



The Hauraki Gulf



How restorable? – a personal viewpoint



Where are we today in the ecological trajectory?

- Latest State of our Gulf report
- Lots of environmental issues and concerns – the Gulf is not what it was historically
- How to change the trajectory into the future to be positive?
- Environment, habitat, species



Environments

Water quality – suspended sediments, nutrients, light regimes

Sediment quality – muddiness

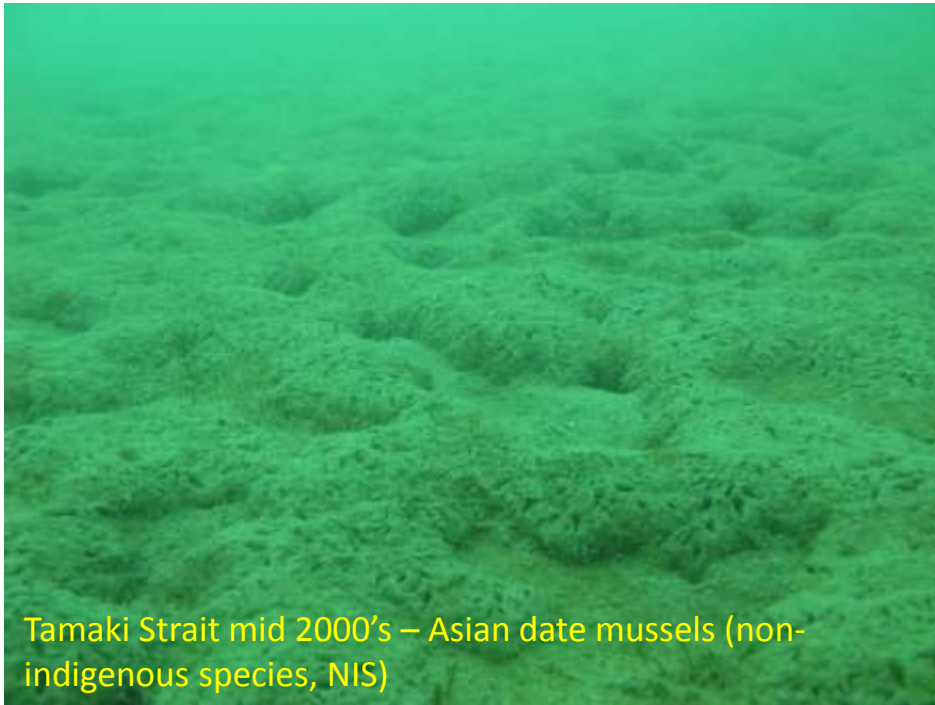


Whangateau Harbour entrance

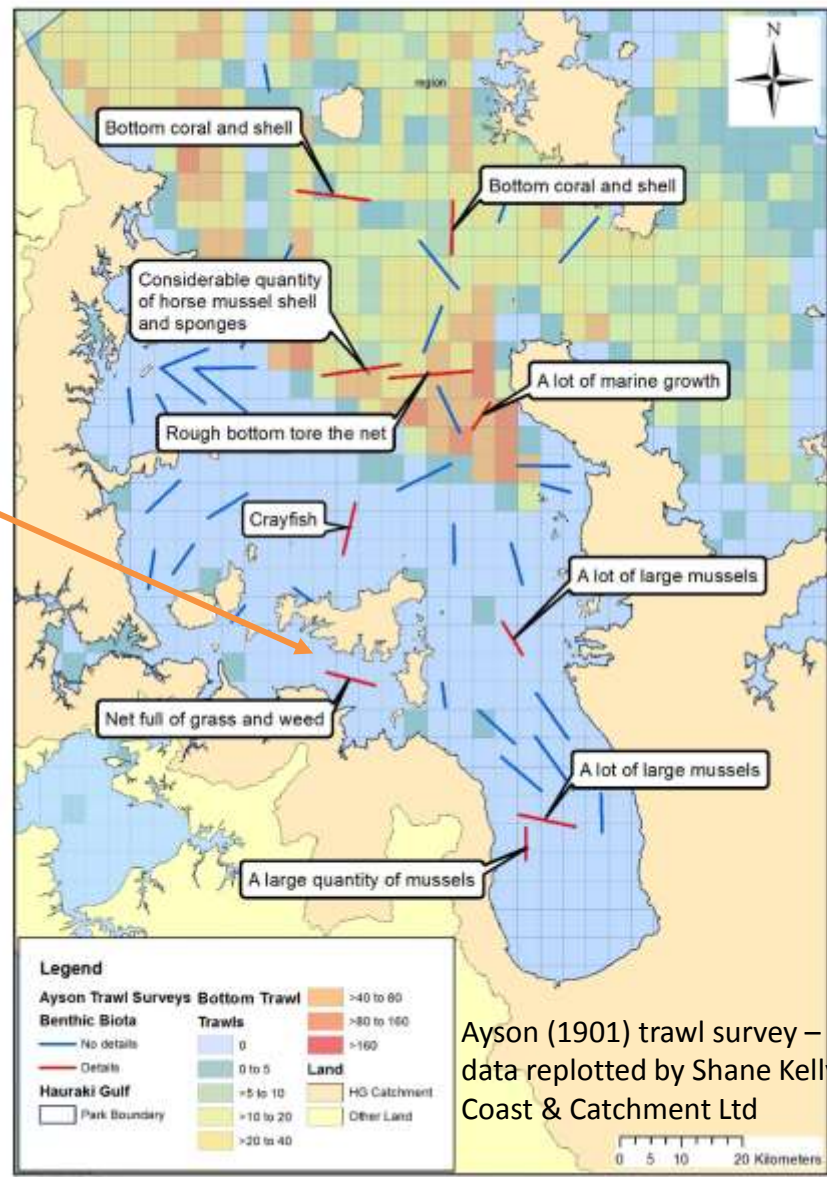
Source: Roger Grace, <http://whangateauharbour.org>

