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Australian Beach Systems—Nature and Distribution

Andrew D. Short

Coastal Studies Unit
School of Geosciences
University of Sydney
Sydney NSW 2006 Australia
A.Short@geosci.usyd.edu.au

ABSTRACT

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The Australian coast contains 10,685 beach systems, which occupy half the coast and can be classified into 15 beach types. These include six wave-dominated, three tide-modified, and four tide-dominated types which are a product of wave-tide and sediment conditions and two types which are influenced by intertidal rocks and fringing reefs. Wave-dominated beaches occupy the higher energy, microtidal southern coast exposed to persistent Southern Ocean swell. Tide-modified and tide-dominated beaches are most prevalent around the more tropical northern coast, which experiences meso-, macro-, and mega-tides and receives lower seas, as well as some sheltered and mesotidal southern locations. This article assesses the roles of waves, sediment, and tide range in contributing to beach type, particularly through the dimensionless fall velocity and relative tide range. It also describes their regional distribution, together with the occurrence of rip currents, multibar beach systems, and the influence of geological inheritance and marine biota.

ADDITIONAL INDEX WORDS: *Australia, beach types, wave-dominated, tide-modified, tide-dominated.*

INTRODUCTION

The Australian mainland coast, including Tasmania, is 29,900 km in length, with 49% consisting of 10,685 predominately sandy beach systems. These beaches occur right around the coast in tropical through temperate latitudes (9–42°S). They are exposed to tides ranging from less than 1 m to 11 m and to wave energy varying from very low seas to the world's most persistent and energetic swell environment (mean $H_o \approx 3$ m). Therefore, the coast and its beaches provide an ideal field site to examine the range of beach types that occur in response to a wide spectrum of wave, tide, and sediment conditions. This article reports on the results of a 17-year study (1987–2004) of all of Australian mainland beaches.

The earliest studies of Australian beaches were concerned with reporting severe erosion caused by major storm events (*e.g.,* ANDREWS, 1912). The first study of Australian beach systems from a morphodynamic perspective commenced with MCKENZIE (1956), who described wave, bar, and rip current conditions on a number of Sydney beaches. Systematic studies of beaches did not commence until the early 1970s, with the establishment of several unique long-term beach surveying programs. In 1972, Bruce Thom initiated monthly beach surveys at Moruya Beach, New South Wales (NSW) (THOM and HALL, 1991), which still continue (see MCLEAN and SHEN, this volume [2006]), and reviewed historic beach erosion in eastern Australia (THOM, 1974). Ian Eliot initiated a year-long study of rips at Durras Beach, NSW (ELIOT, 1973) and later monitored profile changes at Warilla Beach, NSW (ELIOT and CLARKE, 1983); and Short commenced his ongoing Narrabeen Beach, NSW surveys in 1976 (SHORT and TREMBANIS, 2004). At the same time, L.D. Wright and colleagues at the Coastal Studies Unit, University of Sydney, commenced the first morphodynamic field experiments on a range of beaches along the NSW and later the Victorian, South Australian, and Western Australia coasts between 1976 and 1980, leading to the WRIGHT and SHORT (1984) beach model for wave-dominated (microtidal) beaches. This model, often referred to as the "Australian Beach Model," was expanded into meso–macrotidal environments by Short and Coastal Studies Unit postgraduate students on the central Queensland coast in the early 1990s (MASSELINK and SHORT, 1993). In the microtidal south of Western Australia, HEGGE *et al.* (1996) expanded the classification of the lower energy end of the wave-dominated beach systems. Subsequent Australian beach studies are reported in THOM and SHORT (this volume [2006]).

By 1993, beach models had been generated by Australian researchers for wave-dominated microtidal beaches (WRIGHT and SHORT, 1984; Figure 1) and for more tide-dominated beaches (MASSELINK and SHORT, 1993). The Wright and Short model utilised the dimensionless fall velocity (DEAN, 1973; GOURLAY, 1968):

$$\Omega = \frac{H_b}{w_s T} \tag{1}$$

where H_b = breaking wave height, w_s = sediment fall velocity, and T = wave period, to classify wave-dominated beaches

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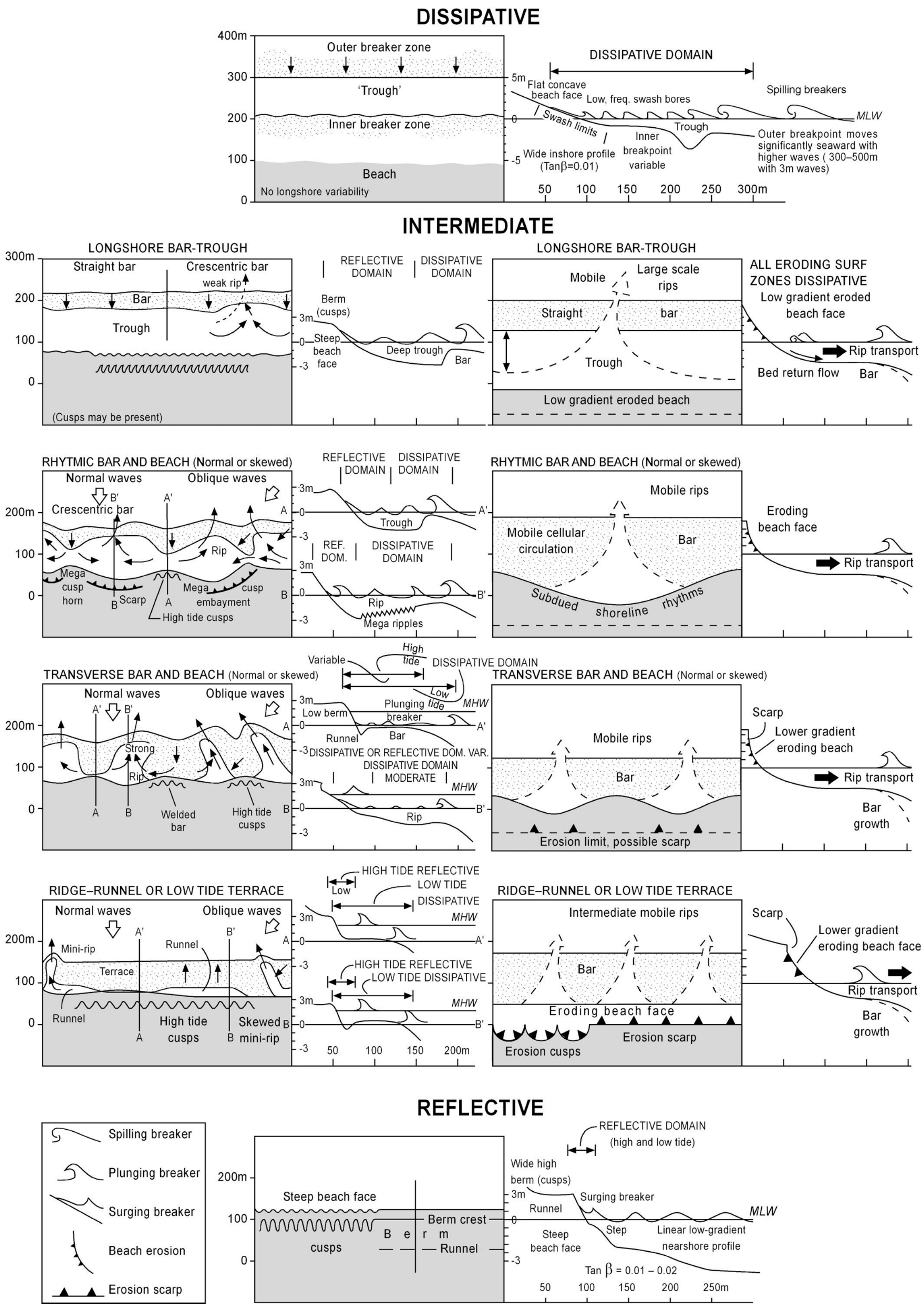


Figure 1. Wave-dominated beaches (from Short, 1999).

TIDE-MODIFIED BEACH TYPES & HAZARDS

KEY

- High tide beach
- Bar
- Intertidal zone/water
- Longshore & rip currents
- Rip head

PLEASE NOTE:

High tide range beaches, with tides greater than 2m, extend across Northern Australia from Exmouth Cape in the west to Hervey Bay in the east and dominate north-west Western Australia, the Northern Territory and north Queensland. Additional high tide range beaches also occur in northern Tasmania, central Victoria and the South Australian gulfs.

Northern Australian high tide range beaches have three characteristics which differentiate them from southern Australian beaches, in terms of their nature and hazards to bathers:

1. They all lie in areas of higher tide ranges, beginning at 2m and reaching 8m in Queensland Broad Sound and 10m in parts of the north-west of Western Australia.
2. They receive lower waves, owing to lower energy wave sources, coupled with the protective impact of the Great Barrier Reef, offshore islands and low gradient nearshores.
3. They mostly lie in areas inhabited by a number of biological hazards, including box jellyfish and crocodiles.

ADDITIONAL HAZARD FACTORS

PHYSICAL:

WAVE HEIGHT – usually increases with onshore wind velocity.

STRONG WINDS – can rapidly build waves to over 1 m. Strong longshore winds will induce longshore currents.

WAVES – over 1 m may induce rip currents on all the beaches at low tide.

AT LOW TIDE – bathers may be located 100s of metres from the dry beach, therefore be very watchful if supervising young children; walk down to the water with them.

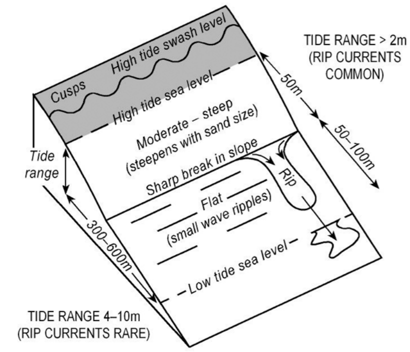
TIDAL CREEKS:

IF TIDAL CREEKS are located near the beach, stay well clear, especially on a falling tide.

