

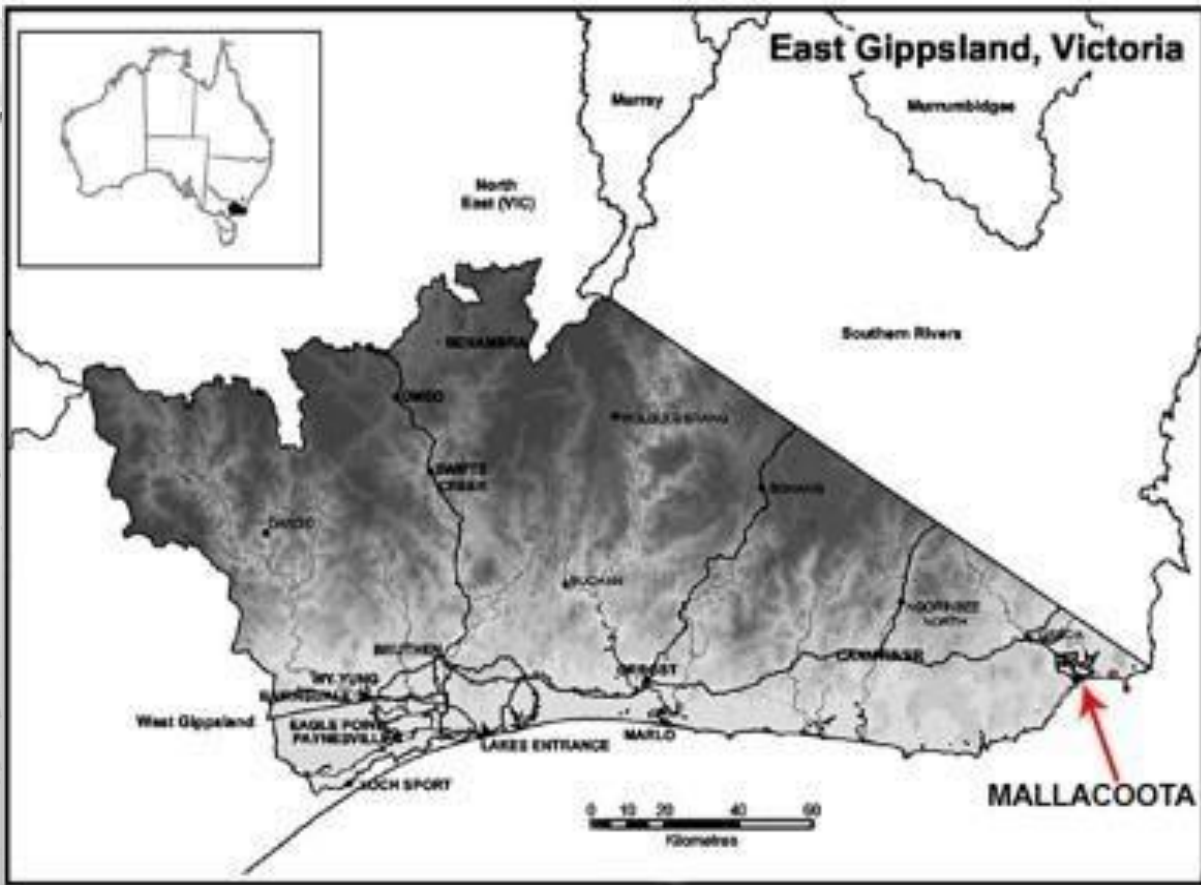
MALLACOOTA KELP FOREST RESTORATION PROJECT

A HISTORY OF URCHIN INCURSION &
MITIGATION PROJECTS IN EASTERN
VICTORIA.

September 2022



Environment,
Land, Water
and Planning



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Project Strategy

Keys to success

- Collaboration between EZAIA, VSUDA and VFA through formal processes, establishing priority sites, documented actions and work schedules for recovery all supported by appropriate permits and reviewed annually.
- The use of industry divers including urchin harvesters in the culling program, enabling adaptive management practices.

Objectives

- To prevent further loss of healthy abalone habitat at key reef locations.
- To recover recently formed barrens to healthy abalone habitat.

Methods

- A list of priority reefs areas and identify appropriate urchin control methods, in consultation with the urchin industry.
- Site selection informed by Diver observations, FIS data, geographic characteristics & budget constraints.
- Target resources at the coal face of removing urchins to maximize environmental benefit for dollars spent.
- Harvesting; is the priority control to be applied wherever urchins are commercially viable.
- Subsidized Harvesting; may be applied to encourage harvesting from remote or marginally viable areas.
- Culling: to be applied only where urchins are not commercially viable or when a rapid response is required.
- Work is coordinated by an onsite project manager.
- Diver must maintain a logbook including, Date, Location, Dive time, Depth range, number of urchins culled.
- Vessels must have a VMS fitted and operational.
- The best time of the year to cull urchins is summer and autumn due to the life cycle of kelp.
- Consider that “An ounce of prevention is worth a ton of cure”.
- Avoid culling bays & sheltered areas because turfing algae not suitable for abalone may become the dominate species.

PROGRAMS:

YEAR	PROGRAM	DESCRIPTION	FUNDING
2011	EZAIA / VFA Island Point Project	“Removing sea urchins (<i>Centrostephanus rodgersii</i>) to recover abalone (<i>Haliotis rubra</i>) habitat.”	\$140k EZAIA/VFA
2011-2021	EZAIA / VSUDA Urchin biomass reduction.	Staged roll out of urchin culling, support for urchin harvesting via subsidies and surveys.	\$430k/10yr EZAIA
2015-2018	FRDC 2014-224	“Rebuilding abalone populations to limit impacts of the spread of urchins, abalone viral ganglioneuritis and theft”	\$150k/ 3yrs FRDC
2018 -2020	DEWLP/VFA/EZAIA Gunshot	“Biodiversity Response Planning – Marine Targeted Actions; Restoring Marine Habitat and Biodiversity in Eastern Victoria.”	\$162k/2yrs years. DEWLP.
2018-2019	FRDC 2017-049	“Monitoring abalone juvenile abundance following removal of <i>Centrostephanus</i> and translocation.”	\$50k FRDC
2019	VFA	“VFA (2019) Spatial and temporal trends in the abundance of long-spined sea urchins (<i>Centrostephanus rodgersii</i>) in Eastern Victoria using available fishery and fishery independent information. Victorian Fisheries Authority Science Report Series No. 10”	VFA



