

FACT SHEET EPA castaway finally comes home

Question: What do a volley-ball named Wilson and an Environmental Protection Agency drifting wave-measuring buoy named BOB have in common?

Answer: They both dropped into the ocean from the sky; they both played a minor role to a bigger actor (Wilson to Tom Hanks, in the 2000 movie *Castaway*; while BOB to severe tropical cyclone Ingrid in March 2005); and both were castaway on a tropical island. But that's where the similarities end – whereas Wilson was eventually lost at sea, BOB was recovered after five months on tiny Noble Island, north of Cooktown. BOB was returned to its home base where, although battered beyond repair, it was still able to yield valuable information about waves and currents during the passage of tropical cyclone Ingrid towards the Queensland coastline.

BOB's story

On Tuesday, 8 March 2005, an EPA Baby Ocean Buoy (BOB) was dropped into the Coral Sea, about 30km northeast of Cooktown, by a Queensland Rescue* helicopter (see figure 1). BOB is a Lagrangian buoy, which means that it gathers information as it moves with the tides and currents, rather than from a fixed position like the rest of the EPA's wave buoys. *Queensland Rescue is part of the Queensland Department of Emergency Services' Counter Disaster and Rescue Services Division.

BOB was deployed to record storm waves generated by severe tropical cyclone Ingrid as it approached the Queensland coastline in an area not covered by the EPA's network of moored wave buoys. A separate report on cyclone Ingrid is also available at:

<http://www.epa.qld.gov.au/publications/p01584aa.pdf/>



Figure 1 – Bell 412 helicopter (courtesy Dept. Emergency Services).

Cyclone Ingrid had been present in the Coral Sea for several days, and was moving towards the north Queensland coastline (see figure 2). With the possibility that the cyclone could come close to Cooktown, it was important to record information on the large waves expected to be generated. Studying large wave events provides a greater understanding of coastal processes generally, and also helps the EPA to make better coastal planning decisions.

The closest of the EPA's fleet of moored Datawell Waverider buoys was located 165km south, at Cairns.

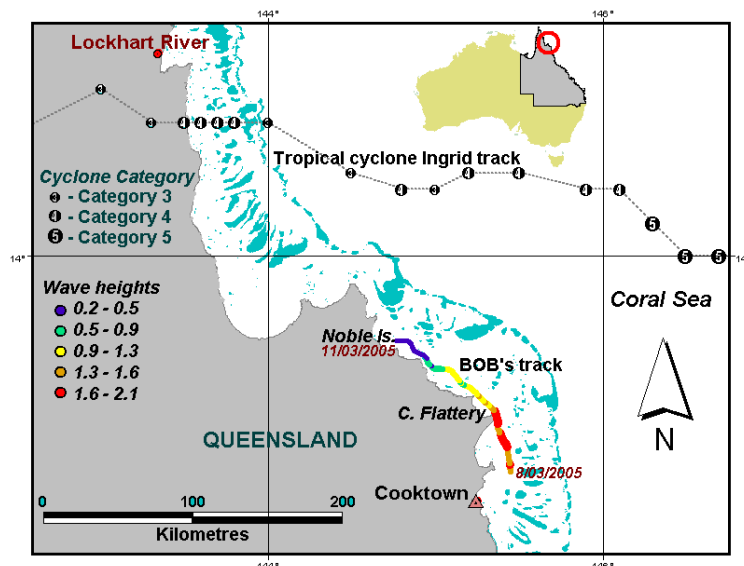


Figure 2 – Tracks of Ingrid and BOB.

It was therefore necessary to rapidly deploy BOB into the Coral Sea. Unlike the moored wave buoys, BOB is a Datawell 0.4m diameter Waverider buoy that drifts with the currents, collecting wave information and storing it to a flash-memory card on board. Conventional deployment from a boat was not possible because of the threat posed by cyclone Ingrid.

As part of the close working relationship between the Department of Emergency Services (DES) and the EPA, DES provided a Rescue Services Bell 412 helicopter to deploy BOB. The helicopter used its global positioning system to locate the deployment site. It then dropped BOB into the water from a height of about 10 metres at around 6pm on 8 March. BOB was then free to drift with the prevailing currents in the Coral Sea, recording its position and information on wave conditions, while storing this on its internal flash-memory card every 30 minutes.

The search for BOB

BOB has a relatively short operational life of about two weeks, due to power requirements. However, this was more than sufficient as cyclone Ingrid crossed the Queensland coast on 10 March, no longer posing a threat in the Coral Sea. As a result, a recovery mission was carried out on 14 March using a vessel from the Australian Volunteer Coast Guard at Cooktown. Portable radio receiving equipment was used to try to obtain a transmission signal from BOB, but no signal was detected and the search was abandoned. BOB was presumed lost, and hope of recovering wave information from cyclone Ingrid faded. Unbeknown to the EPA at this time, BOB was already aground on rocks on the south-eastern side of Noble Island (see figure 3).

