UNDER	the Resource Management Act 1991 (the Act)
IN THE MATTER OF	appeals against to the Bay of Plenty Regional Council Proposed Coastal Environment Plan
BETWEEN	**Ngati Makino Heritage Trust** **ENV-2015-AKL-000140**
AND	**Various** **Section 274 RMA Parties**
AND	**BAY OF PLENTY REGIONAL COUNCIL**
	Respondent

STATEMENT OF EVIDENCE OF DR ROGER VERNON GRACE ON BEHALF OF MOTITI ROHE MOANA TRUST

Dated 09 November 2016

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I, Roger Vernon Grace of Auckland, marine biologist, swear:

1 I am a marine biologist and have over 40 years experience in this field. **Annexure RG1** includes a summary of my experience and qualifications as a marine biologist. My experience includes being involved in marine spatial planning and restoration work for the Hauraki Gulf. I do not have any expertise in relation to Maori cultural matters and rely on the evidence of Umuhuri Matehaere and Nepia Ranapia in relation to taonga species and areas of special cultural importance (such as reefs and toka/rocks) identified as important to Motiti Rohe Moana Trust (**MRMT**).

2 This evidence is given on behalf of MRMT. I confirm that I have read the Code of Conduct for expert witnesses contained in the Court's Practice Note 2014 and that I agree to comply with the Code. I also confirm that I have not omitted to consider material facts known to me that might alter or detract from the opinions expressed in my evidence.

3 This evidence is directed at the following appeal points arising from the Ngati Makino Heritage Trust appeal:

> Add a new Method XX: "To provide appropriate mechanisms for the management, maintenance and protection of iwi Māori and their coastal taonga."
>
> New Policy: Protect the habitats of species in the CMA that are important for commercial, recreational, traditional or cultural reasons from the adverse effects of use and development.
>
> Amend Policy NH 3 to include proposals for activities that can demonstrate positive benefits for iwi Maori that offset adverse effects (such as development of kaitiakitanga capabilities; Restoration of cultural landscape features; Growth and application of matauranga Maori of the area and its landscapes, ecosystems, biodiversity etc.)
>
> Add a new Objective X: "Support the planning involved with, and the application of, particular marine spatial tools in the management and protection of the marine area."

4 My evidence also provides examples of serious historic losses of biodiversity by way of background and to give an idea of the scale of the problem in the Bay of

Plenty and eastern North Island. Examples given in the Hauraki Gulf below also have general application to coastal parts of the Bay of Plenty.

BIODIVERSITY LOSSES IN BAY OF PLENTY AND EASTERN NORTH ISLAND

5 Since early last century commercial and recreational fishing have been responsible for huge losses of biodiversity and other environmental degradation including specific taonga species in both shallow and deeper waters. In some areas seabirds have also been caught up in the impacts of fishing.

6 A brief outline of some of the instances that come to mind includes:

7 Reduction of the snapper population in the Bay of Plenty to only 10% of its pre-fished biomass (current target for biomass is 40%).

8 Decimation of hapuku stocks in the Bay of Plenty and northeastern North Island in general. They used to be common on our inshore reefs (including around Motiti and Otaiti). Only very small numbers are now occasionally caught on pinnacles about 300 metres deep east of Mayor Island and White Island, and large specimens are virtually non-existent.

9 Reduction of crayfish numbers and sizes, particularly on shallow reefs where their lack of presence together with lack of snapper have led to the development of extensive kina barrens, or urchin barrens with no kelp forest.

10 Drastic reduction through commercial purse-seining, of large schools of pelagic fish such as trevally and kahawai, resulting in only small numbers of fish in very few schools throughout the Bay of Plenty and Northland coast.

11 Lack of large abundant schools of trevally and kahawai means that the feeding activity of these fish is no longer sufficient to push krill to the surface where breeding birds such as red-billed gulls can access the krill to feed their chicks.

As a result the red-billed gull population has seriously declined and continues to do so. Some other birds are also affected.

12 Most of our shallow rocky reefs are now kina barrens, where previously dense kelp forests dominated the rocky bottom to at least 20 metres deep. Losing the kelp forest to urchin grazing has also led to the loss of hundreds of species of filter-feeding attached invertebrates such as bryozoans, ascidians, hydroids, anemones, polychaete worms, molluscs and small benthic fishes, which lived under the kelp forest because of the shelter offered by the kelp.