**Eastern Zone Abalone
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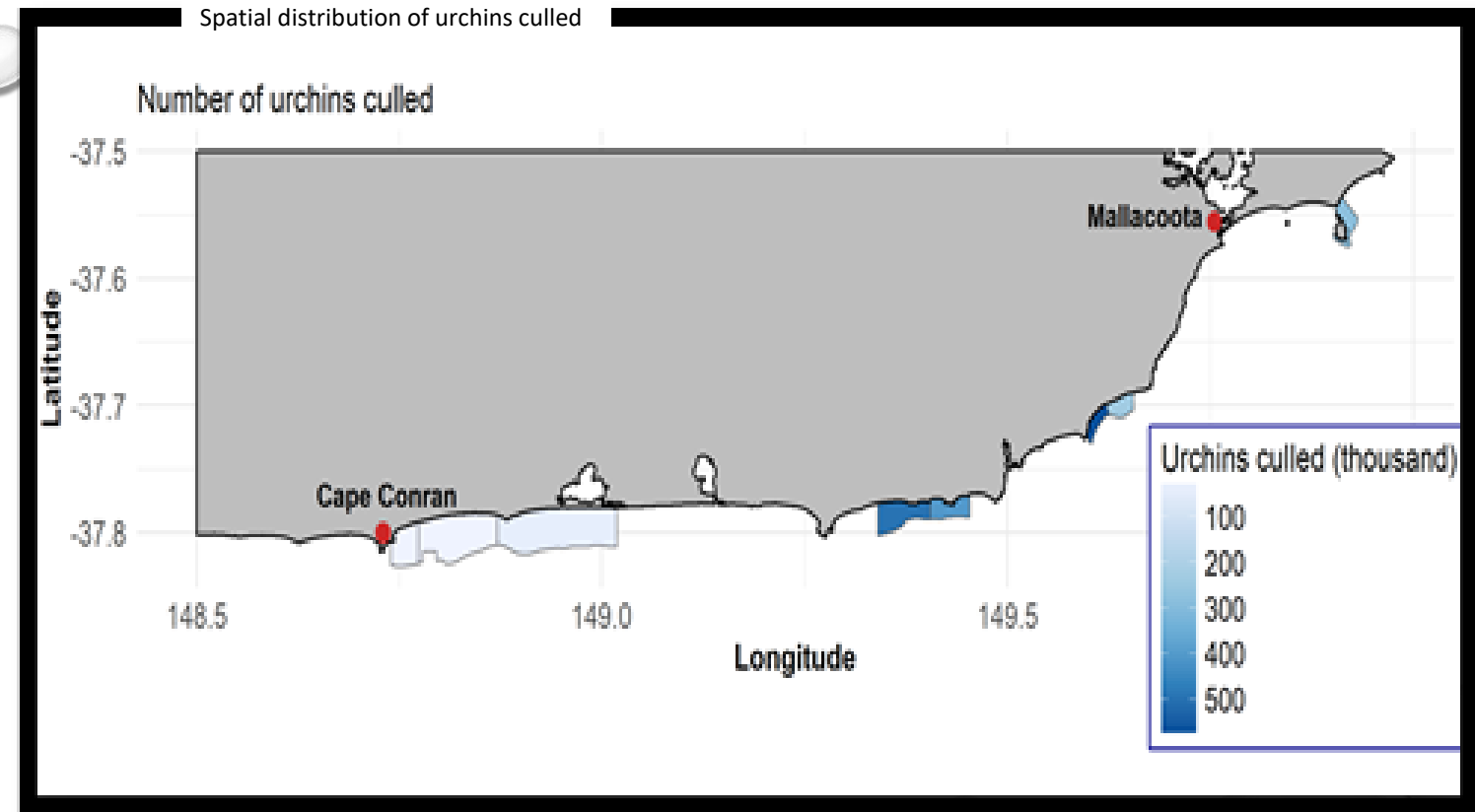
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No. Reef		Area (ha)	Years	Climate-related marine invasive species Submission 4 - Attachment 1		Cost	\$/ha	Status / Control
				Dive hrs	Urchins Culled			
1	Island Point	11.54	2011 - 2014	273	401,400	\$66,200	\$5,736	Harvest subsidy
2	SandPatchLee	14.3	2012 – 2017	361	538,500	\$101,600	\$7,104	Healthy
3	Petrel Point	17.5	2013 – 2018	294	423,600	\$96,700	\$5,525	Culling,
4	Benedore	4.2	2016 – 2018	99	166,200	\$34,400	\$8,190	Culling
5	Gabo East	5.0	2016 – 2018	67	109,200	\$22,450	\$4,490	Harvesting
6	Gabo West	2.0	2017 – 2018	44	79,200	\$10,300	\$5,150	Harvesting
7	Pearl Point	6.5	2015 – 2018	33	35,100	\$8,800	\$1,350	Targeted Harvesting
8	Yeerung	11.7	2014 -2017	23	16,300	\$6,100	\$521	Targeted Harvesting
9	East Cape	6.84	2016 – 2018	11	12,600	\$2,600	\$380	Targeted Harvesting
10	Little Rame Lee	6.0	2019	78	140,400	\$33,000	\$5,500	Harvesting
11	Tull. Island	1.5	2020	32	53,800	\$10,800	\$7,200	Culling
12	Gunshot	18.0	2018-2020	278	514,370	\$162,000	\$9,000	Maintenance culling required

Project Summary

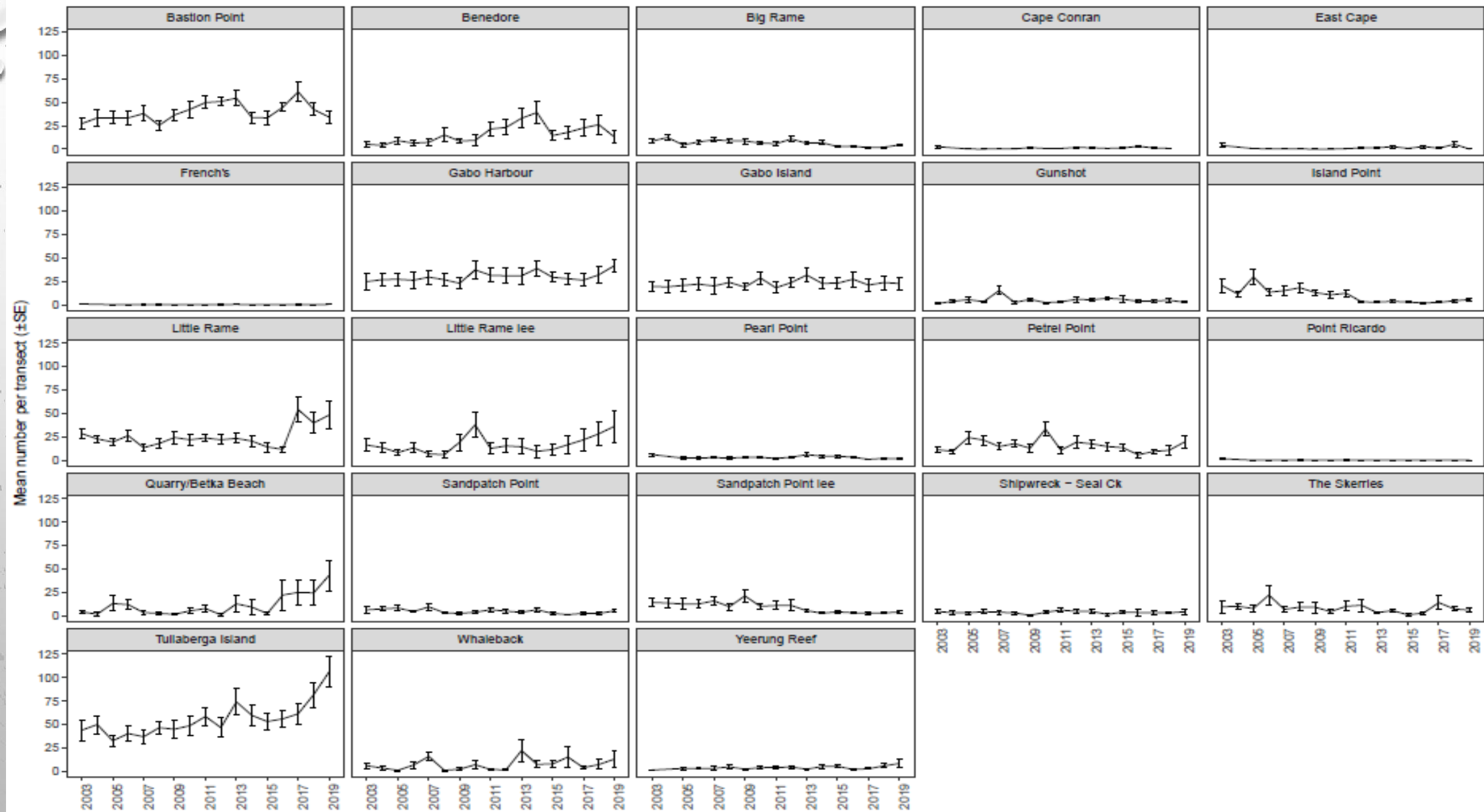
Number of Reefs:	12
Reef Area(ha):	105
Effort (Dive hrs):	1,593
No. urchins removed:	2,490,670
Tonnes urchins removed:	830
Operating costs:	\$554,950
Average cost per ha:	\$5,285
Average cost per urchin kg:	\$0.66
Average cost per urchin:	\$0.22



