

Lahillia and some other Fossils from the Upper Senonian of New Zealand.

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Plate 54.

SOME time ago I received for examination from Mr. P. G. Morgan, Director of the Geological Survey, through Mr. J. Marwick, Palaeontologist, some fossils from several localities in the South Island of New Zealand. I am much indebted to Mr. Morgan for the transmission of this interesting material, which was collected at the following localities: 13 (Amuri Bluff, McKay, 1873 and 1876); 22 (Green Island, near Dunedin, McKay, 1873); 589 (Selwyn River Rapids, Malvern Hills, McKay, 1886); 592 (Shag Point, beach near coal-mine and McIntosh's store, McKay, 1886); and 320 (Shag Point, Hector, 1865).

The conclusion reached after an examination of these fossils is that all the localities represented are of Upper Senonian age.

DESCRIPTION OF THE FOSSILS.

LAMELLIBRANCHIATA.

LAHILLIA Cossm.

Lahillia cf. *luisa* O. Wilek. sp. (Plate 54, figs. 1, 2, 3, 4.)

Outline of shell oval. Umbones very prominent, curving strongly inward and very slightly forward, and situated a little behind middle of dorsal margin. Shell inflated, anterior portion somewhat flatter than posterior and somewhat produced. Anterior margin considerably convex, passing gradually into slightly convex ventral margin. Posterior margin less rounded than anterior and somewhat truncated. Antero-dorsal and postero-dorsal margins concave. Lunule flat. Ornamentation consists of rather coarse concentric ridges at wide intervals, and of thin growth-lines in interspaces, well preserved on ventral portion of shell, while the coarser ribs are less conspicuous in this region. Muscular impressions not visible. One specimen shows portion of ligamental groove (Plate 54, fig. 4).

Hinge of right valve (Plate 54, fig. 3) partly preserved in specimen from Amuri Bluff. As specimen is a rather young individual, hinge is still delicate. Posterior cardinal tooth of rounded-triangular shape and directed downward and forward. Grooves on both sides of this tooth, destined for cardinal teeth of left valve, are more or less well preserved, but lateral teeth are destroyed.

Specimen from locality 589 shows portion of hinge of left valve (Plate 54, fig. 4). In this specimen the considerable thickness of the shell is visible, which is a character of the genus. (It is a consequence of this thickness that umbones of casts are more prominent than those of shells.) Ventral margin of hinge-plate well preserved, but teeth more or less damaged. Most conspicuous is the large groove of triangular outline

destined for posterior cardinal tooth of right valve. Before this large groove is a second but flat one, the posterior two-thirds of which is really base of destroyed anterior cardinal tooth. Behind central groove there ought to be the posterior tooth, but this is no longer present, the weathering of the shell having produced two facets separated by a sharp horizontal edge.

Measurements (in millimetres):—

	(a.)	(b.)	(c.)
Length	65	70	56
Height	60	63	45
Diameter of both valves..	36	..	36

(a.) Internal cast from locality 592 (Plate 54, fig. 1).

(b.) Internal cast from the same locality (Plate 54, fig. 2). Height is that of left valve, of which only dorsal portion is visible in figure.

(c.) Internal cast of a young specimen. In young individuals shell is more inflated than in older ones. Dimensions of (c) agree well with those of a specimen of *Lahillia luisa* O. Wilck. sp. from South Patagonia (1).

Specimens (a) and (b) being damaged, their length may be somewhat greater than stated.

