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FIELD TRIP GUIDES

Edited by
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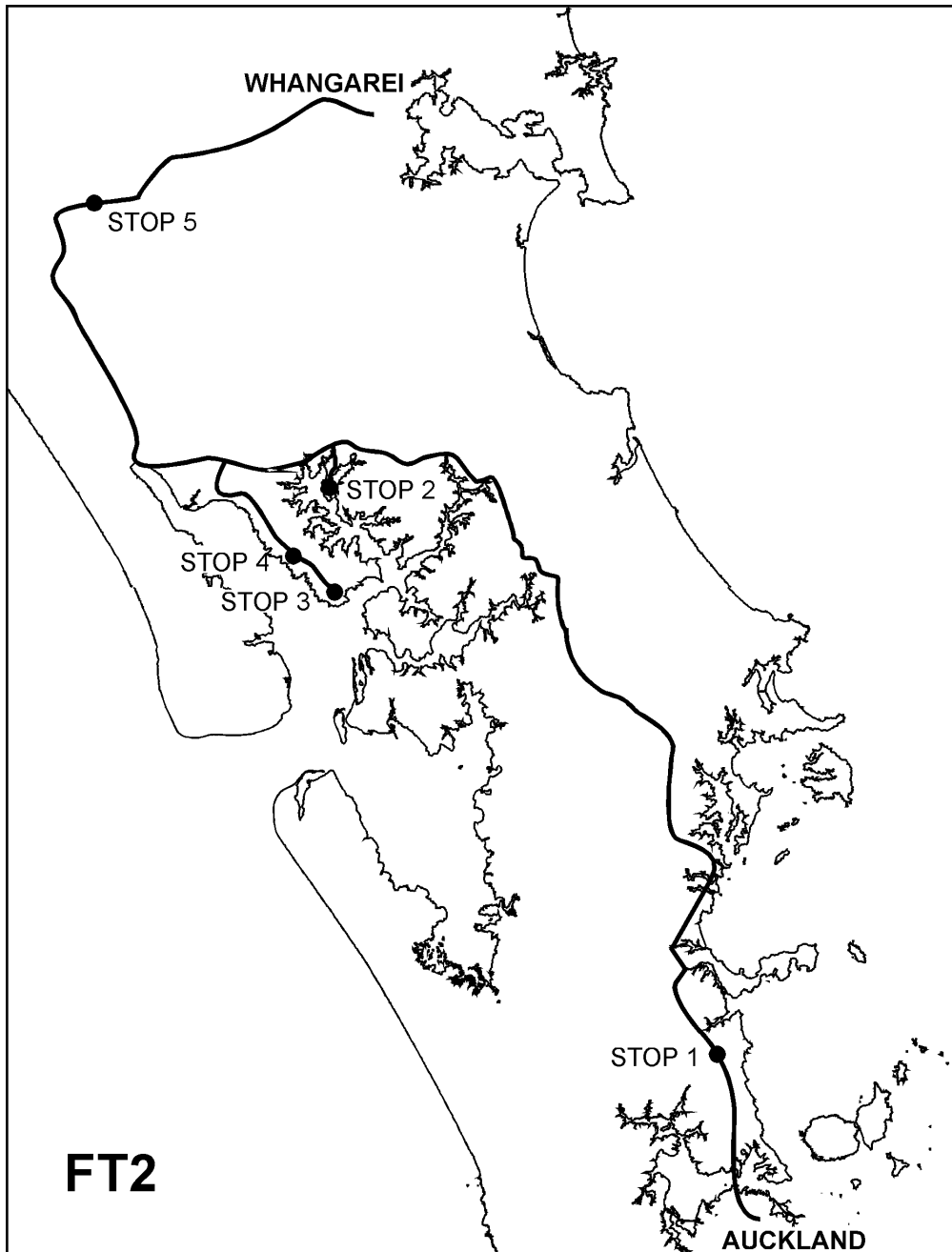
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Field Trip 2

Kaipara allochthon – autochthon

Jack Grant-Mackie and Murray Gregory



Route guide for field trip 2

Field Trip 2

Kaipara allochthon – autochthon*Jack Grant-Mackie and Murray Gregory*

With extended stops at two localities and possible brief visits to some others depending upon time constraints, this excursion will introduce participants to several of the common rock types that characterise geology from Auckland northwards to Whangarei. Consider these but snapshot views into the complexities of Northland's geology. Of necessity (time v distance), your guides will only guarantee stops 3 and 4 or 5. A visit to the Matakoho Kauri Museum – “world famous in Northland” - is also on the menu.

