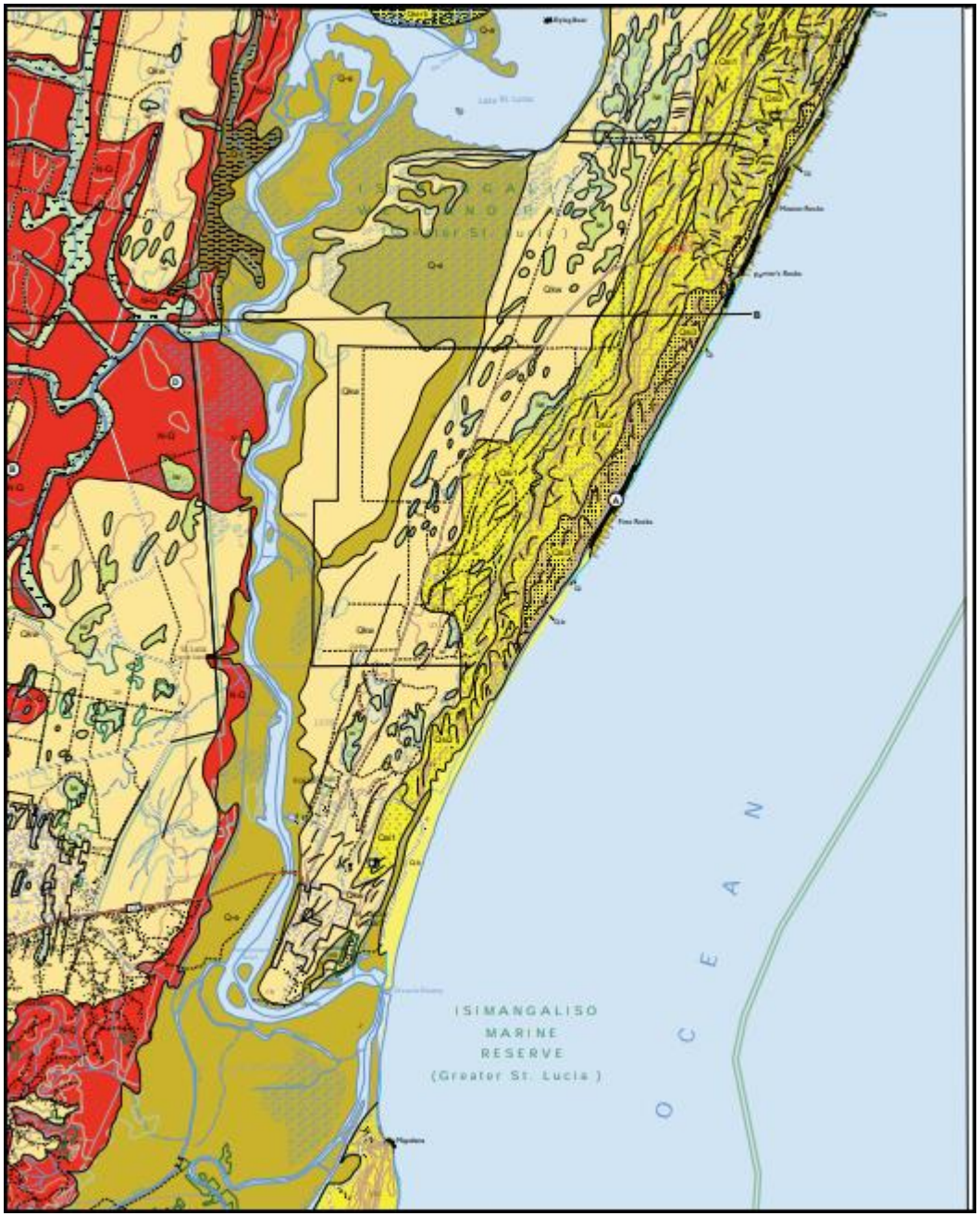
SASQUA 2022

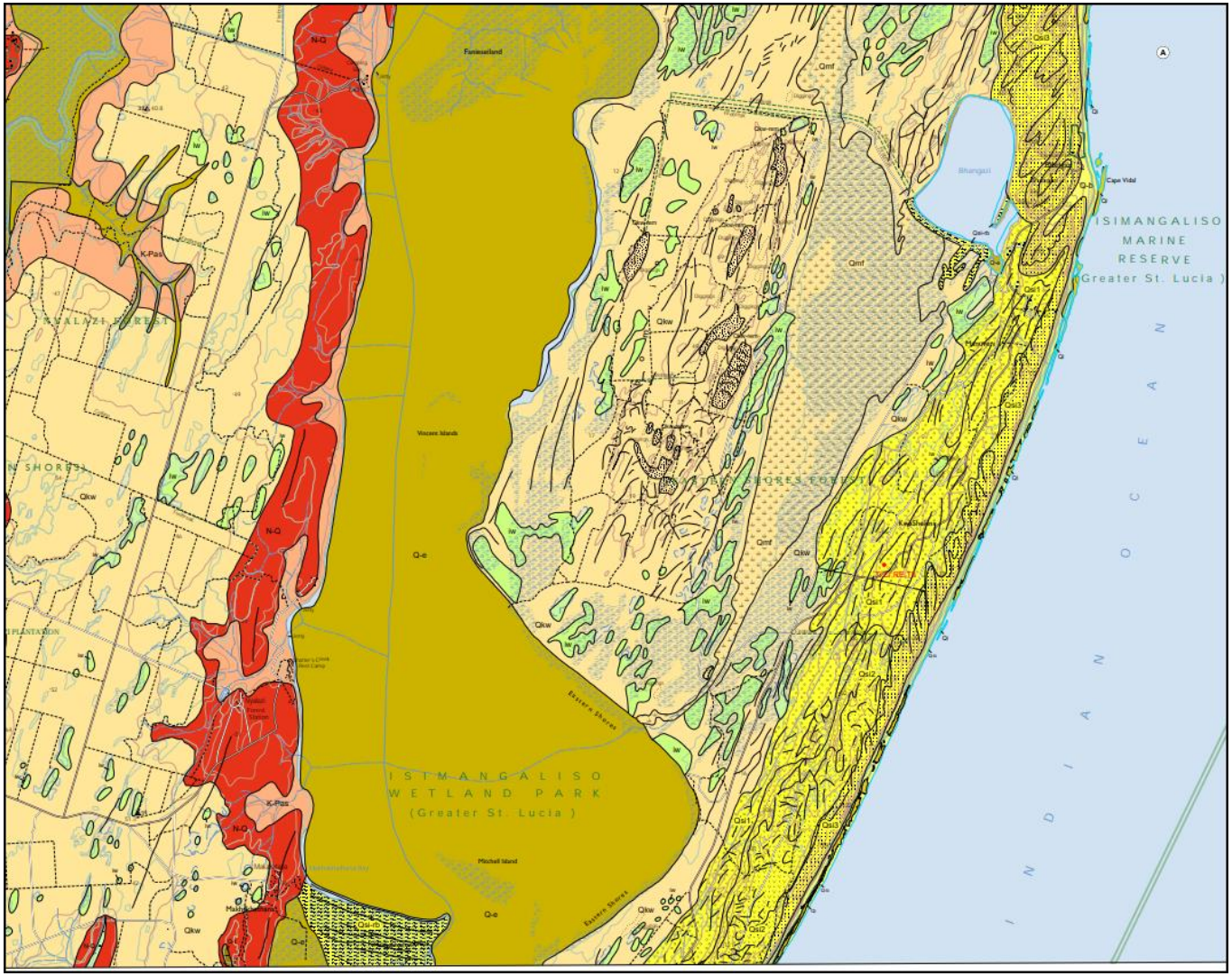
mid-congress field trip

Eastern & Western Shores Reserves,

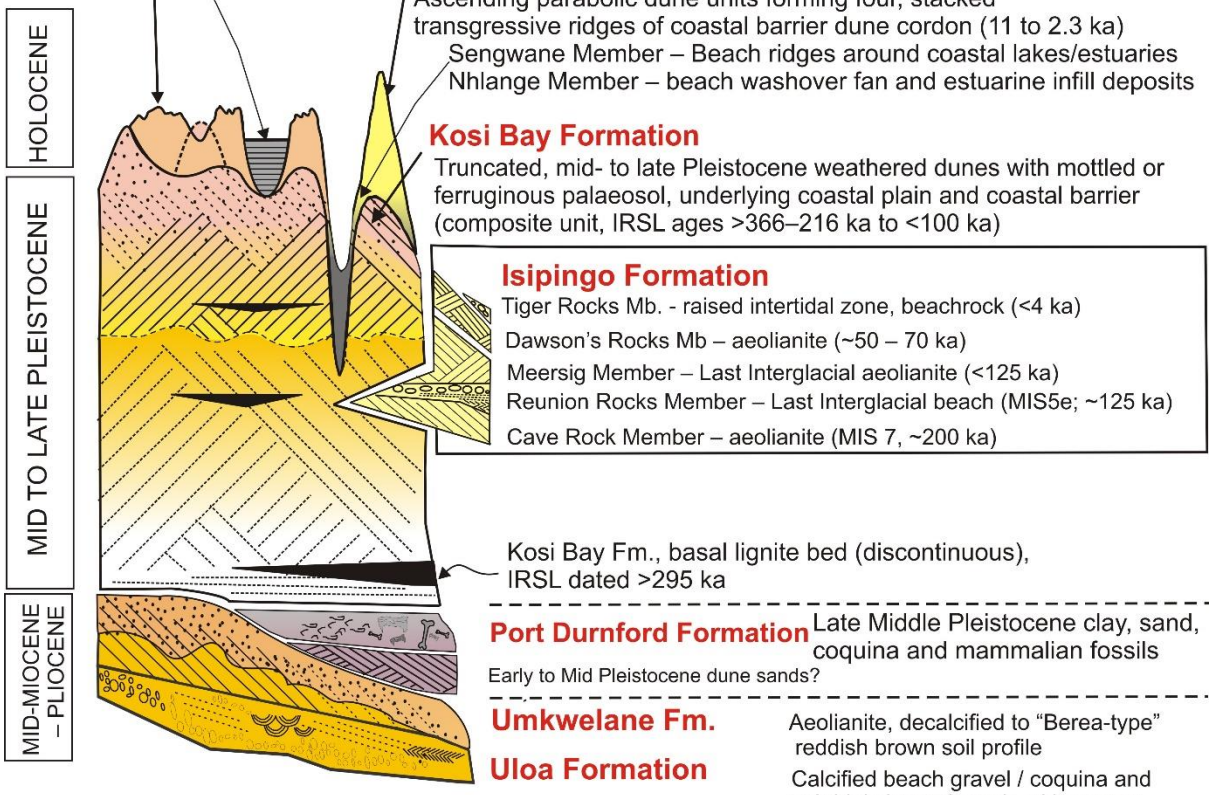
iSimangaliso Wetland Park


Field trip route
Cape Vidal beach
Bhangazi berm
Embomveni Sands
Mfabeni channel
Catalina Bay lookout
Mission Rocks
St Lucia
Makakatana overview
Tree house viewing platform
Makakatana
Pliocene beach
Khula Village
Duku
Dukuduku
Google Earth
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
Image © 2022 TerraMetrics
Image © 2022 Maxar Technologies
9 km
N


ISIMANGALISO
MARINE
RESERVE
(Greater St. Lucia)
O C E A N


Fanieselland
Vincent Islands
Mitchell Island
Eastern Shores
ISIMANGALISO
WETLAND PARK
(Greater St. Lucia)
ISIMANGALISO
MARINE
RESERVE
(Greater St. Lucia)
Cape Vidal
I N D I A N O C E A N
N-Q
K-Pas
Qkw
Qmf
Q-e
Qsi1
Qsi2
Qsi3

MAPUTALAND GROUP



KwaMbonambi Formation coastal plain parabolic dunes (~57–6 ka)
Mfabeni Member, interdune wetland peat (<7 ka)
Mseleni Member, diatomite (>53–13 ka)

Sibayi Formation
Ascending parabolic dune units forming four, stacked transgressive ridges of coastal barrier dune cordon (11 to 2.3 ka)
Sengwane Member – Beach ridges around coastal lakes/estuaries
Nhlange Member – beach washover fan and estuarine infill deposits

Kosi Bay Formation
Truncated, mid- to late Pleistocene weathered dunes with mottled or ferruginous palaeosol, underlying coastal plain and coastal barrier (composite unit, IRSL ages >366–216 ka to <100 ka)

Isipingo Formation
Tiger Rocks Mb. - raised intertidal zone, beachrock (<4 ka)
Dawson's Rocks Mb – aeolianite (~50 – 70 ka)
Meersig Member – Last Interglacial aeolianite (<125 ka)
Reunion Rocks Member – Last Interglacial beach (MIS5e; ~125 ka)
Cave Rock Member – aeolianite (MIS 7, ~200 ka)

