Sediment & Seashores

a community driven approach to marine monitoring

- **Overview of the Marine Metre Squared project**
  - Success of the project to date (and issues)
- **Case study from Otago Harbour**
  - address a local issue
  - enrich the school science
  - increased science understanding and skills
- **Future development of the Mm2 project**
  - Relevance of data, resources, long term involvement

Sally Carson

Department of Marine Science


Marine Metre Squared
Mm2
Mm2.net.nz
Citizen Scientists wanted to monitor
the New Zealand Seashore

Objectives

- To **actively learn** more about our seashore neighbours
- To **participate** in the collection of valuable scientific information about **biodiversity**, **distribution** and **abundance** of seashore animals and plants in NZ's marine environment
- To **monitor change** in this habitat over time and **investigate** what might be causing the change
- To **connect** with scientists, educators, schools and community / Iwi groups

*"engage students, communities and scientists in **participatory science**."*

What has worked ?

- Web site (www.mm2.net.nz)
  - Data storage / data visualization
  - Blog (species id, sharing stories etc)
- Resources (Shore guides, activity guides, videos)
- Relatively simple methods
  - minimal equipment
  - Suitable for any shore (sand/mud or rock)
  - Different levels (m^2 or transect)

- Fits well with NZ Curriculum
  - front end (goals, vision)
  - specific subject areas (specifically science and Nature of Science)

*" In **science**, students explore how both the natural physical world and science itself work so they can **participate as critical, informed and responsible citizens in a society** in which science plays a significant role."*

Five Science Capabilities

- Gather & interpret data

- Use evidence

- Critique evidence

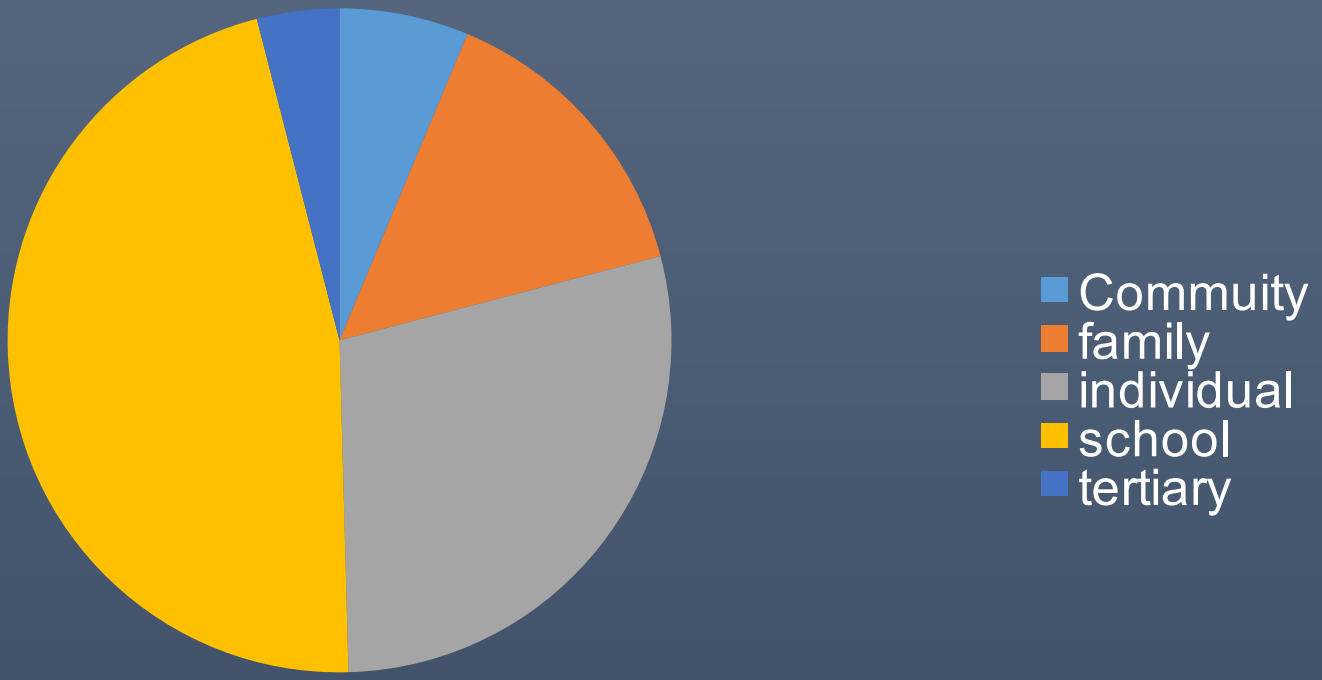
- Interpret representations

- Engage with science

"Students should be willing and able to use their science knowledge."

