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Beach Erosion, May-June, 1974, Central and South Coast, NSW

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Abstract

Between May 24th and June 18th 1974, three periods of erosive wave conditions dramatically changed the character of many beaches along the central and southern New South Wales Coast. This paper documents and evaluates regional variations in the responses of beaches to these erosional events for selected portions of this coast (Figure 1).

Keywords

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Disciplines

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Beach Erosion, May-June, 1974, Central and South Coast, NSW

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Between May 24th and June 18th 1974, three periods of erosive wave conditions dramatically changed the character of many beaches along the central and southern New South Wales Coast. This paper documents and evaluates regional variations in the responses of beaches to these erosional events for selected portions of this coast (Figure 1).

Meteorological conditions

Erosive wave conditions were brought about by winds set up by a recurring pattern of pressure events over southeastern Australia and adjacent coastal waters. The pattern began with the development of an extra-tropical low-pressure cell over the western Tasman Sea, together with the migration eastwards across the Great Australian Bight of an intense Antarctic high-pressure cell (Figure 2a). The high-pressure cell subsequently ridged northwards across the continent, while the low became stationary and intensified over the unseasonably warm waters of the Tasman Sea. Central pressures within the lows and highs were 988-1008 mb and 1030-1032 mb respectively; sea temperatures were 2.5°C above normal. The fully developed synoptic pattern (Figure 2b) remained stationary for several days, during which time

southeasterly onshore winds averaging 40 km/h generated high-energy waves.

Wave and tide conditions

Figure 3a shows significant wave heights recorded from both a deep water and an inshore wave-rider buoy at Port Kembla, and reveals three distinct periods of high-energy waves, centred on May 27th, June 4th and June 13th. Refraction reduced inshore wave height by about 33%. Data from both buoys indicate the May 27th and June 13th storms as being of equal intensity, but more severe than the intermediate event. Unlike wave height, wave period was consistent throughout, averaging 8-9 seconds.

The erosive effect of these waves was exacerbated by their superposition upon unusually high tides resulting from the coincidence of syzygy and perigee. Figure 3b compares the predicted low and high astronomical tides with those observed at Jervis Bay, and is representative of similar but incomplete records for Newcastle, Sydney and Port Kembla. Except during the intermediate event, wind and wave set-up caused actual values to exceed those predicted by 0.7m and 0.6m for high and low tide respectively - the highest such difference ever recorded along this coast. Individually, these storms would have eroded beaches significantly, but because they occurred within such a short time without subsequent beach recovery, their effects were additive. Exceptional as these storms were, the resultant erosion varied both locally and regionally along the coast.

Description of beach responses

Beach responses within the Sydney metropolitan area and at Moruya have previously been documented by Foster *et al* (1975) and McLean and Thom (1975) respectively.

In the Broken Bay area, the severity of the storms' effects depended upon beach location. Large ocean beaches such as Palm, Putty, McMaster and Terrigal experienced continuous cliffing of the frontal dune with seaward movement of sand similar to that of the 1967 storms (Stone, 1967, and Short, 1967). Smaller ocean beaches like Tallow and Whale however suffered more severe cliffing, losing up to 7m of their dune system. Inside the bay storm waves overtopped and eroded 7m-high dunes on Pearl Beach and frequently surged over Patonga spit. In addition, the June 13th storm eroded parts of Terrigal and Whale beaches to bedrock. Despite the general severity of these storms, Ocean Beach and the Pittwater side of Palm Beach underwent only slight erosion.

