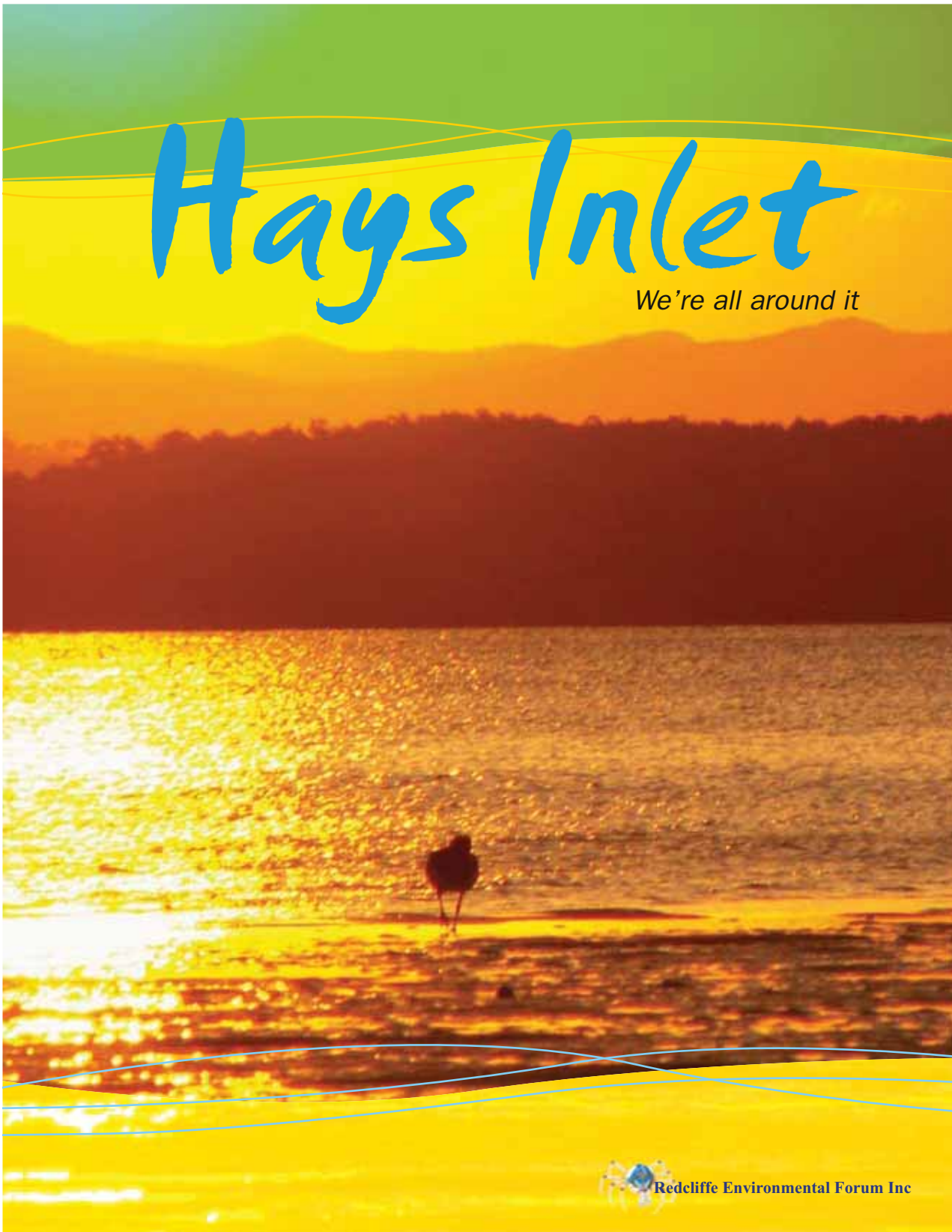


Hays Inlet

We're all around it



Redcliffe Environmental Forum Inc



Contents

Introduction.....	3
Where and What is Hays Inlet?	3
What's Special About Hays Inlet?.....	5
Shaping Hays Inlet.....	7
Human History of Hays Inlet	9
Waterways of Hays Inlet	12
Habitats of Hays Inlet.....	12
Fauna of Hays Inlet	19
Adaptations of Inhabitants of Hays Inlet	22
Human Impacts on Hays Inlet	25
Balancing the System in Hays Inlet.....	27
Glossary	27
Further Reading.....	27

Acknowledgements

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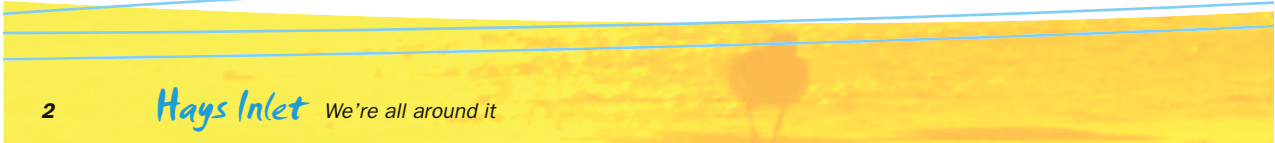
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Front Cover Image: Sunset over Hays Inlet - Bob Crudgington



The Hays Inlet area is celebrated with the Hays Inlet Festival, held every two years. The Festival is a collaborative effort between many volunteers, community groups and Council.



Introduction

This booklet is designed to be used as a teaching resource as well as general information booklet, providing information on the Hays Inlet environment. The booklet contains images of Hays Inlet and the habitats and animals contained within it.

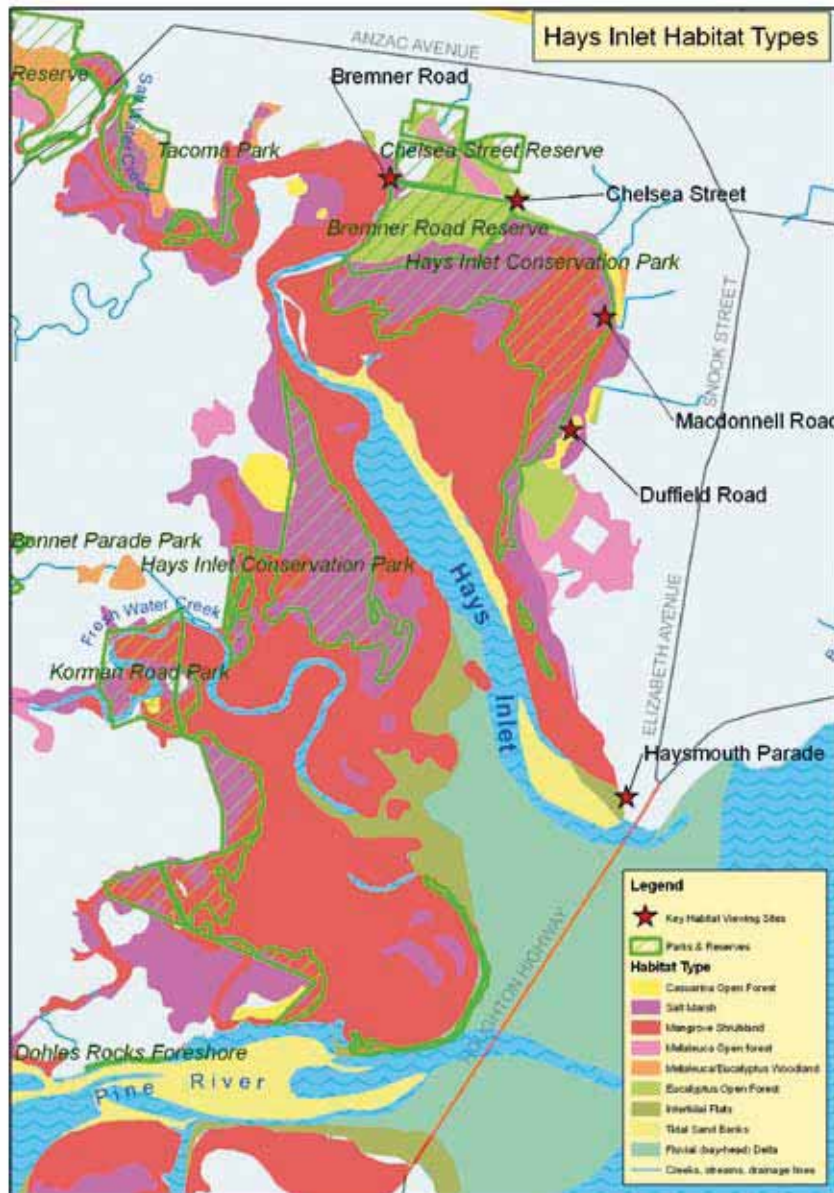


Where and What is Hays Inlet?

