

Range Extension of the Regulus Seastar *Pentaceraster regulus* (Müller & Troschel, 1842) (Echinodermata: Asteroidea: Oreasteridae): Evidence of Tropicalization of the East Australian Coast

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ABSTRACT. The seastar *Pentaceraster regulus* (Müller & Troschel, 1842) is documented from the coastal estuary of Wallis Lake, New South Wales, Australia, c. 600 km from the nearest previous records at Lord Howe Island, an offshore area known to receive a tropical influence from the southern flowing East Australian Current, and between 640 to 800 km south of earlier published records from mainland areas to the north in Queensland. Historical data combined with contemporary observations provide evidence that this is a recent range extension and may be a further example of tropicalization of the south eastern Australian coastal waters. Records from Wallis Lake span a twelve year period and the most recent observations in 2020 indicate it is abundant, and there is considerable difference between the smallest and largest specimens present, suggesting a population that completes most or all of the life cycle is established in the estuary. Given the impacts range shifted species and other echinoderms are known to have in influencing ecosystem dynamics, it is suggested that further study of this seastar is prudent to determine what impacts it may have in the newly colonized area.

Introduction

Continuous tropical–temperate coastlines that are strongly influenced by western boundary currents, including eastern Australia, are potential hotspots for biological change as organisms respond to warming of these coastal waters (Verges *et al.*, 2014). Such biological change includes poleward range expansions of numerous species (Flagor & Bourdeau, 2018). These range expansions may involve shifts from tropical locations to areas previously considered temperate, a process that has been termed tropicalization (Verges *et al.*, 2014). New interactions when range-shifted species arrive can cascade through communities and have the

potential for significant socio-economic impacts, particularly if they involve the appearance of keystone or foundation species (Verges *et al.*, 2014). A significant example of this is the echinoid echinoderm *Centrostephanus rodgersii* which has relatively recently extended its range in southeastern Australia to Tasmania where it not only impacts on the local ecosystem, by overgrazing kelp beds, but affects associated fisheries for abalone and southern rock lobster that depend on the kelp bed habitat (Byrne & Andrew, 2013; Ling & Keane, 2018). Therefore, it is important to document similar instances when they are observed so that they can be further investigated and mitigation procedures can be implemented if deemed necessary.

Keywords: seastar; biogeography; eastern Australia; Echinodermata; Asteroidea; *Pentaceraster regulus*; tropicalization; range shift; climate change

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