

Locating AHS *Centaur* by back-tracking the drift of survivors

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1. INTRODUCTION

Survivors from the sinking of AHS *Centaur* on 14 May 1943 off Brisbane were rescued by the USS *Mugford* at 27°03' S, 154°12' E, after drifting for 34 hours in the water. One of the survivors was Gordon Rippon, the *Centaur*'s navigator and his log notes the ship's position just 2 minutes before the sinking as 27°17'S 153°58' E. At this location the water is about 1500m deep. The purpose of this investigation is to assess the likelihood that these facts are consistent, given present knowledge of ocean currents over the upper continental slope of southern Queensland and the effect of wind on the drift of survivors.

For the historical navigational information to be correct, the average drift velocity of the survivors must have been 0.56kt to the NE.

The upper continental slope between Fraser Island and Byron Bay is where Australia's fastest ocean current velocity is most likely to be found (Figure 1), because this is where the East Australian Current normally flows southwards as a fast, narrow jet. The speed of this southward flow can reach 4kt or more. The existence of the East Australian Current has been known to Europeans since Captain Cook's pioneering voyages, so any mariner reviewing the case of the *Centaur* inevitably doubts the likelihood that both the *Mugford* and *Centaur* positions could be correct, because the implied drift velocity is so different from what is normal for the region.

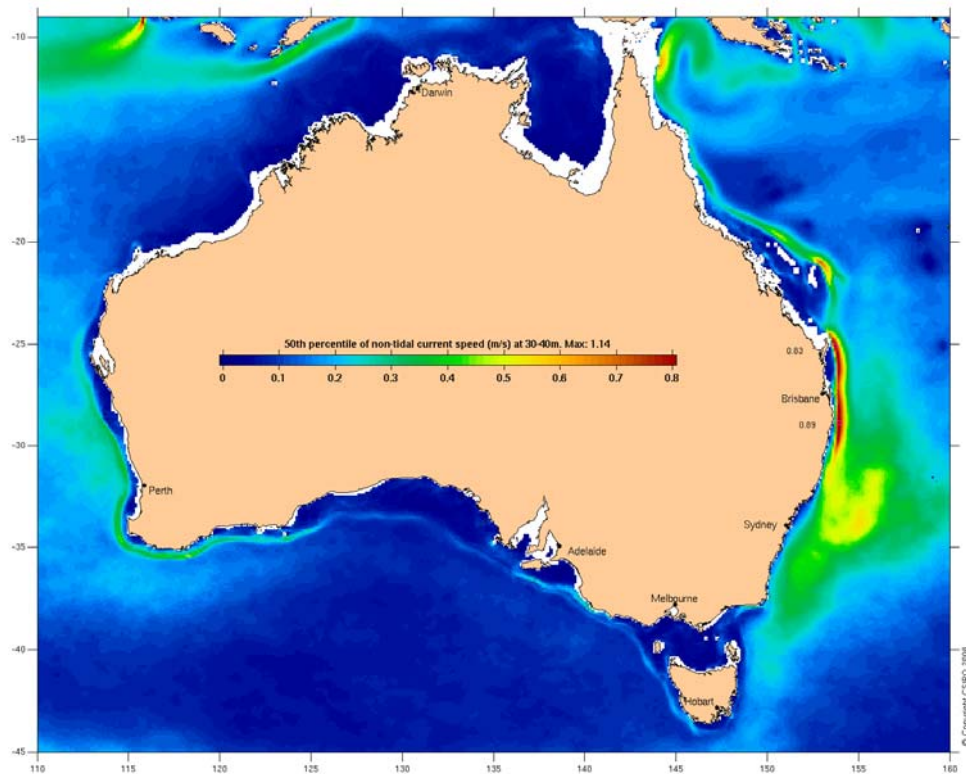


Figure 1 Median non-tidal, near-surface current speed estimated by the Bluelink global ocean model.

An item at sea drifts at a velocity that is the sum of the velocity of the water (the ‘current’), and the velocity of the item with respect to the water (the ‘leeway’). The current velocity, in turn, can be thought of as the sum of the tides, the surface layer wind-drift, and other features such as, on the east coast of Australia, the East Australian Current or eddies and counter-currents associated with it.