Hays Inlet is located along the lower reaches of Saltwater Creek, roughly bordered by Anzac Avenue to the north, Houghton Highway to the east, the Bruce Highway to the west and Dohles Rocks to the south. It is a wetland and estuarine area dominated by intertidal mudflats, lined with mangroves, surrounded by low, flat land containing saltmarsh and coastal bushland. The habitat is of international significance as it supports migratory birds. It covers an area of approximately 2,400 hectares, which makes it one of the largest and most significant wetlands in South East Queensland.

Water flows into Hays Inlet from the Freshwater and Saltwater Creek catchments, and continues into Bramble Bay (part of the Moreton Bay Marine Park - see the catchment map). Water from the Pine Rivers catchment also influences Hays Inlet through tidal mixing.

Within Hays Inlet there are several conservation areas, along with easily accessible areas where you can view the different habitats. Viewing areas are noted on the Habitat Map overleaf.



What's Special About Hays Inlet?

Fisheries Nursery

Wetlands are home to a huge variety and quantity of plants and animals – mammals, birds, reptiles, fish, frogs and invertebrates (including waterbugs). They are among the most productive environments in the world.

With such high levels of productivity, places like Hays Inlet are immensely important breeding grounds for many of the marine species that local fishermen enjoy. Parts of Hays Inlet have been protected from commercial fishing since as early as 1969 for fish habitat protection.



Fishing off the Hornibrook

B. Crudgington

Did you know? Almost 70% of Eastern Australia's commercial seafood catch is made up of mangrove related species.

Natural Water Treatment System

Hays Inlet acts as a natural water treatment plant. It removes some of the pollution that comes from within the inflowing catchments. It therefore helps to deliver cleaner water to Bramble Bay and Moreton Bay for us and the wildlife that use the area.

Air purifier

Bushland areas like Hays Inlet are very good at absorbing carbon dioxide from the air. They act as a natural air filter, absorbing carbon dioxide and pumping out oxygen, thus ensuring that the air we breathe is cleaner.



Fishing in Hays Inlet

B. Crudgington



Scenery

Hays Inlet forms part of a green fringe which surrounds most of the western edge of the Redcliffe Peninsula. It is the reason that we feel better when we cross the bridge coming home from the city.

***Did you know?** Medical research in USA and England has shown that when people visit, live near or observe natural environments they experience effects such as a lowered heart rate, lower blood pressure, stress reduction, and feelings of relaxation. Doctor Hays Inlet doesn't even charge!*

Wildlife

Hays Inlet forms part of the Moreton Bay Marine Park and includes the Hays Inlet Conservation Park. It is also listed as a Key Coastal Site in the South East Queensland Regional Coastal Management Plan. It is significant to many species of marine animals, and birds as a breeding ground, haven and roosting site.

The area supports a wide array of life, from kangaroos to Flying Foxes, Eastern Curlews, fish, crabs and prawns.

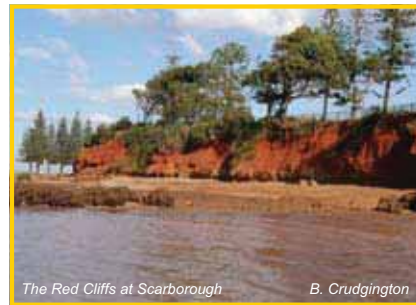
Because of the importance to wader birds, parts of Hays Inlet have been identified and listed as internationally significant under the Ramsar Convention. The Ramsar Convention protects habitats along, and at each end of the wader birds migratory journeys. The importance of Hays Inlet continues to grow as South East Queensland's population growth drives up coastal development, thus removing many areas that were once suitable for birds and animals to inhabit.

***Did you know?** Bar-tailed Godwits (a migratory bird which sometimes visits Hays Inlet) breed in Siberia and Alaska and travel to Australia and New Zealand for our Spring. Their flights can last up to 9 days non-stop! The longest flight on record is 11,570 km. That means that on average the bird flew 24 hours a day for 9 days at an average speed of approximately 50km/hr! The birds can lose up to 30% of their body weight when making these flights. Birds like this rely on areas like Hays Inlet to feed immediately on arrival. They also use these sites to rest and fatten up before continuing their journey.*

Shaping Hays Inlet

Most of the Redcliffe Peninsula is made up of sandstone rock, which would have formed over 150 thousand years ago, laid down by rivers flowing from the west (possibly even by the Brisbane River which had its mouth near Caloundra at one time), and created under water by pressure.

Along the Redcliffe Peninsula shoreline the red soils have developed over years of basalt rock weathering. It is the basalt shoreline which has protected the sandstone peninsula against erosion. To the south and west of the Redcliffe Peninsula lies the area of Hays Inlet, which has been shaped by sediment deposition, and some erosion brought about by natural weathering processes, sea level changes, winds, currents and tides.

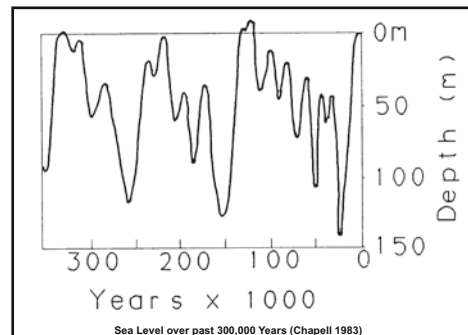


Wind and Currents

Hays Inlet forms the north-western corner of central Moreton Bay. The prevailing currents and south-easterly winds bring sediments from the Pine and Brisbane Rivers, to Hays Inlet. Some wave action brought about by wind, causes erosion, however this is fairly minimal as the area is well protected from ocean waves by North Stradbroke and Moreton Islands. Of course sediment has also been deposited in Hays Inlet from the Saltwater and Freshwater Creek catchments. The timing and rate of deposition has been influenced by sea level changes and tidal oscillations.

Sea levels

Sea levels do not remain static through time, and sea level changes have had a major influence on geology and weathering processes in this area. In the past, Moreton Bay has emptied and filled on several occasions. In recent geological history sea level has risen approximately 130 meters since the peak of the last ice age about 18,000 years ago. Most of the rise occurred before 6,000 years ago. Hays Inlet has been inundated several times in the past until the sea level fell to its present level about 3,000 years ago.



Tides

In present day time, the mudflats, sand bars and estuarine areas of Hays Inlet are inundated with normal high tides. Spring and king tides, which coincide with the phases of the moon, provide tidal inundation across the saltmarsh and marine couch areas. These tidal oscillations influence the movement of sediments throughout the area.



