MIOCENE STRATIGRAPHY OF THE HOKIANGA – WAIMAMAKU COASTLINE, NORTH OF KAWERUA, NORTH AUCKLAND

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SUMMARY

The lower Miocene geology of the 8 km coastal strip from Hokianga South Head to Waimamaku River mouth is described. All four formations recognised are included within the Waitemata Group.

Shallow-water Otaua Formation sandstones, siltstones, pebbly mudstones and minor conglomerates appear conformably overlain by the deltaic, heterolithologic Omapere Conglomerate. Conformably overlying these deposits are interbedded basalt flows, breccias, and sediments of the Waipoua Basalt, which are overlain in turn by interlensing conglomerates, sandstones, siltstones and lignites of the shallow-water and terrestrial Pukorukoru Formation.

The Omapere Conglomerate and Pukorukoru Formation wedge out to the south in this area, while the Waipoua Basalt flows wedge out northwards.

INTRODUCTION

This paper details the Miocene stratigraphy exposed along the 8 km coastal strip from Hokianga South Head to the mouth of the Waimamaku River (Fig. 1), leaving untouched for future studies the detailed sedimentological and structural interpretation of such interesting units as the Omapere Conglomerate and the shallow-water deposits of the Pukorukoru Formation.

This area, situated 5 km north of the A.U.F.C. Field Station at Kawerua, was mapped during a two day visit in November 1972.

PREVIOUS WORK

Harrington (1944) mapped this area in moderate detail but his interpretation differs considerably from that of the present author. He divided the Miocene rocks of this area into two units: the lower or Waitemata Beds (here referred to as Otaua Formation) and the middle or Omapere Beds (here included in the remaining three formations). Harrington interpreted the Waipoua Basalt as overlying an unconformity cut in the Miocene beds and did not correlate the flows on the coast with the Waipoua Basalt. As a result he lumped the Pukorukoru beds with the Omapere beds and believed them to predate rather than postdate Waipoua Basalt in this area.

Thompson (1961) mapped the Omapere Conglomerate and Otaua Formation together, but corrected Harrington by extending the Waipoua Basalt northwards

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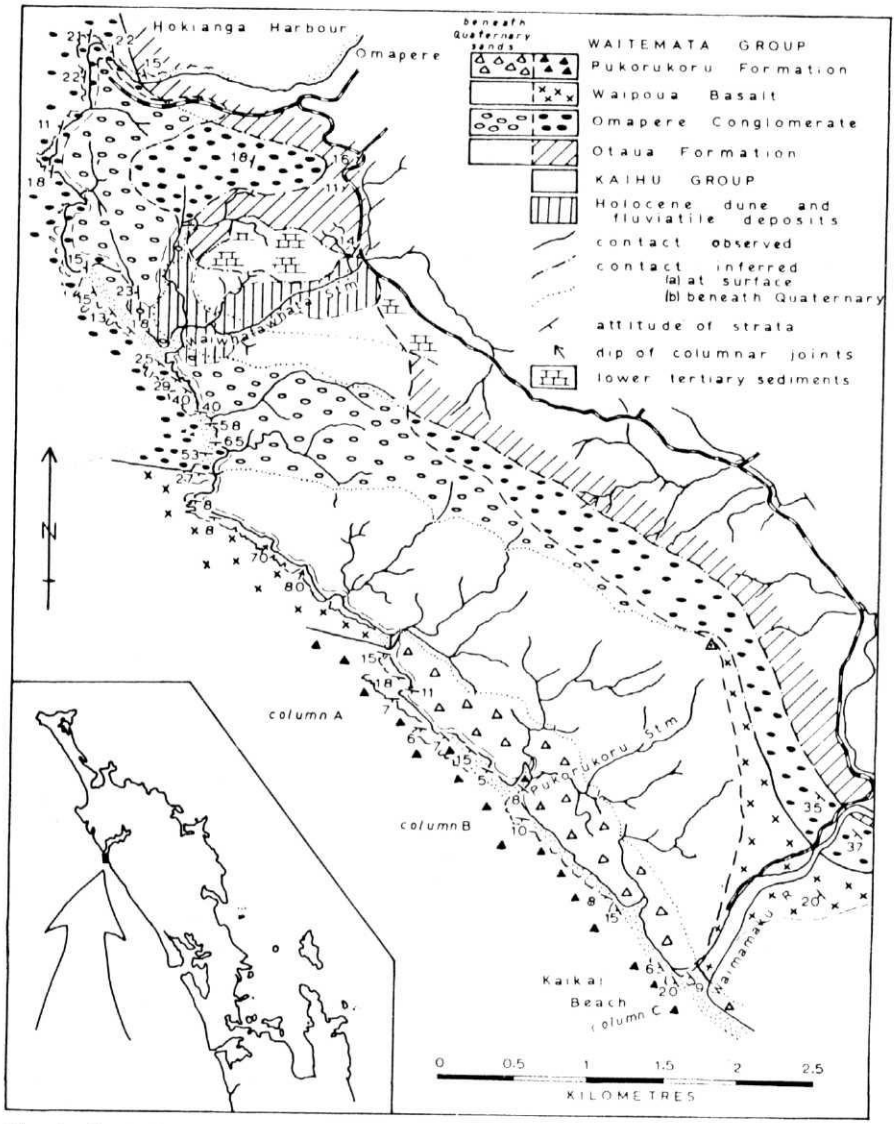