STRONG TIDAL CURRENTS will flow in on the rising tide and seaward on the falling tide.

TIDAL CREEKS are also a preferred crocodile habitat and the source of many marine stingers.

REFLECTIVE + LOW TIDE TERRACE (+RIPS) (R+LTT)

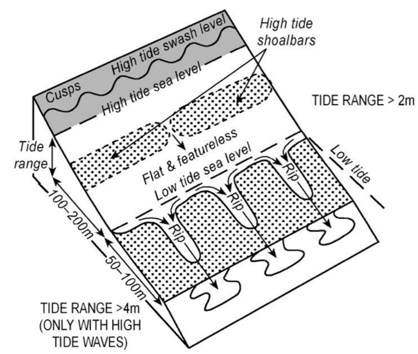


CHARACTERISTICS

Steep beach composed of medium to coarse sand; fronted by flat bar exposed at low tide, composed of finer sand; waves 0.5 to 1 m high.

	High Tide	Low Tide
	Steep beach (3-10°), waves surge at base of beach, no surf or surf zone, deep water (2–4m) immediately off beach.	Flat sand bar exposed at spring low tide, waves > 0.5m plunge on outer end of bar, waves > 1 m may generate rip currents and cut rip channels across the terrace.
HAZARDS	Deep water close inshore, steep beach face may cause a problem for the elderly and young children.	Stay on bar inside breakers, if rip channels are present they will contain seaward moving rip currents, plunging waves can dump heavily on bar.
BEACH HAZARD RATING	2/10	3/10 (no rips) 4/10 (with rips)

REFLECTIVE + BARS & RIPS (R+LTR)

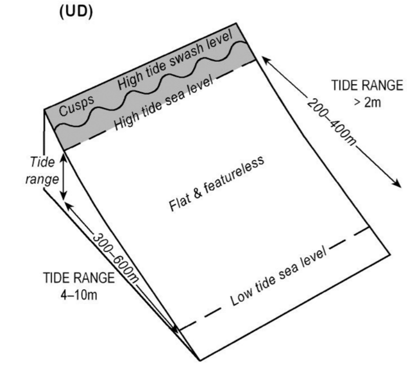


CHARACTERISTICS

Narrow, steep high tide beach face, wide, moderate gradient intertidal zone, low gradient low tide bar and rips, breaker height 0.5 to 1.5m (height increases with onshore wind velocity).

	High Tide	Low Tide
	Moderate beach face slope (2-5'), waves break across narrow continuous surf zone.	Wider surf zone, alternating bars and rips, waves spill to plunge on bar, rip currents in deeper rip channels.
HAZARDS	Stay inshore of breaker zone, deep water beyond breakers.	Waves may plunge on shallow bar; deeper rip channels, seaward flowing rip currents, strongest at low tide.
BEACH HAZARD RATING	2/10	4/10

ULTRA- DISSIPATIVE (UD)



CHARACTERISTICS

Wide, featureless, low gradient beach—intertidal zone and surf zone; fine sand, spilling breakers, breaker height 0.5 to 1.5m (height increases with onshore wind velocity)

	High Tide	Low Tide
	Low to moderate beach slope (1-3°), wide zone of spilling breakers.	Wide, low gradient intertidal and breaker zone, very wide zone of spilling breakers.
HAZARDS	Stay inshore of breaker zone, deep water beyond breakers.	Stay inshore of breaker zone, water depth gradually increases beyond breakers.
BEACH HAZARD RATING	2/10	3/10

Figure 2. Tide-modified beaches (modified from Short, 2000).

TIDE-DOMINATED BEACH TYPES & HAZARDS

KEY
- High tide beach
- Intertidal zone
- Tidal currents

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ADDITIONAL HAZARD FACTORS

PHYSICAL:

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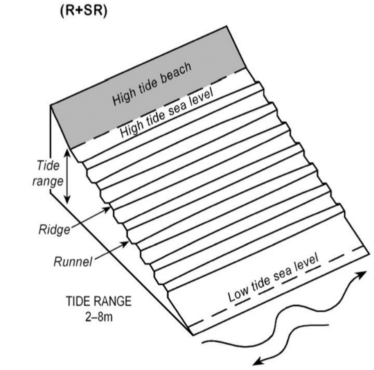
BEACH + SAND RIDGES (R+SR)

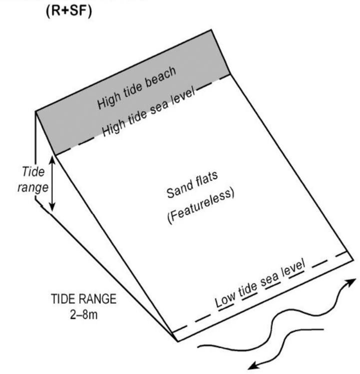


CHARACTERISTICS

Steep high tide beach composed of coarser sand, fronted by an abrupt break in slope and a lower gradient, usually finer sand intertidal zone containing shore parallel, low amplitude sand ridges and runnels. Number of ridges ranges from 2 to 14.

High Tide	Low Tide
Steep beach (3–10'). No waves unless strong on shore winds. Deep water off high tide beach.	Wide, flat ridged intertidal flats, up to several hundred metres wide.
HAZARDS	
Deep water off beach.	Tidal current may parallel the low tide shoreline. Long distance from dry beach to low tide level.
BEACH HAZARD RATING	
1/10	1/10

BEACH + SAND FLATS (R+SF)

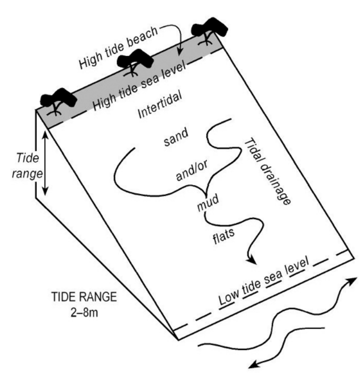


CHARACTERISTICS

Steep high tide beach composed of coarser sand, fronted by an abrupt break in slope and a lower gradient, usually finer sand, flat, featureless intertidal zone.

High Tide	Low Tide
Steep beach (3–10'). No waves unless strong onshore winds. Deep water off high tide beach.	Wide, flat intertidal sand flats, up to several hundred metres wide.
HAZARDS	
Deep water off beach.	Tidal current may parallel the low tide shoreline. Long distance from dry beach to low tide level
BEACH HAZARD RATING	
1/10	1/10

TIDAL SAND/MUD FLATS (RTSF)



CHARACTERISTICS

Wide, low gradient, small high tide beach, intertidal sand flats, may contain tidal draining channels and may lie adjacent to deeper tidal channels, scattered mangroves commonly occur in higher intertidal zone. Usually calm, only low wind chop during strong onshore winds.

High Tide	Low Tide
Entire tidal flat covered by spring high tide.	Wide low gradient (<1°), sand flats up to several hundred metres wide exposed, may contain shallow tidal draining channels, may be fronted by deep tidal channels and currents.
HAZARDS	
Generally low gradient entry to water only a potential hazard to young children (possible crocodile habitat).	Long distance to low tide shoreline; possible deeper tidal channel and currents (possible crocodile habitat).
BEACH HAZARD RATING	
1/10	2/10

Figure 3. Tide-dominated beaches (modified from Short, 2000).

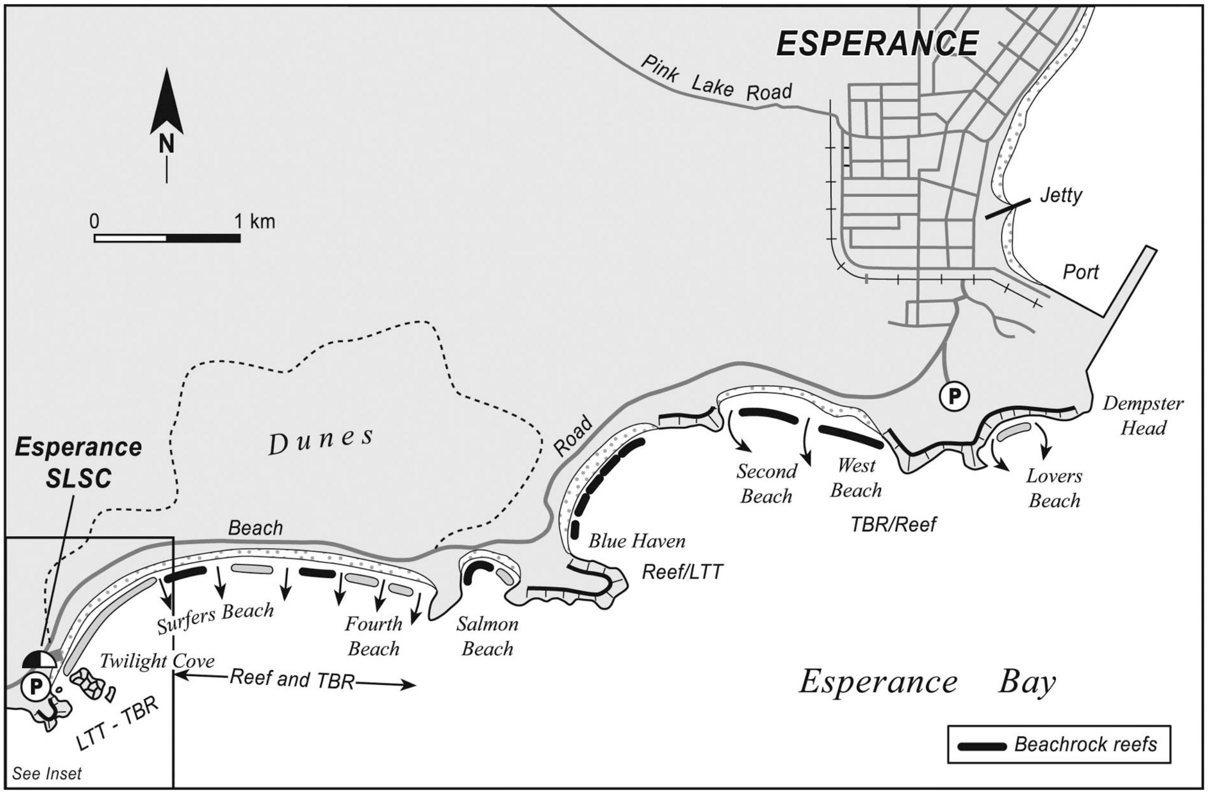


Figure 4. The maps of the Esperance region beaches in Western Australia is taken from Short (2005) and is provided as an example of the beach maps contained in Short (1993, 1996, 2000, 2001, 2005, in press).

worldwide (*e.g.,* KOMAR, 1998). The Masselink and Short model is based on both Ω and the nondimensional relative tide range parameter (*RTR*):

$$RTR = \frac{TR}{H_b} \quad (2)$$

where TR = spring tide range. In this study, beaches with an *RTR* of 10–12 are referred to as 'tide-modified' beaches (Figure 2). This study expands this classification into *RTR* values of >12, the threshold for tide-dominated beaches (Figure 3) and the beginning of the gradation of beaches into tidal flats.