13 The Hauraki Gulf used to be carpeted, in its southern parts, with green-lipped mussels. These were dredged commercially to extinction in the middle of last century, and despite no commercial dredging since then there has been no sign of recovery. Loss of the mussel beds also led to loss of biodiversity of many species associated with the mussels. The vast numbers of mussels also had an important ecological role in helping keep the waters of the Gulf relatively clear, by filtering most of the southern Gulf in two days. The few remaining mussels would take two years to filter the same amount of water.

14 Middle parts of the Hauraki Gulf had extensive beds of horse mussels which were wiped out by trawling activities, again leading to huge loss of associated biodiversity, and loss of nursery areas for small snapper and other fish.

15 Deeper parts of the Gulf featured scattered “oasis communities” of sponges, bryozoans, gorgonians and large black coral “trees” several metres high. These biogenic reefs probably took centuries to develop on open sediment bottom. Clearly these small reefs were biodiversity hot spots, and may have been important landmarks to migrating fish such as hapuku and perhaps snapper. When industrial-scale fishing got started using trawl nets, these oasis communities were a nuisance to fishermen as they tore and clogged their nets with unwanted bycatch. The solution adopted was to drag heavy chains

between two trawlers and flatten these obstructions so the nets could get a clear run at a smooth seabed.

CAN THESE AREAS RECOVER FROM THE IMPACTS OF FISHING GIVEN APPROPRIATE MANAGEMENT ASSISTANCE?

16 Many of these impacts of fishing on the environment of the Hauraki Gulf and eastern North Island have caused damage of a type that will never recover. Some types of damage could be repaired given appropriate management and a lot of time. There is a project underway in the southern Hauraki Gulf to try to restore some of the green-lipped mussel beds so they may again provide the ecological service of filtering the water, but the project is still in its experimental stage. As I note below, avoidance (no-take) is the most effective means to maintain and restore biodiversity, and to protect taonga species, in the coastal marine environment. Current scientific knowledge on the effectiveness of mitigation, restoration and offsetting projects is limited, especially as it applies to biodiversity.

17 Where fisheries management practices can be clearly linked to serious environmental degradation, such as in the kina barrens case, then fishing practices need to be managed, to avoid or remedy the impacts. This may extend to using no-take or rahui as a remedy or mitigation for fishing impacts, and incorporating rahui into spatial management of the marine areas. I acknowledge there may be a legal question as to the overlap between MPI and Regional Council powers.

BIODIVERSITY BENEFITS OF A RAHUI OR NO-TAKE ZONE

18 The biodiversity benefits of a rahui in the Bay of Plenty is discussed in my Affidavit in support of the Motiti Rohe Moana Trust dated 28th October 2016. I produce and adopt that affidavit as **Annexure RG1**. The example used is a common one in the Bay of Plenty - the matter of kina barrens and associated loss of kelp forest including its rich biodiversity. The role of serious depletion of snapper and crayfish through inappropriate fisheries management in the

development of kina barrens is also discussed. This problem can be corrected in areas subject to protection through rahui, marine reserves, appropriate Marine Protected Areas, or specific biodiversity protection and / or fisheries management practices. Recovery of healthy kelp forest on our shallow reefs is regarded as an appropriate form of biodiversity restoration, and can be fostered within a marine spatial planning framework.

19 My **Annexure RG1** also touches on the use of rahui to assist in restoration of depleted taonga species.

BIODIVERSITY AND HABITAT RESTORATION AND PROTECTION. WHAT HAS WORKED AND WHAT HAS NOT?

20 Nationally, we have several examples of habitat and biodiversity restoration in the oldest of our no-take marine reserves. Some of these have been scientifically monitored frequently and we have good data on recovery of marine life and habitats. For most other forms of protection, there is very little hard data to assess their effectiveness.

Rahui

21 There are several long-term rahui in place, though none approaching the longevity of the early marine reserves. Although there are anecdotal reports and probably some good information held by kaumatua associated with specific rahui, as far as I am aware there has been no formal monitoring of habitat, biodiversity and kaimoana changes in any of the rahui established. Another difficulty with rahui is that some are total no-take and some allow limited fishing. Most are also only short-term measures, usually two, four or six years, though I understand they can in principle be long-term. If we can use rahui as a long-term no-take tool, especially if applied to biodiversity generally, then it is likely to have greater biodiversity maintenance and recovery value.

