ZOOLOGY.

EXTINCT FAUNA.

OBSERVATIONS ON THE BONE CAVES OF RODRIGUEZ.—*By Henry H. Slater, B.A., Naturalist to the "Transit of Venus" Expedition.*

I.—The Cave Region of Rodriguez.

The cave tract in Rodriguez is situated about the S.W. side of the island, and is of a very curious nature. We find there 10 or 12 patches of limestone scattered upon the basalt which forms the island; these patches are of irregular form, and usually terminated by an escarpment of various height, from 3 to 10 or 12 feet, which marks their juncture with the basalt. On examination, these patches are found to consist of marine coral upheaved with the basalt.

Sometimes the limestone preserves its original structure or grain which it had in life; sometimes this grain is brought out by weathering, the outer walls or thecæ being harder than the rest, and standing out in relief when the rest is denuded away; sometimes, but more rarely, the septa are visible. But, as a rule, the limestone is much altered: whether by pressure during or previous to upheaval, or whether by an infiltration of acidulous water with carbonate of lime in solution, I must leave to more able geologists than myself to settle upon an investigation of my colleague, Mr. Balfour's, collection of rocks; but the stone is usually rendered very hard and solid, though always very porous. Sometimes weathering produces a quasi-oolitic grain on the surface.

It is in these coralline limestone patches solely that the caves are situated; in Bourbon, on the contrary, the only caves were in the igneous rock itself, and appeared to be the effect of rapid cooling.

The caves have been, if not originated, at least much enlarged by water, of which many bear abundant traces, and in the rainy season some are evidently the courses of subterranean streams.

Another proof of the marine origin of the caves is found in the presence therein of several marine shells, as *Pleurotoma* sp., 150 yards above the sea, and 2,500 yards from the coast line; and *Terebellum* sp. In places where the coral is at its minimum of alteration, perforations were seen in it, which from their slightly oval shape, and gradually increasing diameter, seemed identical with those of the *Lithodomi*, at present common on the reefs in Rodriguez. I quote in allusion from Sir C. Lyell's "Principles:" "Perforations of Lithodomi in limestone cliffs, and in the

" Temple of Serapis at Puteoli, afford conclusive evidence of change in the sea level " of coasts in modern times."

There exists near my camp at the caves a sort of ravine, terminated at each end by a cavern, and having others opening into it. The terminal caves and precipitous sides at once determined me that this has been a vast cavern, the roof of the greater part of which has fallen in; this fall has left a sort of ravine with a level bottom surrounded on all sides by precipices, nearly, if not quite, perpendicular, and having a height of from 30 to 90 feet; the bottom is now covered with earth and full of large trees, the tops of which rise to the level of the cliffs. Descent can only be effected with ease in two places, where two heaps of limestone blocks rear themselves against the precipices. There is no reason to believe that water ever accumulates in the caverns opening into this " Gorge," and in these caves most of my specimens of any value were found, whilst the trees in the Gorge, being the abode of guinea-fowl, supplied my table. There were, judging from the hollow sound of the coral in various places under my boots, other caves with no mouths at all, but I did not judge it needful to open them. Capt. Wharton, of H.M.S. " Shearwater," opened one about a mile and a half W.S.W. of the Gorge, and descended by means of a rope, but nothing was to be seen but stalactites, nothing like earth on the floor.*

II.—Bone Earths and Stalagmites.

The cave-earth was always similar in colour to the reddish brown earth found on the basaltic parts of the island, but differed from it in being generally mixed with a greater or smaller per-centage of coralline sand, formed from the crumbling of the interior of the cave, or washed in. The earth itself was probably washed into such caves as were liable to the influx of water; into the dry caves it seemed to have been blown in in the form of dust, which form it often kept.

Mixed with the cave-earth was a large admixture of land shells, including—

1. *Cyclostoma articulatum*, now living in the island abundantly.
2. *Cyclostoma hæmastoma*, much smaller than above, and also living in the island.
3. *Helix bewsheriana*, $1\frac{3}{4}$ inches in diameter across the whorls.
4. *Pupa sp.*, 1 inch in length, and $\frac{1}{3}$ inch in diameter.

The two latter are now extinct, and only found in the caves; there are also a small *Pupa*, and two small *Bulimi* now living in the island, and an *Achatina* (extinct), which occur in the cave-earth, with remains of a huge *Julus*, much larger than those now in the island, equalling the species in the Seychelles.

I never met with any human remains, either bones or implements, in the cave-earth.

* I was surprised when I made my preliminary survey of the cave tract in Rodriguez to discover the amount of work already done. Out of the first 13 caves, I found 12 to bear unmistakeable signs of previous research. Nevertheless, I deemed it best to dig them over again, a proceeding which elicited a certain number of bones, though it gave no information whatever as to their deposition.

The depth of the bone-earth is very variable; in some caves we find it with a depth of from six inches to three feet; in others, however, it varies from four to nine feet in depth. Below about two feet I never found many bones, which makes me believe that the agency which deposited the bones in the caverns, never operated until the later days of the existence of the Solitaire. The bones might certainly have decayed, but yet I usually found that the bones which were well covered with earth were in much better preservation than those near or upon the surface, which were usually much decayed. This makes me think that the Solitaire resorted to the caverns in case of fire in the island, which has been known to have denuded it several times of its trees; more so, as in several cases I found nearly perfect skeletons, which lay evidently as they died; this precludes the idea that they were carried there by wild cats. Again, in the bottom of a cleft near the mouth of a cave, I found the greater part of the skeletons of a male and female Solitaire; they had clearly fallen in and were unable to extricate themselves, but the bones being but imperfectly covered, many bones were so much decayed as to prevent their removal. But I could not doubt that they arrived there alive, and if not driven into the neighbouring hole as a shelter under some alarm, what could have allured them there? Nor were any bones found in the caves at any distance from the mouths, at least, if there were, they were single, and looked as if they had been washed there. Land crabs inhabit some of the caves, and may have conveyed the dead Solitaires into the inmost recesses, when decay enabled them to remove portions of the carcases at a time.

Stalagmite of any thickness is uncommon in the caves; in three caves only did it occur in anything like extensive sheets, but it often occurred in small patches of a yard or so in diameter under some long stalactite. But in one long cavern, near a fishing station called Patates, there was evidence of there having been rather an extensive system of stalagmite layers. This cave was nearly a mile in length, and ran downhill, having an elevation of about 200 feet above the sea level at one mouth, and not more than 25 at the other; moreover, it was clearly occasionally the bed of a stream. In one place in this cave there was an interesting relic in the shape of a sort of column composed of alternate floors of stalagmite and cave-earth. It occurred in an angle of the cave where the force of a stream coming down from the higher mouth would just have missed it. It was about 8 feet in height, and there were three or four layers of stalagmite in it. At one period, before the streams began to flow through the cave, this system of alternate layers had existed all over the cavern, but had been broken up by the stream, which would wash out the earth, when the stalagmite would fall in. Evidences of the stream were to be found in the trunks of trees and beds of leaves, with smooth ripple-marked sand in the floor of the caves.