Omaha Bay. Fig. 7. Sears and Shears 2015 (Photos by J. Williams).

Habitats (especially biogenic)



Kelp forests, horse mussel beds, sponge gardens, dog cockle beds, bryozoan thickets, rhodolith beds, corals, tubeworm meadows



Ayson (1901) trawl survey – data replotted by Shane Kelly, Coast & Catchment Ltd



Species

Smaller populations, truncation of age/ size structure ('old growth'), less population 'bio-complexity', extent

- Snapper, hapuka, sharks, red/packhorse crayfish, scallops, cockles, pipi..
- Green-lipped and horse mussels..



Figure 6-6: Aggregation of mainly female crayfish during the spawning season in Tawharanui Marine Reserve.

Source: State of the Gulf 2014

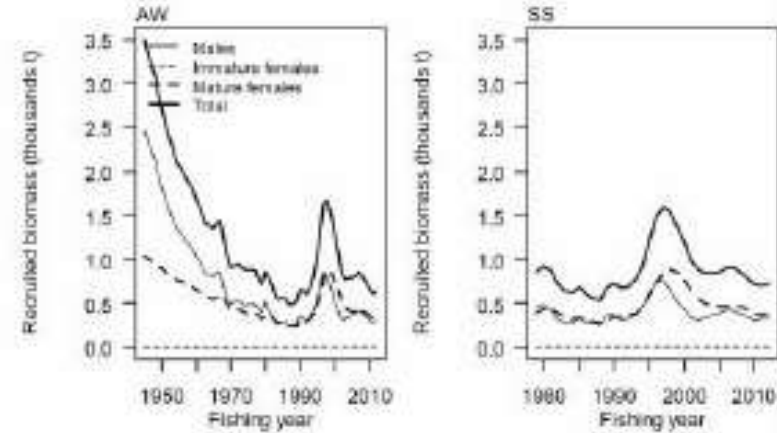


Figure 6-4: b) Historical reconstruction of autumn-winter (AW) and spring-summer (SS) biomass of crayfish above the legal size limit (i.e. the recruited biomass) in CRA 2 (from Starr et al. 2014).

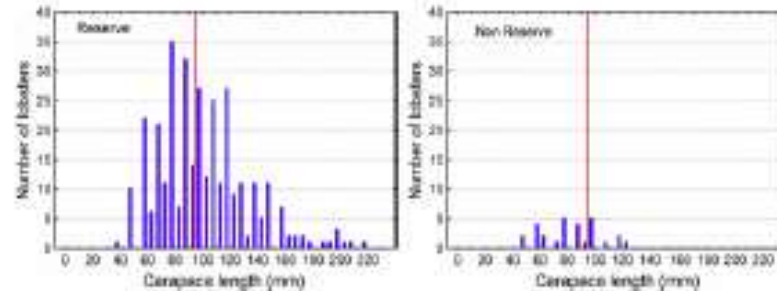


Figure 6-5: Size frequency distributions of lobsters recorded during the 2013 survey of the Te Whanganui-a-Hei Marine Reserve (Data provided by Tim Haggitt).

