

What Happens When the Big One Hits – Surviving Cyclone Monica

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Introduction

It was April 2006. Severe tropical cyclone Larry had just recently crossed the tropical north Queensland coast near Innisfail and devastated the banana fields of the Lockart River region. As I passed through Darwin on my way to Maningrida in Arnhem Land, some wag noted that although it was the end of the wet season, there was another tropical low out in the Coral Sea that could develop into another cyclone. Little did we know.

This presentation gives a first hand experience of a remote indigenous community living through the largest and most intense cyclone to hit Australia in recorded history.

It will highlight the development and outcomes of planning, preparation and survival strategies; the havoc wreaked by the cyclone and the immediate steps to recovery; and the effects on animal welfare and community infrastructure and wellbeing.

Tropical Cyclones

Tropical cyclones are intense low pressure systems that form over tropical oceans with sustained winds exceeding gale force (63 km/h) surrounding the centre. Their circular wind pattern has a clockwise rotation in the southern hemisphere and counter-clockwise in the northern hemisphere. At lower latitudes (50-100) tropical cyclones tend to be small in size (sometimes less than 100 km in diameter) but in higher latitudes they typically grow to more than 1000 km and occasionally to more than 2000 km in diameter.

Severe tropical cyclones have maximum winds surrounding the centre exceeding hurricane force (120 km/h). In Asian countries bordering the Northwest Pacific severe tropical cyclones are called typhoons whilst in the USA and Caribbean they are known as hurricanes.

Lifecycle of a cyclone

The formation of a tropical cyclone is dependent upon a number of favourable environmental conditions including a warm ocean surface (above 26°C) and several physical parameters contributing to a deeply humid and unstable atmosphere. The formation process begins in an area of low pressure coinciding with vigorous convective cloud in the tropics between about 50 and 220 latitude. Usually the cloud cluster drifts slowly towards the west as the convection increases and winds begin spiralling in towards the system centre because of the Coriolis effect (caused by the rotation of the earth).

As the tropical low becomes further organised and the surface winds reach gale force it is then declared a tropical cyclone according to international convention. Satellite and radar observations of the system show the distinctive spiral banding pattern.

If the ocean and atmosphere environment continues to be favourable the cyclone may continue to intensify. The cloud system becomes more circular in shape and develops a distinct eye. This is the severe cyclone stage where the cyclone is at its most dangerous. Approximately half of the cyclones that form progress to full maturity.

Tropical cyclones normally decay when they move into a less favourable environment, either over land or the cooler waters in higher latitudes. The rate of decay varies with the circumstances. A tropical cyclone moving into mid-latitude westerlies may be quickly sheared apart by strong upper winds, or it may react with a frontal system and persists for several more days. Similarly, a cyclone moving over land normally dissipates rapidly due to loss of its energy source, namely the warm ocean surface. However in northern Australia cyclones moving inland are frequently observed to persist as rain depressions for a number of days bringing widespread flood rains, and may even redevelop if they move over the ocean once more.

Tropical cyclones are named according to international conventions and graded according to wind strength. Measurements are made of gusts (wind speed averaged over 2 or 3 seconds) and mean or sustained winds (measured over 10 minutes).

maintained for 10 min

Category	Australian scale	Mean km/h	Gusts km/h	Beaufort
1	Tropical cyclone	63 - 88	90 - 125	Gale
2	Tropical Cyclone	89 - 117	125 - 164	Violent storm
3	Severe Tropical cyclone	118 - 159	165 - 224	Hurricane
4	Severe tropical cyclone	160 - 199	225 - 279	Hurricane
5	Severe tropical cyclone	More than 200	More than 280	Hurricane

The Australian experience

Tropical cyclones occur around the world at latitudes between 5 and 22 degrees, with activity peaking in summer when water temperatures are warmest. They are a regular occurrence during the wet season in northern Australia, where the low pressure systems they bring are responsible for the essential rains.

