EROSION AT AMITY POINT – AN EXAMPLE OF SHORELINE RECESSION IN A TIDAL INLET

by **J.M. Eberhardt**

(with 5 Text-figures)

ABSTRACT. Erosion at Amity Point on North Stradbroke Island is related to the eastward migration of Rainbow Channel resulting from the re-alignment of South Passage to a North-South orientation. Available survey records, aerial photographs, and recent research document this change. Slumping of the channel banks occurs and erosion is greatest where Rainbow Channel is closest to the shore. Rock groynes constructed since 1972, have interrupted the southward movement of beach sediment thereby increasing erosion.

INTRODUCTION

Amity Point, at the northwest extremity of North Stradbroke Island, forms the southern margin of the South Passage tidal inlet (Text-fig. 1)

The months of November to June are dominated by south easterly winds with frequent strong north easterlies, whereas from July to October the winds are more variable tending south westerly to north westerly. Waves from the southeast, west and northwest, are refracted by shoals in the South Passage tidal delta; those from the northeast and southwest having a less restricted approach along Rainbow Channel. Spring tide range averages 1.8 m and the neap tide range averages 1 m. Tidal velocities of 4½ knots have been recorded in the South Passage (Maxwell 1970), and both ebb and flood tides affect the channel inshore at Amity Point, with ebb velocities being the greater of the two (Edwards 1971; Higgins 1971).

ACKNOWLEDGEMENTS

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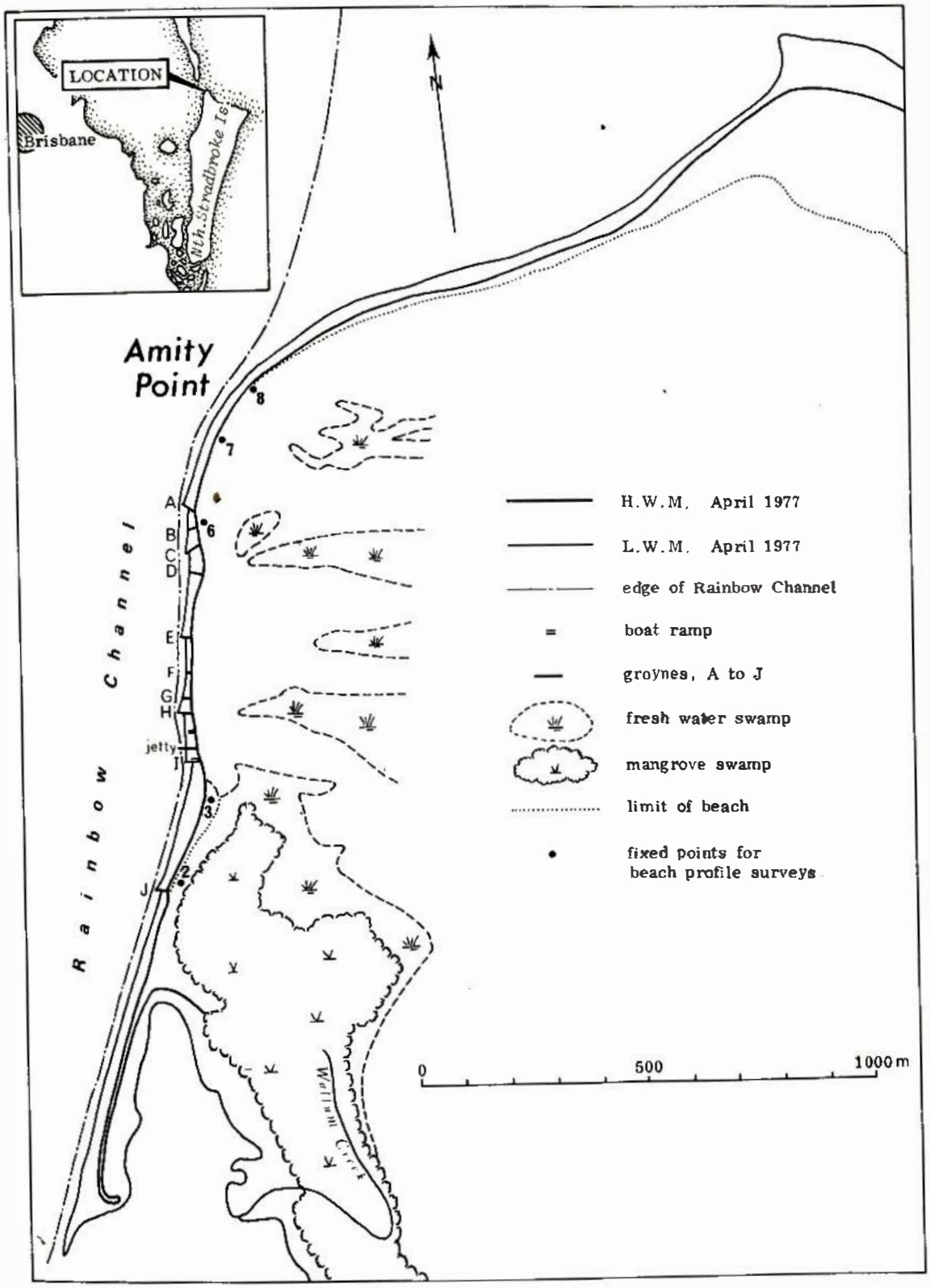
HISTORY OF EROSION

