

Cyclone knowledge and household preparation – some insights from Cyclone Larry

King, Goudie and Dominey-Howes report on how well Innisfail prepared for Cyclone Larry

Abstract

Cyclone Larry crossed the Coral Sea in mid-March 2006, developing into a severe category five as it approached the coast south of Cairns. The eye of Larry crossed the coast between 6.20 and 7.20 am on Monday 20th March (Bureau of Meteorology 2006). Given Larry's magnitude, it would not have been unreasonable to expect devastation of the settlements in its path, with many deaths and injuries. However, there were no deaths and very few injuries. We seek to determine whether this is a reflection of a well prepared and knowledgeable community. We carried out a survey of residents in rural communities in and around Innisfail a week after Larry. This article shows that the impacted communities were, in a very Australian way, well-prepared having generally experienced other severe cyclones. While longer term post-cyclone recovery may be a difficult time for these rural communities, in our opinion their preparations and responses to warnings were appropriate and undoubtedly saved lives and injuries and lessened the overall impact.

Introduction and aim

The North Queensland monsoon had been very active during the early part of 2006. A tropical low in the Coral Sea in mid-March attracted the attention of many North Queensland residents, who watched it develop into a category five cyclone during the days preceding its landfall at 6.20 am on Monday 20th March 2006. Whilst Cyclone Larry could have made landfall anywhere between Port Douglas and Townsville, it headed very rapidly and directly towards Innisfail (see Figure 1). Consequently, even as late as Sunday 19th March, people from Cairns south to Townsville were making cyclone preparations.

During the Cyclone Warning Period on Sunday 19th March Larry intensified from a category four to a five. Shortly after landfall, Larry degraded to a category

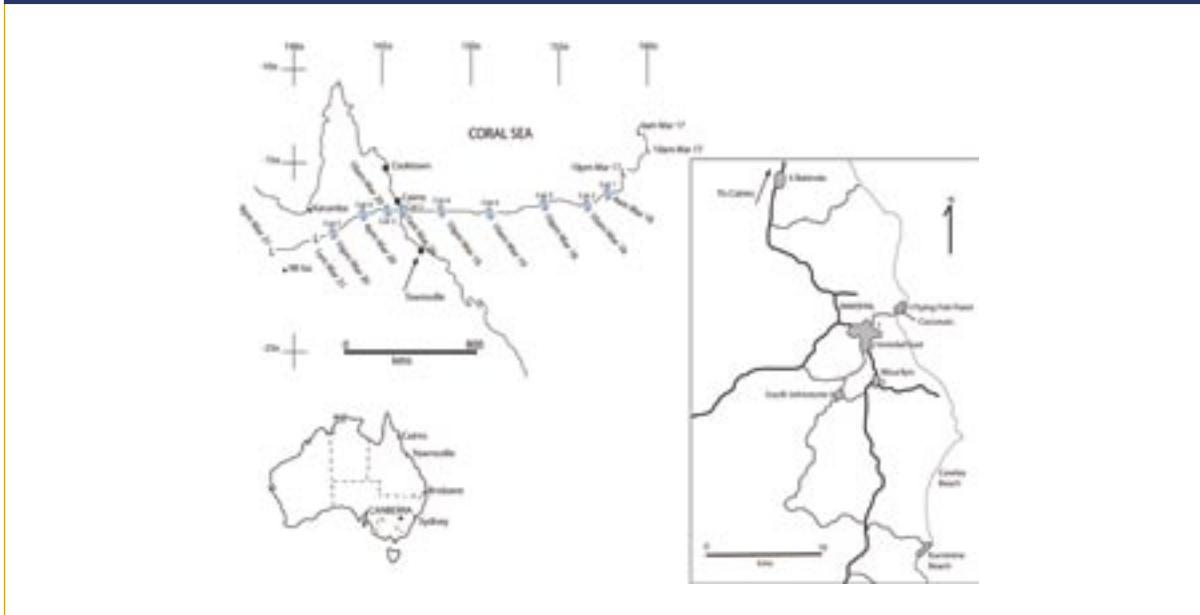
four but continued far inland before it weakened significantly by 21st March (Bureau of Meteorology 2006). Destructive winds started to impact the coast around 4:30 am on Monday 20th March and the cyclone cleared the southern end of the Atherton Tablelands by around 09:30. It maintained a rapid westward speed of about 25 km/hr, such that most communities in its path experienced up to four hours of destructive winds.

