INFLUX OF THE PANTROPICAL BULWER’S PETREL
BULWERIA BULWERII INTO THE TASMAN SEA

SIMON B. Z. GORTA

Centre for Ecosystem Science, School of Biological, Earth and Environmental Sciences, University of New South Wales, Sydney, New South Wales, Australia (s.gorta@unsw.edu.au)

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ABSTRACT


Seabirds exploit marine habitats for resources, responding to many complex environmental signals that ultimately drive their distributions. Occasionally, influxes of seabird species to regions outside their normal range occur and determining the drivers of these patterns can aid in understanding their ecology and their conservation. I documented five birdwatching observations of Bulwer’s Petrel Bulweria bulwerii in the Tasman Sea between 24 January and 08 March 2020, roughly 2000 km south of their core range. Based on demographic, environmental, and anecdotal observations of seabirds, cetaceans, and bait fish, I suggest that the influx was most likely resource-driven, rather than accidental, age-related, or directly linked to adverse weather. Increasingly frequent observations of Bulwer’s Petrel off eastern Australia may also indicate a southward distributional shift in this pantropical seabird, and monitoring of this potential shift will depend on the documentation of further observations.

Key words: Procellariiformes, seabird, vagrant, extralimital, East Australian Current, tropicalisation, marine productivity

INTRODUCTION

Seabirds represent a diverse and functionally important group of predators in marine ecosystems and spend most of their lives at sea. When at sea, their movements are associated with environmental and biological factors. Following resources, seabirds can exploit regions that have high marine productivity relative to the surrounding ocean (e.g., frontal or upwelling zones; Cox et al. 2018), as well as areas with high commercial fishing activity (e.g., Oro et al. 2004; Bartumeus et al. 2010). These movements can also be associated with environmental variables such as sea-surface temperature (SST), primary productivity, and wind (e.g., Pakhomov & McQuaid 1996, Quillfeldt et al. 2015, De Pascalis et al. 2020). Meteorological disturbances such as low-pressure systems can lead to avoidance behaviour in some species (Weimerskirch & Prudor 2019), as well as displacement from their normal range. Warming SSTs and shifting productivity caused by climate change are associated with tropicalisation (poleward shifts in taxon distributions, community composition, and function; Vergés et al. 2014), which may also be happening in some seabird communities (e.g., Gorta et al. 2019). Many species also perform annual migrations and disperse seasonally to distinct marine regions (e.g., breeding and non-breeding distributions as in Rayner et al. 2011), though tracking of breeding adults does not capture the annual movements of all birds within a population (see Priddel et al. 2014). Movements in response to resources and migrations can differ within species among age classes, with younger, less experienced birds often foraging in less productive marine regions than adults (Péron & Grémillet 2013, Fayet et al. 2015, Grecian et al. 2018). Explanations for seabirds occurring in extralimital regions can be complex but can provide valuable insights into seabird ecology, particularly when these occurrences include multiple individuals.

Marine areas are inherently difficult to survey, so most of the unusual influxes of seabirds that have been documented are from nearshore or beach-washed records; therefore, counts are likely to underestimate the number of birds involved. Influxes are also often associated with severe storms that can drive seabirds close to or onto shore where they can be more readily observed. For example, large wrecks of southern seabirds normally found in subantarctic latitudes, including Kerguelen Petrel Aphrodroma brevirostris and Blue Petrel Halobaena caerulea, were recorded on the beaches of southern Australia, New Zealand, and South Africa in winter of 1984 (Brown et al. 1986, Powlesland 1986, Ryan et al. 1989). These events were directly associated with storms that brought the birds ashore, but in New Zealand and South Africa, the birds were also observed at sea beforehand, indicating that they may have been driven into these areas by other factors, such as food resource limitations associated with shifts in broad-scale meteorological processes (Ryan et al. 1989, Duffy 1990). In another example, unprecedented numbers of Brown Booby Sula leucogaster were observed in waters off the northeastern USA in 2018, although the cause of this influx was not determined (Ramirez-Garofalo 2019). Recording these events is important, as they can provide insights into movement patterns and changes in seabird distributions, which can aid our ability to understand and conserve these species and their ecosystems.

Here, I describe an unprecedented influx of Bulwer’s Petrel Bulweria bulwerii into the Tasman Sea off southeastern Australia, based on a series of birdwatching observations and records of birds in care during January–March 2020. Bulwer’s Petrels are abundant and pantropically distributed across the Atlantic, Indian, and Pacific oceans, but have occasionally been observed north and south of this region (Megysi & O’Daniel 2020). In Australia, this species is commonly found off the northwestern coast (GBIF
Gorta: Bulwer’s Petrel influx in Tasman Sea

and has been recorded several times in the Coral Sea (e.g., Cheshire 1989), including some recent records around 28°S (Stewart 2018, 2020; McGovern 2020). There are also records of vagrants from southwestern Victoria (e.g., Carter & Reid 1989, Schultz 1992) and southwestern Western Australia (Palliser 2018). A beach-washed specimen from the Cook Strait, New Zealand, in January 1998 represents the only prior record from the Tasman Sea (Medway 2001).