The aims of this article are (i) to report on the full range of beach types that occur around the Australian coast, together with the role of waves, tides, and sediment in their formation; (ii) to describe the geographic distribution of these beaches around Australia; and (iii) to discuss the occurrence of rips and multibar beaches and the role of geological inheritance and marine biota. As such, this article will serve as a reference guide to the Australian coast for coastal scientists, engineers, and managers alike.

METHODS AND DATA

This systematic investigation of all Australia beaches commenced in late 1986, when the author was invited to assist Surf Life Saving New South Wales in compiling a database of all NSW beaches, and in particular to document the surf zone processes that pose a hazard to swimmers, the latter resulting in more than 20,000 documented surf rescues in Australia each year. The outcome was the formation of the NSW Beach Safety Program, which became the Australian Beach Safety and Management Program (ABSMP) at the invitation of Surf Life Saving Australia in 1990. ABSMP was then given the task of extending the beach study on an Australia-wide basis.

The only previous regional beach study is that of MOBERLEY and CHAMBERLAIN (1964), who offer a detailed assessment of all Hawaiian sandy beaches. A continental scale study of this nature, however, has no prior precedent, so the aims, methods, and outcomes were developed as part of the program. As the primary aim was to document all beaches and their physical characteristics, they first had to be located and then assessed. This was undertaken through a five-stage process.

(1) All recent large-scale (usually 1 : 25,000, 1 : 50,000 or in remote areas 1 : 100,000) topographic maps were obtained together with vertical aerial photographs. The photographs ranged from 1960s and 1970s black-and-white photos at 1 : 40,000 scale to recent color photographs with a scale of 1 : 10,000. One hundred percent coverage of maps and photographs was obtained, with some areas having multiple sets of vertical photographs.

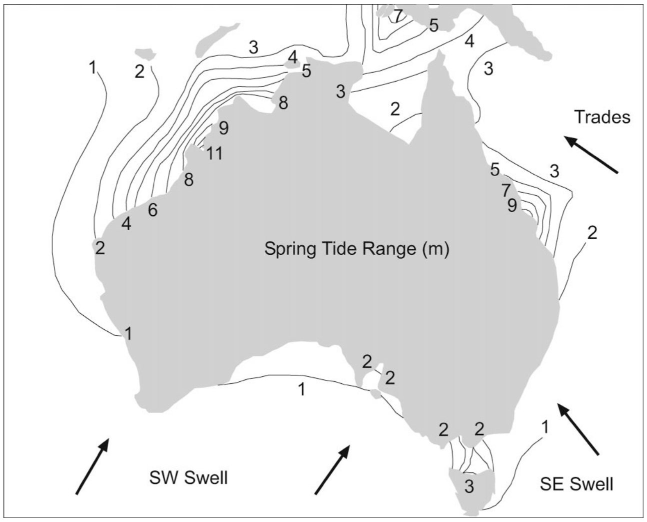


Figure 5. Australian tide range and dominant wave sources.

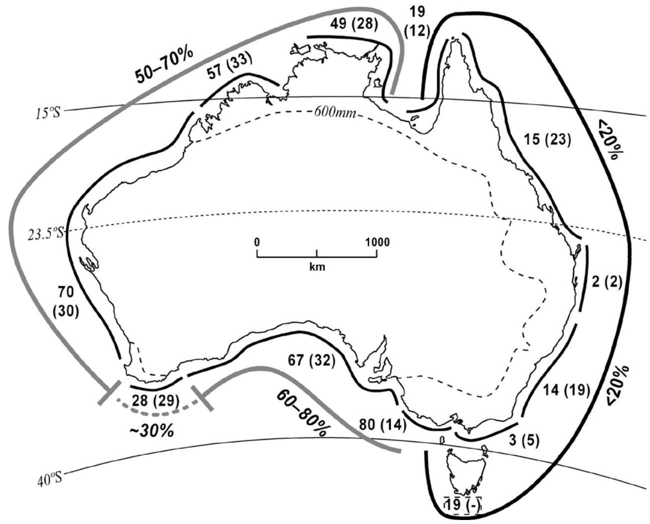


Figure 6. Distribution of carbonate beach sands around Australia. The northeast and east coast is dominated by quartz-rich beaches (>80%), while the south, west, and northwest coasts are rich in carbonate sands derived from the temperate southern shelf and seagrass meadows and in the north fringing coral reefs. Regional means and standard deviation (brackets) are indicated (modified from Short, 2002).

(2) Over a period of several years, the entire coast was flown over at low altitude (~500 m), and aerial oblique color slides were obtained of every beach, and in some cases, multiple flights provided several images. All slides were later digitally scanned, while digital images were taken from 2002 onward, providing digital images of all beaches.
(3) A database was developed for each beach based on information provided by the maps and vertical and oblique aerial photographs. The database includes information on (i) beach location, access, and basic facilities; (ii) beach geomorphology, including physical dimensions, beach type, rips, topographic features, backing dune-barrier types, and dimensions and associated inlets/drainage; (iii) a description and image of each beach; (iv) a beach map of all patrolled and popular beaches (Figure 4); and (v) a beach hazard rating (to swimmers) based on wave-tide conditions and beach type (see Short, 1999).
(4) Local and regional processes, including tide range and deepwater and breaker wave climate, were obtained from a range of sources, including tide tables, Waverider buoys, published wave climates, and estimates based on field observations.
(5) Beaches were inspected to obtain data not available remotely, including ground photographs, sediment samples, beach gradient, local access, and facilities, as well as wave-surf and beach morphology on the day of inspection.

Site inspections were undertaken over a period of 14 years (1987–2001). Vehicles were used to access all beaches accessible by sealed or gravel road (30%) or publicly accessible four-wheel-drive tracks (25%). For the other 45% not accessible by vehicle, small boats were used to land on a representative number of beaches. Vehicle inspections covered the entire coast where accessible, while boat inspections were undertaken in southern Victoria, along the southern NSW coast, all of Queensland between Burrum Heads and Karumba, the Northern Territory between Borroloola and Darwin, and the entire Kimberley coast of northwest Western Australia.

THE AUSTRALIAN COASTAL ENVIRONMENT

Davies (1986) divided the Australian coast along 26°S latitude into roughly northern and southern Australia, with Sandy Cape on Fraser Island marking the eastern boundary and North West Cape on Exmouth Peninsula marking the western boundary. The northern half of the continent has tide ranges of 2–11 m and is generally exposed to low to moderate trade wind and monsoonal seas, which combine with low inner shelf gradients to produce very low to moderate, short-period waves at the shore (H_b = 0.1–1 m; T = 3–5 s) (Figure 5). In contrast, the southern half is exposed to persistent Southern Ocean swell, with a mean significant wave height (H_s) of 3 m (H_{max} = 5 m, T = 13 s) in the source regions. This results in H_b ranging from 3 m on the west coast of Tasmania to 2–3 m along all fully exposed sections of the southern and west coast, to 1.5 m along exposed sections of the southeast coast. All these areas have tides of less than 2 m and are wave dominated. Three sections of the southern coast have tide-modified beaches: (i) the northwest coast of Tasmania and some southeast bays, which are sheltered from the westerly swell (TR = 3 m); (ii) some sheltered sections of the central Victorian coast with tides just exceeding 2 m; and (iii) upper St. Vincent and Spencer gulfs, which are also sheltered from ocean waves, with tides increasing to 2.5–3 m.

Sediments

Australian beaches are predominately composed of fine to medium sand (0.1–1 mm), with a mean grain size of 0.4 mm

