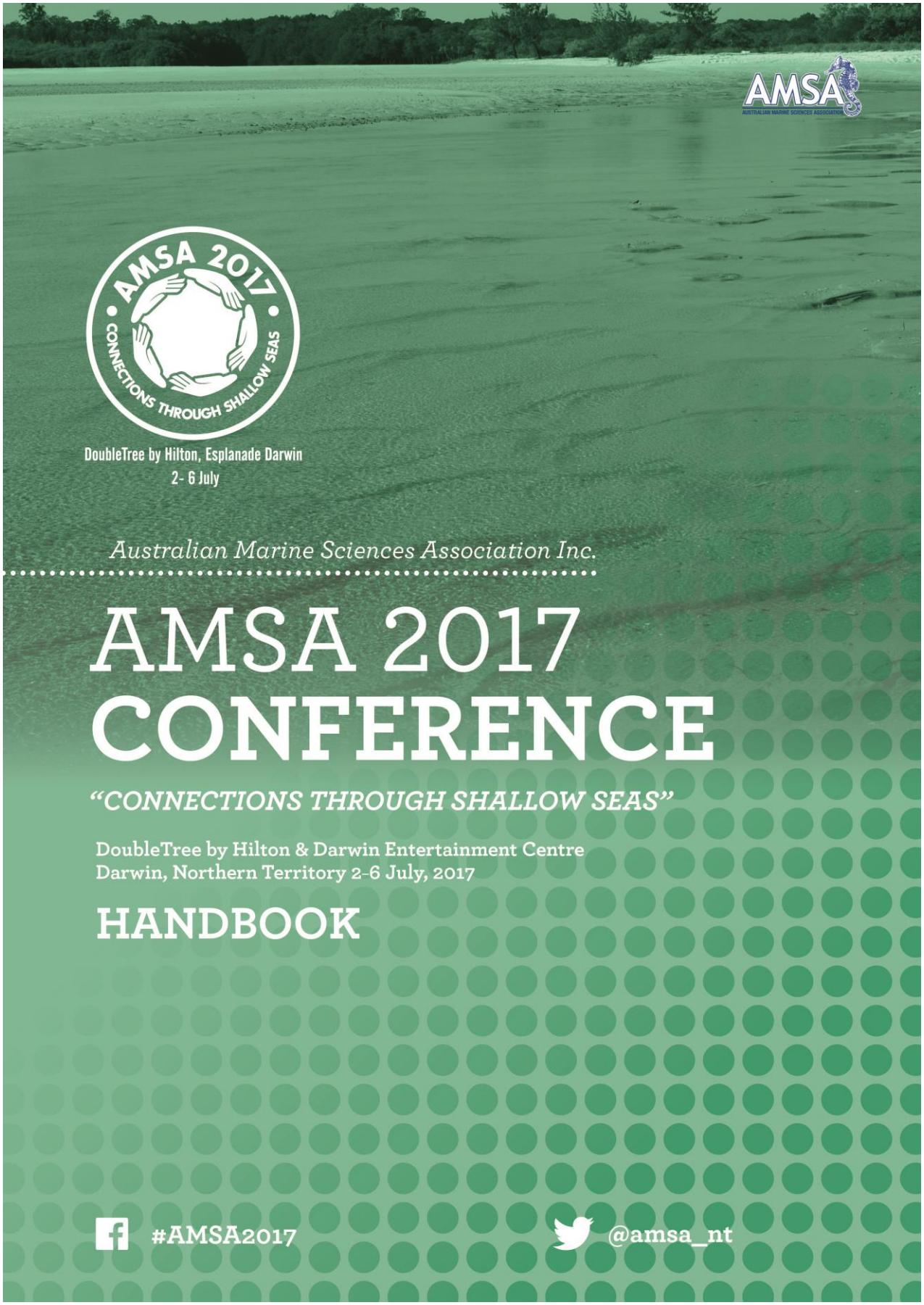
Complex ocean currents promote adaptive diversification and lower dispersal in a tropical reef fish from north-western Australia.

Berry, Oliver[1], Michael Travers*[2], Richard Evans[3], Glenn Moore[4], Ming Feng[1], Udhi Hernawan[5] and Bernd Gruber[6]

[1] CSIRO Oceans and Atmosphere, Level 4 - Indian Ocean Marine Research Centre, The University of Western Australia, Crawley, Western Australia, 6009, Australia
[2] Western Australian Fisheries and Marine Research Laboratories, Department of Fisheries Government of Western Australia, 39 Northside Drive Hillarys, Western Australia, 6025, Australia.
[3] Marine Science Program, Department of Parks and Wildlife, Kensington, Locked Bag 104, Bentley Delivery Centre, WA, 6983, Australia
[4] Aquatic Zoology, Western Australian Museum, 49 Kew Street, Welshpool Western Australia, 6106, Australia
[5] School of Sciences & Centre for Marine Ecosystems Research, Edith Cowan University, 270 Joondalup Drive, Joondalup, Western Australia, 6027, Australia
[6] Institute for Applied Ecology, The University of Canberra, University Drive, Bruce ACT 2617, Australia
oliver.berry@csiro.au

Two important goals of biological conservation are to identify regions of high evolutionary potential, and to manage them at appropriate spatial scales. Yet, characterising adaptive genetic variation and dispersal is a technical challenge, particularly in the marine environment where sampling and observation is difficult. In poorly studied regions, population genomic approaches offer opportunities to simultaneously examine spatial processes as well as contemporary evolutionary diversification. Here we show that a common damselfish from north-western Australia exhibits more spatial genetic structure and greater putative adaptive genetic diversity in a macro-tidal region than a meso-tidal region. Using genome scans consisting of 4,472 SNP loci applied to 847 samples of the damselfish *Pomacentrus milleri*, we detected marked genetic sub-division between the macro-tidal Kimberley bioregion (up to 12 metre tides) and the meso-tidal Pilbara and Gascoyne bioregions (1-5 metre tides). Individually, these bioregions also differed in the extent of population sub-division; spatial autocorrelation was detectable over several hundred kilometres in the Kimberley, but undetectable in the Pilbara. This implies, paradoxically, that substantially stronger currents in the Kimberley promote shorter range dispersal than in the Pilbara, possibly because larval retention zones are created by the region's complex bathymetry, and currents are predominantly tidal rather than along-shore. The Kimberley also exhibited significantly more neutral genetic diversity than the other bioregions, as well as 108 putatively adaptive outlier loci, whereas no outlier loci were detected elsewhere. We conclude that the Kimberley bioregion likely represents an important source of evolutionary novelty in *P. milleri*, and that optimal management of this and similar species would occur on smaller spatial scales than elsewhere in north-western Australia.



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