Case study – Island Point – before & after



VFA FIS data - urchin abundance temporal trends



Climate-related marine invasive species
Submission 4 - Attachment 1

VFA FIS data - Urchin spatial distribution

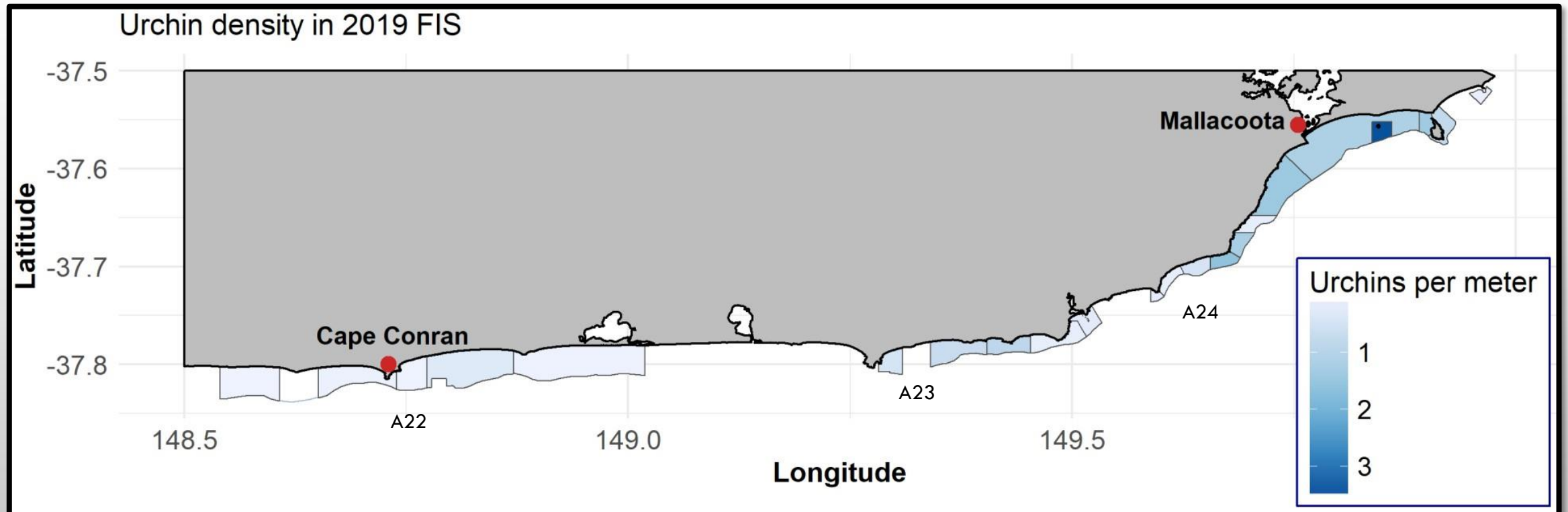


Figure 1: Black urchin density in each Eastern Zone Reef Code during the 2019 Fishery Independent Surveys



VFA FIS data - Urchin abundance temporal trends, culled VS un-culled reefs

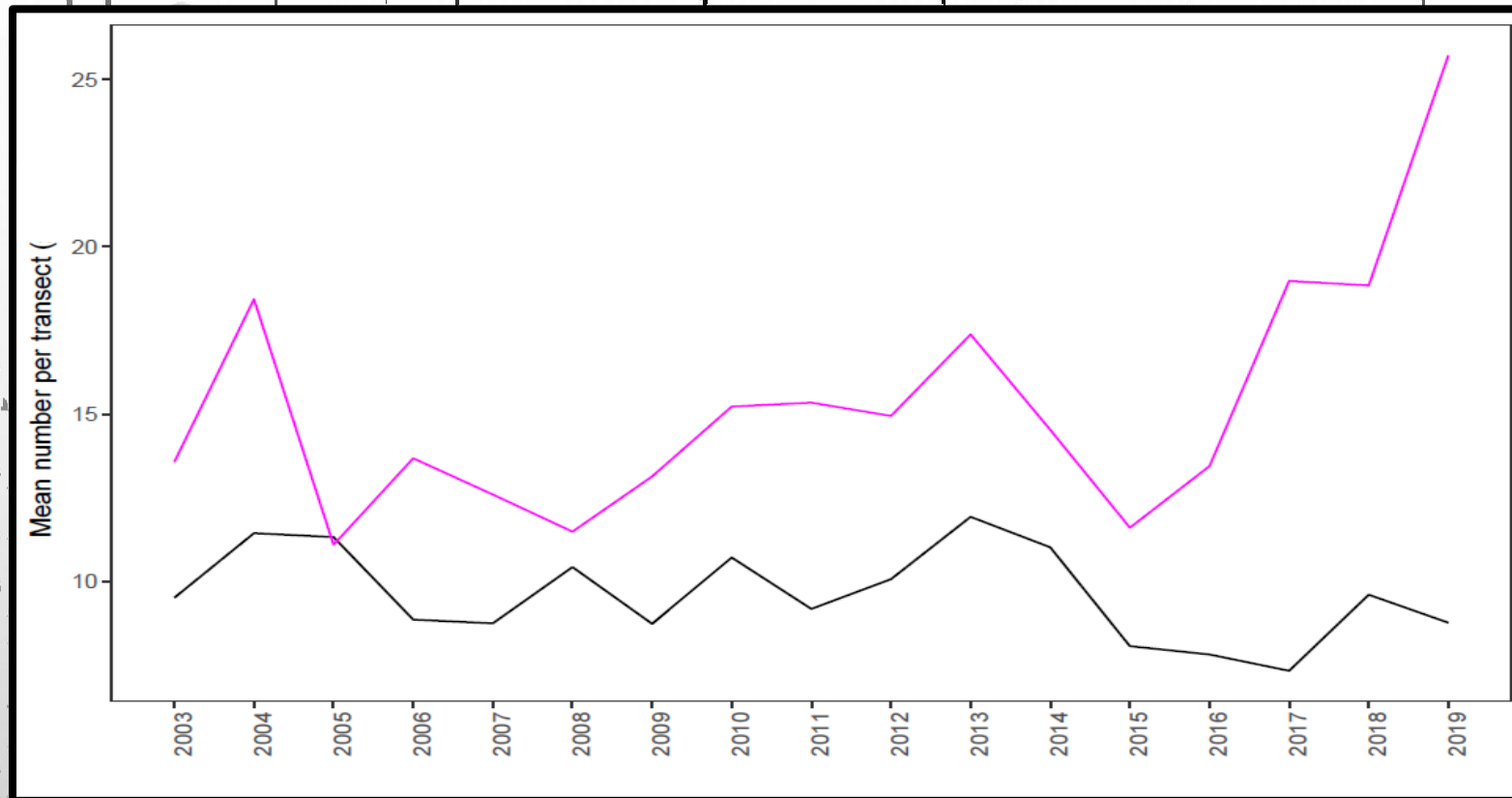


Figure 11: Zone wide temporal trends in urchin abundance on culled (black) and un-culled (magenta) reefs.