STOP 2.1: COATESVILLE (NORTONS) QUARRY**Albany Conglomerate, Waitemata Group (Miocene)**

The Albany Conglomerate was first described from Lucas Creek in the upper Waitemata Harbour by Bartrum (1920). Since that time it has been traced NNW's to c. 10 kms north of Kaukapakapa (Spratt, 1997). A correlative unit (Matapouri Conglomerate) is known from the Kaipara district (Carter, 1971). This distinctive lithology is considered a deep-water, resedimented conglomerate, deposited by channelised turbidity currents in the upper parts of a submarine fan complex. At Coatesville quarry two fan lobes have been identified (Spratt, 1997). Here the conglomerate sits unconformably on and is faulted against Northland Allochthon. Well-rounded igneous clasts, including gabbros, diorites, plagiogranites, dolerites, and basalts/basaltic andesites (80%) dominate and suggest derivation from deep in the Tangihua Complex. Spratt divided these into two geochemical suites; (1) alkaline and intra-plate, (2) Low-K tholeiite and back arc. Shape and roundness suggest the former had undergone extended river transport and the latter had spent time in a beach environment. Some 20% of the clasts are sedimentary – sandstones, mudstones, carbonates, cherts and concretions. These are less well-rounded than the igneous clasts.

Sedimentary features include the following (summarised from Spratt, 1997):

- maximum grain size in the coarse pebble range,
- matrix- poor beds are most common, lateral continuity difficult to assess,
- normal and inverse-to-normal grading is present,
- many beds are clast supported; some lag deposits and matrix rich intervals,
- pebble beds seldom exceed 30cm, often amalgamated,
- Bouma divisions in sandstone beds (Ta – Tb); lenticular bedding, scour structures,
- shape and imbrication suggest NW→SE flow, A (long), B (inter.), C (short) axes

STOP 2.2: MATAKOHE KAURI MUSEUM

A comfort stop at this popular tourist locality. Excellent displays and of wide general interest, but of necessity our stay must be brief.

STOP 2.3: PAHI (Figure 2.1)

Pahi Greensand and Mahurangi Limestone (Eocene and Oligocene)

Until recently, much discussion if not heated debate and controversy centered on the number of argillaceous limestones that there were in the Pahi sequence, and their stratigraphic relationships with a prominent greensand unit (Ferrar, 1934; Bartrum, 1937). "Detailed mapping and nannofossil micropaleontology have revealed two superimposed sheets of mid-Eocene to upper Oligocene limestones, greensands and sandstones with contrasting facies. The sheets are separated by a thin *mélange* zone containing all of these lithologies plus older rocks including some units considered to be Cretaceous. The two sheets have been subsequently cross-folded by NNW-trending, south-verging folds" (Spörl and Kadar, 1989: p115). These stratigraphic relationships are illustrated in Figure 2.1 (note the Late Eocene – Early Oligocene hiatus). The extent to which we may be able to identify the different facies will depend upon the cleanliness of the shore platform. However, you should be able to check out the following:-

- nature of the contact between the Pahi Greensand and the overlying Mahurangi limestone:
- thickness of the well bedded and laminated greensand:
- burrows filled with fine calcareous material in top 10 cm of Pahi Greensand:
- bioturbation in greensands:
- character of Mahurangi limestone, shearing/bedding:
- Northland Allochthon identification.