RESULTS

Bulwer’s Petrel records

Five reports of Bulwer’s Petrel were made by birdwatchers in the western Tasman Sea between 24 January and 08 March 2020. These included photographs of two birds found ashore but later released, one bird photographed at sea, and two sight records from land, all in southeastern Australia. All records except one were accepted by the New South Wales Ornithological Records Appraisal Committee (NSWORAC; Table 1, Appendix 1, available on the website).

Environmental conditions varied among records; however, ocean salinity was fairly constant for all records for which it could be measured (Table 1).

On 24 January 2020, a single birdwatcher reported a Bulwer’s Petrel flying south among foraging Wedge-tailed Shearwaters *Ardenna pacifica* from North Head, Manly in Sydney (Table 1). No rainy weather or strong winds were reported on the day of this observation, although a maximum wind gust of 54 km/h from the north-northwest (i.e., offshore) occurred within the 24 hours before the observation was made (Table 1). No photographs were taken, and this report had not been submitted to NSWORAC at the time of publication.

On 28 January 2020, a Bulwer’s Petrel was found on the balcony of the Cronulla Returned Services League (RSL) Club in southeastern Sydney and taken into care (Table 1; Fig. 1). Strong winds from the south-southwest the night before may have exhausted the bird and driven it to land (Table 1). The bird remained in care supervised by L. Smith of the Southern Ocean Seabird Study Association (http://www.sossa-international.org/) and others until it was flown

<table>
<thead>
<tr>
<th>Date</th>
<th>Maritime jurisdiction</th>
<th>Location</th>
<th>Sea-surface temperature (±1 °C)a</th>
<th>Wind (km/h direction)b</th>
<th>Salinity (PSU)a</th>
<th>Depth (m)c</th>
<th>Summaryd</th>
</tr>
</thead>
<tbody>
<tr>
<td>24 Jan 2020</td>
<td>NSW</td>
<td>Coastal waters off North Head, Manly (33°49′S, 151°19′E)</td>
<td>23</td>
<td>11 SE (54 NNW)</td>
<td>35.5</td>
<td>10–20</td>
<td>Sight record by one observer from land of a single bird flying south among foraging Wedge-tailed Shearwaters. Not reviewed by NSWORAC.</td>
</tr>
<tr>
<td>28 Jan 2020</td>
<td>NSW</td>
<td>Ashore at Cronulla RSL Club, Cronulla (34°03′S, 151°09′E)</td>
<td>23</td>
<td>15 SSW (63 SSW)</td>
<td>35.6</td>
<td>Ashore</td>
<td>Single bird found on the balcony of the Cronulla RSL Club, taken into care and photographed. Later released off Darwin on 14 Feb 2020. Accepted by NSWORAC.</td>
</tr>
<tr>
<td>29 Jan 2020</td>
<td>NSW</td>
<td>Coastal waters off Mistral Point, Maroubra (33°56.5′S, 151°16.0′E)</td>
<td>24</td>
<td>17 SSE (39 S)</td>
<td>35.5</td>
<td>10–20</td>
<td>Sight record by three observers from land of a single bird observed flying south among foraging Wedge-tailed Shearwaters. Accepted by NSWORAC.</td>
</tr>
<tr>
<td>10 Feb 2020</td>
<td>NSW</td>
<td>Ashore at Camden Head (31°38.6′S, 152°50.1′E)</td>
<td>20</td>
<td>35 ENE (43 ENE)</td>
<td>35.5</td>
<td>Ashore</td>
<td>Single bird ashore taken into care during a large low-pressure event off the Australian east coast. Photographed and later released at nearby Perpendicular Point on 11 Feb 2020. Accepted by NSWORAC.</td>
</tr>
<tr>
<td>08 Mar 2020</td>
<td>Australian EEZ</td>
<td>At sea 315 km east of Sydney (34°03′S, 154°40′E)</td>
<td>26</td>
<td>46 S (N/A)</td>
<td>N/A</td>
<td>4961</td>
<td>Single bird photographed and flushed off the water while resting with Grey-faced Petrels at sea. Accepted by NSWORAC.</td>
</tr>
</tbody>
</table>

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a Sourced from the Integrated Marine Observing System (https://portal.aodn.org.au/); PSU = practical salinity units

b Sourced from the Bureau of Meteorology (http://www.bom.gov.au/). Nearshore/shore observations provided are the wind speed/direction, along with the strongest gust in the 24 hours before the observation (parentheses). N/A = not available.

c Source: Amante & Eakins 2009

d NSWORAC = New South Wales Ornithological Records Appraisal Committee
had occurred within the previous 24 hours, indicating moderate onshore or parallel-to-shore winds leading up to the observation (Table 1).