www.scienceonline.tki.org.nz/Science-Capabilities-for-citizenship

Levels of Engagement …



	Auckland	Northland	NZ wide
Registrations	247 (25%)	131 (7%)	1830
# people doing surveys	42 (9%)	2 (2%)	247 (13%)
# surveys done	197 (19%)	5 (1%)	917

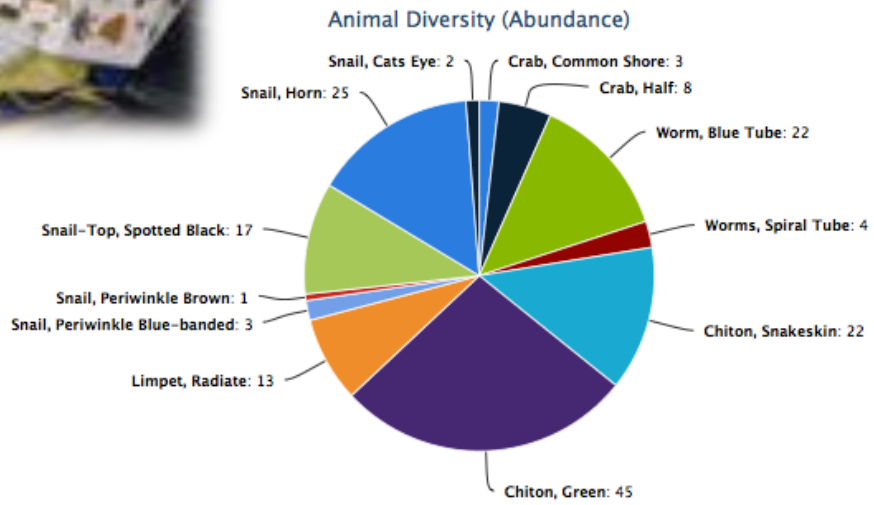
Gathering & interpreting data

Collect Data

Upload Data

Mm2 survey

Transect Survey



Analyse Data

Using the evidence ?

- Where else does this species live?
- Why did we only find 3 species?
- Where are the biodiversity “hotspots”?
- Does the abundance of this species change over the seasons?
- Has this species distribution changed from year to year?
- Where do you find invaders like *Undaria*?

Further Sampling? More Detailed Investigation?

How are our affecting our local shoreline?

Engaging with science?

SOUTH-EAST MARINE PROTECTION FORUM
ROOPU MANAAKI KI TE TOKA

the ROYAL SOCIETY of NEW ZEALAND TE APĀRANGI

Will Your Shore Become Otago's First Marine Reserve?

Did you know that Otago stands out as being the only region in the country without a marine protected area! Recommendations on a location are expected to be made by early 2016. You could make a difference by getting involved.



Prove it, to protect it!

Mm2 Mm2.net.nz
Marine Metre Squared

Marine Metre Squared is a citizen science initiative for long-term monitoring of the New Zealand seashore. Schools, families, community groups and individuals are supported in exploring their local shoreline and collecting valuable, standardised, scientific information that will help build a picture of the distribution and abundance of New Zealand's intertidal species.

YOU can use this scientific information as evidence, to support your recommendation as to where in Otago, our first marine reserve should be.