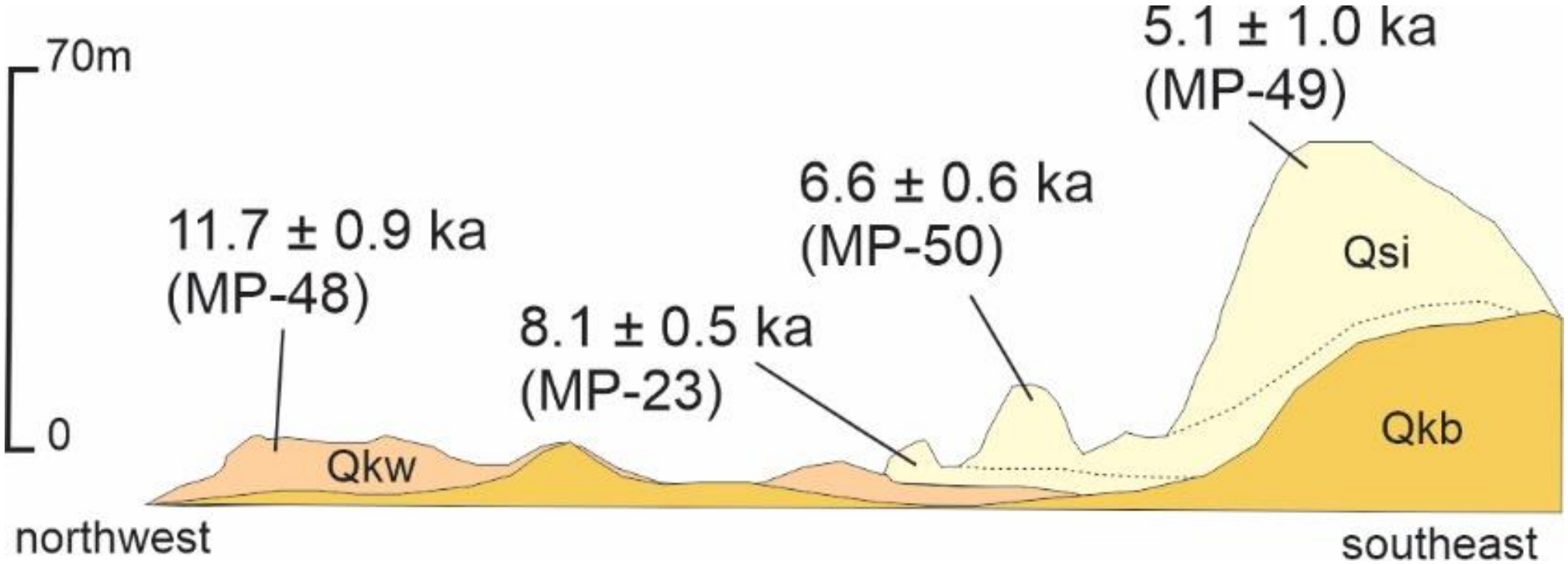
Kosi Bay Fm., basal lignite bed (discontinuous), IRSL dated >295 ka

Port Durnford Formation Late Middle Pleistocene clay, sand, coquina and mammalian fossils

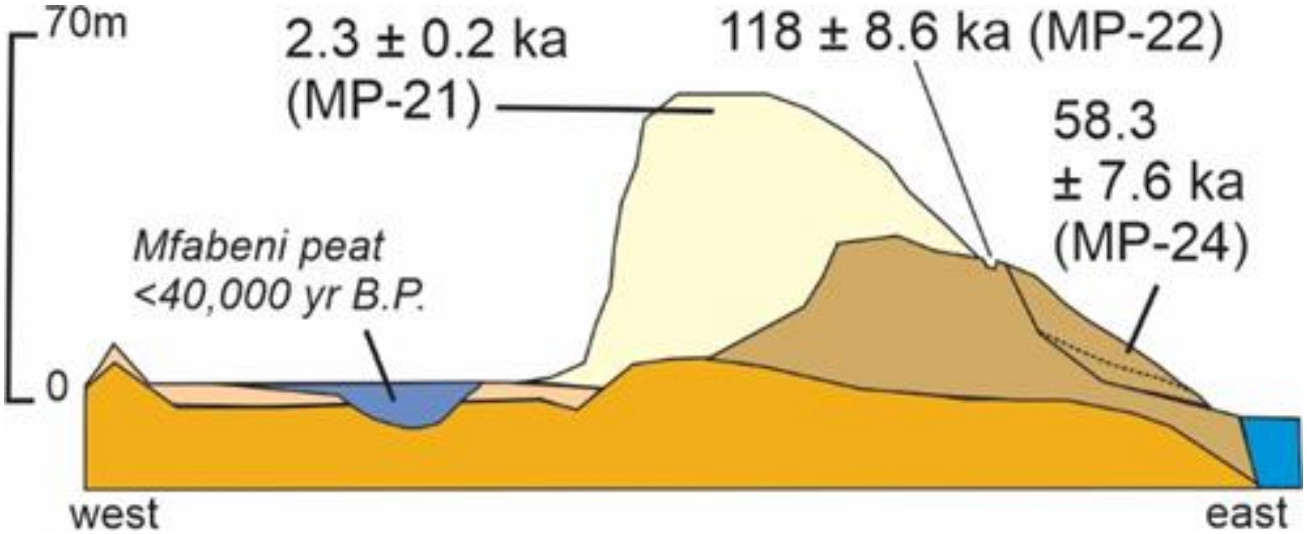
Early to Mid Pleistocene dune sands?

Umkwelane Fm. Aeolianite, decalcified to "Berea-type" reddish brown soil profile

Uloa Formation Calcified beach gravel / coquina and subtidal channel sands with oysters



