

The Ecological Benefits of Wetland Protection

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I've had the opportunity to observe for a rather long period that one of the real problems we have in marine conservation in Australia is that people become very accustomed to what's in their backyard. Often you start thinking that because what you see everyday around you is so common that that's the way the whole world is. In the summer of 1980 at Caringal anchorage, after a hard day of mangrove work I was thinking it would be really nice to start dinner and stuck my head out of the cabin and said 'Oh that's a nice sunset' so I took this photo and I thought 'Oh there are a lot of birds today', so I got up and took the binoculars and wrote down *Caringal sand bank No. 1: 6500 eastern curlews; 6000 bar-tailed godwits*. A year later I had a visitor who was producing his first book in Australia, summarising what we know about these migratory wading birds that fly to Australia from the Northern Hemisphere. When he asked if we had any waders in Moreton Bay, I said 'Yeah, waders are common in Moreton Bay. Let me show you this photo I took', and I pulled out my notebook and photo and showed him that. His response was 'Do you realise that that site you were looking at and thought that they were so common and unimportant, is the single, roosting site in eastern Australia for migratory wading birds. It is also the single most important site, for a larger number of Eastern Curlews are roosting on that bank than at any other site in Australia, and in addition to that what you saw that day was one-third of the world's population of Eastern Curlews'. That day I became aware that you really have to look at what's in your backyard and see if it is something special. We really think quite frequently that it isn't.

I have become involved with inter-tidal wetlands studies quite inadvertently. I started the society for people interested in marine conservation. The first members were mostly a bunch of Queensland university biologists and CSIRO buffs who were all working on the Great Barrier Reef and we were interested in coral reefs and fish. Local community groups, fishing clubs, progress associations kept coming to us and saying 'Hey all these mangrove areas are being destroyed, because of these State Housing developments in south-east Queensland, and all the mangroves are going, so can you tell us if they're important?' There were no other studies of mangroves in Australia; nothing was known about our mangroves. So we put together a group and decided to learn about mangrove ecology. There was a lot of activity going on at that time to produce interest and concern – people living on waterways, a lot of industrial development involving filling in of mangrove areas. We had a lot of mangrove destruction for industry, for airport sites, for port development and for playing fields and particularly for garbage dumps and sewage treatment plants. Virtually all the coastal cities had sewage treatment plants. So we were given the opportunity to study tidal wetlands right along the eastern Australian coastline. We did resource inventory studies at more than 50 sites between Port Phillip Bay in Victoria and the Daintree River. Often we'd work with fishing clubs and conservation groups locally to survey the mangroves. As a result we had a team of about a dozen people who were developing a lot of expertise in identifying the plants and animals in mangroves. Due to these resource surveys and understanding what the threats were, to tidal wetlands, the Australian National Parks Service asked us to do a three-year baseline survey of the Kakadu National Park, where there are hundreds of square kilometres of tidal wetlands. That was particularly interesting because the north is so different from the east coast. The only large wet mangrove forests outside the wet tropics in Cape York are in the Kakadu flood plains where you have forests 30 kilometres long.

Solutions for marine conservation issues, like the problems of shipping, fisheries on the high seas, pollution control, will only come at the international level. So we were going to international meetings and in particular the real conservation union, the IUCN, the global forum where governments and non-government organisations, and other national and

international organisations, get together to discuss the world's environmental problems. A lot of the environmental treaties have come out of these sort of IUCN relations. I was fortunate that at those meetings they were looking for someone to head up a team that would look at the global status of the world's mangrove forest and produce a document on what the threats to mangrove forests were. Over a period of about three years, I was invited to a lot of countries, mainly in South East Asia, and was chairing a group of about 15 people who had a very broad knowledge of the world's mangroves. They had worked in just about every country with mangroves and there are over a hundred countries around the world in the tropics that have mangrove forests. We produced a report of the global status in which we revealed – and we were not totally aware of it until we got all the information together – that really the world's mangroves are under the same degree of threat and for many of the same reasons, as the world's tropical rainforests. They are logged heavily, primarily for woodchip and also for timber products and a great variety of uses like charcoal production. Basically most of the world's mangrove forests are being degraded at a very rapid rate. There are wood chipping operations in Sabah [in Malaysia] and you have them throughout Indonesia and in many other countries. However, it is ironic that while governments have pushed these big mangrove destruction or woodchipping projects they create far less employment for the local communities and in fact they destroy the livelihoods of so many of the people in developing countries who are totally dependent, either as subsistence labour for a commercial fishery or for harvesting produce of the mangroves. In particular in South East Asia, you have extreme poverty that's resulting in many of the coastal communities who no longer have these resources.

