

(3) in the Signal Hill phonolite, where nepheline is rare and feldspar of various types abundant, silica is nearly the same as in the nephelinitoid type, alumina is low, and alkalis are also low.

EXPLANATION OF PLATES VIII-XI.

PLATE VIII.

Geological map of Signal Hill, with sections along lines AA, BB, CC, on map.

PLATE IX.

Fig. 1. Map showing locality.

Fig. 2. Graphic representation of the chemical composition of the rocks (after Iddings).

PLATE X.

Fig. 1. Logan's Point phonolite; $\times 200$. Shows association of cossyrite and ægirine-augite.

Fig. 2. Signal Hill trachtyoid phonolite; $\times 45$. Crossed nicols. Shows large crystal of anorthoclase.

Fig. 3. Signal Hill trachtyoid phonolite; $\times 45$. Shows a large crystal of amphibole partly resorbed.

Fig. 4. Nephelinitoid phonolite; $\times 45$. Shows the groundmass consisting chiefly of nepheline with mossy ægirine.

PLATE XI.

Fig. a. Logan's Point phonolite overlying basalt No. 5 on Main North Road, near Normanby.

Fig. b. Dyke of basalt No. 3, intruded in basalt No. 1.

ART. XXII.—*Further Notes on New Zealand Starfishes.*

By H. FARQUHAR.

Communicated by H. B. Kirk, Professor of Biology, Victoria College.

[Read before the Wellington Philosophical Society, 7th October, 1908.]

Stegnaster inflatus, Hutton. Plate XII.

This species has not been figured before; the figure now given is from an example found at Island Bay by Mr. Stuckey, headmaster of the Island Bay State School, and photographed by Mr. A. Hamilton, in which $R = 63$ mm., and $r = 52$ mm.

The species is interesting as being the type of Sladen's genus *Stegnaster*. In his monograph Sladen says, "I have also added in the following list another genus, *Stegnaster* (n. gen.), which seems to me necessary. The type of *Stegnaster* is the starfish described by Hutton under the name *Pteraster inflatus*, and subsequently placed under *Palmipes* by Perrier. I consider that the disposition of the papulæ, the membranous investment of the abactinal area (with the absence of the characteristic tufts of spines and the presence of granules), and the simple character of the armature of the adambulacral plates, are sufficient to warrant the generic separation of this form from *Palmipes*. I also refer to the same genus *Asterina wessli*, though not without some hesitation, as the examples I have seen of that species appear to be immature forms."*

* "Challenger" Reports, vol. xxx, p. 375.

I have not been able to discover that the association of *A. wessli*, a West Indian species, with *Stegnaster* has been confirmed, or that any other species of this genus have been found.

Asterina neozelanica, Perrier.

The type specimen of this species is in the Paris Museum; it was described by E. Perrier in the "Archives de Zoologie Experimentale et Generale," vol. v, p. 33 (1876), from a specimen which he found among a number of examples of our common littoral form *Asterina regularis*. I have collected a considerable quantity of *A. regularis* in the neighbourhood of Wellington, but I have not found a specimen of *A. neozelanica*. (I write the name "*neozelanica*" in accordance with the rule suggested by Von Martens, and adopted by New Zealand naturalists—see Trans. N.Z. Inst., vol. xxi, p. 238—that specific names should be one word only.) As Perrier's description may not be accessible to New Zealand observers I transcribe it here, so that specimens may be identified when found:—

"Corps de forme penta-gonale, à côtés légèrement échancrés.

"R = 20 mill., r = 13, R = $\frac{3}{2}$ r environ.

"Plaques de la face dorsale entièrement couvertes de petits tubercules mous, serres contre les autres et formant pour chaque plaque un groupe tantôt distinct circulaires, tantôt plus ou moins allongé. Des groupes allongés sont généralement concaves vers le centre du disque et séparés les uns des autres par un ou plusieurs groupes arrondis. Dans les groupes allongés les petits piquants mous ou tubercules forment au moins trois ou quatre rangées. Ces groupes de tubercules ne dessinent pas sur le disque de figure de forme particulière. Plaques marginales imbriquées et formant autour du disque une sorte de bordure où la partie apparente constitue une sorte de pavage à éléments rhomboïdale. La plaque madréporique arrondie est située à 3 millimètres du centre du disque et entourée de groupes de granules plus allongés que les autres. Les sillons qu'elle porte ne sont pas rayonnants autour d'un centre. En somme, sauf le nombre et la disposition des piquants, l'ornementation de la partie dorsale de cette espèce ressemble beaucoup à celle de l'*Asterina gunnii* (*A. regularis*).

"La face ventrale est au contraire toute différente. Les plaques du sillon ambulacraire portent chacune dans le sillon trois piquants divergents, réunis en une lame un peu oblique relativement à la direction du sillon par un repli des téguments qui n'atteint pas le sommet des piquants. En dehors ces plaques portent en outre une rangée oblique de trois piquants, un peu plus grands que ceux qui existent sur les autres plaques de la face ventrale et qui sont aussi au nombre de trois ou même quatre, surtout au voisinage de la bouche sur chaque plaque. Les piquants sont d'autant plus serrés les uns contre les autres qu'on se rapproche davantage des bords du disque, où ils sont fréquemment aussi au nombre de quatre sur chaque plaque. Un seul individu de la Nouvelle-Zélande, en très-bon état et conservé dans l'alcool."

Asterias fragilis, Studer.

I have a manuscript copy of Studer's description of this species, kindly furnished to me by the late Andreas Reischek; I am also indebted to him for the above description of Perrier's *Asterina neozelanica*. Studer's description was published in the "Transactions of the Royal Academy of Science," Berlin, 1884; and I give here a translation of it, so that the species may be identified when rediscovered:—

Small, five-rayed, with slender body and five angular arms which branch off from the flat-shaped body through a ring-like furrow. The body is covered with small stumpy spines arranged in rows along the arms; between these lie depressions in which there are numerous papulae. Ambulacral spines in two rows.