No-take marine reserves

22 The rules in a no-take marine reserve are clear and apply to everyone. Basically there is no taking or disturbance of any marine life, and everything is

left to carry out its natural functions. In a marine reserve established on shallow rocky northern reefs, usually for the first few years this entails recovery from many years of fishing pressure, though kina barrens will persist for several years. Gradually previously exploited species such as snapper and crayfish get a chance to grow older and bigger, and to become more abundant. As they become larger and more abundant their ecological role gradually changes. A larger snapper or crayfish can crunch and eat a reasonable-sized kina, and after several years the crayfish and snapper become large enough and abundant enough to eat the kina.

23 Once the kina have been reduced to less than one per square metre, kelp and other encrusting life can begin to colonise the rock surface and slowly restore the natural benthic biodiversity of lush kelp forest and its understory of hundreds of species of smaller organisms. This process generally takes around 10 to 15 years. Crayfish will slowly establish a full natural population structure including large breeding individuals and the population in the marine reserve will become a useful breeding stock and contributor to larval export and colonization elsewhere. Depending on the size of the reserve, a similar thing may happen with snapper, but the reserve needs to be bigger to be successful for snapper.

Partial protection – no commercial fishing but recreational fishing allowed.

24 We have one studied example of partial protection, where commercial fishing has been banned for 22 years, but recreational fishing has continued with a few minor additional restrictions above the normal recreational fishing rules. This is at Mimiwhangata Marine Park on the Northland east coast between Whangarei and the Bay of Islands.

25 This area of shallow rocky and sandy coastline has been monitored since the mid-1970's. Together with a similar monitoring programme in the totally protected Tawharanui Marine Reserve, this data set provides us with the best available comparison of the relative effects of total no-take on the one hand,

and removal of commercial fishing but continued recreational fishing on the other.

26 After monitoring since the mid-1970's, no commercial fishing at Mimiwhangata since 1994, and total protection at Tawharanui since 1981, the difference between the two management strategies is spectacular.

27 At the totally protected Tawharanui Marine Reserve, snapper and particularly crayfish have recovered to close to natural abundance and population structure. Kina barrens have all but disappeared and are now replaced by lush kelp forest, and its understory of rich and diverse invertebrate life has been restored. Biodiversity is well on the way to full recovery.

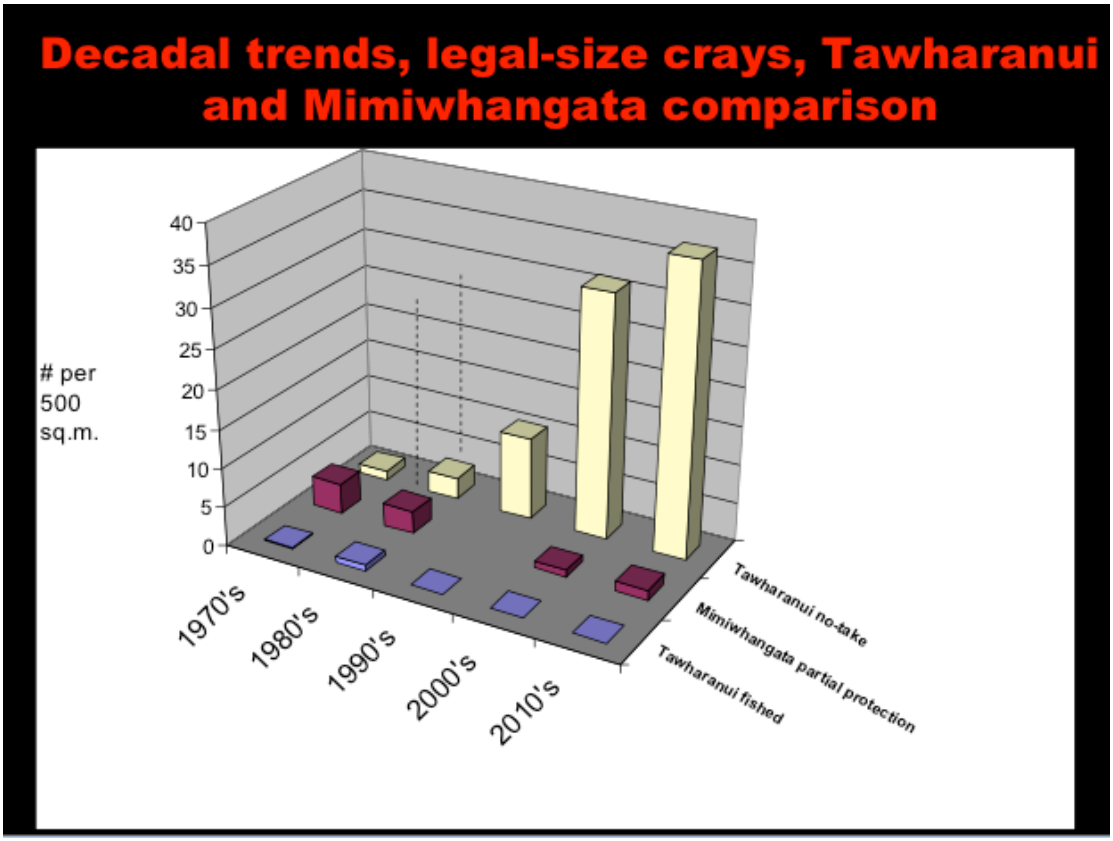
28 At Mimiwhangata, continued recreational fishing has not allowed any recovery whatsoever. In fact the kina barrens and degraded reef systems continue to expand. There are hardly any snapper and crayfish. There is no difference between the fully fished reefs to the north and south of Mimiwhangata, and the so-called partially protected reefs within the boundary of Mimiwhangata Marine Park.