Around Australia we have very extensive mangrove forests. Australia also has very extensive tidal marshes, salt marshes; very hypersaline areas where the tides comes in and because of heat and evaporation, leaves a lot of salt behind and it becomes too salty for mangrove forests. So there are very extensive areas of salt marshes, in fact more salt marshes than there are mangrove forests. And at a lower level on that tidal slope, where it has been more regularly inundated, you get mangrove forests developing. The other part of tidal wetlands that are an equally important part of the whole system are these tidal flats – they can be sand flats, they can be mud flats and sometime they have seagrass beds. Only in the wet tropics of Australia, do we have a totally different situation. We don't have salt marshes, what we have are wall-to-wall mangrove forests because you either have the mangroves going right up and merging with the rainforests or with the *Melaleuca* forests, or sometimes you have sedge moss in between, feeding fresh water into the mangrove forest. In terms of area, Australia is the third wealthiest country in the world in mangroves, despite our efforts in destroying them. Only Indonesia and Brazil have more mangroves. We have about one-sixteenth of the world's resources, about 1100 square kilometres; and Queensland's got the good ones – we have more than anyone else. The Northern Territory doesn't do too badly either. At the rate they are being destroyed in other countries, particularly in Indonesia, before long we will be number one, if we preserve our mangroves. Queensland mangrove forests are very extensive but they are at their tallest in the Wet Tropics because of the high rainfall and the freshwater floods. The only other place we've got those tall mangroves is around Kakadu. What you have here in Queensland is really quite unique, it's very different from Kakadu. As you go north along the east Australian coastline you get more and more mangrove species, so throughout the Wet Tropics we get from about 24 to 36 species up the top and in the Cape York there are actually a few more. But mangroves are at their best in the world's tropics, particularly where there is a lot of water.

Mangrove forests, because they are wet, are pretty productive places. What you have are plants that produce a lot of leaves, fruit, twigs and branches and they produce them very fast and then they drop down and are carried out to the tidal flats. Sometimes they stay in the mangrove areas, sometimes the leaves are carried offshore. This is one of the ways the system is important and I'll show you another one later – how mangrove leaves become really important to fish.

The leaves are broken down by bacteria and protozoa and fungi and if you get a really well-rotted mangrove leaf, it has a sort of slimy feel to it. They're all the goodies and a lot of those organisms that do the breaking down are the basis of the food web for a lot of our prawns and other organisms. Those leaf particles are broken down into smaller and smaller bits, they can go through the gut of one animal and come out the other end and may be consumed by another animal. The smaller animals are eaten by bigger animals and we have a food web in which our commercially and recreationally important fish, crab and prawn stocks are substantially mangrove dependent, or tidal wetland dependent, because in many cases, like tiger prawns, they rely on seagrass species.

Now in the wet tropics there are big mangroves and it is interesting if you look for the one example where you don't have a high freshwater flow in the 120 tidal wetlands in the wet tropics. At Trinity Inlet the mangroves are not as big, the reason being that even though you've got a good rainfall there it doesn't have a high freshwater flow. It only ever has a few little streams running into a big basin and it's got a lot of mangroves, but the biggest mangroves you get are barely over 20 metres. A lot of the mangroves here in the wet tropics are 20–35 metres and that is a result of high freshwater flows in through the mangrove areas. When people down south, from Victoria and Sydney see north Queensland mangroves they say, 'Wow, that's a mangrove?', because they don't have the mangroves like we do in their backyard.

In our studies of mangroves, we've found numerous species. The very first I ever heard about Australian mangroves was in a lecture by a Sydney Professor of Zoology, who didn't like mosquitos and sandflies and kept out of mangroves. It was about 1965 and he said very emphatically that mangroves are very depauperate places; they are so hot and stressful that they don't support any fauna and if you read the consulting reports through this time most of the environmental consultants of Australia would say he must have been right as there are hardly any fauna. There is a species list of about 10 animals. I suggest to you that the reason for that is that they simply can't find them and they can't identify them. A lot of the fauna in mangrove forests are hard to see, can move pretty fast, live down holes. They live down crab holes; you get fish in crab holes, you get worms in crab holes, you get molluscs in crab holes, you get all sorts of things in crab holes. A lot is under the surface and unless you dig and sieve you don't find them. It takes time and it's hard work, you get muddy, you wreck your white shoes. Another part of the fauna in mangrove forests is log fauna which lives inside the rotting logs. The mangrove tree falls over, everyone says 'Hey feed time, let's get into it'. You'll find an enormous variety of species inside rotting logs, breaking the logs down, helping to make that type of organic matter available to other organisms.

