planata, J. C. Fabricius, *Supplementum Entomologiæ Systematicæ*, 350, 1798.

Hymenosoma tridentatum, Lucas, in Hombroun et Jacquinot, *Voyage de l'Astrolabe au pôle sud*, 60, pl. 5, figs. 27-33.

Halicarcinus planatus, White, *Annals and Magazine Nat. Hist.*, vol. xvii, 178, 1846, pl. 2, fig. 1; *Catalogue Crust. British Museum*, 33, 1847.—Dana, *United States Exploring Expedition, Crust.*, 385, pl. 24, fig. 7, 1852.—Edwards, *Annales des Sciences naturelles*, 3me série, xx, 1853, 223.—Heller, *Reise der österreichischen Fregatte Novara um die Erde, Crust.*, 66, 1865.

Specimens of this species were collected at Kerguelen Island, on rocky beaches, and others were dredged in five fathoms. It was previously known from Tierra del Fuego and New Zealand. The males are nearly equal in size to the females, and have very much stouter chelipeds.

AMPHIPODA.

ORCHESTIDÆ.

HYALE VILLOSA, Smith, s. n.

Of this species there is in the collection only a single somewhat mutilated specimen, from which the following description is taken :

Male : Second and third segments of the peduncle of the antennula subequal in length, very slightly shorter than the first ; flagellum imperfect. Ultimate segment of the peduncle of the antenna longer than the penultimate, and almost as long as the last two segments of the peduncle of the antennula ; flagellum nearly twice as long as the peduncle, and composed of about seventeen segments ; the last segments of the peduncle and the proximal portion of the flagellum quite thickly villose.

First pair of gnathopods with the carpus short and triangular ; the propodus not quite twice as long as broad, of the same breadth at each end, the palmary margin slightly oblique and a little convex in outline, armed with a slender spine on the inside at the rounded posterior angle, and clothed with a few hair-like setæ, as is also the distal portion of the posterior margin ; the dactylus long and strongly curved. so as to reach round upon the posterior margin. Second pair of gnathopods with the propodus caudate in outline, about five-sevenths as broad as long, and narrowed rapidly distally ; the palmary and posterior margins forming a continuous curve of nearly the same convexity as the anterior margin, densely villose throughout, and armed on the inside, at the tip of the closed dactylus, with a single stout spine ; dactylus about half as long as the propodus, stout and strongly curved. Posterior pair of pereopods only slightly longer than the fourth pair, which are considerably longer than the third pair ; the bases of these three pairs, with the posterior margin expanded, evenly arcuate and unarmed. Infero-posterior angles of the second and third segments of the pleon right-angled but not produced. Uropods all short ; the bases of the first and second pairs reaching to the same point, and the inner rami in both slightly longer than the outer ; third pair about as long as the bases of the second, and with the ramus about as long as the base.

Length, excluding antennæ, nearly 10^{mm}.

Rocky beaches, Kerguelen Island.

This species is evidently very closely allied to *Hyale hirtipalma* (Allor-

chestes hirtipalma, Dana, Crustacea United States Exploring Expedition, p. 888, pl. 60, fig. 4, 1852) from the coast of Peru. According to the description and figures, however, the propodus in the first pair of gnathopods in that species is much narrowed proximally, the propodus in the second pair is twice as long as broad, the palmary margin is slightly emarginated in the middle, and there is no mention made of any spine. The maxillæ and maxillipeds agree well with the figures of those appendages given by Dana.

LYSIANASSIDÆ.

LYSIANASSA KIDDERI, Smith, s. n.

Eyes of moderate size, oval and black. Antero-lateral margin of the head produced, nearly right-angled, with the angle very slightly rounded. Basal segment of the peduncle of the antennula stout and about as long as the head; second and third segments very short; flagellum scarcely longer than the peduncle; secondary flagellum about half as long. Antenna in the female scarcely longer than the antennula; all the segments of the peduncle very short; the flagellum tapering rapidly, and composed of only seven or eight segments. In the young males the antenna is much longer than the antennula, and the flagellum is composed of twelve to fifteen segments, and furnished along the upper side with vase-shaped sensory organs.

First pair of gnathopods, not subcheliform, short; carpus much stouter than the propodus and nearly as long; propodus tapering distally to scarcely more than the breadth of the dactylus, which is stout, and not more than a third as long as the propodus. Second gnathopods slender; carpus fully a third as broad as long, slightly narrowed distally; propodus almost as wide but not as long as the carpus; the extremity truncated, with the posterior angle produced into a small tooth opposed to the minute hooked dactylus, which arises at its base and below the middle of the terminal margin; the posterior edge is armed with short and acute spines, while the anterior edge and the sides are clothed with slender setæ, and the terminal margin, above the base of the dactylus, with longer and stouter setæ, curved at the tips. Coxæ of the third pair of pereopods broader than long. Posterior edges of the bases of the third to the fifth pair evenly curved, with only very slight emarginations at the insertions of the very minute and widely-separated marginal hairs; the meral segments of the same appendages broad, and their

postero-inferior angles strongly produced. Infero-posterior angles of the second and third segments of the pleon obtusely rounded and not produced. Uropods all short; the posterior pair especially so; the base as thick as long; the outer ramus slender and shorter than the base; the inner minute, not more than half as long as the outer. Telson as broad as long, narrowed toward the extremity, which is truncated and slightly excavated.

Length, excluding antennæ, 3^{mm}. to 4^{mm}.

Rocky beaches, with the last species.

All the specimens received are apparently immature, and the males evidently, and very likely the females also, have not attained the adult characters. The species does not agree fully with the characters assigned by Boeck to the genus *Lysianassa* as restricted by him, and I therefore subjoin a description of the appendages of the mouth.

The mandibles are slender, with the molar area half-way from the tip to the attachment of the long and slender palpus which arises near the base. The inner lobe of the first maxilla is large, reaches more than two-thirds of the way to the tip of the outer lobe, and is furnished with two very minute setæ at the tip and numerous fine hairs along the inner margin; the palpus is very slender and tapers to a point, near which it is armed with a very few slender spines. The inner lobe of the second maxilla is broad and nearly or quite as long as the outer lobe. The inner lobe of the maxillipeds is elongated, armed at the tip with three obtuse teeth, and reaches to the distal extremity of the second segment of the palpus; the outer lobe is very large, unarmed, and reaches beyond the middle of the third segment of the palpus; the palpus is slender, the ultimate segment styliform and less than half as long as the penultimate.

The antennulæ, mandibles, second maxillæ, maxillipeds, and posterior uropods are more like some of the species of *Orchomene* than they are like the species of *Lysianassa*, as described and figured by Boeck, and the characters assigned to *Lysianassa* by this author would require considerable modification to admit our species.

Lysianassa kergueleni, Miers (Annals and Magazine Nat. Hist., iv, vol. xvi, p. 74, 1875), collected at Kerguelen by the Rev. A. F. Eaton, judging from the very short description, is quite a different species and not a *Lysianassa*, even in the unrestricted sense in which that generic term is used by Kroyer and Bate, for the first pair of gnathopods are said to be "subchelate."

GAMMARIDÆ.

ATYLUS (?) AUSTRALIS, Miers (?)

? *Paramœra australis*, Miers, Annals and Magazine Nat. Hist. iv, vol. xiv, 75, July, 1875.

? *Atylus australis*, Miers, loc. cit., 117, Aug., 1875.

There are, in Dr. Kidder's collection, a considerable number of specimens of an *Atylus*-like amphipod which I very hesitatingly refer to this species described by Miers from specimens collected at Kerguelen Island by the Rev. A. E. Eaton. Dr. Kidder's specimens differ in several points from the very brief description given by Miers. The most important of these differences is the existence of minute secondary flagella upon the antennulæ of our specimens, while Miers's species is said to have "exappendiculate" antennulæ. Although the secondary flagellum has usually been said to be wanting in all the *Atylinae*, it exists, according to Bate, in the young of the typical *Atylus carinatus*, Leach, and it has very likely been overlooked in the adults of some of the species of the group. Its minute size might have caused it to be overlooked by Miers in the present case. This species cannot be referred to the genus *Atylus* as restricted by Boeck, but, on account of the doubt in regard to the identity of our specimens with the species described by Miers, and the doubt whether *Paramœra* should be retained for Miers's species if a distinct genus, I content myself on the present occasion with the following description of the species in my possession:

The eyes are very large, oval, and black. The anterior margin of the head projects in a slight obtuse angle, between the bases of the antennulæ. The antennulæ are furnished with a minute secondary flagellum of a single segment, considerably shorter than the diameter of the first segment of the primary flagellum, but tipped with two slender setæ several times as long as the segment itself.

The gnathopods of the male are subequal, but those of the second pair are somewhat larger than the first. The carpus in each pair is about half as long as the propodus, and the distal portion of the posterior margin is armed with numerous setæ. The propodus in the first pair is about a third as broad as long; the edges are nearly parallel, but both slightly convex in outline; the posterior margin is furnished with fascicles of short, setiform hairs; the palmary margin is furnished with a narrow lamellar edge, is slightly oblique, evenly convex in outline, and the posterior angle is broadly rounded and continuous with the posterior margin, which, however, is armed, each side, with several stout

spines. The dactylus fits closely to the palmary margin. The propodus in the second pair is in all respects similar, but stouter, being fully half as broad as long; the palmary margin is a little more oblique, not quite as convex in outline, and the spines at the posterior angle are stouter. The dactylus is so much curved that it does not fit closely the middle part of the palmary margin. The gnathopods of the female are similar to those of the male, but much weaker and nearly equal in size, and the setæ of the posterior margins of the carpi and propodi are very much longer. The propodus in each pair is only a little longer than the carpus, about half as broad as long, and slightly narrowed proximally, and the palmary margin is very nearly transverse, with its posterior angle only very slightly rounded.

The inferior margins of the first three segments of the pleon are slightly arcuate and armed on the outside with a submarginal series of short spines, but the edge is not serrate. The posterior margins of the first and second segments are nearly straight and make nearly a right angle, very slightly rounded, with the inferior margins, while the posterior margin of the third segment is arcuate with the inferior angle broadly rounded. The peduncles of the second uropods do not reach to the tips of the peduncles of the first pair, and the outer rami in both these pairs are much more slender and considerably shorter than the inner, which reach nearly or quite to the tips of the third pair. The rami of the posterior uropods are subequal, longer than the peduncles, taper regularly to acute points, and are armed along each margin with stout spines and long setiform hairs, the latter principally upon the outer margins. The telson is about two thirds as broad as long, narrowed distally, divided two-thirds of the way to the base, and armed with a slender spine at the tip of each lobe, and often with one or two additional spines on each side.

Length of the largest specimens, excluding the antennæ, in the females about 9^{mm}; in the males a little less.

The mouth-appendages agree very well with those of *Atylus carinatus*, as figured by Kroyer (Voyages en Scandinavie, en Laponie, etc., pl. 11, fig. 1), but the mandibular palpus is considerably stouter than represented in the figures referred to, and the second and third segments are very nearly equal in length, the second segment somewhat stouter than the third.

Rocky beaches, Kerguelen Island.

ISOPODA.

ASELLIDÆ.

JÆRA PUBESCENS, Dana.

Jæra pubescens, Dana, United States Exploring Expedition, Crustacea, 744, pl. 49, fig. 9, 1852.

Associated with the following species upon rocky beaches, Kerguelen Island. Dana's specimens were from Nassau Bay, Tierra del Fuego.

SPHÆROMIDÆ.

SPHÆROMA GIGAS, Leach.

Sphæroma gigas, Leach, Dictionnaire des Sciences naturelles, vol. xii, 346 (*teste* Desmarest and Edwards).—Desmarest, Considérations générales sur la classe des Crust., 301, 1825.—Edwards, Histoire naturelle des Crust., vol. iii, 205, 1840.—White, List of Crustaceans in British Museum, 102, 1847.—Dana, United States Exploring Expedition, Crustacea, 775, pl. 52, fig. 1, 1852.

A large series of specimens of all sizes from 5^{mm} to 29^{mm} in length were obtained, all the larger specimens from the gullets of terns, the smaller ones from rocky beaches. All the specimens agree with the typical *gigas*, and do not seem to approach the *S. lanceolata*, White, (Annals and Magazine Nat. Hist., vol. xii, p. 345, 1843, and List of Crustaceans in British Museum, p. 102, 1847).

SEROLIDÆ.

SEROLIS LATIFRONS, White.

Serolis latifrons, White, List of Crust. British Museum, 106, 1847 (no description); Voyage of the Erebus and Terror, Crust., pl. 6, fig. 12.—Miers, Annals and Magazine Nat. Hist. iv, vol. xvi, 74, 1875.

Rocky beach, Kerguelen Island.

Only one specimen was obtained. This is a female, and considerably larger than the British Museum specimen. Our specimen differs somewhat in outline and proportions from White's figure; but the differences are very likely due to sex, although the sex of White's specimen is not stated. The antennæ are smaller than given in White's figure, the peduncle being scarcely longer than the head and the first thoracic segment. The peduncle of the antennula reaches beyond the lateral angle

of the first thoracic segment; the first three segments are scarcely longer than broad, the fourth about as long as the second segment of the antenna, and the fifth about twice as long as the fourth; the third, fourth, and fifth segments are flattened above, with the margins slightly raised, and with a strong median carina.

Length from front of head to tip of pleon, 37^{mm}; length of pleon, 13^{mm}; breadth of first thoracic segment, 24.5^{mm}; greatest breadth at third thoracic segment, 26.5^{mm}; breadth at last thoracic segment, 21.5^{mm}.

ANNELIDS AND ECHINODERMS.

By A. E. VERRILL.

ANNELIDA.

Very few species of annelids were collected, and only two species are represented by sufficiently well preserved specimens to warrant full descriptions. One of these is a large terebelloid worm belonging to a genus hitherto seldom met with and but imperfectly known.

NEREIS ANTARCTICA, Verrill, s. n.

One specimen of a *Nereis*, about two inches long, lacks some of the caudal segments and part of the tentacular cirri, but is otherwise pretty well preserved in glycerine.

The body is moderately stout and tapers from near the head backward. The cephalic lobe is rather narrow, and suddenly more narrowed in front of the eyes, which are large and prominent, those on the same side almost in contact and nearly in the same line; the frontal antennæ are rather long and slender; the upper tentacular cirri are wanting, but the lower ones are rather long and slender, those of the posterior pair reaching back to the sixth body-segment. The buccal segment is narrower but considerably longer than the following ones, and has a median obtuse angle projecting forward over the posterior border of the cephalic lobe. The lateral appendages of the anterior segments are rather stout, with a longer, slender dorsal cirrus. The upper ramus consists of two short, stout, obtusely rounded lobes, which are nearly equal in length and form, the upper one bearing the dorsal cirrus at about the middle of its upper side, on a slight swelling, while a fascicle of slender compound setæ comes out from between them; these setæ project about twice the length of the setigerous lobes, and all have a moderately

long, slender, acute terminal piece. The lower ramus consists of a smaller, subacute, lanceolate upper setigerous lobe, which is a little longer than the upper ramus, and of a shorter, broad, stout, rounded lower lobe, bearing the small, slender ventral cirrus at its base. The setæ of the lower ramus form two groups, the uppermost consisting partly of slender, acute setæ, like those of the upper ramus, but longer, and partly of somewhat shorter ones with a short, curved, bidentate terminal piece. Farther back the form of the appendages changes gradually, chiefly by all the lobes becoming more elongated and acute, and by the gradual development of a special acute setigerous lobe on the upper ramus. Toward the posterior end of the body the upper ramus becomes more elongated than the lower, with a narrow, elongated upper ligula with the elongated and slender dorsal cirrus arising from a decided hump on the middle of the upper edge, and extending more than half its length beyond the ligula; and the lower lobe is also elongated, lanceolate, obtuse, with a shorter, acute, setigerous lobe arising from its upper side. The lower ramus consists of two lanceolate lobes, the upper or setigerous one being about as long as the setigerous lobe of the upper ramus, while the lower one is a little shorter. The setæ are arranged as on the anterior segments, but those of the upper ramus are the longest; the ventral cirrus is very small and hardly one-fourth the length of the dorsal one.