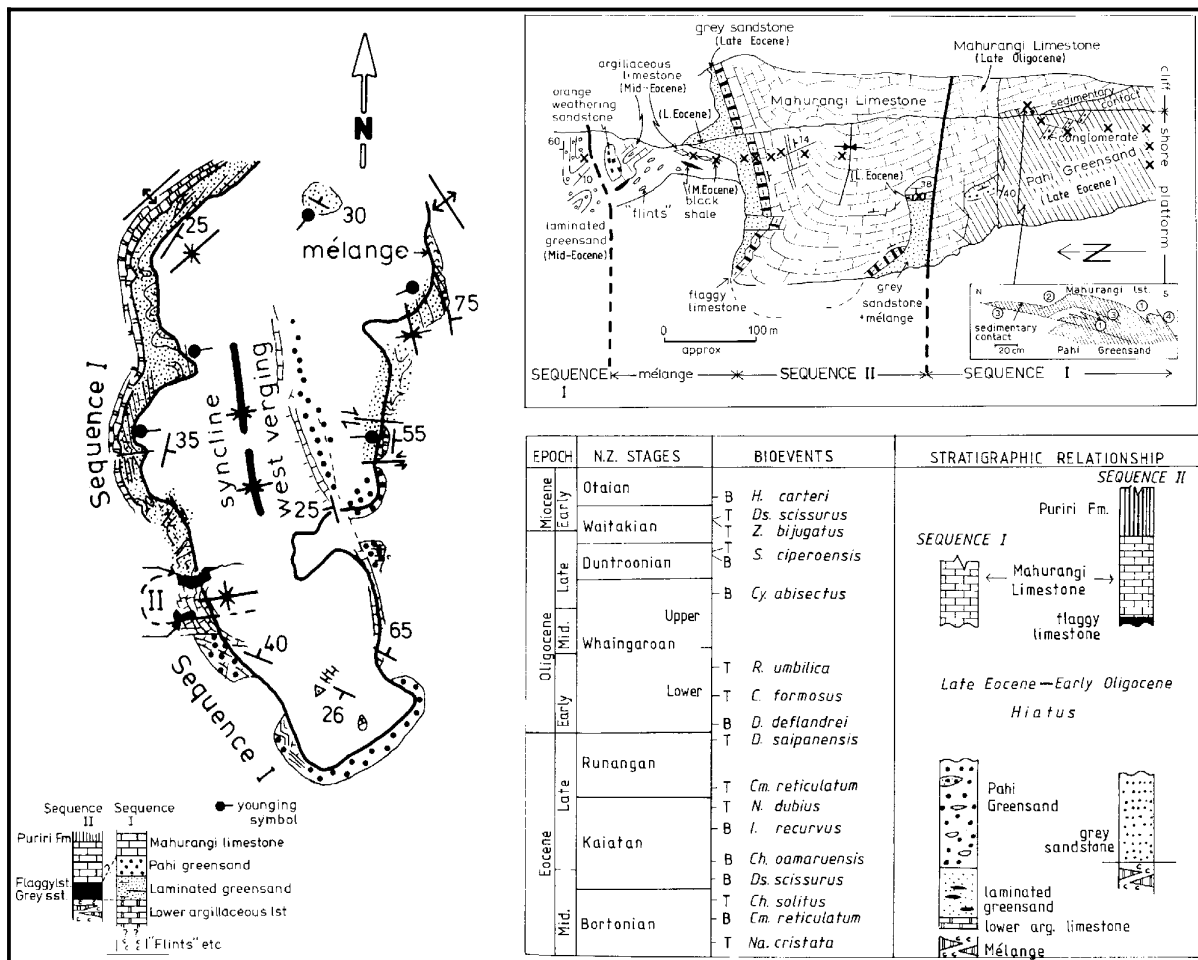


Fig. 2.1: Simplified map of Pahi Peninsula. We will be examining the western coast southwards of the E-W synclinal axis (a): sketch map of south-verging syncline, Pahi Greensand and Mahurangi Limestone exposed along cliffs and in the shore platform (b): lithologies and ages of the two juxtaposed Tertiary sequences. (From Spörl and Kadar, 1983).

STOPS 2.4 & 2.5: HUKATERE PENINSULA

The geology of Hukaterere Peninsula has been of wide and continuing interest since the late 18th century. While much of the focus has been on stratigraphic relationships and rich fossil-assemblages such as those of the Pakurangi Formation (e.g., Marshall, 1918; Laws, 1939; Jones, 1970), igneous rocks have also been subject to considerable attention (e.g., Bartrum, 1917; Black and Brothers, 1968; Wright and Black, 1981).

Your choice between (2.4) *ignimbrites and paleosols*, OR (2.5) *fossils, sediments and pillow lavas*

STOP 2.4: SANDY BEACH

Tinopai Member (unpublished), Puketi Formation (Miocene)

Repeating cycles of tuff breccias, andesite pumice, lapilli-tuffs, stratified and/or crossbedded sandstones and conglomerates with lignites and paleosols have been recognised in the Puketi Formation for some time (Brothers, 1954; Jones, 1969). While not able to confirm this repeating pattern, Brook (1983) considered it appropriate to erect the Tinopai Member for pumice and andesite-pumice lapilli-tuffs units and nominated Sandy Bay as a reference section. Today they would be considered ignimbrites. Aspects to note:- pumice clasts generally exhibit normal grading; one exposure is 'oppositely graded' – with pumice clasts reverse graded and andesite clasts normally graded (Brook, 1983); logs and tree stumps/roots, paleosols with nodular and vertical fabric, silicified (and opalised) wood, much lateral variation. Nearby there is evidence that ignimbrites engulfed mangroves in their passage through an estuarine setting and across shallow- to deeper-water, tidally swept marine environments.

STOP 2.5: STRAWBERRY BAY – PUPUIA ISLAND (Fig. 2.2)

Pupuia and Okaroro Formations (unpublished; late Otaian – early Altonian; Brook 1983).

