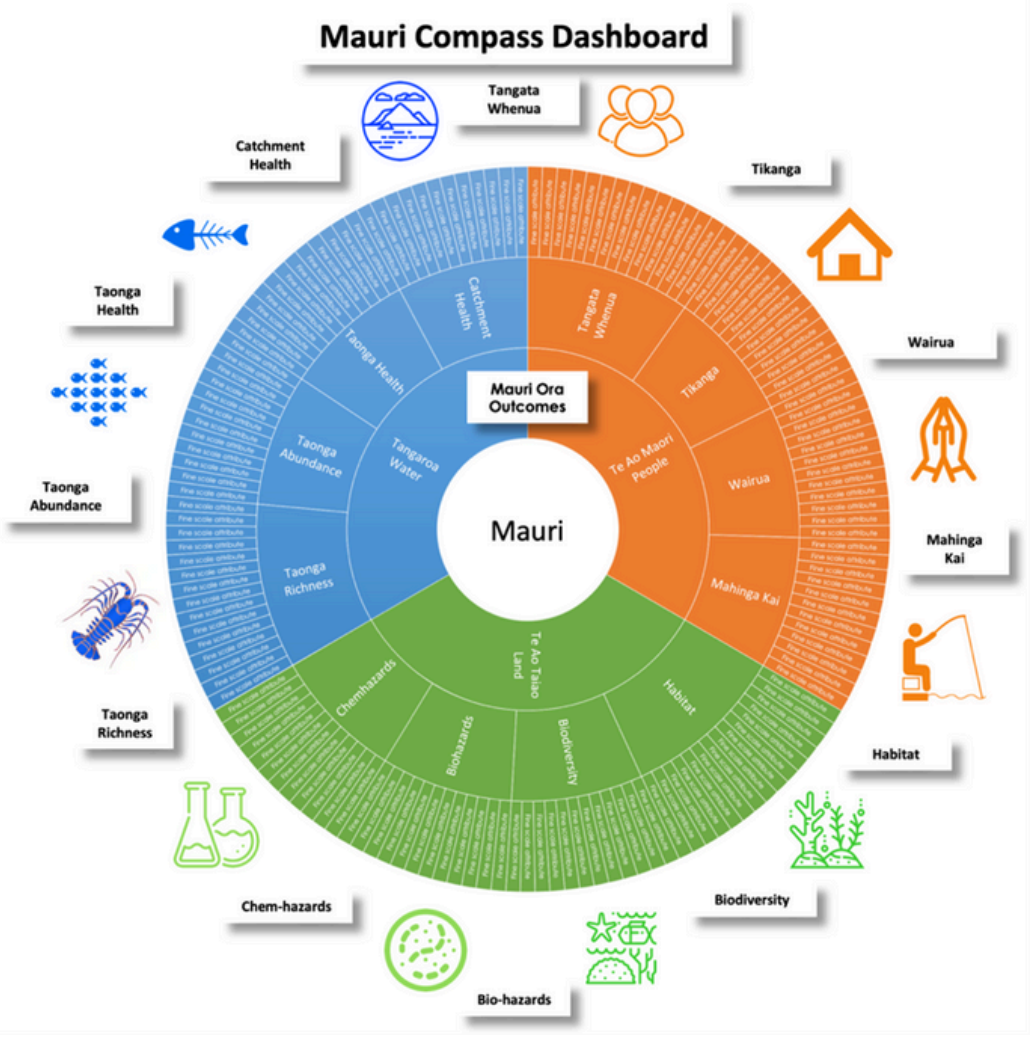
Mauri Compass model calibrated for the marine environment

The Mauri Compass model, specifically calibrated for the marine environment, emerged from a Sustainable Seas National Science Challenge project, *Huataukina o hapū e!* The model, underpinned by mātauranga Māori and Western science, plays a crucial role in environmental resource management. It assists whānau, hapū, iwi, and landowners to assess the impact of various factors on the mauri (life force) of their lands and rivers.

During the co-development phase of the project, which took place through wananga (gatherings) on marae, the Mauri Compass model was expanded to incorporate rohe moana (marine areas) and marine taonga species. Notably, three existing Mauri Compass attributes — Taonga Richness, Taonga Abundance, and Taonga Health — were enhanced. The exemplar model for this calibration process included species such as kina (sea urchin), pāua/abalone, kōura/rock lobster, kūtai/mussels, tio/oyster, marine flora, and marine mammals.

Additionally, a teaching curriculum was developed to support accredited Mauri Compass assessors and tauira (students). This commitment ensures the enduring integrity of the model and empowers kaitiaki (guardians) across New Zealand's coastlines to care for our precious taonga tuku iho (ancestral treasures).