VFA data - Commercial urchin harvesting, annual catches

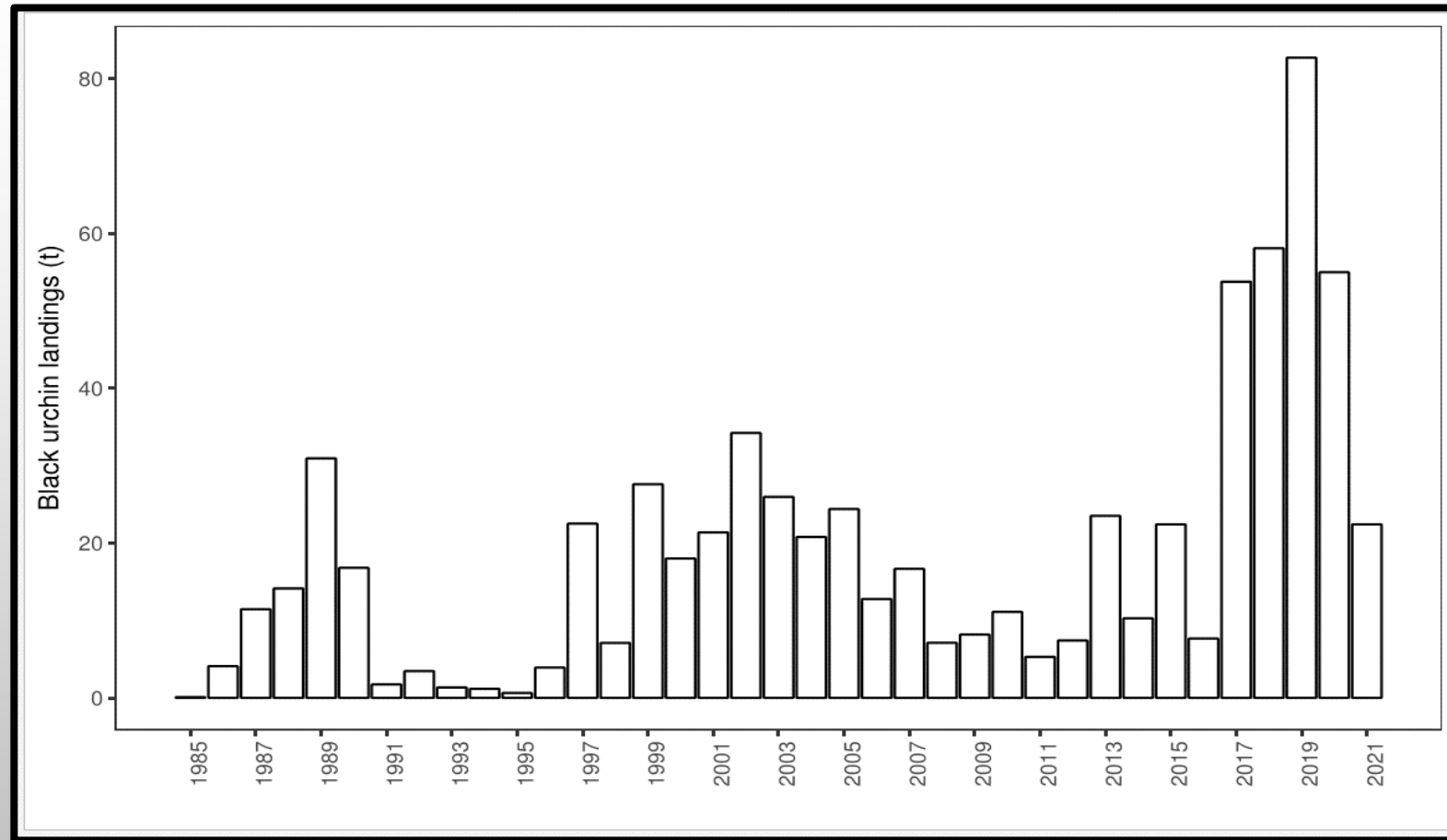
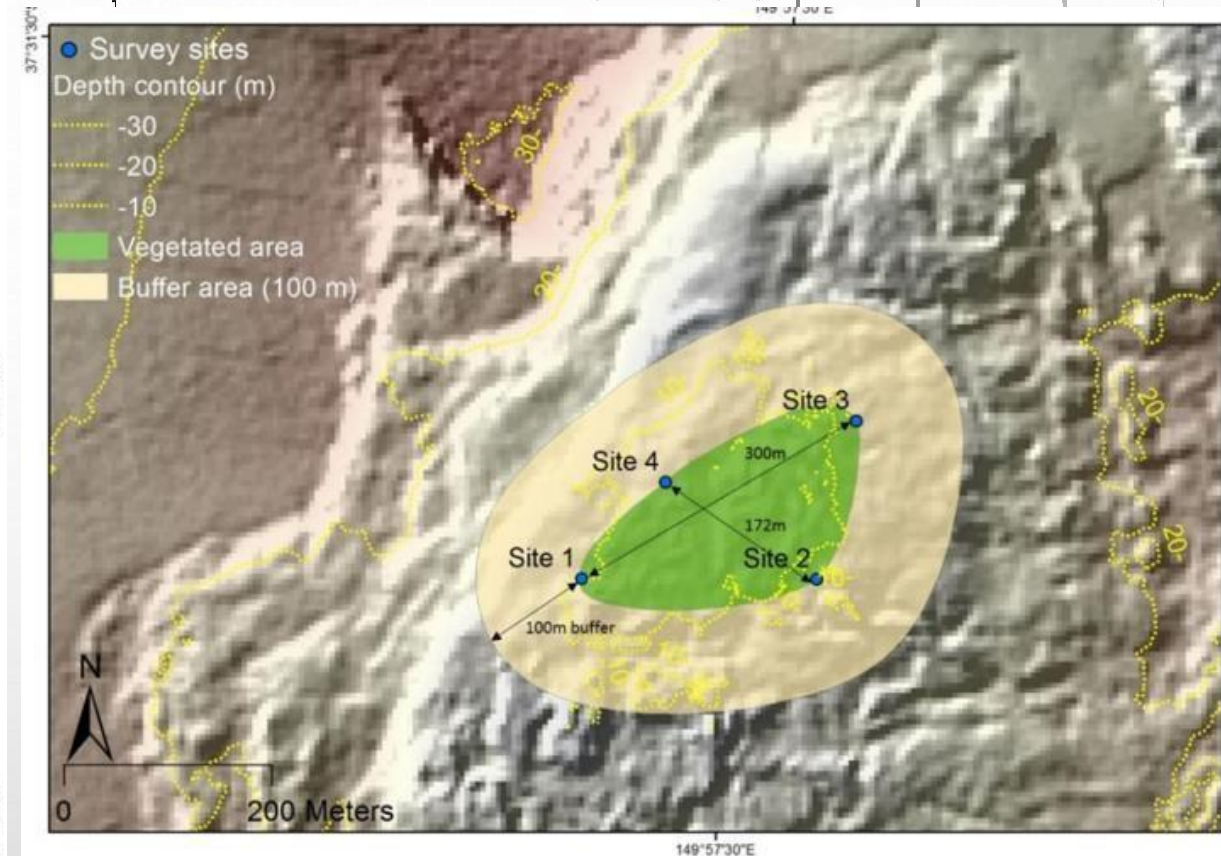
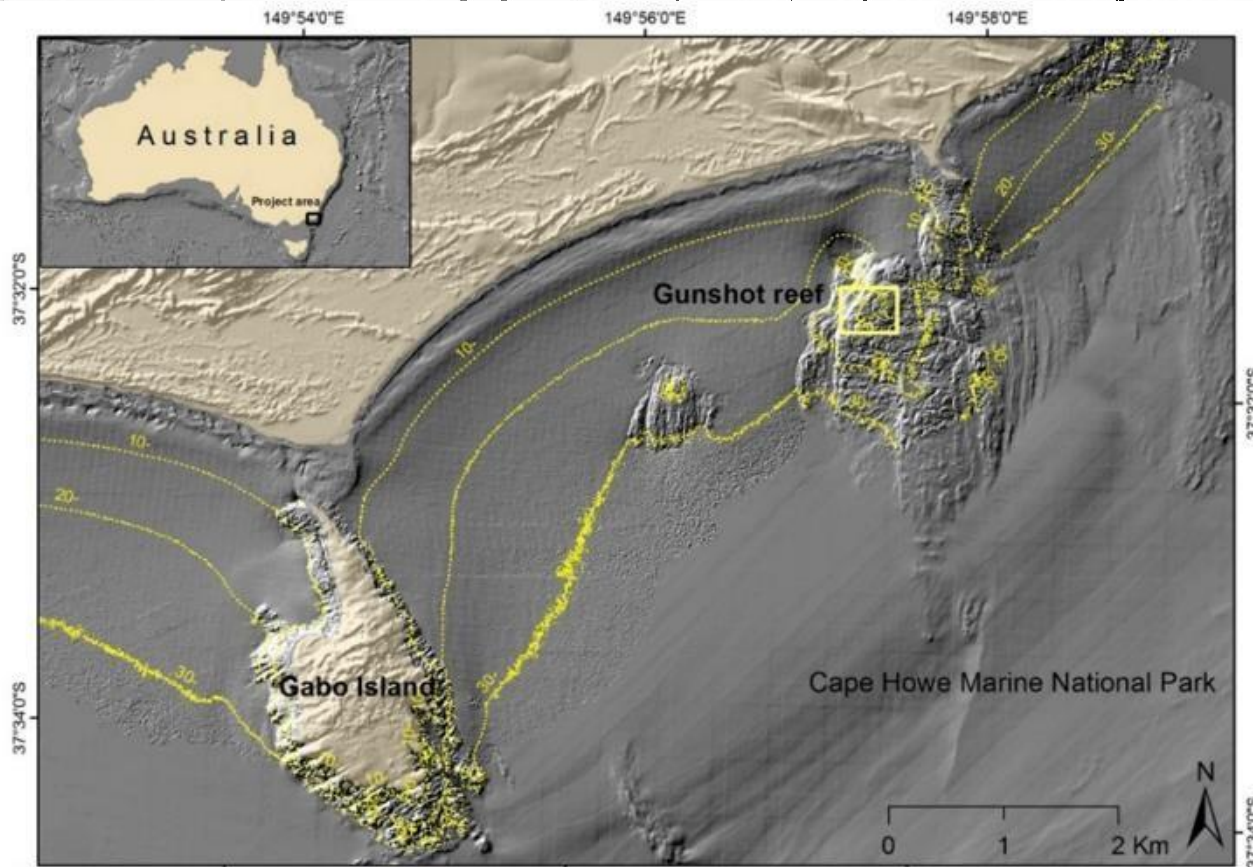