Kerguelen Island, on the beach; Dr. J. H. Kidder.

It differs considerably from any of those known in the North Atlantic, and would hardly go into any of the generic divisions proposed by Dr. Malmgren.

In the same bottle with this species, and probably made by it, there was a curious nest, made of tough mucus threads, which inclosed numerous small eggs in a long crooked band of many rows. The nest is on the side of a flat alga, which is drawn together by the external looser threads, as leaves often are by *Tortrix* larvæ.

NEOTTIS, Malmgren (emended).

Nordiska Hafs-Annulater, in Öfversigt af Kong. Vet. Akad. Forhandlingar, 1865, 388.

This genus was established for the *Terebella triserialis*, Grube,* from Sicily, by Malmgren, but he states that he had only seen a mutilated specimen, and, owing, doubtless, to this fact, he erroneously gave as one of the characters of the genus the existence of fascicles of setæ on all

*Archiv. fur Naturgeschichte, xxi, 118, 1851, tab. iv, fig. 16.

the segments of the body after the third. But Grube states that in his specimens they exist on twenty-nine to thirty-one segments, "fasciculi setarum capillarium utrinque 29 ad 31."

This genus, as thus emended, is characterized by having transverse groups of simple cirriform branchiæ on each side of the second, third, and fourth segments; fascicles of setæ commencing on the second branchiferous segment and extending to about the thirty-second to forty-eighth; uncini, commencing on the third setigerous segment; the tori, changing to prominent papillæ on the last setigerous segments, and as such extending to the posterior end. The cephalic lobe is short, semicircular, bearing on its front edge numerous tentacles, and on the narrow margin behind the tentacles numerous minute, dark, ocelliform specks.

The genus *Streblosoma*, Sars, is closely allied to *Neottis*, if not identical, but in the former ocelli were not noticed.

Thelepus, Leuck., and *Thelepodopsis*, Sars, are both closely related northern genera, the latter differing only in having gills on but two segments, while the former not only differs in the same way, but the fascicles of setæ extend to the posterior end of the body.

NEOTTIS SPECTABILIS, Verrill, s. n.

Body moderately stout, much elongated; the tubercles bearing fascicles of setæ commence on the second branchiferous segment and exist on from thirty-three to forty-four segments, the highest number occurring on a very large specimen; the size of the tubercles and the number and length of the setæ decreasing backward, so that the last tubercles are quite small, with a few inconspicuous setæ. The tori bearing the uncini, beginning on the third setigerous segment, are low and elongated elliptical, extending downward to the ventral shields; farther back they become narrower and more prominent, becoming quite narrow and elevated at about the twenty-fifth setigerous segment, beyond which the same changes increase at the last setigerous segment, and beyond, to the end of the body they become still more prominent and papilliform, exceeding the last of the setigerous tubercles; of the posterior segments there are 30 or more. On the second to the fifth setigerous segments there is a small rounded papilla between the setigerous tubercles and the tori, on each side. The ventral shields are not very distinctly defined in the alcoholic specimens, especially the posterior ones, so that the number cannot be accurately determined, but they are more numerous than usual; the anterior ones are short but transversely broad, with several deep trans-

verse wrinkles. The cephalic lobe is short and apparently broadly truncate in front, the margin being slightly revolute, and bearing on its anterior surface, in a semicircular group, very numerous long canaliculate tentacles, and on its posterior margin there are numerous minute, inconspicuous, blackish ocelli, forming a crowded row or band on each side; these ocelli are much smaller than in *Thelepus cincinnatus* of our coast. The upper lip is broad, somewhat cucullate, and is produced forward; in a front view it forms about two-thirds of a circle. The lower lip is crescent-shaped and less prominent. The branchiæ are slender, cirriform, much curled, and very numerous, forming transversely elongated groups on the second, third, and fourth segments; the most anterior group being considerably the largest, and extending down on the sides below the level of the setigerous tubercles of the succeeding segments; the third cluster of branchiæ is smaller than the second.

Length of alcoholic specimens, 150^{mm} and upward; diameter, 6^{mm} to 8^{mm}; some of the empty tubes indicate still larger specimens.

The tubes are large and crooked, composed of a tough, thin, translucent, parchment-like lining, to which are firmly and closely cemented coarse grains and small pebbles of black volcanic rock, covering the whole surface, except on the upright terminal portion, which is usually coated with fragments of algæ, mixed with sand. The tubes were attached to stones and pebbles.

Kerguelen Island, twelve fathoms, with roots of *Macrocystis pyrifera*; Dr. J. H. Kidder.

An allied species has been described from the Falkland Islands by Dr. W. Baird as *Terebella bilineata*, but he states that it has 36 segments, with fascicles of setæ, which extend to the posterior end; but it is quite probable that his specimen had lost the posterior segments and really belongs to *Neottis*, with which it agrees in the character of the branchiæ.

SPIRORBIS, species undetermined.

The tubes of a species of *Spirorbis*, having three or four rather slender whorls, either coiled nearly in one plane, or with the part near the aperture turned upward, smooth, or with slight transverse wrinkles, occurred attached to the tubes of the preceding species, and on algæ.

Without the animal, it is impossible to identify with certainty the species of this genus.

ECHINODERMATA. HOLOTHURIOIDEA.

PENTACTELLA, g. n.

In general appearance like *Pentacta*, but destitute of calcareous plates around the œsophagus, and having a distinct muscular gizzard. Tentacles ten, arborescent, nearly all equal in the typical species. Suckers in five double rows; the intervening spaces smooth.

PENTACTELLA LÆVIGATA, Verrill, s. n.

Body elongated, fusiform, rounded, with thin integuments. Suckers alternating in two rows in each zone, not crowded, larger and more numerous in the three lower zones than in the two upper. Cloacal orifice with small and inconspicuous papillæ. Tentacles ten, subequal, elongated, much divided arborescently from close to the base. Three very elongated vesicles, much dilated in the middle; slender at tips, where one of them is forked. Œsophagus not surrounded by any calcareous plates, with the first portion for about half an inch cylindrical, minutely papillose externally. This is followed by a distinct, rounded gizzard, smooth externally; beyond this the intestine is constricted, but soon expands into the wider part, which is long and convoluted, with two principal folds, so that it is about three times the length of the body. Two arborescently branched respiratory organs; one of them smaller than the other, with its numerous terminal branches among and around the ovaries; the branches of both are elongated and slender; the ultimate ramuli are also elongated and often dilated at the tips. Ovaries in a large cluster; the numerous tubes are simple and more or less moniliform, about half an inch long. The retractor muscles are well developed and extend from the base of the tentacles nearly to the posterior end. The cloacal cavity is large. The calcareous plates of the skin are few in number, minute, and widely scattered, irregularly rounded, with lobed or crenated edges, and perforated by four to eight or more rounded pores, of which two or four primary ones are largest. The smaller plates are often four-lobed, the lobes rounded and each of them perforated by a rounded pore, with narrow interstices, two of the pores often larger; this is perhaps the primary form, from which, by additions to one or several parts of the border, the somewhat larger and

more irregular plates may have been derived. Color in alcohol, dull yellowish brown; tentacles yellowish white.

Length of body, 80^{mm}; diameter, 24^{mm}; length of tentacles, 8^{mm}.

Kerguelen Island, twelve fathoms, January, 1875 (No. 214); Dr. J. H. Kidder.

ECHINOIDEA.

HEMIASTER CORDATUS, Verrill, s. n.

Two quite distinct forms, which, for reasons given below, I believe to be the males and females of one species, occurred together in about equal numbers. The specimens believed to be females have very deep lateral ambulacral grooves and large genital openings; in nearly every specimen several young ones,* varying in size, were found in the ambulacral grooves, held in place by the convergent spines of the borders, which meet across the grooves and interlock. Two of these specimens, on dissection, proved to be females. Those supposed to be males have much shallower ambulacral grooves and differ somewhat in form.

The form of the body in the female is broadly cordate, depressed, with a decided emargination in front; vertically truncate and slightly emarginate posteriorly; broadest a little in advance of the middle. The lower surface is convex and swollen, especially posteriorly; the sides well rounded; the interambulacral areas are swollen on the upper side; the abactinal area and the anterior ambulacrum are considerably sunken; the latter has two well-defined double rows of pores extending to the mouth. The lateral ambulacra are elliptical, rather broad, obtuse at the outer end, and deeply sunken, the anterior ones broader, but scarcely longer than the posterior ones, but those of the opposite sides are not quite equal in size or form. Ovarial openings large, usually but three, that opposite the right anterior interambulacrum being abortive. Lower border of actinostome rather narrow, prominent, and obtuse. Anal area ovate, the lower border rounded, the upper narrowed, but scarcely acute. Peripetalous fasciole well defined, bending upward but little on the posterior and anterior interambulacral areas, and passing nearly straight across the anterior ambulacrum, but bending upward nearly parallel with the antero-lateral ambulacra, so as to form a decided angle in the front part of the lateral interambulacral areas. Subanal fasciole indistinct or wholly wanting. The tubercles of the upper surface are small, crowded, and pretty uniform in size, ex.

* These young have been sent to Mr. A. Agassiz for examination and description.

cept along the borders of the ambulacral grooves, and especially along the anterior one, where they are somewhat larger; beneath they are considerably larger, but not crowded, the largest ones in front, the size decreasing toward the sides, and especially posteriorly. The spines are rather slender, mostly slightly curved, obtuse, and usually flattened at the tips; the larger ones, bordering the ambulacra, are mostly wider, flattened, and canaliculate at the tip; those within the grooves are very slender, and often capitate; the longer spines of the lower side are 6^{mm} to 8^{mm} in length, and much flatter toward the end. Color of spines, in alcohol, dark greenish brown or olive-green; test, yellowish brown. The ovaries are composed of rather large lobules, looking like immature clusters of grapes, and containing large ova. A specimen measures from centre to anterior emargination, 18.5^{mm}; to border of anterior interambulacra, 21^{mm}; to posterior end, 20^{mm}; to lateral border, 18^{mm}; to end of antero-lateral ambulacral grooves, 15^{mm}; to end of posterior ones, 15^{mm}; breadth of antero-lateral grooves, 5 to 5.5^{mm}; of posterior ones, 4.5^{mm}; depth of each, 5^{mm}; height of test, 21^{mm}; of anal area, 6.5^{mm}; breadth of latter, 4.5^{mm}.

The specimens regarded as males are also cordate, and decidedly emarginate in front, but the form is more elliptical, owing to the ambitus being narrowed opposite and in front of the antero-lateral ambulacra, so that the width decreases nearly equally from the middle, though somewhat more so posteriorly. The interambulacra are less swollen, and consequently the abactinal area is less sunken. The anterior ambulacral furrow is decidedly sunken, though somewhat less so than in the female; but the four other ambulacra are narrower and very much shallower than in the female, being but little deeper than the anterior odd one, with the sides sloping gradually to the central line, while in the female the sides of the grooves are perpendicular, or even overhanging, with a broadly-rounded bottom. The three genital openings are only about half as large as in the female. In the character of the spines, tubercles, peripetalous fasciole, anal area, plastron, actinal area, and lower lip, the two forms agree very closely.

Kerguelen Island, 7 fathoms; Dr. J. H. Kidder.

On most of the specimens were several specimens of a small bivalve shell (*Lepton parasiticum*, Dall) most frequently attached to the under surface, near the mouth. This is evidently a case of "commensualism," for the mollusk is not a genuine parasite but a "messmate" of the echi-noderm.

The specimens of this species described as *females* have some resemblance to *H. cavernosus*, A. Ag.* (*Tripylus cavernosus*, Phil.), from Patagonia, which is the nearest allied form hitherto described. The latter differs, however, in its pentagonal or elliptical form, less emarginate in front, the anterior ambulacrum being but slightly sunken; in having the anal area elliptical and pointed at both ends; the peripetalous fasciole less angulated laterally; the tubercles of the lower surface larger, etc.

The specimens regarded as *males* resemble to about the same extent *H. australis*, A. Ag.† (Phil. sp.), also from Patagonia. The latter differs in being scarcely emarginate anteriorly and not cordate, in having the fasciole less angulated laterally, etc. The two forms from Patagonia differ one from the other in the same way as do the two supposed sexes of *H. cordatus* described above, so that, if my view be correct, the two forms described by Philippi will prove to be only the two sexes of one species for which the name *australis* would be the most appropriate. In *H. cavernosus* the genital pores are large, and the lateral ambulacral grooves are deep. In *H. australis* the genital pores are small, and the ambulacral grooves shallow. It is also probable that the sexes may differ in a similar manner in other related genera.

ASTERIOIDEA.

ASTERIAS RUPICOLA, Verrill, s. n.

A small species, with five short, broad, rapidly tapered rays, but little longer than the radius of the disk. Disk rather thick and swollen, relatively large. Rays swollen, convex above, flat below, broad at base, where the breadth is often equal to half the total length, measuring from the mouth. The longer radius is from two to two and a half times as great as that of the disk. The ambulacral furrows are broad, with very numerous, closely crowded, slender sucker-feet. The grooves are bordered by a single and very regular row of slender, slightly clavate, obtuse adambulacral spines, which are generally spread outward from

* Revision of the Echini, part iii, p. 587, pl. XXI^c, figs. 1 and 2, 1873.

† Op. cit., p. 586, pl. XXI^c, fig. 3. It is proper for me to state that after the above description was in type, Mr. A. Agassiz, to whom I had sent a specimen of each of the forms for examination, wrote to me that he thinks them identical respectively with the two species of Philippi here referred to, notwithstanding the differences noted. I have thought it best, however, to keep them separate until a larger series of specimens of the American species can be studied.

the grooves at a wide angle. Beyond these there is a longitudinal series of larger and stouter obtusely conical ventral spines, arranged in divergent clusters of two to four. Between these and the adambulacral series there are a few scattered spines and a series of large branchial papillæ, mostly placed singly; but above them the papillæ are numerous, mostly crowded in clusters of four to six, both on the sides and dorsal surface. Along the sides of the rays and separated from the ventral series by a wide space there is a row of plates a little more prominent and larger than the rest, bearing spines that are a little larger and more elongated; otherwise the spines are irregularly scattered, and nearly uniform in character, over the upper surfaces of the rays and disk. These spines are small, short, with obtusely rounded, and usually swollen, rough tips; they mostly arise singly from the dorsal plates, which are thin and flat, and rather closely united together. Madreporic plate nearer the centre than the edge of the disk, small, inconspicuous, rather sunken, composed of few convolutions. Major pedicellariæ few, mostly situated along the inner border of the ambulacral grooves, longovate, with obtuse tips; minor pedicellariæ few, with appressed spatulate or broadly rounded valves; they do not form wreaths around the spines, but are mostly placed singly on the naked spaces between them, especially on the sides and ventral surface of the rays. Color of alcoholic specimens, dark reddish brown above, yellowish beneath.