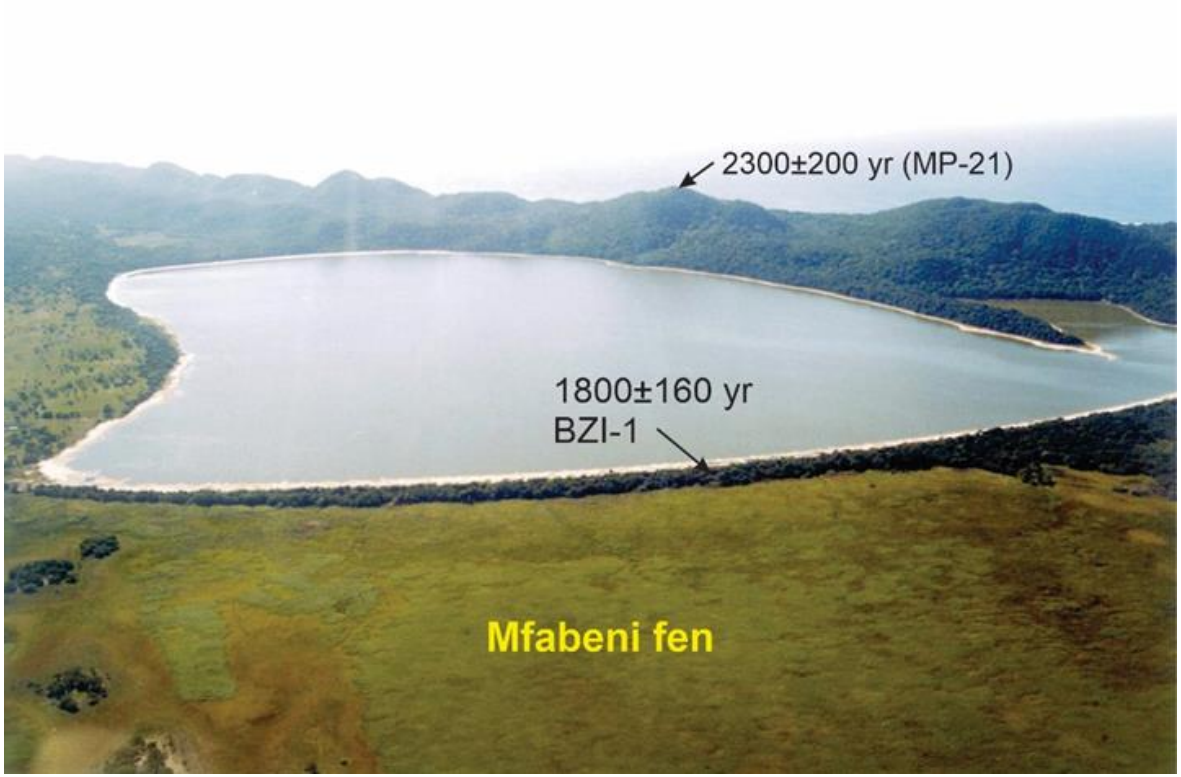
Catalina Bay to Mission Rock section across coastal barrier



Mfabeni to Cape Vidal (south) section across coastal barrier

The Mfabeni peatland, situated on the eastern shores of Lake St. Lucia, contains sediments dating back to 43,100 ^{14}C yr BP at a depth of 9.93 m (Grundling et al., 1998). Early studies carried out within this peatland focused on peat accumulation rates (Grundling, 1996; Thamm et al., 1996) and peatland stratigraphy (Grundling et al., 1998), rather than vegetation or climatic reconstruction.

Finch and Hill (2008) documented a continuous 44,000-yr pollen record derived from the Mfabeni Peatland. A detailed fossil pollen analysis indicates the existence of extensive Podocarpus, abundant coastal forests before ~33,000 cal yr BP. The onset of wetter local conditions after this time is inferred from forest retreat and the development of swampy conditions. Cool, dry conditions are recorded after 24,000 cal yr BP (23,000 ^{14}C yr BP), with a shift from Cyperaceae to Poaceae-dominated vegetation. Conditions during the last glacial maximum (~21,000 cal yr BP) are inferred to have been colder and drier than the present, as evidenced by forest retreat and replacement of swampy reed/sedge communities by dry grassland. Cooler, drier conditions marked the close of the Pleistocene. Forest growth and expansion during the Holocene Altithermal (~8000–6000 cal yr BP) indicates warm, relatively moist conditions. The mid-Holocene decline in Podocarpus at Mfabeni is interpreted as evidence of deforestation and a shift towards more open grassland/savanna, possibly due to burning. These signals of human impact are coupled with an increase in Acacia, indicative of the development of secondary forest and hence disturbance.



Lake Bhangazi (south) & Cape Vidal barrier section

CAPE VIDAL BEACH

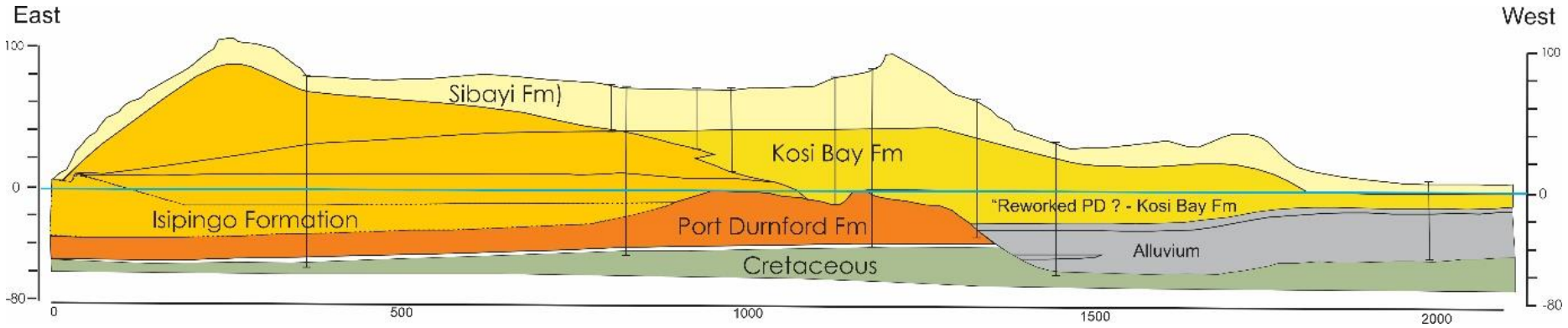
The Cape Vidal resort is a popular holiday and fishing destination. Thy site lies at the interface between the distinct terrain morphological zones on the coastal barrier dune.

The coastal barrier from Mission Rocks north to Cape Vidal comprises a core of late middle to late Pleistocene aeolian sands draped with at least three phases of Holocene dunes that accreted mainly under the influence of southerly windflow. However, at Cape Vidal the vegetated coastal barrier is formed from closely spaced, ascending parabolic dunes, directed mainly towards the southwest under a north-easterly wind regime. The reason for the youngest dune accretion pattern differing from the preceding phases is not clear. The shelf off Cape Vidal is the site of a bedload parting zone where an eddy in the southward flowing Agulhas current splits and circulates sediment towards the coastline.

A walk towards the south along the intertidal zone will traverse a beachrock platform. The eroded face of the barrier dune exposes older, weakly calcified Isipingo Formation dunes that accreted against the barrier core of older MIS5 dunes that area more cemented. The area is known for mammalian fossil bones and teeth so keep your eyes open!