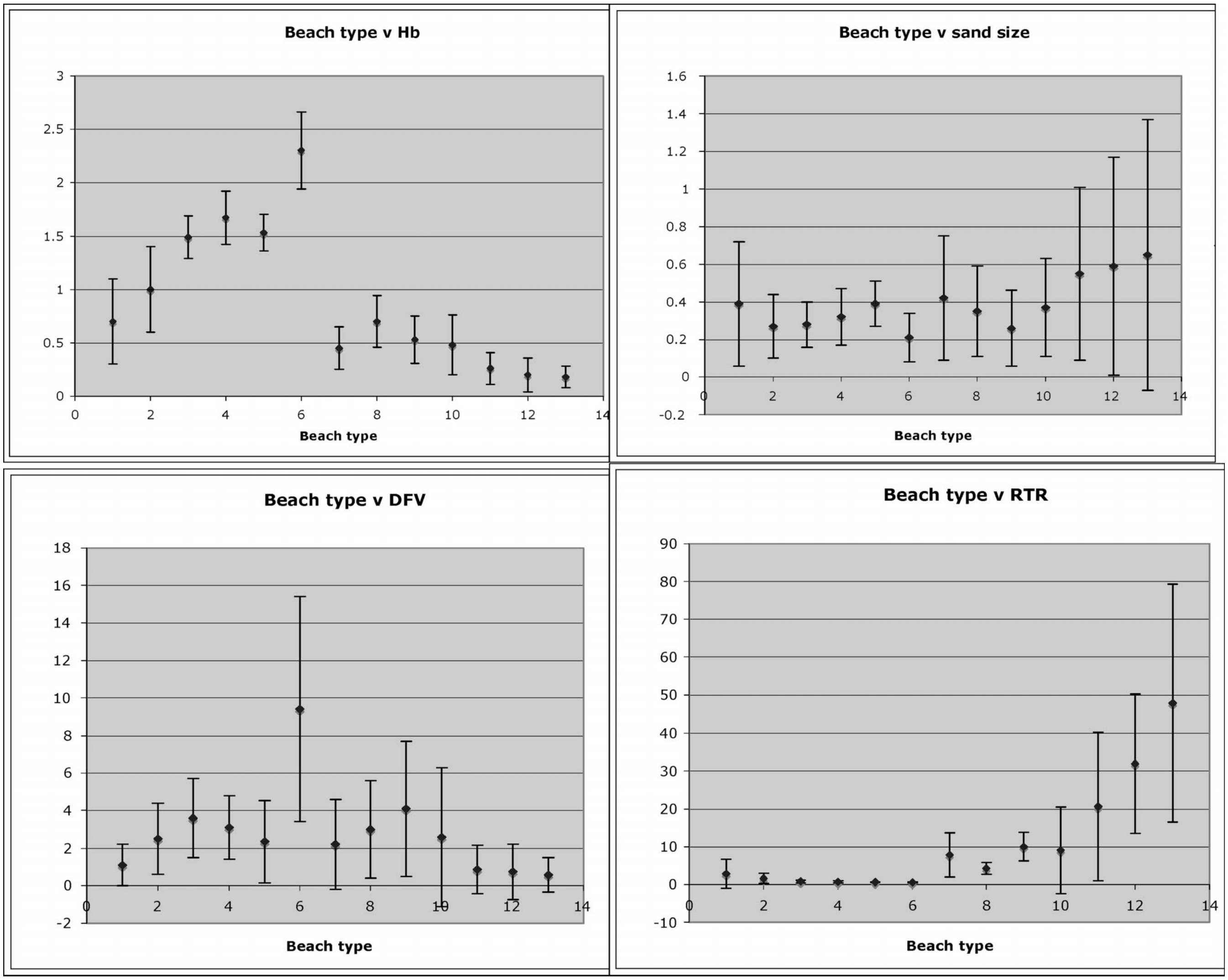


Figure 7. Relationship between beach type and (a) wave height; (b) grain size; (c) Ω; and (d) relative tide range. Bars indicate standard deviation. See Figures 7, 8, and 9 for definitions of beach types.

(σ = 0.4 mm). Only 4% consist of coarse sand and 1% of coarser sand. The sand ranges from pure quartz to pure carbonate, with a mean carbonate content of 39% (σ = 36%), with more than half the continent dominated by carbonate-rich beaches (Figure 6). The carbonate is supplied from the shelf and subtidal seagrass meadows in the south and west and from fringing reefs in the north. See SHORT (2002) for a more detailed discussion of Australian beach carbonate sources, distribution, and impact.

Geological Control

Australia's 10,685 mainland beaches have an average length of 1.37 km (σ = 3.5 km) (Table 1), which implies that physical boundaries in the form of headlands, rocks, reefs, islets, and islands play a major role in beach length and morphology along the coast (Figure 4). The impact of such features is to limit and define beach length; lower deepwater wave height and induce longshore gradations in breaker wave height through both wave attenuation and refraction; induce more curvature in the beach through wave refraction; and favour the formation of topographic rips. Therefore, the typical Australian beach is relatively short, experiences lowered waves at the shore, has variable beach morphology, and tends to have features such as rocks, reefs, and islets at one or both ends. Consequently, geological inheritance is a major factor in defining the boundaries of most Australian beach systems and by reducing the breaker height influencing beach type.

BEACH TYPES AND THEIR DISTRIBUTION

Each Australian beach has been classified into one of 15 types based on its morphological expression (Table 1). These

Table 1. *Australia beach types by state: (a) number of beaches and (b) beach length (km).*

	Beach type*	(a) Qld	NSW	Vic	Tas	SA	WA	NT	Total	%
1	R	40	216	153	786	571	843	61	2670	25.0
2	LTT	13	195	116	174	164	241	28	931	8.7
3	TBR	34	237	170	193	159	221	14	1028	9.6
4	RBB	7	73	83	2	33	81	0	279	2.6
5	LBT	0	0	0	0	7	1	0	8	0.1
6	D	0	0	0	0	14	4	0	18	0.2
7	R+LTT	478	0	32	28	42	60	114	754	7.1
8	R+LT rips	127	0	0	1	2	8	41	179	1.7
9	UD	95	0	0	8	0	66	11	180	1.7
10	R+sand ridges	195	0	0	33	29	35	98	390	3.7
11	R+sand flats	485	0	72	35	364	743	437	2136	20.0
12	R+tidal flats	87	0	0	2	69	552	127	837	7.8
13	R+tidal flats (mud)	12	0	0	0	0	110	120	242	2.3
14	R+rock flats	57	0	66	7	0	247	402	779	7.3
15	R+coral reef	20	0	0	0	0	199	35	254	2.4
	Total	1650	721	692	1269	1454	3411	1488	10685	100

* See Figures 1–3 for definition of beach types 1–13. Qld = Queensland, NSW = New South Wales, Vic = Victoria, Tas = Tasmania, SA = South Australia, WA = Western Australia, NT = North Territory.

types include the six wave-dominated types of WRIGHT and SHORT (1984; Figure 1), the three tide-modified types of MASSELINK and SHORT (1993; Figure 2), the four tide-dominated types (Figure 3) that are described below, and two types in which rock flats or fringing coral reefs dominate the inter- to subtidal zone. The actual location and description of every beach in each state is provided by SHORT (1993, 1996, 2000, 2001, 2005, in press).

The relationships of beach types 1–13 to breaker wave height (H_b), mean sediment grain diameter (D), Ω, and *RTR* are provided in Figure 7. The H_b values are in general agreement with those proposed by SHORT (1999) for wave-dominated beaches, while none have previously been proposed for the tidal-influenced beaches. Their low values, however, reflect the low-energy environments they occur in and around Australia. They are expected to be higher in other more exposed meso-macrotidal environments, as in Europe. The sand size shows no clear relationship, as was expected. The coarsest sands tend to occur on the low-energy tide-dominated beaches (10–14) and the reflective wave-dominated beach (1), in which the sand accumulates on the high-tide beach, while the finer sands are associated with the ultradissipative (9) and dissipative (6) beaches. The Ω increases, as expected, for wave-dominated beaches (1–6) and also for tide-modified beaches (7–9), while it is very low, as expected, for the low-wave and coarse sands of the tide-modified beaches (11–13), apart from the ridged sand flats (10), which typically experience higher wave energy and values of Ω averaging 2.6. Perhaps the most interesting plot is the *RTR,* which is less than 3, and for most less than 1 for the wave-dominated beaches, and with tide modified between 3 and 10 in general agreement with the findings of MASSELINK and SHORT (1993). The tide-dominated beaches have a lower threshold of 10 and an upper of 50, indicating that beyond this boundary, true tidal flats dominate. The suggested boundaries are based on spring tide range at the nearest tidal station, while breaker wave height is based on limited visual records and is an estimated value. Only long-term monitoring of actual wave-tide conditions will permit more definitive *RTR* boundaries to be determined. Interestingly, the three lowest energy beach systems have the coarsest sediments, indicating that they act as a sink for coarser material, including shell detritus, winnowed from the fronting sand, and mud flats.

Wave-Dominated Beaches

In simple terms, wave-dominated beaches occur where $RTR < 3$. They consist of the six wave-dominated beaches types of WRIGHT and SHORT (1984), which are described in detail in SHORT (1999b). Around the Australian coast they form 4934 (47%) of the beaches, predominately around the southern half of the continent, with only 383 (3%) on the northern coast (Table 1), and they occupy 6933 km (47.1%) of the total sandy coast. On beaches with multibars, the beach type is based on the inner bar morphology, as this is the more active morphology and the one more likely to pose a risk to swimmers. Multibar beaches are discussed later in this article.

Dissipative beaches (D; Figures 1a and 8a) occupy the high-energy end of the beach spectrum and are extremely stable and persistent where they occur. This is because of the two fundamental requirements of a true dissipative beach: persistent high waves and fine sands. They are more readily formed by short wave periods. Given the relatively long period ($T \sim 12$–14 s) of the incoming Southern Ocean swell, they are restricted to a few exposed longer beaches in South Australia and Western Australia, where H_b averages 1.9 m, D = 0.2 mm, and tides are less than 1 m. *RTR* values are very low (0.6), and mean Ω is relatively high at 9, both of which are a function of the high wave conditions. A total of 18 dissipative beaches (0.2%) occupy 278 km of the south and southern Western Australian coast. They also tend to occur

Table 1. *Extended.*

	(b) Qld	NSW	Vic	Tas	SA	WA	NT	Total	%
	75	67	73	407	354	1053	34	2062	14.0
	97	200	125	135	203	595	50	1405	9.6
	241	525	353	259	288	660	45	2370	16.1
	112	183	280	0	91	134	0	800	5.4
	0	0	0	0	15	3	0	18	0.1
	0	0	0	0	270	8	0	278	1.9
	792	0	19	17	45	50	182	1105	7.5
	570	0	0	0	16	10	61	658	4.5
	201	0	0	16	0	350	58	625	4.3
	482	0	0	18	44	38	306	887	6.0
	751	0	119	22	517	749	503	2641	18.0
	111	0	0	3	177	411	141	843	5.7
	57	0	0	0	0	54	172	283	1.9
	24	0	20	1	0	192	314	551	3.3
	13	0	0	0	0	92	36	142	1.0
	3525	974	989	878	2020	4398	1902	14,686	100.0
mean (km)	2.14	1.35	1.43	0.69	1.39	1.29	1.28	1.37	

on relatively long beaches that are clear of geological control and have an average length of 15 km (σ = 44 km). This includes 117 km of the 213-km–long Coorong coast (Cape Jaffa to Middleton), which is Australia's longest beach, occupying 1.9% of the sand coast.