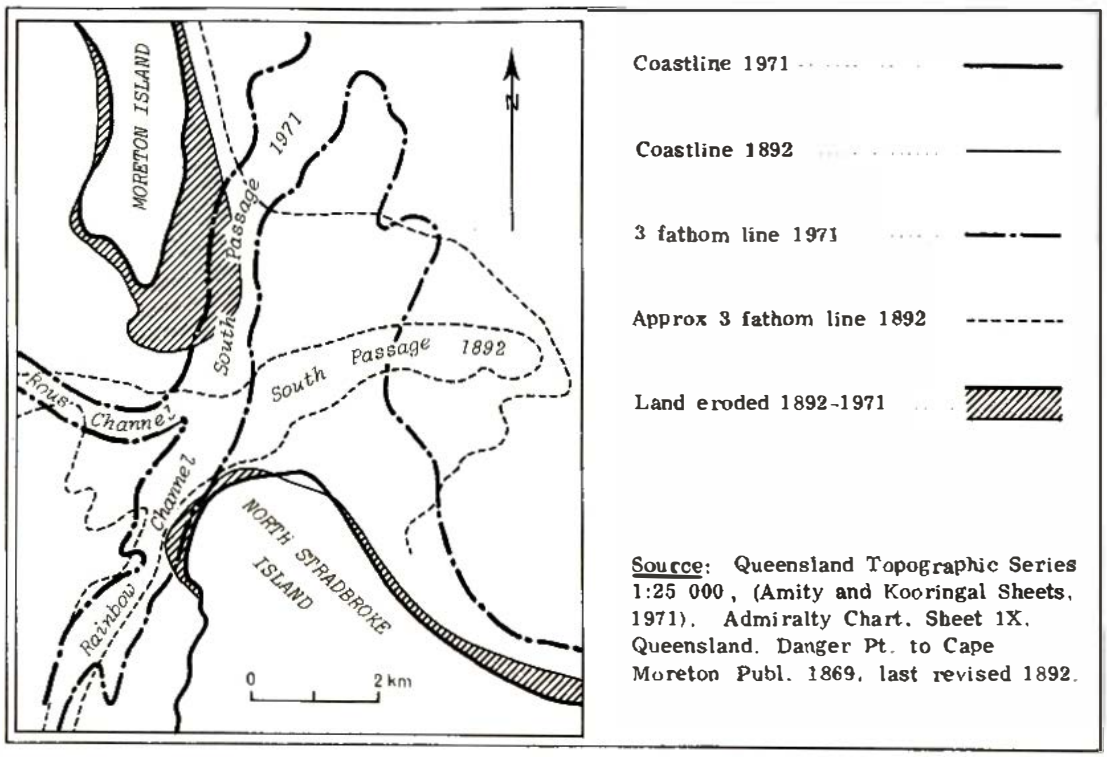
Rainbow Channel is shown on the revised (1892) Admiralty chart of the South Passage. Since 1892 South Passage has moved northward, whilst Rainbow Channel has meandered towards the shore at Amity Point inducing erosion (Text-figs 2, 3). Corroborating evidence of erosion is available in