In the areas primarily affected, the more northern parts of Queensland, the Northern Territory, the Kimberley and the Pilbara in Western Australia, cyclones are not uncommon. There are typically six to ten embryonic cyclones each year, of which about six cross the coast and several develop into full-scale cyclones. Most cyclones form slightly north of Australia in the Indian Ocean or the Coral Sea, but a few originate in the Arafura Sea.

Cyclones form over a day or more and then tend to move vaguely parallel to the top of Australia, usually staying hundreds of kilometres out to sea. Those in Western Australia then tend to move south or south-west, eventually turning in to cross the coast. Most cross the coast somewhere between Broome and Geraldton.

Those that move east do much the same, typically crossing the coast between Cooktown and Townsville, Queensland. However, some cyclones follow different paths. They typically travel at 10km-15km/h, day and night, often gathering strength as they do so. Not all cyclones cross the coast – some progressively lose strength and eventually die out at sea.

Meanwhile, the depression in the Coral Sea had drifted past Papua New Guinea southwest in the Coral Sea and developed into Tropical Cyclone Monica. When TC Monica crossed the coast of Cape York on the afternoon of 19 April it had grown into a Category 3 cyclone. TC Monica weakened rapidly as it passed over the land, and then moved out into the Gulf of Carpentaria.

Maningrida

Maningrida is situated on the northern coast of Arnhem Land some 550 kilometres east of Darwin. With most Australian tropical cyclones originating in the Indian Ocean Timor Sea, in the Arafura Sea, in the Gulf of Carpentaria and in the Coral Sea and Torres Straits, and given the paths that they typically follow, the Arnhem Land coast is right in their path. When the local geography, shallow warm seas, prevailing wind and sea currents and tidal convection are taken into account, it is not surprising that this is one of the most cyclone prone areas in the world.

Maningrida is a coastal community situated at the mouth of the Liverpool river. It is the second largest indigenous community in Australia, with some 2,500 people and approximately 300 buildings. The Maningrida administrative area includes some 34 outstations on the traditional land of the local indigenous people covering an area of approximately 10,000 square kilometres.

Maningrida has an all-weather airstrip and a daily air service to Darwin. Road access to Darwin is via some 600 km of largely unmade road. Apart from the dry season months from May to October, the road is impassable because of several major river crossings. In fact, the main "road" into Maningrida is via the boat ramp, with a coastal barge service bringing major items such as food, building materials etc that cannot come by air.

Being a remote community, they have to be self-sufficient. They generate their own power and reticulate their own water and sewerage. Like most indigenous communities, housing is at a premium with 18 to 20 people per house. Housing stock is of variable age and quality.

My focus in Maningrida is the 700 or so community dogs. Prior to my starting the dog health program in 2003, apart from flying animals to Darwin, the community had no access to veterinary services, medications or education. As a consequence, the dogs were in a parlous state and the dog population was out of control. There were too many dogs and most of them were visibly unhealthy, suffering severely from external and internal parasitism, reproducing without restraint and often starving.

The animals live in very close contact with their owners and there were concerns about nuisance, aggression, hygiene and disease transmission from animals to people.

Human health and living conditions are poor and the indigenous community is socially dysfunctional as a result of dispossession and interaction with the dominant white culture. Communication is difficult because literacy rates are poor and for most indigenous people English is their third or fourth language. Whilst it is clear that the locals love their dogs and are distressed by their condition, the indigenous people do not share our cultural attitudes to animal welfare and individual responsibility to care for the animals.

Working with the local community, the dog health program provides animal health services involving parasite treatment, population control (surgical sterilization, hormonal control and euthanasia where requested) and pet care education.

There is also a facility for humane euthanasia of severely sick or injured animals. Outstation services are also provided in my twice yearly visits of three to four weeks' duration.