29 From a biodiversity recovery point of view, partial protection as at Mimiwhangata is a total waste of time. (Incidentally the Mimiwhangata situation is almost exactly what Environment Minister Nick Smith is advocating for Recreational Fishing Parks in the Hauraki Gulf and Marlborough Sounds. I have no faith that they will perform any better than the Mimiwhangata Marine Park.)

COMPARISON OF CRAYFISH RECOVERY AT MIMIWHANGATA AND TAWHARANUI

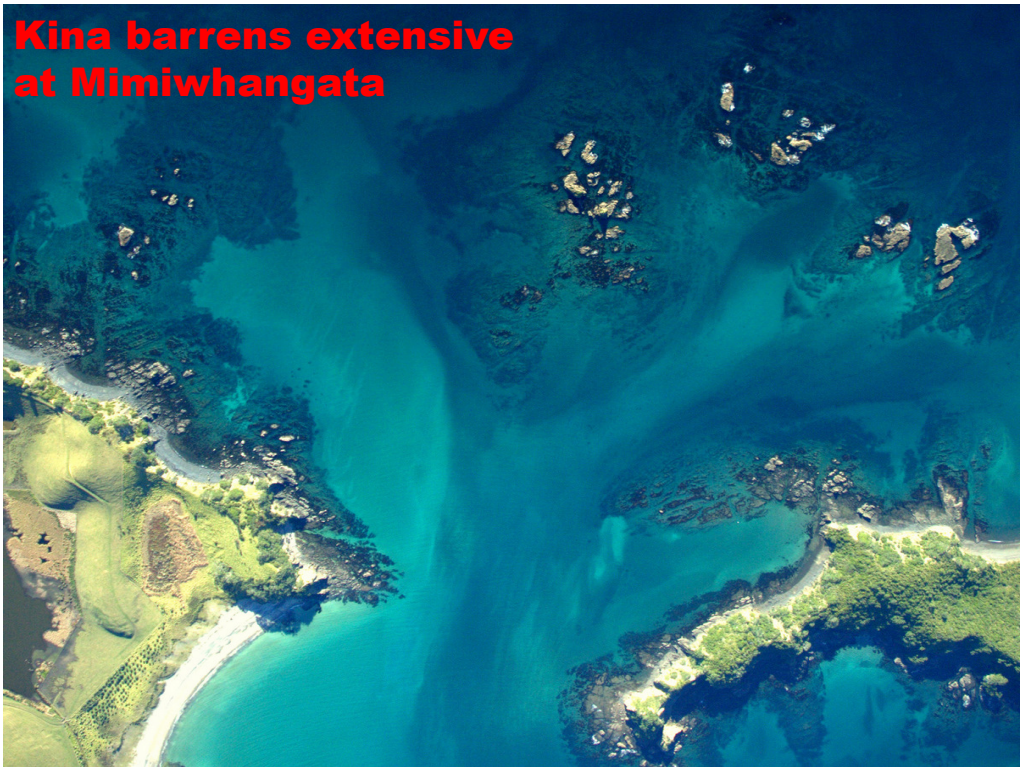
30 The following diagram summarises crayfish data from formal counted transects at Mimiwhangata and Tawharanui, spanning five decades. Simply banning commercial fishing but allowing recreational fishing to continue does not allow the crayfish population to recover. Neither does it provide any biodiversity