Text-fig. 1 Amity Point – Physical Features

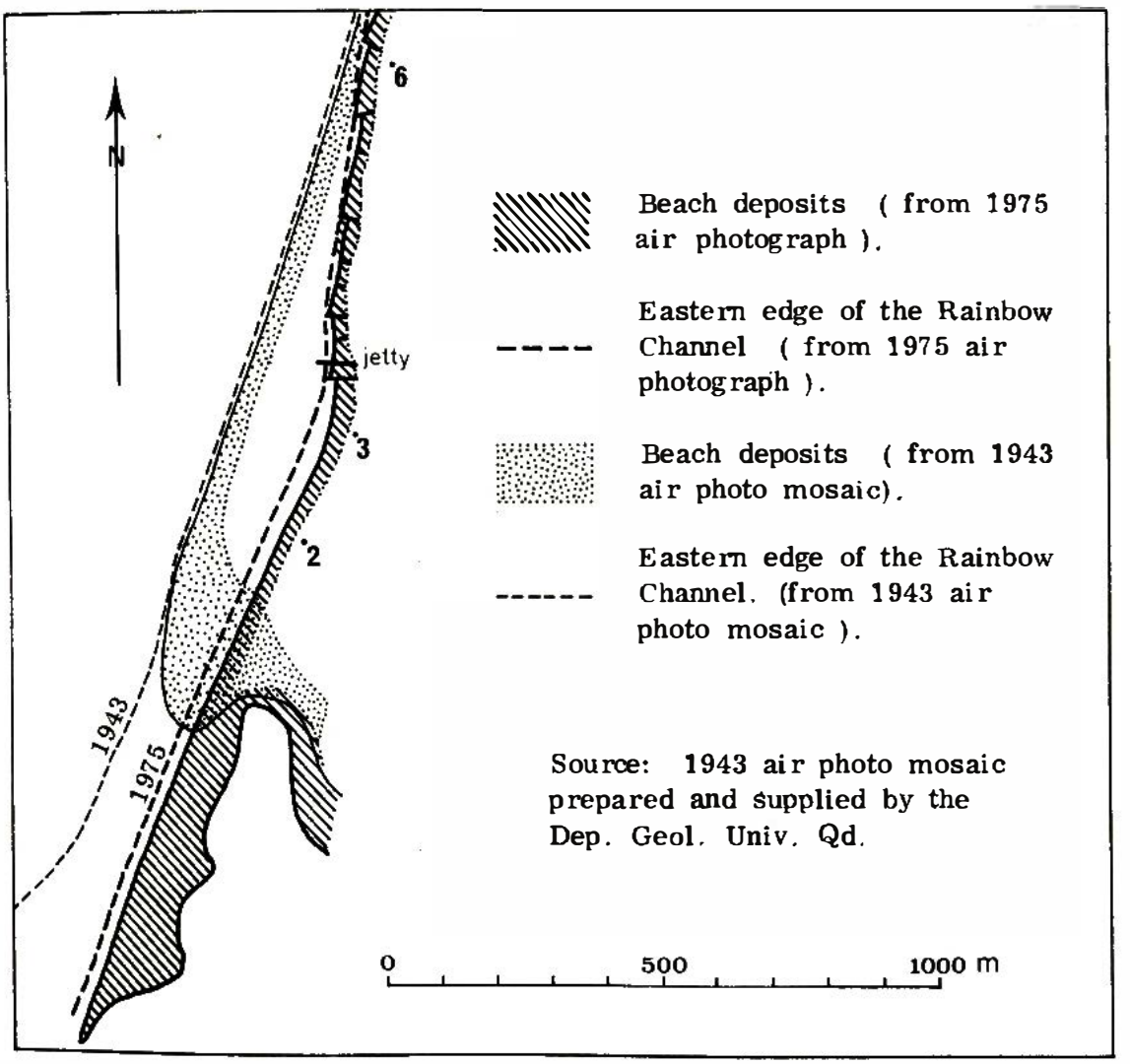
historical writings, survey records and sequential aerial photographs. In 1913 Thomas Welsby, local historian and yachtsman, stated that he had known large ships which had carried away tons of sand at Amity. In a later work (1922) he also recorded how those who obtained land in the subdivision of 1886, became watertitle-holders after Rainbow Channel had moved eastwards. The easterly displacement of the channel is evident on aerial photographs (Text-fig. 3), and successive positions of high water mark (Text-fig. 4) shown on the Town Plan provide evidence of the substantial and continuing erosion.