It had been expected that TC Monica would continue to drift westwards and cross the western gulf coast as a rain depression. However, by the time I reached Maningrida on Friday 21st Monica had changed direction and was heading north-west, rapidly gaining strength and size over the warm waters of the Gulf of Carpentaria. Although it was expected that TC Monica would pass well to the north of Maningrida, the cyclone was being carefully monitored and community preparations were well under way.

Planning

Since a tropical cyclone is a distinct probability each wet season, communities like Maningrida have well developed counter-disaster plans. Buildings are built to cyclone code and the most secure ones that can be used as cyclone shelters are identified for all to see. Emergency generators are serviced at the power station, as are the backup units in the food outlets.

Community awareness programs are conducted regularly, with emergency services visits in November each year. Police are the designated "event managers" should a cyclone hit and have ultimate power and responsibility, but all community agencies are involved in planning, preparedness and response.

One of the major hazards in a severe tropical cyclone is flying debris, so a general community cleanup is conducted to reduce the amount of debris lying around.

Safe storage is developed for electronic assets, so that items such as computers can be moved at short notice. Every attempt is made to ensure that all assets are appropriately insured.

When a cyclone is in the general vicinity, its progress is carefully monitored through the Bureau of Meteorology website and any warning announcements.

Preparation

By Saturday 22nd, TC Monica was in the north-western gulf. It had developed into a Category 5 cyclone, but because it was heading steadily north-west it seemed likely that it would miss Arnhem Land. However, community preparations were now in full swing with four-hourly meetings of all agencies and a massive cleanup operation of any potential missiles.

Community meetings were held to advise people about plans for shelter sites and movement of children and the elderly. People were encouraged to move in to the community from their outstations.

The situation was looking more serious by Sunday. The cyclone had turned onto a more westerly track and was moving parallel to the northern Arnhem Land coast. Because it was such a large cyclone and so intense (Category 5) we were sure to be affected by it to some extent, and landfall near Maningrida was becoming a distinct possibility within the next 18 hours. The community cleanup and other preparations intensified.

On Monday morning (23rd) it was apparent that Monica had turned in a south-westerly direction and the predicted path had it crossing the Top End coast somewhere near Maningrida or possibly closer to Darwin. At that moment we knew we were in serious trouble and would be hit by at least the edge of the central destructive core. Monica became headline news with the threat to Darwin and the shattered complacency of an unprepared population.

Final touches were put in place with the cleanup. Any trees that looked dangerous or unsecure (they all did by now) were cut down.

Designated shelters were serviced with food, water, torches and candles. Last meetings were held and planned evacuations to safer houses were started.

I checked my limited veterinary supplies and wondered what injuries or medical problems I might have to deal with over the next few days.

Those who were staying in their own homes made their own final preparations. Household goods were covered with waterproof materials and raised up from floors.

Food supplies were low in the shops because the barge service had stopped with the impending approach of the cyclone. Non-perishable foods were stocked and any spare containers were filled with water.

As the sky darkened in the early afternoon and the wind started to rise the generators were shut down as a safety measure following an impressive pyrotechnics display in the main street, and the water supply was turned off to prevent wastage. Shops and agencies shut down. Those who still had access to telephone lines rang friends in other places to get the latest details from the BoM website.

The news was grim. TC Monica was headed virtually straight towards us, with gusts estimated to be up to 350 km/h and sustained winds of 250 km/h. The eye radius was 20 km, and the radius of the very destructive winds was 40 km.

Living Through it

I decided to take shelter in my room in the community motel, a relatively new and sturdy structure built to cyclone code from local mud bricks and lots of steel. As the storm approached at about 3 pm I was able to sit on the verandah sheltered from the winds and observe what was happening. I was joined by some local trades people who thought their roof would not survive. In true Territory style, they came prepared with a portable generator for light and to keep the beer cool.

As the wind increased in intensity we watched the trees become denuded of leaves, with the odd one falling. At one stage as we looked on incredulously, the top half of a tree flew past at roof level.