Figure 2: Landings of black urchins from the Eastern Zone.



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Case Study - Gunshot Reef - Survey design

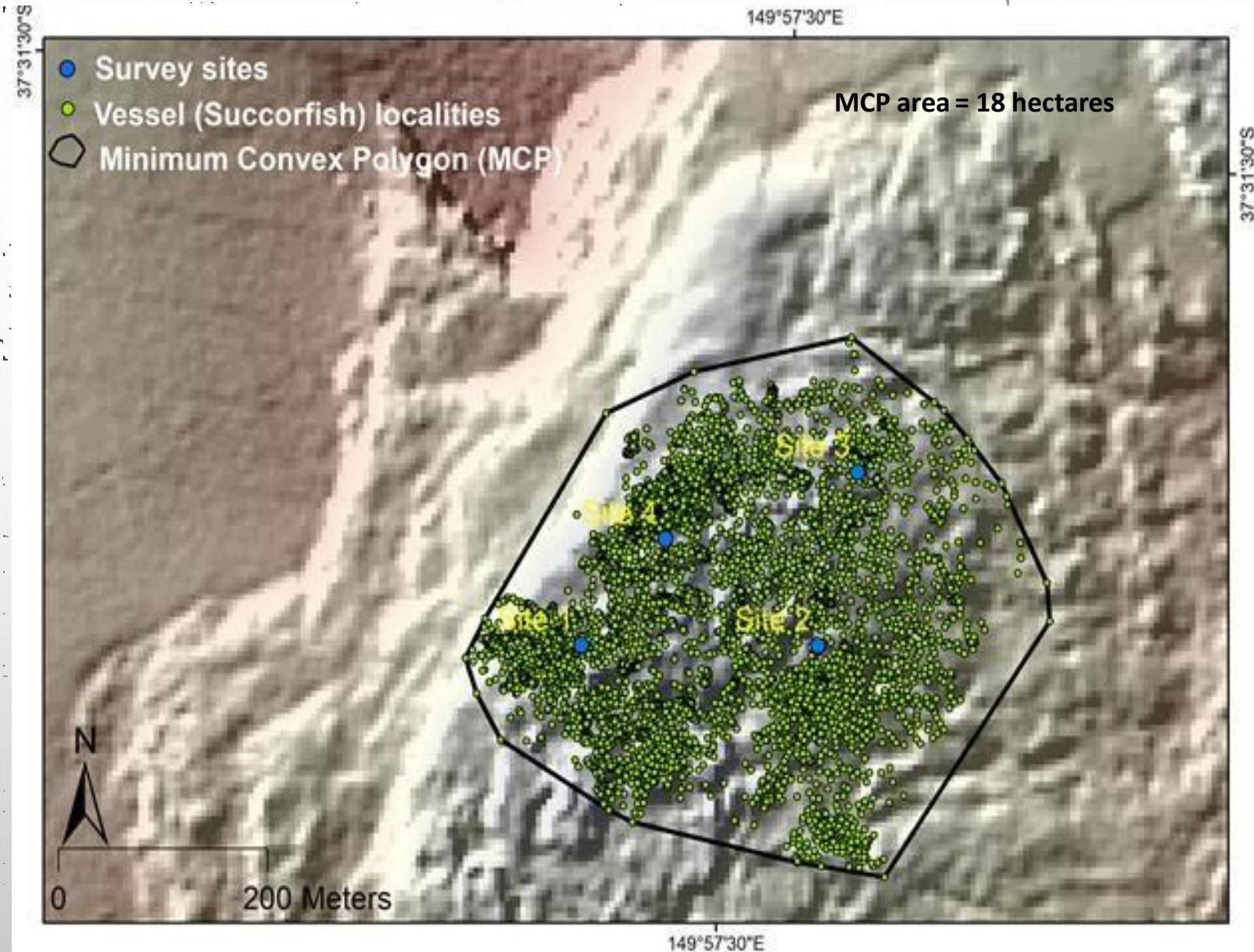


- Inshore/offshore 25m belt transects + video (abalone/urchin counts)
- Timed swim urchin collection
- 100m vertical video (25 images, 25 points, 5000 habitat classifications)
- VMS – 15 minute intervals

