

2 Ghost Islands

Telling an Intertidal Coast

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Prologue

It was said that a long time ago, two great warriors duelled in a fierce battle in the southern waters of Singapore. Many lives were taken. This bloodbath upset the Jinns (sea spirits) living on the seabed. One Jinn angrily sucked the warriors into a whirlpool to drown them, but the warriors persisted undeterred. The Jinn then sprayed a jet of water blinding one of them, causing the stunned warrior to stab his opponent. In retaliation, the wounded warrior thrust his sword back into the other man; both warriors were killed. The sea gods blamed the Jinns for interfering with the affairs of mortals, and so the Jinn transformed the two warriors into islands, thus allowing these spirits to live on. The island formed by the smaller warrior came to be known as Pulau Hantu Kechil, while the larger one was called Pulau Hantu Besar.¹

Singapore's infrastructural treatment of the sea derives from the island city's long-standing anxieties with land limitations.² Today, faced with unprecedented challenges, Singapore is reconsidering the importance of the reef coast to curb future sea level rise. Coral reefs in the subtidal and intertidal zones function as underwater anchoring structures, evolving into living infrastructural seawalls and tide breakers to mitigate the dangers of rising currents. The intertidal coastline occupies the liminal space between the high-water land line and low-water sea datum. Simultaneously sea and land, it is home to creatures with similarly liminal existence – crabs, mussels, sea stars, barnacles, kelp – which can survive under- and over-water, as well as coralline compositions of marine bodies-becoming-geology. The intertidal coast, although central to marine ecology and flood defence, remains at risk of extinction.

Significantly, the revival of natural coastal margins simultaneously uncovers folkloric archipelagic-bound histories. These colourful anecdotes contrast against the coastal threat of *tabula rasa* implicit in technocratic coastline management. The storied fragments reveal other ways of 'seeing' and imagining islands and their watery landscape margins by revealing often distinct relations between above-ground and under-sea – that is, by blurring the lines separating what is seen and unseen. These storied 'views' of the coast challenge technocratic solutions that manipulate organic reef matter into opportunities for erecting seawalls, which perpetuate island edges as distinct lines, devoid of the tidally shifting sea. In this way, we argue for the intertidal margin as a specific kind of island edge which complicates the simplistic definitions and solutions imposed on island edges.

Examining such tensions, this chapter revolves around Pulau Hantu ('Ghost Island' in Malay), an offshore island located in the Singapore Straits and one of Singapore's last surviving living reefs. Said to be haunted, the island remained uninhabited for decades, and



Figure 2.1 May 19, 2022; 7.37 a.m. Exposed tidal reefs of Pulau Hantu, set against the backdrop of Singapore's industrialised offshore islands.

Source: Photograph by Zi Hao Wong.

its intertidal flatland centre was reputedly filled with graves.³ Given a makeover where leisure facilities were added, and increased in size through land reclamation in the early 1970s, Pulau Hantu – located adjacent to the petrochemical base of the industrialised Pulau Bukom – is now at risk of becoming reterritorialised into an offshore commodity, whether focused on leisure or for resource extraction.

Alchemical Ecologies

In May 2022, during a rare occurrence when tides receded to their lowest in 14 years, a team of geoscientists gathered around an intertidal margin along the northern coast of Sentosa, off Singapore's main island, and examined what looked like 'flat, bumpy undersea rocks covered in seagrass', scrubbing layers of sediment off the aged surface of a fossilised coral microatoll.⁴ They took photographs of the microatolls, some as old as 3,000 years. The discovery was significant. These microatolls indicated the possibility of coral growths divulging regional tidal patterns 'before tide gauge records existed'.⁵ The intertidal coast's alchemical character draws from its self-proliferating and self-healing ability. Belatedly, they point towards an ecological future for Singapore's coastlines: Scientific research is in its early phases of test-bedding to rehabilitate the island city's long-gone reef grounds as living seawall eco-technologies.⁶

The intertidal coastal region experiences dramatic shifts in tidal fluctuations, draining out as much as 2 to 3 metres of sea depth on occasion, and exposing tens of metres of the seabed. Characterised by harsh environmental conditions, it is a transitional landscape that transforms once or twice monthly, becoming sea at high tide and land at low tide. Described in marine sciences as a 'highly challenging environment', it is where 'flora and fauna must adapt to the contrasting conditions [...] subjected to cyclical high-tide submergence and

low-tide exposure, it is also where intertidal biodiversity flourishes'.⁷ Cultural geographer Owain Jones and artist Linda Cracknell explain the duality of life-threatening and life-giving potentials of a 'place of in or out-tide' as where 'stalking birds that can wade or fly or float' and 'shellfish that are half-fish, half-flesh; half-stone, half-living-thing' make their homes.⁸ Topographically diverse, it is also where tides 'scramble' up 'two of the most fundamental divisions of physical space on earth – between saltwater and land, and between salt and freshwater'.⁹

