



UK Coastal Research Conference

Liverpool 2025

FUNCTIONAL RESPONSE METRICS EXPLAIN AND PREDICT HIGH BUT DIFFERING ECOLOGICAL IMPACTS OF JUVENILE AND ADULT LIONFISH.

Monica McCard^{1, 2, 3}, Nathan McCard², Neil E. Coughlan^{1, 2, 4}, Josie South⁵, Louise Kregting^{2, 6} and Jaimie T.A. Dick^{1, 2}

¹Institute for Global Food Security, School of Biological Sciences, Queen's University Belfast, 19 Chlorine Gardens, Belfast BT9 5DL, Northern Ireland, UK.

²Queen's University Marine Laboratory, 12-13 The Strand, Portaferry BT22 1PF, Northern Ireland, UK.

³School of Biological and Environmental Sciences, Liverpool John Moore University, Byrom Street, Liverpool, L3 3AF

⁴School of Biological, Earth and Environmental Sciences, University College Cork, Distillery Fields, North Mall, Cork, Ireland.

⁵Water@Leeds, School of Biology, University of Leeds, Woodhouse, Leeds, LS2 9JT

⁶The New Zealand Institute for Plant and Food Research Ltd, Nelson, New Zealand

Recent accumulation of evidence across taxa indicates that the ecological impacts of invasive alien species are predictable from their Functional Response (FR; e.g., the maximum feeding rate) and Functional Response Ratio (FRR; the FR attack rate divided by handling time). Here, we experimentally derive these metrics to predict the ecological impacts of both juvenile and adult lionfish (*Pterois volitans*), one of the world's most damaging invaders, across representative and likely future prey types. Potentially prey-population destabilising Type II FRs were exhibited by both life stages of lionfish towards four prey species: *Artemia salina*, *Gammarus oceanicus*, *Palaemonetes varians* and *Nephrops norvegicus*. FR magnitudes revealed ontogenetic shifts in lionfish impacts where juvenile lionfish displayed similar if not higher consumption rates than adult lionfish towards prey, apart from *N. norvegicus*, where adult consumption rate was considerably higher. Additionally, lionfish FRR values were very substantially higher than mean FRR values across known damaging invasive taxa. Thus, both life stages of lionfish are predicted to contribute to differing but high ecological impacts across prey communities, including commercially important species. With lionfish invasion ranges currently expanding across multiple regions globally, efforts to reduce lionfish numbers and population size structure, with provision of prey refugia through habitat complexity, might curtail their impacts. Nevertheless, the present study indicates that management programmes to support early detection and complete eradication of lionfish individuals when discovered in new regions is advised.