Stabilisation

Hays Inlet has been exposed to increased sedimentation brought about by erosion on the mainland, and in particular within its own and the Pine River catchment areas. Mangrove species have colonised large areas of mudflats created by the deposition of sediments. The mangroves have helped to bind the sand and mud together and advance the coastline in these areas. It is likely, given the increased sedimentation from terrestrial erosion, that there is a steady increase of sand and mud in Hays Inlet, Bramble Bay and Moreton Bay.

Recent changes in mangrove colonization now show that the sea level in Moreton Bay is presently rising. This will also have an influence on erosion and deposition within Hays Inlet.

Did you know? If Moreton Island was not on our doorstep, Hays Inlet and the vegetation / habitat within it would be very different from what it is today!



Aerial view of Hays Inlet and Saltwater Creek

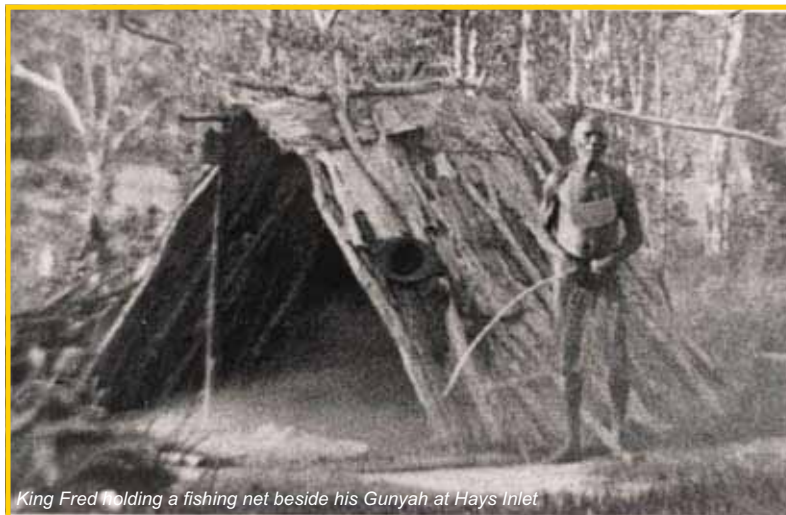
B. Crudgington

Human History of Hays Inlet

Aboriginal people have been living around Moreton Bay during the past 2000 to 4000 years. The traditional inhabitants of the Redcliffe Peninsula, the Ningi Ningi people, enjoyed a comfortable existence with a rich variety of food and plenty of time for ceremonies, traditions and socialising. The Ningi Ningi people are identified as being the southern most clan of the Undambi people of the Sunshine Coast. The Undambi are part of the larger Gubbi Gubbi (or Kabi Kabi) language group. The word Ningi Ningi is believed to mean 'oysters'¹.

Hays Inlet and the Redcliffe area provide a 'Seafood Supermarket'. The food eaten by the Ningi Ningi people included mud crabs, oysters, turtles, dugongs, mullet, whiting, bream, prawns, kangaroos, wallabies, possums, birds' eggs, bush foods and the teredo worm, which were collected from the shallow mangrove swamps.

There are many reports of early explorer observations of Aboriginal dwellings near the area. Lieutenant Matthew Flinders was the first, when he souvenired a 24 meter long Aboriginal fishing net at Clontarf Point. In July 1799, Flinders described Woody Point as a "green head" and Hays Inlet as "a river-like form, but the greatest part of it is dry at high water". His fellow sailor, David Collins, also noted fishing nets found around a hut on the west side of the head (presumably Woody Point), and a canoe made of stringy bark.



King Fred holding a fishing net beside his Ganyah at Hays Inlet

Hollenshed

¹ Ford, R & Blake, T., 1998, *Indigenous Peoples in Southeast Queensland – An annotated guide to ethno-historical sources*, Faira Publications, Brisbane.



In 1843 the botanist and explorer Ludwig Leichardt spent some time in the Woodford area. He took a number of excursions around the region and this included the Ningi Ningi territory, where he experienced the special environment enjoyed by the Ningi Ningi people.

"I made an excursion to the coast and had a treat of oysters with my friends, the Nynga-Nynga blacks. You could have imagined to enter a primitive village – their bark huts in a circle round a fire and irregularly scattered over a sandy flat, with a swamp, which provided them with fresh water. As I came to them, one brought me a handful of oysters, the other some crabs – a species of lupaea, the finest crab which Mr. Archer or myself ever tasted. During the low water the sea leaves a very extensive flat dry, and this gives as many fine oysters to the black-fellows as they wish to collect."

Ludwig Leichardt, 1843

Other accounts of Aboriginal lifestyle in the area included ceremonies, bungwall gathering (the sharing of the root of a bungwall fern from the Moreton area), and dugong preparation and cooking.

Hays Inlet was named during the 1823 or 1824 expeditions, most likely by Oxley in his role as Chief Surveyor. The first known map was produced in 1825 which clearly marked the area as Hay's Inlet (with an apostrophe). Who Hays Inlet was named after is not clear. However, the convention back then was for the surveyor or explorer to name areas after prominent politicians or public servants. Robert William Hay (1786-1861) was a prominent public servant and is almost certainly the person that Hays Inlet was named after.

Redcliffe was chosen as the first white settlement in Queensland. It was settled in September 1824 as a penal colony, however it was found to be unsuitable and was moved to Brisbane in May 1825. Hays Inlet was gazetted in 1861 as part of the Redcliffe Agricultural Reserve. But only a small number of farmers took up allotments. In the 1880s the seaside area of Redcliffe became a tourist destination. Practically all the area around Hays Inlet, which was not classified as 'swamp', was surveyed by 1885, and available for sale.

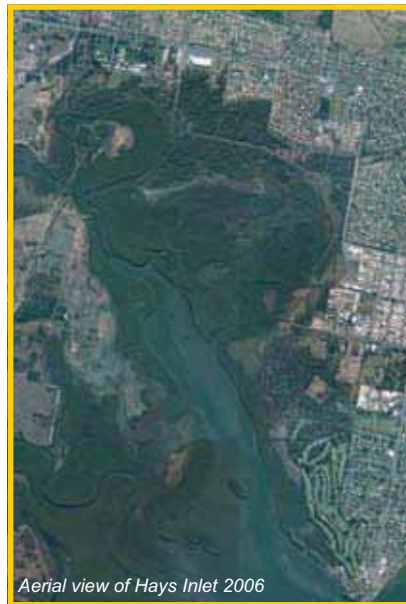
The Ningi Ningi people continued to live in the Redcliffe and Hays Inlet area into the late 1880s and 1890s, due to the slow settlement. Some of them becoming well known characters in the areas, such as King Sandy and Big Fred. Some Aboriginal artifacts have been found around the area, including a necklace of flaked stone and marsupial incisors found on the edge of a tea-tree forest east of the now Bremner Road.

Since then much of the area around Hays Inlet has been cleared and developed. Much of the area that is not cleared today was previously used for cattle grazing, some fence posts are still able to be found intact. The aerial photos of Hays Inlet in 1974 and 2006 show the changes due to clearing and the development of housing and industrial areas.



Aerial view of Hays Inlet 1974

Moreton Bay Regional Council



Aerial view of Hays Inlet 2006

Moreton Bay Regional Council

Today, Hays Inlet is protected as it is recognised as an internationally significant wetland for migratory birds. The area is also used exclusively for bushwalking, cycling, fishing, canoeing, kayaking, boating and exploring. There are also some people using it illegally for activities such as trail bike riding, using 4WD vehicles and the dumping of rubbish.