One of the largest specimens measures from mouth to edge of disk, 12^{mm}; mouth to tip of rays, 30^{mm}; breadth of rays at base, 12^{mm}; length of adambulacral spines, 2.5^{mm}. Smaller specimens have the rays relatively stouter and broader.

Kerguelen Island, on rocky beach, common; Dr. J. H. Kidder, 1874.

OPHIUROIDEA.

OPHIOGLYPHA HEXACTIS, E. A. Smith.*

Annals and Magazine of Natural History. Vol. 17, iii, February, 1876.

Disk hexagonal, with very shallow notches at the bases of the six rays; upper surface slightly swollen, covered with numerous irregular,

* This species had been described as new, under another name, but the description by Mr. Smith was received while correcting the proof. Although there seems to be no question as to the identity of the species, my specimens differ slightly from those described by Mr. Smith. Therefore I have allowed the description to remain, without change.

In the article referred to Mr. Smith also describes the following species from Kerguelen Island; *Asterias meridionalis*, Perrier; *A. Perrieri*, S.; *Pedicellaster scaber*, S.; *Othilia spinulifera*, S.; *Pteraster affinis*, S.; *Porania antarctica*, S.; *Astrogonium meridionale*, S.; *Leptychaster kerguelenensis*, S.; *Ophiacantha vivipara*,? Ljung.; *Ophioglypha brerispina*, S.

unequal, and rather small convex scales, among which the primary ones may be distinguished by their somewhat larger size; radial shields small, wide apart, more or less encroached upon on all sides by the surrounding scales, the exposed portion being rounded or oval; there is a group of a few small scales in the notch at the base of the arms, but neither the notches nor the arm-plates are bordered with papillæ. Lower surface of the disk covered with irregular, flattened scales. Genital slits, with a series of very numerous small, grain-like papillæ along the outer edge, and extending around the upper end and a short distance down the inner margin; on the middle of the outer margin they are crowded in three or four rows, but around the outer end they form a single row. Arms six, about twice as long as the diameter of the disk, convex above, rapidly tapering from the base to the tip. Upper arm-plates, near base of the arms, short, more or less concealed laterally by a group of three or four small, irregular, imbricated scales, on each side, which usually do not extend across the arm, and toward the middle of the arm these are reduced to a single small, triangular scale, and this also soon disappears; toward the middle of the arm the upper plates are nearly as long as broad, the outer and inner edges being nearly parallel and slightly curved; farther out they become longer than broad, and irregularly hexagonal, the proximal end narrowest. Arm-spines three, rather short, subfusiform, tapering to a blunt point, the upper one a little the largest, the length about equal to that of the upper arm-plate toward the base of the arms, but shorter toward the end. Under arm-plates transversely elliptical, with a distinct angle in the middle of the proximal edge, where the lateral plates do not quite unite, leaving slight pits toward the base of the arms. Tentacle-scales, beyond the middle of the arms, single, short, flattened; from about the eighth to sixteenth joints there are two tentacle-scales, the inner one becoming quite small before disappearing; on the second to seventh joints there are mostly three tentacle-scales, the inner one quite small; on the first, and sometimes on the second joint, there are four tentacle-scales, and also a similar group of three or four scales on the opposite border of the tentacle-pores. The outer oral tentacle-pore is very large, in the form of a broad, oblique fissure, occupying more than half the length of the jaw, bordered externally by a row of about five flattened, squarish scales, of which the distal one is largest, and an inner row of four or five smaller ones, of which the proximal ones are situated within

and below the border of the mouth-slits. The mouth-papillæ consist of two small, conical, pointed ones at the angle of the jaw, below the teeth, and of an irregular row of two to four smaller ones on each side, running outward and downward below the proximal papillæ of the upper oral tentacle. Teeth, seven to nine on each jaw, stout, obtuse, the series often double in the middle. Mouth-shields broad, spade-shaped, the broad proximal portion terminating in an obtuse point, the somewhat narrowed distal portion extending outward in the interradial spaces about half the total length and broadly rounded at the end. Side mouth-shields long and narrow, somewhat enlarged at the ends, narrower in the middle. The oral tentacles are very large in the alcoholic specimens, projecting inward beyond the ends of the mouth-slits, and nearly filling them up; they are divided into a series of lobes by transverse constrictions.

Color of alcoholic specimens very dark slate-brown above; yellowish brown beneath.

One of the larger specimens measures, across the disk, 18^{mm}; length of arms from dorsal notch, about 35^{mm} (tips broken off); diameter at base, without spines, 2.25^{mm}; length of spines, 1^{mm}.

Kerguelen Island, five fathoms; Dr. J. H. Kidder.

This species differs widely from all the previously described species of *Ophioglypha*, in having six arms, in the shallow notches at the bases of the arms, and in the characters of the mouth-papillæ and mouth-shields, but in size and general appearance it somewhat resembles some varieties of *O. sarsii* of the North Atlantic. In several respects it is related to *Ophiocten*, but though the surface of the disk is covered with a thin, rough skin, it is not distinctly granulated. Although it would not properly go into either of these two genera, as they are ordinarily defined, it seems most natural to refer it to *Ophioglypha*, which may easily be emended in respect to some of the characters that may now be regarded as merely specific.

ASTROPHYTON AUSTRALE, Verrill, s. n.

Disk unevenly granulous, with ten prominent radiating ribs, starting near the center and extending to the lateral bases of the arms; they are broadest and highest near the outer end, which is gently sloped and evenly rounded. The ribs bear four to ten or more unequal,

large, stout, blunt spines, with rugose tips, arranged irregularly in one or two rows, or scattered unevenly, while there is usually a group of from three to six smaller spines on the spaces between the ribs at the bases of the arms, and often one or two on the interbrachial spaces, near the edge of the disk. Similar small, blunt spines, or tubercles, extend along the dorsal surface of the arms, either in single or double rows. The grains covering the disk and upper and lateral surfaces of the arms are quite uneven in size and prominence, with more or less numerous small, flattened plates or scales scattered among them, and in many parts these scales are more regular, with the grains arranged around their borders, this condition being most apparent on the arms; the prominent tubercles and spines are developed from the center of similar scales or plates. The under side of the disk is more regularly granulous. The arms are rather slender and well rounded dorsally, dividing first at about their own diameter from the ends of the radial ribs; the distance from the first to the second division of the arms is about equal to the larger radius of the disk; and from the second to the third usually somewhat greater. The terminal divisions are numerous and very slender. The arm-spines, toward the base of the arms, are small, stout, fusiform, terminated by two acute spinules, and form transverse rows, usually from five to seven, but farther out they became shorter and stouter in rows of two to four; still farther out the two or three terminal spinules become curved, and near the ends of the arms they have the form of minute hooks.

Color of one dried specimen uniform brownish yellow; of the other light grayish brown, with many narrow transverse bands of darker brown across the arms and radial ribs, changing into irregular streaks and spots of the same color on the interradial spaces.

The larger specimen measures, from center to end of radial ribs, 16^{mm}; center to edge of interbrachial spaces, 13^{mm}; center to first division of arms, 21^{mm}; diameter of arms near base, 5^{mm} to 6^{mm}; beyond first division, 4^{mm}; beyond second division, about 3^{mm}; diameter of larger spines on radial ribs, 2^{mm}; height, 2^{mm}.

Pearson's Point, D'entricasteaux Channel, Tasmania, seven fathoms, clinging to *Primnoella australasiae*; Capt. Ralph Chandler, (Poughkeepsie Soc. Nat. Science.)

ANTHOZOA.

ALCYONARIA.

ANTHOPODIUM AUSTRALE, Verrill, s. n.

Polyp-cells cylindrical or somewhat clavate, with eight distinct sulcations at summit, in contraction; the surface covered with small, rough spicula; the height variable up to a quarter of an inch or more. They arise from a thin encrusting or stolon-like cœnenchyma, which is coriaceous and roughened with spicula, like the polyp-cells. The polyps are irregularly scattered along the cœnenchyma, which creeps over the upright axis of *Primnoella*. Color, light orange-red. Height of polyp-cells, mostly 2^{mm} to 6^{mm}; diameter, about 1.5^{mm}.

The spicula are small, but exceedingly variable in form, and most of them are covered with rough or even lacerate warts, which interlock and thus strengthen the tissues; many of them are flattened. The largest spicula, and perhaps the most abundant, are oblong, two to four times as long as broad, obtuse at the ends, and thickly covered with rough spinulose warts; others are enlarged and irregularly flattened at one end, which is covered with rough laciniate spinules and warts; others, equally rough, are shorter and sometimes irregularly rounded, about as broad as long; irregular rough laciniate crosses are not uncommon; and there are numerous slender fusiform spicula, acute at the ends, about as long as the largest ones, but not half as thick, and less roughly warted; various other more or less intermediate forms also occur.

Bluff Harbor, New Zealand, on *Primnoella australasiæ*; Dr. E. Kershner.

This species is more nearly allied to *A. rubens*, V., from North Carolina, than to any other species known to me.

PRIMNOELLA AUSTRALASIÆ, Gray.

Primnoa Australasiæ, Gray, Proc. Zoölog. Society of London, 1849, 146, pl. 2, figs. 8, 9; Annals and Magazine of Nat. History, 1850, 510.

Primnoella Australasiæ, Gray, Proc. Zoölog. Society of London, 1857, 286; 1859, 483; Catalogue of Lithophytes or stony corals in the collection of the British Museum, 50, 1870.

The specimens are simple, cylindrical stems, some of them more than three feet in length, with the base attached to shells. The polyp-cells are elongated, cylindrical, arranged in close whorls, and closely appressed

to the surface of the stem, with the summit incurved and mostly concealed. There are sixteen to twenty-four or more cells in a single whorl, and the successive whorls are so crowded as to leave only a narrow line between them, except toward the base, where the polyp-cells become shorter and imperfect, leaving spaces often equal to their length between the whorls; in these places the cœnenchyma is covered with small imbricated scales, similar to those of the cells. On the outer or exposed surface of the cells there are two alternating rows of imbricated scale-like spicula, ten to twelve in each row.

The axis is slender, round, tapering from the base to the tip, where it becomes very slender and translucent yellowish horn-color, while toward the base it is dull grayish brown, opaque, rigid, and stony; the middle portion is grayish or ash-color, and sometimes whitish; its surface is sulcated with numerous slightly impressed grooves. Color of the cells and cœnenchyma, yellowish white.

One of the larger specimens, imperfect at the tip, is about 36 inches (915^{mm}) long; greatest diameter, 4^{mm} to 5^{mm}; diameter of axis near base, 2.5^{mm}; length of cells, 2^{mm}.

Bluff Harbor, New Zealand; Dr. E. Kershner; several specimens.

One specimen, from seven fathoms, near Pearson's Point, Tasmania, was sent to me from the Poughkeepsie Society of Natural Science, as received from Capt. Ralph Chandler, U. S. N.

According to the label of the last-named specimen, the native name is "Urialus."

[*Actinia* were numerous along the rocky shores of Kerguelen Island. Specimens have been preserved in alcohol, but not in a condition to admit of specific determination, the tentacles being, of course, retracted. All of those seen by me were of small size and sober colors, mostly of a dark brown; with the exception of one rather rare species, expanding to about the size of a silver half-dollar, the tentacles of which were of a brilliant vermilion. J. H. K.]

APPENDIX.

SURGEON E. KERSHNER'S COLLECTION.

MINERALS.

These include forty-two specimens, representing portions of Otago and other parts of New Zealand. A considerable number was obtained from the museum at Otago, being specimens gathered during the geological survey of the province. Of the remainder, most were collected by Dr. Kershner himself. Besides those already mentioned, this collection includes some fine specimens of copper-ore from the mines in Southern Africa. All of the minerals have been identified by Dr. F. M. Endlich, of the Smithsonian Institution, as per list following :

Original No.

- Geol. survey of Otago. {
19. Pumice (typical specimen).
 20. Doleritic rock with zeolites.
 21. Chrome-ore (Otago Museum).
 22. Hornblende.
 23. White quartz.
 24. White quartz with decomposed feldspar.
 25. Iron and copper ore.
 26. Same as 20.
 27. Pyrite and mica in chloritic schist (Otago Museum).
 28. Chalcopyrite (Otago Museum).
- 29-40. Bornite (copper-ore) associated with quartz.
41. Quartzitic rock impregnated with pyrite.
 42. Copper-ore.
 43. Lignitic coal (Germ. sp. name, Russkohle).
 44. Feldspathic rock decomposed into caolinite.
 45. Quartzitic rock containing caolinite and impregnated with pyrite
 46. Galena and quartz.
 47. Druse of natrolite in basalt.
 48. Sulphur.
 49. Chalcopyrite (copper pyrite).

Original No.

50. Sulphur.
51. Very impure graphite with quartz.
52. Pyrite and quartz.
53. Copper-ore, sulphide and carbonates.
54. Natrolite in basalt.
55. Same as 53.
56. Compact limonite (hydrated sesquioxide of iron).
57. Coal.
58. Chrome-ore.
59. Covellite (copper indigo), copper mineral.
60. Same as 44.
61. Sulphur.
62. Aragonite (carb. of lime), radio-columnar.

Fossils are not determined as yet; nor greenish mineral in basalt. Former appear to be carboniferous.

MISCELLANEOUS.

Nat. Mus. No.

- | | | |
|-------|---|--|
| 14783 | } | Two skulls, with leg-bones of Maoris, from Chatham Island. |
| 14784 | | |
- 14782 Skull of Maori-ori, or Chatham Island aborigine, concerning which Dr. Kershner writes that it was "picked up from the surface of the ground, having been exposed to the weather. It is said that this race never buried their dead, but carried them out and deposited them in heaps, where they were left to decay, so that the bones are easily found in many different parts of the island. They were cannibals; the remnants of the race now found in the island having been known to practice cannibalism as late as about ten years ago. They now number only about twenty-five souls, are limited to a reservation, and sustained by the colonial government. The name Maori-ori is said to mean 'before the Maoris,' and indicates that these people, the aborigines of Chatham Island, had been subdued and, in great measure, displaced by the Maoris." It seems not improbable that this race represents also the aboriginal inhabitants of New Zealand, which had quite disappeared before the discovery of the islands by Europeans. Chatham Island lies east of New Zealand, at the distance of about six hundred miles, in latitude 48° south.

Nat. Mus. No.

- 20254 } Are stone implements of the Maori-ori; a large cleaver-shaped
20255 } stone hatchet and two chisels, also of stone.