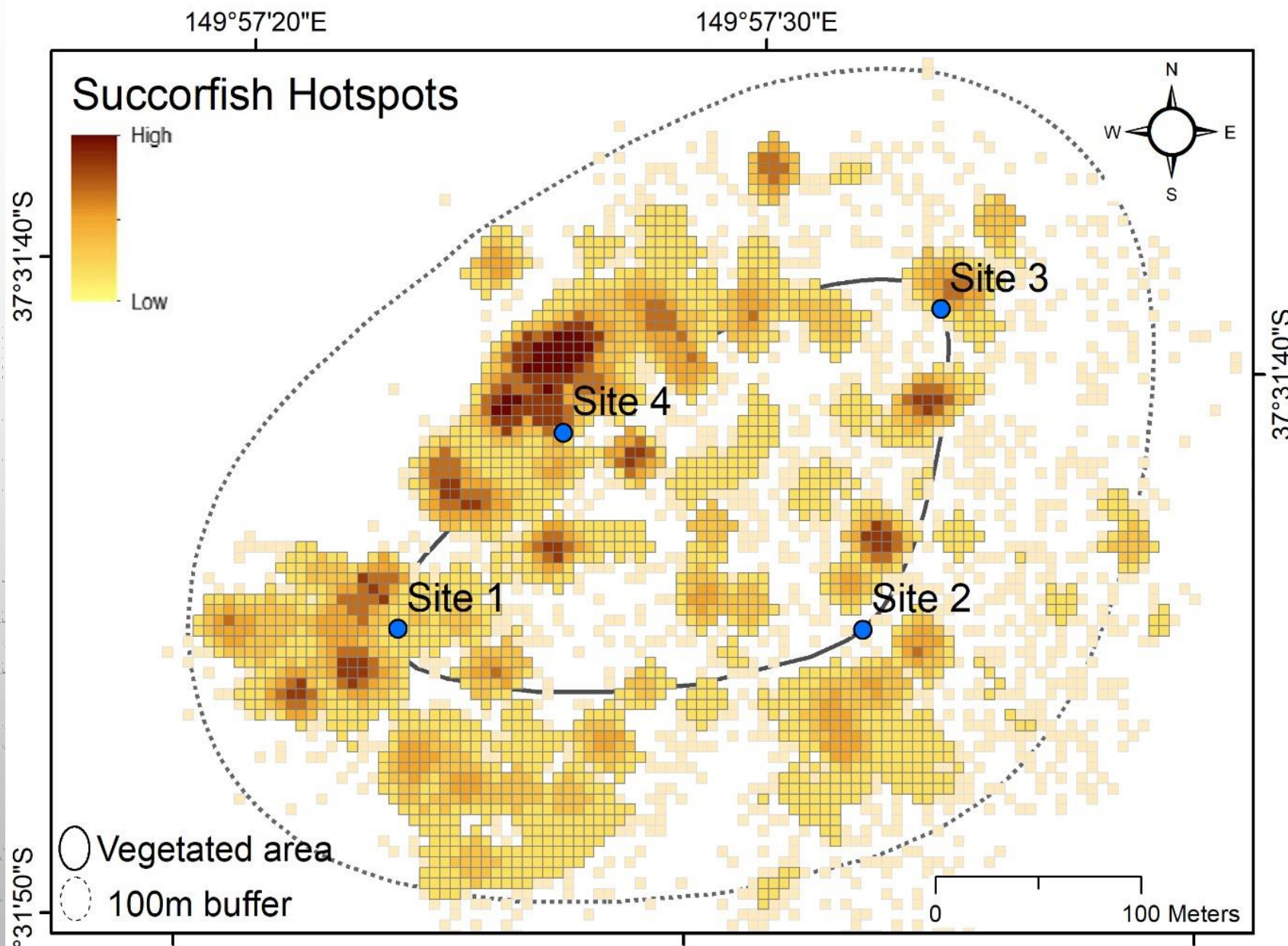
Case study - Gunshot Reef - Culling effort

Climate-related marine invasive species
Submission 4 Attachment 1

Dive date	Number of vessels	Number of divers	Dive time (hours)	Urchins removed (count)
19/04/2019	4	8	17	37500
20/04/2019	2	3	9	16000
24/04/2019	2	4	12	28100
22/05/2019	5	7	12	29500
23/05/2019	5	7	21	34500
24/05/2019	6	8	18	40000
25/05/2019	4	8	21	45500
5/07/2019	5	8	8	10200
7/07/2019	4	8	15	18000
17/12/2019	3	6	16	29600
28/03/2020	8	10	27	48720
30/03/2020	9	10	28	54100
31/03/2020	9	10	27	48900
1/04/2020	10	11	29	52450
28/11/2020	3	6	18	21300
Total	79	114	278	514370