For this study, we are advised (Art Allan, pers. comm, 2009 via D. Mearns) to estimate the leeway of the *Centaur*’s survivors as being 2% of the wind velocity. According to a recent meteorological reanalysis by Len van Burgel, the wind at the time was about 7kt from the SE. The survivors were drifting in deep water where tidal currents are negligible, so we have not considered the purely oscillatory motions due to tides. The surface wind-drift is estimated to be 3% of the wind, following standard practice. Thus, two components of the total drift velocity are estimated directly from the 1943 winds. For the 34h period that the survivors were adrift, these sum to $5\% \times 7\text{kt} = 0.35\text{kt}$ to the NW. The task is therefore to assess the likelihood that the non-wind-driven component of the ocean current was about 0.66kt to the ENE, rather than 1 or 2kt to the south as it normally is.

2. ESTIMATING THE POSITION OF *CENTAUR*

2.1 Method

For locations where long records from current meters do not exist, which is the case for the region of interest, our most advanced technique for estimating the velocity statistics of ocean currents is the ocean modelling approach developed for the CSIRO/BoM/RAN Bluelink project. This model was developed for the purposes of historical re-analyses, and routine forecasting, of ocean currents at high (10km) resolution in the Australasian region. The system relies on access to precise observations of sea level, which are only available (away from land) from 1992 onwards, when a series of satellites (the European Space Agency’s ERS1&2 and Envisat, the NASA/CNES missions Topex/Poseidon and Jason, and the US Navy’s GeoSat Follow-On) carrying accurate altimeters have been operating. The design and performance of the model are described by Oke *et al.* (2008), and Schiller *et al.* (2008).

The period spanned by the Bluelink ReANalysis (version 2.1) dataset is 1992-2006. The output data set comprises daily-averages of the velocity. The Bluelink model includes the effect of the wind as estimated, at 6h intervals, by the ECMWF ERA40 atmospheric reanalysis. But since we can estimate the surface wind drift of the rafts based on estimates of the 1943 wind, we must avoid also including the effect of the modern wind in our estimate of the effect of current. To do this we have simply sampled the model flow field at 25m depth, and calculated two sets of trajectories. One set of trajectories are computed forwards from Rippon’s position while the other set are computed backwards from the *Mugford* position. The forward tracks all go from the same origin (Rippon’s position) to a variety of end points 34h later. For the backward tracks, the destination is held constant (the *Mugford* position) and we compute the origin, each day, of an item destined to be carried to the *Mugford* position by the combined effect of wind and current.

2.2 Results

As expected, the forward tracks go mostly south from Rippon’s position, rather than NE towards the *Mugford* position, while the back-tracks (Figure 2) from the *Mugford* position go mostly north, rather than SW to the Rippon position.