BOB's recovery

Hopes of finding BOB faded further with time, until a yachtsman, Mr Ray Innes, telephoned the EPA on 29 July and reported that he had sighted BOB on rocks on the southeastern side of Noble Island. This is a small, barren and rocky island with a hill rising to 122m, about 80km northwest of Cape Flattery and 120km north-northwest of Cooktown.

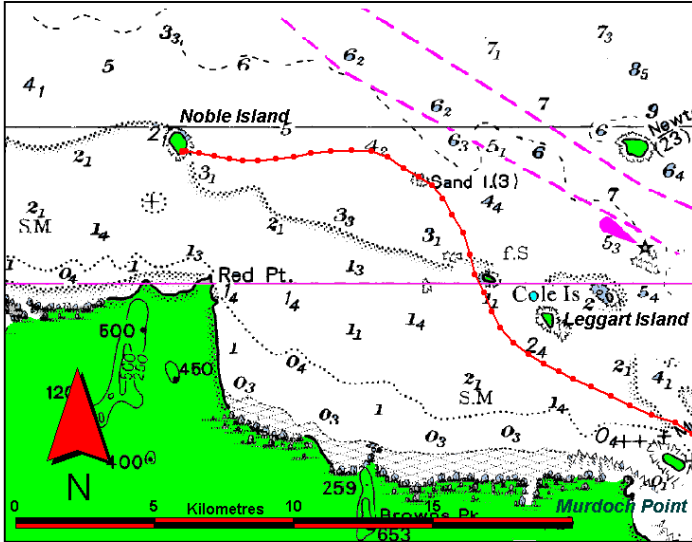


Figure 3 – BOB's track to Noble Island

Figures 2 and 3 shows BOB's track as it travelled towards Noble Island. From the figures it is clear that BOB travelled in a roughly northerly direction, parallel to the coast, at a speed of about 2.5km/h. It passed about 1.3km offshore of Cape Flattery at 9.30am on 9 March and changed direction, now moving towards the northwest and generally tracking along the main shipping channel before turning to the west at 3.30am on 10 March after passing east of Petherbridge Islets. It then maintained a northwesterly track at a speed of about 1.5km/h to pass 3km east of Murdoch Point at 5.05pm on 10 March, and 1.5km west of Cole Islands at 9pm on 10 March. Finally, it veered to the west and eventually ran aground on the southeastern side of Noble Island some time around 10.30am on 11 March where it remained undetected until Mr Innes visited the island and located the buoy in July.

Once the EPA was alerted to BOB's location it was able to enlist the help of the Australian Customs vessel *Storm Bay* that was due to pass near Noble Island. On Thursday 4 August, BOB was located on a fringing reef at the eastern end of the island, just below the high water line. Customs Officer Michael Muhamad, a Cairns resident, recovered BOB using one of *Storm Bay's* 6.4m tenders. BOB was then returned to Cairns from where it was transported to EPA offices in Brisbane, on 19 August.

Although BOB was damaged beyond repair (see figure 4) – saltwater had entered the hull and ruined the electronics – its flash-memory card still contained the valuable data of its travels.

This information has been extracted and preliminary analyses have been presented in figure 5 as time series plots of the wave heights and drift velocities experienced

by BOB. The figure also shows a plot of the predicted tides at Leggart Island, about 11.5km southeast of Noble Island. From the figure, it is clear that sea conditions were roughest on the morning of 9 March, with a peak significant wave height of 2.1m being recorded at 9.35am on 9 March. Peak wave periods of 5.9 seconds also occurred at this time, when tropical cyclone Ingrid's centre was located 162km to the north-northeast of BOB. Ingrid was classed as a category 4 cyclone, with a central pressure of 935hPa and maximum winds of 280km/h near its centre. The cyclone (which had earlier been at category 5) had deviated from its earlier course, and was now moving northwest towards the coast. Predicted tides throughout the period show large spring tides coincided with a new moon on 10 March. No actual tidal information was available in BOB's vicinity. During BOB's travels, lasting 64 hours, it travelled about 130km at an average speed of about 2km/h.



Figure 4 – Damaged BOB beside moored wave buoy

Acknowledgements

The recovery of BOB and the information it contained was due to the efforts of a number of people and organisations. The EPA would like to acknowledge the valuable assistance provided by Mr Ray Innes; the Australian Customs Service; the Department of Emergency Services; and the Cooktown flotilla of the Australian Volunteer Coast Guard.