benefit to the shallow reef system, does not eliminate kina barrens or foster recovery of kelp forests, and does not help snapper recovery.

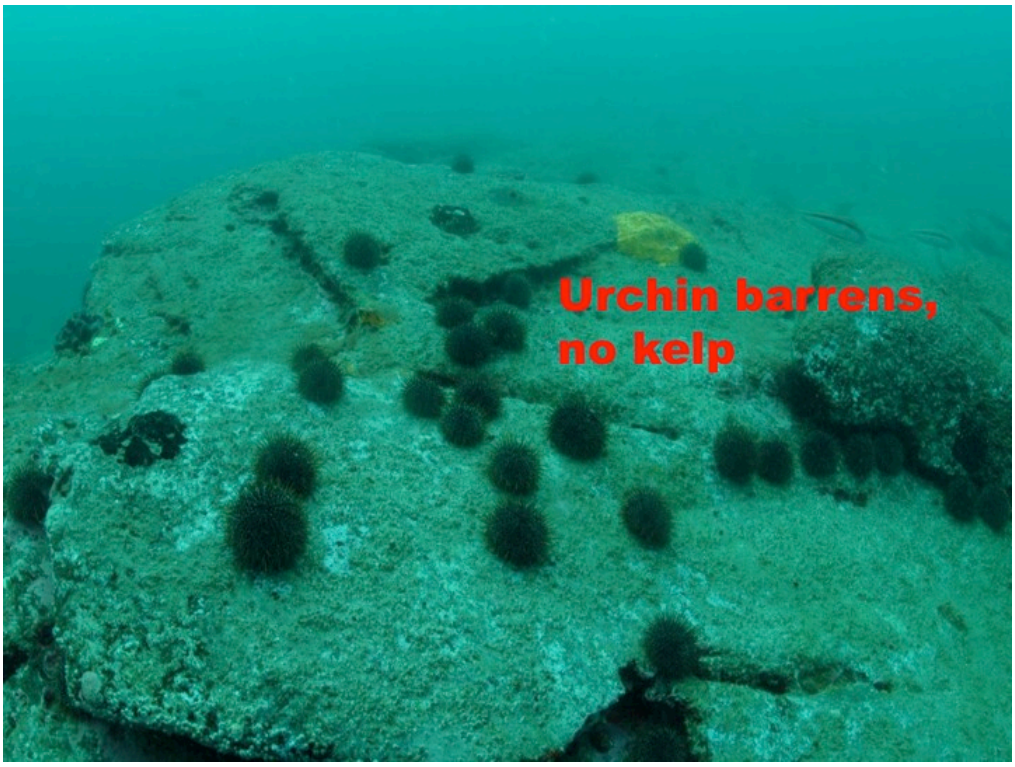


31 In this graph I compare crayfish results in three scenarios – Tawharanui fished in blue in the foreground, Mimiwhangata partly protected in red in the middle, and Tawharanui totally protected in yellow in the background. These are legal-sized red crayfish, and I have grouped the data into five decades, from the 1970's to the 2010's. The vertical dotted lines indicate the period in which the protection regime started. In the fished area at Tawharanui crayfish dropped away to virtually nothing and have stayed that way. At Mimiwhangata crayfish started at a higher level probably because it is remote from population centres and there were still some residual crayfish remaining in the 1970's, but the following trend was downwards despite no commercial fishing. At Tawharanui in the area protected since 1981 crayfish increased dramatically, reaching a peak of 800 legal crays per hectare in 2010. This clearly shows that removing

commercial fishing for crayfish and allowing recreational take has no long-term beneficial effect. Partial protection, by banning commercial fishing, is ineffective at restoring crayfish. It is also ineffective at restoring biodiversity or eliminating kina barrens and restoring kelp forest.