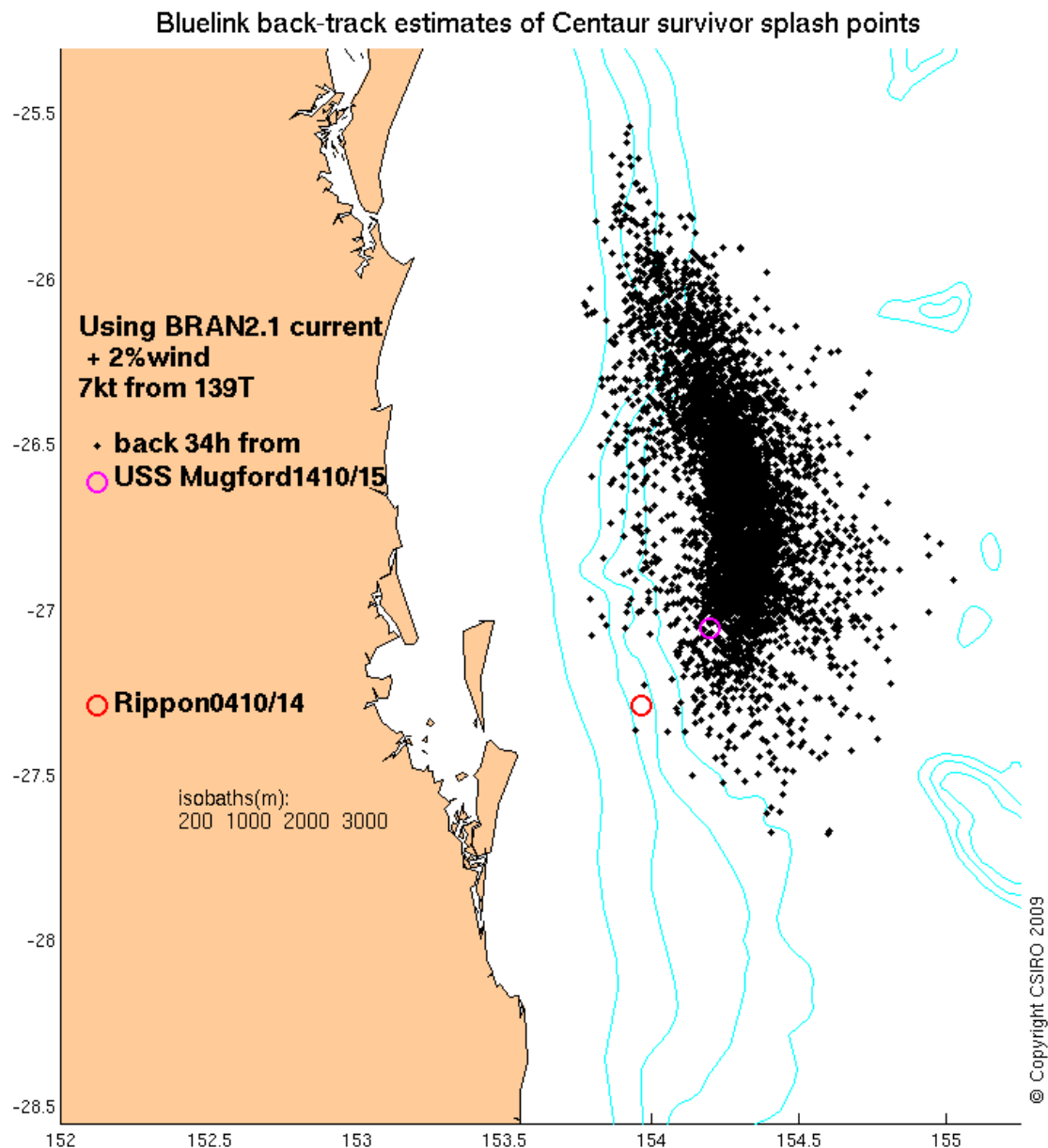


Figure 2 Estimated origins (black dots) of items destined to arrive, after drifting for 34h, at the location (magenta circle) where the USS *Mugford* located the survivors from the sinking of AHS *Centaur*. Each black dot results from using the velocity field hindcast by the model to have occurred on one of the days between 1993 and 2006. The red circle shows the position, recorded in Rippon’s log, of AHS *Centaur* a few minutes before the sinking.

2.3 Discussion

The model is in agreement with the widely-held belief that the most likely position of *Centaur*, taking just the *Mugford* position and winds and currents into account, is due north of the *Mugford* position in the centre of the cloud of black dots in Figure 2. This is wholly to be expected and simply confirms that the model is a reasonable representation of reality.

A more significant question is whether the model can confidently reject Rippon's position as being plausibly correct. Very few of the black dots in Figure 2 are close to Rippon's position, but it is still true that Rippon's position falls within the perimeter of the cloud of plausible origins of items destined to drift to the *Mugford* position. Hence, this simulation does support the notion that Rippon's position is unlikely to be correct, but it cannot conclusively prove beyond reasonable doubt that Rippon's position was incorrect.

Various other positions have been suggested as being the locations of *Centaur*. Figure 2 suggests that positions west or south-west of Rippon's position are even less likely to be correct than Rippon's, while positions to the north or north-east have higher likelihoods.

3. THE SEARCH FOR *CENTAUR*

The actual resting point of AHS *Centaur* turned out to be very close to Rippon's position. Assuming the *Mugford* position was correct, this implies that the ocean current on the day of the sinking was indeed very different from what is normal, or believed to be normal for the region. We may never know exactly how abnormal 14 May 1943 was, but it is worth noting that in December 2009, just as the search for *Centaur* was commencing, a series of events took place off southern Queensland that resulted in the East Australian Current flowing southwards much farther offshore than usual, being separated from the upper continental slope by a series of eddies that could be seen in satellite imagery (Figure 3) as clearly rotating in a clockwise sense while translating southwards with the flow of the current. Clouds obscured the ocean before the eddies could be observed to pass over the site of the *Centaur* but it is clear that as each eddy passed over or near the site, there would have been a time when the flow was quite likely to have been directed north-eastwards or eastwards in the fashion required to explain the drift of the survivors from the site of the sinking to the site of their rescue.