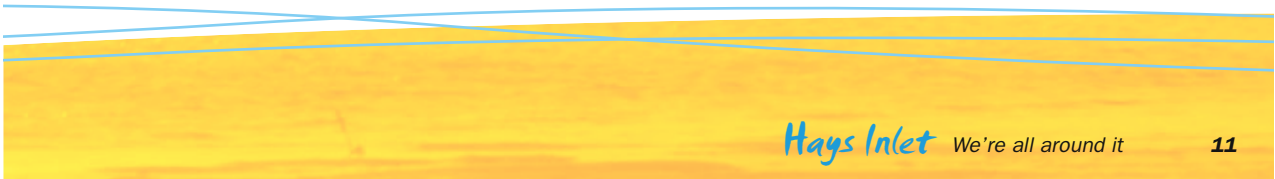
Exploring the intertidal flats

B. Crudgington



Cycling on the Hornibrook Bridge

B. Crudgington





Waterways of Hays Inlet

Throughout the Hays Inlet catchment there are three major types of waterways:

Creeks and Streams

Saltwater Creek is a major creek running from Rothwell and Mango Hill directly into Hays Inlet. This mangrove-lined creek has a number of streams and gutters associated with it. Freshwater Creek is the other major creek on the western side of the Inlet.

Lagoons

There are a number of lagoons on the western side of Hays Inlet. They are generally characterised by shallow pools of brackish water with associated sedges and other plant life. In some areas the water is mostly fresh and you can find stands of melaleuca.

Stormwater Drains

There are a number of stormwater drains leading into Saltwater Creek and the Inlet. These are man made and provide drainage for a significant amount of developed land on the western side of the Redcliffe Peninsula.



Saltwater Creek

B. Crudgington



Lagoon at Griffin

B. Crudgington

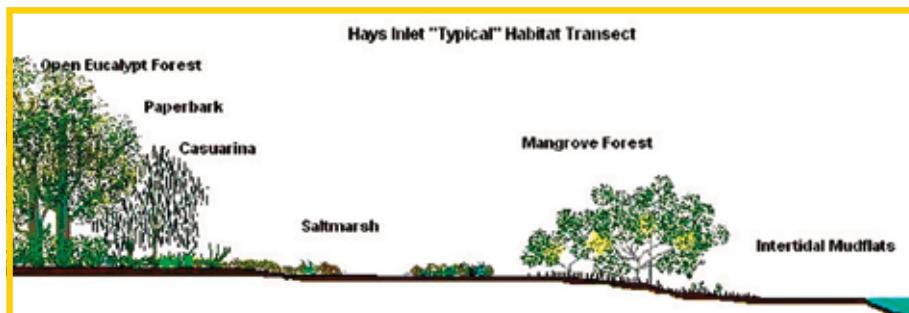


Stormwater drain Rothwell

B. Crudgington

Habitats of Hays Inlet

The following section describes the different habitats of Hays Inlet. These are illustrated in the diagram below.



Intertidal flats

The intertidal flats of Hays Inlet are one of its most conspicuous features when viewed at low tide from the Houghton Highway. At first glance it may not seem like it, but these flats, banks, pools and shallow channels are rich in life. They are characterised by large numbers of invertebrates including worms, crustaceans and molluscs.

These mudflats and banks are made up of very fine particles and detritus (organic matter). The flats also receive nutrients from the surrounding mangrove forest, saltmarsh and coastal bushland. The input of detrital matter from the wetlands along with the proliferation of various algae provides a foundation for a wide variety of invertebrate grazers and scavengers.

Did you know? *Hays Inlet is such an important habitat for birds particularly migratory waders, that it has been listed as a Ramsar site (an international agreement to protect sites recognised for being significant wetland for migratory birds).*

Invertebrate grazers and scavengers provide prey for other organisms including significant numbers of wader birds who use their long beaks to probe and forage through the sediments. These birds are active at low tide when most of the invertebrates have buried themselves into the sand or returned to their burrows to await the next tidal inundation.

When the tide is in, the wader birds retreat to the surrounding wetland vegetation to wait for the next low tide.

With the incoming tide another set of predators move in to take advantage of the intertidal flats and even make their way into the mangrove forest. Schools of the Common Toadfish move in with the leading edge of the tide making sure they are the first to take advantage of any detritus or invertebrates which have been unable to find safety beneath sediments. Other organisms which come to take advantage of the incoming tide include juvenile fish, prawns and other crustaceans. Once the tide turns a number of larger predators including stingrays, Shovel Nosed Sharks, Flathead, Whiting and Bream set themselves up to take advantage of the smaller predators.

However, it's not all about predation, herbivores such as fish including Hardy Heads, Mullet and Garfish move in with the tide to feed on algae.



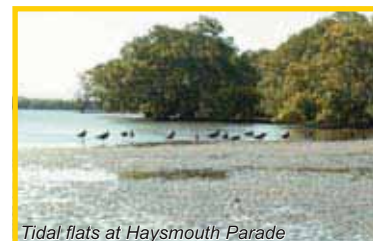
Dog Whelk

B. Crudgington



Pied Oystercatchers

B. Crudgington



Tidal flats at Haysmouth Parade

B. Crudgington



The Common Toadfish

B. Crudgington



Mangrove Forest

The term mangrove covers a diverse range of plants including trees, shrubs, palms and ground ferns. Basically mangroves are grouped together because they share physiological and ecological adaptations to cope with the challenging conditions found in intertidal coasts around the tropics and sub tropics of the world. In Australia there are 41 species of mangrove plants.

The mangrove forests of Hays Inlet are dominated by one species - the Grey Mangrove (*Avicennia marina*). This tree is the most widely distributed of all mangroves in Australia probably due to its tolerance of cooler climates. They can be found on the coastlines of all of our states except Tasmania. Grey Mangroves are pioneer species and are likely to be the first species to grow on a newly-emerged mud bank. Wherever drains have been cut, you will find that the Grey Mangrove will quickly colonise the edges.

Although the Grey Mangrove dominates the forest there are still other mangroves present. They include the River Mangrove (*Aegiceras corniculatum*) the Yellow Mangrove (*Ceriops tagal*) the Stilted Mangrove (*Rhizophora stylosa*) and the Milky Mangrove (*Excoecaria agallocha*).

Mangrove forests provide habitat for many organisms including bacteria, benthic microalgae, macroalgae, fungi, invertebrates and vertebrates including birds, fish reptiles and bats.

Did you know? Mangroves are important in estuary habitats like Hays Inlet for the following reasons:

- They act as buffers providing protection for the adjacent land by absorbing the energy of waves;
- Both the sediments which are trapped, and the mangroves themselves, absorb pollution including heavy metals;
- They provide a habitat for permanent and transient faunal species;
- They act as nurseries for juvenile fish and crustacean species; and
- Mangrove litter (leaves fruit and stems) form the basis of food chains and lead to the export of nutrients and detritus to adjacent marine ecosystems.



Mangrove Forest Griffin

B. Crudginton



Mangrove Forest Hays Inlet

B. Crudginton



River Mangrove Flower

B. Crudginton



Stilted Mangrove

B. Crudginton

Saltmarsh

The saltmarsh habitats associated with Hays Inlet are located in flat areas which receive regular but infrequent tidal flooding. Usually this flooding occurs during king or spring tides. They are generally located on the landward side of the mangrove forests. Saltmarsh areas generally have high levels of salinity and low levels of oxygen in their soils due to evaporation, sea water and the lack of agitation by tidal movements. This is an extreme environment where plants are especially adapted to cope. In some areas the conditions are so extreme that there are no plants at all.

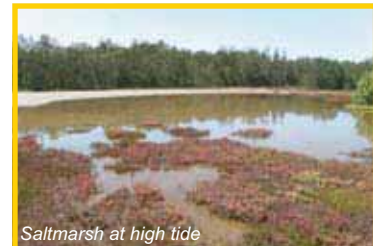
These areas are characterised by a mosaic of salt pans, Marine Couch pastures, sedges and samphires. The maximum height of this vegetation usually ranges between 10 and 30 cm. Saltmarsh areas are often devoid of any shrubs or trees except along the occasional gutter or creek where mangroves can establish themselves.

