ART. XXX.—*Is Access to the Sea a Necessity to Eels?*

By JAMES DUIGAN.

[*Read before the Wellington Philosophical Society, 4th October*, 1875.]

I HAVE had my attention drawn to a paper by Mr. W. T. L. Travers, F.L.S., published in Vol. III. of the "Trans. N. Z. Inst.," in which that gentleman argues that, inasmuch as there is an absence of Eels in the upper waters of the Waiau-ua and its tributaries, it is necessary that Eels should be able to go down to the sea during the spawning season. Dr. Hector, in his notes on the edible fishes of New Zealand, also alludes to this belief, and gives an extract from a letter written by Mr. Maling, a Surveyor, to Mr. Travers on the subject, in which the writer says, "from my own observations, I think it is absolutely requisite for that fish (the Eel) to have access to the sea. There are three notable instances of it here (Taupo). 1st, In the Waikato River, Eels are found as far as the Maungatautari Falls, and in all the streams that flow into it below them. 2nd, In the Kaituna River, which drains Rotorua and Rotoiti Lakes, Eels are caught as far as the Falls below the Taheke, and no further. 3rd, They are caught in Lake Tarawera, but not in Rotokakahi, the waters of which run into Tarawera Lake, but have a perpendicular fall in one place of 100 feet."

That there is something more than the physical difficulties alluded to at work to account for the absence of Eels from the places named by both Mr. Travers and Mr. Maling, I am firmly persuaded, as I have caught Eels in places more completely isolated from access to the sea than any of those named by the above gentlemen; and, as one instance is quite sufficient to establish the fact that Eels not only can, but do live, in waters having no access to the sea, I shall merely state that they exist in large numbers in Virginia Lake, a sheet of deep water close to the town of Wanganui. This lake has neither inlet nor outlet from the surface, and is some three or four miles distant from the sea, and at an elevation of about 250 feet the above sea level. The natives look upon it as one of their best fishing grounds, and catch large quantities there every season. The fact of the lake, which is in places very deep, having no visible source or overflow, and keeping its level and purity throughout the droughts of summer, at once struck me as indicative of subterranean sources of supply and drainage. On examining the strata in the vicinity, I found the lake had its bed in just such a position as to bear out the hypothesis above mentioned. As a section of it would shew first a greater or lesser extent of blue clay, forming an impervious bottom; next, a varying thickness of gravel lying in the blue clay, which dips at a gentle angle to the sea; above the gravel follows yellow clay, or rather a volcanic mud, containing rolled lava stones, over which a post tertiary

deposit of a few feet in thickness has accumulated. It is evident from this that the gravel bed acts as both inlet and outlet, as it drains and filters the water from the high lands to the north of the lake, and carries it down to keep the water of the lake both pure and at a permanent level. When the lake is full, as it always is, the weight of water in it regulates the supply to compensate exactly for what has passed away through the gravel-stratum and been lost by evaporation. It will thus be seen nature has supplied the lake with what is, to all intents and purposes, a "ball-cock," and has further placed it just where it can be best utilised by the people of Wanganui as a source of water supply. I may mention, in support of my hypothesis as to the supply and drainage of the lake, that, where the blue clay bed is exposed on the sea-beach, water flows continually from the overlying gravel.

Returning to the question whether eels can exist without free access to the sea, I may mention that, in Australia, I have caught them in swamps and lagoons hundreds of miles from the sea, and utterly cut off from any possible communication therewith. It is, therefore, plain that there are other reasons than those advanced by Messrs. Travers and Maling, why eels cannot live in the localities they mention. It is more likely that low temperature of the water is the real cause, as eels are notoriously fond of warm, sluggish water, not that the water of Lake Virginia partakes of that character, being always both cold and pure; but even in Lake Virginia they can escape extreme cold by burying in the mud at the shallow end; that they do so is more than probable, as during very cold weather they are seldom seen or caught in the lake. There is one thing quite certain, they cannot leave the lake, which is quite sufficient to controvert the theory of their being unable to exist without having access to the sea.

Art. XXXI.—*On the Habits of the Trap-door Spider.*

By R. Gillies.

[*Read before the Otago Institute, 14th September*, 1875.]

Plates VI., VII., VIII.

Preface.

There are always two departments in the domain of Natural History, the one, that of observation and collection in the field, the other that of classification and description in the study. The cabinet naturalist undertakes the latter, and by his microscope examines and reveals the various functions of the different parts of the animal, their relation to one another, and to other species; measures, records, classifies, and makes drawings for the