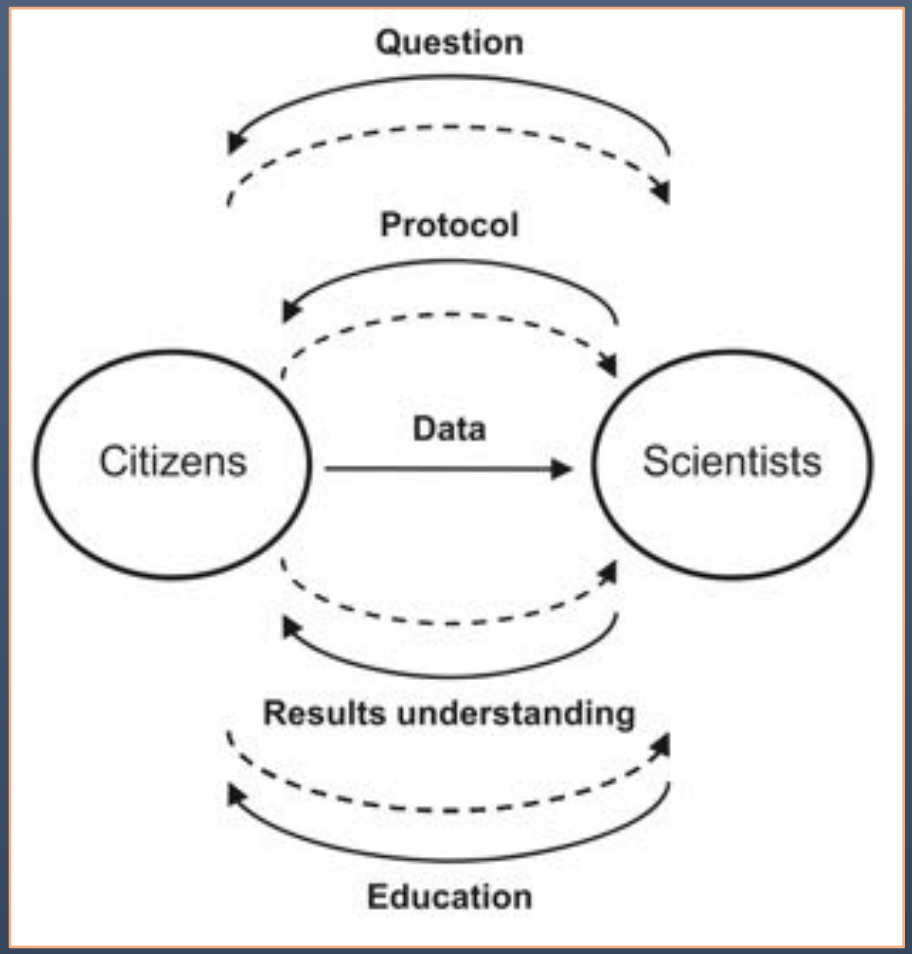
Have your say...

University of Otago NEW ZEALAND
Sally Carson
Department of Marine Science
Sally.carson@otago.ac.nz

Andrea Benwell, STLP Teacher

The Science Teaching Leadership Programme is funded by the New Zealand Government and administered by the Royal Society of New Zealand.

Data Donation or Citizen Engaged Enquiry?



Devictor, V., Whittaker, R. J., & Beltrame, C. (2010)

Sediment & Seashores

Is increased dredging affecting the rocky shore community?

Schools and Study Sites

- Rocky shores
- Metre squared quadrats
- mid and low tide

- St Brigid's
- Arthur Street
- Sawyers Bay
- Ravensborne
- Macandrew Bay
- Broad Bay
- Portobello
- Abbotsford
- Otago Girls' HS
- Otago Boys' HS

1

Introduction
(classroom)

2

Data Collection #1
March / April
(field trip)

3

Data Analysis
(classroom)

Six sessions with each school

4

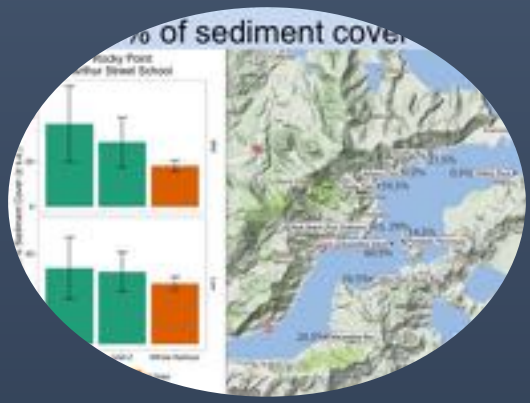
Data Collection #2
May / June
(field trip)