Although the saltmarsh areas may look devoid of life they are actually important habitats for crustaceans, molluscs and juvenile fish. They are also productive areas with detritus and nutrients added to the adjacent estuarine areas. This habitat is also important for many commercially important species where they can feed on detritus washed into the waterways after high tides. Yellowfin Bream have been known to venture on to the saltmarsh with the spring tide to feed directly on the saltmarsh and its inhabitants.

The Marine Couch pastures provide important grazing opportunities for native marsupials. If you look around these areas you will often see mobs of Eastern Grey Kangaroos or the occasional Swamp Wallaby foraging on the lush green couch.

Did you know? Saltmarsh areas are important contributors to the estuarine system for the following reasons:

- The vegetation helps to prevent erosion in the upper tidal zones reducing the amount of sediment entering Hays Inlet;
- They act as a filtration system trapping excess nutrients and run off from the surrounding areas;
- They provide food in the form of detritus and direct grazing of vegetation and algal mats; and
- They provide habitat for invertebrates and vertebrates and are utilised for foraging and roosting areas by wader birds.



B. Crudgington



B. Crudgington



B. Crudgington



B. Crudgington



Casuarina

Casuarinas are a distinctive part of the Australian landscape and can be found in many environments around Australia. There are over 60 species of these trees including the She-oaks, River Oaks and the Desert Oaks.

In Hays Inlet stands of the She-oak are located adjacent to the landward side of the saltmarsh and mangroves. They are often associated with Marine Couch and other saltmarsh vegetation and form part of a buffer between the wetlands and terrestrial vegetation such as the open eucalypt forest.

Did you know? The name *Casuarina* is derived from the Malay word *Kasuari* which means *Cassowary* (similarity between the drooping foliage of these trees and the bird's feathers).

Stands of casuarina have a high litterfall rate. This accumulated leaf, branch, seed and cone litter will form a dense layer on the forest floor. With the advent of heavy rains or extremely high tides the organic matter and nutrients can be transported into the nearby saltmarsh, mangrove and marine habitats.

Casuarinas provide habitat for a number of woodland species including birds, amphibians and reptiles along with invertebrates. In conjunction with associated marine couch these stands are utilised by marsupials and also provide roosting and foraging sites for Flying Foxes. The flowers are a staple in the diet of Rainbow and Scaly-breasted Lorikeets, the seeds are consumed by the Pale Headed Rosella and also form an important food source for several cockatoo species including the Sulfur-crested Cockatoo.

Did you know? *Casuarina glauca* can cope with a much greater level of soil salinity than mangroves.



Double-barred Finch

P. Johnson



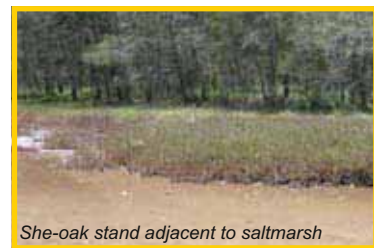
Casuarina (She-oak) at Chelsea St

S. Avery



Golden Whistler

P. Johnson



She-oak stand adjacent to saltmarsh

B. Crudgington

Paperbark Forest

Patches of paperbark or melaleuca forest can be found where ever there is soil inundated with freshwater. The main species is *Melaleuca quinquenervia* or the Paperbark Tea-tree. There are patches of this type of forest dispersed amongst the casuarina and open eucalypt forest throughout the coastal area. There is a large stand adjacent to the MacDonnell Reserve (refer to the habitat map on page 4).

These trees flower profusely between September and May. They are an important food source for a wide range of nectar feeders including Lorikeets, Honeyeaters, Flying Foxes, butterflies and possums. The paperbark forest also provides habitat for birds, amphibians and reptiles as well as invertebrates.

Open Eucalypt Forest

This type of habitat is often seen adjacent to the casuarina stands in Hays Inlet. Open eucalypt forest occurs, along with other terrestrial vegetation on ground which lies above the highest level of tidal inundation. Some of the more common trees in these patches of forest include the Queensland Blue Gum, the Moreton Bay Ash and the Grey Ironbark. Ground cover includes native grasses, Mat Rush and Flax Lily.

This forest provides habitat for a variety of terrestrial animals including Eastern Grey Kangaroos, Swamp Wallabies along with invertebrates, amphibians, reptiles and birds. The tree canopy provides habitat for the Koala and other arboreal marsupials. As eucalypt trees age they begin to form hollows where branches have fallen or died. These hollows are critical as nesting sites for many species of birds, bats, possums and gliders.

Did you know? Open eucalypt and tea-tree forests act as buffer zones to the other habitat areas. Buffers help by:

- Filtering water runoff;
- Reducing the impacts of invasive weeds;
- Minimising disturbance to wildlife;
- Providing corridors for wildlife movement; and
- Separating wetlands from competing uses and minimising nuisance problems.



Paperbark

S. Avery



Kangaroos on look out duty

P. Johnson



Flax Lily

B. Crudgington



Chelsea Street Reserve

B. Crudgington



Fauna of Hays Inlet

Hays Inlet and its associated habitats teem with wildlife, with a significant amount of invertebrate fauna as well as kangaroos, wallabies and birds to be found throughout the area. Even though the saltmarsh areas are quite harsh habitats there is still a wide variety of fauna to be found amongst the sedges and samphires.

Invertebrates

Invertebrates are animals without a backbone. They have other features to give themselves protection and structure. The insects, spiders and crustaceans have developed exoskeletons while many of the molluscs including gastropods have developed shells. Still others such as worms just stay out of sight.

Insects and spiders

Insects are prominent in all of the terrestrial habitats with the Golden Orb Spiders weaving their webs in the casuarinas to butterflies and their larvae utilising the myriad of vegetation which forms the understorey in the tea-tree and open eucalypt forests. Of course some of the most well known insects include the mosquitoes and sandflies associated with wetland systems.

Crustaceans

The dominant crustaceans include the crabs which can be found in the mangrove and saltmarsh habitats. In particular Grapsid Crabs or Shore Crabs can be high in abundance with population numbers up to 70 individuals per square metre of mangrove forest. The Ocypodid Crabs include the Fiddler Crabs and can be seen feeding on the nutrient-rich mud associated with the creek banks and mudflats.

Other prominent crustaceans include Hermit Crabs, and several prawn species including the Bay Prawn and the Snapping Shrimp which can be found in burrows under mangrove roots or rocks. Other crustaceans found in Hays Inlet include yabbies, barnacles and mud shrimps.



Golden Orb Spider

B. Crudgington



Caterpillar

B. Crudgington



Haswell's Shore Crab

B. Crudgington



Pink Clawed Fiddler Crab

B. Crudgington

Molluscs

There is a variety of molluscs found in the marine and saltmarsh habitats of Hays Inlet. The intertidal mudflats are covered with gastropods such as the Australian Mud Whelk, the Club Mud Whelk, Moon Snails and Dog Whelks.

Mangroves provide excellent habitat for a variety of molluscs. Tree Snails are common but can be difficult to spot during the day as they find shelter in the nooks and crannies around the trees. Around the roots of the mangrove trees you will often find the Hooded Oyster. Under the mud lie numerous species of bivalves. Examples include the Mud Ark, the large and aptly named Razor Shell as well as various mussels. It is often possible to see evidence of these bivalves in the form of empty shells scattered around the mudflats. Amongst the saltmarsh vegetation you will also find snails including the Solid Amphibian Snail.