Skin and skeleton of *Dasyurus maculatus*. Concerning this animal, Dr. Kershner writes that it was captured in the mountainous part of Tasmania, near Hobarton; and that it is so destructive to young lambs that it is being rapidly exterminated by the colonists, who call it "tiger-cat." The skin is a very fine one, and has been mounted and placed in the museum collection.

- 1478 Skin and skeleton of *Ornithorhynchus paradoxus*, the "beast with the bill." The skeleton is perfect, but the skin has been somewhat curtailed by trimming, and is valuable only as exhibiting the softness and fineness of the fur. Obtained near Hobarton, Tasmania.

Strigops habroptilis, the "owl-eyed parrot" of New Zealand, obtained from Otago Museum by the courtesy of its curator, Captain Hutton. The bird is nocturnal in its habits, burrows in the ground or in holes in the rocks, and feeds upon worms and grubs. It is becoming very scarce since the introduction of dogs and cats into the island.

Buphagus skua antarcticus, shot at Hobarton. Same species as that observed at Kerguelen, the hawk-like habits of which were described in the National Museum Bulletin No. 2. This individual was shot in the act of devouring a tame duck which it had just captured in the yard of a resident of Hobarton. It is said even to attack young lambs, and to be very destructive to domestic fowls.

Skin of king-penguin (*Aptenodytes longirostris*) obtained at Kerguelen Island, but really captured on the Falkland Islands.

A large collection of bones of the moa (*Dinornis*), the great extinct New Zealand bird, from Christ Church (Middle Island), New Zealand. These have not yet been put together or carefully examined.

- 15485 Head and fins of *Trigla*, *sp.*, from Port Arthur, Tasmania. A fish nearly allied to and much resembling the "sea-robin" of the New England coast.

- 15484 Mutilated skin of *Aracana*, *sp.*, from Hobarton, a fish closely resembling the trunk-fish (*Ostracion*).

Nat. Mus. No.

Hippocampus, *sp.* Port Chalmers, New Zealand. Of very unusual size.

Anguilla aucklandii, Richardson, from Bluff Harbor, New Zealand. An enormous eel.

In the subkingdom MOLLUSCA, Dr. Kershner's collection is peculiarly rich, including large series of shells from New Zealand, Tasmania, the Auckland and Chatham Islands, besides a very handsome *Cephalopod* (*Ommastrephes*), preserved in alcohol. The shells are now undergoing examination by Mr. W. H. Dall.

The botanical collections, also very large, include specimens of the "Ake-aka," an aromatic wood from Chatham Island, and of the seeds of the "Kapu-kapuka" or Chatham lily (*Myosotidium nobile*, Hooker), a flower greatly prized for its beauty. The lily grows only on the verge of the sea-beach, in shady places, in a soil composed of rich mold mixed with sand. If cultivated in gardens it should be watered with salt-water. Besides these are series of ferns from all the localities visited, and a considerable collection of flowering-plants from the Auckland Islands. The plants have been sent to Cambridge for identification; the woods are at the Agricultural Department, Washington.

The collection of plants from the Auckland Islands was taken from the neighborhood of the German transit-station at that place, the same locality occupied by Sir James Clarke Ross when at the Aucklands in 1841, in the Erebus and Terror.

The *Crustacea*, which have been identified by Prof. S. I. Smith, are found to be as follows:

2209 *Heterograpsus sexdentatus*, Edw.

Petrolisthes elongatus, Stimp.

2210 *Livoneca*, near *emarginata*, Bleeker. An isopod parasitic upon fish.

The following note upon some interesting hydroids found in Dr. Kershner's collection is given as received from the writer, Mr. S. F. Clark, of Yale College:

HYDROIDEA.

"Among the invertebrates sent to New Haven, for identification, by Dr. Kidder, is a fine specimen of a pedunculated ascidian, belonging to the genus *Boltenia*. This same genus is represented on the New Eng-

land coast by the species *Bolteni*, the stems of which are the favorite abiding-places of many hydroids; and it is interesting to note that the three genera, *Sertularia*, *Sertularella*, and *Laföä*, which are almost invariably represented on our New England species, are also represented on the stem of this southern specimen.

“The species of *Sertularia* is very close to, if not identical with, *S. operculata* of Linnæus; but there being no gonothecæ present on either of the three species, I shall not attempt to make specific determinations.

“The genus *Sertularella* is represented by a species resembling in mode of growth the *S. tricuspadata* of Alder. Hydrothecæ alternate, stout, and with a tricuspate rim. Possibly this is identical with the *Sertularia johnstoni* of Murray. (Dieffenbach’s New Zealand, London, 1843.)

“The third species is probably a member of the genus *Laföä*; it is a creeping form, and many of the hydrothecæ have only their upper portions free, the lower portions reclining upon the stolon. The ascidian bearing these hydroids was collected at Port Chalmers, New Zealand, in January, 1875, by Dr. E. Kershner, U. S. N.”

II.

A considerable collection was also made by Mr. Israel Russell, one of the photographers to the New Zealand party, mostly from the province of Otago, New Zealand. Mr. Russell’s collection includes a number of Maori implements, with some supposed to belong to a still older race (perhaps the Maori-ori). His bird-skins represent specimens of *Larus dominicanus* ♀, *Daption capensis*, *Casarca variegata*, Gm., *Podiceps cristatus (australis)*, Gould ♂, *Porphyriops crassirostris*, Gray, *Creadion carunculatus*, and two pigeons and a parrot, as yet undetermined. Besides these, there are a number of New Zealand birds preserved in alcohol, and a large collection of the bones of the moa.

Other departments of natural history are well represented in Mr. Russell’s collection. There are a large number of fossil shells from Lake Wakatipu, New Zealand, and of recent forms from the same pit in which the Maori implements were found. Also, a considerable collection of plants, and of insects, *Crustacea*, and small vertebrates which have not yet been studied.

III.

Mr. Edwin Smith, United States Coast Survey, chief of the Chatham Island party, sends three skulls, two of Maoris and one of a Maori-ori, for the authenticity of which he vouches.



A STUDY OF CHIONIS MINOR WITH REFERENCE TO ITS STRUCTURE AND SYSTEMATIC POSITION.

BY J. H. KIDDER, U. S. N., AND ELLIOTT COUES, U. S. A.

“This small family of birds [*Thinochorus*, *Attagis*, and *Chionis*] is one of those which, from its varied relations to other families, although at present offering only difficulties to the systematic naturalist, ultimately may assist in revealing the grand scheme, common to the present and past ages, on which organized beings have been created.” (DARWIN, *Voyage of a Naturalist*, New York, 1871, p. 94.)

CHIONIS MINOR, Hartlaub.

SHEATH-BILL; BEC-EN-FOURREAU.

HISTORY.

The genus *Chionis* was founded by J. R. Forster in 1788,* upon *C. alba*, discovered by him in the neighborhood of Cape Horn. In January, 1841, Dr. G. Hartlaub wrote from Bremen to the *Revue Zoölogique* † that he had discovered a new species of *Chionis* in the museum at Leyden. He described it as differing from *C. alba* by its decided inferiority in size, by the blackness of the entire beak, and particularly by the extraordinary shape of the sheath of the bill. His original description and measurements are as follows:

“CHIONIS MINOR, *Nob.*, *nivea*, *rostro nigerrimo*, *pedibus saturate fusciscentibus*, *spatio supraoculari subrotundo*, *nudo*, *nigro*, *rostri vaginâ subconcaavâ*, *antrorsum ascendente*, *apertâ* (*in Ch. albâ*, *planâ*, *incumbente*).

	<i>C. minor.</i>	<i>C. alba.</i>
<i>Long. total</i>	13 p. 2 lig.	17 p. 3 lig.
<i>rostri à fronte</i>	1 2	1 4
<i>Altit. rostri ad basin</i>	7	8
<i>Latitud. rostri ad angulum oris</i>	0 6½	7½
<i>Long. alæ</i>	9	10½
<i>tarsi</i>	1 10	1 11
<i>caudæ</i>	4 3	5½
<i>digiti medii</i>	1 8	2 1

* *Enchiridion Hist. Nat. Ins.* 1788, p. 37.

† *Rev. Zoöl.*, 1841, v. 5; *ib.* 1842, pl. 2, fig. 2.

“*Patrie inconnue.*”

In the following year he contributed a drawing (of the head) to the same periodical (pl. 2, f. 2).

In 1849 *C. minor* was figured by G. R. Gray,* under a description of the genus which was placed by him in the fifth family (*Chionididae*) of *Gallinae*, the other members of the family being *Thinocorus* and *Attagis*. The supposed relationship between these birds was first pointed out, so far as we know, by Mr. Darwin,† in 1833, when, referring to *Thinocorus*, *Attagis*, and *C. alba*, he utters the pregnant sentence we have chosen as the motto for this essay.

De Blainville meanwhile, in 1836,‡ before *C. minor* had been described, turned his attention to the anomalous relationships of the genus, and decided that its nearest affinity was with *Hæmatopus*. The position he assumed respecting its relationships requires special consideration, since it was defended with learned ingenuity and has been generally accepted without question.

He based his conclusion upon the examination of a skeleton of the trunk of *Chionis alba*, obtained from M. Baillon, of Abbeville, with some details of its internal organization and natural history obtained from M. P. E. Botta, one of his assistants at the Paris Museum. M. Botta's specimen had come on board of a ship, during a commercial voyage around the world, in latitude 55° south, longitude 64° west (between the Falkland Islands and Cape Horn). Previous to this time specimens had been exceedingly rare, only three skins being known to exist, and no anatomical material being accessible.

M. de Blainville enumerates, among those who had already treated of *Chionis*, Forster, Pennant, Latham, Gmelin, Bonnaterre, Illiger, Vieillot, Oken, Temminck, Goldfuss, Pabbé Ranzani, Quoy & Gaimard, Lesson, Wagler, Cuvier, and Isidore-Geoffroy. By these writers it had been successively and alternately considered as a wader (*échassier*), palmipede, and gallinaceous bird, allied (*rapproché*) to three different genera, or considered as a distinct family; while it had been passed over by other naturalists, who did not consider the data sufficiently full for a determination; or held to be *incertæ sedis*, “*ce qui est, en pareil cas, le parti le plus convenable.*”§

* Genera of Birds, 1849, p. 522, pl. —.

† Naturalist's Voyage around the World, p. 94; cf., also, Voy. Beagle, 4to, 1841, pp. 118, 119.

‡ Mémoire sur la place que doit occuper dans le système ornithologique le genre *Chionis* ou Bec-en-fourreau. < Ann. Sci. Nat. vi, 1836, p. 97.

§ De Blainville, l. c.

The three specimens then known to De Blainville were, first, a skin in an English collection, for a long time unique (perhaps Forster's type); second, one obtained by MM. Quoy & Gaimard from the voyage of the *Astrolabe*, in 1824; third, one obtained by MM. Lesson & Garnot, in the course of the voyage of the *Coquille*, when an individual came on board of the ship "at the distance of eighty leagues from Patagonia, the nearest land." "Anderson observed it in flocks in Christmas Harbor," but appears to have given no description by which the peculiarity of the Kerguelen species (*C. minor*) was recognized, and of which this is the first recorded observation.

M. de Blainville describes briefly the external parts of *C. alba*, and the skeleton, the latter including of the skull only the posterior part without the occiput, and being defective also as to the coccyx and limbs. He appears not to have seen either the muscles or viscera, but to have been dependent for his brief description of the latter upon the sometimes erroneous recollections of M. Botta. It should be noticed that the observations upon the natural history and habits of the genus had been made upon specimens that flew on board of ships at sea, and therefore were not under their natural or wild conditions.

His reasons for referring the genus to the vicinity of *Hamatopus* are summed up by himself (p. 106) as follows:

- "1°. Le nombre des vertèbres 15—6—14—8, est le même.
- "2°. Le nombre et la forme des côtes sont les mêmes.
- "3°. Le sternum, de même forme générale, a deux échancrures sub-égales, la supérieure un peu plus grande que l'inférieure.
- "4°. Le canal intestinal a également trois cœcums, dont deux terminaux médiocres et un median fort petit.
- "5°. L'estomac est également formé d'un gésier fort petit sans jabot.
- "6°. La queue est courte et composée de six paires de plumes égales.
- "7°. Les ailes, formées de dix plumes à la main, sont aiguës.
- "8°. Les jambes sont peu élevées, et nues seulement vers le talon.
- "9°. Les tarses, non comprimés, sont également réticulés en avant comme en arrière.
- "10°. La plante des doigts est élargie de manière qu'ils semblent bordés latéralement.
- "11°. Ce sont également des oiseaux marcheurs et coureurs;
- "12°. Habitant les rivages de la mer;
- "13°. Où ils cherchent leur nourriture, consistant en coquillages et peut-être en animaux morts."

Since M. de Blainville relied almost entirely upon the characters of the sternal apparatus* in the classification of birds, it is not strange that he should have found in their resemblance to those of *Hæmatopus* conclusive evidence of natural affinity. The errors of omission and of observation in the above summary (which, it must be acknowledged, are not to be found in the description of those parts seen by De Blainville himself) will be discussed hereafter in their proper connection.

In his continuation of Bonnaterre's "Tableau encyclopédique et méthodique d'Ornithologie" (pp. 1037, 1038), M. L. P. Vieillot speaks of the *black button* on the wing, and describes the sheath of the bill as sometimes yellow, *sometimes black*. It would thus appear that *Chionis minor* was known and had been examined long before Hartlaub differentiated the species; this black color of the epidermal outgrowths being one of the principal specific features of his diagnosis. Bonnaterre's first mention of the genus (as genus 83 of his list, p. cxij) gives no points to indicate whether he was describing *C. alba* or *C. minor*.

In 1867 Mr. E. L. Layard, writing to the Ibis† from Cape Town, under date of June 17, mentions several specimens of *C. minor* brought alive to the Cape from the Crozet Islands by Captain Armson. "A single egg obtained by him was unfortunately attacked by mice on board; but enough remains to show its contour and color. The instant I saw it I was reminded of the eggs of *Hæmatopus*." He describes the egg at some length, and of the living bird says: "He is most *Hæmatopus*-like in his motions, moving with great swiftness, and feeding on meat, which he holds down between his feet and tears into shreds. He is very fearless, and attacked the cats which came near him. The legs are livid brown [!], bill black, with a pink cere around the eye, the iris of which is deep black or dark brown in color."

On the 28th of November, 1867,‡ Dr. P. L. Sclater exhibited to the Zoological Society a skin of *Chionis minor*, "being that of an individual of this species which had been transmitted living to the society by E. L. Layard, and brought from the Crozet Islands by Captain Armson." This was doubtless the same individual referred to by Mr. Layard in the passage just quoted.

* À ces élémens les plus importans d'une évaluation un peu positive des rapports naturels de cet oiseau (puisque j'ai montré, depuis long-temps, que l'appareil sternal, avec ses annexes, les renferme dans cet classe d'animaux) j'ai pu joindre quelques détails d'organisation intérieure, etc." (*Op. cit.*, p. 99.)

† Ibis, 1867, p. 458.

