

## Linking land and sea: different pathways for marine subsidies

Mellbrand, Kajsa<sup>1</sup>, Lavery, Paul<sup>2</sup>, Hyndes, Glenn\*<sup>2</sup> and Hambäck, Peter<sup>1</sup>

<sup>1</sup> Department of Botany, Stockholm University, SE-106 91 Stockholm, Sweden

<sup>2</sup> Centre for Marine Ecosystems Research, School of Natural Sciences, Edith Cowan University, 270 Joondalup Drive, Joondalup WA 6027, Australia

g.hyndes@ecu.edu.au

Several studies have shown nutrients and energy derived from marine autotrophs to subsidize shore ecosystems, increasing productivity and affecting food web dynamics and structure. In this study we have examined how the inland reach of such inflow effects depends on vectors carrying the marine inflow inland and on landscape structure. Through tracking the flow of distinct stable isotopes of marine and terrestrial autotrophs through grazing and predatory arthropods along a gradient from the shoreline to inland areas, we examined the roles of arthropod vectors in carrying marine-derived nutrients inland in two very different shore ecosystems: shore meadows in Sweden with marine inflows of algae and emerging chironomid midges; and sandy beaches and shore dunes in south-western Australia with marine inflows of algae and seagrass. In a colonisation experiment, we found that deposited wrack on the beach is quickly colonised by both grazers and predators. However, in both systems we found a larger inland reach of the marine subsidy than could be accounted for by deposited macrophytes on shores alone, and that dipterans and spiders potentially functioned as vectors for the inflow. Our results indicate that marine inflows are important for near-shore terrestrial ecosystems well above the water's edge, and that this effect is largely due to arthropod vectors (mainly dipterans and spiders) in both low productivity sandy beach ecosystems at the Indian Ocean coast of Australia, and more productive shore meadows on the Baltic Sea coast of Sweden.