Did you know? That insects, crustaceans and molluscs are the dominant fauna in the mangroves and saltmarsh.

Vertebrates

Fish

There are numerous species of fish to be found in Hays Inlet and the creeks and stormwater drains that make their way through the surrounding wetlands. The mangrove and saltmarsh areas provide feeding areas and refuge for many juvenile species including Mullet, Bream and Whiting. The area also teems with schools of fish such as the Yellow Perchlet, Herring, Anchovy and the Hardyhead.

Anglers regularly talk about their catches of Flathead, Bream, Luderick and Whiting (both summer and winter). Another conspicuous fish which works the shallows and the waterways is the Common Toadfish. Less obvious and well camouflaged are various species of Goby. Also moving in with the tide are species of sharks and rays including Estuary Stingrays, Shovel Nosed Sharks and Bull Sharks.



Dog Whelks

B. Crudgington



Barnacles at home on a Whelk

B. Crudgington



Well camouflaged Goby

B. Crudgington



Lace Monitor

B. Crudgington



Amphibians

In the melaleuca and open eucalypt forest you will find frog species including the Ornate Burrowing Frog and the frog with the great name of Scarlet-sided Pobblebonk. The introduced Cane Toad also inhabits these areas.

Reptiles

The larger reptiles found around Hays Inlet include the Common Bearded Dragon and the Lace Monitor. Smaller reptiles associated with the wetlands and forest habitats include skinks and various species of snakes such as the Red-bellied Black Snake and the Marsh Snake.

Birds

Hays Inlet is a Ramsar site which means it is internationally recognised as providing habitat for migratory waders including the Bar-tailed Godwit, the Eastern Curlew and flocks of Sandpipers. Many other birds are year around residents that inhabit the wetlands and intertidal flats. They include the Darter, the Pied Oystercatcher and the Black-winged Stilt.

Although many bird species utilise the mangrove forest there are a number of species totally dependent on it including the Mangrove Kingfisher, the Mangrove Honeyeater and the Mangrove Warbler. The saltmarsh has its own characteristic bird populations including White Faced Herons, Royal Spoonbills and the Common Ibis. A pair of Jabirus inhabits the lagoons associated with the western side of Hays Inlet. One of the most notable birds and an icon for the area is the Pelican which can be seen roosting on the light posts of the Houghton Highway Bridge. Other prominent birds in the area are the raptors, Brahminy Kites and Ospreys, which can be seen hovering over the open water, wetlands and flats.

Mammals

A number of marsupials utilise the wetlands and surrounding vegetation including the Eastern Grey Kangaroo, the Swamp Wallaby and the Koala. Some of the creek banks are inhabited by one of Australia's rarest mammals, the Water Mouse. Other mammals known to inhabit or feed in the area include Flying Foxes and introduced mammals such as the Brown Hare and the Fox.



Mangrove Kingfisher

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Darter drying its wings

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Royal Spoonbills

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Eastern Grey Kangaroo

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Adaptations of Inhabitants of Hays Inlet

An adaptation can be described as a positive characteristic of an organism that helps it to survive within a particular habitat. These adaptations enable organisms to cope with environmental stresses and pressures caused by the physical conditions such as salinity or temperature or by other organisms (such as predators) found in their habitat. Adaptation can be either structural (special body parts) or behavioural such as burrowing.

Estuaries and wetland areas like Hays Inlet are productive habitats and not only provide food for their inhabitants but protection from storms, predators and parasites. Differing levels of tidal inundation can create difficult conditions such as high salinity, low levels of oxygen in the soil and exposure to high temperatures. To survive in these tough physical conditions and to avoid predation plants and animals have developed strategies to cope with the challenges of the Hays Inlet environment.

Flora



Grey Mangrove pneumatophores

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Grey Mangrove roots

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Mangrove plants have developed a number of mechanisms to cope with their difficult habitat. They have developed specialised above ground root structures known as pneumatophores. These specialised roots can develop as stilts, pegs, knees or ribbons and combine with buttresses to provide stability. Numerous small holes in the bark allow oxygen to be transported to the below ground root system. Mangrove plants can cope with high salt concentrations within their sap and can dispose of excess salt through specialised leaf glands. Many mangroves have developed floating seed pods to aid in marine dispersal. In fact some mangroves use vivipary (live seedlings within a floating fruit) to ensure seedlings can get a head start once they have settled in a suitable area.

Saltmarsh areas are very harsh and the vegetation here is characterised by small salt tolerant herbs, shrubs and grasses. These plants are usually reduced in stature and many have developed semi-succulent leaves to store water and reduce evaporation. Saltmarsh plants specialise in dealing with the heat and salt so effectively that they avoid potential competition from other plants.



Fauna

The mangrove and saltmarsh habitats are dominated by crustaceans and molluscs. These invertebrates cope with the harsh conditions through the use of their hard exoskeletons or shells, which reduce evaporation. Many mangrove crabs can absorb surface water to keep their gills wet and to replenish oxygen. Many organisms are well camouflaged to reduce the chances of predation. Another adaptation used by mangrove fauna is through behaviour. Some animals dig burrows to avoid drying out during low tides whilst others hide in the nooks and crannies found in the mangrove and saltmarsh vegetation. When the tide is out, some juvenile fish avoid predation from larger fish by remaining in the shallow pools of water scattered amongst the intertidal flats.

Productivity

There have been many scientific studies highlighting the productivity of mangrove and saltmarsh habitats and their positive impact on the adjacent marine ecosystems. The various habitat zones in Hays Inlet all contribute to the productivity of the area and the adjacent marine environment (including important commercial fish and prawns).

A major source of energy is produced from fallen litter (leaves, fruit, stems and branches). This litter or organic matter provides the nutrition for many of the animals in Hays Inlet. The relationship between the organisms and how they obtain nutrition is of interest to ecologists and fishery management. This forms the understanding of how food webs work, and allows managers of Hays Inlet to understand and maintain biodiversity, fisheries production and recreational values.

Food Webs

To describe the food web of an ecosystem we refer to various levels of production and feeding habits of the organisms within the system. Primary producers (or autotrophs) are organisms which can create energy directly from the sun via photosynthesis or through chemical actions. They include plants and bacteria.

Other organisms obtain nutrition through direct consumption of these autotrophs or through the consumption of other organisms or their by-products. These organisms are called heterotrophs. There are a number of ways they obtain nutrients and energy:

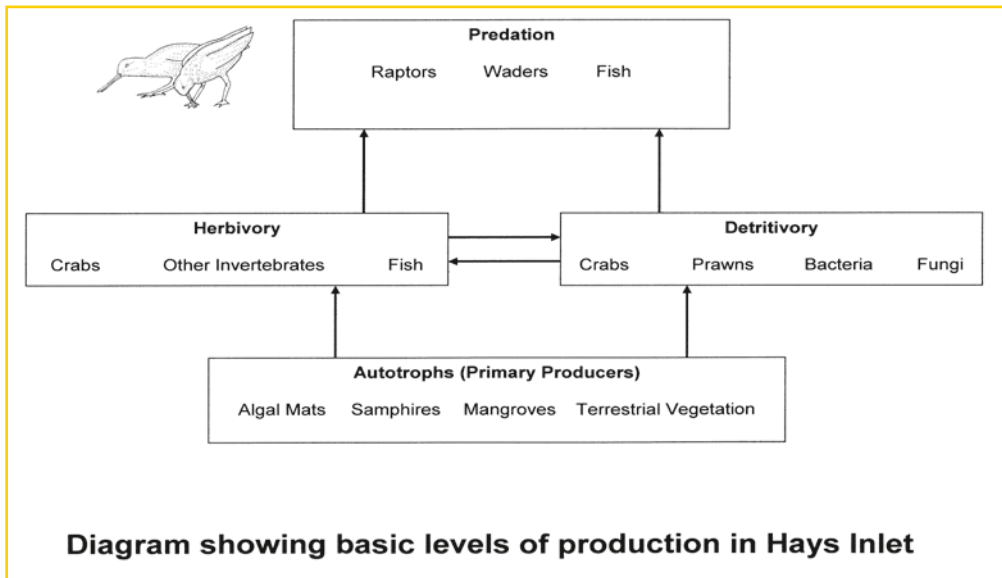
- Herbivory (consumption of plant and bacteria matter);
- Predatory (consumption of other organisms); and
- Detritivory (consumption of litter or detritus).