The following Mauri Compass Dashboard forms one output from the Sustainable Seas Science Challenge project, *Huataukina o hapū e!*



The mātauranga Māori-based, Mauri Compass model is being used extensively in freshwater resource management to assist whanau, hapū, iwi and landowners assess the impact of factors affecting the mauri of their lands, rivers, and ocean.

This project provided the first opportunity to calibrate the Mauri Compass to include rohe moana and marine taonga species.

Calibration involved the process of configuring three of the twelve Mauri Compass attributes with kina as the taonga species. Several severe weather events and covid lockdowns prevented the research team from testing the calibration, therefore a universally generic template was developed instead.

Research was conducted to calibrate the Mauri Compass framework and assessment tool to include marine taonga. This includes further developing the teaching/learning curriculum to enhance the skills and knowledge of accredited Mauri Compass assessors and tauira.

Calibration of attributes with kina as an exemplar template:

Taonga richness and taonga abundance

- Demonstrate knowledge of, the habitat, distribution, and features of the kina both regionally and around New Zealand
- Describe the anatomical features of the kina
- Describe the feeding, reproduction, and lifecycle of the kina
- Discuss potential customary and commercial management solutions to the impacts of climate change

Taonga health

- Describe the factors that impact on the growth of the kina
- Describe abnormal features and/or behaviours that could indicate potential kina health issues
- Describe the potential impact and appropriate customary/commercial management responses to shellfish biotoxin alerts/toxic algae blooms/slash and sedimentation on your taonga species

- Hybrid learning including both online and marae noho options were explored.
- The online portal and Mauri Compass App was updated.
- Future work includes including pāua/abalone, kōura/rock lobster, kūtai/mussels, tio/oyster, marine flora and marine mammals.

A step-by-step guide of the calibration process

1. Define the area.

- This could be any combination of a river, lake, farm, catchment, or oceanic area.
- Exemplar: Rohe moana

2. Identify one (or more) taonga species for the model.

- Use wananga with kaitiaki, hapū/iwi, or landowners.
- Exemplar: Kina (*Evechinus chloroticus*)

3. Build inter-generational monitoring capability and capacity that creates a deeper knowledge of local taonga richness and taonga abundance.

- Deliver Mauri Compass curriculum based on the taonga species that incorporates mātauranga-a-hapū and Western science.
- Exemplar:
  1. Demonstrate knowledge of the habitat, distribution, and features of kina both locally and around New Zealand.
  2. Describe the anatomical features of the kina.
  3. Describe the feeding, reproduction, and lifecycle of the kina.
  4. Discuss potential customary and commercial management solutions to the impacts of climate change.
  5. Describe the factors that impact on the growth of the kina.
  6. Describe abnormal features and/or behaviours that could indicate potential kina health issues.
  7. Describe the potential impact and appropriate customary/commercial management responses to shellfish biotoxin alerts/toxic algae blooms/slash and sedimentation on local kina populations.

4. Measure taonga health and abundance

- Determine the most appropriate methodology for the circumstance.
- Exemplar:
  1. Physical condition
     - Roe quality and quantity
     - Size and weight
     - Spine condition
  2. Population dynamics
     - Density and distribution
     - Recruitment rates
  3. Environmental indicators
     - Habitat quality
     - Water quality
  4. Biological and physiological indicators
     - Gonad Index. Kaitiaki, fishers and researchers determine the health/quality of a kina based on its GI, or gonad index. This is the percentage of the animal's weight that is made up by the roe (male or female gonad). For example, if a kina weighs 300 g and the roe weighs 30 g the GI will equal 10 (or 10%).
     - Disease and parasite load
  5. Behavioural observations
     - Feeding behaviour

5. Determine the baseline and aspirational states for the taonga species(s)

- Using wananga with kaitiaki, hapū/iwi, or landowners.
- Exemplar:
  1. The current/baseline GI of kina is 5. Kaitiaki agree that a GI of 10 is the aspirational state.
  2. Restoration and monitoring programme is implemented.

6. Use the Mauri Compass App to record observations and populate the rest of the model to determine the baseline and aspirational Mauri Compass states.

The ongoing Mauri Compass monitoring programme would involve a combination of these methods to provide a comprehensive picture of kina health. Regular surveys, both by divers and using remote AI-sensing technology, will help kaitiaki track changes over time and identify any emerging threats to the kina population. When coupled with the other nine Mauri Compass attributes, the model can be used to inform marine management and decision-making for kaitiaki.

Application in marine management

The Mauri Compass model provides a comprehensive framework for informing marine management and decision-making. It integrates cultural values with scientific data to guide sustainable practices and enhance the resilience of marine ecosystems.

Future work

Future efforts will expand the model to include other species such as pāua, kōura, kūtai, tio, marine flora, and marine mammals. The development of hybrid learning options, including online and marae noho (live-in) formats, is also planned.

Acknowledgements

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Contact information

For more information on the Mauri Compass model and its applications, interested parties can visit www.mauricompass.com.