Yet the intertidal coast's transitional character defies normative mapping techniques. Visualised through aquatic mapping conventions, nautical charts show an atemporal landscape where the intertidal region's shapeshifting character is omitted. These charts outline a system of numbered depths, representing the sounding measurements of the seabed for safe navigation, indicating where the sea is deep and obstacle-free, or shallow and hindering of passage.¹⁰ Based on astronomical projections, the numbered depths reference the sea's horizon taken at a very low tide level.¹¹ In other words, the numbered surface depicts the sea as a static environment. This stable (mis)representation primes the sea for future planning and growth enabled through maritime legislation, eases changes in territorial zoning, and facilitates improvements in sea commerce.¹²

Complementing nautical charts in the depiction of ideal coastlines, topographical maps show the coast with a thickened stop-line, indicating terrestrial edges.¹³ This land profile line is understood as a definitive boundary which geographical maps, cadastral surveys, and architectural masterplans collectively understand to be the absolute limits of land, thus establishing the visual extent to where property might be kept dry, physically stable, habitable, and, above all, flood-free.¹⁴ Consequently, this land line puts into relation the high-water coastline to future coastal seawalls, a relationship which assumes that the coastline's threshold against the sea remains more or less constant, or that this edge is pristine, without fluctuations: the land edge is perceived to be perpetually water-free.¹⁵ While nautical charts imagine the fluctuating sea as a stilled surface devoid of tidal temporalities, topographical maps materialise further dry land's static edges with a singular line marking out the shape of the coast. Together nautical and topographical mapping offer a static view of the terrain: islands are visibly demarcated as particular and fixed shapes extricated from their watery surroundings.

In contrast, the intertidal coast is a space of continual change. Tiny coral larvae, drifting in with the tides, settle within the pores of a coarse and rugged patch of stable reef ground. Sprouting tentacles, the larva soon 'reveals itself as a coral polyp'.¹⁶ After a few days, the 'small flower-shaped' polyp begins to construct layer upon layer of hard skeleton. It extracts calcium from the sea whilst embedding itself further into the reef ground.¹⁷ The polyp grows and divides over time into 'a colony of [a] thousand', nourished by dead rubble, calcium ions and still more tidal coral larvae, carried from coast to coast.¹⁸ The living intertidal coast is better expounded as sites of 'continual refiguration'.¹⁹ This is a place of flux, alternating between submergence and emergence, susceptible to the ravages of seawater and intense heat, wetness and dryness, all the while oscillating between degeneration and regeneration.²⁰

Curators Natasha Ginwala and Vivian Zihlerl write of the intertidal mangrove coast as a 'place where the earth seems unearthly [...] neither salty nor fresh water, [...] neither [in] daylight nor darkness', somewhere 'extra-territorial'; a place which escapes fixed definitions.²¹ Navigating this landscape requires an in-between modality or what Brian Massumi calls 'thinking-feeling': an affective mode of knowledge which moves between intuitive tacit knowledge and learnt fact.²²

Heeding such accounts, this chapter reads the embodied accounts of old Malay archipelagic folklore and colonial eyewitness journals which describe a temporally submerged intertidal

island edge, such processes going unremarked in both surveys and maps. Knowledge of the intertidal coasts and their land forms are conjugations of natural histories and cultural stories.²³ We argue that the intertidal island edge is better understood through the changing vicissitudes of storytelling, as stories viscerally reimagine an unmapped, vast, and relational terrain. The storied topography remembers, recovers, and conserves the coast's eroded past and eroding present. The stories recuperate a diminished landscape, reclaiming denigrated reef histories and giving insights into lost intertidal sites.

