Rhynchina cæsa, sp. n.

Head and thorax grey, speckled with brownish; abdomen, body beneath, and legs pale greyish ochraceous.

Anterior wings greyish, speckled with pale brown, especially on costal and inner marginal areas; a waved narrow fascia crosses wing at about two thirds from base, beyond which the colour is much darker—purplish brown and violaceous—excepting near base, where it is grey; the dark hue has the appearance of a broad oblique fascia; a waved dark line on outer margin; reniform spot distinct. Posterior wings pale ochraceous, somewhat darker at posterior margins. Wings beneath pale greyish ochraceous, somewhat pale brownish at apices.

Exp. wings 23–29 millim.

Hab. Transvaal, Pretoria (*Distant*), Waterberg (*Wilde*).

XXXV.—*The Islands and Coral-reefs of the Fiji Group.*

By Alexander Agassiz*.

. . . . On our arrival at Suva we found the 'Yaralla,' a twin-screw steamer of about 500 tons, chartered from the Australasian United Steam Navigation Company, awaiting us. We have now been about six weeks cruising among the islands, and have found the boat admirably suited for our purpose. During the past summer I had shipped to Australia our outfit for dredging, sounding, and for deep-sea towing, as well as all the materials necessary for preserving our collections. This equipment we found safely stored in the 'Yaralla.' I had also brought with me deep-sea tow-nets of the various patterns used by the Prince of Monaco, by Dr. Giesbrecht of the Naples Zoological Station, and by Hensen on the 'National' Expedition, in order to compare their efficiency with the Tanner deep-sea self-closing net in use on the 'Albatross' and which I had adopted on my various expeditions. Unfortunately our time here is so limited and the conditions for towing at great depths among so many intercepting islands are such that the results likely to be obtained seemed to make it unadvisable to devote the time necessary for such a comparison. Although nothing was done to test the different deep-sea self-closing towing-nets, yet we have made at various points along

* From the 'American Journal of Science,' February 1898, pp. 113–123: being extracts from a letter of Alexander Agassiz, dated Suva, Fiji Islands, December 15th, 1897, addressed to E. S. Dana.

our course a number of deep hauls, from 150 fathoms to the surface, with the open net. A large number of hauls were made off Suva which gave us an excellent collection of pelagic forms, the collections of Crustacea and of Acalephs being specially noteworthy. Mr. Mayer will prepare a report on the Acalephs. When practicable we have also made collections on the reef-flats of various islands and atolls *.

I also brought to Suva a complete diamond-drill boring apparatus and a competent man to superintend the work—Mr. W. Eyers—recommended to us by the Sullivan Machine Co., of Chicago, from whom the apparatus was obtained †. To provide against contingencies, a comparatively small hand-machine was sent, capable of drilling to a depth of from four to five hundred feet. An oil-motor was also provided to expedite the work with increasing depth.

This machinery had already been shipped when information reached the United States that Professor David, of the University of Sydney, had left for the Atoll of Funafuti in charge of an expedition to take up the unfinished work of boring of the party in charge of Professor Sollas, sent out by the Council of the Royal Society of London. The day before leaving Cambridge for the Pacific, news arrived that Professor David's party had succeeded in reaching a depth of nearly 600 feet, the bottom still being in coral. This information seemed to settle the coral question, and all I hoped to accomplish was merely to confirm the work of Professor David by boring in some other district. Subsequent information received from Professor David leads me to think that the matter is not so simple as was represented by the newspapers. From what we have seen thus far of the Fiji Islands reef I can only conclude that the boring at Funafuti has settled nothing, and that we are still as far as ever from having a general theory of the formation of coral-reefs. In fact, with the present information obtained here I should never have thought of boring in the atolls of this group, for reasons which will be given presently.

The track which we followed was so arranged as to include in our first trip one or two of each type of island and of the different types of atolls, barrier- and fringing-reefs in the

* Dr. Wm. McM. Woolworth and A. G. Mayer accompanied me as assistants. Dr. Woolworth and my son Maximilian have taken a large number of photographs illustrating the physiognomy of the islands and their reefs. A selection from these I shall use in my final report.

