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# Surviving the surf zone: Towards more integrated rip current geographies

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A B S T R A C T

Rip currents are a major cause of drowning on surf beaches worldwide. This article highlights the efficacy of integrating physical and human geographical research approaches with the aim of improving our understanding of the problem presented by rip currents, to people. Coastal geomorphologists working in the field of rip current science have identified the need to bring social science research approaches to the rip current hazard. Geography is a discipline well placed for the task of collaboration between the sciences and social sciences. Although the discipline of geography generally operates along a divide between physical and human sciences more integrative approaches to research problems have begun to gain traction. This article provides an overview of the evolution of rip current science through engagement with physical, and more recently, social sciences. It also demonstrates the emergence of an iterative research process within our research collaboration. This provided unforetold opportunities of cooperation and integration that were revealed as part of the evolution of a highly specialised research endeavour.



## Introduction

Huge surf events, such as occurred during Hurricane Sandy on the eastern seaboard of the USA in October 2012, often include footage or photos of individuals standing perilously close to large and powerful surf breakers (e.g. The Hurricane Sandy Aftermath, 2012). People may be curious about the power of the sea but these images highlight how easy it is to underestimate, or be unaware of the force of dangerous surf. While big cyclonic surf discourages direct physical engagement with the ocean for most people, swimming, paddling, wading and surfing are generally associated with calmer weather and hot, sunny summer days. Yet too many people have found themselves dragged offshore, out of control, in a rip current in what appear to be ideal conditions with calm waters and blue skies. Far too often, many of these "beautiful" beach days end in tragic drowning. Despite the widespread media coverage and high public profile of catastrophic events, such as hurricanes and cyclones, it is often lower magnitude but higher frequency hazards such as rip currents that can account for a higher number of human fatalities in the long term (Brander, Dominey-Howes, Champion, Del Vecchio, & Brighton, 2013).

Rip currents (or rips) are generally defined as strong, narrow, and concentrated flows of water that are common on many ocean, inland sea, and lacustrine beaches characterised by breaking waves (Brander & MacMahan, 2011; Dalrymple, MacMahan, Reniers, & Nelko, 2011; MacMahan et al., 2011). According to traditional geomorphologic models, rip currents consist of alongshore feeder currents that are restricted close to the shore. They carry water towards a narrow and fast-flowing channel of water ("rip neck"), moving at right angles to the shore, which travel through and beyond the surf zone where it decelerates. This water is then able to return to the shore as waves to complete the circuit (Fig. 1; Shepard, Emery, & Lafond, 1941; Shepard & Inman, 1951). Unsuspecting bathers have been carried offshore in these currents, where a combination of lack of knowledge, panic, and exhaustion too often leads to serious consequences (Brander, Bradstreet, Sherker, & MacMahan, 2011; Drozdzewski et al., 2012). As such, rip currents are the leading causes of rescues and drowning deaths at beaches in Australia (Brighton, Sherker, Brander, Thompson, & Bradstreet, 2013; Short & Hogan, 1994; SLSA, 2009) and the United States (Brewster & Gould, 2014; Gensini & Ashley, 2009; Lushine, 1991). They are also a significant problem worldwide (for example see

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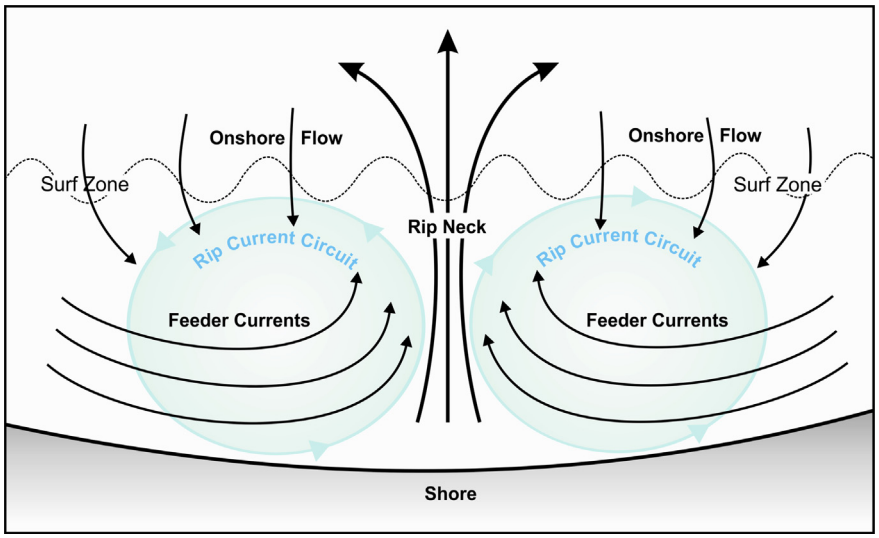


