When Mismatches Don't Matter: The Effects of Divergent Ecological and Economic Scales in Coastal Fisheries.

Michael Bode, University of Melbourne

Abstract

Conservation management decisions are often implemented at the scale of human communities, rather than the scale of the most relevant ecological dynamics. Research frequently points out the loss in efficiency that results from such "scale mismatches". However, the scale of management is influenced by socio-economic constraints on management actors; by the higher implementation costs of variable management plans; and by the independent behaviour of actors. While it is clear that objectives can be better achieved if management and ecological scales are aligned, it is not clear whether such benefits justify the costs of alignment, or how alignment can be achieved in multi-actor contexts. I use bioeconomic models of coastal fisheries to investigate these two questions.

The commercial coral trout (*Plectopomus* spp) fishery in the Great Barrier Reef Marine Park, Australia, is currently managed by a single TAC. We estimate the relationship between an increasingly resolved spatial management policy and the revenue generated by the fishery, to assess whether a more spatially complex policy can be justified. Our results suggest that economic variation is likely to be a more important source of heterogeneity than ecological differences, and that the majority of this variation can be captured by a relatively simple spatial management policy. Interestingly, the highly complex process of biophysical larval dispersal, which plays a critical ecological role in coral reef dynamics, does not demand equally complex management policies.

On Manus Island in Papua New Guinea, small customary tenure areas define the scale of fisheries management decisions, but their fish stocks are connected by pelagic larval dispersal. We quantify the extent of this scale mismatch for the serranid *P. maculatus* by empirically estimating larval dispersal distances, and show that the scale of dispersal should disincentivise sustainable harvesting. Larval dispersal allows individual communities to externalise the costs of overharvesting, and exports the benefits of cooperative behaviour, to non-cooperating groups. Despite these mismatched scales, the communities on southern Manus have recently created a tribal network for management and negotiation, emphasising the importance of social capital in avoiding suboptimal outcomes or the need for top-down governance.