Erosion in the Jervis Bay area was influenced more by beach aspect than by location. Inside Jervis Bay, normally inactive beaches lost up to 25m of their dune systems at Callala (Fleck, 1975) and Vincentia. Outside the bay, on southeasterly facing Cudmirrah

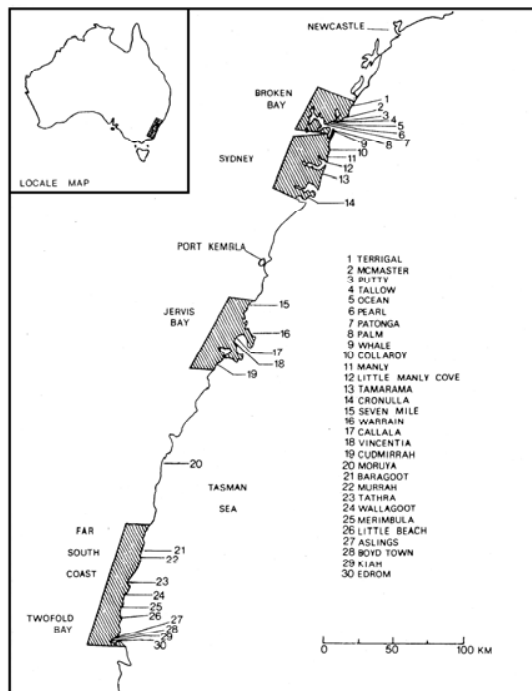


Figure 1 Locality Map

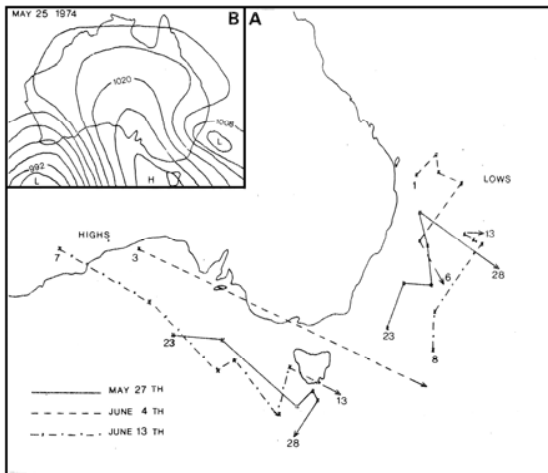


Figure 2 a) Pressure tracks b) Synoptic chart

Beach, surveyed rates of dune retreat increased northwards from 2m to 40m, exposing a previously buried boulder beach, bedrock cliff and rock platform. However, on northeasterly facing Warrain Beach the incipient foredunes, although slightly cliffed, still protected the 1967 erosional scarp. This same scarp remained intact on Seven Mile Beach.

Erosion of Far South Coast ocean beaches tended to be greater on central portions of individual beaches and on those beaches with a more easterly aspect. Southeasterly-facing Baragoot and Wallagoot were least affected while easterly-facing Murrah lost a 6m-wide incipient foredune platform and 3-4m of foredune, Little Beach at Jiguma, although more

sheltered, was severely eroded along its entire length. Erosion decreased towards the ends of beaches except where water debouched from estuaries and lagoons. Tathra Beach retreated at least 25m near the mouth of the Bega River and at Murrah nearly 1 ha of bedrock was exhumed adjacent to Bunga Lake. Within Twofold Bay, Aslings, Boyd Town and Kiah beaches were minimally degraded despite frequent overtopping by broken waves. Edrom, smaller and usually sheltered, was severely eroded, losing 3m of its 1.5 high foredune. On these four beaches the greatest sand loss occurred in the vicinity of the inlet mouth.

Discussion and conclusions

Three trends emerge from these summaries of beach damage. Firstly, large exposed ocean beaches such as Wallagoot, Palm and Putty withstood the destructive forces of the storms better than pocket beaches such as Tallow, Whale and Tamarama. These larger beaches were more able to accommodate and absorb a wide spectrum of storm waves than the pocket beaches, the latter being forced by their spatial confinement to forfeit a greater portion of their backshore in attaining an equilibrium profile.

Secondly, there was a group of beaches whose responses were governed by refraction of the incoming waves. Seemingly sheltered beaches at Little Manly Cove, Edrom and Jiguma were badly eroded because intense refraction concentrated wave energy into these areas. On the other hand, seemingly exposed beaches such as Aslings and Ocean Beach were not badly eroded because their plan form was well adjusted to the refracted southeasterly swell.

