Enhancing A Citizen Science Program For Mollusc Monitoring

Jack Duryea, Alisa Gueco, Julia Karman, Cooper Mann

April 24, 2024

Team Members

Jack Duryea
Civil Engineering

Alisa Gueco
Mechanical Engineering

Julia Karman
Biomedical Engineering

Cooper Mann
Robotics Engineering

Land Acknowledgement

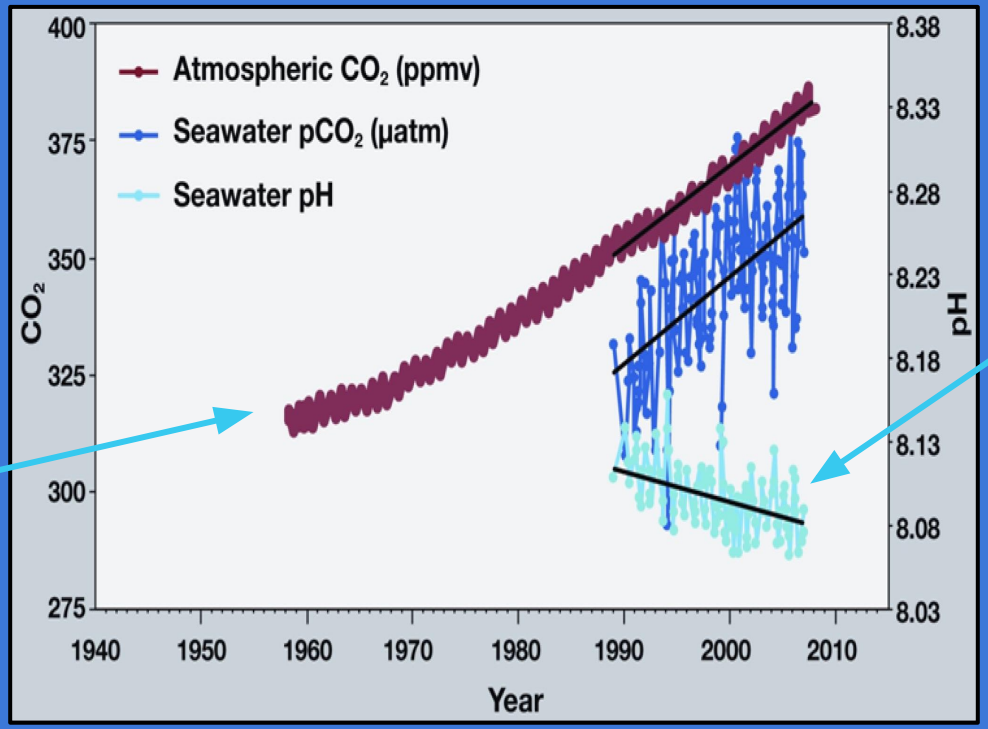
We acknowledge the Kulin Nations, including the Yalukut Weelam clan of the Boon Wurrung language group, traditional owners of the land on which we are located.

We pay respects to their Elders past and present, and extend that respect to other Aboriginal and Elder members of our multicultural community.