An analysis of such hybrid accounts enable us to imagine how experimental modes of architectural-making – speculative writing and projective drawing – can be utilised to creatively tell about an island's evolving edges and coasts, and describe multiple methods of seeing and sensing which approximate the complexities of such at-risk sites.²⁴ This chapter reimagine how stories of ghost islands – referring to submerged reef topographies that evade the map's customary setting apart of land and water, island and sea, and the seen and unseen – can expand and include domains of 'seeing' that remain outside disciplinary conventions of knowledge-making. In this way also, the sharp distinctions installed between the interrelated disciplines of architecture and landscape are intentionally blurred, with tools from one influencing the other and vice versa, mediated by the shared medium of stories.

Two Pulau Hantus

As early as the 16th century, Singapore's seas abounded with isolated patch and fringing reefs that lined its coastal perimeters.²⁵ These reefs posed cartographic concerns for seafarers. By the 19th century, there were efforts to make visible reef obstacles in maps to enable the safe passage of larger and faster trade steamships along these waters. In the 1840s, anticipating the arrival of such steamships, Straits Settlement surveyor John Turnbull Thomson went onboard a navy frigate to chart the depth of the new Keppel Harbour. On a hydrographic map of Singapore's New Harbour dating to 1849–1851, Thomson's drawings show intricate details of reef-fringed landforms lining the harbour's western maritime entrance.²⁶ He also recounts a trip to an intertidal reef called *terumbo* (*terumbu*) *myet*, remarkable because it was 'one of the chief dangers in the Straits of Singapore'.²⁷ *Terumbu* refers to a living, hard, and rocky island constituted by reef grounds seen only at low tide, but 'high enough to scrape or worse, sunder a stray hull'.²⁸ The risks posed by these underwater growths was visceral, as demonstrated by the inclusion of 'myet' (or *mayat*, Malay for corpse).²⁹ This allusion was likely provoked by the rotting reef, as Thomson's early morning experience at low tide reeked of 'the unmistakable odour of the coral reef'.³⁰

*Here I fell across the gigantic cockle, which old Dampier correctly says would dine two hundred men [...] Here again I stumbled over the black slug, called butu kling [a sea cucumber] by the Malays [...] Again, I spy the babi laut [or a sea urchin], a black ball, bristling with needles, which it is almost death to touch. I keep clear of them, while I admire their tender structure. The slightest touch breaks the venomous spears to pieces. I walk over corals of all descriptions, forms, and sizes, enough to fill twenty museums.*³¹

In Thomson's description of his journey afoot an intertidal coastline, his regard for the reef's beauty is mixed with knowledge of its treacherous and deadly outcomes, amongst these: grounded ships, corpses, poisonous needles, perpetual decomposition, and odorous rot. In the same vein and around the same time in 1847, British surgeon Robert Little recounts his suspicions that Malaria-causing miasmatic gases were produced by coral reefs