An hour later the first of the nearby large established trees started to be uprooted as the wind increased in intensity. Smaller trees started to pop almost vertically out of the ground. The rain was sheeting down as a large pine tree narrowly missed our sanctuary as it crashed to earth.

By 5 pm it was noticeable that the wind had started to swing around and was now blowing more from the east, indicating that the eye must have been approaching, somewhere to our north. We wondered how far away it was. As the wind speed increased the noise sank to a lower pitch, with a sustained noise and vibration something akin to standing behind a jumbo jet on take-off. The stronger gusts could be heard approaching, complete with crashes of falling debris and a higher pitched whine. The air was a sheet of water, leaves and branches.

We were taking bets on which tree will be the next to go as a power pole cartwheeled spectacularly in the main street. A tree fell on to the roof above me, but the walls and roofing iron held. Outside the wind was getting stronger, the air had become a solid wall of water and unbelievably large trees were being uprooted. The main street looked like the pictures of tornadoes shown on some grainy TV home movie. The only difference was that we were in this movie. It was time to retire inside.

In a cyclone, the safest place in the building is the bathroom. It is a small room with the walls strengthened by all the pipes. The plan of action is to take your mattress and lie down – with the mattress above you to protect you from flying debris when the roof blows off!

By 6 pm (three hours since the beginning) the noise had risen to a deafening roar that sounded as if it could not possibly get any worse. But it did. Water was raining down from the ceiling and I feared that the roof might give way at any moment. (Later I realize that the roof was still intact, it was just rain being blasted in through the closed louvers and jetting up to the ceiling to rain down on me). I tied the cupboard doors shut in case the roof gave way and moved my gear to higher ground. Incredibly, the bricks were weeping freely as rain was forced through them by the pressure of the wind.

The only positive development was that the wind continued to change direction, now moving to the north indicating that the eye had just missed us and was moving past.

We had survived three hours of southerly wind followed by two hours from the east. Now we just had to survive as the other side of the destructive inner core (40 km wide) moved slowly past us. Probably another three or four hours to go.

The bad news was that as the wind was now coming from a different direction the rain was blasting under the door and front windows, and the remaining trees outside were being buffeted from the opposite direction to before. Hopefully it would mean that any remaining trees will fall away from my abode.

By now it was pitch dark outside. The deafening background roaring and the whistling and whining of the more intense gusts had not diminished in intensity. If anything, it sounded louder. Any sounds of falling trees were lost in the background cacophony. The floor was awash with water and it was getting cold.

I took my sodden mattress into the bathroom and settled down for the duration. I had barely retreated to my sanctuary when a second tree landed on the roof above me. The 30 cm diameter young pine tree had been snapped off like a carrot. It would be instant death outside. Inside it was cold, wet and dark.

Over the next three hours the intensity of the cyclone gradually subsided. By 11 pm it was no more than the gale force wind gusts and torrential rain typical of a severe tropical storm, but in comparison to the events of the afternoon and evening it seemed a minor inconvenience. The cyclone had obviously passed and there was time for a few hours of fitful sleep before the dawn revealed the damage that had been done.

The Aftermath

In the cold light of a wet dawn Maningrida was a sorry sight. A few houses had been completely demolished, the school had lost its roof and 70% of houses suffered some damage from wind and falling trees. In many cases trees seem to have miraculously just missed buildings.

Many streets were impassable tangles of trees, branches and power lines. Many trees had been blown down and any remaining ones were totally devoid of leaves and stripped of most of their branches. The ground was strewn with leaves and branches.

Miraculously, there were no casualties either in town or on the outstations. No-one even cut their finger.

It was a similar story with the community animals. The only casualties were where a fence had blown down and two dogs who had been itching to have a go at each other finally got the chance, but they gave up before much damage was done.

It seems that the community dogs had simply sheltered in safe houses like their owners.

The major problems were now damage to community infrastructure.