Fig. 1. Geological map of the coastal strip between Hokianga South Head and the Waimamaku River, with particular emphasis on the lower Miocene geology.

to the coastal flows and included the Pukorukoru beds within this unit.

The southern 1.5 km of this area was mapped by Hayward (1972), but following the removal of much sand from the beach during the 1972 winter, better exposure has allowed much clearer interpretation of the Pukorukoru Formation, and the outcrops of units identified then in the lower Waimamaku Valley have been extended to their coastal exposures to the north.

STRUCTURE

The structure of this area is simple and appears little affected by large fault displacements or Onerahi Chaos slumping. The four Miocene formations (see Stratigraphy) in this area occur on the western limb of the Waimamaku anticline (Thompson, 1961), and have a general dip of 5^{o} to 40^{o} (averaging 15^{o}) west to south-west.

The strike has a sinuous pattern (Fig. 1), generally aligned north-west around Waimamaku, swinging to the west immediately south of the Waiwhatawhata Stream mouth, and then swinging back through north-west to northerly further north.

Omapere Conglomerate is exposed on the north side of the Hokianga Harbour mouth (L.L. Wakefield, pers. comm.) with no apparent major fault displacement through the Heads to the north of this area.

STRATIGRAPHY

Following Hayward (1972) all the Miocene rocks have been included within the Waitemata Group, which is here divided into four formations: Otaua Formation, Omapere Conglomerate, Waipoua Basalt, Pukorukoru Formation.

1. Otaua Formation

This unit contains the lower Miocene sediments that underlie the Omapere Conglomerate in this area. Hayward (1972) included the conglomerates within this formation. The base of this formation is not exposed in the mapped area but the upper parts are well exposed along the coast east of South Head, in road cuts on State Highway 12 north of the Waiwhatawhata Stream, and on the south side of the Waimamaku River (Fig. 1). These exposures contain alternating graded sandstones and siltstones, massive fossiliferous sandstones, the "orbitolite limestone", argillite and argillaceous limestone, pebble conglomerate, and pebbly mudstones.

Exposures in this area indicate a minimum thickness of 60 metres for the Otaua Formation.

2. Omapere Conglomerate

This formation is erected to include the sequence of cobble and pebble conglomerates and interbedded sandstones that directly underlie the Waipoua Basalt in the Omapere – Waimamaku area. These sediments constitute the major proportion of Harrington's (1944) middle or Omapere Beds, and conformably lie