Slumping is not the only process effecting channel migration. Erosion of the channel side progresses steadily with time, and may be related to tidal scour (see Brunn & Gerritson 1960). Aerial photographs show the development of a shelf extending from above low water mark to the edge of the channel following the construction of groynes in 1955. Wooden groynes were in use at Amity Point prior to the investigations of Patterson (1970), Edwards (1971), and Higgins (1971) but the construction of substantial rock groynes since 1972, has added a new dimension to the pattern of erosion.

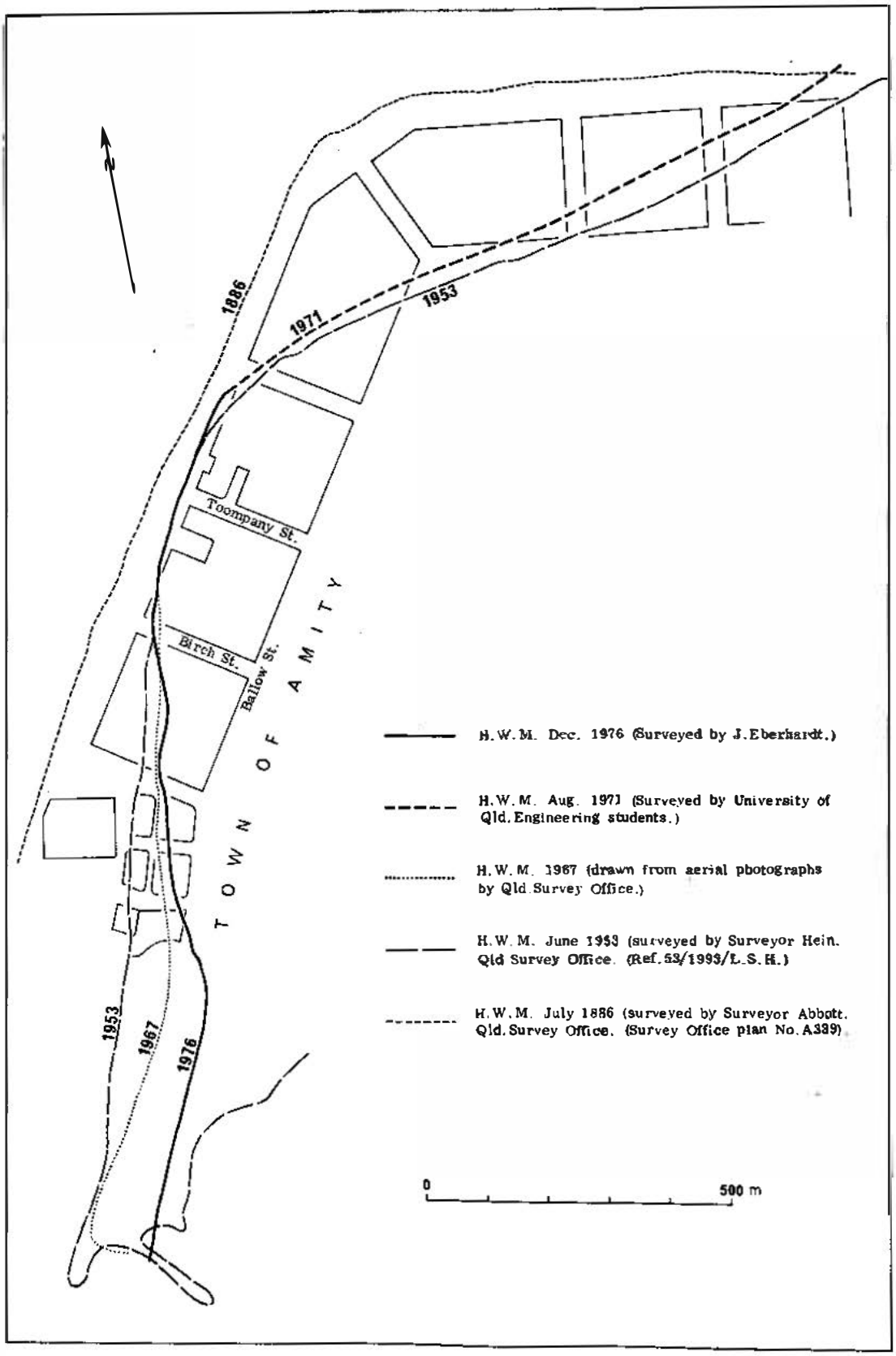


Text-fig. 2 Inlet changes (1892-1971)

Beach profiles surveyed in January 1972 by Beach Protection Authority, have been compared with profiles surveyed during the current investigations. These confirm an easterly migration of the edge of the channel, at an average rate of 1.5 m per year for all points south of survey point 7 (Text-fig. 1). The position of high water mark has receded at unequal rates, averaging 3 m per year (approximately) in the southern area, and less than 2 m per year on profiles 6 and 7. Beach profile changes over the past year do not conform to this longer trend, since positive changes have been recorded on profiles 2, 7 and 8 (see Text-fig. 5).