CIRCULAR DRIVE; LAKE BHANGAZI, SIBOMVINI RIDGE

This new game viewing road crosses the Lake Bhangazi (south) barrier and traverses the slopes of Sibomvini whaleback ridge where the rubified late middle Pleistocene dunes have been remobilized. Looking eastward to the forested coastal barrier dune cordon, the geological cross section below gives some insight into the composite nature of this barrier dune that has been constructed by pulses of parabolic dune accretion over the past 200 ka.

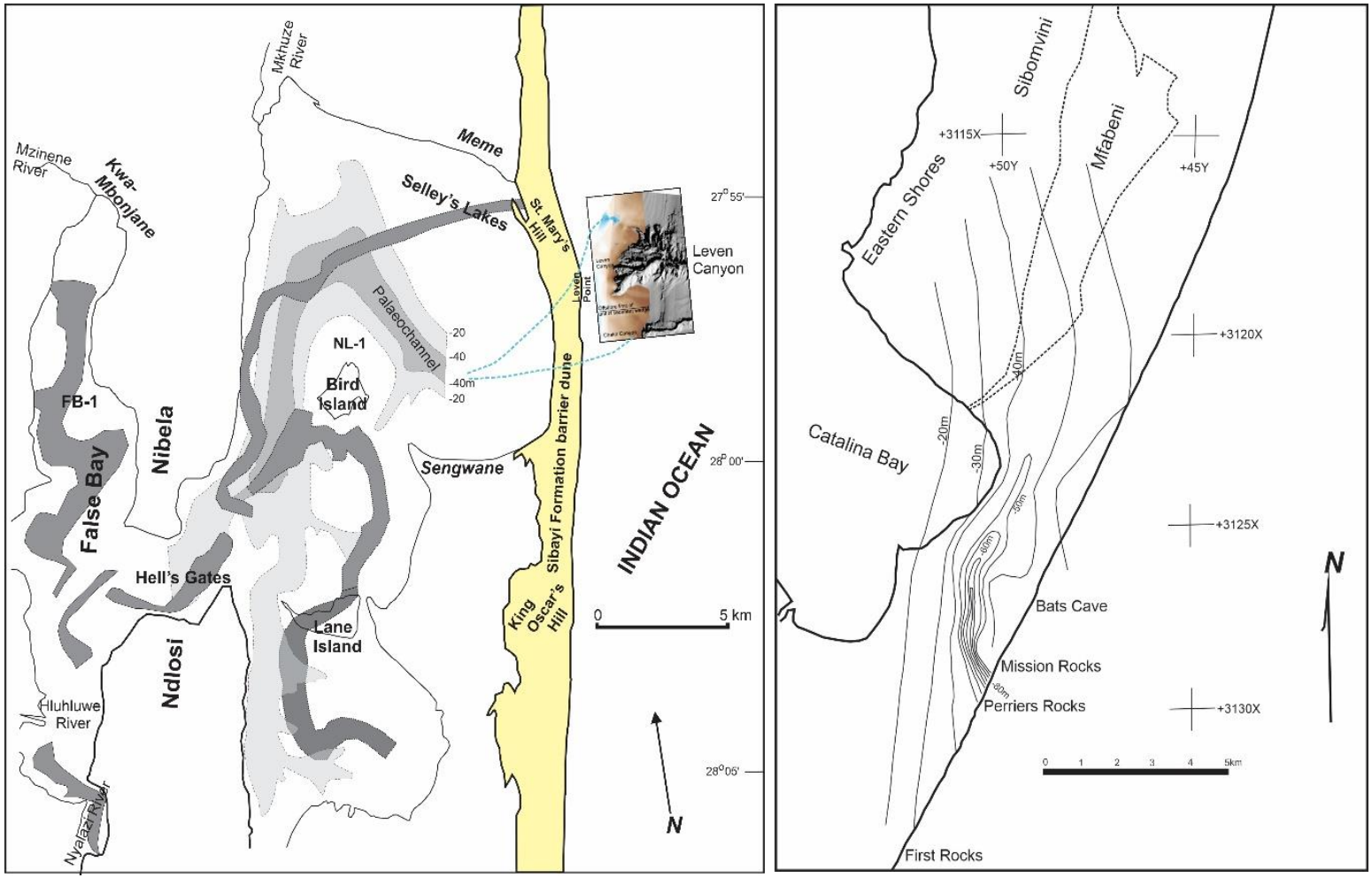


The area was formerly afforested under Pine plantations which were felled as part of the commitment to meet the requirements for UNESCO World Heritage Site status. The alien trees withdrew a lot of the shallow groundwater and reduced the critical shallow groundwater seepage onto the eastern shoreline where the fresh water springs represent ecological refugia during drought periods when the high evaporation rate results in the lake area shrinking and the water becomes hypersaline.

The pioneer vegetation is low scrub that attracts both grazing and browsing antelope. It is not uncommon to see large herds of kudu and even Cape buffalo in this area. The swamp forest along the channel draining Mfabeni swamp drains fresh water into Catalina Bay.