Larry caused widespread and severe damage to housing, agriculture, business property and to a lesser degree infrastructure and the natural environment. Significant post-event studies are underway and organisations like Geoscience Australia will present data concerning these impacts elsewhere. Despite the severity of Larry it was soon apparent that whilst a population of approximately 50,000 people lay in its path, there had been no deaths and only a few injuries. We assume that this negligible effect of people is because the local population had prepared correctly and had then behaved properly during its passage. The aim of this article therefore, is to test this assumption and to use our findings to provide feed back into the mitigation efforts of pre-cyclone education for community awareness and preparedness. Such an analysis should be of use because previous studies of levels of cyclone awareness and preparedness (Dilley 1998, Enders 2001, King 2004, Nielsen and Lidstone 1998, O'Neil 2004, Sullivan 2003) have highlighted many areas of poor knowledge and lack of proper preparation at the community level. Specifically, we are interested in learning from the residents affected by Larry, their views about the effectiveness of the safety weather warnings, the role and value of the media, their preparations, the impacts and lessons learned. The research outcomes are being targeted at emergency managers detailing any perceived community shortfalls in awareness and preparedness (King and Goudie 2006).

Method – the Survey

The Centre for Disaster Studies at James Cook University prepared a short, open-ended survey in conjunction with the Bureau of Meteorology. A team of five researchers began household surveys five days after Larry made landfall. The team interviewed residents of

Figure 1. Map of central North Queensland from Cairns south to Townsville. The map also shows the location where Cyclone Larry originated as a tropical low pressure system in the Coral Sea on 16th March 2006. The storm's track as it approached the coast is indicated together with the locations of the coastal communities affected as it crossed the coast and headed inland. Our survey focuses on coastal communities around Innisfail rather than inland communities affected by Larry



147 households, in their homes, in eight areas of the coastal impact zone (see Figure 1) over four days. The survey focused on issues of warnings, preparations, behaviour and personal and community experience. People were very willing to share their often fearful experiences – Larry was fresh in people’s minds. We surveyed 147 households (totalling 471 people at the time the cyclone impacted) and our results indicate the general pattern of experiences. Our sample may be slightly skewed because people whose properties were made uninhabitable were, perhaps, underrepresented. The complete report and survey instrument can be accessed on the Centre’s web site at <http://www.tesag.jcu.edu.au/CDS/Pages/pdreport.htm>.

Results

We present our results by broad theme. These are: previous cyclone experience; household information sources for cyclone season preparations; warnings; preparations; community and perceptions and information issues.

Previous cyclone experience

Interestingly, 81% of our sample respondents had previously experienced a cyclone (Table 1). We consider this to be a very significant percentage of households within the affected area we studied.

Table 1. Previous experience of a cyclone (by location)

Location	Previously experienced a cyclone			Total number of households
	Winifred	Other cyclone	No previous experience	
Innisfail Estate	18	6	6	30
East Innisfail	18	6	9	33
Flying Fish Point	2		2	4
Coconuts	7	2	2	11
Kurrimine		1		1
Mourilyan	19	2	2	23
South Johnstone	13	2	2	17
Babinda	20	3	5	28
Total	97	22	28	147

Household information sources for cyclone season preparations

At the beginning of the cyclone season in November each year, local authorities conduct a cyclone information campaign. Respondents were asked about where they obtained advice about general cyclone preparedness and whether or not they had discussed an emergency plan with members of their household.

Our respondents gathered cyclone preparedness information from many sources (Figure 2). From the many sources available, 40% stated TV and radio and 31% stated that they just knew what to do. They prepared for the cyclone season on the basis of personal knowledge and previous experience. While this suggests that they felt they did not need to seek any other advice or information, it is probable that most of those who did seek cyclone information also had a high level of personal knowledge and previous cyclone experience (as indicated by the data in Table 1). Over half the households we surveyed had not discussed an emergency plan, although that includes single person households and many couples.