† I have to thank the Trustees of the Bache Fund of the National Academy of Sciences at Washington for an appropriation of $1200 towards defraying a part of the expenses of boring.

group. Starting from Suva, after visiting Mbenga we went to Ovalau, Wakaya, Makongai, Koro, skirted along the western shore of Taviuni, examined the north-eastern coast of the same island, passed through the Matangi passage to Motua Levu and Motua Lailai, skirted along the western extremity of the Nanuku reefs. From there we steamed to Wailangalala, where we landed our boring-apparatus and the crew needed for working the same. We then turned north, passing close to Nuku Mbesanga and Adolphus reef, and entered Ngele Levu Lagoon. We next examined the Ringgold Islands, paying special attention to Thombia, an extinct crater in Budd reef. From there we returned to our former anchorage off Thurston Point in Taviuni, and followed our old track back to Wailangalala, where we found our boring party settled and at work. We then steamed south, examining Williamson reef, the Kimbombo islets, Bell reef, and entered the Vanua Mbalavu Lagoon through the Ngillangillah passage, leaving the lagoon by the Tonga pass. We touched at Mango, Tavutha, Naiau, and Lakemba, passed Aiwa, entered the Oneata Lagoon, visited Thakau Lekaleka, touched at Motha, entered the Komo Lagoon, the Yangasa cluster, and the Ongea Lagoon. We passed Fulanga, close to the entrance, which was too shallow to allow our vessel to enter, but near enough to give an excellent idea of its characteristic structure. We next touched at Kambara, anchored in the crater of Totoya, stopped at Moala; from there we made Solo Lighthouse, examined the North Astrolabe reef, steamed through the Great Astrolabe reef, coming out west of Ono. We next examined a part of the shore of Kandavu, and returned to Suva by way of Vatu Leile. On our second trip we visited Ngau, Nairai, the Horseshoe reef, Mbatiki, and entering the Moturiki Channel south of Ovalau, examined the barrier reef between it and Suva as far as Mbau. After our return to Suva we made a third trip along the southern coast of Viti Levu as far as Naudronga; skirting the reef as closely as was prudent, we were able to follow the changes in the Great Barrier reef of Viti Levu west of Suva as it gradually passes into a fringing reef and disappears off the Singatoka River, to appear again first as a fringing reef and then as a barrier reef extending beyond the Nandi waters to the west of Naudronga. We then paid a second visit to Vatu Leile and returned to Suva, having steamed a little over 1300 miles.

I came to Fiji under the impression that we were to visit a characteristic area of subsidence, for, according to Dana and Darwin, there is no coral-reef region in which it is a simpler

matter to follow the various steps of the subsidence which has taken place here. Dana, in his last discussion of the coral-reef question, states that it is impossible to find a better series of islands than those of the Fiji to illustrate the gradual changes brought about by subsidence, which transform a volcanic island with a fringing reef to one with a barrier, and next to one with a circular reef ring, and finally to one in which the interior island has disappeared and has left only a more or less circular reefing. For these reasons one of the Fiji atolls promised to be an admirable location for boring and settling the question of the thickness of the coral-reef of an atoll. My surprise was great, therefore, to find within a mile from Suva an elevated reef about 50 feet thick and 120 feet above the level of the sea, the base of the reef being underlaid by what is locally called soapstone, probably a kind of stratified volcanic mud. The western extension of this reef can be traced at several points along the north shore of the harbour of Suva, the island of Lambeka and Vua and Dra-ni-mbotu, which are from 60 to 90 feet in elevation, being part of an elevated reef extending to low-water mark. It was this elevated reef or its extension westward which we traced from the Singatoka River to the Nandi waters. A short distance inland from the mouth of the Singatoka there is a bluff of about 250 feet in height, composed of a coral-reef limestone which is the inner extension of the elevated reef-patches and bluffs visible on the shore of Viti Levu. I am informed by Dr. Corney that the islands of Viwa and Asawailau to the northward of the Nandi waters are also remnants of this elevated reef.

But the traces of extensive elevation are not limited to the larger island of Viti Levu. I found the islands on the rim of the atoll of Ngele Levu to consist entirely of coral-rock elevated to a height of over 60 feet on the larger island. The surface of the island where we crossed it was a mass of hummocks of honeycombed, potted, and eroded coral-masses resembling in every way the elevated reefs with which I had become familiar in the Bahamas, Cuba, and Florida. The northern sides of the island of Ngele Levu are on the very outer edge of the rim of the lagoon, deep water running up to the shore-line. We next found that at Vanua Mbalavu the northern line of islands were parts of an elevated reef forming vertical bluffs of coral-rock which had been raised by the central volcanic mass of the main island to a height of over 500 feet at Ngillangillah, at Avea to 600 feet, at the Savu Islands to 230 feet, and on the main island to a height of nearly 600 feet. On the south of the main island the

elevated coral-bluffs are very much lower, those of Malatta and Susni reaching a height of a little over 400 feet. Going farther west and south we find at Mango the vertical bluffs of an elevated coral-reef of over 600 feet, and underlaid by volcanic rocks which crop out at the sea-level.

