

Fresh Discoveries.

While our field-work was concerned mostly with the well-known and often-described sections of Amuri Bluff and the Waipara district, some new observations were made. The basal Cretaceous sandstones and conglomerates were found to be fossiliferous in the hills running from Monkeyface to the south-west of Cherwell Flats. The exact locality is in the cliffs overlooking a small lake situated on the south-west side of the Cherwell River, about 200 ft. above the river. Only two recognizable species were obtained—the one a *Trigonia*, the other an *Aucella*; and it is interesting to note that they do not occur at Amuri Bluff, but are found on the other side of the Kaikoura Mountains, at Bluff River, a tributary of the Middle Clarence. Neither species has yet been described or named.

A second discovery of great interest in elucidating the physiographical history of the district was made by Mr. Cotton in the Amuri Bluff district. Mr. Haine, schoolmaster at Hundalee, showed us apparently Recent shells which he had obtained from a slip in the Oaro Creek, and guided Mr. Cotton to the spot. It was then found that these shells came from a series of sandy beds resting on the basal Cretaceous beds at a height of approximately 900 ft. above sea-level. McKay had already described a raised beach 500 ft. high at Kai's Hill. A small collection was made and submitted to Mr. H. Suter, who stated that some of the species were extinct, and that the beds were probably of Pliocene age. The species determined were as follows:—

Cominella virgata H. & A. Ad.
 „ *zealandica* Reeve
Drillia aequistriata Hutton.
 „ *chordata* Suter.
Siphonalia sp. nov.
Turritella symmetrica Hutton.
Dentalium nanum Hutton.

Chione mesodesma Q. & G.
Olycymmeris modesta Angus.
 „ *laticostata* Q. & G.
Pecten triphooki Zittel.
Venericardia difficilis Desh.
 „ *zealandica* Desh.
Terebratella sanguinea Leach.

As the Mount Brown beds are absent in the Amuri Bluff district, there can be no doubt that here at least an unconformity is present in the younger rock-series (Cretaceous to Pliocene).

A third discovery of some historical interest was made in the Waipara district. Towards the end of our visit two specimens of *Pecten huttoni* were found in the Weka Pass stone, about a foot above the junction of the Amuri limestone on the cuesta of these rocks lying between Mount Brown and Bobby's Creek. We had occasion to follow this junction later only from the Rams' Paddock down to the bed of the Waipara River, and discovered in all twenty-five specimens of *Pecten huttoni* and one of *Cirsotrema rugulosum lyratum*. The best places for fossils are where the Weka Pass stone overhangs in rounded bosses the hollowed-out Amuri limestone. I have little doubt that if the actual junction is examined across country from the Waipara River to the Weka Creek, many other specimens and possibly other species will be obtained. The interest of the discovery lies in the fact that Park had recently thrown doubt on the presence of Tertiary fossils in the Weka Pass stone, although it had never been a matter of doubt to Haast, Hutton, Hector, and McKay.

A slight unconformity was observed within the sandy beds between the Weka Pass stone and the lower calcareous horizon of the Mount Brown beds in a cliff of the Waipara River gorge, just above the junction with Bobby's Creek. It appears, however, to be a purely local accident of bedding. With this exception, there is apparent conformity in section throughout the Waipara district.

Correlation and Subdivision of the Cretaceous Beds.

It cannot be asserted on palæontological grounds that any beds above the Saurian beds are of Cretaceous age. The presence of ammonites, belemnites, *Inoceramus*, and *Aucella*, and the abundance of *Trigonia*, and of gasteropods belonging to the families of *Aporrhaidæ* and *Strombidæ* leave no doubt as to the age of the basal beds; and these peculiarities persist to some extent into the Saurian beds. Above them practically no fossils are found till the Weka Pass stone, with undoubted Tertiary forms, is reached.

It seems reasonable to hope that the Amuri limestone itself will somewhere prove fossiliferous. It occupies a very large extent of country between the Waipara River and Cape Campbell, as well as in the Clarence and Awatere Valleys, and can have been inspected only at a relatively few of the innumerable sections it presents. The same is true for the Tored limestone and greensands between the Saurian horizon and the Amuri limestone.

The lithological similarity of the Saurian beds at Amuri Bluff, Monkeyface, and the Waipara district is so striking that the correlation of these beds cannot be held in doubt. Invertebrate fossils have been obtained from these beds only at Amuri Bluff, the Waipara Gorge, and the Malvern Hills. Below the Saurian beds there is only one fossiliferous horizon in the Malvern Hills, the Waipara Gorge and the Monkeyface section. At Amuri Bluff, however, Hector and McKay proposed several subdivisions. At the time of our visit, unfortunately, the more important sections on which they relied were obscured by slips. So far as I could judge, however, both by the sections that were available and the collections made by McKay, the Black Grit is a persistent horizon in this area, and has distinctive fossils; but the underlying *Aporrhais* beds, *Trigonia* beds, and *Belemnite* beds are not persistent stratigraphically, nor distinct faunally.

McKay has made extensive correlations with the Black Grit throughout the area between Cape Campbell and the Waipara River, but the available evidence seems insufficient to justify them at present.

In the Coverham section of the Clarence Valley, the succession of Cretaceous rocks presents a different facies to the rest of the area under consideration. The basal part of the Amuri limestone is entirely replaced by flint. Between it and the unfossiliferous basal conglomerates of the series there is an immense thickness of black mudstones with occasional calcareous lenticles or concretions,