At Fraser Island in 1968 we kept finding mangroves with holes in them. We were doing surveys in the daytime and weren't finding what was causing the holes. So we started doing night-time surveys and found there are all sorts of animals we could see. They were up in the trees eating the mangrove leaves. There are crabs doing it. The crabs are shredders and they are really important. Not only do they pick up the leaves and take them down to their burrows and line their burrows with them, pack lunch for tomorrow and the day after, they shred the leaf and break particles up and that allows little fibres to get into the system and become food for prawns and crabs, fish, algae and protozoa that are breaking down those little blighters. They are really important in that whole food web. Not only are they important at this end where they are breaking up the leaves, but the faeces from the crab, the larvae of these things float around in the water and they are eaten by fish. Crabs are really important in the tidal wetlands system and they are major decomposers. There are all sorts of species and they climb around on the top of most branches. There are also a few other things; there are quite a few reptiles – geckos and skinks – that live in mangrove trees.

Another value of these tidal wetlands is that they really do support a lot of migratory wading birds that undertake transectorial migrations from the Northern Hemisphere. Some of them are

only as large as a 50 cent piece yet they fly up to 12 000 kilometres – sensibly they come to Australia to get away from the cold. While they are here they feed on the organisms, particularly on the sand flats and mud flats, sometimes amongst the mangroves. A few species will actually roost in mangrove trees but they are more often associated with the fringes of the mangroves than the mangroves themselves although the mangroves are an important source too. Another thing we have in the mangroves that really are of conservation significance are our raptors, our eagle-like birds. The white-bellied sea eagle, is a species which I believe is most vulnerable to human disturbance. If they're regularly disturbed in their nesting sites they seem to abandon them. Osprey and Brahminy kites are often very abundant in these tidal areas and dependent on the food but they are less vulnerable to human disturbance. We have been assessing the coastline to get some idea where they are and where they're going.

In May 1987 we mounted a fairly large survey, 10 people, two weeks. We carried out a study of the Murray River here, not the big Murray but the one you've got down the road north of Cardwell. It was a pretty intensive study – something like 140 person days of research. There are big mangroves in the Murray, 20–30 metre high forests which are very extensive due to the extremely high freshwater flow. There are also a lot of birds – in 1977–78 when we did the study, the brolgas were extremely abundant. There were lots of prawns in the marshes as well and they support barramundi. The barramundi spawn throughout the estuaries and their young move up, or the larvae move up, into the freshwater brackish areas. We did a lot of fish sampling, just big nets, we didn't have a beam trawl, but we sampled all the organisms on those tidal flats. Because we did the survey in May we don't have a clear perception of how important these tidal flats, which were at that time extremely rich in marine life, are to migratory birds. The Murray River was extremely rich in fish in 1978. Barramundi and huge mullet were extremely abundant. It is clearly a very important fish habitat with numerous species.

From Hull River right down to Meunga Creek at Cardwell there is more or less one continuous wetland. When it's all flooded, yes it is all joined up, but to say that we are just going to dump the water over the Tully and everything will be fine because it will stay a wetland is presumptuous – there is no proof the mangroves are going to survive; they need that flow down the Murray, if you want to keep the Murray River mangrove system.

Where we have mangrove forest with a dense, closed canopy, it is very similar to rainforest and in it you get a great many epiphytes on the mangrove trees. In the upstream areas, the mangrove forests merge with rainforests to produce a particular community which is quite rare, where you have some of the rainforest species merging with the mangroves. We have certain water here that is different to other areas of Australia and if you are trying to turn wetland areas into sugarcane, you suffer from the problem of acid sulphate soil. A good example is Cairns, Trinity Inlet – 1415 acres of mangrove forest was attempted to be turned into sugarcane field but because of the acid sulphate it didn't work. The result being that a lot of mangroves were lost for no purpose.

I have developed a tidal wetlands database of Queensland that has examples which illustrate that if mangroves are cut off from their freshwater supply source, they die, even though they may still be partly inundated. No re-colonisation occurs for a variety of reasons: mud lobsters form large burrows and the area is no longer properly inundated; ferns overgrow the areas and mangroves can't colonise. So don't think that if you destroy the mangrove forest in the Murray that you'll get much of it back. Another thing that happens by taking the main energy flow out of the system and diverting it somewhere else is that the mouth of the estuary can silt up, such as at the Shoalhaven River in New South Wales.

Throughout the world, the biggest impacts on mangrove forests are where they are being totally destroyed, filled in for another use. But the scale of individual impacts is interesting. We

are finding that mangroves are generally being destroyed, anywhere from 10 000 to half a million hectares of mangroves at a time. Diversion of freshwater from 1000 to 500 000 hectares – so diversion of freshwater is considered the second greatest threat to the world's wetlands, other than outrightly destroying them. It not only occurs from small-scale development but frequently it is on very large scales, like dams and things like that. So we know we can kill mangroves if you cut off the freshwater flow. You can talk about all the management plans in the world but unfortunately mangroves can't read and they will respond by dying.