

The Moana Project is investigating the connectivity of kuku / green-lipped mussel populations of Aotearoa New Zealand. Connections amongst populations are achieved by the movement of mussel larvae.



*Green-lipped mussel (*Perna canaliculus*) bed off Ōpōtiki, eastern Bay of Plenty. Photo reproduced with permission from Joe Burke, MUSA Environmental.*

Mussel larvae spend up to six weeks in the water column, where they are carried around by ocean currents. This means they can potentially be transported hundreds of kilometres before settling on seaweed, the seabed or a spat collection rope.

New Zealand's \$380M green-lipped mussel aquaculture industry is largely reliant on wild-caught spat. To ensure the ongoing sustainability of the industry, it is important to understand where the spat come from and to identify new potential areas that might be suitable for spat collection.

Using models and genetic techniques to simulate larval movement

Using ocean models and advanced genetic techniques, we tracked the movement of larvae around the country.

We identified two main blocks of connectivity for green-lipped mussels, a northern and a southern block. This is consistent with previous population genetic analyses and modelling studies.

Over multiple generations, particles released from the southern block are eventually transported throughout coastal New Zealand (i.e., throughout the full distributional range of the mussel), while transport from the northern cluster southwards is much more limited. This pattern of connectivity shows no evidence of a barrier to gene flow from south to north, tell us that the genetic divide between South and North Island populations is caused by factors other than oceanographic drivers.

We identified several sites where settlement success rates of larvae are the highest and where larvae produced contribute to recruitment at downstream sites. These include populations in Southland, Stewart Island, and Canterbury, where transport up the east coast of the South Island is facilitated by the Southland Current.

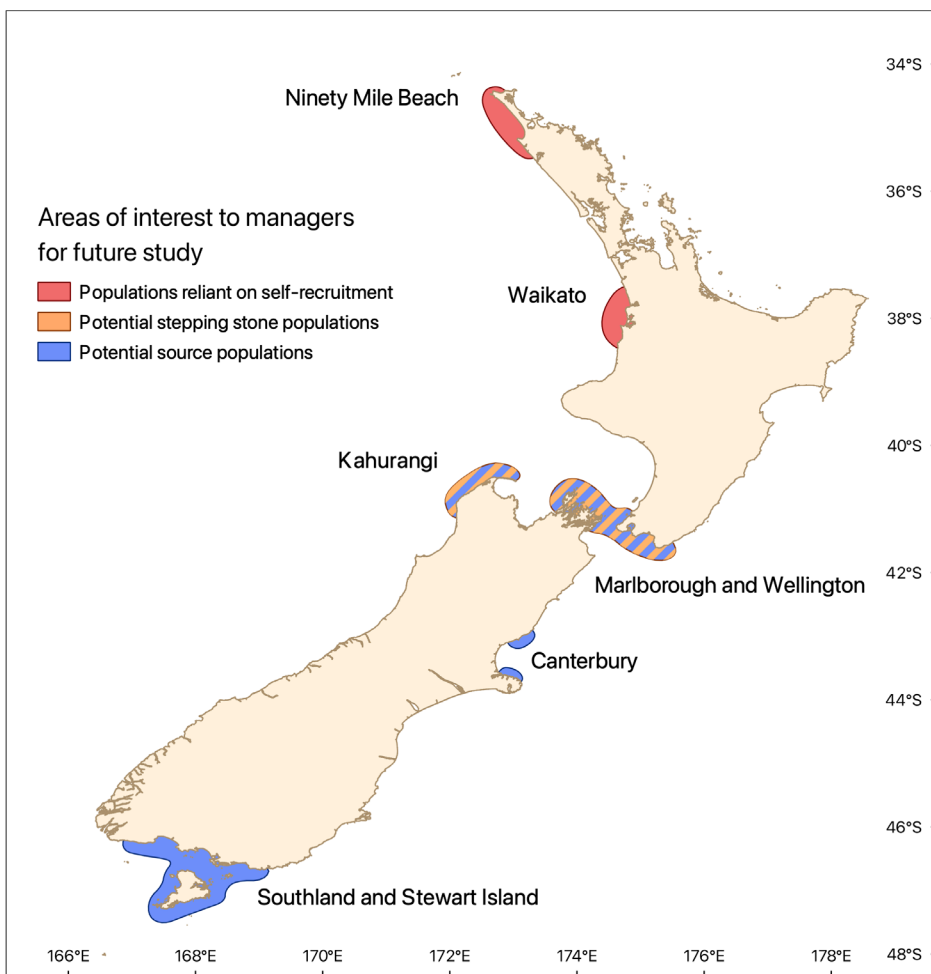
Populations around Kahurangi, Marlborough and Wellington are also potentially important larval sources and play an additional role acting as stepping stone populations linking the northern



and southern clusters, although benthic surveys of actual mussel abundances are necessary to refine these estimates.

Some populations, including near Waikato and Ninety Mile Beach, are not connected to many other upstream populations and depend largely on self-recruitment to supply mussels for the next generation.

This makes these sites especially vulnerable to local disturbances, because if the existing mussel beds become degraded, they cannot rely on larvae from other populations to resettle. In the case of Ninety Mile Beach, which supplies 80% of the spat used in the Greenshell™ mussel aquaculture industry, this is an important threat to acknowledge, and wild mussel beds in the region should be priority sites for active conservation measures.



Map showing indicative areas of mussel source and stepping stone populations, as well as areas of likely self-recruitment.