On the evening of 10 February 2020, an exhausted Bulwer’s Petrel was delivered to P. West (Hastings Birdwatchers, http://www.hastingsbirdwatchers.org.au/) at Camden Head on the Mid North Coast region of New South Wales before being released nearby the following day at Perpendicular Point (Table 1). This record was associated with a low-pressure system off the eastern coast of Australia, which produced moderate to strong winds that were predominantly easterly to northeasterly, reaching 35 km/h.

![Fig. 1](image-url) Photographs of three of the five Bulwer’s Petrel *Bulweria bulwerii* recorded in the Tasman Sea in early 2020. (a, b) A first-year bird was found on 28 January in Cronulla, pictured resting on a carer’s hand and with wings outstretched to show a subtle pale ulnar bar and fresh, same-age wing feathers (photographs by G. Barwell). (c, d) Another bird was found on 10 February at Camden Head; its older age-class than the Cronulla bird is evidenced by obvious primary and secondary moult (see Appendix 2; photographs and film by P. West). (e, f) The last bird was observed at sea 315 km east of Sydney on 08 March (photographs by S.N.G. Howell). It was also of an older age-class than the Cronulla bird and showed a diagnostic pale ulnar bar (e), along with late-stage primary moult and small size compared to a Grey-faced Petrel *Pterodroma gouldi* (f).
the day the petrel was found and 43 km/h the day prior (Table 1). Along with the winds, a total of 371.8 mm of rain fell between 06 and 13 February, including 142.2 mm on 09 February alone, the day before the petrel was found. The bird was photographed (Appendix 1; Fig. 1) and filmed upon release (Appendix 2). Notably, this individual was undergoing both primary and secondary moult, indicating that it was of an older age-class than the Cronulla individual (Fig. 1; Appendix 2).

Almost a month after the Camden Head record, one Bulwer’s Petrel was photographed at sea by S.N.G. Howell roughly 315 km east of Sydney on 08 March 2020 (Table 1; Fig. 1). The bird was loosely associated with a group of Grey-faced Petrels *Pterodroma gouldii* in strong southerly winds and large swell (Fig. 1). This individual was also undergoing primary moult, indicating it too was of an older age-class than the Cronulla bird.

**Other observations**

Seabirds and cetaceans were observed feeding on abundant large balls of bait fish (including blue mackerel *Scomber australasicus*) at the sea surface off Maroubra, Sydney during 44.5 hours of land-based observations from 28 January to 20 February 2020. During this period, three of the five Bulwer’s Petrel observations were based on observations from 28 January to 20 February 2020. During this period, three of the five Bulwer’s Petrel observations were made. Seabird species observed feeding on these bait balls included common shoreline and largely coast-restricted species such as Silver Gull *Chroicocephalus novaehollandiae* and Greater Crested Tern *Thalasseus bergii*, as well as more pelagic seabirds: Pomarine Jaeger *Stercorarius pomarinus*, Parasitic Jaeger *S. parasiticus*, Sooty Tern *Onychoprion fuscatus*, White Tern *Gygis alba*, Australasian Gannet *Morus serrator*, Wedge-tailed Shearwater (numbering >1000 on some occasions and the most abundant in attendance), Flesh-footed Shearwater *A. carneipes*, Flattening Shearwater *Puffinus gavia*, Streaked Shearwater *Calonectris leucomelas*, and White-necked Petrel *Pterodroma cervicalis*. Furthermore, a number of cetaceans were also observed feeding, included four large unidentified *Balaenoptera* whales, short-beaked common dolphin *Delphinus delphis* (including two pods of over 100 individuals), Indo-Pacific bottlenose dolphin *Tursiops aduncus* (pods of up to 10 individuals), and false killer whales *Pseudorca crassidens* (one pod of six individuals).

**DISCUSSION**

Though there has been a recent increase in the number Bulwer’s Petrels sighted in the southern Coral Sea (Tapim 2013; Stewart 2018, 2020; McGovern 2020), the southern limit of their core range is understood to be the northern Coral Sea (Cheshire 1989, Menkhorst et al. 2017). The five observations described were made ~2000 km south of this region. These observations represent the second to sixth records of Bulwer’s Petrel in the Tasman Sea and the first records within the coastal waters of New South Wales and inside Australia’s Exclusive Economic Zone in the Tasman Sea. For the five observations reported here, I have relied on written descriptions, photographs, video footage of the birds, and the environmental conditions surrounding the sightings to infer both the potential scale and cause of this influx.