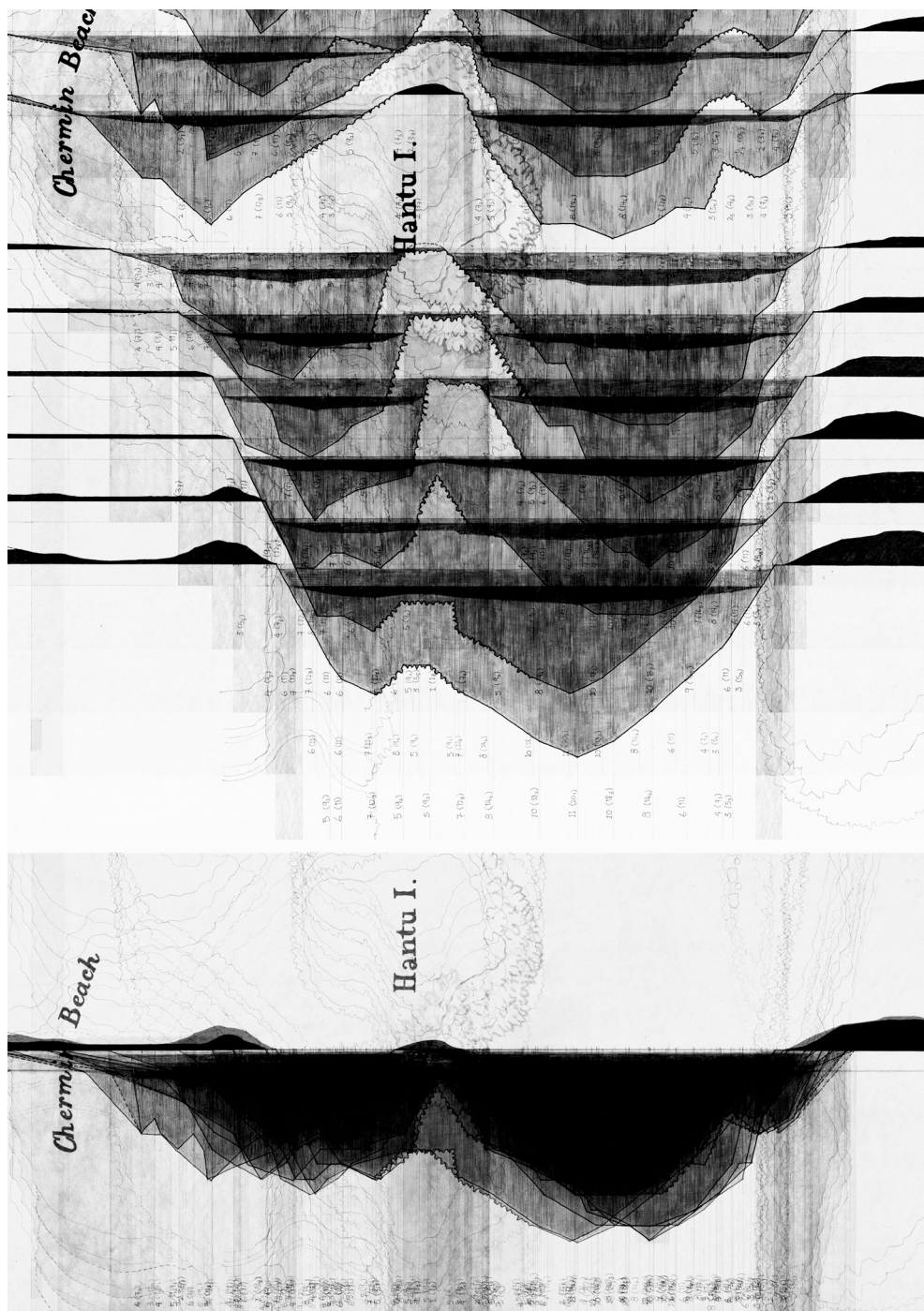


Figure 2.2 Ghostly reefs. View from the hull of a ship sailing into Singapore Harbour, based on hydrographic information from an 1849 map of the New Harbour.

Source: Drawings by Zi Hao Wong, 2021.

fringing Pulau Belakang Mati ('the island of death from behind'), as the present day Sentosa was then known.³² Despite his admiration for the living corals 'of many and wondrous shapes, with tints so beautiful that nothing on earth can equal them', Little opined that when the reefs were 'exposed at ebb tide we have a great destruction of coralline polyps, and a decomposition of animal matter carried on in a gigantic scale'.³³ He likened the coastal reefs to swampy marshlands, waterlogged sources of perpetual decomposition and intermittent fever. While Little's hypothesis turned out inaccurate, these anecdotal reef histories reveal their denigrated imaginary, somewhat echoing the Malay folkloric themes of life, destruction, and death.

Although Thomson's 'Terumbo Myet' disappeared from contemporary maritime maps, the colonial accounts reveal the two men's ambivalence towards the reef grounds. The beauty of the half-hidden reef landscape translated into something risky, as though the lives of men, not least their own, were deeply intertwined with the wide berth they afforded the 'wondrous' and 'tender' landscape at the margins. Each man surveyed from a distance, appreciating its magnificence but choosing to stand markedly apart from the reef fringes.

Recorded as a single island on maps, Pulau Hantu is perceptually understood as two islets connected by an intertidal reef landscape (qualified by the adjectives *besar* meaning 'large' in Malay, and *kecil* meaning 'little'). The reef fringe is an 'extra-territorial space' (here, between two warrior-islands).³⁴ Ginwala and Ziherl use 'extra-territorial' to mean a socio-political landscape which exceeds the measure of terrain and territory. We argue that visual mapping and anecdotal storytelling on these islets were initially linked, with the storied mode of mapping valuable for what it revealed and/or protected, as opposed to later colonial and conventional standard mapping whose focus remains primarily to assert sovereign territoriality. This shortcoming is particularly marked for the intertidal edges. Sometimes visible and other times hidden, the bifurcated centre between the two islets (or the two warriors) is tucked within a dynamic underwater intertidal edge. This region exists in the temporal and momentary margins of sea-becoming-land. Biologically diverse, and unsurprisingly central to flood control efforts, corals – living reef bodies that secrete mineral calcium carbonate to build their hard ground of limestone skeletal structures – though absent from most maps, flourish instead in folklore. The reef islands furnish compelling imagery for narratives woven around supernatural beliefs such as bodies mysteriously hardening into ground.³⁵