What were the drivers of 'loss'?

- Land clearance
- Land use practises
- Urbanisation
- Fishing
- Reclamation
- Navigation works
- Non-indigenous species



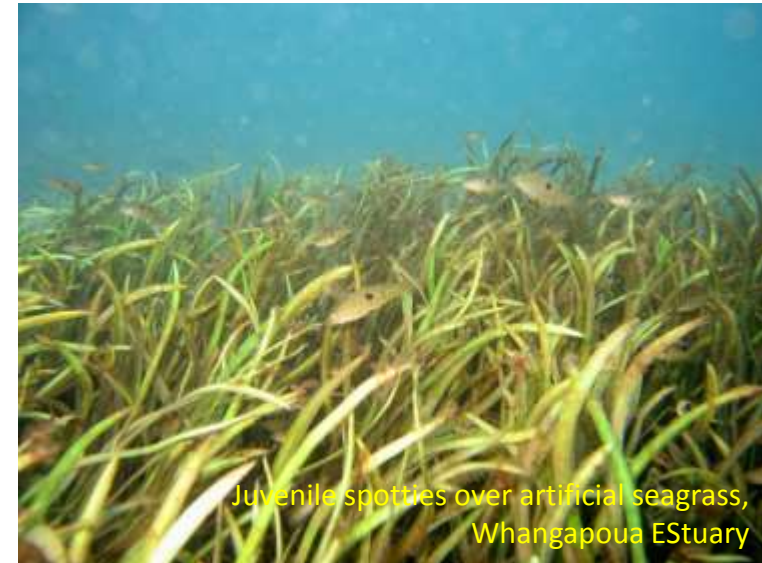
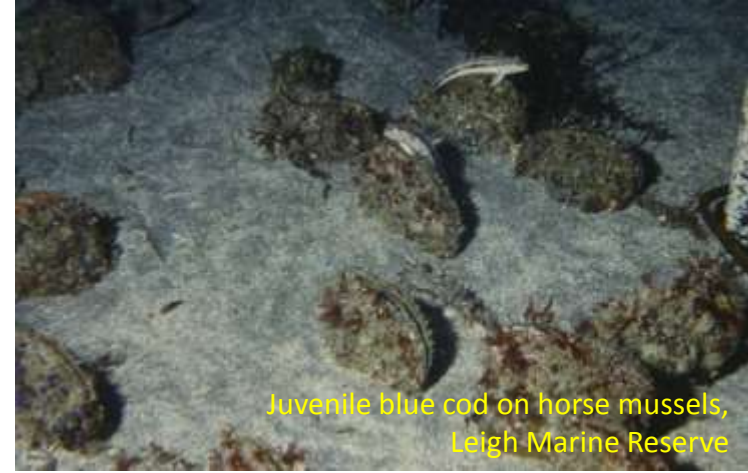
Reversing the trajectory

- Restoration in the broadest sense of the word
- Nature itself is the great driving engine
- How can humans work to repair that engine?
- Restoring function as well as structure

- Have the 'loss drivers' or maintainers been sufficiently removed to permit recovery?

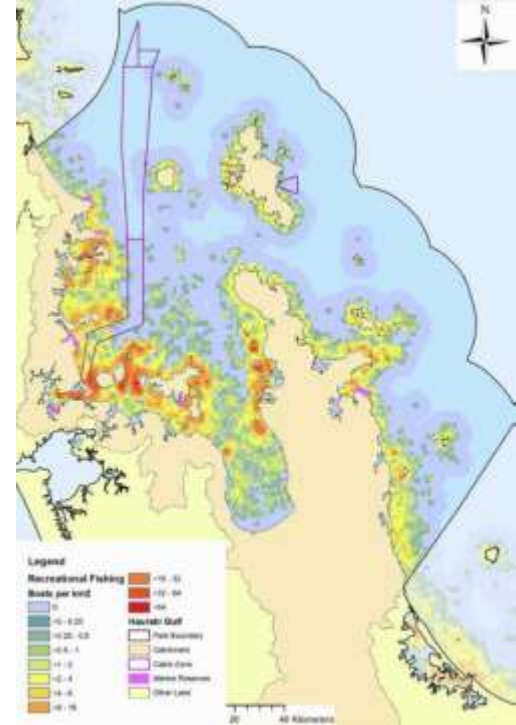
Idealised Restoration Targets

- **Productivity** – wider trophic pyramid base
- **Biodiversity** – increased species richness, more niches
- **Habitats** – greater diversity / extent / quality; foundation species abundant
- **Invertebrate and fish populations** – greater abundance, ‘old growth’, bio-complexity, keystone species functional
- **Fisheries** – increased carrying capacity and ultimately production (yield)