Longshore bar and trough beaches (LBT; Figures 1b and 8b) occur as the inner bar on only eight beaches (0.1%), in South Australia and south Western Australia, with an average length of 2.25 km. Their limited distribution is due to two factors: (i) the insufficiently high waves on the long-period southern coast and (ii) the fact that they occur on 178 double-bar beaches as an outer bar, with a lower energy inner bar. SHORT and HOGAN (1994) also found that most of the NSW double-bar beaches had a LBT outer bar with lower energy intermediate inner bars. Compared to D beaches, they have slightly lower waves (H_b = 1.6 m), medium sand (D = 0.4 mm), a mean Ω of 2.4, and a low *RTR* (0.6), owing to the low tides along the south coast.

Rhythmic bar and beach (RBB; Figures 1c and 8c) occur on high-energy beaches (H_b = 1.7 m) right around southern Australia, usually with fine to medium sands (D = 0.3 mm) that are too coarse to shift into the more dissipative domain. Mean Ω is 3.1, and *RTR* is low at 0.7. There are a total of 279 beaches (2.6%) dominated by an inner RBB, 91 of which occur in the lee of higher energy outer bars, while another 243 beaches have an outer RBB and an RBB or lower energy inner bar. They are the highest energy beach on the Queensland, NSW; Victorian; and Tasmanian coasts occurring in exposed locations and on beaches of above-average length (mean length = 2.3 km, 1 s = 3.9 km) and they occupy 5.4% of the sandy coast.

Transverse bar and rip beaches (TBR; Figures 3d and 8d) are the most extensive beach type across southern Australia, numbering 1028 (9.6%). A total of 1014 occur around the southern coast, with another 14 on the more exposed lower tide range sections in the Northern Territory. TBR beaches occupy 2370 km of shoreline, with an average length of 2.3 km (σ = 8.9 km), occupying 16.1% of the sand coast, and they are the most extensive of the wave-dominated beach types. They have a relatively high Ω (=3.6) (σ = 2.1) and a low *RTR* (=0.8). The dominance of TBR beaches is a product of two factors. First, they occur right around the southern coast in response to waves averaging H_b = 1.5 m (T = 10–13 s), where sand is fine to medium (0.3 mm). Given that the modal deepwater wave height is 2–3 m across the south and 1.6 m along the southeast, they occur on exposed southern coast beaches, where sand is medium in size, and they also represent the inner bar on many of the multibar systems. On the east coast they tend to occur on the most exposed beaches and where sand is fine to medium, as well as the inner bar on most of the double-bar systems, primarily in northern NSW and southeast Queensland. These beaches are also responsible for most rip currents on Australian beaches.

Low tide terrace beaches (LTT; Figures 3e and 8e) are another common wave-dominated beach type that occur right around the coast, although they are predominately located around the southern half (n = 903), with another 28 along sections of the more exposed Northern Territory coast, totaling 931 (8.7%). In southern Australia, all LTT are located in areas partly sheltered from direct wave attack, with the deepwater waves lowered to a mean of 1 m, and especially where sand is fine to medium (D = 0.3 mm). The lower waves result in a lower mean Ω of 2.5 and a *RTR* of 1.6. They have an average length of 1.4 km (σ = 4 km), indicating the increasing role of boundary headland and structures that contribute to the lower waves.

Reflective beaches (R; Figures 3f and 8f) are the most common of the wave-dominated beaches (25%), occurring right around the coast, but again predominately around the southern coast (n = 2585), with a further 85 across the northern coast. Reflective beaches have the lowest waves (H_b = 0.7 m) and have the coarsest sediments (D = 0.4 mm) of the wave-dominated beaches. They are also favoured by the long-period waves of southern Australia. They have a mean Ω of 1.1 and a *RTR* of 2.8, both indicative of the low waves. The lower waves are a function of reflective beaches, often being in lo-

Figure 8. Wave-dominated beaches. (a) dissipative, Dog Fence Beach, South Australia; (b) longshore bar and trough, Eastern Beach, Victoria; (c) rhythmic bar and beach, Mornington Peninsula, Victoria; (d) transverse bar and rip, Seal Rocks, New South Wales (NSW); (e) Low-tide terrace, Pt. Plomer, NSW; (f) reflective, Round Hill, Queensland. For color version of this figure, see page 159.

cations that are sheltered by rocks, reefs, and headlands. Their short average length (0.8 km) highlights the role of bedrock in bordering and dominating this beach type. Many are tucked away between or behind headlands, rocks, reefs, islets, and islands, with higher waves offshore. Because of their short lengths, they occupy only 14% (2062 km) of the sandy coast by length.

Rip Currents

Rip currents are a characteristic of all the 2246 intermediate wave-dominated beaches (LBT, RBB, TBR, and LTT) as well as the 179 tide-modified LT bar and rip beaches of northern Australia. These 2425 beaches produce all of the 13,500 beach rips around the coast, and are also associated with

Table 2. *Australian rip current type and distribution.*

State/Region	Spacing: Beach Rips	Mean (m)	σ	Topo. Rips
Cape York	1598	145	77	10
East Queensland	2544	173	42	105
New South Wales	2952	246	63	677
Victoria	2370	257	95	758
Tasmania	1112	282	106	501
South Australia	1008	305	122	791
Western Australia	1470	355	117	903
Kimberley	15	100	0	3
North Territory	499	139	35	217
	13,568			3965

most of the 4000 topographic rips (Table 2). This implies that, on average, 17,500 rips are operating around the Australian coast at any given time. Beach rips are defined as rip currents associated with sandy beaches and bar systems, while topographic rips are associated with a fixed topographic boundary, such as headlands, rocks, reefs, and groynes, which deflect the beach-initiated rip current seaward. Beach rips are driven by beach–surf zone morphodynamics and tend to have a regular spacing related to wave period and edge wave length. As they are driven by the prevailing wave conditions, they are also prone to change in size and spacing and hence location. As a consequence, the number and spacing in Table 2 reflects an average, which will fluctuate with wave conditions. Topographic rips, in contrast, are fixed in location, usually existing against the controlling boundary (Figure 9a). They tend to occur whenever waves are breaking and a surf zone exists against the boundary. During high wave conditions, most increase in size and velocity and become megarips, that is, large-scale topographically controlled rips (see SHORT, 1985, 1999).

Table 2 also lists the number of each rip type by state/region and the rips' mean spacing and standard deviation. Mean spacing is shortest on the more exposed, short-period, sea-dominated northern Australia beaches ranging between 100 m in the Kimberley to 140–150 m in the Northern Territory, primarily in eastern Arnhem Land and around Cape York. Spacing increases to 250 m along the more exposed east coast, to 280 m around Tasmania, and peaks at 300–350 m along the South Australian and southern Western Australian coasts. Some individual high-energy south coast beaches have typical rip spacing of between 500 and 600 m, with the widest spacing along South Australia's Gunyah Beach at 570 m ($\sigma = 240$ m, $n = 21$). The increase in spacing is a function of both the longer wave periods around southern Australia and the higher level of wave energy, both of which favour longer and higher mode edge waves. The results are also in general agreement with those of SHORT and BRANDER (1999).

Multibar Beaches

Four hundred and sixty-seven Australian beaches (4%) consist of two and, in some cases, three bars (Table 3; Figure 9b and c). All the multibar beaches are located on exposed high-energy ($H_b = 1.5$ m), fine-sand (0.2 mm), southern Australia

Table 3. *Australian multibar systems.**

	Two Bars	Three Bars
Qld	35	
NSW	157	
Vic	114	11
Tas	56	11
SA	35	17
WA	31	
Total	428	39

* See legend to Table 1 for state abbreviation key.

beaches. Only a few of the double-bar systems are fully dissipative, with most having a higher energy intermediate outer bar and rip-dominated intermediate inner bars (Table 4). The triple-bar systems possess a greater number of fully dissipative outer bar types, while intermediate-bar types still dominate the inner bars. The relatively small number of multibar beaches and the dominance of single-bar systems is a product of several interrelated parameters. First, the long wave periods of southern Australia produce longer standing waves, which place potential outer bars in water too deep to form. Second, all beaches composed of sand coarser than 0.2 to 0.3 mm tend to generate surf zone–nearshore gradients that are too steep (and deep) for outer bar formation. Third, relatively few beaches (7.4%) have modal waves exceeding 1.5 m, which appears to be the lower threshold for multibar formation on swell coasts.

