

join the main Auckland trough of sedimentation. Nor can its eastern limits be clearly defined, and the Kaipara basin probably represents a shallow-water facies deposited on the western side of the main Auckland-Bream Tail trough of deep-water Waitemata sedimentation. Its western limits were probably defined by the andesitic chain that extends from Waitakere to Tokatoka, which gave rise to the Manukau Breccia andesites. Its present northern limits extend from Bream Tail to Pahi and Tokatoka, but it possibly extended farther north to Hokianga, Parengarenga, and North Cape. However, the Otaian igneous massif of the Tangihua Ranges (Hughes, 1966) probably separated northern Northland from the Kaipara basin. The Kaipara basin was probably bordered to the north and north-east by a low-lying land mass of early Tertiary and Mesozoic sediments and a schistose and/or acid igneous terrain. Cross-bedding, ripple marks, and pebble imbrication all indicate that depositional currents flowed in a south to south-westerly direction. Derived Foraminifera indicate ages of the source sediments (identifications by G. H. Scott, N.Z. Geological Survey): *Rzehakina* (Mh-Dt) is a siliceous foraminifer which was probably derived from the Mangakahia Group; *Globorotalia crater* group (Dm-Dh) indicates that Dannevirke rocks were exposed in the source area—probably members of the Waiomio Group which are exposed at present in the area between Matakoho and Paparua; *Globigerinopsis index* (Ab-Ak) is probably the commonest derived foraminifer in the Pakaurangi Formation and, together with abundant allochthonous glauconitic pellets, was probably derived from the Bortonian Pahi Greensand; *Rotaliatina sulcigera* (Ab-Lwh) may have also originated from the Pahi Greensand or it may have come from the Landon argillaceous limestones.

The lower Pakaurangi sediments (Waiteroa to Waipukua Members, uppermost Po to Ph age) are all dominantly of shallow-water origin with depths of deposition generally in the order of 0–100m. Penecontemporaneous erosion produced numerous small unconformities and may indicate slight changes in depth of deposition. This suggests that these members were laid down in relatively near-shore conditions and that, therefore, the shoreline could not have been very far distant to the north. The basin deepened rapidly in the Pakaurangi area during the deposition of the Pakaurangi Member (Ph to Pa age—based on the evolution of *Globigerinoides trilobus*, G. H. Scott, pers. comm., 1966). It is estimated to have reached a depth of 150–250m, indicating that transgression took place and that the shoreline consequently migrated farther from Pakaurangi Point. The depth of deposition then decreased again and reached 0–60m prior to the deposition of the unconformably overlying Funnel Member. This suggests a regression of the sea with the shoreline again approaching the area of Pakaurangi Point during the time of deposition of the upper portion of the Funnel Member, which is probably a brackish-water or lagoonal deposit.

A major erosion break occurred after the deposition of the Funnel Member, indicating that regression continued and that the Pakaurangi area was exposed to subaerial erosion. This is represented by the marked unconformity on Pakaurangi Point and a less conspicuous one on Puketotara Peninsula (L. Carter, pers. comm., 1966). The Arapaoa Fault and associated smaller faults were probably active during this period of non-deposition and may have coincided with the start or renewal of andesitic volcanicity to the west. Faulting and consequent differential sliding and folding (see Jones, 1969) took place prior to the deposition of the Puketi Formation, since the latter is unaffected by it.

The Puketi Formation is probably of Pa to Sa age and is a pumiceous phase of the Manakau Breccia deposition. As Arlidge (1955) has suggested, a chain of andesitic volcanoes was probably situated near the western edge of Hukatere Peninsula and extended north to Tokatoka and south at least to Manukau North Head. The Puketi Formation was probably deposited in the very shallow marine or non-marine lagoonal environment enclosed between this chain and the uplifted land