5

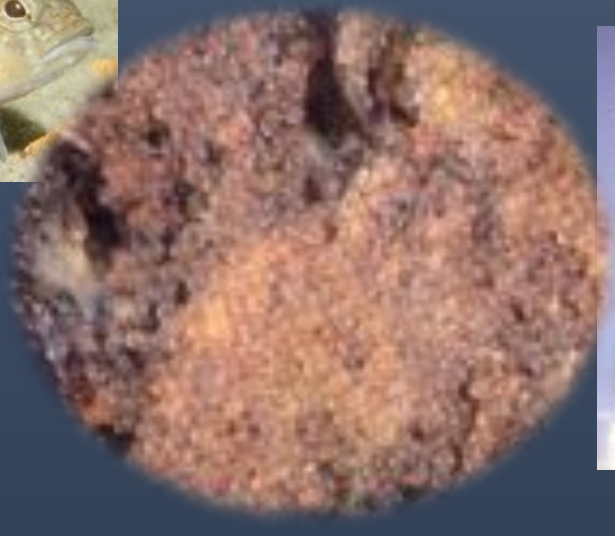
Data Analysis
(classroom)

6

Comparison
and Summary
(classroom)

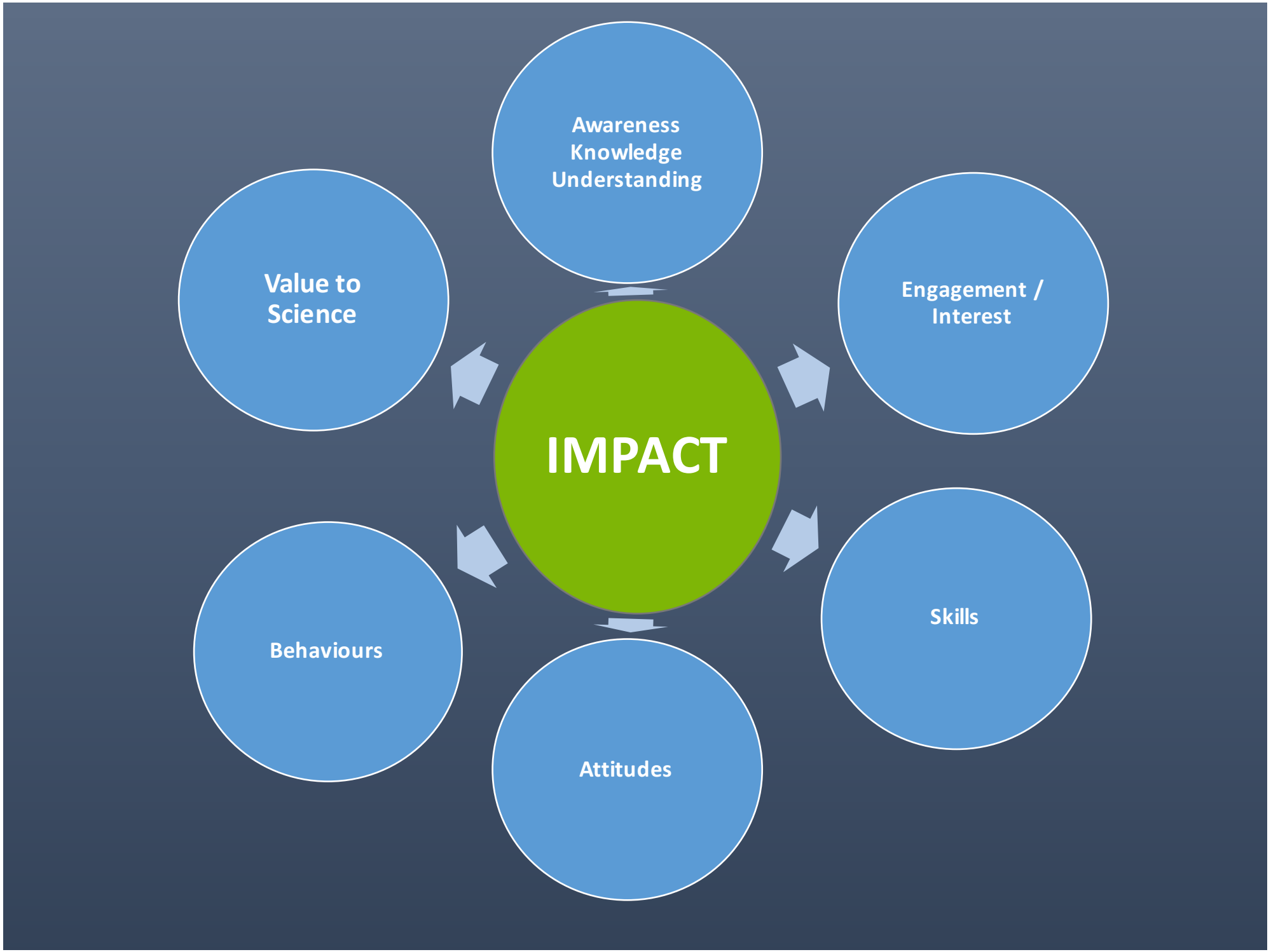


Cool Discoveries…



SCHOOL OUTCOMES:

- Authentic context for learning
- Supported school principles and values
- Curriculum links to: Science, Math, English, Languages, Art, Health, PE
- Teacher PD
- Engagement of wider school community


Awareness
Knowledge
Understanding
Engagement /
Interest
Skills
Attitudes
Behaviours
Value to
Science
IMPACT

Parent Feedback

"I came along to both MM2 rocky shore sessions, and have observed the work done in class. I have also talked about with Esmé quite a lot, and listened as she has told various people about the harbour, and nudibranchs etc. She is really into it! **It is clear that this type of experiential learning, with a chance to reflect and present on learning, is very impactful for children/learners.** That the subject of study is something so vital as the health of our harbour is just wonderful. Contributing to real research, and being part of a large group of people from all over, has also been a real buzz for Esmé. Parents and children sharing experiences is also great. "

Aaron Blaker

Parent, Yr 3-4 class, Arthur Street School


interesting
discoveries
dredging
amazing
sediment
creatures
protect
maths experience
care
educational
fun
sea
good
salty
pollution
water
fantastic
life
weather-dependent
fish
freezing
marine
muddy
conservation
helpful
data
exploring
entertaining
octopus
rain
temperature
science
environment
natural
sad
happy
investigate
surprising
bad
habitat
curious
informative
ocean
salt
confusing
cold
seaweed
unique
important
wildlife
starfish
awesome
windy
seashore
statistical
knowledge
wet
proud
crab
eye-opening
sealife
teamwork
fascinating
experiment
photosynthesis
exciting
rocky
differences
learning
environment
cool
harbour
animals
sea-creatures

Student Feedback

What have you learnt about the way scientists work during our MM2 study?

They:

- work together and help each other
- ask questions
- collect data and measure carefully
- do the same thing over and over again to see if anything has changed
- observe every marine animal carefully
- have to be patient
- look after the plants and animals
- make predictions
- go to the same place over and over again to see if anything has changed
- take time and they don't give up until they are finished
- look at the data and sometimes change their minds.