The type section for the Pupuia Formation, a 150+m-thick pile of pillow lavas, flows, and dikes of basaltic to andesitic composition is on the Hukaterere coast southeast of Pupuia Island (Fig. 2.2). Pillows are common, very well-formed, with single and multiple selvages, circular or elliptical in section, mostly 1-2 m in diameter, with radial cooling joints, vesicular and glassy. The pillow pile at this site was possibly fed by a dike that can be seen on the NE end of Pupuia Island. This unit is known on Hukaterere, Puketotara, and Okahukura Peninsulas and is one of a number of effusive bodies collectively included in the Waitakere Group.

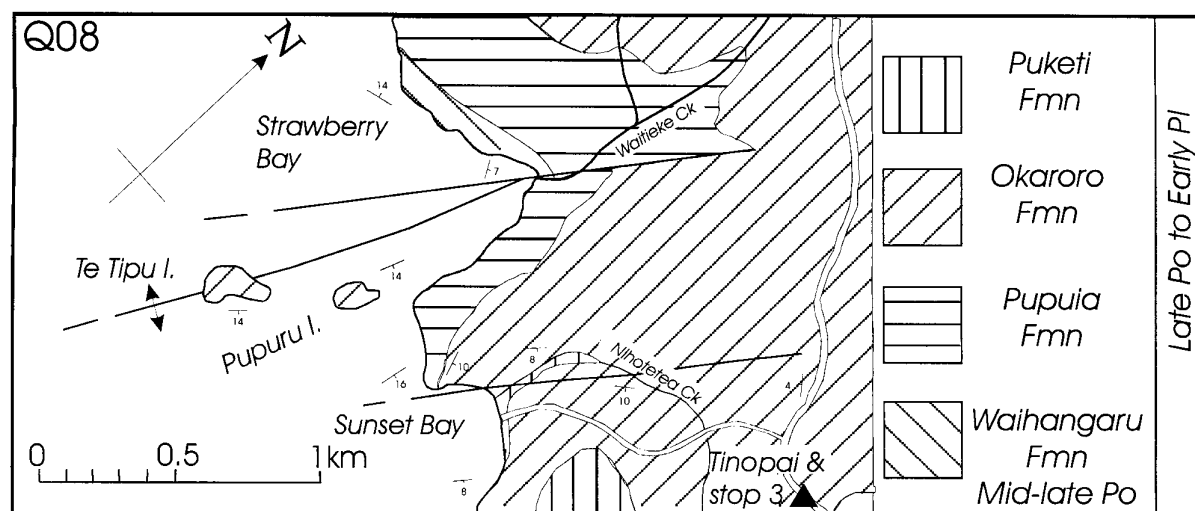


Fig. 2.2: Locality map of Strawberry Bay and features mentioned in text with a simplified stratigraphic column (after Brook, 1983).

The coast SE of Pupua Island is also the type section of the Okaroro Formation, within which the Pupua Formation is enclosed. Okaroro Formation is confined to Hukatere Peninsula, seems to be about 100 m thick, and here lies disconformably within Puketi Formation, but contacts are not seen on this trip. The unit is dominantly crossbedded, stratified, or graded volcanoclastic and gravelly sandstones, with minor tuffs and tuff breccias, and the formation grades laterally into muddy sandstones of the better-known Pakaurangi Formation. Pumice and lava fragments dominate the gravel fraction.

The 8 m of Okaroro Formation immediately above the Pupua lavas west of Nihotetea Creek mouth include bioclastic sandstones with transported molluscs (including pectinids, gastropods, nautiloids), brachiopods, corals (mostly hgermatypic), serpulid worms, bryozoans, and larger foraminifera (*Amphistegina*, *Miogyopsina*, *Victoriella*, *Lepidocyclina*), and two 2 cm-thick hyaloclastite tuff beds. Shell hash and foraminiferal tests are concentrated in laminae and lenses in crossbed foresets

Stop 2.6: AVOCA (roadside)

Greensand with *Scolicia*

At Avoca a unique remnant of coal measures lies within the Northland Allochthon. Structure and stratigraphic relationships are complex and poorly understood. *Scolicia*-bearing, calcareous glauconitic sandstone exposed in the road-cut apparently passes up into a bioclastic limestone (Isaac et al., 1994). This section is considered analogous to the autochthonous Ruatangata Sandstone – Whangarei Limestone sequence (see Fig. 1.3). This greensand is Runangan and at least 16 million years younger than the nearby Avoca coal measures. With a filling of fine-to-coarse shell hash, *Scolicia* trace fossils stand in sharp contrast to the hosting greensand, and from which representative three-dimensional segments of it are easily extracted. Many appear to have been following horizons immediately below shell hash rich laminae. Locally these laminae thicken upwards to layers of 1 cm or more. Should these hash horizons be considered “event” beds? Time permitting, a brief visit may be made to a close-by quarry in Mahurangi Limestone (Late Oligocene). The shelf facies are thrust over this bathyal deposit.