At Tavutha the coral-limestone bluffs are probably 800 feet high. At Naiau they are over 500 feet, at Lakemba they reach a height of about 250 feet on the south-west side of the island; the rest of the island is volcanic. On the island of Aiwa the elevated reef is fully 200 feet thick. In the Oneata group the highest point of the elevated reef-bluffs is about 160 feet. South of the volcanic island of Motha and enclosed within the same barrier reef on the island of Karoni the elevated reef is about 120 feet thick. On the three islands of the Yangasa group it attains a thickness varying between 240 and 390 feet, and, finally, on Ongea, the most south-easterly cluster we visited, the elevated reef attains a thickness of nearly 300 feet. At Fulanga the elevated reef attains a thickness of 360 feet, at Kambara it is about 200 feet thick, and at Wangawa it is perhaps over 300 feet: these islands are in part volcanic. Finally, at Vatu Leile, the most westerly island we examined, the elevated reef forming the island is 110 feet thick at its northern extremity.

All this plainly shows that the southern part of Viti Levu and as far south as Vatu Leile, and the whole length of the windward islands of the Fiji group from Ngele Levu on the north to Ongea on the south, have been subject to an elevation of at least 800 feet, as there is abundant proof that a great part of the thickness of the elevated reef has been eroded to reduce it in certain localities to the level of the sea or to leave at others bluffs and islands or islets, the occurrence of which we have traced at so many points.

But the evidence of a very considerable elevation is not limited to that furnished by the remains of the elevated reefs just mentioned. It is natural to assume that the elevation we have just traced was but a part of a more general elevation which perhaps took place in late Tertiary times, and in which the whole group was involved. It is plain that there must have been most extensive denudation and erosion going on throughout the group for a very considerable period of time, geologically speaking. The outlines of the islands deeply furrowed by gorges and valleys, the sharp and serrated ridges separating them, the fantastic outlines of the peaks of Viti Levu, Vanua Levu, and Ovalau, all attest to the great work of atmospheric agencies which has been going on for so long. The separation of islands, islets, or isolated rocks from the

points or spurs of the larger islands also bears witness to the great length of time during which action of the sea necessary to bring about their separation has been at work: adding to this the fact that we are in a region of a former powerful and extensive volcanic activity, the traces of which can still be seen in all directions, forces which have undoubtedly played a great part in the lifting of the island masses and their subsequent shaping to their present outlines.

From this evidence I am inclined to think that the corals of to-day have actually played no part in the shaping of the circular or irregular atolls scattered among the Fiji Islands; furthermore, that they have had nothing to do in our time with the building-up of the barrier reefs surrounding either wholly or in part some of the islands; I also believe that their modifying influence has been entirely limited in the present epoch to the formation of fringing reefs, and that the recent corals living upon the reefs either of the atolls or of the barriers form only a crust of very moderate thickness upon the underlying base. This base may be either a flat of an eroded elevated reef or of a similar substructure of volcanic rocks, the nature of that base depending absolutely upon its character when elevated in a former period to a greater height than it now occupies.

Denudation and erosion act of course more rapidly upon the elevated reef-rocks than upon those of a volcanic character. It is therefore natural to find that the larger islands like Kandavu, Taviuni, and Ovalau are of volcanic origin, while the islands which once occupied the area of the lagoons of Ngele Levu, of the Nanuku reef, of Vanua Mbalavu, of the Argo reefs, of the Oneata, Yangasa, Aiwa, Ongea, and Vatu Leile clusters, being elevated coral-reefs, have disappeared almost entirely, leaving only here and there a small island to attest to the former existence of the more extensive elevated reef once covering the whole area of what is now an atoll. Smaller volcanic islands like Matuku, Moala, Ngau, Nairai, and Koro also show the extent to which each island has been eroded after its elevation, the erosion being least in Koro and Matuku, somewhat greater in Moala and Ngau, and still greater in Nairai. In such atolls enclosing volcanic islands like Mbenga, Wakaya, Makongai, the erosion and denudation have been still greater, these islands covering but a comparatively small part of the area once occupied by the island originally covering the area of the lagoon. Denudation and erosion have been still more active in the Ringgold Islands, in the Kimbobo cluster, and in Komo, and it may have gone so far as to leave no trace in an atoll to indicate

either its volcanic or coral (elevated reef) origin : the shape of the atoll being entirely due to mechanical action, and not being connected in any way with the growth of the corals which have found a footing upon reef-flats formed by atmospheric agencies or by the action of the sea.