Warnings

The official cyclone warning period covered all of Sunday March 19th. However, 78% of our respondents were aware of Larry's approach before then, most having watched it develop since before Saturday (Table 2). By lunchtime on Sunday 19th, a further 12% were aware of the warning. Informed well in advance, people had plenty of time to make final preparations and many households clearly did so.

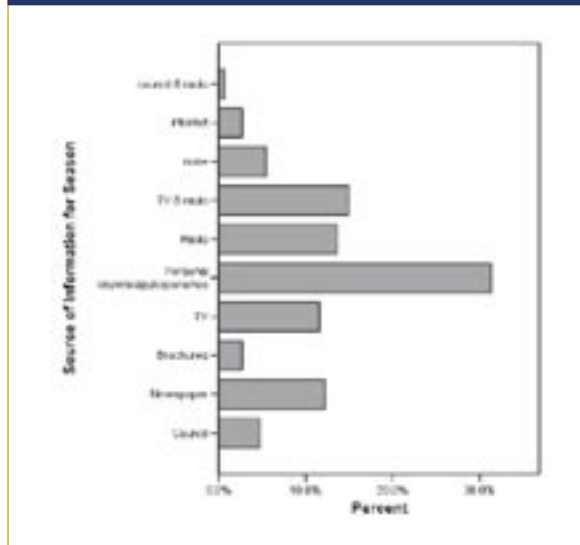
Table 2. Time that households became aware of Cyclone Larry's approach

Time Aware of Larry	Number	Percent
Before Saturday	89	60%
Saturday	26	18%
Sunday 9-1	18	12%
Sunday 1-5	7	5%
Sunday 5-8	5	3%
Sunday after 8	2	1%
Total	147	100%

Television and radio dominated as the main warning sources for Larry. Households also accessed the internet as well as talking to family, friends and neighbours. Internet access appears relatively low at 13% (during the cyclone warning), but this matches the ABS 2001 census (ABS 2001, although this may have changed upward) where only 13% of the population of Johnstone Shire had internet access at home. It is generally the case in rural communities that internet access is low. During the warning period and even during the cyclone, 91% of households had contact with relatives and 86% with their neighbours. This included people coming out of their homes during the eye of the cyclone and talking to neighbours as well as clearing up some of the debris. Those in the centre of the eye had almost 40 minutes of relatively calm conditions.

Throughout the warning period on Sunday 19th, people shared their knowledge and kept seeking information and updates from media and the internet.

Figure 2. Sources of information for cyclone season preparations



They were generally very positive about the Bureau of Meteorology (BoM) messages, but the most common criticism was a call for more regular warnings and updates (see below), especially as the cyclone neared landfall. This criticism was often more directed at the media than at the BoM. People experienced frustration in accessing updates on TV and radio, complaining that some stations were still broadcasting older warnings after the time of a BoM update.

Preparations

The two main levels of preparation are the pre-season cleanup, and response to the specific cyclone warning when impact is imminent. Many households stated that they kept their house and yard in a good state of readiness throughout the cyclone season (Table 3) and did not feel the need to do further preparations (Table 4). Doing nothing (as indicated in Tables 3 and 4) does not indicate apathy or complacency as most respondents qualified it by saying that they did not feel there was anything more they could do.

Table 3. Activities in preparation for the cyclone season

Preparation for cyclone season	Number	Percent
Yard clean up	39	27%
House preparation	17	12%
Emergency kit	6	4%
Nothing	52	36%
Shopping	26	18%
All of the above activities	6	4%
Total	147	100%

Table 4. Additional preparations prompted by Cyclone Larry Warning

Preparations prompted by warning	Number	Percent
Nothing	26	18%
Clear yard	43	29%
Clear up, shop & secure	26	18%
Clear yard & secure boat	10	7%
Buy supplies	8	5%
Store water	7	5%
Secure other belongings	6	4%
Tape windows	5	3%
Buy supplies & store water	4	3%
Store water & secure belongings	3	2%
Evacuate	3	2%
Repair building/trim vegetation	2	1%
Secure car and/or boat	2	1%
Food preparation	1	1%
Buy fuel	1	1%
Total	147	100%

All of these actions are reflected in the positive assessments that people gave of the adequacy of their preparations both for the cyclone season and for the specific warning of Cyclone Larry (Table 5).