Communications in this area depend on a network of solar powered towers and microwave repeaters which were extensively damaged. Hence there were no radio, television or telephone communications. Apart from the inability to pass on messages to loved ones or obtain information about the current position and activities of the cyclone, this situation created a feeling of isolation and abandonment.

The electricity wiring grid had been extensively damaged with many power lines down and most power poles lurching at strange angles. Hence the power station could not be used to generate power and portable generators could not be connected to existing wiring. No electricity meant no lights, refrigeration or air conditioning.

Since the town water is pumped from a bore, this cannot operate without power. Together with extensive damage to the water mains and sewers from uprooted trees, this meant no water supply or sewerage drainage. Paradoxically, at the same time there was extensive water damage to all buildings and general flooding.

The local roads were all impassable as a result of multiple fallen trees and the effects of the flooding rains on the local creeks and river crossings. We were completely cut off.

Some of the backup generators were working in the shops and some refrigerated food was intact, but much had to be dumped at the tip. Because of the danger posed by the cyclone and subsequent high seas, there would not be a barge arriving for several days.

Recovery

Day 1

Tuesday April 25th was Anzac Day. People gingerly emerged from shelter and took stock of the damage. Everyone was buoyed by the adrenalin rush of the experience and the euphoria of survival. After an initial assessment, strategic plans were made for the recovery effort.

The situation was potentially quite critical with respect to food, water and sanitation. And we were on our own. Once it was clear that Monica had dissipated to a rain-bearing tropical low by the time it reached Darwin, everyone seemed to lose interest in Maningrida. The only help received from the outside world was a team of three electricity linesmen who gave invaluable advice and assistance to the town building contractors who set about restoring vital infrastructure. Fortunately these people are used to being self-sufficient. I put aside my veterinary role and became a labourer for the next week.

The first priority was deemed to be restoring the water and sewerage facilities to ward off disease in an already unhealthy environment. This meant restoring the power lines to the bore and getting the electric pump going.

Trees were lifted off houses and power lines. Power poles were pushed back upright in the soft soil and braced with improvised land anchors. No attempt was made to repair the power lines at this stage. Others started work on the water mains and the sewers, or brought food to the workers. Those with satellite phones shared them to enable people to contact loved ones, until the batteries went flat.

It was a long hot day and we were all exhausted as we collapsed into wet beds after a decidedly unromantic candlelit cold dinner.

Day 2

By Wednesday it had stopped raining. The euphoria of "We survived" had been replaced by the depressing reality that the town still had no power (so no refrigeration and frozen food was now going off, no air conditioning or even ceiling fans), no water, no telephones and no means of communication with the outside world.

Water started to appear in trickles. Many taps had been turned on so there was much wastage, exacerbated by broken mains which were not evident until water flowed. There were also many breaks in the sewerage mains caused by uprooted trees.

By the afternoon most of the town's power poles were again pointing skywards, and most of the major tree debris had been cleared. We knew the situation was under control when a chartered plane load of politicians arrived to survey the scene. Not surprisingly, they did not bring one chainsaw, portable generator or satellite telephone or anything else of any material use. They drove through the community in a minibus, cameras dangling out windows, then got back onto their chartered plane to fly back to the comforts of Darwin.

Food was becoming a problem. The shops were open but few people had any cash to buy food. The town bank and Centrelink computers were still down and the ATMs were not working because the telephone lines were still down.

By the end of the day water had been restored to most of the town, and it was a very significant moment in lifting community morale as the first few street lights twinkled into being. Some semblance of normality was returning, though everyone was feeling very tired and bedraggled.

Day 3

Thursday was a day to appreciate the return of services like water and power, to empty the rotten food out of the freezers and restock supplies. There were still major problems with access to cash from the ATMs to purchase food and power cards once power was restored. A system of emergency vouchers which amounted to little more than "store money" was instituted, with many problems.

Amazingly, by the end of the day most houses in town had power and water reconnected. The sewerage system was functioning to a limited extent and most people had been fed. Much work remained to be done over the ensuing days and months, but the immediate crisis had been averted.