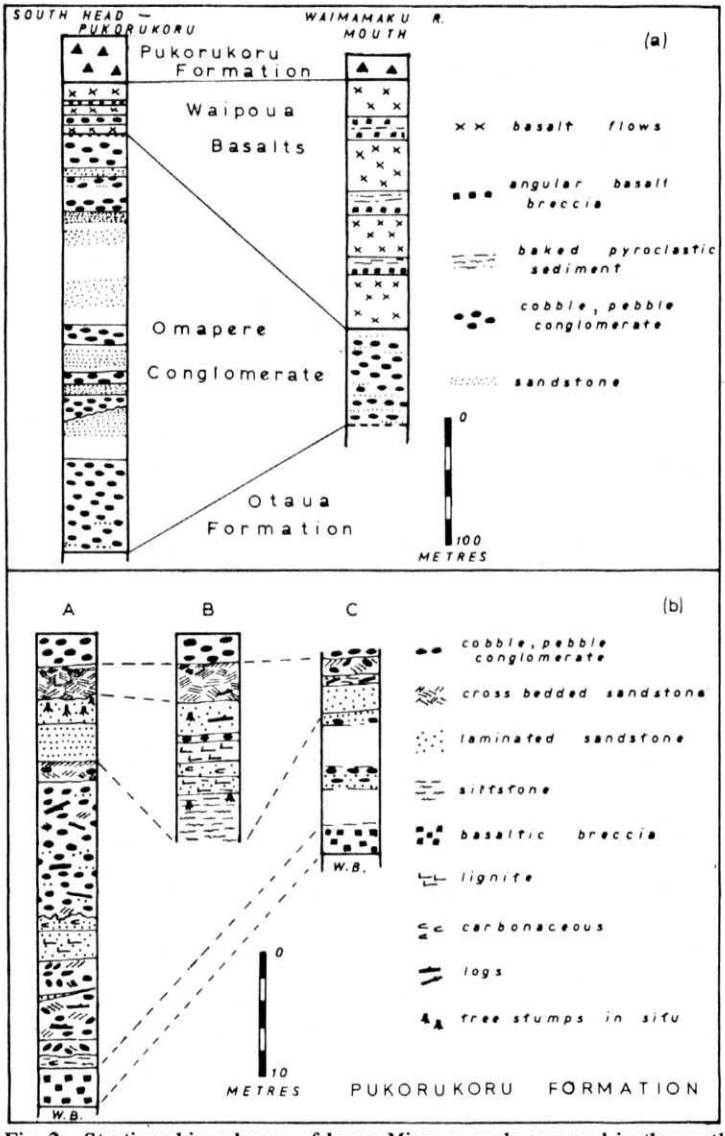

Fig. 2a. Stratigraphic columns of lower Miocene rocks exposed in the north, as opposed to those exposed in the south of the area mapped.

Fig. 2b. Three stratigraphic columns through the Pukorukoru Formation. A. North of Pukorukoru Stream; B. Pukorukoru Stream mouth; C. Waimamaku River mouth. (See Fig. 1 for location).

between the Otaua Formation and Waipoua Basalt.

Omapere Conglomerate is exposed on both sides of the Waimamaku River, 2 km upstream from its mouth, and forms the prominent resistant ridge that runs parallel to the coast between the Waimamaku and Waiwhatawhata valleys. The sequence is exposed almost continuously along the coast from a point 1 km south of Waiwhatawhata Beach to just inside Hokianga South Head (Fig. 1).

This formation is thicker in the north of the area (c. 300 metres) than in the south (80 metres) (Fig. 2a). Besides wedging out to the south it also thins to the east, where on the eastern limb of the Waimamaku anticline the conglomerates are even thinner (L.L. Wakefield, pers. comm.). The conglomerate beds contain rounded to well rounded, moderately well sorted cobbles and pebbles of very variable composition. The majority of clasts are diorites or fine grained basalts, with rarer specimens of andesite, greywacke, jasper, light-coloured early Tertiary sediments, and chlorite schist.

Size sorting stratification makes bedding easily identifiable in the conglomerates, which in numerous places exhibit large scale foreset bedding. Finely laminated, well-bedded grey siltstones and fine to medium sandstones occur interbedded with and as lenses within the conglomerates, especially along the northern coastline. These finer sediments occasionally are delicately crossbedded, bioturbated, or contain carbonaceous laminae. In several places intraformational slumping appears to have irregularly dislocated and disturbed these lenses.

3. Waipoua Basalt

This formation is exposed on both sides of the Waimamaku gorge, between 0.5 and 1.5 km from the sea, and again along 1.5 km of coastline in the north, 1 km north of Pukorukoru Stream mouth. The basalt flows conformably overlie the Omapere Conglomerate in both localities but are not exposed between because of covering by Quaternary Kaihu Group sands (Fig. 1).

The Waipoua Basalt in the Waimamaku gorge has a thickness of c. 200 metres, and consists of at least four basalt flows separated by thin bands of red baked sediment and basaltic breccias. In the north this formation consists of three thin flows separated by basaltic breccia, a little baked sediment, and a band of pebble and cobble conglomerate (Fig. 2a). The total thickness here is only 40 metres. No internal correlation of flows is possible between the two exposures.

