# Bay of Plenty mussel connectivity

Aotearoa New Zealand has a large marine area about which we know relatively little. The MBIE-funded Moana Project aims to improve our understanding of coastal ocean circulation, kaimoana connectivity and marine heatwaves to provide information and tools that support iwi initiatives, sustainable growth of the seafood industry, science research efforts and how we manage our marine environments.

Central to the Moana Project is a case study enhancing ocean knowledge within Te Moana-a-Toi / Bay of Plenty. Part of this study examines the connectivity and transport of mussel larvae in the rohe moana of Whakatōhea iwi in the eastern Te Moana-a-Toi / Bay of Plenty.

## Understanding larval transport

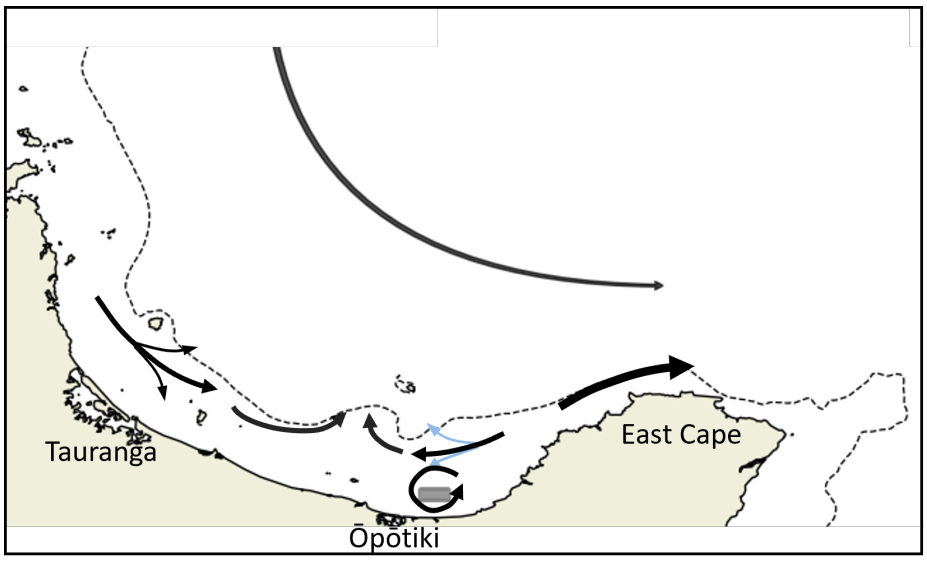
A key theme in the Moana Project is to understand the transport of baby kuku/green-lipped mussels. Kuku larvae (babies) can be in the water column, transported around by ocean currents, for up to six weeks, which means that when they settle on a reef or a mussel farm, it is hard to know where they come from.

The continued health of all the kuku beds in Te Moana-a-Toi / Bay of Plenty depends on healthy adult beds supplying the larvae and the successful settlement and recruitment of the baby kuku at the beds: this also includes the supply of baby kuku to the Whakatōhea offshore mussel farm.
To figure out where the baby kuku that land on the farm come from, we combined the ocean modelling with microchemistry and genetic techniques.

Microchemistry involves analysing the kuku shell - as they grow, kuku absorb chemicals from the water around them into their shell, and through this we can see where the kuku have spent time since they were born. Genetic markers are used to determine the whakapapa of the mussels.

## Currents in Te Moana-a-Toi / the Bay of Plenty

The ocean modelling reveals the current patterns in Te Moana-a-Toi / Bay of Plenty. Although it varies with winds and season, the general flow is eastward, with a retention zone around the Whakatōhea mussel farm area.




*Ocean current flow in Te Moana-a-Toi / Bay of Plenty*

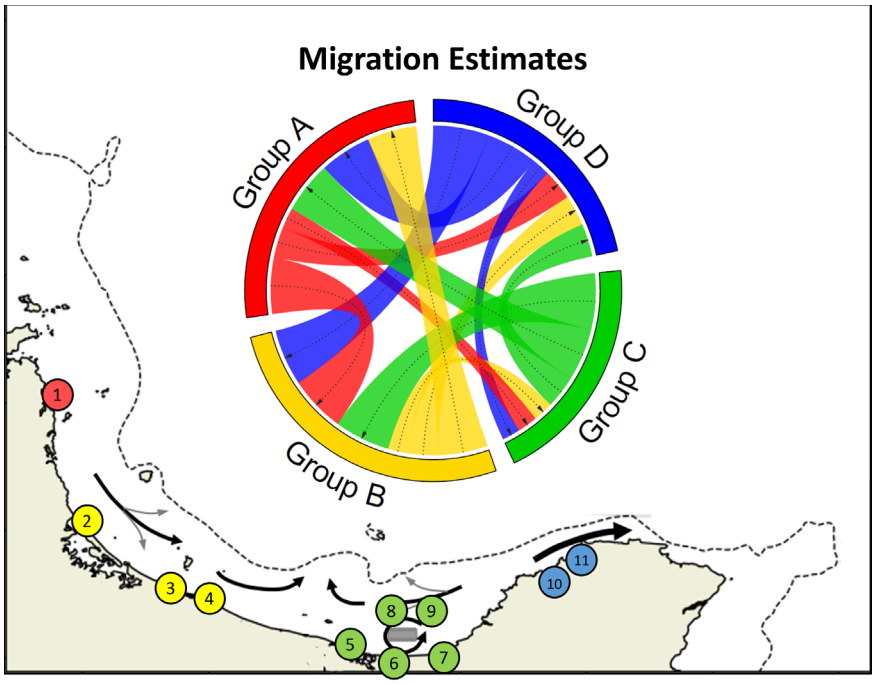
## Genetic and microchemistry results

The field survey results show that most of the baby kuku (termed spat at this stage) arriving at the Whakatōhea farm are quite large, which means that they have already settled once as larvae and then moved on again before reaching the farm as spat.

Further microchemical studies revealed that the majority of the baby mussels came from sites just east and west of Ōhiwa Harbour mouth, and most mussels arriving on farms were likely to have settled to the seafloor as larvae and then recommenced drifting as spat within in this same region. Therefore, the study identified sites that are important natural sources of mussels but also intermediate nursery or aggregation sites for their offspring, the combination of which is vitally important to maintaining wild populations and supplying spat to the offshore mussel farm.

Within Te Moana-a-Toi / Bay of Plenty, there are four main kuku whanau groups – near the Coromandel, Mt Maunganui-Maketu area, around Ōhiwa Harbour and the mussel farm, and near Wairuru.

These whanau groups are very connected, with high genetic exchange. The baby kuku that land on the Whakatōhea farm primarily whakapapa to the populations founds at Ōhiwa, Ōpape and Tirohanga. Because the kuku beds are so interconnected, they need to be managed across Te Moana-a-Toi / Bay of Plenty as a whole.




*The genetic connectivity of mussels in Te Moana-a-Toi / Bay of Plenty. Mussels from different parts of the bay are shown in different colours. The coloured wheel shows the genetic connectivity; the width of the coloured bands stretching between the quarters shows the amount of movement of genes from one population to another that results from larval dispersal.*

*The figure shows that all four populations are freely exchanging genes with one another, indicating the wild mussel populations in the Bay of Plenty have extensive gene/larval exchange and essentially form a single larger Bay-wide interdependent population.*