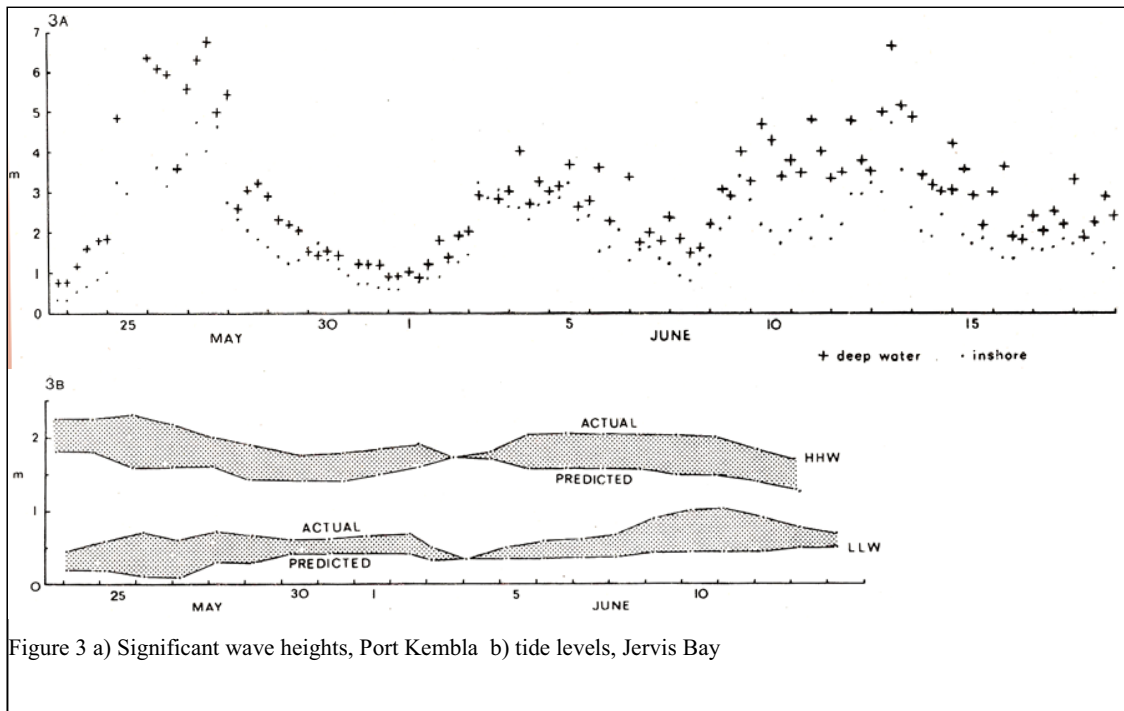


Figure 3 a) Significant wave heights, Port Kembla b) tide levels, Jervis Bay

Furthermore, erosional responses to the refracted storm swell varied both locally along, and regionally between, individual beaches. For example, wave energy and the magnitude of erosion increased concomitantly towards the centre of Baragoot and Wallagoot beaches on the Far South Coast, but northward on Palm and Terrigal beaches on the Central Coast. As a general rule, Central and Far South Coast beaches suffered greater erosion the more southeasterly and easterly their respective aspects.

Finally there was a group of Sydney metropolitan beaches including Cronulla, Manly and Collaroy where human influence was manifest. Here, construction of seawalls prohibited optimum utilization of the foredune sand store, and by reflection, enhanced the erosive capacity of impinging waves.

While all beaches were eroded to some degree, well defined trends emerge when the intensity of such erosion is reviewed. Typically, greatest erosion occurred:

- i)* on pocket beaches;
- ii)* on those beaches where wave energy was concentrated by refraction;

iii) where seawalls had been constructed;

iv) adjacent to inlet mouths.

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