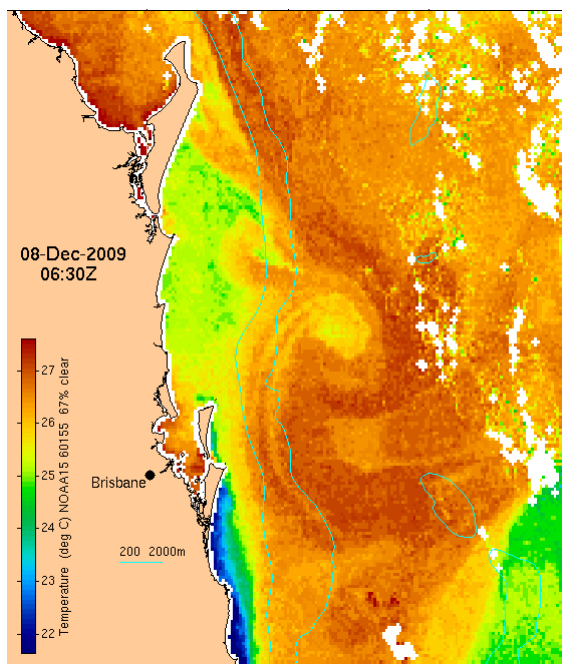


Figure 3 Sea surface temperature image for 8 December 2009, showing relatively cold water on the continental shelf south of Fraser Island and associated offshore displacement of the East Australian Current. Cyclonic rotation of the eddy at 26.5S can be seen if the images acquired before and after this one are all viewed sequentially as an animation (see <http://www.marine.csiro.au/remotesensing/oceancurrents/Centaur20091208.AVI>)

The real-time forecasting version of the Bluelink ocean model successfully simulated the formation and general characteristics of the anomalous event, as shown in Figure 4, suggesting that the modelling approach taken in section 2 is indeed an adequate one.

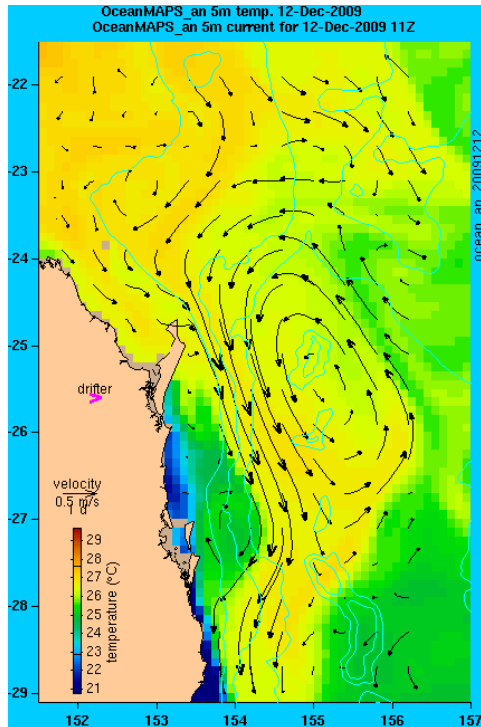


Figure 4 Bluelink model nowcast for 12 December 2009 showing the surface velocity and temperature. Each black arrow shows the path that would have been followed by an item drifting with the current over a 24h period. A small cyclonic eddy is off Brisbane at this time, while the East Australian Current continues southwards by flowing around the eddy on the seaward side.

4. CONCLUSION

The question of whether Rippon's position was correct was settled by successfully finding *Centaur* at that position. This study confirmed that it was perfectly reasonable for people to doubt that the ship would be found there, but also showed that it was not correct to cite the existence of the East Australian Current as positive evidence that Rippon's position had to be wrong. The study also showed that some of the alternative locations of *Centaur* were even less likely to be correct, and therefore of lower priority in the design of a search region.

Finally, we note there is some symmetry in the story of the *Centaur*. If the East Australian Current had been flowing along the upper continental slope in May 1943, the survivors would have drifted southwards at a much greater speed than they actually did, which probably would have resulted in their becoming dispersed over a wider region, resulting in possibly fewer of them being successfully rescued. It was, therefore, quite fortuitous that the EAC was not, at the time of the sinking, flowing as it normally does. A dis-incentive to conducting the search for the ship was the notion that the East Australian Current always flows southwards, implying that searching anywhere near Rippon's position was doomed to be a waste of effort. As if to deliberately dispel that notion, encourage the search, and indeed, make it easier to deploy the tools of the search, the current once again moved offshore in December 2009.

5. REFERENCES

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