

## INVASION OF THE ARGONAUTS!

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### TASMANIA'S ARGONAUTS

Argonauts or paper-nautilus are pelagic octopuses (Cephalopoda: Argonautidae) whose females secrete a papery shell as a brood-chamber for their eggs. Three species occur in Australian waters (Finn 2013), but only two in Tasmania. The typical Tasmanian species is the tuberculated or knobably argonaut *Argonauta nodosus* (Plate 1, upper image), a species that inhabits subtropical to temperate waters right around the Southern Hemisphere; the other is the greater argonaut *Argonauta argo* (Plate 1, lower image), a species that inhabits tropical, subtropical and warm temperate waters worldwide. Shells of the two species are readily told apart by their texture: the tuberculated or knobably argonaut is, well, tuberculated or knobably, with intersecting radial and transverse series of raised tubercles; while the greater argonaut is adorned with sinuous, branching radial ridges instead. On these characters alone, small specimens of greater argonaut could be confused with knobably argonauts, because the ridges may not be clearly discernible. A further means of separation is by overall shape: when viewed aperture-on, the knobably is broad and u-shaped in cross-section; while the greater is narrow and v-shaped; and the whorls of the knobably form a tighter spiral than those of the greater.

The Bass Strait islands are well known localities for mass autumn strandings of the shells of knobably argonaut: they have become one of Flinders Island's iconic attractions for visiting naturalists and beachcombers. Individual shells are also regularly found stranded elsewhere around the Tasmanian coast, including the southeast. The Tasmanian Museum and Art Gallery (TMAG) collections contain 22 registered specimens of this species from various parts of the State. By contrast, the greater argonaut has long been considered a very rare visitor to Tasmanian waters. While occasionally washing up on Bass Strait islands, until recently the only specimen known from the Tasmanian mainland was a shell fragment in TMAG's collections found in 1990 at Triabunna.