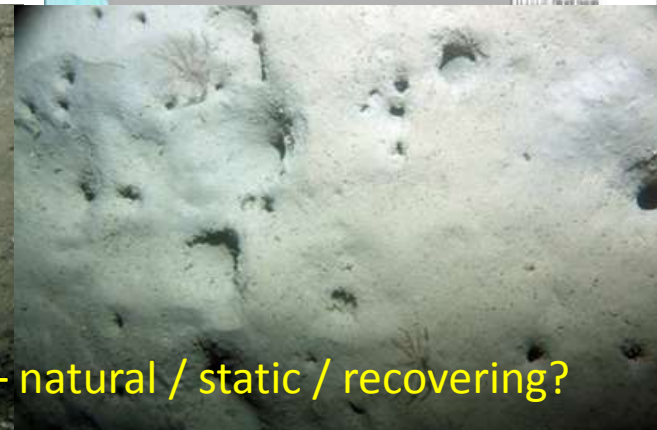
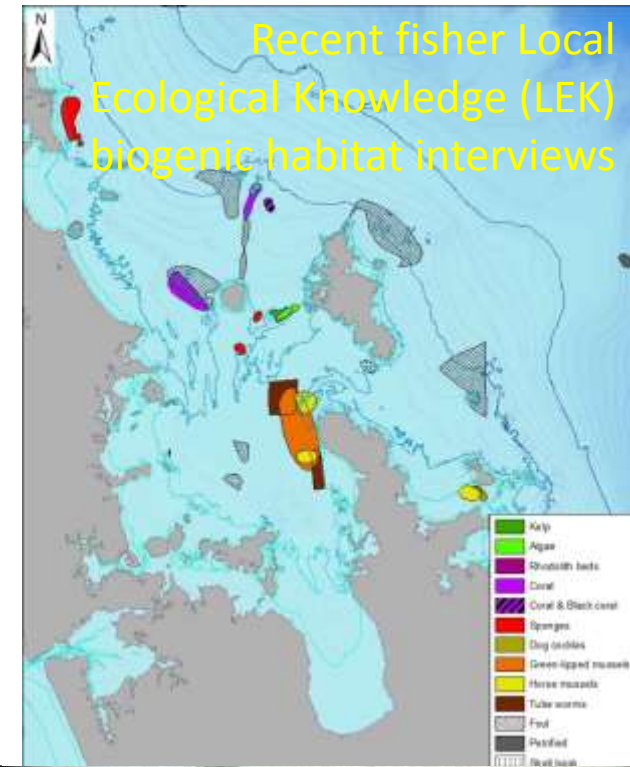
'Realities' to consider

- Have the original drivers of change been removed?
- Are environmental conditions now suitable (e.g., sediment and light regimes)?
- Social licence to operate
 - Spatial zoning of use including exclusion of activities?
 - Buy-out of private rights for public good?
 - Different belief systems
- Can the Gulf truly support ever-increasing recreational fisheries harvests as human population increases?
- Some things such as introduced species are 'here to stay'



What are we restoring to?

- No one really knows what the Hauraki Gulf once looked like
- Natural systems are dynamic
- There is an immense amount we do not know
- Ethics, bioengineering



Seafloor assemblages in the HG Cable Protection Zone in 2015 – natural / static / recovering?

Spatial analogues for the past – harbours

Waitemata versus Rangaunu Harbour (upper East Northland)

Powell (1937) "Unfortunately there is no prior account of the bottom conditions in the harbour... the Zostera (sea-grass), once abundant in the bay, has now almost entirely disappeared... . Tide-deflectors and reclamation works elsewhere have considerably reduced the areas of Zostera... marked effect on the frequency of carnivorous fishes.. maybe a more important factor than either over fishing or assumed harbour pollution

Rangaunu Harbour 2013 – 2 sites



Spatial analogues for the past – coastal seas

Tamaki Strait versus Te Rawhiti Strait (Bay of Islands)

Te Rawhiti 2014

Coastal seagrass and low turfs



Rangaunu Bay east, 2015

Caulerpa meadows



What might a restoration framework look like?