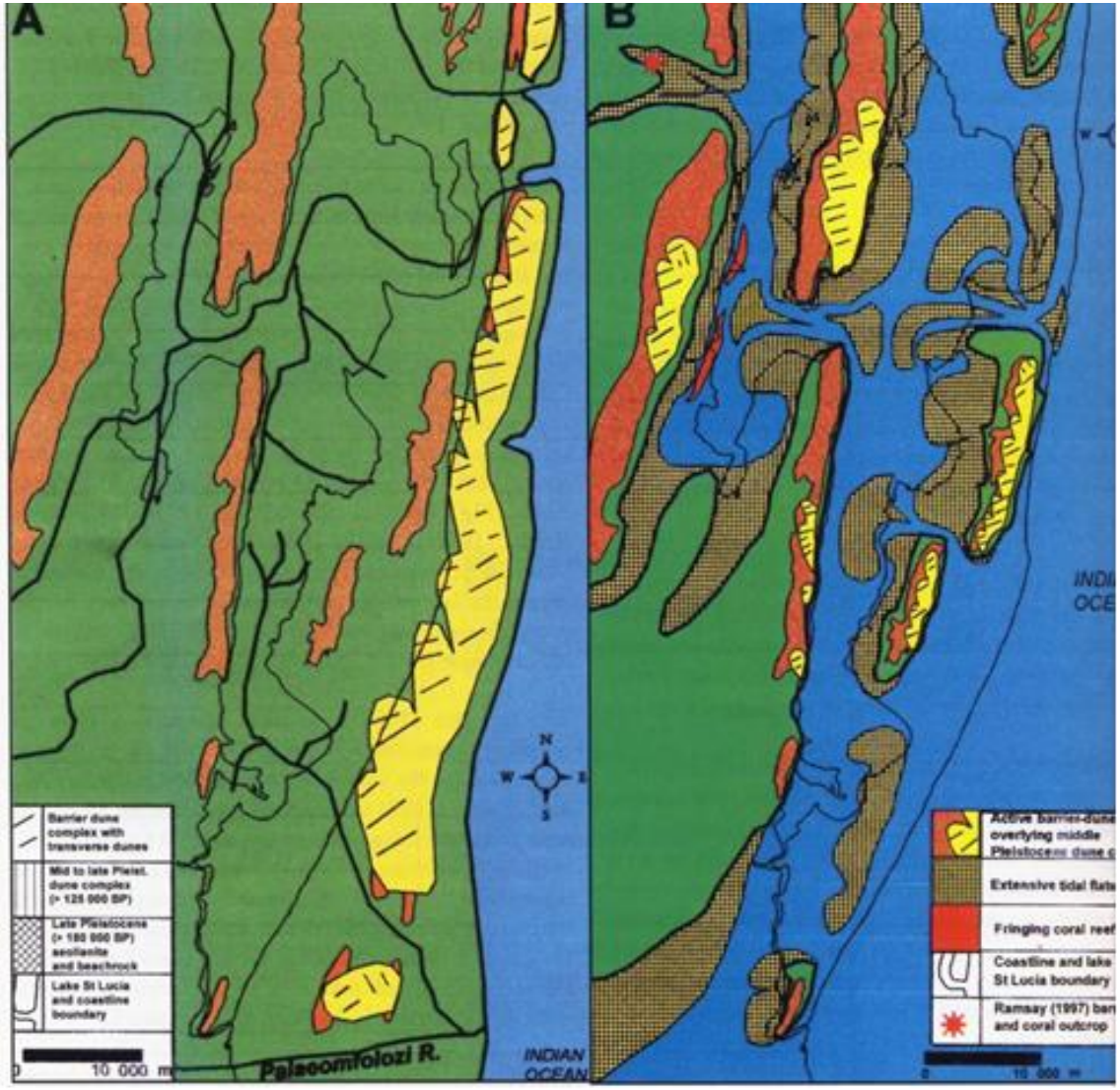
Groundwater modelling by Vaeret et al (2007) has shown that the removal of Pine plantations had a larger effect than a 10% increase in precipitation or the groundwater table rise induced by a 40 cm rise in sea-level.

Hippo in an interdune hollow where the rising groundwater table has submerged an area where Pine trees formerly grew (photo Ricky Taylor).

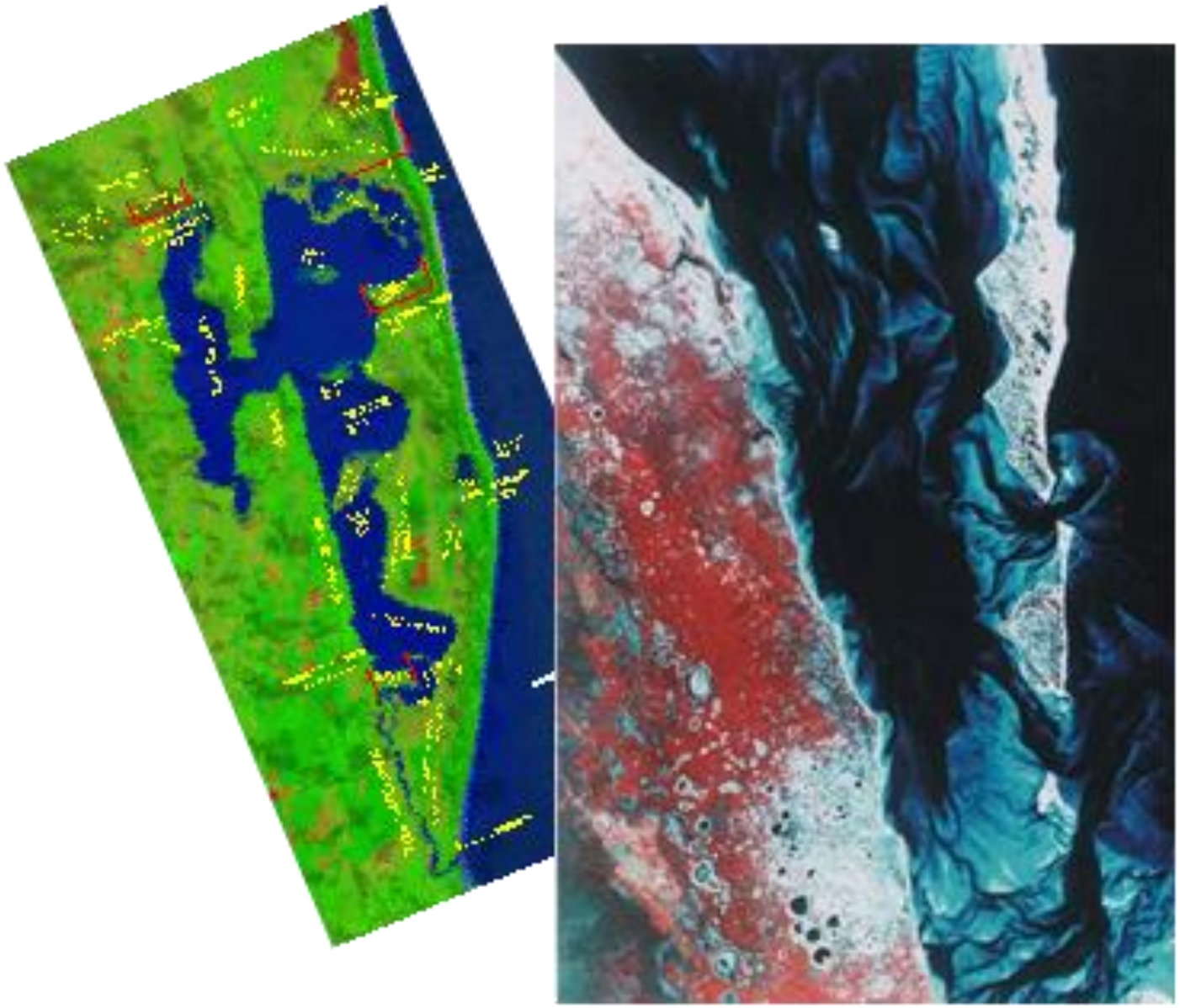


(Right) Infilled palaeo-channels beneath northern St Lucia lakes,

(left) deeply incised narrow channel underlying Last Interglacial Isipingo Formation just south of Mission Rocks



Evolution of the St Lucia estuary basin over the past 125,000 years (Wright, 2002). (A) During the Last Glacial Maximum when sea-level was ~130 m lower than present the basin was dry land incised by stream channels. (B) During the Last Interglacial the core of the present coastal barrier could have been a barrier island similar to the present Bazaruto system and the basin with tributary rivers were flooded.