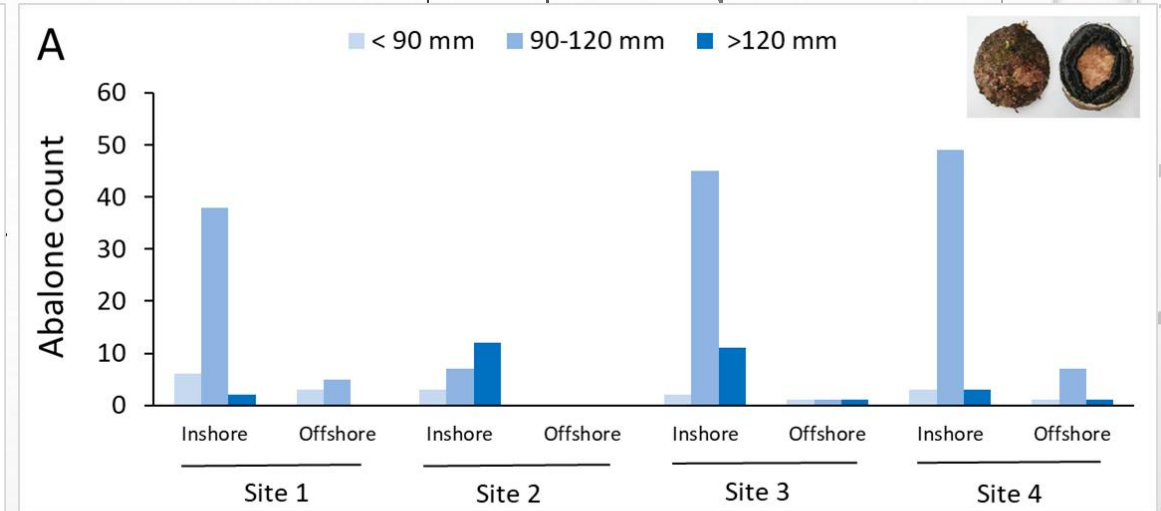
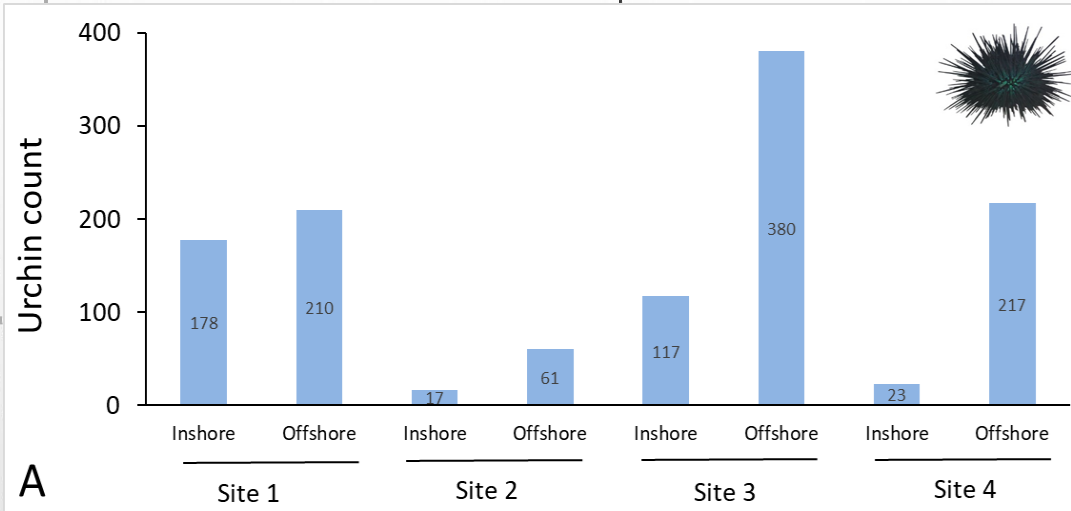


Case study - Gunshot Reef - Culling effort distribution

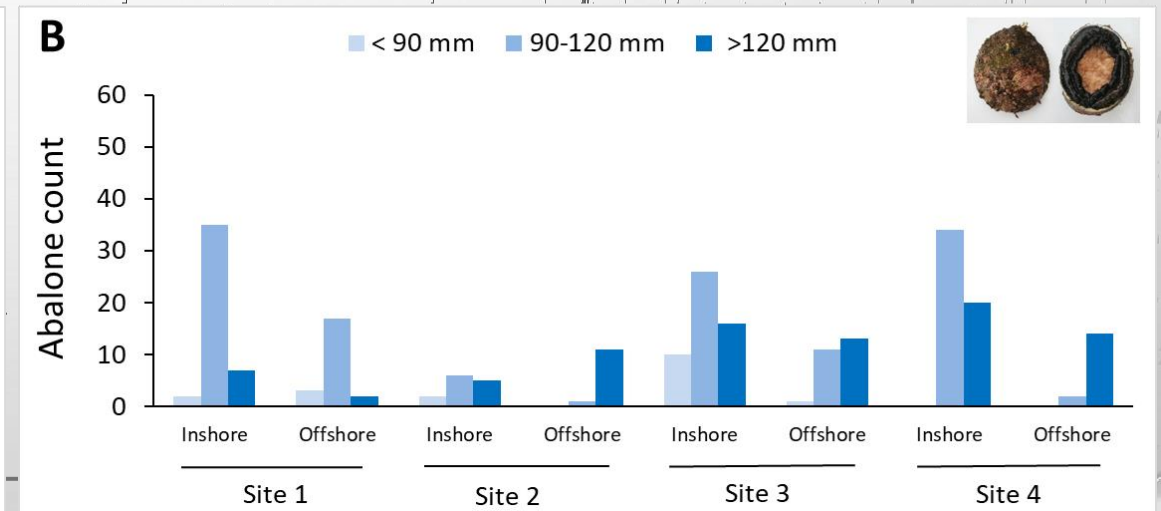
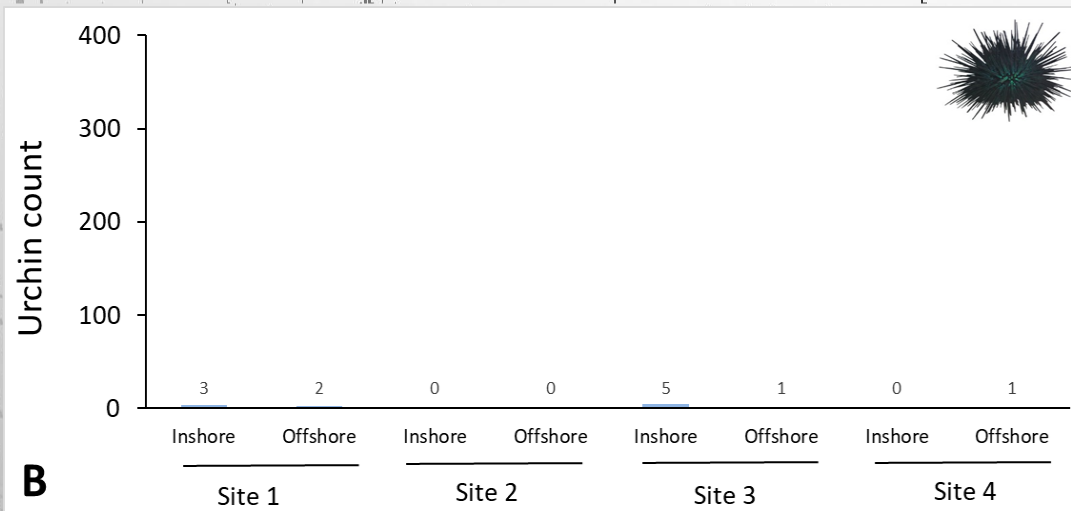


Case study - Gunshot Reef - changes in abalone & urchin abundance.