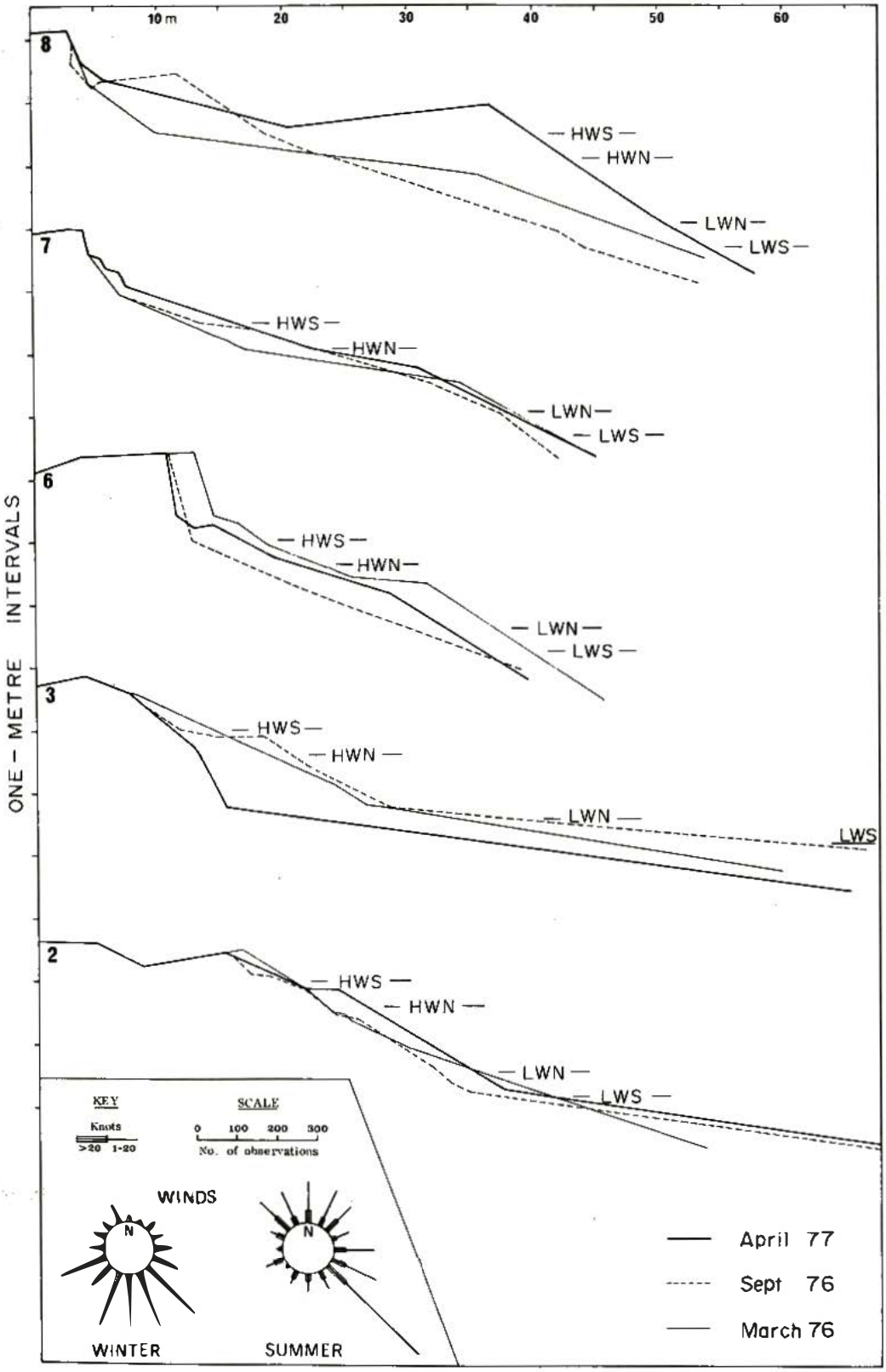


Text-fig. 3 Shoreline changes at southern Amity Point (1943-1975)



Text-fig. 4. Coastline variations at Amity Point (1886-1976).

Source - Beach Protection Authority, map number Sc881.



Text-fig. 5 Beach profiles at Amity Point to show seasonal changes.

For locations of profiles see Text-fig. 1, page 83.

Note that the profiles are oriented east to west as viewed from the north.

Tracing of sediment movements on the beach under north-easterly and south-easterly conditions, over the complete tidal cycle using the technique of Flood (1974) showed net movement of sediment southwards along the beach. Only small numbers of fluorescent sand grains were detected south of groyne A in the weeks following the release of tracers on profile 7. It is, therefore, possible that the groynes serve to deflect sediment from the beach into the channel, where it is carried away by strong tidal currents. To the south of groyne A the increasing width of the shallow shelf allows the deposition of sand. This is returned to the beach during periods of constructive wave action, and has promoted the elongation of the southern spit (see Text-fig. 3).

CONCLUSIONS

The erosion of Amity Point is primarily due to the easterly migration of Rainbow Channel and this is associated with a shift in the alignment of the South Passage. Rainbow Channel is also affected by strong tidal flow and occasional slumping, due to over-steepening of the channel banks. Strong wave action causes sand to be lost from the shore to the channel, so that erosion is at a maximum where the channel is closest inshore.

The construction of rock groynes across the beach has accelerated erosion in the area most affected by the migrating channel. Limited local stability has been achieved in the area immediately to the north of the groyne system but increased recession of the shoreline has occurred on the down-drift side of each groyne.

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