Molluscs Have Significant Roles in Port Phillip Bays' Diverse Coastal Ecosystem

The Mollusc Populations in Port Phillip Bay Are Vulnerable to Ongoing Threats

The Ocean is Acidifying

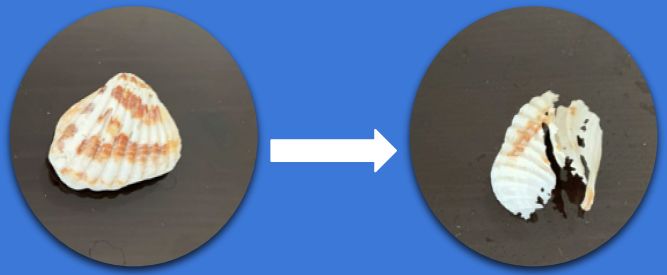


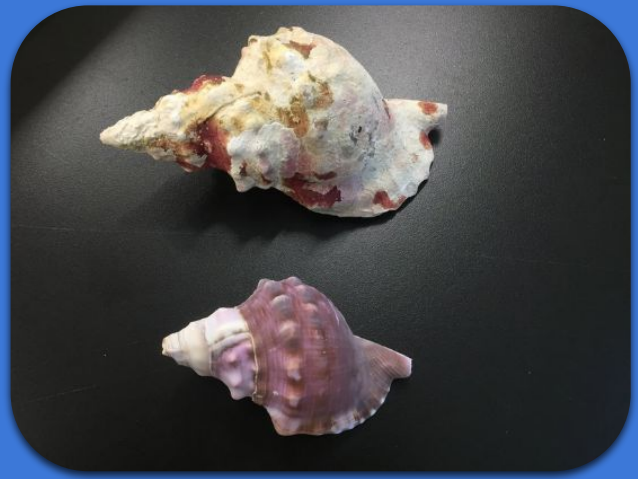
CO_2 Levels

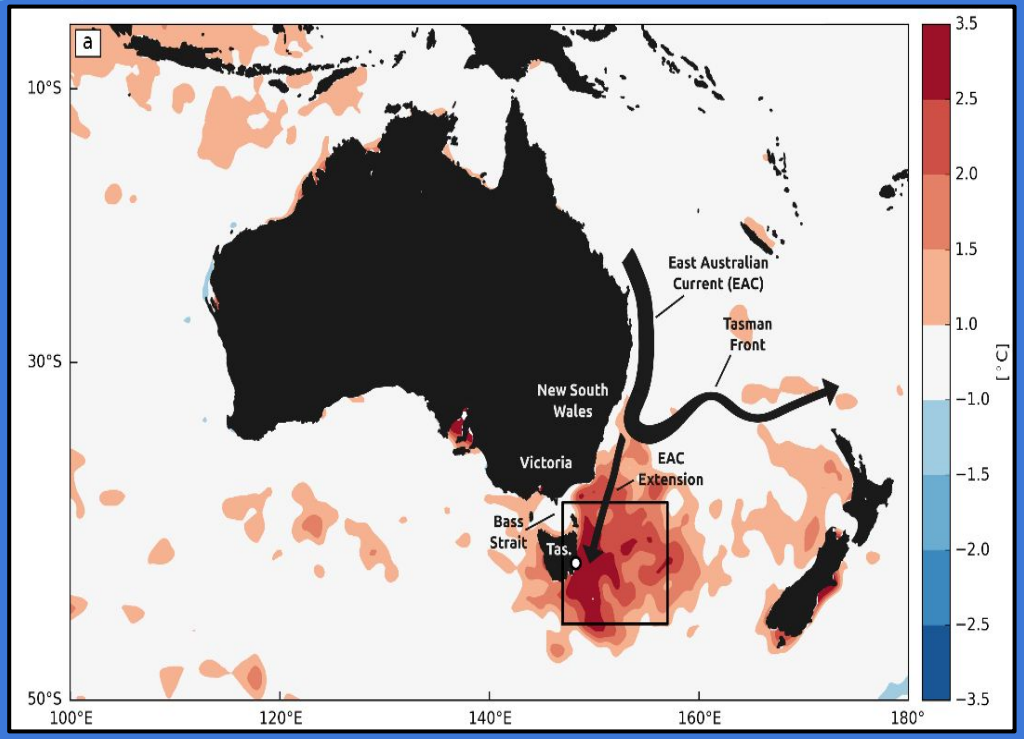
Seawater pH

(National Oceanic and Atmospheric Administration, 2020)

Ocean Acidification Weakens Mollusc Shells







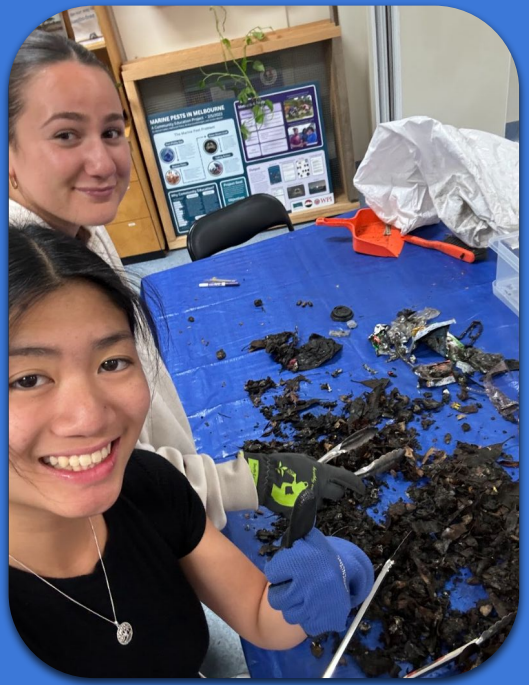
Marine Heatwaves Negatively Affect Mollusc Growth and Filtration Process

Temperature Scale

(Marine, 2015)

The Invasive Northern Pacific Seastar is a Voracious Mollusc Predator

Citizen Science Engages Communities in Environmental Research



What makes a Strong Citizen Science Program?

Project Goal

Refine and promote the Port Phillip EcoCentre mollusc citizen science program by providing recommendations for their shoreline shell surveys to increase community engagement and data reliability.

1. INVESTIGATE THE ROLE OF MOLLUSC SPECIES IN PORT PHILLIP BAY AND REPORT ON KEY INFORMATION AND FINDINGS.

2. DETERMINE EFFECTIVE METHODS OF CITIZEN SCIENCE SURVEYS AND ANALYZE ASPECTS OF THE ECOCENTRE'S SHORELINE SHELL SURVEY.

3. DEVELOP AND PROVIDE RECOMMENDATIONS TO UPDATE THE ECOCENTRE'S SHORELINE SHELL SURVEY.

4. IMPLEMENT THE ECOCENTRE'S MOLLUSC CITIZEN SCIENCE PROGRAM THROUGH MEDIA CONTENT TO INCREASE COMMUNITY ENGAGEMENT.

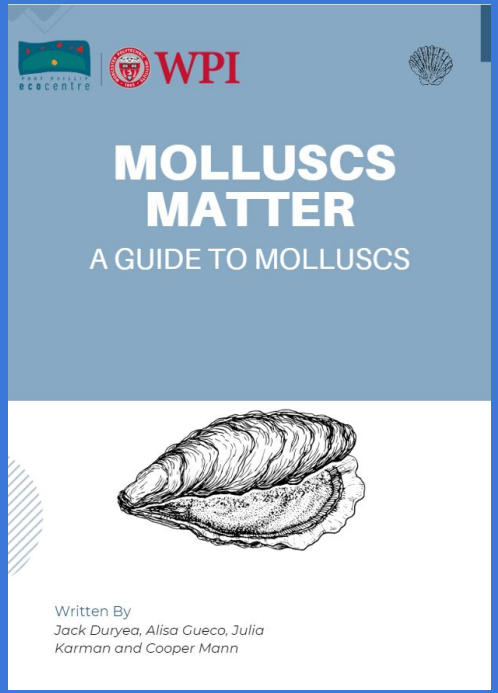
Key Findings and Survey Updates

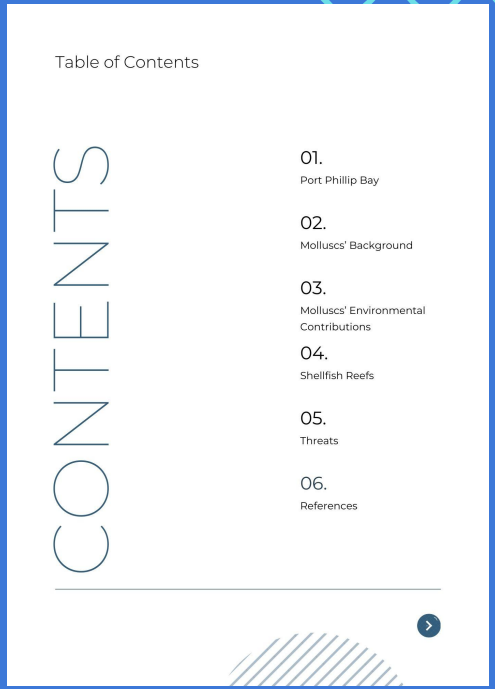
Objective 1

1. INVESTIGATE THE ROLE OF MOLLUSC SPECIES IN PORT PHILLIP BAY AND REPORT ON KEY INFORMATION AND FINDINGS.

Molluscs Matter!

