Catchment nutrient discharges: Good and bad news for the management of fish and shellfish resources in Tasman Bay

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Abstract

Results of a series of investigations of physical, chemical and biological characteristics of Tasman Bay provide clear indication of the interaction of large catchment river inflows with the marine receiving environment. They highlight the influence of the Motueka River on seawater density structure, fertility, and primary productivity. These factors, in turn, influence shellfish production in Tasman Bay. Here we illustrate a few examples of the lessons learned. Overall the news is good. In contrast to many other coastal locations throughout the world, plant nutrients released from the Motueka catchment (and other catchments draining into the Bay) do not result in the many problems associated with over enrichment. Thus at the present rate of inflow (and including input from point-source waste discharges), nutrient runoff from the catchment can be viewed as beneficial rather than detrimental to marine productivity and shellfish resources. Dissolved inorganic nitrogen or DIN (largely in the form of nitrate and ammonium) is the main limiting nutrient for phytoplankton production in Tasman Bay. Our results indicate that the present rate of DIN inflow from all freshwater sources is more than compensated by the loss of biologically available nitrogen through the process of denitrification (conversion of nitrate to N_2 gas) in the sediments of the Bay. Although the fertility of surface waters of the Bay is often enhanced in the vicinity of the Motueka plume (the region influenced by the river), considerable variability is a product of the changing River flows. We propose a long term watching brief on catchment nutrient discharge rates based on a flow vs. concentration model(s) developed from Woodmans Bend water quality monitoring results.

Phytoplankton and seabed microalgae (microscopic plants) are the principle food sources for shellfish in the Bay. As with nutrients, the amount of phytoplankton varies in different regions of the Bay and over time (seasonally and from year to year). It also varies at different depths within the water column. In general, however, there appears to be sufficient food for the growth of farmed mussels at depths >5m. This is good news for proposed developments within the Tasman Bay aquaculture management areas (AMAs). Shellfish living on the seabed (*e.g.* scallops and oysters) can also take advantage of microalgae resuspended from the seabed. Although there is generally more food in the near-bottom waters, scallops in particular may have difficulty in coping with the high levels of inorganic sediments that are often present there. Periodic shellfish mortalities may be related to sediments discharged from the river during floods.

We think that phytoplankton blooms that "normally" occur during late winter/early spring are important to condition shellfish stocks for the coming year. The problem is that these blooms aren't consistent. In fact some years they don't occur at all to a significant extent.

In future we hope to use a newly designed buoy-mounted sensor array to provide long term continual collection of environmental data suitable for validation of hydrodynamic and ecosystem models. The hope is that this will allow us to build in a predictive capability that will be useful for management of marine resources.