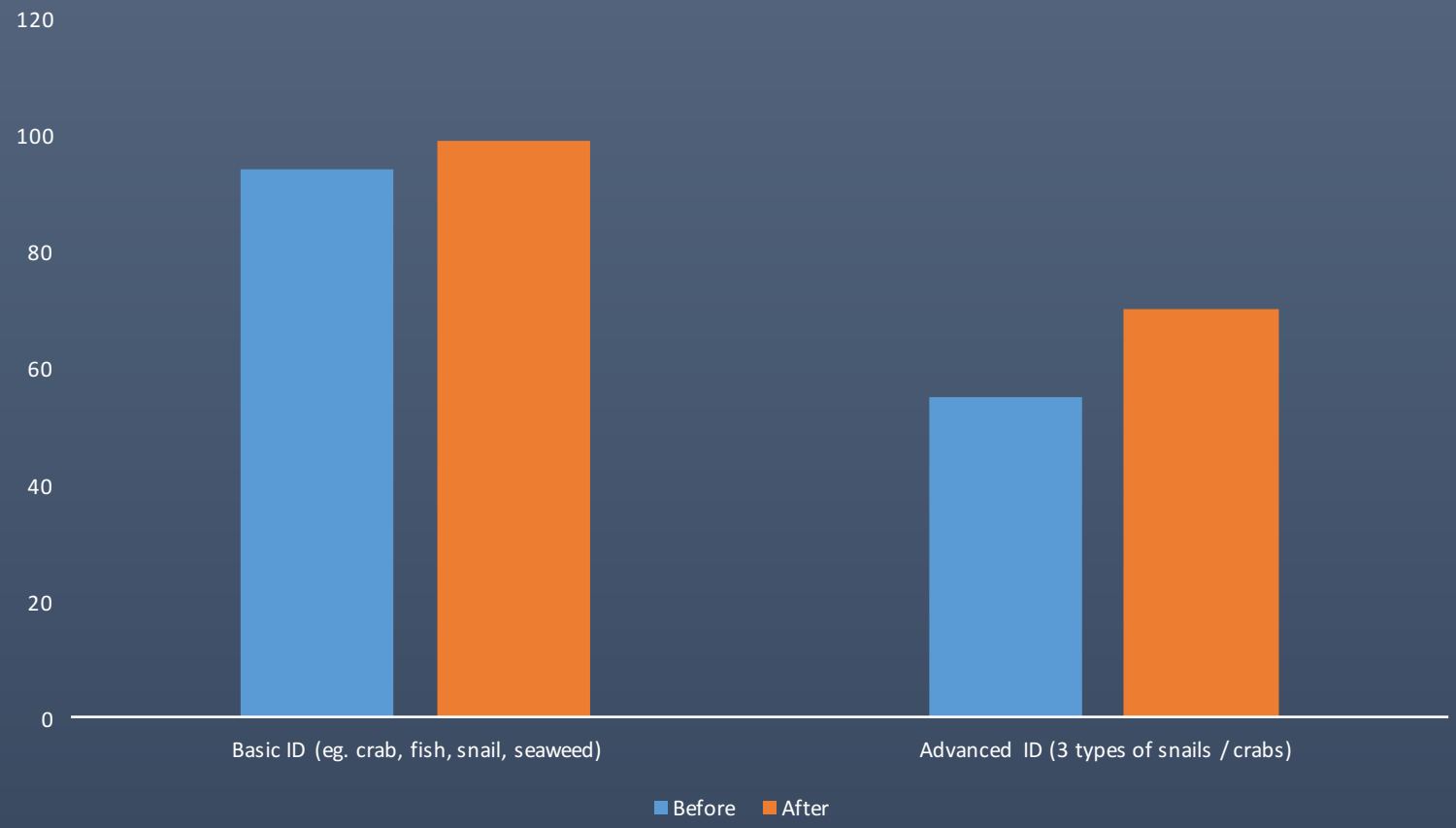
Yr 3-4 class, Arthur Street School

STUDENT OUTCOMES:

- Experience with marine environment / science

# students	Before	After
Visited the seashore	93%	100%
Identified or counted animals or plants on shore	76%	100%
What parts of the S&S project interests you the most?	1.Exploring the seashore 2. Being outside 3. Learning new skills	1. Exploring the seashore 2. Being outside 3. Learning about the local environment

Identification Skills



SCIENCE OUTCOMES:

- **Sediment cover:**
  - highly variable within the harbour
  - typically greater at the low tide level compared to mid tide
  - greater sediment cover among sites close to the turning basin at Port Chalmers.

- **Species richness:**
  - animal and macroalgal richness was negatively correlated with sediment cover
  - lower species richness found in sites with high sediment cover

- **Vulnerability Index:**
  - Species that showed low vulnerability to sedimentation were relatively rare at all sites
  - Species that showed very high vulnerability to sedimentation were the most abundant across the harbour

Feedback from Scientists…

"*The most important lesson I took away which may aid other citizen science projects is to ensure to the system of data entry, storage and analysis is establish or at least well planned before commencing the project. This will hopefully minimise the issues associated with dealing with large data sets.*"

"As usual, I think we underestimated how much work was needed at the back-end to bridge the gap between collection and presentation."

Dr Daniel Prichard

Where to from here?