Where respondents have stated “pretty good” in Table 5 it is reasonable to assume that this is a typical understatement rather than an assessment that is qualitatively lower than good. Good or pretty good may be interpreted as meaning much the same thing.

Table 5 also cross tabulates the perception of adequacy of preparations by the decision to evacuate. Essentially there is no difference in attitudes to preparations between these two groups, although 17% of households who did evacuate also said they thought their preparations were “poor”. People did not evacuate because they had not prepared for Larry, but they had prepared first before they evacuated. Most of the households who evacuated did so because authorities advised them to leave during Sunday. Beachside and low-lying communities that were vulnerable to storm surge were instructed to evacuate. Amongst the survey respondents, this particularly applied to the Innisfail ‘suburbs’ of Flying Fish Point and Coconuts (Figure 1). A single individual who was from Kurrimine Beach was interviewed in Babinda, having evacuated and being unable to return. In all, 17% of households evacuated from their homes. There were no formal shelters to go to, so most people went to stay with relatives or friends in safer locations. A small number left the main cyclone impact area entirely.

For the households that did not evacuate, Table 6 indicates where in the house people chose to shelter. They mostly sheltered in central or inner rooms, stronger rooms such as block built structures underneath high set houses, and some moved location according to the primary wind direction. Their behaviour replicated cyclone advice and kept people safe, even where significant structural damage occurred to dwellings.

Table 5. Household assessment of cyclone preparations and decision to stay or evacuate during Larry

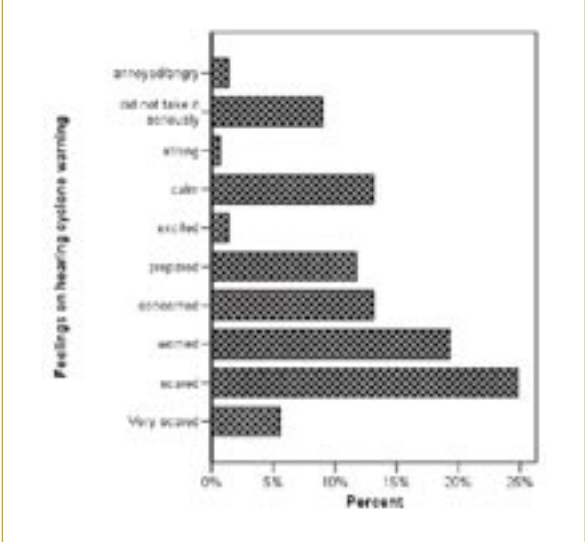
Adequacy of Preparations	Stay in House				Total	
	Yes		No – evacuate		Number	Percent
	Number	Percent	Number	Percent		
Excellent	11	9%	3	12%	14	10%
Good	90	75%	16	67%	106	74%
Pretty good	11	9%	1	4%	12	8%
Fair	8	7%			8	6%
Poor			4	17%	4	3%
Total	120	100%	24	100%	144	100%

Note: 3 households did not respond to this question

Table 6. Place of shelter within home and choice of evacuation shelter

Shelter Location	Number	Percent
Moved around inside	27	21%
Central area/hallway	40	31%
Bathroom/laundry	20	15%
Room under house/ car/garage	15	11%
Lounge	13	10%
Bedroom	9	7%
Kitchen	3	2%
Used mattresses	3	2%
Shelter at work place	1	1%
Total	131	100%
Sheltered elsewhere/Evacuated		
Relative or friend	19	73.1%
Other property	2	7.7%
At workplace	2	7.7%
Shelter/church	1	3.8%
Ignored evacuation order – no response	1	3.8%
Cairns	1	3.8%
Total	26	100%

Figure 3. People’s feelings in response to the cyclone warning



Community and perceptions

There was a great deal of contact between family members, friends and relatives before and during Larry. Much of this was by phone, both mobile and landline, with phone contact continuing during the storm, including broadcast

calls to radio stations. Many extended families came together to shelter as well as some groups of neighbours and friends. A few people mentioned a strong community spirit following Larry and clearly the small community nature of the region probably contributed to positive actions and mutual support.

