A lesson from cyclone Larry: An untold story of the success of good coastal planning

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Abstract

When tropical cyclone Larry crossed the Queensland coast on 20 March 2006, commercial, recreational and naval vessels in the port of Cairns, 60 km north of the eye of the cyclone and others closer to the eye, were protected from the destructive winds by sheltering in deep mangrove creeks in Trinity Inlet and off other coastal rivers. The Trinity Inlet mangroves are protected under the comprehensive multi-use Trinity Inlet Management Plan, agreed by the local and state government agencies (Cairns City Council, the Cairns Port Authority and the Queensland Government). Using this Australian example and one from the town of Palompon in Leyte province, central Philippines, we show how long-term mangrove habitat protection resulting from well-conceived coastal planning can deliver important economic and infrastructure benefits.

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Early in the morning of 20 March 2006, cyclone Larry crossed the eastern Australian coast 60 km south of the city of Cairns in north Queensland. Although not as dramatic an event as the “atmospheric bomb” description afforded with some hyperbole by Time Magazine (The Tipping Point, April 3/06, p. 20), this was an extremely severe and destructive storm. The defined destructive zone of winds extended out 120 km from the center and wind gusts at Mount Bellenden Ker recording station 50 km south of Cairns reached 294 km/h. Smaller in diameter than the southern United State’s hurricane Katrina, and faster moving but with winds as strong, wide scale physical damage and possibly loss of life were almost certain.

In the event there was enormous structural damage to buildings, forests and crops such as banana and sugar cane, although in a narrow spatial band, but no direct loss of life. One elderly person suffered a heart attack sometime during the cyclone period. Why was the outcome so different from that of other severe natural disasters? Why do some disasters have better outcomes for people than others?

The success of the land-based disaster preparedness and emergency recovery efforts for cyclone Larry, integrated across levels of government and between government agency and civil society sectors, have been well covered by the Australian and international media. However, we wish to reflect on the untold story of how the valuable small recreational, tourist, working and naval vessels of Cairns and places even closer to the center of Larry were saved by the protection of the mangrove creeks in which they sheltered. The storm provides, for us as marine scientists, and fisheries, mangrove, seagrass and coastal management professionals an opportunity to contemplate more generally, from our own perspectives, the effect of disasters on coastal communities, how these can be mitigated and how marine scientists have a role to play — well in advance of the disasters themselves.

Although we address a different type of coastal disaster to a tsunami, our reflections offer an opportunity to add a dimension to the recent journal discussion on the role of mangroves.
in mitigating damage from natural events (Kathiresan and Rajendran, 2005; Kerr et al., 2006; Vermaat and Thampanya, 2006). We make the case that the key factor in achieving the best possible protection is good coastal planning, based on sound scientific inputs, and the educated attitudes and expectation of local people who interact with the environment and with those plans can make a major difference to the impacts of natural disasters. Our example is based on the experience of cyclone Larry plus some observations from the Philippines which is also subject to severe tropical revolving storms (referred to there as typhoons) and which used to have extensive coastal mangrove forests.

First, we give a short reflection on mangrove protection in Queensland. There are approximately 348,000 ha of mangroves along the Queensland coast. Protection has a long history with legislation as early as 1914 (Beumer et al., 1997) although early laws were designed more to protect the needs of oyster farmers, who desired a ready supply of the tough mangrove timber for their stakes, than for conservation. Recent legislation (Qld Fisheries Act 1994) is oriented to conservation/biodiversity aims specifically to support the productivity of fisheries — a science-based case underlying this and other parts of the Act. The outcome is that, while significant losses of mangroves have occurred in the past, almost all from canal estate and port infrastructure development, the overall loss of mangroves has been small and has slowed down to a trickle. The mangroves are provided two levels of protection. All mangroves are protected plants and require a permit or notification before they can be damaged or removed. Mangroves identified with high fisheries productivity values (105,000 ha) are provided with a higher level of protection in designated Fish Habitat Areas (McKinnon et al., 2002). The result is that most major coastal towns in Queensland have estuaries with mangrove forests in close proximity and, on the east coast of Queensland, 42% of mangroves are protected for fisheries habitats (McKinnon et al., 2002). The location and details of Queensland’s Fish Habitat Areas are published on line (http://www2.dpi.qld.gov.au/fishweb/13401.html).

The City of Cairns, located on the western bank of Trinity Inlet, is an excellent example. The inlet is almost totally protected by Fish Habitat Areas. It has some 3600 ha mangroves (25 species of trees), 800 ha seagrass (eight species) in a wetland area of 7500 ha. Take a 5-min boat ride from any wharf in Cairns City and you can be in a beautiful, secluded, and sheltered mangrove-lined estuarine waterway. Why has the city not expanded to the east to develop this waterway as port and city infrastructure as has happened in many parts of the world? The answer is that the legislated coastal management plans in place are supported at all levels of Government — local, State and Federal — mainly to protect fishing as part of the Australian lifestyle.

Surveys and scientific studies have shown that 28% of Australians go fishing for recreation and food in any year (Higgs, 2001). And 80% of the value of fish caught commercially in Queensland comes from fish that spend some part of their life cycles in an estuary because the warm shallow waters have no deep sea, cold up-welling to support fisheries (McKinnon et al., 2002). Tourist-based guided fishing is an important industry. People generally accept that mangrove forests and their associated habitats are biologically and economically important. Recreational fishing lobby groups such as ‘Sunfish’ help ensure political support that has been translated to effective coastal management plans. In addition to the Fish Habitat Areas, Trinity Inlet is also a multi-use marine park covered by a Trinity Inlet Management Plan (1999) — a jointly agreed document of the Cairns City Council, the Cairns Port Authority and the Queensland Government that has guided all government agencies in making decisions regarding the inlet. The Fisheries Habitat Areas protection is well embedded in the Management Plan.