Environmental Consequences

As a high Category 5 cyclone, TC Monica was one of the largest, and the most intense tropical cyclone to hit Australia in recorded history. In comparison, cyclone Tracy which devastated Darwin in 1974 was a Category 3 cyclone.

The eye of TC Monica, with wind gusts estimated at over 350 km/h, passed about 10 km to the north of Maningrida as it approached the coast at an oblique angle. The centre of the cyclone eventually made landfall at Junction bay, some 35km to the west of Maningrida.

Damage to Flora

Although the cyclone rapidly decreased in intensity as it crossed the coast, it created a 20km wide swathe of destruction for many kilometers inland. In the coastal impact zone trees were completely defoliated, and most were snapped or uprooted. There are major concerns regarding bushfires wiping out any remnant trees.

In the mangrove forests lining the Goomadeer river, virtually nothing was left standing. It was as if a giant whipper-snipper had gone through the area about three metres above ground level, shredding everything in its path. Two years later there has been only minimal regeneration of this area.

The shallow rooted paperbark forests of the coastal region were particularly devastated, with virtually no trees left standing.

Storm Surge

The extreme winds and rotation of tropical cyclones create a conical rise in the sea surface akin to a huge tide. Storm surges have been recorded to be as much as 15 metres in height and travelling several kilometers inland. The massive waves whipped up by the cyclone are on top of the storm surge.

If this event coincides with a naturally high spring tide, the results can be catastrophic in a relatively flat area such as Maningrida. Fortunately this did not happen with TC Monica, though evidence shows that there was a storm surge of five to six metres in Junction Bay. There was substantial erosion of beaches, coastal dunes were breached and headlands disappeared.

Eutrofication

A combination of flooding rains, storm surge and massive waves along the coastal fringe resulted in the stirring up of deep sediments in muddy mangrove systems and coastal swamps and billabongs. For the next week or more the waters of the creeks and rivers ran black, and there was a massive fish kill associated with water turbidity, low oxygen levels and high levels of organic putrefactants in these estuarine systems.

Conclusion

Severe tropical cyclones are a fact of life in northern Australian communities. Recently published evidence shows that as a consequence of global warming (including rising temperatures of ocean waters) whilst there may not have been more cyclones over the past 20 years, the intensity of the most extreme storms is increasing (there have been more Category 4 and 5 storms).

When a severe tropical cyclone strikes, the extent of the damage will depend on a variety of factors. Some of these factors can be minimised by appropriate planning (such as buildings constructed to cyclone code) and community preparedness. Other factors, such as size and intensity of the cyclone, state of the tide, topography and precise point of impact are beyond our control.

Living through a Category 5 tropical cyclone in a remote location is a once in a lifetime experience. To anyone who thinks they might like to do it for some macho reason or to experience it, I would strongly advise them not to do it! If all the factors described above combined in a worst case scenario of a direct hit by a Category 5 cyclone on a remote community, then I fear there would be devastating damage to the built environment and a very real risk of substantial numbers of human and animal casualties.

Acknowledgements:

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About the Author

Dr Ted Donelan: Dr Donelan is a veterinarian based in Melbourne, where he has been running his own private practices for more than 30 years. He is a Fellow of the Australian Veterinary Association, a Senior Academic Associate of the University of Melbourne and Life Member of RSPCA Victoria.

Ted has a long history of involvement in animal welfare and animal management policy planning and implementation at local, state and national levels. Coupled with decades of interest in indigenous affairs, it was a natural progression to involvement in the developing organisation that became Animal Management in Rural and Remote Indigenous Communities (AMRRIC), where Ted is currently Vice President.

For the past five years Ted has provided a veterinary service including a comprehensive dog health program to the remote indigenous community of Maningrida, which with its outstations encompasses an area of some 10,000 square kilometers in Arnhem Land.

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