‡ Proc. Zool. Soc. 1867.

October 26, 1868,* the receipt of two specimens of *C. minor* by the Zoological Society, from Mr. Layard, was recorded without further particulars. They came from the Crozet Islands.

In the Journal of Anatomy and Physiology for November, 1839,† appeared a letter from R. O. Cunningham, M. D., naturalist to Her Majesty's surveying-ship Nassau, with a figure of the cœca, part of the intestine, the stomach, and larynx of *Chionis alba*, accompanied by some measurements. He found that "the legs present a decided resemblance to *Hæmatopus*, and the sternal characteristics are similar."

An egg of *C. minor* was received by the Zoological Society, January 17, 1871,‡ concerning which Prof. Alfred Newton said: "No egg of either species of this genus had before been known, and this confirms, by its appearance, the systematic position of the form shown by osteology, its affinity, namely, to the plovers."

We have been able to find a record, therefore, of but four specimens of this species, viz: 1. That in the Museum at Leyden, from which the original description was made, of unknown locality; 2. A specimen sent to the Zoological Society by Mr. Layard, from Cape Town, brought from the Crozet Islands; and, 3, 4. Two specimens from the Crozet Islands, also sent to the Zoological Society by Mr. Layard, in 1868.

The literature of the species is meagre, and we do not find that any attempt has been made either to verify or refute De Blainville's conclusions, otherwise than by inspection of external characters, beyond Mr. Cunningham's brief notes upon the digestive system. Authors who have differed from De Blainville respecting the systematic position of the genus have simply placed it where they pleased, apparently without feeling called upon to show cause for the faith that was in them.

The late expedition to observe the transit of Venus at Kerguelen Island afforded an opportunity to improve our acquaintance with this species, which was taken advantage of. Several specimens were preserved in alcohol, a number of skins were secured, and, during a stay of four months upon the island, as frequent and careful observations as possible upon the behavior of the bird during life § were made by Dr. Kidder.

It bears a strong resemblance to the pigeons in form and mode of

* Proceedings Zool. Soc. 1868.

† Pp. 87-89.

‡ Proc. Zool. Soc. 1871, p. 57.

§ See Bull. No. 2, Nat. Mus. 1875 . 1 *et seq.*, for full description of habits, etc.

flight; is easily domesticated, remarkably fearless of man, dislikes water, cannot swim, is largely a vegetable-feeder, and its usual note is a harsh croak. These characteristics, taken together with its attitudes, gait, pugnacity, ready companionship with domestic fowls, and some obvious peculiarities in the structure of the digestive system, seemed to indicate affinity with the *Gallina* rather than with *Haematopus*, so far as superficial characters have weight. And so strong was this impression, based upon field-observation only, in the mind of the observer, that we have made a somewhat extended anatomical examination of two of the alcoholic specimens, and have studied the slender literature of the subject, with the hope of furnishing the materials upon which to base inquiries that may establish the proper position of this confessedly doubtful group. Allowing due weight to the authority and great name of De Blainville, it is proper to remember that this particular species (*C. minor*), at least, differs from the type-species (*C. alba*), as described, in that it is largely a vegetable-feeder; that there is no record of its having been seen "far out at sea";* and in the characters upon which the diagnosis of the species is based.

For comparison with Hartlaub's original description, the field-measurements of eleven specimens are here quoted: †

List of specimens, with measurements.

Smithsonian Institution number.	Original number.	Date.	Sex.	Length.	Extent.	Wing.	Tail.	Bill.	Head.	Tarsus.	Middle toe.	Longest claw.	Remarks.
		1874.											
68956	27	Oct. 12	♂	15.50	30.50	9.00	.....	1.50	1.35	2.00	1.85	0.50	Skin.
68957	31	Oct. 16	♀	14.00	29.00	8.50	.....	1.35	1.65	1.85	1.60	0.45	Do.
68955	32	Oct. 16	♂	15.00	31.00	9.50	.....	1.50	1.60	1.80	1.60	.....	Skin with sternum.
.....	33	Oct. 18	♂	.....	.....	.....	.....	.....	.....	.....	.....	.....	Disembowled and in alcohol.
68958	67	Nov. 14	♂	15.75	32.00	9.35	.....	1.50	1.75	1.75	1.60	0.40	Skin.
.....	127	Dec. 5	♂ (?)	15.00	30.00	9.00	4.65	1.45	.....	1.65	1.55	0.50	Alcohol.
.....	146	Dec. 11	♂ (?)	14.50	29.00	8.50	.....	.....	.....	1.75	1.50	0.50	Do.
.....	203	Dec. 29	♂ (?)	16.50	30.50	9.00	4.85	1.50	.....	1.85	1.75	0.50	Alcohol and carbolic acid.
.....	204	Dec. 29	♀ (?)	15.25	29.15	8.85	4.50	1.35	1.65	1.75	1.65	0.50	Do.
.....	205	Dec. 29	♂ (?)	15.50	29.85	8.85	4.75	1.35	1.65	1.75	1.55	0.45	Do.
.....	206	Dec. 29	♀ (?)	15.75	28.85	8.50	4.75	1.35	1.75	1.75	1.65	0.50	Do.

* *Vid.* Darwin, *Voy. round the World*, p. 94, and Cunningham, *Jour. Anat. and Phys.* 1869, p. 88.

† From Bull No. 2, Nat. Mus., *loc. cit.*

DESCRIPTION.

The first specimen selected for examination was taken from alcohol November 5. The field-measurements, from the flesh, are as follows:—

Smithsonian number.	Original number.	Date of collection.	Sex.	Length.	Extent.	Wing.	Tail.	Bill.	Head.	Toes.	Middle toe.	Longest claw.	Remarks.
146		1874. Dec. 11	♀	14.50	29.00	8.50	.....	.....	.....	1.75	1.50	0.50	Preserved in alcohol.

Plumage universally pure white, very soft and downy. Under plumage slate-colored. Bill black, stout, conical; mandibles of equal length. Chord of culmen 1.22, gape 1.35, depth 0.80, width 0.55; depth of upper mandible 0.37, width 0.40; depth of lower mandible 0.30, width 0.55. Commissure nearly straight, with only a slight downward curve towards apex of bill. Lying over the upper mandible like a saddle, with the pommel tilted up into the air, is the horny black sheath which has given to this bird one of its trivial names. From the insertion of the frontal feathers to its anterior end, this sheath measures 0.50. The flaps of the saddle project downward and backward below the tomial line, its anterior margin presenting two curves, convex forward, including one curve, convex posteriorly. The "pommel" part of the sheath projects above the mandible, like a hood, 0.20 inch. From gape to apex the sheath measures 1.00; perpendicular depth 0.70, width of "pommel" 0.30, of sheath between lower margin of flaps 0.45. At the sides the flaps are firmly soldered to the upper mandible, so that, in this species at least, erection of the sheath (attributed to *C. necrophaga* or *C. alba* by Latham, Lesson and Cuvier,*) is impossible. Structurally continuous with the sheath, and extending backward and upward from its posterior portion, is a thick, black, tumid strip of naked skin, deeply pitted by numerous follicular openings, some of which near the edges give passage to hair-like feathers. It lies in contact with the eyelid superiorly, and the portion uncovered by feathers measures 0.55 by 0.30. Upon clipping away the frontal feathers, this black caruncle is found to extend entirely across the forehead, as a squarish frontal hood, covered by white feathers so thickly as to be invisible in its anterior and central two-thirds. Its upper margin (somewhat wider than the lower) is abruptly distinct, just opposite the highest part of the eyelid. The width of the caruncle at its upper and widest part is 1.10; its height from the lowest inser-

* Animal Kingdom, London, Orr & Co., 1849, p. 250.

tion of the feathers is 0.70. As already stated, the sheath is continuous structurally with this caruncular fold, the epidermal tissue of the latter losing its follicles and assuming a horny structure at the wide angle between the forehead and bill. In appearance the structure is strongly suggestive of the frontal papillose casque borne by the turkey* (*Meleagris*). Opposite the central concavity in the sinuous border of the side-flap of the hood appears, uncovered by the sheath, about half the aperture of the nostril, oval in outline, with its long axis nearly parallel with, but inclining slightly toward, the rictus. The nostrils are pervious. The eyelids are thickened and everted, during life of a pale pink, whence the name "sore-eyed pigeon." Iris, dark-brown to black.

The body is full and heavy. When at rest the head is withdrawn toward the body and the tarsi are nearly concealed by the plumage. Plumage universally pure white, remarkably soft and downy. "After-shaft" of body-feathers distinct and soft, measuring rather more than half the length of the main shaft. Wing primaries 10; first three about of the same length, the second being, perhaps, a trifle the longest. The inner remiges equal the longest primaries. Tail slightly rounded, spreading widely in flight. Rectrices 12, inner and outer vanes of nearly equal width, innermost being rather the wider.

Tibia is naked for 0.40 inch, but covered to below the joint by extremities of feathers. Tarsus is pale flesh-color, 1.70 inch; stout, flattened on its internal surface; narrower posteriorly than anteriorly; covered by prominent hexagonal scales, which merge gradually into scutellations on the toes anteriorly. Middle toe measures 1.5, longest claw 0.45 inch. A strong and distinct row of marginal scales fringes each toe, and a small web connects bases of third and fourth toes. First toe placed at the inner side of tarsus, distinctly above the level of the rest, and with its under surface directed externally. Claws strong, stout, blunt, convex above, concave and deeply grooved beneath; black above, pale horn-whitish below. Joints stout and large.

DISSECTION.

MUSCLES OF THE UPPER EXTREMITY.

Pectoralis major arises from external border of clavicle in its whole length excepting its coracoid enlargement; from the whole length of

* This extension of the caruncular casque across the forehead, being hidden by feathers, has, we believe, never before been noticed, previous descriptions having mentioned only the obviously naked strip along the eye.

lower border and about one-half the lateral surface of carina; and from the posterior and external third of the body of sternum, to be inserted by a broad flat tendon into the palmar margin of the pectoral crest of humerus. The pectoralis major is partly cleft, posteriorly and inferiorly, but the two parts coalesce to be inserted by a single tendon as above.

Second pectoral arises from sterno-clavicular membrane, from the angle between the body and keel of sternum to within 0.25 inch of its posterior end, and from all of the body not occupied by the conjoined segments of pectoralis major. It is inserted by a very long cylindrical tendon, gliding through a tendinous sheath given off from the neighborhood of coraco-clavicular articulation, beneath the angle of their junction, into radial tubercle of humerus, 0.50 inch below its articulating surface. This is the *levator humeri*.

Third pectoral ("pectoralis minimus" Coues*) arises fleshy, pyramidal, from external border near superior external angle of sternum and from the adjoining margins of sternum and coracoid, for about one-third their length, to be inserted by a round tendon directly into inner border of humerus, near its head. In origin and function this muscle agrees with *pectoralis minimus* of Coues, and of Owen, 1836 (but not with third pectoral of Owen, 1866, being an adductor and external rotator but *not* a levator of humerus; arising from external border, *not angle*, of sternum; and passing through no trochlear groove, but being inserted by a *straight* tendon into radial tuberosity of humerus, which it depresses, not elevates).

The article in Todd's Cyclop. Anat. describes the third pectoral-substantially as it is here given; but in Anat. Vert., ii, 1866, p. 97, apparently by some oversight, Professor Owen redescribes the third pectoral in much the same terms as he does the second, making it out to be a levator.

Latissimus dorsi shows no peculiarity of origin or insertion. Anterior fibers are a thin narrow band of pale muscle. Posterior are darker, stouter, and blend, before insertion, with anterior. A few muscular fibers pass downward from sterno-coracoid articulation, parallel with sternal ribs.

Extensor plicæ alaris arises from coraco-clavicular articulation, sending its tendon downward along the pectoral ridge of humerus. It is triangular in form, covering the rest of the muscles of the shoulder-joint. Just beneath it lies the—

* Osteology, etc., of *Colymbus torquatus*, Mem. Bost. Soc. Nat. Hist. i, 1868.

Deltoideus, arising from coracoid end of scapula, filling the space between the tendon of pectoralis medius and latissimus dorsi, to be inserted into the pectoral ridge of humerus.

Biceps presents nothing unusual.

Infraspinatus and *teres major** are represented by a single muscle, which arises from the entire dorsal margin of scapula, and is inserted into the ulnar tuberosity of humerus.

A stout fasciculus of soft, dark muscle, which arises from nearly the whole of the internal surface of coracoid and of the adjoining stout strip of membrane, passes outward and upward through humero-coracoid space to be inserted into the anterior tuberosity of the humerus. Perhaps this is the muscle described by Owen† as the analogue of coraco-brachialis, and said by him to "attain its greatest relative size in the *Rasores*, where it arises from almost the whole of the coracoideum."

Triceps extensor cubiti is divided into two distinct muscles, as usual.

Numerous isolated fibres, representing *platysma myoides*, originate from anterior half of clavicle and proceed upward between the layers of the superficial fascia, to be inserted into the skin, superficial surface of œsophagus, and crop.

MUSCLES OF THE LOWER EXTREMITY.

Sartorius as usual.

Rectus femoris and *tensor vagina femoris* (*abductor magnus* of Owen) arise thin and fan-shaped, by a membranous aponeurosis from the superficial fascia of the back and from outer margin of sacrum and ischium, to be inserted by *two* tendons, the uppermost going to the anterior part of the sheath of *cruræus*, the lowermost to the head of fibula. The muscle is very thin and its tendon a delicate aponeurosis.

Glutæi and *cruræus* (including internal and external *vasti*) present no characters of particular interest.

Biceps arises just above inner hamstring muscle from ischium, and is inserted into fibula, fully 0.8 inch below the knee-joint.

Semimembranosus and *semitendinosus* are inserted into tibia at about the same level, above insertion of biceps.

Adductores and *gastrocnemius* not noted as peculiar.

* *Vid.* Owen, *Comp. Anat. and Phys.*, vol. ii, p. 95. Lond., Longmans, 1866.

† Owen, *l. c.*, p. 97.

The thickening and expansion of the conjoined tendon, just over the posterior part of tibio-tarsal-joint, is very marked, adding much to the lever-power of the muscle.

VISCERA.

On removal of sternum and scapular girdle, the ribs being cut through at a short distance from the sternal margins, only trachea, pericardium, and liver became visible, covering in the rest of the viscera. A considerable deposit of finely granular sabulous matter was found upon the serous covering of the lungs and viscera, which was preserved for future examination. There is no sternal fold of trachea, its bifurcation appearing just above *manubrium sterni*. *Œsophagus* lies beneath and to the right side of trachea. It is dilated into a very wide, triangular, definitely-circumscribed ingluvies, which measures in the alcoholic specimen about 1.50 by 1.09 inch.

Proventriculus is but a slight dilatation of *œsophagus*, well provided with secreting glands internally. The glands are cylindrical in shape, and some of them measure quite 0.10 inch in length. They are disposed in a zone of unequal width about the proventricular opening of the stomach, extending very much further upward anteriorly than posteriorly, where the lining of the proventriculus soon becomes reticulated. The orifices of the glands are very large, and their general structure and disposition are clearly visible to the naked eye.