**Fig. 1.** Rip Currents: conventional paradigm.

case studies by Klein, Santana, Diehl, & Menezes, 2003, Brazil; Hartmann, 2006, Israel; Scott, Russell, Masselink, & Wooler, 2009, UK; Arun Kumar & Prasad, 2014, India).

Not surprisingly, in many countries with popular and accessible surf beaches, summer holidays herald an increase in the likelihood of fatalities by drowning due to rip current incidents (McKay, Brander, & Goff, 2014). Experts, including practitioners, turn to the task of developing ways to avert unnecessary drowning deaths. When fatalities do occur, they seem all the more shocking and macabre because of the setting, and the engagement in enjoyable recreational activities that promote health and well-being. News media headlines begin to appear. Examples from Sydney and regional New South Wales, Australia, include "Quiet heroes of beach tragedy" (Wood & Singh, 2011), "Man drowned, dozens rescued in day of wild seas" (SMH News 2011). As visitors to Australia are often unaware of the dangers, headlines of incidents such as, "French tourist drowns in strong rip" (SMH News, 2012) are all too common. Rip currents have therefore long held community interest and concern, and motivated the establishment of the first lifeguarding services in the United States and Australia, in the late 1800s and early 1900s.

The complex morphodynamics of rip currents are well understood (Dalrymple et al., 2011; Macmahan, Thornton, & Reniers, 2006) but knowledge of the social and psychological aspects of rip current science is critically under-developed. More significantly, little work exists that combines physical and social scientific approaches to the problem of rip currents as a hazard to humans. This is due in part to a long standing divide between physical and human sciences, and particularly in the discipline of geography that, until recently, has maintained a separation between its 'physical' and 'human' sub disciplines (Harrison et al., 2004; Sui & DeLyser, 2012). Much of the research on rip currents, to date, has occurred under the rubric of geomorphology, or more broadly, physical geography.

The overall aim of this article, then, is to follow a call for more integrative geographies by advocating for more integrated approaches to the rip current problem. We do this for three purposes. First, we seek to move the problem of the rip current hazard into a more open interdisciplinary space. Second, we provide a practical *applied* example that draws on both physical and human geographies and, in a fledgling way, brings these disciplinary "sides" into conversation with each other. Third, is the critical perspective that geographical work that marries human and physical approaches is testament to broadening the field by contesting conventional limits to scholarship. The structure of this article is as follows. First, we present an overview of rip currents as a physical earthly phenomenon that becomes a problem, sometimes a 'hazard', when humans are involved – when they enter the surf zone. We then consider the split between physical and human geographies and the emergence of more collaborative possibilities. This is followed by two sections, one is a short history of the science behind the physical phenomenon and the next is an introduction to recent social science approaches, which have largely been driven by the need for beach safety services. To exemplify bringing the "sides" together, we then offer a summary of the application of different research methods derived from a large-scale cross-disciplinary research project that has moved towards a more integrated approach (Dey, 1993) to the problem (for humans) of rip currents. This article does not offer a template for integrated geographies, nor a definitive example of how to straddle the physical and human sciences divide. It offers *an* example of how openness to integration can be an enabling and progressive research process. In the case presented here, a nuanced iterative approach to addressing the rip current problem emerged because of, at times, awkward encounters across a largely well-entrenched but somewhat faltering divide in geography and specifically, rip current science.

We therefore include moments of research reflexivity by reporting on some of the methodological iterations that have resulted from researchers reaching across paradigms during this research process.

## The rip current problem

Each year, hundreds, sometimes thousands, of people drown in rip currents worldwide (Fletemeyer & Leatherman, 2010) and tens of thousands more get caught in them and are rescued, or self-rescue or inadvertently find themselves free of the rip current. Estimates of the number of drownings and rescues attributed to rip currents are imprecise because of a lack of national reporting systems, and difficulties involved in obtaining accurate and reliable incident reports. The figures that do exist vary. The United States Lifesaving Association estimates that rip currents account for eighty