- Desktop Research
- Literature Reviews
- Interviews





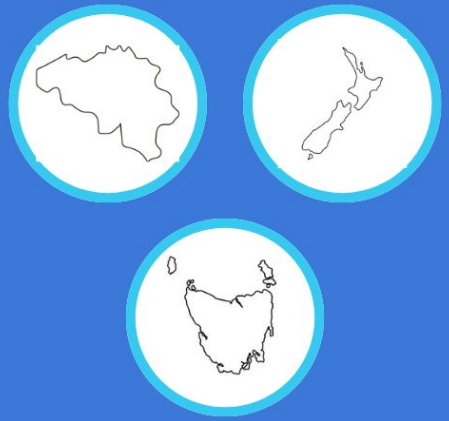
Objective 2

2 DETERMINE EFFECTIVE METHODS OF CITIZEN SCIENCE SURVEYS AND ANALYZE ASPECTS OF THE ECOCENTRE'S SHORELINE SHELL SURVEY.

Evaluate Case Studies

BELGIUM

The Big Seashell Survey



NEW ZEALAND

Northern North Island Shellfish Survey

TASMANIA

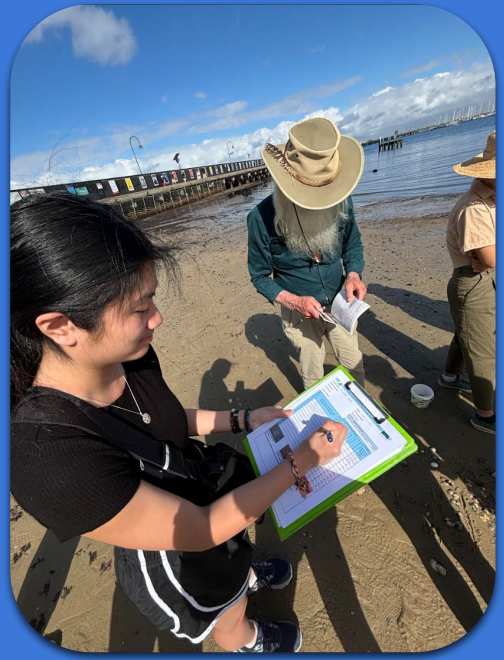
Small Bivalve Survey

Perform Interviews

Interview with Dr. Gary Poore, Principal Marine Biology Curator at Museums Victoria

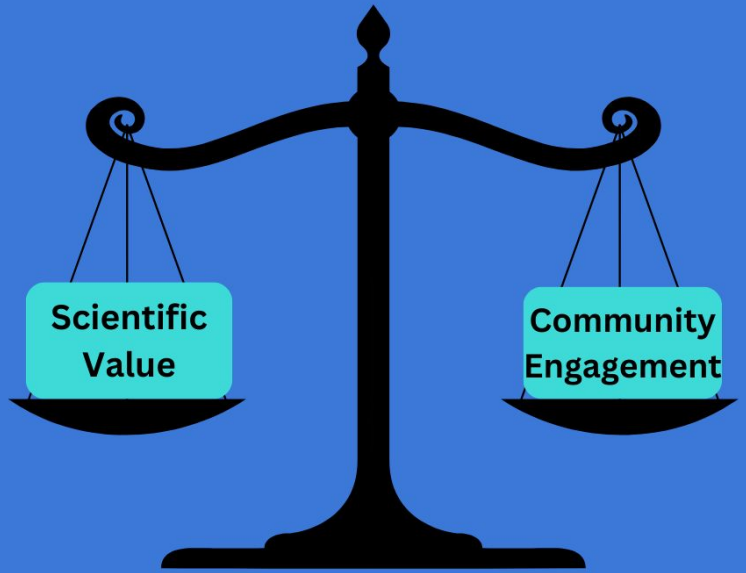
Virtual Interview with Mr. Kade Mills, Victorian National Parks Association Reefwatch Coordinator

