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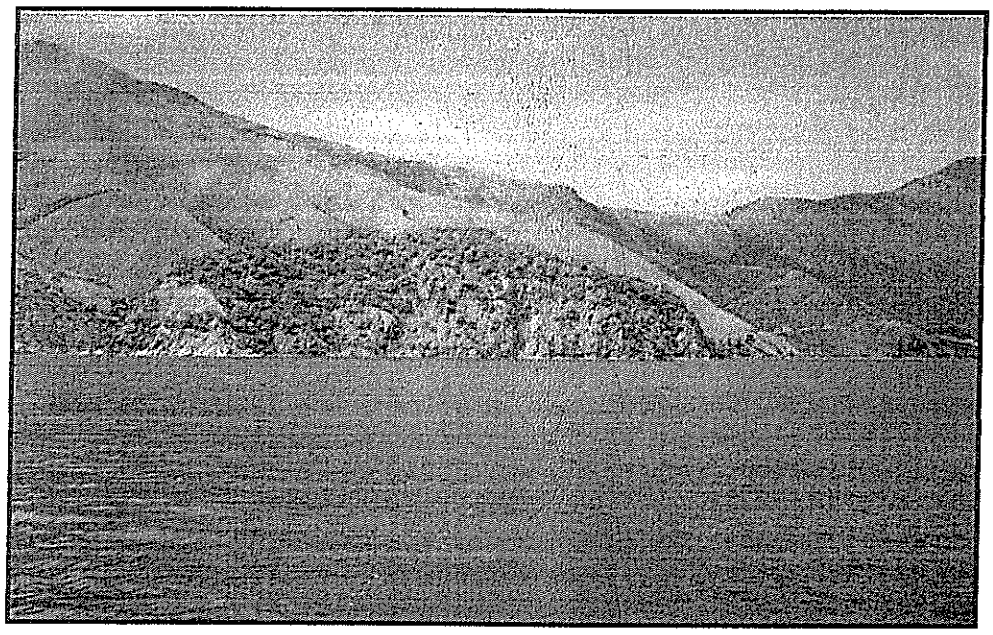
Ecological Assessment
For
A
Marine Farm
Hamilton (Karaka) Island
Admiralty Bay



A Report For
Pirimoana Holdings.
V Smith

November 1999

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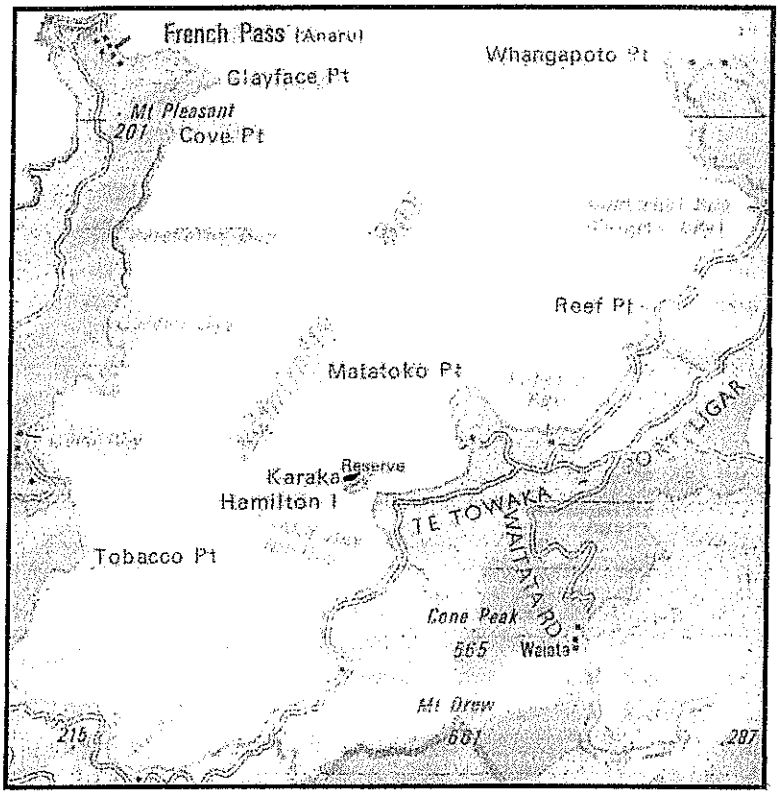
Introduction:
This is a general assessment of the Marine Ecology (macro-benthic flora and fauna) in the subtidal area of Hamilton Island.