Returning to the anecdotal account – more fictive than factual – of the dead warriors turned into twinned islands at the start of the chapter, the situation of Singapore's elusive 'Ghost Island' is further complicated with this next fragment of information: that the island in question had another spectral twin, elsewhere in Singapore's waters. Before 1983, there was once not one but two distinct and separate Pulau Hantus.³⁶ Located in the southern waters close to the mainland and current Sentosa island – within a channel of water historically known as the western maritime approach to Singapore's Keppel Harbour – the second Pulau Hantu has been transformed today into a private yacht marina, accessible via a causeway from Singapore. Renamed Keppel Island in 1983 because the 'ghostly' imagery conjured up by its former moniker was unpalatable to the harbour's prospective shipyard clients, its reef fringes were also destroyed with its image upgrade, flattened into the single line of a dockyard wall.³⁷

Yet, this second Pulau Hantu was no less embellished in old Malay folklore. Visiting Singapore in the 1950s, writer Pelham Groom recalls the anecdotal origins of Keppel Harbour in old Malay coastal and archipelagic myths and superstitions.³⁸ The 'ghostly' associations of the 'island west of King's Dock' (the second Pulau Hantu), score a relationship to the island's intertidal reef grounds:

Many years ago the island was far bigger than it is today and was inhabited by a community of fishermen. One day one of the fishermen caught the largest crab that had ever been seen in Singapore's waters [...] It was a giant of a crab [...] The man didn't want to part with it. And since the crab showed no inclination to return to the depths he allowed it the freedom of the island. [...] Between the man and the crab a strange friendship developed. Finally it reached the stage at which the fisherman told his wife to sleep somewhere else because he wanted the crab to be beside him both by night and by day. The wife took umbrage and became intensely jealous of the crustacean [...] One day when the fisherman was at sea, the wife killed the crab. The crab was eaten, but retribution followed swiftly and everyone who had sat down at the meal took sick and died. [...] The news of the crab's death spread rapidly across the ocean bed and piscatorial demolition parties were organised to reduce the island to a size which would make it impossible for such a large community to live there again.³⁹

Pelham Groom draws on the ancient Malay legend to explain tidal ebb and flow. The story of Pusat Tasek, or 'Naval of the Seas', was familiar to the sea peoples of old Malaya and the Indonesian archipelago. It tells of an 'enormous hole in the bed of the ocean', within which lives an equally enormous crab.⁴⁰ For most of the day, the crab – a scavenging crustacean with its habitat inside the reef grounds – prefers to hide inside its giant pit, though twice daily it emerges to look for food along the coast. As it crawls out, it unplugs a massive ball of rock – the monumental door of its submerged abode – and a great volume of seawater empties into the hole, draining into the underworld. Each time the crab returns home it rolls the monolithic rock back into place, thus plugging the same hole. It follows, then, that the ocean is replenished by falling rain and rivers flowing from land into sea.⁴¹ The stories construct an imagination of intertidal and reef grounds as uneasy and shapeshifting terrains, playing up their imperceptibility by calling into association the marginal landscape's relations to crab spirits, and the ghostly underworld, whose processes mirror natural hydraulic and tide cycles.⁴²

The archipelagic Malay stories draw another kind of web around these reef islands, focusing on the relational character of humans and non-humans. The two attitudes – one of colonial distance and the other of native connectedness – rehearse how knowledge is constructed, and the biases which accompany our competing and often contradictory modes of knowing. Alluding to the spectral nature of the ghost islands, what is compelling about the *terumbu* island formation is *how* it is cast as knowledge. Studied by environmentalists, recounted in stories, elusive to cartographers, negotiated by mariners, threatened by maritime development, the *terumbu* is an island landscape both marginal and undeniable. Its joint status as natural-cultural artefact means that it needs to be told in many ways, through different registers and disciplines. What cannot be pinpointed in full, as a single visual image on the map, needs to be reassembled through storied imaginations: The 'ghost island' is a collaged and layered construction of fragment upon fragment of images – putting into proximate relations landscape topologies elusive and invisible to established ways of mapping and seeing.