Within the mangrove and to a lesser extent the saltmarsh habitats, detritus is an important food source. In Hays Inlet, Grapsid crabs feed directly on detritus created by fallen leaf litter. These crabs can be numerous; some studies have indicated that in the mangrove areas there can be up to 70 crabs in each square metre of mangrove forest! They are efficient feeders and with their specialised mouthparts and claws can cut up mangrove leaves and then ingest them. They can assimilate up to 60% of the energy



stored within the leaves. Their feeding behaviour provides opportunities for bacteria and other organisms to take advantage of the remains including the excrement from the crabs.

The crabs themselves are preyed on by juvenile fish and many species of birds found in Hays Inlet. Another benefit of the behaviour and abundance of these crabs is related to their burrowing activity which helps to break up the substrate and oxygenate the soils below. Some scientists believe that the structure and productivity of the saltmarsh and mangrove habitats would be severely impoverished without the presence of Grapsid crabs.



Nursery for Juvenile Fish and Prawns

Apart from the availability of food for various organisms the saltmarsh and mangrove habitat are also important nurseries for juvenile fish and prawns. The shallow water that floods the mangrove forest floor and saltmarsh area is inaccessible to large predators. The often turbid water and structure associated with the plants themselves provides hiding places and feeding areas for juvenile fish and prawns.

Good management of the habitats around Hays Inlet is critical if locals and visitors are to continue to enjoy the opportunity of catching fresh fish for the dinner table. Much of the commercial fishing industry of South East Queensland and Moreton Bay in particular, relies on the productivity of wetlands like Hays Inlet. Good management will also ensure there is enough shelter and food for other creatures, such as the international waders which also rely on the productivity of the wetlands for their yearly visits.



Human Impacts on Hays Inlet

Hays Inlet is a beautiful area; however with the increasing population of South East Queensland, there are increasing pressures.

Urban Pollution

Waterways convey huge quantities of material from upstream to downstream areas. Anything which is transportable by water will move down the waterways and eventually into areas like Hays Inlet and Moreton Bay.

Increased urban development has created more hard surfaces which enable pollutants to be transported directly to our waterways via a network of stormwater pipes and drains.

These pollutants include rubbish, soil, herbicides, pesticides, fertilisers, animal manure, oil and petrol products. These pollutants can make our rivers, creeks, estuaries and bays very unhealthy.

Gross pollutant traps and litter baskets are now used in new developments, to intercept litter. However soil particles and water soluble pollutants are more difficult to intercept. In undisturbed natural areas vegetation buffers filter the runoff before it enters the waterways.

Pollution from Industrial areas

Industrial areas are high risk areas for water quality. There are several directly adjoining the waterways of Hays Inlet. These areas have traditionally released pollutants directly to waterways, however these days there are strict regulations through the Environment Protection Agency preventing unacceptable pollution. But even with regulation accidents are still possible. Businesses adjoining waterways need to have strict environmental policies and procedures in place to ensure accidents do not occur, and if they do, that the clean up is quick and effective.

The Redcliffe Sewerage Treatment Plant, although it has been upgraded to improve the quality of its treated wastewater, still releases into Hays Inlet.



Litter in the mangroves

B. Crudgington



Rubbish dumped in Hays Inlet

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Swamp Wallaby adjacent to the industrial area

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Vehicle access and illegal dumping

Owners of trail bikes and 4WDs have been accessing areas within Hays Inlet for a long time. They drive over vegetation and create large ruts in the ground creating an unsightly environment, as well as damaging the vegetation and adversely affecting wildlife and water quality of the waterways. Council, with the support of SEQ Catchments has been working to exclude unlawful users from sensitive areas since 2006. Numbers of 4WDs and trail bikes accessing the area have been significantly reduced.



Car wreck in the Hays Inlet Conservation Park

B. Crutdington

Did you know? Council, with the support of SEQ Catchments, has erected fencing behind Bunnings on Bremner Road, to exclude illegal trail bikes and 4WDs from the sensitive area. It is hoped over time that the important saltmarsh community will recover.

Easy vehicle access into the bushland area also provides an excellent location for illegal dumping of rubbish. Many tonnes of rubbish have been dumped in Hays Inlet, including cars, concrete and garden waste which introduce weeds to the area. Council and the community participate in Clean Up Australia Day each year. They target local bushland areas within and adjoining Hays Inlet.



Severe damage caused by Quad bike

P. Johnson

Clearing of vegetation for urban development

As in all other areas of South East Queensland, Hays Inlet and its catchment area is under constant and increasing pressure for natural areas to be cleared for residential and industrial development. Many people view Moreton Bay as an aquatic playground and seek to live close the bayside. As a consequence wetland and riparian areas are often damaged.

Riparian vegetation provides essential habitat for the large diversity of plants and animals that inhabit Hays Inlet. Many animal species need to move around to follow their food resources as the seasons change. Riparian vegetation provides corridors for wildlife to move along. These corridors are especially important in linking large areas of bushland. Within the Hays Inlet catchment there are very few intact riparian areas to provide such safe corridors. One, Saltwater Creek currently has a fairly intact riparian corridor from Clontarf to Narangba (only two major road crossings Boundary Road and Deception Bay Road). Riparian vegetation also has a role in helping to clean water that flows over the land before it enters a waterway. As water flows through grasses and ground covers the water slows down and drops what it is carrying, the vegetation acting as a filter.

Development pressure has resulted in large amounts of vegetation clearing. However, in the case of Hays Inlet the Local Government Planning Schemes for Pine Rivers and Redcliffe areas have been drafted to protect the riparian vegetation adjacent to Hays Inlet and Saltwater Creek.



Balancing the System in Hays Inlet

We must work towards minimising the impacts on Hays Inlet, and improve its resilience to pressure, if we wish to protect this beautiful area for future generations of people and wildlife. International, National, State and Local legislation are in place to prevent harmful activities occurring, and local council and community groups are working on projects to clean up and improve many areas. You can help by improving your environmental awareness and taking action to care for and enjoy Hays Inlet.