Petrographically the flows exposed along the northern coast are indistinguishable from those of the Waimamaku gorge, and all are pyroxene basalts (Hayward, 1972).

4. Pukorukoru Formation

This formation is here erected to replace the Pukorukoru Beds of Hayward (1972). The Pukorukoru Formation consists of interlensing conglomerates, laminated and cross-bedded sandstones, together with minor siltstones and lignites that conformably overlie the Waipoua Basalt in this area.

Pukorukoru sediments are exposed along 3 km of coastline from Waimamaku River mouth to 1.5 km north of the Pukorukoru Stream (Fig. 1). No inland exposures of this formation are known in the vicinity. The basal contact on Waipoua Basalt is exposed at the Waimamaku River mouth and at the

northern-most exposure. In both places 3-4 metres of basaltic breccia with a silty matrix which has penetrated from the overlying sediments, overlies the upper lava flow. The Pukorukoru Formation, like the Omapere Conglomerate, wedges out towards the south (Fig. 2b), having a maximum exposed thickness of 40 metres north of Pukorukoru Stream, and a minimum of 18 metres at Waimamaku River. Three stratigraphic columns are presented in Figure 2b and show not only the wedging out to the south, but also the lensoidal nature of these deposits. The top conglomerate bed is the uppermost exposed member of all three columns and allows ready correlation. Any beds that may once have overlain this conglomerate have now been removed by erosion, so that total thicknesses quoted for the Pukorukoru Formation are only total *exposed* thicknesses.

The best exposed section (column A) contains 20 metres of cobble and pebble conglomerate in the lower and middle portions. These conglomerates contain clasts of similar lithologies to those of the Omapere Conglomerate, but in addition contain numerous partially silicified logs up to 10 metres in length. Pockets of laminated and cross-bedded sandstone and granule conglomerate occur throughout, whilst carbonaceous sandstones, siltstones and some lignites are also common. The upper parts of the section (column A) consist of 1-2 metres of sandstone having tree stumps and rootlets in position of growth, overlain by 3-4 metres of finely cross-bedded sandstone containing occasional logs and lying directly beneath the uppermost conglomerate. These two units are lensoidal and appear to have been coeval with 12 metres of lignite, cross-bedded sandstone and carbonaceous sandstone in column B, and 3 metres of cross-bedded conglomerate and sandstone, and carbonaceous siltstones in column C.

The sediments of this formation would provide excellent material for a study of sedimentological structures, current directions and paleoenvironments.

PALEOENVIRONMENTS OF DEPOSITION

Otaua sediments in this area were deposited in a shallow, inner shelf, marine environment (Hayward, 1972) on the margin of an elongate basin which possibly extended through the entire Northland Peninsula in lower Miocene times.

The Omapere Conglomerate marks an influx of thick, possibly delatic, gravels over the shelf sediments, and the source may have been a river discharging in the north-west where the thickest sequence occurs. Alternatively it is possible that some or all of these gravels were deposited in a fluviatile and flood plain environment.

The Waipoua Basalt flows that followed probably came to rest in a terrestrial or shallow water environment. This area was on the north-western fringe of the large outpouring of basalt that occurred in the vicinity of the Waipoua Plateau, and the Waipoua Basalt of the mapped area is inferred to constitute the northern extremities of flows produced in the south.

Following Waipoua basalt extrusion, sediments were deposited again in a terrestrial and partly shallow water, possibly freshwater, environment. The character of the sediments of the Pukorukoru Formation suggests a depositional

environment like a coastal plain, that at times was covered by swamps, river and beach gravels, forests and shallow seas.

AGE

No fauna has been found in the three upper formations, but from their conformable contacts it is reasonable to infer a nearly continuous sequence of deposition on top of the Otaua Formation. The Otaua Formation in this area is of upper Otaian (Scott, 1971) to Awamoan (Hayward, 1972) age, so that the author infers that all four formations are of lower Miocene, upper Otaian to Altonian (Po-Pl) age. This is in agreement with a K/Ar date of 15.1± 0.49 m.yrs. for a sample of Waipoua Basalt from south of this area (Stipp and Thompson, 1971).

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