If the population was well-prepared it did not mean they were in any way unworried or even complacent. Figure 3 illustrates that people were extremely affected emotionally by the threat. A grouping together of all of the categories of concerned, worried, scared or very scared, which includes terms like frightened, covers 63% of the respondents. Some expressed a feeling of “being prepared” or “strong” as an emotional response to the coming storm.

Table 7 lists the reaction of our respondents to their feelings about the cyclone warnings. Given that the survey took place five to eight days after Larry, it is likely that people felt a complex of emotions, but on reflection have focused on these responses. Taking some kind of action was a cathartic response for half of our respondents. Those who took no further action were mostly households that had already prepared as much as they could. Included in this response was the eighty year old lady who went bowling in the afternoon as “life must go on” and a 40 year old male in Innisfail who reported “panic buying of food”. “We left everything to the very last minute” and another reported “I screwed the windows shut”. There were many other practical but incorrect ideas, like opening the manhole cover to help equalise air pressure. As strong winds blew rain horizontally under sliding windows, the few who sealed the outside bases of their windows with broad tape had less water damage.

Information issues

Respondents identified two major issues in relation to the information available to them and how it was being delivered: (1) conflicting information from the Bureau of Meteorology (BoM) and the media and; (2) outdated media information. Many people reported conflicting information between the Bureau of Meteorology (BoM) www internet site and that released by the media. Respondents stated – “don’t stuff around. Be clear and precise”, “the messages were conflicting”, “felt that messages were misleading and contradictory”, “different sources said different things”, “TV, radio and www all giving different advice”, “Austar said Larry would hit by 6 am, and it did [in Mourilyan]” and “the radio said about 10 am – it was all over by 9.30.” Others call for consistency and accuracy of the information provided.

Other respondents noted that, “there was some confusion, because some of the information was 2 hours old – ie the 6 pm Sunday news gave a 3 pm bulletin”, “Listened to the ABC all night. We would like the broadcast bulletins to be up-to-date” and, “the media was presenting old reports.” A father

Table 7. How respondents acted on their feelings following the cyclone warning

Acted on Feeling	Number	Percent
Increased Preparations & activity	73	50%
No action	29	20%
Stay calm/don't scare others	29	20%
Confused	3	2%
Evacuated	6	4%
Listen to warnings	2	1%
Upset	3	2%
Total	145	100%

Note: 2 households did not respond to this question

of three got updates from out of the region by mobile phone (which had clear reception until Monday 20th) because “the ABC had old news”. A 38 year old male from Flying Fish Point said “the 8 pm report on the ABC was from the 5 pm bulletin from the Bureau... A 1 am bulletin was provided on the web, but a 2 am broadcast on the ABC quoted a 12 midnight Bureau bulletin”.

From the information provided by respondents, it is clear that the prediction of ‘time of impact’ needs to be clarified. For instance, people fearing for their lives, were concerned because the ABC was saying “the eye was coming at 8 am, when it had already passed”. Indeed, a 50 year old from Babinda asked to “make clear in broadcasts if they are talking about the eye of the cyclone, or which quadrant”. This feedback of requests to enlarge the scale as actual landfall approached and occurred, include people asking for “_ hourly warnings, more frequent TV updates”, and “a list of the exact locations which may be heavily impacted”. A significant issue is that, even though the BoM describes Larry as a ‘midget’ cyclone, impact time spread from about 6 am in the south to about 8 am in the north. A clearly shaken family in South Johnstone reported covering in their house as a main roof beam snapped and a panel of louvers blew in, only to hear on the radio that landfall would be in about an hour.

Whilst the BoM warning messages and the media’s dissemination of these messages attracted some criticism, another group of respondents provided much praise. For instance, “we were relying on the forecasts and we got what we needed” and, “The best!”. Some were concerned, after Larry, that Cyclone Wati which was in the Coral Sea was being underplayed and under-reported so as not to alarm residents already affected by Larry. Some asked for the BoM www internet site to be more widely advertised.



Wind impacts were ‘patchy’. This 90 year old house in Mourilyan survived with a couple of damaged windows. Photo: Douglas Goudie

Some found the web site a little hard to navigate into the cyclone information although the BoM have changed their web site format in May 2006.