Tide-Modified Beaches

Tide-modified beaches occur in areas of higher tide range exposed to persistent waves. They occur across meso- to megatidal northern Australia, particularly in Queensland, and in southern Australia along parts of the mesotidal central Victorian coast, northern and southern Tasmania, and the South Australian gulfs (Table 1). In most of these locations they are sheltered from ocean swell and receive low to moderate ($H_b = 0.5$–1 m) and short-period ($T = 3$–6 s) wind waves, with an *RTR* range of between 3 to 4 and 10 to 12, which is in general agreement with the 3 to 15 range suggested by MASSELINK and SHORT (1993). They are the least common beach type, with a total of 1113 beaches (10.5%). The morphodynamics of these beaches have been described by MASSELINK and SHORT (1993), MASSELINK and TURNER (1999), and SHORT (2000). They can be classified into three

Table 4. *Relationship between outer and inner beach/bar types for two- and three-bar systems.*

	Two Bars					Three Bars				
	Outer	6	5	4	3	Outer	6	5	4	3
Inner										
6		2					15			
5			3				1			
4			68	23				12		
3		37	81	163			3		4	4
2			25	52						
1			1	5	2					

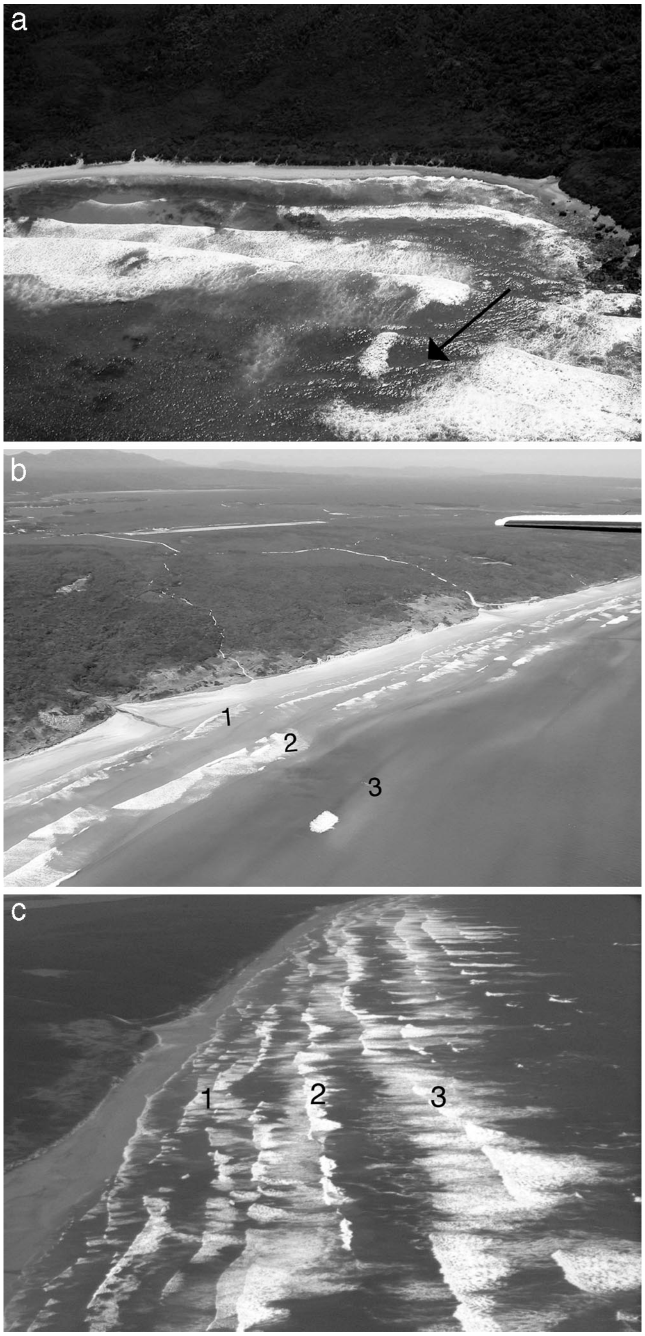


Figure 9. (a) Topographic rip (arrow), Whitehorses Beach, west coast Tasmania; three-bar system with low 1-m waves (b) and normal 3-m waves (c), both Ocean Beach, west coast Tasmania. For color version of this figure, see page 160.

beach types: reflective plus low-tide terrace, reflective plus low-tide bar, and rips and ultradissipative.

Reflective plus low-tide terrace beaches (R+LTT; Figure 2) are the lowest energy of the tide-modified beaches (H_b = 0.45 m), with the coarsest sand (mean = 0.43 mm), a mean Ω of 2.2, and a *RTR* of 9. They are favoured by both the lower waves and the coarser sand, compared to ultradissipative beaches. As a consequence, they tend to have a steep, cusped high-tide beach, which usually grades into an abrupt break in slope at the beginning of the low-gradient, low-tide terrace (Figure 10a), which averages 120 m but which can range from 20 to 1000 m in width (σ = 155 m). They are the most common tide-modified beaches, dominating 754 beaches (7.1%), which occupy 7.5% of the sand coast. They occur in most southern states but are most dominant in Queensland and the Northern Territory.

The highest energy tide-modified beach type is the reflective plus low-tide bar and rips (R+LT rips; Figure 2), which in part overlap with the lower energy wave-dominated beaches. A total of 127 beaches (1.7%) occupy 4.5% of the sand coast and again are more prevalent in Queensland and the Northern Territory. Wave height averages 0.7 m, mean Ω is 3, and because of the higher tide ranges, *RTR* averages 4.2, agreeing with the MASSELINK and SHORT (1994) threshold of 3 for the lower boundary of these beaches. Like all tide-influenced beaches, they lack the shoreline rhythmicity of wave-dominated intermediate beaches and have a relatively straight, steep, usually coarser and cusped reflective high-tide beach, fronted by a lower gradient, relatively featureless intertidal zone and a wave-dominated low-tide surf zone, usually characterised by bar and rip morphology (Figure 10b). They have a mean rip spacing of 100–150 m, the shorter spacing a product of the shorter periods and lower waves. The intertidal zone averages 140 m in width and on some of the higher tidal range beaches reaches 500 m, with a few reaching 1 km in width (σ = 155 m).

Ultradissipative beaches (UD; Figure 2) also tend to occur on the higher energy, tide-modified beaches, with waves averaging 0.5 m. However, they require fine sand (D = 0.26 mm) and are also favoured by higher tide ranges, restricting them to 180 beaches (1.7%), which occupy 4.3% of the sand coast, predominately in Queensland and north Western Australia. The waves and finer sand combine to produce a higher Ω of 4.1, while the *RTR* increases to 10, primarily a product of the higher tide range. These beaches also have a relatively straight, steeper, cusped high-tide beach, with a low-gradient, concave, featureless intertidal zone (Figure 10c) that averages 440 m in width (σ = 510 m) and on some beaches reaches 3 km.

Tide-Dominated Beaches

Tide-dominated beaches occur in areas of higher tide range and very low waves, with a lower *RTR* boundary of about 10 and an upper boundary of about 50, beyond which they grade into tidal flats. In all, 3592 beaches (34%) are tide dominated and occupy 31.6% of the sandy coast, with 2988 (83%) located in northern Australia, where they are the most dominant beach type. In southern Australia they occur in sheltered locations in Victoria (Port Phillip Bay), parts of Tasmania's southern bays, and the upper South Australian gulfs. Little attention has been paid to these beach types, and nothing definitive has been published on their morphodynamics. As Figure 2 indicates, they are associated with low waves (H_b less than 0.5 m) and high *RTR*. The most diagnostic charac-

Table 5. *Tide-dominated beach sand/tidal flats.*

	Beach Type	Mean Intertidal Width (m)	σ (m)	No Ridges	Range (m)	σ
10	R+sand ridges	620	605	7.2 (1–28)		4.6
11	R+sand flats	485	625		10–5000	
12	R+tidal (sand) flats	475	630		50–6000	
12	R+tidal (sand/mud)	170 sand	148		50–500	
	flats	485 mud	480		100–4000	
13	R+tidal (mud) flats	410 m	535		50–4000	

teristic of the tide-dominated beaches is the presence of a small, usually steep, coarser grained, and rarely cusped straight high-tide beach, fronted by wide, very low-gradient, usually finer grained intertidal flats (Table 5). Four types can be distinguished.

The highest energy of the tide-dominated beaches is the reflective plus sand ridges (R+sand ridges; Figure 3). A total of 390 beaches (3.7%) occur, predominately in northern Australia (328), with 33 in sheltered Tasmanian locations and 29 in the upper South Australian gulfs. The beaches occur in areas with an *RTR* averaging 9, where there is sufficient wind wave energy (H_b = 0.5 m) to generate and maintain the low, subdued, multiple, equally spaced shore parallel sand ridges (Figure 11a). The relatively high waves maintain a high mean Ω of 2.6. The number of ridges ranges from 1 to 28 (average = 7.2 ridges; σ = 4.6), which, combined with a mean beach width of 620 m (σ = 600 m), suggests a mean ridge spacing of 86 m. While the ridges require low breaking wind waves for their formation (see DOLPHIN *et al.,* 1995), no formative process has yet been verified, though with their equal spacing they are more likely to be formed by breaking waves than standing waves (see MASSELINK and HUGHES, 2004, for comparison).

The most common of the tide-dominated beaches are the reflective plus sand flats (R+sand flats; Figure 3), which occur on 2123 beaches (20%), predominately across northern Australia (1652), as well as in Port Phillip Bay (72), parts of Tasmania (35), and particularly the upper South Australian gulfs (364) and that occupy 18% of the sand coast, making them the most extensive beach type in Australia. These beaches are typified by a small, low-gradient, very low-energy beach fronted by flat, featureless sand flats (Figure 11b) averaging 485 m (σ = 625 m) and reaching 5 km wide in parts of northern Australia. Waves average 0.26 m, mean Ω is 0.9, and *RTR* increases to 20 (Figure 2), which is above the threshold of 17 proposed by MASSELINK and SHORT (1994) as the boundary between tide-modified and tide-dominated beaches.

The final two tide-dominated beaches represent the transition into true tidal flats. The first consists of a small, low coarse reflective high-tide beach plus tidal sand flats (R+tidal sand flats; Figure 3). These are distinguished from the former type by the fact that tidal currents influence the intertidal morphology (Figure 11c), and in places intertidal vegetation, especially mangroves, may grow on the flats. They occur in areas of low waves (H_b = 0.2 m), with a mean Ω of 0.7 and an *RTR* of 32. Grain size increases to a mean of 0.6 mm. A total of 837 (7.8%) occur around the coast, primarily in northern Australia (766), with 69 in the upper South Australian gulfs and a few in Tasmania. These beaches are fronted by sand flats averaging 475 m (σ = 630 m), with at least 87 of these systems containing inner sand flats averaging 170 m in width fronted by lower intertidal mud flats extending on average 485 m seaward (Table 5).