Storied Futures

The reef stories are proto-ecological in their intersections of nature, society, and interspecies relations. A liminal landscape where water not only meets land but a threshold delimited by a fragile co-existence between creatures from either realm, the intertidal island edge is a metaphorical site of heterogeneous relations. The reef island stories speak of fragile liminality and co-existence. They tell of our embodied dependencies on larger ecosystems – rivers,



Figure 2.3 Plaster casts of coralline fragments mounted/stored in stainless steel boxes, 2022.

Source: Photograph by Zi Hao Wong.

skies, clouds, oceans which affect tides, seasons, and atmospheres. The stories are affective in how they imagine an emergent life that fully implicates all of ‘us’ – a kinship of humans and non-humans (crabs, shellfish, birds, corals, ancestral ghosts) residing together in an interconnected landscape borne of interspecies relations and protected only by mutual care for the other. The cultural stories mirror the intertidal island edges’ natural physiological and biological processes.

Donna Haraway and Anna Tsing have separately argued for ‘speculative fabulations’ and ‘a rush of stories’ in order to say and to think through what we are unable to do within our distinct but ultimately limited and self-contained disciplinary silos.⁴³ Haraway writes that storying is a means of worlding and through these risky but joyful propositional story worlds or ‘livable cosmopolitics’,⁴⁴ we can ‘stay with the trouble’,⁴⁵ which means to fully engage and acknowledge what we do not yet know how to notice or think through, but whose influence we can already sense. How might we relate to this relationship-to-come? Feminist author and poet Ursula K. Le Guin calls us to reconsider ‘our fellowship as creatures with other creatures, things with other things’ and to consider other species as ‘fellow beings – kinfolk’.⁴⁶ The Singaporean archipelago undergoing radical engineered change exemplifies a milieu of fading vitality and systemic compartmentalisation, where it seems more important than ever to revive ancestral vitalist beliefs. Vitalist politics were already interwoven into a modern landscape which has systematically reduced these tales to legends at best, more often to fantasy. The story form is an important carrier of such ‘information’, since the latter is an amalgam of fact and discourse which must survive and resist the censorship of knowledge structures that dismiss unwieldy relations. Rather than think of the island’s edges as a natural landscape in peril, the island reef stories are kinship stories. In reading them and in inhabiting a storied place, we are asked both to reconsider the coastal margin as already in us and to bring back

inland the long-faded edges of island and archipelago, and their outmoded belief systems and ways of relating to the wider shifting – and hence unwieldy – environment.

The relationality between cultural archipelagic stories and natural marine biochemistry is not unprecedented. This crisscrossing of thought undermines the separation of nature from culture; it signals that reefs are – following Jane Bennett's argument – vital, vibrant matter: parts of them are somehow connected to us, or even, part of us, part of humans.⁴⁷ Bennett reiterates Félix Guattari's philosophical argument in *The Three Ecologies* (1986), where he names and connects three 'ecologies': environmental ecology, social ecology, and mental ecology.⁴⁸ Guattari sees these three domains as entangled, interchangeable points of view. They intersect to form an energetic assemblage of diverse bodies and manifold trajectories, such that to effect change to our environment is also to transform our social and mental perspectives. In her study of sought-after matsutake mushrooms thriving in forests-turned-wastelands, Tsing argues that the mushrooms and their habitats are outcomes of 'transformative encounters' and the result of 'contamination' between distinct species and categories – the loss of pine trees to overlogging resulted in a postindustrial forest which in turn became fertile ground for the prized mushrooms.⁴⁹ Tsing's argument for a relational knowledge arc critiques modernist self-contained, authoritative, and siloed categories, which repeat imperialist and colonial epistemologies. Here, the reef stories offer a transformative encounter to their audience, appealing for islandic- and culture-specific ways of sensing and mapping these islands. Singapore's archipelago – some inhabited, some extracted for resource – are potential sites for Tsing's 'transformative encounters'. They facilitate contemporary encounters with biodiverse species, and through their vernacular storied forms, offer alternative ways of thinking through more sustainable means of coastal protection.