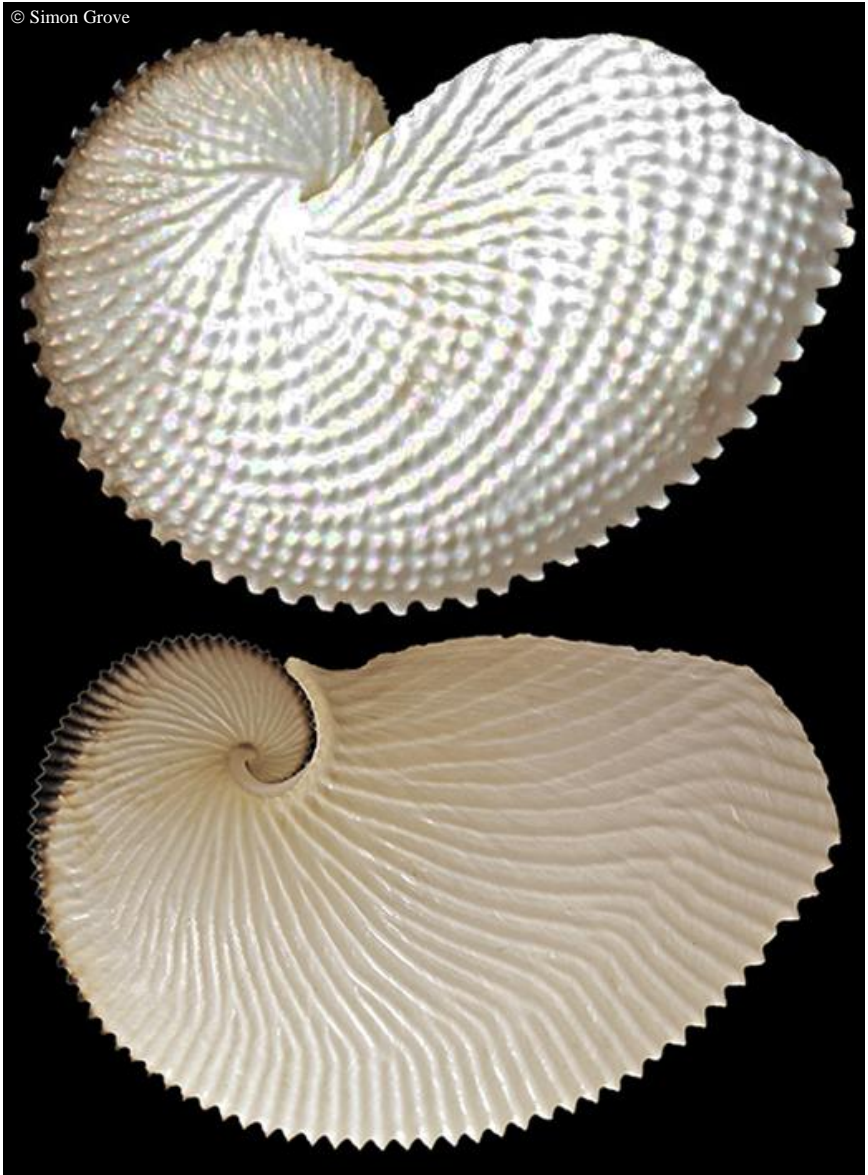
### THE 2014 INVASION

All our assumptions about Tasmanian argonauts went out the window in the

autumn of 2014. On 5 April, Suzanne Barrett photographed an argonaut shell collected on Hope Beach at South Arm. She reported it to Julian Finn at Museum Victoria, the national expert on argonauts, who was surprised to find that it was a greater argonaut. Two days later, Janet Potter witnessed the stranding of a female greater argonaut in its shell at Boronia Beach, between Kingston and Blackmans Bay (Plate 2), and lodged the sighting online, on Redmap. A week later, I received an enquiry at TMAG about another greater argonaut shell that had been found at Seven Mile Beach (9 April: Suzanne Hedgecott).

Alerted to the possibility of further strandings, I arranged for some media coverage of the argonaut story on the local ABC radio and in *The Mercury* newspaper. *The Mercury* article specifically requested observers to send in their records to me and to Redmap. There followed a flurry of

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**Plate 1.** Tasmania's two argonaut species (both about 160 mm across). Upper image: *Argonauta nodosus* from Schouten Island, May 2010, found by the author. Lower image: *Argonauta argo*, from Carlton Beach, March 2013, found by Grant Muir.

records, including several that pre-dated the original observations.

Nearly all of the other records for 2014 were also from within Storm Bay or Frederick Henry Bay, as follows: Seven Mile Beach (21 March: Kim Valentine; early April: Cathy Byrne; 22 April: Bill Bleathman; 4 May: Simon Grove (Plate 3); 8 May: Sarah Bishop; 11 May: Penny Sowter); Clifton Beach (11 February: Robyn Everist; 29 & 30 March and 3 May: Sarah Cameron; 18 April: Ian Woodward); Bellerive Beach (early April: Holly Zeinert); Kingston Beach (early April: Meg Taylor); Howden (22 April: Christine Bickford); Roches Beach (22 April: Peter Watson); Adventure Bay (29 April: Adam Howell).

Geographical outliers include one at Dolphin Sands (26 April: Jane Richardson), and two at Safety Cove (12 & 14 April: see de Little (2014), this issue). Additionally, two southeast Tasmanian strandings from previous years came to light as a result of the publicity: a large and intact specimen found on Carlton Beach (March 2012: Grant Muir); and a smaller one found at Denmans Cove (April 1999: Brendan Baker). The earliest recorded specimen was from 11 February; however the record did not come to light until late April when it was lodged on Redmap, and it remains possible that an incorrect date was entered. The latest record was from 11 May. By contrast, shells of knobbly argonauts only started turning up on select southeastern Tasmanian beaches in mid-May, with sightings continuing into late June.

All known Tasmanian records of greater argonaut (other than some early ‘Bass Strait islands’ records) are plotted in Figure 1.