So that, as far as we can judge from the case of the Fiji Islands, the shape of the atolls and of the barrier reefs is due to causes which have acted during a period preceding our own. The islands of the whole group have been elevated, and since their elevation have, like the northern part of Queensland, remained nearly stationary and exposed to great and prolonged denudation and erosion, which has reduced the islands to their present height; the platforms upon which the barrier-reef corals have grown being merely the flats left by the denudation and erosion of a central island of greater size than that now left, while the atolls are similar flats from the interior of which the islands have been eroded and the lagoons of which have been continually scoured by the action of the sea, the incessant rollers pouring a huge mass of water into the lagoon, which finds its way out through the passages leading into it.

In the Fiji Islands the atolls and islands or islets, surrounded in part or wholly by barrier reefs, have not been formed by the subsidence and disappearance of this central island, as is claimed by Dana and Darwin. The Fiji Islands are not situated, as was supposed, in an area of subsidence, but, on the contrary, they are in an area of elevation, so that the theory of Darwin and of Dana is not applicable to the islands and atolls of the Fiji group.

What the age of the elevated reef of the Fiji is I am unable to state ; its aspect and position show it to be of considerable age, probably antecedent to the present period. In many ways it resembles some of the late Tertiary elevated limestones which I have seen on the northern and southern coasts of Cuba. The great thickness which the elevated coral-reefs attain in this group, at least 800 feet, also shows that they may have been deposited originally during a period of subsidence, but not a period of subsidence taking place in our epoch or which could have had any effect in shaping the outline of the islands of the Fiji group and their accompanying reefs.

Whether the elevation of the Fiji group corresponds in time with that of Northern Queensland I am unable to state. I can only suggest that it is not improbable that the elevation of Queensland and of the Pacific islands to the east, New Caledonia, the Loyalty Islands, the Solomon, New Hebrides,

including Fiji and Samoa, may have been synchronous. It may be that these islands have, like Northern Queensland, been subject to an immense erosion and denudation which have reduced them to their present proportions.

The elevation may have been preceded, as in Queensland, in still earlier geological times by a great period of depression, during which the thick beds of coral-reef limestone may have been formed. How far east this elevation extended is not known; its area probably included the Cook Islands and Tahiti, and, judging from some photographs, I should feel inclined to consider atolls of the Paumotus as having been formed by causes similar to those which shaped those of the Fijis.

The evidence thus far collected on the Fijis shows the futility of boring in this group. Any result obtained would merely at some point indicate the thickness of a former elevated reef—a reef formed in a period preceding our own. We should obtain information which could have no bearing on the main question, if I am correct in the interpretation of what I have observed—information, in fact, which may be obtained as one steams along without the trouble or cost of boring. Should I be correct, it would be natural to look upon the results of the boring at Funafuti much in the same light, and to assume that the island, as well as others in the Ellice group, is also in this area of elevation, and that the great thickness of coral obtained was reached by boring in the base of an ancient reef. So that the results obtained by Professor David from the boring at Funafuti do not assist us in any way in corroborating the theory of subsidence as essential to the formation of atolls.

However that may be, it only emphasizes what has been said so often, that there is no general theory of the formation of coral-reefs, either barrier or atolls, of universal application. Each district must be examined by itself—at least such has been my experience in Florida, in the Bermudas, the Bahamas, in Cuba and the West India Islands and the Sandwich Islands. The results of this trip show plainly that the theory of Darwin and Dana, of the formation of atolls and of barrier reefs by subsidence, is not applicable to the Fiji Islands, notwithstanding the boring at Funafuti. In all the localities I have visited the coral-reefs form but a thin crust upon the underlying base (it is not more than 50 to 60 feet thick in Florida), and the shape and slope of this base are in no way due to the growth of the corals living upon it.