The multispecies stories surrounding the two Pulau Hantus perceive the environment as being *in* us, that is, they constitute part of our selves, rather than something 'out there' for us to contemplate. Bruno Latour separately argues that such a perspectival shift of perceiving environments from within acknowledges the porous connections between human/social/mental and non-human/environmental/organic relations. Latour argues that the modern self is 'cosmically, biotechnologically, medically, virally and pharmacologically' braided with non-human nature.⁵⁰ Bennett even attests that the term 'environment' might be problematic because it distances and makes abstract what is intrinsically part of us.⁵¹

This distancing is prevalent in how coastlines are kept perceptually stagnant with the construction of seawalls to stop the influx of seawater into dry land. The seawall is an example of a self-contained and urban-inflected idea of territory. Seawalls repel waves back into the sea. Instead of breaking them, a seawall causes waves to bounce back somewhere else with greater force. This goes on until the wave hits the weakest point causing imminent collapse of the structure it crashes into. Termed 'managed retreat', the practice of using seawalls is a controversial, though still popular, form of capitalist coastal protection.⁵² An expensive infrastructural investment, seawalls are a crude solution where the economic cost of the wall and ecological damage it wrecks are justified by the exorbitant property prices and their high demand along that coastline. Sociologist Summer Gray points out that seawalls, a global technocratic product, are a colonial legacy.⁵³ Echoing Thomson and Little's instinct to separate themselves from what they could neither control nor fathom, the seawall is the antithesis of the complex reef-fringe coast. The seawall works by containing and rejecting – thus organising whole complex edge island landscapes into separate containable entities of water and land, inside and outside, animate and inanimate, territory and bodies. The intertidal reef island edge, on the other hand, functions by mixing and contaminating. In fact, it defies the assumed isolation of island configurations, demonstrating instead the entangled and impure nature of an islandic existence.



Figure 2.4 'Tactile drawings' for an intertidal coastline. (Top) "Book of Tides", 2022. Refuting the disembodied aerial view and the flattening of cartographic representations landscape temporalities, this chapter's second author extends Anuradha Mathur and Dilip da Cunha's drawing methodology by examining the relationship between drawing and reading bodies,

to produce alternative ways of drawing and sensing Singapore's intertidal landscapes. The "Book of Tides" is a map of the intertidal shoreline, created through layers of corrections and adjustments, requiring careful handling and flipping through fragile pages, slowing down time and immersing the reader in the landscape. (Bottom) "Dragon's Teeth and Ghost Island", 2023. In another two-and a half dimensional iteration, plaster cast tactile 'drawings' explore intertidal terrains and submerged reef grounds. They reinterpret scientific measurements of bathymetric depths of Singapore's waters, evoking fragility, precarity, and fear of the unknown. These haptic 'drawing' explorations reimagine archival maps from the perspective of ships, returning to archipelagic myths of dangerous rocks and shapeshifting underwater landforms.

Source: Composite photographs by Zi Hao Wong.

In this chapter, we probed how archipelagic stories are no less true nor less relevant than scientific knowledge. The affective reef stories of the two Pulau Hantus place unseen things into embodied relationships. The stories extend kinship between matter, landscape, and environment, and forge new bonds between humans and non-human others. Considered in parallel, the archipelagic reef story is another way of speaking to what scientists are tracking: 'science fact and speculative fabulation need each other'.⁵⁴ Through stories and research, storytellers and scientists attempt to convey the shape of their shared subject, to map its complexities and relate to their audiences why the intertidal reef coast matters for the future of islands everywhere. To visualise the intertidal coast as a complex, 'contaminated', and ephemeral site is a representational and methodological challenge. These sites need new modes of representation and references which will not push aside the landscape's cultural storied pasts mingling with its natural fragile formations. The incorporation of eco-technological visions that mix affective stories with infrastructural solutions offers a sustainable way to address urgent environmental issues, and encourage natural recovery. The marginalised archipelagic stories, such as those narrating Pulau Hantu's pasts, also build a cultural recognition for our shared historical landscapes. Intertwined with science, these stories and the representations they inspire build a hybrid and alchemical foundation for preserving our disappearing coasts.

Notes

- 1 Adaptation of story on signboard at the jetties of Pulau Hantu Besar and Pulau Hantu Kechil.
- 2 For a discussion of the infrastructural sea, see Lilian Chee, *Architecture and Affect: Precarious Spaces* (Routledge, 2023), 254–99, <https://doi.org/10.4324/9781315604565>.
- 3 "More Stories and Superstitions of Old Malaya: Tales Related by an Old Malay to 'Yahya,'" *The Straits Times*, April 9, 1939.
- 4 Cheryl Tan, "How 'Accidentally Discovered' Corals in Sentosa Can Help Scientists Predict Sea Level Rise in Singapore," *The Straits Times*, May 23, 2022, www.straitstimes.com/singapore/environment/how-accidentally-discovered-corals-in-sentosa-can-help-scientists-predict-sea-level-rise-in-singapore.
- 5 Tan, "How 'Accidentally Discovered' Corals in Sentosa."
- 6 Loke Ming Chou, "'Living' Coastal Protection and Nearshore Biodiversity Reclamation," in *Sustaining Tomorrow via Innovative Engineering*, ed. David S.-K. Ting and Rupp Carriveau (World Scientific, 2021), 291–310.
- 7 Loke Ming Chou, "Nature-Enhanced Coastal Defence," *Envision* 17 (2020): 52.
- 8 Owain Jones and Linda Cracknell, "A Conversational Essay on Tides by Linda Cracknell and Owain Jones," *Tidal Cultures*, June 7, 2014, <https://tidalcultures.wordpress.com/a-conversational-essay-on-tides-by-linda-cracknell-and-owain-jones/>.
- 9 Jones and Cracknell, "A Conversational Essay."