Evaluating Survey Through User Experience



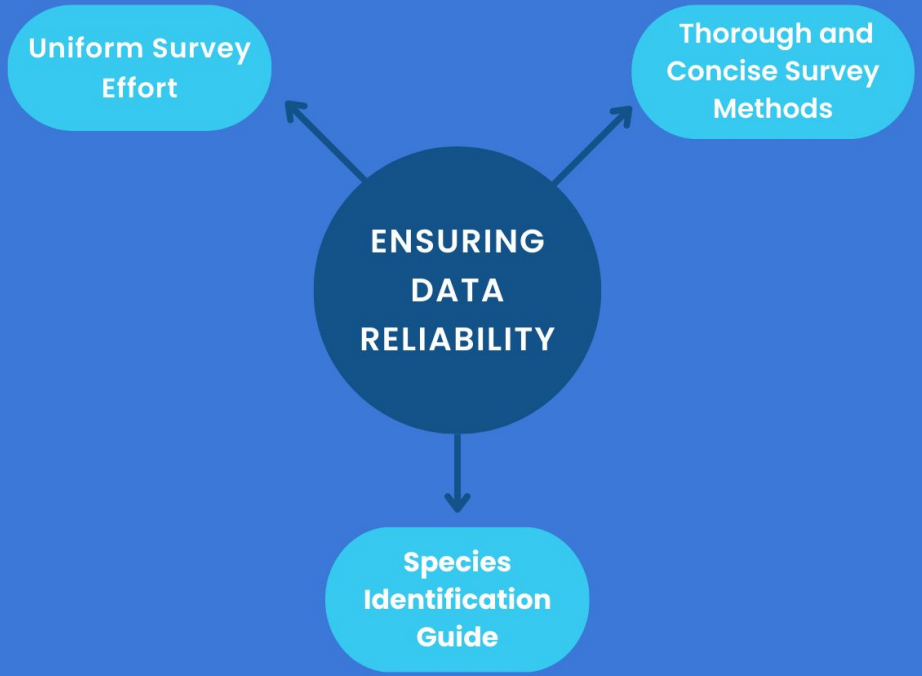
Survey Criteria

Citizen Science Programs Must Balance Scientific Value and Community Engagement



Measuring Metrics Provide Scientific Value

Consistent Methodologies Supported By Identification Resources Ensure Data Reliability



Standardized Collection Areas Lead to Reliable and Comparable Data

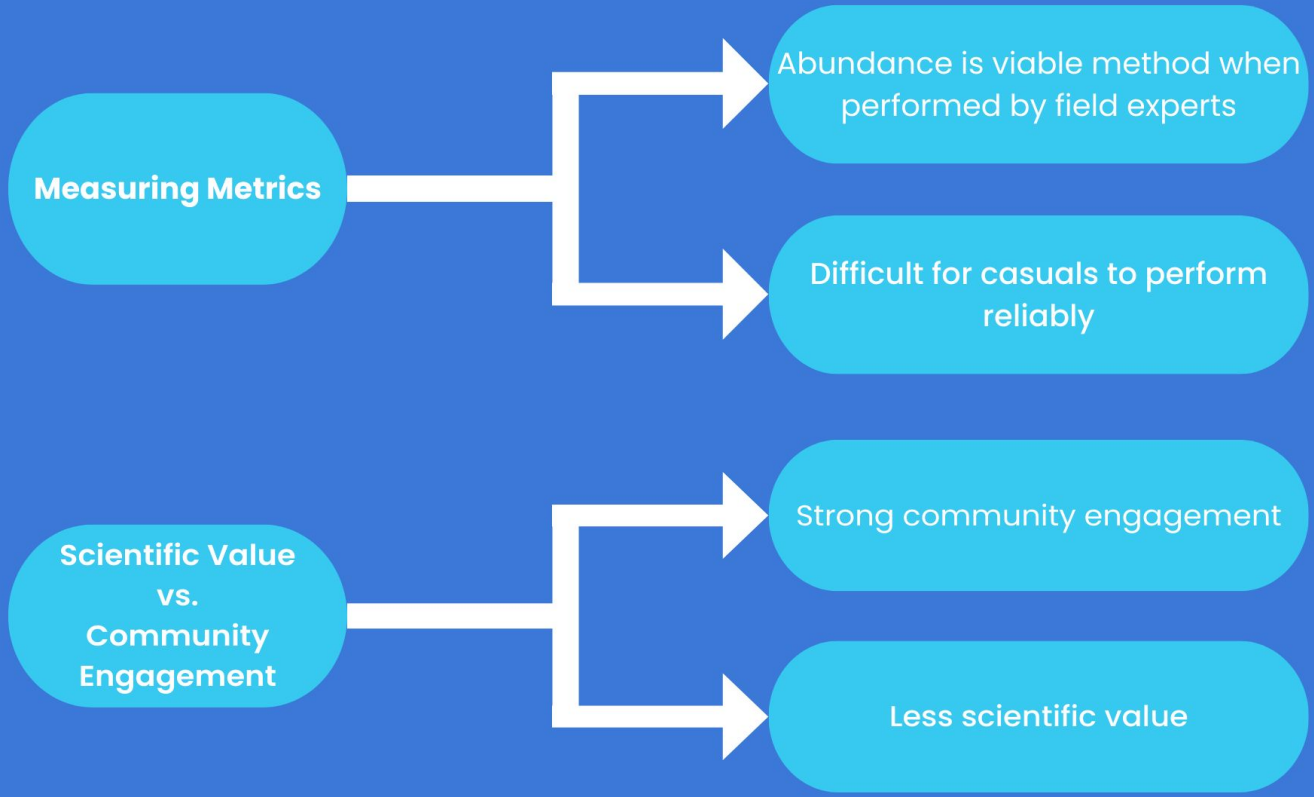
> **"In order to monitor population trends, area needs to be standardized."**
>
> ***- Kade Mills, VNPA Reefwatch Coordinator***