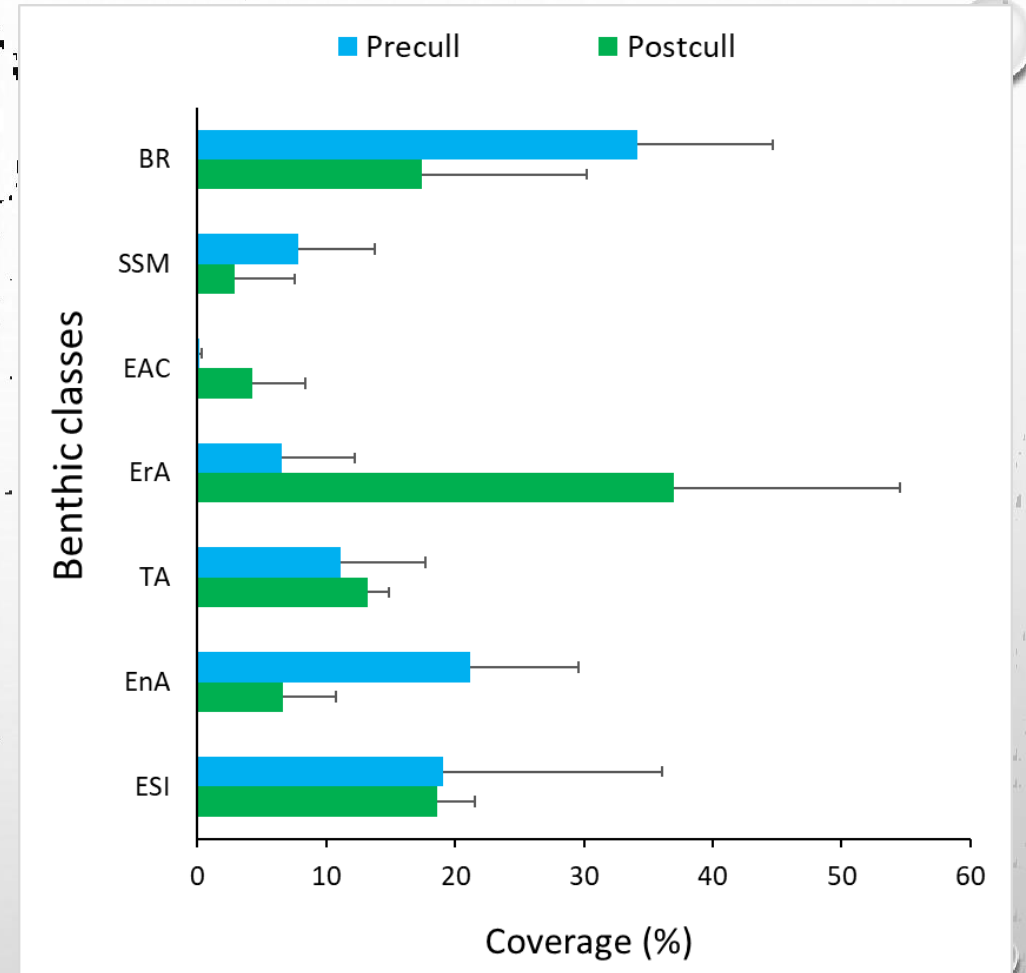
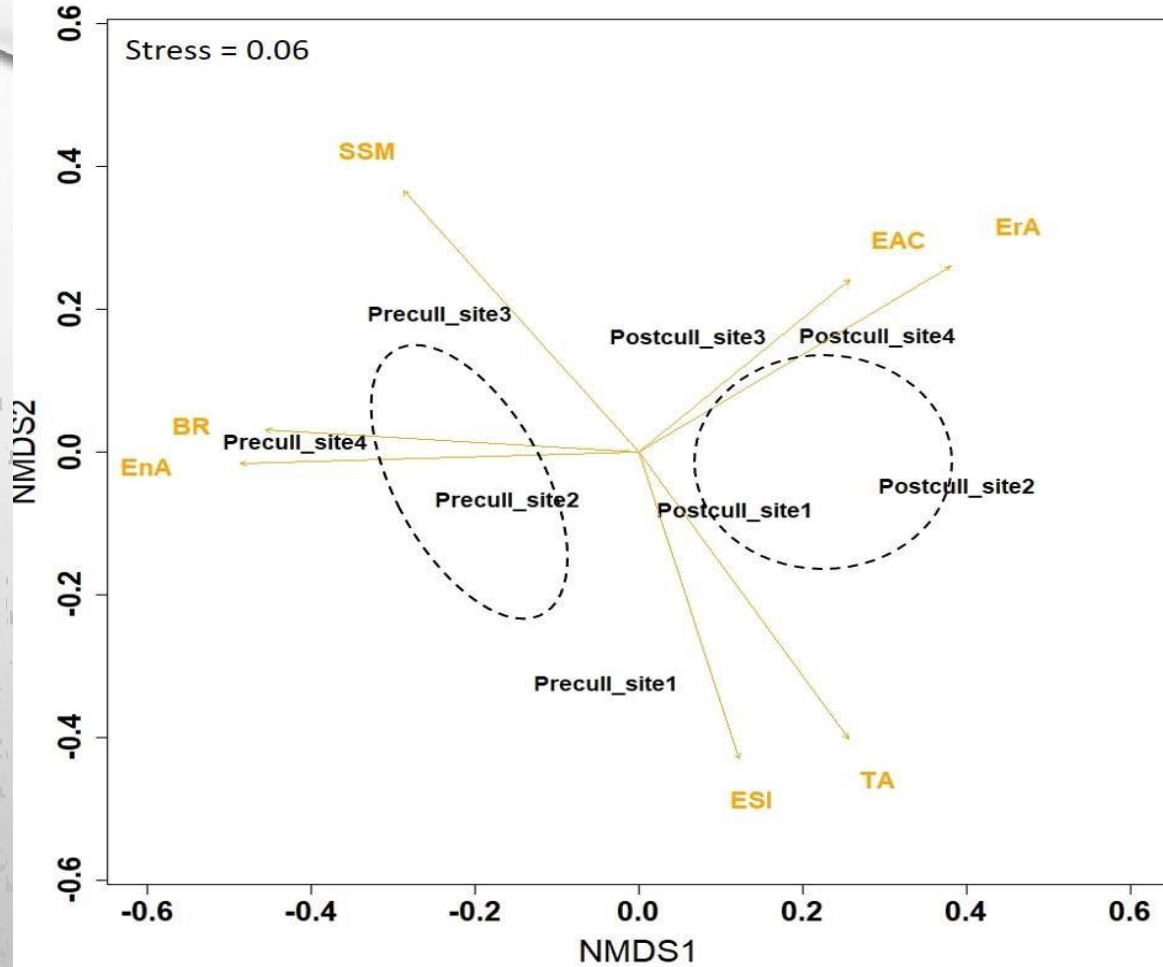
Precull



Postcull



Case study - Gunshot Reef - changes in benthic communities.



BR = bare rock

EnA = encrusting algae

SSM = sand/silt matrix

TA = turfing algae

ErA = erect algae (i.e. kelp)

ESI = encrusting and sessile invertebrates (e.g. sponges)

EAC = encrusting and articulate coralline

Case study - Gunshot Reef - the state of the reef at completion.



- Generally very successful at decreasing urchin density, facilitating recovery
- Algae (i.e. *Ecklonia radiata*) grows slowly
- It takes a long time to fully recover – especially reef complexity
- Important to maintain low urchin density until erect algae establishes
 - Maintenance to ensure full recovery
 - Future surveys to realise full benefit

- 114 diver days
- 278 hours of bottom time
- >514,000 urchins eradicated
- ~28,500 urchins per hectare
- \$9,385 per hectare (in-kind not included)
- 25% of time on healthy habitat, 75% on barrens



Climate-related marine invasive species
Submission 1 - Attachment 1

PROPOSED PROGRAM 2022/23

Objectives

- Gunshot - continue culling to suppress urchins and allow habitat to fully recover.
- Tullaberga (east) - complete initial cull.
- Petrel Point - resume culling due to diver reported increasing urchin abundance.
- Island Point - apply a harvest subsidy, \$1/kg to remove 10 tonnes of urchins.
- Add new areas identified by diver observations, need urgent attention.
- ARMS - re-survey March 2023.

Activity	Vessel Days	Est. Cost	Est No. Urchins
ARMS March 2023	1	\$2,800	n/a
Gunshot - Cull	6	\$12,000	64,800
Tull. Island - Cull	4	\$8,000	43,200
Petrel Point - Cull	10	\$20,000	108,000
Island Pt - harvest subsidy	n/a	\$10,000	30,000
Benedore / Little Rame Cull	10	\$20,000	108,000
Mueller (inside reef) - Cull	3	\$6,000	32,400
Whaleback - Cull	10	\$20,000	108,000
Administration	20%	\$21,200	n/a
Totals	46	\$120,000	494,400



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