Comparison of the Lake St Lucia basin and associated barrier dune with the Bazaruto archipelago in central Mozambique which could represent an environment similar to that which exited in the St Lucia basin during the sea-level highstand of MIS 5e. In both sites the parabolic dunes form the composite eastern barrier that prograded over late Pleistocene dunes. The Bazaruto tidal sand flats can be compared with early Holocene marine deposits within the bed of the lake.

Fig. 10.x b

Fig. 10.x c

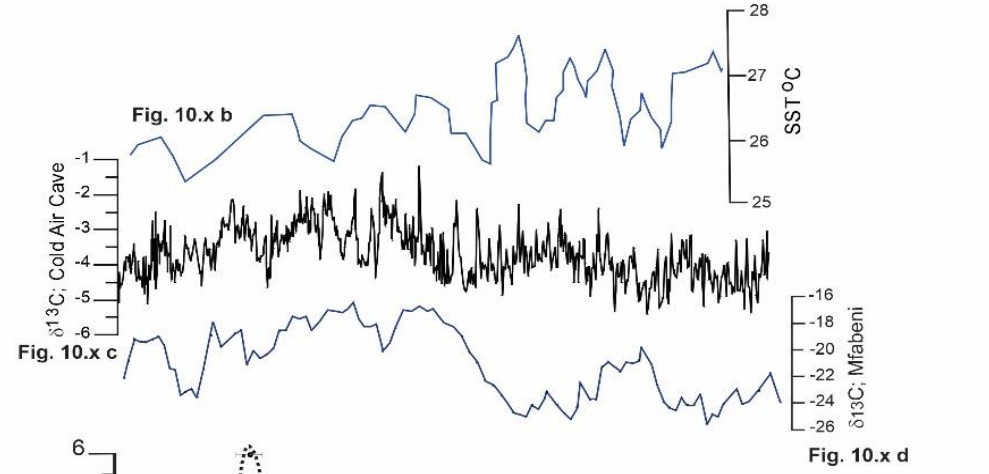


Fig. 10.x d

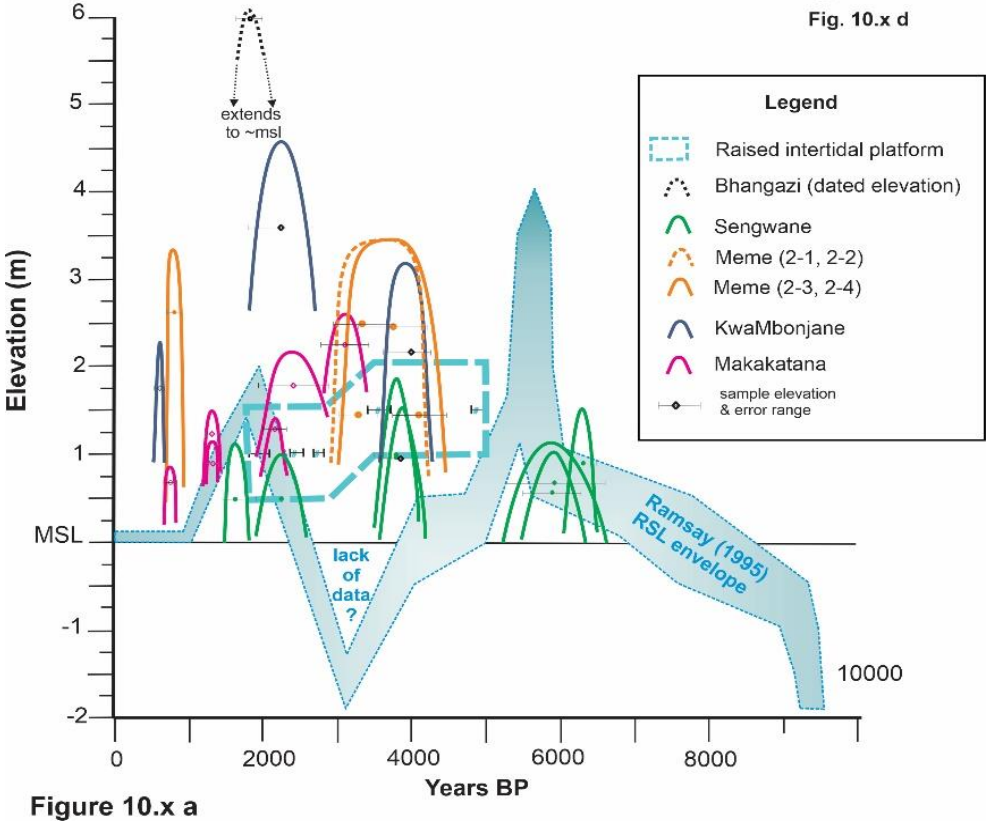
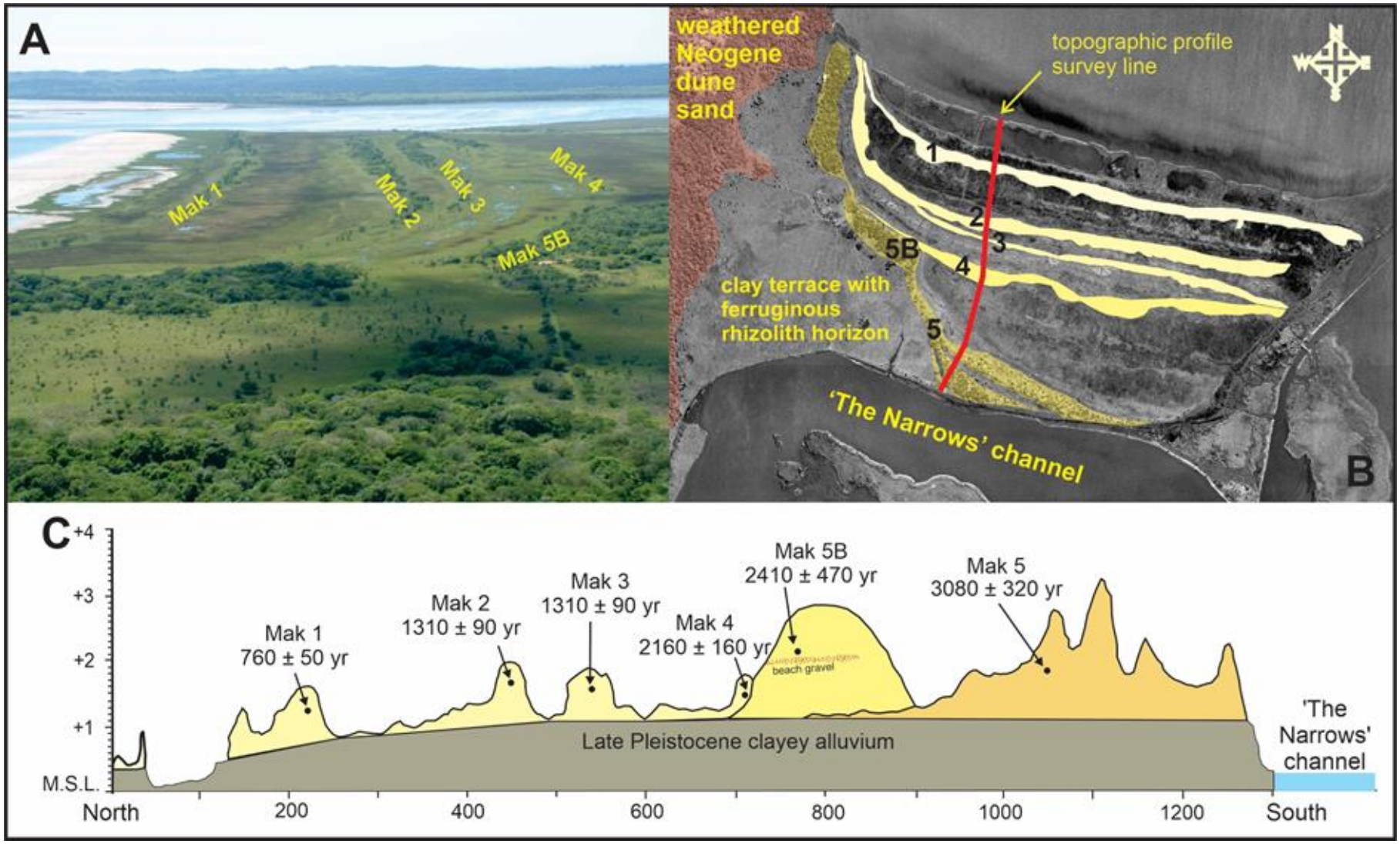
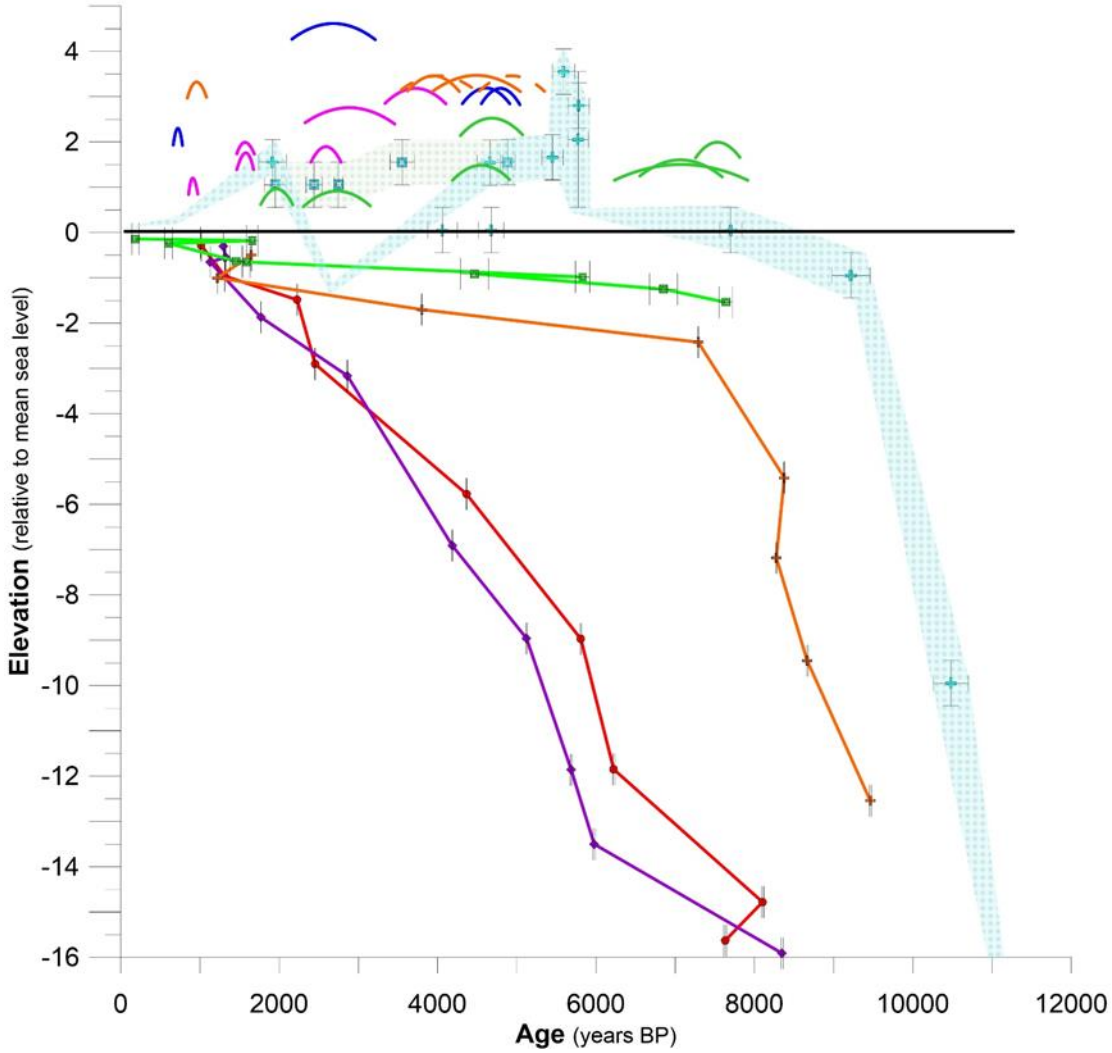


Figure 10.x a



Makakatana beach ridges & correlation with lake infill during the Holocene


4
2
0
-2
-4
-6
-8
-10
-12
-14
-16
Elevation (relative to mean sea level)
0
2000
4000
6000
8000
10000
12000
Age (years BP)