This still leaves open the question of the formation of such thick masses of coral-reef rock, which, though they may

originally have been formed by subsidence, as other massive deposits have been, yet may also have been formed by the gradual pushing out to seaward of the outer edge of a reef; the reef increasing both in height (depth) and in width by the constant pushing out of the mass of debris and of blocks detached from the outer edge, forming a talus upon which corals may grow whenever the talus has reached the depth at which they thrive. I am inclined to think that the careful study of such a shore-reef will alone give us a correct idea of the manner in which such thick masses of coralline limestone may have been formed.

There is still another phase in the formation of atolls which has received but little attention. I refer to the formation of atolls as the result of the denudation and erosion of volcanic summits or of extinct craters. There are in the Fiji two extinct craters which are most interesting; one of these is the small extinct crater of Thombia on the Ringgold Islands. The highest point of its rim, the exterior circumference of which is about 2 miles, is nearly 600 feet, and it is continuous with the exception of a small part of its eastern edge, about a fifth of a mile, across which reaches a fringing reef, the extension of the fringing reef surrounding the island. This reef closes the entrance into the crater, which is about half a mile across at the level of the sea and has a depth of 24 fathoms. The other extinct crater is that of the island of Totoya, an isolated peak in the southern part of the group. It is about 6 miles in outer diameter, with an inner basin of 3 miles, and a depth of 34 fathoms. The highest point of the rim is 1200 feet, and at two points it is low, forming in one case a narrow isthmus separating the crater from the outer lagoon. The horns of the open rim are connected by a fringing reef-flat on which thunders the Pacific swell, piling up the water into the great basin of the crater. This water finds its way out through an opening called the "Gullet," which, though narrow, forms an excellent passage to the anchorage inside of the crater. Totoya has not only a fringing reef, but also a barrier reef, somewhat triangular in shape, surrounding the island. It is evident that the barrier reef has been formed upon the denuded and eroded spurs of the island, which once extended seaward from the outer rim of the volcano.

Supposing now that the erosion of both Thombia and Totoya had continued long enough to reduce the rim of these volcanoes to the level of the sea or to form a chain of small islands, we should have, as soon as corals had covered the flats thus formed, which indicate the former existence of the rim, atolls of nearly circular form—the one, that of Thombia,

being quite small, with a circumference of 2 miles and a depth of 24 fathoms, without patches in the central lagoon; the other being much larger, more than 25 miles in circumference, having a depth of 34 fathoms inside the lagoon. The lagoon of the Totoya atoll would be dotted with patches, some of which formed parts of the rim, others being the remains of eroded spurs extending towards the centre of the extinct crater.

There are in Fiji a number of small atolls from 1 to 3 or more miles in circumference, the formation of which, it seems to me, can only be satisfactorily explained on the theory that they have been formed upon the eroded summits or rims of extinct craters, the rim of the volcano having been eroded either to a continuous flat or to flats separated by deeper passages (as in the case of the low parts of the rim of Totoya) forming entrances into the enclosed lagoons. Such atolls are Motua Levu, Motua Lailai, the Adolphus reef, Bell reef, Williamson, Pitman, and the Horseshoe reefs, and Thakau Lakaleka. Of course it is possible that some of these atolls may have been formed from the erosion and denudation of isolated peaks or ridges. It is also possible that some of the larger atolls in which are enclosed volcanic islands, like Vanua Mbalavu, Komo, Motha, Lakemba, Mbenga, the Ringgold Islands, and others, may represent parts of the rim or ridges and spurs of volcanic peaks and extinct craters which have disappeared by erosion and have left the outer flats upon which the barrier-reef corals have grown; while the deeper valleys and gorges of these now eroded volcanic islands represent the undulations in depths of the lagoons. The depths inside the lagoons vary greatly; in the case of Vanua Mbalavu we find 72 fathoms on parts of the eastern slope of the lagoon. These great depths, far beyond any at which corals can grow, represent the elevated gorges and slopes of the volcanic peaks which probably once extended over the whole area enclosed by the outer reef, during the elevation of which the reef which covered a part of the same area was lifted to its present or even to a greater height.

Such large volcanic centres with extensive craters of considerable depth are not unknown. We can reconstruct conditions from Totoya which would give us an atoll open to the west, with a few islands on the outer rim and a greatest depth of 250 fathoms inside the lagoon. Again, Haleakala in the Sandwich Islands has a crater with a depth of nearly 250 fathoms, while many small volcanic peaks, some fully 1200 feet in height, rise from its bottom. The diameter of Haleakala is fully as great as that of any of the atolls in

Fiji; so that the great depth of the lagoons of some of the atolls can no longer be considered as a proof of the theory of subsidence.