Discussion

The weather warnings seemed to have been taken seriously. There was an aware, informed community, predisposed to precautionary preparation to maximise their safety – although there were still individual households who did not know that a cyclone was coming. Other considerations are that, unlike Tracy in 1974, Larry came and went in about 4 hours. There is a consensus among researchers and many residents that the damage would have been much worse if Larry had been slow moving. The patchy nature of maximum wind speeds may also have helped to restrict damage. A point of concern is that the media were sometimes lagging behind Bureau information and peoples’ ‘real-time’ experience. Prior research indicates people need consistent information from various, trusted sources (Rohrman 2000). While radio announcers were ‘known’, the conflicting information caused some distress.

The majority of people had been through Cyclone Winifred almost exactly 20 years earlier and most people had experienced multiple cyclones and impacts between 1990 and 2000 alone – Joy, Justin, Rona and Steve. During January 2006 the Cairns Post and the Innisfail Advocate ran 20 year anniversary editions remembering Winifred. This was a powerful educational reminder, coming just two months before Larry. People anticipated Larry in knowledge of Winifred’s impact. It is probable that the impact of the two cyclones was very similar.

However there are many qualifying factors that we need to acknowledge to guard against complacency. In our sample, an extremely high percentage of households had previously experienced cyclone events. We have not (or are unable) to separate out their evaluation of the



Power outages, lasting up to weeks post-impact, caused major inconvenience for communities and residents.
Photo: Douglas Goudie



Kurrimine Beach was severely impacted. Coastal vegetation adsorbed some of the wind and sea's energy.
Photo: Douglas Goudie

effectiveness of their household preparations from those households for whom Larry was their first cyclone (i.e., had recently moved in to the area). This latter group may have unique experiences and be especially vulnerable

The surveyed households relied too heavily on previous experience to guide them through their preparations. If for example the advice about what to do had changed since the last cyclone, they might have been relying on old advice rather than the new advice. They may have been denying themselves the possibility of learning new information about protecting themselves and their property by ignoring the yearly pre-season information campaigns. Families sheltering inside their properties did the right thing in terms of where to shelter and when to move around, apart from going outside during the eye.

Almost no household had a "household emergency plan" – even though this is best practice. There may have been an element of luck that no one died this time. If the cyclone had made landfall during daylight hours and families were separated people may have taken greater risks with dire consequences. Some households were lucky this time – rather than well prepared through household level planning. This means that the message about household emergency plans has still not been learnt. Thus we cannot say that no lives were lost purely because of preparedness, as there was an element of luck that it occurred in the middle of the night when families were together rather than moving around trying to find each other in the impact area. If the latter had been the case, we may have seen some (or even many) deaths. Finally our survey focused on coastal communities affected by Larry and did not travel on to the Atherton Tableland or other inland areas. These communities may have had different experiences



This isolated and seemingly vulnerable house, north of Innisfail, stood through the fury, although surrounding sugar cane was flattened; an example of the patchy wind speeds. Photo: Douglas Goudie

Conclusion: Experience and Chance

People, almost universally, and in a very Australian way, were as ready as could be hoped for. The safety weather warnings, coupled with prior experience, caused people to acknowledge the threat as real, and act to maximise (if sometimes belatedly) their safety. Most people had not expected utter devastation, and while the region looked devastated immediately after Larry had gone through, the reality for most people was relatively minor damage to most houses. There was extensive damage to vegetation, sheds, and farm and industrial structures. People had prepared well and relatively thoroughly and were satisfied with their preparations. They then sheltered in the safest parts of their houses and, apart from often fussing around windows during the cyclone, behaved with responsibility and resilience.



Banana crops in the full wind zone were uniformly destroyed, leaving clear indications of 'knock down' wind direction. Photo: Douglas Goudie



Surge and wave reach cause coastal erosion at Cardwell, at least 50 Km south of the main wind impacts. Photo: Douglas Goudie

Although a category five immediately prior to landfall, Larry's most destructive impacts were very patchy. It also moved extremely fast, at more than 20 km an hour, so that the battering of destructive winds was reduced to a much shorter period of time than most other cyclones. These aspects of luck combined with a cyclone-experienced and well-prepared community, reducing negative impact to a minimum. A lesson to be learned is that people do act correctly to protect themselves, but that each household does not necessarily do all of the things that are recommended. Educational campaigns and 'how-to' weather warnings need to consistently build on that resilience.

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