### ***What triggered the invasion?***

It seems likely that the autumn 2014 strandings in southeast Tasmania are historically unprecedented, at least in the

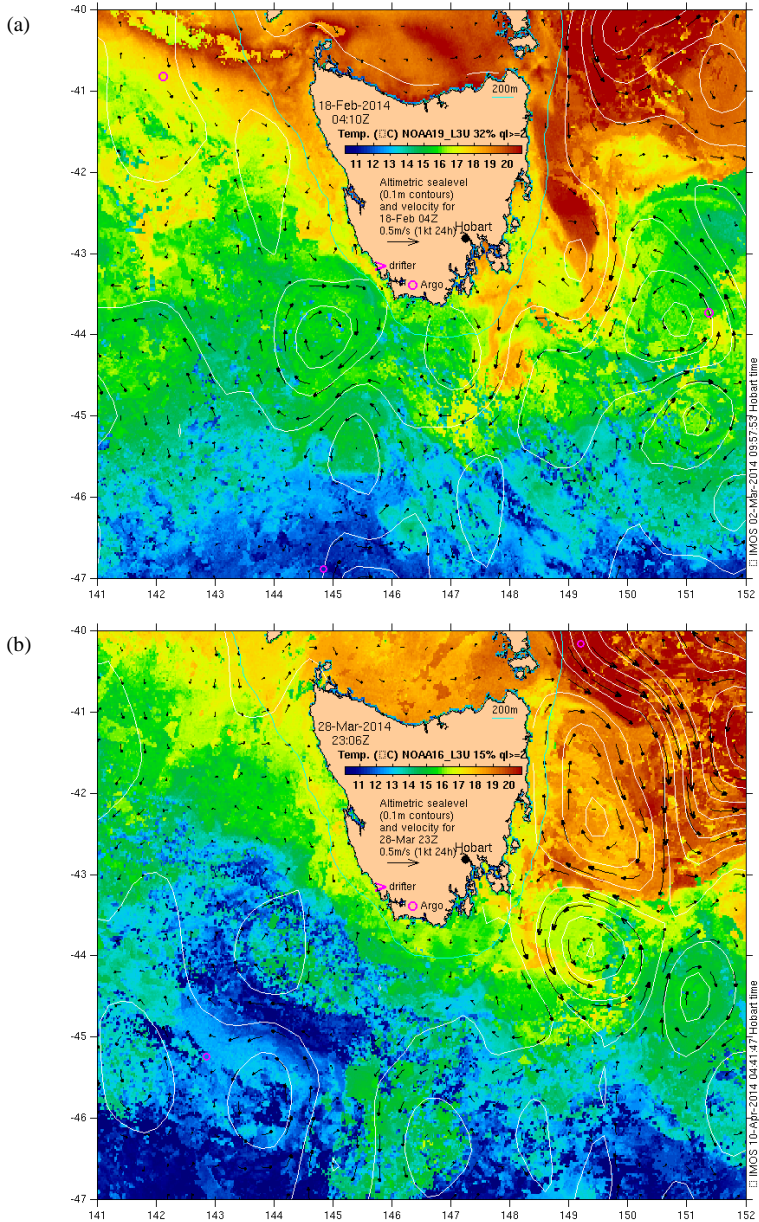
number of animals involved. This begs the question as to what unusual oceanographic or climatological conditions might have triggered the ‘invasion’. The Integrated Marine Observing System (IMOS) maintains a website that host colour-coded charts of sea surface temperature (SST) derived from every successful (clear-sky) pass of a NOAA satellite (every few hours on average) (see <http://oceancurrent.imos.org.au/Tas/> for the Tasmanian maps). Sea level contours and geotrophic current velocity arrows, derived from drifters and floats, are overlain on these charts. Every month, the charts are compiled into animations, allowing one to visualise changes in SST and current direction over hours, days and weeks. Examining the animations for February to May 2014, I could see that by February 2014, waters in the semi-enclosed coastal bays of southeast Tasmania were much warmer than nearby offshore waters. But that’s not the full story. More interestingly, the animations depict the gradual southwards extension of warm water in the East Australian Current (EAC) offshore from Tasmania’s east coast, as well as the intermittent wrapping of the Zeehan Current around the southern coast of Tasmania from its origins to the northwest. Neither of these processes is linear, because the currents form eddies and countercurrents; they also gradually mix with the waters into which they penetrate. Nevertheless, the general pattern, for late summer and autumn 2014, seems to have been for a narrow band of water from the Zeehan Current to feed along Tasmania’s southern coast towards the southeast, and for intermittent pulses of warmer EAC water to be injected into southeast coastal waters from the northeast and deflected landwards by the Zeehan Current. Several particularly clear but short-lived pulses of warm EAC water are visible being pushed towards Storm Bay, the first on 18 February (Figure 2a) and another on 28 March (Figure 2b).