The criteria for this assessment follows the "Guideline for ecological investigations of proposed marine farm areas" (DoC,1995).



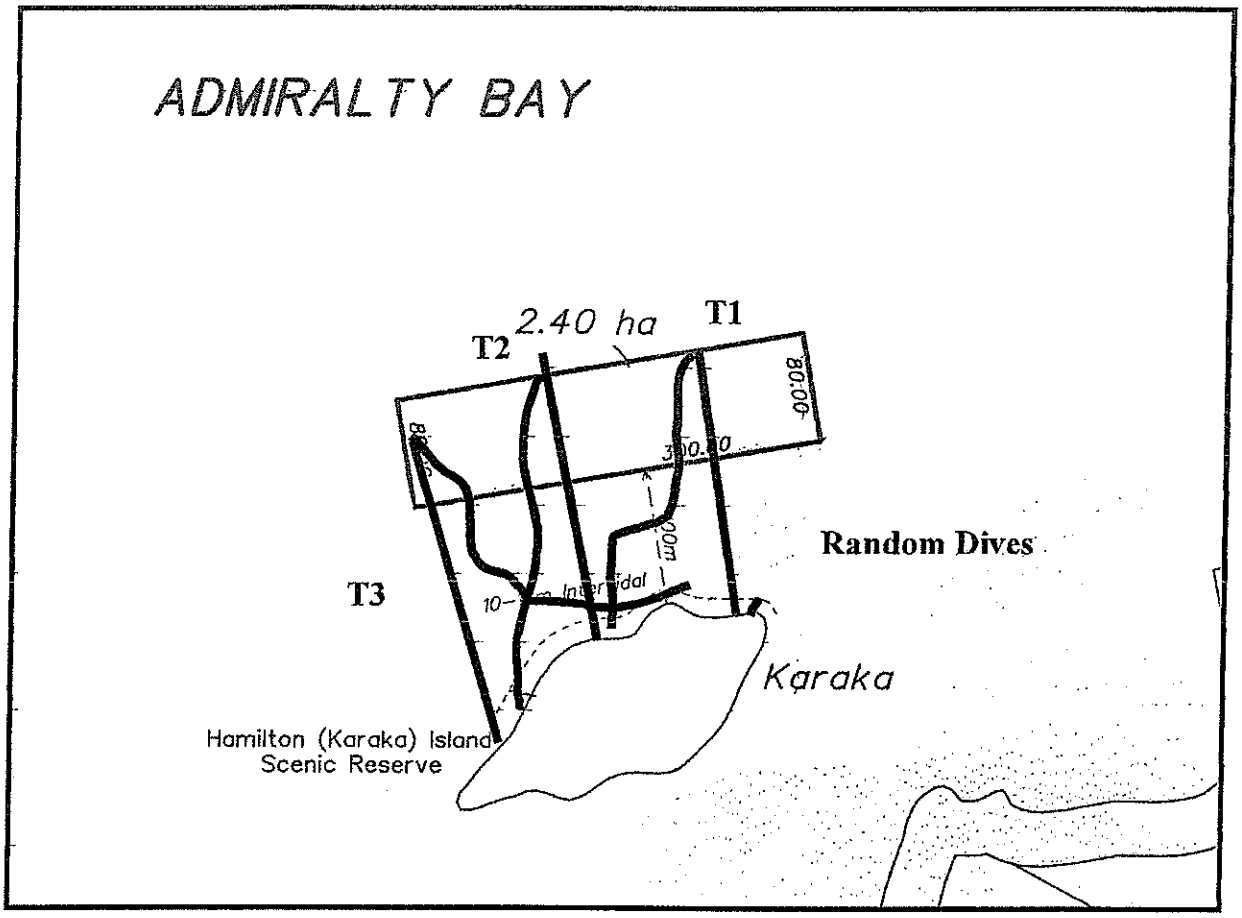
The proposed application is for a new Marine farm.