Gizzard is elongated, 1.50 by 0.80 inch. Tendinous centres are situated *laterally*, a band of stout muscle passing downward over the anterior and central portion, spreading out over the bottom of the viscus, and curving sharply over posteriorly as a thick fleshy lip, the margin of which sinks into a deep sulcus, concave superiorly, and extending nearly the whole width of the stomach. From the centre of this sulcus passes upward a stout muscular fascicle, diverging as it ascends so as to cover the posterior surface of the stomach, and its sides above the lateral tendinous centers. The duodenum is given off from the right side, 0.50 inch from the lower border of proventriculus. Internally, the stomach is deeply rugous, the rugæ running for the most part axially, but merging in the upper third into a rough pavement of irregular prominences, produced by transverse sulci crossing the longitudinal. The principal grinding surfaces are, as was to be expected from the external arrangement of muscle, anterior and posterior instead of lateral, as usually is the case. The gizzard contained several pebbles, three as large as a grain of coffee, the beaks of two cephalopods, shells of small patellæ, and a considerable mass of pale green vegetable matter.

The small intestine passes out from the gizzard on the right side, curving sharply backward (parallel to spine) for 3 inches, and returning upon itself to the level of its exit from the gizzard. Within this fold lies the *pancreas*, moulded to the intestine on each side, and quite filling the interspaces of its curved surfaces. It is, therefore, about 3 inches in length, constricted along its central axis, and spreading out along both its ventral and dorsal surfaces. The anterior end is the larger, opposite to which the hepatic and gall ducts empty into the duodenum at least 6 inches from the gizzard. The pancreatic duct was lost in dissection, at a point about half an inch beyond the entrance of the hepatic duct, so that the point at which it empties into duodenum was not accurately determined, but it is certainly below the termination of hepatic duct. The intestine of this alcoholic specimen measures 44 inches in all; that of a fresh specimen, measured in the field, being 48 inches in length.* The cæca, which are quite as large in diameter as the intestine itself, are each 8 inches long, terminating in a mammillar point. From the origin of cæca to anus the distance is 3 inches; 23 inches below gizzard is another small cæcal appendage, rather less than 1 inch long.

Pericardium is large and full, occupying the central parts of thorax. A process of the pericardium is produced downward upon and between the lobes of the liver. The *heart* is large, and of the usual color. On each side of the trachea are to be seen the superior cavæ, with their branches, and beneath these lie the carotid arteries, which are double, the left being rather larger than the right. They dip beneath the trachea and œsophagus, converge, lying upon the anterior cervical muscles, run parallel for about half an inch, and divide into branches about an inch and a half above the first rib. The specimen not being injected, we were unable to determine whether or no there is an anastomosis between these arteries. The bifurcation of the trachea appears above the sternum, presenting no sternal fold in this species.

The liver is very large, extending on both sides for half an inch beyond the level of the acetabula. Left lobe nearly as large as right. Posteriorly and superiorly, it is deeply grooved by contact with the other viscera; anteriorly, a long-tailed process passes forward and upward, ending in a sort of suspensory ligament; the process of pericardium

* Mr. Cunningham records the length of the intestine of the larger species, *C. alba*, as but 40 inches, the cæca as 7 inches each; distance between their origin and the anus, 2½ inches. (Journ. Anat. and Phys. 1869, p. 89.)

above mentioned being, in fact, though not homologically, the principal suspender of the liver. The posterior margin of the right lobe presents two deep incisions, separating three pointed processes of liver tissue. The left lobe is sharply unciform, the concavity of the hook looking upward. A decided thickening of the isthmus, on the superior surface of the liver, indicates the third lobe. Gall-bladder distinct, empty; biliary ducts very large.

The left ovary was found to have been quite active, resembling a bunch of grapes. We counted twenty-six vesicles as large as No. 6 shot, eleven of these being as large as No. 3, besides very many large enough to be distinct.

Oviduct tortuous; much enlarged; longitudinal plicæ very distinct and laminated, like the leaves of a book. The sex of this specimen, which had black wing-spurs, proves that that feature is not distinctive of male birds, as we had supposed.*

Kidneys are large, 1.95 inch; moulded on their superior (dorsal) surface to fit the irregularities of the sacrum. Near the termination of the ureter, in the cloaca, are noticeable two small glandular bodies.

Palate is wide posteriorly, bounded at the sides and anteriorly by the projecting edges of the bill. Half an inch from the tip of beak, in the median line, is a minute longitudinal crest; 0.10 inch behind this a decided tooth-like, bony process, directed backward; 0.20 inch posterior to this are six tooth-like villi, directed backward and arranged, like a comb, in a horizontal row. Here the lateral palatal ridges become prominent. Marking the anterior end of the aperture of the posterior nares, and 0.30 inch behind the last-named process, are two longer tooth-like villi; on each side of this slit, in the sulcus between central and lateral palatal ridges, are six minute separate villi in a longitudinal row. Behind the slit for the Eustachian tube there is a transverse comb-like row of villi on each side, directed backward and limiting the upper and back part of the pharynx.

SKELETON.

SKULL.—On examination of the skull as a whole, the brain cavity appears relatively very large and high. The frontal region is much inflated, and the whole arch very convex. The attachments for muscles are generally not well marked, and the depression (crotophyte) for the insertion of the temporal muscle is almost obsolete.† Prominent points

* B 11. No. 2, Nat. Mus. 1875, p. 1.

† These observations are very different from those of Mr. T. C. Eytton on the skull of *Chionis alba*. He found the "cranium with a very small cavity for the brain; occipital

are: two deep fossæ just above and parallel to the superior orbital margins, a prominent bony crest (for the support of the caruncle) in front of these, the large size and subcircular form of the foramen magnum—all of which will be described in detail below.

Occipital bone is convex inferiorly and irregularly trapezoidal in shape. Its crest is less prominent than usual, although quite distinct; shaped like a bow, with its extremities distinctly defined as far as the superior border of the *meatus auditorius externus*. The condyle is small and spherical (not nicked, as in *Gallinæ*). *Foramen magnum* is nearly circular in outline, its anterior border being cut off so as to form a high, broad arch. It measures in antero-posterior diameter 0.21, in transverse diameter 0.32 inch. On each side of the condyle is a broad space for ligamentous attachments; laterally and posteriorly to these its paroccipital(?) portions extend downward as vaginal processes, protecting the posterior border of the external auditory meatus. From the foramen magnum to the crest extends upward a prominent median ridge, flanked by lesser ridges on each side from the lateral portions of the foramen.

Sphenoid is irregularly pyramidal in shape, being produced forward into a long cultrate spine (*basisphenoid*), embraced by the two prongs of the *vomer* and upon which ride the *palatine* and *pterygoid* bones. There are no distinct basipterygoid processes. Only the marginal portions of the basisphenoid contribute to the floor of the orbits, its orbital plates passing upward and outward to complete a septum between the brain and orbit. This septum is perforated in the median line by two irregular foramina for the transmission of the optic and olfactory nerves. The inferior (optic) foramen is heart-shaped, the apex of the figure being directed upward, and the lateral lobes much prolonged. The superior (olfactory) foramen presents the outline of the ace of clubs. As these are the chief anterior foramina of the brain-case, they probably transmit other nerves distributed to the orbit and face, as well as the olfactory and optic. Rising from the superior margin of the basi-sphenoid is the *inter-orbital septum*, perforated anteriorly in this species by an irregular vacuity, and posteriorly by an extension forward of the optic and olfactory foramina already noted. The interorbital septum is, however,

ridge very prominent; * * * * ridges for the attachment of the masseter muscles strongly marked." (*Osteologia Avium*, London, 1867, p. 176.) As we cannot believe there is any marked difference in the skulls of *C. alba* and *C. minor*, we simply fail to appreciate the pertinence of the author's remarks in this case.

properly speaking, incomplete only as regards the irregular foramen above mentioned. It is marked anteriorly by prominent stout bridges of bone, disposed so as to form the letter Y, which are continuous apparently with the notable exostosis marking the anterior portion of the frontal bone.

Parietal and *temporal* bones are not distinctly limited, owing to the complete ossification of the brain-case. The external auditory meatus is large, and so well protected by its surrounding periotic processes as to seem to be almost a tubular prolongation of the skull.

Os quadratum is in shape somewhat like a molar tooth, its crown being directed downward, and one fang (*i. e.* orbital process) projecting upward, forward, and inward nearly to the body of the basisphenoid. It presents five articulating facets; one inferior, broad, triangular, and marked by three marginal mammillæ, for the mandible; one external to and a little above this, for the zygoma; two, on its upper surface, for articulation with the temporal; and one, internal to these, for the pterygoid.

Pterygoids are relatively slender, 0.32 inch long, flattened from side to side, and slightly twisted upon themselves. They diverge from the palato-ptyerygoid articulation at an unusually wide angle, rather more than 90°.

Vomer is long, slender, bifid posteriorly, apparently extending from pterygo-palatine articulation to beyond the anterior extremity of the *maxillo-palatines*. Its complete ankylosis with the palatines, however, renders it impossible to determine exactly its posterior limit. Its superior surface is deeply channeled for its whole length. Beneath the vomer are to be found the *maxillo-palatines* and *palatines*, the latter soldered together on each side, but quite separated in the middle line.

Palatines are thin laminae, irregularly concavo-convex. They present two prominent laminae, external and internal. The external, which constitutes most of the bone, flares widely outward and downward, ending behind transversely, yet with a gently-rounded angle. From its under surface descends obliquely inward the much smaller internal lamina, like a keel.

Maxillo-palatines.—These bones are rather stout, squarish, tumid bodies, anteriorly joining the palatines at a point, but in all the rest of their extent entirely separated therefrom, as they also are from the vomer and from each other. The "body" is a very thin osseous wall, inclosing a hollow cavity. Anteriorly the *palatines* are produced as maxillary

processes to form the lateral borders of the palate and part of the osseous support of the basal portion of the bill.

From these accounts it appears that the palatal structure, as a whole, is what Huxley calls *schizognathous*.

Frontal bone is marked by two very distinct deep fossæ, occupying nearly the whole roof of the orbit, separated from one another by a prominent central ridge, and bounded anteriorly by a curious exostosis, which supports the fleshy caruncle of the forehead. The floor of this fossa is perforated by an anterior large circular foramen, transmitting the nasal duct of the gland which occupies the fossa. Behind this are several irregular perforations, disposed in a line parallel with the orbital margin. This last (the orbital margin) extends horizontally as a thin lamellar process, completing the roof of the orbit on each side. The remarkable exostosis above referred to may be described as consisting of two prominent bosses, one on each side, separated by a shallow central fossa, and presenting somewhat the outline of a bat with wings extended. From the external portion of each "wing" runs downward, parallel with the nasals, a slender bone (*maxilla*), articulated above by an expanded condyle, joining, below, the rest of the maxilla at the base of the bill. A narrow linear space is left between these bones and the nasal on each side. The construction of these parts is what Garrod calls *schizorhinal*.

Zygoma or malar bone is long (1.00 inch) and slender, of uniform diameter throughout, extending from the *os quadratum* to the base of the bill. It diverges rather widely from the middle line, the distance between its posterior attachments measuring 1.00 inch. *Lachrymals* are distinct, although small, easily detached, and liable to be overlooked. They are crooked little nibs of bone, with heeled base of support.

Mandible expands posteriorly into a flat articulating head, marked superiorly by a deep, irregularly concave glenoid cavity. On the internal side of this projects upward, and a little inward, a stout pyramidal process, slightly hooked toward its apex. Directly behind the articulation projects the *angle of the mandible*, a lamellar rostrum, nearly square in outline and very slightly canted upward; 0.15 inch in diameter. Externally there is a low pyramidal prominence, its apex filling the angle between zygoma and os quadratum, at their articulation. The body of the mandible is continued forward to the symphysis as a thin strip of bone, flattened from side to side, and sending upward a very thin lamella from its external surface to complete the contour of the bill. At

about the middle of the mandible, this lamella is incomplete, leaving a long, oval foramen, parallel to ramus, measuring 0.40 by 0.10 inch.

General measurements of skull.

	Inches.
Occipital crest to tip of bill.....	2.60
Occipital crest to fronto-maxillary articulation.....	1.40
Width of skull at base.....	1.00
Width between meatus auditorii.....	0.42
Extreme length of brain case.....	1.00
Extreme height of brain case.....	0.75
Width of frontal crest.....	0.80
Height of frontal crest, middle line.....	0.50
From fronto-maxillary articulation to tip of bill.....	1.40

The length of the symphysis is about one-fourth that of the entire mandible.

VERTEBRÆ.—*Cervical* are thirteen in number, differing considerably in shape. The second, third, and fourth show a distinct and prominent neural spine, which becomes very small on the fifth, and can scarcely be said to exist at all on the others. The second, third, fourth, ninth, tenth, eleventh, and twelfth present also very prominent laminar hyp-apophyses, which are not developed on the others. The bodies of the first four are very short, rapidly lengthening to the ninth, which is the longest, and again diminishing to the thirteenth, which is about as long as the fifth. All the cervical vertebræ but the atlas present large and distinct vertebral foramina, narrowing gradually toward the skull. The arteries which pass through these would seem to be of unusual size, since the bodies of the vertebræ are deeply grooved beneath for their reception. Rudimentary ribs are distinct on the last five cervical vertebræ, as uncinæ processes directed downward and backward from the extremities of the transverse processes. They are less obvious farther up the neck.

Dorsal are eight in number, each carrying a rib, of which all but the first and last articulate also with sternum. Each rib articulates both with the body and transverse process of its vertebra, leaving a space between its tubercle and head, which completes a morphological continuation of the vertebral foramina. From the third to the eighth inclusive the dorsal vertebræ show very prominent lamellar neural spines, forming, by their apposition end to end, a continuous thin perpendicular ridge, which projects above the dorsum of the bird. The bodies of the fourth and fifth are much compressed and flattened from

side to side, making a semblance to a series of prominent lamellar hypapophyses along this part of the column. The transverse processes also of all except the first dorsal are very thin and broad, projecting as a series of flat tiles above the heads and tubercles of the ribs. The last dorsal lies between the crests of the ilia, beneath and abutting against which the rib which it bears comes out. The *sacro-lumbar* vertebræ, *i. e.*, those which are anchylosed with each other and which articulate with the pelvis, appear to be thirteen in number. Viewed from above, the broad, expanded portion of the sacrum (opposite the acetabula) shows six inter-trabecular spaces, the contour of the exposed surface being approximately diamond-shaped, about $\frac{3}{4}$ inch broad at the widest part by $1\frac{1}{8}$ inches in length. The median line above is flat, without indication of spinous processes. Viewed from below, the conjoined centra of the *sacro-lumbar* vertebræ are a narrowly fusiform mass, broadest about opposite the middle of the ilia. Inferiorly they are flattened and somewhat excavated, though anteriorly pinched together and deepening to join the articulation with the last dorsal vertebræ. The trabeculæ are longest and most distinct opposite the acetabula, two of them being especially prominent, while anteriorly four or five are conspicuous. Then follows an interspace of about the same length, in which they nearly disappear; nor are they strongly marked toward the posterior extremity of the column.