Key Aspects To Current Survey Methods

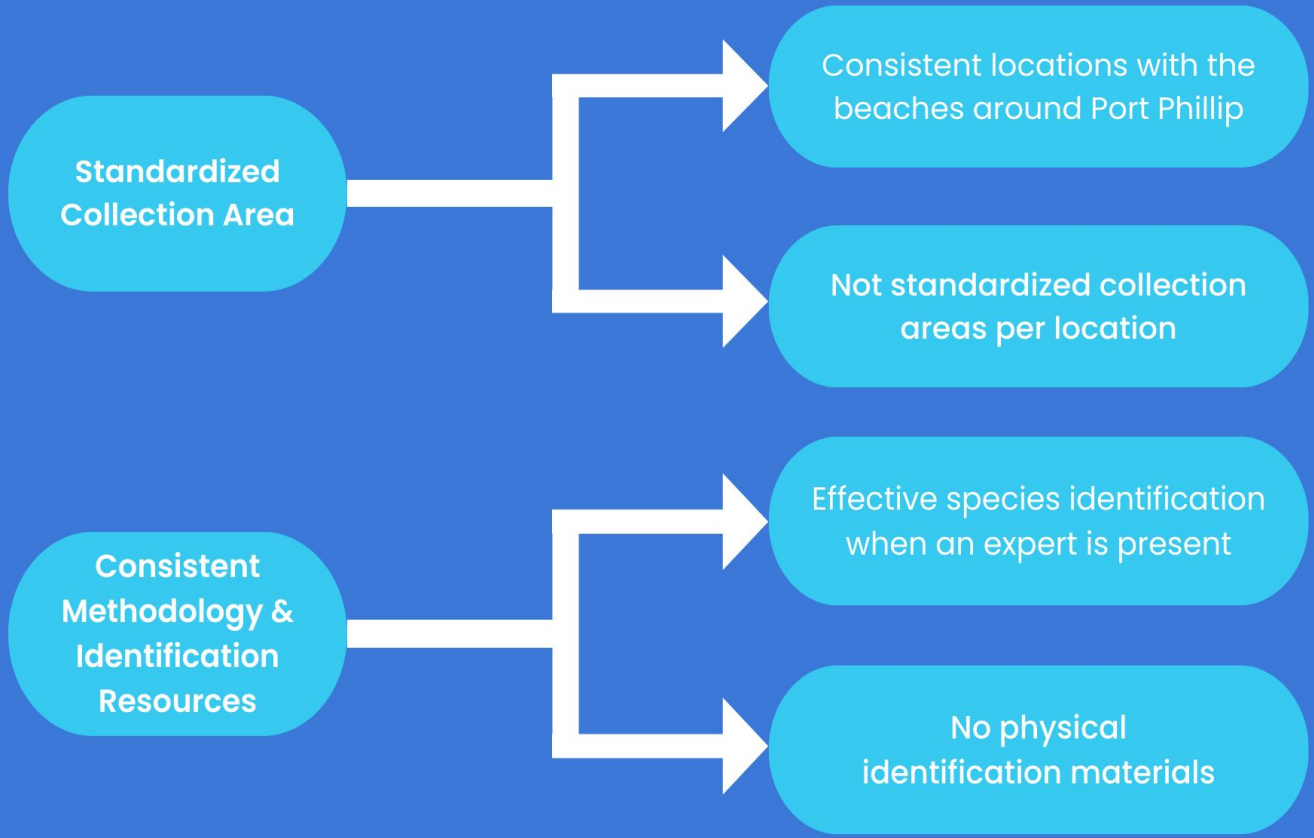
- Two Landmarks at Least 40 Paces Apart
- Record Start and End Time
- Collect Different Types of Each Shell
- Shell Identification from Field Expert

- Estimate the Number of Each Shell Type
- Record Number of Intact Shells
- Record Length of Largest Shell
- Take Pictures of Each Shell Species

Survey Criteria Evaluation



Survey Criteria Evaluation



Objective 3

3 DEVELOP AND PROVIDE RECOMMENDATIONS TO UPDATE THE ECOCENTRE'S SHORELINE SHELL SURVEY.

Species Identification Guide

1. BLUE MUSSELS

(Mytilus Galloprovincialis planualtus)

- Black, blue-black or brown shell
- Teardrop shaped with concentric lines marking the outside
- Distinct ridges running along their length

2. PACIFIC OYSTERS

(Crassostrea gigas)

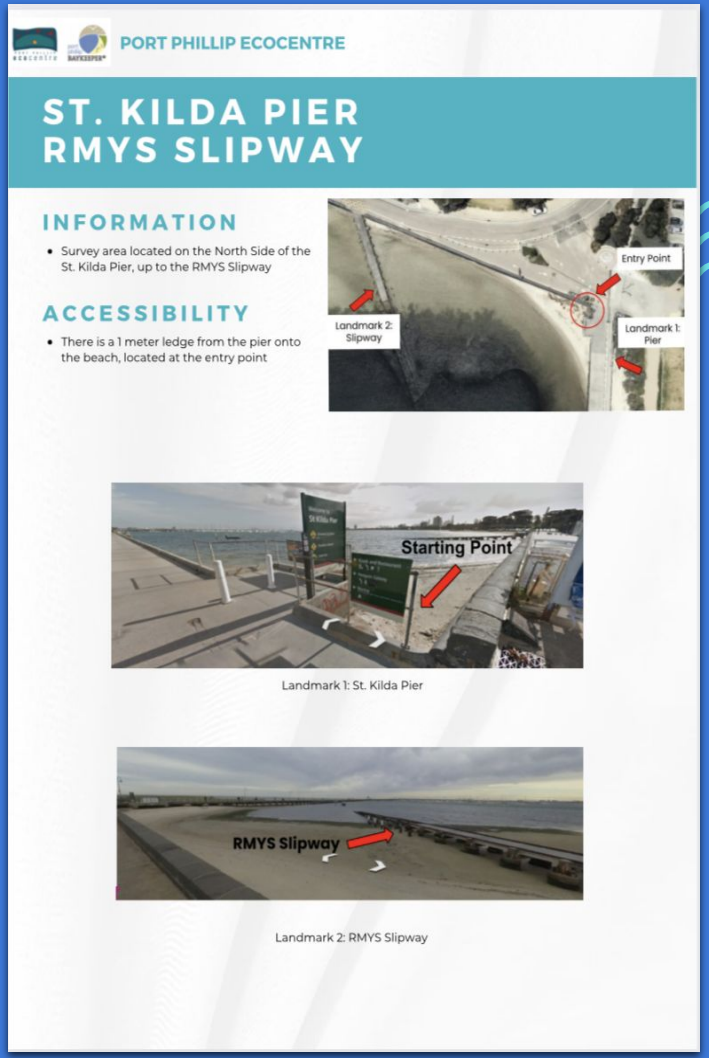
- Elongated, thick, rough and sometimes sharp shell
- Interior is white to off/white with purple streaks
- "Cupped" shape Shell

Fresh Kill Identification

Figures 3 & 4: Examples of Fresh Kills

4. Record each shell species on the data sheet and the number of shells collected of each species. For each species, mark the number of freshly killed shells. A freshly killed shell will have a hinge ligament that is still intact. Refer to figures 3 and 4 to see what a fresh kill looks like.

