5th Western Australian State
COASTAL CONFERENCE 2009
Whose Coast Is It?
adapting for the future

Understanding Scales of Connectivity for Better Management

12A:
Management and Engagement:
1.25–1.55pm
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Orion Room

PRESENTER:

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Introduction

Management of the marine environment often focuses on particular aspects of the system, with an emphasis on water quality issues, fisheries and protection of iconic species and habitats. While spatial management, i.e. Marine Protected Areas (MPAs), has been adopted as a fisheries management tool in many parts of the world (Halpern 2003), it is commonly used to protect iconic habitats and maintain biodiversity in Australia. For management of biodiversity, management zones with high levels of protection (e.g. Sanctuary Zones) are often placed around particular habitats (e.g. reefs or seagrass meadows) and are of limited size. Yet, landscape processes can occur over large spatial scales involving connectivity among a range of habitats separated by scales of metres to 10s of kilometres.

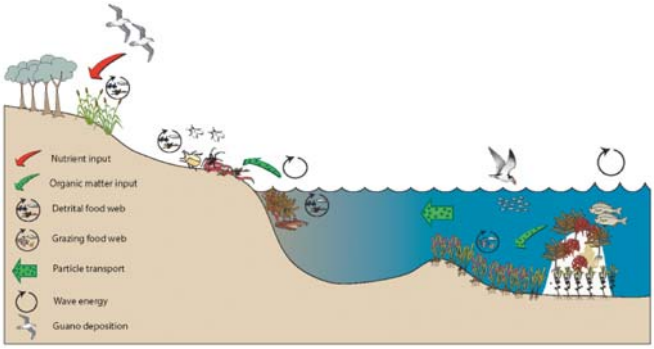
Landscape-scale processes, which occur through movement of material and nutrients across habitat boundaries, can alter foodweb and community structure as well as drive production in recipient systems (see Marczak *et al*., 2007). These processes of connectivity can occur through the movement of animals (e.g. Polis *et al*., 1997) or detritus (e.g. Wallace *et al*., 1999) within marine environments and between terrestrial and marine environments. The scales of the movement of nutrients or food into recipient ecosystems, and the resultant influence on biodiversity and production have clear ramifications on the size or design of single or networks of MPAs. This talk examines the scales of connectivity that can occur in our marine environment and discusses the implications on spatial management using a number of examples from recent research in Western Australia.

Methodology

The synthesis in the paper draws on the methods and results of a range of published and unpublished studies that have examined the influence of nutrients or detritus on the biodiversity or production of recipient habitats in coastal waters in temperate Western Australia. Specifically, the paper will examine the role of kelp (*Ecklonia radiata*) that has been detached from reefs and accumulated in seagrass meadows, surf zones and beaches, as well as the influence of seabird guano on island vegetation and invertebrates.

Project Outcomes/Conclusion

Figure 1. Pathways of trophic connectivity in coastal waters of Western Australia.



Kelp derived from reefs has a strong influence on the productivity of invertebrates in the surf zone and beaches where wrack accumulates (Figure 1). Amphipods have been shown to preferentially graze and incorporate nutrients from kelp compared to other algae and seagrass that also accumulate in surf zones. Furthermore, wrack has a profound influence on the invertebrate biodiversity on beaches. Kelp also appears to influence both primary and secondary production in seagrass meadows, which contain considerable in situ productivity and food resources.

Nutrients from seabird guano are incorporated into sediment, vegetation and invertebrates on islands in the Perth region. Thus, like other regions of the world (Polis *et al*., 1997), seabirds feeding on fish in the marine environment and resting or roosting on islands, appear to influence vegetation and fauna on islands.

The studies show that nutrients and detritus can move across habitat or ecosystem boundaries over distances of up to 10s kilometres. The biodiversity and productivity in one habitat or ecosystem may therefore be either fully or partially reliant on the movement of material across these scales. The design and size of MPAs, therefore, need to incorporate processes that occur over these scales.

References

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