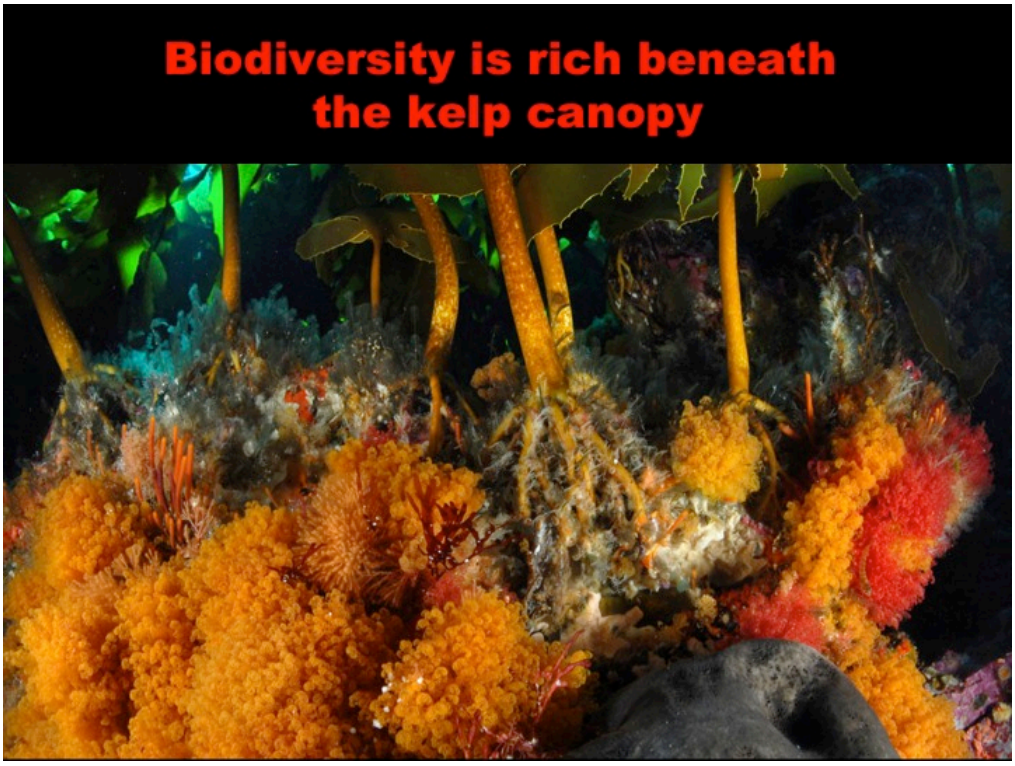


32 The pale reef areas are kina barrens – heavily degraded reef areas because there are not enough snapper and crayfish to keep the kina numbers down to a level where the kelp forest can survive. The result is extensive kina barrens on shallow reefs of Mimwhangata and adjacent coasts. This aerial photo at Mimiwhangata shows a narrow fringe of algae around emergent rocks, and a small amount of kelp forest on the edges of some of the deeper reefs, but the rest of the rocky reef is pale-coloured kina barren.



33 Typical kina barren on the fished coast outside Tawharanui Marine Reserve. Kina have eaten all the kelp and maintain the rock surface relatively bare by their continual grazing activities. This is a serious loss of biodiversity brought about by too much fishing.

34 Healthy kelp forest has recovered inside Tawharanui Marine Reserve where snapper and crayfish have been allowed to build up numbers and sizes to a point where they ate all the kina in the degraded kina barren. Then the kelp forest could re-establish in the absence of heavy grazing by kina, restoring the natural biodiversity of the shallow reef.



35 Kelp forest is very important to the ecology of the reef, by providing shelter for a vast variety of life which lives under the kelp canopy. Over 350 species have been found living amongst the holdfasts of the kelp. Remove the kelp cover and we lose all this biodiversity and the reef becomes an “ecological desert” with drastically reduced ecological value in the kina barren.

Dated this 09th day of November 2016

Dr Roger Grace