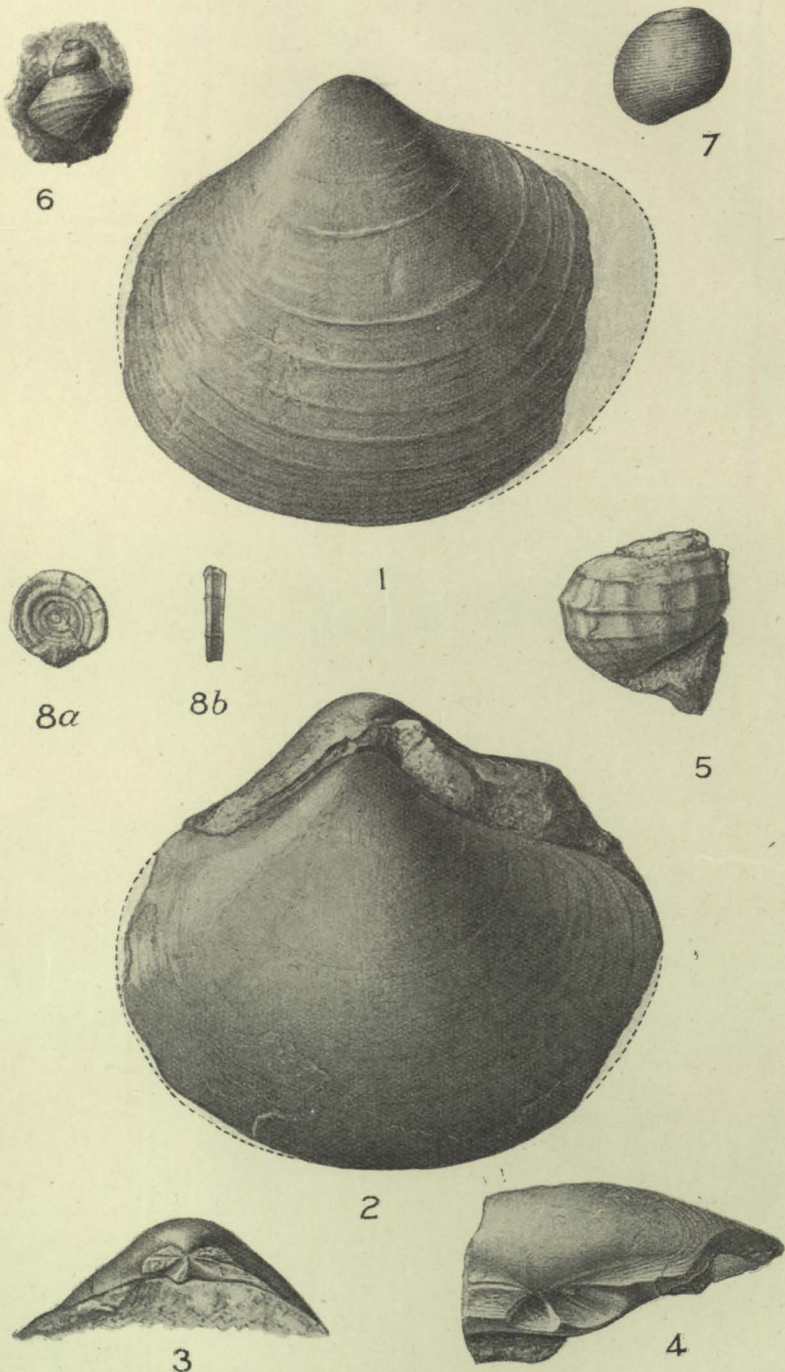
Localities.—(a) Shag Point, loc. 592; (b) Amuri Bluff, loc. 13; (c) Malvern Hills, loc. 589.

Affinities.—Undoubtedly the fossils here in question belong to the genus *Lahillia* Cossm. (antea *Amathusia* R. A. Philippi). Other Cretaceous species of this genus are—*L. veneriformis* Hupé (2) sp., from the Quiriquina beds of Chile; *L. luisa* O. Wilck. sp., from the Louisa beds of South Patagonia and of the Upper Senonian of Graham Land (Antarctica). These two species are nearly related. The chief differences between them are (i) the form of the hinge-teeth and (ii) the margin of the hinge-plate. The specimens from New Zealand agree best with *Lahillia luisa*. I have not given this name to them without any restriction, because the material is not sufficiently complete. Furthermore, the posterior cardinal tooth of the New Zealand pelecypod is directed obliquely forward and in the Patagonian one obliquely backward. The occurrence of nearly related species of *Lahillia* in the Upper Senonian of New Zealand, Quiriquina, South Patagonia, and Graham Land is another demonstration of the close relations which existed in Upper Senonian times between these regions bordering the present southern Pacific Ocean.