Survey Location Guide to Standardize Survey Areas



PORT PHILLIP ECOCENTRE

ST. KILDA PIER RMYS SLIPWAY

INFORMATION

- Survey area located on the North Side of the St. Kilda Pier, up to the RMYS Slipway

ACCESSIBILITY

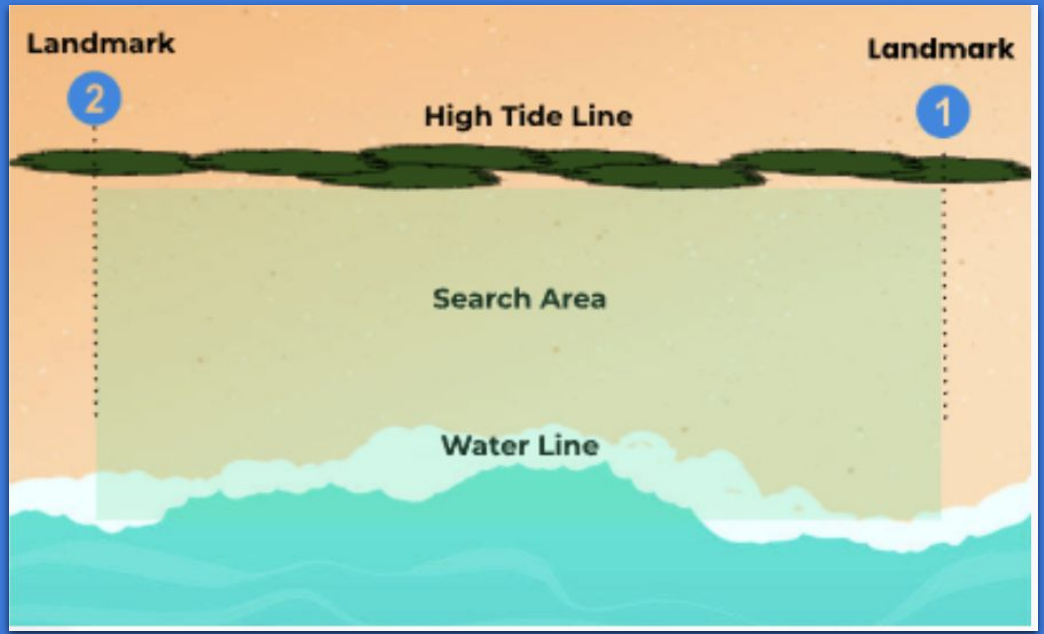
- There is a 1 meter ledge from the pier onto the beach, located at the entry point

Landmark 1: St. Kilda Pier

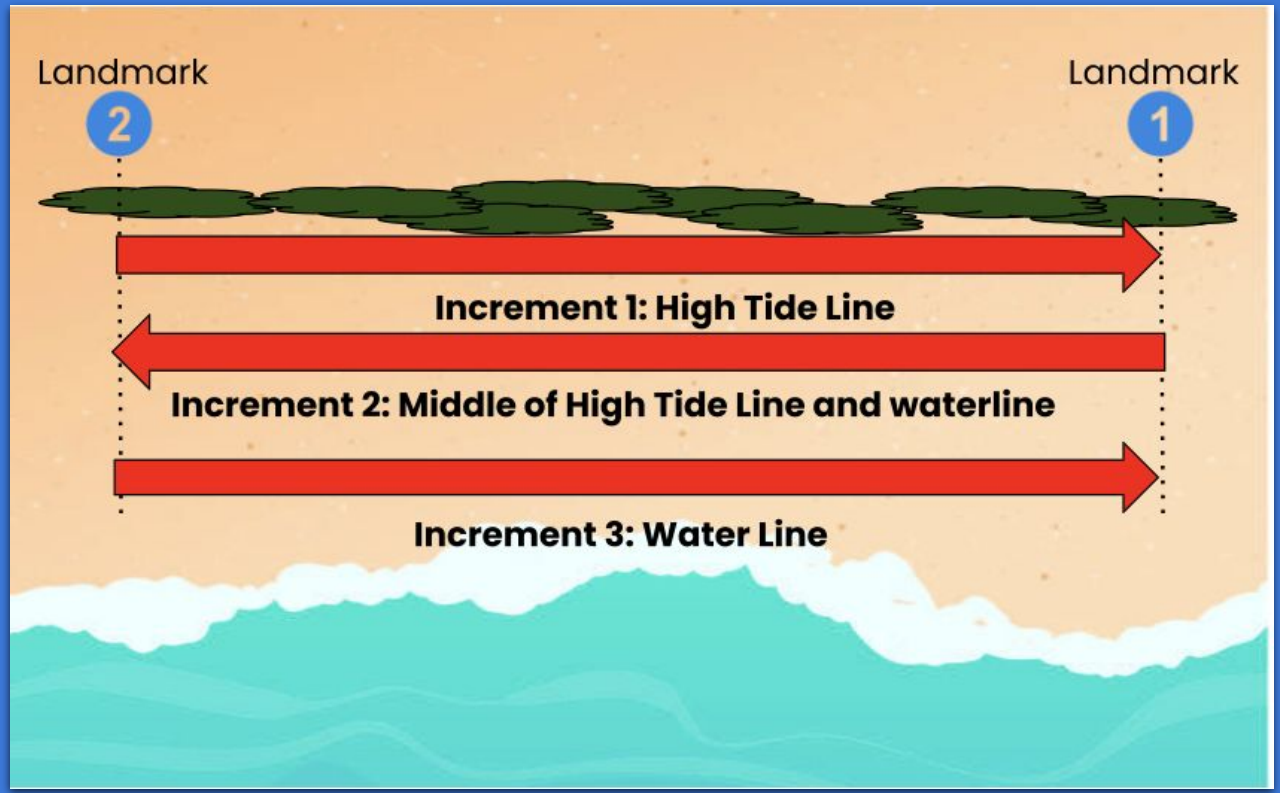
Landmark 2: RMYS Slipway

“Collect as many shells as possible within the time period”