- 10 Mark Monmonier, *Coastlines: How Mapmakers Frame the World and Chart Environmental Change* (University of Chicago Press, 2008), 17–18.
- 11 This horizontal datum is projected from an astronomical calculation of the lowest possible tide level for a given area of the sea. Monmonier, *Coastlines*, 17–18.
- 12 See Milica Topalovic, Hans Hortig, and Stephanie Krautzig, *Architecture of Territory: Sea Region Singapore, Johor, Riau Archipelago* (ETH Zurich DArch and FCL Singapore, 2015).
- 13 Monmonier, *Coastlines*, ix–x.
- 14 See Anuradha Mathur and Dilip da Cunha, *Soak: Mumbai in an Estuary*, published in conjunction with the exhibition “Soak: Mumbai in an Estuary” at the National Gallery of Modern Art, 2009 (Rupa & Co., 2009).
- 15 Monmonier, *Coastlines*, 21.
- 16 Kate Madin, “Dead Corals Do Tell Tales,” *Oceanus: The Journal of Our Ocean Planet*, March 9, 2007, www.whoi.edu/oceanus/feature/dead-corals-do-tell-tales/.
- 17 Madin, “Dead Corals.”
- 18 Madin, “Dead Corals.”
- 19 Natasha Ginwala and Vivian Ziherl, “Sensing Grounds: Mangroves, Unauthentic Belonging, Extra-Territoriality,” *E-Flux* 45 (May 2013), www.e-flux.com/journal/45/60128/sensing-grounds-mangroves-unauthentic-belonging-extra-territoriality/.
- 20 Ginwala and Ziherl, “Sensing Grounds.”
- 21 Ginwala and Ziherl, “Sensing Grounds.”
- 22 Brian Massumi, *Politics of Affect* (Polity Press, 2015), 94. For discussion on landscapes and affect see Chee, *Architecture and Affect*, 205–99.
- 23 See also Lilian Chee, “Swerving With a Tiger: Architecture after the Animal,” *The Journal of Architecture* 28, no. 6 (2023): 980–95, <https://doi.org/10.1080/13602365.2023.2283208>; Lilian Chee, “The Ruler, the Ruled and the Unruly: Animality, Anecdotes and Storytelling,” in *Architecture and Affect* (Routledge, 2023), 31–63.
- 24 Hélène Frichot, *Creative Ecologies: Theorizing the Practice of Architecture* (Bloomsbury, 2018).
- 25 Marcus Ng, “Through Time and Tide: A Survey of Singapore’s Reefs,” *Biblioasia: Reclamation and Reincarnation* 13, no. 1 (June 2017): 31.
- 26 J. T. Thomson, “Singapore New Harbour,” hydrographic chart, Hydrographic Department, Admiralty Office, London UK, 1849/1851, access no. HC000532.
- 27 John Turnbull Thomson, *Some Glimpses into Life in the Far East* (Richardson & Company, 1864), 211.
- 28 Ng, “Through Time and Tide,” 31.
- 29 Thomson, *Some Glimpses*, 211–16.
- 30 Thomson, *Some Glimpses*, 212.
- 31 Thomson, *Some Glimpses*, 212–13.
- 32 Little records this observation to be made on June 1, 1847. Robert Little, “An Essay on Coral Reefs as a Cause of Blakan Mati Fever, and of the Fevers in Various Parts of the East,” in *The Journal of the Indian Archipelago and Eastern Asia*, ed. J. R. Logan, vol. 2 (Singapore, 1848), 571–602, cited in Ng, “Through Time and Tide,” 30–1.
- 33 Little, “An Essay on Coral Reefs,” 599.
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