Historical Remarks.—In view of the palaeontological, stratigraphical, and palaeogeographical importance of *Lahillia*, it may be advisable to give readers in New Zealand an account of the historical development of our knowledge of this genus.

The first description of a *Lahillia* was that which in 1854 Hupé gave of *L. veneriformis* from the Upper Senonian of the island of Quiriquina, near Concepcion, Chile. Hupé called it *Crassatella*. In 1887 R. A. Philippi gave various specific names to this pelecypod, and placed it in the genus *Mactra*: *M. tumida*, *M. ferrieri*, *M. d'orbigny*, *M. pinguis* (3). Moericke (4) described a specimen from Quiriquina under the name *Mactra tumida*. In 1904 I showed (5) that all these species belonged to the genus *Amathusia* R. A. Phil., and that all the species named are to be united under the name of *Amathusia veneriformis* Hupé sp. In 1907 the Upper Senonian of South Patagonia furnished the nearly related species *A. luisa* O. Wilck (6).

The genus *Amathusia* was established by Philippi for two species from the Chilian Tertiary (7); von Ihering (8) and Ortmann (9) described it from the Tertiary of Patagonia. The name *Amathusia* being preoccupied, Cossmann introduced the name *Iheringia* for the genus, and, as this name was also preoccupied, *Lahillia* (10).



FIGS. 1-4.—*Lahillia* cf. *luisa* O. Wilck. sp.
 FIG. 3.—Hinge of right valve.
 FIG. 4.—Portion of hinge of left valve.
 FIG. 5.—*Neritopsis*? sp.
 FIG. 6.—Gastropodum gen. et spec. indet.
 FIG. 7.—Ringiculidarum gen. et spec. indet.
 FIGS. 8a and 8b.—*Tubulostium* cf. *discoideum* Stol.



In 1910 *Lahillia luisa* was described from the Antarctic Upper Senonian (11), and *L. larseni* Sharm. & Newt. sp. from the Antarctic Tertiary (12). Woods (13) in 1917 described a *Lahillia* from the Upper Senonian of New Zealand under the name *Mactra*? This determination was rectified by me in 1920 (14).

In 1907 v. Ihering (15) wrote, "The genus *Lahillia*, which is well developed in the Upper Cretaceous and Palaeogene faunas of Patagonia and Chile, has not been found in New Zealand," and "*Lahillia* seems not to have reached New Zealand." One sees that his cautious manner of speaking was justifiable.

GASTROPODA.

ARRHOGES Gabb.

Arrhoges haastianus O. Wilck.

1922. *Arrhoges haastianus* O. Wilckens, The Upper Cretaceous Gastropods of New Zealand, *N.Z. Geol. Surv. Pal. Bull. No. 9*, p. 9, pl. 2, figs. 5-7.

An internal cast with strongly weathered surface. The determination would scarcely be possible were the shell not well preserved at the margin of the outer lip, so that the outline of the wing can be seen.

Locality.—Shag Point, loc. 592.

PERISSOPTERA Tate.

Perissoptera waiparaensis (Hector) O. Wilck.

1922. *Perissoptera waiparaensis* (Hector sp.) O. Wilckens, The Upp. Cret. Gastrop. of N.Z., *N.Z. Geol. Surv. Pal. Bull. No. 9*, p. 11, pl. 2, figs. 8, 9.

A sculptured internal cast of 3-4 whorls, reaching down to the beginning of the outer lip.

Locality.—Shag Point, loc. 592.

PROTODOLIUM O. Wilck.

Protodolium speighti (Trechmann sp.).

1917. *Neritopsis speighti* C. T. Trechmann, Cret. Moll. from N.Z., *Geol. Mag.*, n.s., dec. 6, vol. 4, p. 300, pl. 19, figs. 12-15.