Web links

Queensland Rescue
<http://www.emergency.qld.gov.au/aviation/default.asp>
Australian Customs Service
<http://www.customs.gov.au>
Cooktown flotilla (Australian Volunteer Coast Guard)
<http://www.coastguard.com.au/squadrons/qld/flotillas/QF16/qf16.htm>
Datawell
<http://www.datawell.nl>
EPA fact sheets and other reports on cyclone Ingrid
http://www.epa.qld.gov.au/waves/wave_monitoring_publications/

Additional information on waves and tides can be obtained on-line at the following EPA web pages:

www.epa.qld.gov.au/waves
www.epa.qld.gov.au/tides

Glossary

- Significant wave height** **wave** The significant wave height (in metres), defined as the average of the highest one-third of the zero up-crossing wave heights in a 26.6-minute wave record. Meteorologists, oceanographers and coastal engineers frequently used this value. It is based on the concept that smaller (least significant) waves should be ignored from the observations as they have little influence on wave processes generally.
- Peak wave period** Wave period at the peak spectral energy (in seconds). This indicates the period of those waves producing the most energy in a wave record.
- Wave direction** The direction that peak wave period waves are coming from (in ° True). In other words, where waves with the most wave energy are coming from.
- Predicted tide** Tide expected to occur under average meteorological conditions. Tide predictions are typically based on previous observed tide readings gathered over a long period (usually one year or more). The sun, moon and earth are not in the same relative position from year to year. Accordingly, the gravitational forces that generate the tides, and the tides themselves, are not the same each year.
- Observed tide** Tide actually recorded by the storm tide gauge.

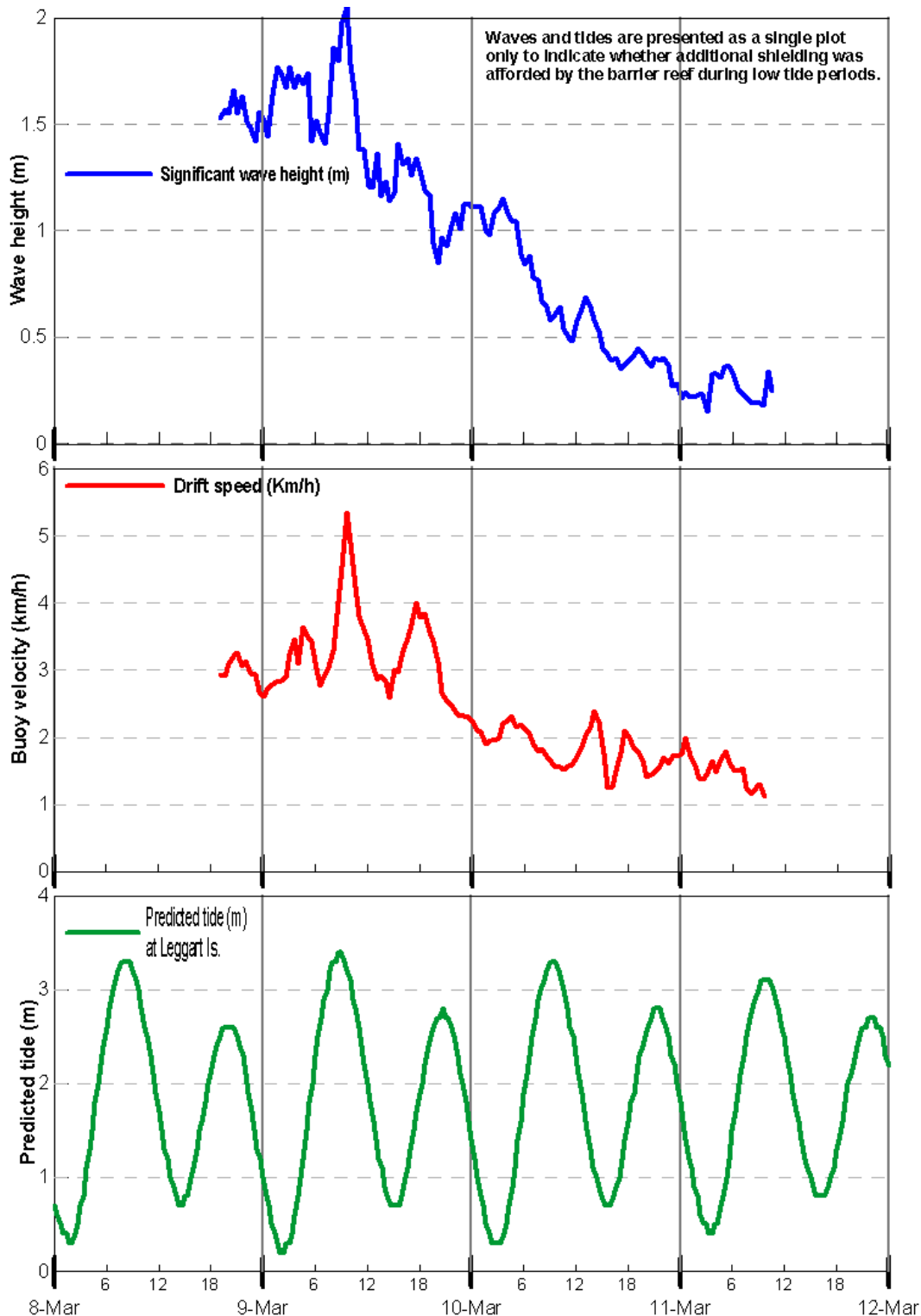


Figure 5 – Time series plots 8–11 March 2005.