Fulanga is also interesting as illustrating the formation of an atoll by the same causes which have produced the Sounds in the Bermudas. In the case of Fulanga we have a volcanic summit which has raised the elevated coral-reef forming its rim to a height of probably 200 feet. This coral rim has been broken through, and the action of the sea has gradually hollowed out in the interior a circular sound resembling a crater, which is due solely to the disintegration of the inner parts of the elevated reef. In the interior and outer edge of the Sound of Fulanga many parts of this reef still exist as small mushroom-shaped islands or small rounded or conical hills. It is also probable that some of the elevated reef-flats forming the rims of atolls owe their origin to causes similar to those which have shaped the crater-like Sound of Fulanga. This has perhaps been the case with such atolls as Ngele Levu, the Oneata, Ongea, and Yangasa clusters and others.

The great variety of causes which have been active in shaping the present physiognomy of the reefs and atolls of Fiji shows the impossibility of assigning any one factor, like subsidence for instance, as is done by Dana and Darwin, as the single cause for the formation of the many different kinds of atolls and barrier-reef islands to be found in the Fiji group. The formation of the great barrier reef of the southern shores of Viti Levu is due to causes very similar to those which have given to the northern coast of Cuba between Nuevitas and Matanzas its present physiognomy. Along those parts of the island where denudation and erosion proceed rapidly, owing to the soft character of the shore-rocks, very extensive flats have been formed, as those south of Ovalau. When the reef-barrier flats have been eroded from a harder base, like volcanic rocks, the flats are less prominent and somewhat more extensive than when the old elevated coral-reef formed the shore-hills; or the reef-flats may disappear altogether when the harder volcanic rocks have been only little affected by erosion or denudation. From the nature of the negro-heads scattered upon the reef-flats it is generally a simple matter to ascertain the character of the base of the reef-flats of an atoll or of a barrier reef.

We were fortunate in being at Levuka at the time of the appearance of the "Bololo." On the morning of the 17th of November we left the ship at 3 o'clock, bound for a spot named "Bololo" Point, about 3 miles south of Levuka. We had scarcely reached the spot when our guide fished up a few

of the worms, and in a few minutes the water was full of them. Canoes put off from the shore: men, women, and children were wading on the reef with nets and all kinds of utensils to catch "Bololo." With the increase of daylight the "Bololo" became more abundant, and at one time they were so plentiful that the water surrounding the boat was filled with them to such an extent as to resemble thick vermicelli soup. We made an excellent collection of the worms, preserving a large number by different methods. We found, as we had expected, that their sudden appearance was connected with spawning. There were males and females full of sperm and eggs. When in captivity the discharged spermatozoa rendered the water milky, and the masses of eggs were left as patches of dark green granules on the bottom of the dish. The discharge of the eggs and spermatozoa was followed by the collapse of the worms, of which nothing was left but an empty skin scarcely visible. The "Bololo" seems thus suddenly to disappear. The males are light brown or greenish, while the females are coloured dark green. Their activity while swimming about is something wonderful, and the bursting of the animal when it discharges its eggs or spermatozoa is quite a peculiar phenomenon. Dr. Woolworth has made it an object to collect all the material possible in regard to the "Bololo," and on our return he will prepare a paper on this interesting annelid.

I have to thank the State Department at Washington for their kind offices in obtaining for us letters from the Foreign Office to the Government of Fiji. Sir George O'Brien, the High Commissioner for the Western Pacific, gave us all possible facilities for visiting the different islands of the group. I am also indebted to the Hon. Charles Stuart, the Colonial Secretary, and to the Hon. W. L. Allardyce, assistant native Commissioner, for assistance and advice. To Dr. Corney and the Hon. John Berry I owe information regarding the presence of elevated reefs at various points I had not examined. To Captain D. Calder I am greatly indebted for his interest in our behalf. We were fortunate in retaining the services of Captain Robert Cocks as pilot during our expedition. His knowledge of the reefs is accurate and extensive. Finally I have to thank Captain Thomson, as well as the officers and crew of the 'Yaralla,' who have been indefatigable in our interest.

I hope during the coming summer to prepare a fully illustrated report of this interesting cruise. . . . .