1922. *Protodolium speighti* Trechm. sp.: O. Wilckens, Upp. Cret. Gastrop. N.Z., *N.Z. Geol. Surv. Pal. Bull. No. 9*, p. 18, pl. 4, figs. 3-5.

Three sculptured casts. Only to one of these are attached some small remnants of the shell.

The normal internal cast of *Protodolium* possesses smooth whorls. Such sculptured internal casts as occur at the locality 592 (see above, *Lahillia*!) may have been formed in the following manner: The shell was equally dissolved on the whole surface, so that finally the ornamentation was transferred to the cast when the innermost layers of the shell were dissolved.

Locality.—Shag Point, loc. 592. Three specimens.

PLEUROTOMA Lam.

Pleurotoma otagoensis O. Wilck.

1922. *Pleurotoma otagoensis* O. Wilckens, Upper Cret. Gastrop. N.Z., *N.Z. Geol. Surv. Pal. Bull. No. 9*, p. 35, pl. 5, figs. 18, 19.

The specimens are badly preserved sculptured casts, and exhibit nothing that can increase our knowledge of this species.

Locality.—Shag Point, loc. 592. Six specimens.

NERITOPSIS Grateloup.

Neritopsis ? sp. (Plate 54, fig. 5.)

An internal cast of a gasteropod, consisting only of body-whorl and a small portion of penultimate one. Ornamentation is cancellate. There are 6-7 spiral ribs on last whorl, crossed by somewhat retrocurrent axial ribs. At crossing-points ribs form slight tubercles. Aperture and lips not preserved.

Specimen was labelled "*Neritopsis*" and it was stated on the label that this fossil also occurs at locality 83, Waimarama, coast south of Cape Kidnappers, Hawke's Bay (16).

There is a certain similarity between this fossil and *Neritopsis crassa* Stol. (17) from the Utatúr group of Southern India. A definite determination is impossible on account of the poor preservation of the specimen.

Locality.—Shag Point, loc. 592. One specimen.

GASTROPODUM genus et species indet. (Plate 54, fig. 6.)

An internal sculptured cast, consisting of two whorls. The last preserved whorl possesses a sharp median carina. Above this the whorl is declivous, below it is slightly convex. In upper portion of whorl are three rounded spiral ribs, in lower are four of the same kind. It is probably only in consequence of the worse preservation of this portion of the cast that upper ribs are slighter than lower. In figure lower ribs are drawn a little too sharp. In the other whorl median carina is situated at a third of height of whorl above suture.

Genus and species are indeterminable.

Locality.—Shag Point, loc. 592. One specimen.

RINGICULIDARUM genus et species indet. (Plate 54, fig. 7.)

Shell globular, spire inconspicuous. Number of whorls $2\frac{1}{2}$ -3. Ornamentation of whorls consists of spiral lirae. There is no punctation of these lirae, but probably this is due to bad preservation of sculpture, for all specimens are only sculptured casts. Body-whorl much inflated and ornamented with more than 30 spiral lines. Aperture large, ovate, angled above, rounded below, and oblique to axis of shell. Outer lip not preserved, but one can see that spiral sculpture ends at an axial groove. It is neither possible to state if outer lip possesses denticulations nor if there are folds on inner lip, so the genus cannot be determined.

The specimens were labelled "*Gilbertia curta* Marsh." This species has been described by P. Marshall from Wangaloa, South Otago (18). It attains only half the height of the specimens here examined. The diversity or the identity cannot be asserted.

<i>Measurements</i> (in millimetres)—	(a.)	(b.)	(c.)
Height	18.5	18.0	16.5
Diameter	17.5	17.5	15.0

Locality.—Shag Point, loc. 592. Eight sculptured internal casts.

Remarks.—This gasteropod undoubtedly belongs to the family of the Ringiculidae. This is represented in the Pacific Upper Senonian by *Cinulia*, *Eriptycha*, and others. A Ringiculid of perhaps similar dimensions as the fossils here in question is mentioned (19) from loc. 761 (Saurian beds, Middle Waipara).