Black-winged Stilts

B. Crudegington

Glossary

<i>Basalt</i>	<i>A rock of igneous origin, consisting of augite and triclinic feldspar, with grains of magnetic or titanite iron, and also bottle-green particles of olivine frequently disseminated.</i>
<i>Bivalves</i>	<i>Molluscs with two shells</i>
<i>Catchment</i>	<i>An area drained by a river or body of water</i>
<i>Cryptic behaviour</i>	<i>Hiding in nooks, crannies or sediment to avoid predation</i>
<i>Detritus</i>	<i>Non-living particulate organic material (as opposed to dissolved organic material). It typically includes the bodies of dead organisms or fragments of organisms or fecal material.</i>
<i>Erosion</i>	<i>The carrying away or displacement of solids (sediment, soil, rock and other particles) usually by the agents of currents such as, wind, water, or ice by downward or down-slope movement in response to gravity or by living organisms (in the case of bioerosion).</i>
<i>Estuary</i>	<i>A semi-enclosed coastal body of water with one or more rivers or streams flowing into it, and with a free connection to the open sea</i>
<i>Food Web</i>	<i>The interconnected feeding relationships within an ecosystem</i>
<i>Intertidal</i>	<i>The intertidal zone (also known as the foreshore) is the area that is exposed to the air at low tide and submerged at high tide.</i>
<i>Nutrients</i>	<i>A nutrient is a substance used in an organism's metabolism which must be taken in from the environment.</i>
<i>Oxygenate</i>	<i>To create a situation where oxygen is added to the system</i>
<i>Ramsar</i>	<i>The Convention on Wetlands signed in Ramsar, Iran in 1971 is an intergovernmental treaty that provides the framework for national action and international cooperation for conservation and wise use of wetlands and their resources.</i>



<i>Riparian buffer</i>	<i>A vegetated area near a stream, usually forested, which helps shade and partially protect a stream from the impact of adjacent land uses.</i>
<i>Riparian vegetation</i>	<i>Any vegetation on land that adjoins, directly influences or is influenced by a body of water.</i>
<i>Sandstone</i>	<i>A rock made of sand more or less firmly united. Common or siliceous sandstone consists mainly of quartz sand.</i>
<i>Sediment deposition</i>	<i>Where eroded soil settles in a location.</i>
<i>Substrate</i>	<i>The material (e.g. dirt, rocks, sand, gravel) in the bottom of a marine habitat, or one that forms the bed of a stream (or of an aquarium); the source of food for some microorganisms</i>
<i>Terrestrial</i>	<i>Things having to do with the land or earth.</i>
<i>Tidal oscillations</i>	<i>Oscillation is a motion that repeats itself in a regular cycle, such as a sine wave or pendulum. Tidal oscillation is the regular cycle of incoming and outgoing tide.</i>
<i>Turbid</i>	<i>Cloudy, as by sediment or insoluble matter in a solution.</i>
<i>Wader Birds</i>	<i>Long-legged bird that frequents shallow water especially in search of food</i>
<i>Wave action</i>	<i>The action of erosion brought about by wave impact.</i>
<i>Weathering</i>	<i>The process of rocks breaking down into soil under the action of wind, water, sun, microorganisms and/or tectonic movement.</i>

Further Reading

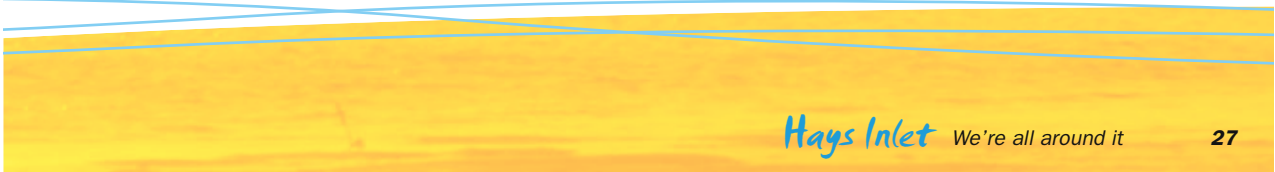
Davies P. 1998. "Wild Guide to Moreton Bay: Wildlife and habitats of a beautiful Australian Coast – Noosa to the Tweed" Queensland Museum

Duke N.C. 2006. "Australia's Mangroves: The Authoritative Guide to Australia's Mangroves" University of Queensland

Louise Johns 2006. "Field Guide to Common Saltmarsh Plants of Queensland" Department of Primary Industries and Fisheries publication.

Useful Websites

Environmental Protection Agency	www.epa.qld.gov.au
Department of Primary Industries and Fisheries	www.dpi.qld.gov.au
Moreton Bay Regional Council	www.moretonbay.qld.gov.au
South East Queensland Catchments	www.seqcatchments.com.au
Osprey House Environmental Centre	www.ospreyhouse.asn.au



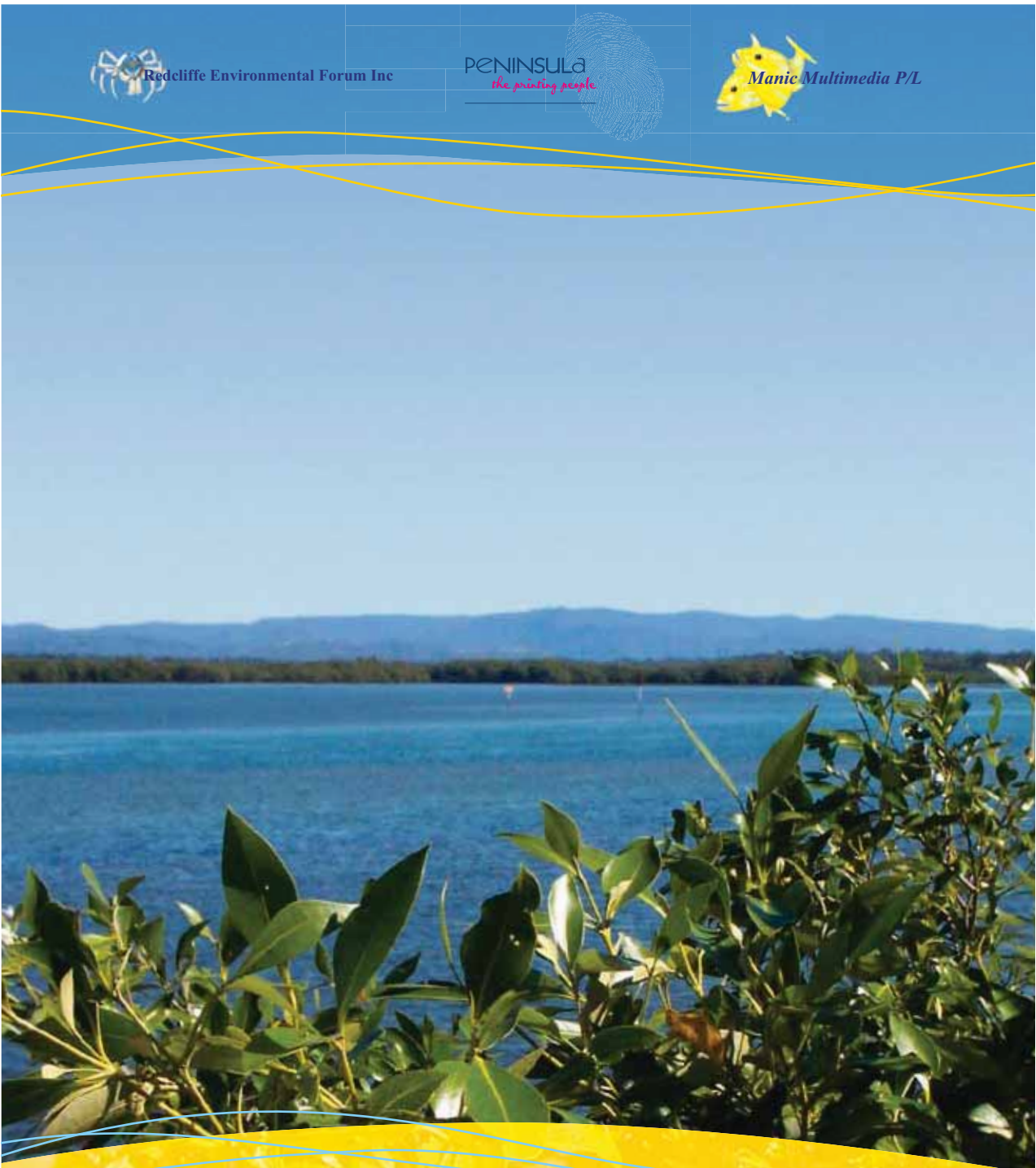


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