20 Minute Time Cap



Three 10 Minute Survey Increments



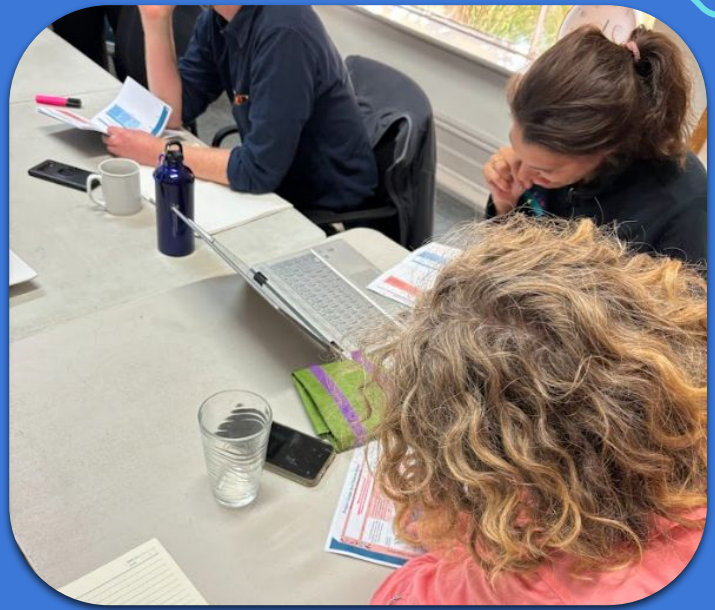
Other Updates

SMALLEST SHELL SIZE (CM)	LARGEST SHELL SIZE (CM)

Objective 4

4 IMPLEMENT THE ECOCENTRE'S MOLLUSC CITIZEN SCIENCE PROGRAM THROUGH MEDIA CONTENT TO INCREASE COMMUNITY ENGAGEMENT.

Shoreline Shell Survey Workshop



Interviews and Case Studies

INTERVIEWS

Advertising strategies to connect the community

CASE STUDIES

Connections between participation and community engagement

Key Principles For Community Engagement

Media Inspires People to Engage

Accessible Findings Incentivize Citizen Science Involvement

Program Follow-Up Fosters Interpersonal Relations

Conceptualized Shoreline Survey Website

PROJECT STORY

Inspire citizens to volunteer and help leave a positive impact on the environment

Shoreline Shell Surveys

Let's Shell-ebrate Our Coastlines! Conduct a Shoreline Shell Survey.

Help us convey the vital role mollusc play in maintaining the balance of marine ecosystems. Molluscs, often overlooked, play a vital role in maintaining the balance of marine ecosystems, serving as both prey and predators. Their presence reminds us of the interconnectedness of all life forms and the delicate web of biodiversity that sustains our planet. By becoming aware of the importance of molluscs, we advocate for the protection of our oceans and the preservation of Earth's natural heritage for generations to come.

Conceptualized Shoreline Survey Website

ACCESSIBLE DATA

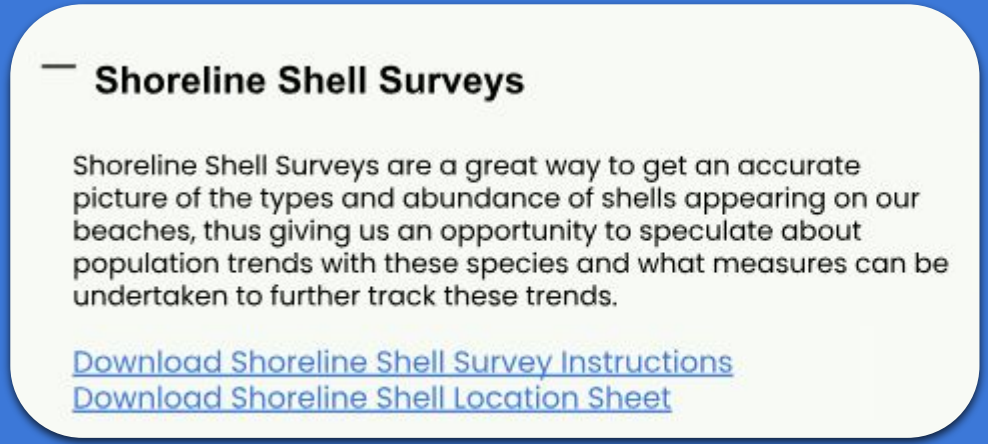
Participants can view the current data and status of the program