DENTALIUM L.

Dentalium cf. *morganianum* O. Wilck.

The material contains a *Dentalium* from locality 22 (Green Island, near Dunedin, greensands). It is a fragment, height of which is 44 mm. and diameter 11.5 mm. at larger and 9.5 mm. at smaller end. It lies in an imprint 70.5 mm. long. Shell 2 mm. thick. The fossil agrees well with *Dentalium morganianum* O. Wilck. (20). Shape and growth-lines are the same, only there are some extremely slight axial furrows and rounded ribs. This observation induced me to make a new examination of two specimens of *Dentalium morganianum* still in my hands. I could perceive also in these a very few extremely slight furrows; but there is no real axial sculpture, as I have already pointed out in the description of the species.

Locality.—Green Island, near Dunedin (not an island!). One specimen.

ANNELIDA.

TUBULOSTIUM Stoliczka.

Tubulostium cf. *discoideum* Stol. (Plate 54, figs. 8a, 8b.)

The discoid shell is spirally enroled. One side seems somewhat more concave than the other. Centre of shell not preserved, but only the last two whorls. The last is quadrangular in outer section. On outer periphery it is somewhat concave, and bounded on both sides by a thin sharp keel. On both sides the whorl has a spiral marginal arch near outer keel, bordered interiorly by a spiral furrow, and a second spiral arch. On last third of last whorl are three radial ribs situated at nearly equal distances, the middle one slighter than the others. The first and third are present also on periphery of shell, but it is only the last which continues to its other side.

The shell was labelled "*Discohelix* sp.," but undoubtedly this is no *Discohelix*, and no gasteropod at all, but an annelid. This can be stated from the form of the whorls and the irregular surface of the shell.

Dimensions.—Height, 2.5 mm.; diameter, 13 mm.

Locality.—Shag Point, loc. 592. One specimen.

Affinities.—*Tubulostium ornatum* (Hect. MS. sp.) O. Wilck. from the Upper Senonian of New Zealand (21) is quite different, but *Tubulostium discoideum* Stol. (22) from the Utatúr of S. India is related to or even identical with the New Zealand form. The Indian species shows a sudden contraction near the aperture. This is missing in our shell. But it is not impossible that in our specimen this contraction was present and has been broken off.

GENERAL RESULTS.

1. The genus *Lahillia*, a pelecypod genus occurring in the Upper Senonian of Quiriquina (Chile), South Patagonia, and Graham Land (Antarctica), is represented in the Upper Senonian of New Zealand by a species nearly related to or identical with *Lahillia luisa* O. Wilck. sp. In New Zealand *Lahillia* has been collected at the following localities: Amuri Bluff (loc. 13); Middle Waipara (loc. 761); Selwyn River, Malvern Hills (loc. 589); Shag Point (loc. 592).

2. The fauna of Shag Point (loc. 592) is of Upper Senonian age, and comprises the following species:—

- Lahillia cf. luisa* O. Wilck.
Arrhoges haastianus O. Wilck.
Perisoptera waiparaensis (Hect. sp.) O. Wilck.
Protodolium speighti Trechm. sp.
Pleurotoma otagoensis O. Wilck.
Neritopsis sp.
 Gastrop. gen. et sp. indet.
 Ringiculidarum gen. et sp. indet.
Tubulostium cf. discoideum Stol.

3. The locality Shag Point 320 is also of Upper Senonian age. This was left in uncertainty before (23).

4. *Dentalium cf. morganiatum* O. Wilck. indicates an Upper Senonian age of the locality 22 (Green Island, near Dunedin).

5. The material examined has yielded three species, which are new for the Upper Senonian of New Zealand: *Neritopsis*?; a gasteropod, genus and species indeterminable; and *Tubulostium cf. discoideum* Stol. Perhaps the described ringiculid gasteropod is also a new species. It is noteworthy that *Conchothyra parasitica*, which is common at all localities of Upper Senonian age in the South Island of New Zealand, does not occur at Shag Point.

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