Prior records of vagrant Bulwer’s Petrel in the region, including one from the Tasman Sea in New Zealand, have exclusively involved spatially and temporally isolated individuals (e.g., Carter & Reid 1989, Schultz 1992, Medway 2001, Palliser 2018). In the 2020 influx, five separate records were documented over 44 days, including four in an 18-day period, and spanned roughly 300 km². Four of the observations occurred around 34°S, which coincides with the latitude of Sydney, a major city with more potential observers than elsewhere along the New South Wales coast. Furthermore, non-breeding Bulwer’s Petrels in the southern Atlantic Ocean show predominantly nocturnal flight at latitudes south of 20°S, and this species often occupies offshore pelagic and continental slope regions (Rodríguez et al. 2013, Dias et al. 2015, Ramos et al. 2015), which would make observations difficult for birdwatchers, particularly from land. As such, it is possible that more individuals were present than reported, and that the spatial and temporal distribution of the five records indicate this event was an influx of Bulwer’s Petrel into the Tasman Sea, rather than coincidental or accidental occurrence of vagrant individuals independent of each other.

Based on the observed absence or presence of moult, the influx also involved at least two distinct generations: a first-year individual that likely fledged in mid-2019 and two older immature or adult birds. The other two birds were not observed well enough to age. Age-related patterns in dispersal from breeding grounds and foraging distribution are poorly known for Bulwer’s Petrel (Megysi & O’Daniel 2020); in other seabirds, these patterns can differ with age (Péron & Grémillet 2013, Fayet et al. 2015, Grecian et al. 2018). However, both first-year and more mature birds were observed, providing little support for the notion that extralimital juvenile dispersal was accidental. The blood sample from the Cronulla bird has been stored at the Australian Museum, but in the absence of prior work genetically differentiating Bulwer’s Petrel populations, analysis was not undertaken. Thus, the breeding location of this bird (and potentially most or all of the birds involved in this influx) will remain unknown, though geographically, they are likely from a colony or colonies in the northwestern or central Pacific Ocean (e.g., the Ogasawara Islands roughly 6500 km north of Sydney), which is within the migration distance recorded in the Atlantic (Ramos et al. 2015).

In the absence of severe weather conditions to displace these birds southwards from their usual range (e.g., a tropical cyclone that moved south from the Coral Sea to the Tasman Sea, as in Roderick & Richardson (2013) and Tapim (2013)), high resource availability is most likely to have attracted and sustained the petrels in the Tasman Sea. Like the widespread northerly influx of southern seabirds in 1984 (Ryan et al. 1989, Duffy 1990), local weather conditions may have increased visibility of this influx, but these conditions cannot directly explain the presence of Bulwer’s Petrel beforehand in the region. Older and more experienced seabirds often exploit regions with higher resource reward than younger birds in many seabird species (Péron & Grémillet 2013, Fayet et al. 2015, Grecian et al. 2018), and non-breeding adult Bulwer’s Petrels in the Atlantic travel from their breeding grounds at 38ºN to 20ºS in pursuit of productive foraging grounds (Ramos et al. 2015). The presence of moulting (older) Bulwer’s Petrel during the 2020 influx and coincident land-based observations of various coastal and pelagic avian and mammalian marine predators foraging in the area, among which two Bulwer’s Petrel were observed, lends support to the theory that this influx was resource-driven.

Observations of Bulwer’s Petrel in the southern Coral Sea have been increasing. In 2013, an exhausted individual found in Toowoomba, Queensland (west of the southern Coral Sea)
was associated with Cyclone Oswald, which may have driven the bird south from tropical northern Australia (Tapim 2013). Subsequently, pelagic birdwatching trips regularly surveying waters east of Southport, Queensland, recorded their first Bulwer’s Petrel in 2017, followed by records in January and December 2019 (Stewart 2018, 2020; McGovern 2020). Climatic warming of the Tasman Sea is occurring relatively quickly due to the strengthening of the East Australian Current, resulting in tropicalisation of ecological communities (Vergès et al. 2014), potentially including seabirds (Gorta et al. 2019). Increasing presence of Bulwer’s Petrel may be part of this shift. Timely documentation of such phenomena is paramount to understanding the effects of fast-changing environmental conditions in our marine ecosystems, and documentation of further observations over time will be critical to confirm this theory.

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