The *caudal*, *i. e.*, unanchylosed post-sacral vertebræ, are nine in number, considering the pygostyle as one. Pygostyle is simply laminar, with thickened under edge, irregularly quadrilateral in shape; long diameter, $\frac{1}{2}$ inch. Of the other vertebræ, the transverse processes of the intermediate ones are shorter than those of either extremity. Moderate neural spines, with no obvious hypapophyses except on penultimate vertebra. The whole series presents no special characters.*

* Comparison with De Blainville's vertebral formula will show several points to be considered.

In the first place, De Blainville is in expressed doubt as to the number of post-sacral vertebræ, and his formulæ, as given at p. 102 and at p. 106, differ with each other, the first being 15—6—14—7=42, the other being 15—6—14—8=43. Accounting for this discrepancy on the supposition of imperfection of his specimen, we throw the post-sacrals out of further consideration, and turn attention to the remaining elements of his formula, which are really less different from ours than appears at first sight, we giving 13—8—13, and he 15—6—14.

For we reckon the last costiferous vertebra as dorsal, he as sacral. This leaves the numeration of non-costiferous anchylosed lumbo-sacrals the same, namely, 13, in each case, adding one to his numeration of dorsals. We furthermore reckon as a dorsal

Sternum measures 2.40 inches by 1.20 at upper borders, and is therefore exactly twice as long as broad. (Others measure 2.5 by 1.3, No. 32♂; 2.42 by 1.20, No. 232.) The manubrial process projects slightly in front of anterior border, sending downward a small, thin beak-like process. Articulating surface for coracoid extends from external and posterior margin of manubrial process, nearly meeting its fellow above it backward and outward, to an angular prominence on the ridges limiting sterno-coracoid articulation .80 inch from the manubrial process. When the coracoid has been removed, the anterior margin of sternum is nearly transverse, showing only a shallow curve upon each side. The costal process projects laterally beyond lateral margins of sternum 0.22 inch, and behind coracoid articulation. There thus presents on each side a triangular space, defined in front by the ridge limiting sterno-coracoid articulation, its base occupied by a grooved facet for coracoid, and its two other sides constituted by the horizontal and lateral margins of the costal process.

The ridge limiting sterno-coracoid articulation inferiorly is prominent and sinuous—bow-shaped. It extends nearly to lateral margin of sternum, which is a thickened ridge, bearing facets for the articulations of ribs on its flattened wide edge, and passing upward to join costal process at nearly a right angle. Costal process is flat and obtusely pyramidal in shape. It projects upward and outward, and covers the posterior aspect of sterno-coracoid articulation. Body is slightly constricted at its middle part, where it measures 1.00, expanding again posteriorly to measure 1.40 inches from apex to apex of its external laminæ. Posterior border is convex, the xiphoid process being cut off transversely. The posterior border is deeply incised on each side by two notches, of which the inner measures .40 and the outer .45 in depth, measuring from the curved margin indicated by the extremities of the intervening strips of bone (hyposternal elements of Owen). The outer notch is thus *a little deeper* than the inner, yet, owing to the convexity of the posterior borders of the lateral parts of the sternum, the two laminæ limiting the notches are almost exactly of equal length. The margins of the lateral sternal elements are thickened, as already stated, becoming stoutest in the area

that vertebra which bears a distinct, though small and asternal, rib. Removing this disputed one from his cervical series, and adding it to the dorsal series, gives the eight dorsals we enumerate. The only discrepancy, in total numeration of cervical, dorsals, and sacro-lumbar, between his count (35) and ours (34) is one cervical. There being certainly but thirteen cervicals in our specimens, *C. alba* must possess one more cervical than *C. minor*, unless De Blainville miscounted.

occupied by the articulations of sternal ribs, about junction of anterior and middle thirds. Here the ridge is re-enforced by the thickened line, limiting externally the area of origin of pectoralis medius. At the posterior edge of costal process it bifurcates, becoming continuous on the one side with the ridge limiting coraco-sternal articulation, and with the external and posterior margin of the costal process on the other. The area occupied by the origin of pectoralis medius is the thinnest part of the bone. *Keel* begins strictly at apex of manubrial process, whence a sort of beak is given off, its margin looking downward and backward for 0.30 inch. Then follows a sharp angle, with a quite deeply excavated curve, backward, downward, and forward again, to the most prominent part of the rostrum. The anterior border of the keel is therefore quite deeply concave, and its anterior extremity pointed. Its inferior border is slightly convex, and runs backward and upward, bifurcating at its extremity to join the angles of the expanded gladiolus. It measures along its curve 2.1, and at its deepest part, opposite the anterior angle, 0.80 inch. Its anterior border is much thickened by a stout ridge, proceeding backward and downward from the internal angle of sterno-coracoid articulation.

Coracoid measures 1.30 inches in length, and consists of a subcylindrical shaft and two expanded extremities, bearing three articulating facets. The scapular extremity is produced upward and forward, terminating in a prominent facet for the articulation of the clavicle. This articulating head arches over inward, so as to constitute, by aid of a coraco-scapular ligament, a considerable foramen continuous upon the coracoid with a deep groove which runs down upon its lower face, and is bounded by a ridge of bone internally. Three-tenths of an inch above and behind the anterior end of the coracoid is a broad articulating surface, extending entirely across the posterior face of the bone, for the scapula. At the external junction of scapula and coracoid is the glenoid cavity. The shaft of coracoid is inferiorly convex, superiorly flat, and toward its posterior end slightly concave. It sends off a remarkable sickle-shaped spine from the outer side of its posterior head, which curves slightly upward and extends just to the extremity of the costal process of sternum. Internally to this, on its posterior margin, is a triangular spine, extending backward, which fits into a corresponding depression in the ridge limiting sterno-coracoid articulation. From this spine the articulating facet extends inward, arching upward at the same time, and measures 0.40 from without inward. Including the external spine above referred to, the bone measures .63 across its base.

Scapula is long and sword-shaped. It is flattened from before backward near its articulation, and from side to side from its middle third outward, being slightly twisted upon itself. It articulates with the coracoid by a broad oblique head, marked posteriorly by three prominences, and measures 2.10 inches in length by an average width of 0.15 inch.

Furculum is moderately stout, **U** instead of **V** shaped, its sides at first parallel, then curving gently toward each other. It runs backward, with little downward inclination, and its apex is directly beneath the *manubrium sterni*, falling far short of the apex of the sternal keel. There is no prominent process at the union of its two elements, only a small mass of bone, facing the manubrium.

Ribs are eight in number, of which all but the first and last articulate with sternum. Splint ribs are distinct, averaging 0.40 inch in length, slightly curved, pointed, and directed obliquely upward and backward; but we cannot say how many there are, owing to the carelessness of the person who boiled the subject.

Humerus measures 2.70 inches in length; a slender bone, slightly curved, like an italic *f*. Its head is much expanded and flattened from without inward, covering the region of the joint as with a shield, convex externally, concave internally. It is marked by many deep grooves and depressions for muscular attachments, and by a very prominent ridge along its dorsal surface, whereto are attached the tendons of the pectoralis major and minor, latissimus dorsi, and scapular muscles.

The forearm is slightly longer than the humerus, measuring 2.9 inches from elbow to wrist. The *radius* measures 2.70 inches, and the *ulna* 2.80 inches. Both bones are rather stout for their length. Just below the carpal joint is given off from the radial side of the carpus a prominent exostosis, knob-shaped, 0.30 inch long by 0.20 inch wide at the base, growing out perpendicularly to the axis of the bone. This knob supports the wing-spur, is undoubtedly bony, but presents no recognizable evidence of independent ossification. The principal bone of the metacarpus, that representing the middle finger, carries two phalanges, measuring together 1.20 inches. To its ulnar side is attached at each end the metacarpal bone of the fourth finger, which acts as a splint-bone, being quite separate excepting at its extremities. This fourth metacarpal carries but a single phalanx. The radial metacarpal is a small spicule.

Femur measures 2.1 inches in length. Trochanter is flattened so as

to protect the joint externally, and rises above the margin of acetabulum.

Tibia is much longer than femur, 3.30 inches. Its head is much expanded, with a very prominent anterior flattened process, triangular in shape and curved slightly outward.

Fibula is distinct above; united to tibia by a thin, bony bridge along the middle part of its course; becoming free again as a very slender rod, which is finally fused with tibia at about its center, and quite lost an inch above its tarsal extremity.

Tarso-metatarsus terminates in three double condyloid facets, claw-like, partly separated. The outermost is shortest (highest), the middle longest, and the innermost one intermediate in length. About one-tenth of an inch above the junction of the middle and innermost elements is a foramen quite through the bone from before backward, and about large enough to admit an ordinary pin. From the head to the end of the middle division of its lower part the bone measures 1.75 inches, to the inner division, 1.65, and to the outer, 1.50, inches.

Toes are four in number. The first toe, articulated to the metatarsus above the level of the rest, has two elements. Its accessory metatarsal is very short. The second toe, articulating with the inner condyle, has three elements, successively diminishing in length. The third toe has four elements, similarly diminishing; and the fourth toe has five, of which the first is longest, the second and fourth next and equal, the third next, and the fifth shortest.

Pelvis is long, compressed anteriorly in the middle line of its dorsal surface, expanded posteriorly, and diverging so as to include the sacrum. The crests of the ilia extend so far forward as to cover the articulation of the last rib, and are separated in the middle line only by the lumbar neuropophyses, to which they are closely apposed, being turned up to form a sheath. Eight-tenths of an inch from the anterior margin of the pelvis the ilia begin to diverge, inclosing a hastate interval, which is filled up by the sacrum. Here the dorsal surface of the ilia becomes convex (from concave), presenting a well-defined, smooth surface for the origin of the gluteal muscles. Posteriorly, the ilium ends in a sinuate border limited externally by a prominent ridge, which terminates posteriorly in a considerable spine, the tuberosity of the ischium. The *acetabulum* is perforate, protected posteriorly and superiorly by a prominent bony lip, which separates it from the ischiatic foramen. Between the ischiatic foramen and the acetabulum, and inferior to both, is the obturator

space, limited below by the pubis and above by the ischium. It is converted during life into an oval foramen by a stout ischio-pubic ligament. The ramus of the ischium runs downward and backward as a long falcate process, flat, thin, and curved on the flat somewhat inward. The *pubis* is long, very slender, shaped like an italic *f*, and crosses the ischium externally to its ramus, extending 0.40 beyond it, curving inward as it passes backward. Both ischium and pubis extend considerably beyond the coccyx posteriorly, and approximate each other, inclosing, with ilium, an irregular, circular outlet, of which the sacro-pubic diameter is 1.30 and the inter-ischiatric 1.10 inches. Internally the ilia are deeply excavated opposite the sacrum for the kidneys, so that the acetabular and ischiatic foramina pass out *laterally* from the cavity so formed. Its roof is crossed by the sacral trabeculæ, and encroached upon by the sacrum, somewhat like the ridge-pole and lateral ties of the roof of a house. This iliac cavity is limited anteriorly by the margin of a ridge formed by the fusion of the ischium and pubes. Posteriorly, although the rami of the ischium do not articulate or fuse together, they *touch*, doubtless closing during life the whole obturator space, here very long and narrow.

STATEMENT OF CONCLUSIONS DEDUCED FROM THE FOREGOING.

HABITS, GENERAL APPEARANCE IN LIFE, AND EXTERNAL CHARACTERS.

The observer is first struck by the strong resemblance which *Chionis* bears to the pigeons, in general appearance, gait, and mode of flight. The general shape of the body is of an ordinary columbine character, the head being notably small, as usual in that group, the neck short and full, and the body plump; the tail, moreover, having but 12 rectrices. The sheath of the bill may furnish a distant analogy with the soft, swollen membrane which covers the nostrils throughout the *Columbæ*. But this is a mere resemblance, the affinity indicated being, as will be seen later, with such sheaths as the *Procellariidæ* and especially *Lestridinæ* bear. The strongly convex outline of the frontal feathers at the base of the upper mandible is a very decided columbine feature. These superficial resemblances to *Columbæ* are not correlated with more important structural characters, and are themselves overbalanced by other external features, which indicate relationship with other groups. Thus the pterylosis is entirely different, large after-shafts and abundant down

being present. The pterylosis stops above the suffrago; the inner remiges reach to the ends of the primaries in the folded wing. As to the exterior portions of the body not covered with feathers, the feet are entirely different from those of the pigeons, in the shortness and elevation of the hallux and other features, while the bill, aside from the sheathed portion, is altogether diverse. The reference of this form, therefore, to, or even near, the *Columbæ* is out of the question.

The only external character indicating a *passerine* affinity is the form and size of the beak, which are decidedly corvine; an analogy which, however, is as feeble as that deduced from the croaking note of the bird when on its feet, and has, of course, no taxonomic significance.

The external resemblances to the *Gallinæ* are much more obvious and important. The contour-feathers have large after-shafts—at least half as long as the main shafts. There is a curious gallinaceous trait exhibited in the mode of holding the wings during life—drooping and parallel with the tail instead of meeting each other above it. The frontal caruncular casque presents an obvious resemblance to the combs which ornament so many of the typical *Gallinæ*. The few tail feathers and contour of those of the forehead are, however, columbine rather than gallinaceous, while the elongation of the inner remiges and general shape of the wing is rather grallatorial. The feet, in almost every particular, are thoroughly gallinaceous, even to the character of the marginal fringe of the toes, which retains strong pectinations instead of presenting the smooth border characterizing the feet of many of the *Grallatores*. The points in which the feet differ from those of most *Gallinæ* are: The reticulation instead of the anterior scutellation of the tarsus, and nakedness of the lower portion of the tibiæ; both these features being essentially grallatorial, though shared by the gulls. As to other naked portions of the body: The presence of the wing-spur indicates affinities lower than the *Gallinæ* so far as it has any taxonomic value, such spurs being a rare accident of higher (*i. e.*, more recent) birds, and its development being most pronounced in older, more generalized types—struthious birds, for instance. The abundance of gray down is an indication of relationship with pelagic birds, and by so far removes the bird from the neighborhood of *Gallinæ*. The legs are altogether below the average grallatorial length, and the small extent (one-half inch) of the unfeathered part of the tibia seems to assimilate it, as De Blainville has observed, with the gulls. The system of coloration also is extremely gull-like. The bird, in fact, closely resembles super-

ficially *Pagophila eburnea*, or *Pagodroma nivea*. The thoroughly anomalous bill offers nothing of interest in this connection. On the other hand, the bird's omnivorous diet, habits under confinement, easy domestication, dislike of water, entire inability to swim, and many other points in its habits, are strongly gallinaceous characteristics, by so much removing it from the vicinity of either grallatorial or natatorial birds.

Proceeding to consider the relationships of *Chionis* with *Grallæ* as to external features, the following points present themselves: A small, flat, twelve-feathered tail, a wing with the inner remiges equaling the longest primaries, a tibia bare below, a completely reticulate tarsus. These are all grallatorial features. As to other indications to be afforded by external characters alone, we should not omit to refer to a struthious feature already noted by W. K. Parker (Trans. Zool. Soc., vol. v, p. 207) in the following terms: "There are certain curious, thoroughly *marine* plovers (*Chionis*), in which the sheathing of the upper jaw is very perfect. They thus retain a struthious character, but in an exaggerated condition."

