INTRODUCTION

Aims

This report investigates the history of dredging in Cleveland Bay and aims to assess its influence on sediment movement and on the growth of mangroves, fringing coral reefs and seagrass. The history of dredging will be traced from its small scale beginnings in 1883, when the port of Townsville was starting to emerge, through its important role in the subsequent development of the port. Attention will be focused on the location of dredging, the amount and types of material dredged and the dump sites used for its disposal. All available Townsville Port Authority records have been used, together with records from the Queensland Department of Harbours and Marine (and its predecessors) and Port of Brisbane Authority, in so far as they relate to dredging in the Port of Townsville.

Assessment of the influence of dredging will be made in relation to changes identified on a series of aerial surveys flown between 1941 and 1988. Changes shown on a limited number of replicate coastal ground surveys, carried out by the Beach Protection Authority and the Townsville Port Authority, will be considered also. Such an assessment must take into account the natural processes operating in the area. Here the processes operating in the coastal catchments relating to geology, climate, and river regime will be examined in so far as they influence fluvial sediment supply to the coast. Man's intervention in the natural sediment supply system and his pollution of parts of it will be considered as well. Marine processes relating to wind, wave and tidal conditions will be examined, concentrating especially on their effects on sediment movement both over the sea-bed and in suspension.

Because of limitations in the earlier dredging records between 1883 and 1964 only a broad general assessment of the effects of dredging can be made for this period. The

existence of much more detailed dredging records and data relating to processes enables a more detailed assessment to be made for the subsequent period between 1965 and 1988. Separate consideration will be given then to coastal and intertidal zone changes, and changes to the mangrove coasts, the fringing coral reefs and the seagrass beds, which extend from the intertidal zone into adjacent parts of the subtidal zone.

Cleveland Bay Area

Cleveland Bay located at about latitude 19°S, is approximately 17km square and faces north-eastwards to the Coral Sea (Figure 1). On its north-west side is Magnetic Island which is separated from the adjacent mainland by the narrow and shallow West Channel. The 15m isobath lies across the entrance to the bay with the 10m isobath approximately parallel to it on its landward side. A channel, which Carter and Johnson (1987) named Orchard Channel, runs parallel to the north-east coast of Magnetic Island and these isobaths swing south round it. The central and southern parts of the bay slope gently landwards. West Channel in its shallowest central part is under 4m depth with the elongated Middle Reef rising above Low Water Mark (LWM) on its south side. Townsville Harbour has been sited on the south-west coast of Cleveland Bay with the artificial Platypus Channel, the main approach channel for shipping, extending northwards from it and terminating in the dog-leg Sea Channel off the south-east coast of Magnetic Island.

The coast of Cleveland Bay is mainly depositional in type but with the granite and volcanic rock headlands of Cape Pallarenda and Cape Cleveland bounding it on its western and eastern sides repectively, and Kissing Point forming a low granite promontory on the south-west coast. Seagrass has colonized on an intertidal and subtidal foreland north of Cape Pallarenda. A series of beach ridges flank the west coast of the bay, which has a narrow sand beach backed by low sand dunes. The south-east coast between Kissing Point and

Townsville harbour is backed by an artificial wall of large rocks to protect The Strand in Townsville from coastal erosion, and only a narrow sand beach lies at its foot. The mouths of Ross River and its distributary Ross Creek now form part of the Port of Townsville with the harbour extending seawards between them. Previously this area was part of the aggrading Ross River delta, which extends westwards to the mouth of Sandfly Creek. A series of beach ridges have developed here as the coast extended seaward. Further east, along the south coast of Cleveland Bay a beach ridge and chenier plain has formed north of the Muntalunga Range, with narrow sand ridges interspersed by salt flats with saltmarsh along their margins. Alligator, Crocodile and Cocoa Creeks flow in meandering courses across this plain. Along the whole coast eastwards from near the Ross River mouth to the southern end of Cape Cleveland a strip of mangroves straddles High Water Mark (HWM) and is flanked by an intertidal zone of fine silty sand. Along the west coast of Cape Cleveland, rock headlands separate sandy bayhead beaches, with mangroves colonizing in the most sheltered localities. In the lower part of the intertidal zone and the adjacent part of the subtidal zone along the south and east coasts of the bay, extensive seagrass beds have developed.

The triangular shaped Magnetic Island is formed mainly of granite with volcanic rocks outcropping near West Point. The north and south-east facing coasts consist of rock headlands, with bays between containing sandy bayhead beaches. In the most sheltered localities fringing coral reefs have formed and these are best developed in Geoffrey, Nelly and Picnic Bays on the south-east coast. The south-west coast flanks West Channel and gains maximum shelter from the prevailing south-east winds and waves. Here the largest fringing coral reef is found and landwards a belt of mangroves has developed near HWM. Seagrass grows in sediment on the reef flat.

Units of Measurement

Inevitably in records such as those relating to dredging which span a period of over 100 years, different units have been used at different times. In addition to imperial and metric units which may be converted readily, other units, eg barge yards, were used, the precise meaning of which has proved impossible to determine. For uniformity of treatment within Chapter 1 concerned with the 'History of Dredging in Cleveland Bay' the original units are retained as used in the Townsville Port Authority records and in the various reports and books referred to. This also should assist those readers who wish to refer back to the source material. Elsewhere in the report, in the text, tables and figures metric measurements are used except where conversion proved impossible.