Methods Used for Macro benthos Assessment
The proposed site was surveyed on the 9th November 1999.

Sampling was carried out along three transects- 200 metre. Due to the depth of this site two of the transects were terminated at 41 metres (actual water depth). This was augmented by a random dive and sounder runs.

All depths have been adjusted to chart datum. All distances from shore were measured from MLW. While all due care was, taken the distances however, must be treated as approximate for all data given.

Quantitative survey
Trigger species were countered in a two metre wide by 5 metre long strips, all the way along the transect. The presence / abundance and general distribution of all other species were noted.



The Random dives were executed on the return swims (from the seaward end of the transects), this in effect increase the area covered. This was under taken to establish the position of the soft substrate and to identify any species that were not seen on the transects.

A shore line swim was under taken to ascertain the extent and general species assemblage of the inshore hard strata area.

A video was taken along each of the transects and in the inshore area.

Qualitative survey
In addition to the quantitative survey, a qualitative survey (i.e. random dives) of the inshore & offshore area was undertake. The area of the marine farm was conducted. The dive covered considerable area to:

- determine the presence of any "rare species"
- determine the presence of species with patchy distribution
- to verify that the transects are a true and accurate representation of the biotic patterns
- locate any reef structures or areas of hard substrate

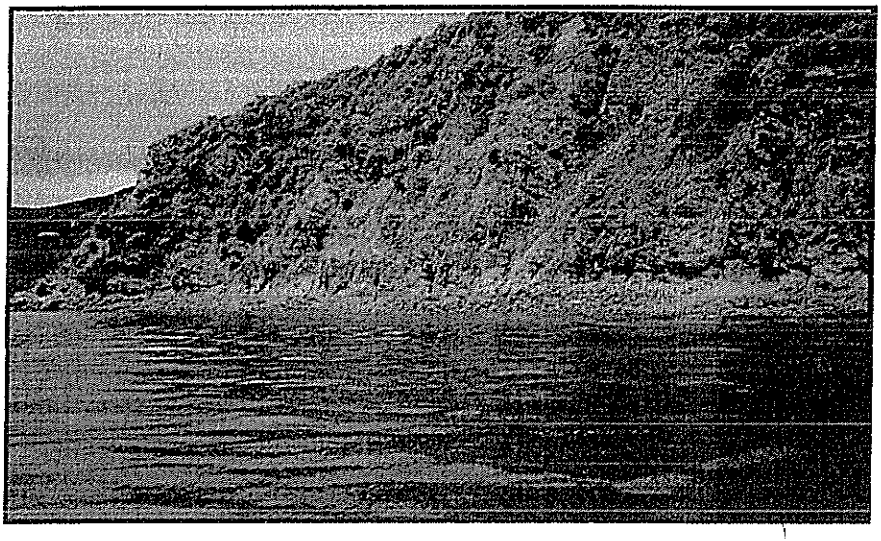
The approximate location of this random dive is shown in the proceeding diagram.

Substrate Survey
The entire site was surveyed using a 3D sounder (Humming Bird 3D Wide Vista) placed on dual mode 3D and concurrent 2D mode. This was used to locate the existence of any reef structures or hard substrate. The sounder was "ground truthed" by diver to check depth and substrate type.

Conditions Encountered during Sampling
Visibility underwater was 2.0 to 2.5metres in soft substrate zone visibility decreased considerably on contact with the substrate surface. While the area of the hard substrate visibility was 5 to 7 metres.
No noticeable currents were experienced during the sampling.
Water temperature was 18 degrees Celsius.
Wind conditions were light during sampling.

Results and General Evaluation

General Evaluation and Substrate



The inshore land form is an island, the proposed marine farm situated on the seaward flank. The vegetation is a combination of low bush and scrub.
Bear basement rock, slips & rubble at the base of bluffs/cliffs with increasing vegetation coverage tending towards the top/plateau

Intertidal Platform

The intertidal platform is a combination of basement rock boulders and patches of cobble and gravel.