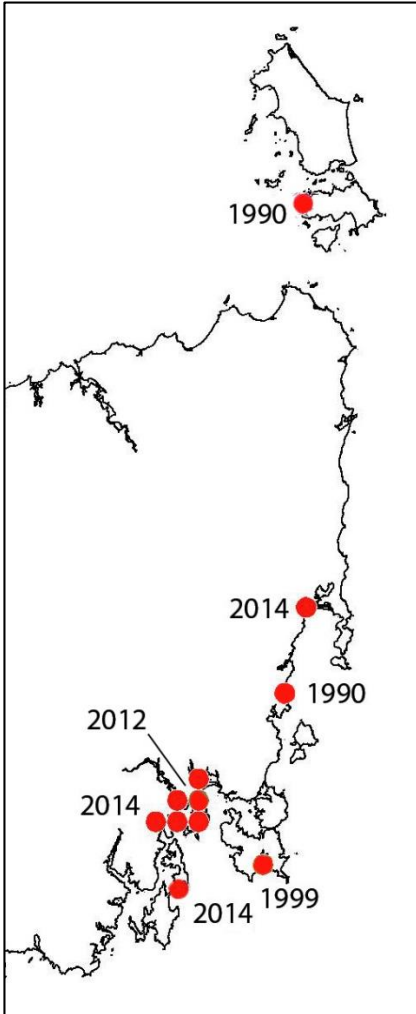
**Plate 2.** Stranded greater argonaut at Boronia Beach, Kingston, south of Hobart, on 7 April 2014



**Plate 3.** One of six beached greater argonauts found by the author at Seven Mile Beach on 4 May 2014



**Figure 2.** Sea surface temperatures, relative sea levels and currents around Tasmania: (a) 0410 hrs, 19 February 2014; (b) 2306 hrs, 28 March 2014 (source: IMOS)



**Figure 1.** Tasmanian records of greater argonaut grouped by 10 km square, and coloured by date of first known record (the given year and location of the Cape Barren Island record is approximate)

These pulses only correlate very loosely with the spate of greater argonaut strandings. Nevertheless, it makes sense that the occurrence of a warm water species

beyond the normal southern limits of its range would depend on injections of warm EAC water originating from within the species' normal range further north. Time will tell whether the pattern will be repeated in future years.

### **FINALLY...HOW THE ARGONAUT GOT ITS NAME, AND SOME OTHER JUST-SO STORIES**

In ancient Greek mythology, Jason set sail in search of the Golden Fleece. His ship was the *Argo*, built by one Argus and crewed by a band of heroes called the Argonauts ('Argus' sailors'). More than two thousand years later, in Linnaeus' magnum opus *Systema Naturae* (tenth edition, 1758), the founding father of modern taxonomy co-opted *Argonauta* as the generic name for the papery-thin shells which in Mediterranean folk taxonomy had long been known as *nautilus* (meaning 'little sailors'); while he co-opted *Nautilus* as the generic name for the tropical, heavy-shelled pearly or chambered nautilus.

We now know that the shell's maker is a female pelagic octopus, who uses two specially adapted webbed tentacles to magically secrete the shell as her brood-chamber; but to the ancient Greeks, and the Minoans before them, the 'little sailors' were enigmas. Their two webbed tentacles were thought to be held aloft to catch the wind, like sails. In Linnaeus' time, the whole octopus was dismissed as some ghastly parasite that had ousted the rightful occupant from its papery shell; while it took until the middle of the 19<sup>th</sup> century for the detached reproductive arm of the minute male, embedded in the female's mantle, to be recognised for what it is rather than a 'mere' parasite (Finn 2013).

### **ACKNOWLEDGEMENTS**

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argonauts (Grove & Finn 2014) on which this article is based. I thank the many observers who submitted their records of argonauts to me or to Redmap. Thanks also to Janet Potter for permission to reproduce her photo of a beached greater argonaut. The Redmap team is also thanked for allowing me access to the geographical data behind the records. Data on sea surface temperatures, relative sea levels and currents were sourced from the Integrated Marine Observing System (IMOS) - IMOS is supported by the Australian Government through the National Collaborative Research Infrastructure Strategy and the Super Science Initiative.

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