Measurements of rip current flow and swimmer behaviour in Australian rip current systems using low-cost GPS: implications for beach safety

Dr Robert Brander[1], Dr Ian Turner[1], Ben Jones[1], Warren Jones[1], Jenna Brown[2], Dr Jamie MacMahan[2], Dr Shauna Sherker[3] and Matthew Thompson[3]

University of New South Wales[1], Naval Postgraduate School[2], Surf Life Saving Australia[3]

Rip currents are a global phenomenon on beaches characterised by breaking waves and are the major cause of beach drowning and surf rescue in many countries. According to Surf Life Saving Australia (SLSA) 94 coastal drowning deaths and 25,000 beach rescues took place in 2008–2009. Many of these were related to rip currents. In 2009, SLSA launched an ongoing national rip education campaign based on a behavioural response message for swimmers 'to escape a rip, swim parallel to the beach'. This message is traditional and common advice promoted around the world by various beach safety practitioners in regards to rip currents.

However, recent and state-of-the-art scientific research on rip currents on beaches in California, the United Kingdom and France using surf zone drifters with Global Positioning System (GPS) units attached showed that rip current flow exhibits a circulatory behaviour without extending beyond the surf zone (1). 80% of the drifters circulated back into shallower depths of adjacent sand bars within minutes. The implication of these findings was that swimmers should adopt a 'stay afloat' and 'do nothing' approach when caught in a rip current within the surf zone. However, this excluded considerations of swimmer reaction and behaviour when caught in rips. Subsequently a debate has been raised within the world of rip current education as to the appropriateness and preference of the 'swim parallel' versus 'stay afloat' responses for swimmers caught in rips. Furthermore, drifters are inanimate objects that may not accurately mimic the drifting tendencies of human beings. Few studies have used human 'rip floaters' to measure rip flow.

Australian beaches are characterised by a plethora of rip currents, but no study has attempted to measure the flow trajectory of GPS drifters and human 'rip floaters' in an Australian rip current simultaneously. Additionally, no study has attempted to test or quantify the 'swim parallel' versus 'stay afloat' response using real swimmers.

This study presents results from a pilot study conducted in a rip current at Bondi Beach in Sydney, Australia in September 2010. The aims of the study were to: i) test the rip circulation results of MacMahan et al. (1) in Australian open beach fixed rip currents by monitoring rip flow trajectories using GPS devices attached to drifters and human rip floaters; ii) directly compare the flow trajectories observed between the drifters and the human rip floaters; and iii) provide quantitative data and observations of the effectiveness of the following types of swimmer responses in rip currents: stay afloat and go with the flow and swim parallel to the beach.

A total of 114 GPS drifter deployments were made over two days with 96.5% of the drifters re-circulating within the surf zone. A total of 125 human floaters entered the rip over two days: 27 swam parallel to the beach to the left, 27 parallel to the right and the remainder simply floated. All of the swimmers reached the adjacent sandbars and 99% of the floaters recirculated. The study was conducted under unusually high wave energy conditions and a strong longshore current which likely affected results. However, the findings provide valuable direction for future similar studies using human rip floaters of various swimming abilities and can easily be replicated in different rip current environments.

References

1. MacMahan, J., Brown, J., Brown, J., Thornton, E., Reniers, A., Stanton, T., Henriquez, M., Gallagher, E., Morrison, J., Austin, M.J., Scott, T.M. and Senechal, N. (2010). Mean lagrangian flow behaviour on an open coast rip-channeled beach: a new perspective. Marine Geology, 268: pp. 1–15.

Corresponding Author

Dr Robert Brander
Senior Lecturer
University of New South Wales
School of Biological, Earth and Environmental Sciences
University of New South Wales
Sydney NSW Australia 2052
Email: rbrander@unsw.edu.au
Website: www.scienceofthesurf.com
Telephone: +61 2 9385 2899