- This work has created a great baseline and established repeatable methods
  - quality control methods
- We now need to…
  - Continue sampling
  - Cover all seasons
  - Look in new locations
  - Improve methods for measuring sediment deposition
- Challenge is to put data into use
  - Engagement with industry
  - share project with other regions

"Sedimentation ranked as one of the top 4 threats to marine habitats"

Whose Science?
For what purpose?

To engage schools and communities across NZ's coastal regions to participate in the Mm2 project we need to show them how the project can be used to address issues of local concern…

- understand of value of long term data sets
  - *Why should we engage with this project?*
- interpret their data
  - *What does this information tell us about our marine environment?*
- ask questions about issues relevant to their region
  - *What is having an impact on our marine environment?*
- design further studies to answer those questions
  - *How can we better understand what is affecting our marine environment?*
  - *What can we do to help restore our coastal environment?*

Partnerships

Science

- Science questions
- Standardized protocols
- Resources
- Science expertise

Schools

- diverse audience
- authentic context for curriculum
- Teaching resources

Community

- Environmental concerns
- Local knowledge
- Networks for community action

What questions are scientists asking?

- Baseline data … environmental monitoring
- Invasive species … spread / impact
- Distribution … habitats / range
- Impact of climate change
- Location of indicator species
- Traditional values and community knowledge

Recruitment?

Rare?

Population Variability?

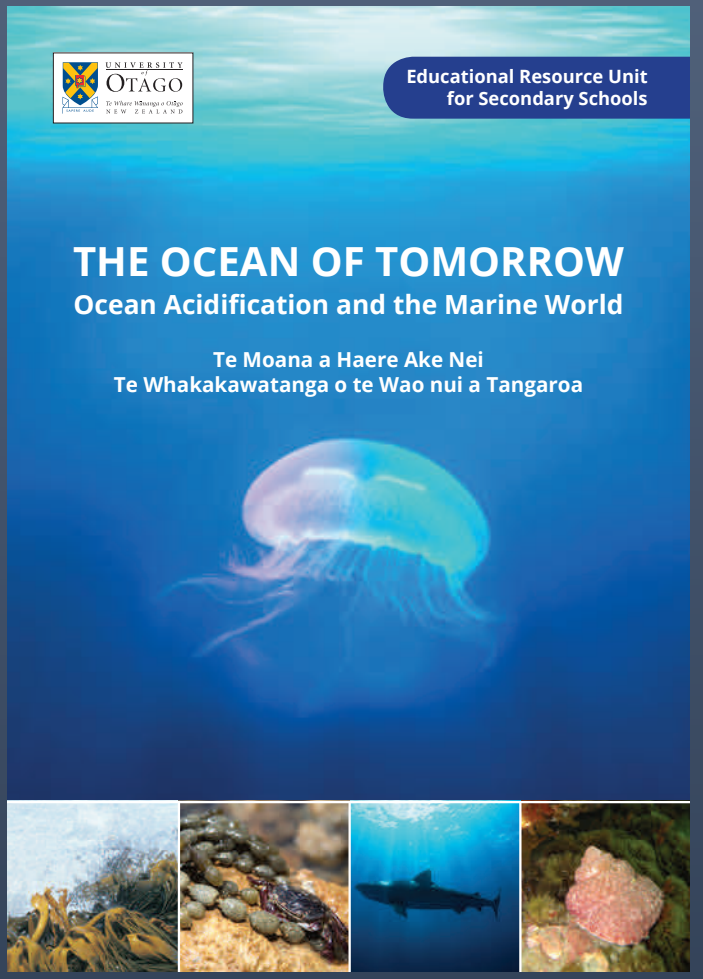
FUTURE PLANS

- delivery of workshops / field trips in partnership with scientists, environmental managers, iwi, schools and community groups etcl
- develop methods, resources and training systems to improve the quality of the data collected (eg. app for data collection) and create links to other relevant tools and organisations (eg Naturewatch).
- facilitation of the extension of the project to address local questions and encourage stewardship and restoration projects;
- Share stories and case studies
- develop a feedback (rewards) system to acknowledge contributions and encourage long term involvement of participants.
- Development of a reporting system to help participants interpret and understand the health of their local marine environment.

Cultivating curiosity…

Ultimately we want to educate and support communities to be effective guardians of their coastal environment.

New Projects…



Thanks

- All the students, teachers and parents involved in data collection.