		Survey date		11/3/2011			2/18/2014			5/1/2014			2/19/2015			11/8/2016		
Ref page	Common name	Scientific name	Max Length	Datasheet #	Abundance	Length	Datasheet #	Abundance	Length	Datasheet #	Abundance	Length	Datasheet #	Abundance	Length	Datasheet #	Abundance	Length
76	Blue Mussel	*Mytilus galloprovincialis*	80	4	10	70	1	10	75	15	10	76						
86		*Fulvia tenuicostata*	50	6	8	45				22	10	25						
74	Sydney Cockle	*Anadara trapezia*	80	5	5	70				23	8	55						
		Turbo undulatus	60	1	2	60	4	8	50	3	5	45						
36	Sand Snail	*Polinices sordidus*	50	2	2	40	6	5	35	1	8	35						
80	Common Mud Oyster	*Ostrea angasi*	100	7	2	70				14	10	88						
96	Smoky Venus	*Eumarcia fumigata*	42	11	1	42												
50	Cominella	*Cominella lineolata*	37							10	5	34						
94		*Soletellina biradiata*	60							21	10	46	1	2	60			
20		*Austrocochlea odontis*	20							5	8	12						
36	Conical Sand Snail	*Polinices conicus*	35	2	2	32				2	5	35						
`		*Cellan solida*	40															
98	Ridged Venus	*Katelysia rhytiphora*	45	10	5	45												
80		*Notospisula trigonella*	24							28	10	24						
102		*Pholas australasiae*	85	3	2	85	2	2	70									
98		*Katelysia scalarina*	35							24	5	20						
10	Ariel Pattellid Limpet -	*Cellana tramoserica*	36							12	5	36						
54		*Nassarius pyrrhus*	17							11	5	17						
76		*Xenostrobus pulex*	28															
50		*Pleuroploca australisia*	100							8	2	56						
74		*Barbatia pistachia*	37							6	2	31						
100		*Venerupis galactites*	57	12	1	57												
		Asterias amurensis	0															
20		*Austrocochlea concamer*	23							4	2	23						
78	Butterfly shell	*Electroma georgiana*	27							210	2	27						
12	Abalone	*Haliotis rubra rubra*	90															
46		*Pterynotus triformis*	50															
26		*Zeacumantus diemenens*	16							9	2	16						
56		*Amoria undulata*	60															
48		*Dicathais orbita*	47															
98		*Gomphina undulosa*	16							27	1	16						
26		*Nerita atramentosa*	18															
		11 armed seastar	0															
80		*Anomia trigonopsis*	0															
44		*Ataxocerithium serotinur*	0															
20	Ribbed Top shell -	*Austrocochlea constricta*	0															
20		*Austrocochlea porcata*	0															
96		*Bassina disjecta*	0															
26		*Batillaria australis*	0															

		Survey date	2/23/2017			11/21/2017			1/13/2018			3/13/2018			7/18/2018			1/15/2019		
Ref page	Common name	Scientific name	Datasheet #	Abundance	Length	Datasheet #	Abundance	Length	Datasheet #	Abundance	Length	Datasheet #	Abundance	Length	Datasheet #	Abundance	Length	Datasheet #	Abundance	Length
76	Blue Mussel	*Mytilus galloprovincialis*	3	5	76	3	10	75	8	10	75	21	10	80	2	8	80	1	10	80
86		*Fulvia tenuicostata*	2	10	46	1	10	50	2	5	48				4	10	40	10	8	37
74	Sydney Cockle	*Anadara trapezia*	1	8	64	2	8	75	1	2	48	25	10	80	21	10	30	4	2	60
		Turbo undulatus	22	5	45				3	5	48	27	10	50	1	5	60	9	10	39
36	Sand Snail	*Polinices sordidus*	21	5	36	24	2	30	5	2	38	22	8	40	3	8	50	7	5	35
80	Common Mud Oyster	*Ostrea angasi*				29	5	100	9	2	100				3	8	100	3	5	100
96	Smoky Venus	*Eumarcia fumigata*	7	2	23	4	5	29	6	5	30				5	8	25	15	5	35
50	Cominella	*Cominella lineolata*	23	2	32	5	5	33							5	5	25	11	5	37
94		*Soletellina biradiata*							14	2	50	28	8	50						
20		*Austrocochlea odontis*																17	5	20
36	Conical Sand Snail	*Polinices conicus*				21	5	30	4	1	22									
`		*Cellan solida*	**24**	**2**	**38**	5	2	39				23	8	40						
98	Ridged Venus	*Katelysia rhytiphora*	6	5	32															
80		*Notospisula trigonella*																		
102		*Pholas australasiae*	5	1	71				11	2	80							2	2	65
98		*Katelysia scalarina*																6	2	35
10	Ariel Pattellid Limpet -	*Cellana tramoserica*																		
54		*Nassarius pyrrhus*																		
76		*Xenostrobus pulex*	4	5	28															
50		*Pleuroploca australisia*													4	2	100			
74		*Barbatia pistachia*																14	1	37
100		*Venerupis galactites*																5	2	50
		Asterias amurensis														2				
20		*Austrocochlea concamer*																		
78	Butterfly shell	*Electroma georgiana*																		
12	Abalone	*Haliotis rubra rubra*													2	2	90			
46		*Pterynotus triformis*																7	2	50
26		*Zeacumantus diemenens*																		
56		*Amoria undulata*										26	1	60						
48		*Dicathais orbita*																12	1	47
98		*Gomphina undulosa*																		
26		*Nerita atramentosa*							13	1	18									
		11 armed seastar																		
80		*Anomia trigonopsis*																		
44		*Ataxocerithium serotinur*																		
20	Ribbed Top shell -	*Austrocochlea constricta*																		
20		*Austrocochlea porcata*																		
96		*Bassina disjecta*																		
26		*Batillaria australis*																		

Totals and Counts | Altona Chart | Dromana Chart | Pt Gellibrand Chart | Pt Lonsdale Chart | Rye Chart | Seaford Chart | St Kilda Beach Chart | St Kilda Pier to RMYS Chart

Conceptualized Shoreline Survey Website



SURVEY MATERIAL

Printable materials are available for volunteers to conduct the shoreline shell survey.

LEARNING TOOLS

Supplementary materials are available to learn more about molluscs and the EcoCentre

Additional Recommendations

- Social Media Posts
- Email Alias
- Certificate of Completion
- Posters in Public Places
- Consistency with Event Dates

Acknowledgements

IQP Advisors
Professor Beth Eddy
Professor Stephen McCauley

EcoCentre Staff
Neil Blake
Tyler King
Sabrina Trocini

Special Thanks
All of our interviewees and workshop volunteers

Thank you!

Questions?