A nested framework

Broad scale

- Improving water quality, reduced land-based inputs
- Ecosystem-based Fisheries Management (EBFM)

Intermediate scale

- Explicit spatial management of critical habitats and functional hot-spots

Fine scale

- Targeted 'jump-starting' of key habitats, substrate 'conditioning'

Aspatial

- Packhorse crayfish, hapuka

Intermediate scale

Marine reserves

- Currently used as a catch-all

Fisheries habitat zones

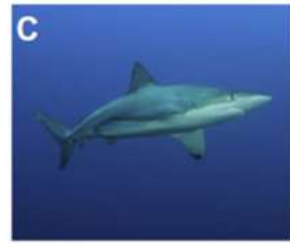
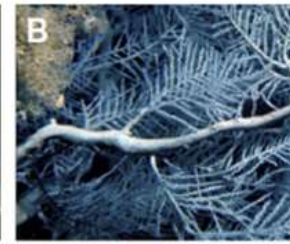
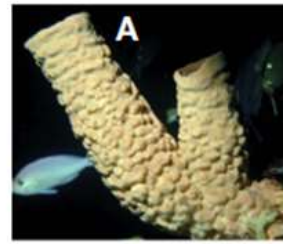
- Critical places such as fish nurseries, spawning locations*, migration corridors*

Invertebrate brood-stock zones

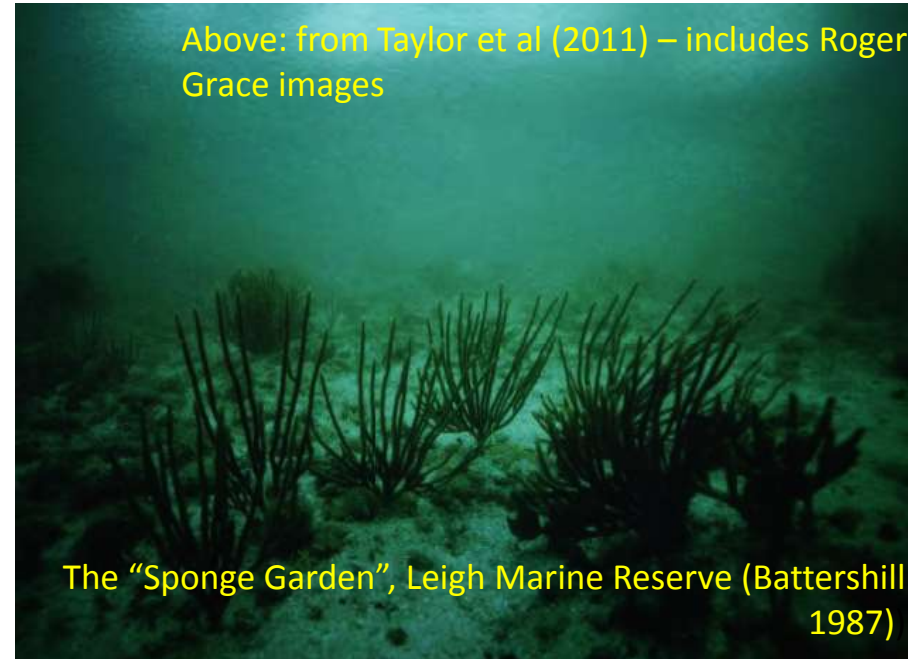
- Critical larval sources, e.g., 'source' scallop beds

Biodiversity zones (esp. soft sediments)

- Highly diverse seafloor assemblage areas



Above: from Taylor et al (2011) – includes Roger Grace images



The "Sponge Garden", Leigh Marine Reserve (Battershill 1987)

Fine scale active restoration – ‘jump-starting’ key habitats, substrate conditioning

Green-lipped mussel beds



Images: S. Kelly,
Revive Our Gulf Trust



Seagrass restoration
Image: Fleur Matheson



Key 'human' aspects for success

- Agency leads / support including tools and resourcing
 - Champions
 - Buy-in from Auckland citizens
 - Clear work plans with staged objectives, adaptive approach
 - Empirical 'evidence-based' framework – robust, high-quality science
 - Document everything
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- Accept that timeframes extend across several decades; manage 'staleness / fatigue / burnout'
 - Expect surprises, both good and not so good, and serendipitous moments

How restorable?