Upon one point which we consider important, the required data are wanting. We refer to the nature of the bird, whether altricial or præ-social. The now well-known egg itself has been perhaps hastily considered to be decidedly pluvialine; yet, for all we can see, it is quite as thoroughly larine. Now, as we shall see beyond, the relationships of the bird are nearly balanced between the plover-snipe and the gull-petrel groups. If *Chionis* lays regularly four eggs, and if the young run about at birth, this would be a great argument for De Blainville; if it lays two or three eggs, and rears its young in the nest, the boot would be on the other leg.

In summing external characters, therefore, we see how exactly *Chionis* stands between grallatorial and natatorial birds, retaining slight but perfectly distinct traces of several other types of structure.

Inasmuch as M. de Blainville is the only naturalist who has made any careful study of this genus (based upon specimens of *C. alba*), and as his conclusion that its nearest affinities are with *Hæmatopus* have never been formally disputed, it seems proper to consider here the external features upon which this distinguished naturalist based his deductions.

In the first place, De Blainville labored under the disadvantage of never having seen a specimen of *C. minor* (it had, indeed, not been dif-

ferentiated at the time of his description) which we regard as clearly the type species of the family. Secondly, the description of the living bird to which he had access related only to individuals observed under the unnatural conditions of confinement on shipboard, which may account for the discrepancies between his and our descriptions of its habits, and tends to invalidate the conclusions which he draws therefrom. While he has stated fairly and accurately many of the resemblances to *Hæmatopus*, or in other words to *Grallatores*, he seems to us to have failed to give due weight to the many important points of difference from that family, some of which we have already discussed, and others of which will appear in a stronger light as we proceed to examine the internal structure.

MUSCULAR AND DIGESTIVE SYSTEMS.

The muscular system affords less important and decisive indications than either the digestive or osseous. According to our dissections, the general disposition of the pectoral muscles which act upon the humerus is, as would have been anticipated from the mode of flight, rather gallinaceous than grallatorial. This statement is borne out by the relative development of the several pectorals, the bulk and extensive origin of a "coraco-brachialis" (see page 94), and a specialization of a sort of *platysma myoides* with reference to its action upon a large crop. A tolerably minute description of the more important muscles has been given on a preceding page as material for further comparisons than we are at present prepared to undertake.

In the digestive system we meet at the outset with several gallinaceous characters. The breadth of the mouth, especially near the base of the bill, shape of the tongue, and general disposition of the several palatal and lingual appendices, are rather those of a gallinaceous than of a grallatorial bird. In the shore-birds, among which *Hæmatopus* falls, narrowness of the bill and constriction of the whole buccal cavity is a very distinctive feature. The slender œsophagus of *Chionis*, much narrower than is usual in shell-eating birds, presents the extremely rasorial feature of a large and circumscribed crop. The proventriculus is not a marked dilatation of the œsophagus. Its solvent glands differ widely from those of the *Gallinæ* in their simple structure, approaching, in this respect, to those of various water birds, such as the swan and gannet. But the low taxonomic value of this feature is illustrated by the marked differences exhibited by those of so nearly related birds as the swan and goose, for example. No greater value attaches to the disposition

of the zone of glands as a whole, since it varies widely in closely-allied genera.

The gizzard appears to be unique, so far as we know, in the antero-posterior, instead of lateral disposition of its masses of muscle. The development of muscle is intermediate between the great masses found in the *Rasores* (and such *Natatores* as the goose) and the less considerable layers found in *Grallatores*, but altogether different from the thin membranous bags of fish-eating birds like gulls. The length of the intestine (about three times that of the bird), and its calibre, do not differ greatly from the same characteristics in *Rasores*. The cæca are very long, and dilated toward their blind ends; in this respect totally unlike the grallatorial type, in which the cæca, when present, are commonly small and simple.

The third cæcum, of uncertain significance, is distinct, although small. This appendage is found in various grallatorial, some struthious, and many other birds. On the whole, it is safe to say that the digestive canal is decidedly rasorial in character.

OSSEOUS SYSTEM.

From a decided position among *Gallinæ*, on the other hand, certain parts of the skeleton exclude this bird as effectually as the existence of a sternal keel renders the consideration of struthious affinities unnecessary in this connection. The sternum departs furthest from that of a struthious bird, and next most widely from the very peculiar rasorial form. The most cursory inspection throws out at once the deeply-cleft, strongly specialized sternum of gallinaceous birds. It is of a very simple generalized type, presenting characteristics to be found in widely diverse groups of birds, but on the whole resembles most closely the commonest form of the sternum of the *Laridæ*, with a marked likeness also to the breast-bone of a plover. The obvious resemblance of this bone to that of *Hæmatopus* is the central point of De Blainville's argument. Yet we are inclined to believe that the sternal characters upon which De Blainville most relies as distinctively pluvialine are simply the most generalized features of the bone—those which, under various modifications, are to be found in the greatest number of different groups. And simple comparison shows beyond dispute a greater resemblance of this sternum to that of the gulls than to that of wading birds.

The general form, the existence of a prominent manubrial process, the width and extent of the costal margins, the great prolongation of

the costal processes, the development of the keel relative to the size of the body of the bone, the general disposition of the coraco-sternal articulation, and the doubly-notched posterior border, are all thoroughly gull-like. The point of difference of this sternum from that of the gulls, is a moderate rounding of its posterior margin, so that the outer of the two spurs of bone does not reach so far back as the inner; the reverse being the case in *Laridæ*. Such form of the posterior margin is a common grallatorial character; nevertheless, in *Limosa*, for instance, this border is perfectly transverse. Moreover, the difference between *Chionis* and *Larus* in this respect is less than the difference between *Larus* and its near neighbor *Lestris*. In the wading birds the manubrium is either absent or quite small, the keel is very deep in proportion to the extent of the body, and the body is compressed anteriorly, and very deeply hollowed. As to all of these features, the sternum of *Chionis* differs from that of the plovers and approaches that of the gulls. In comparison with either plovers or gulls, there is a feature peculiar to *Chionis* in the relation borne by the furculum to the sternum. For both gulls and plovers have a strongly bent furculum with a well developed posterior spine reaching nearly to the apex of the sternal keel; whereas, in *Chionis* the furculum is scarcely bent, has no spine whatever, and its apex is closer to the manubrium than to the sternal keel. In place of a posterior spine there is a slight process of bone directly facing the manubrium.

The clue to the true affinity of the bird furnished by these gull-like sternal characters, is traceable in every part of the skeleton.

To begin with the skull. The *Gallinæ* may be at once thrown out of the discussion by the absence in *Chionis* of the following, among other, distinctively "*alectoromorphic*" features.* The occipital condyle is simple, not notched; there are no basiptyergoid facets, the pterygoids articulating with the basisphenoid only at their extremities; the internal lamellæ of the palatine bone are strongly developed instead of rudimentary; and the shape of the palatines, as a whole, is radically different. The maxillo-palatines are long and spongy, instead of being lamellar. Vomer is large, conspicuous, and completely ankylosed with the palatines. The articulation of the quadrate bone with the temporal is very different, nor is there in front of this bone the immense fenestrated process so conspicuous in *Gallinæ*. The angle of the mandible is not strongly upcurved. There are great pits on top of the skull for the

* Huxley on Classification, P. Z. S. 1867, p. 459.

lodgment of the nasal glands not seen in *Gallinæ*. In fact, the curious frontal bosses found on some cocks are one of the most obvious points of resemblance, aside from the fact that the palates of both are *schizognathous*; but a fortuitous exostosis like this has, of course, no classificatory significance.

On the other hand, every important feature of the skull is identical with the characters presented by the skull of the gulls. So perfect is the resemblance that after careful comparison the principal discrepancy between the two skulls that we are able to detect is the wider divergence of the pterygoids from each other, and the consequently more posterior position of the palato-ptyergoid articulation in the skull of *Chionis*. The most trifling details of the gull's skull are repeated in that of *Chionis*. It is needless to enumerate them. There is, however, a character of uncertain value in the front of the gull's orbit, where a strong transverse plate of bone projects, bounding the orbit anteriorly; no such formation being found in *Chionis*, wading, or gallinaceous birds. As to the angle of the mandible, it is found to be in *Chionis* essentially as in the gulls, yet with a slight production posteriorly, much like that found in some wading birds. In general, the slight differences observed between the details of the skulls of *Chionis* and gulls are differences of degree only; a less development of bony ridges and processes, a greater relative breadth, and less forcible expression of differential details. The difference in the form of the rostrum, which is likely to attract attention, is of no significance whatever, since extraordinary differences in this respect are found among the *Laridæ* themselves (*cf. Rhynchops, e. g.*)

Nitzsch first, from consideration of the pterylosis alone, and Huxley subsequently, with reference to the skeleton, have demonstrated a very close, although not generally recognized, connection between the great plover-snipe group and the gulls; and in discussing the affinity of *Chionis* to the gulls, we might be supposed to imply nearly or quite as intimate relationship with the plovers. But in *Chionis* we miss precisely those characters which are relied upon to distinguish the plovers from the gulls, namely, an extensive naked space above the suffrago as regards pterylosis, and the presence of distinct basi-ptyergoid processes as regards osteology. Furthermore, plovers do not possess the great pits on top of the skull which are so conspicuous in *Laridæ* and in *Chionis*, their rostrum is slender and elongate, their maxillo-palatines are never swollen or spongy (as in *Chionis*), and the angles of their mandibles are produced into slender recurved processes.

Throughout the skeleton, minute and careful comparison, bone by bone, shows only close similarity between *Chionis* and the gulls, as great as that already signalized in treating of the skull. In short, had we only the skeleton of *Chionis* to go upon, we should be obliged to place the genus in *Laridae*; its peculiarities being less widely diverse from those characterizing that family than are to be found within the limits of the family itself.

We thus find in *Chionis* a connecting link, closing the narrow gap between the plovers and gulls of the present day. In our opinion, this group represents the survivors of an ancestral type from which both gulls and plovers have descended. And this opinion is strongly supported by the geographical isolation of its habitat, affording but few conditions favorable to variation.*

In the practical matter of classification, it is evident that *Chionis* is not exactly referable to either of the two groups between which it stands. A consideration of its external characteristics, its digestive system, or its osteology, solely, would lead to very widely diverse conclusions. For we have presented in this bird a genus with the general appearance, gait, and flight of a pigeon, with the beak and voice of a crow; with the habits of a wader, yet dreading the water, and with the pugnacity and familiarity with man of a rasorial bird. With the last group its digestive system would certainly place it, to say nothing of the long after-shafts of the feathers. And osteological comparison establishes its position definitely between the gulls and plovers, but rather nearer to the former.

* It is interesting to note in this connection that the fauna of Kerguelen Island is rather remarkable as containing several forms of animal life whose structure would give no clue whatever to their habits, so aberrant has been the progress of their variation in the peculiar conditions under which they live. Thus the great southern skua (*Buphagus skua antarcticus*, Bull. No. 2 Nat. Mus., p. 11) has there adopted the habits of a land-hawk; three very remarkable genera of apterous *Diptera* occupy the place and live the life of leaf-eating and carnivorous beetles; and the only beetles found by Dr. Kidder were curculios (in a country without trees or shrubs), and a small water-beetle (*Oethebius*), living at a distance from any body of fresh water. The curculios lived upon the rocks and moss, and had lost their northern habit of simulating death, while one genus of apterous *Diptera* had taken up the habit, and lived upon the leaves of the largest plants there represented. Several orders of insects, including *Hymenoptera*, *Hemiptera*, *Orthoptera*, and *Neuroptera*, among the commonest elsewhere, are here entirely absent; so that those which are represented are placed altogether anomalous surroundings. As Latreille has said (Hist. Nat., vol. xi, p. 51), "*La nature en général a un certain nombre de modèles qu'elle reproduit avec des modifications dans tous les classes, et même dans les ordres.*"

Such distinctive characteristics, amounting almost to anomalies, certainly appear to us to be of a super-family value; equivalent in taxonomic importance to those upon which the groups which Professor Huxley has characterized by the termination "*-morphæ*" are founded. Much of the discussion which *Chionis* has occasioned has grown out of the tacit assumption that it was merely a genus or family, which *must go somewhere* in a pre-established system; the fact being simply, that it is a member of no recognized group, and must consequently alone constitute one of super-family grade.

Such a group, therefore, we propose to establish, upon the following combination of characters:

CHIONOMORPHÆ.

Palate schizognathous; no basiptyergoid facets; divergence of the pterygoids greater than 90°; maxillo-palatines inflated or spongy, not laminar; angle of mandible not hooked; nasals schizorhinal; marked supraorbital fossæ.

Furculum without a spine; its apex nearer manubrium sterni than the point of the keel; a small bony process over its symphysis, facing manubrium. Osseous system thoroughly Larine.

A definitely circumscribed crop; a strongly muscular gizzard, the muscular masses being antero-posterior instead of lateral; very long caecal appendages. Digestive system generally resembling that of the Gallinæ.

Contour-feathers with well-developed after-shafts; abundant gray down-feathers; tibiae naked below; rectrices 12; inner remiges equaling the longest primaries; outline of frontal feathers convex.

Beak corvine, peculiarly sheathed.

Feet not palmate; digits, 4; hallux short and elevated.

There being but a single family and genus recognized in this group, it is difficult, if not impossible, to distinguish those characters which are of family value from those which may prove to be only generic. Indeed, it is rather upon the extraordinary combination here presented, of very diverse characters, than upon the importance attaching to those of any single "system" of the birds' anatomy that we base the suborder hereby proposed. We regard the Chionomorphs as constituting exactly the heretofore unrecognized link between the Charadriomorphs and Cecomorphs, nearer the latter than the former, and still nearer the common ancestral stock of both.

Mr. A. R. Wallace (Remarks on the value of osteological characters in

the classification of birds) "will not allow that the osteological characters are an all-sufficient guide (in classification), believing that the whole structure of a bird and its corresponding habits may be profoundly modified, while its sternum may closely resemble a common form, and *vice versa*." (See *Ibis*, 1864, pp. 36-41.) *Chionis* is a forcible illustration of this sound remark.

It seems worth while to note a generic distinction probably existing between *Chionis alba* and the so-called *C. minor*. We have not had the opportunity of examining the former, and must judge solely by the descriptions thereof which have been published. According to De Blainville there is even a difference in the number of the cervical vertebræ. He describes *C. alba* as possessing one more cervical vertebra than we find in *C. minor*. No descriptions allude to the extension of the caruncular casque entirely across the forehead in either species. The various descriptions of *C. alba* indicate a very different arrangement of the caruncular folds about the eye; the sheath of the bill in *C. alba* is flat and closely apposed to the upper mandible, as in *Lestris*, while in *C. minor* it is canted upward anteriorly and tubular, almost as in the petrels.

These characteristics, among others, seem to us to be supra-specific; and in view of the fact that we consider *Chionis minor* to be undoubtedly nearest to the ancestral type, we propose to call it *Chionarchus*. Its name would then be in strictness *Chionarchus minor* (Hartl.).

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