The final and lowest energy beach type is the beach plus intertidal mud flats (R+tidal mud flats; Figure 3), of which 242 (2.3%) occur entirely in northern Australia, where they occupy 283 (1.9%) of the sand coast. They are also favoured by low waves (H_b = 0.18 m), with the lowest mean Ω of 0.6 and an *RTR* of 48. They tend to occur in locations close to a source of mud, where waves are sufficient to build a small, coarse high-tide sand beach (mean = 0.65 mm) but are insufficient to entrain and remove the intertidal mud flats. In northern Australia, they are commonly partly vegetated in with mangroves (Figure 11, day). They have an average width of 410 m (σ = 535 m) and range from 50 to 4000 m (Table 5).

The data presented in Figure 7 indicate that an upper threshold for tide-dominated beaches is a mean *RTR* of close to 50. However, as mentioned earlier, only more accurate wave-tide data will permit a more definitive *RTR* boundary, as well as the processes that control cross-sectional morphology, to be determined.

Table 6. *Australian beaches fronted by reefs and fringing reefs.*

	Number	Mean (m)	σ (m)	Range (m)
All beaches	1429	495	755	50–8000
R+coral reef				
Cape York	21	219	124	50–500
Western Australia	36	1405	1200	200–4000
Kimberley	158	219	210	30–2000
Northern Territory	34	691	539	100–2000
	Σ = 254	X = 456	X = 671	50–4000

Beaches Plus Rock Flats

As previously discussed, bedrock geology exerts considerable influence on the length of many beaches and, in addition, dominates the intertidal zones of 779 beaches (7.3%) sufficiently for them to be classed as reflective plus rock flats (R+rock flats; Figure 12a). On these beaches, the usually steep reflective high-tide beach is fronted by rock extending

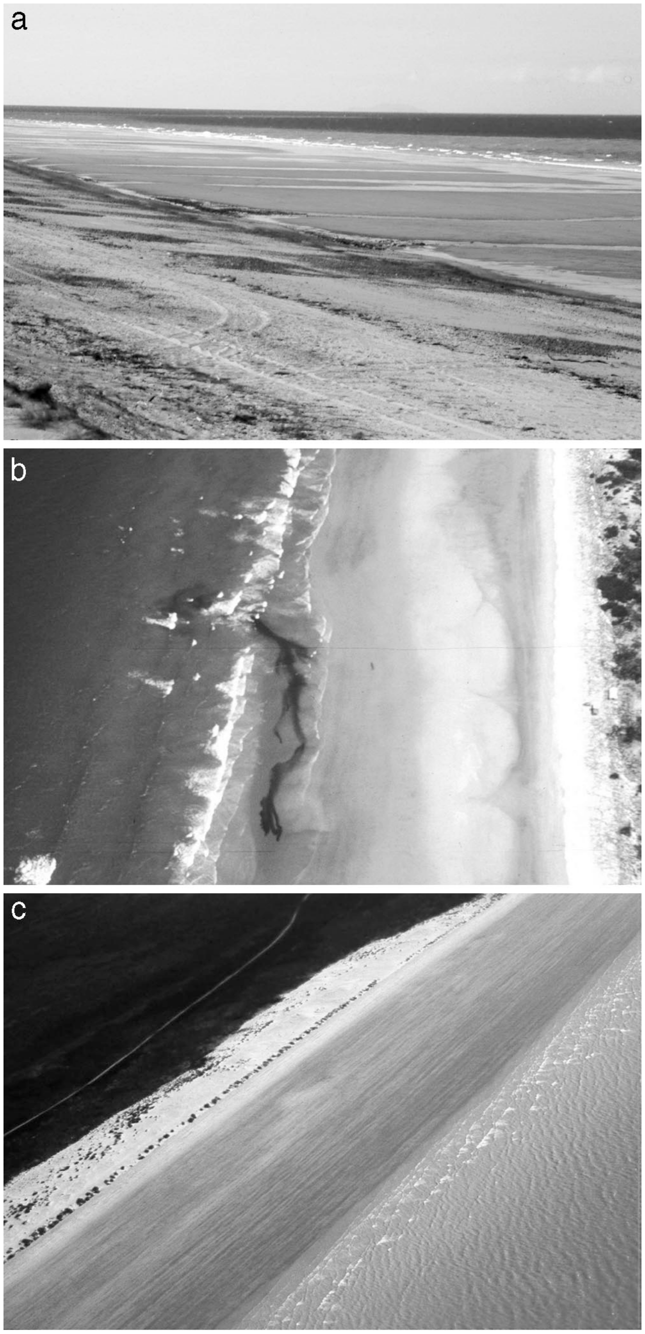


Figure 10. Tide-modified beaches. (a) reflective plus low tide terrace, Mackay, Queensland; (b) reflective plus low tide bar and rips, Nine Mile Beach, Queensland; (c) ultradissipative, Eighty Mile Beach, Western Australia. For color version of this figure, see page 160.

seaward as an intertidal rock platform and/or rock flat. The bedrock control also influences the length of these beaches, as they are the shortest of any beach type, averaging 0.7 km in length (σ = 1 km). Waves average only 0.5 m, which is partially a function of the protection afforded by the rocks in southern Australia, as well as their occurrence in northern

Table 7. *Regional proportion of sand coast.**

	Sand Coast (km)	Total (km)	%Sand
Qld	3525	6091	57.9
NSW	974	1590	61.2
Vic	989	1489	66.4
Tas	878	2235	39.3
SA	2020	3273	61.7
WA	4398	10,194	43.1
NT	1902	5029	37.8
Total	14,686	29,901	49.1

* See footnote to Table 1 for abbreviation key.

Australia, especially along the meso- to macrotidal Northern Territory coast (402), where laterite rocks and reef flats are common. This results in a high *RTR* (=16) and a low Ω (=1.3).

Beaches Plus Fringing Coral Reefs

Coral reef structures are located immediately seaward of at least 1430 beaches across northern Australia (Table 6). The reefs extend on average 500 m offshore, with the maximum extent of 8 km. Most are barrier reefs backed by a lagoon and lower energy beaches. On 254 beaches the reef extends as reef flats to the shore, resulting in an usually steep reflective high-tide beach plus fringing reef (R+coral reef). This beach type is most prevalent in Western Australia (199), particularly in the Kimberley (158), and totals 2.4% of the beaches Australia-wide. The fringing reefs average 460 m (σ = 670 m) and range up to 4 km wide. The reefs are narrowest along the Kimberley and Cape York coasts (220 m) and wider along the Northern Territory (690 m), and particularly along the Ningaloo Reef system of Western Australia (1400 m) (Figure 12b). Wave breaking occurs across the reefs lower wave heights at the shore, where they average 0.3 m, and which combine with the higher tides ranges across the north to maintain an average *RTR* of 22, while mean Ω is 0.6.

DISCUSSION

Australian beach systems are spread around the entire coast, with the only two long rocky sections that are free of beaches being the 180-km–long Nullabor Cliffs in South Australia and a 94-km–long section of the Zuytdrop Cliffs in Western Australia. The bedrock-dominated Kimberley coast has the smallest area of beaches, with only 16% of the coast being sandy. The remainder is predominately bedrock together with extensive areas of mud flats and mangroves. Elsewhere, beaches occupy between 38% and 66% of each state (Table 7). Bedrock and calcarenite do play a major role in the beach systems by forming the boundaries of most beaches, which average only 1.37 km in length, as well as lying along and off the coast as beachrock, rocks, headlands, reefs, islets, and islands, all of which induce wave refraction and attenuation, resulting in lower energy beach types.

The large number and wide range of beach systems provide an opportunity to assess the role of waves, tide, and sediment conditions in beach type. A number of factors are evident from this overview of these beach systems.

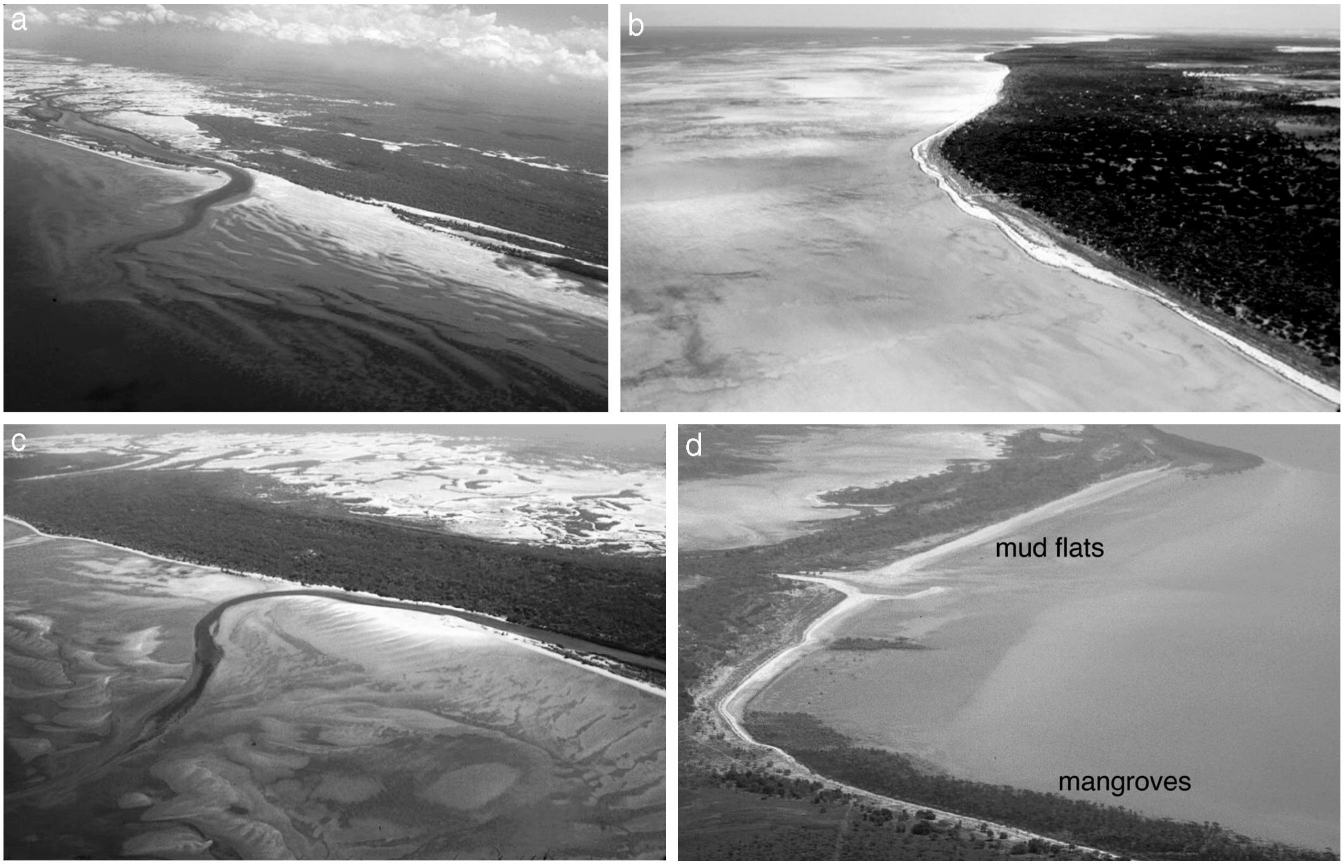


Figure 11. Tide-dominated beaches. (a) reflective plus sand ridges, Shark Creek, eastern Northern Territory; (b) reflective plus sand flats, Shoalwater Point, Spencer Gulf, Southern Australia; (c) reflective plus tidal sand flats, Sandy Creek, eastern Northern Territory; (d) reflective plus tidal mud flats, Tree Point, western Northern Territory. For color version of this figure, see page 161.