$R = 16\frac{1}{2}$, $r = 4$. Width of arm at the proximal end, 8 mm.

The body itself is flat, but bulky, and separated from the rays dorsally by more or less distinct pentagonal wrinkles. At this point the arms very easily separate themselves from the body. At the base they are somewhat contracted, but soon widen out, and then gradually taper away. Each arm has a perfectly flat ventral surface, two straight side surfaces, and a back raised somewhat like the keel of a boat. The ambulacral furrow is broad, and bounded by two rows of small cylindrical spines, the inner row having a third fewer spines than the outer. Outside the furrow there is a row of straight pedicellariae. On the back there is a row of bluntly pointed spines, three or four together. The perpendicular side surface of the arm is free of spines, and is clothed with a thin and soft skin, which is pierced by a row of papulae, between which there are straight pedicellariae. The dorsal skeleton of the arms consists of a thick mass of lime stems and knotted points, which are arranged in three long rows, and are raised. These bear short blunt spines, whilst the depressions lying between bear papulae. The lime covering of the body is very dense, and is armed with short stumpy spines, lying about here and there without order. Between them there are crossed pedicellariae and papulae, the latter in a radius equidistant from the central point, and the circumference of the body forming a circle. The madreporic plate is very small, and contains few furrows. It is nearly covered by a surrounding half-circle of 6 blunt spines, situated close up to the disc-wall. The entire skeleton of the starfish is rigid and inflexible. The peculiar formation of the skeleton of the arm induces me to place this starfish next to *A. sulcifera*. The colour when fresh was pale reddish-orange.

Found east of New Zealand in S.L. $35^{\circ} 21'$ and E.L. $175^{\circ} 40'$, in 597 fathoms depth.

Asterias calamaria, Gray.

In vol. xxx, page 188, of the Transactions I noted that adult specimens of *A. calamaria* in Port Nicholson have 10 or 11 arms of equal length, while "young individuals of this species always have a number of small arms budding out between the larger ones, or a group of small ones on one side of the disc. . . . They appear to have only a small number of arms at first (4 to 7), and the others are budded afterwards." Recently I and my family were spending the summer holidays at Muritai, on the other side of the bay, where a company of Italian fishermen draw their seine nets ashore on fine evenings. There were always a few large examples, 10 in. to 12 in. in diameter, with 10 or 11 equal arms, and often some smaller ones with a less number of unequal arms (the smaller the specimen the less the number of arms), and on one occasion my son Harry found two very young ones among the refuse of the net. These had only 2 arms each, and measured about 1 in. between the tips of the arms. The 2 arms of both examples were the same size and equally developed, and one specimen had one and the other two little tubercles on the side of the disc—the beginnings of other arms just starting to bud out. It therefore appears probable that the young of this species have only 2 arms at first, and the

number increases with age until 10 or 11—usually 11 in Port Nicholson—are developed.

Species which divide, and those in which the number of arms increases by budding from the disc, usually have more than 1 madreporic plate. *Stichaster insignis* usually has 4, but examples may be found with 1; 2, or 3; *Stichaster polyplax* has from 1 to 4; and *Asterias calamaria* often has 2 or 3.

Asterias calamaria var. *reischeki*, var. n.

I described a variety of *Asterias calamaria* in vol. xxi, page 187, of the Transactions, which occurs freely at Nelson, under stones at low water. Its general facies differs much from that of the form which is common in Port Nicholson. The arms are not stout and rounded at the tips like the Wellington specimens and the Mauritius forms as figured by Lorient, but are more delicate, and taper evenly to a very fine extremity; and the spines are never coarse or truncated, but always fine, long, single, and very finely pointed. These differences are so definite and constant that I am now of opinion that, if not a distinct species, it is at any rate a well-marked variety, and worthy of a distinct name. I therefore dedicate this form to the late Andreas Reischek, who has added largely to our knowledge of the habits and characteristics of the New Zealand birds. It would have been more appropriate had his name been associated with one of our native birds, but, as their history, as regards the finding of new species, is probably closed, this much more humble form may serve, in a measure, to commemorate the man and his work. Reischek's natural-history work in New Zealand extended over about twelve years (1877-89), and the records of his observations, which are published in vols. xiv, xvii, xviii, xix, xx, and xxi of the Transactions, show that he was a keen and good observer. He also wrote "The Story of a Wonderful Dog," an extremely interesting little book, published at the Star Office, Auckland, 1889, in which he gives an account of the training of his dog "Cæsar," and his experiences in the New Zealand "bush."

Stichaster polyplax, Müller and Troschel.

I stated in vol. xxvii, page 208, of the Transactions that probably subdivision takes place in *S. polyplax*, as in *S. insignis*. The latter species, which has six arms, three of which are usually smaller than the other three, continually undergoes a process of transverse division, each half regenerating the parts that are missing; but I am now convinced that this does not occur in *S. polyplax*. The young examples of *S. polyplax* which I and my son have collected in the neighbourhood of Wellington always have a few, —1 to 4—fully developed arms, and a number of smaller ones usually of different lengths, some just budding from the disc; and hence it appears probable that the same process occurs in the development of the arms as in *Asterias calamaria*, with this difference: adult specimens of *A. calamaria* have 10 or 11 arms, while those of *S. polyplax* have only 7 or 8.

EXPLANATION OF PLATE XII.

Fig. 1. *Stegnaster inflatus*: abactinal view; reduced.
Fig. 2. " " actinal view; reduced.