The width of the platform varies from 6 metres to 15 metres. This forms a wide shelf at the seaward side of the island but is some what smaller at the ends of the island. This shelf area then grades into a cobble/boulder area that descends rapidly.

Sediment Description

The following is a combined assessment based upon the three transects and random dive.

Sediment Type	**Distance & Depth**	**Flora & Fauna**
Basement rock grading to Cobble boulders grading to sand/dead shell	MHW to MLW MLW to 60 metres	Tube worm, chiton, Neptunes necklace, triplefin flap jack. Blue mussel, green mussel
Sand/ silt /mud	From 60 metres % of shell (dead) sometimes	sea squirt, sea cucumber Horse Mussel cushion star
Dead shell variable %		sea cucumber scallop

Below the intertidal platform the substrate varies from basement rock to boulder, cobble, to dead shell to silt/mud.

Reef System

The reef system- while there is no axial system as such, the inshore area has been treated as a reef system in terms of this proposal.

Biota of the Inshore to 50 metres from MLW

The "inshore" area supports a diversity of species (a list of those species observed follows donated with a *).

Those species observed in this area are all common to Admiralty Bay area in general.

The species can be broadly divided into two distinct communities, however, to a certain extent these communities meld from one to the next- sharing common species.

- **The inshore cobble/ hard substrate / reef community:** associated with this suite of species were the:spotty, triplefins, tube worms, spiny stars, cushion stars, blue mussel, green mussel, limpets, Carpophyllum, Neptune's necklace, coralline algae & turf. The complex substrate allows for greater assemblage species compared to that of the soft substrates.

- **Deeper sediments:** The substrate is a complex of dead shell silt mud that offers little in the way of attachment for organisms such as tube worms. However, those species that live on and in this substrate are: scallops, hermit crabs, sea cucumbers and saddle ascidians (attached to dead shell material).

Biota of the proposed marine farm 0 to 200 metres from MLW
The diversity and density of macro- epibenthic species in this area was found to be generally low in the area of the proposed spat farm. While that of the reefs was also low.

Soft substrate*
Hard substrate # (inshore area of basement rock & cobble to reef area)

Common Name	Scientific name	Abundance
Algae		
Red Filamentous	*Rhodymenia* novzelandica?	R #
Red weed	*Rhodymenia dichotoma*	R*
Neptune's Necklace	*Hormosira banksii*	C #
	Caulerpa geminata	R
Flapjack	*Carpophyllum Flexuosum*	C#
	Codium convolutum	O#
Air weed	*Colpomenia sinuosa*	O#
zigzag weed	*Cystophora distenta*	C#
Porifera		
Grey sponge	*Ancorina alata*	C#
Sulphur sponge	*Aplysilla sufurrea*	O#
Encrusting sponge		
Golf ball	*Tethya sp.*	R#
Arthropoda - Crustacea		
Hermit crab	*Pagurus sp.*	O*
Barnacle	*Elminius modestus*	C#
Echinodermata		
Snake star	*Pectinura maculata*	R #
Sea cucumber	*Sticopus mollis*	O #*
Cushion star	*Patiriella regularise*	C*
11 armed star	*Coscinaterias calamaria*	C#*
Jewel Star	*Pentagonaster pulchellus*	R#
Kina	*Evechinus chloroticus*	C #*
Pink urchin	*Pseudechinus novaezelandia*	R*
Ascidiacea		
Solitary sea squirt	*Cnemidocarpa sp.*	C#*
Warty sea squirt		
Coelenterate		
Fine hydroid		
White tentacled	*Actinothoe alboincta*	C#