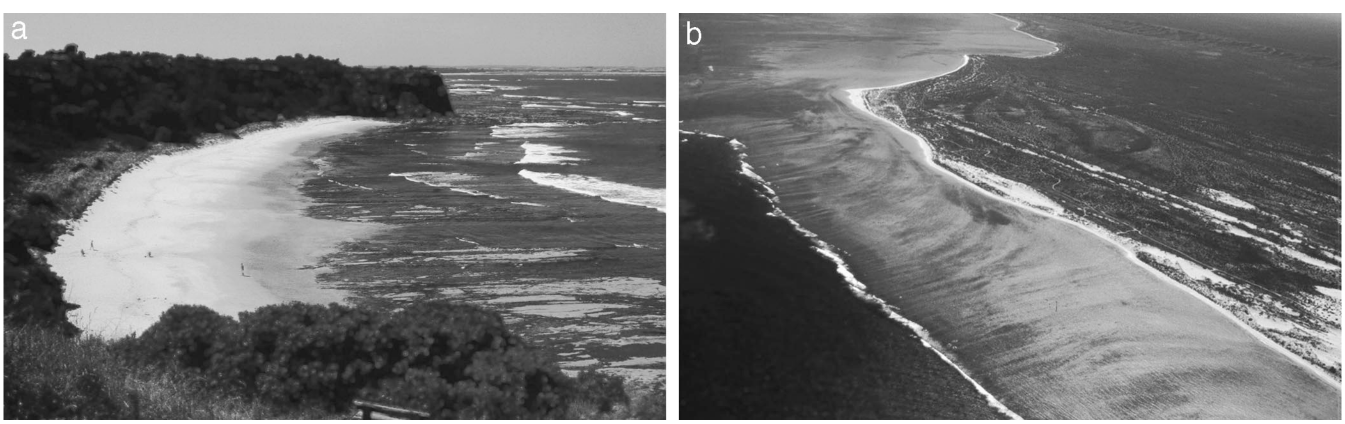


Figure 12. (a) Reflective beach plus rock flats, The Caves, Victoria; (b) reflective plus fringing coral reef, Ningaloo Reef, Western Australia. For color version of this figure, see page 161.

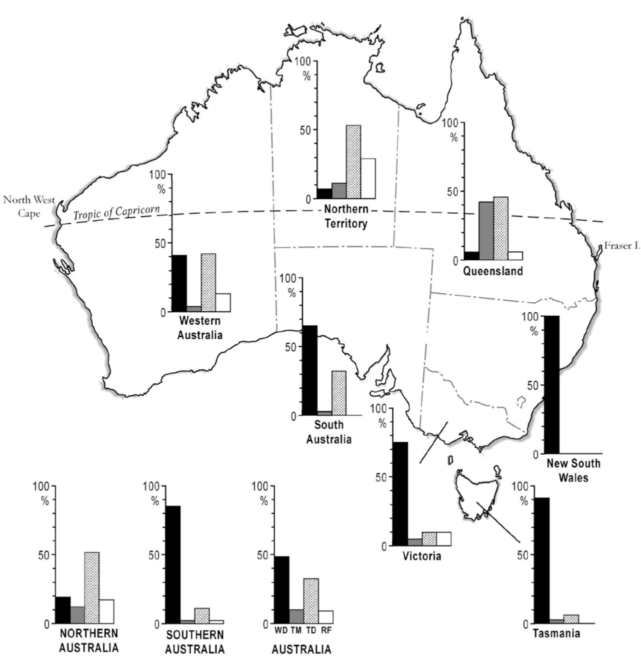


Figure 13. State, regional, and Australian distribution of wave-dominated (WD), tide-modified (TM), and tide-dominated (TD) beaches and beaches with rock/coral flats (RF).

First, all Australian beaches can be classified into one of 15 types depending solely on wave, tide, and sediment characteristics, which include the six wave-dominated types of Wright and Short (1984), together with three tide-modified types based on the work of Masselink and Short (1993), and four new tide-dominated types, together with two additional types influenced by the presence of intertidal rocks and coral reefs. The wave-dominated beaches predominate around the higher wave energy southern coast, while tide-modified and tide-dominated types are most prevalent amongst the higher tides and lower waves of northern Australia. Figure 13 provides a state, regional, and continental overview of their distribution.

Masselink and Short (1993) proposed an *RTR* threshold of 3 between the wave-dominated and tide-modified types of beach, with an upper threshold of 15 for these beaches. This study has confirmed the lower threshold value of 3 and has revised the upper threshold down to 12. The tide-dominated types range from 12 to an upper threshold of 50, beyond which beaches cease to form and tidal flats dominate. While considerable research has been undertaken on wave-dominated beaches (see, for example, Short, 1999) and, to a lesser extent, on tide-modified beaches (see, for example, Masselink and Turner, 1999), tide-dominated beaches remain largely unknown in terms of their formative processes and morphodynamics.

Regional and local geology exerts a considerable influence on Australian beach systems. First, it defines the lateral boundaries of many beaches and is the major reason why beaches average only 1.37 km in length, with the longest state average in Queensland being 2.14 km, while the bedrock-dominated Kimberley regions average only 0.52 km. Furthermore, rocks, reefs, islets, and islands all induce wave attenuation and refraction, leading to lower energy beaches, more crenulate beaches, and the formation of topographic rips where there is significant surf. For this reason, 4000 (23%) of Australia's 17,500 rips are topographically controlled.

The influence of geology on wave attenuation can be verified by the number of beaches on the southern open coast that have breaker waves lower than the deepwater waves. Along the long, open Eastern Victoria coast, 55% of the beach receives breakers that are wave equal in height to the deepwater waves, whereas the more embayed NSW and central–western Victorian coast have only 16% and 7% of beaches, respectively, receiving the full deepwater wave height. Even along the west coast of Tasmania, which faces into one of the highest wave climates in the world, only 10% of the beaches receive the full deepwater waves. In South Australia, 30% of beaches on the very exposed southeast coast receive the full deepwater wave height; however, on the similarly exposed, but reef-dominated, western Eyre Peninsula coast, only 3% receive the full wave height. Similarly, on the long, straight central–west coast of Western Australia, which has a deepwater wave height of 1.7 m, only 3% of beaches receive waves approximating this height, owing to the prevalence of near-continuous Pleistocene calcarenite reef, islets, and occasional islands. Most of the southern Australian coast, which is exposed to persistent high swell, is sheltered to varying degrees from this swell, resulting in lower waves and lower energy beach types, on an otherwise high-energy coast.

Regional inter- and subtidal biota is a major source of sediment for Australian beach systems. First, it contributes 39% of all beach sediment, and for more than half the coast, it is the major source of beach and dune sands, with some beaches reaching 90–100% carbonate material (Short, 2002). This sand is derived from three major habitats—lower energy seagrass meadows across southern Australia and up the Western Australian coast; shelf biota along the higher energy southern Australian coast; and debris from fringing coral reefs across tropical northern Australia. In addition, waves are attenuated by greater friction across seagrass meadows and by breaking across fringing reefs leading to lower waves at the shore, ensuring that low-energy beaches occur in the lee of these systems.

CONCLUSION

The size of the Australian coast and its wide range of wave, tide, and sedimentary systems have resulted in the formation of 15 beach types, which can be classified into six wave-dominated, three tide-modified, four tide-dominated, and two fringed by rock flats and reefs types. Because of the role of waves and tides, during their formation, the beaches are regionally controlled by deepwater/breaker wave climate and tide range, with wave-dominated beaches dominating the high-energy southern half of the continent. Tide-modified beaches occur across northern Australia as well as in sheltered mesotidal southern locations, while tide-dominated beaches are dominant in northern Australia as well as occurring in some very sheltered mesotidal southern locations. In addition to waves, tides, and sediment, bedrock in the form of headlands, rocks, rock flats, rock platforms, reefs, islets, and islands exerts considerable influence on beach plan form by forming boundaries and inducing wave attenuation and refraction, as well as through the formation of topographic rips. These result in shorter, curving-crenulate, lower energy beach types. Finally, a number of beaches are fringed by rock platforms and/or flats and, in the tropical north, by fringing coral reefs and laterite.

The 15 beach types that occur around the Australian coast also occur in similar wave–tide–sediment environments throughout the world and provide a framework for identifying many of the world's beaches. What the Australian coast does not possess, however, are tide-modified beaches exposed to higher ocean swell and storm seas, resulting in similar though higher energy beaches. It also has relatively few gravel and cobble beaches, and, finally, it does not have any ice-affected beaches.

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