Likewise, mangroves that line the Philippine archipelago’s 7150 islands have their share of legal protection. The 1975 Forestry Code specifies a 25-m mangrove strip for shelter from typhoons. Later this greenbelt was expanded to 20–50 m along riverbanks and 50–100 m facing open seas with the higher value applied to typhoon-prone provinces (Primavera et al., 2004). However, in the Philippines while legislation has been adequate, law enforcement and political are often wanting (Primavera, 2000).

Trinity Inlet exemplifies proactive initiatives to conserve existing mangroves. The Philippine mangroves are degraded to the extent that only 20% remain of ~500,000 ha in 1918. Some local governments and communities have learnt the value of good coastal planning and the need to restore or rehabilitate mangrove areas. In the Philippines, a yearly average of 20–30 typhoons leave in their wake more than 2000 persons injured, dead or missing and damage to infrastructure, private property and agricultural crops. The town of Palompon in Leyte province, central Philippines provides a good case study. A destructive typhoon in the early 1990s pushed townspeople and their local officials to undertake multi-sectoral consultations that produced an Environmental Amelioration Plan which included mangrove reforestation. Starting with 60,000 seedlings in 1996, a total of 600,000 mangroves have been planted since then by a broad coalition of local and national government agencies, various cooperatives, religious associations and even schools, primarily for typhoon protection but also with added benefits of improved fish catches and ecotourism. This initiative has started to pay-off for the stakeholders who in turn, have re-elected local officials with the pro-environment platform.

To return to Australia, how can the biological values of Trinity Inlet be related to a story of storms and disasters and the role of mangroves? The Trinity Inlet Management Plan (1999) acknowledged briefly in its list for ‘port-related value’ that ‘Trinity Inlet is an important safe anchorage during cyclones’. The Inlet’s role in cyclone protection is more formally recognised and detailed in the “Maritime Cyclone Contingency Plan for the Port of Cairns” (Fig. 1). This plan lists each of the Inlet’s normal anchorages, mooring piles, marinas and wharfs and directs boats in each area to a section of the mangrove-lined creeks in Trinity Inlet in the event of a cyclone. A series of alert levels ensures small vessels move up the creeks first followed by larger vessels. Once
located, the instructions allow for the vessels to moor to the mangrove tree trunks and roots. When implemented this plan has the force of law. On arrival in the port, boats will be given a copy of the one-page Cyclone Contingency Plan which assigns a mangrove creek location for the vessel (contained in Cairns Port Authority (2004)).

In March 2006, just 60 km from the center of cyclone Larry, the Trinity Inlet mangrove creeks were highly effective in protecting the vessels that normally berth in the Inlet. Similar experiences near the center of cyclone Larry were reported in newspapers in Innisfail and Cardwell (e.g., The Coastal Passage, 2006).

Mangrove protection to the small and medium vessels was critical to the Cairns economy directly and indirectly. Directly, the vessels were spared the expensive damage that could have occurred had they stayed more exposed at their normal port moorings and berths. After the 1997 cyclone Justin, the marina infrastructure was rebuilt to now withstand severe cyclones provided the pontoon berths are emptied of vessels (Heggie and Wallis, 2002, personal communication, Marina managers). Indirectly, the undamaged commercial vessels benefited as they were able to return to business on the day after the cyclone. As well as harbour work such as transporting the pilots to and from ships navigating the sea lanes of the Great Barrier Reef, the Cairns fleet includes vessels that registered about 11,000 scheduled ferry and vessel arrivals in 2004—2005 (Cairns Port Authority, 2005), mainly serving tourists visiting the World Heritage listed Great Barrier Reef.

In the Philippines, fishers in their small boats seek shelter in the nearest mangrove at the sight of a typhoon.

So do mangroves provide the service of protection from cyclonic storms and should we value them for that? The answer is obviously yes. Mangroves in our example protected the anchored vessels in Cairns — none were damaged. But mangroves and the mangrove-lined creeks remain in Trinity Inlet not by luck, nor are farms, houses, businesses and infrastructure located elsewhere by accident. They are still there as the successful outcome of a lot of work, science, negotiation, confrontation and whatever was needed to achieve a sensible coastal plan. In this case, scientists and other technical experts, using information on the fisheries, ecological and coastal protection values of the mangroves, played a critical role in developing the Trinity Inlet Management Plan that integrates the protection of the mangroves with the city and port locations.

From our perspective, we have witnessed how the full values of the natural resources of Cairns and Trinity Inlet are being realised through a concerted coastal planning process that has ensured the presence of the mangroves for their many benefits and determined the location of houses and business. We believe that the strength of that process will determine the risk of loss of life and infrastructure. In this case, the mangroves are important, but as a symbol of good planning and not just as a convenient refuge for vessels in a cyclone.

Does good coastal planning save lives? It does. Did people affected by Cyclone Larry know how to respond, were they well prepared, did they know where to get help and was it available? The answer is yes. Mangroves are important but it is good planning and plans that will save lives and property. That is what is important.

On a personal note, Jurgenne is from a country where coastal damage from typhoons is a fact of life, and coastal management and mangrove conservation a continuing battle which she hopes to win through education and eco-governance. Meryl rode out cyclone Larry on a yacht protected from all but a small amount of excitement by the excellent shelter of Seelee Creek mangroves — a designated Trinity Inlet cyclone shelter zone. Rob sheltered with his family at home a few miles from the...
Bellenden Ker recording station, an experience best left described as a brief opportunity for introspection on the awesome power of nature.

References