Mollusca		
chiton	*Eudoxochition nobilis*	O#
Horse Mussel	*Atrina zelandica*	C*
Sea slug	*Lamellaria cerebroides*	R#
Scallop	*Peeten novaezelandica*	C*
Green mussel	*Perna canaliculus*	O#
Blue mussel	*Mytilus edulis*	O#
Nestling mussel	*Modiolarca impacta*	O#
Tiger shell	*Maurea punctulata*	R#
Cats eye	*Turbo smaragdus*	C#
Limpet	*Cellana sp.*	C#
Window oyster	*Monia zelandica*	C#
Snakeskin Chiton	*Chiton pelliserpentis*	O#
Sea hare	*Scutus antipodes*	O#
Fan shell	*Chlamys zealandiae*	O#
Cooks Turban	*Cookia sulcata*	R#

Annelida Polychaeta		
Brown tube worm	*Branchiomma serratibranchis*	R#
	Amphitrite ruba	C#
Tube worms	*Galeolaria hystrix*	C#

few colonies inshore 2-300mm and solitary

Brachiopoda

Lamp shell	*Magasella sanguinea*	R*

Fishes		
Variable trip	*Forsterygion varium*	C#
Common Trip	*Forsterygion* lapillum	O#
Spotty	*Notolabrus celidotus*	C#
Blue eyed Trip	*Notoclinops segmentatus*	O#
Banded Wrasse	*Notolabrus fucicola*	R#
Blue Cod	*Parapercis colias*	R#
Leatherjacket	*Parika s*	R#
Tarakihi	*Nemadactylus macropterus*	R#
Butterfly perch	*Caesioperca lepidoptera*	R#
Carpet Shark	*Cephaloscyllium isabella*	R

R = Rare (1 to 5 individuals dependant upon the species) O = Occasional
C = Common A = Abundant

Trigger Levels

The Qualitative surveys found patches/beds of trigger level species inshore of the proposed marine farm.

Blue cod (*Parapercis colias*) were sighted, a total of five were seen.

Tube worm mounds of up to 300 mm high were found in the inshore area. These were over 60 metres from the propose marine farm.

Both the qualitative and quantitative surveys found areas of substrate above trigger levels.

Horse mussels (*Atrina zelandica*) were observed in the soft substrate area, the densities were below the trigger level. The random dive failed to find any beds or zones of this species above trigger levels.

Lamp shell (*Magasella sanguinea*) were observed on two of the transects and during the random dives counts were below trigger levels.

Scallops (*Pecten novaezelandica*) failed to reach trigger levels.

Inshore - hard substrate area.
This system is composed of basement rock and large boulders on the inshore- grading to cobble to the seaward extent some metres from MLW.

Due to the extent of the cobble substrate the Marine Farm will not be within 120 metres of MLW.

Discussion
Effects of Mussel Farming (General over view)
The presence of a marine farm will increase the natural sedimentation rate of an area, by reducing the water "flow thru" structures, particles tend to settle out of the water column. This is further augmented (collection of "fines" below marine farms) by the accumulation of shell material on the substrate causing the turbulence of the near bottom water movement. This results in collection of fine material of both organic and inorganic in origin.
The location of a marine farm as proposed will result in the accumulation of shell, faecal & pseudofaecal from present marine farming methodologies. This material will fall on to a silt/mud substrate increasing the percentage of organic material (and deceasing the Redox layer). Sessile species (non mobile) may become smothered, while mobile species are capable of moving.

Considering these effects it is considered that marine farms should be located over a silt/mud substrate, rather than hard substrates. The requirement of protecting the inshore environment (hard substrate/habitat), this has been accomplished by shifting the proposed position from 50 metres from MLW to 120 MLW thus the marine farm will be situated in a water depth of approximately 40 - 44 metres over a "soft bottom" being made up of silt mud.

Due to the depth, two of the transects were terminated at 42 metres actual water depth. At this position the substrate was soft silt/mud with a variable percentage of dead shell material

Conclusion

This site would be appropriate for a spat marine farm considering the guidelines (DoC,1995) and the general ecology of the area with the changes to the proposed boundaries.

References

Department of Conservation, 1995. Guideline for ecological investigations of proposed marine farm areas in the Marlborough Sounds. Report prepared for the Marlborough District Council by the Department of Conservation, Nelson/Marlborough Conservancy. Occasional publication No. 25